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Superseding AS4764

Validation Methods for MIL-STD-1760 Aircraft Station Interfaces

RATIONALE

This document has been determined to contain basic and stable technology which is not dynamic in nature.

STABILIZED NOTICE

This document has been declared "Stabilized" by the SAE AS-1B Aircraft Store Integration Committee and will no longer be subjected to periodic reviews for currency. Users are responsible for verifying references and continued suitability of technical requirements. Newer technology may exist.

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FOREWORD

This SAE Aerospace Standard (AS) a document for validating aircraft station compliance with the interface requirements of MIL-STD-1760A. This document was prepared by the SAE AS-1B, MIL-STD-1760 Validation Requirements Task Group to provide industry guidelines to the U.S. Government's MIL-STD-1760A Notice #2. This document was prepared to minimize unnecessary or undesirable variations in aircraft station validation against MIL-STD-1760.

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1. SCOPE:

This document establishes techniques for validating that an aircraft station complies with the interface requirements delineated in MIL-STD-1760.

1.1 Purpose:

The purpose of this document is to provide methods for validating that an aircraft's store electrical interface complies with the aircraft station interface (ASI) requirements of MIL-STD-1760. This document provides a modular, independent set of methods for each of the requirements in MIL-STD-1760 that applies to aircraft requirements. The methods herein apply to the auxiliary (AUX) interface as well as the primary interface of MIL-STD-1760.

1.2 Application:

The methods herein apply to initial validation of an aircraft design to the requirements of MIL-STD-1760 and are expected to be conducted as part of aircraft design validation (as opposed to qualification test, quality conformance test, flight line test, etc.). The methods contained in this document are sufficient to cover the Class I interface. Aircraft with Class II ASIs will use the appropriate subset of these Class I methods.

1.3 Tailoring:

The methods contained herein are general methods for conducting ASI validation and, as such, do not provide detailed procedures for these methods. It is intended that detailed procedures for validation of a specific ASI will be covered by tailored test plans and procedures prepared specifically for that aircraft. These tailored test procedures would, for example, address those peculiar commands required to step through sufficient operations and states to demonstrate compliance with the particular aircraft/store electrical interconnection system (AEIS) requirement under test.

1.4 Limitations:

The methods contained herein are based on MIL-STD-1760A through Notice 2. A future revision of this document will address MIL-STD-1760B test techniques. In addition, this document addresses testing compliance of an aircraft to MIL-STD-1760 based on the assumption that all tests are conducted at the aircraft's ASI connector and measurements of performance occur only at this ASI.

1.5 Identification System:

The test methods contained in this document are designated by an alphanumeric identification scheme. Each method is identified by a three alphabetical character combination followed by a three digit number. The meaning of the first three individual letters is:

a. HBW: High Bandwidth Interface
b. MUX: Digital Multiplex Data Interface
c. LBW: Low Bandwidth Interface
d. REL: Release Consent Interface
e. INL: Interlock Interface
f. ADR: Address Interface
g. GND: Structure Ground
h. DCP: 28 V DC Power Interface
i. ACP: 115 V/200 V AC Power Interface
j. HVP: 270 V DC Power Interface
k. FOC: Fiber Optic Interface
l. INT: Initialization
m. CON: ASI Connector
n. COM: Communication Rules
o. MSG: Messages on the Digital Multiplex Data Interface

The three numbers following the letter code is a sequentially assigned number such that numbers 101 through 199 are for ASI requirements and 201 through 299 are for mission store interface (MSI) requirements. When applicable, the letter following this three digit number is the test method revision letter. For example, HBW101 represents the original version of the first test requirement (TR) for the ASI HBW interface while HBW101A represents the first revision of that requirement.

2. REFERENCE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and 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.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AS4113 Validation Test Plans for the Digital Time Division Commands/Response Multiplex Data Bus Bus Controllers

2.2 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-B-5087	Bonding, Electrical and Lightning Protection for Aerospace Systems
MIL-E-6051	Electromagnetic Compatibility Requirements, Systems
MIL-A-8591	Airborne Stores, Associated Suspension Lugs, and Aircraft - Store Interface (Carriage Phase); General Design Criteria for
MIL-C-38999	Connectors Electrical, Circular, Miniature, High Density, Quick Disconnect
MIL-C-39029	Contacts, Electric
MIL-C-45662	Calibration System Requirements
MIL-STD-461	Electromagnetic Interference Characteristics, Requirements for Equipment
MIL-STD-462	Electromagnetic Interference Characteristics, Measurement of
MIL-STD-704	Electric Power, Aircraft, Characteristics and Utilization of
MIL-STD-1498	
MIL-STD-1553	Digital Time Division Command/Response Multiplex Data Bus
MIL-STD-1560	Insert Arrangements for MIL-C-38999 and MIL-C-27599 Electrical Circular Connectors
MIL-STD-1760	Aircraft/Store Electrical Interconnection System
STANAG 3350 AVS	Monochrome Video Standard for Aircraft System Applications
MIL-HDBK-1553	Multiplex Application Handbook
MIL-HDBK-235	
ASD-TR-87-5028	Design Principals and Practices for Implementation of MIL-STD-1760 in Aircraft and Stores - June, 1987

2.3 EIA Publications:

Available from Electronics Industries Association, 2001 Eye Street NW, Washington, DC 20006.

