DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Parts 21, 36, and 91

[Docket No. FAA–2000–7587 Amdt No. 21–81, 36–54 & 91–275]

RIN 2120–AH03

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

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule; requests for comments.

SUMMARY: The FAA is amending the noise certification standards for subsonic jet airplanes and subsonic transport category large airplanes. These 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 changes will 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 will simplify airworthiness approvals for import and export purposes.

DATES: *Effective Date:* August 7, 2002. *Comments Date:* Comments on revised 36.2 concerning the applicable noise requirements are due on or before September 6, 2002.

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 e-mail at *james.skalecky@faa.gov.*

SUPPLEMENTARY INFORMATION:

Comments Invited

This final rule is being adopted with prior notice and prior public comment. In response to a comment received during the comment period the FAA is proposing a change to section 36.2. Considering the degree of the change from what was noted in Notice No. 00–08 and the requirement that is being implemented, this final rule includes a request for comments only on revised section 36.2.

Interested persons are invited to participate in this rulemaking by submitting such written data, views, or arguments as they may desire. Comments must include the regulatory docket or amendment number and must be submitted in duplicate to the address above. All comments received, as well as a report summarizing each substantive public contact with FAA personnel on this rulemaking, will be filed in the public docket. The docket is available for public inspection before and after the comment closing date.

The FAA will consider all comments received on or before the closing date for comments. Late filed comments will be considered to the extent practicable. This final rule may be amended in light of the comments received.

Availability of Rulemaking Documents

You can get an electronic copy using the Internet by taking the following steps:

(1) Go to the search function of the Department of Transportation's electronic Docket Management System (DMS) web page (*http://dms.dot.gov/search).*

(2) On the search page type in the last four digits of the Docket number shown at the beginning of this notice. Click on ''search.''

(3) On the next page, which contains the Docket summary information for the Docket you selected, click on the document number for the item you wish to view.

You can also get an electronic copy using the Internet through the Office of Bulemaking's web page at *http://www.faa.gov/avr/armhome.htm* or the Government Printing Offices's web page at *http://www.access.gpo.gov/su_docs/aces/aces140.html.*

You can also get a copy 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. Make sure to identify the amendment number of docket number of this rulemaking.

Small Business Regulatory Enforcement Fairness Act

The Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996 requires FAA to comply with small entity requests for information or advice about compliance with statutes and regulations within its jurisdiction. Therefore, any small entity that has a question regarding this document may contact its local FAA official, or the person listed under **FOR FURTHER INFORMATION CONTACT.** You can find out more about SBREFA on the Internet at our site, *http://www.faa.gov/avr/arm/sbrefa.htm.* For more information on SBREFA, e-mail us *9–AWA–SBREFA@faa.gov.*

Background

Current Regulations

Under 49 U.S.C. 44715, the Administrator of the Federal Aviation Administration is directed to prescribed ''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 contains the FAA's noise standards and regulations that apply to the issuance of type certificates for all types of aircraft. Subpart A, B, and C and appendices A, B, and C of part 36 contain the requirements and standards and 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 JAA Council, which consists of JAA members from European countries and the FAA, the FAA Administrators committed the FAA to support the harmonization of U.S. regulations with the Joint Aviation Regulations (JAR). The JARs are 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 tasked ARAC with noise certification issues. These issues involve the harmonization of 14 CFR 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 part 36, and harmonizing them with the corresponding applicable provisions of JAR 36. The FAA asked the working group 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. The working group forwarded a recommendation to amend part 36 to the ARAC. After due consideration, including a meeting open to the public on May 18, 2000, ARAC forwarded this recommendation, in the form of a draft NPRM, to the FAA for consideration.

On July 11, 2000, the FAA published Notice No. 00–08 entitled ''Noise Certification Standards for Subsonic Jet Airplanes and Subsonic Transport Category Large Airplanes'' (65 FR 42796). The FAA solicited comments on the proposals, which are discussed in the following section. This final rule is based on Notice No. 00–08.

Discussion of Comments

Four commenters responded to Notice No. 00–08. These comments and the FAA responses are discussed below.

General Comments

The Air Line Pilots Association (ALPA) comments that it had reviewed both the Notice of Proposed Rulemaking (NPRM) (Notice No. 00–08) and draft Advisory Circular 36–4C (65 FR 48794). In its comments, ALPA compliments the FAA and JAA for pursuing the harmonization of noise certification standards and concurred with both documents. ALPA also states that certification standards are the appropriate means of reducing noise, and that aviation noise reduction should be accomplished primarily through technological advances in engine and aircraft design/certification, and not with the development of special pilot procedures.

The Aerospace Industries Association (AIA) endorses the FAA's efforts to harmonize the U.S. and European regulations. The AIA also comments that the proposed rule would improve the compatibility of part 36 with the noise standards prescribed in ICAO Annex 16, Volume 1. However, AIA also urges FAA to eliminate the language differences that would remain between part 36 and ICAO Annex 16 and its associated guidance material. The AIA identified several sections where it believes that these differences would cause the typical noise certification applicant to question whether the two standards (*i.e.*, part 36 and ICAO Annex 16) have the same meaning. The AIA comments that these differences could make it more difficult and costly for applicants that might want reciprocal approvals by different certificating authorities.

FAA Response

While recognizing AIA's concern about potential misinterpretations that might result from the language differences between part 36 and ICAO Annex 16, harmonization of part 36 with JAR 36 and ICAO Annex 16 is not contingent upon these standards being identical, word for word. These language differences resulted primarily from the need to (1) ensure that the terminology used in part 36 is consistent with that which is commonly used in U.S. regulations, and (2) more precisely define several JAR 36 and ICAO Annex 16 provisions that were incorporated into part 36. The FAA believes that, rather than leading to misinterpretation, as suggested by AIA, more precise definitions of these regulatory provisions will result in less chance of misinterpretation. Accordingly, the FAA has not changed the proposed rule to eliminate these language differences.

Calibration

The AIA notes the inconsistent use of the term ''changes'' in section A36.3.9.5 of the proposed rule, compared to ''any changes,'' used in section A36.3.9.7 to refer to calibration requirements.

FAA Response

The FAA agrees. The word ''any'' has been removed from section A36.3.9.5.

Sound Propagation Effects on the Lateral Noise Measurement

The AIA comments that the material in section A36.9.3.2(b)(1) concerning sound propagation effects on the lateral noise measurement would be more appropriate in section A36.9.3.2(b)(2)(ii).

FAA Response

The FAA agrees and the material has been moved to section A36.9.3.2(b)(2)(ii). This text is now designated as a ''note,'' since it is advisory in nature. This change is also included in section A36.9.4.2(b)(2)(ii), which contains the same material.

Compatibility With ICAO Standards

The AIA comments that the proposed rule preamble discussion under ''Compatibility With ICAO Standards'' suggests that the FAA is willing to simply file differences between the 14 CFR part 36 noise standards and ICAO noise standard and maintain that status because it had not been possible to reach agreement on some items in the ARAC Harmonization Working Group. The AIA urges the FAA to review the proposed rule to re-assess the FAA's position on achieving full compatibility with ICAO noise standards. The AIA further urges that all items that have not been agreed upon by the Harmonization Working Group should be identified as technical issues to be studied and resolved by appropriate task groups within ICAO committee on Environmental Protection (CAEP) Working Group 1.

FAA Response

Those items identified in the proposed rule as items for which the FAA intends to file differences were placed in that category after considerable review by the Harmonization Working Group indicated that the differences could not realistically be resolved prior to publication of the proposed rule. The FAA fully intends to continue to work toward resolution of these remaining differences, and is currently participating in ICAO CAEP Working Group 1 task groups that are addressing each of these differences.

Special Retroactive Requirements

The AIA expresses support for the FAA's recognition of the incompatibility of current 14 CFR part 36, ICAO Annex 16, and JAR 36 on the date used in determining the applicable noise standards relative to the date of type certificate application. The AIA comments, however, that simply removing section 36.2, as proposed, would not solve the incompatibility problem. Further, given the text contained in ICAO Annex 16 (*i.e.,* date of application for the certificate of airworthiness for the prototype), AIA does not view the proposed rule as meeting the FAA's stated intent to ''harmonize with the applicability designation of part 36 with that contained in section 1.7 of ICAO Annex 16, Chapter 1.''

The AIA comments that the proposed rule did not make clear how the FAA would handle the date for applicable noise standards for type design changes if reference to part 36 is removed from part 21.

Further, considering the proposal to revise section 36.2, the AIA questions whether section A36.1.1 should continue to specify that the procedures used for noise certification are those in effect on the effective date of this final rule.

FAA Response

The FAA agrees that removing and reserving section 36.2 and deferring to part 21 as proposed is not adequate to determine the applicable noise certification basis. Accordingly, section 36.2 has been retained and revised to address the concerns expressed by AIA in its comment, while maintaining the FAA's intent to use the date of certification application as a basis for part 36 applicability. The heading of section 36.2 is also changed to ''Requirements as of date of application.'' The revisions made to section 36.2 are within the scope of Notice No. 00–08; the FAA is not proposing a new standard. The change was made because of the comment that was received relative to section 36.2. Given the change from Notice No. 00–08 in the manner in which this requirement is implemented, however, this final rule includes a request for comments on the revised section 36.2.

The FAA recognizes that revised section 36.2 in this final rule does not correspond word for word with section 1.7 of ICAO Annex 16, Chapter 1. The FAA believes, however, that the revised section 36.2 is in agreement with the intent of section 1.7 to use the date of certification application as the basis for noise certification standard applicability.

The change to section 36.2 specifies that the part 36 requirements applicable to a specific certification project are those in effect on the date of application for the new, amended, or supplemental type certificate. The FAA also agrees with the AIA's comment that a date need not be specified in section A36.1.1. Accordingly, since section 36.2 will determine the applicable noise certification requirements, no date is specified in section A36.1.1.

Measurement of Airplane Noise Received on the Ground

Transport Canada comments that the calibration adjustments of proposed section A36.3.9.1 be applied to the measured sound levels at the output of the analyzer, rather than within the analyzer, as permitted by the current rule. The commenter states that because the algorithms for adjustments are defined and pre-programmed into the analyzer by the applicant, the impact on the final result can be predicted with a high degree of accuracy. The commenter further states that, provided that these correction algorithms are discussed and agreed upon with the certificating authority, it should not make much difference whether they are programmed internally or applied externally to the analyzer. The commenter recommends that the current rule requirement be retained.

FAA Response

The FAA disagrees with the comment. There have been instances in which certification applicants have either not applied, or have incorrectly applied, calibration adjustments to acoustic data. Although such adjustments are usually of small magnitude, their effect can be significant, especially when calculated noise levels are close to the noise level limits specified in part 36.

As the commenter suggests, the effect of applying these adjustments will be the same, whether performed internally or externally to the analyzer. Other adjustments to acoustic data, however, such as microphone and system response corrections, are required to be applied externally to the analyzer, even though it is technically possible with many current systems to apply them internally.

External application of these corrections enables the reconstruction of calculated noise levels from raw acoustic data, if such need should arise. Therefore, even though the internal or external application of these calibration adjustments will have the same effect, the requirement to apply the calibration adjustments externally to the analyzer will remain as proposed to enable the FAA to determine whether these adjustments have been applied correctly. Moreover, the requirement to apply these calibration adjustments externally was included in the revision to ICAO Annex 16 that was approved by the ICAO Council on June 27, 2001.

Reporting of Airplane Center of Gravity

Transport Canada recommends that the FAA provide a more detailed explanation of why information on center of gravity is needed and how it will benefit aircraft definition for noise certification purposes.

Airbus (U.K.) also comments that section A36.5.2.5(c), would require noise certification applicants to report the center of gravity range for each series of test runs. The commenter states that it already reports center of gravity in the flight manual, but notes that it currently reports the takeoff center of gravity as being ''mid center of gravity'' and the approach center of gravity as being ''forward center of gravity.'' The commenter hopes that this reporting practice would continue to be sufficient and that no greater detail would be required.

FAA Response

In section A36.5.2.5, the FAA proposed specific airplane configuration items and engine operating parameters that must be reported to the FAA in the applicant's noise certification compliance report. The FAA explained that each of the proposed configuration items and parameters can affect the airplane noise signature, and that the reporting requirements 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.

The FAA proposed in section A36.5.2.5(c) that the test airplane's center of gravity be reported. Transport Canada requests that the FAA provide more detail to explain why reporting is needed. In response to Transport Canada's comment, the 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. The center of gravity will affect the performance of the airplane and is therefore an integral part of the noise certification flight test and reference procedure. For example, for the approach noise certification, where part 36 requires that the reference airplane configuration be the noisiest configuration, the forward center of gravity position is usually associated with the noisiest airplane configuration. The forward center of gravity position forces the airplane's elevator to push down on the tail thereby increasing airframe drag and, in turn, the power required to maintain the required 3 degree glideslope. Both the increase in airframe drag and required power result in a higher approach noise level.

The final rule specifically identifies the requirement to report center of gravity. Accordingly, the current practice identified by Airbus (U.K.) of reporting center of gravity as ''forward'' or ''mid'' for each series of test runs will still be acceptable after the effective date of this final rule. Further, the center of gravity used in demonstrating compliance with part 36 is not required to be reported in the Airplane Flight Manual for noise certification purposes, as Airbus (U.K.) implies. This final rule only specifies that the center of gravity range must be reported in the applicant's noise certification compliance report.

