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MILITARY STANDARD
ACOUSTICAL NOISE LIMITS
IN HELICOPTERS



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MIL-STD-1294A

DEPARTMENT OF DEFENSE
WASHINGTON, D.C. 20301

ACOUSTICAL NOISE LIMITS IN HELICOPTERS.

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1. This military standard is approved for use by all departments and agencies of the Department of Defense.
2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: US Army Aviation Systems Command, ATTN: AMSAV-ELSS, 4300 Goodfellow Boulevard, St. Louis, MO 63120-1798, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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FORWARD

This standard is intended to provide the baseline by which the developer and user of military helicopters can establish realistic internal sound level control during development, testing, and operational phases of the total system. It is a design standard evolved from consideration of hearing damage risk, helicopter aircrew mission profile exposure, speech intelligibility, state-of-the-art helicopter noise reduction, and the helicopter weight, performance, and cost trade-offs of acoustical treatment. This standard is neither a hearing damage risk criterion nor a hearing conservation criterion.

To meet the requirements of this standard and not place undue restrictions on aircraft performance, it will be necessary to apply state-of-the-art noise reduction practices in the design of the helicopter and in the placement and general design of subsystems. The percentages of gross weight historically allocated to acoustic treatment of military helicopters ranges from 0.5% to 1.5%. It is anticipated, therefore, that the combination of source noise control measures and military type acoustic treatment will require about 1.0% of vehicle gross weight to achieve the noise limits contained herein. It should be emphasized that experience to date has shown that source noise control measures generally provide more weight efficient design solutions than the utilization of acoustical barrier/absorptive materials alone. Source noise control measures include, but are not limited to: fuselage damping; gear and housing stiffness damping; gear and tooth profile control; tooth mesh phasing; low noise component selection; hydraulic pump selection and isolation; hydraulic line isolation; hydraulic system damping; and drive system dynamic control.

The allowable noise levels in this standard were established to represent a reasonable compromise between those levels which the current state-of-the-art permits the designer to achieve in helicopters with approximately 1% of vehicle gross weight devoted to noise treatment, and those levels which would minimize hearing damage risk and maximize speech communication. The allowable levels will also insure that the aided speech intelligibility provides an articulation index of at least 0.6. Helicopters below 20,000 pounds (9070 kilograms) gross weight are treated separately from those at 20,000 pounds (9070 kilograms) and above because of the strong positive relation between internal noise levels and vehicle gross weight. The design limit levels for helicopters under 20,000 pounds (9070 kilograms) permit eight (8) hours of daily flight mission exposure for aircrew members wearing the SPH-3C, SPH-4 or HGU derivative aviators helmet assemblies and six (6) hours for passengers using approved hearing protection. The design limit levels for helicopters over 20,000 pounds (9070 kilograms) permit four (4) hours of daily flight mission exposure for aircrew members wearing the SPH-3C, SPH-4 or HGU derivative aviators helmet assemblies and three (3) hours for passengers using approved hearing protection.

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1. SCOPE

1.1 Purpose. Adherence to the provisions of this standard is intended to:

a. Minimize hearing loss among personnel exposed to helicopter noise and near-field exterior noise at maintenance/service locations around the helicopter.

b. Improve both aided and unaided speech communications in the noise environment of military helicopter compartments.

c. Optimize aircraft performance, costs, and weight tradeoffs relating to acoustical treatments applied within military helicopters.

d. Standardize the methods of testing, verifying, and documenting of noise control within helicopters.

1.2 Scope. This standard establishes steady state acoustical noise limits within personnel occupied spaces of military helicopters. It provides general requirements for control of noise, prescribes the testing requirements to verify conformance and the assessment of personnel safety and communications, and describes the data analysis and reporting requirements.

1.3 Application. This standard is intended to provide the baseline by which the developer as well as the user of the helicopter can establish realistic noise control during development, testing and operation of helicopters. It is applicable to the design of all systems, subsystems, component hardware, and equipment which can contribute to the noise within the occupied areas of the helicopter during its operation and maintenance. Impulse noise limits for helicopters are defined in MIL-STD-1474. Steady state noise limits for fixed wing aircraft are contained in MIL-A-8806.

2. REFERENCED DOCUMENTS

2.1 Issues of documents. The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this standard to the extent specified herein.

SPECIFICATION

MILITARY

MIL-STD-8806

Acoustical Noise Levels in Aircraft,
General Specification for

STANDARD

MILITARY

MIL-STD-1473

Standard General Requirements for Color
and Marking of Army Material

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MIL-STD-1474

Noise Limits for Army Material

(Copies of the standard required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer).

