

REQUIREMENTS SPECIFICATION

CREW-SERVED ACOUSTIC HAILING DEVICE (AHD)

Version 1.5
12 October 2004

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1.	Introduction	3
1.1	Standards	3
1.2	Order Of Precedence	3
2.	Crew-Served Acoustic Hailing Device (AHD) Top Level Requirements	3
2.1	Height	3
2.2	Width	3
2.3	Depth	3
2.4	Weight	4
2.5	Power (Input)	4
2.6	Heat Dissipation	4
2.7	Sea State	4
2.8	Cooling/Positive Pressure	4
2.9	Equipment Marking	5
2.10	Radar Cross Section	5
2.11	Cable Diameter	5
2.11.1	Cable Type	5
2.11.2	Cable Length	5
2.12	On-time Counter	5
2.13	Connectors	5
2.14	Mean Time Between Failures (MTBF)	6
2.15	Mean Time To Repair (MTTR)	6
2.16	Equipment Finish	6
2.17	Environmental	6
2.18	UID Tag	7
2.19	Safety	7
2.20	Maintenance Test Equipment	7
2.21	Local Kill Switch	7
2.22	Noise Level	7
3.	Crew-Served Acoustic Hailing Device (AHD) Description	8
3.1	Crew-Served AHD Mounting	8
3.2	Transmission Range	8
3.3	Digital Media Device Connection	8
3.4	Analog Microphone Connection	8
3.5	Crew-Served AHD Stops	8
3.6	Off-Time for Audio Transmission	9
3.7	Removable Handles	8
3.8	Audio Level	8
3.9	Adjustable Audio Level	8
3.10	Audio Main Lobe	9
3.11	Audio Side Lobe	9
3.12	AHD Interchangeability	9
3.13	Visual Indication	9
3.14	Harmonic Distortion Of Emitter	9
3.15	Frequency Response	9
3.16	FCC Compliance	9
4.	Ancillary Equipment	10
5.	Acronyms	10
	Appendix A – MIL-STDs	11
	Appendix B – Environmental Specifications	13

1. Introduction

This document provides the technical specifications for the Crew-Served version of the Acoustic Hailing Device (AHD). This Crew-Served AHD shall be a rugged and lightweight loudspeaker system with very high directivity that is intended for long-range hailing and warning.

1.1 Standards

The following specifications, standards, and handbooks form a part of this specification to the extent specified herein. In keeping with the most recent Department of Defense and Secretary of the Navy policy, it is encouraged to propose alternatives to the specifications and standards cited herein for government concurrence. Unless otherwise specified, the issues of the military documents are those listed in the issue of the Department of Defense Index of Specifications and Standards on the date of this specification. The issue of non-government standards is in effect on the date of this specification. Invoked documents and standards specifically called out in Section 2 and Section 3 are to be followed. Guidance documents provide a reference to use a general guide in the development of processes, documents, or data. See **Appendix A** for a list of standards and applicable documents that shall be considered.

1.2 Order of Precedence

In the event of a conflict between the text of this document and the reference cited herein, the text of this document takes precedence. Nothing in this document supersedes applicable Federal, State or Local laws and regulations unless a specific exemption has been obtained.

2. Crew-Served Acoustic Hailing Device (AHD) Top Level Requirements

The AHD shall comply with the following electrical and mechanical specifications. For the purpose of this specification, the speaker system only is considered a single AHD unit. The following requirements only pertain to the speaker assembly, not including the mounting apparatus.

