(XI-P-187.9/FC)
15 October 1973

MILITARY SPECIFICATION

BUOY, RADIO TRANSMITTING T-616( )/SRT

1. SCOPE

1.1 This specification covers a radio transmitting buoy for emergency use by a submarine. The equipment operates on a frequency of 243.0 megahertz (MHz) and transmits an emergency message. The buoy is similar, in many respects, to the model T-616B/SRT.

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of issuance of procurement action, form a part of this specification to the extent specified herein. In the event of conflict between the detail requirements of this specification and those of supporting documents, this specification shall govern.

SPECIFICATIONS

MILITARY

MIL-S-901 - Shock Tests, H.I. (High Impact): Shipboard Machinery, Equipment and Systems, Requirements for
MIL-Q-9858 - Quality Program Requirements
MIL-E-16400 - Electronic Equipment, Naval Ship and Shore; General Specification
MIL-E-17555 - Electronic and Electrical Equipment, Accessories, and Repair Parts, Packaging and Packing of

STANDARDS

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-109 - Quality Assurance Terms and Definitions
MIL-STD-167 - Mechanical Vibrations of Shipboard Equipment
MIL-STD-454 - Standard General Requirements for Electronic Equipment
MIL-STD-749 - Preparation and Submission of Data for Approval of Nonstandard Parts
MIL-STD-781 - Reliability Tests: Exponential Distribution
MIL-STD-785 - Reliability Program for Systems and Equipment Development and Production

3. REQUIREMENTS

3.1 First article sample. Prior to beginning production, a sample shall be tested as specified in 4.2 (see 6.4).

3.2 Equipment. The buoy includes the major assemblies specified below. The equipment shall be in accordance with MIL-E-16400 except as hereinafter specified.

3.2.1 Major assemblies. The equipment shall consist of one each of the following major assemblies.

(a) Buoy
(b) Battery
(c) Dessicator
(d) Top Shield
(e) Shock and Vibration Mount

3.3 Output frequency, accuracy and stability. The output frequency shall be 243.0 MHz within ±30 kilohertz (kHz) under all environmental conditions specified herein. The frequency determining crystal and associated circuits shall permit manual adjustment of the output frequency to precisely 243.0 MHz to counter the effects of intermittent testing and storage for periods up to 5 years.

3.4 Emission. The emission shall be A-2 (keyed audio only, carrier "on" continuously).

3.5 Modulating frequency. The modulating frequency shall be 500 Hz ±10 percent.

3.6 Modulation percentage. The percentage modulation shall be 75 percent ±5 percent.

3.7 Radio frequency output spectrum. Ninety percent of the radio frequency (RF) output energy, carrier and sidebands, shall be within a 7.5 kHz bandwidth.

3.8 Keying. Keying shall be from an internal code wheel containing the letters and forming the message "SOS SUB SUNK SOS" in International Morse Code. The Code wheel RPM shall not be less than two nor more than three during the 14 hour specified operating time and conditions.

3.9 RF power output. The RF power output shall not be less than 560 milliwatts (mW) with the carrier unmodulated and not less than 270 mW with the carrier modulated.

3.10 Antenna. The RF radiating system shall effect radiation in an essentially omnidirectional pattern. The antenna shall be automatically self-erecting after buoy launching.

3.11 Battery. The battery shall be a magnesium silver chloride sea water activated type. Nominal voltage shall be 7.5 volts.

3.12 Continuous operation. The equipment shall be capable of meeting the performance required herein for a continuous period of 14 hours without battery change.

3.13 Automatic operation. The buoy operation shall be automatic and shall meet the performance requirements specified herein within 5 minutes subsequent to immersion of the battery.

3.14 Size. The overall diameter and length shall not exceed 3.0 inches (7.62 cm) and 39 1/2 inches (100.33 cm) respectively.

3.15 Weight. The dry buoy weight, less battery and accessories (dessicator assembly, trim weights, top shields, and so forth) shall be 3 lbs. 10 ounces, ±1/2 ounce.

3.16 Flotation requirements.

3.16.1 The buoy freeboard in calm sea water shall be 5 1/4 inches ±1/4 inch (13.335 ±0.635 cm) measured from the water surface to the joint between the housing and antenna cap.

3.16.2 The buoy shall free float in calm sea water within 5 degrees of vertical.

(Sea water for the purposes of this specification is defined as water obtained from a city source that is provided for drinking purposes and modified to contain 3.5 percent (by weight) of NaCl (Sodium Chloride).)

