DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Parts 21 and 36

[Docket No. FAA–2000–7587; Notice No. 00–08]

RIN 2120–AH03

Noise Certification Standards for Subsonic Jet Airplanes and Subsonic Transport Category Large Airplanes

AGENCY: Federal Aviation Administration, DOT.

ACTION: Notice of Proposed Rulemaking (NPRM).

SUMMARY: The FAA is proposing changes to the noise certification standards for subsonic jet airplanes and subsonic transport category large airplanes. These proposed changes are based on the joint effort of the Federal Aviation Administration (FAA), the European Joint Aviation Authorities (JAA), and Aviation Rulemaking Advisory Committee (ARAC), to harmonize the U.S. noise certification regulations and the European Joint Aviation Requirements (JAR) for subsonic jet airplanes and subsonic transport category large airplanes. These proposed changes would provide nearly uniform noise certification standards for airplanes certificated in the United States and in the JAA countries. The harmonization of the noise certification standards would simplify airworthiness approvals for import and export purposes.

DATES: Comments must be received on or before October 10, 2000.

ADDRESSES: Address your comments to the Docket Management System, U.S. Department of Transportation, Room Plaza 401, 400 Seventh Street, SW., Washington, DC 20590–0001. You must identify the docket number FAA–2000–7587 at the beginning of your comments, and you should submit two copies of your comments. If you wish to receive confirmation that FAA received your comments, include a self-addressed, stamped postcard.

You may also submit comments and you may review public dockets through the Internet at http://dms.dot.gov. You may review the public docket containing comments to these proposed regulations in person in the Dockets Office between 9:00 a.m. and 5:00 p.m., Monday through Friday, except Federal holidays. The Dockets Office is on the plaza level of the NASSIF Building at the Department of Transportation at the above address.

FOR FURTHER INFORMATION CONTACT: James Skalecky, AEE–100, Office of Environment and Energy (AEE), Federal Aviation Administration, 800 Independence Avenue, SW., Washington, DC 20591; telephone (202) 267–3699; facsimile (202) 267–5594; or email at james.skalecky@faa.gov.

SUPPLEMENTARY INFORMATION:

Comments Invited

Interested persons are invited to participate in this rulemaking by submitting written comments, data, views, or arguments. Comments on the possible environmental, economic, and federalism or energy related impact of the adoption of this proposal are welcomed.

Comments should carry the regulatory docket or notice number and should be submitted in triplicate to the Rules Docket address specified above. All comments received and a report summarizing any substantive public contact with FAA personnel on this rulemaking will be filed in the docket. The docket is available for public inspection both before and after the closing date for receiving comments.

Before taking any final action on this proposal, the Administrator will consider the comments made on or before the closing date for comments, and the proposal may be changed in light of the comments received.

The FAA will acknowledge receipt of comments if commenters include a self-addressed, stamped postcard with the comments. The postcards should be marked ''Comments to Docket No. FAA–2000–7587.'' When the comments are received by the FAA, the postcards will be dated, time stamped, and returned to the commenters.

Availability of the NPRM

An electronic copy of this document may be downloaded using a modem and suitable communications software from the FAA regulations section of the FedWorld electronic bulletin board service (telephone: (703) 321–3339) or the Government Printing Office (GPO)'s electronic bulletin board service (telephone: (202) 512–1661).

Internet users may reach the FAA's web page at http://www.faa.gov/avr/arm/nprm/nprm.htm or the GPO's web page at http://www.access.gpo.gov/nara for access to recently published rulemaking documents.

Any person may obtain a copy of this document by submitting a request to the Federal Aviation Administration, Office of Rulemaking, ARM–1, 800 Independence Avenue SW., Washington, DC 20591, or by calling (202) 267–9680. Communications must identify the notice number or docket number of this NPRM.

Persons interested in being placed on the mailing list for future rulemaking documents should request from the above office a copy of Advisory Circular No. 11–2A, Notice of Proposed Rulemaking Distribution System, which describes the application procedure.

Background

Current Regulations

Under 49 U.S.C. 44715, the Administrator of the Federal Aviation Administration is directed to prescribe ''standards to measure aircraft noise and sonic boom; . . . and regulations to control and abate aircraft noise and sonic boom.'' Part 36 of Title 14 of the Code of Federal Regulations (part 36) contains the FAA's noise standards and regulations that apply to the issuance of type certificates for all types of aircraft. Subparts A, B and C and appendices A, B and C of part 36 contain the requirements and standards that apply to subsonic jet airplanes and subsonic transport category large airplanes. Appendices A, B and C of part 36 specify the test conditions, procedures, and noise levels necessary to demonstrate compliance.

Government and Industry Cooperation

In June 1990 at a meeting of the Joint Aviation Authorities (JAA) Council, which consists of JAA members from European countries and the FAA, the FAA Administrator committed the FAA to support the harmonization of the U.S. regulations with the Joint Aviation Regulations (JAR). The Joint Aviation Regulations are being developed for use by the European authorities that are member countries of the JAA.

In January 1991, the FAA established the Aviation Rulemaking Advisory Committee to serve as a forum for the FAA to obtain input from outside the government on major regulatory issues facing the agency. The FAA has tasked ARAC with noise certification issues. These issues involve the harmonization of part 36 with JAR 36, the harmonization of associated guidance material including equivalent procedures, and interpretations of the regulations. On October 17, 1995, the ARAC established the FAR/JAR Harmonization Working Group for Subsonic Transport Category Large Airplanes and Subsonic Turbojet Powered Airplanes (60 FR 53824). The working group task included reviewing the applicable provisions of subparts A, B, and C, and appendices A, B, and C of part 36, and harmonizing them with the corresponding applicable provisions of JAR 36. The working group was asked to consider the current international standards and recommended practices, as issued under International Civil Aviation Organization (ICAO), Annex 16, Volume 1, and its associated Technical Manual, as the basis for development of these harmonization proposals. A recommendation for amending part 36 was forwarded to the ARAC. After due consideration including a meeting open to the public on May 18, 2000, this recommendation agreed to by ARAC was forwarded, in the form of a draft NPRM, to the FAA for consideration.

Synopsis of the Proposal

Part 36 contains noise standards for aircraft type and airworthiness certification. Subparts A, B, and C, and the related appendices A, B, and C, of part 36 prescribe noise levels and test procedures for subsonic jet airplanes and subsonic transport category large airplanes, including rules governing the issuance of original, amended, or supplemental type certificates.

This notice of proposed rulemaking includes changes to part 36 in three major categories. First, there are substantive changes to technical material, such as proposing a revised method for demonstrating the lateral noise certification level for propeller-driven large airplanes. These changes are discussed individually in this preamble. Second, there are many proposed changes to regulatory text that would serve to minimize the language differences between part 36 and JAR 36, while having no substantive effect on the regulatory standards of part 36. These text changes are not specifically discussed in this preamble Third, there are numerous proposed changes to the section designations of current Appendices A, B, and C of part 36 that would more closely align part 36 and JAR 36 formats. Changes in this category would have no substantive effect on the regulatory standards of part 36. The changes in part 36 appendices designation are shown in a tabular format that identifies current part 36 appendices sections and the corresponding section of the proposed revision. This redesignation table appears at the end of the section-by-section discussion.

Section-by-Section Discussion

The following is a section-by-section discussion of the proposed amendments that will cover the substantive changes being proposed for the regulatory standards of part 36 and its appendices. Sections that are proposed for redesignation, but not substantively changed, will not be discussed, but will appear only in the redesignation table that follows the section-by-section discussion. Throughout the proposed amendment, the term ''jet'' has been used when referring to turbojet and turbofan engines. This would change the terminology in current part 36, which uses the term ''turbojet'' when referring to both turbojet and turbofan engines. This change would result in the same terminology usage by both part 36 and JAR 36, when referring to turbojet and turbofan engines.

Section 36.1

The FAA is proposing to remove § 36.1(d)(3). This section should have been removed by Amendment 36–10 (43 FR 28406, June 29, 1978), which redesignated § 36.1(d)(3) as § 36.1(d)(1)(iii).

In § 36.1(f)(1), the terms ''takeoff'' and ''sideline'' are proposed to be replaced with the terms ''flyover'' and ''lateral'', respectively. This change would harmonize the terminology based on the international standard.

Section 36.2

Section 36.2, ''Special retroactive requirements'' would be removed. Section 36.2 requires that the noise certification applicant show compliance to the part 36 amendment that is in effect on the date of certification. This requirement was included in part 36 when the FAA did not have the authority to prevent the issuance of a type certificate for an aircraft for which available and reasonable noise reduction design practices had not been incorporated. The FAA subsequently received this authority under the Noise Control Act of 1972; the retroactive requirement contained in § 36.2 is no longer necessary. This change would harmonize the applicability designation of part 36 with that contained in § 1.7 of ICAO annex 16, Chapter 1. In conjunction with the proposed removal of the special retroactive requirements of part 36 § 36.2, this notice proposes changes to §§ 21.17 and 21.101(a) of part 21 of this chapter to remove references to part 36 that are contained in these sections of part 21.

Section 36.6

The FAA proposes to add five specifications to the incorporated matter under § 36.6. These specifications are referred to under proposed section A36.3, which would update requirements for measurement and analysis systems to address the latest standards and equipment technology. Updated addresses for the International Electrotechnical Commission, American National Standards Institute, and FAA Regional Headquarters are also included in proposed § 36.6.

Sections 36.101 and 36.103

Two sections, 36.101, Noise measurement, and 36.103, Noise evaluation, would be replaced with a new § 36.101, Noise measurement and evaluation. The proposed § 36.101 reflects the proposal to combine the material contained in current Appendix A and Appendix B into proposed Appendix A. This proposed change would more closely align part 36 and JAR 36 formats without any substantive effect. Also for the purpose of aligning the formats of part 36 and JAR 36, the FAA proposes to redesignate § 36.201 as § 36.103. Current subpart C would be reserved.

Appendix A—Aircraft Noise Measurement and Evaluation Under § 36.101

The proposed Appendix A to part 36, Aircraft Noise Measurement and Evaluation under § 36.101, would replace current Appendix A, Aircraft Noise Measurement under § 36.101, and Appendix B, Aircraft Noise Evaluation under § 36.103. The harmonization objective is to develop seamless part 36 and JAR 36 regulations that reflect ICAO Annex 16 to the extent possible. The text of JAR 36, Appendix A, is essentially a copy of Annex 16, Appendix 2. The proposed Appendix A to part 36 was developed with the intent of maintaining a section format consistent with JAR 36, Appendix A and ICAO Annex 16, Appendix 2.

Appendix A36.1 Introduction

A new section A36.1.2 would be added to state that the noise certification instructions and procedures given are intended to ensure uniform results and to permit comparison between tests of various types of aircraft conducted in various geographical locations.

Appendix A36.2 Noise Certification Test and Measurement Conditions

Proposed section A36.2 would replace current section A36.1. This proposed section describes the conditions under which noise certification testing would be conducted and the measurement procedures that would be required.

Under the proposal, current section A36.5(e)(4), that addresses the use of equivalent procedures, would be deleted. The key requirement of the section, that equivalent procedures must be FAA-approved, is already addressed in the regulatory text of § 36.101. Additional information on the use of equivalent procedures would be provided in the note contained in section A36.2.1.1. Therefore, section A36.5(e)(4) would be deleted since its content would be addressed in § 36.101.

A note in section A36.2.1.1 would reference the guidance material on the use of equivalent procedures contained in Advisory Circular 36–4C, ''Noise Standards: Aircraft Type and Airworthiness Certification''. Current AC36–4B, ''Noise Certification Handbook'', contains guidance material on the use of equivalent procedures. AC36–4B will be revised and significantly changed in format and content, and will be designated AC36–4C, ''Noise Standards: Aircraft Type and Airworthiness Certification.'' The FAA intends to issue the new AC36–4C concurrently with the final rule that results from this notice. The AC36–4C is referred to as ''the current Advisory Circular for this part'' throughout the proposed regulatory text in order to avoid the need for formal rulemaking any time the Advisory Circular is revised. Throughout this preamble, however, the Advisory Circular is referred to as Advisory Circular 36–4C.

Most of proposed section A36.2 is moved from sections A36.1, A36.5 and A36.9. Under the proposal, the material in current section A36.1(c)(1) would be moved to proposed section A36.2.2.2(a) and revised to remove the word ''rain'', since rain is included in the term ''precipitation.'' The material in section A36.1(c)(2) would be moved to proposed section A36.2.2.2(b) and the minimum test temperature limit decreased from 36 °F (2.2 °C) to 14 °F (−10 °C). The current 36 °F (2.2 °C) temperature limit is considered unnecessarily restrictive, given that no higher levels of atmospheric absorption, compared with those existing in the current test window, could be encountered by lowering the test day temperature. Under this revised minimum test temperature limit, testing would still be required to be conducted in conformance with the operational temperature limit for the noise measuring equipment being used.

Proposed section A36.2.2.2(c), does not contain the current section A36.1(c)(3) provision that permits expanded atmospheric attenuation rates when the dew point and dry bulb temperatures used for obtaining relative humidity are measured with a device which is accurate to within ±0.5 °C. This allowance for expanded atmospheric attenuation rates is already permitted as an equivalent procedure by AC36–4B, and will continue to be permitted as an equivalent procedure in the revision to AC36–4B (i.e., AC36–4C). The result would be no change in the allowance of expanded atmospheric attenuation rates. This change is proposed to meet the harmonization objective to more closely align part 36 and JAR 36 formats.

The requirement to obtain meteorological measurements within ''25 minutes'' of each noise test measurement as required in current section A36.9(b)(3) would be changed to ''30 minutes'' in proposed section A36.2.2.2(g). Thirty minutes is the established international standard in ICAO Annex 16. The FAA was unable to find a technical reason why the meteorological measurement time was originally set at 25 minutes. Based on technical and application considerations, an increment of 5 minutes does not constitute a substantive difference. No known technical criteria exist with which to assess this minimal time increment. This change is being proposed to achieve harmonization by adopting a single international standard.

Current section A36.9(d)(3) would be revised and moved to section A36.2.2.3. This amendment would change the method used to establish layer depth to a single international standard. Part 36 does not provide specific criteria for determining layer depth, except to require that it be no greater than 100 ft. The proposed criteria for determining layer depth is the same as that used to specify the onset of required layering, i.e. under weather conditions where the atmospheric attenuation rate changes by more than +/−1.6 dB/1000 ft (+/−0.5 dB/100m) over the sound propagation distance. Under this proposal, the minimum layer depth would be established as 100 feet (30 meters). Thus, the layer depth would be 100 feet (30 meters) in cases where the atmospheric rate change criteria would limit the layer depth to less than 100 feet (30 meters).

Section A36.3 Measurement of Aircraft Noise Received on the Ground

The proposed changes to this section are intended to update the requirements for measurement and analysis systems to address the latest standards and equipment technology. The changes were drafted by an international task group, that has years of knowledge and experience in the noise certification of airplanes, and was assembled to update the ICAO Annex 16 requirements for measurement and analysis systems. The proposed changes in section A36.3 incorporates the international task group's recommendations, which were agreed to by Working Group 1 of the ICAO Committee on Aviation Environmental Protection (ICAO/CAEP). Further, the proposed changes are intended to harmonize with the international standard, Annex 16. The primary purpose of this work was to address considerations related to the use of digital equipment. Many of these considerations are addressed in the International Electro-Technical Commission (IEC) Standard 61265 and IEC Standard 61260. Accordingly, much of the pertinent text from these standards has been included in the requirements developed by the international task group. These IEC standards also reflect general improvements to instrumentation technology that have occurred over the past decade, although they are not necessarily related to the advent of digital technology. In addition to improvements tied to the IEC standards, several changes that resulted from the work of the task group are linked to general advancements in noise measurement instrumentation overall.

Proposed section A36.3 includes the following specific changes to current section A36.3. Current section A36.3 does not include definitions. Section A36.3.1, Definitions, would be added to define the terms used in proposed section A36.3. Under the proposal, section A36.3.2, Reference environmental conditions, would be added for specifying the performance of a measurement system.

Section A36.3.3.2 would specify anti-alias requirements for measurement systems that include analog to digital signal conversion.

Proposed section A36.3.4.1 would add a requirement that windscreen insertion loss not exceed ±1.5 dB. In addition, proposed section A36.3.9.10 would specify allowable changes in windscreen insertion loss.

Proposed sections A36.3.5.3 and A36.3.5.4 would specify microphone sensitivity requirements only at the midband frequencies. This is a simplification of the current part 36 requirement contained in sections A36.3(c)(2)(ii) and A36.3(c)(2)(iii). Sections A36.3.5.3 and A36.3.5.4 would also specify more stringent tolerances on microphone sensitivity. Typical microphones that are currently used in part 36 noise certification testing comply with this more stringent microphone sensitivity requirement.

Proposed section A36.3.6.3 would add a tolerance for frequency response of the measurement system.

For analog tape, proposed section A36.3.6.4 would add a ±0.5 dB tolerance for amplitude fluctuations of a recorded 1 kHz signal.

Proposed section A36.3.6.5 would add a tolerance for amplitude linearity, at several specific frequencies, for the measurement system (exclusive of the microphone.)

Proposed section A36.3.6.6 would require that the electronic signal level corresponding to the calibration sound pressure level be from 5 dB to 30 dB less than the upper boundary of the measurement system level range. A similar requirement in current part 36, section A36.(c)(3)(i), is 10 dB.

Proposed section A36.3.6.8 would add a requirement for an overload indicator in the recording and reproducing system.

Proposed section A36.3.6.9 would allow for measurement system attenuators to operate in known intervals of decibel steps, rather than in equal interval steps, as in current part 36 section A36.3(b)(6).

Proposed section A36.3.7.2(e) would add a requirement that the analyzer operate in real time from 50 Hz through at least 12 kHz.

Proposed section A36.3.7.3 would specify IEC 61260 class 2 electrical performance requirements as the minimum standard for analyzers. This change updates the specifications for analyzers used in conjunction with part 36 noise certification. Proposed section A36.3.7.3 would also require that filter bandwidth adjustments be determined in accordance with IEC 61260. The IEC method requires that the adjustment be based on more frequencies than are required under current part 36.

Proposed section A36.3.7.4 would contain a correction to the slow time-weighting characteristics in current section A36.3(d)(5)(ii) and (iii). Section A36.3.7.6 would specify that the instant in time at which a slow time weighted sound pressure level is characterized should be 0.75 seconds earlier than the actual readout time. The current requirement specifies that the instant in time at which a readout is characterized must be the midpoint of the averaging period.

Proposed section A36.3.7.5 would specify a continuous exponential averaging process equation through which simulated slow weighted sound pressure levels can be obtained. Section A36.3.7.5 would also specify an equation that results in an approximation of continuous exponential averaging.

Section A36.3.7.7 would require that the analyzer resolution must be 0.1 dB or finer. The current requirement, in section A36.3(d)(7) specifies that the amplitude resolution of the analyzer must be at least ±0.25 dB.

Proposed section A36.3.9.1 would require that calibration adjustments be applied to the measured sound levels determined from the output of the analyzer; the current rule permits these calibrations to be applied within the analyzer. This change is necessary to enable the FAA to determine whether these calibration adjustments have been applied correctly.

Proposed section A36.3.9.3 would allow the free-field corrections based on grazing incidence to be applied when the sound incidence angle is within ±30 degrees of grazing incidence.

Proposed section A36.3.9.4 would require that at least 30 seconds of pink noise be recorded for analog tape recorders; the current section A36.3(e)(4)(ii) requirement is for at least 15 seconds of pink noise. This change would result in a more accurate pink noise correction and would harmonize with the international standard.

Proposed section A36.3.9.6 would require that attenuator accuracy be within 0.1 dB. Section A36.3(b)(6) currently requires that attenuator accuracy be within 0.2 dB. The proposed rule would require that calibration be checked within six months of each test series. The current rule does not specify a time period within which calibration must be checked.

Proposed sections A36.3.9.5 and A36.3.9.7 would change calibration requirements for the pink noise generator and sound calibrator to allow calibration to occur within six months preceding or succeeding the test instead of requiring it to be within the preceding six months as required by current section A36.3(e)(7).

Proposed section A36.3.9.7 would add a new calibration requirement that limits the change in output of the sound calibrator to not more than 0.2 dB, as compared to the previous calibration.

Proposed section A36.3.9.8 would allow for the use of sound calibrators other than pistonphones, as specified by current section A36.3(e)(4). Section A36.3.8.1 would specify the class 1L requirements of IEC 60942, entitled ''Electroacoustics—Sound calibrators'', as the minimum standard for the sound calibrator.

Proposed section A36.3.9.9 would add a requirement for the recording medium (*e.g.,* tape reel) to carry at least a 10-second sound pressure level calibration at its beginning and end. This proposed change would more precisely define the current section A36.3(e)(4) sound pressure level calibration requirement.

Section A36.4 Calculations of Effective Perceived Noise Level From Measured Data

To further harmonize the formats of part 36 and JAR 36, Table B–1, ''Perceived Noisiness (NOYs) as a Function of Sound Pressure Level'', referenced in current section B36.13(a) would be moved to AC36–4C. The noy values contained in Table B–1 can be calculated from the equations contained in proposed section A36.4.7.3.

A minor technical change is proposed for the Perceived Noise Level (PNL) equation in proposed section A36.4.2.1(c) (current section B36.3(c)). The more exact term 10/log 2 is replacing the rounded-off term (33.22). The difference between PNL values that are determined using the current and proposed equations is not expected to be significant.

To harmonize the formats of part 36 and JAR 36, Figure B1, ''Perceived noise level as a function of noys'', would be moved from current section B36.3(c) to AC36–4C. The perceived noise level values contained in Figure B1 can be calculated from the equations contained in proposed section A36.4.2.1(c).

Proposed section A36.4.5.2 would change the value of ''d'' from 1.0 seconds to 0.5 seconds to reflect current standard practice. Parallel changes are proposed for section A36.4.5.4 and section A36.6. This change is a text update to reflect the current practice of using 0.5 second data samples, and would have no substantive effect.

To harmonize the formats of part 36 and JAR 36, the material in section B36.5(m) addressing methods for removing the effects of tones resulting from ground plane reflections would be moved to AC36–4C.

The FAA is proposing the deletion of current section B36.9(e), which specifies the duration time interval when the value of PNLT(k) at the 10 dB-down points is 90 PNdB or less. This provision was eliminated for applications made after September 17, 1971 by Amendment 36–5 (41 FR 35053, August 19, 1976). The text permitting the use of this provision has erroneously remained in part 36.

In addition, current section B36.9(f) would also be deleted. The text contained in current section B36.9(f) was added to part 36 in Amendment 36–5 to distinguish between the procedure for determining duration for applications made before and after September 17, 1971. This distinction is no longer necessary if current section B36.9(e) is deleted as proposed.

Section A36.5 Data Reporting. Proposed section A36.5.2 would require that the data specified under section A36.5.2 be reported to the FAA in the applicant's noise certification compliance report. While current part 36 does not specifically identify a requirement for the applicant to submit a noise certification compliance report, these reports represent the standard practice that is used by applicants for submitting this information to the FAA. Proposed section A36.5.2.5 would also identify the specific airplane configuration items and engine operating parameters that must be reported. Each of these configuration items and parameters can affect the airplane noise signature. The reporting requirement for these items and parameters already exist under current section A36.5 which specifies that the aircraft configuration and engine performance parameters relative to noise generation be reported. Further, these configuration items and parameters are also included in the international standard. Their addition to part 36 would promote harmonization.

Proposed section A36.5.2.5(c) would require that the test airplane's center of gravity be reported to the FAA. Airplane center of gravity is an example of an identifying characteristic of the airplane test configuration and an item that could influence measured noise levels. Proposed section A36.5.2.5(d) would require that airbrake and propeller pitch angle also be reported. Proposed sections A36.5.2.5(e), (f), and (j) would, respectively, require reporting of whether the auxiliary power unit (APU) is operating, the status of pneumatic engine bleeds and engine power take-offs, and non-standard airplane test configurations.

