[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 36

[Docket No. FAA-2000-7958; Amendment No. 36-25]

RIN 2120-AH10

Noise Certification Regulations for Helicopters

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: The Federal Aviation Administration (FAA) is amending the noise certification regulations for helicopters. These changes are based on a joint effort by the FAA, the European Joint Aviation Authorities (JAA), and the Aviation Rulemaking Advisory Committee (ARAC), to harmonize the U.S. noise certification regulations with the European Joint Aviation Requirements (JAR) for helicopters. These changes will provide nearly uniform noise certification standards for helicopters certificated in the United States, the JAA countries, and other countries that have adopted as their national regulation, either the United States regulations, the JAA regulations, or the International Civil Aviation Organization (ICAO) standards. Harmonizing the noise certification standards will simplify airworthiness approvals for imported and exported helicopters.

DATE: Effective [Insert date 30 days after date of publication in the Federal Register.]

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SUPPLEMENTARY INFORMATION

Availability of Rulemaking Documents

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Background

Statement of the Problem

Various governmental bodies have developed noise certification regulations to control noise emissions from helicopters. The International Civil Aviation Organization (ICAO) issues ongoing prototypical sets of aircraft noise standards that its member States, including the United States, are encouraged to adopt into their respective national regulations. Many ICAO member States have adopted the ICAO standards word for word. The United States has adopted noise certification regulations in Title 14 of the Code of Federal Regulations (CFR) part 36. Although similar to the ICAO standard, the U.S. regulations contain substantive differences from the ICAO version. A third body, the JAA, is developing its own version of the ICAO standards with JAA member States in Europe. Thus, from a practical standpoint, three sets of helicopter noise certification requirements exist, each controlled by an independent political entity.

Helicopter manufacturers must demonstrate compliance with at least one, and often all three, of the sets of noise certification regulations when a helicopter is exported from its country of manufacture and certification. It became apparent to the manufacturers the differences among the three versions of the helicopter noise standards represent an undesirable burden. The manufacturers requested that the regulating agencies harmonize the three sets of regulations in order to minimize the costs for demonstrating compliance and facilitate international trade.

These three aviation certification authorities, the United States, the JAA, and the ICAO, had previously recognized the value of harmonizing civil aircraft certification and operating regulations.

The Administrator of the FAA supports harmonization and has committed the FAA to support harmonizing U.S. regulations with those of the JAA and the ICAO.

Current United States Helicopter Noise Certification Regulations

Under 49 U.S.C. 44715, the Administrator of the Federal Aviation Administration is directed to prescribe "standards to measure aircraft noise and sonic boom...and regulations to control and abate aircraft noise and sonic boom." In the United States, noise standards and regulations that apply to issuing type certificates, changes in type design, and airworthiness certificates for specified classes and categories of aircraft are contained in 14 CFR part 36. Subpart H and appendices H and J of part 36 contain the requirements and standards that apply to helicopters. Appendices H and J of part 36 specify the test conditions, procedures, and noise levels required to demonstrate compliance with certification requirements for helicopters. The original helicopter noise certification standards and regulations, including appendix H, were published on February 5, 1988 (53 FR 3534). On September 16, 1992, the FAA published an alternative noise certification procedure, appendix J, for helicopters that do not exceed 6,000 pounds maximum takeoff weight (57 FR 42846).

ICAO Helicopter Noise Certification Standards

The ICAO has adopted a set of Standards and Recommended Practices for aircraft noise certification. These ICAO standards are similar to the U.S. regulations. The ICAO Annex 16 standards, which are not alone enforceable, are intended to be prototypical regulations upon which the Contracting States to ICAO may base their own national regulations. For helicopters, Chapter 8 of Annex 16 is the approximate equivalent of part 36, appendix H. Chapter 11 of Annex 16 is the approximate ICAO equivalent to part 36, appendix J. The ICAO standards are issued as

International Standards and Recommended Practices, Environmental Protection, Annex 16 to the Convention on International Civil Aviation, Volume 1, Aircraft Noise.

Joint Aviation Authorities Helicopter Noise Certification Standards

The civil aviation authorities of certain European countries have agreed to common comprehensive and detailed airworthiness and operating requirements; these are known as the Joint Aviation Regulations, or JARs. One goal of the JARs is to minimize type certification differences on multinational European ventures and to facilitate the export and import of aviation products between European nations. Aviation authorities of participating European countries recognize the JARs as an acceptable basis for showing compliance with their national aviation laws. The JAA added aircraft noise certification (JAR 36), including the helicopter requirements of subsection D, to the JARs effective May 23, 1997. The JAA's JAR 36 study group is tasked with the technical responsibilities for overseeing the noise certification standards.

Aviation Rulemaking Advisory Committee

In June 1990, at a meeting of the JAA Council, which consists of JAA members and the FAA, the FAA Administrator committed the FAA to support harmonizing the U.S. regulations with the JARs.

In January 1991, the FAA established the Aviation Rulemaking Advisory Committee (ARAC) 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 the ARAC with several noise certification issues. These issues involve harmonizing 14 CFR part 36 with JAR 36, harmonizing associated guidance material, and interpretations of the regulations. On May 3, 1994, the FAR/JAR Harmonization Working Group for Helicopters was established (59 FR 22883). The Helicopter

Harmonization Working Group (HHWG), as it is known, is comprised of helicopter noise certification experts, and is responsible for addressing tasks assigned by ARAC. The United States and European interests are represented in the HHWG, which includes representatives of the helicopter manufacturers and aviation authority representatives from the FAA and the JAA/ANCAT. The HHWG is co-chaired by industry representatives from the United States and Europe, and meetings are held alternately in the United States and Europe.

The HHWG reviewed the helicopter noise certification provisions of 14 CFR part 36, subparts A and H, and appendices H and J, and the corresponding applicable provisions of JAR 36 and ICAO Annex 16. Differences between the regulations were identified and discussed. The goal of the HHWG is to harmonize the regulations by modifying or deleting conflicting requirements. The HHWG is not authorized to recommend the creation of new requirements or the removal of existing requirements that are common among the different sets of regulations. Methods for resolving the differences were agreed to and forwarded to each regulatory body for approval. A recommendation for amending part 36 was forwarded to the ARAC. After due consideration including a meeting open to the public on August 23, 2000, ARAC agreed to this recommendation and forwarded it to the FAA for consideration in the form of a draft NPRM.

On October 5, 2000, the FAA published Notice No. 00-11 entitled "Noise Certification Regulations for Helicopters" (65 FR 59634). On October 16, 2000, a correction document was published (65 FR 61125) correcting the notice number from 00-11 to 00-12. The FAA solicited comments on the proposals, which are discussed below. This final rule is based on Notice No. 00-12.

Discussion of Comments

Two commenters responded to Notice No. 00-12.

Transport Canada reviewed the proposed rule and agrees with its content. Bell Helicopter Textron, Inc. (BHTI) also supports the amendment to harmonize the U.S. regulations with the European JARs.

In its comment, BHTI suggests adopting changes that were recommended by the Helicopter Harmonization Working Group (HHWG). BHTI was a member of the HHWG that identified three items that were expected to be in the NPRM but were inadvertently omitted in the drafting process. These include clarification of test series requirements, the allowable weather data time window, and flight requirements relative to wind direction and minimal wind threshold.

Specifically, BHTI made the following three comments:

1. Section H36.101(c)(7): BHTI requests a change in the allowable timeframe for meteorological temperature and relative humidity measurements to be obtained relative to each noise test measurement. This change would increase the timeframe from 25 minutes to 30 minutes and results in a single international standard.
2. Section H36.107(b)(2): BHTI states that the height tolerances of ±30 ft (±9 meters) are not consistent with the JAR 36 glide slope tolerance limits. BHTI suggests that the FAA adopt the JAR standards. This change would conform to related requirements made in section H36.101(b)(7) and maintains technical consistency.
3. Section J36.105(b): BHTI states the current flyover procedures require at least six flights over the noise measuring station, with an equal number in the opposite direction. BHTI suggests that relative wind effects (head versus tail winds) be accounted for

during test series. This change would improve noise repeatability by further balancing directional wind effects over a test series and results in a balanced flight procedure that is the same as JAR 36 requirements.

The FAA agrees with incorporating these harmonization changes in this final rule. These changes were agreed upon by the HHWG and do not change noise stringency, and provide further comprehensive technical uniformity of the noise certification requirements in the U.S. regulations, JAR requirements, and ICAO guidelines.

Corrections and other minor changes to the proposed rule

This final rule incorporates the BHTI comments. It also corrects typographical errors, and word omissions that appear in the proposed rule. In addition, we are correcting section and appendix designations, cross-references, symbol designations, equation changes, and terminology that will harmonize the rule more closely. The following is a list of the corrections and changes discussed above.

1) In section H36.3(d), the symbol "D" is changed to "D_r" and the symbol "J" to "J_r"; the word "reference" is added before the word "airspeed" to indicate that the specifications are for reference flight conditions.

2) In section H36.3(f)(1)(i), the approach reference profile designation is changed from "EK" to "E_rK_r", and the angle measure is changed from "6° +/- 0.5 °" to "6°."

3) In section H36.111(c)(2), the word "engine" is deleted.

4) In section H36.201(a)(1), the word "Instantaneous" is deleted to be consistent with the nomenclature and title used in section A36.6.

5) In sections H36.205(a)(1)(i) and H36.205(a)(ii), the range of correctional variation is changed to show that it can be less than zero.

6) In section H36.205(c)(1), the text that discusses operational speed is deleted because it is not applicable when describing flight profile criteria.

