**[4910-13]**

**DEPARTMENT OF TRANSPORTATION**

**Federal Aviation Administration**

**14 CFR Parts 21 and 36**

**Docket No. FAA-2011-0629; Amdt. Nos. 21-97; 36-29**

**RIN 2120-AJ76**

# Noise Certification Standards for Tiltrotors

**AGENCY:** Federal Aviation Administration (FAA), DOT.

**ACTION:** Final rule.

**SUMMARY:** This rule amends the regulations governing noise certification standards for issuing type and airworthiness certificates for a new civil, hybrid airplane-rotorcraft known as the tiltrotor. This noise standard establishes new noise limits and procedures as the basis to ensure consistent aviation noise reduction technology is incorporated in tiltrotors for environmental protection. It provides uniform noise certification standards for tiltrotors certificated in the United States and harmonizes the U.S. regulations with the standards of the International Civil Aviation Organization's (ICAO) Annex 16.

**DATES:** Effective [INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

**ADDRESSES:** For information on where to obtain copies of rulemaking documents and other information related to this final rule, see "How To Obtain Additional Information" in the SUPPLEMENTARY INFORMATION section of this document.

**FOR FURTHER INFORMATION CONTACT:** For technical questions concerning this final rule contact Sandy Liu, AEE-100, Office of Environment and Energy, Federal

Aviation Administration, 800 Independence Avenue, SW, Washington, DC 20591; telephone: (202) 493-4864; facsimile (202) 267-5594; email: sandy.liu@faa.gov.

For legal questions concerning this final rule contact Karen Petronis, AGC-200, Office of the Chief Counsel, International Law, Legislation, and Regulations Division, Federal Aviation Administration, 800 Independence Avenue, SW, Washington, DC 20591; telephone: (202) 267-3073; e-mail: karen.petronis@faa.gov.

**SUPPLEMENTARY INFORMATION**:

**Authority for this Rulemaking**

The FAA's authority to issue rules on aviation safety is found in Title 49 of the United States Code. Subtitle I, Section 106 describes the authority of the FAA Administrator. Subtitle VII, Aviation Programs, describes in more detail the scope of the agency's authority.

This rulemaking is promulgated under the authority described in Subtitle VII, Part A, Subpart III, Section 44715, Controlling aircraft noise and sonic boom. Under that section, the FAA is charged with prescribing regulations to measure and abate aircraft noise. This regulation is within the scope of that authority since it would establish new noise certification test procedures and noise limits for a new class of aircraft. Applicants for type certificates, changes in type design, and airworthiness certificates for tiltrotors are required to comply with these new regulations.

**Overview of Final Rule**

The standards in this final rule apply to the issuance of an original type certificate, changes to a type certificate, and the issuance of a standard airworthiness certificate for tiltrotors. This final rule creates noise certification standards that are applicable to all

tiltrotors, such as the AgustaWestland Model AW609 currently under development. These regulations incorporate the same standards as ICAO Annex 16, Volume 1, Chapter 13, Attachment F (Amendment 7) for tiltrotors, consistent with the FAA goal of harmonizing U.S. regulations with international standards.

**Background**

A new aircraft type known as a tiltrotor is currently in production after more than six decades of research and development. The aircraft uses rotating nacelles, a hybrid of propellers and helicopter rotors, to provide both lift and propulsive force. The tiltrotor is designed to function as a helicopter for takeoff and landing and as an airplane during the en-route portion of flight operations.

The most recognizable tiltrotor operating today is the V-22 Osprey used by the U.S. Marines and the U.S. Air Force. The V-22 Osprey was designed for the U.S. Department of Defense Special Operations Forces and can transport 24 fully equipped troops. The proposed civil version of the tiltrotor would carry up to nine passengers.

The tiltrotor concept was first explored for the U.S. Army in the mid-1950s as a convertiplane concept that incorporated mixed vertical and forward flight capabilities. In 1958, Bell Helicopter Textron Inc. (Bell) of Fort Worth, Texas developed the XV-3 tiltrotor for a joint research program between the U.S. Army and the U.S. Air Force. The Bell XV-3 completed a successful full conversion from vertical flight to forward cruise and demonstrated the feasibility of tiltrotor technology. Following the successful full conversion of the Bell XV-3, the U.S. Army and National Aeronautics and Space Administration awarded Bell a prototype development contract in the mid 1970s to build two Bell XV-15 tiltrotor demonstrator aircraft. These tiltrotor aircraft served as

predecessors to the V-22 Osprey to demonstrate mature tiltrotor technology and flight capabilities.

ICAO Noise Certification Standards

ICAO is the international body with responsibility for the development of International Standards and Recommended Practices pursuant to the Convention on International Civil Aviation (the Chicago Convention). Consistent with their obligations under the Chicago Convention, Contracting States agree to implement ICAO standards in their national regulations to the extent practicable. The standards for aircraft noise are contained in Annex 16, Environmental Protection, Volume 1, Aircraft Noise.

In anticipation of civil tiltrotor production, ICAO's Committee on Aviation Environmental Protection (CAEP) chartered the Tiltrotor Task Group (TRTG) in 1997 to develop noise certification guidelines for tiltrotors. The FAA participated in the TRTG and its development of the tiltrotor noise guidelines from 1997 to 2000. The ICAO tiltrotor guidelines used the same noise limits that the United States had incorporated into part 36, Appendix H for helicopter noise certification. The ICAO has included additional requirements that are unique to the design of tiltrotors.

On June 29, 2001, the TRTG's guidelines were adopted by the ICAO Council for incorporation into Annex 16, Volume 1, Chapter 13, Attachment F (Amendment 7). The ICAO guidelines became effective on October 29, 2001, with an applicability date of March 21, 2002.

Statement of the Problem

Current regulations in part 36 do not contain noise certification requirements specific to the tiltrotor and its unique flight capabilities. Since no standards for the

tiltrotor currently exist, the FAA is adding new standards to part 36, and amending part 21, § 21.93 (Classification of Changes in Type Design) to accommodate certification of the tiltrotor. In order to harmonize the U.S. regulations with the international standards, this rulemaking adopts the same noise certification standards as used in ICAO Annex 16, Volume 1, Chapter 13, Attachment F (Amendment 7) for tiltrotors.

Type Certification Activity in the United States

As the tiltrotor concept and technology proved promising with the production of the V-22 Osprey, Bell and Agusta (now AgustaWestland) established a joint business venture in September 1998 to co-develop the Bell/Agusta model BA609 civil tiltrotor.

In August 1996, Bell, the original and lead developer of the tiltrotor, applied for a U.S. type certificate for the model BA609 tiltrotor, prior to the establishment of the joint venture. The BA609 would be type certificated as a "special class" of aircraft under §§ 21.17 and 21.21, using the applicable airworthiness provisions of part 25 (Airworthiness Standards: Transport Category Airplanes) and part 29 (Airworthiness Standards: Transport Category Rotorcraft). This is the first application for this class of aircraft.