3.17 The buoy shall meet the electrical performance required herein upon each surfacing following submergence for 15 continuous minutes and then again submerged for 2 continuous seconds during each minute for 500 minutes.

3.18 Performance recovery subsequent to submergence. The buoy shall meet the electrical performance required herein within 1 second upon emergence of the complete antenna insulator following complete buoy, including antenna, submergence in sea water.

3.19 Desiccator. The desiccator shall be a two-piece assembly consisting of a sleeve covering the battery compartment sides and a removable transparent case covering the open end of the sleeve. O rings placed at the top and lower ends of the sleeve shall provide necessary sealing to preclude excessive moisture entrance to the battery compartment. Another cushioning ring shall be located on the sleeve above the top of transparent case to center and cushion the lower end of the battery case. The desiccant shall be retained in the transparent case by an easily removable perforated metal screen. A contact probe shall be mounted on the desiccant case and permit application of an external test voltage to the buoy circuits without removal of the desiccator. The desiccant employed shall be type bright blue 6-16B Mesh Silica Gel, Eagle Chemical Works, Mobile, Alabama or equivalent. The seals shall be adequate to reduce requirement for substitution of the desiccant to greater than 3,000 hour intervals. The transparent desiccant container material shall be acrylic or equivalent.

3.20 Finish and painting. The finish and painting shall be in accordance with MIL-E-16400. The exterior color except for markings shall be bright red fluorescent.

3.21 Top shield. The top shield shall provide the following functions:

(a) Protect the top portion of the buoy finish coat.
(b) Retain antenna in folded position when buoy is stored.
(c) Enclosure for antenna end of buoy when installed in shock and vibration mounting.

(1) The shield dimensions shall permit easy insertion and removal of the buoy and be adequate for use under the specified environmental conditions, for instance, temperature, humidity, shock, vibration, and so forth.

(2) The overall length of the shield shall be 7 7/8 inches ±1/8 inch (20.0025 ±0.3175 cm).

(3) The shield material shall be "Pliobond ADH" or equivalent.

(4) The words "REMOVE BEFORE LAUNCHING" in 1/4 inch (0.635 cm) block letters shall be silk screened on white on the outer surface.

3.22 Shock and vibration mount. A mounting assembly shall be provided for retaining the buoy. The assembly shall permit easy removal and insertion of the buoy without damage or the use of tools or special procedures. By removing only the upper portion of the buoy from the assembly, complete operational testing shall be possible. The upper bracket shall be provided with a test bridle to hold the buoy in the test position. It shall not be possible to return the buoy to its normal position without releasing the test bridle. Complete instructions for buoy launching shall be included as part of this mounting assembly.

3.23 Launching time. It shall be possible to remove the buoy from its normally installed condition and inserted in an adjacent launching tube within 5 seconds.

3.24 Identification and labeling. Each buoy shall be clearly identified by an identification plate. Additionally, an aluminum foil label containing the following shall be provided:

"THIS DEVICE IS A RADIO TRANSMITTER AND DOES NOT CONTAIN ANY EXPLOSIVES. IT WAS RELEASED BY A U. S. NAVAL VESSEL IN DISTRESS. IF FOUND, PLEASE INFORM U. S. NAVY IMMEDIATELY."

3.25 Environmental. The equipment shall meet the performance requirements specified herein, without the necessity for realignment or readjustment of any controls, under the following environmental conditions:

3.25.1 Temperature.

(a) Nonoperating - minus 62°C to plus 75°C.
(b) Continuous operation (in air) -0°C to plus 40°C.

3.25.2 Humidity. The buoy (nonoperating) shall be capable of withstanding relative humidities ranging up to 95 percent for both continuous and intermittent periods.

3.25.3 Shock. The equipment shall be capable of withstanding the shock test for Grade A, Class I, light weight, Type A equipment as specified in MIL-S-901 when the buoy is mounted in the shock and vibration mount.

3.25.4 Vibration. The equipment shall be capable of withstanding Type I of MIL-STD-167 when buoy is mounted in the shock and vibration mount.

3.25.5 Inclination. Inclination shall be as specified in MIL-E-16400 except plus and minus 30 degrees at the rate of 7 cycles per minute in any plane.

