MILITARY SPECIFICATION

DETECTING-RANGING SET, SONAR AN/AQS-13B

This specification has been approved by the
Naval Air Systems Command, Department of the Navy.

1. SCOPE

1.1 Scope - The equipment covered by this specification shall provide a lightweight, dipped, underwater, detecting-ranging system capable of rapid 360 degree search. It shall consist of electronic units which operate with certain equipment of the AN/AQS-13A Sonar Set. These units shall provide for the transmission, reception, and display of sonar signals. The Indicator portion of this system shall be adaptable for the display of sonobuoy signals.

1.2 Classification - The Detecting-Ranging Set, Sonar AN/AQS-13B shall consist of the following items:

Item	Type Designation	Applicable Paragraph
Receiver, Sonar	R-1695/AQS-13B	3.5.1
Indicator, Azimuth-Range	IP-1045/AQS-13B	3.5.2
Transmitter, Sonar	T-1178/AQS-13B	3.5.3
Control, Dome	C-8598/AQS-13B	3.5.4
Indicator, Bearing-Range	ID-1751/AQS-13B	3.5.5
Mounting Base, Receiver/ Indicator	MT-4311/AQS-13B	3.5.6
Mounting Base, Transmitter	MT-4312/AQS-13B	3.5.7
Hydrophone, Sonar	DT-299/AQS-13	#
Projector, Sonar	MX-6647/AQS-13	#
Recorder	RO-358/AQS-13A	#
Reeling Machine, Cable, Hydraulic	RL-237A/AQS-13	#
Cable Assembly and Reel	RC-466A/AQS-13	#
Housing, Transducer	CW-1007/AQS-13A	#
Housing, Reeling Machine	CW-757A/AQS-13	#
Mounting Base (Recorder)	MT-4035/AQS-13A	#

#NOTE: The detail requirements for these items shall be as specified in Specification MIL-D-81622.

1.3 Associated Equipment - This equipment shall operate with the associated equipment listed in 6.8.

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

Military

MIL-D-81873(AS) Addendum 1	Classified Addendum, Detecting-Ranging Set, Sonar AN/AQS-13B (U)
MIL-C-172	Cases; Bases, Mounting; and Mounts, Vibration (for use with Electronic Equipment in Aircraft))
MIL-W-5088	Wiring; Aircraft, Installation of
MIL-E-5400	Electronic Equipment, Aircraft, General Specification for
MIL-T-5422	Testing, Environmental, Aircraft Electronic Equipment
MIL-I-6181	Interference Control Requirements, Aircraft Equipment
MIL-C-6781	Control Panel; Aircraft Equipment, Rack or Console Mounted
MIL-P-7788	Panels, Information, Integrally Illuminated
MIL-M-7793	Meter, Time Totalizing
MIL-E-17555	Electronic and Electrical Equipment and Associated Repair Parts, Preparation for Delivery of
MIL-T-18303	Test Procedures; Preproduction and Acceptance, For Aircraft Electronic Equipment, Format for
MIL-N-18307	Nomenclature and Nameplates for Aeronautical Electronic and Associated Equipment
MIL-T-23103	Thermal Performance Evaluation, Airborne Electronic Equipment, General Specification for
MIL-I-81219	Indicator, Elapsed Time, Electrochemical
MIL-D-81622	Detecting-Ranging Set, Sonar AN/AQS-13A

Naval Air Systems Command

AR-5	Microelectronic Devices Used in Avionic Equipment, Procedures for Selection and Approval of
AR-8	Versatile Avionic Shop Test System Compatibility, General Requirements for
AR-9	Versatile Avionic Shop Test Programs, General Requirements for
AR-10	Maintainability of Avionics Equipment and Systems, General Requirements for
AR-34	Failure Classification for Reliability Testing, General Requirements for

STANDARDS

Military

MIL-STD-704	Electric Power, Aircraft, Characteristics and Utilization of
MIL-STD-781	Reliability Tests, Exponential Distribution
MIL-STD-785	Requirements for Reliability Program for System and Equipment Development and Production
MIL-STD-794	Parts and Equipments Procedures for Packaging and Packing of

Federal

FED-STD-595	Colors

PUBLICATIONS

EI-636	Avionics Installation Instructions for Detecting-Ranging Set, Sonar AN/AQS-13B
ET-636	Avionics Bench, Preflight and Flight Test Instructions for Detecting-Ranging Set, AN/AQS-13B

2.1.1 Availability of Documents

When requesting specifications, standards, drawings, and publications refer to both title and number. Copies of this specification and applicable specifications required by contractors in connection with specific procurement functions may be obtained upon application to the Commanding Officer, Publications and Forms Center, Code 105, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120.

3. REQUIREMENTS

3.1 Preproduction - This specification makes provision for preproduction testing.

3.2 Parts and Materials - In the selection of parts and materials, fulfillment of major design objectives shall be the prime consideration. In so doing, the following shall govern:

(1) Microelectronic technology shall be considered and microelectronic items shall conform to requirements specified herein.

(2) Other parts and materials requirements shall conform to Specification MIL-E-5400.

(3) Nonrepairable subassemblies shall be used in accordance with Specification AR-10 and as outlined in Specification MIL-E-5400.

(4) When previously produced models of this equipment did not use nonrepairable subassemblies, the design shall not be changed to employ nonrepairable assemblies without the approval of the procuring activity.

3.2.1 Nonstandard Parts and Materials Approval - Approval for the use of nonstandard parts and materials (including electron tubes, transistors, diodes, and thin and thick film hybrids) other than monolithic microelectronic devices shall be obtained as outlined in Specification MIL-E-5400. Monolithic microelectronic devices shall be approved as outlined in AR-5.

3.2.2 Microelectronic Modular Assemblies - Microelectronic Modular Assemblies shall meet the requirements of Specification AR-10.

3.2.3 Modules - The electronic portions of the equipment shall be functionally modularized in accordance with Specification AR-10.

3.3 Design and Construction - The equipment shall conform with all the applicable requirements of Specification MIL-E-5400 for design, construction, and workmanship, except as otherwise specified herein.

3.3.1 Total Weight - The total weight of the equipment, excluding cables, shall be a minimum consistent with good design and shall not exceed 598.3 pounds.

3.3.2 Reliability - The contractor shall conduct a reliability program using MIL-STD-785 as a guide. On a reorder from a supplier who has previously produced the equipment, the program previously used may be continued unless otherwise indicated in the contract or order.

3.3.2.1 Operational Stability - The equipment shall operate with satisfactory performance, continuously or intermittently, for a period of at least 350 hours without the necessity for readjustment of any controls which are inaccessible to the operator during normal use.

3.3.2.2 Operating Life - The equipment shall have a total operating life of 5000 hours with reasonable servicing and replacement of parts. Parts requiring scheduled replacement shall be specified by the contractor.

3.3.2.3 Reliability In Mean Time Between Failure (MTBF) - The equipment specified in 3.5.1 through 3.5.7, including any Built-in Test provisions, shall be tested as a subsystem composed of one each of the referenced equipments for reliability demonstration purposes, and shall have a mean (operating) time between failures of 350 hours when tested and accepted as outlined under the requirements of 4.4.3.

3.3.2.4 Time Totalizing Meter - The following units shall contain time totalizing meters in accordance with Specification MIL-M-7793 or MIL-I-81219.

Unit	Type of Meter
Receiver, Sonar R-1695/AQS-13B	MIL-M-7793
Indicator, Azimuth-Range IP-1045/AQS-13B	MIL-M-7793
Transmitter, Sonar T-1178/AQS-13B	MIL-M-7793
Control, Dome C-8598/AQS-13B	MIL-I-81219

3.3.3 Cabling and Connections -

3.3.3.1 Cables and Connectors - The equipment shall provide for the use of cables and connectors in accordance with Specification MIL-E-5400.

3.3.3.2 Interconnection Cabling - The equipment shall be capable of satisfactory operation using external wiring in accordance with the applicable requirements of Specification MIL-W-5088. The external wiring shall be unshielded, except that a minimum number of the individual wires may be shielded when demonstrated as necessary to meet interference control requirements and provided the assembly of the cable to its plugs may be easily accomplished. External cables and that portion of the connectors attached to the cables shall not be supplied as part of the equipment.

3.3.4 Control Panels - All rack or console-mounted control panels shall conform to the applicable requirements of Specification MIL-C-6781, except the edge-lighted panels may be 0.350 inch maximum thickness. The lamp voltage shall be +28 Vdc. The configuration of all panels shall be approved by the procuring activity prior to preproduction testing. The lighting of the plastic panel shall conform to Specification MIL-P-7788 as follows:

Unit	MIL-P-7788 Requirement	
Receiver, Sonar R-1695/AQS-13B	Class 2R	Type V
Indicator, Azimuth-Range IP-1045/AQS-13B	Class 2R	Type V
Control, Dome C-8598/AQS-13B	Class 1R	Type V
Indicator, Bearing-Range ID-1751/AQS-13B	Class 1R	Type V

3.3.5 Interchangeability - The equipment shall meet the interchangeability requirements of Specification MIL-E-5400.

3.3.6 Interference Control - The generation of radio interference and the vulnerability to radio interference for the equipment specified in 3.5.1 through 3.5.7 shall be controlled within the limits of Specification MIL-I-6181, except as follows:

(1) The 3.0 volt rms signal level listed under Test Methods of Military Specification MIL-I-6181 in 4.3.4.1.2, Audio Frequency Conducted, shall be reduced to 0.3 volt at the system local oscillator frequency of 12 ±3 kHz.

(2) The broadband and pulse (cw) conducted interference limits using current probe measured by the methods of Military Specification MIL-I-6181 shall not exceed the limits of straight-line curves plotted on semi-log paper between the following points: 105 dB above one microampere per MHz at 0.15 MHz; 73 dB above one microampere per MHz at 0.60 MHz; and 55 dB above one microampere per MHz at 25.0 MHz.

(3) The narrowband (cw) radiated and conducted interference limits measured by the methods of MIL-I-6181 shall not exceed the limits indicated by the following table at the system clock frequency (7.6 MHz) and associated harmonics.