In June 2011, the contract for the joint tiltrotor program between Bell and AgustaWestland was renegotiated, with AgustaWestland assuming full ownership. The change in ownership resulted in the BA609 designation being renamed to the AW609, and on February 15, 2012, AgustaWestland applied for a type certificate from the FAA. AgustaWestland is targeting existing helicopter operators as the primary civil market for the AW609, and has stated that the AW609 could operate from existing heliports without the need for new infrastructure to accommodate the aircraft.

Summary of the NPRM

The FAA published a notice of proposed rulemaking (NPRM) on June 21, 2011 (76 FR 36001) that proposed the changes to parts 21 and 36 discussed above that would establish noise certification standards for issuing type and airworthiness certificates for the tiltrotor.

**Discussion of Public Comments**

The comment period for the NPRM closed on October 19, 2011. The FAA received one comment, from AgustaWestland. AgustaWestland stated that the proposed rule did not specify the entity that would determine the flyover configuration in Appendix K to Part 36. AgustaWestland recommended that the regulation specify that the applicant be the entity that prescribes the constant flyover aircraft configuration.

The FAA agrees the regulation needs to specify what entity prescribes the constant flyover configuration. The FAA agrees the applicant is the proper entity, and has modified the final rule to incorporate this change.

Differences Between the NPRM and the Final Rule

We are adopting this final rule for the reasons stated in the NPRM, with the following changes. First, the NPRM incorrectly included $V_{MCP}$ and $V_{MO}$ as requirements for tiltrotors. Both $V_{MCP}$ and $V_{MO}$ are voluntary reporting parameters for airspeeds at maximum continuous power and maximum operating limit for airplane mode as noted in the ICAO standards. The FAA is not requiring them in Part 36. However, the voluntary reporting of $V_{MCP}$ and $V_{MO}$ will be recommended in an accompanying Advisory Circular as supplemental information. The FAA is removing $V_{MCP}$ and $V_{MO}$ representing airplane mode from § 36.1 and Appendix K in the final rule since airplane mode is only a

voluntary and supplemental condition for noise. The harshest (maximum) noise levels are identified in helicopter mode.

Second, the labels used in the proposed Figure K.2 of Appendix K to part 36 incorrectly describe the two sideline noise measurement points as $S_{(starboard)}$ and $S_{(port)}$ instead of $S_{(sideline)}$ for both. Since the flyover condition has a symmetrical test set-up, the generic label assignment, $S_{(sideline)}$, is used to indicate that flight from either direction is allowable without a reference to right or left. The figure is adopted in this final rule with the corrected labels.

Third, the NPRM included the term "power-on" in section K6.1(f) of Appendix K to part 36. That terminology is outdated and is replaced in this final rule by the term "reference".

Fourth, the final rule adds the phrase "throughout the 10 dB-down time interval." in sections K7.5, K7.9 and K7.10 of Appendix K of part 36 to be consistent throughout the appendix.

Fifth, based on AgustaWestland's comment discussed previously, section K6.3(b) of Appendix K to part 36 specifies that the flyover configuration is to be selected by the applicant.

**Regulatory Evaluation, Regulatory Flexibility Determination, International Trade Impact Assessment, and Unfunded Mandates Assessment**

Changes to Federal regulations must undergo several economic analyses. First, Executive Order 12866 and 13563 direct each Federal agency to propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs. Second, the Regulatory Flexibility Act of 1980 (Public Law 96-354)

requires agencies to analyze the economic impact of regulatory changes on small entities. Third, the Trade Agreements Act (Public Law 96-39) 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 and, where appropriate, that they be the basis of U.S. standards. Fourth, the Unfunded Mandates Reform Act of 1995 (Public Law 104-4) 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 with base year of 1995). This portion of the preamble summarizes the FAA's analysis of the economic impacts of this final rule.

Department of Transportation Order DOT 2100.5 prescribes policies and procedures for simplification, analysis, and review of regulations. If the expected cost impact is so minimal that a proposed or final rule does not warrant a full evaluation, this order permits that a statement to that effect and the basis for it be included in the preamble if a full regulatory evaluation of the cost and benefits is not prepared. Such a determination has been made for this final rule. The reasoning for this determination follows,

This final rule:

(1) Imposes minimal incremental costs and provides benefits;

(2) Is not an economically "significant regulatory action" as defined in section 3(f) of Executive Order 12866;

(3) Is not significant as defined in DOT's Regulatory Policies and Procedures;

(4) Will not have a significant economic impact on a substantial number of small

entities;

(4) Will not have a significant effect on international trade; and

(5) Will not impose an unfunded mandate on state, local, or tribal governments, or on the private sector by exceeding the monetary threshold identified.

These analyses are summarized below.

No comments were received on the regulatory evaluation of the proposed rule. However, after the NPRM was published on June 21, 2011, there was a change in the ownership of the known civil tiltrotor program.

When the NPRM was published, the one known civil tiltrotor development program was jointly owned by the Bell and AgustaWestland helicopter companies; the project was designated the BA609. In November, 2011 AgustaWestland purchased Bell's share of the civil tiltrotor program and changed the designation of the aircraft in development to AW609. The former Bell Agusta Aerospace Company (BAAC) was renamed the AgustaWestland Tilt-Rotor Company, LLC and merged with Agusta US Incorporated to become AgustaWestland Tilt-Rotor Company Incorporated, an American company that is the applicant for a type certificate for the AW609. The new company is incorporated in Delaware and is a wholly owned subsidiary of AgustaWestland that is owned by Finmeccanica, an Italian firm.

The AgustaWestland Tilt-Rotor Company, Inc. has rented a facility at the Arlington, Texas Municipal Airport. The facility consists of approximately 99,000 square feet including a hangar/office building. The company plans to construct an adjacent office building. The facilities may be used for aircraft sales, engineering and design, flight testing, and aircraft maintenance, and other activities when approved by the airport.

Because of the change in ownership of the civil tiltrotor program that occurred after the publication of the NPRM, this regulatory evaluation has been revised to incorporate the changed circumstances.

There are currently no part 36 noise certification standards for tiltrotors in U.S. regulations. This final rule provides part 36 noise certification requirements for tiltrotors by adopting existing ICAO standards. The initial regulatory evaluation estimated that these noise requirements would be minimal cost. We asked for comments and received none. Accordingly, we affirm our determination that these requirements will be minimal cost. Providing U.S. tiltrotor noise certification standards will facilitate the startup and development of a new commercial class of aircraft, the tiltrotor, and allow for certification in the United States as exists for other aircraft designs. The tiltrotor aircraft type can then be marketed domestically and internationally. The FAA believes that this could result in substantial benefits.

The FAA used the same price/cost estimates for the NPRM and received no comments. The FAA maintained in the NPRM that this rule was minimal cost and we received no comments on that determination.

The total value of the estimated market equals the aircraft purchase price multiplied by the estimated units sold. The potential size of the tiltrotor market has been estimated using the sales projections of the previous developer, Bell/Agusta. In the next 10 years, one model of a civil tiltrotor is expected to be available, the AW609 (previously the BA609). This aircraft is currently in development.

