

INCH-POUND
MIL-DTL-7879E
25 June 2013
SUPERSEDING
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31 January 2008

DETAIL SPECIFICATION
ANTENNA AT-141A/ARC

This specification is approved for use by the Naval Air Systems Command and is available for use by all Departments and Agencies of the Department of Defense.

INACTIVE FOR NEW DESIGN
AFTER
31 JANUARY 2008

1. SCOPE

1.1 Scope. This specification establishes the requirements for antenna type AT-141A/ARC which is streamlined blade, transmitting and receiving antenna used with airborne communication equipment operating over the frequency band of 225 to 400 Megahertz (MHz). The equipment covered by this specification shall be of one type and shall consist of the following:

<u>Maj. Unit</u>	<u>Type Designation</u>	<u>Size (in)</u>	<u>Max. Allow. Weight (lbs.)</u>	<u>Applicable Paragraphs</u>
Antenna	AT-141A/ARC	15 x 8.875 x 1.5	2.5	3.2 and 3.3

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-T-152	-	Treatment, Moisture and Fungus Resistant of Communications, Electronic and Associated Electrical Equipment.
MIL-DTL-15024	-	Plates, Tags, and Bands for Identification of Equipment, General Specification for
MIL-DTL-18307	-	Nomenclature and Identification for Aeronautical Systems Including Joint Electronics Type Designated Systems and Associated Support Systems.
MIL-PRF-39012	-	Connectors, Coaxial, Radio Frequency General Specification for.

Comments, suggestions or questions on this document should be addressed to DLA Land and Maritime, ATTN: VAT, Post Office Box 3990, Columbus, OH 43218-3990, or emailed to Tubesamps@dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.dla.mil>.

DEPARTMENT OF DEFENSE STANDARDS

[MIL-STD-810](#) - Environmental Engineering Considerations and Laboratory Tests.

(Copies of these documents are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094 or from <https://assist.dla.mil>.)

2.2.2 Other Government drawings. The following Government drawings form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

OTHER DRAWINGS

52A1D40-1 - Bureau of Aeronautics Drawing: Antenna AT-141A/ARC, Outline and Detail Drawing.

(Inquiries to obtain this document should be directed to Commander, Naval Air Systems Command Systems Standardization Division Code 4L8000B120-3 Highway 547 Lakehurst, NJ 08733-5100 or from dwight.tabit@navy.mil.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are those cited in the solicitation or contract.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) INTERNATIONAL

[ASTM-D295](#) - Standard Test Methods for Varnished Cotton Fabrics Used for Electrical Insulation.

[ASTM-D3955](#) - Standard Specification for Electrical Insulating Varnishes.

(ASTM publications are available through ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959 or from <http://www.astm.org>.)

IPC - ASSOCIATION CONNECTING ELECTRONICS INDUSTRIES

[IPC J-STD-004](#) - Soldering Fluxes Requirements For.

[IPC J-STD-005](#) - Soldering Pastes Requirements For.

[IPC J-STD-006](#) - Electronic Grade Solder Alloys And Fluxed And Non-Fluxed Solid Solders For Electronic Soldering Applications Requirements For.

(Copies of these documents may be purchased from IPC - 3000 Lakeside Drive, Suite 309S Bannockburn, Illinois 60015-1249; Tel 847 615.7100; Fax 847 615.7105 or from <http://www.ipc.org/>.)

SAE INTERNATIONAL (SAE) AEROSPACE MATERIALS SPECIFICATIONS (AMS)

[SAE-AMS-C-83231](#)- Coatings, Polyurethane, Rain Erosion Resistant for Exterior Aircraft and Missile Plastic Parts.

(Society of Automotive Engineers documents are available through SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, or from <http://www.sae.org>.)

