1. The part heading, Regional Resource Centers, is revised to read as follows:

PART 305—REGIONAL RESOURCE AND FEDERAL CENTERS

2. The authority citation for Part 305 is revised to read as follows:

Authority: 20 U.S.C. 1421, unless otherwise noted.

3. Section 305.1 is revised to read as follows:

§ 305.1 What are the Regional Resource and Federal Centers?

(a) This program supports the establishment and operation of Regional Resource Centers that provide consultation, technical assistance, and training to State educational agencies, and through those State educational agencies, to local educational agencies and to other State agencies providing early intervention services. The purpose of this assistance is to aid these agencies in providing early intervention, special education, and related services to handicapped infants, toddlers, children, and youth, and their families.

(b) This program also supports the establishment and operation of a Federal Center that provides assistance to the Regional Resource Centers in the delivery of technical assistance focusing on national priorities established by the Secretary.

(Authority: 20 U.S.C. 1421)

4. Section 305.2 is revised to read as follows:

§ 305.2 Who is eligible to apply for an award under this program?

The Secretary may provide assistance under this part through a grant to, or cooperative agreement or contract with—

(a) Institutions of higher education;

(b) Private nonprofit organizations;

(c) State educational agencies;

(d) Public agencies; or

(e) Combinations of these agencies and institutions, such as combinations including one or more local educational agencies within particular regions of the United States.

(Authority: 20 U.S.C. 1421)

5. Section 305.3 is revised to read as follows:

§ 305.3 What regulations apply to this program?

(a) The following regulations apply to grants and cooperative agreements for Regional Resource Centers:

(1) The regulations in this Part 305.

(2) The Education Department General Administrative Regulations (EDGAR) at Title 34 of the Code of Federal Regulations in—

(i) Part 74 (Administration of Grants);

(ii) Part 75 (Direct Grant Programs);

(iii) Part 77 (Definitions that Apply to Department Regulations);

(iv) Part 78 (Education Appeal Board); and

(v) Part 79 (Intergovernmental Review of Department of Education Programs and Activities).

(b) The Federal Acquisition Regulation (FAR) in 48 CFR Chapter 1 and the Department of Education Acquisition Regulation (EDAR) in 48 CFR Chapter 34 apply to contracts for Regional Resource and Federal Centers.

(Authority: 20 U.S.C. 1421)

6. Section 305.10 is revised to read as follows:

§ 305.10 What kinds of services are required under this part?

Each Regional Resource Center shall—

(a) Assist State educational agencies, through services such as consultation, technical assistance, and training, to provide more effectively special education, related services, and early intervention services to handicapped infants, toddlers, children, and youth, and their families;

(b) Assist in identifying and solving persistent problems in providing quality special education, related services, and early intervention services to handicapped infants, toddlers, children, and youth, and their families;

(c) Assist in developing, identifying, and replicating successful programs and practices that will improve special education, related services, and early intervention services to handicapped infants, toddlers, children, and youth, and their families;

(d) Gather and disseminate information to all State educational agencies in the region and coordinate activities with other Regional Resource Centers and with other relevant projects conducted by the Department;

(e) Assist in the improvement of information dissemination to, and training activities for, professionals and parents of handicapped infants, toddlers, children, and youth; and

(f) Provide information to and training for agencies, institutions, and organizations regarding techniques and approaches for submitting applications for grants and cooperative agreements under this part and Parts D through G of the Act.

(Authority: 20 U.S.C. 1421)

* * * * *

7. Section 305.11 is amended by revising paragraph (f) to read as follows:

§ 305.11 What is the composition of the regions?

* * * * *

(f) *Region 6:* Oregon, Idaho, Washington, Alaska, California, Arizona, Nevada, the Republic of Palau, the Republic of the Marhsall Islands, the Federated States of Micronesia, Guam, American Samoa, Hawaii, and the Commonwealth of the Northern Mariana Islands.

(Authority: 20 U.S.C. 1421)

§ 305.12 [Removed]

8. Section 305.12 is removed.

9. The heading of Subpart E is revised to read as follows:

Subpart E—What Conditions Must Be Met by the Recipient of an Award?

10. In § 305.40, the introductory text is revised, paragraph (c) is added, and the authority citation for the section is revised to read as follows:

§ 305.40 What additional activities must each Regional Resource Center perform?

Each Regional Resource Center shall—

* * * * *

(c) Assure that the services provided are consistent with the priority needs identified by the States served by the center, and with the findings of the Secretary in monitoring reports prepared by the Secretary under section 617 of the Act.

(Authority: 20 U.S.C. 1421)

[FR Doc. 88-2325 Filed 2-4-88; 8:45 am]

BILLING CODE 4000-01-M

Federal Register

Friday
February 5, 1988

Part IV

Department of Transportation

Federal Aviation Administration

14 CFR Part 71

Proposed Establishment of an Airport Radar Service Area; Nebraska; Notice of Proposed Rulemaking

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 71

[Airspace Docket No. 88-AWA-1]

Proposed Establishment of an Airport Radar Service Area; Nebraska

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of proposed rulemaking.

SUMMARY: This notice proposes to establish an Airport Radar Service Area (ARSA) at Lincoln Municipal Airport, NE. This location is a public airport at which a nonregulatory Terminal Radar Service Area (TRSA) is currently in effect. Establishment of an ARSA would require that pilots maintain two-way radio communication with air traffic control (ATC) while in the ARSA. Implementation of ARSA procedures at the affected location would promote the efficient control of air traffic and reduce the risk of midair collision in terminal areas.

DATES: Comments must be received on or before May 6, 1988. The informal airspace meeting date is April 6, 1988.

ADDRESSES: Send comments on the proposal in triplicate to: Federal Aviation Administration, Office of the Chief Counsel, Attention: Rules Docket [AGC-204], Airspace Docket No. 88-AWA-1, 800 Independence Avenue SW., Washington, DC 20591.

The informal airspace meeting place is as follows:

Lincoln Municipal Airport, NE, ARSA.

Time: 7:00 p.m.

Location: Duncan Aviation Inc., Second Floor Meeting Room, Lincoln Municipal Airport, Lincoln, NE 68524

The official docket may be examined in the Rules Docket, weekdays, except Federal holidays, between 8:30 a.m. and 5:00 p.m. The FAA Rules Docket is located in the Office of the Chief Counsel, Room 916, 800 Independence Avenue SW., Washington, DC.

The informal docket may also be examined during normal business hours at the office of the Regional Air Traffic Division.

FOR FURTHER INFORMATION CONTACT: Joe Gill, Airspace Branch (ATO-240), Airspace-Rules and Aeronautical Information Division, Air Traffic Operations Service, Federal Aviation Administration, 800 Independence Avenue SW., Washington, DC 20591; telephone: (202) 267-9252.

SUPPLEMENTARY INFORMATION:

Comments Invited

This notice involves one location. Interested parties are invited to participate in this proposed rulemaking by submitting such written data, views, or arguments as they may desire. Comments that provide the factual basis supporting the views and suggestions presented are particularly helpful in developing reasoned regulatory decisions on the proposal. Comments are specifically invited on the overall regulatory, economic, environmental, and energy aspects of the proposal. Communications should identify the airspace docket and be submitted in triplicate to the address listed above. Commenters wishing the FAA to acknowledge receipt of their comments on this notice must submit with those comments a self-addressed, stamped postcard on which the following statement is made: "Comments to Airspace Docket No. 88-AWA-1." The postcard will be date/time stamped and returned to the commenter. All communications received before the specified closing date for comments will be considered before taking action on the proposed rule. The proposal contained in this notice may be changed in the light of comments received. All comments submitted will be available for examination in the Rules Docket both before and after the closing date for comments. A report summarizing each substantive public contact with FAA personnel concerned with this rulemaking will be filed in the docket.

Availability of NPRM's

Any person may obtain a copy of this Notice of Proposed Rulemaking (NPRM) by submitting a request to the Federal Aviation Administration, Office of Public Affairs, Attention: Public Inquiry Center, APA-230, 800 Independence Avenue SW., Washington, DC 20591, or by calling (202) 267-3484. Communications must identify the notice number of this NPRM. Persons interested in being placed on a mailing list for future NPRM's should also request a copy of Advisory Circular No. 11-2 which describes the application procedure.

Meeting Procedures

In addition to seeking written comments on this proposal, the FAA will hold an informal airspace meeting for the proposed ARSA location in order to receive additional input with respect to the proposal. The date, time, and place for this meeting is listed above. Persons who plan to attend the meeting should be aware of the following procedures to be followed:

(a) The meeting will be informal in nature and will be conducted by the designated representative of the Administrator. Each participant will be given an opportunity to make a presentation.

(b) There will be no admission fee or other charge to attend and participate. The meeting will be open to all persons on a space-available basis The FAA representative may accelerate the agenda to enable early adjournment if the progress of the meeting is more expeditious than planned.

(c) The meeting will not be recorded. A summary of the comments made at this meeting will be filed in the docket.

(d) Position papers or other handout material relating to the substance of the meeting may be accepted at the discretion of the FAA representative. Participants submitting handout materials should present an original and two copies to the presiding officer for approval before distribution. If approved by the presiding officer, there should be an adequate number of copies provided for further distribution to all participants.

(e) Statements made by FAA participants at the meeting should not be taken as expressing a final FAA position.

Agenda

Presentation of Meeting Procedures.
FAA Presentation of Proposal.
Public Presentations and Discussion.

Background

On April 22, 1982, the National Airspace Review (NAR) plan was published in the **Federal Register** (47 FR 17448). The plan encompassed a review of airspace use and procedural aspects of the ATC system. Among the main objectives of the NAR was the improvement of the ATC system by increasing efficiency and reducing complexity. In its review of terminal airspace, NAR Task Group 1-2 concluded that TRSA's should be replaced. Four types of airspace configurations were considered as replacement candidates, of which Model B, since redesignated ARSA, was the consensus recommendation.

In response, the FAA published NAR Recommendation 1-2.2.1, "Replace Terminal Radar Service Areas with Model B Airspace and Service" in Notice 83-9 (July 28, 1983; 48 FR 34286) proposing the establishment of ARSA's at the Robert Mueller Municipal Airport, Austin, TX, and the Port of Columbus International Airport, Columbus, OH. ARSA's were designated at these airports on a temporary basis by SFAR

No. 45 (October 28, 1983; 48 FR 50038) in order to provide an operational confirmation of the ARSA concept for potential application on a national basis.

Following a confirmation period of more than a year, the FAA adopted the NAR recommendation and, on February 27, 1985, issued a final rule (50 FR 9252; March 6, 1985) defining an ARSA and establishing air traffic rules for operation within such an area. Concurrently, by separate rulemaking action, ARSA's were permanently established at the Austin, TX, and Columbus, OH, airports and also at the Baltimore/Washington International Airport, Baltimore, MD, (50 FR 9250; March 6, 1985). The FAA has stated that future notices would propose ARSA's for other airports at which TRSA procedures were in effect.

Additionally, the NAR Task Group recommended that the FAA develop quantitative criteria for proposing to establish ARSA's at locations other than those which are included in the TRSA replacement program. The task group recommended that these criteria take into account, among other things, traffic mix, flow and density, airport configuration, geographical features, collision risk assessment, and ATC capabilities to provide service to users. This criteria has been developed and is being published via the FAA directives system.

The FAA has established ARSA's at 98 locations under a paced implementation plan to replace TRSA's with ARSA's. This is one of a series of notices to implement ARSA's at locations with TRSA's. This notice proposes ARSA designation at one of the locations identified as candidates for an ARSA in the preamble to Amendment No. 71-10 (50 FR 9252). Other candidate locations will be proposed in future notices published in the **Federal Register**.

The Current Situation at the Proposed ARSA Location

A TRSA is currently in effect at Lincoln Municipal Airport. A TRSA consists of the airspace surrounding a designated airport where ATC provides radar vectoring, sequencing, and separation for all aircraft operating under instrument flight rules (IFR) and for participating aircraft operating under visual flight rules (VFR). TRSA airspace and operating rules are not established by regulation, and participation by pilots operating under VFR is voluntary, although pilots are urged to participate. This level of service is known as Stage III and is provided at all locations identified as TRSA's. The NAR task group recommended the replacement of most TRSA's with ARSA's.

A number of problems with the TRSA program were identified by the task group. The task group stated that because there are different levels of service offered within the TRSA, users are not always sure of what restrictions or privileges exist, or how to operate within those restrictions. According to the task group, there is a shared feeling among users that TRSA's are often poorly defined, are generally dissimilar in dimensions, and encompass more area than is necessary or desirable. There are other users who believe that the voluntary nature of the TRSA does not adequately address the problems associated with nonparticipating aircraft operating in relative proximity to the airport and associated approach and departure courses. There is strong advocacy among user organizations that terminal radar facilities should provide all pilots the same service, in the same way, and, to the extent feasible, within standard size airspace designations.

Certain provisions of FAR 91.87 highlight potential inadequacies of the TRSA identified by the task group. For example, aircraft operating under VFR to or from a satellite airport and within the airport traffic area (ATA) of the primary airport are excluded from the two-way radio communications requirement of § 91.87. This condition is acceptable until the volume and density of traffic at the primary airport dictates further action.

Regulatory Evaluation

The FAA has conducted a Regulatory Evaluation of the proposed establishment of this additional ARSA site. The major findings of that evaluation are summarized below. The evaluation is available in the regulatory docket.

a. *Costs*

Costs which potentially could result from the establishment of additional ARSA sites fall into the following categories:

(1) Air traffic controller staffing, controller training, and facility equipment costs incurred by the FAA.

(2) Costs associated with the revision of charts, notification of the public, and pilot education.

(3) Additional operating costs for circumnavigating or flying over the ARSA.

(4) Potential delay costs resulting from operations within an ARSA.

(5) The need for some operators to purchase radio transceivers.

(6) Miscellaneous costs.

It has been the FAA's experience, however, that these potential costs do not materialize to any appreciable degree, and when they do occur, they are transitional, relatively low in magnitude, or attributable to specific implementation problems that have been experienced at a very small minority of ARSA sites. The reasons for these conclusions are presented below.

FAA expects that the additional ARSA site proposed in this notice can be implemented without requiring additional controller personnel above current authorized staffing levels, because participation in radar services at this location is already quite high, and the separation standards permitted in ARSA's will allow controllers to absorb the slight increase in participating traffic by handling all traffic much more efficiently. Further, because controller training will be conducted during normal working hours, and this facility already operates the necessary radar equipment, the FAA does not expect to incur any appreciable implementation costs. Essentially, the FAA will modify its terminal radar procedures at the proposed ARSA site in a manner that will make more efficient use of existing resources.

No additional costs are expected to be incurred because of the need to revise sectional charts to incorporate the new ARSA airspace boundaries. Changes of this nature are routinely made during charting cycles, and the planned effective dates for newly established ARSA's are scheduled to coincide with the regular 6-month chart publication intervals.

This rulemaking proceeding and process will satisfy much of the need to notify the public and educate pilots about ARSA operations. The informal public meeting being held at each location where an ARSA is being proposed provides pilots with the best opportunity to learn both how an ARSA works and how it will affect their local operations. The expenses associated with public meetings are considered costs attributable to the rulemaking process; however, any public information costs following establishment of a new ARSA are strictly attributable to the ARSA. The FAA expects to distribute a Letter to Airmen to all pilots residing within 50 miles of ARSA sites explaining the operation and configuration of the ARSA finally adopted. The FAA also has issued an Advisory Circular on ARSA's. The combined Letter to Airmen and prorated Advisory Circular costs have been estimated to be approximately $500 for each ARSA site. This cost is incurred only once upon the initial establishment of an ARSA.