2.2 Other publications. The following documents form a part of this standard to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI S1.1	Acoustical Terminology (including Mechanical Shock and Vibration)
ANSI S1.4	Sound Level Meters, Specification for
ANSI S1.11	Octave and Third-Octave Band Filter Sets, Specification for
ANSI S3.5	Articulation Index, Method for the Calculation of the
ANSI S6.1	Qualifying a Sound Data Acquisition System, Recommended Practice
ANSI S1.13	Sound Pressure Level, Method for Measurement of

(Application for copies should be addressed to the American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018).

3. DEFINITIONS

Note: Acoustical terms not otherwise defined in this section shall be in accordance with ANSI S1.1.

3.1 Aided communication. Electrically (including electronically enhanced, real-time, analog or digital voice communications. The communication parts include intra-aircraft, inter-aircraft, and aircraft-to-ground links.

3.2 Articulation index (AI). A weighted number representing, for a given set of speech and noise conditions, the effective proportion of the normal speech signal that is available to a listener for conveying speech intelligibility. AI is computed from acoustical measurements (or estimates) of speech spectrum and of the effective masking spectrum, and is defined on a scale of 0 to 1.0. See ANSI S3.5.

3.3 A-weighting (dB(A)). The standard abbreviation for sound levels (decibels) measured with A-weighting network of a sound level meter. It is an octave band modification to take an approximate the frequency dependent response of human hearing. See ANSI S1.4 for definition of A-weighting filter

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characteristics.

3.4 C-weighting (dB(C)). The standard abbreviation for sound levels (decibels) measured with a C-weighting network of a sound level meter. It is generally used to limit the low and high frequency response of the instrument so that the instrument will not respond to signals outside the human hearing frequency range at high levels. See ANSI S1.4 for definition of C-weighting filters.

3.5 Decibel (dB) reference level (0dB). The level that corresponds to an RMS pressure of 20 micropascal (μPa_2) or 20 micronewtons per square meter ($\mu\text{N}/\text{M}^2$) or 0.0002, μbar or 0.0002 dyne/cm².

3.6 Hearing protectors. Devices designed primarily to reduce the noise reaching the auditory system. They may be of any type, i.e., earplugs, ear muffs, ear canal caps, attenuating helmets or headsets, provided they are approved by the Surgeon General. A current list of approved items can be obtained from the Army Surgeon General, HQDA (DASG-PSP), Washington, DC 20314.

3.7 Noise. Unless otherwise identified, the term noise shall mean acoustical noise and shall be measured in terms of dB, sound pressure level re 20 μPa .

3.8. Impulse noise. A short burst of acoustic energy consisting of either a single impulse or a series of impulses. The pressure-time history of a single impulse includes a rapid rise to a peak pressure, followed by a somewhat slower decay of the pressure envelope to ambient pressure, both occurring within one second. A series of impulses may last longer than one second.

3.9 Octave band. A frequency interval whose upper limit is twice the frequency of its lower limit. The center frequencies of this band are 31.5, 63, 125, 250, 500, 1000, 2000, 4000, 8000, and 16,000 Hz.

3.10 1/3 Octave band. A frequency interval whose upper limit is $\sqrt[3]{2}$ time the frequency of its lower limit. The center frequencies of this band are 25, 31.5, 40, 50, 63, 80 ...12,500, 16,000 and 20,000 Hz.

3.11 Sound pressure level (SPL). The pressure of an acoustic wave, normally expressed in decibels (dB), equal to 20 time the logarithm to the base 10 of the ratio of the effective (rms) pressure of this sound to the reference pressure, i.e.,

$$\text{SPL} = 20 \log_{10} \left[\frac{P}{20 \mu\text{Pa}} \right] = 20 \text{Log}_{10} P - 94$$

where P = the effective (rms) sound pressure in micropascals.

3.12 Steady state noise. A periodic or random variation in atmospheric pressure at audible frequencies. It may be continuous, intermittent, or fluctuating, with the sound pressure level varying over a wide range, provided such variations have a duration exceeding one second.

3.13 Hover, in ground effect. A condition when the helicopter is motionless

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with respect to the ground and the rotor is operating at one rotor diameter height or less above ground level.

