

INCH-POUND

MIL-A-49314 (CR)

22 February 1990

MILITARY SPECIFICATION

ANTENNAS, UHF SATCOM,
PORTABLE, FOLDABLE
(LIGHT WEIGHT, MEDIUM WEIGHT AND HEAVY DUTY),

GENERAL SPECIFICATION FOR

This specification is approved for use by the Communications-Electronics Command, Department of the Army, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification establishes the performance, manufacture, test and inspection requirements for three UHF SATCOM Portable Antenna types that are used with a family of UHF SATCOM transceivers. The transceivers are of the manpack and vehicular type and are used in at halt operation.

1.2 Note. The required First Article and quality conformance testing for prototype and production antennas is contained in Section 4. of this specification. However, the Government, when deemed necessary, will reserve the right to inspect and test deliverable production antennas beyond the stated percentages. Any deliverable antenna shall comply with all the requirements of these Technical Specifications and with the applicable specification sheet.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Cdr, US Army Communications-Electronics Command, ATTN: AMSEL-ED-TO, Fort Monmouth, NJ 07703-5000 by using the self addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 5985

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto cited in the solicitation.

Specifications:

MIL-P-11268	Parts, Materials, and Processes used in Electronic Equipment
MIL-M-13231	Marking of Electronic Items
MIL-F-14072	Finishes for Ground Signal Equipment
MIL-I-45208	Inspection, System Requirements

Standards:

FED-STD-595	Colors
MIL-STD-454	Standard General Requirements for Electronic Equipment
MIL-STD-749	Preparation and Submission of Data for Approval of Non-Standard Parts
MIL-STD-810	Environmental Test Methods
MIL-STD-882	System Safety Program for Systems and Associated Subsystems and Equipment

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Naval Publications and Forms Center, (ATTN: NPODS), 5801 Tabor Avenue, Philadelphia, PA 19120-5099).

2.2 Non-Government publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation.

ANSI-Y-32.16-1975 Electrical and Electronic Reference
Designations, Parts, and Equipments

(Application for copies should be addressed to the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161-2171).

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern.

3.2 Item definition. The foldable, portable SATCOM antenna, also referred to as the antenna or the item, may be any configuration, such as a crossed dipole, helix, logarithmic periodic or related types, using either equal length or tapered director arrays. The SATCOM antenna shall consist of the following major components:

- a. Antenna Element (boom, ground plane, array, etc.), foldable.
- b. Tripod.
- c. RF cables.
- d. Operator's and Maintenance Manual.
- e. Carrying Case, for stowage of above items.

3.3 Electrical requirements. The antenna shall comply with the following electrical requirements over a minimum bandwidth of 244 to 318 MHz:

3.3.1 RF cables. The antenna shall be supplied with two identical low attenuation 50 Ohm RF cables. Each cable shall be 12.5 feet long and shall serve as an extension of the other.

3.3.2 Antenna RF connector. The antenna connector shall be a type "BNC" male, coaxial cable connector. The connector shall mate with any of the cables of 3.3.1 and shall provide reliable operation in all climates and weather. The connector shall be accessible and easily operable with arctic gloves.

3.3.3 Polarization. Polarization shall be right-handed circular.

3.3.4 Gain patterns, cpi. The contractor shall record and demonstrate the circularly polarized gain patterns for 360 degrees rotation about the antenna azimuth and elevation axes at the following frequencies: 244, 260, 280, 300, 318 Mhz. These measurements shall be performed with a circularly polarized source antenna.

3.3.5 Gain patterns, linear. The recording of gain patterns shall be repeated with a linearly polarized antenna source at 244 and 318 Mhz only.

3.3.6 Axial ratio. The antenna axial ratio shall not exceed 3 dB at the half power point of the beam.

3.3.7 RF conductivity of folding joints. The electrical RF conductivity of the folding joints shall remain unaffected by deployment and teardown operations during military exercises undertaken over ten years in various field environments. The RF energy, traveling on the surface of conductors, shall not be attenuated by insulating materials or build up of metal oxides or corrosion at mechanical joint interfaces.

3.3.8 Impedance. The antenna impedance shall be 50 Ohms.

3.3.9 Antenna VSWR. The antenna VSWR shall be 1.5:1 maximum over the specified frequency range.

3.3.10 Half power beam width. The nominal half power beam width of the antenna shall be 80 degrees.

3.3.11 Side lobes. Side lobes shall be at least 10 dB below the peak gain of the main lobe.

3.3.12 Power handling. The antenna shall not be damaged when driven for 15 minutes at a CW power level of 100 Watts at any frequency in the range from 225 to 400 MHz.