The price of a BA609 (now the AW609) was estimated to be $10 to $14 million (aircraftcompare.com, “Bell Agusta BA609”,http://www.aircraftcompare.com/helicopter-

airplane/Bell%20Agusta%20BA609%20/279). This is an increase from the original estimate of $7 million in 2000. The price of $14 million for a BA609 was used to estimate the potential market size for tiltrotor aircraft because AgustaWestland has not announced a purchase price for the AW609.

Bell estimated that the market would result in sales of approximately 100 BA609s over 10 years, making the potential near-term tiltrotor market worth a nominal $1 billion to $1.4 billion. Table 1 shows the nominal and present value estimates of the tiltrotor market. The present value is based on a 7 percent discount rate, and a ten year production period with 10 tiltrotors being delivered each year. The present value of the tiltrotor market is estimated to be between $702,000,000 and $983,000,000.

**Table 1**

**Nominal and Present Value of Tiltrotor Market at a $14,000,000 and $10,000,000 selling price**

| Year | Units Produced | Unit Price | Total Market Value | | Unit Price | Total Market Value | |
|---|---|---|---|---|---|---|---|
| | | | Nominal | Present Value @ 7% | | Nominal | Present Value @ 7% |
| 1 | 10 | $14,000,000 | $140,000,000 | $130,844,000 | $10,000,000 | $100,000,000 | $93,460,000 |
| 2 | 10 | $14,000,000 | $140,000,000 | $122,276,000 | $10,000,000 | $100,000,000 | $87,340,000 |
| 3 | 10 | $14,000,000 | $140,000,000 | $114,282,000 | $10,000,000 | $100,000,000 | $81,630,000 |
| 4 | 10 | $14,000,000 | $140,000,000 | $106,806,000 | $10,000,000 | $100,000,000 | $76,290,000 |
| 5 | 10 | $14,000,000 | $140,000,000 | $99,820,000 | $10,000,000 | $100,000,000 | $71,300,000 |
| 6 | 10 | $14,000,000 | $140,000,000 | $93,282,000 | $10,000,000 | $100,000,000 | $66,630,000 |
| 7 | 10 | $14,000,000 | $140,000,000 | $87,178,000 | $10,000,000 | $100,000,000 | $62,270,000 |
| 8 | 10 | $14,000,000 | $140,000,000 | $81,480,000 | $10,000,000 | $100,000,000 | $58,200,000 |
| 9 | 10 | $14,000,000 | $140,000,000 | $76,146,000 | $10,000,000 | $100,000,000 | $54,390,000 |
| 10 | 10 | $14,000,000 | $140,000,000 | $71,162,000 | $10,000,000 | $100,000,000 | $50,830,000 |
| **Totals** | **100** | **N.A.** | **$1,400,000,000** | **$983,276,000** | **N.A.** | **$1,000,000,000** | **$702,340,000** |

3/29/2011

Table 2 summarizes the incremental manufacturer costs for the noise certification of a civil tiltrotor as discussed in the initial regulatory evaluation. At that time we determined that these costs were minimal. We received no comments on that determination and it is not changed in the final rule.

| Table 2 | | | |
|---|---|---|---|
| Estimated Noise Certification Costs For a Civil Tiltrotor Aircraft | | | |
| Item | Hours | Cost Per Hour | Total Cost |
| | | | |
| Acoustics Group | 2,000 | $ 125 | $ 250,000 |
| | | | |
| Flight Test Groups | 2,000 | $ 110 | $ 220,000 |
| | | | |
| Aircraft | 10 | $ 5,000 | $ 50,000 |
| | | | |
| Miscellaneous Expenses | | | $ 68,000 |
| | | | |
| Total Hours & Costs | 4,010 | N.A. | $ 588,000 |
| | | | 8/15/2012 |

Issuance of a type certificate requires compliance with the applicable noise certification requirements of part 36. Full noise certification testing is generally required for each new aircraft type and for certain voluntary changes to type design that are classified as acoustical change under § 21.93(b). The incremental costs recur only when a new type certificate is issued, or when a change to a type design results after an acoustical change is made.

Noise certification costs consist of four major items: Acoustics; Flight Test; Aircraft; and Miscellaneous. For tiltrotors noise certification, as for any aircraft certification, the noise demonstration flight testing and reporting is the largest incremental cost of the noise certification.

To meet the regulatory requirements for noise control, acoustical measurements are used to quantify the characteristic noise levels of the aircraft. Almost half the noise certification expense ($250,000) is invested in the acoustics group equipment and

analysis. This cost includes overall noise test planning and coordination, noise test site preparation and measurement set-up.

The second highest noise certification expense involves the flight test support ($220,000). These are the expenses for configuring and preparing the aircraft to execute the required noise flight test procedures.

The last two noise certification expense groups are aircraft and miscellaneous expenses. The aircraft expense ($50,000) involves costs associated with aircraft flight time, fuel, and flight crew support. Most other general expenses of test support are miscellaneous costs ($68,000).

The cost estimates for noise certification were provided by Bell Helicopter Textron, the original developer of the civil tiltrotor. The cost of noise certification for the tiltrotor is comparable to that for a large helicopter (over 7,000 pounds). As shown in Table 2, the estimated total incremental cost of a single noise certification is $588,000. As the $588,000 would be incurred in the first year, the nominal value equals the present value.

The FAA may incur costs in this certification process. However, these costs are not expected to vary significantly from the agency's current costs to noise certificate any other new aircraft type.

Based on the above analyses, and consistent with the determinations made in the NPRM, this final rule is considered to be a minimal cost rule.

Since the tiltrotor industry is still developing, the costs and benefits discussed are based on the single existing civil tiltrotor program. This final rule establishes the noise certification requirements for a tiltrotor. While the estimated benefits and costs are based

on a single tiltrotor type, we have also determined that any future designs will benefit from the established noise certification requirements.

The present value cost of the final rule is $588,000 for the certification of one tiltrotor type, about the same as would be required for a traditional helicopter design. The FAA considered this cost to be minimal in the NPRM. The FAA received no comments on this minimal cost determination. Therefore, the FAA considers this cost to be minimal in this final regulatory evaluation.

The FAA believes that this final rule will be cost beneficial because it is minimal cost, and because it facilitates the development of tiltrotor aircraft and the commercial market for them.

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 rule and of applicable statutes, to fit regulatory and informational requirements to the scale of the businesses, 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 agency determines that it will, the agency must prepare a regulatory flexibility analysis as described in the Act.

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

When the NPRM was published, the tiltrotor was being developed by a joint venture of Bell Helicopter, an American company and AgustaWestland, an Italian firm. Because an American firm was potentially affected by the proposed rule, a Regulatory Flexibility Analysis was prepared. No comments were received on the Regulatory Flexibility Analysis which concluded there was no significant economic impact on a substantial number of small entities.