3.14 V_{NE} . Velocity never exceeded.

3.15 V_H . Maximum horizontal velocity at maximum continuous power.

4. GENERAL REQUIREMENTS

4.1 Total system noise.

4.1.1 Subsystems. All aircraft subsystems which are to be normally operated in flight continuously for more than five (5) minutes per hour shall be selected and integrated in such a manner that the noise produced by the entire system in flight does not exceed the requirements of this standard. Aircraft subsystems shall include, but not be limited to the rotor(s), drive train, on-board auxiliary power unit (APU) and accessory equipment such as environmental control units, hydraulic pump systems, blowers and fans.

4.1.2 Other on-board installations. Ducting systems as well as other vibrational noise generating source locations that either produce noise attributable to the fluid flow phenomena or electrical/electronics induction as well as the installed non-moving parts or components that can be mechanically induced to vibrate, all may contribute to the total systems noise.

4.1.3 Government furnished equipment (GFE). The fact that a subsystem or component which contributes to the internal sound levels may be GFE shall not eliminate the requirement that the total system noise conform to this standard. Acoustic information on such systems shall be provided by the procuring agency to the contractor as required.

4.1.4 Ground operations. Considerations shall be given to the installation and location of auxiliary power units (APUs) so as to minimize the exposure of personnel to hazardous noise levels during maintenance and ground operations. Where applicable, additional acoustic treatment, which can be removed prior to flight, should be provided.

4.2 Posting of internal noise hazard areas.

4.2.1 General. When steady state noise levels are 85 dB(A) or greater, regardless of exposure time, or when impulse noise levels exceed 140 dB peak pressure level at any personnel occupied areas (in flight or during ground operations and maintenance), caution signs shall be prominently and permanently posted and the appropriate manuals shall contain a warning to be followed with a discussion of the hazard in a readily identifiable printing format.

4.2.2 Caution signs. Caution signs shall be located in helicopters so they are visible to all passengers who are normally not required to wear aviation helmets or headphones. The signs may be printed on adhesive back labels for application to hard smooth surfaces, or printed by means of stencils over fabric lined or acoustic blanketed areas. They shall be sized, color coded and worded in

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accordance with Figure 1 for labels, and Figure 2 for stencils. The stenciled signs shall have black lettering on a yellow background with a black border.

4.2.3 Manuals. Operation and maintenance manuals (field manuals, technical manuals, etc.) shall contain warning or caution notes to identify and highlight the hazard resulting from excessive noise levels. In addition, manuals shall contain a discussion of the noise hazard including the requirement for hearing protection, and the need for personnel to complete a required hearing conservation program. This discussion shall include the requirement for wearing the aircrew helmet or other appropriate hearing protection. It should also point out, when applicable, that improved intelligibility and attenuation characteristics are provided by wearing earplugs under the helmet.

5. DETAILED REQUIREMENTS.

5.1 Noise limit design criteria. Table 1 presents the sound pressure levels which shall not be exceeded when measured in accordance with paragraph 5.2. Helicopters with a design gross weight less than 20,000 pounds (9070 kilograms) shall not exceed the levels of Column A. Helicopters with a design gross weight equal to, or greater than 20,000 pounds (9070 kilograms) shall not exceed the levels of Column B. In cases where compliance with the levels of Column B can be documented as placing unacceptable penalties on aircraft performance and/or cost, the procuring activity may after reviewing the adequacy of hearing protectors to be used in conjunction with sound insulation installation for the benefit of hearing conservation, permit the extension of the levels of Column B to the extreme levels of Column C.

TABLE I

HELICOPTER SOUND PRESSURE LEVEL (dB) DESIGN LIMITS			
OCTAVE BAND CENTER FREQUENCY (Hz)	DESIGN GROSS WT. LESS THAN 20,000 LBS. (9070 kilograms)	DESIGN GROSS WT. 20,000 LBS. (9070 kilograms) OR GREATER	
	DESIGN LIMIT COLUMN A	DESIGN LIMIT COLUMN B	EXTREME DESIGN LIMIT* COLUMN C
63	116	116	120
125	106	106	110
250	99	99	103
500	91	93	97
1000	87	90	94
2000	82	89	93
4000	80	89	93
8000	85	91	95
16000	89	95	99

* Verifiable justification must be provided to the procuring activity to use levels in Column C for design limit.

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5.2 Noise measurement requirements for compliance. This section defines the noise level measurements, measurement techniques, and aircraft operating conditions which are to be used to measure the aircraft's internal noise for compliance with the sound pressure levels of Table I, above. It is particularly important that these measurement techniques and operating conditions be followed rigorously to assure uniformity of measurement from one measurement facility to another, and from one aircraft configuration to another.