Information on ARSA's following the establishment of additional sites will also be disseminated at aviation safety seminars conducted throughout the country by various district offices. These seminars are regularly provided by the FAA to discuss a variety of aviation safety issues and, therefore, will not involve additional costs strictly as a result of the ARSA program. Additionally, no significant costs are expected to be incurred as a result of the follow-on user meetings that will be held at each site following implementation of the ARSA which will allow users to provide feedback to the FAA on local ARSA operations. These meetings are being held at public or other facilities which are being provided free of charge or at nominal cost. Further, because these meetings are being conducted by local FAA facility personnel, no travel, per diem, or overtime costs will be incurred by regional or headquarters personnel.

FAA anticipates that some pilots who currently transit the terminal area without establishing radio communications or participating in radar services may choose to circumnavigate the mandatory participation airspace of an ARSA rather than participate. Some minor delay costs will be incurred by these pilots because of the additional aircraft variable operating cost and lost crew and passenger time resulting from the deviation. Other pilots may elect to overfly the ARSA, or transit below the 1,200 feet above ground level (AGL) floor between the 5- and 10-nautical-mile rings. Although this will not result in any appreciable delay, a small additional fuel burn will result from the climb portion of the altitude adjustment (which will be offset somewhat by the descent).

FAA recognizes that the potential exists for delay to develop at some locations following establishment of an ARSA. The additional traffic that the radar facilities will be handling as a result of the mandatory participation requirement may, in some instances, result in minor delays to aircraft operations. FAA does not expect such delay to be appreciable. FAA expects that the greater flexibility afforded controllers in handling traffic as a result of the separation standards allowed in an ARSA will keep delay problems to a minimum. Those that do occur will be transitional in nature, diminishing as facilities gain operating experience with ARSA's and learn how to tailor procedures and allocate resources to take fullest advantage of the efficiencies that an ARSA will permit. This has been the experience at most of the locations where ARSA's have been in effect for the longest period of time and is the recurring trend at the locations that have been more recently designated.

The FAA does not expect that any operator will find it necessary to install radio transceivers as a result of establishing the ARSA proposed in this notice. Aircraft operating to and from primary airports already are required to have two-way radio communications capability because of existing airport traffic areas and, therefore, will not incur any additional costs as a result of the proposed ARSA. Further, the FAA has made an effort to minimize these potential costs throughout the ARSA program by providing airspace exclusions, or cutouts, for satellite airports located within 5 nautical miles of the ARSA center where the ARSA would otherwise have extended down to the surface. Procedural agreements between the local ATC facility and the affected airports have also been used to avoid radio installation costs.

At some proposed ARSA locations, special situations might exist where establishment of an ARSA could impose certain costs on users of that airspace. However, exclusions, cutouts, and special procedures have been used extensively throughout the ARSA program to alleviate adverse impacts on local fixed base and airport operators. Similarly, the FAA has eliminated potential adverse impacts on existing flight training practice areas, as well as soaring, ballooning, parachuting, ultralight and banner towing activities, by developing special procedures to accommodate these activities through local agreements between ATC facilities and the affected organizations. For these reasons, the FAA does not expect that any such adverse impact will occur at the candidate ARSA site proposed in this notice.

b. Benefits

Much of the benefit that will result from ARSA's is nonquantifiable and is attributable to simplification and standardization of ARSA configurations and procedures. Further, once experience is gained in ARSA operations, the flexibility allowed air traffic controllers in handling traffic within an ARSA will enable them to move traffic with both efficiency and increased safety.

Some of the benefits of the ARSA cannot be specifically attributed to individual candidate airports, but rather will result from the overall improvements in terminal area ATC procedures realized as ARSA's are implemented throughout the country. ARSA's have the potential of reducing both near and actual midair collisions at the airports where they are established. Based upon the experience at the Austin and Columbus ARSA confirmation sites, FAA estimates that near midair collisions may be reduced by approximately 35 to 40 percent. Further, FAA estimates that implementation of the ARSA program nationally may prevent approximately one midair collision every 1 to 2 years throughout the United States. The quantifiable benefits of preventing a midair collision can range from less than $100,000, resulting from the prevention of a minor nonfatal accident between general aviation aircraft, to $300 million or more, resulting from the prevention of a midair collision involving a large air carrier aircraft and numerous fatalities. Establishment of an ARSA at the site proposed in this notice will contribute to these improvements in safety.

c. Comparison of Costs and Benefits

A direct comparison of the costs and benefits of this proposal is difficult for a number of reasons. Many of the benefits of the rule are nonquantifiable, and it is difficult to specifically attribute the standardization benefits, as well as the safety benefits, to individual candidate ARSA sites.

FAA expects that any adjustment problems that may be experienced at the ARSA location proposed in this notice will only be temporary, and that once established, the ARSA will result in efficient terminal area operations. This has been the experience at the vast majority of ARSA sites that have already been implemented. In addition, establishment of the proposed ARSA site will contribute to a reduction in near and actual midair collisions. For these reasons, FAA expects that establishment of the ARSA site proposed in this notice will produce long term, ongoing benefits that will far exceed their costs, which are essentially transitional in nature.

International Trade Impact Analysis

This proposed regulation will only affect terminal airspace operating procedures at selected airports within the United States. As such, it will have no effect on the sale of foreign aviation products or services in the United States, nor will it affect the sale of United States aviation products or services in foreign countries.

Regulatory Flexibility Determination

The Regulatory Flexibility Act of 1980 (RFA) was enacted by Congress to ensure that small entities are not unnecessarily and disproportionately

burdened by government regulations. Small entities are independently owned and operated small businesses and small not-for-profit organizations. The RFA requires agencies to review rules that may have a significant economic impact on a substantial number of small entities.

The small entities that potentially could be affected by implementation of the ARSA program include the fixed-base operators, flight schools, agricultural operators and other small aviation businesses located at satellite airports within 5 nautical miles of the ARSA center. If the mandatory participation requirement were to extend down to the surface at these airports, where under current regulations participation in radar services and radio communication with ATC is voluntary, operations at these airports inside the core might be altered, and some business could be lost to airports outside of the ARSA core. FAA has proposed to exclude many satellite airports located within 5 nautical miles of the primary airport at candidate ARSA sites to avoid adversely impacting their operations and to simplify coordinating ATC responsibilities between the primary and satellite airports. In some cases, the same purposes will be achieved through Letters of Agreement between ATC and the affected airports that establish special procedures for operating to and from these airports. In this manner, FAA expects to eliminate any adverse impact on the operations of small satellite airports that potentially could result from the ARSA program. Similarly, FAA expects to eliminate potentially adverse impacts on existing flight training practice areas, as well as soaring, ballooning, parachuting, ultralight, and banner towing activities, by developing special procedures that will accommodate these activities through local agreements between ATC facilities and the affected organizations. FAA has utilized such arrangements extensively in implementing the ARSA's that have been established to date.

Further, because the FAA expects that any delay problems that may initially develop following implementation of an ARSA will be transitory, and because the airports that will be affected by the ARSA program represent only a small proportion of all the public use airports in operation within the United States, small entities of any type that use aircraft in the course of their business will not be adversely impacted.

For these reasons, the FAA certifies that the proposed regulation, if adopted, will not result in a significant economic impact on a substantial number of small entities, and a regulatory flexibility analysis is not required under the terms of the RFA.

The Proposal

The FAA is considering an amendment to § 71.501 of Part 71 of the Federal Aviation Regulations (14 CFR Part 71) to establish an ARSA at Lincoln Municipal Airport, NE. The above location is a public airport at which a nonregulatory TRSA is currently in effect. The proposed location is depicted on the chart to this notice.

The FAA has published a final rule (50 FR 9252; March 6, 1985) which defines ARSA and prescribes operating rules for aircraft, ultralight vehicles, and parachute jump operations in airspace designated as an ARSA. The final rule provides in part that any aircraft arriving at any airport in an ARSA or flying through an ARSA, prior to entering the ARSA must: (1) Establish two-way radio communications with the ATC facility having jurisdiction over the area, and (2) while in the ARSA, maintain two-way radio communications with that ATC facility. For aircraft departing from the primary airport within the ARSA, two-way radio communications must be maintained with the ATC facility having jurisdiction over the area. For aircraft departing a satellite airport within the ARSA, two-way radio communications must be established as soon as practicable after takeoff with the ATC facility having jurisdiction over the area, and thereafter maintained while operating within the ARSA.

All aircraft operating within an ARSA are required to comply with all ATC clearances and instructions and any FAA arrival or departure traffic pattern for the airport of intended operation. However, the rule permits ATC to authorize appropriate deviations to any of the operating requirements of the rule when safety considerations justify the deviation or more efficient utilization of the airspace can be attained. Ultralight vehicle operations and parachute jumps in an ARSA may only be conducted under the terms of an ATC authorization.

The FAA adopted the NAR task group recommendation that each ARSA be of the same airspace configuration insofar as practicable. The standard ARSA consists of airspace within 5 nautical miles of the primary airport extending from the surface to an altitude of 4,000 feet above that airport's elevation, and that airspace between 5 and 10 nautical miles from that primary airport from 1,200 feet above the surface to an altitude of 4,000 feet above that airport's elevation. Proposed deviation from the standard has been necessary at some airports due to adjacent regulatory airspace, international boundaries, topography, or unusual operational requirements.

Definitions, operating requirements, and specific airspace designations applicable to ARSA may be found in 14 CFR Part 71, § 71.14 and § 71.501, and Part 91, § 91.1 and § 91.88.

The FAA has determined that this proposed regulation is not a "significant rule" under DOT Regulatory Policies and Procedures (44 FR 11034; February 26, 1979). Further, for the reasons discussed under "Regulatory Evaluation," the FAA has determined that this proposed regulation is not a "major rule" under Executive Order 12291.

List of Subjects in 14 CFR Part 71

Aviation safety, Airport radar service areas.

The Proposed Amendment

Accordingly, pursuant to the authority delegated to me, the Federal Aviation Administration proposes to amend Part 71 of the Federal Aviation Regulations (14 CFR Part 71) as follows:

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

1. The authority citation for Part 71 continues to read as follows:

Authority: 49 U.S.C. 1348(a), 1354(a), 1510; Executive Order 10854; 49 U.S.C. 106(g) (Revised Pub. L. 97–449, January 12, 1983); 14 CFR 11.69.

2. Section 71.501 is amended as follows:

Lincoln Municipal Airport, NE [Added]

That airspace extending upward from the surface to and including 5,200 feet MSL within a 5-mile radius of the Lincoln Municipal Airport (lat. 40 51'03"N., long. 96'45'32"W.) and that airspace extending upward from 2,700 feet MSL to 5,200 feet MSL within a 10-mile radius of the Lincoln Municipal Airport.

Issued in Washington, DC, on February 1, 1988.

Shelomo Wugalter,

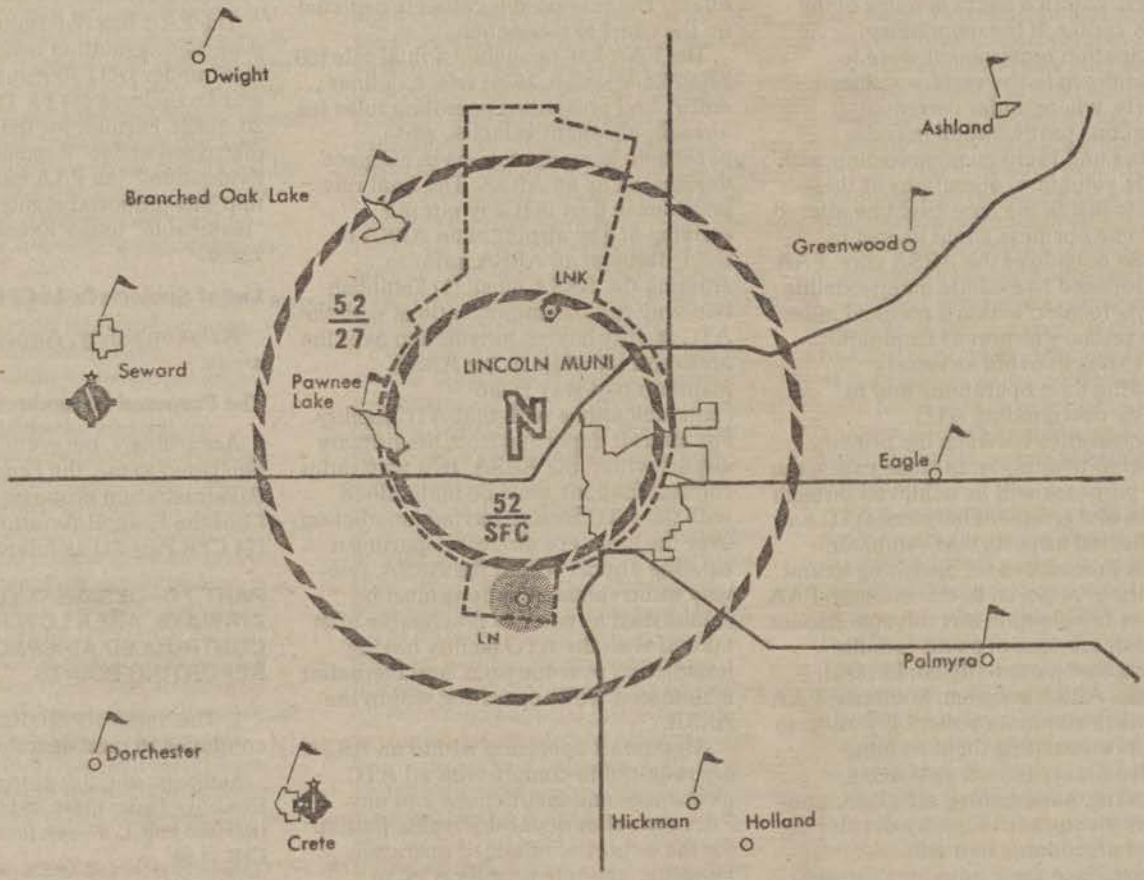
Acting Manager, Airspace-Rules and Aeronautical Information Division.

BILLING CODE 4910-13-M

AIRPORT RADAR SERVICE AREA

(NOT TO BE USED FOR NAVIGATION)

LINCOLN, NEBRASKA
LINCOLN MUNI AIRPORT
FIELD ELEV. 1214' MSL



LEGEND

VFR CHECK POINT

ARSA

ALTITUDES ARE MSL
BEARINGS ARE MAGNETIC

Prepared by the
FEDERAL AVIATION ADMINISTRATION
Cartographic Standards Section
ATO-259

[FR Doc. 88-2372 Filed 2-4-88 8:45 am]
BILLING CODE 4910-13-C

Federal Register

Friday
February 5, 1988

Part V

Department of Transportation

Federal Aviation Administration

14 CFR Parts 21 and 36

Noise Standards for Helicopters in the Normal, Transport, and Restricted Categories; Final Rule

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Parts 21 and 36

[Docket No. 24929; Amdt. Nos. 21-61 and 36-14]

Final Rule for Noise Standards for Helicopters in the Normal, Transport and Restricted Categories

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

ACTION: Final rule.