Reporting of Propeller Pitch Angle

Transport Canada comments on the requirement to report propeller pitch angle proposed in section A36.5.2.5(d). Because the pitch angle at which a propeller operates is a function of torque demand and propeller revolutions per minute (RPM) the commenter recommended that torque and propeller RPM be reported as a substitute for propeller pitch angle. The commenter stated that Stage 3 noise compliant turboprops generally operate on the principle of governed propeller speed. In other words the propeller RPM is held constant by varying the pitch angle based on torque demand. The commenter further stated that, while torque is a measured parameter, propeller pitch angle is not.

FAA Response

The FAA agrees that torque and propeller RPM are an acceptable substitute for propeller pitch angle. The source noise (i.e., the noise generated by the airplane) adjustments required by section A36.9.3.4 can be made using torque and propeller RPM, and torque and propeller RPM can be more readily determined than propeller pitch angle. Engine torque and propeller rotational speed reporting requirements were proposed and reporting of these parameters is required by section A36.5.2.5(h)(2). Therefore, the proposed requirement to report propeller pitch angle has been removed in this final rule.

Adjustment of Airplane Flight Test Results

Transport Canada comments that section A36.9.1.1 needs an explanatory note to identify the components that are the likely noise sources that must typically be addressed in accounting for the effect that airspeed has on source noise.

FAA Response

The FAA agrees with the commenter's recommendation to identify the components that are the likely noise sources to typically be addressed in accounting for the effect of airspeed on source noise. This type of information is, however, more appropriate for inclusion in guidance material associated with part 36 rather than in part 36 itself. Therefore, information on the components to typically be addressed in accounting for the effect of airspeed on source noise have been included in Advisory Circular 36–4C, which is being published concurrently with this final rule.

Noise Certificates

In the proposed rule discussion of compatibility with ICAO standards, the FAA stated that the agency is not authorized to issue Noise Certificates. The proposed rule also notes that while section 36.1581 of part 36 requires that the certificated noise levels be included in the Airplane Flight Manual (AFM), the FAA does not require the AFM to be carried in the airplane. An operations manual that may not contain certificated noise levels is carried in some airplanes. The FAA invited comments on the extent of any problems encountered because noise compliance data are not on board the airplane.

We received one comment concerning this subject. Airbus (U.K.) comments that it has received occasional queries from British Aircraft Corporation (BAC) 1–11 operators who have had difficulties with certain airport authorities when approved noise data have not been available. The commenter states that in the absence of a noise certificate, the AFM is the only FAA-approved manufacturer's document that is, or may be, available to provide substantiation of the noise levels. If the AFM is not carried on board, the commenter recommends that the FAA consider issuing noise certificates.

FAA Response

Because only one comment was received, there is no indication that a widespread problem exists. The FAA, however, is continuing to pursue solutions that would result in sufficient noise data being carried on board aircraft to assist carriers in certain situations.

Noise Certification Reference Procedures

Airbus (U.K.) comments on proposed section B36.7(c)(5). Airbus (U.K.) states that the landing approach certification is already done at a range of aircraft configurations in case specific airports need it.

FAA Response

No change is made to the final rule based on this comment. The proposed rule did not propose to change the current section C36.9(b) requirement that bases the approach noise certification on the airplane landing configuration that is the most critical from a noise standpoint. The proposed rule moves the requirement from current section C36.9(b) to section B36.7(c)(5) to more closely align the formatting of part 36 with JAR 36 and ICAO Annex 16. Further, this requirement is consistent with that contained in JAR 36 and ICAO Annex 16.

Noise Certification Test Procedures

Airbus (U.K.) comments that the approach glide path angle (3 degrees ± 0.5 degrees) proposed in section B36.8(e) does not allow for designs for steeper approaches, despite the existing use of steeper approaches at specific airports. The commenter further states that if an aircraft was now designed specifically for steeper approach and was not capable of the 3 degree approach it might be uncertifiable, or difficult to certify, for noise purposes.

FAA Response

The proposed rule did not propose any change to the current section A36.5(c)(2)(ii) 3 degree approach reference glide path angle or the current section C36.9(c) glide path angle test tolerance. The proposed rule moves the current requirement for approach glide path angle from the current sections to sections B36.7(c)(1) and B36.8(e) to more closely align the formatting of part 36 with JAR 36 and ICAO Annex 16. The approach glide path angle requirements are also consistent with those contained in JAR 36 and ICAO Annex 16.

In addition, while the 3 degree reference glide path angle is currently used to establish the part 36 approach noise certification level, part 36 requirements for noise tests have no bearing on the use of other glide path angles during normal operation of an airplane. The FAA believes, however, that a glide path angle of 3 degrees is the nominal glide path angle that is generally used during normal operations by the class of airplanes to which part 36, subpart B is appropriate. In the case of an airplane that is designed with steep approach capability such that it may not be capable of a 3 degree approach, the FAA may determine that part 36, subpart B is not the appropriate noise certification standard for that airplane. If such a determination were made, an appropriate noise certification basis for the airplane would be developed using U.S. rulemaking procedures including a public comment period. No change to the glide path requirement proposed in sections B36.7(c)(1) and B36.8(e) of the proposed rule is being made.

Corrections and Other Minor Changes to the Proposed Rule

This final rule includes some corrections and other minor changes from the proposed rule.

Typographical errors, word omissions, etc., that appeared in the proposed rule have been corrected. Incorrect section and appendix designations have also been corrected. For example, the change in appendix designation from "C" to "B" was not changed in all of the sections that it should have been. Corrections to terminology have been made. For example, in some sections of part 36 the proposed change in terminology from "sideline" to "lateral", or from "turbojet" to "jet" was not carried through in all of the sections that needed to be changed. Errors in the section cross reference table have been corrected.

Sections 36.1(f)(4) and 36.1(f)(6) have been changed to reflect the relocation of the tradeoff provision from current section C36.5(b) to section B36.6.

In section 36.103(a) the reference to the ''flight test conditions'' of section B36.8 has been changed to ''test procedures'' to be consistent with the title of section B36.8.

In section B36.4(b), the phrase ''* * * obtain a sufficient number * * *'' has been changed to ''* * * use a sufficient number * * *'' since the word ''use'' more appropriately defines the requirement of this section for a sufficient number of noise measurement points (i.e., locations) to be used in demonstrating the maximum lateral noise level.

The title of section B36.7 has been changed from ''Noise certification reference procedures'' to ''Noise certification reference procedures and conditions'' to be consistent with the content of section B36.7.

Section B36.7(b)(3) now contains reference to section B36.7(b)(2) rather than B36.7(b)(1). This change was made because section B36.7(b)(2) is a more appropriate reference to the thrust cutback requirements.

The symbol ''$EPNL_r$'' meaning ''Effective perceived noise level adjusted for reference conditions'', has been added to section A36.6. This symbol is used in section A36.9.4.3.1.

In order to reflect the section formatting used by ICAO, the ambient noise requirements of proposed sections A36.4.9.11 and A36.3.9.12 have been adopted in this final rule as a part of a new section A36.3.10, ''Adjustments for Ambient Noise''. This formatting was used by ICAO in the amendment to ICAO Annex 16 that was approved by the ICAO Council on June 27, 2001.

Draft Advisory Circular 36–4C

The FAA made draft Advisory Circular (AC) 36–4C available for public comment and published a notice of availability in the **Federal Register** on August 9, 2000 (65 FR 48794). In the proposed rule, the FAA stated that it intended to publish AC 36–4C concurrently with this final rule. The AIA comments that its review of the draft AC indicates that it encompasses much more explanation and interpretation of the regulatory requirements than the current ICAO Environmental Technical Manual guidance material, which is focused primarily on the use of equivalent procedures. The AIA encourages the FAA to take two important steps regarding AC 36–4C. As a first step, the AIA suggests that there is important work to be done in coordination with manufacturers for buy-in of the document concept before it is published, followed by integration of all sections of the document so that it can be easily used by readers and applicants. Second, the AIA suggests that the FAA recommend to ICAO Working Group 1 that it study the document and consider development of similar internationally accepted guidance material concerning compliance with the ICAO Annex 16 overall noise certification process.

FAA Response

The FAA agrees with the AIA's observation that AC 36–4C encompasses more than the current ICAO Environmental Technical Manual. AC 36–4C was developed to provide comprehensive guidance on implementing the part 36 noise certification standards. In meeting this objective, AC 36–4C covers many more subjects than the ICAO Environmental Technical Manual.

Given that the AIA members constitute a significant segment of the intended users of AC 36–4C, the FAA accepted the assistance of the AIA in editing the draft AC to make it more useful to the intended users. These changes eliminated redundancies and improved the integration of the guidance material with its associated regulatory text. These changes have been incorporated into the final version of AC 36–4C, which is being published concurrently with this final rule.

The FAA agrees with AIA's suggestion that the FAA recommend to ICAO Working Group 1 that it study the document and consider development of similar internationally accepted guidance material concerning compliance with the ICAO Annex 16 overall noise certification process. In fact, ICAO CAEP Working Group 1 has begun development of such a document under its current work program.

Synopsis of the Final Rule

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 final rule adopts changes to part 36 in three major categories. First, there are substantive changes to technical material, such as a revised method for demonstrating the lateral noise certification level for propeller-driven airplanes. These changes are discussed individually in this preamble. Second, there are many changes to regulatory text that will 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 changes to the section designations of current Appendices A, B, and C of part 36 that will more closely align part and JAR 36 formats. Changes in this category will have no substantive effect on the regulatory standards of part 36. The changes in part 36 section designations are shown in a tabular format that identifies current part 36 sections and the corresponding sections of the 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 substantive changes to 14 CFR part 36 and its appendices. Throughout the final rule, the term ''jet'' has been used when referring to turbojet and turbofan engines. This changes the terminology in current part 36, which uses the term ''turbojet'' when referring to both turbojet and turbofan engines. This change will result in the same term being used in 14 CFR part 36 and JAR 36, when referring to turbojet and turbofan engines. For consistency with part 36, this change in terminology has also been included in the aircraft noise related sections of parts 21 and 91. This change to parts 21 and 91 is discussed in the following section-by-section discussion.

Sections 21.93 and 21.183

Section 21.93(b)(2) and section 21.183(e)(1), which pertain to the part 36 noise certification requirements, are revised to add the term ''jet'' and retain the term ''turbojet powered'' when referring to turbojet or turbofan engines. This change is made to reflect the use of the term ''jet'' in part 36 and does not change the meaning of the term turbojet as it is used in either the noise certification related sections, or other sections of 14 CFR chapter 1.

Section 36.1

This final rule removes section 36.1(d)(3). Amendments 36–10 (43 FR 28406, June 29, 1978) should have removed this section when it redesignated section 36.1(d)(3) as section 36.1(d)(1)(iii).

Section 36.1(f) and its subparagraphs are revised to incorporate changes in terminology, *i.e.,* from ''takeoff'' to ''flyover,'' ''sideline'' to ''lateral,'' and ''turbojet'' to ''jet,'' and the changes to part 36 appendix and section designations that result from this final rule. Several of these changes were inadvertently omitted from the proposed rule, but are necessary to correctly reflect the changes in part 36 formatting and terminology.

Sections 36.1(f)(4) and 36.1(f)(6) are revised to reflect the relocation of the tradeoff provision from current section C36.5(b) to Section B36.6. These changes are necessary to reflect the change in past 36 formatting.

Section 36.2

The context of section 36.2, ''Special retroactive requirements'' is revised, and the heading of this section is changed to ''Requirements as of date of application''. As discussed under the Discussion of Comments section of this preamble, this final rule retains and revises section 36.2, rather than removing this section, as proposed. Revised section 36.2 maintains the intent of the proposal (*i.e.,* to base applicability on the date of certification) while addressing the comments submitted by the AIA.

Current section 36.2 requires that the noise certification applicant show compliance with the part 36 requirements that are in effect on the date of certification. This provision was included in part 36 before the FAA had the authority to prevent the issuance of a type certificate for an aircraft design that did not include reasonable noise reduction design practices. The FAA subsequently received this authority under the Noise Control Act of 1972; the retroactive requirement contained in section 36.2 is no longer necessary. Therefore, this final rule revises section 36.2 to specify compliance with the noise certification requirements that are effective on the date of application for the type certificate, amended type certificate, or supplemental type certificate. This change will harmonize the applicability designation of part 36 with the intent of section 1.7 of ICAO Annex 16, Chapter 1. Given the change from Notice No. 00–08 in the manner in which this requirement is implemented, the FAA invites comments on revised section 36.2.

Section 36.6

This final rule updates the incorporation by the reference form the new measurement requirements specified in section A36.3. These specifications are referred to under new section A36.3, which updates 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 section 36.6.

Section 36.7

Section 36.7 is revised to incorporate changes in terminology, *i.e.,* from ''takeoff'' to ''flyover,'' ''sideline'' to ''lateral,'' and ''turbojet'' to ''jet''. Section 36.7 is also revised to reflect the changes to part 36 appendix and section designations that result from the changes adopted in this final rule. Several of these changes were inadvertently omitted from the proposed rule, but are included in this final rule to correctly reflect the changes in part 36 formatting and terminology.

Sections 36.101 and 36.103

Two sections, 36.101, Noise measurement, and 36.103, Noise evaluation, were combined to become a new section 36.101, Noise measurement and evaluation. New section 36.101 reflects the combination of current Appendix A and Appendix B into revised Appendix A. These changes more closely align part 36 and JAR 36 formats without introducing any substantive changes. For the same reasons, section 36.201 is redesignated as section 36.103.