7) In section H36.205(e)(2), the range specification for Mach Number is changed from "0.3" to "0.03."

8) In section H36.205(f)(1)(i), the equation designations of measured takeoff sound propagation path and length are changed from, "$L_r A$" to "AL" in the second sentence and from "$L_r A$" to "AL_r" in the third sentence.

9) In section H36.205(f)(2)(i), the equation designations of takeoff distances for measured and reference paths are changed from "AM" to "AN" and AMr" to "AN_r".

10) In section H36.205(f)(2)(ii), the paragraph reference is changed from (d)(1)(ii) to (f)(1)(ii) to cite the correct procedures.

11) In section H36.205(f)(4), the flyover distance designations for measured and reference paths are changed from, "AN" to "AM" and ANr" to "AM_r".

12) In sections H36.205(f)(1)(i) ,(f)(2)(i), (f)(3) and (f)(4), the symbols and units in the equation are corrected to be consistent with the definition of corrected maximum sound pressure level in appendix A to part 36.

13) In sections H36.205(g)(1)(i) through (iv), the constant value "-10" in the first term is changed to "-7.5" for each of the Δ_2 equations.

14) In section H36.205(g)(1)(i), the word "corrected" is changed to "reference" throughout the section for consistent terminology between measured and reference conditions.

The measured and reference length terms are changed from, "AT" to "AL" and from "ATr" to "AL_r", within the Δ_2 equation and paragraph text. Also, the words "as the corrected and" are deleted.

15) In section H36.205(g)(1)(ii), the approach designations of measured and reference lengths are changed from, "AS" to "AN" and from "ASr" to "AN_r", within the Δ_2 equation and paragraph text.

16) In section H36.205(g)(1)(iii), the sideline measured and reference length designations for each of the flight conditions is changed from, "T" to "L" , from "Tr" to "L_r" , from "S" to "M", from "S_r" to "M_r", from "G" to "N", from "G_r" to "N_r", and from "K" to "S". The word "approach" is changed to "flyover" and "flyover" is changed to "approach" to be consistent with the changed format.

17) In section H36.205(g)(1)(iv), the measured and reference length terms are changed from "AG" to "AM" and from "AG_r" to "AM_r", within the Δ_2 equation and paragraph text.

18) In section J36.3(c), the term "power on" is removed to simplify and more accurately express the operating condition.

Sections H36.205(f) and H36.205(g) are reordered to match the sequence of the flight conditions, and establishes format consistency throughout appendix H. These sections are reordered to follow the flight conditions order of takeoff, flyover, approach, and sideline measures. A related format change is made in section H36.205(f)(3) where the sideline station designations are changed from "Ln" to "L_r", and from "Mn" to "M_r". Also, the word "approach" is changed to "flyover" and "flyover" to "approach" to be consistent with the changed format.

Synopsis of the final rule

Part 36 of 14 CFR contains noise standards for aircraft type and airworthiness certification. Subpart H of part 36, and its related appendices H and J, prescribe noise levels and test procedures used for certifying civil helicopters in the normal, transport, restricted, or primary category. This includes rules governing issuing original, amended, or supplemental type certificates for helicopters for which application is made on or after March 6, 1986.

The FAA is amending some of the technical specifications included in appendices H and J, and adding a new definition of maximum normal operating RPM in section 36.1. This final rule does not substantively alter the prescribed noise limits or change the relative stringency of the regulations, i.e., the relationship between the noise level limits and the measured noise level of a given helicopter. These changes in this final rule can be categorized as (a) replacing an existing specification with a similar ICAO specification; (b) adding an existing ICAO specification to part 36 where a corresponding part 36 specification does not exist; or (c) removing an existing part 36 specification where there is no corresponding ICAO specification. The FAA has chosen to remove those part 36 specifications that are no longer technically appropriate and for which the practice is outdated.

The FAA has examined the part 36 helicopter noise certification process and analyzed how the changes will affect previous helicopter noise certification projects. The cumulative positive and negative effect of the changes on a single certification would not typically exceed ± 0.1 decibels and would not be expected to exceed ± 0.3 decibels under a worst-case combination of conditions. The FAA has determined that the changes will not substantively alter the noise certification levels or the finding of compliance for helicopters currently certificated under appendix H or appendix J.

Section-by-Section Discussion

The following is a section-by-section discussion of the changes proposed in Notice No. 00-12 that are incorporated in this final rule.

Section 36.1 Applicability and definitions

A new definition for "maximum normal operating RPM" is added to section 36.1(h)(5) of the final rule. Maximum normal operating RPM is defined as the highest rotor speed corresponding to the airworthiness limit imposed by the manufacturer and approved by the FAA. This term will cover instances where a tolerance on the highest rotor speed is specified, where the rotor speed is automatically linked to flight condition, or where the rotor speed can be changed by pilot action.

Section 36.11 Acoustical change: Helicopters and Section 36.801 Noise measurement

The applicability of appendix J in the final rule is changed. It increases the maximum takeoff weight limit from 6,000 pounds to 7,000 pounds. This change reflects a previous change to 14 CFR part 27 airworthiness standards for normal category rotorcraft. The part 27 revision, published on October 18, 1999, increased the maximum weight limitation for normal category rotorcraft to 7,000 pounds, increased the passenger seat limitation to nine, and updated the safety standards for airworthiness.

Subpart O – Operating Limitations and Information

Subpart O of part 36 specifies requirements for documentation of noise levels in an airplane flight manual or rotorcraft flight manual. This final rule adds the word "Documentation" to the subpart title to better identify the subject matter of subpart O.

In section 36.1581(a)(2), the reference to appendix F is changed to appendix G. The noise certification requirement for propeller-driven small airplanes was moved to appendix G in Amendment 36-16 (53 FR 47394, November 22, 1988), and this change was overlooked in the NPRM.

In new § 36.1581(a)(3), the requirement to include helicopter noise levels in the rotorcraft flight manual is added. This change includes noise certification documentation requirements and is similar to requirements for other types of aircraft. This change will provide uniform noise level documentation requirements for each aircraft category and will standardize documentation procedures.

Section H36.3 Reference Test Conditions

Sea level pressure in metric units of hector Pascal (hPa) is added to section H36.3(a)(1) of this final rule. The English units of pounds per square foot (psf) that are specified in the current rule remain in the final rule. The outdated designation for inches of mercury is deleted. This change will prevent possible variations in measured data resulting from differing conversion factors made by applicants using metric units.

The reference to rotor speed in section H36.3(d) is deleted in the final rule. The FAA has determined that it is unnecessary when describing a flight profile, since rotor speed is an operational procedure and not a flight profile description.

Two new criteria for flyover reference airspeeds: $0.9V_{NE}$ and $0.45V_{NE}+65$ knots are added to section H36.3(d) of the final rule. Currently, the reference airspeed required is the lesser of $0.9V_H$ or $0.45V_H+65$ knots. [Note: V_{NE} is the never-exceed airspeed, an airworthiness limitation imposed by the manufacturer and approved by the FAA.] The advent of more powerful engines

and improved gearboxes has resulted in helicopters that can have a V_H airspeed in excess of the power-on V_{NE} airspeed. The new noise certification airspeed criteria are needed to keep up with technological advances and still accommodate the airworthiness limitations imposed for safety. The value of V_{NE} is also added to section H36.3(e).

Test approach angle tolerance limits between 5.5° and 6.5° are removed from section H36.3(f)(1)(ii) of the final rule. These limits are added to section H36.3(f)(1)(i). Since section H36.3(f)(1)(ii) defines approach profile requirements and section H36.3(f)(1)(i) defines operating procedures, paragraph (i) is the appropriate place for the tolerance limits.

Section H36.5 Symbols and units

The symbols S_r, T, and T_r and their definitions are removed from in the "Flight Profile Identification-Positions" table in section H36.5. The symbols AS, AS_r, AT, and AT_r and their definitions in the Flight Profile Distances table are also removed from section H36.5. Since the closest points of approach are not used for testing, these symbols are no longer addressed on the Figures.

The description for the symbol S is revised and three new symbols and their definitions are added to the Flight Profile Identification Positions table in the final rule. The new symbols and their definitions are as follows:

F_r.....Position on reference takeoff path directly above noise measuring Station A.

G_r.....Position on reference flyover path directly above noise measuring Station A.

H_r.....Position on reference approach path directly above noise measuring Station A.

S....Sideline noise measuring station (note: a subscript denotes the aircraft orientation relative to the direction of flight). These changes and corrections make these tables consistent with revised Figures H1, H2, and H3.

Section H36.101 Noise Certification Test and Measurement Conditions

The requirement that flyover test conditions be at, or above the maximum certification weight are added to section H36.101(b)(6)(i) of the final rule. Requiring the maximum certification weight limit for at least three flight conditions, eliminates the necessity for requiring separate comprehensive weight test series. In accounting for the maximum noise due to weight effects, it reduces test cost by minimizing the number of flights previously necessary. This change also harmonizes the flight condition weight criteria necessary to be consistent with JAR 36 requirements.

Section H36.101(b)(6)(iii) is deleted. The requirement for additional flight test data to determine the variation of EPNL with weight for the takeoff condition is unnecessary because takeoff noise generation is a function of torque (power) to the rotor systems, not weight.

The requirement for approach test weight in section H36.101(b)(8)(ii) is changed from a "maximum of 90 percent" to "between 90 percent and 105 percent" of the rotorcraft's maximum certification weight. This change makes this section consistent with section H36.101(b)(6)(ii), and simplifies the weight requirements for the three flight conditions.