PARAGRAPH NUMBER	TOP LEVEL ATTRIBUTE	THRESHOLD	OBJECTIVE
2.1	Height	AHD height shall not exceed 45.0 Inches	AHD height shall not exceed 30.0 Inches
2.2	Width	AHD width shall not exceed 45.0 Inches	AHD width shall not exceed 30.0 Inches
2.3	Depth	AHD depth shall not exceed 15.0 Inches	AHD depth shall not exceed 9.0 Inches

2.4	Weight	AHD weight shall not exceed 74.0 Pounds	AHD weight shall not exceed 60.0 Pounds
2.5	Power (Input)	<p>AHD shall run on power:</p> <p>115VAC ± 5% ≤ 10 Amps ± 5% 60 Hz ± 5% Single Phase</p> <p>Or</p> <p>440VAC ± 5% ≤ 5 Amps ± 5% 60 Hz ± 5% Three Phase</p>	N/A
2.6	Heat Dissipation	Above Deck Equipment: 2.3kw / 7,855 BTUs/hour	N/A
2.7	Sea State (Based On Pierson – Moskowitz Sea Spectrum Scale)	<p>Operational: AHD shall operate up to and including sea state 3.</p> <p>Survival: AHD shall survive up to and including sea state 8.</p>	N/A
2.8	Cooling/Positive Pressure	<p>If OEM requires, dry air shall be provided.</p> <p>The AHD shall be cooled at ≤ 6 cfm at ≤ 100 psi.</p> <p>No chilled water shall be provided</p> <p>No hazardous material shall be used to keep the AHD cool</p> <p>The AHD shall not require dry air, desiccant packs, or chilled water to cool the system</p>	<p>The AHD shall not require dry air, desiccant packs, or chilled water to cool the system</p> <p>N/A</p>

2.9	Equipment Marking	Nameplates and markings for all pieces of equipment shall be clean, concise, legible, and durable. Markings shall be provided for all controls, lamps, switches, fuses, jacks, test points, and other components	N/A
2.10	Radar Cross Section	The Radar Cross Section (RCS) shall be in accordance with Radar Cross Section Requirements for IROS ³ CONFIDENTIAL/NO FORN letter dated 30 December 2002. The AHD shall have a RCS no greater than the value for gun mount assembly called out in above letter.	N/A
2.11	Cable Diameter	No interface cable shall exceed 2 Inches in diameter	No shipboard cable shall exceed 1 Inch in diameter
2.11.1	Cable Type	All interface cables shall be low smoke in accordance with MIL-C-24643A (See Appendix A).	N/A
2.11.2	Cable Length	All interface cables shall support cable runs up to and including 25 feet.	All interface cables shall support cable runs up to and including 300 feet.
2.12	On-time Counter	The AHD shall place an easily accessible and visible on time counter on all major components. The counter shall record operating hours of each major component. Counter shall be a minimum of 4 digits with minimum lowest valued digit in hours.	N/A
2.13	Connectors	All exterior AHD connectors shall be in accordance with MIL-DTL-38999K (See Appendix A)	N/A

2.14	Mean Time Between Failures (MTBF)	<p>Mean Time Between Failures (MTBF) is the predicted mean time between failures, in terms of operating hours.</p> <p>MTBF can be calculated by the following formula:</p> <p>MTBF = Average Uptime/Number of Failures</p> <p>The AHD shall have a MTBF \geq 720 hours</p>	The AHD shall have a MTBF \geq 1,440 hours
2.15	Mean Time To Repair (MTTR)	<p>Mean Time To Repair (MTTR) is the predicted mean time to repair the item, in elapsed hours. This factor is used to compute A_o of the equipment and to provide estimates of maintenance shop workloads.</p> <p>The AHD shall have a MTTR \leq 1 hour</p>	The AHD shall have a MTTR \leq 30 minutes
2.16	Equipment Finish	<p>All equipment shall be Navy Haze Gray, Color #26270 per FED-STD-595B</p> <p>Per one of the following as applicable:</p> <ul style="list-style-type: none"> a.) Hard coat anodize per MIL-A-8625F, type III, class1 or, b.) Commercial grade powder coat epoxy with appropriate priming system 	N/A
2.17	Environmental	The AHD shall meet the Environmental Requirements in Appendix B	N/A