Subpart C

The text in subpart C has been reincorporated in subpart B and A and the title for subpart C is reserved.

Section 36.301

Section 36.301 is revised by replacing the reference to ''Appendix C'' with a reference to ''Appendix B''. This revision reflects the changes in part 36 formatting.

Section 36.1581

Section 36.1581 is revised to incorporate changes in terminology, *i.e.,* from ''takeoff'' to ''flyover,'' ''sideline'' to ''lateral,'' and ''turbojet'' to ''jet''. Section 36.1581 is also revised to reflect the appendix designation changes. The change in terminology from ''takeoff'' to ''flyover'' and from ''sideline'' to ''lateral,'' and the replacing of the reference to part 36 Appendix C with a reference to Appendix B reflects the changes in part 36 formatting and terminology.

Appendix A—Aircraft Noise Measurement and Evaluation Under § 36.101

Revised Appendix A to part 36, Aircraft Noise Measurement and Evaluation under section 36.101 replaces current Appendices A and B. The revised Appendix A to part 36 was developed to maintain a section format consistent with JAR 36, Appendix A, and with ICAO Annex 16, Appendix 2. The text of JAR 36, Appendix A, mirrors ICAO Annex 16, Appendix 2.

Section A36.1 Introduction

Section A36.1.2 is added to state that the noise certification instructions and procedures are intended to ensure uniform results and to permit comparison between tests of various types of aircraft conducted in different geographical locations.

Section A36.2 Noise Certification Test and Measurement Conditions

Section A36.2 replaces current section A36.1. This new section describes the conditions under which noise certification testing is conducted and the measurement procedures that are required.

The note in section A36.2.1.1 references the guidance material on the use of equivalent procedures contained in Advisory Circular 36–4C, ''Noise Standards: Aircraft Type and Airworthiness Certification.'' Current AC 36–4B, ''Noise Certification Handbook,'' contains guidance material on the use of equivalent procedures. AC 36–4C revises and significantly changes the format and content of the advisory material and is not titled, ''Noise Standards: Aircraft Type and Airworthiness Certification.'' The FAA is issuing new AC 36–4C concurrently with this final rule. The AC 36–4C is referred to as ''the current advisory circuit for this part'' throughout the regulatory text in this final rule.

Under this final rule, the material in current section A36.1(c)(1) is moved to 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) is moved to section A26.2.2.2(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 must be conducted in conformance with the operational temperature limit for the noise measuring equipment used.

In Notice No. 00–08, new section A36.2.2.2(c) did not include 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. As explained in Notice No. 00–08, the allowance for expanded atmospheric attenuation rates was not included because it would continue to be permitted as an equivalent procedure. Subsequent to the publication of Notice No. 00–08, however, the FAA determined that it is more appropriate to retain the allowance for expanded atmospheric attenuation rates as an alternative procedure in the rule text of part 36. Therefore, this allowance is contained in section A36.2.2.2(c) of this final rule.

In addition, the allowance for expanded atmospheric attenuation coefficients has been revised to be consistent with the ICAO Environmental Technical Manual allowance by (1) eliminating the 14 dB/100 meter limit on the allowable extension, (2) requiring the use of atmospheric layering in accordance with the requirements of new section A36.2.2.3, and (3) adding an alternative allowance for cases where the peak noy values at the time of tone-corrected perceived noise level (PNLT) occur at frequencies of less than or equal to 400 hertz (Hz). The effect of this change is a further expansion of the allowable test weather conditions, but with the requirement that atmospheric layering be used.

The requirements to obtain meteorological measurements within ''25 minutes'' of each noise test measurement as required in current section A36.9(b)(3) is changed to ''30 minutes'' in 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 to assess this minimal time increment. This change will achieve harmonization by adopting a single international standard.

Current section A36.9(d)(3) is revised and moved to section A36.2.2.3. This final rule changes the method used to establish layer depth to reflect the international standard. Current part 36 does not provide specific criteria for determining layer depth, except to require that it be no greater than 100 feet. The criteria for determining layer depth that is adopted by this final rule 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 final rule, the minimum layer depth is 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 changes to this section update the requirements for measurement and analysis systems to include the latest standards and equipment technology. These changes were drafted by an international task group having years of knowledge and experience in the noise certification of airplanes. This task group was assembled under Working Group 1 of the ICAO Committee on Aviation Environmental Protection (CAEP) to draft changes that would update the ICAO Annex 16 requirements for measurement and analysis systems. On June 27, 2001, the ICAO Council approved the revision to ICAO Annex 16 that includes the updated requirements.

The primary purpose of the international task group 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.

Revised section A36.3 includes the following specific changes. Current section A36.3 does not include definitions. Section A36.3.1, Definitions, is added to define the terms used in section A36.3. Section A36.3.2, Reference environmental conditions, is added in this final rule to specify the performance of a measurement system.

Section A36.3.3.2 is added and specifies anti-alias requirements for measurement systems that include analog-to-digital signal conversion.

Section A36.3.4.1 adds a requirement that windscreen insertion loss not exceed ±1.5 dB. Section A36.3.9.10 also limits the change in windscreen insertion loss calibration to 0.4 dB from the previous calibration.

Sections A36.3.5.3 and A36.3.5.4 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). The new sections 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.

Section A36.3.6.3 adds a tolerance for frequency response of the measurement system.

Section A36.3.6.4 adds a ±0.5 dB tolerance for amplitude fluctuations of a recorded 1 kHz signal on analog tape.

Section A36.3.6.5 adds a tolerance for amplitude linearity, at several specific frequencies, for the measurement system (exclusive of the microphone).

Section A36.3.6.6 requires 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. This replaces the 10 dB requirement in current part 36, section A36.3(c)(3)(i).

Section A36.3.6.8 adds a requirement for an overload indicator in the recording and reproducing system.

Section A36.3.6.9 allows 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).

Section A36.3.7.2(e) adds a requirement that the analyzer operate in real time from 50 Hz through at lease 12 kHz.

Section A36.3.7.3 specifies 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. Section A36.3.7.3 also includes a note stating that IEC 61260 specifies procedures for testing one-third octave band analysis systems for relative attenuation, anti-aliasing filters, real time operation, level linearity, and filter integrated response (effective bandwidth). The IEC filter bandwidth adjustment method requires that the adjustment be based on more frequencies than are required under current part 36.

Section A36.3.7.4 contains a correction to the slow time-weighting characteristics in current section A36.3(d)(5) (ii) and (iii). Section

A36.3.7.6 specifies 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 sound pressure level is characterized must be the midpoint of the averaging period.

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

Section A36.3.7.7 requires that the analyzer resolution 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.

Section A36.3.9.1 requires 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. As discussed in the disposition of comments, this change is necessary to enable the FAA to determine whether these calibration adjustments have been applied correctly.

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

Section A36.3.9.4 requires that at lease 30 seconds of pink noise be recorded for analog tape recorders; the current section A36.3(e)(4)(ii) requirement is for at lease 15 seconds of pink noise. This change will result in a more accurate pink noise correction and will be the same as the Annex 16 requirement.

Section A36.3.9.6 requires that attenuator accuracy be within 0.1 dB. Section A36.3(b)(6) currently requires that attenuator accuracy be within 0.2 dB. This final rule requires that calibration be checked within six months of each test series, while the current rule does not specify a time period.

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

Section A36.3.9.7 adds a new calibration requirement that limits the change in output of the sound calibrator to not more than 0.2 dB.

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

Section A36.3.9.9 adds a requirement for the recording medium (e.g., tape reel) to carry at least a 10-second duration sound pressure level calibration at its beginning and end. This change more precisely defines 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), is moved to AC 36–4C. The final rule now uses the equation to obtain the values. The noy values contained in Table B–1 can be calculated for the equations contain in section A36.4.7.3.

A minor technical change is made to the Perceived Noise Level (PNL) equation in 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 changed 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'', is 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 section A36.4.2.1(c).

Section A36.4.5.2 changes the value of ''d'' in the equation for the duration correction factor from 1.0 seconds to 0.5 seconds to reflect current standard practice. The same changes are included in 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 has 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 is moved to AC 36–4C.

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, is removed. 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 was retained in part 36 unnecessarily.

Section B36.9(f) is also removed. The text contained in current section B36.9(f) was added to part 36 in 1976 to distinguish between the procedure for determining duration for applications made before and after September 17, 1971. This distinction is no longer necessary since current section B36.9(e) is removed. The section B36.9(f) requirement for the aircraft testing procedures to include the 10 dB-down points is contained in section A36.2.3.2 of this final rule.

Section A36.5 Data Reporting

Section A36.5.2 requires that the data specified in that section 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. This final rule now requires a report be submitted. Section A36.5.2.5 also identifies the specific airplane configuration items and engine operating parameters that must be reported. Each of these configuration items and parameters can affect airplane noise. The reporting requirement for these items and parameters exists 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.

Section A36.5.2.5(c) requires 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 is an item that could influence measure noise levels. Section A36.5.2.5(d) requires that the airbrake position also be reported. Sections A36.5.2.5(e), (f), and (j), 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.

Section A36.5.2.5(h)(2) requires reporting of engine performance parameters specifically related to propeller-driven airplanes.

Current section A36.5(d)(3) does not permit an effective perceived noise level (EPNL) to be computed or reported from data from which 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 is 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. Section A36.3.10.2 will specify the ambient noise level limitations that require corrections (adjustments) to be made, and also will reference AC 36–4C, which contains a procedure for removing the affects of ambient noise.

Current section A36.5(e)(4), that addresses the use of equivalent procedures, is removed. The key requirement of the section, that the FAA must approve equivalent procedures, is already addressed in section 36.101. Additional information on the use of equivalent procedures is provided in the note contained in section A36.2.1.1.

Section A36.6 Nomenclature: Symbols and Units

Section A36.6, Nomenclature: Symbols and units replaces current section A36.7, symbols and units. Section A36.6 incorporates ICAO Annex 16 symbols and units, while retaining the English units. This change is made to more closely align part 36 with JAR 36. No substantive technical changes are anticipated to result from incorporation of the ICAO Annex 16 symbols and units.

Section A36.7 Sound Attenuation in Air

Currently, atmospheric attenuation rates of sound with distance must use 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). In this final rule, section A36.7.2 contains 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. Accordingly, the tables are being removed and applicants must use the equation. This change will 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), is not included in new section A36.9.1. This distinction is no longer relevant given: (1) The evolution of data correction procedures since part 36 was originally promulgated in 1969 and, (2) 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 obtain FAA approval of, any planned or anticipated data correction that is not a mandatory correction procedure under part 36.

Current section A36.1(b)(3) is deleted because it is obsolete. This section 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. A 20-foot height allowance/tolerance could change the final EPNL value by several tenths of a dB under some circumstances. Under current noise certification 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 new section A36.9.

Section A36.9.1.1(d) will 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.

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

Section A36.9.3.2.1 provides equations that 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) will be moved to section A36.9.3.2.2 and revised to specify the adjustment for multiple peak values of PNLT. This adjustment is based upon the difference in corrected PNLT values, rather than upon APNL as in the current part 36. This change more clearly defines the intent of the multiple peak correction.

Under section A36.9.3.3.2 a correction term is added to account for the difference between (1) the measured airspeed during the noise certification flight test and (2) the airspeed calculated for the noise certification reference flight procedure. This correction term is added to the duration correction ($\Delta 2$) contained in current section A36.11(e). The speed correction term is defined as 10 log (V/V_r), where V is the airplane test speed and V_r is the airplane reference speed. This change specifies the speed correction that is required by current section A36.11(f)(1).

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

Appendix B will include the material from current appendix C. This will make Appendix B essentially the same as JAR 36, section 1, subpart B.

Section B36.3 Reference Noise Measurement Points

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

Section B36.3(a)(2) will include a simplified test procedure that may be used in determining the sideline (lateral) noise certification level for propeller-driven airplanes. 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 C36.3(c) 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 airplane. By measuring full-power noise at a predetermined point (650 meters) below the takeoff flight path, many of the difficulties that 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 certifying 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 available as an alternative to the current section C36.3(c) method for tests conducted before August 7, 2002, after which it will become the sole method for demonstrating sideline (lateral) noise level compliance.

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

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). Notice No. 00–08 proposed to move this procedure to the guidance material in AC 36–4C. Subsequent to the publication of Notice No. 00–08, however, the FAA determined that it is more appropriate to retain this procedure in part 36 as an alternative procedure for determining the maximum lateral noise level. This procedure is included in section B36.3(a)(1). In addition, the target altitude and target altitude tolerance requirements of this section are adjusted so that they are now consistent with those of the similar procedure contained in section 2.1.3.2 of the ICAO Environment Technical Manual.

Section B36.4 Test Noise Measurement Points

Most of the requirements of current section A36.1(b)(7) are moved to section B36.4.

Section B36.4(b) requires that, in demonstrating the sidelines (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 made because of the asymmetric nature of propeller noise. Part 36 has required simultaneous measurement at one test measurement point opposite the main lateral measurement line to account for the possibility of lateral noise asymmetry. In the case of propeller-driven airplanes, however, 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 runway from the main lateral line. This change will further harmonize part 36 and JAR 36.