Section H36.101(b)(8)(iii) is deleted. The requirement for additional flight test data that is used to determine the variation of EPNL with weight for the approach condition is unnecessary. During approach, noise generation is predominantly a function of complex aeroacoustic sources

associated with main rotor blade vortex interaction, not weight. This change will further harmonize measurement procedures and streamline certification testing.

The minimum test temperature in section H36.101(c)(2) is changed from 36°F (2.2°C) to 14°F (-10°C). The current 36°F (2.2°C) temperature limit is unnecessarily restrictive, given that no higher levels of atmospheric absorption could be encountered by lowering the test day temperature. The temperature limit for noise measuring equipment in part 36 is unchanged.

Section H36.101(c)(2) of the final rule specifies that the atmospheric test window be based on the 10-meter temperature values and relative humidity values instead of the average temperature between the aircraft and the 10-meter tower above the ground. The final rule also specifies that the atmospheric test window be used to adjust the sound propagation path for propagation path absorption. Noise certification data collected to date demonstrate that EPNL values corrected using atmospheric data measured at 33 feet (10 meters) are acoustically identical to the previous correction standard. The previous correction standard used both averaged aircraft altitude temperature and relative humidity data, and ground based temperature and relative humidity data. This change makes the part 36 requirements the same as JAR 36 requirements.

Section H36.101(c)(3) of the current rule requires relative humidity and ambient temperature values to be measured at the 10-meter measurement station for allowable sound attenuation in the one-third octave band centered at 8 kHz. The final rule eliminates the requirement that the sound attenuation determination use aircraft measurements. This change is supported by years of noise certification data demonstrating that atmospheric measurements at 33 feet (10 meters) satisfy the sound attenuation determination. Analysis has indicated minimal differences between humidity measured at the helicopter altitude and the 10-meter measurement

position. Corrections have been no greater than 0.1 dB, except under extreme conditions that would be considered an anomalous meteorological condition under which a test could not be conducted.

Section H36.101(c)(5) of the final rule expands the testing limitations under anomalous conditions to account for other meteorological factors such as temperature and relative humidity. The current criterion specifies only the anomalous test condition for wind effects. As an example, the typical desert test environment provides acceptable wind conditions but also develops complex temperature and relative humidity gradients that highly influence and distort noise measurements. Additional limitations on anomalous conditions of meteorological factors to maintain noise repeatability are added in the final rule. FAA-approved procedures are to be used to determine compliance. This change results in harmonizing the testing limitations with that in JAR 36.

As discussed previously in this document, the allowable timeframe for meteorological temperature and relative humidity measurements that must be obtained relative to each noise test measurement in section H36.101(c)(7) is included in the final rule. The timeframe is increased from 25 minutes to 30 minutes and results in a single international standard. This change harmonizes the testing procedures in part 36 with those in JAR 36.

Sections H36.101(d)(2) and (d)(3) currently require that the helicopter height and lateral position be determined relative to the reference flight track, rather than the centerline or runway. The final rule, allows the use of a differential global positioning system (DGPS), as an alternate, acceptable independent method for determining helicopter position.

Section H36.103 Takeoff Test Conditions

Section H36.103(b)(1) of the final rule adds the requirement to establish the takeoff procedure airspeed before entering the 10dB-down time interval of the climb out. The current rule requires only that the takeoff procedure airspeed be established during the horizontal portion of the takeoff test procedure. Adding this requirement clarifies that portion of the takeoff flight profile for which the required airspeed must be maintained. This revised takeoff procedure allows the pilot to establish and stabilize required power settings at the time the climb is started. This procedure simplifies and shortens the pilot's workload by requiring one less parameter (power) that must be adjusted from horizontal flight to the time the climb is initiated. This method is satisfactory only if the initial 10 dB-down time interval occurs during the climb portion of the profile. If this does not occur during the climb portion of the flight, the test run is invalid and must be repeated.

An alternate criterion of maximum takeoff power corresponding to minimum installed engine power is added to section H36.103(b)(3). The current rule only allows for the use of torque limit at the minimum installed power available. The final rule adds the use of maximum takeoff power available as an alternate takeoff test condition. As amended, the lower of the two limits (gearbox torque limit or maximum takeoff power) will be used to satisfy the takeoff condition requirement. This change makes the requirements in part 36 the same as in JAR 36.

The current takeoff airspeed requirement in section H36.103(b)(4) states that either the best rate of climb airspeed, or the lowest airworthiness approved takeoff speed, be maintained during the 10db down time interval. The language used to describe takeoff airspeed requirements has caused confusion between the FARs and the JARs in the past. This final rule harmonizes the language used to explain takeoff airspeed requirements; the requirement has not changed.

A definition of the highest rotor speed used in takeoff is added to section H36.103(b)(5). The current rotor speed criterion specifies normal operating RPM. The term "normal" is being removed. The average rotor speed is required to be within ± 1.0 percent of maximum normal operating RPM during the 10 dB-down time interval. A complete discussion of this change can be found in the discussion of section 36.1 (h)(5) of this preamble.

A new alternate allowable altitude criteria of a wider zenith tolerance, in meters, for low altitudes near the start point of the 10 dB-down time interval is added to section H36.103(b)(6). The current permitted zenith tolerance defined in degrees throughout the 10 dB-down time interval is still allowed. This change harmonizes the part 36 criteria with those used in JAR 36.

A new paragraph (b)(7) is added to section H36.103. This new paragraph requires that a constant takeoff configuration be maintained, and permits the landing gear to be retracted when establishing the best rate-of-climb speed, V_y. Both conditions must be consistent with aircraft airworthiness standards. This change makes the requirements in part 36 the same as the requirements in JAR 36.

Section H36.105 Flyover Test Conditions

Current section H36.105(b) requires that an even number of flights be conducted to assure a balanced measurement of any directional effects related to flight path orientation. As previously discussed in this document, relative wind effects (head versus tail winds) must also be accounted for during test series. After further analysis, the FAA has determined that the suggested change to add the relative wind effects will improve noise repeatability by further balancing directional wind effects over a test series. This final rule incorporates this change because it is a technically sound

approach that results in a balanced flight procedure. Adding this requirement harmonizes part 36 with JAR 36 requirements.

The requirement that a constant cruise configuration be maintained is added to section H36.105(b)(1). This change adopts the commonly understood term "cruise configuration" to clarify the requirement for steady, controlled-piloting, constant speed operations during flyover test conditions.

Two alternative flyover reference airspeed criteria are added to the current requirement of continuous power (V_H) in section H36.105(c)(1). The two alternative level flyover reference airspeeds are 90 percent of the never-exceed airspeed, V_{NE}, and 45 percent of the never-exceed airspeed plus 65 knots. The least of the three airspeeds is required to be used as the reference airspeed. The advent of more powerful engines and improved gearboxes has resulted in helicopters that can have a V_H airspeed in excess of the power-on V_{NE} airspeed. These new noise certification airspeed criteria are needed to keep up with technological advances while accommodating the airworthiness limitations imposed for safety. This addition makes the airspeed criteria in part 36 the same as the criteria in JAR 36.

A definition of the highest rotor speed used in flyover is added to section H36.105(c)(2). The current rotor speed criterion specifies normal operating RPM. The average rotor speed is required to be within ± 1.0 percent of maximum normal operating RPM during the 10 dB-down time interval. This change is being made for the same reasons previously discussed for section 36.1 (h)(5) of this final rule.

Section H36.107 Approach Test Conditions

As previously discussed in this document, the height tolerance of ±30 ft (±9 meters) in current section H36.107(b)(2) is not consistent with the JAR 36 glide slope tolerance limits. The height tolerance in section H36.107(b)(2) is changed to ±33 ft (±10 meters) in order to be accurate and consistent with the 6° +/- 0.5 ° glide slope requirement of section H36.101(b)(7). This change conforms to related requirements made in section H36.101(b)(7) and maintains technical consistency.

A new fixed-distance-lateral-tolerance at low altitudes is added to section H36.107(b)(3). This new tolerance adds flexibility to operations conducted near the end of the approach test condition. The current vertical ground convergent zenith tolerance was overly strict for approach flight operations. The upper altitude zenith tolerance criterion must still be met beyond the altitude range where the two criteria overlap or converge. This change makes the requirements in part 36 the same as the requirements in JAR 36. The use of expanded tolerances in JAR 36 has had no impact to noise acquisition and has reduced the number of approach test flights required.

A definition for the highest rotor speed used in approach is added to section H36.107(b)(5). The current rotor speed criterion specifies normal operating RPM. The average rotor speed is required to be within ± 1.0 percent of maximum normal operating RPM during the 10 dB-down time interval. This change is made for the same reasons discussed at section 36.1 (h)(5) in the preamble.

A new paragraph (b)(6) is added to section H36.107 of the final rule. This paragraph requires that a constant approach configuration be maintained and permits the landing gear to be extended when establishing the best rate-of-climb or the lowest approved speed for the approach.

Both conditions must be consistent with aircraft airworthiness standards. This change makes the requirements for approach configuration in part 36 the same as the requirements in JAR 36.

Section H36.109 Measurement of Helicopter Noise Received on the Ground

In the final rule, the text in section H36.109 is being replaced with a reference to the procedures for measurements of helicopter noise received on the ground in section A36.3 of Appendix A. In the current rule, the procedures are listed in section H36.109 and A36.3. The final rule removes the text in section H36.109 because it is not necessary to have the same text repeated in part 36.

Section H36.111 Reporting and Correcting Measured Data

An allowable EPNL correction for takeoff flight condition is added to section H36.111(c)(2). The amount of this allowable correction is limited to 4.0 EPNdB. This change is intended to reduce the number of takeoff flights required during testing by allowing a greater range of acceptable data.