	Maximum Allowable Level Above MIL-I-6181 Limits		
Frequency (MHz)	Radiated (dB)	Conducted LSN (dB)	Current Probe (dB)
7.6	30	18	37
15.0	17	12	23
23.0	16	15	16
30.0	20		
45.0	8		
60.0	12		
75.0	16		
90.0	10		
105.0	5		
152.0	6		
167.0	4		

(4) The peak power output requirements listed under test methods of MIL-I-6181 in 4.3.3.2 are not applicable to the equipment defined by this specification.

(5) The intermodulation requirements listed under test methods of MIL-I-6181 in 4.3.4.4 are not applicable to the equipment defined by this specification.

3.3.7 Provisions for Maintainability - The maintainability program, built-in test features, construction and packaging, provisions for test points, and other maintainability parameters for the equipments specified in 3.5.1 through 3.5.7 shall be as specified in Specification AR-10, except as modified herein.

Modifications to AR-10 shall be as follows:

(1) Automatic Initiation (Ref 3.3.1.1.1 of AR-10). An on-demand manually activated test mode of operation shall be employed.

(2) Remote Initiation (Ref 3.3.1.1.3 of AR-10). This requirement is not applicable.

(3) Equipment Status Indication (Ref 3.3.1.2 of AR-10). This requirement is not applicable.

(4) Failure Location Function (Ref 3.3.2 of AR-10). The failure location function shall be automatic in those circuits having fixed definable parameters, such as power supply voltage, timing intervals, trigger levels, and transmitter output levels. This built-in failure location shall be such as to obviate the need for auxiliary test devices for the performance of organizational maintenance.

(5) Failure Location Indicators (Ref 3.3.2.2 of AR-10). This requirement is not applicable.

(6) Built-In Test (BIT) Dependability (Ref 3.3.3 of AR-10). The BIT features shall be such that at least 90 percent of the equipment failures shall be detected. At least 90 percent of the detected failures shall be located to the faulty WRA. At least 90 percent of the failure indications shall result from equipment failures (performance below acceptable levels). The Receiver and Indicator shall be considered as a single WRA for purposes of this requirement.

(7) Non-Ambiguity (N-A) Ratio (Ref 3.4.2.2 of AR-10). The N-A ratio shall not be less than 0.9.

(8) Quick Replaceable Assembly (QRA) Ratio (Ref 3.4.3.1 of AR-10). The QRA ratio shall not be less than 0.9 for the receiver, 0.8 for the indicator, 0.5 for the transmitter, 0.4 for the reeling machine control unit, and 0.4 for the remote indicator.

(9) Functional Test Point Arrangement (Ref 3.5.2 of AR-10). Shop test points for intermediate maintenance will not be brought to the surface of the WRA.

(10) Shop Non-Ambiguity (SN-A) Ratio (Ref 4.3.2.2 of AR-10). If the equipment is required to be compatible with the AN/USM-247 Versatile Avionic Shop Test System (VAST), the SN-A ratio shall be demonstrated as required by AR-8 and AR-9, when specified in the contract.

3.3.7.1 Compatibility with VAST - The equipment shall be compatible with the Versatile Avionics Test System (VAST) and shall meet the requirements of Specification AR-8. When required by contract, VAST Operational Test Program Sets shall be furnished in accordance with Specification AR-9. If Operational VAST Test Program Sets exist for the equipment, and changes to the equipment are made which will affect the fault diagnosis procedure, changes to the existing Test Program Sets shall be prepared as part of the equipment changes in accordance with Specification AR-9. The requirements of AR-8, Test Points (para 3.2) shall be met by isolating a fault to the level of a Functional Group of Boards, such as an I.F. Amplifier/AGC, Timing Assy, etc.

3.3.8 Nomenclature, Nameplates, and Identification Marking - Nomenclature and serial number assignment, nameplate approval and identification marking shall be in accordance with Specification MIL-N-18307.

3.3.9 Standard Conditions - The following conditions shall be used to establish normal performance characteristics under standard conditions and for making laboratory bench tests.

Temperature	Room ambient (25°C ±10°C)
Altitude	Normal ground
Vibration	None
Humidity	Room ambient up to 90% relative humidity
Input power voltage	115 ±1.0 Vac 400 Hz 27.5 ±0.5 Vdc

3.3.10 Service Conditions - The equipment shall operate satisfactorily under any of the environmental service conditions or reasonable combination of these conditions as specified in Specification MIL-E-5400 for Class IA equipment, except as modified herein.

3.3.10.1 Vibration - The equipment shall operate satisfactorily when subjected to the vibration requirements of Curves II and III of Specification MIL-E-5400, except that the console control panel shall meet Curve III.

3.3.10.2 Temperature - The equipment shall meet the temperature requirements of Class IA equipment except that the extreme operating temperature limits shall be -30 degrees C to +55 degrees C.

3.3.10.2.1 Overtemperature Shutoff - Overtemperature protection circuits shall be provided for the Azimuth-Range Indicator and the Transmitter Units which shall interrupt input power under conditions of excessive ambient temperature or reduced internal airflow at elevated temperatures. The power shall be manually resettable when the temperature returns to a safe operating level.

3.3.10.3 Altitude - The equipment shall meet the altitude requirements of Class IA equipment except that the maximum operating altitude shall be 15,000 feet.

3.3.11 Warmup Time - The time required for the equipment to warm up prior to operation shall be kept to a minimum and shall not exceed two minutes under standard conditions and three minutes at extreme service conditions.

3.3.12 Input Electrical Power - Input power applies to all equipments of the AN/AQS-13B.

3.3.12.1 Operating Power - The equipment shall meet all applicable requirements of MIL-STD-704 and shall give specified performance when energized from the following power sources having characteristics and limits as defined in MIL-STD-704. The power required shall not exceed the specified amounts.

(1) AC Power (Single Phase), 115V, Category B, 40 VA (Separate power input for depth-height and drift sensing subsystem.)

(2) AC Power (Three Phase), 115/200V, Category B, 670 VA, up to 10,000 VA during sonar transmit pulse.

(3) DC Power, 28V, Category B, 3000 Watts (for auxiliary Reeling Machine operation only).

(4) DC Power, 28V, Category B, 150 Watts (for normal system and Reeling Machine operation).

(5) DC Power, 28V, Category B, 40 Amps (Sonar Guillotine).

3.3.12.2 Separate Systems - The following circuits of the AQS-13B shall receive their power independently of the primary sonar set input: Sonar guillotine, AC cable angle sensing, Reeling Machine DC motor, and cable height subsystem inputs to the automatic flight control system.

3.3.12.3 Lighting Power - Input power for lighting shall require not more than 2 amperes at 28 Vdc.

3.3.12.4 Degraded Performance - Degraded performance will be permitted for voltage transients not exceeding 0.5 second during normal electric system operation. Operation shall return to normal with no resulting damage to the equipment.

3.3.13 Hydraulic Power Requirements - Hydraulic power requirements for the reeling machine shall be a flow rate of 5.6 ±0.1 GPM at 2550 PSI pressure. Operation of the reeling machine will not be adversely affected at the maximum flow rate of 5.7 GPM and at a pressure of 3000 PSI. The aircraft return line pressure at 5.6 GPM shall not exceed 25 PSI and at 0.0 GPM it shall not exceed 4 PSI.

3.3.14 Cooling - The design and evaluation of equipment cooling shall comply with the requirements of Specification MIL-E-5400. Data from the thermal evaluation test program shall be in accordance with Specification MIL-T-23103.

3.4 Performance - Unless otherwise specified, values set forth to establish the requirements of satisfactory performance apply to performance under both standard and extreme service and input power conditions. When reduced performance under the extreme conditions is acceptable, tolerances or values setting forth acceptable variations from the performance under the standard conditions will be specified.

3.4.1 Operation - The equipment shall operate from a hovering helicopter for the purpose of detecting submarines. In operation, the AN/AQS-13B lowers a transducer assembly into the water and provides echo ranging, passive listening, communication, ASPECT and Bathythermograph modes of operation. The signals derived from 16 preformed beams are supplied to the multi-channel receiver for processing and presented on a CRT, a chart recorder and aurally. The CRT display may also be used to display processed sonobuoy signals from a separate unit.

3.4.2 Echo-Ranging Mode

3.4.2.1 Frequency - Three operating frequencies, 9,230 ±15 Hz, 10,000 ±15 Hz, and 10,770 Hz ±15 Hz shall be individually or sequentially selectable.

3.4.2.2 Pulse Width - The transmitted pulse width shall be 3.5 ms ±15% or 35 ms ±15%.

3.4.2.3 Pulse Rate - Front panel selectable range scales of 1, 3, 5, 8, 12, and 20 kiloyards provide the nominal pulse rate.

3.4.2.4 Acoustic Output - The sound pressure output in the high power mode shall be at least 211 decibels referenced to 1 micropascal at 1 yard at any of the three operating frequencies, when measured at the linear midpoint of the 35 ms pulse with the 500 foot cable. The sound pressure output in the low power mode shall be at least 199 decibels referenced to 1 micropascal at 1 yard at any of the three operating frequencies. The power output shall be controlled in accordance with the following conditions.

3.4.2.4.1 Output Enable - The transmitter output signal shall be enabled only when a water entry signal is present indicating that the transducer is completely submerged in accordance with 3.4.11.3.3 or when a BITE test enable signal is present.

3.4.2.4.2 Low Power Operation - The transmitted output signal shall be automatically maintained in the low power mode under any of the following conditions:

(1) When the transducer is raised to a depth less than 35 ±10 feet.

(2) When a range of 1 kiloyard has been selected.

(3) When selected by means of the BITE test switches (BITE A0B9) to override the normal high power mode.

3.4.2.4.3 High Power Operation - The transmitted output signal shall be automatically maintained in the high power mode when the transducer is lowered to a depth greater than 40 ±10 feet, the selected range setting is at 3 kiloyards or greater, and when a lower power override command from the BITE switch is not present.

3.4.2.5 Receiver Bandwidth - The Receiver shall have a bandwidth of 500 ±25 Hz at the -3 dB points centered at the operating frequencies.

3.4.2.6 Range Accuracy - Reference Addendum 1. (Paragraph 2.1.)

3.4.2.7 Range Rate Accuracy - Reference Addendum 1. (Paragraph 2.2.)

3.4.2.8 Bearing Accuracy - Reference Addendum 1. (Paragraph 2.3.)

3.4.2.9 Overall Sonar System Wideband Sensitivity - A signal-to-noise (wideband) ratio of 0 dB (with a deviation within a normal curve of error with a sigma value 1.5 dB) shall be produced within the receiver bandwidth specified in 3.4.2.5 when the transducer is subjected to an on-axis sound field of +48 dB referenced to 1 micropascal. This specification shall apply with the signal at any of the three specified operating frequencies of 3.4.2.1. For the purposes of measurement, this specification shall apply at an operating depth of 10 feet.

