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MILITARY SPECIFICATION

INTERFERENCE LIMITS AND METHODS OF MEASUREMENT; AIRCRAFT RADIO AND ELECTRONIC INSTALLATIONS

This specification was approved by the Departments of the Army, the Navy, and the Air Force for use of procurement services of the respective Departments.

1. SCOPE

1.1 This specification covers interference limits applicable to experimental, electronic-test, and production aircraft, including pilotless aircraft in which provisions are made for a safety pilot.

1.1.1 An understanding of the key words defined in Section 5 is essential to the understanding of this specification.

2. APPLICABLE SPECIFICATIONS

2.1 There are no other specifications applicable to this specification.

(Copies of this publication and copies of military publications required for Government procurement, and the Index of Military Aeronautical (AN or MIL) Standards may be obtained upon application to the Commanding General, Air Materiel Command, Wright-Patterson Air Force Base, Dayton, Ohio; or to the Commanding Officer, U. S. Naval Air Station, Johnsville, Pennsylvania.

3. REQUIREMENTS

3.1 There shall be no undesirable response from electronic receivers above the area noise level, nor malfunctioning of other electronic equipment due to radio interference produced by any or all electrical, electronic, and other equipment of the aircraft when tested as specified herein. This requirement applies to the entire frequency range of all installed electronic equipment and to those for which complete installation provisions have been made.

3.2 Undesirable transient responses are exempted from the requirements specified herein if they cause no malfunctioning and occur only during ground engine starting, or if they cause no malfunctioning, are less than 1 second in duration, and do not recur during normal operation more frequently than once every 3 minutes. Undesirable aural transient responses are further exempted if their duration is less than 3 seconds and they do not occur more than once per flight.

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3.3 Method and Material.-- The method and material used to accomplish suppression or elimination of radio interference, such as the installation of filtering, bonding, and shielding, shall be in accordance with good engineering practice and approved by the Procuring Service. Where a proposed method or material has not been previously approved, the contractor shall forward, with the proposal, substantiating engineering data for its use.

4. SAMPLING, INSPECTION, AND TEST PROCEDURES

4.1 Identification of Tests.-- The two tests outlined herein are identified as follows:

- (1) Interference Compliance test
- (2) General Acceptance test

4.2 Interference Compliance Test.--

4.2.1 Aircraft to be Tested.--

4.2.1.1 Each experimental and electronic-test aircraft shall be submitted to an Interference Compliance test.

4.2.1.2 Each aircraft produced after the electronic-test aircraft shall be given a complete Interference Compliance test until a minimum of two consecutive aircraft have passed Government inspection without rework.

4.2.1.3 The Government Inspector shall cause an Interference Compliance test to be performed on any aircraft whenever inspection indicates a deviation from normal workmanship, material, or arrangement which might effect conformance with the requirements of this specification.

4.2.1.4 If any modification or relocation of the installed radio, electrical, or electronic equipment is incorporated in production aircraft, the first two consecutive aircraft shall be required to pass successfully an Interference Compliance test on such modification or alternate installation.

4.2.1.5 Whenever an aircraft does not meet the requirements of an Interference Compliance test without rework, an Interference Compliance test shall be made on the unsatisfactory items of the reworked aircraft and each aircraft thereafter until two consecutive aircraft have passed without rework.

4.2.2 Test Equipment.--

4.2.2.1 Electronic Receivers.-- Electronic receivers for conducting tests under this specification shall be taken from stock equipment of the aircraft, shall meet the sensitivity requirements for the individual equipment, and shall be acceptable to the Procuring Service.

4.2.2.2 Output Meter.-- An alternating-current output meter of at least 1000 ohms/volt input impedance, with a damping factor not more than 0.7 (critical) and capable of measuring audio outputs at -10 db below one milliwatt at 600 ohms shall be used for measuring audio outputs of receivers when conducting radio interference tests in aircraft.

4.2.2.3 Headsets.-- Standard low-impedance AN headsets shall be used for detecting radio interference in the audio output of receivers. When special headsets are required for a special equipment, they shall be used with that equipment when conducting these tests.

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4.2.3 . Test Conditions and Procedures.-

4.2.3.1 All electrical and electronic equipment included in the aircraft detail specification and changes thereto shall be installed in the aircraft and shall be in normal operating condition as determined by the test procedures and techniques specified by the Procuring Service.

4.2.3.2 For all tests, locations shall be chosen where area noise level is at a minimum and in no case produces an output exceeding 8 decibels above the receiver-system background level of any installed receiver.