After the NPRM was published, AgustaWestland, an Italian company, bought the ownership interests of Bell Helicopter. As such, the original BAAC was renamed and merged to become AgustaWestland Tilt-Rotor Company Incorporated, a wholly owned subsidiary of AgustaWestland, an Italian company. AgustaWestland is owned by Finmeccanica, also an Italian company.

Section 601 of the RFA defines the term "small business" as follows: "the term "small business" has the same meaning as the term "small business concern" under section 3 of the Small Business Act, …"

Section 3 (a) (1) of the Small Business Act defines a small business concern as follows: "For the purposes of this Act, a small business concern, including, but not limited to enterprises that are engaged in the business of the production of food and fiber, ranching and raising of livestock, aquaculture, and all other farming and agricultural

related industries, shall be deemed to be one which is independently owned and operated and which is not dominant in its field of operation: ”

Section 3 (a) (2) of the Small Business Act discusses the establishment of size standards. The Small Business Administration (SBA) size standard for a small entity in aircraft manufacturing is 1,500 employees.

The AgustaWestland Tilt-Rotor Company Incorporated currently employs 12 people. While the number of employees of the AgustaWestland Tilt Rotor Company meets the SBA employment size standard for a small entity, the company is not a small entity as defined by the SBA because it is not independently owned and operated. The owner of the AgustaWestland Tilt-Rotor Company, Inc. is Finmeccanica, which has 75,733 employees, far exceeding the aircraft manufacturing size standard of 1,500 employees.

There are no other companies which are known to be developing or manufacturing a civil tiltrotor. Therefore, Finmeccanica (including its subsidiaries) is the dominant company involved in the development of a civilian tiltrotor. This final rule is expected to be minimal cost and there are no small entities affected. Therefore, as the acting FAA Administrator, I certify that this final rule will not have a significant economic impact on a substantial number of small tiltrotor manufacturers.

International Trade Impact Assessment

The Trade Agreements Act of 1979 (Public Law 96-39), as amended by the Uruguay Round Agreements Act (Public Law 103-465), prohibits Federal agencies from establishing standards or engaging in related activities that create unnecessary obstacles to the foreign commerce of the United States. Pursuant to these Acts, the establishment

of standards is not considered an unnecessary obstacle to the foreign commerce of the United States, so long as the standard has a legitimate domestic objective, such as the protection of safety, and does not operate in a manner that excludes imports that meet this objective. The statute also requires consideration of international standards and, where appropriate, that they be the basis for U.S. standards.

The FAA has assessed the potential effect of this final rule and determined that it will encourage international trade by adopting the international standards of ICAO as the basis for a rule for the noise certification of tiltrotors.

Unfunded Mandates Assessment

Title II of the Unfunded Mandates Reform Act of 1995 (Public Law 104-4) 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 an expenditure of $100 million or more (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". The FAA currently uses an inflation-adjusted value of $143.1 million in lieu of $100 million. This final rule does not contain such a mandate; therefore, the requirements of Title II do not apply.

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. The FAA has determined that there is no new requirement for information collection associated with this final rule.

International Compatibility

In keeping with U.S. obligations under the Convention on International Civil Aviation, it is FAA policy to conform to International Civil Aviation Organization (ICAO) Standards and Recommended Practices to the maximum extent practicable. In 2001, ICAO adopted tiltrotor noise guidelines. This regulation harmonizes U.S. noise standards with the international standards by adopting the same requirements, adapted for the U.S. regulatory format.

Environmental Analysis

FAA Order 1050.1E identifies FAA actions that are categorically excluded from preparation of an environmental assessment or environmental impact statement under the National Environmental Policy Act in the absence of extraordinary circumstances. This rule adopts internationally established noise standards for a new civil, hybrid airplane-rotorcraft known as the tiltrotor. Based on the presence of both helicopter and propeller airplane characteristics inherit in the tiltrotor, the noise standards use preexisting helicopter noise certification limits and procedures. This final rule adopts these noise limits to control the harshest (maximum) noise levels when the tiltrotor operates in its noisiest configuration – helicopter mode. In airplane mode, the tiltrotor is significantly quieter because of its low RPM design in cruise mode. The FAA finds the applicability of the noise limits adopted here as technologically and environmentally consistent for this new class of aircraft.

The FAA has determined this rulemaking action qualifies for the categorical exclusion identified in paragraph 312f of the Order and involves no extraordinary circumstances.

**Executive Order Determinations**

Executive Order 13132, Federalism

The FAA has analyzed this final rule under the principles and criteria of Executive Order 13132, Federalism. The agency determined that this action will not have a substantial direct effect on the States, or the relationship between the Federal Government and the States, or on the distribution of power and responsibilities among the various levels of government, and, therefore, does not have Federalism implications.

Executive Order 13211, Regulations that Significantly Affect Energy Supply, Distribution, or Use

The FAA analyzed this final rule under Executive Order 13211, Actions Concerning Regulations that Significantly Affect Energy Supply, Distribution, or Use (May 18, 2001). The agency has determined that it is not a "significant energy action" under Executive Order 12866 and DOT's Regulatory Policies and Procedures, and it is not likely to have a significant adverse effect on the supply, distribution, or use of energy.

**How To Obtain Additional Information**

Rulemaking Documents

An electronic copy of a rulemaking document my be obtained by using the Internet —

1. Search the Federal eRulemaking Portal (http://www.regulations.gov);
2. Visit the FAA's Regulations and Policies Web page at http://www.faa.gov/regulations_policies/ or
3. Access the Government Printing Office's Web page at http://www.gpo.gov/fdsys/.

Copies may also be obtained by sending a request (identified by notice, amendment, or docket number of this rulemaking) to the Federal Aviation Administration, Office of Rulemaking, ARM-1, 800 Independence Avenue SW., Washington, DC 20591, or by calling (202) 267-9680.

Comments Submitted to the Docket

Comments received may be viewed by going to http://www.regulations.gov and following the online instructions to search the docket number for this action. Anyone is able to search the electronic form of all comments received into any of the FAA's dockets by the name of the individual submitting the comment (or signing the comment, if submitted on behalf of an association, business, labor union, etc.).

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. A small entity with questions regarding this document, may contact its local FAA official, or the person listed under the FOR FURTHER INFORMATION CONTACT heading at the beginning of the preamble. To find out more about SBREFA on the Internet, visit http://www.faa.gov/regulations_policies/rulemaking/sbre_act/.

**List of Subjects**

**14 CFR Part 21**

Aircraft, Aviation Safety, Reporting and recordkeeping requirements.

**14 CFR Part 36**

Aircraft, Noise Control.

**The Amendment**

In consideration of the foregoing, the Federal Aviation Administration amends chapter I 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:** 42 U.S.C. 7572; 49 U.S.C 106(g), 40105, 40113, 44701-44702, 44704, 44707, 44709, 44711, 44713, 44715, 45303.

2. Amend § 21.93 by adding paragraph (b)(5) to read as follows:

**§ 21.93 Classification of changes in type design.**

* * * * *

(b) * * *

(5) Tiltrotors.