3.4 Mechanical requirements. The antenna shall meet the following physical requirements:

3.4.1 Mechanical freedom. The antenna shall be mounted on a tripod that shall permit azimuth and elevation adjustments of the antenna.

3.4.1.1 Elevation freedom. Elevation angle shall be adjustable from horizon to 70 degrees above the horizon. Ten degree steps are acceptable.

3.4.1.2 Azimuth freedom. Azimuth freedom shall be at least ± 180 degrees by repositioning the tripod legs or by AZ rotation.

3.4.2 Antenna folding. The antenna tripod legs as well as the antenna elements and ground plane rods, shall snugly and easily fold down near the major boom, without the need for releasing a number of triggers and without mutual element interference.

3.4.3 Ease of handling. Deployment of the antenna as well as teardown shall be accomplished easily with arctic gloves worn by the operator.

3.4.4 Antenna and tripod mechanical interface. The tripod shall be capable of being disengaged from the antenna when the antenna is to be mounted on a vehicular or shelter mount that has a mechanical interface, ending in a fiber-glass tube of the following dimensions: Outside diameter = 1.600 inches, inside diameter = 1.437 inches and a minimum length of 24 inches. The tolerance of these measurements shall be 0.005 inches.

3.4.5 Telescoping tubes. Antenna and tripod rods, directors, dipoles, legs, etc. of the telescoping type shall not be acceptable in this design because ice crystals form inside the tubes in winter time, which may cause mechanical jamming and damage during stowing procedure.

3.4.6 Antenna-tripod adapter.

- a. The antenna-tripod adapter shall remain with the antenna when the tripod is disengaged from the antenna.
- b. The adapter shall not be an obstruction to the requirement of snugly folding down the antenna elements near the center section.

3.4.7 Transport configuration. The antenna with tripod shall be capable of being folded in a compact manner for ease of storage and transport in its carrying case.

3.4.8 Antenna carrying case. The antenna carrying case shall accept the antenna element, tripod, two cables and instruction manual. The carrying case material shall be thermoformed plastic or fiberglass that can survive 10 years of military operation in any geographical area and climate. The cover shall be hinged to the case.

3.4.9 Padding for carrying case. The carrying case shall be properly padded to prevent damage to the antenna items during military transportation handling.

3.4.10 Ballast. The antenna tripod shall be equipped with a device near its base that can be loaded with ballast (logs, rocks, etc.), when necessary, to keep the center of gravity as low as possible and keep the antenna stable in the operating wind requirements of this specification.

3.4.11 Set-up/tear-down for tripod mode. The antenna shall be designed and built such that erection and orientation to any given coordinates be accomplished by one person in less than three minutes on flat surface, with arctic gloves worn by the operator. Repacking shall be achieved in the same time under the same conditions.

3.4.12 Field environment. The antenna shall be designed to be deployed in the military tactical field, in darkness, on slopes of 15 degrees and rugged, uneven terrain or jungle. No small, loose components are acceptable.

3.4.13 Design life. The antenna shall be designed to survive 1000 set-up/tear-down cycles per year for 10 years.

3.5 Environmental conditions. The antenna shall be designed for storage and operation in climate design types "Hot", "Basic" and "Cold" as outlined in MIL-STD-810.

3.5.1 Equipment nonoperating. The item (in carrying case) and all antenna components separately shall comply with all requirements of this specification after undergoing any of the conditions specified below.

3.5.1.1 Temperature. The antenna shall withstand continuous exposure to air temperature from -65 degrees Fahrenheit (degrees F) for periods up to 24 hours daily to +160 degrees F for 4 hours daily.

3.5.1.2 Relative humidity. As specified in MIL-STD-810 for climate design types "Hot", "Basic", and "Cold".

3.5.1.3 Rain. The antenna shall withstand a rainfall rate of 4.0 inches per hour (in/hr).

3.5.1.4 Altitude. The antenna shall withstand an altitude up to 50,000 feet above sea level.

3.5.1.5 Salt/fog atmosphere. The antenna shall withstand a salt/fog atmosphere as encountered during coastal service.

3.5.1.6 Vibration, shock, and bounce. The antenna shall withstand vibration, shock, and bounce as encountered in military ground transportation by rail, highways, and unimproved roads and by fixed and rotary winged aircraft. The antenna, in its padded carrying case, shall withstand shipment as loose cargo in wheeled and tracked vehicles.

3.5.1.7 Bench handling. The antenna in its servicing condition shall withstand bench handling shocks.

3.5.1.8 Tropical conditions/fungus. The antenna shall withstand tropical conditions including fungus-laden air. Prolonged periods of exposure to a fungus growth environment shall not result in evidence of fungus growth on any surface whether internal or external. Fungus-resistant materials shall be used in accordance with MIL-STD-454, Requirement 4.