4.2.3.3 During all tests bus voltage shall be maintained within the limits specified in the detail requirements for the aircraft.

4.2.3.4 All electronic receivers for conducting tests shall be adjusted for maximum performance with antenna connected. Where provided, external gain controls shall be "full on," squelch circuits inoperative, modulated continuous wave (MCW) reception employed, and all external antenna trimmers adjusted for maximum sensitivity at a mid-frequency of the range covered. No internal adjustment shall be made unless specified by the Procuring Service.

4.2.3.5 Electronic equipment which provides an aural output shall have a headset and an output meter connected in parallel at the normal operating positions. The jack box gain control shall be "full on," and all other jack boxes shall be set on a position other than the position on which the test is being accomplished. Where in an electronic system any receiver output is normally fed into a radio-interphone amplifier, the headset and output meter shall be connected in the amplifier output circuit. The controls for the radio-interphone amplifier shall be adjusted for the conditions of normal system operation.

4.2.3.6 Tests for the presence of radio interference in the output of each electronic receiver shall be made at a representative number of frequencies within the range of the equipment while all other equipments and systems which are potential sources of radio interference are operated. Whenever possible, test frequencies shall be selected on the basis of listening tests covering the entire frequency range. Acceptable demonstration by the contractor at a limited number of frequencies shall not be construed as a waiver of the requirements for interference free operation throughout the frequency range.

4.3 General Acceptance Test.-

4.3.1 A General Acceptance test shall be conducted on every aircraft on which an Interference Compliance test is not made.

4.3.2 The test conditions and procedures for the General Acceptance test shall be as specified for the Interference Compliance test, except that no output meter need be used, and quantitative measurements are not required.

4.3.3 Whenever an aircraft does not meet the requirements of a General Acceptance test without rework, an Interference Compliance test shall be made on the unsatisfactory items of the reworked aircraft and each aircraft thereafter until two consecutive aircraft have passed without rework.

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5. NOTES

5.1 Purpose.-- The purpose of this specification is to obtain radio-interference-free performance of electronic installations in aircraft by providing interference limits and methods of test for a complete aircraft.

5.2 Definitions.--

5.2.1 "Electronic-Test Aircraft" is defined as an early aircraft, mutually selected by the contractor and the Government Inspector, which incorporates the complete installation of a particular complement of electrical and electronic equipment.

5.2.2 "Radio Interference" to any electronic equipment is defined as any disturbance or disturbances which cause an undesirable response or malfunctioning of any electronic equipment.

5.2.3 "Malfunctioning" is defined as that type of output which departs from normal, due to interference, in such manner that the operator or actuating mechanism is unable to differentiate operationally between desired and undesired signals. Examples are the undesired actuating of an auto-pilot, and the introduction of a fixed target on a radar scope.

5.2.4 "Undesirable Response" is defined as a recognizable interruption to normal output which introduces no malfunctioning. Examples are snow on a radar scope, and static in headsets.

5.2.5 "Receiver-System Background Noise Level" is defined as that output obtained at the test position, with controls adjusted as described for the Interference Compliance test, with all sources of interference associated with the aircraft silenced, with the antenna disconnected at the equipment terminal, and with the equipment antenna input terminal terminated by a suitable dummy antenna.

5.2.6 "Area Noise Level" is defined as that output obtained at the test position, with controls adjusted as described for the Interference Compliance test, with all sources of interference associated with the aircraft silenced, and with the antenna connected.

5.2.7 "Rework" is defined as any modification or change in the aircraft or its components, or in assembly procedure, other than the replacement of defective parts, performed as a result of the aircraft failing to meet any test specified herein.

5.3 Equipment Source.-- Where equipment is needed to complete a system for which installation provisions have been made by the contractor, the Procuring Service, upon request, will supply such equipment or waive the tests involved.

5.4 Phantom Antennas.-- Ground tests facilitate the locating of the aircraft interference sources and the coupling paths into receivers. For such tests, usual area interference and other interference externally coupled via the antenna can be eliminated by terminating receiver antenna lead-ins at the skin of the aircraft, using suitable phantom antennas.

5.5 The aircraft contractor is responsible for the proper installation engineering of all equipment to achieve an interference-free aircraft. Where it can be demonstrated that interference caused by

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government furnished items cannot be eliminated by means within the contractor's control, including reasonable application of shielding or filtering, the Procuring Service may waive the requirements of this specification applicable to the particular equipment upon formal request from the contractor.

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.

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