* * * * *

**PART 36 —NOISE STANDARDS: AIRCRAFT TYPE AND AIRWORTHINESS CERTIFICATION**

3. 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.

4. Amend § 36.1 as follows:

A. Add paragraph (a)(5);

B. Amend paragraph (c) by removing the phrase “or 36.11” and adding the phrase “36.11 or 36.13” in its place; and

C. Add paragraph (i)

The additions and revisions read as follows:

**§ 36.1 Applicability and definitions.**

* * * * *

(a) * * *

(5) Type certificates, changes to those certificates, and standard airworthiness certificates, for tiltrotors.

* * * * *

(i) For the purpose of showing compliance with this part for tiltrotors, the following terms have the specified meanings:

*Airplane mode* means a configuration with nacelles on the down stops (axis aligned horizontally) and rotor speed set to cruise revolutions per minute (RPM).

*Airplane mode RPM* means the lower range of rotor rotational speed in RPM defined for the airplane mode cruise flight condition.

*Fixed operation points* mean designated nacelle angle positions selected for airworthiness reference. These are default positions used to refer to normal nacelle positioning operation of the aircraft. The nacelle angle is controlled by a self-centering switch. When the nacelle angle is 0 degrees (airplane mode) and the pilot moves the nacelle switch upwards, the nacelles are programmed to automatically turn to the first default position (for example, 60 degrees) where they will stop. A second upward move

of the switch will tilt the nacelle to the second default position (for example, 75 degrees). Above the last default position, the nacelle angle can be set to any angle up to approximately 95 degrees by moving the switch in the up or down direction. The number and position of the fixed operation points may vary on different tiltrotor configurations.

*Nacelle angle* is defined as the angle between the rotor shaft centerline and the longitudinal axis of the aircraft fuselage.

*Tiltrotor* means a class of aircraft capable of vertical take-off and landing, within the powered-lift category, with rotors mounted at or near the wing tips that vary in pitch from near vertical to near horizontal configuration relative to the wing and fuselage.

*Vertical takeoff and landing (VTOL) mode* means the aircraft state or configuration having the rotors orientated with the axis of rotation in a vertical manner (i.e., nacelle angle of approximately 90 degrees) for vertical takeoff and landing operations.

$V_{CON}$ is defined as the maximum authorized speed for any nacelle angle in VTOL/Conversion mode.

*VTOL/Conversion mode* is all approved nacelle positions where the design operating rotor speed is used for hover operations.

*VTOL mode RPM* means highest range of RPM that occur for takeoff, approach, hover, and conversion conditions.

5. Add § 36.13 to subpart A to read as follows:

**§ 36.13 Acoustical change: Tiltrotor aircraft.**

The following requirements apply to tiltrotors in any category for which an acoustical change approval is applied for under § 21.93(b) of this chapter on or after [INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]:

(a) In showing compliance with Appendix K of this part, noise levels must be measured, evaluated, and calculated in accordance with the applicable procedures and conditions prescribed in Appendix K of this part.

(b) Compliance with the noise limits prescribed in section K4 (Noise Limits) of Appendix K of this part must be shown in accordance with the applicable provisions of sections K2 (Noise Evaluation Measure), K3 (Noise Measurement Reference Points) , K6 (Noise Certification Reference Procedures), and K7 (Test Procedures) of Appendix K of this part.

(c) After a change in type design, tiltrotor noise levels may not exceed the limits specified in § 36.1103.

6. Add Subpart K of part 36 to read as follows:

**Subpart K – Tiltrotors**

Sec.



**Subpart K – Tiltrotors**

**§ 36.1101 Noise measurement and evaluation.**

For tiltrotors, the noise generated must be measured and evaluated under Appendix K of this part, or under an approved equivalent procedure.

**§ 36.1103 Noise limits.**

(a) Compliance with the maximum noise levels prescribed in Appendix K of this part must be shown for a tiltrotor for which the application for the issuance of a type

certificate is made on or after [INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

(b) To demonstrate compliance with this part, noise levels may not exceed the noise limits listed in Appendix K, Section K4, Noise Limits of this part. Appendix K of this part (or an approved equivalent procedure) must also be used to evaluate and demonstrate compliance with the approved test procedures, and at the applicable noise measurement points.

7. Add Appendix K to part 36 to read as follows:

**Appendix K to Part 36 – Noise Requirements for Tiltrotors under Subpart K**

Sec.



***Section K1 General***

This appendix prescribes noise limits and procedures for measuring noise and adjusting the data to standard conditions for tiltrotors as specified in § 36.1 of this part.

***Section K2 Noise Evaluation Measure***

The noise evaluation measure is the effective perceived noise level in EPNdB, to be calculated in accordance with section A36.4 of Appendix A to this part, except

corrections for spectral irregularities must be determined using the 50 Hz sound pressure level found in section H36.201 of Appendix H to this part.

***Section K3 Noise Measurement Reference Points***

The following noise reference points must be used when demonstrating tiltrotor compliance with section K6 (Noise Certification Reference Procedures) and section K7 (Test Procedures) of this appendix:

(a) *Takeoff reference noise measurement points –*

As shown in Figure K1 below:

(1) The centerline noise measurement flight path reference point, designated A, is located on the ground vertically below the reference takeoff flight path. The measurement point is located 1,640 feet (500 m) in the horizontal direction of flight from the point Cr where transition to climbing flight is initiated, as described in section K6.2 of this appendix;

(2) Two sideline noise measurement points, designated as S(starboard) and S(port), are located on the ground perpendicular to and symmetrically stationed at 492 feet (150 m) on each side of the takeoff reference flight path. The measurement points bisect the centerline flight path reference point A.