Proposed section A36.5.2.5(h)(2) would require reporting of engine performance parameters specifically related to propeller-driven large airplanes.

Current section A36.5(d)(3) does not permit an effective perceived noise level (EPNL) to be computed or reported from data that more than four one-third octave bands in any spectrum within the 10 dB-down points have been excluded from the EPNL computation. This section would be removed since correction (adjustment) methods for removing the effects of ambient noise from airplane noise data must be used in lieu of excluding one-third octave bands. Proposed section A36.3.9.12 specifies the ambient noise level limitations that would require corrections (adjustments) to be made, and also references AC36–4C, which contains an acceptable procedure for removing the affects of ambient noise.

Section A36.6 Nomenclature: Symbols and Units

Under the proposal, current section A36.7, Symbols and units, would be replaced by revised section A36.6, Nomenclature: Symbols and units. The proposed section would incorporate Annex 16 symbols and units, while retaining the English units. This change is proposed to more closely align part 36 with JAR 36. No substantive technical changes to the regulatory standards of part 36 are anticipated to result from incorporation of the Annex 16 symbols and units.

Section A36.7 Sound Attenuation in Air

Currently, atmospheric attenuation rates of sound with distance must be determined in accordance with Society of Automotive Engineers, Inc. (SAE), Aerospace Recommended Practice (ARP) 866A, (SAE ARP 866A) as specified in current section A36.9(c). Under the proposal, section A36.7.2 would contain the actual formulation (equations) from SAE ARP 866A. These equations are provided in both the International System of Units and the English System of Units. Whereas equations are continuous and provide consistent values, tables and graphs can provide minor differences. This proposed change would further harmonize part 36 and JAR 36 and is not expected to result in any substantive difference in attenuation rates.

Section A36.9 Adjustment of Airplane Flight Test Results

The current distinction between allowable/required positive and negative correction procedures contained in current sections A36.11(a)(1) and (2) are not included in proposed section A36.9.1. The distinction is no longer relevant, given the evolution of data correction procedures since part 36 was originally promulgated in 1969 and the need for noise certification levels to reflect airplane noise characteristics as accurately as possible. Prior to any noise certification compliance test, a noise certification applicant is required to identify and gain FAA approval of any planned or anticipated data correction that is not a mandatory correction procedure under part 36.

Under the proposal, current section A36.1(b)(3), which requires that the corrections prescribed in current section A36.5(d) be made when the height of the ground at a noise measuring station differs from that of the nearest point on the runway by more than 20 feet, would be deleted because it is obsolete. A 20-foot height allowance/tolerance could change the final EPNL value by several tenths of a dB under some circumstances. Under current practices, corrections (adjustments) are made over the sound propagation path from the microphone to airplane height as part of normal data corrections (adjustments). These corrections (adjustments) are specified in current section A36.11 and proposed section A36.9.

Proposed section A36.9.1.1(d) would require that the effect that airspeed has on source noise be considered with regard to the difference between test day airplane speed and the airplane reference flight profile speed. Thus, the proposed section would specify that, "in addition to the effect on duration, the effects of airspeed on component noise sources must be accounted for as follows: For conventional airplane configurations, when differences between test and reference airspeeds exceed 15 knots (28 km/h) true airspeed, test data and/or analysis approved by the FAA must be used to quantify the effects of the airspeed adjustment on resulting certification noise levels."

The symbols and figures used to describe the takeoff and approach profiles in current sections A36.11(b) and (c), would be replaced by the JAR 36 symbols and figures that have been incorporated into proposed section A36.9.2. There would be no substantive changes to the takeoff and approach profile technical requirements as a result of these changes.

Proposed section A36.9.3.2.1 provides equations that would enable data adjustments to be made using either the English System of Units or International System of Units.

The material in current section B36.11(c) would be moved to section A36.9.3.2.2 and revised to provide that the adjustment for multiple peak values of tone-corrected perceived noise level (PNLT) is based upon the difference in corrected PNLT values, rather than upon EPNL as in the current part 36. This change would more clearly define the intent of the multiple peak correction.

Under proposed section A36.9.3.3.2, a correction term to account for the difference between test and reference airplane airspeeds would be added to the duration correction ($\Delta 2$) contained in current section A36.11(e). The speed correction term would be defined as 10 log (V/V_r), where V is the airplane test speed and V_r is the airplane reference speed. This proposed change specifies the speed correction that is a requirement of current section A36.11(f)(1).

Appendix B—Noise Levels for Transport Category and Jet Airplanes Under § 36.103

Proposed appendix B would include the material from current appendix C. The objective is to harmonize proposed appendix B, and JAR 36, Section 1, Subpart B. The proposed appendix B is essentially the same as JAR 36, section 1, subpart B.

Section B36.3 Reference Noise Measurement Points.

Under the proposal, the material in current section C36.3 would be moved to section B36.3 and revised as follows. The term ''takeoff'' in current section C36.3(a) would be replaced with the term ''flyover'' in proposed section B36.3(b).) The term ''sideline'' in current section C36.3(c) would be replaced with ''lateral'' in proposed section B36.3(a). These terminology changes would harmonize the part 36 terminology with that used in JAR 36 and Annex 16.

Proposed section B36.3(a)(2) includes a simplified test procedure that may be used in determining the sideline (lateral) noise level for propeller-driven large airplanes in demonstrating the sideline (lateral) noise certification level. This procedure is also contained in JAR 36 and ICAO Annex 16. For propeller-driven airplanes, it can be difficult to establish the maximum lateral noise level specified under current section C36.3C, because this noise level may occur at a very low height. There is usually a significant difference in noise levels between the port and starboard sides of a propeller-driven large airplane. By measuring full-power noise at a predetermined point (650meters) below the takeoff flight path, many of the difficulties which arise because of the directional nature of the noise from propeller-driven airplanes when measured at the conventional lateral site will be eliminated. Ground effects that distort measurements will also be reduced. Under the current requirement, it is difficult to judge the airplane altitude at which the peak noise level occurs, and in the past this has required applicants to conduct as many as 30 flight tests to satisfy certification authorities, an expensive process. Moreover, the current method for testing propeller-driven airplanes has generally resulted in low confidence in accuracy and repeatability of measurements. The simplified test procedure is proposed to be available as an alternative to the current section C36.3(c) method for tests conducted before March 20, 2002, after which it would become the sole method for demonstrating sideline (lateral) noise level compliance.

Current section C36.3(b) would be moved to section B36.3(c) and text would be added to define the approach measurement point relative to the runway threshold. This change would more clearly describe the geometric relationship between the test airplane and the ground, and would further harmonize part 36 and JAR 36.

Section B36.4 Test Noise Measurement Points

As proposed, most of the requirements of current section A36.1(b)(7) would be moved to proposed section B36.4(b). Current section A36.1(b)(7), allows (when approved) for the sideline (lateral) noise certification level demonstration for jet airplanes to be based on the assumption that the peak sideline (lateral) noise level occurs at an airplane altitude of 1,000 feet (1,440 feet for Stage 1 or Stage 2 four-engine airplanes). Under the proposed rulemaking, this procedure would be moved to the guidance material in AC 36–4C as an equivalent procedure for demonstrating the sideline (lateral) noise certification level. This change would further harmonize part 36 and JAR 36 and would have no substantive effect.

Proposed section B36.4(b) would require that, in demonstrating the sideline (lateral) noise certification level for propeller-driven airplanes, noise measurements be made at symmetrically located noise measurements points on either side of the runway for each and every noise measurement point along the main sideline (lateral) noise measurement line. This change is proposed because of the asymmetric nature of propeller noise. Because of the possibility of lateral noise asymmetry, part 36 has required simultaneous measurements at one test measurement point opposite the main lateral measurement line. In the case of propeller-driven airplanes, whose noise field is known to be asymmetrical, having only one measuring point opposite the main lateral measurement line is not adequate to define the peak lateral noise on the other side of the runway from the main lateral line. This change would further harmonize part 36 and JAR 36.

Section B36.5 Maximum Noise Levels

The material in current section C36.5 would be moved to proposed section B36.5 and revised to include minor format and language changes to harmonize with JAR 36. Amendment 36–15 (53 FR 16360, May 6, 1988) removed section C36.5(c); the reference to section C36.5(c) in current section C36.5(a) should have been removed under that amendment but it was not. The reference to section C36.5(c) is not included in this proposal.

In order to further harmonize part 36 and JAR 36, the term ''sideline'' has been changed to ''lateral'' in each place that it appears throughout section B36.5. This is a change in terminology that does not affect the noise measurement/analysis procedures or noise limits. Similarly, the term ''takeoff'' has been changed to ''flyover.'' No change in test procedures should be inferred from this change.

Section B36.6 Trade-Offs

The material in current section C36.5(b) would be moved to proposed section B36.6 and the reference to section 36.7(d)(3)(i)(B), in current section C36.5(b), would be changed to section 36.7(d)(1)(ii). This section reference should have been changed by Amendment 36–15 (53 FR 16360, May 6, 1988). This error is corrected by this proposed revision.

Section B36.7 Noise Certification Reference Procedures

The material addressing takeoff and approach reference and test limitations in current sections C36.7 and C36.9 would be moved to section B36.7, addressing takeoff and approach *reference* procedures, and section B36.8, addressing takeoff and approach *test* procedures. This material would also be revised as discussed in the following paragraphs.

Proposed section B36.7(b)(1) requires the use of ''average engine'' performance in defining the takeoff thrust for the reference takeoff procedures. This revision of current section C36.7(b)(2) would further harmonize the takeoff reference procedure, and would serve to eliminate confusion in compliance with the requirement. This change would also further standardize part 36 and JAR 36 regulations.

Proposed section B36.7(b)(1) would also specify ''Takeoff thrust/power'' as the maximum available for normal operations as scheduled in the performance section of the airplane flight manual for the reference atmospheric conditions given in proposed section B36.7(a)(5).

Currently section C36.7(b)(2) specifies different minimum cutback altitudes for jet powered and non-jet powered airplanes. Proposed section B36.7((b)(1)(ii) would contain the same minimum cutback altitude for all airplanes, the same altitude specified in current section C36.7(b)(2) for jet airplanes. Since the selection of the minimum cutback altitude is determined by the minimum safe altitude for cutback initiation, there is no reason to distinguish between propeller-driven and jet airplanes. It is the FAA's understanding that this change would not have a substantive effect in practice, since cutback initiation heights greater than 1,500 feet are generally chosen for propeller-driven airplanes. Thus, the cutback initiation heights generally chosen are greater than both the current and proposed part 36 minimum cutback height requirements.

Under the proposal, the requirements of section A36.1(b)(2) is moved to section B36.7(b)(3) and revised to require that, for tests conducted after March 19, 2002, the lateral (sideline) noise level be demonstrated using full takeoff power throughout the takeoff flight path. Before that date, the lateral noise level may be demonstrated using the current section A36.1(b)(2) procedure, under which both the takeoff (flyover) and sideline (lateral) noise certification levels are determined using a single reference flight path that may include a thrust cutback. This change is proposed to reflect the intent of the international standard that the lateral measurement be based on the full-power condition. Since the revised lateral procedure might result in increased stringency, the use of this procedure would be optional for tests conducted before March 20, 2002. This change would mainly effect three and four engine airplanes.

The takeoff reference speed requirement specified in current section C36.7(e)(2) would be revised to be consistent with the takeoff reference speed contained in JAR 36 and Annex 16. The all-engine operating climb speed range (V2+10 to V2+20 kts) specified in proposed section B36.7(b)(4) represents the typical range of takeoff initial climb speeds seen in normal operation for most airplanes. For some airplanes, this proposed change to part 36 could result in an increase of up to 10 knots in the noise certification reference takeoff speed relative to the current part 36 reference takeoff speed requirements. For the affected airplanes, the increased takeoff speed could result in some noise level reduction at the sideline (lateral) noise measurement point with a resulting increase in noise level at the takeoff (flyover) noise measurement point. The FAA has found the change in takeoff reference speed to be acceptable because of this tradeoff of sideline (lateral) and takeoff (flyover) noise levels, although it might not be a one-to-one tradeoff.

Proposed section B36.7(b)(5) adds the meaning of configuration. This is not a change in requirement. Proposed section B36.7(b)(5) is intended to clarify the meaning and includes specific configuration elements, based on certification experience, that can have an effect on noise source.

Proposed section B36.7(b)(7) defines ''average engine'' as the average of all the certification compliant engines used during the airplane flight tests up to and during certification when operating within the limitations and according to the procedures given in the Flight Manual.

Under the proposal, current section C36.9(e)(1), reference approach speed, would be revised to incorporate the use of 1-g stall-based approach speeds by basing the approach noise certification reference speed on the reference landing speed (V_{REF}) that is used for the airworthiness certification. This proposal was included in Notice 95–17, published on January 18, 1996 (61 FR 1260), in which the FAA proposed to redefine the reference stall speeds for transport category airplanes as the 1-g stall speed instead of the minimum speed obtained in the stalling maneuver. Under Notice 95–17, a definition of V_{REF} would be included in 14 CFR part 1. Notice 95–17 has not been issued as a final rule. If a final rule based on Notice 95–17 is not issued before this notice becomes a final rule; the definition of V_{REF} (*i.e.,* the speed of the airplanes, in a specified landing configuration, at the point where it descends through the landing screen height in the determination of the landing distance for manual landings) would be added to part 36. The proposed change to section C36.9(e)(1) would also be consistent with an anticipated change to ICAO/Annex 16 that is expected to be recommended by Working Group 1 of the ICAO Committee on Aviation Environmental Protection (CAEP) in conjunction with the current CAEP work program cycle. Under this proposed change, existing section C36.9(e)(1) would be redesignated as section B36.7(c)(2).

Current section C36.9(d) requires that all engines must operate at approximately the same power or thrust for approach tests conducted to demonstrate compliance with part 36. Under the proposal, this specific requirement would be removed, and instead, proposed section A36.9.3.4 would require that source noise adjustments be applied to account for any difference, between test and reference conditions, in engine parameters that affect engine noise (*e.g.,* corrected low pressure rotor speed).

This proposed change would meet the intent of the current part 36 requirement and would also further harmonize with JAR 36.

Section B36.8—Test Procedures

The current section A36.1(d)(5) and A36.1(d)(7), limitations on the difference between the test weight and the maximum takeoff/approach weight for which noise certification is requested, would be replaced by the limitation in proposed section B36.8(d). The current section A36.1(d)(5) and A36.1(d)(7) limitations help insure the integrity of the final certification results by indirectly limiting the magnitude of the EPNL adjustments that may be applied to the test data in normalizing to the noise certification reference conditions. Proposed section B36.8(d) would directly limit the magnitude of the correction by specifying a limitation on the EPNL adjustment that can be made when correcting between test weight and maximum certification weight.

Under the proposal, current section A36.5(d)(5) would be revised and moved to section B36.8(f). The amounts of adjustment permitted when equivalent test procedures are different from the reference procedures remain unchanged, except that the amended requirements do not specify that tradeoffs are permitted when comparing adjusted levels against the appendix C noise levels, for the purpose of determining adjustment limits. Several interpretations of the current section A36.5(d)(5) requirement are possible as to whether the proposal represents a more stringent or less stringent adjustment limitation as compared with the current limitation. The FAA believes that the proposed change to remove the tradeoff provision from the current limitation and base the proposed limitation solely on the difference between the adjusted noise levels and the maximum noise levels in proposed B36.5 meets the intent of the adjustment limitation, as stated above, and clarifies ambiguity in its interpretation. The proposed change would also result in harmonization of the adjustment limitation with that in JAR 36 and ICAO Annex 16.

Proposed section B36.8(g) would revise the test speed tolerance specified in current sections C36.7(e)(1) and C36.9(e)(3). Current section C36.7(e)(1) specifies that takeoff tests must be conducted at the test day speeds ±3 knots. Current section C36.9(e)(3) specifies that a tolerance of ±3 knots may be used throughout the approach noise testing. Proposed section B36.8(g) would specify that during takeoff, lateral, and approach tests, the airplane variation in instantaneous indicated airspeed must be maintained within +/ −3% of the average airspeed between the 10dB-down points. Under the proposal, the instantaneous indicated airspeed is determined by the pilot's airspeed indicator. However, if the instantaneous indicated airspeed exceeds +/−3 kt (+/−5.5 km/h) of the average airspeed over the 10dB-down points, and is determined by the FAA representative on the flight deck to be due to atmospheric turbulence, then the flight so affected must be rejected for noise certification purposes.

Appendix G Noise Requirements for Propeller-Driven Small Airplanes and Commuter Category Airplanes Under Subpart F

Current Section G36.105(f)

The proposal would change the designation of the reference to current part 36 section A36.3(e) to A36.3.8 and A36.3.9 to maintain the correct cross-reference.

Appendix H Noise Requirements for Helicopters Under Subpart H

Current Section H36.111(c)(3)

The proposal would change the designation of the reference to current part 36 section A36.3(f)(3) to A36.3.9.11 to maintain the correct cross-reference.

Current section H36.201

The proposal would change the designation of the reference to current part 36 section B36.5(a) to A36.4.3.1(a) to maintain the correct cross-reference.

Redesignation Table for Proposed Appendices A and B

CROSS REFERENCE TABLE

Old Section	New Section
A36.1	A36.1, A36.2
A36.1(a)	A36.1.1, A36.2.1.1
A36.1(b)	A36.2.2
A36.1(b)(1)	A36.2.3.2, B36.3
A36.1(b)(2)	B36.7(b)(1)(iii)
A36.1(b)(3)	Deleted
A36.1(b)(4)	A36.2.2.1
A36.1(b)(5)	A36.2.2.4
A36.1(b)(6)	A36.2.2.1
A36.1(b)(7)	A36.9.3.5, A36.9.3.5.1, B36.4(b)
A36.1(c)	A36.2.2.2
A36.1(c)(1)	A36.2.2.2(a)
A36.1(c)(2)	A36.2.2.2(b)
A36.1(c)(3)	A36.2.2.2(c) AC36–4C
A36.1(c)(4)	A36.2.2.2(e)
A36.1(c)(5)	A36.2.2.2(f)
A36.1(d)(1)	B36.8(b), B36.2
A36.1(d)(2)	A36.2.3.1
A36.1(d)(3)	A36.2.3.2, A36.2.3.3
A36.1(d)(4)	B36.7(b), B36.8
A36.1(d)(5)	B36.8(d)
A36.1(d)(6)	B36.7(c), B36.8(e)
A36.1(d)(7)	B36.8(d)
A36.1(d)(8)	A36.2.3.3
A36.3	A36.3
A36.3(a)	A36.3.3
A36.3(b)	A36.3.3.1
A36.3(c)(2)(i-iv), A36.3(f)(1)	A36.3.5
A36.3(c)(2)(v)	A36.3.4
A36.3(c)(3)	A36.3.6
A36.3(d)	A36.3.7
A36.3(e)(1–6), A36.3(f)(2)	A36.3.9
A36.3(f)(2–4)	A36.3.9.11
A36.3(e)(7)	A36.3.8
A36.5(a)	A36.5.1.1, A36.5.1.2, A36.5.1.3
A36.5(b)(1)	A36.5.2.1
A36.5(b)(2)	A36.5.2.2
A36.5(b)(3)	A36.5.2.3
A36.5(b)(4)	A36.5.2.4
A36.5(b)(5)(i-vi)	A36.5.2.5
A36.5(b)(vii)	A36.5.2.5(i)
A36.5(b)(6)	A36.2.3.2, A36.2.3.3 A36.5.2.5(i)
A36.5(c)	A36.5.3
A36.5(c)(1)	B36.7(a)(5)
A36.5(c)(2)	B36.3(c), B36.7(b)(1)(vi), B36.7(c)(1)(i), B36.7(c)(1)(iv)
A36.5(d)(1)	A36.5.3.1, A36.9, B36.8(c)
A36.5(d)(2)	A36.9.1
A36.5(d)(2)(i)-(iv)	B36.8(d)
A36.5(d)(3)	A36.3.9.12
A36.5(d)(4)	A36.3.9.12
A36.5(d)(5)	B36.8(f)
A36.5(e)(1)	A36.5.4.1
A36.5(e)(2)	A36.5.4.2
A36.5(e)(3)	A36.5.4.3
A36.5(e)(4)	Deleted
A36.7	A36.6, A36.9.5, A36.9.6
A36.9(a)	A36.9.1.1
A36.9(b)(1)	A36.2.2.4
A36.9(b)(2)	A36.2.2.2(b)
A36.9(b)(3)	A36.2.2.2(g)
A36.9(c)	A36.7
A36.9(d)(1)	A36.9.1, A36.9.1.1
A36.9(d)(2)	A36.2.2.2(d)
A36.9(d)(3)	A36.2.2.3
A36.11(a)	A36.9.1
A36.11(a)(1)	Deleted
A36.11(a)(2)	Deleted
A36.11(a)(3)(i)	A36.9.1, B36.7
A36.11(a)(3)(ii)	A36.9.1.1
A36.11(a)(3)(iii)	A36.9.1.1
A36.11(a)(3)(iv)	A36.9.1.1, A36.9.3.4
A36.11(a)(3)(v)	A36.9.1
A36.11(b)(1)(i-ii)	A36.9.2.1(c)
A36.11(b)(2)	A36.9.3.1, A36.9.4.1
A36.11(b)(3)	A36.9.3.2(a)
A36.11(c)	A36.9.2.2
A36.11(c)(1)	A36.9.3.2(a-c)
A36.11(c)(2)	A36.9.3.2(a)
A36.11(d)(1–3)	A36.9.3, A36.9.3.1, A36.9.3.2.1, A36.9.3.2.1.1, A36.9.3.2.1.2
A36.11(e)(1–2)	A36.9.3.3.1, A36.9.3.3.2
A36.11(f)	B36.4(a), AC36–4C
A36.11(f)(1)	A36.9.1.2
A36.11(f)(2)	A36.9.1.2
A36.11(f)(2)(i-ii)	A36.9.4
B36.1	A36.1, A36.1.1, A36.4.1.3
B36.1(a)	B36.4.1.3(a)
B36.1(b)	A36.4.1.3(b)
B36.1(c)	A36.4.1.3(c)
B36.1(d)	A36.4.1.3(d)
B36.1(e)	A36.4.1.3(e)
B36.3	A36.4.2.1
B36.3(a)	A36.4.2.1, Step 1
B36.3(b)	A36.4.2.1, Step 2
B36.3(c)	A36.4.2.1, Step 3, AC 36–4B
B36.5	A36.4.3.1
B36.5(a)	A36.4.3.1, Step 1
B36.5(b)	A36.4.3.1, Step 2
B36.5(c)	A36.4.3.1, Step 3
B36.5(d)	A36.4.3.1, Step 4
B36.5(e)	A36.4.3.1, Step 5
B36.5(f)	A36.4.3.1, Step 6
B36.5(g)	A36.4.3.1, Step 7
B36.5(h)	A36.4.3.1, Step 8
B36.5(i)	A36.4.3.1, Step 9
B36.5(j)	A36.4.3.1, Step 10
B36.5(k)	A36.4.3.1, Step 10
B36.5(l)	A36.4.3.1, Step 10
B36.5(m)	A36.4.3.1, Step 10 Note, AC36–4C
B36.5(n)	A36.4.4.2
B36.7	A36.4.4
B36.7(a)	A36.4.4.1, A36.4.4.1 Note 1
B36.7(b)	A36.4.4.1-Note 2
B36.9	A36.4.5.1
B36.9(a)	A36.4.5.2
B36.9(b)	A36.4.5.3
B36.9(c)	A36.4.5.4
B36.9(d)	A36.4.5.5
B36.9(e)	Deleted
B36.9(f)	Deleted
B36.11(a)	A36.4.6.1
B36.11(b)	Deleted
B36.11(c)	A36.9.3.2.2
B36.13(a)	A36.4.7.1, Table A1 moved to AC 36–4C
B36.13(a)(1),(2),(3)	A36.4.7.2(a-c)
B36.13(b)	A36.4.7.3
B36.13(c)	A36.4.7.4
C36.1	B36.1
C36.3(a)	B36.3(b)
C36.3(b)	B36.3(c)
C36.3(c)	B36.3(a)
C36.5(a)	B36.5
C36.5(a)(1)	B36.5(a)
C36.5(a)(2)	B36.5(b)
C36.5(a)(2)(i)	B36.5(b)(1)
C36.5(a)(2)(ii)	B36.5(b)(2)
C36.5(a)(3)	B36.5(c)
C36.5(a)(3)(i)(A)	B36.5(c)(1)(i)
C36.5(a)(3)(i)(B)	B36.5(c)(1)(ii)
C36.5(a)(3)(i)(C)	B36.5(c)(1)(iii)
C36.5(a)(3)(ii)	B36.5(c)(2)
C36.5(a)(3)(iii)	B36.5(c)(3)
C36.5(b)(1)	B36.6
C36.5(b)(2)	B36.6
C36.5(b)(3)	B36.6
C36.7(a)	B36.7(a)(3)
C36.7(b)	B36.7(b)(1)(i)
C36.7(b)(1)	B36.7(b)(1)(i)
C36.7(b)(1)(i)	B36.7(b)(1)(i)
C36.7(b)(1)(ii)	B36.7(b)(1)(i)
C36.7(b)(2)(i)	B36.7(b)(1)(i)
C36.7(b)(2)(ii)	B36.7(b)(1)(i)
C36.7(b)(2)(iii)	B36.7(b)(1)(i)
C36.7(b)(2)(iv)	B36.7(b)(1)(i)
C36.7(c)	B36.7(b)(1)(ii)
C36.7(d)	B36.7(b)(1)(v)
C36.7(e)(1)	B36.7(b)(1)(iv)
C36.7(e)(1) Next to last sentence.	B36.8(g)
C36.7(e)(2)	B36.7(b)(1)(iv)
C36.7(e)(3)	B36.7(a)(5), A36.9.1
C36.9(a)	B36.7(a)(3), B36.7(c)(1)
C36.9(b)	B36.7(c)(1)(iii) & B36.7(c)(1)(v)
C36.9(c)	B36.7(c)(1)(i), B36.7(c)(iii)
C36.9(d)	Deleted
C36.9(e)(1)	B36.7(c)(1)(ii)
C36.9(e)(2)	B36.7(c)(1)(ii)
C36.9(e)(3)	B36.8(g)