2.18	UID Tag	The AHD shall have Unique IDentification (UID) tags at the LRU level Government shall provide UID tag part numbers prior to production of the AHD.	N/A
2.19	Safety	The AHD shall be designed to ensure system is safe to use, and there shall be no electrical, mechanical, or radiation hazard to users as specified in MIL-STD-882D. Safety lockout capabilities shall be included.	N/A
2.20	Maintenance Test Equipment	Organizational level preventive/corrective maintenance shall not require any special purpose test equipment. General-purpose test equipment is allowed if necessary.	N/A
2.21	Local Kill Switch	The AHD shall be equipped with a local kill switch that shall secure the power during manual troubleshooting or manipulation of the system.	N/A
2.22	Noise Level	The AHD mechanical audible noise level shall be no louder than 63 decibels in accordance with MIL-STD-740-1, Grade A3. This requirement does not include the audio output of the AHD required for sound/message annunciation.	N/A

3. Crew-Served Acoustic Hailing Device (AHD) Description

The Crew-Served AHD shall allow for long range acoustic hailing and warning using an input microphone or recorded sound file. With the Crew-Served AHD, audio transmission beyond 500 meters shall be feasible with minimal lobing and rear radiation. The Crew-Served AHD shall meet the following operational and reliability requirements.

PARAGRAPH NUMBER	OPERATIONAL ATTRIBUTE	THRESHOLD	OBJECTIVE
3.1	AHD Mounting	The AHD shall be designed for use with a universal mounting bracket. This bracket shall be designed for use with a stand-alone tripod.	The AHD shall be designed for use with a universal mounting bracket. This bracket shall be designed for use with a stand-alone tripod, a standard machine gun mount, or a rail having a diameter up to 4 inches.
3.2	Transmission Range	The AHD shall be capable of producing a SPL that shall be ≥ 98 dB at 500 yards.	The AHD shall be capable of producing a SPL that shall be ≥ 95 dB at 1000 yards.
3.3	Digital Media Device Connection	The AHD shall be capable of having standard commercial audio files played. These audio files shall include but not be limited to high quality .WAV and MPEG-3 compression files.	The AHD shall be delivered with a standard digital audio playback hardware that can be easily loaded via personal computer.
3.4	Analog Microphone Connection	The AHD shall have the ability to allow the connection of an external microphone as well as accept near real time voice input with a latency ≤ 25 ms. The external microphone frequency response range shall at least include the 600 Hz – 6 kHz frequency range.	N/A
3.5	AHD Stops	The Universal mounting bracket shall have the ability to set configurable Hard Stops that will prevent crew-served rotation into unwanted zones. Hard Stops shall not allow physical movement of the AHD past these configurable positions.	N/A

3.6	Off-time for Audio Transmission	The AHD shall have a disengagement period of ≤ 5 seconds.	The AHD shall have a disengagement period of ≤ 2 seconds
3.7	Removable Handles	The AHD shall have removable handles that makes lifting and moving the AHD during corrective and preventive maintenance.	N/A
3.8	Audio Level	Audio volume level shall be ≥ 125 dB at 4 meters.	Audio volume level shall be ≥ 135 dB at 4 meters
3.9	Adjustable Audio Level	The AHD shall have an adjustable audible level from 3 dBA to maximum dBA.	N/A
3.10	Audio Main Lobe	The AHD Main Lobe of audio transmission shall be \leq than 30° .	The AHD Main Lobe of audio transmission shall be \leq than 15°
3.11	Audio Side Lobe	The AHD Side Lobe of audio transmission shall be \leq than 75° .	The AHD Side Lobe of audio transmission shall be \leq than 30°
3.12	AHD Interchangeability	N/A	The AHD shall be interchangeable with the standard remote-operated AHD.
3.13	Visual Indication	The AHD shall have a visual sight check which allows pointing of device towards target.	The AHD shall have a optical device which display ROI on a LCD display resident on back of AHD. The optical device shall allow zooming and allow for viewing contacts during low light conditions.
3.14	Harmonic Distortion Of Emitter	The AHD shall have harmonic distortion of less than 1% THD at 120 dB (2 meters 2.5 kHz)	N/A
3.15	Frequency Response	The AHD frequency response range shall at least include the 2000 – 8000 Hz frequency range.	The AHD frequency response range shall at least include the 20 – 20000 Hz frequency range.
3.16	FCC Compliance	The AHD shall comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules.	N/A