3.25.6 Hydrostatic pressure. The equipment shall be capable of being launched from the submarine's flare tube into sea water which is at a hydrostatic pressure of 1,000 pounds per square inch (psi) and subsequently upon reaching the water surface meet the electrical performance requirements specified herein.

3.26 Reliability program. The supplier shall establish and implement a reliability program in accordance with MIL-STD-785.

3.26.1 Quantitative reliability requirement. The equipment shall have a mean time between failures (MTBF) of 100 hours.

3.27 Equipment, materials, parts and manufacturing. Equipment, materials, parts and manufacturing shall be in accordance with MIL-E-16400 except as otherwise specified herein. As this equipment must be fully operational subsequent to periods of nonoperating times (except for limited testing from external battery) up to 10 years, particular care shall be exercised in the selection of materials and parts and manufacturing methods which sustain characteristics over long periods with only infrequent testing.

3.28 Design and construction. A buoy will be loaned to the contractor as a guideline sample only (see 6.5). The use of the Government furnished sample shall not relieve the contractor of meeting the performance requirements of this specification.

3.29 Interchangeability. Overall equipments, modules, assemblies, subassemblies, components and parts of the first article and production models shall be electrically and mechanically interchangeable with corresponding units contained in the standard sample.

3.30 Nonstandard items. Wherever nonstandard items are employed in the sample the contractor shall substitute mechanically and electrically interchangeable standard parts wherever possible. Use of nonstandard parts in the sample does not establish or imply nonstandard parts waiver or approval to use nonstandard parts in this equipment. Procedures for obtaining approval for use of nonstandard items shall be in accordance with requirement 22 of MIL-STD-454 except that steps I and II of MIL-STD-749 shall be accomplished simultaneously. Approvals for nonstandard items are contingent on subsequent performance within limits specified herein for both first article and production type equipments.

3.31 Workmanship. Workmanship shall be in accordance with requirement 9 of MIL-STD-454.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other

facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Contractor's quality assurance system. The contractor shall provide and maintain a documented quality program acceptable to the Government for all contracted items. The quality program shall be in accordance with MIL-Q-9858.

4.1.2 Quality assurance terms and definitions. Quality assurance terms and definitions shall be as defined in MIL-STD-109.

4.1.3 General inspection. Inspection shall be as specified in MIL-E-16400 except as hereinafter specified.

4.2 Classification of inspections. The methods of examination and testing are classified as follows:

(a) First article inspection (see 4.3)
(b) Quality conformance inspection

(1) Production inspection (see 4.4.1)
(2) Production control inspection (see 4.4.2)
(3) Environmental inspection (see 4.4.3)
(4) Inspection of preparation for delivery (see 4.4.4)

(c) Reliability testing (see 4.5)

4.3 First article inspection. Unless otherwise specified (see 6.1) one unit shall be required for first article inspection. First article inspection shall consist of all examinations and tests necessary, as determined by the Government to indicate conformance with each requirement of this specification. First article inspection shall consist of the tests as specified in table I and the preproduction examinations and tests of MIL-E-16400.

4.4 Quality conformance inspection.

4.4.1 Production inspection. Production inspection shall be in accordance with MIL-E-16400 and table I and shall be made on every equipment offered for delivery.

4.4.2 Production control inspection. Production control inspection shall be in accordance with MIL-E-16400 and table I including sampling, shall conform to the inspection procedures of MIL-STD-105 using the special inspection levels. The inspection level shall be S-4 for normal, tightened and reduced inspection with an Acceptable Quality Level (AQL) of 4.0 percent. Production control inspection shall be performed on equipments that have passed production inspection.

4.4.2.1 If an inspection lot is rejected, the supplier may withdraw the lot from further inspection. The supplier may also rework a rejected lot to correct the defective units and reinspect the lot using tightened inspection.

Rejected lots shall be kept separate from new lots and shall not lose their identity.

4.4.3 Environmental inspection. Environmental inspection shall be in accordance with MIL-E-16400 and table I and shall be performed on units which have been subjected to and have passed production inspection and production control inspection.

4.4.3.1 Sampling for environmental inspection shall be as indicated below:

One of first 5 production units.
One of next 20 production units.
One of each next 100 units.
One of the final lot if more than 50 units.