3.4.2.10 MTI Threshold - The front panel positions of low, medium, and high shall correspond to 1, 2, and 3 knots respectively. These thresholds shall have an accuracy of ±5 Hz when referenced to the transmit frequency by a factor of 7 Hz per knot.

3.4.2.11 MTI Lockout - When the reverberation to wide band noise ratio, as measured in the I.F. processor bandwidth, has fallen to less than 0 ±3 dB the MTI processing shall be inhibited. Each sector shall be independent. When the PASSIVE mode is selected the MTI shall be inhibited.

3.4.3 Passive Mode - Provisions shall be made to display bearing information and to listen aurally for signal sources from any bearing without transmitting.

3.4.3.1 Frequency and Bandwidth - The Receiver shall have a bandwidth of 500 ±25 Hz at the -3 dB points centered at the operating frequencies.

3.4.4 Communicate Mode - An underwater voice communication mode shall be provided. This mode of operation shall allow two way communication by means of a suppressed carrier, upper sideband technique compatible with the AN/UQC-1. The output transmission shall be at a suppressed carrier frequency of 8,087 ±25 Hz. The maximum amplitude of the voice modulated signal shall be at least ±199 dB referenced to 1 micropascal at 1 yard.

3.4.5 Recorder Associated Modes -

3.4.5.1 Bathythermograph - The Bathythermograph mode of operation shall present on the chart a temperature versus depth profile accurate to ±5°F and to ±27.5 feet of depth.

3.4.5.2 Echo Ranging - A continuous strip chart presentation of target range accurate to ±3 percent of full scale shall be displayed.

3.4.5.3 ASPECT - A continuous display of target classification data shall be presented.

3.4.5.4 Test - A self-test mode shall provide an end to end check of the Recorders writing and timing functions.

3.4.6 System Test Modes - Two primary modes of system test shall be provided.

3.4.6.1 Mission Readiness - These tests shall provide a quantitative readout of the overall system operation including range accuracy, bearing accuracy, and minimum detectable signal.

3.4.6.2 Fault Isolation - These tests shall provide a qualitative means of isolating a fault to a specific Weapons Replaceable Assembly (WRA).

3.4.7 Sonobuoy Display Mode - Provisions shall be made to simultaneously display up to 4 channels of externally processed sonobuoy signals including their respective range cursors. The audio amplifiers and range rate meter shall also be switched to accept sonobuoy data. In this mode certain power supplies and Indicator circuits are switched from the sonar Receiver to a Sonobuoy adapter unit. These are as follows:

(1) Vertical Deflection

(2) Horizontal Deflection

(3) Video Signal

(4) Left Audio

(5) Right Audio

(6) +10.5 Vdc Power

(7) -10.5 Vdc Power

(8) +5 Vdc Power

(9) +28 Vdc Power

(10) Signal Ground

Other power supply and Indicator circuits are provided continuously. These are as follows:

(11) Sono Fault

(12) Sono Relay Interlock

(13) Sono Video Gate

(14) Sono Cursor Gate

(15) BITE Logic Signals

(16) Lamp Test Signals

(17) Doppler Signal Input

(18) Panel Light Power

(19) Advisory Light Power

(20) MTI Control Signals

(21) Power and Signal Returns

(22) -28 Vdc

3.4.8 Indications -

3.4.8.1 Visual - The following visual indications shall be provided.

3.4.8.1.1 CRT Range and Bearing Display - In the dipped SONAR mode a polar coordinate display of target range and bearing shall be provided. A cursor circle can be positioned over the target by an operator control to determine target range and bearing. This PPI display of the surrounding area shall be presented for the entire 360 degree area. The display shall be stabilized such that the top is always oriented to magnetic north regardless of Transducer rotation. A processor for presenting moving targets and eliminating stationary targets shall be provided (MTI).

3.4.8.1.2 CRT Sonobuoy Display - When the Indicator is in the BUOY mode the display shall accept externally processed video signals in an X, Y, and Z format for deflection and brightening of the CRT.

3.4.8.1.3 Chart Recorder Display - A permanent chart recording of Bathythermograph, Range, and ASPECT data shall be presented.

3.4.8.1.4 Range and Bearing Display - A front panel digital display shall provide a 5 digit range readout in yards with a resolution of 10 yards, and a 3 digit bearing readout in degrees with a resolution of one degree.

3.4.8.1.5 Target Range Rate Display - A front panel meter readout shall be provided to read opening and closing target range rate. The meter shall display the range rate of a target within cursor circle.

This meter shall also be used to display quantitative test readouts in some BITE test positions as follows:

(1) BITE 10 - A calibrated input reference to test the meter circuit shall be provided.

(2) BITE 11, 12, 13, 14 and 15 - Calibrated target signal levels shall be provided to test minimum discernible signal level capability of the system.

(3) BITE 30 - A precise +2 knot doppler frequency signal shall be provided to test the doppler meter.

3.4.8.2 Aural - An audio output shall be available from each of the eight receivers. Two modes shall be provided such that all eight sectors may be listened to simultaneously (AUDIO ALL mode), or so that the audio signal from any one of the eight 45 degree sectors may be separately selected (AUDIO ONE mode). The audio frequency shall correspond to the sector in which the video is displayed as defined in 3.5.1.4.5.

3.4.9 Cursor Selected Outputs - The output from only one of the eight 45 degree sectors shall be individually selected by placing the cursor in that sector of the display. Placement of the cursor shall automatically select the sector from which signals are derived for the following functions: AUDIO ONE, Recorder Range and ASPECT, and for the target range rate readout.

3.4.10 Additional Indications - The following indications and outputs shall also be provided.

Indications to the operator:

(1) Advisory TEST mode lamp

(2) Advisory test READY lamp

(3) Advisory POWER FAULT lamp

(4) Advisory FAULT lamp

(5) Transducer DEPTH in feet

(6) Advisory transducer TRAIL lamp

(7) Advisory transducer UNSEATED lamp

(8) Transmitter READY lamp

(9) Transmitter high voltage (H.V.) caution lamp

(10) Transmitter STANDBY lamp

(11) Transmitter FAULT lamp

(12) Running time meters on the Indicator, Receiver, Transmitter, and Dome Control.

Indications to the pilot:

(13) Remote target range and bearing readout when VERIFY command initiated.

(14) Transducer submerged signal

(15) Cable height fault signal

3.4.11 System Aircraft Interface - The following interface signals are either generated within the AN/AQS-13B or received by it from the aircraft.

3.4.11.1 Auxiliary Raise Interface - The Dome Control auxiliary raise switch shall energize a contactor which in turn will switch power for the DC motor on the Reeling Machine. This contactor shall be part of the associated equipment specified in para 6.8.

3.4.11.2 System Audio Interface -

3.4.11.2.1 Direct Audio - Binaural left and right channels of direct audio shall be provided to drive a headphone load of 150 ohms each. The level shall be controlled by the front panel audio gain control and each channel shall have a power output of at least 0.33 watt.

3.4.11.2.2 Sum Audio - A summed output for the Aircraft Intercommunication System shall be provided at a quiescent level of 1.1 volts RMS with a peak level of at least 14 volts RMS into a 15 K ohm load.

3.4.11.2.3 Voice Communication - In the Communicate mode the AN/AQS-13B shall require an input from a carbon microphone and a transmit/receive command from the operators selector switch. The AN/AQS-13B shall provide DC power to the carbon microphone.

3.4.11.3 Flight Control Interface - The AN/AQS-13B shall provide the following signals.

3.4.11.3.1 Cable Altitude - A 400 Hz AC signal of 60 millivolts RMS per foot of cable height ±0.75 volt whose phase is within ±10 degrees of the reference power shall be provided up to a maximum height of 80 feet.

3.4.11.3.2 Height Fault Protection - The AN/AQS-13B shall accept an altitude transfer switch signal from the aircraft, 28 Vdc or open circuit, to enable and reset fault protection circuits and to serve as a source for an altitude transfer relay signal to a 250 ohm, 28 Vdc relay in the aircraft. In the event of a height fault, the altitude transfer relay signal shall be

inhibited; the cable height signal shall be reduced to less than 180 millivolts rms; the signal to the aircraft Dome Submerged lamp shall be periodically interrupted, and the FAULT lamp of the Indicator, Azimuth-Range shall flash.

3.4.11.3.2.1 Height Faults - A height fault shall be defined as: an internal sonar fault, the aircraft height signal being less than 20 ±9 feet, or an aircraft vertical velocity greater than ±2.86 ±0.70 feet per second.

3.4.11.3.3 Transducer Submerged Indication - The AN/AQS-13B shall supply to a Dome Submerged lamp a nominal 26 Vdc at a maximum steady-state current of 80 mA when the transducer is deeper than 13.0 ±7.5 feet. This lamp signal shall be interrupted at a nominal rate of once each 0.5 second when a height fault has occurred. A steady-state water entry signal capable of driving a 28 Vdc, 250 ohm relay shall also be supplied whenever the transducer is deeper than 13.0 ±7.5 feet.

3.4.11.3.3.1 Lamp Reset. The flashing Dome Submerged lamp shall revert to a steady on condition when the altitude transfer switch in the aircraft is not in the Cable Altitude position. The height fault shall be resettable by the sonar operator only when the aircraft altitude transfer switch has been set to a position other than the Cable Altitude mode, and the fault has been corrected.

3.4.11.3.4 Cable Angle Sensing - The required output shall be as defined in MIL-D-81622.

3.4.11.3.5 Cable Angle Lockout - A set of normally closed relay contacts shall be opened for a period of 6 ±2 seconds only when the Raise/Lower switch on the Dome Control is released from the Raise position. The relay contacts shall be rated at 1.0 amps maximum for a 28 Vdc resistive load.