The description of the corrective conditions for reporting corrected measured noise data in section H36.111(c)(2) of the final rule is revised. This revised description is more general, and removes an outdated reference specifying the use of the ILS antenna position, which is not applicable to most other positioning methods. Paragraph (c)(2)(iii) is revised to include a reference to the detailed corrections specified in H36.205. Paragraph (c)(2)(iv) is deleted because we no longer correct for engine thrust or power for flyover noise levels. The major source of noise comes from the rotor systems; the engine thrust or power is a secondary noise effect. These changes make the requirements in part 36 the same as the requirements in JAR 36.

In section H36.111(c)(3), the aircraft noise level measurement required in each 1/3 octave band is changed from an allowance threshold of 5dB over the background noise to an allowance threshold of 3dB over the background noise. This change to appendix H adopts the same noise analysis change made in appendix B for transport category and turbojet powered airplanes. This amendment also replaces the term "10 dB down points" with "10 dB-down time interval" as the accepted nomenclature for this specific time segment. This harmonized background noise analysis threshold limit and the "10 dB-down time interval" term are in the final rule, "Noise Certification Standards for Subsonic Jet Airplanes and Subsonic Transport Category Large Airplanes," published in the Federal Register on July 8, 2002 (67 FR 45196). .

Section H36.113 Atmospheric Attenuation of Sound

In section H36.113(c)(1)(iii) of the final rule, the adjustment for the sound propagation path absorption is revised to require the use of the 10-meter temperature and relative humidity measurement values. The current sound propagation path absorption was based upon the average of temperature and relative humidity measurements made at aircraft altitude and at the 10-meter measurement stations. Noise certification data voluntarily collected by industry to date have demonstrated that EPNL values corrected using atmospheric data measured at 33 feet (10 meters) are acoustically identical to those corrected using averaged temperature and relative humidity.

Section H36.205 Detailed Data Correction Procedures

Section H36.205(a)(1) of the final rule is revised to include the addition of negative value corrections to the test data measurements. Currently, negative differences are assigned a zero value. The FAA has determined that negative value corrections are appropriate to account accurately for

any differences between reference and test conditions. This change more accurately reflect the effects of noise reduction in the measurements.

In section H36.205(a)(1)(iii) of the final rule, the criteria for maximum certification weight for corrections are deleted. The effect of weight on EPNL is better accounted for by limiting the allowable test weight to be between 90 and 105 percent of the maximum certification weight.

In section H36.205(a)(2) of the final rule, the negative value correction procedures for reference and test conditions are revised. As discussed above, negative corrections are now included in paragraph (a)(1) of this section. Accordingly, section H36.205(a)(3) is redesignated as H36.205(a)(2).

In sections H36.205(a)(3)(iii), (b)(3) and (d)(3) of the final rule, the distance criterion used to calculate the duration corrections between measured and reference altitudes is revised. The new distance criterion is the distance between the measuring station and helicopter when the maximum PNLT (PNLTM) noise value is measured. The current distance criterion uses the simplified geometric closest point of approach (CPA). This change in distance criterion to the PNLTM-measured value is a more accurate method for computing noise duration corrections because it is based on the actual peak noise source characteristics.

The final rule amends section H36.205(a)(3)(iv) to permit the use of more general source noise data in flyover, when submitted for FAA approval prior to testing. The current formats require that the data be expressed in the form of EPNL curves or tables for variation of RPM and test speed. This final rule permits the use of more general source noise data, and alternative data formats.

In section H36.205(b)(ii)(2) of the final rule, the takeoff airspeed criteria is simplified by designating the slowest climb speed allowed under the aircraft airworthiness requirements as the minimum boundary. This final rule also removes the reference to rotor speed, because rotor speed is not needed in describing a flight profile for data correction purposes.

As discussed previously in this document, a conforming change to section H36.105(b) and an associated harmonization issue were inadvertently omitted from proposed section H36.205(c)(1). The current flyover procedures require subsequent flyovers in reverse direction with a minimal of three flights in each direction. The FAA has determined that the suggested change to add the relative wind effects (head versus tail winds) will improve noise repeatability by further balancing directional wind effects over a test series. This final rule incorporates this additional effect of head versus tail wind because it is a technically sound approach, and results in a balanced flight procedure that is the same as JAR 36 requirements.

Section H36.205(d)(2) of the final rule eliminates the requirement that the noise test approach procedure be included in the Flight Manual. Noise test approach procedures are more appropriate for noise certification test reports. Including the procedures in the Flight Manual could be confused with approved airworthiness approach procedures. This final rule will also replace the

term "10 dB down period" with "10 dB-down time interval" in section H36.205(d)(2), as the accepted nomenclature for this specific time segment.

Section H36.205(e)(1) of the final rule removes the requirement that only the advancing blade tip Mach number can be used when making source noise adjustments. The revised section allows the use of an alternate procedure for off-reference tip Mach number adjustments. The alternate procedure is expected to yield results identical to that of the more complex current procedure while substantially reducing the amount of additional flyover passes necessary to generate statistically valid source noise sensitivity curves. The flexibility of offering an alternative procedure is consistent with ICAO practices.

Figures H1, H2 and H3

In Notice No. 00-12, the FAA proposed to revise Figures H1 and H3 to include the height above measurement points in metric units and to delete the closest point of approach (CPA) distance designations. The FAA received no comments on this proposal and it is being adopted as proposed.

Although Figure H2 changes were not addressed in the NPRM, for accuracy and completeness, the FAA is making corrections to typographical errors and replacing incomplete designations. The word "corrected" is replaced with the word "reference" in the titles of Figures H1, H2 and H3 in the final rule. This change keeps the language in the final rule consistent throughout Appendix H.

Section H36.305 Noise levels

Sections H36.305(a)(2)(i) through (iii), are revised by removing the phrase "for maximum weight of 1,764 pounds or less" from the end of each paragraph and replacing it with the phrase "after which the limit is constant" to adopt the same language used by ICAO standards.

Section J36.1 General

The maximum takeoff weight requirement of appendix J is increased from 6,000 pounds to 7,000 pounds in section J36.1 of the final rule. In the final rule, "Normal Category Rotorcraft Maximum Weight and Passenger Seat Limitation," published in the Federal Register on August 18, 1999, (64 FR 45092), the allowable passenger seat limit for part 27 rotorcraft was increased to nine and the corresponding weight limit was increased to 7,000 pounds. The weight limit change is made in part 36, appendix J in this final rule.

Section J36.3 Reference test conditions

Section J36.3(c) of the final rule adds the phrase "maintained throughout the measured portion of the flyover" to clarify the requirement for stabilized airspeed. Stabilized airspeed will minimize the likelihood of variability of advancing tip Mach number. Section J36.3(c)(1) of the final rule adds the requirement that airspeed V_{NE} must be included in the approved Flight Manual. This change standardizes the language used in appendices H and J. This section is also amended by replacing the term "10 dB down time period" with "10 dB-down time interval" as the accepted nomenclature for this specific time segment, as discussed previously.

Section J36.101 Noise Certification and Measurement Conditions

Section J36.101(c)(4) of the final rule revises the criterion by which meteorological data is collected. The current rule requires measurements to be made at the noise measuring station. The

revision removes this requirement. This change and the following related changes to the final rule are harmonized with the JARs and add flexibility in the use of meteorological station requirements. The requirements of section J36.101(c)(6) are amended as follows:

1. The physical location of meteorological instruments must be representative of the atmospheric conditions existing near the surface over the geographical area where the helicopter noise measurements are made.
2. A fixed meteorological station, such as those found at airports, may be used to meet the location requirement.
3. A fixed meteorological station, if used, must be within 2,000 meters of the noise measurement area. The 2,000-meter distance limitation is a reasonable allowance when conducting tests relative to a "fixed meteorological station," such as those found at airport sites or other facilities.

These changes harmonize this final rule with the JARs and do not pose a known increase in noise levels.

Section J36.105 Flyover Test Conditions

As previously stated in this document, an associated harmonization issue was inadvertently omitted in proposed section J36.105(b). The current flyover procedures require at least six flights over the noise measuring station, with an equal number in opposite direction. The FAA has determined the suggested change to add the relative wind effects (head versus tail winds) will improve noise repeatability by further balancing directional wind effects over a test series. This final rule incorporates this additional effect of head versus tail wind because it is a technically sound approach, and results in a balanced flight procedure that is the same as JAR 36 requirements.

The maximum weight limit is increased from 6,000 pounds to 7,000 pounds in section J36.305(a) of the final rule. This is a conforming change made for the reasons discussed above at section J36.1. The final rule also revises the value for the noise/weight reduction rate from "3.01" to "3.0". The effect of this change is so minimal that it has no effect on noise limit calculations.

Paperwork Reduction Act

The Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)) requires that the FAA consider the impact of paperwork and other information collection burdens imposed on the public. We have determined that there are no new information collection requirements associated with this final rule.

International Compatibility

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 two differences with this final rule. The FAA filed these differences with ICAO in 1999.

(1) In sections 36.11 and H36.305 of part 36, helicopters certificated before March 6, 1986 are permitted to amend their type certificates to reflect acoustical changes. The measured levels at recertification must meet either Stage 2 noise limits plus 2 EPNdB, or be no greater than the noise levels of the parent helicopter after a change in type design; and

(2) In section 36.805(c) of part 36, helicopters of the United States Armed Forces that operated on or before March 6, 1986 are permitted to amend their type certificates to reflect

acoustical changes. The measured levels at recertification must meet either Stage 2 noise limits, or be no greater than the noise levels of the parent helicopter after a change in type design.

