SAE INTERNATIONAL

# AEROSPACE STANDARD

AS4950 REV. B

Issued 1998-03
Revised 2007-03
Reaffirmed 2013-07

Superseding AS4950A

## (R) Design and Performance Criteria Transport Aircraft Portable Megaphones

RATIONALE

AS4950B has been reaffirmed to comply with the SAE five-year review policy.

1. SCOPE

This SAE Aerospace Standard (AS) provides design criteria and performance tests for portable, handheld, battery-powered, electronic megaphones used by aircraft crew members to provide information and guidance in the event of an aircraft emergency or other non-routine situation.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1.1 RTCA Publications

Available from Radio Technical Commission for Aeronautics Inc., 1828 L Street, NW, Suite 805, Washington, DC 20036, Tel: 202-833-9339, www.rtca.org.

RTCA/DO-160D Environmental Conditions and Test Procedures for Airborne Equipment





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**http://www.sae.org/technical/standards/AS4950B**

## 2.2 Related Publications

The following publications are provided for informational purposes only and are not a required part of this document.

### 2.2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

ARP577 Emergency Placarding - Internal and External

ARP583 Flight Attendant Stations

ARP997 Passenger Cabin Emergency Equipment Stowage

### 2.2.2 FAA Publications

Available from Federal Aviation Administration, 800 Independence Avenue, SW, Washington, DC 20591, Tel: 866-835-5322, www.faa.gov.

Code of Federal Regulations, Title 14, Part 21, Certification Procedures for Products and Parts

Code of Federal Regulations, Title 14, Part 25, Airworthiness Standards: Transport Category Airplanes

Code of Federal Regulations, Title 14, Part 121, Operating Requirements: Domestic, Flag, and Supplemental Operations

AC 121-6 Portable Battery-Powered Megaphones

TSO-C137 Aircraft Portable Megaphones

## 2.3 Definitions

### 2.3.1 RATED INPUT

Rated input shall be determined as follows: The megaphone shall be set up under free field conditions and an input applied to the microphone from an acoustically isolated artificial voice, emitting a warble frequency of 1250 to 1750 Hz at a pressure of 10,000,000 micropascals at 0.75 in (1.91 cm) and placed at a distance of 0.06 in (0.15 cm) away from and on the microphone axis. The electrical output of the microphone measured across a resistance equal to the input impedance shall be considered rated input.

### 2.3.2 FULL GAIN

The full gain is defined as the input/output ratio of the electronic amplifier at rated input that produces maximum megaphone output within the distortion limits allowed.

### 2.3.3 USABLE GAIN

The usable gain is defined as the input/output ratio of the electronic amplifier at rated input with the megaphone volume control (if provided) set as high as possible without feedback.

2.4 Mandating and Recommending Words

“Shall” - The word “shall” indicates a mandatory criterion.

“Should” - The word “should” indicates a criterion for which an alternative, including noncompliance, may be applied if it is documented and justified.

3. GENERAL REQUIREMENTS

3.1 Handle Size

The grip shape shall allow easy and secure handling of the megaphone with either hand. The grip circumference shall be no more than 6.5 in (16.5 cm) and the grip length shall be no less than 3.5 in (8.9 cm).

3.2 Weight

The megaphone shall weigh no more than 6 lb (2.7 kg) including batteries.

3.3 Balance

The megaphone shall be balanced to allow easy one-handed operation for 1 hour of continuous use.

3.4 Durability and Reliability

The megaphone shall be designed to meet the following requirements:

3.4.1 All materials used except small parts (knobs, triggers, fasteners, seals, and small electrical parts) that would not contribute significantly to the propagation of a fire shall be self-extinguishing when tested in accordance with applicable requirements of 14 CFR 25.853.

3.4.2 The megaphone should comply with Section 5 of this standard.

3.4.3 The megaphone shall be shown to operate continuously at usable gain for a period of at least 4 hours after being completely submerged in seawater for a period of 2 seconds.

3.5 Stowage Provisions

The megaphone design may include a stowage bracket. If included, the stowage bracket shall meet the following specifications:

3.5.1 The bracket shall be designed to minimize the possibility of inadvertent actuation.

3.5.2 The bracket shall allow the release and removal of the megaphone using only one hand.

3.5.3 The bracket should allow for ease of serviceability checks.

3.5.4 The bracket shall be of a contrasting color to the color of the megaphone.

3.6 Color

The majority of the megaphone’s exterior surface shall be of a bright color (e.g., white, yellow, orange) known to be highly visible in such circumstances as near darkness, smoke, and/or immersion in water.

### 3.7 Anti-feedback Design

The megaphone design and construction materials shall minimize the possibility of feedback when operated in a transport category aircraft cabin.

### 3.8 Power Source

The megaphone power source shall be self-contained with no external electrical connections. An external indicator of power source status is desirable. The manufacturer shall provide a defined power service life for the power source or a means of indicating or testing the status of the power source.

### 3.9 Activation

The means for activating the megaphone shall be obvious, and if incorporated into the handle, shall be invoked by positive compression of the handle itself, or a trigger or button mechanism actuated by the index finger of the holding hand.