SUMMARY: This final rule adds to the Federal Aviation Regulations noise certification standards applicable to helicopters. This rule applies to civil helicopters in the normal, transport, and restricted categories and provides noise level limits and test procedures for the issuance of original and amended type certificates. The rule prohibits changes in type design of helicopters that may increase noise levels beyond certain limits. This rule does not limit further manufacturing of existing helicopter types. This rule provides for commonality between U.S. standards and those adopted by the International Civil Aviation Organization (ICAO). In addition, the rule contains the technical noise measurement and procedures for conducting and evaluating helicopter noise tests. This rule is necessary to provide current and future relief and protection of the public health and welfare from helicopter noise.

DATES: Effective date of this amendment is February 5, 1988.

FOR FURTHER INFORMATION CONTACT: Mr. Steven R. Albersheim, Noise Policy and Regulatory Branch (AEE-110), Noise Abatement Division, Office of Environment and Energy, Federal Aviation Administration, 800 Independence Avenue SW., Washington, DC 20591; telephone (202) 267-3553.

SUPPLEMENTARY INFORMATION: The purpose of this revision is to amend portions of the Federal Aviation Regulations (14 CFR Part 36) and amend references to specific rules of Part 36 in other parts (14 CFR Parts 21 and 25). This amendment is based on Notice No. 86-3 (51 FR 7878; March 6, 1986; Docket No. 24929) in which comments were invited. All comments received were fully considered in the issuance of this Final Rule.

Synopsis of the Proposal

Part 36 of the Federal Aviation Regulations (14 CFR Part 36) contains noise standards for aircraft type and airworthiness certification. As the Part is currently organized, Subparts B and C and Appendices A, B, and C apply to transport category, large airplanes and subsonic turbojet powered airplanes regardless of type certification category. Appendix F contains the provisions applicable to propeller-driven small airplanes. This amendment prescribes noise levels and test procedures for civil helicopters certificated in the normal, transport, and restricted categories; included are rules governing the issuance of original and amended type certificates for helicopters for which application is made on or after the adoption date of this amendment. The rule prohibits certain growth, or other design changes, if the changes are likely to result in noise levels above prescribed limits. The rule prescribes test conditions and procedures for conducting helicopter noise tests to demonstrate compliance with the prescribed noise levels, including the technical noise measurement and evaluation specifications, employing Effective Perceived Noise Level (EPNL) as the evaluation unit. The helicopter noise standards have the following effects:

A. Certification Procedures Provisions

FAR Part 21, as amended, prescribes the procedural requirements for noise certification of civil helicopters certificated in the normal, transport, and restricted categories. These amendments apply to issuance of new type certificates in the normal, transport, or restricted categories for which application was made on or after the publication date of Notice 86-3. The effect of these provisions is to prohibit issuance of the affected certificates after the effective date of the amendments for helicopters which have not been shown to comply with the applicable noise requirements of Part 36. Thus, newly type certificated helicopters (except those for which application was made before the publication date of Notice 86-3) are required to comply with Part 36 noise standards. Further, the "acoustical change" provisions prescribe requirements that must be met to obtain approval of certain changes in type design of helicopters that may increase noise levels.

Appropriate references to Part 36 acoustical change requirements are contained in Part 21. The acoustical change rules for helicopters apply to any type design change, including operational limitations, that the Administrator determines may increase noise levels of that helicopter, such as changes in rotor size or trim, rpm, number of blades, weight or power. Under this amendment to Part 36, test procedures, conditions, and noise limits for acoustical changes are now prescribed.

B. Noise Standard Provisions

FAR Part 36 is amended to prescribe noise standards for civil helicopters certificated in the normal, transport, and restricted categories. These provisions are similar to those currently applicable to other aircraft under Part 36 and are summarized as follows:

1. General

The general provisions of Part 36, Subpart A, are amended to provide applicability, definitional, and acoustical change provisions covering civil helicopter noise certification. For example, the work "aircraft" is substituted for "airplane" in those provisions where the applicability simply would be expanded to include helicopters. Under this proposal, definitions identify two "stages" or levels of helicopter noise, "Stage 1" and "Stage 2". Stage 2 helicopters are those which have been shown to comply with the State 2 noise levels. Stage 1 helicopters are those which have not been shown to comply with Stage 2 levels.

A new section is added to prescribe noise requirements for those changes in type design defined as "acoustical changes" under FAR Part 21. Those provisions apply to acoustical change approvals applied for on and after the publication date of Notice 86-3. Specifically, no increase in any noise level (takeoff, flyover, or approach) is allowed after a change in the type design of a Stage 1 helicopter. For acoustical changes of Stage 1 helicopters, the tradeoff provisions can not be used to increase any Stage 1 notice level. A Stage 2 helicopter before a change in type design may not be a Stage 1 helicopter after the design change. It should be noted that the ICAO Annex 16 accoustical change standards applicable to Stage 1 helicopters are more stringent than those proposed herein that all helicopters must meet the complete Stage 2 limits after such a change.

The helicopter noise standards apply to all helicopters, as defined under FAR Part 1, except those configurations designated *exclusively* for agricultural operations, the dispensing of fire fighting materials, or the transport of external loads. This exception is similar to the one for small propeller-driven airplanes, but is especially important for helicopters since nearly every type has provisions for at least occasionally carrying external loads. Such loads

would make it extremely difficult to meet either the weight or performance requirements; thus, the noise standards only apply to internal load configurations. On the other hand, an exclusion of all helicopters with external load capability would defeat the entire purpose of the regulation. It should be noted that these standards are applicable to type certification actions for which applications are received on or after the publication date of Notice 86-3.

2. Manuals, Markings, and Placards

The Part 36 provisions regarding requirements for operating limitations in manuals, marking, and placards under current Subpart G is redesignated as Subpart O and amended to extend their applicability by including approved Rotorcraft Flight Manuals, manual materials, or placards, as appropriate.

3. Helicopter Noise Rule

A new Subpart H to Part 36 prescribes the basic requirements for demonstrating compliance with the helicopter noise rules. The technical standards, conditions, and procedures for conducting noise tests and the helicopter noise limits are presented in the Appendix H.

4. Noise Measurement and Evaluation

The new Subpart H to Part 36 is a stand-alone document containing, among other things, the technical specifications for conducting and evaluating helicopter noise tests. With exceptions necessary to account for the unique operating characteristics of helicopters, the rule applies the specifications currently applicable to tests of transport category large airplanes and turbojet-powered airplanes under Appendices A and B of Part 36 (as amended by FAR Amendment 36-9; 43 FR 873, March 2, 1978, and as proposed in Notice 85-2, 50 FR 4172, January 29, 1985).

Highlights of the differences for helicopter noise test under Appendix H and the requirements of Appendices A and B are summarized as follows:

a. Three noise test series are used: takeoff, flyover, and approach. Simultaneous noise measurements are made for each test series at a measuring station under the flight track and at two sideline measuring stations with one on each side of the flight track.

b. Helicopter height and lateral position from the noise measuring station are measured relative to the referenced flight path.

c. The approach angle for the helicopter approach noise test is 6°(±0.5°) rather than the 3.0°±0.5° used for fixed wing aircraft.

d. Symbols and units appropriate to helicopter noise certification have been substituted for fixed wing aircraft noise symbols in § A36.7 "Flight Profile Identification Positions" and "Distance-Unit-Meaning" descriptors used in Part 36.

5. Noise Levels

The new Appendix H to Part 36 contains helicopter noise levels for which compliance must be shown by actual flight tests. These levels include:

(1) "Stage 1" and "Stage 2" noise limits for each test series which are related to the maximum certificated takeoff weight of the helicopter;

(2) Tradeoff provisions which govern limited "exceedances" of noise levels for one or two tests series when such exceedances are offset by reductions in the noise levels of the other test series; and

(3) Separate test conditions for each of the three noise test series including airspeed, altitude, and operational profile over the noise measuring station, power, and helicopter position relative to the flight-track noise measuring station.

"Stage 1" noise limits include prohibition of noise level increases prescribed for "acoustical changes" of those helicopters which cannot achieve Stage 2 noise limits. These limits are prescribed separately for the takeoff, flyover, and approach tests series. Depending upon maximum certificated weights of the helicopter, maximum allowable noise levels are between 88 and 108 EPNdB for flyover, 90 and 100 EPNdB for approaches and 89 and 109 EPNdB for takeoff. The highest noise limit applies to maximum weights of 176,370 pounds or more. The noise limit is then reduced by 3.01 EPNdB for each halving of the maximum weight down to a maximum weight of 1,764 pounds.

Tradeoffs of any "exceedances" are limited to a sum not greater than 4 EPNdB with no single exceedances greater than 3 EPNdB; this is consistent with the ICAO standard. (For turbojet powered airplanes, the numbers are 3 and 2 EPNdB respectively.) The exceedances must be completely offset by noise levels below those required at the other two points.

The noise level limits apply to helicopters of all weights, just as the noise level limits for other categories of aircraft are applied. However, no United States civil helicopters currently have maximum weights above 50,000 pounds.

This rule allows the first civil derivative of a military helicopter, including those operated by the U.S. Coast Guard, to be treated as though the military "parent" were a Stage 1 civil helicopter the noise levels of which are more than two dB decibels above the Stage 2 noise level limit. This has the effect of removing noise data requirement from the parent aircraft. Among the reasons for instituting this area: (1) lack of availability of noise level data for military aircraft and; (2) the costs associated with performing test on both versions.

6. Applicability to current production types

As noted earlier, the rule is not applicable to helicopter types currently in production as long as an "acoustical change" is not made that may increase noise levels.

Regulatory History

On December 28, 1973, the FAA published an Advanced Notice of Proposed Rulemaking (ANPRM) (Notice No. 73-32; 38 FR 35487) in which it announced that it was considering proposing noise standards for aircraft that were expected to be developed for efficient short stage length operations. It was anticipated that such a class of aircraft, referred to as "short-haul", would include aircraft having short, reduced, vertical or near vertical takeoff and landing capabilities. Since the noise technologies appropriate to those aircraft as a separate class required further study, original FAR Part 36 in 1969 did not prescribe separate rules for those aircraft; some, such as helicopters, were not covered by any regulation. Notice No. 73-32 (ANPRM) was issued as part of an additional study to invite early public participation in the identification and selection of a course, or alternative courses, of action to develop noise standards which would provide additional relief and protection to the public health and welfare from aircraft noise. On July 9, 1979, a Notice of Proposed Rulemaking (NPRM) Notice No. 79-13; (44 FR 42410) was published by the FAA. This notice proposed helicopter noise certification standards and limits on further production of older, noisier helicopter types. The procedures proposed for noise testing in NPRM 79-13 were similar, although not identical, to those proposed in Notice 86-3; however, the proposed noise level limits were significantly more stringent. Information submitted to the Docket indicated that the economic impact on the industry of limiting future production of existing helicopter types might be several hundred million dollars, due to the general unavailability of the noise abatement technology needed to meet

the specified noise levels. After careful consideration of the economic impacts of the proposed rule and of the Docket comments on the effects of those impacts, Notice No. 79–13 was withdrawn (December 17, 1981; 46 FR 61486). At the time of withdrawal, the FAA stated that the action neither precluded consideration of similar proposals in the future nor committed the agency to any further or future course of action on this subject.

During the time since Notice No. 79–13 was withdrawn, the FAA has continued to study issues surrounding noise level certification of helicopters. One of such issue is the ICAO rule, contained in Annex 16, Chapter 8. The United States has been an active participant in modifications to that rule, including raising the allowable noise levels, with the aim of better balancing costs and environmental benefits.

As noted before the FAA has been studying issues surrounding noise level certification of helicopters since 1973. On March 6, 1986, a Notice of Proposed Rulemaking (NPRM) [Notice No. 86–3, 51 FR 7878] was published by the FAA, based on the comments and issues raised during this period. In addition, the NPRM provided for a commonality between U.S. standards and those adopted by ICAO. This rule revises portions of FAR 14 CFR Part 36 and amends references to Part 36 in other parts (14 CFR Part 21 and 25) with the purpose of better balancing the economic costs and the environmental benefits.

Aircraft Noise Rules

Public Laws 90–411 and 92–574 were enacted to provide the statutory basis, under the Federal Aviation Act of 1958 (the Act), for relief and protection of the public health and welfare from noise and sonic boom from civil aircraft. Under the Act, the Administrator of the Federal Aviation Administration, after consultation with the Secretary of Transportation and the Administrator of the Environmental Protection Agency, is responsible for the adoption and amendment of rules which prescribe the necessary standards and regulations. On November 3, 1969, the Administrator adopted FAR Part 36 entitled "Noise Standards: Aircraft Type Certification" (34 FR 18355; November 18, 1969). That regulation initiated the FAA noise abatement regulatory program under the new statutory authority by prescribing noise type certification standards for subsonic turbojet powered airplanes regardless of category. Part 36 also prescribed the technical specifications for illustrating compliance with the noise level limits.

In promulgating proposals and amendments under the authority of § 611 of the Act, factors which the FAA must consider include the following:

1. Available data relating to aircraft noise, including results of research, development, testing, and related evaluation activities.
2. The appropriate views and position of other Federal, state and interstate agencies.
3. Whether the proposed regulations are consistent with safety in air commerce and air transportation and the public interest.
4. Whether proposed regulations are:
   a. Economically reasonable;
   b. Technologically practicable; and
   c. Appropriate for the particular type of aircraft, aircraft engines, appliances, or certificates to which they would apply.
5. The extent to which the proposed regulations contribute to providing protection to the public health and welfare by carrying out the purposes of § 611 of the Act. The overall environmental impacts of the regulations including environmental factors other than noise must be addressed in accordance with the National Environmental Policy Act of 1969, and implementing Federal guidelines and directives.

Need For Regulation

FAA data of the active rotorcraft fleet for 1985 shows 2,221 U.S. helicopter operators in the United States utilizing an active fleet of 6,412 helicopters. U.S. corporate/executive use of helicopters accounted for 1,391 aircraft and U.S. commercial helicopters accounted for 4,244 aircraft. The remainder of the fleet are comprised of emergency service aircraft. In 1984, there were 4,020 public use heliports and helistops in the United States. Approximately 9 percent of these heliports are rooftop facilities located in noise sensitive areas. The usage of helicopters is fully recognized in today's society.

For example, city ordinances in Chicago and Los Angeles require that buildings above a certain height be provided with rooftop emergency landing facilities for helicopters because modern fire-fighting apparatus cannot reach above eight floors. As other municipal governments recognize the need to provide increased protection for high-rise inhabitants, the number of heliports for both routine and emergency uses may increase significantly.

The growth of the civil helicopter fleet caused by the increased and more diversified use of helicopters, has intensified the demand for additional heliports. However, environmental concerns are imposing restrictions on heliport operations at an increasing rate. Environmental pressure has also forced closing of heliports with the resultant loss of helicopter services at those locations. The FAA believes that the adoption of appropriate helicopter noise standards will help protect the public by reducing helicopter noise and thereby maintain the benefits of their services in the air transportation system.