Economic Evaluation

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

In conducting these analyses, the FAA has determined 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) reduces barriers to international trade; and 4) does not impose an unfunded mandate on state, local, or tribal governments, or on the private sector. These analyses, available in the docket, are summarized below.

This final rule will provide nearly uniform noise certification standards for helicopters certificated in the United States, the JAA countries, and any other countries that have adopted as their national regulation either the United States regulation, the JAA regulation, or the ICAO standard.

This final rule will more closely harmonize the flight test conditions, procedures, and documentation mandated by Appendices H and J of 14 CFR part 36 with the corresponding applicable provisions of the JAR 36 and the ICAO Annex 16. Specifically, this final rule will amend the technical specifications embodied in Appendix H and Appendix J of part 36 along with a minor technical change to Appendix B, and add a new definition to § 36.1.

The FAA concludes that this final rule will be cost beneficial. This final rule will lessen the certification test burden by (1) requiring fewer takeoffs and approaches; (2) eliminating aircraft humidity and temperature measurements and the requirements to process test data twice and to issue separate reports for FAA and ICAO methods and; (3) extending the upper gross weight limit for rotorcraft using the Appendix J certification test procedure. The expected cost savings of the final rule will be $6.6 million ($4.6 million, discounted) over a 10 year period. The one-time cost of this final rule will be $40,800 ($33,300 discounted) and will accrue to those manufacturers that also need to obtain ICAO/JAA certification.

Regulatory Flexibility Determination

The Regulatory Flexibility Act of 1980 (RFA) establishes "as a principle of regulatory issuance that agencies shall endeavor, consistent with the objective of the final rule and of applicable statutes, to fit regulatory and informational requirements to the scale of the business, organizations, and governmental jurisdictions subject to regulation." To achieve that principle,

the RFA requires agencies to solicit and consider flexible regulatory proposals and to explain the rationale for their actions. The RFA covers a wide-range of small entities, including small businesses, not-for-profit organizations and small governmental jurisdictions.

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 as described in the RFA.

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 RFA provides that the head of the agency may so certify and that a regulatory flexibility analysis is not required. The certification must include a statement providing the factual basis for this determination, and its reasoning should be clear.

Small entities are firms employing 1,500 employees or less, based on Small Business Administration guidelines. Enactment of this final rule will impose a one-time cost of $10,200 per test for a small entity, which would be incurred by two small helicopter manufacturers that met the criterion of small entity. The expected cost savings per test for a small entity could be at least $85,000. In view of the net cost savings per small entity, the FAA has determined that this final rule will not have a significant adverse economic impact on a substantial number of small entities; therefore, a regulatory flexibility analysis is not required under the terms of the RFA.

International Trade Impact Assessment

The Trade Agreement Act of 1979 prohibits Federal agencies from engaging in any related activities to develop standards 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 effect of this final rule and has determined that it will reduce trade barriers by reducing the differences between U.S. and European regulations.

Unfunded Mandates Assessment

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

Executive Order 13132, Federalism

The FAA has analyzed this final rule under the principles and criteria of Executive Order 13132, Federalism. The FAA has determined that this action will not have substantial direct effects on the States, on the relationship between the national Government and the States, or on

the distribution of power and responsibilities among the various levels of government. Therefore, the FAA has determined that this final rule will not have federalism implications.

Environmental Analysis

In accordance with the provisions of regulations issued by the Council on Environmental Quality (40 CFR Parts 1500-1508), FAA Order 1050.1D identifies certain FAA actions that may be categorically excluded from preparing an Environmental Assessment or an Environmental Impact Statement. Pursuant to FAA Order 1050.1D, appendix 4, paragraph 4(j), this rulemaking action qualifies for a categorical exclusion because no significant impacts to the environment are expected to result from its finalization or implementation and no extraordinary circumstances exist as prescribed under paragraph 32 of Order 1050.1D.

Regulations that Significantly Affect Energy Supply, Distribution, or Use

The FAA has analyzed this NPRM under Executive Order 13211, Actions Concerning Regulations that Significantly Affect Energy Supply, Distribution, or Use (May 18, 2001). We have determined that it is not a "significant energy action" under the executive order because it is not a "significant regulatory action" under Executive Order 12866, and it is not likely to have a significant adverse effect on the supply, distribution, or use of energy.

List of Subjects in 14 CFR Part 36

Aircraft, Noise Control.

The Amendment

In consideration of the foregoing the FAA amends part 36 of Title 14 Code of Federal Regulations, as follows:

PART 36 - NOISE STANDARDS: AIRCRAFT TYPE AND AIRWORTHINESS CERTIFICATION

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

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

2. Section 36.1 is amended by adding a new paragraph (h)(5) to read as follows:

§ 36.1 Applicability and definitions.

* * * * *

(h) * * *

(5) Maximum normal operating RPM means the highest rotor speed corresponding to the airworthiness limit imposed by the manufacturer and approved by the FAA. Where a tolerance on the highest rotor speed is specified, the maximum normal operating rotor speed is the highest rotor speed for which that tolerance is given. If the rotor speed is automatically linked with flight condition, the maximum normal operating rotor speed corresponding with that flight condition must be used during the noise certification procedure. If rotor speed can be changed by pilot action, the highest normal operating rotor speed specified in the flight manual limitation section for power-on conditions must be used during the noise certification procedure.

§ 36.11 [Amended]

3. Section 36.11 is amended by removing the term"6,000" and adding the term "7,000" in its place in the introductory text and paragraph (a)(1).

4. Section 36.801 is amended by removing the term "6,000" and adding the term "7,000" in its place.

Subpart O-Documentation, Operating Limitations and Information

5. Revise the heading of Subpart O to read as set forth above.

6. In § 36.1581 paragraph (a)(2) is revised and a new paragraph (a)(3) is added to read as follows:

§ 36.1581 Manuals, markings, and placards

(a) * * *

(2) For propeller driven small airplanes, the noise level information must be one value for takeoff as defined and required by appendix G of this part, along with the maximum takeoff weight and configuration.

(3) For rotorcraft, the noise level information must be one value for each takeoff, flyover, and approach as defined and required by appendix H of this part, or one value for flyover as defined and required by appendix J of this part, at the maximum takeoff weight and configuration.

* * * * *

7. In appendix H to Part 36, section H36.3 is amended by revising paragraphs (a)(1), (c)(2), (d), (e), (f)(1)(i), and (f)(1)(ii) to read as follows:

Appendix H to Part 36 – Noise Requirements For Helicopters Under Subpart H

* * * * *

Section H36.3 Reference test conditions.

(a) * * *

(1) Sea level pressure of 2,116 psf (1,013.25 hPa).

* * * * *

(c) * * *

(2) The reference flight path is defined as a straight line segment inclined from the starting point (1,640 feet (500 meters) from the center microphone location and 65 feet (20 meters) above ground level) at a constant climb angle β defined by the certificated best rate of climb and V_y for minimum engine performance. The constant climb angle β is derived from the manufacturer's data (approved by the FAA) to define the flight profile for the reference conditions. The constant climb angle β is drawn through C_r and continues, crossing over station A, to the position corresponding to the end of the type certification takeoff path represented by position I_r.

(d) Level flyover reference profile. The beginning of the level flyover reference profile is represented by helicopter position D_r (Figure H2). The helicopter approaches position D_r in level flight 492 feet above ground level as measured at Station A. Reference airspeed must be either $0.9V_H$; $0.9V_{NE}$; $0.45V_H$ +65 kts ($0.45V_H$ +120km/h); or $0.45V_{NE}$ +65kts ($0.45V_{NE}$ +120 km/h), whichever of the four speeds is least. The helicopter crosses directly overhead station A in level flight and proceeds to position J_r.

(e) For noise certification purposes, V_H is defined as the airspeed in level flight obtained using the minimum specified engine torque corresponding to maximum continuous power available for sea level pressure of 2,116 psf (1,013.25 hPa) at 77° F (25° C) ambient conditions at the relevant maximum certificated weight. The value of V_{NE} is the never-exceed airspeed.

The values of V_H and V_{NE} that are used for noise certification must be listed in the approved Rotorcraft Flight Manual.

* * * * *

(f) * * *

(1) * * *

(i) The beginning of the approach profile is represented by helicopter position E. The position of the helicopter is recorded for a sufficient distance (EK) to ensure recording of the entire interval during which the measured helicopter noise level is within 10 dB of Maximum Tone Corrected Perceived Noise Level (PNLTM). The reference flight path, E_rK_r represents a stable flight condition in terms of torque, rpm, indicated airspeed, and rate of descent resulting in a 6° approach angle.

(ii) The test approach profile is defined by the approach angle η passing directly over the station A at a height of AH, to position K, which terminates the approach noise certification profile. The test approach angle η must be between 5.5° and 6.5°.

* * * * *

8. In appendix H to Part 36, section H36.5, the Flight Profile Identification-Positions table is amended by removing the symbols S_r, T and T_r and their descriptions; the Flight Profile Distances table is amended by removing the symbols AS, AS_r, AT, and AT_r and their descriptions. The Flight Profile Identification-Positions table is amended by adding in alphabetical order three new symbols (F_r, G_r, H_r), with their descriptions and revising the entry for S to read as follows:

* * * * *

Section H36.5 Symbols and units.

Flight Profile Identification – Positions

Position	Description
* * * * *	
F_r.....	Position on reference takeoff path directly above noise measuring Station A.
* * * * *	
G_r.....	Position on reference flyover path directly above noise measuring Station A.
* * * * *	
H_r.....	Position on reference approach path directly above noise measuring Station A.
* * * * *	
S.....	Sideline noise measuring station (note: a subscript denotes the aircraft orientation relative to the direction of flight).