CROSS REFERENCE TABLE

New Section	Old Section
A36.1	A36.1, B36.1
A36.1.1	A36.1(a), B36.1
A36.1.2	New section
A36.1.3	New section
A36.2	A36.1
A36.2.1	A36.1(a)
A36.2.1.1	A36.1(a)
A36.2.2	A36.1(b)
A36.2.2.1	A36.1(b)(4), A36.1(b)(6)
A36.2.2.2	A36.1(c)
A36.2.2.2(a)	A36.1(c)(1)
A36.2.2.2(b)	A36.1(c)(2), A36.9(b)(2)
B36.2.2.2(c)	A36.1(c)(3)
B36.2.2.2(d)	A36.9(d)(2)
A36.2.2.2(e)	A36.1(c)(4)
A36.2.2.2(f)	A36.1(c)(5)
A36.2.2.2(g)	A36.9(b)(3)
A36.2.2.3	A36.9(d)(3)
A36.2.2.4	A36.1(b)(5), A36.9(b)(1)
A36.2.3	A36.1(d)
A36.2.3.1	A36.1(d)(2)
A36.2.3.2	A36.1(b)(1), A36.1(d)(3), A36.5(b)(6)
A36.2.3.3	A36.1(d)(8), A36.5(b)(6)
A36.3	A36.3

CROSS REFERENCE TABLE—Continued

New Section	Old Section
A36.3.1	New
A36.3.2	New
A36.3.3	A36.3(a)
A36.3.3.1	A36.3(b)
A36.3.3.2	New
A36.3.4	A36.3(c)(2)(v)
A36.3.5	A36.3(c)(2)(i-iv), A36.3(f)(1)
A36.3.6	A36.3(c)(3)
A36.3.7	A36.3(d)
A36.3.8	A36.3(e)(7)
A36.3.9	A36.3(e)(1–6), A36.3(f)(2)
A36.3.9.11	A36.3(f)(2–4)
A36.3.9.12	A36.5(d)(3–4)
A36.4	B36.1
A36.4.1	B36.1
A36.4.1.1	B36.1
A36.4.1.2	B36.1
A36.4.1.3	B36.1
A36.4.2	B36.3
A36.4.2.1	B36.3; AC 36–4C
A36.4.3	B36.5
A36.4.3.1	B36.5(a-m)
A36.4.3.2	B36.5(n)
A36.4.4	B36.7
A36.4.4.1	B36.7(a) & (b)
A36.4.4.2	B36.5(n)
A36.4.5	B36.9
A36.4.5.1	B36.9
A36.4.5.2	B36.9(a)
A36.4.5.3	B36.9(b)
A36.4.5.4	B36.9(c)
A36.4.5.5	B36.9(d)
A36.4.6	B36.11
A36.4.6.1	B36.11(a)
A36.4.7	B36.13
A36.4.7.1	B36.13(a)
A36.4.7.2	B36.13(a)(1–3)
A36.4.7.3	B36.13(b)
A36.4.7.4	B36.13(c)
A36.5	A36.5
A36.5.1	A36.5(a)
A36.5.1.1	A36.5(a)
A36.5.1.2	A36.5(a)
A36.5.1.3	A36.5(a)
A36.5.2	A36.5(b)
A36.5.2.1	A36.5(b)(1)
A36.5.2.2	A36.5(b)(2)
A36.5.2.3	A36.5(b)(3)
A36.5.2.4	A36.5(b)(4)
A36.5.2.5	A36.5(b)(5)
A36.5.3	A36.5(c)
A36.5.3.1	A36.5(d)(1)
A36.5.4	A36.5(e)
A36.5.4.1	A36.5(e)(1)
A36.5.4.2	A36.5(e)(2)
A36.5.4.3	A36.5(e)(3)
A36.6	A36.7
A36.7.1–A36.7.3	A36.9(c)
A36.8	New section—Reserved
A36.9	A36.5(d)(1), A36.11
A36.9.1	A36.5(d)(2), A36.9(d)(1), A36.11(a), A36.11(a)(3)(i) & (v)
A36.9.1.1	A36.9(a), A36.9(d)(1), A36.11(a)(3)(ii-iii), A36.11(a)(3)(iv)
A36.9.1.2	A36.11(f)(1–2)
A36.9.2	A36.11(b)&(c)
A36.9.2.1	A36.11(b)(1)(i-ii)
A36.9.2.2	A36.11(c)
A36.9.3	A36.11
A36.9.3.1	A36.11(a), A36.11(f)(1)
A36.9.3.2(a)	A36.11(b)(3), A36.11(c)(2)
A36.9.3.2(b)	New section
A36.9.3.2.1	A36.9(d)(1–3)
A36.9.3.2.1.1	A36.11(d)(1)(ii)
A36.9.3.2.1.2	A36.11(d)(1)(ii)
A36.9.3.2.2	B36.11(c)
A36.9.3.3	A36.11(e)
A36.9.3.3.1	A36.11(e)(1)(2)
A36.9.3.3.2	A36.11(e)
A36.9.3.4	A36.11(a)(3)(iv)
A36.9.3.4.1	A36.11(a)(3)(iv)
A36.9.3.4.2	A36.11(a)(3)(iv)
A36.9.3.5	A36.1(b)(7)
A36.9.3.5.1	A36.1(b)(7)
A36.9.4	A36.11(f)(2)(i-ii)
A36.9.4.1	A36.11(b)(2), A36.11(f)(2)(i-ii)
A36.9.4.2	A36.11(f)(2)(i-ii)
A36.9.4.2.2	A36.11(f)(2)(i-ii)
A36.9.4.2.3	A36.11(f)(2)(i-ii)
A36.9.4.3	A36.11(f)(2)(i-ii)
A36.9.4.4	A36.11(f)(2)(i-ii)
A36.9.4.4.1	A36.11(f)(2)(i-ii)
A36.9.5	A36.7
A36.9.6	A36.7
B36.1	C36.1
B36.2	A36.1(d)(1)
B36.3(a)	C36.3(c)
B36.3(b)	C36.3(a)
B36.3(c)	A36.5(c)(2), C36.3(b)
B36.4(a)	A36.11(f)
B36.4(b)	A36.1(b)(7)
B36.5	C36.5(a)
B36.5(a)	C36.5(a)(1)
B36.5(b)	C36.5(a)(2)
B36.5(b)(1)	C36.5(a)(2)(i)
B36.5(b)(2)	C36.5(a)(2)(ii)
B36.5(c)	C36.5(a)(3)
B36.5(c)(1)(i)	C36.5(a)(3)(i)(A)
B36.5(c)(1)(ii)	C36.5(a)(3)(i)(B)
B36.5(c)(1)(iii)	C36.5(a)(3)(i)(C)
B36.5(c)(2)	C36.5(a)(3)(ii)
B36.5(c)(3)	C36.5(a)(3)(iii)
B36.6	C36.5(b)(1)-(3)
B36.7(a)(1)	
B36.7(a)(2)	A36.11(a)(3)(i)
B36.7(a)(3)	C36.7(a), C36.9(a)
B36.7(a)(4)	New section—Reserved
B36.7(a)(5)	A36.5(c)(1), C36.7(e)(3)
B36.7(b)(1)	C36.7(b), C36.7(b)(2)
B36.7(b)(2)	C36.7(c)
B36.7(b)(3)	A36.1(b)(2)
B36.7(b)(4)	C36.7(e)(1–2)
B36.7(b)(5)	C36.7(d)
B36.7(b)(6)	A36.5(c)(2)
B36.7(b)(7)	New section
B36.7(c)	C36.9
B36.7(c)	C36.9(a)
B36.7(c)(1)	A36.5(c)(2), C36.9(c)
B36.7(c)(2)	C36.9(e)(1), C36.9(e)(2)
B36.7(c)(3)	C36.9(b-c)
B36.7(c)(4)	A36.5(c)(2)
B36.7(c)(5)	C36.9(b)
B36.8(a)	New section
B36.8(b)	A36.1(d)(1)
B36.8(c)	A36.5(d), A36.11(a)
B36.8(d)	A36.1(d)(5–7)
B36.8(e)	A36.1(d)(6)
B36.8(f)	A36.5(d)(5)
B36.8(g)	C36.7(e)(1), C36.9(e)(3)

Paperwork Reduction Act

In this NPRM, Noise Certification Standards for Subsonic Jet Airplanes and Subsonic Transport Category Large Airplanes, Part 36, proposed §§ A36.5.2 and A36.5.2.5 contain information collection requirements. As required by the Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)), the FAA has submitted a copy of these proposed sections to the Office of Management and Budget (OMB) for its review.

The information to be collected is needed for the applicant's noise compliance report that is required by the Aircraft Noise Abatement Act of 1968. This statute authorized FAA to prescribe standards for the measurement of aircraft noise and to prescribe regulations providing for the control and abatement of aircraft noise. The noise compliance report information is part of the aircraft certification test. The collected information is incorporated into the noise compliance report that is provided to and approved by the FAA. The annual burden for § A36.5.2 is estimated to range from $80 × 80 hours at $6,400 per noise certification project to $100 × 160 hours at $16,000 per noise certification project. The annual burden for § A36.5.2.5 is estimated to range from $500 (5 hours × $100 per hour) to $2,000 (25 hours × $80 per hour) per certification. If proprietary information is submitted, it will be protected in accordance with appropriate laws.

The agency is soliciting comments to (1) evaluate whether the proposed collection of information is necessary; (2) evaluate the accuracy of the agency's estimate of the burden; (3) enhance the quality, utility, and clarity of the information to be collected; and (4) minimize the burden of the collection of information on those who are to respond, including through the use of appropriate automated, electronic, mechanical, or other technological collection techniques or other forms of information technology (for example, permitting electronic submission of responses).

Individuals and organizations may submit comments on the information collection requirement by September 11, 2000 and should direct them to the address listed in the **ADDRESSES** section of this document.

According to the regulations implementing the Paperwork Reduction Act of 1995, (5 CFR 1320.8(b)(2)(vi)), an agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid Office of Management and Budget (OMB) control number. The public will be notified of the OMB control number when it is assigned.

Compatibility With ICAO Standards

In keeping with the U.S. obligations under the Convention on International Civil Aviation, it is FAA policy to comply with International Civil Aviation Organization (ICAO) Standards and Recommended Practices to the maximum extent practicable. The FAA has reviewed the corresponding ICAO Standards and Recommended Practices and has identified the following differences with these proposed regulations. If this proposal is adopted, the FAA intends to file these differences with ICAO.

Wind Speed. Section A36.2.2.2(e) of the proposal requires that tests be carried out under atmospheric conditions where the average wind velocity 10 meters above ground does not exceed 12 knots and the crosswind velocity for the airplane does not exceed 7 knots. Section A36.2.2.2(e) of the proposal also specifies that maximum wind velocity 10 meters above ground is not to exceed 15 knots and the crosswind velocity is not to exceed 10 knots during the 10 dB down time interval. Section 2.2.2(e) of ICAO Annex 16, Appendix 2 contains a similar average wind speed limitation, but specifies a maximum windspeed limitation only in cases where an anemometer with a built-in detector time constant of less than 30 seconds is used. The FAA does not agree to adopt this Annex 16 provision because it could result in tests being conducted in windspeed conditions that exceed those currently permitted under part 36; the effect of these higher wind conditions might have on the resulting noise levels could not be determined based on the information that was available to the harmonization working group.

Adjustments to PNL and PNLT. In adjusting measured sound pressure level data to reference conditions, section 9.3.2.1 of Annex 16 Appendix 2 requires that when a sound pressure level value is equal to zero (for example, as a result of applying a background noise correction) the adjusted sound pressure level must be kept equal to zero in the adjustment process. The FAA did not agree to adopt this provision. The FAA's view is that the sound pressure level values should be carried through the adjustment process regardless of whether they are greater than zero, equal to zero, or less than zero. It is entirely possible for a negative or zero sound pressure level value that results from the background noise correction process to become positive when adjustments are applied to account for the difference between the test and reference airplane heights above the noise measurement point.

Design characteristics that require different reference procedures. Section 3.6.1.4 of ICAO Annex 16, Appendix 2 permits the certificating authority to approve reference procedures that depart from those contained in section 3.6.2 and 3.6.3 of Annex 16 Appendix 2 when design characteristics of an airplane would prevent flight from being conducted in accordance with the 3.6.2 and 3.6.3 reference procedures. FAA did not agree to adopt this provision since it views the need to depart from the specified reference procedures due to airplane design characteristics as an indication that part 36 may not be appropriate for a given airplane. In this case, under U.S. procedures, the exemption or rulemaking processes, which include a public comment period would be followed to develop an appropriate noise certification basis.

Noise Certificates. Section 1.2 of ICAO Annex 16, Chapter 1 specifies that the documents attesting noise certification may take the form of a separate Noise Certificate or a suitable statement contained in another document approved by the State of Registry and required by that State to be carried in the aircraft. However, under 49 U.S.C. 44702, the FAA is not authorized to issue Noise Certificates. Section 36.1581 of part 36 requires that the certificated noise levels be included in the Airplane Flight Manual. However, the FAA does not require the Airplane Flight Manual to be carried in the airplane. An operations manual that does not contain certificated noise levels is carried in some airplanes. The FAA is aware of a number of cases in which airplane operators had difficulty in substantiating airplane noise compliance status to the satisfaction of airport authorities. The FAA invites comments on the extent of any problems encountered due to the absence of noise compliance substantiation when the Airplane Flight Manual is not on board the airplane.

Economic Evaluation

Proposed changes to Federal regulations undergo several economic analyses. First, Executive Order 12866 directs that each Federal agency propose or adopt a regulation only upon a determination that the benefits of the intended regulation justify its costs. Second, the Regulatory Flexibility Act of 1980 requires agencies to analyze the economic impact of regulatory changes on small entities. Third, the Trade Agreements Act (19 U.S.C. section 2531–2533) prohibits agencies from setting standards that create unnecessary obstacles to the foreign commerce of the United States. In developing U.S. standards, this Trade Act also requires agencies to consider international standards and, where appropriate, use them as the basis of U.S. standards. And fourth, the Unfunded Mandates Reform Act of 1995 requires agencies to prepare a written assessment of the costs, benefits and other effects of proposed or final rules that include a Federal mandate likely to result in the expenditure by State, local or tribal governments, in the aggregate, or by the private sector, of $100 million or more annually (adjusted for inflation.)

In conducting these analyses, the FAA has determined that this rule (1) has benefits which do justify its cost, is not a ''significant regulatory action'' as defined in the Executive Order and the Department of Transportation's (DOT) Regulatory Policies and Procedures; (2) will not have a significant impact on a substantial number of small entities; (3) reduces barriers to international trade; and (4) does not impose an unfunded mandate on state, local, or tribal governments, or the private sector. These analyses, available in the docket, are summarized below.

Costs

Many of the changes in the proposed rule are either editorial or procedural in nature. These types of proposed revisions would not add any new requirements or impose costs. However, 38 sections of the proposed changes to part 36 entail changes, which warranted further evaluation to determine whether they involve changes in criteria or could impose additional costs. The key factor in evaluating the proposed changes in criteria was assessing whether an applicant could pass the noise certification test under the proposed change but fail the test under the current rule or vice versa, indicating a change in the stringency of the existing standard.

Eight sections that would be removed by the proposed rule warranted further evaluation. These include sections that had previously been eliminated by an earlier amendment but the text had erroneously remained in part 36, as well as sections that are no longer relevant given improvements in test equipment and the enhancement of data correction procedures since the time part 36 was originally promulgated. The deletion of these sections has no cost impact.

The FAA evaluated the remaining items to determine whether costs would be incurred and examined the magnitude of the cost. The sections of the proposed rule with potential cost fall into four categories: (1) Software costs, (2) additional testing procedures, (3) additional or new measuring provisions, and (4) additional reporting requirements.

Software Costs—Five proposed provisions address the maintenance of the computer programs used to correct as-measured noise certification data to 14 CFR part 36 reference conditions. Such maintenance often times involves administrative cost. However, based on discussions with staff at the Volpe National Transportation Center, which work under contract to the FAA and evaluate certification software, the FAA has determined that four of these proposed changes would have no cost impact. The fifth, Section A36.3.7.6, would deal with technical differences in the ''readout'' time of the time-weighted measurement of the sound pressure level between the test data and the reference data. Implementation of this change would require modifying the computer software used by the applicants. The estimated times required for each applicant to implement the software change and for the FAA to verify correct implementation the change are 40 and 20 hours, respectively at hourly wage rates of $85 and $75, respectively. The FAA estimates that 39 applicants would incur this one-time cost, and that these software costs would be incurred in the first 3 years after the proposed rule's implementation. The total cost to industry and the FAA are $132,600 and $58,500 ($116,000 and $51,200 discounted), respectively.

Testing Costs—Three proposed changes relate to the operating specifications of test aircraft, but none have any cost impacts.

Measurement Costs—The FAA has determined that of the ten proposed changes that could affect the allowable test conditions and correction of test results to reference conditions, only one would have a cost impact. Under the proposed changes to Appendix B36.4(b), a special requirement would be added for propeller-driven airplanes that would require the placement of symmetrical positioned microphones at each and every test measurement point. However, most applicants already take advantage of FAA-approved equivalent test procedures that require only one set of symmetrical microphones for sideline noise measurements. Changing part 36 would not result in increased costs for most applicants. However, an applicant choosing to use multiple pairs of microphones could incur additional costs ranging up to an estimated $28,000 per test. These costs would involve an increase in the number of microphone systems, including cable, calibration, site surveys, and data recording, analysis and reporting. The FAA has calculated costs assuming that two domestic large-propeller applicants would conduct 4 tests meeting this requirement over the next 10 years. The total cost would be $112,000, or $79,200, discounted.

Reporting Costs—Section A36.5.2 would require applicants to include test results in their noise certification compliance report. While part 36 currently does not specifically require applicants to submit a compliance report it is a standard practice for applicants to do so, since applicants already address these data elements under JAR 36 or ICAO Annex 16. The addition of this provision would codify industry practice. Since the information is already provided, the FAA does not believe there will be additional costs to comply with this requirement. The FAA requests comments on this assumption and requests that all comments be accompanied by clear documentation supporting any proposed changes.

The FAA has determined that one proposed change, to section A36.5.2.3, would add new data elements to the required test report. There would be five new elements. All of these are test airplane operating configuration items that could effect the airplanes noise signature and are already a part of the international standard. Additional labor costs for documenting data not previously reported are estimated to range from $500 (5 hours × $100 per hour) to $2,000 (25 hours × $80 per hour) per test. These estimates are based on the number of additional items to be reported and on the assumption of a lower and upper range of required labor hour increases of 5 to 8 hours and 20 to 25 hours, respectively, at hourly labor rates that range from $80 to $100 per hour.

Based on FAA estimates, 14 noise certification projects involving flight tests are undertaken each year. Four of these projects are conducted among the 15 foreign firms which already comply with these proposed reporting requirements under JAR 36 or ICAO Annex 16 and thus would not incur additional reporting costs. Ten projects are conducted from among 24 domestic firms engaged in flight-testing and the FAA estimates that these firms would conduct 100 tests over the next 10 years. The FAA further estimates that some domestic firms will incur additional reporting costs of $1,250 per test based on the midpoint of the estimated additional labor costs. Domestic firms with a large international presence are estimated to conduct 40 of the 100 tests to be conducted over the next 10 years, based on the composition of the industry. Since these larger firms already frequently comply with the existing international reporting standard, the FAA estimates that only 10 of the 40 tests to be conducted by these firms would incur the additional reporting costs of $1,250 each, or a total of $12,500. The FAA estimates that of the 60 tests to be conducted by smaller domestic firms 24 tests would incur the additional reporting costs of $1,250 per test or a total of $30,000 over the next 10 years. Thus, the additional labor costs for reporting the additional information would total $42,500 ($30,000 plus $12,500) for these affected firms.

However, it is possible that some applicants might accrue additional costs. If an applicant was required to invest in new instrumentation or data recording equipment to comply with these requirements, the estimated total reporting costs could increase to between $5,000 and $10,000 per test. This is based on a range of estimates and scenarios involving purchasing and installing additional instrumentation, and labor for adding recording capability, data analysis, etc. For example, one possible scenario would entail the purchase and installation of instrumentation hardware at $4,200 ($2,500 for hardware and $1,700 for labor [20 hours × $85 per hour]), plus the labor cost for adding recording capability and data recording/analysis at $3,400 (40 hours × $85 per hour) for a total of $7,600 of additional cost. The FAA estimates that only three firms would incur this additional cost of $7,600 per test and that these firms would conduct a total of 12 tests over the next 10 years at a total cost of $91,200. Thus, the total additional reporting costs to the industry would be $133,700, or $93,900 discounted, based on the minimal additional reporting costs of $42,500 incurred by some firms and $91,200 incurred by the three firms requiring additional instrumentation/ data recording.

Summary of Costs

The total costs for this proposed rule are $436,800, or $340,300 discounted. Of this total, industry costs are $378,300, or $289,100 discounted, and FAA costs are $58,500, or $51,200 discounted. Comments are invited on these additional cost elements; the FAA requests that all comments be accompanied by clear economic documentation.

Cost Savings

Several of the proposed changes could result in cost savings to applicants, depending upon the current inventory of the applicant's test equipment and the particular weather circumstances of the flight test. However, given the uncertainty in the annual number and duration of flight tests, it is difficult to accurately quantify these savings. For example, Section A36.2.2.2(b) would lower the minimum test temperature from 36 degrees Fahrenheit to 14 degrees Fahrenheit. This proposed change is based on technical data from extensive noise testing experience and is within the operational temperature limit of the noise measuring equipment. One of the largest cost elements of the test certification process is the cost associated with airplane down time; by extending the temperature range, down time could be minimized. Down time occurs when the test aircraft, crew, equipment and technicians are ready to commence testing but testing is delayed or postponed because the weather conditions specified in Section A36.2 are not met. While airplane noise testing is not normally planned for cold weather, circumstances may dictate that the test be conducted under conditions which could take advantage of this new lower temperature. Under this circumstance, assuming various scenarios of daily temperature warming patterns that could result in reduced hours of airplane down time, an applicant might reduce total on-site test time of a typical certification flight test conducted under these conditions by 10 to 15 percent.