### 3.10 Volume Adjustment

If included, volume adjustment hardware shall comply with the following:

3.10.1 The volume adjustment shall be controlled by a knob that facilitates easy operation.

3.10.2 Volume controls shall increase the volume when turned clockwise and decrease the volume when turned counterclockwise.

3.10.3 The volume adjustment shall provide logarithmic control of the megaphone output for a linear rotation of the knob.

### 3.11 Maintainability

The megaphone should be easily maintained with common tools.

### 3.12 Markings

The megaphone shall be marked with the specification to which it has been qualified.

## 4. MINIMUM PERFORMANCE CRITERIA

### 4.1 Operational Life

At the end of the defined power source service life, the megaphone shall be capable of continuously producing rated output sound pressure at rated input for a period of not less than 1 hour.

### 4.2 Rated Output Pressure

With the rated input applied to the electronic amplifier set to provide full gain, the megaphone output pressure shall be measured at a distance of 10 ft (3.0 m) on the horn axis. The rated output pressure shall be 112 dBA minimum (referenced to 13.79 psi (95,079 pascals)).

### 4.3 Usable Output Pressure

With the megaphone set up under free field conditions and an input applied to the microphone from an acoustically isolated artificial voice emitting a warble frequency of 1250 to 1750 Hz at a pressure of 10,000,000 micropascals at 0.75 in (1.91 cm) placed at a distance of 0.06 in (0.15 cm) away from and on the microphone axis and the electronic amplifier set to the usable gain position, the megaphone output pressure shall be measured at a distance of 10 ft (3.0 m) on the horn axis. The usable output pressure shall be 112 dBA (referenced to 13.79 psi (95,079 pascals)).

### 4.4 Amplifier Distortion

With rated input applied to the electronic amplifier set to provide full gain, the distortion contained in the amplifier output (measured across any resistive load within 20% of rated load) shall not exceed 10% at the usable output pressure, nor shall it exceed 15% at the rated output pressure at any frequency between 400 and 5500 Hz. With rated input applied to the electronic amplifier set to provide a megaphone output pressure equal to usable output pressure, the distortion contained in the amplifier output (measured across any resistive load within 20% of rated load) shall not exceed 10%, nor shall it exceed 15% at the rated output pressure at any frequency between 400 and 5500 Hz.

### 4.5 Output Sound Pressure Distribution

With rated input applied to the electronic amplifier set to provide a megaphone output pressure equal to the rated output pressure, sound pressure measurements shall be made at both 15° (0.26 rad) and 30° (0.52 rad) off the megaphone sound axis. Four measurements shall be made at each off axis angle, one in the horizontal plane on each side of the sound axis and one in the vertical plane above and below the sound axis. The off axis output pressure for each off-axis angle shall be figured as the arithmetical average of the four readings. The maximum off-axis deviation from the rated output pressure shall be 3 dBA at 15° and 6 dBA at 30°.

### 4.6 Frequency Response

The megaphone shall be set up under free field conditions with an input applied to the microphone from an acoustically isolated artificial voice emitting a warble frequency of 1250 to 1750 Hz at a sound pressure of 14,100,000 micropascals at 0.75 in (1.91 cm) placed at a distance of 0.06 in (0.15 cm) away from and on the microphone axis. The megaphone output shall be measured at a distance of 10 ft (3.0 m) on the horn axis, and the megaphone volume control shall be set to provide a measured output pressure of 106 dBA (referenced to 13.79 psi (20 micropascals). The input frequency shall then be varied over a range of 400 to 5500 Hz and the megaphone output pressure measured. The megaphone output pressure shall vary no more than 10 dBA. The volume control shall then be set to yield an output of 99 dBA (referenced to 13.79 psi (20 micropascals) and the input frequency again varied over a frequency range of 400 to 5500 Hz. The measured megaphone output pressure shall vary no more than 10 dBA through this range.

### 4.7 Internal Noise

With the electronic amplifier input bridged with a resistor equal in value to the input impedance and the amplifier output terminated with a resistance equal to the megaphone load impedance, set the amplifier to provide full gain. The measured voltage across the output load shall be 55 dBA below rated output pressure level when measured with a thermal type of voltmeter.

### 4.8 Loudspeaker Noise

With the megaphone operating at usable output pressure, the natural resonance(s) of the mechanical structure(s) shall occur at frequencies outside the usable frequency range of the loudspeaker. In addition, other inherent megaphone noises shall not impair the output sound quality.

### 4.9 Operation in Aircraft Environment

The directional characteristics of the microphone unit while it is mounted on the horn assembly shall be measured:

Use a pink noise source with an acoustical frequency response that is flat within ±3 dBA over the usable bandwidth of the megaphone. Pink noise source shall be at a distance of 10 ft (3.0 m) from the megaphone in an anechoic chamber. Rotate the megaphone system and record the polar sensitivity of the microphone output voltage by monitoring the output of the megaphone speaker amplifier terminated into a resistive load equivalent to the average impedance of the horn loudspeaker.

The microphone must have 10 dBA less signal at the most rearward point of rotation (180 degrees) when compared to the on axis (0 degree) signal.