* * * * *

9. In appendix H to Part 36, section H36.101 is amended by removing paragraphs (b)(6)(iii), (b)(8)(iii), and (b)(9); by revising paragraphs (b)(6)(i), (b)(8)(ii), (c)(2), (c)(3), (c)(5), (c)(7), (d)(1), (d)(2), (d)(3); and by adding a new paragraph (d)(4) to read as follows:

* * * * *

Section H36.101 Noise certification test and measurement conditions.

* * * * *

(b) * * *

(6) * * *

(i) At least one takeoff test and one flyover test must be conducted at, or above, the

maximum certification weight.

* * * * *

(8) * * *

(ii) Each test weight must be between +5 percent and -10 percent of the maximum certification weight.

* * * * *

(c) * * *

(2) Ambient air temperature between 14°F and 95°F (-10°C and 35°C), inclusively, at a point 33 feet (10 meters) above the ground at the noise measuring station and at the aircraft. The temperature and relative humidity measured at a point 33 feet (10 meters) above the ground at the noise measuring station must be used to adjust for propagation path absorption.

(3) Relative humidity and ambient temperature at a point 33 feet (10 meters) above the ground at the noise measuring station and at the aircraft, is such that the sound attenuation in the one-third octave band centered at 8 kHz is not greater than 12 dB/100 meters and the relative humidity is between 20 percent and 95 percent, inclusively.

* * * * *

(5) No anomalous meteorological conditions (including turbulence) that will significantly affect the noise level of the aircraft when the noise is recorded at each noise measuring station.

* * * * *

(7) Temperature and relative humidity measurements must be obtained within 30 minutes of each noise test.

(d) Aircraft testing procedures. (1) The aircraft testing procedures and noise measurements must be conducted and processed in a manner that yields the noise evaluation measure designated as Effective Perceived Noise Level (EPNL) in units of EPNdB, as prescribed in Appendix A of this part.

(2) The helicopter height and lateral position relative to the reference flight track (which passes through the flight track noise measuring station) must be determined using an FAA-approved method. The equipment used to make the determination must be independent of normal flight instrumentation. Applicable independent systems are radar tracking, theodolite triangulation, laser trajectography, photo scaling, or differential global positioning system.

(3) The helicopter position along the flight path must be related to the noise recorded at the noise measuring stations by means of synchronized signals recorded at an approved sampling rate. The helicopter position must be recorded relative to the reference flight track during the entire time interval in which the recorded signal is within 10 dB of PNLTM. Measuring and sampling equipment must be approved by the FAA before testing.

(4) Aircraft performance data sufficient to make the corrections required under section H36.205 of this appendix must be recorded at an FAA-approved sampling rate using FAA-approved equipment.

* * * * *

10. In appendix H to Part 36, section H36.103 is amended by revising paragraphs (b)(1), (b)(3), (b)(4), (b)(5), and (b)(6), and by adding new paragraph (b)(7) to read as follows:

* * * * *

Section H36.103 Takeoff test conditions.

* * * * *

(b) * * *

(1) An airspeed of either V_y ±5 knots or the lowest approved speed ±5 knots for the climb after takeoff, whichever speed is greater, must be established and maintained throughout the 10 dB-down time interval.

(2) * * *

(3) Upon reaching a point 1,640 feet (500 meters) from the noise measuring station, the helicopter must be stabilized at the maximum takeoff power that corresponds to minimum installed engine(s) specification power available for the reference ambient conditions or gearbox torque limit, whichever is lower.

(4) The helicopter must be maintained throughout the 10 dB-down time interval at the best rate of climb speed V_y ±5 knots, or the lowest approved speed for climb after takeoff, whichever is greater, for an ambient temperature of 25°C at sea level.

(5) The average rotor speed must not vary from the maximum normal operating rotor RPM by more than ±1.0 percent during the 10 dB-down time interval.

(6) The helicopter must stay within ±10° or ±65 feet (±20 meters), whichever is greater, from the vertical above the reference track throughout the 10dB-down time interval.

(7) A constant takeoff configuration selected by the applicant must be maintained throughout the takeoff reference procedure with the landing gear position consistent with the airworthiness certification tests for establishing best rate-of-climb speed, V_y.

* * * * *

11. In appendix H to Part 36, Section H36.105 is amended by revising paragraphs (b) introductory text, (b)(1), (b)(3), (c)(1), and (c)(2) to read as follows:

Section H36.105 Flyover test conditions.

* * * * *

(b) A test series consists of at least six flights. The number of level flights made with a headwind component must be equal to the number of level flights made with a tailwind component with simultaneous measurements at all three noise measuring stations--

(1) In level flight cruise configuration;

(2) * * *

(3) The helicopter must fly within ±10° or ±65 feet (±20 meters), whichever is greater, from the vertical above the reference track throughout the 10 dB-down time interval.

(c) * * *

(1) At a speed of $0.9V_H$; $0.9V_{NE}$; $0.45V_H + 65$ kts ($0.45V_H + 120$ km/h); or $0.45V_{NE} + 65$ kts ($0.45V_{NE} + 120$ km/h), whichever speed is least, to be maintained throughout the measured portion of the flyover;

(2) At average rotor speed, which must not vary from the maximum normal operating rotor RPM by more than ±1.0 percent during the 10 dB-down time interval.

* * * * *

12. In appendix H to Part 36, Section H36.107 is amended by revising paragraphs (b)(2), (b)(3) and (b)(5) and adding new paragraph (b)(6) to read as follows:

* * * * *

Section H36.107 Approach test conditions.

* * * * *

(b) * * *

(2) At a height of 394 ±33 feet (120 ±10 meters)

(3) The helicopter must fly within ±10° or ±65 feet (±20 meters) lateral deviation tolerance, whichever is greater, from the vertical above the reference track throughout the 10 dB-down time interval;

(4) * * *

(5) At average rotor speed, which may not vary from the maximum normal operating rotor RPM by more than ±1.0 percent during the 10 dB-down time interval; and

(6) The constant approach configuration used in airworthiness certification tests, with the landing gear extended, must be maintained throughout the approach reference procedure.

* * * * *

13. In appendix H to Part 36, section H36.109 is revised to read as follows:

* * * * *

Section H36.109 Measurement of helicopter noise received on the ground.

The measurement system and the measurement, calibration and general analysis procedures to be used are provided in Appendix A, section A36.3 of this part.

14. In appendix H to Part 36, section H36.111 is amended by revising paragraphs (c)(2) and (c)(3) to read as follows:

* * * * *

Section H36.111 Reporting and correcting measured data.

* * * * *

(c) * * *

(2) The measured flight path must be corrected by an amount equal to the difference between the applicant's predicted flight path for the certification reference conditions and the measured flight path at the test conditions. Necessary corrections relating to helicopter flight path or performance may be derived from FAA-approved data for the difference between measured and reference conditions, together with appropriate allowances for sound attenuation with distance. The Effective Perceived Noise Level (EPNL) correction may not exceed 2.0 EPNdB except for takeoff flight condition, where the correction may not exceed 4.0 EPNdB, of which the arithmetic sum of Δ_1 (described in section H36.205(f)(1)) and the term -7.5 log (AL/AL_r) from Δ_2 term (described in section H36.205(g)(1)(i)) may not exceed 2.0 EPNdB, for any combination of the following:

(i) The helicopter not passing vertically above the measuring station.

(ii) Any difference between the reference flight track and the actual test flight track; and

(iii) Detailed correction requirements prescribed in section H36.205 of this appendix.

(3) Helicopter sound pressure levels within the 10 dB-down time interval must exceed the mean background sound pressure levels determined under section B36.3.9.11 by at least 3 dB in each one-third octave band, or must be corrected under an FAA-approved method.

* * * * *

15. In appendix H to Part 36, section H36.113 is amended by revising paragraphs (b) and (c)(1)(iii) to read as follows:

* * * * *

Section H36.113 Atmospheric attenuation of sound.

* * * * *

(b) Attenuation rates. The procedure for determining the atmospheric attenuation rates of sound with distance for each one-third octave bands must be determined in accordance with Society of Automotive Engineering (SAE) ARP 866A. The atmospheric attenuation equations are provided in both the International and English system of units in section A36.7 of this part.

(c) * * *

(1) * * *

(iii) The temperature and relative humidity measured at 33 feet (10 meters) above the ground must be used to adjust for propagation path absorption.

* * * * *

16. In appendix H to Part 36, section H36.201 is amended by removing the term "appendix B" and adding the term "appendix A" in paragraph (a) introductory text, and by removing the term "instantaneous" in paragraph (a)(1).

17. In appendix H to Part 36, section H36.205 is amended by removing paragraph (a)(3); by revising paragraphs (a)(1), (a)(2), (b)(2), (b)(3), (c)(1), (d)(2), (d)(3), (e), (f), and (g)(1)(i) through (iv) and by revising Figures H1, H2, and H3 to read as follows:

* * * * *

Section H36.205 Detailed data correction procedures.

(a) * * *

(1) If there is any difference between measured test and reference conditions, an appropriate correction must be made to the EPNL calculated from the measured noise data. Conditions that can result in a different value include:

(i) Atmospheric absorption of sound under measured test conditions that are different from the reference test conditions; or

(ii) Measured flight path that is different from the reference flight path.

(2) The following correction procedures may produce one or more possible correction values which must be added algebraically to the calculated EPNL to bring it to reference conditions:

(i) The flight profiles must be determined for both reference and test conditions. The procedures require noise and flight path recording with a synchronized time signal from which the test profile can be delineated, including the aircraft position for which PNLTM is observed at the noise measuring station. For takeoff, the flight profile corrected to reference conditions may be derived from FAA approved manufacturer's data.