As an example of the impact of permitting testing to be conducted at a lower temperature, assuming an on-site test time of 5 to 7 days to complete a typical certification flight test under these conditions, the applicant might reduce the total test time between half a day to one full day by testing during a time period when the lower temperature condition prevailed. Assuming a cost factor of $150,000 to $200,000 per day for larger planes and $70,000 to $140,000 per day for smaller airplanes, cost reductions per test made possible by this change in minimum test temperatures could range between approximately $75,000 and $200,000 for larger airplanes and manufacturers and between $35,000 and $140,000 for smaller airplanes and manufacturers. The number of such tests conducted under cold weather conditions might be, at most, one per applicant over a 10 year period. Some applicants might not encounter this situation during a 10 year period.

The FAA estimates that 24 larger applicants would each derive cost savings of $137,500 per test and 13 smaller firms would save $87,500 each per test. The estimated industry cost savings over ten years totals $4.44 million, or $3.12 million discounted. Comments on these estimates are invited; the FAA requests that all comments be accompanied by clear documentation supporting any proposed changes.

Proposed section B36.3(a) includes a simplified test procedure that may be used in determining the sideline (lateral) noise level for propeller-driven large airplanes. This test procedure would allow the full power noise measurement to be obtained at a point (650m) below the takeoff flight path and thus eliminate the problems associated with obtaining this measurement from the conventional sideline site. According to industry sources, 40 to 45 fly-bys per test could be eliminated and between 2 and 8 microphone systems could be eliminated depending on the size of the array used by the applicant. (Many applicants currently use a 2-microphone sideline array.) In addition to the significant savings resulting from the reduction in the number of fly-bys and the number of microphone systems, further cost savings could result from a reduction in site surveying and field set-up expenses in addition to the analysis and reporting savings that result from fewer fly-bys. The total cost savings of these changes are estimated at $200,000 to $350,000 per test for manufacturers of propeller-driven large planes. These estimates are based on a range of potential scenarios involving combinations of the above elements (the number of fly-bys and the number of microphones used, flight test costs, *etc.*). As an example, based on a reduction of 42 fly-bys, the midpoint of the estimated range, and an example cost factor of $6,000 per fly-by, cost savings of $252,000 would be realized. In addition, assuming a reduction of 4 microphone systems, including surveying, setup, recording analysis and reporting at an assumed cost factor of $7,000 per system, another $28,000 (4 systems × $7,000 per system) in savings would be realized, for a total example savings of $280,000 per test under this example. Given the increasing demand for regional jets, and the financial status of large propeller-driven manufacturers, the FAA estimates that no more than 10 tests would be conducted over the next 10 years and that the derived cost savings would total $2.80 million or $1.97 million discounted.

Industry sources estimate that cost savings on the order of $37,500 per year for those applicants with considerable certification activity would be realized by the harmonization of testing, data measurement and analysis, reporting and documentation. Industry sources also claim that these cost savings would be achieved by a reduction in the confusion and the multiple interpretations that lead to delays, duplicate effort and costly negotiation caused by the existing dual certification standards. The FAA estimates that 10 firms engaged in noise certification activities would achieve cost savings of $375,000 annually for the industry. The estimated industry cost savings over ten years totals $3.75 million, or $2.63 million discounted.

Total quantifiable cost savings over ten years would be $10.99 million, or $7.72 million discounted. The FAA has not been able to quantify other potential savings made possible by the greater efficiencies and flexibility resulting from the uniformity that the proposed rule would provide. Comments are invited; the FAA requests that all comments be accompanied by clear documentation. The FAA would particularly appreciate specific cost savings data.

Benefits

Currently, airplane manufacturers must satisfy both the FAA and the European noise certification standards in order to market their aircraft in both the United States and Europe. Meeting two sets of noise certification requirements raises the cost of developing a new transport category airplane, often with no increase in safety or environmental benefit. Adoption of these proposed changes to the noise certification standards of part 36 will foster international trade, lower the cost of aircraft development, and make the certification process more efficient.

Cost-Benefit Analysis

If the proposed rule becomes effective, U.S. noise certification procedures would be nearly uniform with the JAA procedures. This harmonization between the test conditions, procedures, and noise levels necessary to demonstrate compliance with certification requirements for subsonic jet airplanes and subsonic transport category large airplanes would result in significant cost savings without compromising the environmental benefits of the noise certification standards.

The proposed rule's cost savings, over ten years (attributable to specific proposed changes to part 36 and achieving near uniformity of the standards), would be $7.24 million, $5.08 million discounted. In addition, $3.75 million, $2.63 million discounted, would be derived from overall efficiencies attributable to the harmonization effort in achieving near uniformity of the FAA and JAA standards for a total savings of $10.99 million, $7.72 million, discounted which exceeds the proposed rule's cost of $436,800 ($340,300, discounted). Since the potential cost savings exceed the additional costs, the proposed rule would be cost beneficial.

Initial Regulatory Flexibility Act

The Regulatory Flexibility Act of 1980 (Act) establishes ''as a principle of regulatory issuance that agencies shall endeavor, consistent with the objective of the rule and applicable statues, to fit regulatory and informational requirements to the scale of the business, organizations, and governmental jurisdictions subject to regulation.'' To achieve that principle, the Act requires agencies to solicit and consider flexible regulatory proposals and to explain the rational for their actions. Agencies must perform a review to determine whether a proposed or final rule will have a significant economic impact on a substantial number of small entities. If the determination is that it will, the agency must prepare a regulatory flexibility analysis (RFA) as described in the Act.

However, if an agency determines that a proposed or final rule is not expected to have a significant economic impact on a substantial number of small entities, section 605(b) of the 1980 act provides that the head of the agency may so certify and an RFA is not required. The certification must include a statement providing the factual basis for this determination, and the reasoning should be clear.

Enactment of this proposal would impose costs of $436,800 on the FAA and noise certification applicants over the ten year period of which $250,400 would be incurred by smaller applicants. The FAA has assumed that two smaller applicants which is not a substantial number of applicants would each incur measurement costs of $56,000, or a total of $112,000. Additional reporting costs requiring additional instrumentation/data recording totaling $60,800 over the ten year period would be incurred by 2 other smaller applicants or $30,400 each. Additional labor costs for new reporting requirements totaling $30,000 over the 10 year period would be incurred by 6 smaller applicants at a cost to each of these smaller applicants over the 10 year period of $5,000.

All the small (14) applicants at a cost of $3,400 each or a total of $47,600 would incur one time software costs and for four of these firms this would be the only cost they incur. The first-year cost to each of the six small applicants incurring both software and additional labor reporting costs would be $4,650. In this case, the FAA has determined this would not be a significant cost to a substantial number of small noise certification applicants. Therefore, the FAA had determined that this proposed rule would not have a significant economic impact on a substantial number of small entities.

International Trade Impact Assessment

The Trade Agreement Act of 1979 prohibits Federal agencies from engaging in any standards or related activity that create unnecessary obstacles to the foreign commerce of the United States. Legitimate domestic objectives, such as safety, are not considered unnecessary obstacles. The statute also requires consideration of international standards and where appropriate, that they be the basis for U.S. standards. In addition, consistent with the Administration's belief in the general superiority and desirability of free trade, it is the policy of the Administration to remove or diminish, to the extent feasible, barriers to international trade, including both barriers affecting the export of American goods and services to foreign countries and barriers affecting the import of foreign goods and services into the U.S.

In accordance with the above statute and policy, the FAA has assessed the potential effect of this proposed rule and has determined that it will impose the same costs on domestic and international entities and thus has a neutral trade impact.

Executive Order 13132, Federalism

The FAA has analyzed this proposed rule under the principles and criteria of Executive Order 13132, Federalism. The FAA has determined that this action would not have substantial direct effects on the States, on the relationship between the national Government and the States, or on the distribution of power and responsibilities among the various levels of government. Therefore, the FAA has determined that this notice of proposed rulemaking would not have federalism implications.

Unfunded Mandates

The Unfunded Mandates reform Act of 1995 (2 U.S.C. 1532–1538) requires the FAA to assess the effects of Federal Regulatory actions on state, local, and tribal governments, and on the private sector of proposed rules that contain a Federal intergovernmental or private sector mandate that exceeds $100 million in any one year. This action does not contain such a mandate.

Environmental Assessment

FAA Order 1050.1D defines FAA actions that may be categorically excluded from preparation of a National Environmental Policy Act (NEPA) environmental assessment (EA) or environmental impact statement (EIS). In accordance with FAA Order 1050.1D, appendix 4, paragraph 4(j), regulations, standards, and exemptions (excluding those, which if implemented may cause a significant impact on the human environment) qualify for a categorical exclusion. The FAA proposes that this rule qualifies for a categorical exclusion because no significant impacts to the environment are expected to result from its finalization or implementation.

Energy Impact

The energy impact of the notice has been assessed in accordance with the Energy Policy and Conservation Act (EPCA) Pub. L. 94–163, as amended (42 U.S.C. 6362) and FAA Order 1053.1. It has been determined that the notice is not a major regulatory action under the provisions of the EPCA.

List of Subjects in 14 CFR Part 21 and 36

Aircraft, Noise control.

The Proposed Amendment

In consideration of the foregoing the Federal Aviation Administration proposes to amend 14 CFR parts 21 and 36, as follows:

PART 21—CERTIFICATION PROCEDURES FOR PRODUCTS AND PARTS

1. The authority citation for part 21 continues to read as follows:

Authority: 42 U.S.C. 7572; 49 U.S.C. 106(g), 40105, 40113, 44701–44702, 44707, 44709, 44711, 44713, 44715, 45303.

§ 21.17 [Amended]

2. Amend paragraph (a) of § 21.17 by removing the word ''parts'' and adding the word ''part'' and removing the words ''and 36''.

§ 21.101 [Amended]

3. Amend paragraph (a) of § 21.101 by removing the word ''parts'' and adding the word ''part'' and removing the words ''and 36''.

PART 36—NOISE STANDARDS: AIRCRAFT TYPE AND AIRWORTHINESS CERTIFICATION

1. The authority citation for part 36 continues to read as follows:

Authority: 42 U.S.C. 4321 *et seq.*; 49 U.S.C. 106(g), 40113, 44701–44702, 44704, 44715; sec. 305, Pub. L. 96–193, 94 Stat. 50, 57; E.O. 11514, 35 FR 4247, 3 CFR, 1966–1970 Comp., p. 902.

§ 36.1 [Amended]

2. Amend § 36.1 as follows:

a. In paragraph (a)(1) remove the words ''turbojet powered'' and add the word ''jet'' in its place.

b. In paragraph (d), introductory text, remove the words ''turbojet powered'' and add the word ''jet'' in its place.

c. Remove paragraph (d)(3).

d. In paragraph (f) remove the words ''turbojet powered'' and insert the word ''jet'' in its place.

e. In paragraph (f)(1) remove the reference to ''C36.5(a)(2)'' and add ''B36.5(b)'' in its place; remove the word ''takeoff'' and add the word ''flyover'' in its place; and remove the word ''sideline'' and add the word ''lateral'' in its place;

f. In paragraph (f)(3) remove the reference to ''C36.5(a)(2)'' and add ''B36.5(b)'' in its place and remove the reference to ''C36.5(a)(3)'' and insert ''B36.5(c)'' in its place;

g. In paragraph (f)(4) remove the reference to ''C36.5'' and add ''B36.5(b)'' in its place;

h. In paragraph (f)(5) remove the reference to ''C36.5(a)(3)'' and add ''B36.5(c)'' in its place;

i. In paragraph (f)(6) remove the reference to ''C36.5'' and add ''B36.5(c)'' in its place; and.

j. In paragraph (g) remove the word ''turbojet'' and add the word ''jet'' in its place.

§ 36.2 [Removed and reserved]

3. Remove and reserve § 36.2.

§ 36.6 [Amended]

* * * * *

4. Amend § 36.6 as follows:

a. Add paragraphs (c)(1)(vi) through (x);

b. Revise paragraphs (d)(1)(i) and (ii), (e)(3)(ii), (e)(3)(vii), and (e)(3)(ix).

The additions and revisions read as follows:

(c) * * *

(1) * * *

(vi) IEC Publication 61094–3, entitled ''Measurement Microphones—Part 3: Primary Method for Free-Field Calibration of Laboratory Standard Microphones by the Reciprocity Technique'', edition 1.0, dated 1995.

(vii) IEC Publication 61094–4, entitled ''Measurement Microphones—Part 4: Specifications for Working Standard Microphones'', edition 1.0, dated 1995.

(viii) IEC Publication 61260, entitled ''Electroacoustics-Octave-Band and Fractional-Octave-Band filters'', edition 1.0, dated 1995.

(ix) IEC Publication 61265, entitled ''Instruments for Measurement of Aircraft Noise-Performance Requirements for Systems to Measure One-Third-Octave-Band Sound pressure Levels in Noise Certification of Transport-Category Aeroplanes'', edition 1.0, dated 1995.

(x) IEC Publication 60942, entitled ''Electroacoustics-Sound Calibrators'', edition 2.0, dated 1997.

* * * * *

(d) * * *

(1) * * *

(i) International Electrotechnical Commission, 3, rue de Varembe, Case postale 131, 1211 Geneva 20, Switzerland

(ii) American National Standard Institute, 11 West 42nd Street, New York City, New York 10036

(e) * * *

(3) * * *

(iii) Southern Region Headquarters, 1701 Columbia Avenue, College Park, Georgia, 30337.

* * * * *

(vi) Southwest Region Headquarters, 2601 Meacham Boulevard, Fort Worth, Texas, 76137–4298.

(vii) Northwest Mountain Region Headquarters, 1601 Lind Avenue, Southwest, Renton, Washington 98055.

* * * * *

(ix) Alaskan Region Headquarters, 222 West 7th Avenue, 14, Anchorage, Alaska, 99513.

* * * * *

§ 36.7 [Amended]

5. Amend § 36.7 to read as follows:

a. In paragraph (a) remove the words ''turbojet powered'' and add the word ''jet'' in its place.

b. In paragraph (b)(1) remove the reference to ''Appendices A and B'' and add ''Appendix B'' in its place.

c. In paragraph (b)(2) remove the reference to ''C36.9'' and add ''B36.8'' in its place.

d. In paragraph (c)(1) remove the reference to ''C36.5(b)'' and add ''B36.6'' in its place.

e. In paragraph (d)(1) remove the word ''turbojet'' and add the word ''jet'' in its place.

f. In paragraph (d)(1)(ii) remove the reference to ''C36.5(b)'' and add ''B36.6'' in its place.

g. In paragraph (d)(2) remove the word ''turbojet'' and add the word ''jet'' in its place.

Subpart B—Transport Category Large Airplanes and Jet Airplanes

6. Revise the heading of Subpart B to read as set forth above.

7. Revise § 36.101 to read as follows:

§ 36.101 Noise measurement and evaluation.

For transport category large airplanes and jet airplanes, the noise generated by the airplane must be measured and evaluated under appendix A of this part or under an approved equivalent procedure.

8. Revise § 36.103 to read as follows:

§ 36.103 Noise Limits.

(a) For subsonic transport category large airplanes and subsonic jet airplanes compliance with this section must be shown with noise levels measured and evaluated as prescribed in Appendix A of this part, and demonstrated at the measuring points, and in accordance with the flight test conditions under section C36.8 (or an approved equivalent procedure), stated under appendix C of this part.

(b) Type certification applications for subsonic transport category large airplanes and all subsonic jet airplanes must show that the noise levels of the airplane are no greater than the Stage 3 noise limits stated in section B36.5(c) of appendix B of this part.

§ 36.201 (Subpart C) [Removed]

9. Remove and reserve subpart C, consisting of § 36.201.

§ 36.1581 [Amended]

10. Amend § 36.1581(a)(1) and (d) by removing the words ''turbojet powered'' and adding the word ''jet'' in its place.

11. Revise appendix A of part 36 to read as follows:

Appendix A to Part 36—Aircraft Noise Measurement and Evaluation Under § 36.101

Sec.

Section A36.1 Introduction.

A36.1.1 This appendix prescribes the conditions under which airplane noise certification tests must be conducted and states the measurement procedures that must be used to measure airplane noise during each test conducted on or after [insert effective date of final rule]. The procedures that must be used to determine the noise evaluation quantity designated as effective perceived noise level, EPNL, under §§ 36.101 and 36.803 are also stated.

A36.1.2 The instructions and procedures given are intended to ensure uniformity during compliance tests and to permit comparison between tests of various types of airplane conducted in various geographical locations.

A36.1.3 A complete list of symbols and units, the mathematical formulation of perceived noisiness, a procedure for determining atmospheric attenuation of sound, and detailed procedures for correcting noise levels from non-reference to reference conditions are included in sections A36.6 to A36.9 of this appendix.

Section A36.2 Noise certification test and measurement conditions.

A36.2.1 *General.*

A36.2.1.1 This section prescribes the conditions under which noise certification must be conducted and the measurement procedures that must be used.

Note: Many noise certifications involve only minor changes to the airplane type design. The resultant changes in noise can often be established reliably without the necessity of resorting to a complete test as outlined in this appendix. For this reason the FAA permits the use of appropriate ''equivalent procedures''. There are also equivalent procedures that may be used in full certification tests, in the interest of reducing costs and providing reliable results. Guidance material on the use of equivalent procedures in the noise certification of subsonic jet and propeller-driven large airplanes is provided in the current Advisory Circular for this part.

A36.2.2 *Test environment.*

A36.2.2.1 Locations for measuring noise from an airplane 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 that significantly influence the sound field from the airplane must exist within a conical space above the point on the ground vertically below the microphone, the cone being defined by an axis normal to the ground and by a half-angle 80° from this axis.

Note: Those people carrying out the measurements could themselves constitute such obstruction.

A36.2.2.2 The tests must be carried out under the following atmospheric conditions.

(a) No precipitation;

(b) Ambient air temperature not above 95°F (35°C) and not below 14°F (-10°C), and relative humidity not above 95% and not below 20% over the whole noise path between a point 33 ft (10 m) above the ground and the airplane.

Note: Care should be taken to ensure that the noise measuring, airplane flight path tracking and meteorological instrumentation are operated within their environmental limitations.

(c) Relative humidity and ambient temperature over the whole noise path between a point 33 ft (10 m) above the ground and the airplane such that the sound attenuation in the one-third octave band centered on 8 kHz will not be more than 12 dB/100 m;

(d) If the atmospheric absorption coefficients vary over the PNLTM sound propagation path by more than ±1.6dB/1000ft (±0.5dB/100m) in the 3150Hz one-third octave band from the value of the absorption coefficient derived from the meteorological measurement obtained at 33 ft (10 m) above the surface, ''layered'' sections of the atmosphere must be used as described in section A36.2.2.3 to compute equivalent weighted sound attenuations in each one-third octave band; the FAA will determine whether a sufficient number of layered sections have been used. For each measurement, where multiple layering is not required, equivalent sound attenuations in each one-third octave band must be determined by averaging the atmospheric absorption coefficients for each such band at 33 ft (10 m) above ground level, and at the flight level of the airplane at the time of PNLTM, for each measurement;

(e) Average wind velocity 10 meters above ground is not to exceed 12 knots and the crosswind velocity for the airplane is not to exceed 7 knots. The average wind velocity must be determined using a thirty-second averaging period spanning the 10 dB down time interval. Maximum wind velocity 10 meters above ground is not to exceed 15 knots and the crosswind velocity is not to exceed 10 knots during the 10 dB down time interval.

(f) No anomalous meteorological or wind conditions that would significantly affect the measured noise levels when the noise is recorded at the measuring points specified by the FAA; and

(g) Meteorological measurements must be obtained within 30 minutes of each noise test measurement; meteorological data must be interpolated to actual times of each noise measurement.

A36.2.2.3 When a multiple layering calculation is required by section A36.2.2.2(d) the atmosphere between the airplane and 33 ft (10 m) above the ground must be divided into layers of equal depth. The depth of the layers must be set to not more than the depth of the narrowest layer across which the variation in the atmospheric absorption coefficient of the 3150 Hz one-third octave band is not greater than +/-1.6 dB/1000 ft (+/-0.5 dB/100m), with a minimum layer depth of 100 ft (30 m). This requirement must be met for the propagation path at PNLTM. The mean of the values of the atmospheric absorption coefficients at the top and bottom of each layer may be used to characterize the absorption properties of each layer.

A36.2.2.4 The airport control tower or another facility must be approved by the FAA for use as the central location at which measurements of atmospheric parameters are representative of those conditions existing over the geographical area in which noise measurements are made.

A36.2.3 *Flight path measurement.*

A36.2.3.1 The airplane height and lateral position relative to the flight track 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.

A36.2.3.2 The airplane position along the flight path must be related to the noise recorded at the noise measurement locations by means of synchronizing signals over a distance sufficient to assure adequate data during the period that the noise is within 10 dB of the maximum value of PNLT.

A36.2.3.3 Position and performance data required to make the adjustments referred to in section A36.9 of this appendix must be automatically recorded at an approved sampling rate. Measuring equipment must be approved by the FAA.

Section A36.3 Measurement of Airplane Noise Received on the Ground.

A36.3.1 *Definitions*

For the purposes of this section the following definitions apply:

A36.3.1.1 *Measurement system* means the combination of instruments used for the measurement of sound pressure levels, including a sound calibrator, windscreen, microphone system, signal recording and conditioning devices, and one-third octave band analysis system.

Note: Practical installations may include a number of microphone systems, the outputs from which are recorded simultaneously by a multi-channel recording/analysis device via signal conditioners, as appropriate. For the purpose of this section, each complete measurement channel is considered to be a measurement system to which the requirements apply accordingly.

A36.3.1.2 *Microphone system* means the components of the measurement system which produce an electrical output signal in response to a sound pressure input signal, and which generally include a microphone, a preamplifier, extension cables, and other devices as necessary.

A36.3.1.3 *Sound incidence angle* means in degrees, an angle between the principal axis of the microphone, as defined in IEC 61094–3 and IEC 61094–4, as amended and a line from the sound source to the center of the diaphragm of the microphone.

Note: When the sound incidence angle is 0°, the sound is said to be received at the microphone at ''normal (perpendicular) incidence''; when the sound incidence angle is 90°, the sound is said to be received at ''grazing incidence''.

A36.3.1.4 *Reference direction* means, in degrees, the direction of sound incidence specified by the manufacturer of the microphone, relative to a sound incidence angle of 0°, for which the free-field sensitivity level of the microphone system is within specified tolerance limits.

A36.3.1.5 *Free-field sensitivity of a microphone system* means, in volts per Pascal, for a sinusoidal plane progressive sound wave of specified frequency, at a specified sound incidence angle, the quotient of the root mean square voltage at the output of a microphone system and the root mean square sound pressure that would exist at the position of the microphone in its absence.

A36.3.1.6 *Free-field sensitivity level of a microphone system* means, in decibels, twenty times the logarithm to the base ten of the ratio of the free-field sensitivity of a microphone system and the reference sensitivity of one volt per Pascal.

Note: The free-field sensitivity level of a microphone system may be determined by subtracting the sound pressure level (in decibels re 20 μPa) of the sound incident on the microphone from the voltage level (in decibels re 1 V) at the output of the microphone system, and adding 93.98 dB to the result.

A36.3.1.7 *Time-average band sound pressure level* means in decibels, ten times the logarithm to the base ten, of the ratio of the time mean square of the instantaneous sound pressure during a stated time interval and in a specified one-third octave band, to the square of the reference sound pressure of 20 μPa.

A36.3.1.8 *Level range* means, in decibels, an operating range determined by the setting of the controls that are provided in a measurement system for the recording and one-third octave band analysis of a sound pressure signal. The upper boundary associated with any particular level range must be rounded to the nearest decibel.