4. Ancillary Equipment

This specification has been written with the intent of only documenting requirements for a single Crew-Served AHD. As an objective, ancillary equipment to support the AHD shall not be required. As a threshold, ancillary equipment is permissible to support the AHD. Ancillary equipment shall be evaluated in conjunction with the AHD requirements. Less ancillary equipment shall have preference over more ancillary equipment, and smaller/lighter ancillary equipment shall have preference over larger/heavier ancillary equipment.

5. Acronym Definitions

A _o	Operational Availability
AHD	Acoustic Hailing Device
BIT	Built-In Test
BTU	British Thermal Unit
FCC	Federal Communications Commission
IROS ³	Integrated Radar Optical Surveillance and Sighting System
LRU	Lowest Replaceable Unit
MDT	Mean Down Time
MTBMCF	Mean Time Between Mission Critical Failures
MTBF	Mean Time Between Failures
MTTR	Mean Time To Repair
NFOV	Narrow Field Of View
NSWC	Naval Surface Warfare Center
ROI	Regions Of Interest
SPL	Sound Pressure Level
THD	Total Harmonic Distortion
OEM	Original Equipment Manufacturer
RFID	Radio Frequency Identification
WFOV	Wide Field Of View

Appendix A

MIL-HDBK-2036	01 NOV 1999	Preparation Of Electronic Equipment Specifications
Federal Acquisition Register	JAN 1998	Y2K Document
MIL-HDBK-46855A	17 MAY 1999	Human Engineering Requirements For Military Systems, Equipment, And Facilities
MIL-STD-2525B	30 JAN 1999	Common Warfighting Symbology
MIL-DTL-38999K	12 JUL 2002	Connectors, Electrical, Circular, Miniature, High Density, Quick Disconnect (Bayonet, Threaded, and Breech Coupling), Environment Resistant, Removable Crimp And Hermetic Solder Contacts, General Specification For
MIL-DTL-5015H	18 MAY 2000	Connectors, Electrical, Circular Threaded, AN Type, General Specification For
MIL-C-24643A	14 MAR 1994	Cable And Cords, Electric, Low Smoke, For Shipboard Use, General Specification For
MIL-STD-2042B	25 JUL 2002	Fiber Optic Cable Topology Installation Standard Methods For Naval Ships
MIL-C-28876D	04 MAY 1995	Connectors, Fiber Optic, Circular, Plug And Receptacle Style, Multiple Removable Termini, General Specification For
MIL-PRF-85045F	12 AUG 1999	Cables, Fiber Optics, (Metric), General Specification For
FED-STD-595B	11 JAN 1994	Colors Used In Government Procurement
MIL-A-8625F	10 SEP 1993	Anodic Coatings For Aluminum And Aluminum Alloys