3.5 Detail Requirements -

3.5.1 Receiver, Sonar - The Receiver, Sonar R-1695/AQS-13B shall meet the following requirements:

3.5.1.1 Function - The Receiver shall provide signal processing, control, and interface for the AN/AQS-13B Sonar Set.

3.5.1.2 Form Factor - The maximum dimensions of the Receiver shall be 6.5 inches in height, 13.5 inches in width, and 23.0 inches in depth. Part of the height (0.75 inch on top and 0.75 inch on bottom) is for mounting hardware which is hidden when the unit is mounted. Mounted space height is 5.0 inches.

3.5.1.3 Weight - The weight of the Receiver shall not exceed 30.0 pounds.

3.5.1.4 Contents of Unit - The Receiver shall contain the following functional groups of circuits.

3.5.1.4.1 IF Processor - The Receiver shall contain eight identical IF processors. The IF processors shall accept signals from the 16 half-beam outputs of the Transducer and provide eight full beam outputs, each containing summed input and IF signals, an amplitude detected and filtered video signal, and a phase detected signal proportional to the left and right half-beam electrical phase difference. The IF processors shall have the following characteristics:

(1) AGC Flatness Factor - The flatness factor over the input signal range of -50 dBV to +10 dBV shall be 21 ±4.

(2) Bandwidth - The bandwidth, centered around 2,157 ±10 Hz, shall be 500 ±25 Hz at the -3 dB points and less than 1500 Hz at the -50 dB points.

(3) Active Mode Time Constant - The closed loop time constant, measured in percent dB midway in the operating range, shall be 200 ±100 ms.

(4) Passive Mode Time Constant - The closed loop time constant, measured with a signal in all channels at a level between -40 dBV and -20 dBV in percent voltage shall be 200 ±100 ms.

(5) Noise Level - The equivalent in band input noise level shall be less than -65 dBV.

(6) Crosstalk - Adjacent channel crosstalk shall be better than -30 dB.

(7) Dynamic Range - A pulsed dynamic range of 31 ±3 dB shall be maintained up to an input level of +10 dBV.

(8) Post Detection Filter Time Constants - The short pulse time constant shall be 10 ±3 ms and the long pulse time constant shall be 55 ±17 ms.

(9) Active Mode Gain Tracking - The sum IF output level of any receiver shall be 100 ±20 mV rms with an input signal of -50 dBV.

(10) Passive Mode Gain Tracking - The sum IF output level of any receiver shall have a difference less than 5 dB with respect to any other channel at a common input signal level between -40 dBV and -10 dBV. The flatness factor over the -40 dBV to -10 dBV range shall be greater than 15.

(11) Receiver Detection Capability - The detection capability shall be defined in two different noise-limited environments. Wide band noise shall refer to noise uniformly distributed over the system 500 Hz bandwidth and typical of the long range detection situation. Narrow band noise shall be typical of the close range reverberation limited detection situation and for purposes of this specification, shall have a spectrum defined as:

Center frequency at 0 dB = 10,000 ±1 Hz

-3 dB points = 9,990 ±2 Hz and 10,010 ±2 Hz

-10 dB points = 9,970 ±5 Hz and 10,030 ±5 Hz

-20 dB points = 9,900 ±10 Hz and 10,100 ±10 Hz

Greater than 20 dB atten = outside the range of 9,890 to 10,110 Hz

(a) Wideband Detection (MTI-OFF) A signal-to-noise ratio of +3 dB in the receiver 500 Hz bandwidth shall produce a minimum probability of detection of 50% at 10 to 20 false alarms per minute.

(b) Narrow Band Detection (MTI-ON) The following signal-to-noise (narrow band) ratios at the indicated range rate shall produce a minimum probability of detection of 50% at 10 to 20 false alarms per minute.

S/N	Range Rate
+11 dB	1.5 KTS
+7 dB	3.0 KTS
+5 dB	5.0 KTS
+4 dB	10.0 KTS

For purposes of this measurement, the signal shall be 35 ±2 ms, and the range rate threshold shall be ±0.5 knot. The signal-to-noise ratio shall be measured after the narrow band noise and signal have been summed at the input to the receiver.

(12) AGC Operation - In the active modes of operation, each sector shall have its individual AGC control. In the passive mode of operation, the signal level of the lowest of all eight sectors shall be used to derive a common AGC control voltage. This voltage shall control the gain of all sectors simultaneously so that each shall have the same gain at any given time.

In the event of high level input signals, the TVG shall automatically reduce the preamplifier gain.

3.5.1.4.2 Operating Frequencies - The frequencies generated within the Master Timer shall be as follows:

(1) Transmit - 9,230 ±4 Hz, 10,000 ±4 Hz, and 10,770 ±4 Hz

(2) Local Oscillator - 11,388 ±4 Hz, 12,158 ±4 Hz, and 12,928 ±4 Hz

(3) Video Sector Scan - 6453 ±4 Hz

(4) Circular Scan - 806.6 ±1 Hz

(5) Cursor Update - 25 ±1 Hz

(6) Voice Communication Carrier - 8,066 ±4 Hz

3.5.1.4.3 Display Circuits - The following groups of circuits shall provide the X, Y, and Z outputs necessary for the CRT display.

(1) Range Sweep Generator - The Range Generator shall develop a linear sweep proportional to the selected range scale and compensated for sound velocity variations due to water temperature. Its nominal duration shall be determined by the range scale selected. When a scale change is made the sweep shall reset in nominally 2.5 seconds or end of sweep, whichever is first.

(2) Circular Scan Generator - Amplitude stabilized sine and cosine signals shall be derived which are phase locked to the circular scan frequency. These shall be phase shifted by the compass follower and modulated by the range sweep generator to develop the video X and Y signals.

(3) Cursor - A circular cursor shall be controlled by an integrated range and bearing handwheel control. This control shall also generate the signals required for the digital range and bearing readout on the front panel. The range and bearing signals shall be capable of transmission to a Remote Indicator.

(4) Video Brightening - The system shall provide 8 phase comparator outputs which shall be sequentially scanned in sync with the video sector scan frequency. Coincidence of each bearing scan output shall be synchronized to the circular scan frequency. The instantaneous video filter outputs shall be gated to the CRT Z axis and provide brightening as a function of target range and bearing.

(5) Compass Follower - This unit shall convert the flux valve compass output to drive a sine/cosine resolver. This resolver shall shift the phase of the circular scan generator to stabilize the CRT display to magnetic North. The compass follower shall have an accuracy of ±0.5°, track at 10 rpm, and slew at 15 rpm.

3.5.1.4.4 Cursor Trained Selector - The system shall provide a Cursor Trained Selector which, when moved to any given sector, will select the signal for the single sector audio (AUDIO ONE), Range Rate readout, and Range and ASPECT Recorder input. The output signal for these functions shall nominally be derived from only one sector at a time. However, in order to prevent ambiguity, when the cursor is placed between two sectors, an interpolation shall take place and sum the outputs of both sectors. This interpolation shall take place whenever the cursor is placed at an angle greater than 18.5 ±4 degrees from the centers of both adjacent sectors.

3.5.1.4.5 Audio - The audio shall have two modes: AUDIO ONE and ALL.

3.5.1.4.5.1 ONE Mode - In this mode the signal from the cursor trained selector shall be heterodyned to a center frequency of 1046 ±64 Hz, and sent to both the audio left and audio right channel.

3.5.1.4.5.2 ALL Mode - In this mode the outputs of each sector shall be individually heterodyned and sent to the two audio outputs as follows:

Audio Left -

Sector 7 at 1,046 ±64 Hz	Sector 1 at 2,093 ±83 Hz
Sector 8 at 1,568 ±75 Hz	Sector 2 at 2,637 ±96 Hz

Audio Right -

Sector 3 at 2,637 ±96 Hz	Sector 5 at 1,568 ±75 Hz
Sector 4 at 2,093 ±83 Hz	Sector 6 at 1,046 ±64 Hz

3.5.1.4.6 Communicate (UQC) - The voice communicate mode shall have two conditions of operation, Transmit and Receive.

3.5.1.4.6.1 Communicate Transmit - After the circuit receives a transmit enable command it shall process the output of a carbon microphone. With a microphone load of 100 ohms resistive, the system shall provide 20 ±5 mA bias current to the microphone. Automatic Level Control (ALC) shall be provided with an attack time constant of 50 ±30 ms and a release time constant of 18 ±6 seconds measured over the range from -40 dBV to -10 dBV. The flatness factor shall be greater than 10 from an input of -50 dBV to -10 dBV.

3.5.1.4.6.2 Communicate Receive - In the audio ONE mode the circuits shall process one channel of information as received from the cursor trained selector. In the audio ALL mode it shall process signals omnidirectionally. The receiver shall have an AGC control with a flatness factor greater than 10 between -50 dBV and 0 dBV input. In the event of a greater input signal, the TVG shall automatically reduce the preamplifier gain on a proportional basis. The attack time constant shall be 110 ±40 ms and the release time constant shall be 3.5 ±2 seconds between an input of -40 dBV and -10 dBV.

3.5.1.4.7 Range Rate Detection - The output of the cursor trained selector shall be processed by an MTI circuit to furnish an analog voltage proportional to frequency for the target Range Rate Display.

3.5.1.4.8 Recorder Range and ASPECT Outputs - The output of the cursor trained selector shall be detected and processed with a short or long post detection filter, depending on the transmitted pulse length. The short pulse filter time constant shall be 2.2 ±0.5 ms and the long pulse filter time constant shall be 49 ±12 ms. This signal shall be used by the Recorder and in BITE test circuits.

3.5.1.4.9 Recorder Interface - The necessary functions shall be provided to control the recorder in the BT, Range, and ASPECT modes.

3.5.1.4.9.1 Bathythermograph - The data from the resistance temperature probe shall be processed to drive the Recorder chart presentation, the Recorder sound velocity correction, and the CRT Range Sweep Generator sound velocity correction circuit. The temperature signal output to the Recorder shall be in two scales, 25° to 75°F and 45° to 95°F. The Recorder shall sync a time delay circuit with a delayed output proportional to temperature. The two sound velocity temperature correction outputs shall be in the form of an analog voltage proportional to temperature.

3.5.1.4.9.2 Range - Interface signals shall be provided to slave the Recorder to the proper range scale. When the 5 KYD range scale is selected, the Recorder shall operate in the 8 kiloyard scale.

3.5.1.4.9.3 ASPECT - Proper timing signals shall be provided to operate with the Recorder. End of cursor and transmit/receive period signals shall be provided to control the burst length to a transmit/receive duty cycle of nominally 50 percent (reference MIL-D-81622).