A36.3.1.9 *Calibration sound pressure level* means, in decibels, the sound pressure level produced, under reference environmental conditions, in the cavity of the coupler of the sound calibrator that is used to determine the overall acoustical sensitivity of a measurement system.

A36.3.1.10 *Reference level range* means, in decibels, the level range for determining the acoustical sensitivity of the measurement system and containing the calibration sound pressure level.

A36.3.1.11 *Calibration check frequency* means, in hertz, the nominal frequency of the sinusoidal sound pressure signal produced by the sound calibrator.

A36.3.1.12 *Level difference* means, in decibels, for any nominal one-third octave midband frequency, the output signal level measured on any level range minus the level of the corresponding electrical input signal.

A36.3.1.13 *Reference level difference* means, in decibels, for a stated frequency, the level difference measured on a level range for an electrical input signal corresponding to the calibration sound pressure level, adjusted as appropriate, for the level range.

A36.3.1.14 *Level non-linearity* means, in decibels, the level difference measured on any level range, at a stated one-third octave nominal midband frequency, minus the corresponding reference level difference, all input and output signals being relative to the same reference quantity.

A36.3.1.15 *Linear operating range* means, in decibels, for a stated level range and frequency, the range of levels of steady sinusoidal electrical signals applied to the input of the entire measurement system, exclusive of the microphone but including the microphone preamplifier and any other signal-conditioning elements that are considered to be part of the microphone system, extending from a lower to an upper boundary, over which the level non-linearity is within specified tolerance limits.

Note. Microphone extension cables as configured in the field need not be included for the linear operating range determination.

A36.3.1.16 *Windscreen insertion loss* means, in decibels, at a stated nominal one-third octave midband frequency, and for a stated sound incidence angle on the inserted microphone, the indicated sound pressure level without the windscreen installed around the microphone minus the sound pressure level with the windscreen installed.

A36.3.2 *Reference environmental conditions.*

A36.3.2.1 The reference environmental conditions for specifying the performance of a measurement system are:

(a) air temperature—73.4°F (23°C);
(b) static air pressure—101.325 kPa; and
(c) relative humidity—50 %.

A36.3.3 *General.*

Note. Measurements of aircraft noise that use instruments that conform to the specifications of this section yield one-third octave band sound pressure levels as a function of time. These one-third octave band levels are to be used for the calculation of effective perceived noise level as described in section A36.4.

A36.3.3.1 The measurement system must consist of equipment approved by the FAA and equivalent to the following:

(a) A windscreen (see A36.3.4);

(b) A microphone system (see A36.3.5);

(c) A recording and reproducing system to store the measured aircraft noise signals for subsequent analysis (see A36.3.6);

(d) A one-third octave band analysis system (see A36.3.7); and

(e) Calibration systems to maintain the acoustical sensitivity of the above systems within specified tolerance limits (see A36.3.8).

A36.3.3.2 For any component of the measurement system that converts an analog signal to digital form, such conversion must be performed so that the levels of any possible aliases or artifacts of the digitization process will be less than the upper boundary of the linear operating range by at least 50 dB at any frequency less than 12.5 kHz. The sampling rate must be at least 28 kHz. An anti-aliasing filter must be included before the digitization process.

A36.3.4 *Windscreen.*

A36.3.4.1 In the absence of wind and for sinusoidal sounds at grazing incidence, the insertion loss caused by the windscreen of a stated type installed around the microphone must not exceed ±1.5 dB at nominal one-third octave midband frequencies from 50 Hz to 10 kHz inclusive.

A36.3.5 *Microphone system.*

A36.3.5.1 The microphone system must conform to the specifications in sections A36.3.5.2 to A36.3.5.4. Various microphone systems may be approved by the FAA on the basis of demonstrated equivalent overall electroacoustical performance. Where two or more microphone systems of the same type are used, demonstration that at least one system conforms to the specifications in full is sufficient to demonstrate conformance.

Note. This demonstration of equivalent performance does not eliminate the need to calibrate and check each system as defined in section A36.3.9.

A36.3.5.2 The microphone must be mounted with the sensing element 4 ft (1.2 m) above the local ground surface and must be oriented for grazing incidence, *i.e.,* with the sensing element substantially in the plane defined by the predicted reference flight path of the aircraft and the measuring station. The microphone mounting arrangement must minimize the interference of the supports with the sound to be measured. Figure A36–1 illustrates sound incidence angles on a microphone.

A36.3.5.3 The free-field sensitivity level of the microphone and preamplifier in the reference direction, at frequencies over at least the range of one-third-octave nominal midband frequencies from 50 Hz to 5 kHz inclusive, must be within ±1.0 dB of that at the calibration check frequency, and within ±2.0 dB for nominal midband frequencies of 6.3 kHz, 8 kHz and 10 kHz.

A36.3.5.4 For sinusoidal sound waves at each one-third octave nominal midband frequency over the range from 50 Hz to 10 kHz inclusive, the free-field sensitivity levels of the microphone system at sound incidence angles of 30°, 60°, 90°, 120° and 150°, must not differ from the free-field sensitivity level at a sound incidence angle of 0° (''normal incidence'') by more than the values shown in Table A36–1. The free-field sensitivity level differences at sound incidence angles between any two adjacent sound incidence angles in

Table A36–1 must not exceed the tolerance limit for the greater angle.

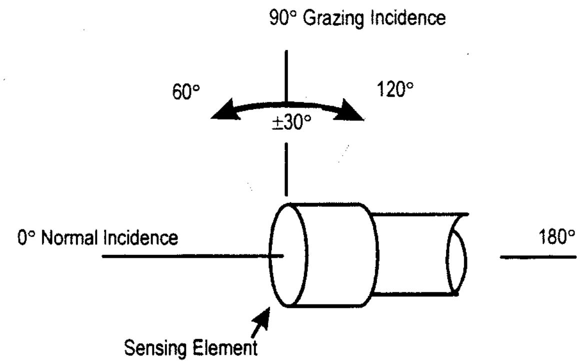


Figure A36-1: Illustration of sound incidence angles on a microphone

MAXIMUM DIFFERENCE BETWEEN THE FREE-FIELD SENSITIVITY LEVEL OF A MICROPHONE SYSTEM AT NORMAL INCIDENCE AND THE FREE-FIELD SENSITIVITY LEVEL AT SPECIFIED SOUND INCIDENCE ANGLES

Nominal midband frequency kHz	dB Sound incidence angle degrees				
	30	60	90	120	150
0.05 to 1.6	0.5	0.5	1.0	1.0	1.0
2.0	0.5	0.5	1.0	1.0	1.0
2.5	0.5	0.5	1.0	1.5	1.5
3.15	0.5	1.0	1.5	2.0	2.0
4.0	0.5	1.0	2.0	2.5	2.5
5.0	0.5	1.5	2.5	3.0	3.0
6.3	1.0	2.0	3.0	4.0	4.0
8.0	1.5	2.5	4.0	5.5	5.5
10.0	2.0	3.5	5.5	6.5	7.5

Table A36–1 Microphone Directional Response Requirements

A36.3.6 *Recording and reproducing systems.*

A36.3.6.1 A recording and reproducing system, such as a digital or analog magnetic tape recorder, a computer-based system or other permanent data storage device, must be used to store sound pressure signals for subsequent analysis. The sound produced by the aircraft must be recorded in such a way that a record of the complete acoustical signal is retained. The recording and reproducing systems must conform to the specifications in sections A36.3.6.2 to A36.3.6.9 at the recording speeds and/or data sampling rates used for the noise certification tests. Conformance must be demonstrated for the frequency bandwidths and recording channels selected for the tests.

A36.3.6.2 The recording and reproducing systems must be calibrated as described in section A36.3.9.

(a) For aircraft noise signals for which the high frequency spectral levels decrease rapidly with increasing frequency, appropriate pre-emphasis and complementary de-emphasis networks may be included in the measurement system. If pre-emphasis is included, over the range of nominal one-third octave midband frequencies from 800 Hz to 10 kHz inclusive, the electrical gain provided by the pre-emphasis network must not exceed 20 dB relative to the gain at 800 Hz.

A36.3.6.3 For steady sinusoidal electrical signals applied to the input of the entire measurement system including all parts of the microphone system except the microphone at a selected signal level within 5 dB of that corresponding to the calibration sound pressure level on the reference level range, the time-average signal level indicated by the readout device at any one-third octave nominal midband frequency from 50 Hz to 10 kHz inclusive must be within ±1.5 dB of that at the calibration check frequency. The frequency response of a measurement system, which includes components that convert analog signals to digital form, must be within ±0.3 dB of the response at 10 kHz over the frequency range from 10 kHz to 11.2 kHz.

Note: Microphone extension cables as configured in the field need not be included for the frequency response determination. This allowance does not eliminate the requirement of including microphone extension cables when performing the pink noise recording in section A36.3.9.5.

A36.3.6.4 For analog tape recordings, the amplitude fluctuations of a 1 kHz sinusoidal signal recorded within 5 dB of the level corresponding to the calibration sound pressure level must not vary by more than ±0.5 dB throughout any reel of the type of magnetic tape used. Conformance to this requirement must be demonstrated using a device that has time-averaging properties equivalent to those of the spectrum analyzer.

A36.3.6.5 For all appropriate level ranges and for steady sinusoidal electrical signals applied to the input of the measurement system, including all parts of the microphone system except the microphone, at one-third-octave nominal midband frequencies of 50 Hz, 1 kHz and 10 kHz, and the calibration check frequency, if it is not one of these frequencies, the level non-linearity must not exceed ±0.5 dB for a linear operating range of at least 50 dB below the upper boundary of the level range.

Note 1: Level linearity of measurement system components may be tested according to the methods described in IEC 61265 as amended.

Note 2: Microphone extension cables configured in the field need not be included for the level linearity determination.

A36.3.6.6 On the reference level range, the level corresponding to the calibration sound pressure level must be at least 5 dB, but no more than 30 dB less than the upper boundary of the level range.

A36.3.6.7 The linear operating ranges on adjacent level ranges must overlap by at least 50 dB minus the change in attenuation introduced by a change in the level range controls.

Note: It is possible for a measurement system to have level range controls that permit attenuation changes of either 10 dB or 1 dB, for example. With 10 dB steps, the minimum overlap required would be 40 dB, and with 1 dB steps the minimum overlap would be 49 dB.

A36.3.6.8 An overload indicator must be included in the recording and reproducing systems so that an overload indication will occur during an overload condition on any relevant level range.

A36.3.6.9 Attenuators included in the measurement system to permit range changes must operate in known intervals of decibel steps.

A36.3.7 *Analysis systems.*

A36.3.7.1 The analysis system must conform to the specifications in sections A36.3.7.2 to A36.3.7.7 for the frequency bandwidths, channel configurations and gain settings used for analysis.

A36.3.7.2 The output of the analysis system must consist of one-third octave band sound pressure levels as a function of time, obtained by processing the noise signals (preferably recorded) through an analysis system with the following characteristics:

(a) A set of 24 one-third octave band filters, or their equivalent, having nominal midband frequencies from 50 Hz to 10 kHz inclusive;

(b) Response and averaging properties in which, in principle, the output from any one-third octave filter band is squared, averaged and displayed or stored as time-averaged sound pressure levels;

(c) The interval between successive sound pressure level samples must be 500 ms ±5 milliseconds (ms) for spectral analysis with or without slow time weighting, as defined in section A36.3.7.4;

(d) For those analysis systems that do not process the sound pressure signals during the period of time required for readout and/or resetting of the analyzer, the loss of data must not exceed a duration of 5 ms; and

(e) The analysis system must operate in real time from 50 Hz through at least 12 kHz inclusive. This requirement applies to all operating channels of a multi-channel spectral analysis system.

A36.3.7.3 The minimum standard for the one-third octave band analysis system is the class 2 electrical performance requirements of IEC 61260 as amended, over the range of one-third octave nominal midband frequencies from 50 Hz through 10 kHz inclusive.

Note: Tests of the one-third octave band analysis system may be made according to the methods described in IEC 61260 for relative attenuation, anti-aliasing filters, real time operation, level linearity, and filter integrated response (effective bandwidth).

A36.3.7.4 When slow time averaging is performed in the analyzer, the response of the one-third octave band analysis system to a sudden onset or interruption of a constant sinusoidal signal at the respective one-third octave nominal midband frequency, must be measured at sampling instants 0.5, 1, 1.5 and 2 seconds(s) after the onset and 0.5 and 1 s after interruption. The rising response must be -4 ± 1 dB at 0.5 s, -1.75 ± 0.75 dB at 1 s, -1 ± 0.5 dB at 1.5 s and -0.5 ± 0.5 dB at 2 s relative to the steady-state level. The falling response must be such that the sum of the output signal levels, relative to the initial steady-state level, and the corresponding rising response reading is -6.5 ± 1 dB, at both 0.5 and 1 s. At subsequent times the sum of the rising and falling responses must be -7.5 dB or less. This equates to an exponential averaging process (slow weighting) with a nominal 1 s time constant (i.e., 2 s averaging time).

A36.3.7.5 When the one-third octave band sound pressure levels are determined from the output of the analyzer without slow time weighting, slow time weighting must be simulated in the subsequent processing. Simulated slow weighted sound pressure levels can be obtained using a continuous exponential averaging process by the following equation:

$$L_s(i,k) = 10 \log [(0.60653)10^{0.1Ls[i,(k\ ndash;1)]} + (0.39347)\ 10^{0.1\ L(i,k)}]$$

Where $L_s(i,k)$ is the simulated slow weighted sound pressure level and L(i,k) is the as-measured 0.5 s time average sound pressure level determined from the output of the analyzer for the k-th instant of time and the i-th one-third octave band. For k =1, the slow weighted sound pressure Ls[i,(k-1=0)] on the right hand side should be set to 0 dB. An approximation of the continuous exponential averaging is represented by the following equation for a four sample averaging process for k ≥(4:

$$L_s(i,k) = 10 \log [(0.13)10^{0.1L[i,(k\ ndash;3)]} + (0.21)\ 10^{0.1L[i,(k\ ndash;2)]} +(0.27)\ 10^{0.1L[i,(k\ ndash;1)]} + (0.39)10^{0.1L[i,k]}]$$

Where $L_s(i,k)$ is the simulated slow weighted sound pressure level and L(i,k) is the as measured 0.5 s time average sound pressure level determined from the output of the analyzer for the k-th instant of time and the i-th one-third octave band.

The sum of the weighting factors is 1.0 in the two equations. Sound pressure levels calculated by means of either equation are valid for the sixth and subsequent 0.5 s data samples, or for times greater than 2.5 s after initiation of data analysis.

Note: The coefficients in the two equations were calculated for use in determining equivalent slow weighted sound pressure levels from samples of 0.5 s time average sound pressure levels. The equations should not be used with data samples where the averaging time differs from 0.5 s.

A36.3.7.6 The instant in time by which a slow time weighted sound pressure level is characterized must be 0.75 s earlier than the actual readout time.

Note: The definition of this instant in time is required to correlate the recorded noise with the aircraft position when the noise was emitted and takes into account the averaging period of the slow weighting. For each 0.5 second data record this instant in time may also be identified as 1.25 seconds after the start of the associated 2 second averaging period.

A36.3.7.7 The resolution of the sound pressure levels, both displayed and stored, must be 0.1 dB or finer.

A36.3.8 *Calibration systems.*

A36.3.8.1 The acoustical sensitivity of the measurement system must be determined using a sound calibrator generating a known sound pressure level at a known frequency. The minimum standard for the sound calibrator is the class 1L requirements of IEC 60942 as amended.

A36.3.9 *Calibration and checking of system.*

A36.3.9.1 Calibration and checking of the measurement system and its constituent components must be carried out to the satisfaction of the FAA by the methods specified in sections A36.3.9.2 through A36.3.9.10. The calibration adjustments, including those for environmental effects on sound calibrator output level, must be reported to the FAA and applied to the measured one-third-octave sound pressure levels determined from the output of the analyzer. Data collected during an overload indication are invalid and may not be used. If the overload condition occurred during recording, the associated test data are invalid, whereas if the overload occurred during analysis, the analysis must be repeated with reduced sensitivity to eliminate the overload.

A36.3.9.2 The free-field frequency response of the microphone system may be determined by use of an electrostatic actuator in combination with manufacturer's data or by tests in an anechoic free-field facility. The correction for frequency response must be determined within 90 days of each test series. The correction for non-uniform frequency response of the microphone system must be reported to the FAA and applied to the measured one-third octave band sound pressure levels determined from the output of the analyzer.

A36.3.9.3 When the angles of incidence of sound emitted from the aircraft are within ±30° of grazing incidence at the microphone (see Figure A36–1), a single set of free-field corrections based on grazing incidence is considered sufficient for correction of directional response effects. For other cases, the angle of incidence for each 0.5 second sample must be determined and applied for the correction of incidence effects.

A36.3.9.4 For analog magnetic tape recorders, each reel of magnetic tape must carry at least 30 seconds of pink random or pseudo-random noise at its beginning and end. Data obtained from analogue tape-recorded signals will be accepted as reliable only if level differences in the 10 kHz one-third-octave-band are not more than 0.75 dB for the signals recorded at the beginning and end.

A36.3.9.5 The frequency response of the entire measurement system while deployed in the field during the test series, exclusive of the microphone, must be determined at a level within 5 dB of the level corresponding to the calibration sound pressure level on the level range used during the tests for each one-third octave nominal midband frequency from 50 Hz to 10 kHz inclusive, utilizing pink random or pseudo-random noise. The output of the noise generator must be determined by a method traceable to the U.S. National Institute of Standards and Technology or an equivalent national standards laboratory as determined by the FAA within six months of each test series. Any changes in the relative output from the previous calibration at each one-third octave band may not exceed 0.2 dB. The correction for frequency response must be reported to the FAA and applied to the measured one-third octave sound pressure levels determined from the output of the analyzer.

A36.3.9.6 The performance of switched attenuators in the equipment used during noise certification measurements and calibration must be checked within six months of each test series to ensure that the maximum error does not exceed 0.1 dB.

A36.3.9.7 The sound pressure level produced in the cavity of the coupler of the sound calibrator must be calculated for the test environmental conditions using the manufacturer's supplied information on the influence of atmospheric air pressure and temperature. This sound pressure level is used to establish the acoustical sensitivity of the measurement system. Within six months of each test series the output of the sound calibrator must be determined by a method traceable to the U.S. National Institute of Standards and Technology or an equivalent national standards laboratory as determined by the FAA. Changes in output from the previous calibration must not exceed 0.2 dB.

A36.3.9.8 Sufficient sound pressure level calibrations must be made during each test day to ensure that the acoustical sensitivity of the measurement system is known at the prevailing environmental conditions corresponding with each test series. The difference between the acoustical sensitivity levels recorded immediately before and immediately after each test series on each day may not exceed 0.5 dB. The 0.5 dB limit applies after any atmospheric pressure corrections have been determined for the calibrator output level. The arithmetic mean of the before and after measurements must be used to represent the acoustical sensitivity level of the measurement system for that test series. The calibration corrections must be reported to the FAA and applied to the measured one-third octave band sound pressure levels determined from the output of the analyzer.

A36.3.9.9 Each recording medium, such as a reel, cartridge, cassette, or diskette, must carry a sound pressure level calibration of at least 10 seconds duration at its beginning and end.

A36.3.9.10 The free-field insertion loss of the windscreen for each one-third octave nominal midband frequency from 50 Hz to 10 kHz inclusive must be determined with sinusoidal sound signals at the incidence angles determined to be applicable for correction of directional response effects per section A36.3.9.3. The interval between angles tested must not exceed 30 degrees. For a windscreen that is undamaged and uncontaminated, the insertion loss may be taken from manufacturer's data. Alternatively, within six months of each test series the insertion loss of the windscreen may be determined by a method traceable to the U.S. National Institute of Standards and Technology or an equivalent national standards laboratory as determined by the FAA. Changes in the insertion loss from the previous calibration at each one-third-octave frequency band must not exceed 0.4 dB. The correction for the free-field insertion loss of the windscreen must be reported to the FAA and applied to the measured one-third octave sound pressure levels determined from the output of the analyzer.

A36.3.9.11 Ambient noise, including both acoustical background and electrical noise of the measurement system, must be recorded for at least 10 seconds at the measurement points with the system gain set at the levels used for the aircraft noise measurements. Ambient noise must be representative of the acoustical background that exists during the flyover test run. The recorded aircraft noise data is acceptable only if the ambient noise levels, when analyzed in the same way, and quoted in PNL (see A36.4.1.3 (a)), are at least 20 dB below the maximum PNL of the aircraft.

A36.3.9.12 Aircraft sound pressure levels within the 10 dB-down points (see A36.4.5.1) must exceed the mean ambient noise levels determined in section A36.3.9.11 by at least 3 dB in each one-third octave band, or must be adjusted using a method approved by the FAA; one method is described in the current Advisory Circular for this part.

Section A36.4 Calculation of Effective Perceived Noise Level From Measured Data.

A36.4.1 General.

A36.4.1.1 The basic element for noise certification criteria is the noise evaluation measure known as effective perceived noise level, EPNL, in units of EPNdB, which is a single number evaluator of the subjective effects of airplane noise on human beings. Simply stated, EPNL consists of instantaneous perceived noise level, PNL, corrected for spectral irregularities, and for duration. The spectral irregularity correction, called ''tone correction factor'', is made at each time increment for only the maximum tone.

A36.4.1.2 Three basic physical properties of sound pressure must be measured: Level, frequency distribution, and time variation. To determine EPNL, the instantaneous sound pressure level in each of the 24 one-third octave bands is required for each 0.5 second increment of time during the airplane noise measurement.

A36.4.1.3 The calculation procedure that uses physical measurements of noise to derive the EPNL evaluation measure of subjective response consists of the following five steps:

(a) The 24 one-third octave bands of sound pressure level are converted to perceived noisiness (noy) using one of the methods of sub-section A36.4.2.1(a). 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 spectral irregularities.

(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:

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

The instantaneous values of tone-corrected perceived noise level are derived and the maximum value, PNLTM, is determined.

(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:

$$EPNL = PNLTM + D$$

A36.4.2 *Perceived noise level.*

A36.4.2.1 Instantaneous perceived noise levels, PNL(k), must be calculated from instantaneous one-third octave band sound pressure levels, SPL(i,k) as follows:

(a) Step 1: For each one-third octave band from 50 through 10,000 Hz, convert SPL(i,k) to perceived noisiness n(i,k), by using the mathematical formulation of the noy table given in section A36.4.7, or to the Table of Perceived Noisiness in the current Advisory Circular for this part.

(b) Step 2: Combine the perceived noisiness values, n(i,k), determined in step 1 by using 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.

(c) Step 3: Convert the total perceived noisiness, N(k), determined in Step 2 into perceived noise level, PNL(k), using the following formula:

$$PNL(k) = 40.0 + \frac{10}{\log 2} \log N(k)$$

Note: PNL(k) is plotted in the current Advisory Circular for this part.

A36.4.3 *Correction for spectral irregularities.*

A36.4.3.1 Noise having pronounced spectral irregularities (for example, the maximum discrete frequency components or tones) must be adjusted by the correction factor C(k) calculated as follows:

(a) Step 1: After applying the corrections specified under section A36.3.9, start with the 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:

$s(3,k)$ = no value

$s(4,k) = SPL(4,k) - SPL(3,k)$

•

•

$s(i,k) = SPL(i,k) - SPL(i-1,k)$

•

•

$s(24,k) = SPL(24,k) - SPL(23,k)$

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

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

(c) Step 3:

(1) 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).

(2) 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).

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

(d) Step 4: Compute new adjusted sound pressure levels SPL′(i,k) as follows:

(1) For non-encircled sound pressure levels, set the new sound pressure levels equal to the original sound pressure levels, SPL′(i,k) = SPL(i,k).