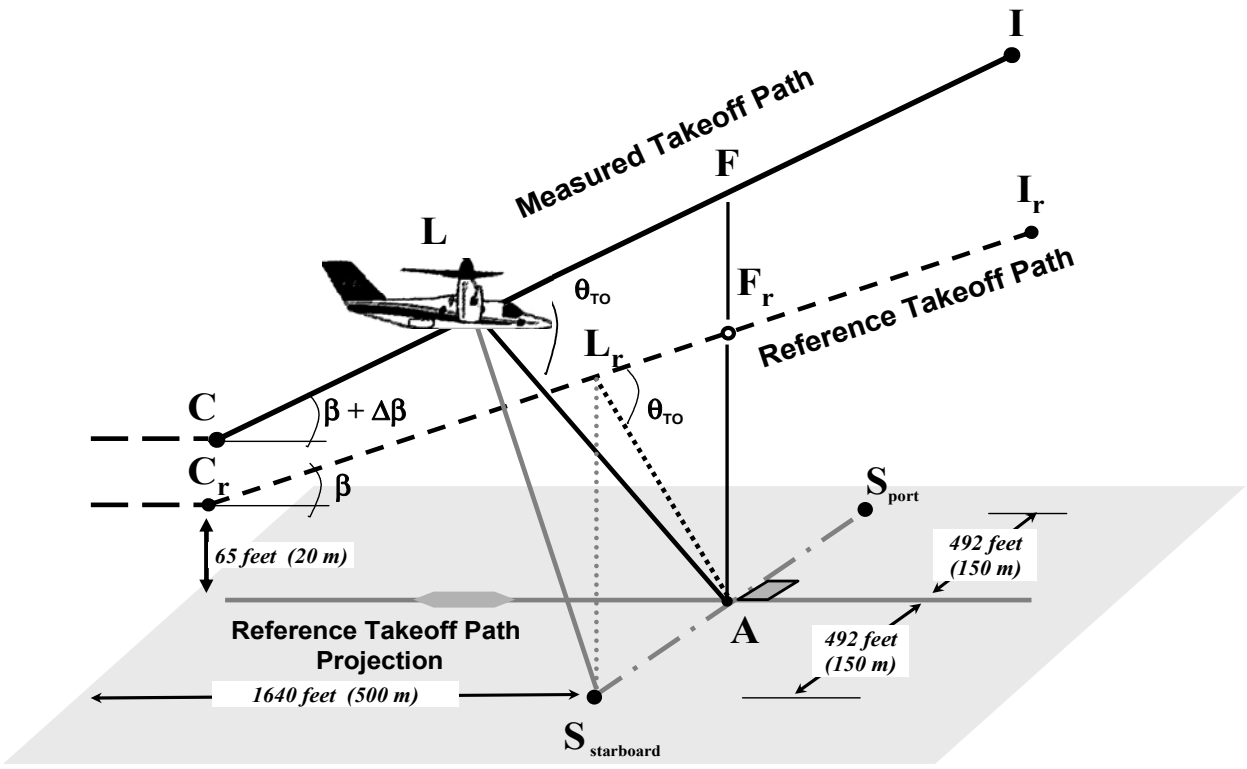


**Figure K1.**
**Comparison of Measured and Reference Takeoff Profiles**

(b) *Flyover reference noise measurement points* -

As shown in Figure K2 below:

(1) The centerline noise measurement flight path reference point, designated A, is located on the ground 492 feet (150 m) vertically below the reference flyover flight path. The measurement point is defined by the flyover reference procedure in section K6.3 of this appendix;

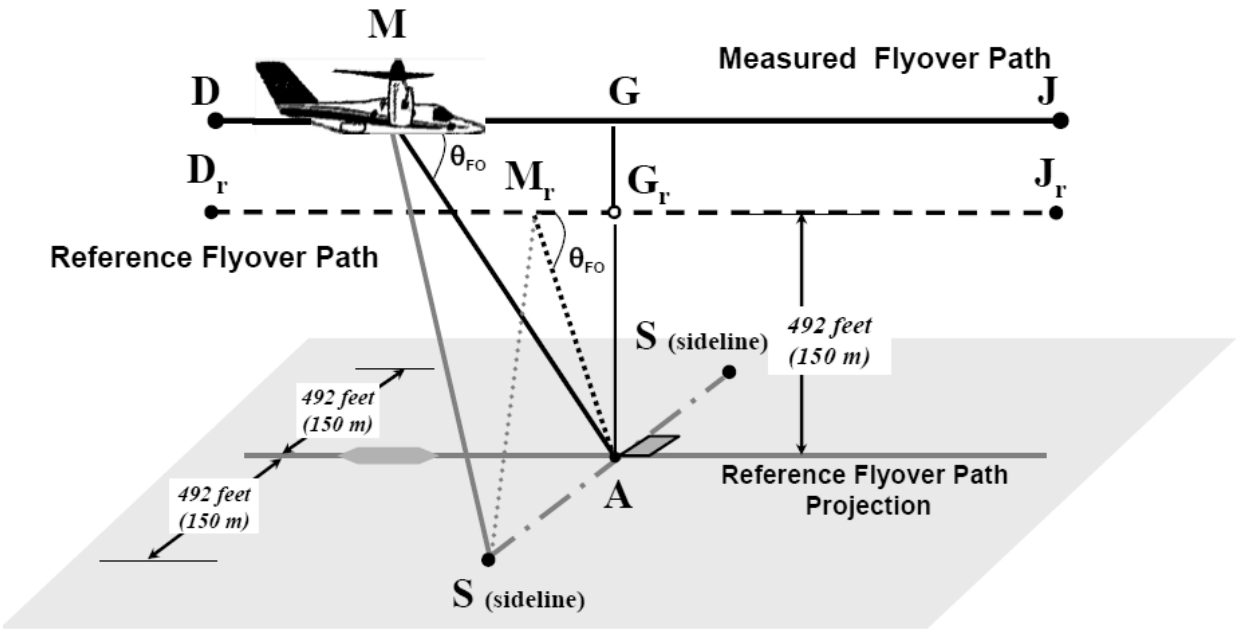


**Figure K2.**
**Comparison of Measured and Reference Flyover Profiles**

(2) Two sideline noise measurement points, designated as $S_{(sideline)}$, are located on the ground perpendicular to and symmetrically stationed at 492 feet (150 m) on each side of the flyover reference flight path. The measurement points bisect the centerline flight path reference point A.

(c) *Approach reference noise measurement points* -

As shown in Figure K3 below:

(1) The centerline noise measurement flight path reference point, designated A, is located on the ground 394 feet (120 m) vertically below the reference approach flight path. The measurement point is defined by the approach reference procedure in section K6.4 of this appendix. On level ground, the measurement point corresponds to a position 3,740 feet (1,140 m) from the intersection of the 6.0 degree approach path with the ground plane;

(2) Two sideline noise measurement points, designated as S(starboard) and S(port), are located on the ground perpendicular to and symmetrically stationed at 492 feet (150 m) on each side \of the approach reference flight path. The measurement points bisect the centerline flight path reference point A.