3.5.1.9 Blowing sand and dust. The antenna shall withstand the following:

a. Blowing sand particles of 0.01 to 1.0 millimeters in diameter, driven by 5700 feet per minute (fpm) (58 knots) winds.

b. Blowing dust particles 0.0001 to 0.01 millimeters in diameter driven by 1750 fpm (17 knots) winds.

3.5.1.10 Icing. The antenna shall be operable and sustain no physical damage when subjected to icing accumulations of 1/2 inch of clear ice with a specific gravity of 0.85 gr/cm³.

3.5.1.11 Sea water. The antenna shall withstand submersion in 3 feet of sea water for a period of two hours.

3.5.2 Equipment operating. The antenna shall comply with all requirements of this specification, while undergoing any of the conditions specified below.

3.5.2.1 Temperature. From -50 degrees F to +125 degrees F (plus the effects of solar radiation of 355 British thermal units per square foot per hour at 125 degrees F).

3.5.2.2 Relative humidity. Same as nonoperating.

3.5.2.3 Rain. Same as nonoperating.

3.5.2.4 Altitude. The antenna shall also be operable without degradation in specified performance at altitudes up to 15,000 feet above sea level.

3.5.2.5 Salt atmosphere. Same as nonoperating.

3.5.2.6 Tropical conditions/fungus. Same as nonoperating.

3.5.2.7 Blowing sand and dust. Same as nonoperating.

3.5.2.8 Wind. The antenna, with an accumulation of 1/4 inch of clear glaze ice, shall be operable and sustain no physical damage during winds of 45 knots for a 5-minute period with gusts to 65 knots while standing alone. Hold-down facilities shall permit the antenna to withstand winds of 80 knots.

3.6 Workmanship. The equipment shall be manufactured in accordance with MIL-STD-454, requirement #9.

3.7 Interchangeability. All parts and basic subassemblies of the antenna shall be interchangeable between antennas of different serial numbers, of the same antenna type, in accordance with MIL-STD-454, requirement #7.

3.8 Safety. The safety characteristics of the antenna shall be consistent with MIL-STD-882B. RF radiation signs shall be permanently affixed to the antenna, stating the maximum distance of the RF radiation hazard zones. Antenna element tips shall have tip caps or other suitable design features to minimize puncture hazard to eyes.

3.9 External protective finish. The antenna shall be given a protective finish in accordance with MIL-F-14072. The final paint film on Type 1 surface shall be dull black polyurethane Color No. 37038 per Federal Standard 595. All materials and finishes shall be resistant to the effects of standard decontamination agents such as STB, hot soapy water, germicidal soap and 5% washing soda solution. Marking RADIATION HAZARD labels shall be provided. All carrying case surfaces shall likewise be of dull black color.

3.10 Product identification.

3.10.1 General. Marking and identification shall conform to MIL-M-13231; the equipment shall be considered air-transportable. Reference designation shall be assigned and marked in accordance with ANSI-STD-Y-32.16- 1975.

3.10.2 Visibility. Wherever practicable, parts shall be marked so that when mounted, their identification marking will be readily visible with minimum disassembly of the equipment.

3.10.3 Serial numbers. Serial numbers as specified by the Contracting Officer shall be assigned to all units.

3.10.4 Nameplates. Nameplates shall be provided for the antenna assembly.

3.11 Parts, materials, and processes. Parts, materials, and processes shall be selected in accordance with MIL-P-11268. Approval for use of non-standard parts, shall be in accordance with MIL-STD-749 or as otherwise directed by the contracting officer.

3.12 Reliability. The item shall have an MTBF of at least 25,000 hours. A failure of this equipment is defined as any interruption of performance or deviation from performance as specified.

3.13 Human factors engineering. The equipment shall be designed to enable configurations which are human engineered for efficient relationships between man and machine in accordance with MIL-STD-454, Requirement 62.

3.14 First Article. Two sample antennas of each type of the first production series shall be subjected to first article testing in accordance with section 4. of this specification.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. All inspections shall be conducted in accordance with MIL-I-45208. 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 Responsibility for compliance. All items shall meet all requirements of Sections 3 and 5 and the applicable specification sheet. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any part of inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. First Article inspection (see 4.3).
- b. Quality conformance inspection (see 4.4).

4.3 First Article inspection. First Article inspection shall be performed on each SATCOM antenna type. This inspection shall encompass the examination of 4.5 and the tests of 4.6.1 through 4.6.3.