(2) For encircled sound pressure levels in bands 1 through 23 inclusive, set the new sound pressure level equal to the arithmetic average of the preceding and following sound pressure levels as shown below:

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

(3) If the sound pressure level in the highest frequency band (i =24) is encircled, set the new sound pressure level in that band equal to:

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

(e) Step 5: Recompute new slope s′(i,k), including one for an imaginary 25th band, as follows:

$s'(3,k) = s'(4,k)$

$s'(4,k) = SPL'(4,k) - SPL'(3,k)$

•

•

$s'(i,k) = SPL'(i,k) - SPL'(i-1,k)$

•

•

$s'(24,k) = SPL'(24,k) - SPL'(23,k)$

$s'(25,k) = s'(24,k)$

(f) Step 6: For i, from 3 through 23, compute the arithmetic average of the three adjacent slopes as follows:

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

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

$SPL''(3,k) = SPL(3,k)$

$SPL''(4,k) = SPL''(3,k) + \bar{s}(3,k)$

•

•

$SPL''(i,k) = SPL''(i-1,k) + \bar{s}(i-1,k)$

•

•

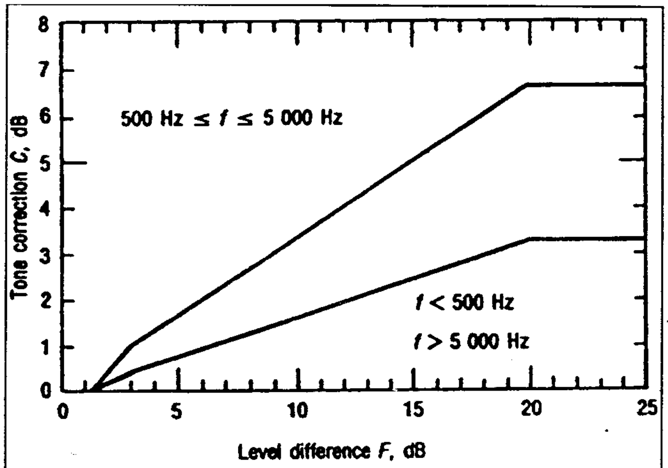
$SPL''(24,k) = SPL''(23,k) + \bar{s}(23,k)$

(h) Step 8: Calculate the differences, F (i,k), between the original sound pressure level and the final background sound pressure level as follows:

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

and note only values equal to or greater than 1.5.

(i) Step 9: For each of the relevant one-third octave bands (3 through 24), determine tone correction factors from the sound pressure level differences F (i,k) and Table A36–2.



Frequency f, Hz	Level difference F, dB	Tone correction C, dB
50 ≤ f < 500	1½* ≤ F < 3	F/3 — ½
	3 ≤ F < 20	F/6
	20 ≤ F	3⅓
500 ≤ f ≤ 5 000	1½* ≤ F < 3	2 F/3 — 1
	3 ≤ F < 20	F/3
	20 ≤ F	6⅔
5 000 < f ≤ 10 000	1½* ≤ F < 3	F/3 — ½
	3 ≤ F < 20	F/6
	20 ≤ F	3⅓

* See Step 8, 4.3.1.

Table A36-2. Tone correction factor

(j) 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 the current Advisory Circular for this part.) Tone-corrected perceived noise levels PNLT(k) must be 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 airplane 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 these suspicions, then a revised value for the background sound pressure level SPL''(i,k), may be determined from the narrow band analysis and used to compute a revised tone correction factor for that particular one-third octave band. Other methods of rejecting spurious tone corrections may be approved.

A36.4.3.2 The tone correction procedure will underestimate EPNL if an important tone is of a frequency such that it is recorded in two adjacent one-third octave bands. An applicant must demonstrate that either:

(a) No important tones are recorded in two adjacent one-third octave bands; or

(b) That if it has occurred that the tone correction has been adjusted to the value it would have had if the tone had been recorded fully in a single one-third octave band.

A36.4.4 Maximum tone-corrected perceived noise level.

A36.4.4.1 The maximum tone-corrected perceived noise level, PNLTM, must be the maximum calculated value of the tone-corrected perceived noise level PNLT(k). It must be calculated using the procedure of section A36.4.3. To obtain a satisfactory noise time history, measurements must be made at 0.5 second time intervals.

Note 1: Figure A36–2 is an example of a flyover noise time history where the maximum value is clearly indicated.

Note 2: In the absence of a tone correction factor, PNLTM would equal PNLM.

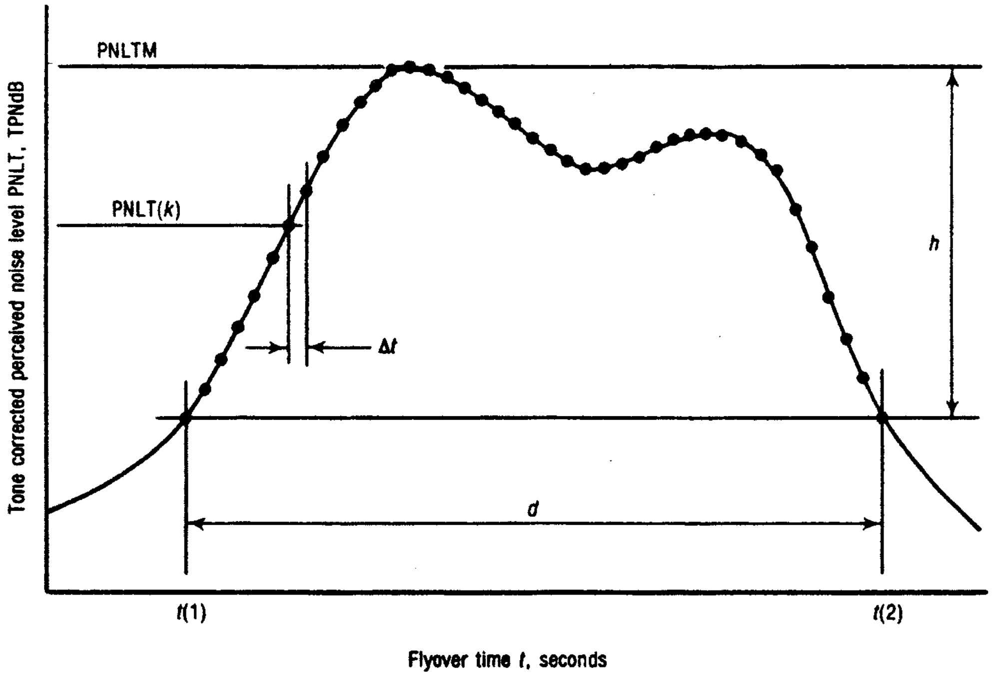


Figure A36-2. Example of perceived noise level corrected for tones as a function of aircraft flyover time

A36.4.4.2 After the value of PNLTM is obtained, the frequency band for the largest tone correction factor is identified for the two preceding and two succeeding 500 ms data samples. This is performed in order to identify the possibility of tone suppression at PNLTM by one-third octave band sharing of that tone. If the value of the tone correction factor C(k) for PNLTM is less than the average value of C(k) for the five consecutive time intervals, the average value of C(k) must be used to compute a new value for PNLTM.

A36.4.5 *Duration correction.*

A36.4.5.1 The duration correction factor D determined by the integration technique is defined by the expression:

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

Where T is a normalizing time constant, PNLTM is the maximum value of PNLT, t(1) is the first point of time after which PNLT becomes greater than PNLTM–10, and t(2) is the point of time after which PNLT remains constantly less than PNLTM–10.

A36.4.5.2 Since PNLT is calculated from measured values of sound pressure level (SPL), there is no obvious equation for PNLT as a function of time. Consequently, the equation is to be rewritten with a summation sign instead of an integral sign as follows:

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

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 0.5s during which PNLT(k) remains greater or equal to PNLTM–10.

A36.4.5.3 To obtain a satisfactory history of the perceived noise level use one of the following:

(a) Half-second time intervals for Δt; or

(b) A shorter time interval with approved limits and constants.

A36.4.5.4 The following values for T and Δt must be used in calculating D in the equation given in section A36.4.5.2:

T = 10 s, and

Δt = 0.5 s (or the approved sampling time interval).

Using these values, the equation for D becomes:

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

Where d is the duration time defined by the points corresponding to the values PNLTM–10.

A36.4.5.5–If in using the procedures given in section A36.4.5.2, the limits of PNLTM–10 fall between the calculated PNLT(k) values (the usual case), the PNLT(k) values defining the limits of the duration interval 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.

A36.4.6–*Effective perceived noise level.*

A36.4.6.1–The total subjective effect of an airplane noise event, designated effective perceived noise level, EPNL, 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 using the procedures given in sections A36.4.2, A36.4.3, A36.4.4. and A36.4.5.

A36.4.7–*Mathematical formulation of noy tables.*

A36.4.7.1–The relationship between sound pressure level (SPL) and the logarithm of perceived noisiness is illustrated in Figure A36–3 and Table A36–3.

A36.4.7.2–The bases of the mathematical formulation are:

(a) The slopes (M(b), M(c), M(d) and M(e)) of the straight lines;

(b) The intercepts (SPL(b) and SPL(c)) of the lines on the SPL axis; and

(c) The coordinates of the discontinuities, SPL(a) and log n(a); SPL(d) and log n = -1.0; and SPL(e) and log n = log (0.3).

A36.4.7.3 Calculate noy values using the following equations:

(a)

$SPL \geq SPL(a)$

$n = \text{antilog} \{M(c)[SPL - SPL(c)]\}$

(b)

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

$n = \text{antilog} \{M(b)[SPL - SPL(b)]\}$

(c)

$SPL(e) \leq SPL < SPL(b)$

$n = 0.3 \text{antilog} \{M(e)[SPL - SPL(e)]\}$

(d)

$SPL(d) \leq SPL < SPL(e)$

$n = 0.1 \text{ antilog} \{M(d)[SPL - SPL(d)]\}$

A36.4.7.4 Table A36–3 lists the values of the constants necessary to calculate perceived noisiness as a function of sound pressure level.

Section A36.5 Reporting Of data to the FAA.

A36.5.1 General.

A36.5.1.1 Data representing physical measurements and data used to make corrections to physical measurements must be recorded in an approved permanent form and appended to the record.

A36.5.1.2 All corrections must be reported to and approved by the FAA. In particular, the corrections to measurements for equipment response deviations must be reported.

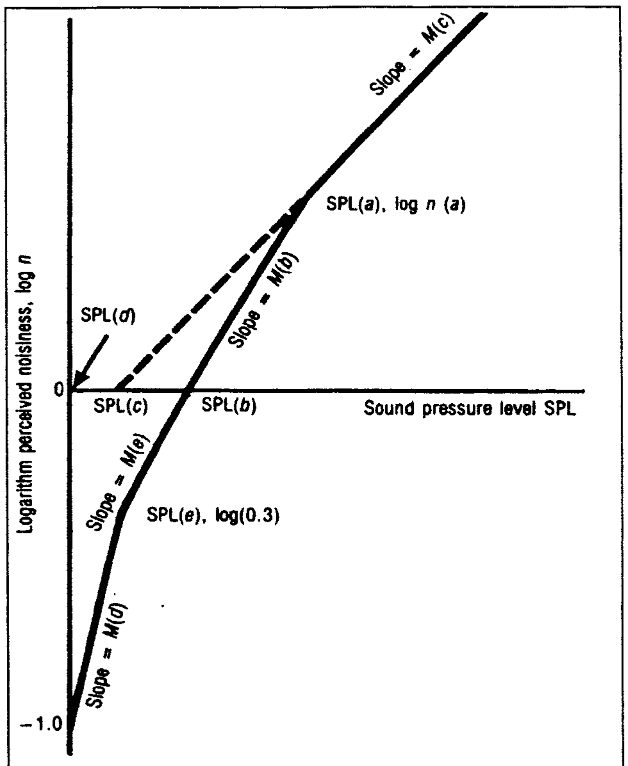


Figure A36-3. Perceived noisiness as a function of sound pressure level

A36.5.1.3 Applicants may be required to submit estimates of the individual errors inherent in each of the operations employed in obtaining the final data.

A36.5.2 *Data reporting.*

The following must be reported to the FAA in the applicant's noise certification compliance report.

A36.5.2.1 The applicant must present measured and corrected sound pressure levels in one-third octave band levels that are obtained with equipment conforming to the standards described in section A36.3 of this appendix.

A36.5.2.2 The applicant must report the make and model of equipment used for measurement and analysis of all acoustic performance and meteorological data.

BAND (*i*)	*f* HZ	SPL (*a*)	SPL (*b*)	SPL (*c*)	SPL (*d*)	SPL (*e*)	*M*(*b*)	*M*(*c*)	*M*(*d*)	*M*(*e*)
1	50	91.0	64	52	49	55	0.043478	0.030103	0.079520	0.058098
2	63	85.9	60	51	44	51	0.040570	↑	0.068160	”
3	80	87.3	56	49	39	46	0.036831		”	0.052288
4	100	79.9	53	47	34	42	”		0.059640	0.047534
5	125	79.8	51	46	30	39	0.035336		0.053013	0.043573
6	160	76.0	48	45	27	36	0.033333		↑	”
7	200	74.0	46	43	24	33	”			0.040221
8	250	74.9	44	42	21	30	0.032051	↓		0.037349
9	315	94.6	42	41	18	27	0.030675	0.030103		0.034859
10	400	∞	40	40	16	25	0.030103			↑
11	500	↑	40	40	16	25	↑			
12	630		40	40	16	25				
13	800		40	40	16	25				
14	1 000		40	40	16	25	↓		↓ 0.053013	
15	1 250		38	38	15	23	0.030103		0.059640	↓ 0.034859
16	1 600		34	34	12	21	0.029960	NOT APPLICABLE	0.053013	0.040221
17	2 000		32	32	9	18	↑		”	0.037349
18	2 500		30	30	5	15			0.047712	0.034859
19	3 150		29	29	4	14			”	↑
20	4 000		29	29	5	14			0.053013	
21	5 000	↓	30	30	6	15	↓		”	↓ 0.034859
22	6 300	∞	31	31	10	17	0.029960		0.068160	0.037349
23	8 000	44.3	37	34	17	23	0.042285	0.029960	0.079520	”
24	10 000	50.7	41	37	21	29	”	”	0.059640	0.043573

Table A36-3. Constants for mathematically formulated noy values

A36.5.2.3 The applicant must report the following atmospheric environmental data, as measured immediately before, after, or during each test at the observation points prescribed in section A36.2 of this appendix.

(a) Air temperature and relative humidity;

(b) Maximum, minimum and average wind velocities; and

(c) Atmospheric pressure.

A36.5.2.4 The applicant must report conditions of local topography, ground cover, and events that might interfere with sound recordings.

A36.5.2.5 The applicant must report the following:

(a) Type, model and serial numbers (if any) of airplane, engine(s), or propeller(s) (as applicable);

(b) Gross dimensions of airplane and location of engines;

(c) Airplane gross weight for each test run and center of gravity range for each series of test runs;

(d) Airplane configuration such as flap, airbrakes and landing gear positions and propeller pitch angles (if applicable) for each test run;

(e) Whether auxiliary power units (APU), when fitted, are operating for each test run;

(f) Status of pneumatic engine bleeds and engine power take-offs for each test run;

(g) Indicated airspeed in knots or kilometers per hour for each test run;

(h) Engine performance data:

(1) For jet airplanes: engine performance in terms of net thrust, engine pressure ratios, jet exhaust temperatures and fan or compressor shaft rotational speeds as determined from airplane instruments and manufacturer's data for each test run;

(2) For propeller-driven airplanes: engine performance in terms of brake horsepower and residual thrust; or equivalent shaft horsepower; or engine torque and propeller rotational speed; as determined from airplane instruments and manufacturer's data for each test run;

(i) Airplane flight path and ground speed during each test run; and

(j) The applicant must report whether the airplane has any modifications or non-standard equipment likely to affect the noise characteristics of the airplane. Any such modifications or non-standard equipment must be approved by the FAA.

A36.5.3 *Reporting of noise certification reference conditions.*

A36.5.3.1 Airplane position and performance data and the noise measurements must be corrected to the noise certification reference conditions specified in the relevant sections of appendix C of this part. The applicant must report these conditions, including reference parameters, procedures and configurations.

A36.5.4 *Validity of results.*

A36.5.4.1 Three average reference EPNL values and their 90 per cent confidence limits must be produced from the test results and reported, each such value being the arithmetical average of the adjusted acoustical measurements for all valid test runs at each measurement point (flyover, lateral, or approach). If more than one acoustic measurement system is used at any single measurement location, the resulting data for each test run must be averaged as a single measurement. The calculation must be performed by:

(a) Computing the arithmetic average for each flight phase using the values from each microphone point; and

(b) Computing the overall arithmetic average for each reference condition (flyover, lateral or approach) using the values in paragraph (a) of this section and the related 90 per cent confidence limits.

A36.5.4.2 For each of the three certification measuring points, the minimum sample size is six. The sample size must be large enough to establish statistically for each of the three average noise certification levels a 90 per cent confidence limit not exceeding ±1.5 EPNdB. No test result may be omitted from the averaging process unless approved by the FAA.

Note: Methods available for calculating the 90 per cent confidence interval are shown in the current Advisory Circular for this part.

A36.5.4.3 The average EPNL figures obtained by the process described in section A36.5.4.1 must be those by which the noise performance of the airplane is assessed against the noise certification criteria.

Section A36.6 Nomenclature: Symbols and Units.

Symbol	Unit	Meaning
antilog		Antilogarithm to the base 10.
C(k)	dB	*Tone correction factor.* 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	s	*Duration time.* The time interval between the limits of t(1) and t(2) to the nearest 0.5 second.
D	dB	*Duration correction.* The factor to be added to PNLTM to account for the duration of the noise.
EPNL	EPNdB	*Effective perceived noise level.* The value of PNL adjusted for both spectral irregularities and duration of the noise. (The unit EPNdB is used instead of the unit dB).
f(i)	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 sound pressure level and the final background sound pressure level in the i-th one-third octave band at the k-th interval of time. In this case, background sound pressure level means the broadband noise level that would be present in the one-third octave band in the absence of the tone.
h	dB	*dB-down.* The value to be subtracted from PNLTM that defines the duration of the noise.
H	per cent	*Relative humidity.* The ambient atmospheric relative humidity.
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(a)		*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), *etc.*		*Noy inverse slope.* The reciprocals of the slopes of straight lines representing the variation of SPL with log n.
n	noy	The perceived noisiness at any instant of time that occurs in a specified frequency range.
n(i,k)	noy	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), *etc.*		*Noy slope.* The slopes of straight lines representing the variation of SPL with log n.
PNL	PNdB	The perceived noise level at any instant of time. (The unit PNdB is used instead of the unit dB).
PNL(k)	PNdB	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). (The unit PNdB is used instead of the unit dB).

Symbol	Unit	Meaning
PNLT	TPNdB	*Tone-corrected perceived noise level.* The value of PNL adjusted for the spectral irregularities that occur at any instant of time. (The unit TPNdB is used instead of the unit dB).
PNLT(k)	TPNdB	The tone-corrected perceived noise level that occurs at the k-th increment of time. PNLT(k) is obtained by adjusting the value of PNL(k) for the spectral irregularities that occur at the k-th increment of time. (The unit TPNdB is used instead of the unit dB).
PNLTM	TPNdB	*Maximum tone-corrected perceived noise level.* The maximum value of PNLT(k). (The unit TPNdB is used instead of the unit dB).
$PNLT_r$	TPNdB	Tone-corrected perceived noise level adjusted for reference conditions.
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.
$\bar{s}$(i,k)	dB	Average slope of sound pressure level.
SPL	dB re 20 μPa	*Sound pressure level.* The sound pressure level that occurs in a specified frequency range at any instant of time.
SPL(a)	dB re 20 μPa	*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 20 μPa	*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 20μPa	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 20μPa	*Adjusted sound pressure level.* The first approximation to background sound pressure level in the i-th one-third octave band for the k-th instant of time.
SPL(i)	dB re 20μPa	*Maximum sound pressure level.* The sound pressure level that occurs in the i-th one-third octave band of the spectrum for PNLTM.
$SPL(i)_r$	dB re 20μPa	*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.
SPL″(i,k)	dB re 20μPa	*Final background sound pressure level.* The second and final approximation to background sound pressure level in the i-th one-third octave band for the k-th instant of time.
t	s	*Elapsed time.* The length of time measured from a reference zero.
t(1), t(2)	s	*Time limit.* The beginning and end, respectively, of the noise time history defined by h.
Δt	s	*Time increment.* The equal increments of time for which PNL(k) and PNLT(k) are calculated.
T	s	*Normalizing time constant.* The length of time used as a reference in the integration method for computing duration corrections, where T = 10s.
t(°F)(°C)	°F, °C	*Temperature.* The ambient air temperature.
α(i)	dB/1000ft dB/100m	*Test atmospheric absorption.* The atmospheric attenuation of sound that occurs in the i-th one-third octave band at the measured air temperature and relative humidity.
$α(i)_o$	dB/1000ft dB/100m	*Reference atmospheric absorption.* The atmospheric attenuation of sound that occurs in the i-th one-third octave band at a reference air temperature and relative humidity.
A_1	degrees	First constant climb angle (Gear up, speed of at least V_2+10 kt (V_2 +19 km/h), takeoff thrust)
A_2	degrees	Second constant climb angle (Gear up, speed of at least V_2+10 kt (V_2 +19 km/h), after cutback)
δ, ε	degrees	*Thrust cutback angles.* The angles defining the points on the takeoff flight path at which thrust reduction is started and ended respectively.
η	degrees	Approach angle.
$η_r$	degrees	Reference approach angle.
θ	degrees	*Noise angle (relative to flight path).* The angle between the flight path and noise path. It is identical for both measured and corrected flight paths.
ϕ	degrees	*Noise angle (relative to ground).* The angle between the noise paths and the grounds. It is identical for both measured and corrected flight paths.
μ		Engine noise emission parameter.
$μ_r$		Reference engine noise emission parameter.
$Δ_1$	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.
$Δ_2$	EPNdB	*Adjustment to duration correction.* The adjustment to be made to the EPNL calculated from measured data to account for noise level changes due to the noise duration between reference and test conditions.
$Δ_3$	EPNdB	*Source noise adjustment.* The adjustment to be made to the EPNL calculated from measured data to account for noise level changes due to differences between reference and test engine operating conditions.

Section A36.7 Sound Attenuation in Air.

A36.7.1 The atmospheric attenuation of sound must be determined in accordance with the procedure presented in section A36.7.2.

A36.7.2 The relationship between sound attenuation, frequency, temperature, and humidity is expressed by the following equations.

A36.7.2(a) For calculations using the English System of Units:

$$a(i) = 10^{\left[2.05 \log(f_0/1000) + 6.33 \times 10^{-4}\theta - 1.45325\right]} + n(\delta) \times 10^{\left[\log(f_0) = 4.6833 \times 10^{-3}\theta - 2.4215\right]}$$

and

$$\delta = \sqrt{\frac{1010}{f(0)}}10^{\left(\log H - 1.97274664 + 2.288074 \times 10^{-2}\theta\right)} \times 10^{\left(-9.589 \times 10^{-5}\theta^2 + 3.0 \times 10^{-7}\theta^3\right)}$$

Where

η(δ) is listed in Table A36–4 and f_0 in Table A36–5;

α(i) is the attenuation coefficient in dB/1000 ft;

θ is the temperature in °F; and

H is the relative humidity, expressed as a percentage.

A36.7.2(b) For calculations using the International System of Units (SI):

$$a(i) = 10^{\left[2.05 \log\left(f_0/1000\right) + 1.1394 \times 10^{-3}\theta - 1.916984\right]} + n(\delta) \times 10^{\left[\log\left(f_0\right) + 8.42994 \times 10^{-3}\theta - 2.755624\right]}$$

and

$$\delta = \sqrt{\frac{1010}{f_0}}10^{\left(\log H = 1.328924 + 3.179768 \times 10^{-2}\theta\right)} \times 10^{\left(-2.173716 \times 10^{-4}\theta^2 + 1.7496 \times 10^{-6}\theta^3\right)}$$

Where

η(δ) is listed in Table A36–4 and f_0 in Table A36–5;

α(i) is the attenuation coefficient in dB/100 m;

θ is the temperature in °C; and

H is the relative humidity, expressed as a percentage.

