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MILITARY SPECIFICATION

ELECTRICAL-ELECTRONIC SYSTEM COMPATIBILITY AND INTERFERENCE CONTROL REQUIREMENTS FOR AERONAUTICAL WEAPON SYSTEMS AND ASSOCIATED SUBSYSTEMS

1. SCOPE

1.1 This specification outlines design requirements and test procedures necessary to control the electronic interference environment of weapon systems and associated electronic and electrical subsystems.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on the date of invitation for bids, form a part of this specification:

SPECIFICATIONS

Military

MIL-B-5087	Bonding; Electrical (for Aircraft)
MIL-T-9107	Test Reports, Preparation of
MIL-D-9310	Data for Guided Missile Weapon Systems
MIL-F-15733	Filters, Radio Interference
MIL-D-25876	Data for Fixed Wing Aircraft Weapon Systems
MIL-I-26600	Interference Control Requirements, Aeronautical Equipment

(Copies of documents required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

3. REQUIREMENTS

3.1 General.- The electro-interference environment shall be controlled to eliminate undesired interaction and malfunctioning of all electronic and electrical subsystems in or associated with the weapon system regardless of whether the ultimate output of the subsystem is electrical, aural, video, or mechanical. This requirement applies to the entire frequency range of the installed subsystems and those for which complete installation provisions have been made. This requirement specifically includes electronic compatibility of subsystems when operating with their installed antennas and when performing their intended radiation or reception function. There shall be no unacceptable response from the output of any subsystem because of electro-interference produced by any or all of the installed or associated electrical, electronic, and other equipment of the weapon system when tested as specified herein. The data required herein shall be considered to be part of the design compatibility data and the acceptance test reporting for the system as specified in MIL-D-9310 and MIL-D-25876.

3.2 Interference Control Plan.- Within ninety days after approval of the weapon system configuration by the procuring activity, the contractor shall submit to the procuring activity a detailed plan outlining his interference control program, the engineering design procedures, and techniques that will be used in complying with this specification. The design aspects of the interference environment which is created by the weapon system, the radio frequency media in which it will operate, utilization of the inherent shielding characteristics of the weapon, antenna location, shielding and bonding techniques, cable routing, and all other pertinent factors shall be included in the interference control plan. Addendums shall be submitted whenever it becomes necessary to revise or supplement the information in the interference control plan or at a date approved by the contracting officer.

3.2.1

3.3 Interference Test Plan.- The contractor shall submit a detailed test plan showing the means of implementation and the application of the test procedures in this specification to the procuring activity thirty days prior to the starting date of the electrical-electronic compatibility test specified herein, or at such later date as the contracting officer may authorize.

3.4 Susceptibility Characteristics of Electrical and Electronic Subsystem Contractor-Furnished Airborne Equipment.- The interference control requirement stated herein shall be considered in the design phases of the weapon system. All support systems and subsystems shall incorporate interference control requirements in accordance with MIL-I-26600. Specific attention shall be given to the ~~interference susceptibility~~ characteristics of the subsystem in relation to the predicted electronic interference environment. Where additional requirements are necessary, it shall be the responsibility of the weapon system contractor to impose these requirements on the subsystem. Compliance with the requirements relating to subsystems shall not relieve the weapon system contractor of the overall responsibility of controlling the weapon system electromagnetic environment.

3.5 Government-Furnished Equipment.- It shall be the responsibility of the weapon system contractor to comply with the requirements stated herein in connection with Government-furnished subsystems, provided these systems comply with the requirement indicated in the interference control plan.

3.6 Bonding.- Bonding shall be accomplished in accordance with the requirements of MIL-B-5087. Bonding shall be provided for current return paths, antenna installations, and to provide equal potential between all equipments and the basic structure of the weapon system.

[illegible] fields over 150 kc

3.7 Shielding.- The materials and construction methods used on weapon **systems shall** provide an attenuation to electromagnetic emanations that is generally over 60 db. This inherent shielding effectiveness is of considerable importance in preventing interference and interaction to subsystems caused by sources outside the weapon system. A great saving in weight, space, and money is realized when maximum use is made of this shielding effectiveness. Continuity of shielding **shall** be maintained in order to utilize the shielding effectiveness of the fuselage to a maximum degree. All coaxial cables, waveguides, and other antenna lead-ins shall have sufficient shielding effectiveness to use this inherent shielding advantageously. A solid or triple-braided shield may be necessary.