Table I. First Article (FA), Production (P), Production Control (PC) and Environmental (E) Inspections

Item	Applicable specification paragraphs	Inspection type			
		FA	P	PC	E
Examination, material and workmanship	3.19, 3.20, 3.21, 3.22, 3.24, 3.27	X	X		
Weight	3.15	X	X		
Size	3.14	X	X		
Output frequency, accuracy and stability	3.3	X	X		X
Modulating frequency	3.5	X		X	X
Modulation percentage	3.6	X		X	X
Keying (code wheel RPM)	3.8	X		X	X
Emission	3.4	X			
Keying (message)	3.8	X	X		X
RF output (modulated)	3.9	X	X		X
RF output (unmodulated)	3.9	X	X		X
RF output spectrum	3.9	X		X	
Battery voltage	3.11	X	X	X	X
Battery energization time	3.13	X			
Battery operating life	3.12	X			

Table I. First Article (FA), Production (P), Production Control (PC) and Environmental (E) Inspections (Continued)

Item	Applicable specification paragraphs	Inspection type			
		FA	P	PC	E
Antenna	3.10	X			
Launching time	3.23	X			
Freeboard	3.16.1	X		X	
Vertical flotation angle	3.16.2	X		X	
Recovery time	3.18	X		X	
Submergence cycling	3.17	X			
Hydrostatic pressure	3.25.6	X	X		
Environmental	3.25.1, 3.25.2, 3.25.3, 3.25.4, 3.25.5, 4.4.3, 4.4.3.1, 4.4.3.2	X			
Reliability	3.26, 3.26.2, 4.5, 4.5.1, 4.5.2, 4.5.3			X	
Construction and design	3.28	X			
Interchangeability	3.29	X		X	
Nonstandard items	3.30	X			
Preparation for delivery	4.4.4	X		X	
Preservation and packaging, packing and marking	5.1			X	

4.4.3.2 Should a unit fail environmental inspection the supplier shall immediately investigate the cause of failure and shall report to the Government Quality Assurance Representative the results thereof and provide details of the corrective action taken to correct units which were manufactured under the same conditions, with the same materials, processes, and so forth.

4.4.3.3 Sample units which have been subjected to and have passed production control or environmental inspections or both may be accepted on the contract provided that any damage or deterioration resulting from these tests is corrected and resubjected to and pass the production inspection.

4.4.4 Inspection of preparation for delivery. Inspections shall be conducted to ensure conformance to the requirements of section 5.

4.5 Reliability demonstration. Reliability demonstrations shall be performed using test level A-1, Test plan VI of MIL-STD-781.

4.5.1 Test schedule. The test shall consist of three 8-hour schedules per day, the first being manned where performance measurements shall be made. The other two schedules may be unmanned provided pertinent data is automatically recorded.

4.5.2 Reliability demonstration (qualification) test. The reliability demonstration test shall be performed on the first production unit(s). No equipment may be offered to the government for acceptance until the successful completion of this test.

4.5.3 Reliability sampling tests. Reliability sampling tests shall be performed on one out of each 50 production units.

5. PREPARATION FOR DELIVERY

(The preparation for delivery requirements specified herein apply only for direct Government procurements. Preparation for delivery requirements of referenced documents listed in Section 2 do not apply unless specifically stated in the contract or order. Preparation for delivery requirements for products procured by contractors shall be specified in the individual order.)

5.1 Preservation and packaging, packing, and marking. Unless otherwise specified, preparation for delivery shall be in accordance with MIL-E-17555 (see 6.2).

6. NOTES

6.1 Intended use. This equipment is for use by submarines.

6.2 Ordering data. Procurement documents should specify the following:

(a) Title, number and date of this specification.
(b) Number of first article samples to be submitted if other than specified (see 4.3).
(c) Marking, levels of preservation and packaging and packing required (see 5.1).

6.3 Contract data requirements. Deliverable data shall be as specified on the contract data requirements list (DD Form 1423).

6.4 First article. Invitations for bids should provide that the Government reserves the right to waive the requirement for first article samples as to those bidders offering a product which has been previously procured or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending procurement.

6.5 Standard sample. A sample representative of the buoy to be supplied by the contractor will be made available by the procuring activity. The sample will serve as a guideline only, unless otherwise specified in the contract or order.

Preparing activity:
Navy - EC

(Project 5820-N631)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

OMB Approval
No. 22-R255

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NAME OF ORGANIZATION AND ADDRESS

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1. HAS ANY PART OF THE DOCUMENT CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?
   A. GIVE PARAGRAPH NUMBER AND WORDING.

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