

MIL-A-6325(USAF)

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MILITARY SPECIFICATION

ANTENNAE, GLIDE PATH RADIO RECEIVING EQUIPMENT, GENERAL SPECIFICATION FOR DESIGN OF

1. SCOPE

1.1 This specification covers the performance requirements for the design of antennae for use with glide path radio receiving equipment, including the furnishing of engineering reports.

2. APPLICABLE SPECIFICATIONS

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

2.1.1 Specifications:

2.1.1.1 Air Force-Navy Aeronautical:

AN-E-19 Electronic Equipment; General Specification For

2.1.1.2 U. S. Air Force:

40146 Reports; Manufacturer's Engineering (For Communication and Related Equipment)

R-7035 Radio Receiving Equipment AN/ARN-5A, Bench, Pre-Flight and Flight Tests Of

(Copies of this specification, Air Force-Navy Aeronautical, and U. S. Air Force specifications may be obtained upon application to the Commanding General, Air Materiel Command, Wright-Patterson Air Force Base, Dayton, Ohio. Both the title and identifying number or symbol should be stipulated when requesting copies.)

3. REQUIREMENTS

3.1 General.- The requirements, including material and workmanship, specified in Specification AN-E-19 are applicable as requirements of this specification.

3.2 Design.- The detail requirements specified herein are for an antenna to be installed after manufacture of the aircraft, during manufacture of the aircraft, or as an integral part of the aircraft structure. The antenna is to

be used with Radio Receiving Equipment AN/ARN-5(), or AN/ARN-18. The antenna may be physically in combination with any other antenna thus serving two or more equipments. If the antenna is made in combination with another antenna or antennas it shall be possible to operate the equipments simultaneously and with no interference, one with the other. The antenna shall be supplied together with the necessary transmission lines, connectors, filters, matching sections and impedance converting sections.

3.3 Mechanical Requirements:

3.3.1 The antenna shall consist of a slot, cavity, loop, stub, dipole, array or other system suitable for installation in aircraft and consistent with the position in which it is to be mounted.

3.3.2 The antenna shall be so designed and installed that in any position of the antenna while the aircraft is in flight or on the ground no water or other liquid will be capable of collecting in any portion of the antenna.

3.3.3 External antennas shall be constructed to withstand the most severe icing conditions encountered in flight. The antenna shall be designed to minimize undesirable performance effects due to icing.

3.3.4 The antenna shall be located as near the fore and aft centerline of the aircraft fuselage as practicable. The location of the antenna more than 10 feet from a horizontal plane through the fore and aft centerline of the aircraft shall require specific approval from the Procuring Agency.

3.4 Frequency.- The antenna shall adequately cover the frequency range of 329 to 335 megacycles per second.

3.5 Polarization.- The antenna shall receive horizontally polarized radio signals with minimum practicable reception of vertically polarized radio signals.

3.6 Impedance.- The input shall be designed to match a 52 ohm coaxial line with a voltage standing wave ratio of less than five to one over the frequency range 329 to 335 megacycles. The ratio shall be measured with slotted line or equivalent method with the antenna mounted in a full-scale mockup of the aircraft section surrounding the antenna and extending at least two wavelengths from the antenna. The method used shall require approval by the Procuring Agency.

3.7 Transmission Line and Connectors.- The antenna shall be so designed and installed that connection can be made readily to the associated radio equipment through a minimum length of Radio Frequency Cable RG-8/U unless other cable is specified, using appropriate Army-Navy standard connectors.

3.8 Radio Interference.- The radio interference of other equipment with the glide path receiving equipment shall be considered at any acceptable low level when the operation of other equipment in the aircraft will not give erroneous glide path receiver indications throughout the flight patterns of Figures 1 and 2 passes P1, P2, P5 and P6 sufficient to interfere with a successful glide path approach.