One of the key issues in the withdrawal of Notice 79–13 was the lack of effective noise abatement technology. To develop this technology, an accelerated joint research program was set up in 1982 by the National Aeronautics and Space Administration (NASA), the FAA, and American helicopter manufacturers. This National Rotorcraft Noise Research Program is a multi-year twenty-million dollar cooperative effort under the technical guidance of NASA and has two major goals: (1) development of noise abatement technology for reducing helicopter external noise levels and (2) the development of detailed parametric noise prediction techniques. This program is expected to furnish the techological basis for helicopter noise reduction into the twenty-first century and could significantly lower the cost of applications of that technology. At the conclusion of the program, the FAA will consider the appropriateness of lowering the certification noise levels for the helicopters; however, the FAA does not consider it appropriate, in light of the considerations listed in section 611 of the Act, to delay all rulemaking on noise standards for helicopters until the cooperative research program is completed.

The FAA has evaluated the helicopter as a noise source which affects persons and property and as a result concluded that it is now appropriate to adopt helicopter noise regulations necessary to protect the public health and welfare according to section 611 of the Act. This rule achieves that objective by preventing further escalation of helicopter noise levels and by laying the regulatory foundation for assuring that future helicopter types and eventually all newly produced helicopters of older type designs comply with realistic noise standards. The FAA has determined that sufficient noise control technology exists to meet the considerations of section 611(d) of the Act.

Economic aspects of this regulation are discussed in more detail in the rulemaking assessment prepared in conjunction with this rulemaking, and placed in the Docket. However, it should be noted that U.S. manufacturers of

rotorcraft are already subject to the ICAO noise certification standards for each helicopter type that they wish to export. Since exports account for approximately 40 percent of the civil sales of U.S. helicopter manufacturers and, since the standards in this rule (except for "acoustical changes" of older, State 1 aircraft) are nearly identical to those of ICAO, only minimal cost impacts are expected from this standard. Offsetting these minimal costs are savings which will accrue to American manufacturers by one-time certification in the U.S. rather than certificating in each foreign country as necessary.

Rule Structure

As part of this rulemaking, certain portions of the current Part 36 were recognized and restructed without any changes in their substance to improve their usefulness and understandability. The technical provisions of Appendices A & B, governing the measurement and evaluation of aircraft noise test data, which were referenced in Notice 86–3, were brought into Appendix H where appropriate. This was done in answer to several comments to the Docket citing confusion over the number and length of referenced sections.

Regulatory Impact Evaluation

The FAA conducted a detailed regulatory evaluation which is included in the regulatory docket and also reviews the changes to Parts 21 and 36. The FAA determined that the rule is consistent with the objectives of Executive Order 12291 and does not impose an unnecessary or unreasonable regulatory burden on the private sector or on the public.

These amendments provide benefits that outweigh the costs of compliance. Specifically, the benefits are the greater acceptability of helicopters and heliports in urban environments and the attendant increased market for helicopters and helicopter their services. Thus, the economic benefits accrue not only to the manufacturers and operators, but to the general public as well. The environmental benefits would accrue mainly to those working or residing near heliports, although some noise level improvements can be expected near helicopter flight corridors.

Costs result from increased development and certification expenses and are originally borne by the manufacturers but are expected to be passed on to helicopter operators and eventually to the public. These costs are mitigated by two factors: (1) the National Aeronautics and Space Administration has underway a joint helicopter noise reduction technology program with U.S. manufacturers and the FAA to improve the state-of-the-art and to lower the cost of application and (2) all helicopter models for export are required to comply with ICAO noise standards even if the U.S. were not to adopt the requirements contained in this rule.

Regulatory Flexibility Determination

As detailed in the evaluation, the only cost associated with the changes to FAR Part 36 will be the cost to manufacturers related to the noise certification test. However, no domestic helicopter manufacturer is considered a small entity as is currently defined. Therefore, it is certified that the rule will not have a significant economic impact on a substantial number of small entities under the criteria of the Regulatory Flexibility Act.

Environmental Analysis

Pursuant to the Department of Transportation "Policies and Procedures for Considering Environmental Impacts" (FAA Order 1050.1D), the FAA has determined that this rule does not constitute a major federal action significantly affecting the quality of the human environment. The amendment has the effect of limiting the growth of noise from new helicopter types and derivatives of existing types. This will reduce noise levels around heliports and, to some extent, under helicopter flight corridors, when compared to unconstrained growth. Little noticeable short-term general effect is expected, since it is estimated that it will take at least five years after adoption of the rule before a significant number of affected aircraft enter the nation's fleets. However, some helicopter operations and heliports are expected to be designed based upon the lower noise capabilities of newer aircraft, making site-specific improvements in the noise environment. Therefore, no environmental assessment or environmental impact statement was prepared.

Trade Impact Analysis

There will be little or no impact on U.S. or foreign trade from this rulemaking. Absent the rule, U.S. helicopter exports would have been placed at comparative cost disadvantage since each helicopter model still would be required to meet ICAO standards. The cost of multiple certifications would have resulted in either higher selling prices or lower profits to U.S. manufacturers.

Discussion of Comments

Interested persons were afforded the opportunity to participate in development of this rulemaking by submitting written comments to the public regulatory docket on or before June 5, 1986. All comments received have been reviewed and duly considered in promulgating this amendment.

Sixteen public comments were received in response to the notice (Docket No. 24929). All of the commenters supported promulgation of noise certification standards for helicopters; however, each commenter also had specific suggestions about one or more of the FAA's proposed amendments.

The comments received in public Docket No. 24929 are discussed below. They are grouped by broad categories of issues.

1. Flight Procedures

Notice 86–3 proposed both flight test procedures and flight reference procedures. The first of these procedures gives instructions to the pilots so that the helicopters can be flown allowing realistic variations in weather, piloting techniques, and aircraft performance. The second specifies uniform flight path profiles so that the measured data may be compared to the standard. Several comments were received concerning the amount of variation in flight test techniques that the regulation should allow. Commenters explicitly stated that the rule should allow the helicopter operator to use a "normal" approach during the noise certification test. In addition, some comments claimed that noise data measured during normal approach differs significantly from noise measured under the constant six degree glide slope approach. They further stated that the certification flight test procedures should be used based upon practical "real-world" flight procedures rather than rigidly-prescribed procedures which are seldom used in service.

Much of the concern with flight procedures lies with their effect on the generation of the distinctive helicopter blade slap. Helicopter noise levels vary between models for different glide slopes. In 1979, the ICAO Committee on Aircraft Noise considered adding a blade slap correction to the calculation of EPNdB for helicopters. However, after extensive investigation, it was determined that the six degree approach would not unduly penalize any particular helicopter type.

Regarding the commenters' position, the development of alternative procedures was pursued by the FAA and the Helicopter Association International which was represented by both operators and manufacturers. However, experience showed that the versatility of helicopters was so great that there was often no single "real-world" approach procedure. Conversely, redefining the procedures to allow applicants to choose any normal approach between three and nine degrees would result in an undesirable decrease in the stringency of the standard, unless the noise level limits were adjusted.

Further, it is noted that § 36.801 specifically allows certification noise measurements to be made using an FAA-approved equivalent procedure. This provision is intended to prevent hardships occuring as the result of the application of an inappropriate certification process.

Lastly, the FAA notes that the six degree approach glide slope has been adopted by ICAO in its helicopter noise certification standard and that both foreign and domestic manufacturers will have to certificate using six degrees, whether or not the United States adopts that procedure. The economic costs of developing and using a separate flight procedure specification that does not conform to the international standard are unjustified.

For the above mentioned reasons, the FAA is adopting the test and reference flight procedures as proposed.

2. No-Correction Window

The FAA solicited comments on the need for a "no-correction window", i.e., combinations of test and weather conditions that are so close to the standard reference conditions that no corrections to the measured test data are necessary. In response, several commenters expressed the opinion that the rule should have a "no correction window". Their opinion was that a practical test "window" would limit the cost and complexity of the helicopter certification process.

The FAA believes that since most of the measurements have to be made either to make the corrections or to determine which measurements are inside the "window", it serves little purpose to avoid making appropriate corrections. Cost savings, if any, would be negligible and would be far outweighed by the quality of the data available to the applicant. However, it is noted that the ICAO standard does not require corrections of reported noise levels for small variations from the reference conditions of flight path, airspeed, weight, ambient temperature, relative humidity, and rotor rpm for the takeoff and approach tests. Only the level flyover test does not have such a no-correction window. Because it would be unfair to require American helicopter manufacturers to bear disproportionately high costs, the FAA has determined to follow the lead of ICAO and allow small no-correction windows for takeoff and approach tests.

3. Upper Bound Weight Limit

The FAA requested comments with regard to establishing an appropriate upper bound to the noise versus weight standards. There are currently no American civil helicopters which have maximum weights above 50,000 pounds. Under Notice 86-3, the noise level limits for takeoff, approach, and sideline would vary with maximum takeoff gross weight. An earlier industry proposal would have the noise limits end at an upper weight of 56,000 pounds.

There were no comments in support of the 56,000 lb. limit. The manufacturers reported that there was no need for such a restriction at this time. One commenter objected to the proposal on the basis that it violated the ICAO agreements. The FAA has determined that there is no valid reason to enact a rule which would have the effect of creating a unique class of unregulated helicopters that would be at a distinct disadvantage on the export market. Therefore, this rule does not contain an upper weight limitation.

4. Applicability to Current Production

Notice 86-3 proposed establishing noise limits for new and derivative helicopter types, but did not propose to require compliance with the new noise standards as a condition for further production of current helicopter types. The FAA solicited comments on the appropriateness of this exclusion.

One commenter indicated that the industry had over seven years of notice of this rule. The commenter further indicated that industry consistently opposed the rule, even to the point of successfully arguing for the withdrawal of the original NPRM in 1982. He observed that all helicopters now in production meet the Stage 2 noise limit and, therefore, there is reason to establish a Stage 2 rule for all helicopters in production. This would assure that no Stage 1 helicopters would be produced. Another commenter recommended that the regulation be revised to set a date beyond which Stage 1 helicopters may no longer be introduced into the U.S. fleet. He was concerned that the rule almost ensures that excessively noisy helicopters will continue to be introduced into the fleet.

The FAA recognizes that most, if not all, the civil helicopters in production were derived from military aircraft. The FAA believes that it would create an undue economic burden on the industry for requiring lower noise levels for which the military helicopters were originally designed. However, the FAA has a statutory responsibility to ensure that economically reasonable and technologically practicable noise limits are applied fairly and uniformly. The rules prohibit noise level increases from those helicopters which already cannot achieve Stage 2 noise levels before a change in type design. The rule would not allow a Stage 1 helicopter the noise levels of which exceed the Stage 2 noise limits by more than 2 EPNdB to grow in noise after the change in type design. Those Stage 1 helicopters the noise levels of which do not exceed the Stage 2 noise limits by more than 2 EPNdB may "grow up" to the plus 2 EPNdB limit. The FAA believes that this limited growth does not place undue restrictions on industry, but provides a realistic "cap" on the growth of helicopter noise impacts. Even though the rule allows helicopters currently in production to continue to be produced and added to the fleet, the fact still remains that all of the helicopters currently being produced meet Stage 2 limits. The FAA reserves the right to propose a new production rule that would restrict production to Stage 2 helicopters if and when it is warranted.

5. Stringency

One of the key issues in the public Docket was the stringency of the proposed noise level standards. Several commenters stated their belief that the noise level limits were not stringent enough and noted that the noise level standards were higher than those proposed in Notice 79-13 for both new helicopter types and derivatives. It was also noted that all helicopters currently in production would meet the standard, even though little or no effort had been made by their manufacturers to lower their noise levels. The opinion was expressed that the proposed rule would provide no real protection to the public.

The FAA generally agrees with the comments as far as they go. However, there is more to the issue of stringency than just the noise levels of current helicopters. After all, a certification regulation is actually applied to future aircraft types and to changes in existing types, not to aircraft already in service. In this case, the helicopters for which the regulation is intended are the next

generation of high speed, high performance aircraft that will be introduced into service in the late 1980's and beyond. Current civil helicopters are largely derived from military versions. Accordingly, the missions for which they were designed have limited civilian application. However, the new helicopters are being designed for the speed and productivity demanded by a business-oriented economy.

From a technical point of view, new helicopters pose a greater noise control design challenge because the characteristics that would make a helicopter successful in the open market will also make it noisier. For instance, the increased speed and payload capabilities are largely the result of modern, high speed rotor design. As the rotor speed increases, the noise increases even more. As the payload increases, the rotor loading also increases and so does noise. Thus, the noise level limits will cap the noise to ensure that helicopters do not get noisier as new technology is introduced.

Some have suggested that the FAA should now place a cap on the noise levels with the intention to lower the permissible noise by 3 to 5 decibels in a specific time, possibly five years. The FAA believes that such a suggestion is premature, as NASA and the U.S. industry have an extensive research program under way to provide the tools needed to design and evaluate effective noise abatement technology for new type design helicopters. At the conclusion of the NASA program, the FAA will consider the appropriateness of lowering the noise certification levels of helicopters. Lastly, the standards in this rule are identical to ICAO's standards which industry must meet to maintain its export market and which foreign-made helicopters must also meet.

6. Test Costs

Several commenters were of the opinion that the complexity of the rule, especially the requirement for correcting the data if the test is performed outside of the "no correction window," is too costly. For certain helicopter models, the sales are in such small quantities and at such irregular intervals, that a requirement to perform extensive and costly noise certification testing could lead to discontinuing the sales, despite the fact that the helicopter as measured by the FAA meets the noise limits. A commenter stated that because fewer commercial helicopters are being manufactured, the cost of any design modification must be absorbed by these few, increasing the per-unit cost, which is ultimately passed on to the consumer. If sales decrease substantially, the per unit cost becomes so high as to be totally impractical and the design is no longer profitable. One commenter indicated that the cost of certificating a helicopter to the noise standards in the rule would be approximately $500,000, which exceeds the costs of some helicopters by as much as a factor of ten.

The cost as cited above is unsubstantiated and the FAA estimates the costs to range between $5,000 to $50,000, depending largely on the manner in which the helicopter flight time was billed. Standardization of the FAA and ICAO test procedures should provide further savings. The issue of the complexity of the rule regarding a "no correction window" resulting in extra cost is not supported. As indicated previously, the manufacturer would be required to make most of the measurements anyway to determine whether the data had to be corrected. The extra cost to adjust the data to a given standard is negligible with today's microcomputers.

7. Other Issues

Commenters to the Docket raised a number of other technical and editorial issues. One industry group observed that the rule as proposed in Notice 86–3 was difficult to follow because it repeatedly referenced other sections of FAR Part 36. This was especially noted in those sections which specified acoustical and meteorological instrumentation and correction procedures. Several comments were also received about the organization of Appendix H and about the perceived need to reorganize it more along functional lines. The FAA agrees with these suggestions and has brought into Appendix H most of the materials that were referenced in the Notice. The one major exception to this process is that the definition of the noise metric, Effective Perceived Noise Level (EPNL) and the procedures for computing it, remain solely in Appendix B. This arrangement will ensure that the EPNL used for each aircraft category remains consistent with that used for any other category. Any modifications to the basic formulations will automatically apply to all categories.

The contents of Appendix H have been reorganized to make them clearer and easier to follow. The new Table of Contents is at the beginning of the appendix. Typographical mistakes that appeared in the Notice have been corrected. In addition, several minor changes to the test specifications have been made to incorporate test tolerances that correspond to ICAO values and to incorporate metric equivalents where they had been inadvertently omitted.