(Non- Government standards and other publications are normally available from the organizations which prepare or which distribute the documents. These documents may be available in or through libraries or other informational services)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Parts and materials. In the selection of parts and materials, fulfillment of major design objectives shall be the prime consideration. Materials and parts shall be used which meet or exceed the performance requirements of the respective standard specifications. Materials shall meet general requirements such as being nonflammable, fungus resistant and nontoxic and being capable of satisfying environmental conditions specified in [MIL-STD-810](#).

3.1.1 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs. All components supplied shall be new and unused.

3.1.2 Design objectives. Minimum size and weight, simplicity of operation and improvement in performance and reliability of specific functions beyond the requirements of this specification are objectives in the design of the equipment specified herein. Materials, parts and processes shall foster reduction in size and weight and improvement in simplicity or performance.

3.1.3 Plating. Surface plating in accordance with accepted industry practices shall afford corrosion protection equal to or exceeding that of cadmium plating. Surface plating shall be used to insure electrical contact between brass and aluminum alloy metal. Cadmium plating shall not be used without technical justification to the acquiring activity that no other plating can meet performance requirements.

3.1.4 Soldering. Soldering materials, fluxes, and procedures for soldering and cleaning shall be non-corrosive and consistent with Joint Industry Standards [IPC J-STD-004](#), [IPC J-STD-005](#) and [IPC J-STD-006](#). Mechanical loads shall not be imposed on soldered connections.

3.1.5 Dielectric material. The dielectric material(s) used between the stub and the sleeve of the antenna shall be chosen so the antenna will best fulfill the requirements of this specification. If impregnated glass cloth is used in the construction of the antenna it shall be of suitable fine mesh and shall be impregnated with suitable polyester resin.

3.2 General design requirements.

3.2.1 General. The antenna shall meet general design and performance requirements as follows:

3.2.2 Construction. The antenna shall have the airfoil mounting dimensions, and general features of construction as shown on Bureau of Aeronautics Drawing [52A1D40-1](#). The bottom portion of the antenna, which mates with the outer surface of the aircraft skin, shall be so designed as to permit essentially a high pressure electrical contact between the aircraft skin and the periphery of the base surface of the antenna, and at the same time allow for the use of a small moisture sealing gasket within the periphery of the base, without interfering with the electrical contact with the skin. Best manufacturing practices shall be employed to secure the dielectric portion of the antenna to its upper and lower metal portions and to insure adequate structural strength of the antenna. The external dielectric surface shall be coated with a non-conducting, low loss dielectric material to prevent absorption of moisture or the formation of a film of moisture on the surface. In addition a Class I rain erosion coating shall be applied to the antenna in accordance with the requirements of specification [SAE-AMS-C-83231](#).

3.2.3 Mechanical strength. The antenna shall be designed to withstand a uniformly distributed lateral ultimate design load of 9.5 pounds per square inch.

3.2.4 Mating surfaces. Electrically conducting mating surfaces shall be clean metal surfaces, free from grease, paint lacquer, anodizing or similar or similarly resistive film so as to insure negligible radio frequency impedance. Unless suitably protected against electrolytic corrosion, dissimilar metals shall not be used in intimate contact with each other or where water surface film may provide electrolytic contact.

3.2.5 RF connectors. The radio frequency (RF) connector included as part of the antenna shall be designed to accommodate plug M39012/1-0005, in accordance with [MIL-PRF-39012](#).

3.2.6 Safety. All internally and externally threaded parts shall be made positively safe by the use of lock washers, lock nuts, or other suitable methods.

3.2.7 Weight. The antenna shall be of the lightest practicable weight consistent with the other requirements of this specification. The installed weight of the antenna shall not exceed 2.5 pounds. Installed weight shall include the complete antenna assembly with nameplate and receptacle, but shall not include cabling, external to the antenna, plugs, mounting nuts or bolts, or any mounting bracket or fastening device which is not an integral part of the antenna assembly.

3.2.8 Tropics adaptation. Antennas covered by this specification shall be adapted for tropical environments in accordance with [MIL-T-152](#), [ASTM-D3955](#) and [ASTM-D295](#).