Section B36.5 Maximum Noise Levels

The material in current section C36.5 is moved to section B36.5 and revised to include minor format and language changes to harmonize with JAR 36. Amendment 36–15 ''Standards Governing the Noise Certification of Aircraft'' (53 FR 26360, May 6, 1988) removed section C36.5(c); the references to section C36.5(c) in current section C36.5(a) should have been removed under that amendment but was not. The reference is removed in this final rule.

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 change in terminology 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 requirements of current section C36.5(b) are moved to section B36.6. The reference to section 367(d)(3)(i)(B), in current section C36.5(b), is changed to section 36.7(d)(1)(ii) in the new section. This section reference should have been changed in 1988 by Amendment 36–15.

Section B36.7 Noise Certification Reference Procedures

The takeoff and approach reference and test limitation in current sections C36.7 and C36.9 are moved to sections B36.7 and B36.8. This material is also revised as follows.

Section B36.7(b)(1) requires the use of ''average engine'' performance in defining the takeoff thrust for the reference takeoff procedure. Specifying the use of ''average engine'' performance further harmonizes the part 36 takeoff reference procedure with JAR and ICAO Annex 16, and will eliminate confusion in compliance with the requirement.

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

Currently section C36.7(b)(2) specifies different minimum cutback altitudes for jet and propeller-driven airplanes. Section B36.7(b)(1)(ii) contains the same minimum cutback altitude for all airplanes, which is the 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 will not have a substantive effect in practice.

Since cutback initiation heights greater than 1,500 feet are generally chosen for propeller-driven airplanes and this height is greater than both the current and revised part 36 minimum requirements, the FAA has determined that there will be no change in practice.

In this final rule, the requirements of section A36.1(b)(2) are moved to section B36.7(b)(3) and revised to require that, for tests conducted on or after August 7, 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 reflects 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 is optional for tests conducted before August 7, 2002. This change will mainly affect three and four engine airplanes.

The takeoff reference speed requirement specified in current section C36.7(e)(1) is revised to be consistent with the takeoff reference speed contained in JAR 36 and ICAO Annex 16. The all-engine operating climb speed range (V2+10 to V2+20 kts) specified in section B36.7(b)(4) represents the typical range of takeoff initial climb speed seen in normal operation for most airplanes. For some airplanes, this 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.

In section B36.7(b)(5) the FA is adding a definition of configuration, which includes specific configuration elements, based on certification experience, that can have a effect on source noise. There is no change in takeoff configuration requirement.

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.

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. In this final rule, this specific requirement is removed, and instead, section A36.9.3.4 will require that source noise adjustments be applied to account for any differences between test and reference conditions, in engine parameters that affect engine noise (e.g., corrected low pressure rotor speed). This change will meet the intent of the current part 36 requirement and also further harmonizes with JAR 36.

Current section C36.9(e)(1), reference approach speed, is 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. In Notice No. 95–17, published on January 18, 1996 (61 FR 1260), 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. Notice No. 95–17 proposed that a definition of V_{REF} would be added to 14 CFR part 1. Since a final rule based on Notice No. 95–17 has not been published, the definition of V_{REF} has been included in this final rule. The definition of V_{REF} is the only element of Notice No. 95–17 that has been included in this final rule. In section B36.7(c)(2), V_{REF} is defined as ''the speed of the airplane, 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.'' The change to section C36.9(e)(1) is also consistent with a change to ICAO Annex 16 that was approved by the ICAO Council on June 27, 2001. Current section C36.9(e)(1) is redesignated as section B36.7(c)(2).

Section B36.8 Noise Certification Test Procedures

Current sections A36.1(d)(5) and A36.1(d)(7), which contain limitations on the difference between the test weight and the maximum takeoff/approach weight for which noise certification is requested, are replaced by section B36.8(d). The current 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. Section B36.8(d) will 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.

The current requirements of section A36.5(d)(5) are 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 B noise level limits, for the purpose of determined adjustment limits. Several interpretations of the current requirement are possible as to whether this final rule represents a more stringent or less stringent adjustment limitation as compared with the current limitation. The FAA believes that the change to remove the tradeoff provision from the current limitation and base the limitation solely on the difference between the adjusted noise levels and the maximum noise levels in section B36.5 meets the intent of the adjustment limitation, as stated above, and clarifies ambiguity in its interpretation. The change also results in harmonization of the adjustment limitation with that in JAR 36 and ICAO Annex 16.

Section B36.8(g) will 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. Section B36.8(g) will 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 10 dB-down points. In the final rule, the instantaneous indicated airspeed is determined from the pilot's airspeed indicator. If the instantaneous indicated airspeed exceeds ±3 kt (±5.5 km/h) of the average airspeed over the 10 dB-down points, and is determined by the FAA representative on the flight deck as the result of atmospheric turbulence, then that flight must be rejected for noise certification purposes.

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

Section G36.105 Sensing, Recording, and Reproducing Equipment

To maintain the correct cross reference, this final rule changes the references in paragraph (f) from section A36.3(e) to A36.3.8 and A36.3.9.

Appendix H—Noise Requirements for Helicopters Under Subpart H Section H36.101 Noise Certification Test and Measurement Conditions.

To maintain the correct cross reference, this final rule amends section H36.101(d)(1) by removing the reference to ''appendix B'' and adding ''appendix A.''

Section H36.111 Reporting and Correcting Measured Data

To maintain the correct cross reference, this final rule amends section H36.111(c)(3) by removing the reference ''A36.3(f)(3)'' and adding ''A36.3.10.1.''

Section H36.201 Noise Evaluation in EPNdB

To maintain the correct cross reference, this final rule amends section H36.201 by: (1) Removing the reference to ''appendix B'' in paragraph (a) of this section and adding ''appendix A,'' and (2) removing the reference to ''B36.5(a)'' in paragraph (b) of this section and adding ''A36.4.3.1(a).''

Sections 91.801 and 91.851

Section 901.801(a)(1), 91.801(a)(2), 91.801(c), 91.801(d), and 91.851, which are related to the part 36 noise certification requirements, are revised to incorporate the term ''jet'' in addition to ''turbojet'' when referring to turbojet or turbofan engines. This change is made to reflect the use of the term ''jet'' in part 36 and does not change the meaning of the term turbojet as it is used in either the noise certification related sections, or other sections of 14 CFR chapter 1.

REDESIGNATION TABLE FOR 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)	A36.7(b)(3)
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

REDESIGNATION TABLE FOR APPENDICES A AND B—Continued

Cross Reference Table

Old section	New section
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) AC 36–4C
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)	A36.3.10.1
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)(6), B36.7(c)(1), B36.7(c)(4)
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)	A36.3.10.2
A36.5(d)(4)	A36.3.10.2
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
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), AC 36–4C
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(a)
B36.3(b)	A36.4.2.1(b)
B36.3(c)	A36.4.2.1(c), AC 36–4B
B36.5	A36.4.3.1
B36.5(a)	A36.4.3.1(a)
B36.5(b)	A36.4.3.1(b)
B36.5(c)	A36.4.3.1(c)
B36.5(d)	A36.4.3.1(d)
B36.5(e)	A36.4.3.1(e)
B36.5(f)	A36.4.3.1(f)
B36.5(g)	A36.4.3.1(g)
B36.5(h)	A36.4.3.1(h)
B36.5(i)	A36.4.3.1(i)
B36.5(j)	A36.4.3.1(j)
B36.5(k)	A36.4.3.1(j)
B36.5(l)	A36.4.3.1(j)
B36.5(m)	A36.4.3.1(j), AC 36–4C
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
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)(2)	B36.7(b)(1)(ii)
C36.7(c)	B36.7(b)(2)
C36.7(d)	B36.7(b)(5)
C36.7(e)(1)	B36.7(b)(4)
C36.7(e)(1) Next to last sentence	B36.8(g)
C36.7(e)(2)	B36.7(b)(4)
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)(3) & B36.7(c)(4)
C36.9(c)	B36.7(c)(1), B36.7(c)(3)
C36.9(d)	Deleted
C36.9(e)(1)	B36.7(c)(2)
C36.9(e)(2)	B36.7(c)(2)
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), A36.1(d)
A36.2.3	A36.1(d)
A36.2.3.1	A36.1(d)(2)

CROSS REFERENCE TABLE—Continued

New section	Old section
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
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)
A36.3.10.1	A36.3(f)(2–4)
A36.3.10.2	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	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

REDESIGNATION TABLE FOR APPENDICES A AND B—Continued

Cross Reference Table	
Old section	New section
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	A36.11(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	A36.11(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)
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)	C36.5(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)	C36.5(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)(2)(i–iv)
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

Notice No. 00–08, Noise Certification Standards for Subsonic Jet Airplanes and Subsonic Transport Category Large Airplanes, contained proposed information collection requirements. As required by the Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)), the FAA submitted a copy of the proposed rule to the Office of Management and Budget (OMB) for its review.

The agency did not receive any comments concerning this collection of information. The collection of information was approved and assigned OMB Control Number 2120–0659.

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. The FAA is participating in an effort, sponsored by the ICAO Committee on Aviation Environmental Protection (CAEP) Working Group 1, that is aimed at resolving these differences. Any remaining differences with Annex 16 Recommended Standards and Practices after conclusion of these efforts will be filed with ICAO. Differences will not be filed for those items that are ''notes'' in Annex 16.

Wind Speed. Section A36.2.2.2(e) of this final rule 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 final rule 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 A36.2.2.2(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 has not agreed to adopt this ICAO Annex 16 provision because it could result in tests being conducted in windspeed conditions that exceed those currently permitted under part 36; based on the information that was available to it, the harmonization working group could not determine the effect that these higher wind conditions might have on the resulting noise levels.

Adjustments to PNL and PNLT. In adjusting measured sound pressure level data to reference conditions, a note in Annex 16, Appendix 2 section 9.3.2.1 suggests 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 does not agree with this provision. The FAA has determined 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 adjusted to account for the difference between the test and reference airplane heights above the noise measurement point.

Design characteristics that requires different reference procedures. Section 3.6.1.4 of ICAO Annex 16, Chapter 3 permits the certificating authority to approve reference procedures that are different from those contained in sections 3.6.2 and 3.6.3 of ICAO Annex 16 when design characteristics of an airplane would prevent flight from being conducted in accordance with sections 3.6.2 and 3.6.3 of ICAO Annex 16. The FAA will not adopt this ICAO Annex 16 provision. The FAA recognizes that there may be a need for changes to the specified reference procedures when part 36 may not be appropriate for a particular airplane. In cases where part 36 is not appropriate, the rulemaking process, which includes a public comment period, would be followed to develop an appropriate noise certification standard. Accordingly, although the provision is not being adopted, the section reference will be reserved to preserved the ICAO format as much as possible.

Noise Certificates. A note in section 1.2 of ICAO Annex 16, Chapter 1 indicates that documents attesting to 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. The FAA however, is not authorized to issue noise certificates.

The U.S. regulations require that the certification noise levels be included in the Airplane Flight Manual (AFM)/ Rotorcraft Flight Manual (RFM), and an AFM/REM is approved for each carrier/ operator or airplane/rotorcraft model by the FAA. Some U.S. operating regulations, however, such as 14 CFR part 121, allow an operator to create an operations manual that is based on the limitations and performance requirements contained within the FAA-approved AFM. This manual is required to be used by the flight, maintenance, and ground crews of the operators. There is no specific requirement that the entire FAA-approved AFM be carried in the airplane. The operations manual (or Flight Crew Operating Manual) may not contain the noise characteristics page from the FAA-approved AFM depending on how the manual was constructed and whether or not the information contained on the noise characteristics page was deemed of any benefit to the flight or operations crews.

In Notice No. 00–08, the FAA invited 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. One comment was received on this subject and is included under the Discussion of Comments section of this preamble.

Economic Summary

Proposed changes to Federal regulations must undergo several economic analyses. First, Executive Order 12866 directs each Federal agency to propose or adopt a regulation only if the agency makes a reasoned 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 requires agencies to consider international standards. Where appropriate, agencies are directed to use those international standards as the basis of U.S. standards. 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. This requirement applies only to rules that include a Federal mandate on State, local, or tribal governments or the private sector, likely to result in a total expenditure of $100 million or more in any one year (adjusted for inflation).

In conducting these analyses, the FAA has determined that this final rule: (1) Has benefits which do justify its costs, is not a ''significant regulatory action'' as defined in the Executive Order and is not ''significant'' as defined in DOT's Regulatory Policies and Procedures; (2) will not have a significant impact on a substantial number of small entities; (3) will reduce trade barriers by narrowing the difference between United States and Joint Aviation Authority regulations; and (4) does not impose an unfunded mandate on State, local, or tribal governments, or on the private sector.

The FAA has placed these analyses in the docket and summarized them below.

Comments

Four parties provided comments in response to the NPRM. Only one party, the Aerospace Industries Association (AIA) made any comment on the costs associated with the proposal and the reference concerned only one of the five broad categories to which AIA addressed its comments. In the category entitled ''FAA differences representing additional or dissimilar requirements'', AIA lists twelve sections of the NPRM that ''either are or can easily be interpreted to be different than those in Annex 16''.

The AIA states that ''these differences, if maintained, would also make it much more difficult and costly to applicants that might want reciprocal approvals by different certificating authorities''. The FAA reviewed the sections in question and in some cases was unable to determine the specific concern that the commenter was raising.