(ii) The sound propagation paths to the microphone from the aircraft position corresponding to PNLTM must be determined for both the test and reference profiles. The SPL values in the spectrum of PNLTM must then be corrected for the effects of --

(A) Change in atmospheric sound absorption;

(B) Atmospheric sound absorption on the linear difference between the two sound path lengths; and

(C) Inverse square law on the difference in sound propagation path length. The corrected values of SPL must then be converted to a reference condition PNLTM value from which PNLTM must be subtracted. The resulting difference represents the correction which must be added algebraically to the EPNL calculated from the measured data.

(iii) As observed at the noise measuring station, the measured PNLTM distance is different from the reference PNLTM distance and therefore the ratio must be calculated and used to determine a noise duration correction factor. Effective perceived noise level, EPNL, is determined by the algebraic sum of the maximum tone corrected perceived noise level (PNLTM) and the duration correction factor.

(iv) For aircraft flyover, alternative source noise corrections require FAA approval and must be determined and adjusted to account for noise level changes caused by the differences between measured test conditions and reference conditions.

(b) * * *

(2) For the actual takeoff, the helicopter approaches position C in level flight at 65 feet (20 meters) above ground level at the flight track noise measuring station and at either V_y ±5 knots or the lowest approved speed for the climb after takeoff, whichever speed is greater.

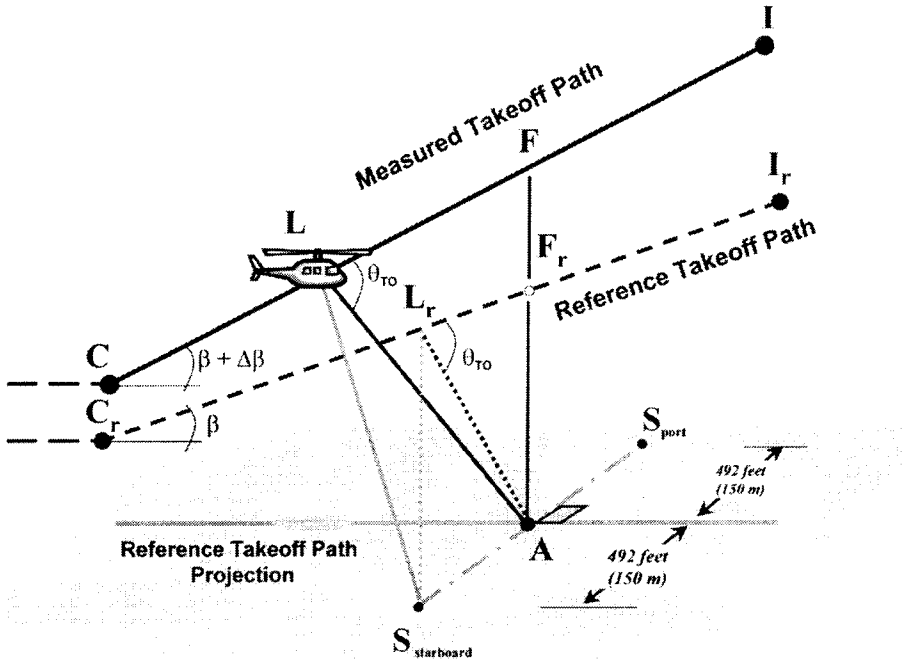

Figure H1.
Comparison of Measured and Reference Takeoff Profiles

(3) Figure H1 illustrates the significant geometrical relationships influencing sound propagation. Position L represents the helicopter location on the measured takeoff path from which PNLTM is observed at station A, and L_r is the corresponding position on the reference sound propagation path. Propagation paths AL and AL_r both form the same angle □ (theta) relative to their respective flight paths.

(c) Level flyover profiles. (1) The noise type certification level flyover profile is shown in Figure H2. Airspeed must be stabilized within ±5 knots of the reference airspeed determined using the procedures in section H36.3(d). The number of level flights made with a headwind component must be equal to the number of level flights made with a tailwind component.

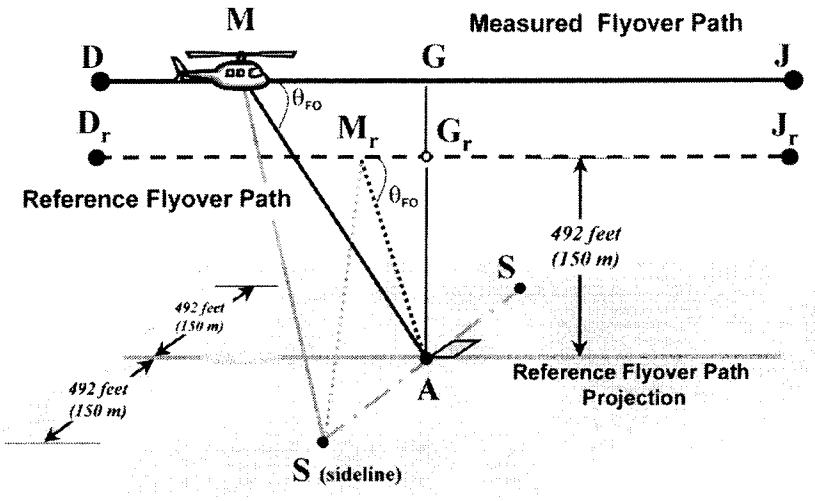

Figure H2.
Comparison of Measured and Reference Flyover Profiles

* * * * *

(d) * * *

(2) The helicopter approaches position H along a 6° (±0.5°) average approach slope throughout the 10dB-down time interval. Deviation from the 6° average approach slope must be approved by the FAA before testing.

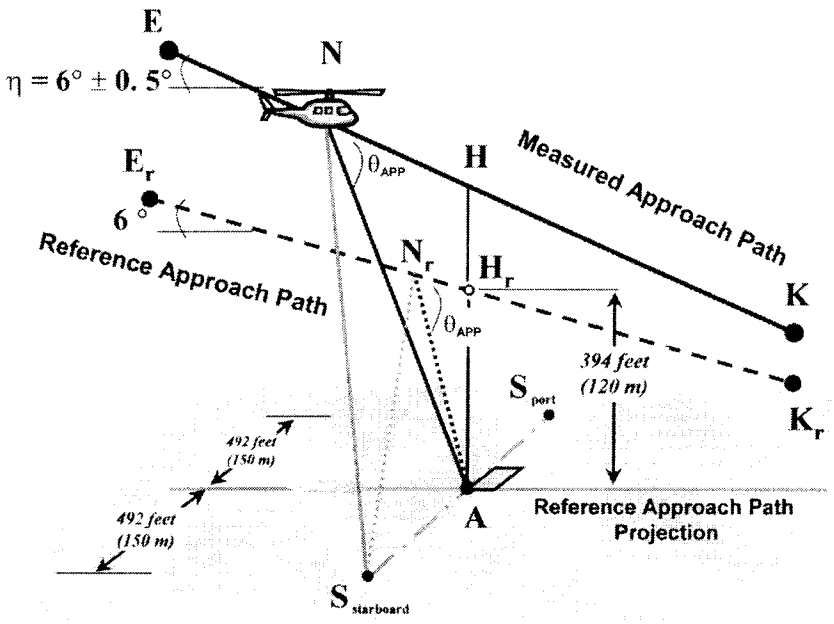

Figure H3.
Comparison of Measured and Reference Approach Profiles

(3) Figure H3 illustrates portions of the measured and reference approach flight paths including the significant geometrical relationships influencing sound propagation. The measured approach path is represented by segment EK with an approach allowable angle □. Reference positions, E_r and K_r, define an idealized reference approach angle of 6°. Position N represents the helicopter location on the measured approach flight path for which PNLTM is observed at measuring station A, and N_r is the corresponding position on the reference approach flight path. The measured and reference noise propagation paths are AN and AN_r, respectively, both of which form the same angle, $□_{APP}$, corresponding to PNLTM relative to their approach flight paths.

(e) Correction of noise at source during level flyover. (1) For level overflight, if any combination of the following three factors, airspeed deviations from reference, rotor speed deviations from reference, and temperature deviations from reference, results in a noise correlating parameter whose value deviates from the reference value of this parameter, then source noise adjustments must be determined from the manufacturer's data that is approved by the FAA.

(2) Off-reference tip Mach number adjustments must be based upon a sensitivity curve of PNLTM versus advancing blade tip Mach number, deduced from overflights performed at different airspeeds surrounding the reference airspeed. If the test aircraft is unable to attain the reference value, then an extrapolation of the sensitivity curve is permitted if data cover at least a range of 0.03 Mach units. The advancing blade tip Mach number must be computed using true airspeed, onboard outside air temperature, and rotor speed. A separate PNLTM versus advancing blade tip Mach number function must be derived for each of the three certification microphone locations, i.e., centerline, sideline left, and sideline right. Sideline left and right are defined relative to the direction of flight for each run. PNLTM adjustments are to be applied to each microphone datum using the appropriate PNLTM function.

(f) PNLT corrections. If the measured ambient atmospheric conditions of temperature and relative humidity differ from those prescribed as reference conditions under this appendix (77 degrees F and 70 percent, respectively), corrections to the EPNL values must be calculated from the measured data under paragraph (a) of this section as follows:

(1) Takeoff flight path. For the takeoff flight path shown in Figure H1, the spectrum of PNLTM observed at station A for the aircraft at position L is decomposed into its individual SPL*(i)* values.