3.2.9 Interchangeability ([see 6.5](#)). Interchangeability shall be measured against a model, manufacturing drawings or other technical information as provided for that purpose.

3.2.10 Collection of liquids. The antenna shall be designed and constructed such that when mounted vertically either on the top or on the bottom surface of an aircraft structure no water or other liquids can collect in any portion of the antenna that could ultimately result in failure or deterioration of performance of the antenna or rupture due to freezing.

3.3 Performance requirements.

3.3.1 Performance. The antenna shall be so designed that when mounted in the center of a large horizontal ground plane it shall provide vertically polarized radiation of essentially uniform intensity over 360 degrees of azimuth. The antenna shall satisfy the performance requirements which are outlined in Section 4 when subjected to the following tests:

- a. Mechanical stress test
- b. Insulation test
- c. Radiation test
- d. Voltage standing wave ratio (VSWR)

3.4 Identification of product.

3.4.1 Nameplates and nomenclature. Nameplate and nomenclature approval and assignment shall be granted by acquiring activity only upon compliance with the applicable requirements of [MIL-DTL-18307](#) and [MIL-DTL-15024](#).

3.4.2 Use of AN or MIL designations. AN or MIL designations shall not be applied to a product except for preproduction test samples, nor referred to in correspondence, sales material or otherwise, until notification has been received from acquiring activity, that the product has been approved. When the antenna is procured by a prime contractor through subcontract, purchase order, or otherwise (not including Government furnished) the prime contractor shall be responsible for compliance with the requirements of paragraph [3.4.1](#) and approval, when granted, will extend only to that one antenna source or to that one prime antenna contract.

3.5 Pure tin. The use of pure tin, as an underplate or final finish, is prohibited both internally and externally. Tin content of antenna components and of solder shall not exceed 97 percent, by mass. Tin shall be alloyed with a minimum 3 percent lead, by mass ([see 6.6](#))

3.6 Workmanship. All details of workmanship shall be in accordance with the best manufacturing practice for high-quality electronic equipment. Particular attention shall be given to neatness and thoroughness in the making of parts, plating, soldering, and finishing.

4. VERIFICATION.

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

- a. Contractor tests. Contractor tests are those tests conducted by the contractor on an antenna to determine that the antenna complies to the best of his knowledge and belief with all applicable requirements.
- b. Preproduction tests. Preproduction tests are conducted by the acquiring activity, after the award of the contract, on samples which are representative of the production antennas to determine that the antennas meet all the requirements of this specification.

c. Inspection tests. Inspection tests are those tests accomplished on the antennas submitted for acceptance under the contract.

4.2 Contractor tests. The contractor shall conduct tests on one or more sample antennas as necessary to determine that the design of the antennas as proposed by the contractor will meet the requirements of this specification. Contractor tests shall be conducted in accordance with the approved preproduction test procedure. The data obtained by the contractor in conducting these tests shall be included with the design data submitted with the preproduction test antennas. The acquiring activity shall be advised when tests are to be conducted so designated Government representatives may witness or supervise the test when desired. Portions of the preproduction tests which duplicate the contractor tests may be omitted with acquiring activity approval; however, tests may be repeated when deemed necessary. Contractors lacking laboratory facilities to conduct all tests shall either obtain services of a commercial testing laboratory or receive written approval to omit that portion of the tests.

4.3 Preproduction tests.

4.3.1 Sampling instructions. Preproduction test samples shall consist of three antennas representative of the production antennas to be supplied under the contract. Preproduction tests shall be conducted at laboratories designated by acquiring activity. Samples shall be plainly identified by securely attached durable tags marked with the information specified below, and forwarded with the design data to the laboratory designated by acquiring activity.