List of Subjects

14 CFR Part 21

Aircraft certification, Helicopters, Accoustical change.

14 CFR Part 36

Noise standards, Noise limits, Aircraft noise measurement, Test conditions, Helicopters.

The Amendment

Accordingly, the Federal Aviation Administration amends Parts 21 and 36 of the Federal Aviation Regulations (14 CFR Parts 21 and 36) as follows:

PART 21—CERTIFICATION PROCEDURES FOR PRODUCTS AND PARTS

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

Authority: 49 U.S.C. 1344, 1348(c), 1352, 1354(a), 1355, 1421 through 1431, 1502, 1651(b)(2); 42 U.S.C. 1857f–10, 4321 et seq.; E.O. 11514; 49 U.S.C. 106(g) (Revised Pub. L. 97–449, January 12, 1983).

2. In § 21.93 the introductory text of paragraph (b) is revised, and a new paragraph (b)(4) is added:

§ 21.93 Classification of changes in type design.

* * * * *

(b) For the purpose of complying with Part 36 of this chapter, and except as provided in paragraphs (b)(2), (b)(3), and (b)(4) of this section, any voluntary change in the type design of an aircraft that may increase the noise levels of that aircraft is an "acoustical change" (in addition to being a minor or major change as classified in paragraph (a) of this section) for the following aircraft:

* * * * *

(4) Helicopters, (except for those helicopters that are designated exclusively for "agricultural aircraft operations", as defined in § 137.3 of this chapter, as effective on January 1, 1966, for dispensing fire fighting materials, or for carrying external loads, as defined in § 133.1(b) of this chapter, as effective on December 20, 1976). For helicopters to which this paragraph applies, "acoustical changes" include the following type design changes:

(i) Any changes to, or removal of, a muffler or other component designed for noise control.

(ii) Any other design or configuration change (including a change in the operating limitations of the aircraft) that, based on FAA-approved analytical or test data, the Administrator determines may result in an increase in noise level.

3. Section 21.115(a) is amended by removing "§§ 36.7 and 36.9 of this chapter" and substituting "§§ 36.7, 36.9, or 36.11 of this chapter".

PART 36—NOISE STANDARDS: AIRCRAFT TYPE AND AIRWORTHINESS CERTIFICATION

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

Authority: 49 U.S.C. 1344, 1348, 1354(a), 1355, 1421, 1423, 1424, 1425, 1428, 1429, 1430, 1431(b), 1651(b)(2), 2121 through 2125; 42 U.S.C. 4321 et seq.; Sec. 124 of Pub. L. 08–473; E.O. 11514; 49 U.S.C. 106(g) (Revised Pub. L. 97–449, January 12, 1983).

§ 36.1 [Amended]

2. Section 36.1 Applicability and definitions is amended as follows:

a. By adding a new paragraph (a)(4) to read as follows:

(a) * * *

(4) Type certificates, and changes to those certificates, for helicopters except those helicopters that are designated exclusively for "argicultural aircraft operations" (as defined in § 137.3 of this chapter, as effective on January 1, 1966), for dispensing fire fighting materials, or for carrying external loads (as defined in § 133.1(b) of this chapter, as effective on December 20, 1976).

* * * * *

b. By amending paragraph (c):

(1) By removing the word "airplane" and substituting for it the word "aircraft"; and

(2) By removing "the applicable provisions of § 36.7 or § 36.9 of this part" and substituting "the applicable provisions of § 36.7, 36.9, or 36.11 of this part".

c. By adding a new paragraph (g) to read as follows:

* * * * *

(g) For the purpose of showing compliance with this part, of helicopters in the normal, transport, and restricted categories, the following terms have the specified meanings:

(1) A "Stage 1 noise level" means a takeoff, flyover, or approach noise level greater than the Stage 2 noise limits prescribed in § H36.305 of Appendix H of this part.

(2) A "Stage 1 helicopter" means a helicopter that has not been shown under this part to comply with the takeoff, flyover, and approach noise levels required for Stage 2 helicopters.

(3) A "Stage 2 noise level" means a takeoff, flyover, or approach noise level at or below the Stage 2 noise limits prescribed in § H36.305 of Appendix H of this part.

(4) A "Stage 2 helicopter" means a helicopter that has been shown under this part to comply with Stage 2 noise levels (including applicable tradeoffs) prescribed in § H36.305 of Appendix H of this part.

§ 36.2 [Amended]

3. Section 36.2(a) is revised to read as follows:

(a) Notwithstanding § 21.17 of this chapter, each person who applies for a type certificate:

(1) For an airplane covered by this part, irrespective of the date of application for the type certificate, or

(2) For a helicopter covered by this part, on or after March 6, 1986,

must show compliance with the applicable provisions of this part.

§ 36.3 [Amended]

4. Section 36.3 is amended by removing the word "airplane" wherever it appears and substituting for it the word "aircraft".

5. Subpart A is amended by adding a new § 36.11 to read as follows:

§ 36.11 Acoustical change: helicopters.

This section applies to all helicopters in the normal, transport, and restricted categories for which an acoustical change approval is applied under § 21.93(b) of this chapter on or after March 6, 1986.

(a) *General requirements.* Except as otherwise provided, for helicopters covered by this section, the acoustical change approval requirements are as follows:

(1) In showing compliance, noise levels must be measured, evaluated, and calculated in accordance with the applicable procedures and conditions prescribed in Parts B and C of Appendix H of this Part.

(2) Compliance with the noise levels prescribed in Section H36.305 of Appendix H must be shown in accordance with the applicable provisions of Part D of Appendix H of this part.

(b) *Stage 1 helicopters.* Except as provided in § 36.805(c), for each Stage 1 helicopter prior to the change in type design, the helicopter noise levels may not, after the change in type design, exceed the noise levels specified in Section H36.305(a)(1). The tradeoff provisions under § H36.305(b) may not be used to increase any Stage 1 noise level beyond these limits.

(c) *Stage 2 helicopters.* For each Stage 2 helicopter prior to the change in type design, the helicopter must be a Stage 2 helicopter after the change in type design.

Subpart G—[Redesignated as Subpart O]

6. Subpart G is redesignated as "Subpart O—Operating Limitations and Information" and Subparts G, I, J, K, L, M, and N are reserved.

§ 36.1581 [Amended]

a. By amending paragraph (a) after the words "Airplane Flight Manual" in each place where those words appear by adding the words "or Rotorcraft Flight Manual."

b. By amending paragraph (b) in the prescribed statement by deleting the word "airplane" and substituting for it the word "aircraft."

c. By redesignating paragraph (e) as "paragraph (f)" and revising it to read as follows:

* * * * *

(f) Except as provided in paragraph (c), (d), and (e) of this section, no operating limitations are furnished under this part.

d. By adding a new paragraph (e) to read as follows:

* * * * *

(e) For normal, transport, and restricted category helicopters, if the weight used in meeting the takeoff, flyover, or approach noise requirements of this part is less than the certificated maximum takeoff weight, established under either § 27.25(a) or 29.25(a) of this chapter, that lesser weight must be furnished, as an operating limitation, in the operating limitations section of the Rotorcraft Flight Manual, in FAA-approved manual material, or on an FAA-approved placard.

* * * * *

8. A new Subpart H is added to read as follows:

Subpart H—Helicopters

Sec.

Subpart H—Helicopters

§ 36.801 Noise measurement.

For normal, transport, and restricted category helicopters, the noise generated by the helicopter must be measured at the noise measuring points and under the test conditions prescribed in Part B of Appendix H of this part or under an FAA-FAA-approved equivalent procedure.

§ 36.803 Noise evaluation and calculation.

The noise measurement data obtained under § 36.801 must be corrected to the reference conditions and evaluated under Part C of Appendix H of this part

or an FAA-FAA-approved equivalent procedure.

§ 36.805 Noise limits.

(a) Compliance with the noise levels prescribed under Part D of Appendix H of this part must be shown for helicopters for which application for issuance of a type certificate in the normal, transport, or restricted category is made on or after March 6, 1986.

(b) For helicopters covered by this section, except as provided in paragraph (c), it must be shown, in accordance with this subpart, that the noise levels of the helicopter are no greater than the applicable limits prescribed under § H36.305 of Appendix H of this part.

(c) For helicopters for which application for issuance of an original type certificate in the normal, transport or restricted category is made on or after March 6, 1986, and which the FAA finds to be the first civil version of a helicopter which was designed and constructed for, and accepted for operational use by, an Armed Force of the U.S. or the U.S. Coast Guard on or before March 6, 1986, it must be shown that the noise levels of the helicopter are no greater than the noise limits for a change in type design as specified in § H36.305(a)(1)(ii). Subsequent civil versions must meet the Stage 2 requirements.

9. By amending Appendix B of Part 36; section B36.1 at the end of the first sentence by removing "under § 36.103" and substituting "under §§ 36.103 and 36.803".

10. By adding a new Appendix G and marking it reserved.

11. By adding a new Appendix H to read as follows:

Appendix H—Noise Requirements For Helicopters Under Subpart H

Sec.

Part A—Reference Conditions

Section H36.1 *General.* This appendix prescribes noise requirements for helicopters specified under § 36.1, including:

(a) The conditions under which helicopter noise certification tests under Part H must be conducted and the measurement procedures that must be used under § 36.801 to measure helicopter noise during each test;

(b) The procedures which must be used under § 36.803 to correct the measured data to the reference conditions and to calculate the noise evaluation quantity designated as Effective Perceived Noise Level (EPNL); and

(c) The noise limits for which compliance must be shown under § 36.805.

Section H36.3 *Reference Test Conditions.*

(a) *Meteorological conditions.* Aircraft position, performance data and noise measurements must be corrected to the following noise certification reference atmospheric conditions which shall be assumed to exist from the surface to the aircraft altitude:

(i) Sea level pressure of 2116 psf (76 cm mercury).

(ii) Ambient temperature of 77 degrees F (25 degrees C).

(iii) Relative humidity of 70 percent.

(iv) Zero wind.

(b) *Reference test site.* The reference test site is flat and without line-of-sight obstructions across the flight path that encompasses the 10 dB down points.

(c) *Takeoff reference profile.* (1) Figure H1 illustrates a typical takeoff profile, including reference conditions.

(2) The reference flight path is defined as a straight line segment inclined from the starting point (1640 feet prior to the center microphone location at 65 feet above ground level) at an 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 (FAA-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 (Figure H2). The helicopter approaches position D in level flight 492 feet above ground level as measured at station A. Airspeed is stabilized at either 0.9 V_H or 0.45 V_H + 65 knots (0.45 V_H + 120 km/hr), whichever speed is less. Rotor speed is stablized at the maximum continuous RPM throughout the 10 dB down time period. The helicopter crosses station A in level flight and proceeds to position J.

(e) For noise certification purposes, V_H is defined as the airspeed in level flight obtained using the minimum specification engine torque corresponding to maximum continuous power available for sea level, 25° C ambient conditions at the relevant maximum certificated weight. The value of V_H thus defined must be listed in the Rotorcraft Flight Manual.

(e) *Approach reference profile.* (1) Figure H3 illustrates approach profile, including reference conditions.

(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), as required. EK represents a stable flight condition in terms of torque, rpm, indicated airspeed, and rate of descent resulting in a 6° ± 0.5° approach angle.

(ii) The approach profile is defined by the approach angle β passing directly over the station A at a height of AH, to position K, which terminates the approach noise certification profile.

(2) The helicopter approaches position H along a constant 6° approach slope throughout the 10 dB down time period. The helicopter crosses position E and proceeds along the approach slope crossing over station A until it reaches position K.

Section H36.5 *Symbols and units.* The following symbols and units as used in this appendix for helicopter noise certification have the following meanings.

FLIGHT PROFILE IDENTIFICATION—POSITIONS

Position	Description
A	Location of the noise measuring point at the flight-track noise measuring station vertically below the reference (takeoff, flyover, or approach) flight path.
C	Start of noise certification takeoff flight path.
C_r	Start of noise certification reference takeoff flight path.
D	Start of noise certification flyover flight path.
D_r	Start of noise certification reference flyover path.
E	Start of noise certification approach flight path.
E_r	Start of noise certification reference approach flight path.
F	Position on takeoff flight path directly above noise measuring station A.
G	Position on flyover flight path directly above noise measuring station A.
H	Position on approach flight path directly above noise measuring station A.
I	End of noise type certification takeoff flight path.
I_r	End of noise type certification reference takeoff flight path.
J	End of noise type certification flyover flight path.
J_r	End of noise type certification reference flyover flight path.
K	End of noise certification approach type flight path.
K_r	End of noise type certification reference approach flight path.
L	Position on measured takeoff flight path corresponding to PNLTM at station A.

FLIGHT PROFILE IDENTIFICATION—POSITIONS—Continued

Position	Description
L_r	Position on reference takeoff flight path corresponding to PNLTM of station A.
M	Position on measured flyover flight path corresponding to PNLTM of station A.
M_r	Position on reference flyover flight path corresponding to PNLTM of station A.
N	Position on measured approach flight path corresponding to PNLTM at station A.
N_r	Position on reference approach flight path corresponding to PNLTM at station A.
S	Position on measured approach path nearest to station A.
S_r	Position on reference approach path nearest to station A.
T	Position on measured takeoff path nearest to station A.
T_r	Position on reference takeoff path nearest to station A.

FLIGHT PROFILE DISTANCES

Distance	Unit	Meaning
AF	Feet	*Takeoff Height.* The vertical distance between helicopter and station A.
AG	Feet	*Flyover Height.* The vertical distance between the helicopter and station A.
AH	Feet	*Approach Height.* The vertical distance between the helicopter and station A.
AL	Feet	*Measured Takeoff Noise Path.* The distance from station A to the measured helicopter position L.
AL_r	Feet	*Reference Takeoff Noise Path.* The distance from station A to the reference helicopter position L_r.
AM	Feet	*Measured Flyover Noise Path.* The distance from station A to the measured helicopter position M.
AM_r	Feet	*Reference Flyover Noise Path.* The distance from station A to helicopter position M_r on the reference flyover flight path.
AN	Feet	*Measured Approach Noise Path.* The distance from station A to the measured helicopter noise position N.
AN_r	Feet	*Reference Approach Noise Path.* The distance from station A to the reference helicopter position N_r.
AS	Feet	*Measured Approach Minimum Distance.* The distance from station A to the position S on the measured approach flight path.
AS_r	Feet	*Reference Approach Minimum Distance.* The distance from station A to the position S_r on the reference approach flight path.

FLIGHT PROFILE DISTANCES—Continued

Distance	Unit	Meaning
AT	Feet	*Measured Takeoff Minimum Distance.* The distance from station A to the position T on the measured takeoff flight path.
AT_r	Feet	*Reference Takeoff Minimum Distance.* The distance from station A to the position T_r on the reference takeoff flight path.
CI	Feet	*Takeoff Flight Path Distance.* The distance from position C at which the helicopter establishes a constant climb angle on the takeoff flight path passing over station A and continuing to position I at which the position of the helicopter need no longer be recorded.
DJ	Feet	*Flyover Flight Path Distance.* The distance from position D at which the helicopter is established on the flyover flight path passing over station A and continuing to position J at which the position of the helicopter need no longer be recorded.
EK	Feet	*Approach Flight Path Distance.* The distance from position E at which the helicopter establishes a constant angle on the approach flight path passing over station A and continuing to position K at which the position of the helicopter need no longer be recorded.