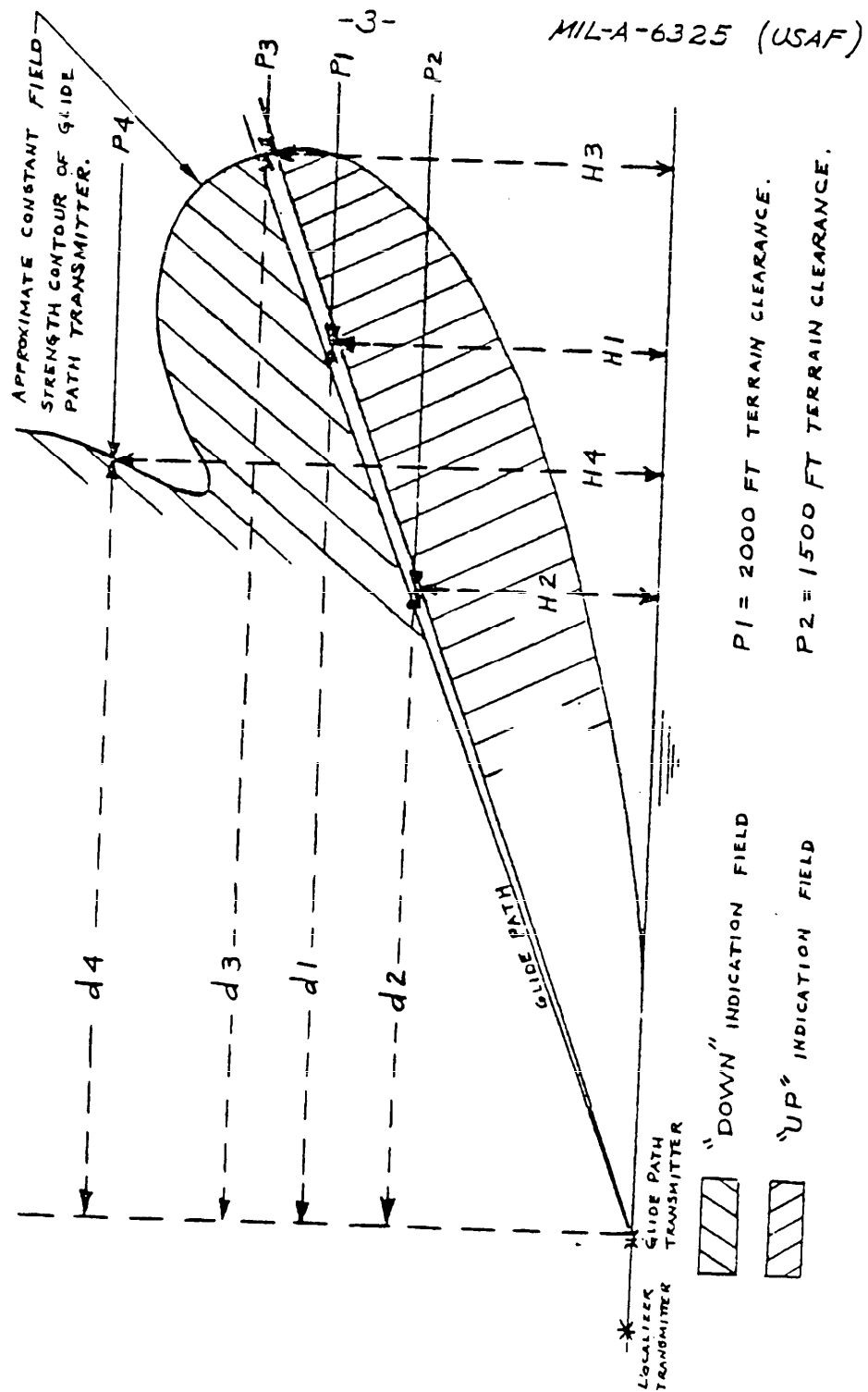


FIGURE 1

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- NOTE 1: P1 = 2000 FT TERRAIN CLEARANCE P5 = 1500 FT TERRAIN CLEARANCE
 P2 = 1500 FT TERRAIN CLEARANCE P6 = 1500 FT TERRAIN CLEARANCE
- NOTE 2. PASSES P5 AND P6 MAY BE ACCOMPLISHED BY FLYING OUTBOUND ON LOCALIZER COURSE TO POINT 2A, AS DETERMINED BY P2, THEN MAKING A 30° LEFT TURN (RIGHT TURN TO DETERMINE P6). CONTINUE COURSE 5 MILES THEN MAKE PROCEDURE TURN (180°) RETURNING ON SAME COURSE TO INTERSECT AT 2A.