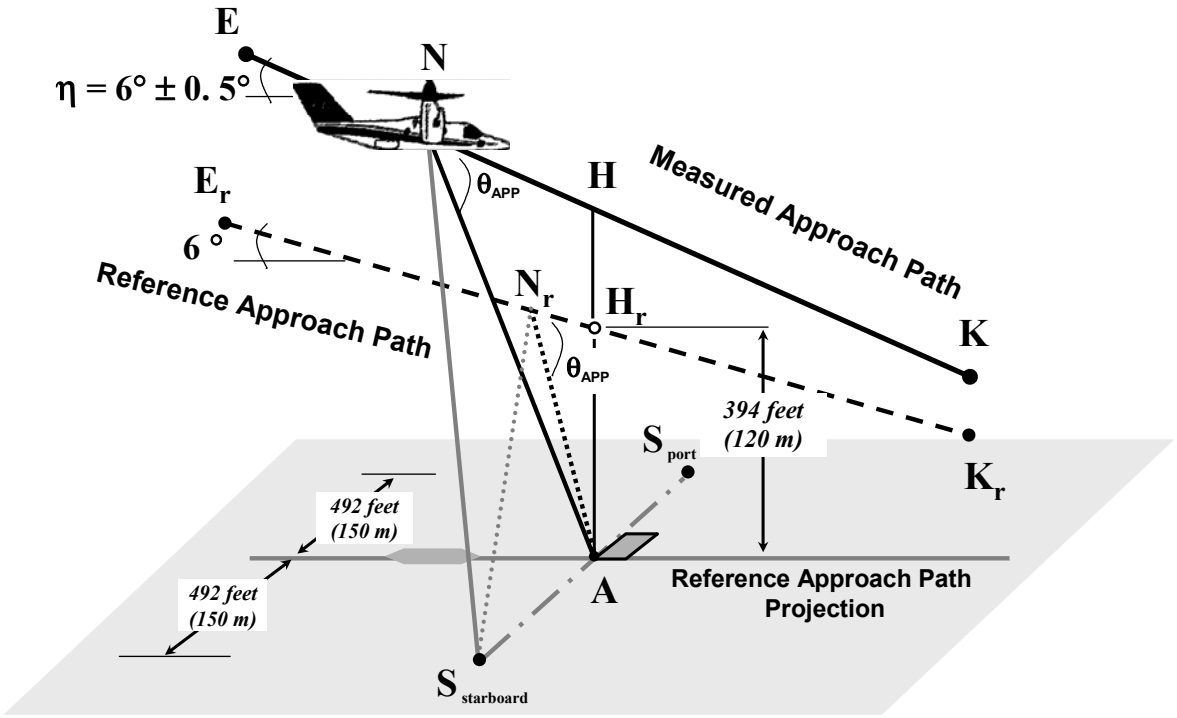


**Figure K3.**
**Comparison of Measured and Reference Approach Profiles**

### *Section K4 Noise Limits*

For a tiltrotor, the maximum noise levels, as determined in accordance with the noise evaluation in EPNdB and calculation method described in section H36.201 of Appendix H of this part, must not exceed the noise limits as follows:

(a) *At the takeoff flight path reference point*: For a tiltrotor having a maximum certificated takeoff weight (mass) of 176,370 pounds (80,000 kg) or more, in VTOL/Conversion mode, 109 EPNdB, decreasing linearly with the logarithm of the tiltrotor weight (mass) at a rate of 3.0 EPNdB per halving of weight (mass) down to 89

EPNdB, after which the limit is constant. Figure K4 illustrates the takeoff noise limit as a solid line.

(b) *At the Flyover path reference point:* For a tiltrotor having a maximum certificated takeoff weight (mass) of 176,370 pounds (80,000 kg) or more, in VTOL/Conversion mode, 108 EPNdB, decreasing linearly with the logarithm of the tiltrotor weight (mass) at a rate of 3.0 EPNdB per halving of weight (mass) down to 88 EPNdB, after which the limit is constant. Figure K4 illustrates the flyover noise limit as a dashed line.

(c) *At the approach flight path reference point:* For a tiltrotor having a maximum certificated takeoff weight (mass) of 176,370 pounds (80,000 kg) or more, in VTOL/Conversion mode, 110 EPNdB, decreasing linearly with the logarithm of the tiltrotors weight (mass) at a rate of 3.0 EPNdB per halving of weight (mass) down to 90 EPNdB, after which the limit is constant. Figure K4 illustrates the approach noise limit as a dash-dot line.

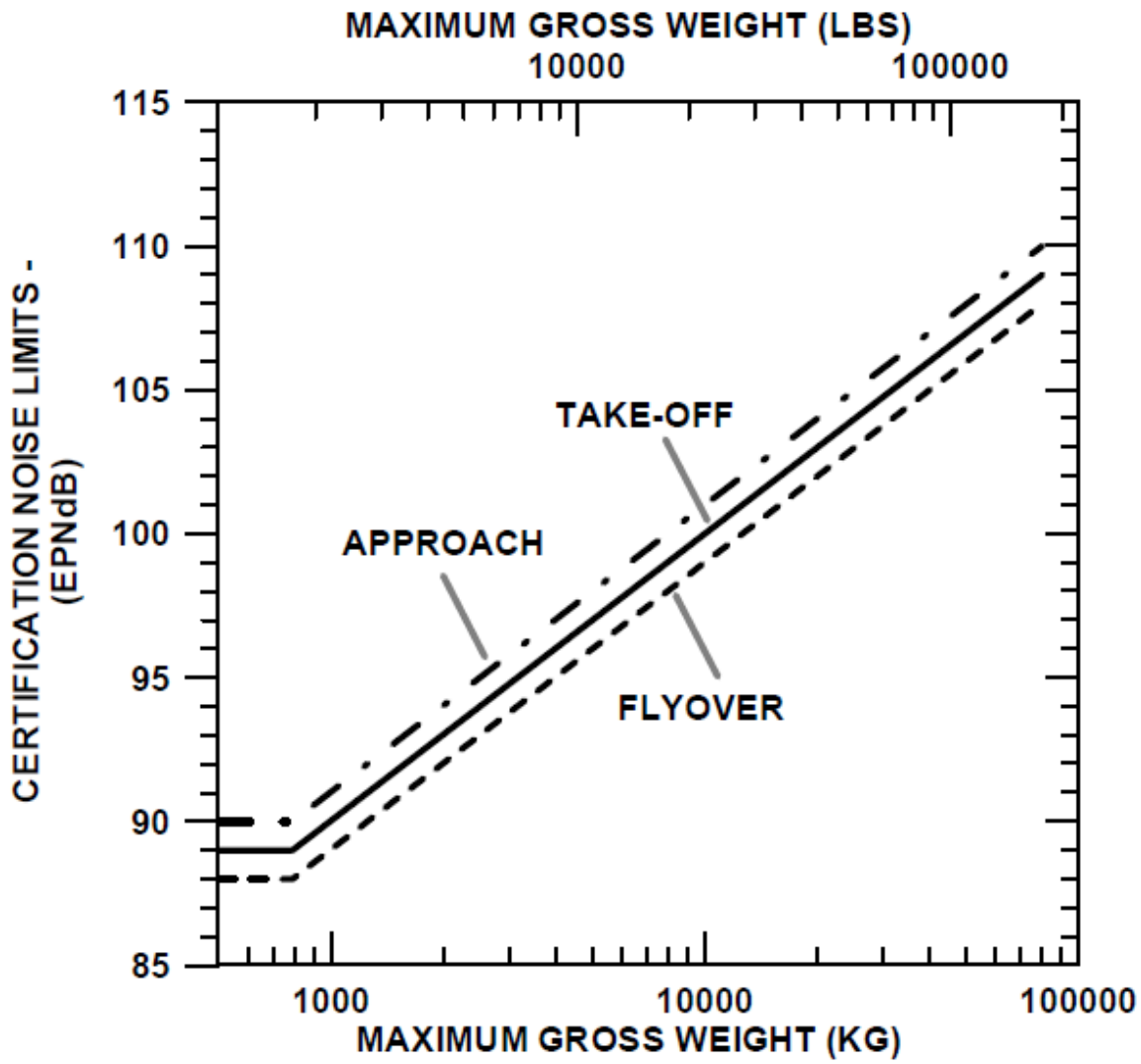


FIGURE K4.
TILTROTOR NOISE LIMITS

***Section K5 Trade-Offs***

If the noise evaluation measurement exceeds the noise limits described in K4 of this appendix at one or two measurement points:

(a) The sum of excesses must not be greater than 4 EPNdB;

(b) The excess at any single point must not be greater than 3 EPNdB; and

(c) Any excess must be offset by the remaining noise margin at the other point or points.