In eight of the sections, the FAA views the minor text differences as serving to clarify part 36 requirements without introducing any additional or dissimilar requirements relative to Annex 16. In the ninth section, the FAA concludes that, rather than adding a burden, the changed text clarifies that the specified windscreen testing need only be performed under certain conditions and does not view the section as an additional or dissimilar requirement for ICAO Annex 16. The FAA corrected an equation in the tenth section. The FAA has been unable to identify any costs associated with ten of the twelve sections in question and in view of the lack of any specific cost data submitted by the commenter the FAA concludes that there are no additional costs associated with these amendments.

The comments on the two remaining sections in question are beyond the scope of this rulemaking. In one case, adoption of the ICAO provision would violate United States administrative procedures and in the second case, the FAA intends to work within the ICAO process to achieve future resolution of the difference.

Analysis of Costs

The FAA has analyzed the expected costs of this regulatory rule for a 10-year period, from 2002 through 2011. As required by the Office of Management and Budget (OMB), the present value of this cost stream was calculated using a discount factor of 7 percent. All costs in this analysis are expressed in 2000 dollars.

The sections of the final rule that will impose costs fall into three categories: (1) Software costs, (2) additional or new measuring provisions, and (3) additional reporting requirements.

Software Costs

Section A36.3.7.6 specifies 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. Implementation of this change will require modifying the computer software used by the applicant. The FAA must verify the software change. The estimated time required to make this one-time software change is 40 hours for each applicant. The estimated time required by the FAA to verify correct implementation of the change is 20 hours for each applicant.

Based on internal data, the FAA estimates that 11 applicants will incur this one-time cost. This is significantly less than the number of applicants estimated in the NPRM. The NPRM erroneously included all original equipment manufacturers and supplemental type certificate applicants as being required to make this software change. The estimated cost to the industry is $39,200. The verification cost to the FAA is estimated at $17,400. The FAA estimates that these software costs will be incurred in the first 3 years of the 10-year period; the present value cost to the industry and the FAA will be $34,200 and $15,200, respectively.

Measurement Costs

Section B36.4(b) will add a special requirement for propeller-driven airplanes that will require the placement of symmetrically 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. These equivalent test procedures will be unaffected by this change and most applicants are expected to continue to use them. If more than a two-microphone array were used, however, the cost will be realized as part of the certification test performed under the specifications of JAR 36 or ICAO Annex 16.

Industry sources estimate that there are currently six firms engaged in the noise certification of large propeller-driven airplanes and that all but one are foreign manufacturers that already incur this cost if they are not using the approved equivalent procedure. The domestic firm is a large entity that probably also already incurs this cost under the JAR specifications if it does not use the approved equivalent procedures. Therefore, changing part 36 will not result in increased costs for known applicants.

An applicant choosing to use multiple pairs of microphones, however, could incur additional costs ranging up to an estimated $29,350 per test. The FAA has calculated costs assuming two domestic large-propeller applicants will conduct 4 tests meeting this requirement over the next 10 years. The total cost is estimated to be $117,400, or $83,000 discounted.

Reporting Costs

Section A36.5.2.5 (c through f, h(2), j) adds five new data elements to be reported to the FAA. All of these new reporting requirements are already a part of the international standard. Because most applicants already address these requirements under JAR 36 or ICAO Annex 16, and the data is already reported to the FAA on a voluntary basis, minimal cost impact is expected. Additional labor costs for documenting data not previously reported are estimated to range from $525 to $2,100 per certification.

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 that already comply with these new reporting requirements under JAR 36 or ICAO Annex 16 and thus will not incur additional reporting costs.

Ten projects are conducted from among the 24 domestic firms engaged in flight testing and the FAA estimates that these firms will conduct 100 tests over the next 10 years. The FAA further estimates that some domestic firms will incur additional reporting costs of $1,315 per test, based on the midpoint of the estimated additional labor costs (($525 + $2,100)/2).

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. Because 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 will result in the additional reporting costs of $1,315 each, or a total of $13,150. The FAA estimates that of the 60 tests to be conducted by smaller domestic firms, 24 tests will incur the additional reporting costs of $1,315 per test or a total of $31,600 over the next 10 years. Thus, the additional labor costs for reporting the additional information will total approximately $44,700 for these affected firms.

It is possible, however, that some applicants might accrue additional costs. If an applicant is required to invest in new instrumentation or data recording equipment to comply with these requirements, the estimated total reporting costs could increase to between $5,250 and $10,500 per test. One possible scenario could entail the purchase and installation of instrumentation hardware at $4,400, plus the labor cost for adding recording capability, and data recording and analysis at $3,600 for a total of $8,000 of additional cost. The FAA estimates that three domestic firms, one large and two small, could incur this additional cost of $7,960 for each test and that each of these firms will conduct 4 tests for a total of 12 tests over the next 10 years at a total cost of $95,520. Thus, the total additional reporting costs to the industry will be $140,200, or $98,485 discounted, based on the minimal additional reporting costs of $44,700 and $95,520 incurred by the firms requiring additional instrumentation and data recording.

Summary of Increased Costs

The following table summarizes the estimated cost of changing the noise certification standards of part 36 and achieving greater harmonization with the JAA regulations.

TOTAL COST OF FINAL CHANGES TO PART 36

	Total cost	Present value
Software Costs:		
Industry	$39,160	$34,250
FAA	17,380	15,200
Total Software Costs	56,540	49,450
Measurement Costs	117,400	83,000
Reporting Costs	140,200	98,500
Grand Total Costs	314,140	230,950
Total Industry Costs	296,760	215,750
Total FAA Costs	17,380	15,200

Cost Savings

Several of the amendments should result in cost savings to applicants, depending upon the current inventory of an applicant's test equipment and the particular weather circumstances of the flight test. Given the uncertainty in the annual number and duration of flight tests, however, it is difficult to accurately quantify these savings.

For example, Section A36.2.2.2(b) will lower the minimum test temperature from 36 degrees Fahrenheit to 14 degrees Fahrenheit. One of the largest cost elements of the test certification process if the cost associated with airplane down time; by extending the temperature range, down time should 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 patterns that could result in reduced hours of airplane down time, an applicant might reduce the 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 $157,200 to $209,700 per day for larger planes and $73,400 to $146,800 per day for smaller airplanes, cost reductions per test made possible by this change in minimum test temperatures could range between approximately $78,600 and $209,700 for larger airplanes and manufacturers and between $36,700 and $146,800 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 nit encounter this situation during a 10-year period.

Based on the size of the firms conducting noise certifications, the FAA estimates that 25 larger applicants will each derive cost savings of $144,100 per test and 14 smaller firms will save $91,700 each per test, based on the mid-points of the estimated savings ranges. Because it is possible that certain applicants may not encounter this situation in the 10-year period, however. the FAA has reduced the number of firms by three, one large and two small. Thus large firms will save $3.46 million ($144,100 × 24) and small firms $1.1 million ($91,700 × 12). The estimated industry cost savings over ten years totals $4.56 million (3.46 + $1.10 million), or $3.2 million discounted.

Amended 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 allows the full power noise measurement to be obtained at a point (650m) below the takeoff flight path and thus eliminates 40 to 45 fly-bys per test, and between 2 and 8 microphone systems depending on the size of the array used by the applicant. (Many applicants currently use a 2-microphone sideline array.

In addition to the savings resulting from the reduction in the number of fly-bys and the number of microphone systems, further cost savings will 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 by industry experts at $200,000 to $350,000 per test for manufacturers of propeller-driven large airplanes. As an example, based on a reduction of 42 fly-bys the midpoint of the estimated range, and an example cost of $6,290 per fly-by, cost savings of $264,180 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 $7,340 per system, another $29,360 in savings will be realized for a total estimated savings of $293,540 per test under this example. The FAA estimates that no more than 10 tests and that the derived estimated cost savings will total $2.94 million based on a per test savings of $293,540 or $2.06 million discounted.

Industry sources estimate that cost savings of $26,205 to $52,410 per year for those applicants with considerable certification activity will be realized by the harmonization of testing, data measurement and analysis, reporting and documentation, and other noise certification efficiencies. Industry sources also claim that these cost savings will be achieved by a reduction in the confusion and the multiple interpretations that lead to delays and duplicate effort caused by the existing dual certification standards. The FAA estimates that 10 firms engaged in noise certification activities, each employing 10,000 or more workers, will each achieve cost savings of $39,310 (the midpoint of the estimated savings) or $393,000 annually for the industry. The estimated industry cost savings over ten years totals $3.93 million, or $2.76 million discounted.

The following table summarizes the estimated cost savings of the final rulemaking.

TOTAL COST SAVINGS OF AMENDMENTS TO PART 36

[In millions of dollars]

	B36.22.2 savings	B36.3(a) savings	Efficiency savings	Total savings
Savings	$4.56	$2.94	$3.93	$11.4
Present Value	3.20	2.06	2.76	8.02

The FAA has not been able to quantify other potential savings that may be made possible by the greater efficiencies and flexibility resulting from the uniformity that the final rule provides.

Summary

When this new final rule becomes effective, U.S. noise certification procedures will 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 will result in significant cost savings without compromising the environmental benefits of the noise certification standards.

This final rule's estimated cost savings, over ten years, (attributable to specific changes to part 36) will be $7.5 million, or $5.26 million discounted., In addition, $3.93 million, $2.76 million discounted, could be derived from overall efficiencies attributable to the harmonization effort in achieving near uniformity of the FAA and JAA standards for a total estimated saving of $11.43 million, $8.,02 million discounted.

The final rule's cost consist of software costs of $56,500, measurement costs of $117,400 and reporting costs of $140,200 for a total of $314,100, or $230,900 discounted.

Final Regulatory Flexibility Determination

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 rationale 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 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.

Adoption of this final rule will impose costs of $314,000 on the FAA and noise certification applicants over the ten year period, of which $241,120 is estimated to be incurred by small applicants. Small firms will incur software costs of $28,480, measurement costs of $117,400, and reporting-related costs of $95,250. This is a conservative estimate because it assumes small firms will elect to use multiple pairs of microphones to conduct tests when most applicants already utilize a less costly equivalent procedure that is FAA-approved.

Small firms are firms employing 1,500 employees or fewer based on Small Business Administration guidelines. A review of firms engaged in noise certification of subsonic jet airplanes and subsonic transport category large airplanes found that 14 firms met the criteria. The FAA assumes that no more than two small firms will elect to use multiple microphone systems to test large-propeller airplanes two times each and each will incur measurement costs of $58,700 for a total cost of $117,400.

Additional reporting costs requiring additional instrumentation and data recording totaling $63,680 over the ten year period will be incurred by two other small applicants or $31,840 each. Additional labor costs for new reporting requirements totaling $31,560 over the 10 year period will be incurred by 6 small firms at a cost to each of these smaller firms over the 10 years period of $5,260. Eight small noise certification firms will incur one-time software costs of $3,560 each. Small firms that incur the software charge and also incur labor costs to report additional data will have an annualized cost of $770. The FAA does not consider these costs to be significant. The highest potential annualize cost, $6,700, will be borne by two firms that incur both the software and reporting costs ($780, annualized) and also elect to use multiple microphones four times each to measure the noise of a large propeller-driven airplane ($5,910 annualized).

The FAA does not have information on the revenues of these two potential small entrants but based on information about two small current manufacturers the revenue from the sale of one of their aircraft ranges from $750,000 to $2.7 million depending on the model. If a new entrant sells only a single aircraft each year, the cost of this final rule will be less than one percent of the lowest price aircraft. Hence, the FAA has determined that the estimated costs of compliance are marginal with this final rule are marginal.

Therefore, the FAA has determined that this final rule will not have a significant economic impact to the Regulatory Flexibility Act, 5 U.S.C. 605(b), the Federal Aviation Administration certifies that this rule will 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 activities 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 accordance with the above statute, the FAA has assessed the potential affect of this final rule and has determined that it will impose the same costs on domestic and international entities for comparable services and thus has a neutral trade impact. It will reduce trade barriers by narrowing differences between United States and Joint Aviation Authority regulations.

Unfunded Mandates

The Unfunded Mandates Reform Act of 1995 (the Act), enacted as Pub. L. 104–4 on March 22, 1995, is intended, among other things, to curb the practice of imposing unfunded Federal mandates on State, local, and tribal governments.

Title II of the Act requires each Federal agency to prepare a written statement assessing the effects of any Federal mandate in a proposed or final agency rule that may result in a $100 million or more expenditure (adjusted annually for inflation) in any one year by State, local, and tribal governments, in the aggregate, or by the private sector; such a mandate is deemed to be a ''significant regulatory action.''

This rule does not contain such a mandate. Therefore, the requirements of Title Ii of the Unfunded Mandates Reform Act of 1995 do not apply.

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 concludes that this final 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 final rule 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 document is not a major regulatory action under the provision of the EPCA.

List of Subjects in 14 CFR Parts 21, 36, and 91

Aircraft, Noise control.

The Amendment

In consideration of the foregoing the FAA amends parts 21, 36, and 91 of Title 14 Code of Federal Regulations, as follows:

PART 21—CERTIFICATION PROCEDURES FOR PRODUCTS AND PARTS

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

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

§ 21.93 [Amended]

2. In paragraph (b)(2) remove the words ''Turbojet powered'' and add the words ''Jet (Turbojet powered)'' in its place.

§ 21.183 [Amended]

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

PART 36—NOISE STANDARDS: AIRCRAFT TYPE AND AIRWORTHINESS CERTIFICATION

4. 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. 11513, 35 FR 4247, 3 CFR 1966–1970 Comp., p. 902.