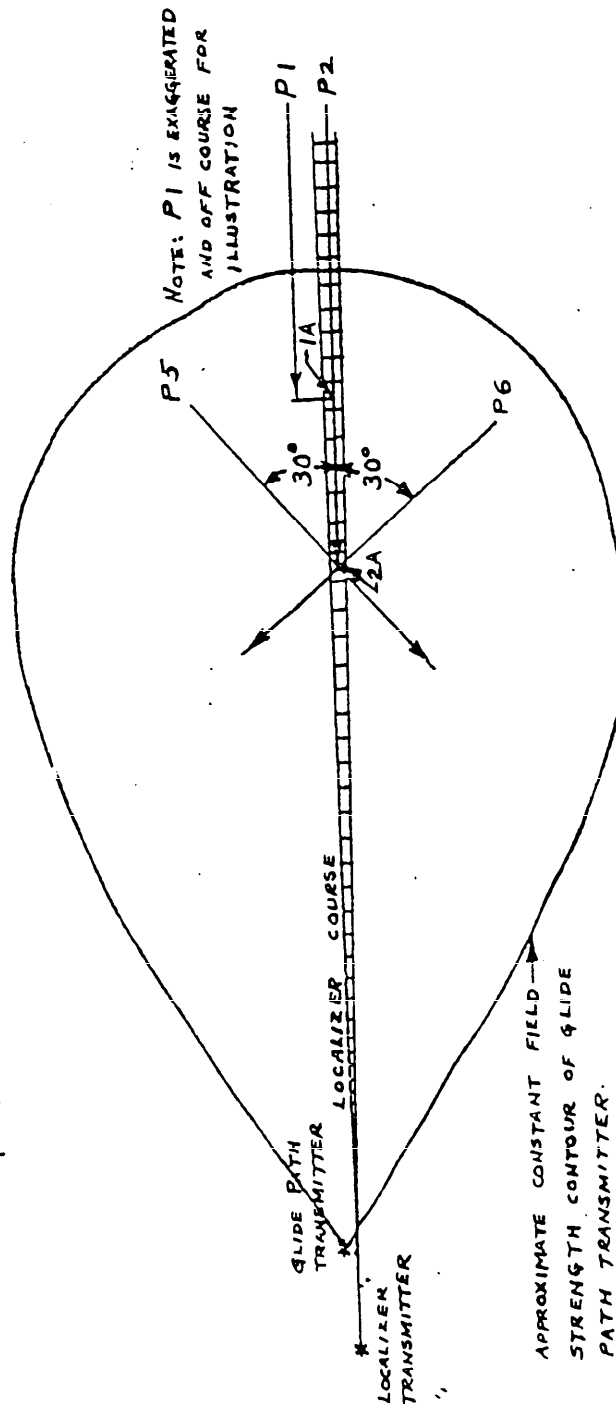


FIGURE 2

3.9 Selective Isolating Devices.- The contractor shall provide such selective isolating devices as are necessary to assure compliance with the interference requirements specified herein. The performance of the radio sets and antennas as specified herein shall be obtained with any such selective isolating devices included as a part of the system.

3.10 Radiation Pattern.- The antenna, when installed in the aircraft, shall receive horizontally-polarized signals when the aircraft is heading toward the glide path transmitter or at any heading of the aircraft within 90 degrees of the direction of the transmitter, and flying at any altitude between horizontal and 20 degree bank, glide or climb. The pattern in the forward half of the horizontal plane shall be free from nulls or sharp variations in gain. The gain of the antenna in the forward hemisphere below the horizon shall not be more than 3 db greater than the gain in the forward direction at the horizon.

3.11 Range.- The electrical performance of the antenna shall be such that it will provide a radio frequency signal of 130 microvolts or more to Radio Receiver R-89()/ARN-5 (which has a 95 ohm balanced radio frequency input) or 92 microvolts or more to Radio Receiving Equipment AN/ARN-18 (which has a 50 ohm coaxial input) when the aircraft is on a standard CAA or USAF instrument approach path, 10 or more nautical miles from the glide path transmitter and flying at any heading within 60 degrees of the direction of the transmitter and any attitude less than 10 degrees from horizontal flight. The signal source shall be the transmitter of Radio Set AN/CRN-2.

3.12 Performance.- The radiation receiving pattern and efficiency of the antenna shall be such that satisfactory indications shall be obtained with the navigation receiver indicators when the antenna is flight tested as specified herein.

3.13 Engineering Reports:

3.13.1 Preliminary Report.- A preliminary letter report shall be submitted describing the intent, method of approach, general outline, and the target date.

3.13.1.1 Interim Report.- A letter report shall be submitted describing any change in method, antenna program, or target date as established by 3.13.1.