## *Section K6 Noise Certification Reference Procedures*

### *K6.1 General Conditions*

(a) [Reserved]

(b) [Reserved]

(c) The takeoff, flyover and approach reference procedures must be established in accordance with sections K6.2, K6.3 and K6.4 of this appendix, except as specified in section K6.1(d) of this appendix.

(d) If the design characteristics of the tiltrotor prevent test flights from being conducted in accordance with section K6.2, K6.3 or K6.4 of this appendix, the applicant must revise the test procedures and resubmit the procedures for approval.

(e) The following reference atmospheric conditions must be used to establish the reference procedures:

(1) Sea level atmospheric pressure of 2,116 pounds per square foot (1,013.25 hPa);

(2) Ambient air temperature of 77° Fahrenheit (25° Celsius, i.e. ISA + 10°C);

(3) Relative humidity of 70 percent; and

(4) Zero wind.

(f) For tests conducted in accordance with sections K6.2, K6.3, and K6.4 of this appendix, use the maximum normal operating RPM corresponding to the airworthiness limit imposed by the manufacturer. For configurations for which the rotor speed automatically links with the flight condition, use the maximum normal operating rotor speed corresponding with the reference flight condition. For configurations for which the rotor speed can change by pilot action, use the highest normal rotor speed specified in the flight manual limitation section for the reference conditions.

***K6.2 Takeoff Reference Procedure.*** The takeoff reference flight procedure is as follows:

(a) A constant takeoff configuration must be maintained, including the nacelle angle selected by the applicant;

(b) The tiltrotor power must be stabilized at the maximum takeoff power corresponding to the minimum installed engine(s) specification power available for the reference ambient conditions or gearbox torque limit, whichever is lower. The tiltrotor power must also be stabilized along a path starting from a point located 1,640 feet (500 m) before the flight path reference point, at 65 ft (20 m) above ground level;

(c) The nacelle angle and the corresponding best rate of climb speed, or the lowest approved speed for the climb after takeoff, whichever is the greater, must be maintained throughout the takeoff reference procedure;

(d) The rotor speed must be stabilized at the maximum normal operating RPM certificated for takeoff;

(e) The weight (mass) of the tiltrotors must be the maximum takeoff weight (mass) as requested for noise certification; and

(f) The reference takeoff flight profile is a straight line segment inclined from the starting point 1,640 feet (500 m) before to the center noise measurement point and 65 ft (20 m) above ground level at an angle defined by best rate of climb and the speed corresponding to the selected nacelle angle and for minimum specification engine performance.

***K6.3 Flyover Reference Procedure.*** The flyover reference flight procedure is as follows:

(a) The tiltrotor must be stabilized for level flight along the centerline flyover flight path and over the noise measurement reference point at an altitude of 492 ft (150 m) above ground level;

(b) A constant flyover configuration selected by the applicant must be maintained;

(c) The weight (mass) of the tiltrotor must be the maximum takeoff weight (mass) as requested for noise certification;

(d) In the VTOL/Conversion mode:

(1) The nacelle angle must be at the authorized fixed operation point that is closest to the shallow nacelle angle certificated for zero airspeed;

(2) The airspeed must be $0.9V_{CON;}$ and

(3) The rotor speed must be stabilized at the maximum normal operating RPM certificated for level flight.

***K6.4 Approach Reference Procedure***. The approach reference procedure is as follows:

(a) The tiltrotor must be stabilized to follow a 6.0 degree approach path;

(b) An approved airworthiness configuration in which maximum noise occurs must be maintained;

(1) An airspeed equal to the best rate of climb speed corresponding to the nacelle angle, or the lowest approved airspeed for the approach, whichever is greater, must be stabilized and maintained; and

(2) The tiltrotor power during the approach must be stabilized over the flight path reference point, and continue as if landing;

(c) The rotor speed must be stabilized at the maximum normal operating RPM certificated for approach;

(d) The constant approach configuration used in airworthiness certification tests, with the landing gear extended, must be maintained; and

(e) The weight (mass) of the tiltrotor at landing must be the maximum landing weight (mass) as requested for noise certification.

### *Section K7 Test Procedures*

***K7.1*** [Reserved]

***K7.2*** The test procedures and noise measurements must be conducted and processed to yield the noise evaluation measure designated in section K2 of this appendix.

***K7.3*** If either the test conditions or test procedures do not comply to the applicable noise certification reference conditions or procedures prescribed by this part, the applicant must apply the correction methods described in section H36.205 of Appendix H of this part to the acoustic test data measured.

***K7.4*** Adjustments for differences between test and reference flight procedures must not exceed:

(a) For takeoff: 4.0 EPNdB, of which the arithmetic sum of delta 1 and the term -7.5 log (QK/QrKr) from delta 2 must not in total exceed 2.0 EPNdB;

(b) For flyover or approach: 2.0 EPNdB.

***K7.5*** The average rotor RPM must not vary from the normal maximum operating RPM by more than +/-1.0 percent throughout the 10 dB-down time interval.

***K7.6*** The tiltrotor airspeed must not vary from the reference airspeed appropriate to the flight demonstration by more than +/- 5 kts (+/-9 km/h) throughout the 10 dB-down time interval.

***K7.7*** The number of level flyovers made with a head wind component must be equal to the number of level flyovers made with a tail wind component.

***K7.8*** The tiltrotor must operate between +/-10 degrees from the vertical or between +/-65 feet (+/-20 m) lateral deviation tolerance, whichever is greater, above the reference track and throughout the 10 dB-down time interval.

***K7.9*** The tiltrotor altitude must not vary during each flyover by more than +/-30 ft (+/-9 m) from the reference altitude throughout the 10 dB-down time interval.

***K7.10*** During the approach procedure, the tiltrotor must establish a stabilized constant speed approach and fly between approach angles of 5.5 degrees and 6.5 degrees throughout the 10 dB-down time interval.

***K7.11*** During all test procedures, the tiltrotor weight (mass) must not be less than 90 percent and not more than 105 percent of the maximum certificated weight (mass). For each of the test procedures, complete at least one test at or above this maximum certificated weight (mass).

***K7.12*** A tiltrotor capable of carrying external loads or external equipment must be noise certificated without such loads or equipment fitted

***K7.13*** The value of $V_{CON}$ used for noise certification must be included in the approved Flight Manual.

Issued in Washington, DC, on December 21, 2012.

Michael P. Huerta
Acting Administrator

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