Part B—Noise Measurement Under § 36.801

Section H36.101 *Noise certification test and measurement conditions.*

(a) *General.* This section prescribes the conditions under which aircraft noise certification tests must be conducted and the measurement procedures that must be used to measure helicopter noise during each test.

(b) *Test site requirements.* (1) Tests to show compliance with established helicopter noise certification levels must consist of a series of takeoffs, level flyovers, and approaches during which measurement must be taken at noise measuring station located at the measuring points prescribed in this section.

(2) Each takeoff test, flyover test, and approach test includes simultaneous measurements at the flight-track noise measuring station vertically below the reference flight path and at two sideline noise measuring stations, one on each side of the reference flight track 492 feet (150m) from, and on a line perpendicular to, the flight track of the noise measuring station.

(3) The difference between the elevation of either sideline noise measuring station may not differ from the flight-track noise measuring station by more than 20 feet.

(4) Each noise measuring station must be surrounded by terrain having no excessive sound absorption characteristics, such as might be caused by thick, matted, or tall grass, shrubs, or wooded areas.

(5) During the period when the takeoff, flyover, or approach noise/time record indicates the noise measurement is within 10 dB of PNLTM, no obstruction that significantly influences the sound field from the aircraft may exist—

(i) For any flight-track or sideline noise measuring station, within a conical space above the measuring position (the point on the ground vertically below the microphone) the cone being defined by an axis normal to the ground and by half-angle 80° from this axis; and

(ii) For any sideline noise measuring station, above the line of sight between the microphone and the helicopter.

(6) If a takeoff or flyover test series is conducted at weights other than the maximum takeoff weight for which noise certification is requested, the following additional requirements apply:

(i) At least one takeoff test must be conducted at a weight at, or above, the maximum certification weight.

(ii) Each test weight must be within +5 percent or −10 percent of the maximum certification weight.

(iii) FAA-approved data must be used to determine the variation of EPNL with weight for takeoff test conditions.

(7) Each approach test must be conducted with the aircraft stabilized and following a 6.0 degree ±0.5 degree approach angle and must meet the requirements of § H36.107 of this Part.

(8) If an approach test series is conducted at weights other than the maximum landing weight for which certification is requested, the following additional requirements apply:

(i) At least one approach test must be conducted at a weight at, or above, the maximum landing weight.

(ii) Each test weight must exceed 90 percent of the maximum landing weight.

(iii) FAA-approved data must be used to determine the variation of EPNL with weight for approach test conditions.

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

(c) *Weather restrictions.* The test must be conducted under the following atmospheric conditions:

(1) No rain or other precipitation.

(2) Ambient air temperature between 36 F and 95 F (2.2 C and 35 C), inclusively, over that portion of the sound propagation path between the aircraft and a point 10 meters above the ground at the noise measuring station. The temperature and relative humidity measured at aircraft altitude and at 10 meters above ground shall be averaged and used to adjust for propagation path absorption.

(3) Relative humidity and ambient temperature over the portion of the sound propagation path between the aircraft and a point 10 meters above the ground at the noise measuring station 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.

(4) Wind velocity as measured at 10 meters above ground does not exceed 10 knots (19 km/h) and the crosswind component does not exceed 5 knots (9 km/h). The wind shall be determined using a continuous thirty-second averaging period spanning the 10dB down time interval.

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

(6) The wind velocity, temperature, and relative humidity measurements required under the appendix must be measured in the vicinity of noise measuring stations 10 meters above the ground. The location of the meterological measurements must be approved by the FAA as representative of those atmospheric conditions existing near the surface over the geographical area which aircraft noise measurements are made. In some cases, a fixed meteorological station (such as those found at airports or other facilities) may meet this requirement.

(7) Temperature and relative humidity measurements must be obtained within 25 minutes of each noise test measurement. Meteorological data must be interpolated to actual times of each noise measurement.

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

(2) The aircraft height and lateral position relative to the centerline of the reference flight-track (which passes through the noise measuring point) must be determined by an FAA approved method which is independent of normal flight instrumentation, such as radar tracking, theodolite triangulation, laser trajectography, or photographic scaling techniques.

(3) The aircraft position along the flight path must be related to the noise recorded at the noise measuring stations by means of synchronizing signals at an approved sampling rate. The position of the aircraft must be recorded relative to the runway during the entire time period in which the recorded signal is within 10 dB of PNLTM. Measuring and sampling equipment must be approved by the FAA.

Section H36.103 *Takeoff test conditions.*

(a) This section, in addition to the applicable requirements of sections H36.101 and H36.205(b) of this appendix, applies to all takeoff noise tests conducted under this appendix to show compliance with Part 36.

(b) A test series must consist of at least six flights over the flight-track noise measuring station (with simultaneous measurements at all three noise measuring stations) as follows:

(1) An airspeed of either $V_y \pm 5$ knots or the lowest approved speed ± 5 knots for the climb after takeoff, whichever speed is greater, must be established during the horizontal portion of each test flight and maintained during the remainder of the test flight.

(2) The horizontal portion of each test flight must be conducted at an altitude of 65 feet (20 meters) above the ground level at the flight-track noise measuring station.

(3) Upon reaching a point 1,640 feet (500 meters) from the noise measuring station, the helicopter shall be stabilized at:

(i) The torque used to establish the takeoff distance for an ambient temperature at sea level of 25° C for helicopters for which the determination of takeoff performance is required by airworthiness regulations; or

(ii) The torque corresponding to minimum installed power available for an ambient temperature at sea level of 25° C for all other helicopters.

(4) The helicopter shall be maintained throughout the takeoff reference procedure at:

(i) The speed used ± 5 knots to establish takeoff distance for an ambient temperature at sea level of 25° C for helicopters for which the determination of takeoff performance is required by airworthiness regulations; or

(ii) The best rate of climb speed $V_y \pm 5$ knots, or the lowest approved speed for climb after takeoff, whichever is greater, for an ambient temperature at sea level of 25° C for all other helicopters.

(5) The rotor speed must be stabilized at the normal operating RPM ($\pm 1\%$) during the entire period of the test flight when the measured helicopter noise level is within 10 dB of PNLTM.

(6) The helicopter must pass over the flight-track noise measuring station within $\pm 10°$ from the zenith.

Section H36.105 *Flyover test conditions.*

(a) This section, in addition to the applicable requirements of sections H36.101 and H36.205(c) of this appendix, applies to all flyover noise tests conducted under this appendix to show compliance with Part 36.

(b) A test series must consist of at least six flights (three in each direction) over the flight-track noise measuring station (with simultaneous measurements at all three noise measuring stations)—

(1) In level flight;

(2) At a height of 492 feet ± 30 feet (150 ± 9 meters) above the ground level at the flight-track noise measuring station; and

(3) Within $\pm 5°$ from the zenith.

(c) Each flyover noise test must be conducted—

(1) At a speed of 0.9 V_H or 0.45 $V_H + 120$ km/hr (0.45 $V_H + 65$ kt), whichever is less, maintained throughout the measured portion of the flyover;

(2) At rotor speed stabilized at the normal operating rotor RPM (± 1 percent); and

(3) With the power stabilized during the period when the measured helicopter noise level is within 10 dB of PNLTM.

(d) The airspeed shall not vary from the reference airspeed by more than ± 5 knots (9 km/hr).

Section H36.107 *Approach test conditions.*

(a) This section, in addition to the requirements of sections H36.101 and H36.205(d) of this appendix, applies to all approach tests conducted under this appendix to show compliance with Part 36.

(b) A test series must consist of at least six flights over the flight-track noise measuring station (with simultaneous measurements at the three noise measuring stations)—

(1) On an approach slope of $6° \pm 0.5°$;

(2) At a height of 394 ± 30 feet (120 ± 9 meters) above the ground level at the flight-track noise measuring station;

(3) Within $\pm 10°$ of the zenith;

(4) At stabilized airspeed equal to the certificated best rate of climb V_y, or the lowest approved speed for approach, whichever is greater, with power stabilized during the approach and over the flight path reference point, and continued to a normal touchdown; and

(5) At rotor speed stabilized at the maximum normal operating rotor RPM (± 1 percent).

(c) The airspeed shall not vary from the reference airspeed by more than ± 5 knots (± 9 km/hr).

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

(a) *General.* (1) The measurements prescribed in this section provide the data needed to determine the one-third octave band noise produced by an aircraft during testing, at specific noise measuring stations, as a function of time.

(2) Sound pressure level data for aircraft noise certification purposes must be obtained with FAA-approved acoustical equipment and measurement practices.

(3) Paragraphs (b), (c), and (d) of this section prescribe the required equipment specifications. Paragraphs (e) and (f) prescribe the calibration and measurement procedures required for each certification test series.

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

(1) A microphone system with frequency response and directivity which are compatible with the measurement and analysis system accuracy prescribed in paragraph (c) of this section.

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

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

(4) Calibrators using sine wave, or pink noise, of known levels. When pink noise (defined in paragraph (e)(1) of this section) is used, the signal must be described in terms of its root-mean-square (rms) value.

(5) Analysis equipment with the response and accuracy which meets or exceeds the requirements of paragraph (d) of this section.

(6) Attenuators used for range changing in sensing, recording, reproducing, or analyzing aircraft sound must be capable of being operated in equal-interval decibel steps with no error between any two settings which exceeds 0.2 dB.

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

(2) The microphone must be a pressure-sensitive capacitive type, or its FAA-

approved equivalent, such as a free-field type with incidence corrector.

(i) The variation of microphone and preamplifier system sensitivity within an angle of ±30 degrees of grazing (60–120 degrees from the normal to the diaphragm) must not exceed the following values:

Frequency (Hz)	Change in sensitivity (dB)
45 to 1,120	1
1,120 to 2,240	1.5
2,240 to 4,500	2.5
4,500 to 7,100	4
7,100 to 11,200	5

With the windscreen in place, the sensitivity variation in the plane of the microphone diaphragm shall not exceed 1.0 dB over the frequency range 45 to 11,200 Hz.

(ii) The overall free-field frequency response at 90 degrees (grazing incidence) of the combined microphone (including incidence corrector, if applicable) preamplifier, and windscreen must be determined by using either (A) an electrostatic calibrator in combination with manufacturer-provided corrections, or (B) an anechoic free-field facility. The calibration unit must include pure tones at each preferred one-third octave frequency from 50 Hz to 10,000 Hz. The frequency response (after corrections based on that determination) must be flat and within the following tolerances:

44–3,549 Hz..... ±0.25 dB
3,550–7,099 Hz..... ±0.5 dB
7,100–11,200 Hz..... ±1.0 dB

(iii) Specifications concerning sensitivity to environmental factors such as temperature, relative humidity, and vibration must be in conformity with the recommendations of International Electrotechnical Commission (IEC) Publication No. 179, entitled "Pecision Sound Level Meters", as incorporated by reference under § 36.6 of this Part.

(iv) If the wind speed exceeds 6 knots, a windscreen must be employed with the microphone during each measurement of aircraft noise. Correction for any insertion loss produced by the windscreen, as a function of frequency, must be applied to the measured data and any correction applied must be reported.

(3) If a magnetic tape recorder is used to store data for subsequent analysis, the record/replay system (including tape) must conform to the following:

(i) The electric background noise produced by the system in each one-third octave must be at least 35 dB below the standard recording level, which is defined as the level that is either 10 dB below the 3 percent harmonic distortion level for direct recording or ±40 percent deviation for frequency modulation (FM) recording.

(ii) At the standard recording level, the corrected frequency response in each selected one-third octave band between 44 Hz and 180 Hz must be flat and within ±0.75 dB, and in each band between 180 Hz and 11,200 Hz must be flat and within ±0.25 dB.

(iii) If the overall system satisfies the requirements of paragraph (c)(2)(ii) of this section, and if the limitations of the dynamic range of the equipment are insufficient to obtain adequate spectral information, high frequency pre-emphasis may be added to the recording channel with the converse de-emphasis on playback. If pre-emphasis is added, the instantaneously recorded sound-pressure level between 800 Hz and 11,200 Hz of the maximum measured noise signal must not vary more than 20 dB between the levels of the maximum and minimum one-third octave bands.

(d) *Analysis equipment.* (1) A frequency analysis of the acoustic signal must be performed using one-third octave filters which conform to the recommendations of International Electrotechnical Commission (IEC) Publication No. 225, entitled "Octave, Half-Octave, and Third-Octave Band Filters Intended for Analysis of Sound and Vibrations," as incorporated by reference under §36.6 of this Part.

(2) A set of 24 consecutive one-third octave filters must be used. The first filter of the set must be centered at a geometric mean frequency of 50 Hz and the last filter at 10,000 Hz. The output of each filter must contain less than 0.5 dB ripple.

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

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

(ii) Averaging or integrating; and

(iii) Converting linear formulation to logarithmic.

(4) Each detector must operate over a minimum dynamic range of 60 dB and perform as a root-mean-square device for sinusoidal tone bursts having crest factors of at least 3 over the following dynamic range:

(i) Up to 30 dB below full-scale reading must be accurate within ±0.5 dB;

(ii) Between 30 dB and 40 dB below full-scale reading must be accurate within ±1.0 dB; and

(iii) In excess of 40 dB below full-scale reading must be accurate within ±2.5 dB.

(5) The averaging properties of the integrator must be tested as follows:

(i) White noise must be passed through the 200 Hz one-third octave band filter and the output fed in turn to each detector/integrator. The standard deviation of the measured levels must then be determined from a statistically significant number of samples of the filtered white noise taken at intervals of not less than 5 seconds. The value of the standard deviation must be within the interval 0.48±0.06 dB for a probability limit of 95 percent. An approved equivalent method may be substituted for this test on those analyzers where the test signal cannot readily be fed directly to each detector/integrator.

(ii) For each detector/integrator, the response to a sudden onset or interruption of a constant amplitude sinusoidal signal at the respective one-third octave band center frequency must be measured at sampling times 0.5, 1.0, 1.5, and 2.0 seconds after the onset or interruption. The rising responses must be in the following amounts before the steady-state level:

0.5 seconds, 4.0±1.0 dB
1.0 seconds, 1.75±0.5 dB
1.5 seconds, 1.0±0.5 dB
2.0 seconds, 0.6±0.25 dB

(iii) The falling response must be such that the sum of the decibel readings below the initial steady-state level, and the corresponding rising response reading is 6.5± 1.0 dB, at both 0.5 and 1.0 seconds and, on subsequent records, the sum of the onset plus decay must be greater than 7.5 decibels.

Note 1.—For analyzers with linear detection, an approximation of this response would be given by:

$$SPL(i,k) = 10 \log\ldots [0.17(10^{0.1(Li,\ k-3)}) + 0.21(10^{0.1(Li,\ k-2)}) + 0.24(10^{0.1(Li,\ k-1)}) + 0.33(10^{0.1(Li,\ k)})]$$

When this approximation is used, the calibration signal should be established without this weighting.

Note 2.—Some analyzers have been shown to have signal sampling rates that are insufficiently accurate to detect signals with crest factor ratios greater than three which is common to helicopter noise. Preferably, such analyzers should not be used for helicopter certification. Use of analysis systems with high signal sampling rates (greater than 40KHz) or those with analog detectors prior to digitization at the output of each one-third octave filter is encouraged.