3.13.2 Substantiating Data.- Data shall be submitted in substantiating tests. The submitted data shall include the following:

3.13.2.1 Reports outlining in detail the tests corresponding to the data being furnished.

3.13.2.2 Status reports of all tests conducted by agencies other than the Procuring Agency.

3.13.3 Flight Testing.-- The flight testing reports shall be in accordance with the following:

3.13.3.1 Flight test reports describing each test flight conducted by the contractor and commenting upon any operating defects encountered and/or modifications found necessary.

3.13.3.2 A final report shall be prepared, containing the analysis of each flight test performed by the contractor and corresponding to the flight tests specified herein.

3.13.4 Complete information sufficient to design and construct a laboratory test model of the finished antenna in its structural location shall be furnished the Procuring Agency three months prior to delivery of the aircraft for flight test by the U. S. Air Forces.

3.13.5 Preparation of Reports.-- Final engineering reports shall be prepared in accordance with Specification No. 40146.

3.14 Government Loaned Property.-- When provided for in the contract or purchase order, the following items will be furnished by the Government on loan to the contractor upon his request.

<u>Item No.</u>	<u>Stock No.</u>	<u>Nomenclature</u>	<u>Spec No.</u>	<u>Quant.</u>
1	1690-327878727	Test Set TS-67/ARN-5	71-5027	1
1	1690-327879517	Test Oscillator TS-170/ARN-5	71-5060	1

4. METHOD OF SAMPLING, INSPECTION, AND TEST

4.1 The antenna shall be subject to inspection by authorized Government Inspectors. When inspection is conducted at the contractor's or manufacturer's plant, tests shall be conducted by the contractor, or manufacturer, under the supervision of the authorized Government Inspector.

4.2 Previous acceptance or approval of material or the release of any design by the Procuring Agency shall in no case be construed as a guarantee of acceptance of the finished product.

4.3 Test Conditions:

4.3.1 Equipment Required:

- (1) Radio Receiving Equipment AN/ARN-5(), modified, or Radio Receiving Equipment AN/ARN-18
- (2) 0-50 D.C. Voltmeter and 0-50 D.C. Microammeter
- (3) Test Set TS-67/ARN-5
- (4) Test Set TS-170/ARN-5

4.3.2 Primary Supply Voltage.- The direct-current supply voltage at the equipment being tested shall be 27.5 to 28.5 volts.

4.4 Test Procedure.- Tests shall be repeated at each assigned test frequency in the range of the set. Not more than three equally spaced frequency channels shall be assigned for testing.

4.4.1 Radio Interference.- The glide path receiver shall operate without spurious responses sufficient to interfere with its successful use in navigating throughout the flight patterns as specified in paragraph headed, "Radio Interference".

4.4.2 Glide Path Receiver Performance.- The test shall be performed using a glide path receiver in good operating condition and adjusted in accordance with Specification No. R-7035. The sensitivity of the Radio Receiver R-89()/ARN-5 shall be better than 70 microvolts. The radio set shall be properly installed and connected. The sensitivity of Radio Receiving Set AN/ARN-18 shall be better than 25 microvolts.

4.4.2.1 Ground Test Station.- The ground test station shall be a Standard USAF Instrument Landing System or a CAA I-L-S station in good operating condition, properly adjusted, installed and maintained by the USAF or CAA.

4.4.2.2 Procedure.- The flight plans shown in Figure 1 and Figure 2 shall be executed once for each assigned test frequency. Not more than three frequencies shall be assigned for test. Flight passes P1, P2, P5 and P6 are the only required passes of Figures 1 and 2 and if any one of these passes does not prove acceptable, engineering correction shall be made before completing the figures. All passes are to be made without changes in equipment or tuning once the test has been initiated. Passes P3 and P4 are shown to demonstrate possible intersection courses which will not prove the acceptance of the antenna. Passes P3 and P4, though not required, illustrate possible characteristics of the antenna pattern.

4.4.2.2.1 Figure 1:

4.4.2.2.1.1 Radio Receiving Equipment AN/ARN-5(), as modified, or Radio Receiving Equipment AN/ARN-18 shall be used. (The receiver performance specified in 4.4.2 shall apply to the modified receiver).

$$4.4.2.2.1.2 \frac{d1}{H1} \approx \frac{d2}{H2} \approx \frac{d3}{H3}$$

4.4.2.2.1.3 Passes P1 and P2 shall be made on the localizer course to intersect the glide path and determine the intersection points 1A and 2A by range and azimuth from the glide path transmitter.