§ 36.1 [Amended]

5. 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 (b) introductory text remove the words ''turboject powered'' and add the word ''jet'' in its place; and remove the reference to ''appendix C'' and add ''appendix B'' in its place.

c. Remove paragraph (d)(3).

d. In the introductory text of (f) remove the words ''turbojet powered'' and add 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 ins place; remove the reference to ''appendix C'' and add ''appendix 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)(2) 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;

g. 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 add ''B36.5(c)'' in its place; and remove all references to ''appendix C'' and add ''appendix B'' in its place;

h. In paragraph (f)(4) remove the reference to ''C36.5'' and add ''B36.5(b)'' in its place; remove the reference to ''appendix C'' and add ''appendix B'' in its place; and add the words ''specified in section B36.6'' after ''tradeoff provisions'';

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

j. In paragraph (f)(6) remove the reference to ''C36.5'' and add ''B36.5(c)'' in its place; remove the reference to ''appendix C'' and add ''appendix B'' in its place; and add ''appendix B'' in its place; and add the words ''specified in section B36.6'' after ''tradeoff provisions'';

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

6. Revise the heading and § 36.2 to read as follows:

§ 36.2 Requirements as of date of application.

(a) Section 21.17 of this chapter notwithstanding, each person who applies for a type certificate for an aircraft covered by this part, must show that the aircraft meets the applicable requirements of this part that are effective on the date of application for that type certificate. When the time interval between the date of application for the type certificate and the issuance of the type certificate exceeds 5 years, the applicant must show that the aircraft meets the applicable requirements of this part that were effective on a date, to be selected by the applicant, not earlier than 5 years before the issue of the type certificate.

(b) Section 21.101(a) of this chapter notwithstanding, each person who applies for an acoustical change to a type design specified in § 21.95(b) of this chapter must show compliance with the applicable requirements of this part that are effective on the date of application for the change in type design. When the time interval between the date of application for the change in type design and the issuance of the amended or supplemental type certificate exceeds 5 years, the applicant must show that the aircraft meets the applicable requirements of this part that were effective on a date, to be selected by the applicant, not earlier than 5 years before the issue of the amended or supplemental type certificate.

(c) If an applicant elects to comply with a standard in this part that was effective after the filing of the application for a type certificate or change to a type design, the election:

(1) Must be approved by the FAA;

(2) Must include standards adopted between the date of application and the date of the election;

(3) May include other standards adopted after the standard elected by the applicant as determined by the FAA.

§ 36.6 [Amended]

7. Amend § 36.6 as follows:

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

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

§ 36.6 Special retroactive requirements.

* * * * *

(c) * * *

(1) * * *

(iv) 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 Nose-Performance Requirements for systems 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]

8. Amend § 36.7 to read as follows:

a. In the heading of the section and 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 A'' in its place.

c. In paragraph (b)(2) remove the reference to ''C36.5'' and add ''B36.5'' in its place, remove the reference to ''C36.7'' and add ''B36.7'' in its place; remove the reference to ''C36.9'' and add ''B36.8'' in its place; and remove the reference to ''appendix C'' in both places it appears and add ''appendix B'' in its place;

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

e. In paragraph (c)(2)(ii) remove the words ''takeoff and sideline'' and add the words ''flyover and lateral'' in its place;

f. In paragraph (d)(1) introductory text remove the word ''turbojet'' and add the word ''jet'' in its place;

g. In paragraph (d)(1)(ii) remove the reference to ''C36.5(b)'' and add ''B36.6'' in its place; and remove the reference to ''appendix C'' and add ''appendix B'' in its place;

h. In paragraph (d)(1)(iii) remove the words ''takeoff and sideline'' and add the words ''flyover and lateral'' in its place;

i. In paragraph (d)(2) introductory text remove the word ''turbojet'' in both places that it appears and add the word ''jet'' in its place.

j. In paragraph (d)(2)(ii) remove the words ''takeoff and sideline'' and add the words ''flyover and lateral'' in its place.

Subpart B—Transport Category Large Airplanes and Jet Airplanes

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

10. Revise section 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.

11. Revise section 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 test procedures under section B36.8 (or an approved equivalent procedure), stated under appendix B 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]

12. Remove and reserve subpart C, consisting of section 36.201.

§ 36.301 [Amended]

13. In paragraph (a) of section 36.301 remove the reference to ''appendix C'' and add ''appendix B'' in its place.

§ 36.1581 [Amended]

14. Amend § 36.1581 (a)(1) and (d) by removing the words ''turbojet powered'' and adding the word ''jet'' in its place; in paragraph (a)(1) remove the reference to ''appendix C'' and add ''appendix B'' in its place; and in paragraph (a)(1) remove the words ''takeoff, sideline'' and add the words ''flyover, lateral'' in its place.

15. 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. 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 airplanes 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 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 resulting changes in noise can often be established reliably without resorting to a complete test as outlined in this appendix. For this reason, the FAA permits the use of approved 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 also operated within their specific 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 unless:

(1) The dew point and dry bulb temperatures are measured with a device which is accurate to ±0.9°F (±0.5°C) and used to obtain relative humidity; in addition layered sections of the atmosphere are used as described in section A36.2.2.3 to compute equivalent weighted sound attenuations in each one-third octave band; or

(2) The peak noy values at the time of PNLT, after adjustment to reference conditions, occur at frequencies less than or equal to 400 Hz.;

(d) If the atmospheric absorption coefficients vary over the PNLTM sound propagation path by more than ±1.6 dB/1000 ft (±0.5 dB/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 33 ft (10 m) above ground may not exceed 12 knots and the crosswind velocity for the airplane may not exceed 7 knots. The average wind velocity must be determined using a 30-second averaging period spanning the 10 dB-down time interval. Maximum wind velocity 33 ft (10 m) 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(c) or 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 aproved 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 section A36.3 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 means 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 angel 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 are made using instruments that conform to the specifications of this section will 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, 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 meet the specifications in sections A36.3.5.2 to A36.3.5.4. Various microphone systems may be approved by the FAA on the basic 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: An applicant must still calibrate and check each system as required 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.

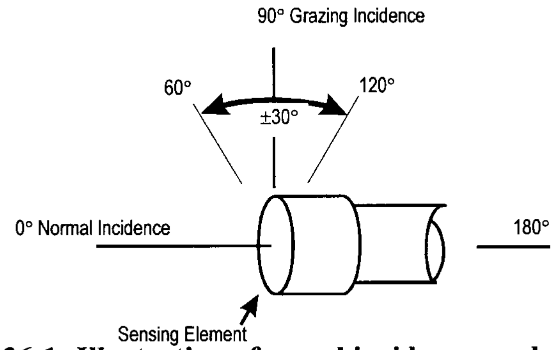


Figure A36-1: Illustration of sound incidence angles on a microphone

Nominal midband frequency kHz	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 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 away that a record of the complete acoustical signal is retained. The recording and reproducing systems must meet 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 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.

A36.3.6.7 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: IEC 61260 specifies procedures for testing of one-third octave band analysis systems 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 is after interruption. The rising response must be −4 ±1 dB at 0.5s, −1.75 ±0.75 dB at 1s, −1 ±0.5 dB at 1.5s and −0.5 ±0.5 dB at 2s relative to the steady-state level. The failing 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 1s. At subsequent times the sum of the rising and failing responses must be −7.5 dB or less. This equates to an exponential averaging process (slow time-weighting) with a nominal 1s time constant (*i.e.,* 2s 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 time-weighted sound pressure levels can be obtained using a continuous exponential averaging process by the following equation:

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

where $L_s(i,k)$ is the simulated slow time-weighted sound pressure level and $L(i,k)$ is the as-measured 0.5s time average sound press level determined from the output of the analyzer for the k-th instant of time and i-th one-third octave band. For k=1, the slow time-weighted sound pressure $L_s[i, (k-1=0)]$ 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 $k \geq 4$:

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

where $L_s(i, k)$ is the simulated slow time-weighted sound pressure level and $L(i, k)$ is the as measured 0.5s 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 0.5s data samples, or for times greater than 2.5s after initiation of data analysis.

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

A36.3.76 The instant in time by which a slow time-weighted sound pressure level is characterized must be 0.75s earlier than the actual readout time.

Note: The definition of this instant in time is needed to correlate the recorded noise with the aircraft position when the noise was emitted and takes into account the averaging period of the slow time-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 razing 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 analog 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. Within six months of each test series the output of the noise generator must be determined by a method traceable to the U.S. National Institute of Standards and Technology or to an equivalent national standards laboratory as determined by the FAA. 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 to 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 know at the prevailing environmental conditions corresponding with each test series. The differences 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 note 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.

A36.3.10 Adjustments for ambient noise.

A36.3.10.1 Ambient noise, including both a 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.

A36.3.10.2 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 A36.3.10.1 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. 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 the method described in 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.

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

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

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

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:

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

(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:

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

•
•

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

•
•

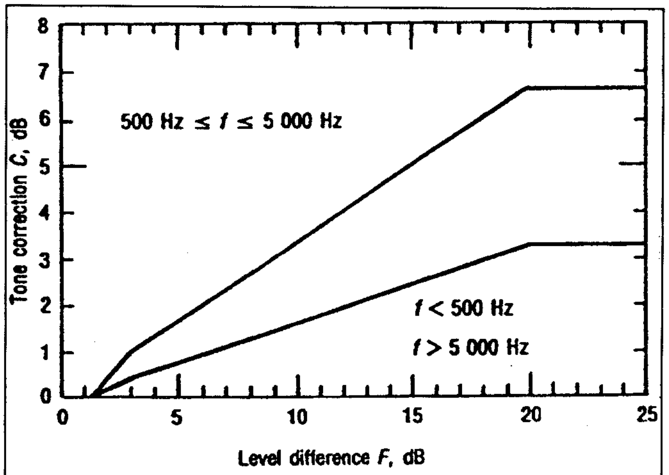
$SPL''(24,k) = SPL''(23,k) + \bar{s}(23,k)$

(h) Setp 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
$50 \le f < 500$	$1\frac{1}{2}^* \le F < 3$	$F/3 - \frac{1}{2}$
	$3 \le F < 20$	$F/6$
	$20 \le F$	$3\frac{1}{3}$
$500 \le f \le 5\,000$	$1\frac{1}{2}^* \le F < 3$	$2F/3 - 1$
	$3 \le F < 20$	$F/3$
	$20 \le F$	$6\frac{2}{3}$
$5\,000 < f \le 10\,000$	$1\frac{1}{2}^* \le F < 3$	$F/3 - \frac{1}{2}$
	$3 \le F < 20$	$F/6$
	$20 \le F$	$3\frac{1}{3}$

* 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) value 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 an important tone has occurred, 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.

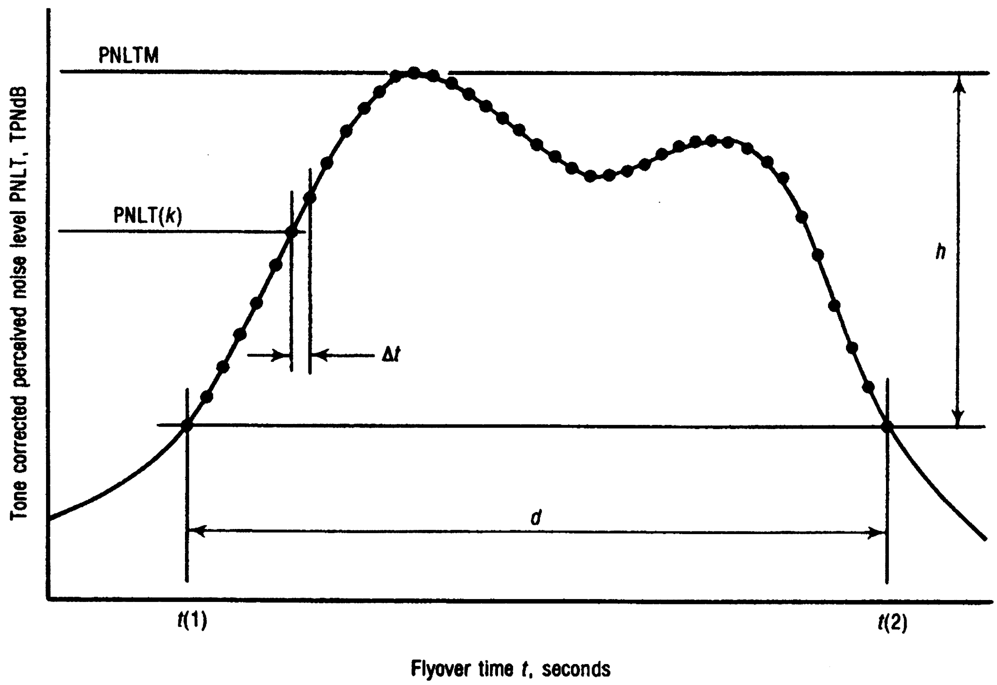


Figure A36-2. Example of perceived noise level corrected for tones as a function of aircraft flyover time

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 identity 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:

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

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:

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

where Δt is the length of the equal increments of time for which PNLT(k) is calculated and d is the time interval to the nearest 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 = 0.5s (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.*

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.