3.8 Interference Control Components.- Interference control filters shall be in accordance with MIL-F-15733. When the environmental requirements of the weapon system dictate additional requirements on interference control components, they shall be detailed in the interference control plan. (Suppression components shall be held to a minimum and shall be applied as close as possible to the interference source.)

4. QUALITY ASSURANCE PROVISIONS

4.1 General.- All tests performed by the contractor shall be described by test reports and submitted to the procuring activity for approval and possible verification. When the procuring activity waives verification, the tests and test reports shall be approved and certified. Evidence of certification and approval, either by the Government or the contractor, shall be in accordance with MIL-T-9107. The Government reserves the right to have technical representatives of the procuring activity present during testing.

4.2 Test Conditions and Procedures.- All electronic and electrical equipment included in the applicable weapon system specification shall be included in the weapon system test complex and shall be in normal operating condition as determined by the test procedures and techniques specified in the detailed subsystem specifications.

4.2.1 Power Limits.- When conducting acceptance tests, all electrical power shall be maintained within the limits specified in the detailed specification for the particular weapon system.

4.2.2 Test Location.- Test locations shall be chosen from areas under the contractor's control or Government control ~~jurisdiction~~ where the area interference level is at a minimum. Test shall not be conducted in any area ~~or~~ at a time when the external electromagnetic environment would cast doubt as to the validity of the tests. not more than 4 db [illegible]

4.2.3 Adjustments.- All electronic subsystems for conducting tests shall be adjusted for standard performance in an operating condition in accordance with the requirements of the subsystem performance specification. for maximum of susceptibility.

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4.2.4 Malfunctioning.- Tests to indicate malfunctioning or unacceptable response for each subsystem shall be made at a representative number of frequencies or operating ranges of the subsystem while all subsystems or equipments are operated. Specific tests shall be conducted at the image frequencies, intermediate frequencies, local oscillator frequencies, and fundamental transmitter frequencies through the fifth harmonic frequencies.
([illegible])

4.2.5 Headsets.- Headsets of the proper impedance shall be used for detecting interference in the audio output of receivers. When special headsets are required for an equipment, they shall be used with that equipment when conducting these tests.

4.2.6 Output Response.- A complete description of the devices used for measuring electrical, aural, video, and mechanical outputs of all electronic and electrical subsystem elements shall be included in the interference test plan.

4.2.7 Exi output meter

4.3 Tests

4.3.1 Electrical-Electronic Compatibility Test of System.- The first electrical-electronic weapon system shall be subjected to a complete functional compatibility test. The weapon system shall be instrumented as outlined in the requested test plan to indicate compliance or noncompliance with the requirements herein. Any modification or relocation of the electronic or electrical subsystem or equipment of production weapon system shall require a retest unless specifically waived by the procuring activity.

4.3.2 Specification Compliance Test System.- Any changes or modification required as a result of the electronic compatibility test shall be incorporated in the system. In no case shall the specification compliance weapon system be more than five production systems removed from the electronic compatibility test system unless specifically authorized by the procuring activity. The contractor shall submit engineering details outlining modifications required for effecting compliance with this specification on all weapon systems produced prior to the specification test system.

4.3.3 General Acceptance Test.- Each production system shall be given a limited test as outlined in the contractor's test plan to insure production compliance with the stated requirements. Government acceptance crews may conduct this test on manned systems. Each unmanned system shall be subjected to a simulated prelaunch countdown with the minimum instrumentation necessary to insure production compliance.

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4.3.4 Unacceptable Response.- Compliance with the requirements of unacceptable response shall be satisfied for aural response when the output of the interphone subsystem or receiver does not exceed 3 millivolts when measured across the headset impedance of 8 ohms, when tested as specified herein. Output responses from any subsystem, regardless of the type of presentation other than aural response, shall be unacceptable when operation of other electrical or electronic subsystems produces a change or indication different from the inherent response of the subsystem being tested.