A36.7.3 The values listed in table A36–4 are to be used when calculating the equations listed in section A36.7.2. A term of quadratic interpolation is to be used where necessary.

Section A36.8 [Reserved]

TABLE A36–4.—VALUES OF η(δ)

δ	η(δ)	δ	η(δ)
0.00	0.000	2.50	0.450
0.25	0.315	2.80	0.400
0.50	0.700	3.00	0.370
0.60	0.840	3.30	0.330
0.70	0.930	3.60	0.300
0.80	0.975	4.15	0.260
0.90	0.996	4.45	0.245
1.00	1.000	4.80	0.230
1.10	0.970	5.25	0.220
1.20	0.900	5.70	0.210
1.30	0.840	6.05	0.205
1.50	0.750	6.50	0.200
1.70	0.670	7.00	0.200
2.00	0.570	10.00	0.200
2.30	0.495	....	....

TABLE A36–5.—VALUES OF F_0

One-third octave center frequency	f_0 (Hz)	One-third octave center frequency	f_0 (Hz)
50	50	800	800
63	63	1000	1000
80	80	1250	1250
100	100	1600	1600
125	125	2000	2000
160	160	2500	2500
200	200	3150	3150
250	250	4000	4000
315	315	5000	4500
400	400	6300	5600
500	500	8000	7100
630	630	10000	9000

Section A36.9 Adjustment of Airplane Flight Test Results.

A36.9.1 When certification test conditions are not identical to reference conditions, appropriate adjustments must be made to the measured noise data using the methods described in this section.

A36.9.1.1 Adjustments to the measured noise values must be made using one of the methods described in sections A36.9.3 and A36.9.4 for differences in the following:

(a) Attenuation of the noise along its path as affected by ''inverse square'' and atmospheric attenuation.

(b) Duration of the noise as affected by the distance and the speed of the airplane relative to the measuring point.

(c) Source noise emitted by the engine as affected by the differences between test and reference engine operating conditions.

(d) Airplane/engine source noise as affected by differences between test and reference airspeeds. In addition to the effect on duration, the effects of airspeed on component noise sources must be accounted for as follows: For conventional airplane configurations, when differences between test and reference airspeeds exceed 15 knots (28 km/h) true airspeed, test data and/or analysis approved by the FAA must be used to quantify the effects of the airspeed adjustment on resulting certification noise levels.

A36.9.1.2 The ''integrated'' method of adjustment, described in section A36.9.4, must be used on takeoff or approach under the following conditions:

(a) When the amount of the adjustment (using the ''simplified'' method) is greater than 8 dB on flyover, or 4 dB on approach; or

(b) When the resulting final EPNL value on flyover or approach (using the simplified method) is within 1 dB of the limiting noise levels as prescribed in Section B36.5 of this part.

A36.9.2 *Flight profiles.*

As described below, flight profiles for both test and reference conditions are defined by their geometry relative to the ground, together with the associated airplane speed relative to the ground, and the associated engine control parameter(s) used for determining the noise emission of the airplane.

A36.9.2.1 *Takeoff Profile.*

Note: Figure A36–4 illustrates a typical takeoff profile.

(a) The airplane begins the takeoff roll at point A, lifts off at point B and begins its first climb at a constant angle at point C. Where thrust or power (as appropriate) cut-back is used, it is started at point D and completed at point E. From here, the airplane begins a second climb at a constant angle up to point F, the end of the noise certification takeoff flight path.

(b) Position K_1 is the takeoff noise measuring station and AK_1 is the distance from start of roll to the flyover measuring point. Position K_2 is the lateral noise measuring station, which is located on a line parallel to, and the specified distance from, the runway center line where the noise level during takeoff is greatest.

(c) The distance AF is the distance over which the airplane position is measured and synchronized with the noise measurements, as required by section A36.2.3.2 of this part.

A36.9.2.2 *Approach Profile.*

Note.: Figure A36–5 illustrates a typical approach profile.

(a) The airplane begins its noise certification approach flight path at point G and touches down on the runway at point J, at a distance OJ from the runway threshold.

(b) Position K_3 is the approach noise measuring station and K_3O is the distance from the approach noise measurement point to the runway threshold.

(c) The distance GI is the distance over which the airplane position is measured and synchronized with the noise measurements, as required by section A36.2.3.2 of this part.

The airplane reference point for approach measurements is the instrument landing system (ILS) antenna.

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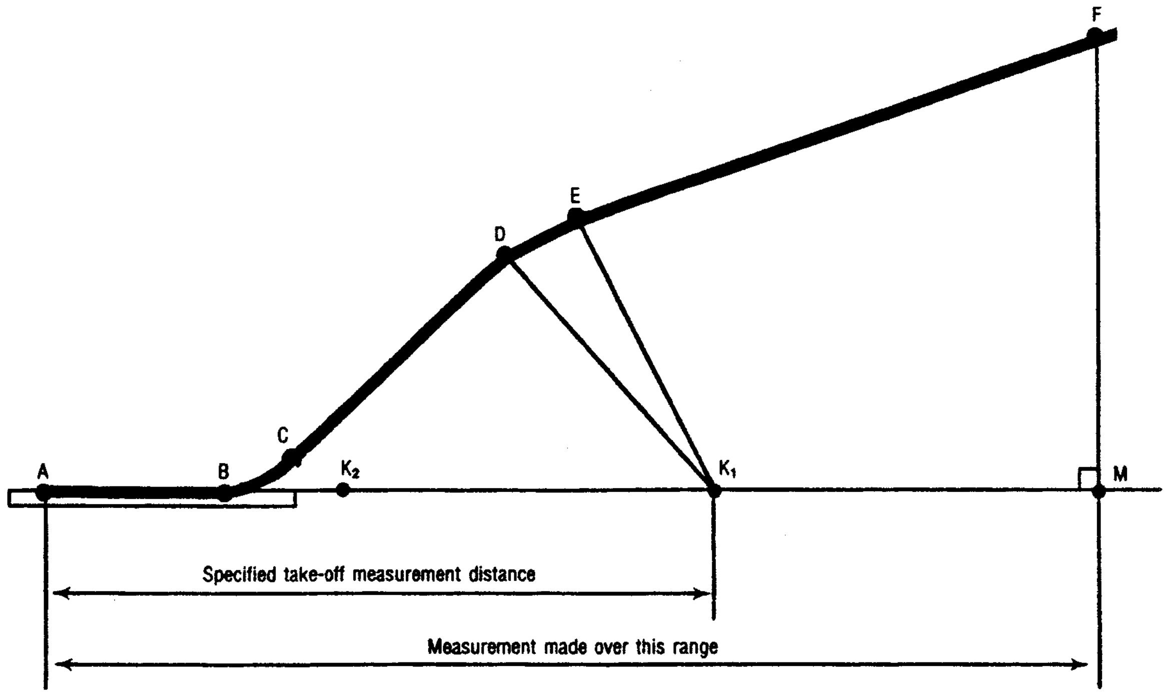

Figure A36-4. Typical Takeoff profile

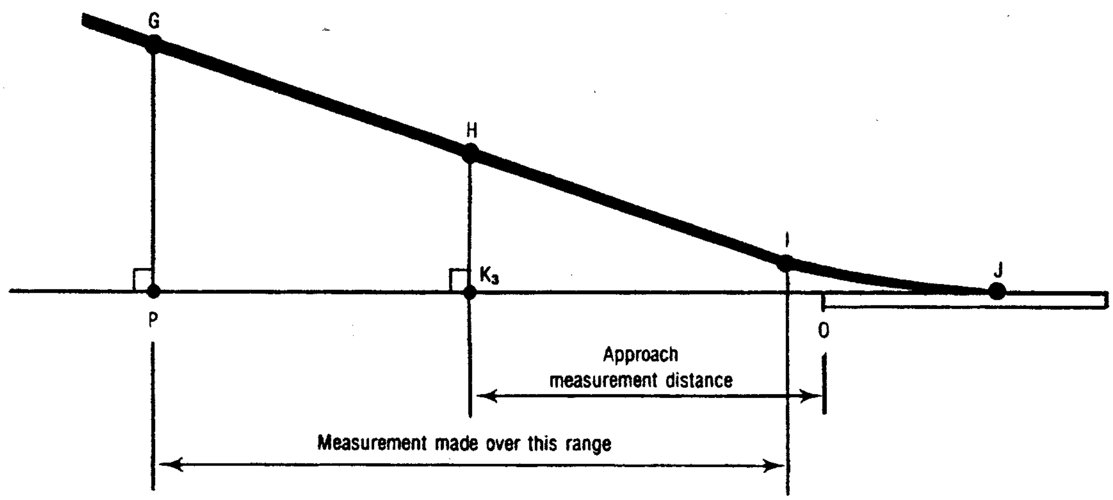

Figure A36-5. Typical Approach profile

A36.9.3 *Simplified method of adjustment.*

A36.9.3.1 *General.* As described below, the simplified adjustment method consists of applying adjustments (to the EPNL, which is calculated from the measured data) for the differences between measured and reference conditions at the moment of PNLTM.

A36.9.3.2 *Adjustments to PNL and PNLT.*

(a) The portions of the test flight path and the reference flight path described below, and illustrated in Figure A36–6, include the noise time history that is relevant to the calculation of flyover and approach EPNL. In figure A36–6:

(1) XY represents the portion of the measured flight path that includes the noise time history relevant to the calculation of flyover and approach EPNL; X_rY_r represents the corresponding portion of the reference flight path.

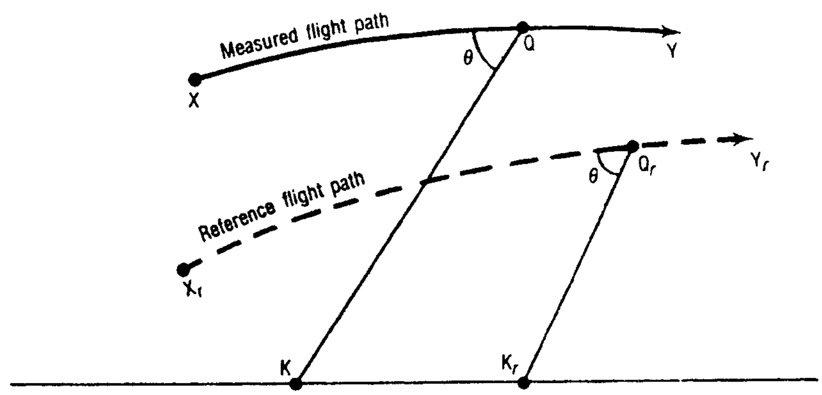

Figure A36-6. Profile characteristics influencing sound level

(2) Q represents the airplane's position on the measured flight path at which the noise was emitted and observed as PNLTM at the noise measuring station K. Q_r is the corresponding position on the reference flight path, and K_r the reference measuring station. QK and Q_rk_r are, respectively, the measured and reference noise propagation paths, Q_r being determined from the assumption that QK and Q_rK_r form the same angle θ with their respective flight paths.

(b) The portions of the test flight path and the reference flight path described in paragraphs (b)(1) and (2) of this section below, and illustrated in Figure A36–7(a) and (b), include the noise time history that is relevant to the calculation of Lateral EPNL.

(1) In figure A36–7(a), XY represents the portion of the measured flight path that includes the noise time history that is relevant to the calculation of Lateral EPNL; in figure A36–7(b), X_rY_r represents the corresponding portion of the reference flight path. For the Lateral noise measurement, sound propagation is affected not only by inverse square and atmospheric attenuation, but also by ground absorption and reflection effects which depend mainly on the angle ψ.

(2) Q represents the airplane position on the measured flight path at which the noise was emitted and observed as PNLTM at the noise measuring station K. Q_r is the corresponding position on the reference flight path, and K_r the reference measuring station. QK and Q_rK_r are, respectively, the measured and reference noise propagation paths. In this case K_r is only specified as being on a particular Lateral line; K_r and Q_r are therefore determined from the assumptions that QK and Q_rK_r:

(i) Form the same angle θ with their respective flight paths; and

(ii) Form the same angle ψ with the ground.

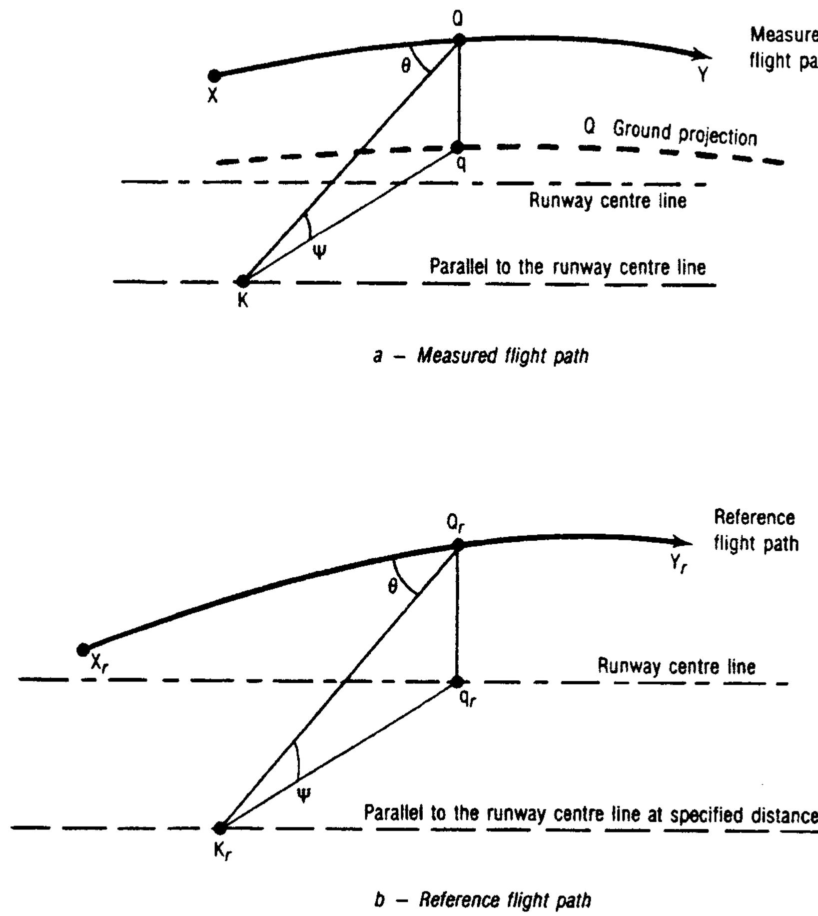

Figure A36-7. Lateral measurement - determination of reference station

A36.9.3.2.1 The one-third octave band levels SPL(i) comprising PNL (the PNL at the moment of PNLTM observed at K) must be adjusted to reference levels $SPL(i)_r$ as follows:

A36.9.3.2.1(a) For calculations using the English System of Units:

$$SPL(i)_r = SPL(i) + 0.001[\alpha(i)-\alpha(i)_o]QK + 0.001\alpha(i)_o (QK - Q_rK_r + 20\log(QK/Q_rK_r)$$

In this expression,

(1) The term $0.001[\alpha(i)-\alpha(i)_o]QK$ is the adjustment for the effect of the change in sound attenuation coefficient, and α(i) and $\alpha(i)_o$ are the coefficients for the test and reference atmospheric conditions respectively, determined under section A36.7 of this appendix;

(2) The term $0.001\alpha(i)_o(QK-Q_rK_r)$ is the adjustment for the effect of the change in the noise path length on the sound attenuation;

(3) The term $20\log(QK/Q_rK_r)$ is the adjustment for the effect of the change in the noise path length due to the "inverse square" law;

(4) QK and Q_rK_r are measured in feet and α(i) and $\alpha(i)_o$ are expressed in dB/1000 ft.

A36.9.3.2.1(b) For calculations using the International System of Units:

$$SPL(i)_r = SPL(i) + 0.01[\alpha(i)-\alpha(i)_o]QK + 0.01\alpha(i)_o (QK - Q_rK_r + 20\log(QK/Q_rK_r)$$

In this expression,

(1) The term $0.01[\alpha(i)-\alpha(i)_o]QK$ is the adjustment for the effect of the change in sound attenuation coefficient, and α(i) and $\alpha(i)_o$ are the coefficients for the test and reference atmospheric conditions respectively, determined under section A36.7 of this appendix;

(2) The term $0.01\alpha(i)_o (QK-Q_rK_r$ is the adjustment for the effect of the change in the noise path length on the sound attenuation;

(3) The term $20\log(QK/Q_rK_r)$ is the adjustment for the effect of the change in the noise path length due to the inverse square law;

(4) QK and Q_rK_r are measured in meters and α(i) and $\alpha(i)_o$ are expressed in dB/100 m.

A36.9.3.2.1.1 *PNLT Correction.*

(a) Convert the corrected values, SPL(i)r, to $PNLT_r$;

(b) Calculate the correction term using the following equation:

$$\Delta_1 = PNLT_r - PNLTM$$

A36.9.3.2.1.2 Add Δ_1 arithmetically to the EPNL calculated from the measured data.

A36.9.3.2.2 If, during a test flight, several peak values of PNLT that are within 2 dB of PNLTM are observed, the procedure defined in section A36.9.3.2.1 must be applied at each peak, and the adjustment term, calculated according to section A36.9.3.2.1, must be added to each peak to give corresponding adjusted peak values of PNLT. If these peak values exceed the value at the moment of PNLTM, the maximum value of such exceedance must be added as a further adjustment to the EPNL calculated from the measured data.

A36.9.3.3 *Adjustments to duration correction.*

A36.9.3.3.1 Whenever the measured flight paths and/or the ground velocities of the test conditions differ from the reference flight paths and/or the ground velocities of the reference conditions, duration adjustments must be applied to the EPNL values calculated from the measured data. The adjustments must be calculated as described below.

A36.9.3.3.2 For the flight path shown in Figure A36–6, the adjustment term is calculated as follows:

$$\Delta_2 = -7.5\log(QK/Q_rK_r) + 10\log(V/V_r)$$

(a) Add Δ_2 arithmetically to the EPNL calculated from the measured data.

A36.9.3.4 *Source noise adjustments.*

A36.9.3.4.1 To account for differences between the parameters affecting engine noise as measured in the certification flight tests, and those calculated or specified in the reference conditions, the source noise adjustment must be calculated and applied. The adjustment is determined from the manufacturer's data approved by the FAA. Typical data used for this adjustment are illustrated in Figure A36–8 that shows a curve of EPNL versus the engine control parameter μ, with the EPNL data being corrected to all the other relevant reference conditions (airplane mass, speed and altitude, air temperature) and for the difference in noise between the test engine and the average engine (as defined in section B36.7(b)(7)). A sufficient number of data points over a range of values of μ_r are required to calculate the source noise adjustments for lateral, flyover and approach noise measurements.

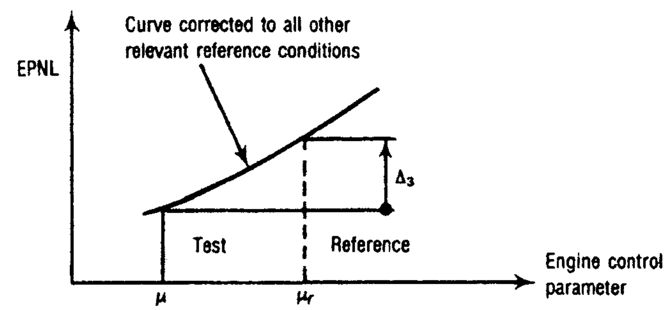

Figure A36-8. Noise thrust correction

A36.9.3.4.2 Calculate adjustment term Δ_3 by subtracting the EPNL value corresponding to the parameter μ from the EPNL value corresponding to the parameter μ_r. Add Δ_3 arithmetically to the EPNL value calculated from the measured data.

A36.9.3.5 *Symmetry adjustments.*

A36.9.3.5.1 A symmetry adjustment to each lateral noise value (determined at the section B36.4(b) measurement points), is to be made as follows:

(a) If the symmetrical measurement point is opposite the point where the highest noise level is obtained on the main lateral measurement line, the certification noise level is the arithmetic mean of the noise levels measured at these two points (see Figure A36–9(a));

(b) If the condition described in paragraph (a) of this section is not met, then it is assumed that the variation of noise with the altitude of the airplane is the same on both sides; there is a constant difference between the lines of noise versus altitude on both sides (see Figure A36–9(b)). The certification noise level is the maximum value of the mean between these lines.

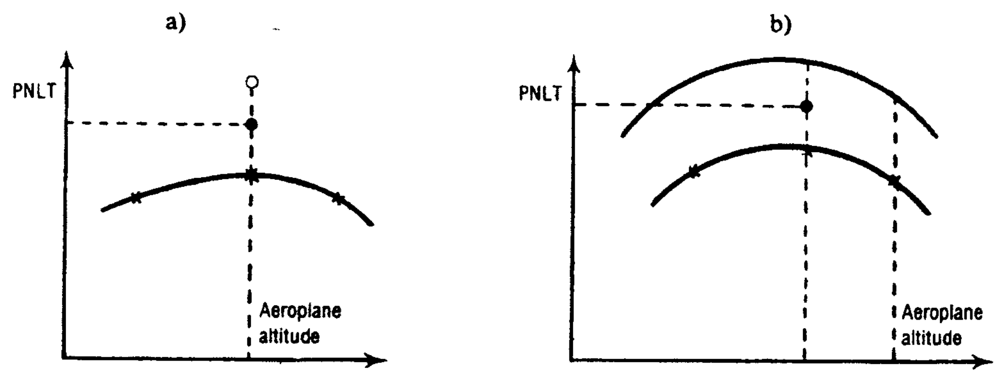

Figure A36-9. Symmetry correction

A36.9.4 Integrated method of adjustment

A36.9.4.1 *General.* As described in this section, the integrated adjustment method consists of recomputing under reference conditions points on the PNLT time history corresponding to measured points obtained during the tests, and computing EPNL directly for the new time history obtained in this way. The main principles are described in sections A36.9.4.2 through A36.9.4.4.1.

A36.9.4.2 *PNLT computations.*

(a) The portions of the test flight path and the reference flight path described in paragraph (a)(1) and (2) of this section, and illustrated in Figure A36–10, include the noise time history that is relevant to the calculation of flyover and approach EPNL. In figure A36–10:

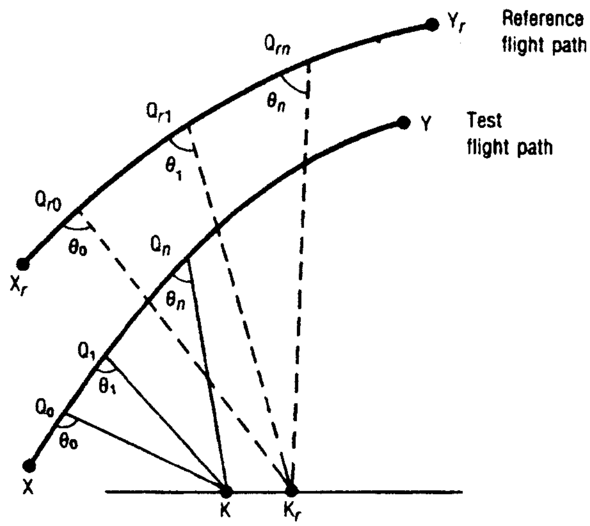

Figure 36-10. Correspondence between measured and reference flight paths for the application of the integrated method of adjustment

(1) XY represents the portion of the measured flight path that includes the noise time history relevant to the calculation of flyover and approach EPNL; X_rY_r represents the corresponding reference flight path.

(2) The points Q_0, Q_1, Q_n represent airplane positions on the measured flight path at time t_0, t_1 and t_n respectively. Point Q_1 is the point at which the noise was emitted and observed as one-third octave values $SPL(i)_1$ at the noise measuring station K at time t_1. Point Q_{r1} represents the corresponding position on the reference flight path for noise observed as $SPL(i)_{r1}$ at the reference measuring station K_r at time t_{r1}. Q_1K and $Q_{r1}K_r$ are respectively the measured and reference noise propagation paths, which in each case form the angle ($_{01}$ with their respective flight paths. $Q_r\theta$ and Q_{rn} are similarly the points on the reference flight path corresponding to Q_0 and Q_n on the measured flight path. Q_0 and Q_n are chosen so that between Q_{r0} and Q_{rn} all values of $PNLT_r$ (computed as described in paragraphs A36.9.4.2.2 and A36.9.4.2.3) within 10 dB of the peak value are included.