(iv) Analyzers using true integration cannot meet the requirements of (i), (ii), and (iii) directly, because their overall average time is greater than the sampling interval. For these analyzers, compliance must be demonstrated in terms of the equivalent output of the data processor. Further, in cases where readout and resetting require a dead-time during acquisition, the percentage loss of the total data must not exceed one percent.

(6) The sampling interval between successive readouts shall not exceed 500 milliseconds and its precise value must be known to within ±1 one percent. The instant in time by which a readout is characterized shall be the midpoint of the average period where the averaging period is defined as twice the effective time constant of the analyzer.

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

(8) After all systematic errors have been eliminated, each output level from the analyzer must be accurate within ±1.0 dB of the level of the input signal. The total systematic errors for each of the output levels must not exceed ±3.0 dB. For contiguous filter systems, the systematic corrections between adjacent one-third octave channels must not exceed 4.0 dB.

(9) The dynamic range capability of the analyzer to display a single aircraft noise event, in terms of the difference between full-scale output level and the maximum noise level of the analyzer equipment, must be at least 60 dB.

(e) *Calibrations.* (1) Within five days prior to beginning each test series, the complete electronic system, as installed in field including cables, must be electronically calibrated for frequency and amplitude by the use of a pink noise signal of known

amplitudes covering the range of signal levels furnished by the microphone. For purposes of this section, "pink noise" means a noise whose noise-power/unit-frequency is inversely proportional to frequency at frequencies within the range of 44 Hz to 11,200 Hz. The signal used must be described in terms of its average root-mean-square (rms) values for a nonoverload signal level. This system calibration must be repeated within five days of the end of each test series, or as required by the FAA.

(2) Immediately before and after each day's testing, a recorded acoustic calibration of the system must be made in the field with an acoustic calibrator to check the system sensitivity and provide an acoustic reference level for the sound level data analysis. The performance of equipment in the system will be considered satisfactory if, during each day's testing, the variation in the calibration value does not exceed 0.5 dB.

(3) A normal incidence pressure calibration of the combined microphone/preamplifier must be performed with pure tones at each preferred one-third octave frequency from 50 Hz to 10,000 Hz. This calibration must be completed within 90 days prior to the beginning of each test series.

(4) Each reel of magnetic tape must:

(i) Be pistonphone calibrated; and

(ii) At its beginning and end, carry a calibration signal consisting of at least a 15 second burst of pink noise, as defined in paragraph (e)(1) of this section.

(5) Data obtained from tape recorded signals are not considered reliable if the difference between the pink noise signal levels, before and after the tests in each one-third octave band, exceeds 0.75 dB.

(6) The one-third octave filters must have been demonstrated to be in conformity with the recommendations of IEC Publication 225 as incorporated by reference under § 36.6 of this Part, during the six calendar months preceding the beginning of each test series. However, the correction for effective bandwidth relative to the center frequency response may be determined for each filter by:

(i) Measuring the filter response to sinusoidal signals at a minimum of twenty frequencies equally spaced between the two adjacent preferred one-third octave frequencies; or

(ii) Using an FAA approved equivalent technique.

(7) A performance calibration analysis of each piece of calibration equipment, including pistonphones, reference microphones, and voltage insert devices, must have been made during the six calendar months preceding the beginning of each day's test series. Each calibration must be traceable to the National Bureau of Standards.

(f) *Noise measurement procedures.* (1) Each microphone must be oriented so that the diaphragm is substantially in the plane defined by the flight path of the aircraft and the measuring station. The microphone located at each noise measuring station must be placed so that its sensing element is approximately 4 feet above ground.

(2) Immediately before and immediately after each series of test runs and each day's testing, acoustic calibrations of the system prescribed in this section of this appendix must be recorded in the field to check the acoustic reference level for the analysis of the sound level data. Ambient noise must be recorded for at least 10 seconds and be representative of the acoustical background, including system noise, that exists during the flyover test run. During that recorded period, each component of the system must be set at the gain-levels used for aircraft noise measurement.

(3) The mean background noise spectrum must contain the sound pressure levels, which, in each preferred third octave band in the range of 50 Hz to 10,000 Hz, are the averages of the energy of the sound pressure levels in every preferred third octave. When analyzed in PNL, the resulting mean background noise level must be at least 20 PNdB below the maximum PNL of the helicopter.

(4) Corrections for recorded levels of background noise are allowed, within the limits prescribed in § H36.111(c)(3) of this appendix.

Section H36.111 Reporting and correcting measured data

(a) *General.* Data representing physical measurements, and corrections to measured data, including corrections to measurements for equipment response deviations, must be recorded in permanent form and appended to the record. Each correction must be reported and is subject to FAA approval. An estimate must be made of each individual error inherent in each of the operations employed in obtaining the final data.

(b) *Data reporting.* (1) Measured and corrected sound pressure levels must be presented in one-third octave band levels obtained with equipment conforming to the standards prescribed in § H36.109 of this appendix.

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

(3) The atmospheric environmental data required to demonstrate compliance with this appendix, measured throughout the test period, must be reported.

(4) Conditions of local topography, ground cover, or events which may interfere with sound recording must be reported.

(5) The following aircraft information must be reported:

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

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

(iii) Aircraft gross weight for each test run.

(iv) Aircraft configuration, including landing gear positions.

(v) Airspeed in knots.

(vi) Helicopter engine performance as determined from aircraft instruments and manufacturer's data.

(vii) Aircraft flight path, above ground level in feet, determined by an FAA approved method which is independent of normal flight instrumentation, such as radar tracking, theodolite triangulation, laser trajectography, or photographic scaling techniques.

(6) Aircraft speed, and position, and engine performance parameters must be recorded at an approved sampling rate sufficient to correct to the noise certification reference test conditions prescribed in § H36.3 of this appendix. Lateral position relative to the reference flight-track must be reported.

(c) *Data corrections.* (1) Aircraft position, performance data and noise measurement must be corrected to the noise certification reference conditions as prescribed in sections H36.3 and H36.205 Appendix.

(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 aircraft flight path or performance may be derived from FAA-approved data for the difference between measured and reference engine conditions, together with appropriate allowances for sound attenuation with distance. The Effective Perceived Noise Level (EPNL) correction must be less than 2.0 EPNdB for any combination of the following:

(i) The aircraft's not passing vertically above the measuring station.

(ii) Any difference between the reference flight-track and the actual minimum distance of the aircraft's ILS antenna from the approach measuring station.

(iii) Any difference between the actual approach angle and the noise certification reference approach flight path.

(iv) Any correction of the measured level flyover noise levels which accounts for any difference between the test engine thrust or power and the reference engine thrust or power.

Detailed correction requirements are prescribed in § H36.205 of this appendix.

(3) Aircraft sound pressure levels within the 10 dB-down points must exceed the mean background sound pressure levels determined under § A36.3(f)(3) by at least 5 dB in each one-third octave band or be corrected under an FAA approved method to be included in the computation of the overall noise level of the aircraft. An EPNL may not be computed or reported from data from which more than four one-third octave bands in any spectrum within the 10 dB-down points have been excluded under this paragraph.

(d) *Validity of results.* (1) The test results must produce three average EPNL values within the 90 percent confidence limits, each value consisting of the arithmetic average of the corrected noise measurements for all valid test runs at the takeoff, level flyovers, and approach conditions. The 90 percent confidence limit applies separately to takeoff, flyover, and approach.

(2) The minimum sample size acceptable for each takeoff, approach, and flyover certification measurements is six. The number of samples must be large enough to establish statistically for each of the three average noise certification levels a 90 percent confidence limit which does not exceed ±1.5 EPNdB. No test result may be omitted from the averaging process, unless otherwise specified by the FAA.

(3) To comply with this appendix, a minimum of six takeoffs, six approaches, and six level flyovers is required. To be counted toward this requirement, each flight event

must be validly recorded at all three noise measuring stations.

(4) The approved values of V_H and V_y used in calculating test and reference conditions and flight profiles must be reported along with measured and corrected sound pressure levels.

Section H36.113 Atmospheric attenuation of sound.

(a) The values of the one-third octave band spectra measured during helicopter noise certification tests under this appendix must conform, or be corrected, to the reference conditions prescribed in section H36.3(a). Each correction must account for any differences in the atmospheric attenuation of sound between the test-day conditions and the reference-day conditions along the sound propagation path between the aircraft and the microphone. Unless the meteorological conditions are within the test window prescribed in this appendix, the test data are not acceptable.

(b) *Attenuation rates.* The atmospheric attenuation rates of sound with distance for each one-third octave band from 50 Hz to 10,000 Hz must be determined in accordance with the formulations and tabulations of SAE ARP 866A, entitled "Standard Values of Atmospheric Absorption as a Function of Temperatures and Humidity for Use in Evaluating Aircraft Flyover Noise", as incorporated by reference under § 36.6 of this Part.

(c) *Correction for atmospheric attenuation.* (1) EPNL values calculated for measured data must be corrected whenever—

(i) The ambient atmospheric conditions of temperature and relative humidity do not conform to the reference conditions, 77 °F and 70%, respectively, or

(ii) The measured flight paths do not conform to the reference flight paths.

(2) The temperature and relative humidity measured at aircraft altitude and at 10 meters above the ground shall be averaged and used to adjust for propagation path absorption.

(iii) The mean attenuation rate over the complete sound propagation path from the aircraft to the microphone must be computed for each one-third octave band from 50 Hz to 10,000 Hz. These rates must be used in computing the corrections required in section H36.111(d) of this appendix.

PART C—NOISE EVALUATION AND CALCULATION UNDER § 36.803

Section H36.201 Noise Evaluation in EPNdB.

(a) Effective Perceived Noise Level (EPNL), in units of effective perceived noise decibels (EPNdB), shall be used for evaluating noise level values under § 36.803 of Part 36. Except as provided in paragraph (b) of this section, the procedures in Appendix B of Part 36 must be used for computing EPNL. Appendix B includes requirements governing determination of noise values, including calculations of:

(1) Instantaneous perceived noise levels;
(2) Corrections for spectral irregularities;
(3) Tone corrections;
(4) Duration corrections;
(5) Effective perceived noise levels; and
(6) Mathematical formulation of noy tables.

(b) Notwithstanding the provisions of section B36.5(a), for helicopter noise certification, corrections for spectral irregularities shall start with the corrected sound pressure level in the 50 Hz one-third octave band.

Section H36.203 Calculation of noise levels.

(a) To demonstrate compliance with the noise level limits of section H36.305, the noise values measured simultaneously at the three noise measuring points must be arithmetically averaged to obtain a single EPNdB value for each flight.

(b) The calculated noise level for each noise test series, i.e., takeoff, flyover, or approach must be the numerical average of at least six separate flight EPNdB values. The 90 percent confidence limit for all valid test runs under section H36.111(d) of this appendix applies separately to the EPNdB values for each noise test series.

Section H36.205 Detailed data correction procedures

(a) *General.* If the test conditions do not conform to those prescribed as noise certification reference conditions under § H36.305 of this appendix, the following correction procedure shall apply:

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

(i) Atmospheric absorption of sound under test conditions which is greater than the reference;

(ii) Test flight path at an altitude which is higher than the reference; or

(iii) Test weight which is less than maximum certification weight.

(2) If a negative value results from any difference between reference and test conditions, no correction may be made to the EPNL calculated from the measured data, unless the difference results from:

(i) An atmospheric absorption of sound under test conditions which is less than the reference; or

(ii) A test flight path at an altitude which is lower than the reference.

(3) 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 are 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 are then converted to PNLTM from which PNLTM must be substracted. The resulting difference represents the correction which must be added algebraically to the EPNL calculated from the measured data.

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

(iv) From FAA approved data in the form of curves or tables giving the variation of EPNL with rotor rpm and test speed, corrections are determined and must be added to the EPNL, which is calculated from the measured data to account for noise level changes due to differences between test conditions and reference conditions.

(v) From FAA approved data in the form of curves or tables giving the variation of EPNL with approach angle, corrections are determined and must be added algebraically to the EPNL, which is calculated from measured data, to account for noise level changes due to differences between the 6 degree and the test approach angle.

(b) *Takeoff profiles.* (1) Figure H1 illustrates a typical takeoff profile, including reference conditions.

(i) The reference takeoff flight path is described in § H36.3(c).

(ii) The test parameters are functions of the helicopter's performance and weight and the atmospheric conditions of temperature, pressure, wind velocity and direction.

(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 $V_y \pm 5$ knots (± 9 km/hr) or the maximum speed of the curve tangential at the ordinate of the height-speed envelope plus 3.0 knots (± 5 knots), whichever speed is greater. Rotor speed is stabilized at the normal operating RPM (± 1 percent), specified in the flight manual. The helicopter is stabilized in level flight at the speed for best rate of climb using minimum engine specifications (power or torque and rpm) along a path starting from a point located 1640 feet (500 meters) forward of the flight-track noise measuring station and 65 feet (20 meters) above the ground. Starting at point B, the helicopter climbs through point C to the end of the noise certification takeoff flight path represented by position I. The position of point C may vary within limits allowed by the FAA. The position of the helicopter shall be recorded for a distance (CI) sufficient to ensure recording of the entire interval during which the measured helicopter noise level is within 10 dB of PNLTM, as requird by this rule. Station A is the flight-track noise measuring station. The relationships between the measured and corrected takeoff flight profiles can be used to determine the corrections

which must be applied to the EPNL calculated from the measured data.

(3) Figure H1 also illustrates the significant geometrical relationships influencing sound propagation. Position L represents the helicopter location on the measured takeoff flight path from which PNLTM is observed at station A and L_r is the corresponding position on the reference sound propagation path AL and AL_r, both form the angle ϕ with their respective flight paths. Position T represents the point on the measured takeoff flight path nearest station A, and T_r is the corresponding position on the reference flight path. The minimum distance to the measured and reference flight paths are indicated by the lines AT and AT_r, respectively, which are normal to their 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 given in H36.3(d). For each run, the difference between airspeed and ground speed shall not exceed 10 knots between the 10 dB down points. Rotor speed must be stabilized at the maximum continuous RPM within one percent, throughout the 10 dB down time period. If the test requirements are otherwise met, flight direction may be reversed for each subsequent flyover, to obtain three test runs in each direction.