(i) Step 1. A set of corrected values are then computed as follows:

$$SPL(i)_r = SPL(i) + C\,[\alpha(i) - \alpha(i)_o]AL + C\,\alpha(i)_o\,(AL - AL_r) + 20\log(AL/AL_r)$$

where SPL*(i)* and $SPL(i)_r$ are the measured and corrected sound pressure levels, respectively, in the *i*-th one-third octave band. The first correction term adjusts for the effect of change in atmospheric sound absorption where $\alpha(i)$ and $\alpha(i)_o$ are the sound attenuation coefficients for the test and reference atmospheric conditions, respectively, for the *i*-th one-third octave band, and AL is the measured takeoff sound propagation path. The conversion factor constant, *C*, is 0.001 for English System of Units and is 0.01 for International System of Units. The second correction term adjusts for the effects of atmospheric attenuation due to the difference in the sound propagation path length where AL_r is the Reference takeoff sound propagation path. The third correction term, known as the "inverse square" law, adjusts for the effect of the difference in the sound propagation path lengths.

(ii) Step 2. The corrected values of the $SPL(i)_r$ are then converted to reference condition PNLT and a correction term calculated as follows:

$$\Delta_1 = PNLT - PNLTM$$

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

(2) Level flyover flight path. (i) The procedure described in paragraph (f)(1) of this section for takeoff paths is also used for the level flyover paths, with the values of $SPL(i)_r$ relating to the flyover sound propagation paths shown in Figure H2 as follows:

$$SPL(i)_r = SPL(i) + C\,[\alpha(i) - \alpha(i)_o]AM + C\,\alpha(i)_o\,(AM - AM_r) + 20\log(AM/AM_r)$$

where the lines AM and AM_r are the measured and reference level flyover sound propagation paths, respectively.

(ii) The remainder of the procedure is the same for the flyover condition as that prescribed in the paragraph (f)(1)(ii) of this section regarding takeoff flight path.

(3) Approach flight path. (i) The procedure described in paragraph (f)(1) of this section for takeoff paths is also used for the approach paths, with the values of $SPL(i)_r$ relating to the approach sound propagation paths shown in Figure H3 as follows:

$$SPL(i)_r = SPL(i) + C\,[\alpha(i) - \alpha(i)_o]AN + C\,\alpha(i)_o\,(AN - AN_r) + 20\log(AN/AN_r)$$

where the lines AN and AN_r are the measured and reference approach sound propagation paths, respectively.

(ii) The remainder of the procedure is the same for the approach condition as that prescribed in the paragraph (f)(1)(ii) of this section regarding takeoff flight path.

(4) Sideline microphones. (i) The procedure prescribed in paragraph (f)(1) of this section for takeoff paths is also used for the propagation to the sideline locations, with the values of $SPL(i)_r$ relating as follows to the measured sideline sound propagation path shown in Figure H3 as follows:

$$SPL(i)_r = SPL(i) + C\,[\alpha(i) - \alpha(i)_o]SX + C\,\alpha(i)_o\,(SX - SX_r) + 20 \log (SX/SX_r)$$

where S is the sideline measuring station and, based upon the flight condition, the helicopter positions, X and X_r, correspond to:

$X = L$, and $X_r = L_r$ for takeoff

$X = M$, and $X_r = M_r$ for flyover

$X = N$, and $X_r = N_r$ for approach

(ii) The remainder of the procedure is the same for the sideline paths as that prescribed in the paragraph (f)(1)(ii) of this section regarding takeoff flight paths.

(g) * * *

(1) * * *

(i) Takeoff flight path. For the takeoff path shown in Figure H1, the correction term is calculated using the formula --

$$\Delta_2 = -7.5 \log (AL/AL_r) + 10 \log (V/V_r)$$

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

(ii) Level flyover flight paths. For the level flyover flight path, the correction term is calculated using the formula --

$$\Delta_2 = -7.5 \log (AM/AM_r) + 10 \log (V/V_r)$$

where AM is the measured flyover distance from the noise measuring station A to the measured flyover path, and AM_r is the reference distance from station A to the reference flyover path.

(iii) Approach flight path. For the approach path shown in Figure H3, the correction term is calculated using the formula --

$$\Delta_2 = -7.5 \log (AN/AN_r) + 10 \log (V/V_r)$$

where AN is the measured approach distance from the noise measuring station A to the measured approach path, and AN_r is the reference distance from station A to the reference approach path.

(iv) Sideline microphones. For the sideline flight path, the correction term is calculated using the formula --

$$\Delta_2 = -7.5 \log (SX/SX_r) + 10 \log (V/V_r)$$

where S is the sideline measuring station and based upon the flight condition, the helicopter positions, X and X_r, correspond to:

$X = L$, and $X_r = L_r$ for takeoff

$X = M$, and $X_r = M_r$ for flyover

$X = N$, and $X_r = N_r$ for approach

* * * * *

18. In appendix H, section H36.305(a)(2) is revised to read as follows:

Section H36.305 Noise levels.

(a) * * *

(2) Stage 2 noise limits are as follows:

(i) For takeoff calculated noise levels--109 EPNdB for maximum takeoff weights of 176,370 pounds (80,000 kg) or more, reduced by 3.01 EPNdB per halving of the weight down to 89 EPNdB, after which the limit is constant.

(ii) For flyover calculated noise levels--108 EPNdB for maximum weights of 176,370 pounds (80,000 kg) or more, reduced by 3.01 EPNdB per halving of the weight down to 88 EPNdB, after which the limit is constant.

(iii) For approach calculated noise levels--110 EPNdB for maximum weights of 176,370 pounds (80,000 kg) or more, reduced by 3.01 EPNdB per halving of the weight down to 90 EPNdB, after which the limit is constant.

* * * * *

Appendix J [Amended]

19. Amend the title of appendix J to Part 36 and section J36.1 introductory text by removing the term "6,000" and adding "7,000" in its place.

20. In appendix J to Part 36, section J36.3 is amended by revising paragraph (c) introductory text and paragraph (c)(1) to read as follows:

Appendix J to Part 36 – Alternative Noise Certification Procedure for Helicopters Under Subpart H Having a Maximum Certificated Takeoff Weight of Not More Than 7,000 Pounds

* * * * *

Section J36.3 Reference test conditions

* * * * *

(c) Level flyover reference profile. The reference flyover profile is a level flight 492 feet (150 meters) above ground level as measured at the noise measuring station. The reference flyover profile has a linear flight track and passes directly over the noise monitoring station. Airspeed is stabilized at $0.9V_H$; $0.9V_{NE}$; $0.45V_H$ + 65 kts (120 km/h); or $0.45V_{NE}$ + 65 kts (120 km/h), whichever of the four airspeeds is least, and maintained throughout the measured portion of the flyover. Rotor speed is stabilized at the maximum normal operating RPM throughout the 10 dB-down time interval.

(1) For noise certification purposes, V_H is defined as the airspeed in level flight obtained using the minimum specification engine power corresponding to maximum continuous power available for sea level pressure of 2,116 psf (1,013.25 hPa) at 77°F (25°C) ambient conditions at the relevant maximum certificated weight. The value of V_H and V_{NE} used for noise certification must be included in the Flight Manual.

* * * * *

21. In appendix J to Part 36, section J36.101 is amended by revising paragraph (c)(4) and (c)(6) to read as follows:

* * * * *

Section J36.101 Noise certification test and measurement conditions

* * * * *

(c) * * *

(4) Measurements of ambient temperature, relative humidity, wind speed, and wind direction must be made between 4 feet (1.2 meters) and 33 feet (10 meters) above the ground. Unless otherwise approved by the FAA, ambient temperature and relative humidity must be measured at the same height above the ground.

* * * * *

(6) If the measurement site is within 6560 feet (2,000 meters) of a fixed meteorological station (such as those found at airports or other facilities) the weather measurements reported for temperature, relative humidity and wind velocity may be used, if approved by the FAA.

* * * * *

22. In appendix J to Part 36, section J36.105 is amended by revising paragraph (b) introductory text to read as follows:

* * * * *

Section J36.105 Flyover test conditions

* * * * *

(b) A test series must consist of at least six flights. The number of level flights made with a headwind component must be equal to the number of level flights made with a tailwind component over the noise measurement station:

* * * * *

23. In appendix J to Part 36, section J36.109 is amended in paragraph (d)(1)(ii) and by removing the words "section H36.109(c)(3) of appendix H" and adding the words "section A36.3.6 of appendix A"; in paragraph (e)(1) by removing the words "section H36.109(e) of

appendix H," and adding the words "section A36.3.6 of appendix A"; and by revising paragraph (c)(4) to read as follows:

* * * * *

Section J36.109 Measurement of helicopter noise received on the ground

* * * * *

(c) * * *

(4) The calibration and checking of measurement systems must use the procedures described in Section A36.3.9.

* * * * *

24. In Appendix J, section J36.305 is amended by revising paragraph (a) to read as follows:

* * * * *

Section J36.305 Noise Limits.

* * * * *

(a) For primary, normal, transport, and restricted category helicopters having a maximum certificated takeoff weight of not more than 7,000 pounds that are noise tested under this appendix, the Stage 2 noise limit is 82 decibels SEL for helicopters up to 1,737 pounds maximum certificated takeoff weight at which the noise certification is requested, and increasing at a rate of 3.0 decibels per doubling of weight thereafter. The limit may be calculated by the equation: L_{AE} (limit) = 82 + 3.0 [$\log_{10}$ (MTOW/1737)/$\log_{10}$(2)] dB, where MTOW is the maximum takeoff weight, in pounds, for which certification under this appendix is requested.

* * * * *

Issued in Washington, DC, on MAY 24 2004

Marion C. Blakey,
Administrator

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