3.5.1.4.10 Built-In-Test Mode - The system shall provide a Receiver test mode which when selected shall provide a test signal at 10,017 +5 Hz with an equal on and off duration of 602 +18 milliseconds summed into the signal inputs of all 8 Receivers. In this test condition the compass signals shall be disconnected and a simulated North condition inserted into the bearing stabilization system. A temperature of 68°F shall also be simulated during this mode.

3.5.1.5 Controls - The following operational controls shall be provided on the Receiver front panel:

(1) RANGE SCALE KYDS - A six-position rotary selector switch shall determine the specific full scale range of 1, 3, 5, 8, 12, or 20 kiloyards.

(2) FREQUENCY - A four-position rotary selector switch shall select one of the 3 operating frequencies or automatic sequential selection of the frequency.

(3) MODE - A four-position rotary switch shall select one of the following operating modes: Short pulse, Long pulse, Passive, or Communicate.

(4) CURSOR - A single integrated range and bearing cursor positioning control shall be provided. Bearing shall be selected directly through a 360 degree knob rotation. Range shall be positioned by moving a 3-position, center off, switch in the direction of desired cursor movement.

(5) TARGET - A two-position, push on/push off switch labeled VERIFY shall be provided to illuminate the Remote Range and Bearing Indicator.

(6) AUDIO - A two-position, push on/push off switch labeled ALL and ONE shall be provided to select either a 360 degree audio presentation, or a single audio sector determined by the cursor position.

3.5.1.6 Color - The Receiver case and control panel shall be gray in accordance with No. 36231 FED-STD-595.

3.5.1.7 Electrical Connections - Connections to external circuits shall be provided as indicated in the Equipment Installation instructions.

3.5.2 Indicator, Azimuth-Range - The Indicator, Azimuth-Range IP-1045/AQS-13B shall meet the following requirements:

3.5.2.1 Function - The Indicator shall provide a PPI video presentation, audio outputs, and necessary interface and control of the Sonar system.

3.5.2.2 Form Factor - The maximum dimensions of the Indicator shall be 8.5 inches in height, 13.5 inches in width, and 22.5 inches in depth.

3.5.2.3 Weight - The weight of the Indicator shall not exceed 44.8 pounds.

3.5.2.4 Contents of Unit - The Indicator shall contain the following functional groups of circuits.

3.5.2.4.1 Mode Control - The indicator shall have a Sonar mode and a Buoy mode.

3.5.2.4.1.1 Selection Function - In the Sonar mode, the Indicator shall supply power to and display signals only from the Receiver. In the Buoy mode the Indicator shall supply power to and display signals only from the Sonobuoy Adapter (not part of the AN/AQS-13B).

3.5.2.4.1.2 Interlock - In the event the Receiver or the Sonobuoy Adapter is not connected to the system, then that mode of operation shall be interlocked to prevent switching into a meaningless operating condition. If neither unit is connected to the Indicator, then it shall revert to the built-in-test mode and display a 45-degree line on the CRT.

3.5.2.4.2 Power Supplies - The following voltages shall be furnished for use by the Indicator and either the Receiver or Sonobuoy Adapter. Power shall not be supplied to both simultaneously.

(1) +10.5 ±0.2 Vdc at 3 amps
(2) -10.5 ±0.2 Vdc at 3 amps
(3) +5.0 ±0.3 Vdc at 15 amps
(4) +28 ±5 Vdc at * amps
(5) -28 ±5 Vdc at * amps
(6) +38 ±6 Vdc at 0.3 amps

* The combined load of 2.5 amps can be divided between the two supplies.

3.5.2.4.3 Video Display - A CRT display capable of X, Y and Z input signals with a dual speed deflection system shall be used.

3.5.2.4.3.1 CRT - A seven-inch, one gun, magnetically deflected CRT with a long persistence P-33 phosphor shall be used.

3.5.2.4.3.2 Deflection Amplifiers - A four coil yoke with four deflection amplifiers shall be used. The amplifiers shall have a dual speed capability: low speed for use in the Sonar mode and high speed for the Buoy mode. Nominal response times shall be as follows:

Sonar Mode (low speed)

Fall time of 180 us with 33 us input.

Rise time of 30 us with 15 us input.

Buoy Mode (high speed)

Fall time of 40 us with 33 us input.

Rise time of 25 us with 15 us input.

High speed switching shall only be used in the Buoy mode and shall then automatically switch between high and low speed as required by the input signal.

3.5.2.4.3.3 Video Amplifier - The video amplifier shall provide intensity control for the background threshold level of the CRT, the video signal and the cursor.

3.5.2.4.3.4 Bearing Reference Scale - An illuminated bezel shall be provided around the CRT as a quick relative reference for target bearings.

3.5.2.4.4 Audio Output - Three audio outputs shall be provided. The Left and Right audio direct outputs for headphones shall each have a capability of supplying at least 0.33 watts into a 150 ohm load. With the audio gain at maximum, the quiescent output level shall be 3 volts rms. The ICS high impedance output shall be capable of driving 15,000 ohms at 14 volts rms. It shall have a quiescent level of 1.1 volts rms. All three outputs shall be coupled through isolation transformers.

3.5.2.4.5 Range Rate Display Control - These circuits shall process an analog doppler signal by converting to a logarithmic output and then using a sample-and-hold technique to continuously display the range rate on a zero-center meter. This meter shall also be used to display quantitative BITE test results.

3.5.2.4.6 Built-In-Test Mode - The Mission Readiness system test and the hydrophone tests shall be initiated and controlled within the Indicator. All test conditions except those for the Recorder shall be initiated from the Indicator. The Indicator test itself shall verify operation of the video display.

3.5.2.4.7 Over Temperature Shutoff - An over temperature shutoff shall interrupt the input power to the Indicator, Azimuth-Range unit if the ambient temperature exceeds 65 +7°C or if the internal airflow is reduced at elevated temperature. The power shall be manually resettable when the equipment has been restored to a safe operating condition.

3.5.2.5 Controls -

3.5.2.5.1 Operational Controls - The following operational controls shall be located on the Indicator front panel:

(1) POWER - A two-position push on/push off switch shall be provided labeled ON. It shall control the prime power for use by the sonar set except as noted in 3.3.12.2. The power for the Dome Control flight stabilization inputs shall not be controlled by this switch.

(2) DISPLAY - A two-position push-on/push-off switch shall select the SONAR or BUOY mode.

(3) TEST - Four switches shall be provided.

(a) Two numerical selector switches shall initiate the test commands. The first shall be numbered from 0 to 11, and the second from 0 to 9. They shall be pushbutton stepped in either direction.

(b) The two-position normally off (TEST/READY) push switch shall be used for the lamp test function.

(c) The two-position normally off (POWER/FAULT) push switch shall be used to reset system faults.

(4) MTI THRESHOLD - A four-position rotary switch shall select either MTI off, low, med, or high thresholds.

(5) CURSOR INTENSITY - A potentiometer control shall be provided to independently adjust the intensity level of the cursor.

(6) CRT INTENSITY - A potentiometer control shall be provided to adjust the background threshold level of the CRT display.

(7) VIDEO GAIN - A potentiometer control shall be provided to adjust the video signal intensity on the CRT display.

(8) AUDIO GAIN - A potentiometer control shall be provided to simultaneously adjust the Left and Right direct headphone outputs.

3.5.2.5.2 Maintenance Adjustment Controls - The following screwdriver adjusted potentiometers shall be provided inside the Indicator.

(1) Deflection Amplifier Offset Adjust - There shall be an offset adjustment control on each deflection amplifier.

(2) Deflection Amplifier Gain Adjust - There shall be a gain adjustment control on each deflection amplifier.

(3) CRT Centering - There shall be two controls; one for vertical and one for horizontal CRT centering.

(4) CRT Intensity - There shall be a control to normalize the initial CRT bias threshold.

3.5.2.6 Color - The Indicator, Azimuth-Range case and control panel shall be gray in accordance with No. 36231 of FED-STD-595.

3.5.2.7 Electrical Connections - Connections to external circuits shall be as shown in Equipment Installation instructions.

3.5.3 Transmitter, Sonar - The Transmitter, Sonar T-1178/AQS-13B shall meet the following requirements:

3.5.3.1 Function - The Transmitter shall provide the necessary low and high power transmit signals to the Projector.

3.5.3.2 Form Factor - The maximum dimensions of the Transmitter shall be 7.5 inches in height, 9.5 inches in width, and 25.0 inches in depth.

3.5.3.3 Weight - The weight of the Transmitter shall not exceed 35.6 pounds.

3.5.3.4 Contents of Unit - The Transmitter shall contain the following functional groups of circuits.

3.5.3.4.1 Power Amplifier Stage - The power amplifier shall consist of four identical modules which together shall exhibit the following Transmitter characteristics:

(1) High Power Mode - The Transmitter shall deliver a minimum power of 5000 watts rms at the linear midpoint of the pulse at the fundamental of the transmitted frequency into a resistive 28-ohm load.

(2) Low Power Mode - The nominal low power pulsed output shall be 500 watts. In the voice communicate mode the maximum level of the modulated envelope shall be at least 500 watts.

(3) Duty Cycle - The high power mode shall be capable of at least a 40-millisecond pulse at a rate of one per 3.6 seconds.

(4) Load Impedance - The Transmitter shall be capable of operation into an impedance of 28 ± 5 ohms at a power factor between 1.0 and 0.7, leading or lagging.

3.5.3.4.2 Driver Amplifier - The driver amplifier shall have a nominal input bandwidth from 6.5 to 15 kHz at the -1 dB points and from 1.5 to 33 kHz at the -30 dB points. It shall operate at a signal level of 0.9 Vrms for either high or low power output. The Transmitter shall require an enable key signal and the transmit signal into the driver amplifier in order to operate.

3.5.3.4.3 Input Power Protection - The 3-phase, 400-Hz input power shall furnish the necessary internal voltages. Line condition protection shall be provided as follows:

(1) High/Low Line Voltage - An input voltage in excess of 140 Vrms or less than 60 Vrms shall cause the Transmitter to assume a standby condition. Proper operation shall resume when the voltage returns to normal.

(2) Phase Loss - The loss of voltage on one phase shall cause the Transmitter to go into a standby condition. Normal operation shall resume when all three phases are present.