(b) The portions of the test flight path and the reference flight path described in paragraphs (b)(1) and (2) of this section, and illustrated in Figure A36–11(a) and (b), include the noise time history that is relevant to the calculation of lateral EPNL.

(1) In figure A36–11(a) XY represents the portion of the measured flight path that includes the noise time history that is relevant to the calculation of Lateral EPNL; in figure A36–11(b), X_rY_r represents the corresponding portion of the reference flight path. For the Lateral noise measurement, sound propagation is affected not only by ''inverse square'' and atmospheric attenuation, but also by ground absorption and reflection effects which depend mainly on the angle ψ.

(2) The points Q_0, Q_1 and Q_n represent airplane positions on the measured flight path at time t_0, t_1 and t_n respectively. Point Q_1 is the point at which the noise was emitted and observed as one-third octave values $SPL(i)_1$ at the noise measuring station K at time t_1. The point Q_{r1} represents the corresponding position on the reference flight path for noise observed as $SPL(i)_{r1}$ at the measuring station Kr at time t_{r1}. Q_1K and $Q_{r1}K_r$ are respectively the measured and reference noise propagation paths. Q_{r0} and Q_{rn} are similarly the points on the reference flight path corresponding to Q_0 and Q_n on the measured flight path. Q_0 and Q_n are chosen so that between Q_{ro} and Q_{rn} all values of $PNLT_r$ (computed as described in paragraphs A36.9.4.2.2 and A36.9.4.2.3) within 10 dB of the peak value are included. In this case K_r is only specified as being on a particular lateral line. The position of K_r and Q_{r1} are determined from the following requirements:

(A) Q_1K and $Q_{r1}K_r$ form the same angle θ_1 with their respective flight paths; and

(B) The differences between the angles ψ_1 and ψ_{r1} must be minimized using a method, approved by the FAA. The differences between the angles are minimized since, for geometrical reasons, it is generally not possible to choose K_r so that the condition described in paragraph A36.9.4.2(b)(2)(A) is met while at the same time keeping ψ_1 and ψ_{r1} equal.

A36.9.4.2.1 In paragraphs A36.9.4.2(a)(2) and (b)(2) the time t_{r1} is later (for $Q_{r1}K_r > Q_1K$) than t_1 by two separate amounts:

(1) The time taken for the airplane to travel the distance $Q_{r1}Q_{r0}$ at a speed V_r less the time taken for it to travel Q_1Q_0 at V;

(2) The time taken for sound to travel the distance $Q_{r1}K_r–Q_1K$.

Note 1: For the flight paths described in paragraphs A36.9.4.2(a) and (b), if thrust or power cut-back is used there will be test and reference flight paths at full thrust or power and at cut-back thrust or power. Where the transient region between these affects the final result an interpolation must be made between them by an approved method such as that given in the current Advisory Circular for this part.

A36.9.4.2.2 The measured values of $SPL(i)_1$ must be adjusted to the reference values $SPL(i)_{r1}$ to account for the differences between measured and reference noise path lengths and between measured and reference atmospheric conditions, using the methods of section A36.9.3.2.1 of this appendix. A corresponding value of PNL_{r1} must be computed according to the method in section A36.4.2. Values of PNL_r must be computed for times t_0 through t_n.

A36.9.4.2.3 For each value of PNL_{r1}, a tone correction factor C_1 must be determined by analyzing the reference values $SPL(i)_r$ using the methods of section A36.4.3 of this appendix, and added to PNL_{r1} to yield $PNLT_{r1}$. Using the process described in this paragraph, values of $PNLT_r$ must be computed for times t_0 through t_n.

A36.9.4.3 *Duration correction.*

A36.9.4.3.1 The values of $PNLT_r$ corresponding to those of PNLT at each one-half second interval must be plotted against time ($PNLT_{r1}$ at time t_{r1}). The duration correction must then be determined using the method of section A36.4.5.1 of this appendix, to yield $EPNL_r$.

A36.9.4.4 *Source Noise Adjustment.*

A36.9.4.4.1 A source noise adjustment, Δ_3, must be determined using the methods of section A36.9.3.4 of this appendix.

A36.9.5 Flight path identification positions.

Position	Description
A	Start of Takeoff roll.
B	Lift-off.
C	Start of first constant climb.
D	Start of thrust reduction.
E	Start of second constant climb.
F	End of noise certification Takeoff flight path.
G	Start of noise certification Approach flight path.
H	Position on Approach path directly above noise measuring station.
I	Start of level-off.
J	Touchdown.
K	Noise measurement point.
K_r	Reference measurement point.
K_1	Flyover noise measurement point.
K_2	Lateral noise measurement point.
K_3	Approach noise measurement point.
M	End of noise certification Takeoff flight track.
O	Threshold of Approach end of runway.
P	Start of noise certification Approach flight track.
Q	Position on measured Takeoff flight path corresponding to apparent PNLTM at station K See section B36.9.3.2.
Q_r	Position on corrected Takeoff flight path corresponding to PNLTM at station K. See section A36.9.3.2.
V	Airplane test speed.
V_r	Airplane reference speed.

A36.9.6 Flight path distances.

Distance	Unit	Meaning
AB	Feet (meters)	Length of takeoff roll. The distance along the runway between the start of takeoff roll and lift off.
AK	Feet (meters)	Takeoff measurement distance. The distance from the start of roll to the takeoff noise measurement station along the extended center line of the runway.
AM	Feet (meters)	Takeoff flight track distance. The distance from the start of roll to the takeoff flight track position along the extended center line of the runway after which the position of the airplane need no longer be recorded.
QK	Feet (meters)	Measured noise path. The distance from the measured airplane position Q to station K.
Q_rK_r	Feet (meters)	Reference noise path. The distance from the reference airplane position Q_r to station K_r.
K_3H	Feet (meters)	Airplane approach height. The height of the airplane above the approach measuring station.
OK_3	Feet (meters)	Approach measurement distance. The distance from the runway threshold to the approach measurement station along the extended center line of the runway.
OP	Feet (meters)	Approach flight track distance. The distance from the runway threshold to the approach flight track position along the extended center line of the runway after which the position of the airplane need no longer be recorded.

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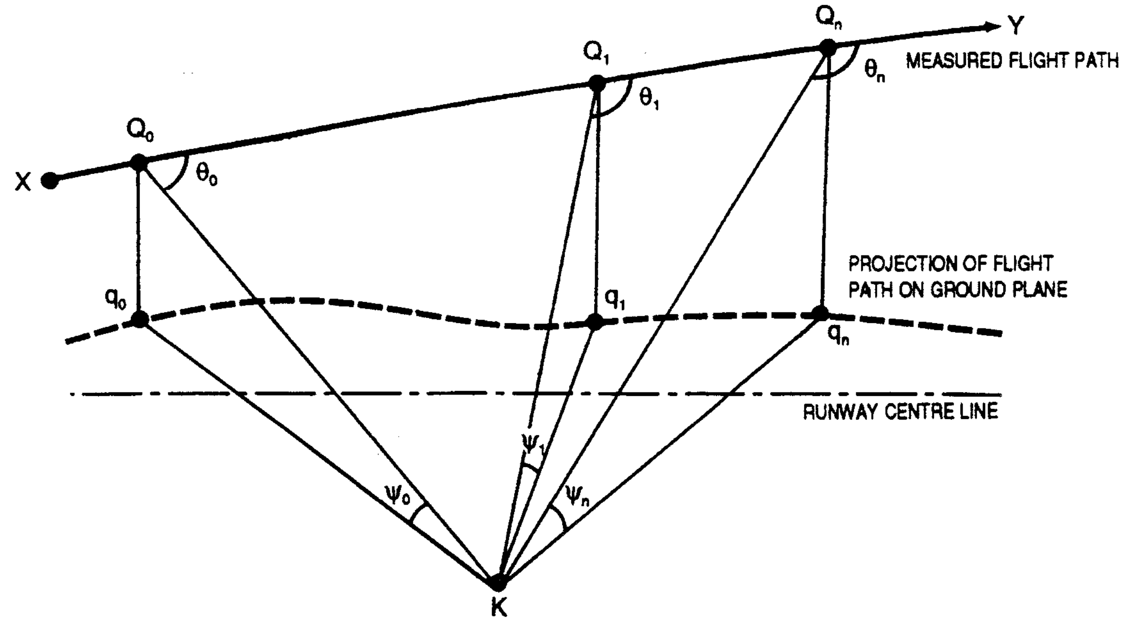

Figure A36-11(a). Measured flight path

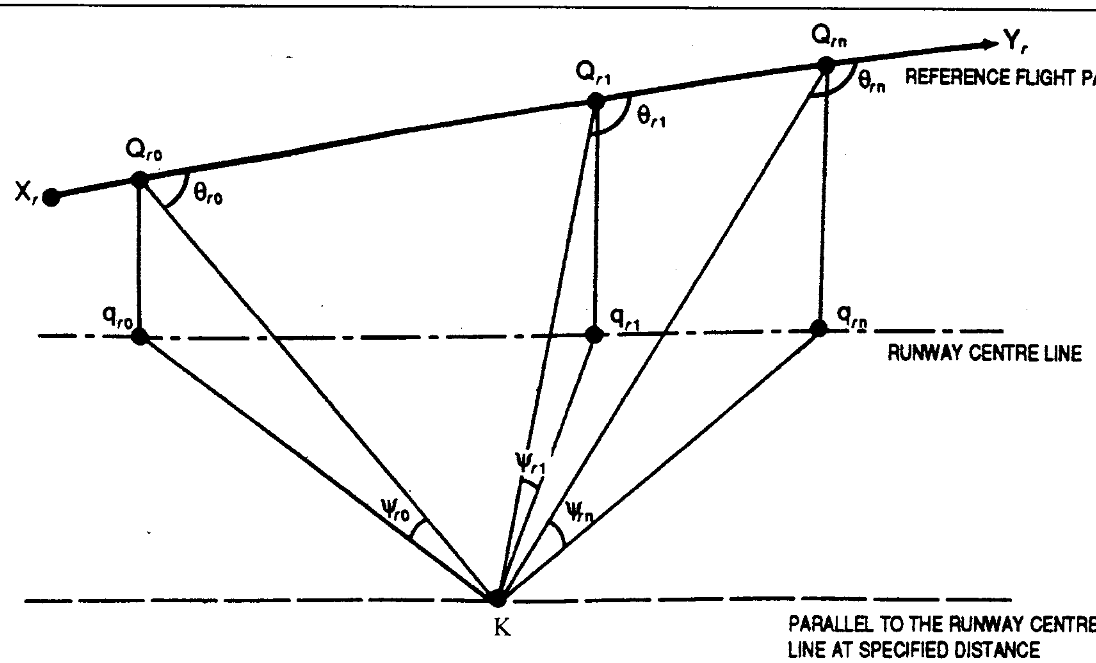

Figure A36-11(b). Reference flight path

12. Appendix B of part 36 is revised to read as follows:

Appendix B to Part 36—Noise Levels for Transport Category and Jet Airplanes Under § 36.103

Sec.

Section B36.1 Noise Measurement and Evaluation

Compliance with this appendix must be shown with noise levels measured and evaluated using the procedures of appendix A of this part, or under approved equivalent procedures.

Section B36.2 Noise Evaluation Metric

The noise evaluation metric is the effective perceived noise level expressed in EPNdB, as calculated using the procedures of appendix A of this part.

Section B36.3 Reference Noise Measurement Points

When tested using the procedures of this part, except as provided in section B36.6, an airplane may not exceed the noise levels specified in section B36.5 at the following points on level terrain:

(a) Lateral full-power reference noise measurement point:

(1) For jet airplanes: The point on a line parallel to and 1,476 feet (450 m) from the runway centerline, or extended centerline, where the noise level after lift-off is at a maximum during takeoff. For the purpose of showing compliance with Stage 1 or Stage 2 noise limits for an airplane powered by more than three jet engines, the distance from the runway centerline must be 0.35 nautical miles (648 m).

(2) For propeller-driven airplanes: the point on the extended centerline of the runway above which the airplane, at full takeoff power, reaches a height of 2,133 feet (650 meters). For tests conducted before March 20, 2002, an applicant may use the measurement point specified in section B36.3(a)(1) as an alternative.

(b) Flyover reference noise measurement point: The point on the extended centerline of the runway that is 21,325 feet (6,500m) from the start of the takeoff roll;

(c) Approach reference noise measurement point: The point on the extended centerline of the runway that is 6,562 feet (2,000 m) from the runway threshold. On level ground, this corresponds to a position that is 394 feet (120 m) vertically below the 3° descent path, which originates at a point on the runway 984 feet (300 m) beyond the threshold.

Section B36.4 Test Noise Measurement Points

(a) If the test noise measurement points are not located at the reference noise measurement points, any corrections for the difference in position are to be made using the same adjustment procedures as for the differences between test and reference flight paths.

(b) The applicant must obtain a sufficient number of lateral test noise measurement points to demonstrate to the FAA that the maximum noise level on the appropriate lateral line has been determined. For jet airplanes, simultaneous measurements must be made at one test noise measurement point at its symmetrical point on the other side of the runway. Propeller-driven airplanes have an inherent asymmetry in lateral noise. Therefore, simultaneous measurements must be made at each and every test noise measurement point at its symmetrical position on the opposite side of the runway. The measurement points are considered to be symmetrical if they are longitudinally within 33 feet ((±10 meters) of each other.

Section B36.5 Maximum Noise Levels

Except as provided in section B36.6 of this appendix, maximum noise levels, when determined in accordance with the noise evaluation methods of appendix A of this part, may not exceed the following:

(a) For acoustical changes to Stage 1 airplanes, regardless of the number of engines, the noise levels prescribed under § 36.7(c) of this part.

(b) For any Stage 2 airplane regardless of the number of engines:

(1) Flyover: 108 EPNdB for maximum weight of 600,000 pounds or more; for each halving of maximum weight (from 600,000 pounds), reduce the limit by 5 EPNdB; the limit is 93 EPNdB for a maximum weight of 75,000 pounds or less.

(2) Lateral and approach: 108 EPNdB for maximum weight of 600,000 pounds or more; for each halving of maximum weight (from 600,000 pounds), reduce the limit by 2 EPNdB; the limit is 102 EPNdB for a maximum weight of 75,000 pounds or less.

(c) For any Stage 3 airplane:

(1) Flyover.

(i) For airplanes with more than 3 engines: 106 EPNdB for maximum weight of 850,000 pounds or more; for each halving of maximum weight (from 850,000 pounds), reduce the limit by 4 EPNdB; the limit is 89 EPNdB for a maximum weight of 44,673 pounds or less;

(ii) For airplanes with 3 engines: 104 EPNdB for maximum weight of 850,000 pounds or more; for each halving of maximum weight (from 850,000 pounds), reduce the limit by 4 EPNdB; the limit is 89 EPNdB for a maximum weight of 63,177 pounds or less; and

(iii) For airplanes with fewer than 3 engines: 101 EPNdB for maximum weight of 850,000 pounds or more; for each halving of maximum weight (from 850,000 pounds), reduce the limit by 4 EPNdB; the limit is 89 EPNdB for a maximum weight of 106,250 pounds or less.

(2) Lateral, regardless of the number of engines: 103 EPNdB for maximum weight of 882,000 pounds or more; for each halving of maximum weight (from 882,000 pounds), reduce the limit by 2.56 EPNdB; the limit is 94 EPNdB for a maximum weight of 77,200 pounds or less.

(3) Approach, regardless of the number of engines: 105 EPNdB for maximum weight of 617,300 pounds or more; for each halving of maximum weight (from 617,300 pounds), reduce the limit by 2.33 EPNdB; the limit is 98 EPNdB for a maximum weight of 77,200 pounds or less.

Section B36.6 Trade-Offs

Except when prohibited by sections 36.7(c)(1) and 36.7(d)(1)(ii), if the maximum noise levels are exceeded at any one or two measurement points, the following conditions must be met:

(a) The sum of the exceedance(s) may not be greater than 3 EPNdB;

(b) Any exceedance at any single point may not be greater than 2 EPNdB, and

(c) Any exceedance(s) must be offset by a corresponding amount at another point or points.

Section B36.7 Noise Certification Reference Procedures

(a) General conditions:

(1) All reference procedures must meet the requirements of section 36.3 of this part.

(2) Calculations of airplane performance and flight path must be made using the reference procedures and must be approved by the FAA.

(3) Applicants must use the takeoff and approach reference procedures prescribed in paragraphs (b) and (c) of this section.

(4) [Reserved]

(5) The reference procedures must be determined for the following reference conditions. The reference atmosphere is homogeneous in terms of temperature and relative humidity when used for the calculation of atmospheric absorption coefficients.

(i) Sea level atmospheric pressure of 2116 pounds per square foot (psf) (1013.25 hPa);

(ii) Ambient sea-level air temperature of 77°F (25°C, *i.e.* ISA+10°C);

(iii) Relative humidity of 70 per cent; and

(iv) Zero wind.

(v) In defining the reference takeoff flight path(s) for the takeoff and lateral noise measurements, the runway gradient is zero.

(b) Takeoff reference procedure:

The takeoff reference flight path is to be calculated using the following:

(1) Average engine takeoff thrust or power must be used from the start of takeoff to the point where at least the following height above runway level is reached. The takeoff thrust/power used must be the maximum available for normal operations given in the performance section of the airplane flight manual under the reference atmospheric conditions given in section B36.7(a)(5).

(i) For Stage 1 airplanes and for Stage 2 airplanes that do not have jet engines with a bypass ratio of 2 or more, the following apply:

(A): For airplanes with more than three jet engines—700 feet (214 meters).

(B): For all other airplanes—1,000 feet (305 meters).

(ii) For Stage 2 airplanes that have jet engines with a bypass ratio of 2 or more and for Stage 3 airplanes, the following apply:

(A): For airplanes with more than three engines—689 feet (210 meters).

(B): For airplanes with three engines—853 feet (260 meters).

(C) For airplanes with fewer than three engines—984 feet (300 meters).

(2) Upon reaching the height specified in paragraph (b)(1) of this section, airplane thrust or power must not be reduced below that required to maintain either of the following, whichever is greater:

(i) A climb gradient of 4 per cent; or

(ii) In the case of multi-engine airplanes, level flight with one engine inoperative.

(3) For the purpose of determining the lateral noise level, the reference flight path must be calculated using full takeoff power throughout the test run without a reduction in thrust or power. For tests conducted before March 20, 2002, a single reference flight path that includes thrust cutback in accordance with paragraph (b)(1) of this section, is an acceptable alternative in determining the lateral noise level.

(4) The takeoff reference speed is the all-engine operating takeoff climb speed selected by the applicant for use in normal operation; this speed must be at least V2+10kt (V2+19km/h) but may not be greater than V2+20kt (V2+37km/h). This speed must be attained as soon as practicable after lift-off and be maintained throughout the takeoff noise certification test. For Concorde airplanes, the test day speeds and the acoustic day reference speed are the minimum approved value of V2 +35 knots, or the all-engines-operating speed at 35 feet, whichever speed is greater as determined under the regulations constituting the type certification basis of the airplane; this reference speed may not exceed 250 knots. For all airplanes, noise values measured at the test day speeds must be corrected to the acoustic day reference speed.

(5) The takeoff configuration selected by the applicant must be maintained constantly throughout the takeoff reference procedure, except that the landing gear may be retracted. Configuration means the center of gravity position, and the status of the airplane systems that can affect airplane performance or noise. Examples include, the position of lift augmentation devices, whether the APU is operating, and whether air bleeds and engine power take-offs are operating;

(6) The weight of the airplane at the brake release must be the maximum takeoff weight at which the noise certification is requested, which may result in an operating limitation as specified in § 36.1581(d); and

(7) The average engine is defined as the average of all the certification compliant engines used during the airplane flight tests, up to and during certification, when operating within the limitations and according to the procedures given in the Flight Manual. This will determine the relationship of thrust/power to control parameters (e.g., N_1 or EPR). Noise measurements made during certification tests must be corrected using this relationship.

(c) Approach reference procedure:

The approach reference flight path must be calculated using the following:

(1) The airplane is stabilized and following a 3° glide path;

(2) For subsonic airplanes, a steady approach speed of V_{REF} + 10 kts (V_{REF} + 19 km/h) with thrust and power stabilized must be established and maintained over the approach measuring point. For Concorde airplanes, a steady approach speed that is either the landing reference speed + 10 knots or the speed used in establishing the approved landing distance under the airworthiness regulations constituting the type certification basis of the airplane, whichever speed is greater. This speed must be established and maintained over the approach measuring point.

(3) The constant approach configuration used in the airworthiness certification tests, but with the landing gear down, must be maintained throughout the approach reference procedure;

(4) The weight of the airplane at touchdown must be the maximum landing weight permitted in the approach configuration defined in paragraph (c)(3) of this section at which noise certification is requested, except as provided in § 36.1581(d) of this part; and

(5) The most critical configuration must be used; this configuration is defined as that which produces the highest noise level with normal deployment of aerodynamic control surfaces including lift and drag producing devices, at the weight at which certification is requested. This configuration includes all those items listed in section A36.5.2.5 of appendix A of this part that contribute to the noisiest continuous state at the maximum landing weight in normal operation.

Section B36.8 Noise Certification Test Procedures

(a) All test procedures must be approved by the FAA.

(b) The test procedures and noise measurements must be conducted and processed in an approved manner to yield the noise evaluation metric EPNL, in units of EPNdB, as described in appendix A of this part.

(c) Acoustic data must be adjusted to the reference conditions specified in this appendix using the methods described in appendix A of this part. Adjustments for speed and thrust must be made as described in section A36.9 of this part.

(d) If the airplane's weight during the test is different from the weight at which noise certification is requested, the required EPNL adjustment may not exceed 2 EPNdB for each takeoff and 1 EPNdB for each approach. Data approved by the FAA must be used to determine the variation of EPNL with weight for both takeoff and approach test conditions. The necessary EPNL adjustment for variations in approach flight path from the reference flight path must not exceed 2 EPNdB.

(e) For approach, a steady glide path angle of 3° ± 0.5° is acceptable.

(f) If equivalent test procedures different from the reference procedures are used, the test procedures and all methods for adjusting the results to the reference procedures must be approved by the FAA. The adjustments may not exceed 16 EPNdB on takeoff and 8 EPNdB on approach. If the adjustment is more than 8 EPNdB on takeoff, or more than 4 EPNdB on approach, the resulting numbers must be more than 2 EPNdB below the limit noise levels specified in section B36.5.

(g) During takeoff, lateral, and approach tests, the airplane variation in instantaneous indicated airspeed must be maintained within +/−3% of the average airspeed between the 10dB-down points. This airspeed is determined by the pilot's airspeed indicator. However, if the instantaneous indicated airspeed exceeds +/−3 kt (+/−5.5 km/h) of the average airspeed over the 10dB-down points, and is determined by the FAA representative on the flight deck to be due to atmospheric turbulence, then the flight so affected must be rejected for noise certification purposes.

Note: Guidance material on the use of equivalent procedures is provided in the current Advisory Circular for this part.

13. Remove and reserve appendix C of part 36.

Section G36.105 [Amended]

14. Amend paragraph (f) of section G36.105 of appendix G by removing the reference ''paragraph A36.3(e) of Appendix A'' and adding ''paragraphs A36.3.8 and A36.3.9 of Appendix A'' in its place.

Section H36.111 [Amended]

15. Amend paragraph (c)(3) of section H36.111 of appendix H by removing the reference ''A36.3(f)(3)'' and adding ''A36.3.9.11'' in its place.

Section H36.201 [Amended]

16. Amended paragraph (b) of section H36.201 of appendix H by removing the reference ''B36.5(a)'' and adding ''A36.4.3.1—Step 1'' in its place.

Issued in Washington, DC, on June 29, 2000.

Paul R. Dykeman,
Acting Director of Environment and Energy.

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