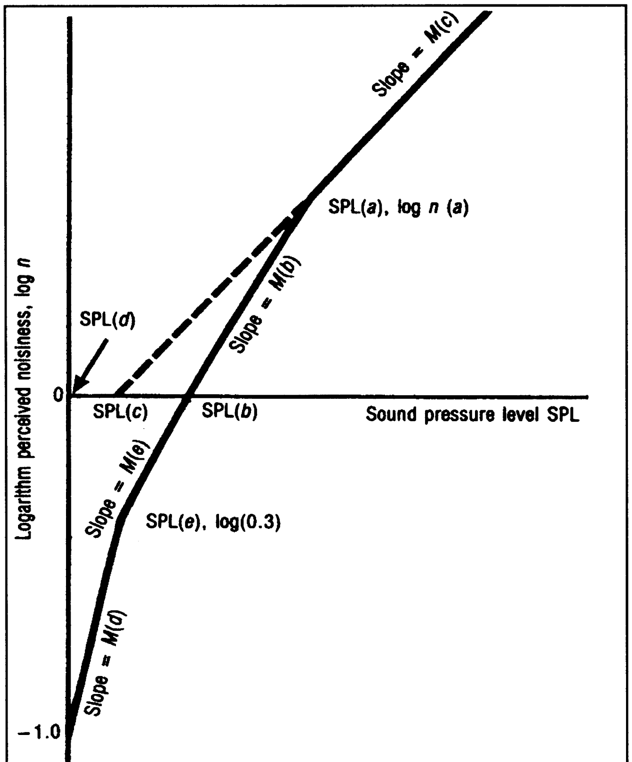


Figure A36-3. Perceived noisiness as a function of sound pressure level

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	↓	NOT APPLICABLE	0.053013	↓
15	1 250		38	38	15	23	0.030103		0.059640	0.034859
16	1 600		34	34	12	21	0.029960		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

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, including corrections to measurements for equipment response deviations.

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.*

An applicant is required to submit a noise certification compliance report that includes the following.

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.

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 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. The FAA must approve any such modifications or non-standard equipment.

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 B 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 percent 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 percent 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 percent confidence limit not exceeding ±1.5 EPNdB. No test result may be omitted from the averaging process unless approved by the FAA.

Note: Permitted methods for calculating the 90 percent 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).
$EPNL_r$	EPNdB	Effective perceived noise level adjusted for reference conditions.
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	Percent	*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 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).

SECTION A36.6 NOMENCLATURE: SYMBOLS AND UNITS—Continued

Symbol	Unit	Meaning
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).
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) 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 20 μPa	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 20 μPa	*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 20 μPa	*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 20 μPa	*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 20 μPa	*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	*Reference 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.
$\alpha(i)_o$	dB/1000ft db/100m	*Reference atmospheric absorption.* The atmospheric attenuation of sound.
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 cut-back).
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.
ψ	Degrees	*Noise angle (relative to ground).* The angle between the noise path and the ground. It is identical for both measured and corrected flight paths.

SECTION A36.6 NOMENCLATURE: SYMBOLS AND UNITS—Continued

Symbol	Unit	Meaning
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:

$$\alpha(i) = 10^{\left[2.05\log\left(f_0/1000\right)+6.33\times10^{-4}\theta-1.45325\right]} + \eta(\delta)\times10^{\left[\log\left(f_0\right)+4.6833\times10^{-3}\theta-2.4215\right]}$$

and

$$\delta = \sqrt{\frac{1010}{f(0)}10^{\left(\log H-1.97274664+2.288074\times10^{-2}\theta\right)}\times10^{\left(-9.589\times10^{-5}\theta^2+3.0\times10^{-7}\theta^3\right)}}$$

where

$\eta(\delta)$ is listed in Table A36–4 and f_0 in Table A36–5;
$\alpha(i)$ 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):

$$\alpha(i) = 10^{\left[2.05\log\left(f_0/1000\right)+1.1394\times10^{-3}\theta-1.916984\right]} + \eta(\delta)\times10^{\left[\log\left(f_0\right)+8.42994\times10^{-3}\theta-2.755624\right]}$$

and

$$\delta = \sqrt{\frac{1010}{f_0}10^{\left(\log H-1.328924+3.179768\times10^{-2}\theta\right)}\times10^{\left(-2.173716\times10^{-4}\theta^2+1.7496\times10^{-6}\theta^3\right)}}$$

where

$\eta(\delta)$ is listed in Table A36–4 and f_0 in Table A36–5;

$\alpha(i)$ 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 $\eta(\delta)$

δ	$\eta(\delta)$	δ	$\eta(\delta)$
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 qualify 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.

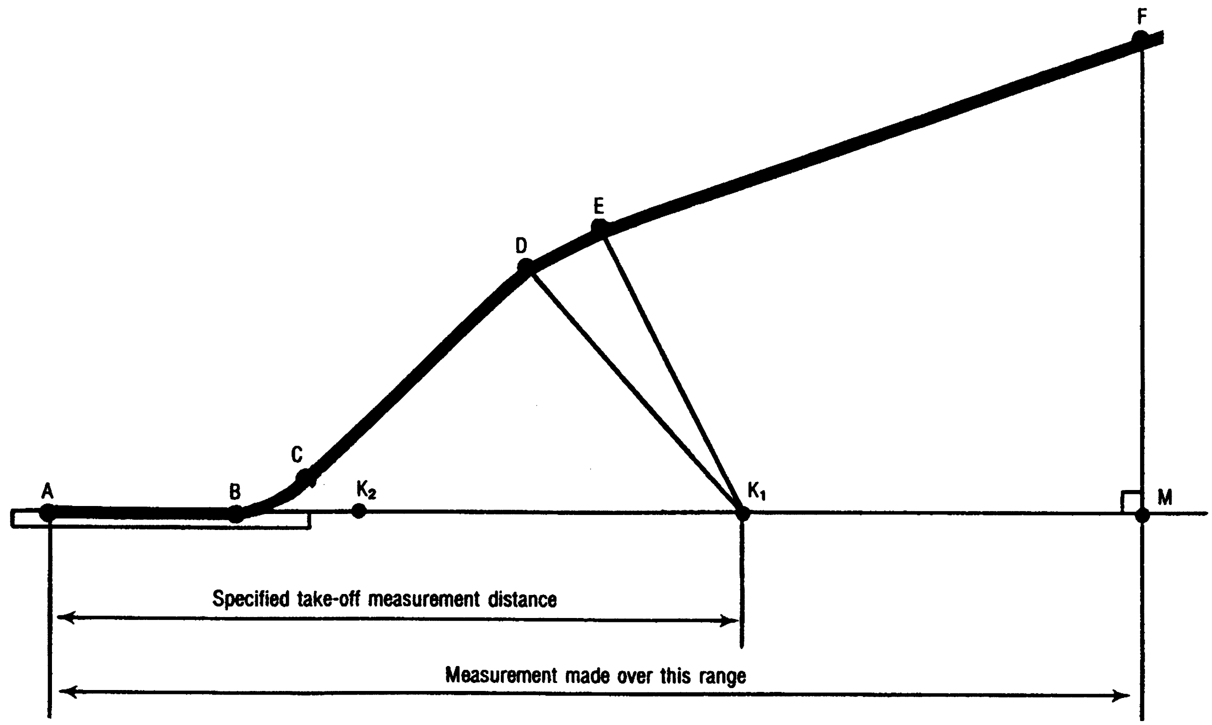


Figure A36-4. Typical Takeoff profile

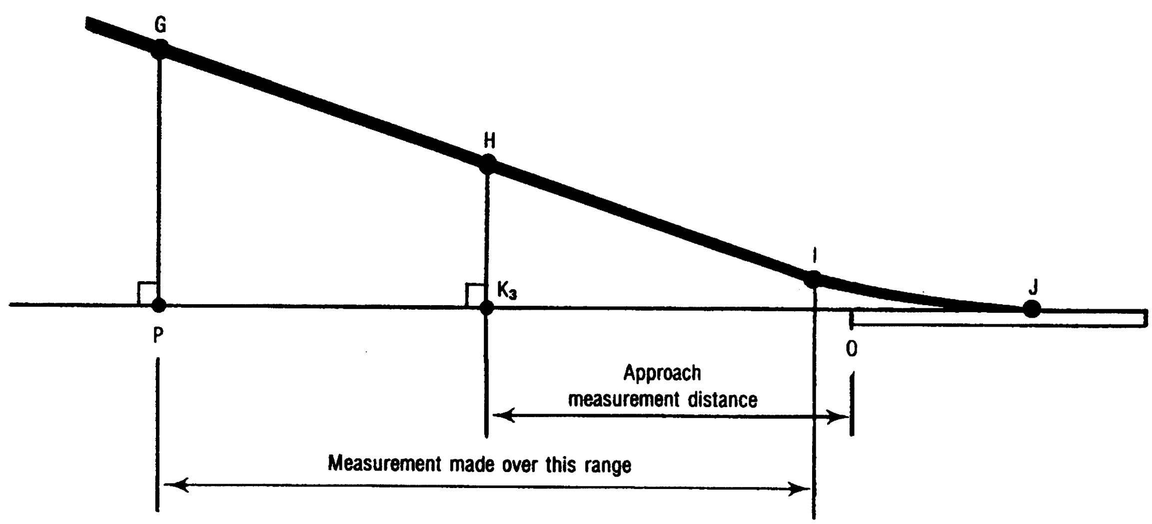


Figure A36-5. Typical Approach profile

The airplane reference point for approach measurements is the instrument landing system (ILS) antenna. If no ILS antenna is installed an alternative reference point must be approved by the FAA.

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 portion 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.

(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

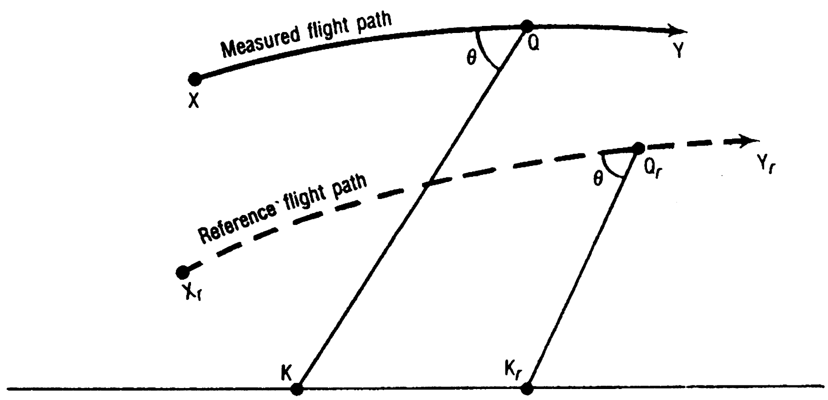


Figure A36-6. Profile characteristics influencing sound level

and reference noise propagation paths, Q_r being determined from the assumption that QK and Q_rK_r form the same angle with their respective flight paths.

(b) The portions of the test flight path and the reference flight path described in paragraph (b)(1) and (2), 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 AQ36–7(b), X_rY_r represents the corresponding portion of the reference flight path.

(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 assumption 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.

Note: 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.

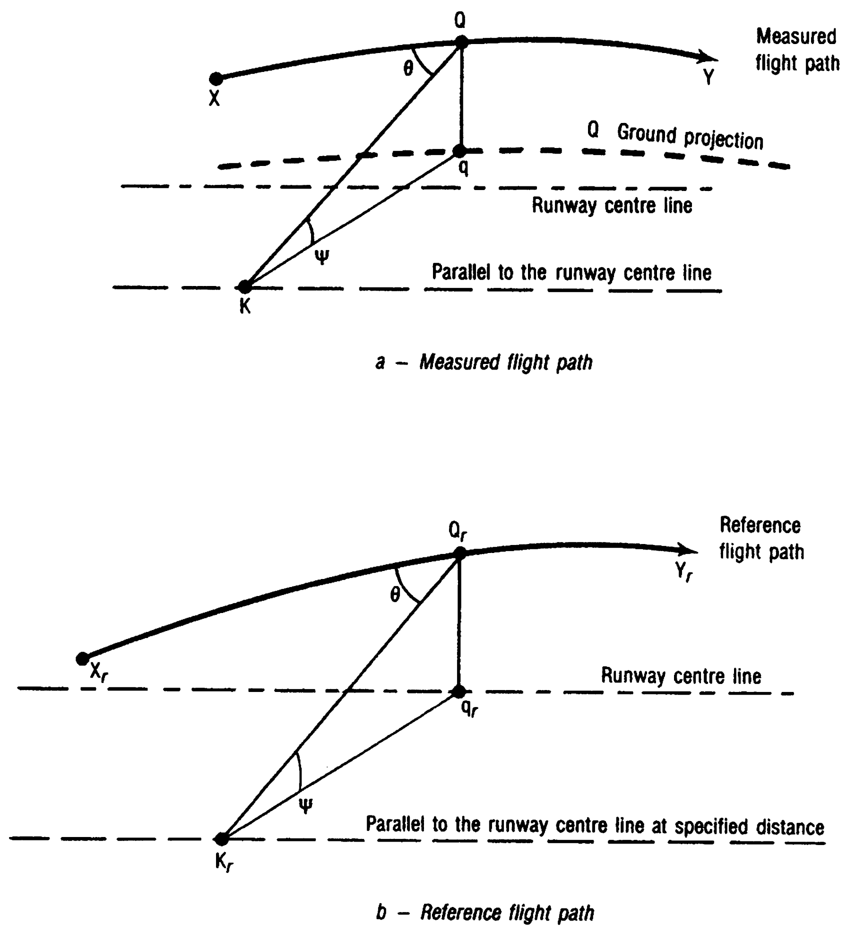


Figure A36-7. Lateral measurement - determination of reference station

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:

$$SPL(i)_r = SPL(i) + 0.001[\alpha(i) - \alpha(i)_0]QK + 0.0001\alpha(i)_0(QK - Q_rK_r) + 20\log(QK/Q_rK_r)$$

In this expression,

(1) The term $0.001[\alpha(i) - \alpha(i)_0]QK$ is the adjustment for the effect of the change in sound attenuation coefficient, and α(i) and $\alpha(i)_0$ are the coefficients for the test and reference atmosphere conditions respectively, determined under section A36.7 of this appendix;

(2) The term $0.001\alpha(i)_0(QK - Q_rK_r)$ 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 $\alpha(i)_0$ are expressed in dB/1000 ft.