(3) Power Supply Monitors - If the ±160 Vdc and the ±80 Vdc power supplies are not all present, or if an associated fuse is blown, the transmitter shall assume a permanent fault condition. The Transmitter shall return to normal operation after the power supply voltage has been restored and the power input reset by manually turning the POWER/OFF switch off then on.

3.5.3.4.4 Transmitter Protection - The Transmitter shall contain the following output protection circuits.

3.5.3.4.4.1 Under Power Monitor - An underpower fault shall occur under the following nominal conditions:

(1) In a normal high power mode if the output falls below 2500 watts.

(2) In a normal low power pulse mode if the output falls below 250 watts.

(3) In the low power test modes if the output falls below 50 watts.

The under power monitor shall be inhibited in the voice communicate mode of operation. When a fault occurs, the fault lamp shall illuminate. The fault shall be automatically reset when the power returns to normal.

3.5.3.4.4.2 Duty Cycle Monitor - A duty cycle fault shall inhibit the Transmitter for at least one second under the following nominal conditions:

(1) If a power level of 5000 watts exceeds 80 milliseconds in high power operation.

(2) If a power level of 500 watts exceeds 2 seconds in low power operation.

3.5.3.4.4.3 Load Monitor - When the ratio of the average load voltage to average current indicates a load impedance of less than 11 ±3 ohms, transmission shall be inhibited and a fault indicated. When the load impedance is corrected the transmission shall resume automatically.

3.5.3.4.4.4 Overtemperature Shutoff - An overtemperature shutoff shall operate if the ambient temperature exceeds 75 +7 degrees C, or if the internal airflow is reduced at elevated temperatures. After a safe operating condition has been restored, resetting the input power shall cause the Transmitter to resume normal operation.

3.5.3.4.4.5 Automatic Level Control - A level control circuit shall be provided which shall automatically control the transmitter input drive level in the voice communicate mode.

3.5.3.4.5 True Power Monitor - An internal monitor of the true power at the fundamental transmit frequency shall be provided for fault protection and as a maintenance aid. This monitor shall have an accuracy of ±10% of full scale. Full scale shall be 10,000 watts in high power and 1,000 watts in low power.

3.5.3.4.6 Advisory Indicators - The Transmitter shall contain circuits to properly activate the Ready, Standby, Fault, and High Voltage present indicators.

3.5.3.4.7 Built-in-Test Mode - In high power test, an internal oscillator shall produce a nominal 6 millisecond transmit pulse into an internal 28 ohm dummy load. In low power test, the 6 millisecond pulse shall drive the Projector.

3.5.3.4.8 Turn-On Sequence - An automatic turn-on sequence shall be provided to verify the supply voltages and high voltage capacitor charging circuits. After a satisfactory turn-on sequence of 35 seconds, the Transmitter shall be ready for operation. If a fault is indicated, the Transmitter shall shut off.

3.5.3.5 Controls - The Transmitter front panel shall contain a two-position, 3 phase circuit breaker switch to turn the prime power on and off. The on position shall permit the Transmitter prime AC power to be controlled by the operators power switch on the Indicator. The off position shall prevent prime power from being applied to the Transmitter.

3.5.3.6 Color - The transmitter case and front panel shall be gray in accordance with No. 36231 of FED-STD-595.

3.5.3.7 Electrical Connections - Connections to external circuits shall be provided as shown in Equipment Installation instructions.

3.5.4 Control, Dome - The Control, Dome C-8598/AQS-13B shall meet the following requirements:

3.5.4.1 Function - The Dome Control shall control the Reeling Machine and provide the flight control signals to the aircraft.

3.5.4.2 Form Factor - The maximum dimensions of the Dome Control shall be 4.875 inches in height, 5.75 inches in width, and 8.0 inches in depth except that the depth from the mounting surface shall not exceed 7.0 inches.

3.5.4.3 Weight - The weight of the Dome Control shall not exceed 5.0 pounds.

3.5.4.4 Contents of Unit - The Dome Control shall contain the following functional groups of circuits.

3.5.4.4.1 Raise/Lower Modes - The Dome Control shall provide for the proper operation of the Reeling Machine hydraulic controls.

3.5.4.4.1.1 Normal Raise/Lower - The necessary controls shall be provided to activate the normal raise/lower functions of the Reeling Machine. This function shall not operate when the Indicator power switch is off, or when the Indicator has been removed from the aircraft.

3.5.4.4.1.2 Intermediate Speed - During the normal raise mode, the intermediate speed valve shall be activated at a water depth of 35 ±10 feet.

3.5.4.4.1.3 Seat - A separate control shall be provided to activate the Reeling Machine seat function between trail and seated positions.

3.5.4.4.1.4 Auxiliary Raise - A control shall be provided to activate a contactor for auxiliary retrieval of the Cable and Transducer.

3.5.4.4.2 Depth System - The signal derived from the depth pressure sensor in the Transducer shall furnish the following information.

3.5.4.4.2.1 Depth Readout - A three digit readout shall be provided to display transducer depth. This readout shall be accurate to ±27.5 feet.

3.5.4.4.2.2 Recorder Output - A depth analog voltage shall be provided to the Recorder for the BT mode.

3.5.4.4.2.3 Transducer Submerged Indications - Water entry signals shall be provided in accordance with 3.4.11.3.3. When a water entry signal is not present, the operators digital depth readout shall be blanked.

3.5.4.4.2.4 Intermediate Speed - The intermediate speed signal shall be derived from the depth system as specified in 3.5.4.4.1.2.

3.5.4.4.3 Height System - An aircraft above water height (cable height) signal shall be provided as specified in 3.4.11.3.1. Fault protection shall be provided as specified in 3.4.11.3.2. In addition, a height fault shall be indicated if the depth or payout sensor is shorted or open, or if the height output is shorted.

3.5.4.4.4 Cable Angle Lockout - Cable angle lockout shall be provided as specified in 3.4.11.3.5.

3.5.4.4.5 Advisory Indicator - The Dome Control shall contain Reeling Machine monitor circuits to properly activate the Unseated, Trail, Seated, and auxiliary raise indicators.

3.5.4.4.6 Built-In-Test Mode - The Dome Control shall provide a self-test mode which shall cause simulated depth and height signals to be produced. Under standard conditions (3.3.9) the depth readout shall indicate 52 ±8 feet, the depth on the Recorder shall be 52 ±20 feet, and the aircraft height signal shall be 52 ±8 feet in the test mode. Under service environmental conditions (3.3.10) the depth readout shall indicate 52 ±13 feet and the height signal shall be 52 ±13 feet. The test mode shall be enabled only in the seat or trail positions.

3.5.4.4.6.1 Test Activation - When built-in-test mode is initiated, cable angle lockout shall be activated. The lockout shall inhibit the Indicator, AZIMUTH-RANGE READY lamp illumination for the nominal 6 second lockout period.

3.5.4.5 Controls - The following operational controls shall be provided on the Dome Control front panel.

(1) SEAT - A momentary contact pushbutton switch shall activate the seat mode when depressed.

(2) RAISE/LOWER - A normally center off, 3-position, momentary contact rocker switch shall activate the raise/lower mode.

(3) AUX RAISE - A momentray contact pushbutton switch shall activate the auxiliary raise contactor when depressed. The switch contacts shall be rated at 2 amperes, 28 Vdc.

3.5.4.6 Color - The Dome Control case and control panel shall be black in accordance with No. 37038 of FED-STD-595.

3.5.4.7 Mounting - The Dome Control unit shall be mounted in accordance with Equipment Installation instructions and MIL-C-6781 Type I requirements.

3.5.4.8 Electrical Connections - Connections to external circuits shall be provided as indicated in Equipment Installation instructions.

3.5.5 Indicator, Bearing-Range - The Indicator, Bearing-Range ID-1751/AQS-13B (Remote Indicator) shall meet the following requirements:

3.5.5.1 Function - The Remote Indicator shall repeat the range and bearing information of the Indicator.

3.5.5.2 Form Factor - The maximum dimensions of the Remote Indicator shall be 3.28 inches in height, 3.28 inches in width, and 5.5 inches in depth.

3.5.5.3 Weight - The weight of the Remote Indicator shall not exceed 1.3 pounds.

3.5.5.4 Contents of Unit - The Remote Indicator shall contain the necessary circuits to convert the serially formatted range, bearing and verify command data into a parallel format for display. A front panel digital display shall provide a 5-digit range readout in yards with a resolution of 10 yards, and a 3-digit bearing readout in degrees with a resolution of one degree.

3.5.5.5 Controls - A potentiometer control shall be provided to adjust the intensity of the range and bearing display.

3.5.5.6 Color - The Remote Indicator case and control panel shall be black in accordance with No. 37038 of FED-STD-595.

3.5.5.7 Electrical Connections - Connections to external circuits shall be provided as indicated in Equipment Installation instructions.

3.5.6 Mounting Base, Electrical Equipment - The Mounting Base, Electrical Equipment MT-4311/AQS-13B shall meet the following requirements.

3.5.6.1 Function - The Mounting Base shall provide a vibration and shock isolating mount for the Receiver and Indicator. The base shall include fastener assemblies which allows quick unit installation and removal.

3.5.6.2 Form Factor - The maximum dimensions of the Mounting Base shall be 2.5 inches in height, 13.5 inches in width, and 20.5 inches in depth.

3.5.6.3 Weight - The weight of the mounting base shall not exceed 3.5 pounds.

3.5.6.4 Contents of Unit - The mounting base shall meet the requirements of MIL-C-172 except for dimensions and type of fastener assemblies.

3.5.6.4.1 Base Assembly - The base shall consist of a structural support and fasteners.

3.5.6.4.2 Vibration Isolators - The vibration and shock mounts shall be fastened to the base assembly and be installed on the airframe.

3.5.6.5 Installation Requirements - The installation requirements for the Receiver and the Indicator shall be in accordance with the Equipment Installation instructions.

3.5.7 Mounting Base, Electrical Equipment - The Mounting Base, Electrical Equipment MT-4312/AQS-13B shall meet the following requirements.

3.5.7.1 Function - The Mounting Base shall provide a vibration and shock isolation mount for the Transmitter.

3.5.7.2 Form Factor - The maximum dimensions of the Mounting Base shall be 3.0 inches in height, 10.2 inches in width, and 26.5 inches in depth.