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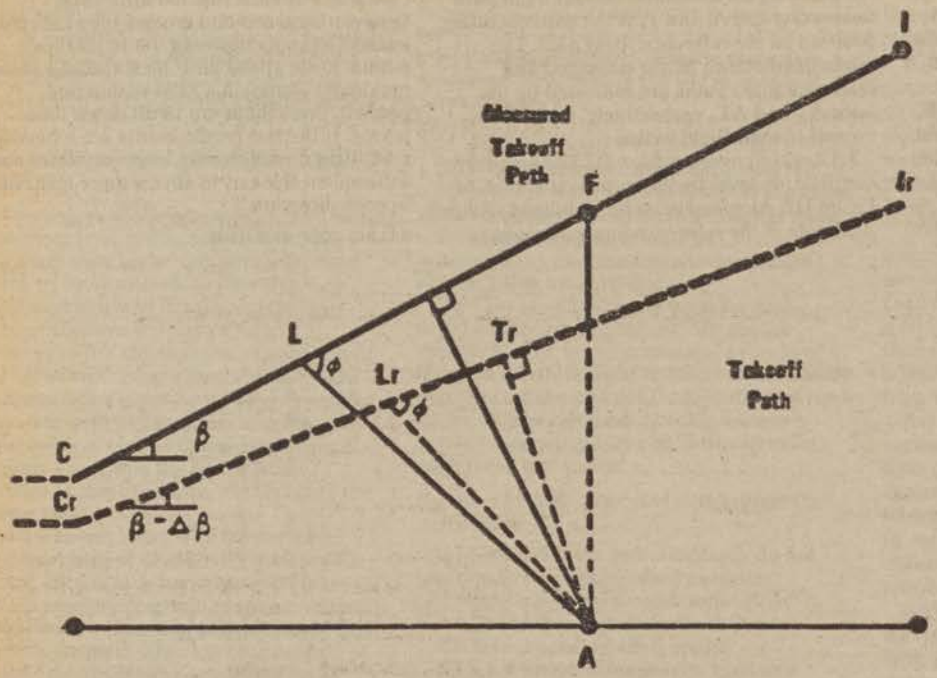

Figure H1. COMPARISON OF MEASURED AND CORRECTED TAKEOFF PROFILES

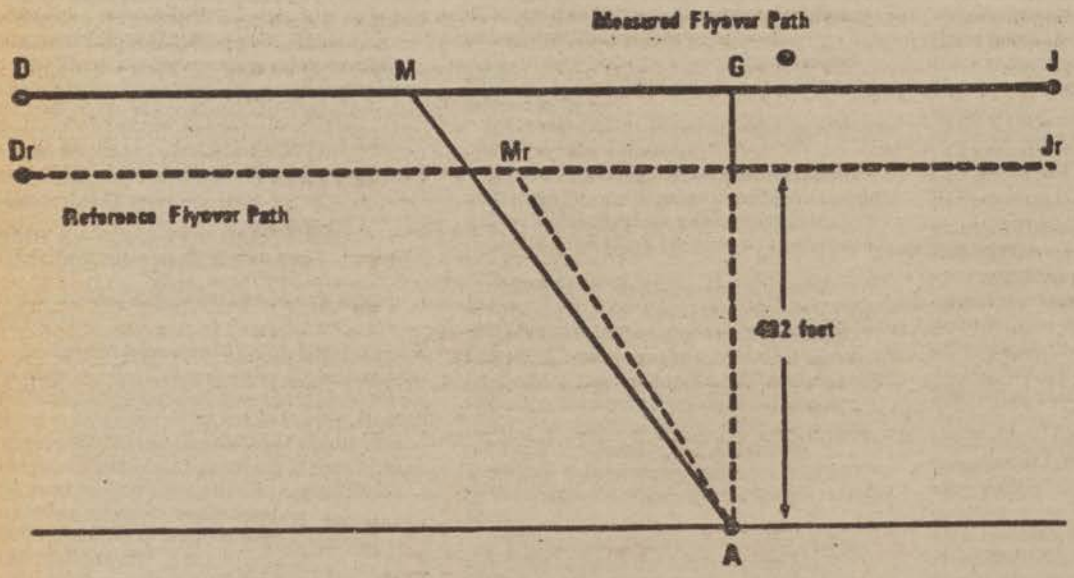

Figure H2. COMPARISON OF MEASURED AND CORRECTED FLYOVER PROFILES

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(2) Figure H2 illustrates comparative flyover profiles when test conditions do not conform to prescribed reference conditions. The position of the helicopter shall be recorded for a distance (DJ) sufficient to ensure recording of the entire interval during which the measured helicopter noise level is within 10 dB of PNLTM, as required. The flyover profile is defined by the height AG which is a function of the operating conditions controlled by the pilot. Position M represents the helicopter location on the measured flyover flight path for which PNLTM is observed at station A and M, is the corresponding position on the reference flight path.

(d) *Approach profiles.* (1) Figure H3 illustrates a typical approach profile, including reference conditions.

(2) The helicopter approaches position H along a 6° (±0.5°) average approach slope throughout the 10 dB down period. The approach procedure shall be acceptable to the FAA and shall be included in the Flight Manual.

(3) Figure H3 illustrates portions of the measured and reference approach flight paths including the significant geometrical relationships influencing sound propagation. EK represents the measured approach path with approach angle η and E_r and K_r represent the reference approach angle of 6°. Position N represents the helicopter location on the measured approach flight path for which PNLTM is observed at station

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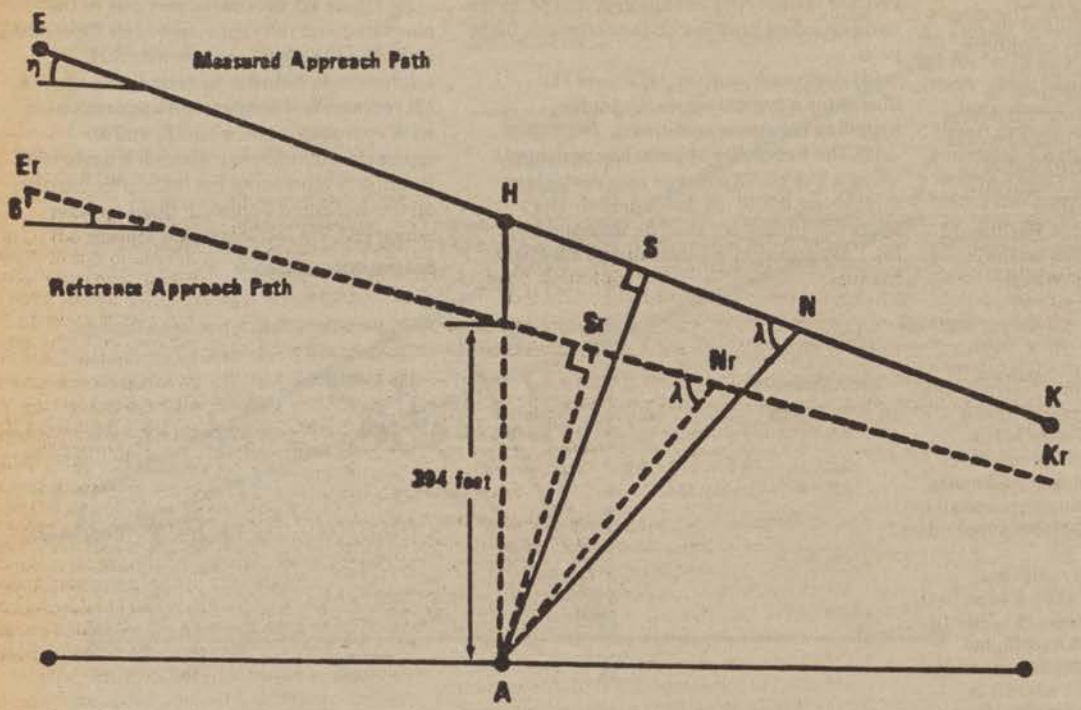

Figure H3. COMPARISON OF MEASURED AND CORRECTED APPROACH PROFILES

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A and N_r corresponding position on the reference approach flight path. The measured and corrected noise propagation paths are AN and An_r, respectively, both of which form the same angle with their flight paths. Position S represents the point on the measured approach flight path nearest station A and S_r is the corresponding point on the reference approach flight path. The minimum distance to the measured and reference flight paths are indicated by the lines AS and AS_r, respectively, which are normal to their flight paths.

(e) *Correction of noise at source during level flyover.* (1) For level overflight, if any combination of the following three factors, 1) airspeed deviation from reference, 2) rotor speed deviation from reference, and 3) temperature deviation from reference, results in an advancing blade tip Mach number which deviates from the reference Mach value, then source noise adjustments shall be determined. This adjustment shall be determined from the manufacturer supplied data approved by the FAA.

(2) Off-reference tip Mach number adjustments shall be based upon a sensitivity curve of PNLTM versus advancing blade tip Mach number, deduced from overflights carried out at different airspeeds around 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 0.3 Mach units. The advancing blade tip Mach number shall be computed using true airspeed, onboard outside air temperature, and rotor speed. A separate PNLTM versus advancing blade tip Mach number function shall 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 the flight on each run. PNLTM adjustments are to be applied to each microphone datum using the appropriate PNLTM function.

f. *PNLT corrections.* If the ambient atmospheric conditions of temperature and relative humidity are not 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_t is decomposed into its individual SPLi values.

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

$$SPLic = SPLi + (\alpha i - \alpha io)AL + (\alpha io)AL - ALr) + 20 \log(AL/ALr)$$

where SPLi and SPLic are the measured and corrected sound pressure levels, respectively, in the i-th one-third octave band. The first correction term accounts for the effects of change in atmospheric sound absorption where ai and aio are the sound absorption coefficients for the test and reference atmospheric conditions, respectively, for the i-th one-third octave band and L,A is the measured takeoff sound propagation path. The second correction term accounts for the effects of atmospheric sound absorption on the change in the sound propagation path length where L_tA_c is the corrected takeoff sound propagation path. The third correction term accounts for the effects of the inverse square law on the change in the sound propagation path length.

(ii) Step 2. The corrected values of the SPLic are then converted to PNLT and a correction term calculated as follows:

$$\Delta_1 = PNLT - PNLTM$$

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

(2) *Approach flight path.*

(i) The procedure described in paragraph (f)(1) of this section for takeoff flight paths is also used for the approach flight path, except that the value for SPLic relate to the approach sound propagation paths shown in Figure H3 as follows:

$$SPLic = SPLi + (\alpha - \alpha io)\,AM + \alpha(AM - AMr) + 20 \log(AM/AMr)$$

where the lines NS and N_rS_r are the measured and referenced approach sound propagation paths, respectively.

(ii) The remainder of the procedure is the same as that prescribed in paragraph (d)(1)(ii) of this section, regarding takeoff flight path.

(3) *Sideline microphones.* The procedure prescribed in paragraph (f)(1) of this section for takeoff flight paths is also used for the propagation to the sideline microphones, except that the values of SPLic relate only in the measured sideline sound propagation path as follows:

$$SPLic\text{-}SPLi + (\alpha io - \alpha + io)KX + \alpha io\,(KX - KXr) + 20 \log (KX/KXr)$$

K is the sideline measuring station where
X=L and Xr=Ln for take off
X=M and Xr=Mn for approach
X=N and Xr=Nr for fly-over

(4) *Level flyover flight path.* The procedure prescribed in paragraph (f)(i) of this section for takeoff flight paths is also used for the level flyover flight path, except that the values of SPLic relate only to the flyover sound propagation paths as follows:

$$SPLic = SPLi + (\alpha - \alpha io)\,AN + \alpha io\,(AN - ANr) + 20 \log (AN/ANr)$$

(g) *Duration corrections.*

(1) If the measured takeoff and approach flight paths do not conform to those prescribed as the corrected and reference flight paths, respectively, under § A36.5(d)(2) it will be necessary to apply duration corrections to the EPNL values calculated from the measured data. Such corrections must be calculated as follows:

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

$$\Delta_2 = -10 \log (AT/ATr) + 10 \log (V/Vr)$$

which represents the correction which must be added algebraically to the EPNL calculated from the measured data. The lengths AT and ATr are the measured and corrected takeoff minimum distances from the noise measuring station A to the measured and the corrected flight 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 flight path is at greater altitude than the corrected flight path.

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

$$\Delta 2 = -10 \log (AS/ASr) + 10 \log (V/Vr)$$

where AS is the measured approach minimum distance from the noise measuring station A to the measured flight path and 394 feet is the minimum distance from station A to the reference flight path.

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

$$\Delta_2 = -10 \log (KX/KXr) + 10 \log (V/Vr)$$

K is the sideline measuring station
where X=T and Xr=Tr for takeoff
where X=S and Xr=Sr for approach
where X=G and Xr=Gr for flyover

(d) *Level flyover flight paths.* For the level flyover flight path, the correction term is calculated using the formula—

$$\Delta_2 = -10 \log (AG/AGr) + 10 \log (V/Vr)$$

where AG is the measured flyover altitude over the noise measuring station A.

(2) The adjustment procedure described in this section shall apply to the sideline microphones in the take-off, overflight, and approach cases. Although the noise emission is strongly dependent on the directivity pattern, variable from one helicopter type to another, the propagation angle θ shall be the same for test and reference flight paths. The elevation angle ψ shall not be constrained but must be determined and reported. The certification authority shall specify the acceptable limitations on ψ. Corrections to data obtained when these limits are exceeded shall be applied using FAA approved procedures.

PART D—NOISE LIMITS UNDER § 36.805

Section H36.301 Noise measurement, evaluation, and calculation

Compliance with this part of this appendix must be shown with noise levels measured, evaluated, and calculated as prescribed under Parts B and C of this appendix.

Section H36.303 [Reserved]

Section H36.305 Noise levels

(a) *Limits.* For compliance with this appendix, it must be shown by flight test that the calculated noise levels of the helicopter, at the measuring points described in § H36.101 of this appendix, do not exceed the following, with appropriate interpolation between weights:

(1) *Stage 1* noise limits for acoustical changes for helicopters are as follows:

(i) For takeoff, flyover, and approach calculated noise levels, the noise levels of each Stage 1 helicopter that exceed the Stage 2 noise limits plus 2 EPNdB may not, after a change in type design, exceed the noise levels created prior to the change in type design.

(ii) For takeoff, flyover, and approach calculated noise levels, the noise levels of each Stage 1 helicopter that do not exceed the Stage 2 noise limits plus 2 EPNdB may not, after the change in type design, exceed the Stage 2 noise limits plus 2 EPNdB.

(2) *Stage 2* noise limits are as follows:

(i) *For takeoff calculated noise levels*—109 EPNdB for maximum takeoff weights of

176,370 pounds or more, reduced by 3.01 EPNdB per halving of the weight down to 89 EPNdB for maximum weights of 1,764 pounds or less.

(ii) *For flyover calculated noise levels*—108 EPNdB for maximum weights of 176,370 pounds or more, reduced by 3.01 EPNdB per halving of the weight down to 88 EPNdB for maximum weights of 1,764 pounds or less.

(iii) *For approach calculated noise levels*—110 EPNdB for maximum weights of 176,370 pounds or more, reduced by 3.01 EPNdB per halving of the weight down 90 EPNdB for maximum weight of 1,764 pounds or less.

(b) *Tradeoffs.* Except to the extent limited under § 36.11(b) of Part 36, the noise limits prescribed in paragraph (a) of this section may be exceeded by one or two of the takeoff, flyover, or approach calculated noise levels determined under § H36.203 of this appendix if

(1) The sum of the exceedances is not greater than 4 EPNdB;

(2) No exceedance is greater than 3 EPNdB; and

(3) The exceedances are completely offset by reduction in the other required calculated noise levels.

Note.—For reasons discussed earlier in the preamble, the FAA has determined that this document: (1) involves a proposed regulation which is not major under Executive Order 12291, (2) is not a significant rule pursuant to the Department of Transportation Regulatory Policies and Procedures (44 FR 11034; February 26, 1979), and (3) it is certified under the criteria of the Regulatory Flexibility Act that this proposed rule, as promulgated, will not have a significant impact on a substantial number of small entities. In addition, this rule will have little or no impact on trade opportunities for U.S. firms doing business overseas or for foreign firms doing business in the United States.

Issued in Washington, DC, on January 21, 1988.

T. Allan McArtor,

Administrator.

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