5.2.1 Measurement location. Measurements with instrumentation as specified in 5.4 shall be made at:

- a. Each flight crew station.
- b. A representative number of mission crew or passenger stations, the number and locations to be approved by the procuring activity.

5.2.2 Test sample. Noise measurements shall be performed on an adequate number of production configured helicopters as early as possible in the development cycle. The test helicopter(s) shall be determined jointly by the procuring activity and the contractor.

5.2.3 Operating conditions.

5.2.3.1 Flight conditions. The flight conditions shall be:

- a. Hover, in ground effect. The helicopter shall be flown at a height determined by a $\frac{Z}{D}$ ratio of $0.4 \pm$ one foot (0.3 meter) where:

Z = the height of the rotor above the ground, and

D = the main rotor diameter.

- b. Level flight. At lower forward airspeed of either $0.9 V_H$ or $0.9 V_{NE}$ where:

$V_H =$

$V_{NE} =$

5.2.3.2 Gross weight and rotor speed conditions. Noise measurements shall be made while the helicopter is in flight at maximum design gross weight and at normal $\pm 5\%$ of rated rotor speed.

5.2.3.3 Helicopter subsystems/equipment. The subsystem/equipment which are normally operated continuously for more than five (5) minutes per hour in flight shall be operating during flight noise data acquisition. The heater shall be operating unless air conditioning is present and creates a higher dB(A) level;

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then the air conditioning shall be operated. In cases in which heaters and air conditioners may be operated at the same time (such as for humidity control) both shall be operated.

5.2.3.4 Helicopter configuration. The helicopter shall be operated with doors, windows and vents closed, and acoustical/thermal insulation treatment (hereafter referred to only an acoustic treatment) intact and in place.

5.2.4 Data acquisition. All real time measurements of noise data shall be tape recorded.

5.2.4.1 Microphone locations. Noise measurements shall be made at or near the head positions of all crew stations and at a representative number of passenger stations. Whenever possible, noise measurements should be made with the crew member or passenger absent and at a nominal ear position at a distance of 31.5 in. (80cm) above the seat reference point or, if standing, at a height of 65 in. (165 cm). If practicable during each measurement, the microphone shall be rotated horizontally in a 6 to 12 in. (15 to 30cm) diameter circle with the microphone diaphragm facing up vertically.

5.2.4.2 Recording Time. The recording time of each noise data sample shall be sufficient to produce a continuous 30 second record or longer of analyzed data.

5.3 Noise measurement requirements for personnel safety and communications. The purpose of these measurements is to identify potential noise hazards to personnel operating, servicing and maintaining the helicopter on ground as well as in flight and to determine the effectiveness of electrically aided and person-to-person voice communications while the helicopter and its subsystems equipment are in full operation (see also 5.2.3.3). These measurements shall be completed as early as possible during development of representative prototype and production helicopters so that appropriate corrective action can be timely initiated and in a cost effective manner.

5.3.1 Simulation/communication. A 60-second in-flight recording of the electrical noise on the communication system shall be made at a single key helmet interconnection jack (e.g., pilot or co-pilot). The recording shall be made across an 8-ohm impedance connected to the headset lines, with the selected interphone volume control(s) set at maximum. Communication silence (no microphone keyed) shall be maintained during the period of recording. Recording shall be preceded and ended with a calibration tone (1000 Hz sinusoidal signal 200 milliwatts, 8-ohm).

5.3.2 Personnel safety.

5.3.2.1 Flight measurements. Using the data acquisition procedures of 5.2.4, measurements shall be made (other than the configuration described in paragraph 5.2.3.4) at selected crew and passenger stations as approved by the procuring activity. These measurements shall be made for the following conditions and aircraft configurations:

- a. Doors and windows open, removable acoustic treatment in, and other

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operating conditions as specified in 5.2.3.

NOTE: The maximum allowable forward airspeed for this condition may be less than that specified in 5.2.3.1.b.

b. Doors and windows closed, removable acoustic treatment out, and other operating conditions as specified in 5.2.3.

c. Doors and window open, removable acoustic treatment out, and other operating conditions as specified in 5.2.3.

NOTE: The maximum allowable forward airspeed for this condition may be less than that specified in 5.2.3.1.b

d. Armament systems operating. Flight conditions, door and window configuration, and acoustic treatment as applicable for service use of armaments. Repeat measurements with each armament system operating alone more than one operating systems in certain combination and all systems operating simultaneously.