3.5.7.3 Weight - The weight of the Mounting Base shall not exceed 3.1 pounds.

3.5.7.4 Contents of Unit - The Mounting Base shall meet the requirements of MIL-C-172 except for dimensions. Automatic locking devices shall be provided.

3.5.7.4.1 Base Assembly - The base shall consist of a structural support and fasteners.

3.5.7.4.2 Vibration Isolators - The vibration and shock mounts shall be fastened to the base assembly and be installed on the airframe.

3.5.7.5 Installation Requirements - The installation requirements for the Transmitter shall be in accordance with the Equipment Installation instructions.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection - Unless otherwise specified, the supplier is responsible for the performance of all test requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the tests set forth in the specification where such tests are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Classification of Tests - Items covered by this specification shall be subjected to the following tests to determine compliance with all applicable requirements.

(1) Preproduction (First Article) Tests

(2) Initial Production Tests

(3) Acceptance Tests

(4) Life Tests

4.2 Preproduction (First Article) Tests - Preproduction tests shall be conducted by the contractor on an equipment representative of the production equipments to be supplied under the contract. Preproduction tests shall be accomplished under the approved test procedure of 4.6. The Government inspector and the procuring activity shall be advised when tests are to be conducted so that a government representative may be designated to witness or supervise the tests when so desired. Contractors not having adequate facilities to conduct all required tests shall obtain the services of a commercial testing laboratory acceptable to the Government.

4.2.1 Preproduction (First Article) Test Data - The contractor shall submit all data collected in conducting these tests to the procuring activity for review.

4.2.2 Scope of Tests - Preproduction tests shall include all tests deemed necessary by the procuring activity to determine that the equipment meets all the requirements of this specification, other applicable specifications, and the contract. Preproduction tests shall include environmental tests in accordance with the procedures of specification MIL-T-5422 to the limits specified in MIL-E-5400 except as modified herein. Fungus testing shall not be required. All parts and materials shall conform to the requirements of MIL-E-5400 for resistance to fungus. Testing for sand and dust shall be included. Radio Frequency Interference tests and tests methods shall be in accordance with Specification MIL-I-6181.

4.2.3 Preproduction (First Article) Approval - Approval of the preproduction sample shall be by the procuring activity upon satisfactory completion of all tests. No production equipments shall be delivered prior to the approval of the preproduction sample. Prefabrication of production equipment prior to the approval of the preproduction sample is at the contractor's own risk. The approved preproduction sample shall be retained by the contractor for his use in the fabrication and testing of equipment to be submitted for acceptance. The preproduction sample shall not be considered as one of the equipments under the contract.

4.2.4 Production Equipments - Equipments supplied under the contract shall in all respects, including design, construction, workmanship, performance and quality, be equivalent to the approved preproduction sample. Each equipment shall be capable of successfully passing the same tests as imposed on the preproduction sample. Evidence of noncompliance with the above shall constitute cause for rejection and for equipment already accepted by the Government, it shall be the obligation of the contractor to make necessary corrections as approved by the procuring activity.

4.3 Initial Production Tests - One of the first ten production equipments shall be selected and sent at the contractor's expense to a designated Government laboratory for tests. This equipment shall be selected by the procuring activity after the equipment has successfully passed all individual tests. No other tests shall be conducted on equipment prior to starting the Initial Production Tests. The preproduction sample shall not be selected for this test.

4.3.1 Scope of Tests - This equipment may be subjected to any and all tests the procuring activity deems necessary to assure that the production equipment is equivalent to the previously approved preproduction sample in design, construction, workmanship, performance, and quality, and that it meets all applicable requirements.

4.3.2 Accessory Material - In addition to the complete equipment submitted for Initial Production Tests, the contractor shall also submit such accessory material and data necessary to test the equipment.

4.3.3 Initial Production Sample Approval - Approval of the Initial Production Sample shall be by the procuring activity upon satisfactory completion of all tests. Any design, material, or performance defect made evident during this test shall be corrected by the contractor to the satisfaction of the procuring activity. Failure of the Initial Production Sample to pass any of the tests shall be cause for deliveries of equipment under the contract to cease until proper corrective action is approved and accomplished. Corrective action shall also be accomplished on equipment previously accepted when requested by the procuring activity.

4.3.4 Reconditioning of Initial Production Test Sample - On completion of the initial production test, the equipment shall be reworked by the contractor by replacing all limited life or damaged items. After reworking, the contractor shall resubmit the equipment for acceptance.

4.4 Acceptance Tests - The contractor shall furnish all samples and shall be responsible for accomplishing the acceptance tests. All inspection and testing shall be under the supervision of the Government inspector. Contractors not having adequate facilities for conducting all required tests shall engage the service of a commercial testing laboratory acceptable to the procuring activity. The contractor shall furnish test reports showing quantitative results for all acceptance tests. Such reports shall be signed by an authorized representative of the contractor or laboratory, as applicable. Acceptance or approval of material during the course of manufacture shall not be construed as a guarantee of the acceptance of the finished product. Acceptance tests shall consist of the following:

(1) Individual Tests

(2) Sampling Tests

(3) Reliability Assurance Tests

(4) Special Tests

4.4.1 Individual Tests - Each equipment submitted for acceptance shall be subjected to the individual tests. These tests shall be adequate to determine compliance with the requirements of material, workmanship, operational adequacy and reliability. As a minimum, each equipment accepted shall have passed the following tests:

(1) Examination of Product

(2) Operational Test

(3) Manufacturing Run-in Test

4.4.1.1 Examination of Product - Each equipment shall be examined carefully to determine that the material and workmanship requirements have been met.

4.4.1.2 Operational Test - Each equipment shall be operated long enough to permit the equipment temperature to stabilize and to check sufficient characteristics and record adequate data to assure satisfactory equipment operation.

4.4.1.3 Manufacturing Run-In Test - Each equipment shall be operated under the conditions specified herein for a period of 40 hours. Should a failure occur it shall be repaired and the test continued except that the last 10 hours of the test shall be failure free. A failure shall be defined as anything which causes malfunctioning of the equipment. Only those adjustments will be permitted which can be made by using such controls and adjustments that are accessible to the operator during the normal use of the equipment.

The 40-hour period specified above may be composed of shorter periods to conform with standard working hours.

This test shall be performed regardless of whether or not a reliability test on each equipment is called for by contract.

4.4.1.3.1 Vibration - The equipment shall be vibrated (without vibration isolators) for a period of 10 minutes prior to the beginning of the 40 hour period of operation. Where feasible, the equipment shall be operated during this vibration period for the purpose of detecting flaws and imperfect workmanship. Operation within the specified limits of satisfactory performance is not necessarily required during the vibration period. The direction of vibration should be vertical to the normal mounting plane for 5 minutes and lateral to the plane for 5 minutes.

Where it is not feasible to vibrate the equipment in two directions, the vertical direction shall be used. The vibration shall be at any frequency within the range of 20 to 30 Hz, excluding resonant points, at a minimum amplitude of 2.2 g's.

During the 40-hour period of operation following the 10-minute vibration period, the equipment shall be mechanically cycled periodically through its various phases of operation. Should a failure occur, it shall be repaired and the test resumed. Should repetitive failures occur, corrective action shall be taken to eliminate this defect from future equipment. A record shall be kept of all failures.

4.4.1.3.2 Ambient Temperature Run-In - Each equipment shall be operated at ambient room temperature and humidity for a period of 20 hours minimum following the vibration period.

4.4.1.3.3 High/Low Temperature Cycle - Following the ambient temperature run-in, each equipment shall be temperature cycled as defined herein until a minimum of 20 hours of equipment operating time is accumulated. The minimum number of temperature cycles shall be two. Each cycle shall consist of lowering the chamber temperature to -30°C, with equipment non-operating,

and maintained until the equipment temperature stabilizes. The cold period shall be followed by a period wherein the equipment is turned on and the chamber temperature is raised to +55°C. The last 10-hours under temperature shall be failure free. If a failure should occur the equipment shall be repaired and the last 10 hours repeated.

4.4.2 Sampling Tests - Equipments selected for sampling tests shall first have passed the individual tests. Equipments shall be selected for sampling tests by the Government inspector in accordance with the following:

Quantity of Equipments Offered for Acceptance	Quantity to be Selected for Sampling Test
First 10	0#
Next 50	1
Next 75	1
Next 100	1
	1 for each additional 200 or fraction thereof

Sampling tests are not required when Reliability Assurance Tests are conducted.

#NOTE: If by contract action the Initial Production Test is deleted, a Sample Test shall also be conducted on one equipment from the first 10 produced.

4.4.2.1 Scope of Tests - As a minimum, each equipment selected for sampling tests shall be subjected to the following tests:

(1) Complete operational test at ambient room conditions, making all necessary measurements to assure that all applicable specification requirements have been met.

(2) Operational test at certain environmental conditions. The conditions may vary for each equipment tested and should be based on results of the preproduction, initial production, individual, and special tests.

(3) Manufacturing run-in test specified in 4.4.1.3 except that the test duration shall be 120 hours with no restriction on the number of failures. However, each failure shall be analyzed as to cause and remedial action necessary to reduce the possibility of its recurrence in future equipment.

4.4.3 Reliability Assurance Tests - Reliability Assurance Tests shall be conducted using MIL-STD-781. Tests as required by both the Qualification Phase and the Production Acceptance (Sampling) Phase shall be conducted. Classification of failure shall be in accordance with MIL-STD-781 and AR-34.

4.4.3.1 Qualification Phase - Prior to the acceptance of equipments under the contract or order, a minimum of three (3) equipments shall be tested as outlined in MIL-STD-781, under the section entitled "Qualification Phase of Production Reliability Tests." The maximum number of equipments to be used shall be those listed in Table 5 of MIL-STD-781. For the Qualification Phase, Test Level E shall be used. The Accept-Reject Criteria for Test Plan IV shall be used.

4.4.3.2 Reliability Production Acceptance Phase Tests - The equipment, throughout production, shall be tested as outlined in MIL-STD-781 (as modified herein) under the section entitled "Production Acceptance (Sampling) Phase of Production Reliability Tests," except that all equipments produced shall be tested. Test level E of MIL-STD-781 shall be used.