4.4 Quality conformance inspection. Quality conformance inspection shall include the examination of 4.5 and the tests of 4.6.4 and 4.6.5.

4.5 Examination. Each antenna shall be examined or tested for compliance with the requirements specified in Section 3. Any redesign or modification of the contractor's standard product to comply with specified requirements, or any necessary redesign or modification following failure to meet the specified requirements shall receive particular attention for adequacy and suitability.

This element of inspection shall encompass all visual examinations and dimensional measurements. Noncompliance with any specified requirements or presence of one or more defects preventing or lessening maximum efficiency shall constitute cause for rejection.

4.6 Methods of inspection.

4.6.1 First Article acceptance testing and inspection. A detailed instrumented test program using the developed test procedures shall be conducted to demonstrate compliance with all requirements of section 3 and section 5 of this specification and the applicable specification sheet.

4.6.2 Environmental tests (First Article). The antenna shall be subjected to the following tests of MIL-STD-810:

- a. Low Temperature - Method 502.2, Procedure I and II.
- b. High Temperature - Method 501.2, Procedure I and II.
- c. Humidity - Method 507.2, Procedure III.
- d. Rain - Method 506.2, Procedure I.
- e. Altitude - Method 500.2, Procedure I.
- f. Salt Fog - Method 509.2, Procedure I.
- g. Vibration - Method 514.3, Procedure II-2.
- h. Bench Handling - Method 516.3, Procedure VI.
- i. Shock - Method 516.3, Procedure II.
- j. Sand and Dust - Method 510.2, Procedure I and II.
- k. Icing - Method 521.0, Section I.-1, see also 3.5.2.8
- l. Fresh Water - Method 512.2, Procedure I.
- m. Sea water - See 3.5.1.11.
- n. Wind - See 3.5.2.8.

4.6.3 Reliability (First Article). The equipment reliability compliance shall be determined by analysis.

4.6.4 Production acceptance testing. The instrumented test program will consist of the specific tests identified in Table I of this specification and shall be identical to the corresponding First Article tests. The percentages listed refer to the percent of production units which shall be tested. Test candidate production units selected for production test shall be evenly distributed throughout the production run if the percentage is less than 100%.

4.6.5 Production acceptance inspection. Visual, mechanical and related inspections will consist of the specific inspections identified in Table II of this specification and shall be identical to the corresponding First Article inspections. The percentages listed refer to the percent of production units which shall be inspected. Test candidate production units selected for production inspection shall be evenly distributed throughout the production run if the percentage is less than 100%.

5. **PACKAGING**

5.1 Packaging requirements. The packaging requirements for the desired level(s) of protection shall be as specified by the acquisition activity.

6. **NOTES**

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use of the antenna. The antenna is intended to be used during rapid deployment type of operations in tactical global military environments of all climates. A prime requirement for this antenna is to be air deployed and to provide for a satellite communication link within three minutes after touch-down from a hovering helicopter. The antenna, when operationally deployed, will function as an integral part of a small tactical UHF satellite communications ground terminal such as the AN/PSC-3, HST-4A, LST-5B, or AN/URC-110.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Title, number, and date of the specification.

b. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced.

6.3 Subject term (keyword) listing.

Ground Mobile Forces Satellite Aerial

Custodian:

Army - CR

Preparing Activity:

Army - CR

(Project 5985-A594)

TABLE I. Production acceptance test matrix

Ref Par.	Test Title	Sample
3.3.3	Polarization	5%
3.3.4	AZ/EL Patterns, cpi, calibrated	5% *
3.3.5	AZ/EL Patterns with linear source,calibrated	5% *
3.3.6	Axial ratio	5%
3.3.8	Impedance	5%
3.3.9	VSWR	20%
3.3.11	Side lobes	5%
3.3.12	Power Handling	5%
3.4.11	Demo Setup/Tear Down	5%
3.5.2.8	Exposure to 80 knot wind	5%

* required gain is stated on the applicable specification sheet.

TABLE II. Production acceptance inspection matrix

Ref Par.	Test Title	Sample
3.2(a)-(e)	Components	5%
3.3.2	Antenna RF connector	5%
3.3.7	RF Conductivity	5%
3.4	Mechanical Requirements	5%
3.6	Workmanship	5%
3.7	Interchangeability	5%
3.8	Safety	100%
3.10	External Protection Finish	5%
3.10.1	Product Identification	5%
3.10.2	Visibility	5%
3.10.3	Serial Numbers	100%
3.10.4	Name Plates	50%
3.11	Parts Materials Processes	5%
3.13	Human Factors Engineering	5%
Spec sheet	Length of Package	5%
Spec sheet	Weight of Package	5%

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