Sample for Preproduction Test

Antenna AT-141A/ARC

Name of Manufacturer

Submitted by (name) (date) for approval in accordance with requirements of Specification MIL-DTL-7879 under authorization (reference authorizing letter)

4.3.2 Scope of tests. Preproduction tests shall include any tests deemed necessary to determine that the antennas meet all the requirements of this specification and the contract, and shall consist of at least the following tests conducted in the order stated:

- First - Service condition tests
- Second - Mechanical stress test
- Third - Insulation test
- Fourth - Voltage Standing Wave Ratio(VSWR) Test

4.3.3 Design data. The contractor shall submit with the preproduction models complete design data including manufacturing drawings in accordance with applicable requirements.

4.3.4 Model acceptance. Acceptance of the preproduction model by acquiring activity shall be upon satisfactory completion of all tests. No additional antennas shall be delivered prior to the approval of the preproduction models. Pre-fabrication of any antennas prior to the approval of preproduction antennas is at the contractor's own risk. The approved preproduction antennas will be returned to the contractor for use in fabrication and testing of the antennas to be submitted for acceptance under the contract. The preproduction antennas shall not be considered as equipment under the contract, however, they may be reworked by the contractor and submitted for acceptance as production equipment.

4.4 Inspection tests. Inspection tests shall be conducted on all antennas submitted for acceptance under contract and on all antennas furnished by the contractor with aircraft or other equipment under contract. Inspection tests shall be conducted under Government supervision at the manufacturer's facility. Contractors lacking suitable (to the acquiring activity) laboratory test facilities shall engage the services of an acceptable commercial testing laboratory. The contractor shall furnish test reports showing quantitative results for all tests required by this specification and signed by an authorized representative of the contractor or the laboratory, as applicable. Acceptance or approval of material during course of manufacture shall not be construed as a guaranty of acceptance of the finished product.

4.4.1 Scope of tests. Inspection tests shall consist of the following tests:

- a. Individual tests. Each antenna shall be given the following tests:
 - Insulation test
 - Voltage Standing Wave Ratio test
 - Visual inspection test

- b. Sample tests. Sample tests shall be conducted on one antenna selected from each lot of fifty or portion thereof submitted for inspection. Samples shall be selected by the inspector and shall first have passed the individual tests and shall include any of the tests listed under preproduction tests which are deemed necessary by the inspector in addition to the following tests conducted in the order stated.

- First - Mechanical stress test
- Second - Insulation test
- Third - VSWR test
- Fourth - Visual inspection test

4.5 Test methods and requirements.

4.5.1 Service condition tests. The Service Condition Test shall be conducted in accordance with all the guidelines of MIL-STD-810. Satisfactory operation for this antenna shall consist of passing the Insulation Test of paragraph 4.5.3 and passing the Voltage Standing Wave Ratio (VSWR) test of 4.5.5 at frequencies from 240 to 360 MHz, inclusive. Variation in VSWR of more than 50 percent at any one frequency during the progress of the service condition tests shall be cause for rejection.

4.5.2 Mechanical stress test. The antenna shall be fastened securely in a fixture by means of 3/8-inch bolts and loaded laterally. A uniformly distributed load shall be applied in increments until a static load of 6.9 pounds per square inch has been attained. No yielding of any structural part nor impairment of electrical performance shall result.

4.5.3 Insulation test. The resistance of the insulation between the stub and the sleeve of the completely assembled antenna shall be measured in accordance with the best commercial practice using a self-contained and self-powered insulation resistance test set having a 500 volt generator and a scale range of 0-1000 megohms with an additional scale marking for infinite resistance. The dc resistance shall be not less than 50 megohms.

4.5.4 Radiation test. The radiation test shall consist of connecting the antenna through a fifty foot length of RG-21/U cable to a monitored signal source tuned to one frequency within the frequency range of the antenna and observing the relative level of energy radiated from the antenna as indicated on the output meter of an RF receiving device tuned to the same frequency as the signal source. All conditions of tests shall be identical for each antenna tested. The relative level of radiation shall not vary more than 0.5 dB from an average level determined from the approved preproduction models under identical conditions and methods of test.