5.3.2.2 Ground measurements. Using the data acquisition procedures of paragraph 5.2.4, measurements shall be made at the head position at a representative number of normal maintenance locations, as approved by the procuring activity. These measurements shall be made with the aircraft on the ground. All subsystems which are normally operated during ground maintenance (generators, hydraulics, environmental control unit, etc.) shall be operating. The doors and windows shall be open. All those acoustic treatments and access panels normally removed for maintenance shall be removed. Measurements shall be made under each of the following operating conditions:

a. Engines off, APU operating (if so equipped).

b. All engines operating with rotors turning at flight-idle rpm (minimum collective pitch), and the APU operating, if so equipped.

c. Same as b. above but with rotors not turning, if the aircraft can be operated in such a condition.

5.3.2.3 85 dB(A) Contour. The 85 dB(A) contour line around the helicopter shall be measured. The microphone shall be a nominal 5 ft. 5 in. (165 cm) above the ground. The helicopter shall be on the ground and operating per the conditions of 5.3.2.2.b. An on-site measurement using a sound level meter meeting ANSI S1.4 type 1 may be used instead of tape recording and subsequent analyses.

5.4 Instrumentation.

5.4.1 Instrument specifications. Unless otherwise specified herein, all test instrumentation and procedures shall conform to the appropriate specifications and standards listed in paragraphs 2.1 and 2.2. Sound level meters shall conform to requirements for Type 1, as specified by ANSI S1.4. Octave band filter sets shall conform to requirements for Type E, Class II, as specified by ANSI S1.11. One-third octave filters shall conform to requirements for Type E, Class

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III, as specified in ANSI S1.11. Other noise recording instrumentation or combinations of instrumentation shall conform to ANSI S6.1, and applicable provisions of ANSI S1.4. System response shall be within the limits specified by ANSI S6.1.

5.4.2 Calibration. Appropriate calibration procedures shall be followed for all tests.

5.4.3 Microphones. Microphones shall conform to the requirements of ANSI S1.4.

5.4.4 Instrumentation shielding & electrical isolation. Test instrumentation shall be electrically isolated (e.g., battery powered or isolation transformers) from the aircraft electrical system to assure that electrically induced noise is not included in acoustic measurements. Test instrumentation shall be adequately shielded to preclude the recording of erroneous data resulting from the spurious response of the instrumentation to radio transmitter activation or the normal operating of aircraft electrical subsystems and devices. Precautionary measures should be taken to prevent erroneous response of the aircraft navigational systems due to the operation of on-board magnetic devices (e.g., tape recorders). A tape recording shall be made in flight with the microphone replaced by an equivalent shielded impedance to establish an instrumentation baseline.

5.4.5 Tape recorders. Tape recorders shall meet the requirements of ANSI S6.1.

5.5 Data analysis and reporting.

5.5.1 Data analysis. All steady state noise data shall be analyzed in octave band, 1/3 octave band, A-weighted and C-weighted sound pressure levels for each of the measured stations and conditions defined in 5.2 and 5.3 using the frequency range encompassed by Table 1, Section 5.1. All impulse noise data shall be analyzed in time history format suitable for comparison to impulse noise criteria. Data should be corrected to compensate for any non-flat frequency response of the entire measurement/analysis system including microphone and windscreen directivity characteristics.

5.5.2 Reporting. Data deliverable to the government will be in accordance with Section 6 (Notes).

5.5.2.1 Data tapes. Copies of data tapes shall be furnished to the procuring activity. Appropriate identification coding information shall be provided on each tape (See 6.1).

5.5.2.2 Noise control measures report. A report describing the planned approach for noise control and the estimated sound pressure levels shall be furnished to the procuring activity prior to fabrication or prototype or major modification of the aircraft (See 6.1).

5.5.2.3 Noise level assessment report. A report presenting measured sound pressure levels of the operating aircraft (on ground and in flight) with the

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sound abatement provisions incorporated shall be furnished to the procuring activity (See 6.1).

6. NOTES

6.1 Data requirements. When this standard is used in an acquisition which incorporates a DD Form 1423, Contract Data Requirements List (CDRL), the data requirements identified below shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved CDRL incorporated into the contract. When the provisions of DAR 7-104.9(n)(2) are invoked and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this standard is cited in the following paragraphs:

Paragraph No.	Data requirement title	Applicable DID No.
5.5.1	Computer/Machine Products (Special)	DI-A-30008
5.5.2	Noise Control Measures Report (Helicopters)	DI-H-7130
5.5.3	Noise Level Assessment Report (Helicopters)	DI-H-7131

(Data item descriptions related to this standard, and identified in section 6 will be approved and listed as such in DOD 5000.19L., Vol. II, AMSDL. Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center or as directed by the contracting officer).