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

$$SPL(i)_r = SPL(i) + 0.01[\alpha(i) - \alpha(i)_0]QK + 0.01\alpha(i)_0 (QK - Q_rK_r) + 20 \log(QK/Q_rK_r)$$

In this expression,

(1) The term $0.01[\alpha(i) - \alpha(i)_0]QK$ is the adjustment for the effect of the change in sound attenuation coefficient, and α(i) and $\alpha(i)_0$ are the coefficients for the test and reference atmospheric conditions respectively, determined under section A36.7 of this appendix;

(2) The term $0.01\alpha(i)_0(QK - Q_rK_r)$ 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 $\alpha(i)_0$ 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 Δ_1 using the following equation:

$$\Delta_1 = PNT_r - PNLTM$$

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 is required to calculate the source noise adjustments for lateral, flyover and approach noise measurements.

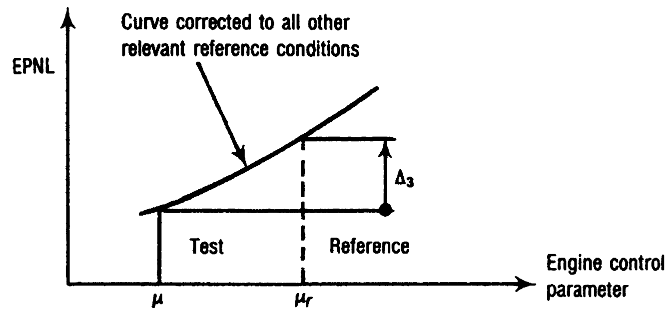


Figure A36-8. Noise thrust correction

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.

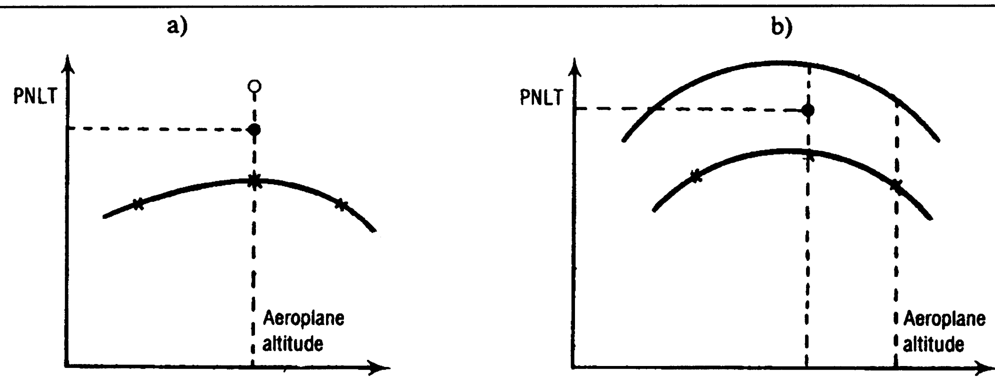


Figure A36-9. Symmetry correction

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), 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:

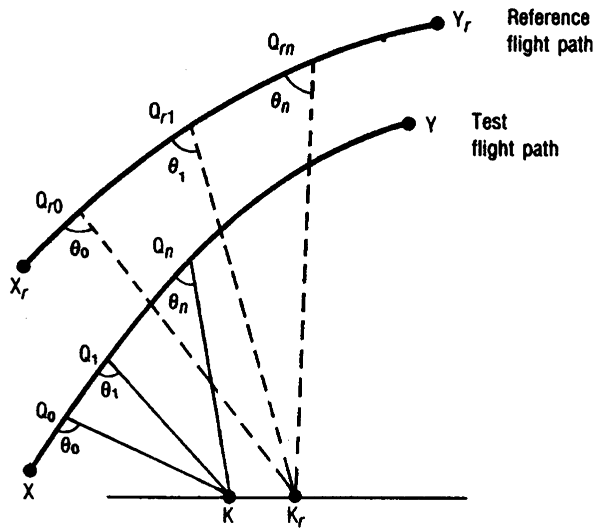


Figure A36-10. Correspondence between measured and reference flight paths for the application of the integrated method of adjustment

(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 a 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 θ_1 with their respective flight 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_{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 paragraph (b)(1) and (2), 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.

(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 K_r 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.

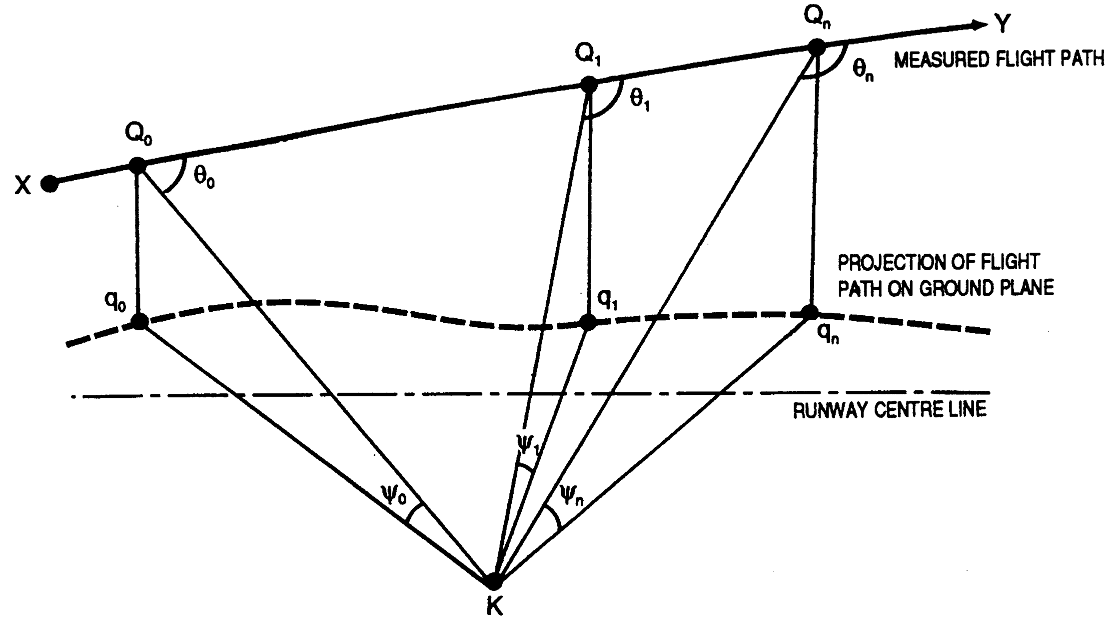


Figure A36-11(a). Measured flight path

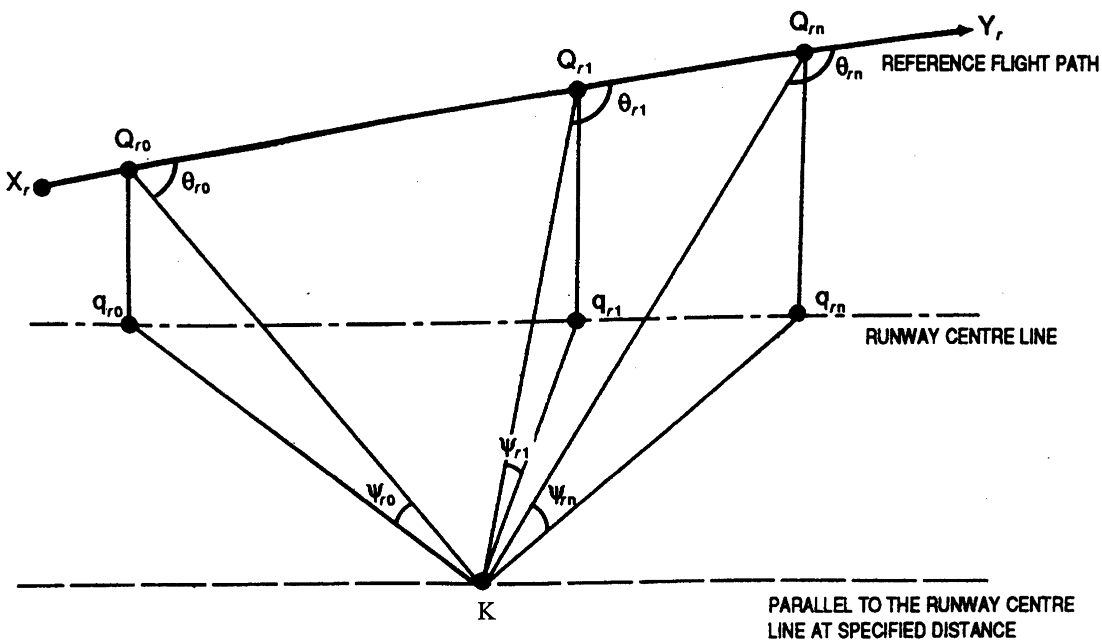


Figure A36-11(b). Reference flight path

Q_0 and Q_n are chosen to 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.

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

(ii) The differences between the angles $\mathbf{\Psi}_1$ and $\mathbf{\Psi}_{r1}$ 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)(i) is met while at the same time keeping $\mathbf{\Psi}_1$ and $\mathbf{\Psi}_{r1}$ equal.

Note: 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 $\mathbf{\Psi}$.

A36.9.4.2.1 In paragraphs A36.9.4.2(a)(2) and (b)(2) the time t_{r1} is later (for $Q_{r1}K_r > Q_1K$) 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: For the flight paths described in paragraphs A36.9.4.2(a) and (b), the use of thrust or power cut-back will result in test and reference flight paths at full thrust or power and at cut-back thrust or power. Where the transient region between these thrust or power levels 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.

A37.9.5 FLIGHT PATH IDENTIFICATION POSITIONS

Position	Description
A	Start of Takeoff roll.
B	Lift-off.
C	Start of first constant climb.
D	Start of thurst 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 A36.9.3.2.
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.

A36.9.6 FLIGHT PATH DISTANCES—Continued

Distance	Unit	Meaning
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.

16. 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

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 an 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). For jet airplanes, when approved by the FAA, the maximum lateral noise at takeoff thrust may be assumed to occur at the point (or its approved equivalent) along the extended centerline of the runway where the airplane reaches 985 feet (300 meters) altitude above ground level. A height of 1427 feet (435 meters) may be assumed for State 1 or Stage 2 four engine airplanes. The altitude of the airplane as it passes the noise measurement points must be within +328 to −164 feet (+100 to −50 meters) of the target altitude. For airplanes powered by other than jet engines, the altitude for maximum lateral noise must be determined experimentally.

(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 [the effective date of this final rule], 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 (6,500 m) 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 use 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; 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 and Conditions

(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;

(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 state 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 [the effective date of this final rule], a single reference flight path that includes thrust cutback in accordance with paragraph (b)(2) 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 Concord 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 engines 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 points. V_{ref} is the reference landing speed, which is defined as 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. 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 10 dB-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 10 dB-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.

17. Remove and reserve appendix C of part 36.

Appendix G [Amended]

18. In appendix G, amend paragraph (f) of section G36.105 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.

Appendix H [Amended]

19. Amend appendix H as follows:

a. In paragraph (d)(1) of section H36.101 by removing the reference to ''appendix B'' and adding ''appendix A'' in its place;

b. Amend paragraph (c)(3) of section H36.111 of appendix H by removing the reference ''A36.3(f)(3)'' and adding ''A36.3.10.1'' in its place.

c. Amend section H36.201 of appendix H in paragraph (a) introductory text by removing the references to ''appendix B'' and adding ''appendix A'' in its place; and in paragraph (b) by removing the reference to ''B36.5(a)'' and adding ''A36.4.3.1(a)'' in its place.

PART 91—GENERAL OPERATING AND FLIGHT RULES

20. The authority citation for part 91 continues to read as follows:

Authority: 49 U.S.C. 106(g), 1155, 40103, 40113, 40120, 44101, 44111, 44701, 44709, 44711, 44712, 44715, 44716, 44717, 44722, 46306, 46315, 46316, 46504, 46506–46507, 47122, 47508, 47528–47531, articles 12 and 29 of the Convention on International Civil Aviation (61 stat. 1180).

§ 91.801 [Amended]

21. In paragraphs (a)(1) introductory text, (a)(2), (c), and (d) remove the word ''turbojet'' and add the words ''jet (turbojet)'' in its place.

§ 91.851 [Amended]

22. In the definitions of ''Fleet'', ''Stage 2 airplane'', and ''Stage 3 airplane'' remove the word ''turbojet'' and add the words ''jet (turbojet)'' in its place.

Issued in Washington, DC, on June 18, 2002.

Jane F. Garvey,

Administrator.

[FR Doc. 02–15835 Filed 7–5–02; 8:45 am]

BILLING CODE 4910–13–M