4.4.2.2.1.4 On passes P1 and P2 an "UP" indication shall be received before either "ON COURSE" or "DOWN" indication for acceptable performance.

4.4.2.2.1.5 For passes P1 and P2 the product of the radio frequency input signal to the receiver in microvolts multiplied by the distance of the glide path intersection (from the transmitter) in nautical miles shall be equal to or greater than 1300 for Radio Receiving Equipment AN/ARN-5() and 920 for Radio Receiving Equipment AN/ARN-18.

4.4.2.2.1.6 Passes P1 and P2 prove acceptable antenna performance for Figure 1.

4.4.2.2.2 Figure 2:

4.4.2.2.2.1 Radio Receiving Equipment AN/ARN-5(), as modified, or Radio Receiving Set AN/ARN-18 shall be used.

4.4.2.2.2.2 Passes P1 and P2 shall be same as those made for Figure 1.

4.4.2.2.2.3 Passes P5 and P6 shall intersect the localizer and glide path courses simultaneously (plus or minus one mile) at point 2A at 1500 ft. altitude (or 1A if at 2000 ft. altitude) for antenna acceptance. This proves the symmetry of the airborne antenna pattern.

4.4.2.2.2.4 On passes P1, P2, P5 and P6, an "UP" indication shall be received before either "ON COURSE" or "DOWN" indication for acceptable performance, as for Figure 1.

4.4.2.2.2.5 For passes P5 and P6 the product of the radio frequency input signal to the receiver in microvolts multiplied by the distance of the glide path intersection (from the transmitter) in nautical miles shall be equal to or greater than 1300 for Radio Receiving Equipment AN/ARN-5() and 920 for Radio Receiving Equipment AN/ARN-18.

4.5 Retest.- Rejected antennas shall not be resubmitted for inspection without furnishing full particulars concerning previous rejection and measures taken to overcome the defects.

4.6 All parts, specimens, or assemblies destroyed in making tests required by this specification and/or drawings, to determine compliance with the specification and/or drawings, shall be in addition to the quantity specified in the contract or purchase order and shall be furnished without increasing the cost of the contract or order.

5. PREPARATION FOR DELIVERY

5.1 Not applicable.

6. NOTES

6.1 Use.- The antennae covered by this specification are intended to be used with glide path radio receiving equipment.

6.2 Radio Receiving Equipment AN/ARN-5() has a 95 ohm balanced radio frequency input. Radio Receiving Equipment AN/ARN-18 has a 52 ohm coaxial radio frequency input. When Radio Receiving Equipment AN/ARN-5() is used with an antenna having a coaxial input, or when Radio Receiving Equipment AN/ARN-18 is used with an antenna having a balanced input, the contractor will be required to supply an impedance converting and matching section equivalent to Transmission Line Coupler CU-231/U in the transmission line.

6.3 Design Information.- The contractor may obtain available design and installation data upon request to the Procuring Agency.

6.4 Instructions for obtaining calibrated flight test data of glide path and localizer antennae may be obtained upon request to the Procuring Agency.

6.5 When Radio Receiving Equipment AN/ARN-18 is supplied for installation, instructions for modifying a receiver for test purposes will be furnished upon request to the Procuring Agency.

6.6 The following publications may be of interest in connection with tests:

6.6.1 U. S. Air Forces Technical Order:

AN-08-30ARN5-2 Handbook of Operating Instructions for
Receiver R-89(A&B)/ARN-5 and R-89(A&B)/ARN-5A
AN-16-30ARN5-3 Handbook of Maintenance Instructions for
Receiver R-89A/ARN-5 and R-89/ARN-5A

NOTICE: When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data, is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No. 119-R004

INSTRUCTIONS

This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity (as indicated on reverse hereof).

SPECIFICATION

ORGANIZATION (of submitter)

CITY AND STATE

CONTRACT NO.

QUANTITY OF ITEMS PROCURED

DOLLAR AMOUNT

\$

MATERIAL PROCURED UNDER A

☐

DIRECT GOVERNMENT CONTRACT

☐

SUBCONTRACT

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3. IS THE SPECIFICATION RESTRICTIVE?

☐

YES

☐

NO IF "YES", IN WHAT WAY?

4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)

SUBMITTED BY (Printed or typed name and activity)

DATE

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