MIL-STD-810F	30 AUG 2002	Department Of Defense Test Method Standard For Environmental Engineering Considerations And Laboratory Tests
MIL-STD-167-1	19 JUN 1987	Mechanical Vibrations Of Shipboard Equipment (Type 1 – Environmental And Type II - Internally Excited)
MIL-S-901D	17 MAR 1989	Shock Tests. H.I. (High Impact) Shipboard Machinery, Equipment, And Systems, Requirements For
DOD-STD-1399/70-1	30 NOV 1989	Interface Standard For Shipboard Systems Section 070 - Part 1 D.C. Magnetic Field Environment (Metric)
MIL-STD-461E	20 AUG 1999	Requirements For The Control Of Electromagnetic Interference Characteristics Of Subsystems And Equipment
OPNAVINST 3000.12	30 SEP 1999	Operational Availability Handbook
MIL-STD-882D	10 FEB 2000	Standard Practice For System Safety
MIL-STD-1399-300A	11 MAR 1992	Interface Standard For Shipboard Systems Section 300A Electric Power, Alternating Current (Metric)
MIL-STD-1472F	23 AUG 1999	Department Of Defense Design Criteria Standard, Human Engineering
MIL-STD-740-1	30 DEC 1986	Airborne Sound Measurements And Acceptance Criteria Of Shipboard Equipment
ANSI Z136.1-2000	26 OCT 2000	Safe Use Of Lasers
CONFIDENTIAL/NO FORN	30 DEC 2002	Radar Cross Section (RCS) Requirements For Integrated Radar Optical Surveillance And Sighting System (IROS ³)

Appendix B

ENVIRONMENTAL SPECIFICATIONS (OPERATING)			
Ambient Temperature	-40 °C to 70 °C	MIL-STD-810F Method 501.4 and 502.4, Procedure II	Above Deck Equipment
Ambient Temperature	-10 °C to 49 °C	MIL-STD-810F Method 501.4 and 502.4, Procedure II	Below Deck Equipment
Storage Ambient Temperature	-40 °C to 70 °C	MIL-STD-810F, Method 501.4 and 502.4, Procedure I	Above Deck Equipment And Below Deck Equipment
Solar Radiation	350 BTU/hr/ft ²	MIL-STD-810F, Method 505.4, Procedure II, Basic Hot	Above Deck Equipment
Rain	Rainfall rate 6 cm/hr, wind speed 18 m/s, water pressure 377 kPa	MIL-STD-810F, Method 506.4 Procedure I (Blowing rain).	Above Deck Equipment
Humidity	100% condensing	MIL-STD-810F, Method 507.4	Above Deck Equipment And Below Deck Equipment
Salt Fog	MIL-STD-810F, Method 509.4 Procedure I	MIL-STD-810F, Method 509.4 Procedure I	Above Deck Equipment And Below Deck Equipment
Ice	4.5 lbs/ft ²	MIL-STD-810F, Method 521.2 Procedure I	Above Deck Equipment
Fungus	MIL-STD-810F, Method 508.5	MIL-STD-810F, Method 508.5	Above Deck Equipment And Below Deck Equipment
Sand/Dust	MIL-STD-810F, Method 510.4 Procedure I (Blowing Dust)	MIL-STD-810F, Method 510.4 Procedure I (Blowing Dust)	Above Deck Equipment
Wind velocity	90 knots	To be incorporated into design and supported by analyses	Above Deck Equipment
Vibration	MIL-STD-167-1 Type 1 and MIL-STD-810F, Method 514.5 Categories 2 and 21 (Transportation and Shipboard vibration)	MIL-STD-167-1 Type 1 and MIL-STD-810F, Method 514.5 Categories 2 and 21 (Transportation and Shipboard vibration)	Above Deck Equipment And Below Deck Equipment
Shock	Grade B, Type A, Class III	MIL-HDBK-2036 (Shock); MIL-S-901D	Above Deck Equipment
Shock	Grade B, Type A, Class III	MIL-HDBK-2036 (Shock); MIL-S-901D	Below Deck Equipment
DC Magnetic Field	DOD-STD-1399-70-1	DOD-STD-1399-70-1	Below Deck Equipment
Non-Operating Altitude	MIL-STD-810F, Method 500.3 Procedure I	MIL-STD-810F, Method 500.3 Procedure I	Above Deck Equipment And Below Deck Equipment
EMI/EMC	MIL-STD-461E surface ships	MIL-STD-461E surface ships	Above Deck Equipment And Below Deck Equipment