Custodians:

Army-AV
AF-11
Navy-AS

Preparing Activity:

Army-AV

Review activities:

ARMY-MI

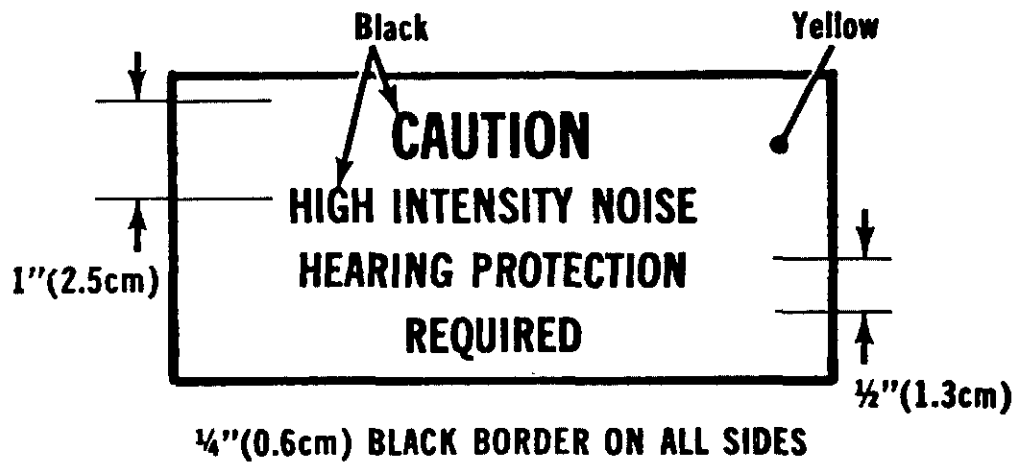
Project No. HFAC-0016

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NOTE: SIZES SHOULD BE PROPORTIONED IN ACCORDANCE WITH MIL-STD-1473 AND SHOULD BE SUFFICIENTLY LARGE TO INSURE LEGIBILITY AT REQUIRED READING DISTANCES.

Fig. 1 NOISE HAZARD CAUTION SIGN



INSTRUCTIONS: In a continuing effort to make our standardization documents better, the DoD provides this form for use in submitting comments and suggestions for improvements. All users of military standardization documents are invited to provide suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge (*DO NOT STAPLE*), and mailed. In block 5, be as specific as possible about particular problem areas such as wording which required interpretation, was too rigid, restrictive, loose, ambiguous, or was incompatible, and give proposed wording changes which would alleviate the problems. Enter in block 6 any remarks not related to a specific paragraph of the document. If block 7 is filled out, an acknowledgement will be mailed to you within 30 days to let you know that your comments were received and are being considered.

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DEPARTMENT OF THE ARMY



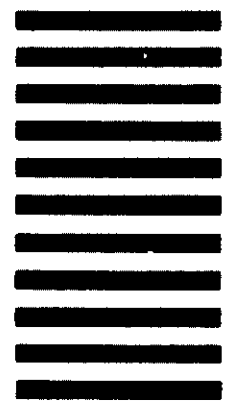
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4300 Goodfellow Blvd.
St. Louis, MO 63120-1798



STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER MIL-STD-1294A		2. DOCUMENT TITLE Acoustical Noise Limits in Helicopters	
3a. NAME OF SUBMITTING ORGANIZATION		4. TYPE OF ORGANIZATION (Mark one)	
b. ADDRESS (Street, City, State, ZIP Code)		<input type="checkbox"/> VENDOR	
		<input type="checkbox"/> USER	
		<input type="checkbox"/> MANUFACTURER	
		<input type="checkbox"/> OTHER (Specify): _____	
5. PROBLEM AREAS			
a. Paragraph Number and Wording:			
b. Recommended Wording:			
c. Reason/Rationale for Recommendation:			
6. REMARKS			
7a. NAME OF SUBMITTER (Last, First, MI) - Optional		b. WORK TELEPHONE NUMBER (Include Area Code) - Optional	
c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional		8. DATE OF SUBMISSION (YYMMDD)	

TO DETACH THIS FORM, CUT ALONG THIS LINE.