4.5.5 Voltage Standing Wave Ratio (VSWR) tests. The voltage standing wave ratio shall be determined in accordance with the best engineering practice when the antenna is mounted centrally on the convex surface of a semi-cylindrical ground plane of 3.5 feet (1.1 m) radius and 10 feet (3.0 m) in length. The VSWR measured at or corrected to the antenna connector shall not be greater than 2.0 on a 50 ohm coaxial transmission line for the frequency range from 225 to 400 MHz. VSWR measurements should be made using test equipment that sweeps the entire frequency range from 200 to 420 MHz.

- a. On preproduction models measurements shall be made at frequencies from 200 to 420 MHz, inclusive.
- b. On inspection samples measurements shall be made at frequencies from 240 MHz to 360 MHz, inclusive.

4.5.6 Visual inspection test. The antenna shall be examined visually to determine that it is properly marked, that its dimensions and construction are as specified, that the workmanship is satisfactory, and that it has not yielded or deteriorated physically under any of the other tests.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging 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. The AT-141A/ARC antenna is intended for use with airborne receiving and transmitting equipment in the frequency range from 225 to 400 MHz. A 50-ohm RF transmission line (such as RG-8/U is required between the equipment and the antenna.)

6.2 Acquisition requirements. Acquisition requirements must specify the following:

- a. Title, number and date of this specification.
- b. ASSIST online database at <https://assist.dla.mil> should be cited in the solicitation, and if require, the specific issue of individual documents referenced (see 2.1).
- c. Packaging requirements (see 5.1).
- d. The complete PIN and type designation (see 1.1).
- e. The antennas must be protected from corrosion and deterioration during shipment and storage.
- f. The right is reserved to reject any materials which have not been subjected to the required tests and found satisfactory.

6.3 Alternate forms of construction. This specification is not intended to be restrictive with respect to the details of construction, except where such details are specified. Alternate forms of construction will be considered, provided that the contractor submits for approval a clear description of the points of difference and further provided that all performance requirements of this specification are met.

6.4 Subject term (keyword) listing.

airborne	radiation
blade	receiving
communication	transmitting
dielectric	VSWR
insulation	

6.5 Interchangeability (see 3.2.9). The interchangeability guidelines as presented in MIL-HDBK-5400 must be extended to include interchangeability of antennas with the latest model of any previously produced antennas. In the event that guidelines of MIL-HDBK-5400 conflict with interchangeability requirements, interchangeability requirements shall govern.

6.6 Tin whisker growth. The use of alloys with tin content greater than 97 percent, by mass, may exhibit tin whisker growth problems after manufacture. Tin whiskers may occur anytime from a day to years after manufacture and can develop under typical operating conditions, on products that use such materials. Conformal coatings applied over top of a whisker-prone surface will not prevent the formation of tin whiskers. Alloys of 3 percent lead, by mass, have shown to inhibit the growth of tin whiskers (see 3.5). For additional information on this matter, refer to ASTM-B545 (Standard Specification for Electrodeposited Coatings of Tin).

6.7 Environmentally preferable material. Environmentally preferable materials should be used to the maximum extent possible to meet the requirements of this specification. As of the dating of this document, the U.S. Environmental Protection Agency (EPA) is focusing efforts on reducing 31 priority chemicals. The list of chemicals and additional information is available on their website at <http://www.epa.gov/osw/hazard/wastemin/priority.htm>. Included in the list of 31 priority chemicals are cadmium, lead, and mercury. Use of the materials on the list should be minimized or eliminated unless needed to meet the requirements specified herein (see section 3).

6.8 Changes from previous issue. The margins of this specification are marked with vertical lines to indicate where changes from the previous issue were made. This was 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 irrespective of the marginal notations and relationship to the last previous issue.

Custodians:
Navy - AS
DLA - CC

Preparing activity:
DLA – CC

(Project 5985-2013-029)

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <https://assist.dla.mil/>.