4.4.3.2.1 All Equipment Test - Each equipment produced shall be tested for 75 hours. Prior to the 75-hour test on each equipment, a burn-in period may be used at the option of the contractor. If the burn-in period is to be used, the details thereof must be included in the approved test procedures. To determine whether the MTBF is being met at any time during the contract, the operating test hours and the failures thereon (not counting burn-in failures or burn-in operating time) shall be totaled and the results compared with the reject line of Test Plan II of MIL-STD-781. (Extend the line as necessary to accommodate the data.) These totals shall accumulate so that at any one time the experience from the beginning of the contract is included. At the end of each month, when required by contract, the test results shall be sent to the procuring activity and to the Naval Air Systems Command, Attention: Avionics Division. At any time that the current totals of test hours and test failures plotted on Test Plan II curves show a reject situation, the procuring activity shall be notified. The procuring activity reserves the right to stop the acceptance of equipment at any time that a reject situation exists pending a review of the contractor's efforts to improve the equipment, the equipment parts, the equipment workmanship, etc., so that the entire compilation will show other than a reject decision.

4.4.3.3 Test Details - The test details such as the length of the test cycle, the length of the heat portion of the cycle, the performance characteristics to be measured, special failure criteria, preventive maintenance to be allowed during the test, etc., shall be part of the test procedures to be submitted and approved by the procuring activity prior to the beginning of the Qualification Test Phase of the Reliability Assurance Tests.

4.4.4 Special Tests - Special tests shall be conducted for the purpose of checking the effect of any design or material change on the performance of the equipment and to assure adequate quality control. The equipment selected for special tests may be selected from equipments previously subjected to the sampling or reliability assurance tests.

4.4.4.1 Special Test Schedule - Selection of equipments for special tests shall be made as follows:

(1) On an early equipment after an engineering or material change.

(2) Whenever failure reports or other information indicate that additional tests are required. (This will be determined by the procuring activity.)

4.4.4.2 Scope of Tests - Special tests shall consist of such tests as approved by the procuring activity. Test procedures previously approved for the preproduction tests shall be used where applicable. When not applicable, the contractor shall prepare a test procedure and submit it to the procuring activity for approval prior to conducting the tests.

4.4.5 Equipment Failure - Should a failure occur during either the sampling, reliability assurance, or special tests, the following action shall be taken:

(1) Determine the cause of failure.

(2) Determine if the failure is an isolated case or design defect.

(3) Submit to the procuring activity for approval, proposed corrective action intended to reduce the possibility of the same failure(s) occurring in future tests.

(4) Where practical, include a test in the individual test to check all equipment for this requirement until reasonable assurance is obtained that the defect has been satisfactorily corrected.

4.5 Life Test - The contractor shall furnish all samples and shall be responsible for accomplishing the life tests. The test shall be of 300 hours duration and shall be conducted on equipments that have passed the individual test. The life test shall be performed under the conditions specified in 4.5.1. The life test sample shall be selected by the Government inspector in accordance with the following. (Equipments which have successfully passed the Initial Production Test, Sampling Tests, Reliability Tests, or Special Tests may be selected for life tests.) When reliability tests are conducted, the life test shall be omitted if, during the reliability tests, a quantity of equipments equal to, or more than, that listed below receive at least 300 hours each of test time.

Quantity of Equipments Offered for Acceptance	Quantity to be Selected for Life Test
First 25	1
Next 175	1
Next 300	1
	1 for each additional 500 or fraction thereof

4.5.1 Test Conditions - The life test shall be conducted under the following simulated service conditions:

Temperature	Normal Room
Altitude	Normal ground (0-5000 ft)
Humidity	Room ambient
AC Voltage	115 ±5 volts (at lowest applicable frequency)
DC Voltage	27.5 ±2.0 volts

4.5.2 Test Periods - The test may be run continuously or intermittently. Any period of operation shall be of sufficient duration to permit the equipment temperature to stabilize. Periodically, the equipment shall be turned on and off several times and put through its various phases of operation.

4.5.3 Performance Check - At appropriate intervals during the test, a limited performance check shall be made. The performance check proposed by the contractor shall be subject to approval by the procuring activity.

4.5.4 Test Data - The contractor shall keep a daily record of the performance of the equipment, making particular note of any deficiencies or failures. In the event of part failures, the defective part shall be replaced and the operation resumed for the balance of the test period. A record shall be kept of all failures throughout the test. This record shall indicate the following:

(1) Part type number

(2) The circuit reference symbol number

(3) The part function

(4) Name of the manufacturer

(5) Nature of the failure

(6) The number of hours which the part operated prior to failure.

4.5.4.1 Failure Report - In the event of a failure, the Government inspector shall be notified immediately. A report shall be submitted to the procuring activity upon completion of test. In this report, the contractor shall propose suitable and adequate design or material corrections for all failures which occurred. The procuring activity will review such proposals and determine whether they are acceptable.

4.6 Test Procedures - The procedures used for conducting preproduction tests, acceptance tests, and life tests shall be prepared by the contractor and submitted to the procuring activity for review and approval. The right is reserved by the procuring activity or the Government inspector to modify the tests or require any additional tests deemed necessary to determine compliance with the requirements of this specification or the contract. Specification MIL-T-18303 shall be used as a guide for preparation of test procedures. When approved test procedures are available from previous contracts, such procedures will be provided and may be used when their use is approved by the procuring activity. However, the right is reserved by the procuring activity to require modification of such procedures, including additional tests when deemed necessary.

4.7 Reconditioning of Tested Equipment - Equipment which has been subjected to initial production, acceptance, and life tests shall be reconditioned by the contractor by replacing all wear or damaged items. After reworking, the contractor shall resubmit the equipment for acceptance.

4.8 Presubmission Testing - No item, part, or complete equipment shall be submitted by the contractor until it has been previously tested and inspected by the contractor and found to comply, to the best of his knowledge and belief, with all applicable requirements.

4.9 Rejection and Retest - Equipment which has been rejected may be reworked or have parts replaced to correct the defects and resubmitted for acceptance. Before resubmitting, full particulars concerning previous rejection and the action taken to correct the defects found in the original shall be furnished the Government inspector.

5. PREPARATION FOR DELIVERY

5.1 General - All major units and parts of the equipment shall be preserved, packaged, packed and marked for the level of shipment specified in the contract or order in accordance with Specifications MIL-E-17555 and MIL-STD-794. In the event the equipment is not covered in Specification MIL-E-17555, the method of preservation for Level A shall be determined in accordance with the selection chart in Appendix D of MIL-STD-794.

6. NOTES

6.1 Intended Use - The equipment covered by this specification is intended for installation and operation in an ASW helicopter and shall be utilized while airborne, to detect, locate, track, and communicate with submerged objects in the vicinity of the immersed transducer.

6.2 Ordering Data - Purchasers should exercise any desired options offered herein, and procurement documents should specify the following:

(1) Title, number, and date of this specification.

(2) Selection of applicable levels of testing (see 4.).

(3) Selection of applicable levels of packaging and packing (see 5.1).

(4) Title, number, and revision of each end item data list.

6.3 Precedence of Documents - When the requirements of the contract, this specification, or applicable subsidiary specifications are in conflict, the following precedence shall apply:

(1) Contract - The contract shall have precedence over any specification.

(2) This Specification - This specification shall have precedence over all applicable subsidiary specifications. Any deviation from this specification, or from subsidiary specifications where applicable, shall be specifically approved in writing by the procuring activity.

(3) Referenced Specifications - Any referenced specification (2.) shall have precedence over all applicable subsidiary specifications referenced therein. All referenced specifications shall apply to the extent specified.

6.4 Performance Objectives - Minimum size and weight, simplicity of operation, ease of maintenance, and an improvement in the performance and reliability of the specific functions beyond the requirements of this specification are objectives which shall be considered in the production of this equipment. Where it appears a substantial reduction in size and weight or improvement in simplicity of design, performance, ease of maintenance or reliability will result from the use of materials, parts and processes other than those specified in Specification MIL-E-5400, it is desired their use be investigated. When investigation shows advantages can be realized, a request for approval shall be submitted to the procuring activity for consideration. Each request shall be accompanied by complete supporting information.

6.5 Nonrepairable Subassemblies - As a general rule, nonrepairable subassemblies should be encapsulated or hermetically-sealed. The number of connections internal to the subassembly should be held to a minimum. Detail parts tolerances and ratings should be so selected that the life of the subassembly is greater than that of a similar repairable one. With few exceptions (such as high voltage power supplies), the nonrepairable subassembly should evidence a Mean Time to Failure greater than 5000 hours, and for many applications this figure must be nearer 50,000 hours.

6.6 Type Designations - The type designation may be modified by the procuring activity upon application by the contractor for assignment of nomenclature in accordance with 3.3.8. The correct type number shall be used on nameplates, shipping records and instructions books, as applicable.

6.7 Revisions - In specification revisions and superseding amendments an asterisk "*" preceding a paragraph number denotes paragraphs in which changes have been made from the previous issue. This has been done as a convenience only, and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content as written, irrespective of the asterisk notations and relationship to the last previous issue.

6.8 Associated Equipment -

(1) Headset, Binaural

(2) Hover Indicators

(3) Voice communicate Transmit/Receive selector switch, and carbon microphone

(4) Auxiliary Raise Contactor, 300 amps at 28 Vdc

(5) Panel Lamp dimmer rheostat and day position switch

(6) One set system interconnecting cables

(7) Cable Shear Switch (Guillotine)

(8) The associated equipment required for the model SH-3D, SH-3G, or SH-3H helicopters is defined by the following equipment installation chart.

ASSOCIATED EQUIPMENT	HELICOPTER MODEL SH-3D	SH-3G	SH-3H
Mounting Base, Receiver/Indicator MT-4311/AQS-13B	X	X	
Shockmount Assy. Receiver/Indicator MT-4690/AQS-13B			X
Mounting Base, Recorder MT-4035/AQS-13A	X	X	
Shockmount Assy, Recorder MT-4689/AQS-13A			X
Funnel, Transducer MX-8522/AQS-13A	X		
Funnel, Lower Bendix P/N 3185355		X	X
Funnel, Upper Bendix P/N 3185350		X	X

6.9 This specification is under the cognizance of AIR-53302C.

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Project No. 5845-N053

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

OMB Approval
No. 22-R255

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   A. GIVE PARAGRAPH NUMBER AND WORDING.

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