4.3.5 No Malfunctioning.- The requirement of "no malfunctioning" shall be considered to have been met when the sum of all extraneous electromagnetic energy that may be introduced into the most critical point of a subsystem is six db below that desired input which would produce operation, actuation, or functioning of the subsystem or equipment. Detailed test methods, instrumentation, monitoring point, and test procedures applicable to the functional usage of the particular subsystem shall be outlined in the test plan specified herein. For example, the key test point in a guidance subsystem is that relay which actuates a hydraulic valve for control purposes. In this case, an ammeter in the relay circuit, indicating no more than half the current required for operation, would be the no-malfunction limit.

5. PREPARATION FOR DELIVERY

5.1 This section is not applicable to this specification.

6. NOTES

6.1 Intended Use.- The purpose of this specification is to control the electromagnetic environment to the degree necessary to insure interference-free operation of electronic and electrical subsystems in all weapon systems. This specification is applicable to all items of equipment which utilize or may be affected by electrical phenomena. Such items may be operated individually, in combination, or collectively and comprise a portion of or a total weapon system.

6.2 Definitions

6.2.1 Weapon System.- A weapon system is composed of equipment, skills, and techniques, the composite of which forms an instrument of combat usually but not necessarily having an air vehicle as its major operational element. The complete weapon system includes all related equipment, materials, services, and personnel required solely for the operation of the air vehicle or other major elements of the system so that the instrument of combat becomes a self-sufficient unit of striking power in its intended operational environment.

6.2.2 Support System.- A support system is a composite of equipment, skills, and techniques which, while not an instrument of combat, can perform a clearly defined function in support of an Air Force mission. Examples are weather, air-sea rescue, logistics, intelligence and training systems.

6.2.3 Subsystem.- A subsystem is a major functional part of a weapon system, usually consisting of several equipments, which is essential to the operational completeness of the weapon system. Examples are airframe, propulsion, guidance, navigation,and communication.

6.2.4 Equipment.- Equipment is a major functional part of a weapon system or subsystem, usually consisting of several components, which is essential to operational completeness of the weapon system or subsystem. Examples are radio compass, radio command set, and electrical power supply.

6.2.5 Component.- A component is a functional part of a subsystem or equipment essential to operational completeness of the subsystem or equipment.

Examples are radio transmitter unit, radio receiver unit, amplifier unit, analyzer unit, computer unit, and control box.

6.2.6 Government-Furnished Airborne Equipment (GFAE).- GFAE is that portion of equipment which, under the terms of an Air Force vehicle contract, is procured and furnished by the Air Force directly to the air vehicle contractor for inclusion in an air vehicle.

6.2.7 Contractor-Furnished Airborne Equipment (CFAE).- CFAE is that portion of equipment that is furnished and included in the air vehicle by the air vehicle contractor.

6.2.8 Weapon System Contractor.- A weapon system contractor is a prime contractor to the Government for detailed weapon system development, production, and installation of certain portions of weapon system, including necessary planning and scheduling under the supervision and final authority of the Government.

6.2.9 Prime Contractor.- A prime contractor is a contractor having a direct contract with the procuring activity.

6.2.10 Electromagnetic Environment.- The electromagnetic environment is the signal and noise complex within which a weapon system, subsystem, or equipment is likely to be immersed for operational use.

6.2.11 Unacceptable Response.- Unacceptable response is an abnormality in the expected operation or output of a receiver or subsystem due to electro-interference which usually cannot be termed a malfunction but which may be considered intolerable.

6.2.12 Electro-Interference.- Electro-interference is an undesired electrical phenomena which is created by, or which adversely affects, any device whose normal functioning is predicated upon the utilization of electrical phenomena. Electrical interference is known coloquially and is referred to as radio and electrical noise or interference, hash, jitter, grass, hunting, ambiguity, cross modulation, TV interference (TVI), hum, etc. The word "interference" may be used alone or with appropriate modifiers in reference to some manifestation of electro-interference when mutually understood.

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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