EIA-STD-RS-170	Electrical Performance Standards - Monochrome Television Studio Facilities
EIA-STD-RS-343-A	Electrical Performance Standards for High Resolution Monochrome Closed Circuit Television Camera

2.4 Abbreviations and Acronyms:

AC	Alternating Current
ACP	Alternating Current Power
ADR	Address
AEIS	Aircraft/Store Electrical Interconnection System
AS	Aerospace Standard
ASD	Avionics Systems Division
ASI	Aircraft Station Interface
AUX	Auxiliary

2.4 (Continued):

BC	Bus Controller
COM	Communication
CON	Connector
CSSI	Carriage Store Station Interface
dB	Decibel
dBm	Decibels above 1 mW
DC	Direct Current
DCP	Direct Current Power
DoDISS	Department of Defense Index of Specifications
EIA	Electronic Industries Association
FOC	Fiber Optic Channel
GHz	Gigahertz
GND	Ground
HB	High Bandwidth
HBW	High Bandwidth
HDBK	Handbook
HVP	High Voltage Power
Hz	Hertz
ICD	Interface Control Document
INL	Interlock
INT	Initialization
kHz	Kilohertz
LB	Low Bandwidth
LBW	Low Bandwidth
mA	Milliamps
MHz	Megahertz
MIL	Military
ms	Milliseconds
MSG	Message
MSI	Mission Store Interface
MUX	Multiplex
N/A	Not Applicable
p-p	Peak-to-Peak
REL	Release
RT	Remote Terminal
RMS	Root Mean Squared
SAE	Society of Automotive Engineers
STANAG	Standardization Agreement
STD	Standard

2.4 (Continued):

TDP	Technical Data Package
TR	Test Requirement
TRMS	True Root Mean Squared
UUT	Unit Under Test
V	Volts
VSWR	Voltage Standing Wave Ratio

3. DEFINITIONS:

3.1 AEIS Terms:

Terminology peculiar to the AEIS is defined in MIL-STD-1760.

3.2 Unit Under Test (UUT):

The UUT is defined as the "production configuration aircraft" undergoing validation tests. The test point for all electrical tests is the ASI.

3.3 Validation:

Validation is defined as the process whereby the final design of an AEIS is evaluated to determine its compliance with the requirements imposed by MIL-STD-1760. This compliance evaluation is accomplished using a combination of techniques including tests, analysis, and inspections. This validation is conducted to determine that the design complies with MIL-STD-1760 under nominal ambient conditions. While this validation may be part of an aircraft's qualification test (if specified in the aircraft's system specification), it is not necessarily intended to be conducted under all aircraft environmental and operational conditions and, as such, does not specifically "qualify" the aircraft to its system specification/interface control document (ICD) requirements.

4. GENERAL REQUIREMENTS:

4.1 Introduction:

As part of an aircraft's qualification to its system specification requirements, the AEIS design shall be validated against the requirements of MIL-STD-1760. The specific validation effort for a given ASI will be defined in a test plan prepared for the AEIS. The methods defined in this document provide guidance for the preparation of the test plans by delineating the pertinent requirements in MIL-STD-1760 and validation methodology. For those requirements that can be validated by test or analysis, this document also provides test techniques. Section 5, herein, presents validation details associated with each requirement in MIL-STD-1760.

4.2 Validation Techniques:

Validation of a design to the requirements of MIL-STD-1760 can be accomplished through the use of a number of techniques. A general listing of these techniques includes:

a. Test
b. Analysis
c. Inspection

4.2.1 Test: Tests are those methodologies that measure characteristics or performance under specified conditions. Tests also include techniques that "demonstrate" operation of circuitry or system performance.

4.2.2 Analysis: Analyses are those methodologies that verify design compliance with the designated requirements of MIL-STD-1760 without performance of validation test or inspection. These methodologies will primarily be based on technical evaluation of aircraft design documentation such as drawings, parts lists, software listings, etc.

4.2.3 Inspection: Inspections are visual examinations and other nondestructive investigations of hardware and materials to determine compliance with the physical requirements of MIL-STD-1760.

4.3 Tailoring:

The implementation of an AEIS could be unique for each type of aircraft. Therefore, the test techniques presented in this document are written in general terms to avoid addressing aircraft unique operating details that would be required if detailed test techniques were presented. As a result, the procedures for validating an ASI will need to be defined by a custom "Test Plan" tailored specifically for the AEIS. This custom test plan would address specific test setups, test equipment, and those operating procedures required to exercise the ASI under test. These are a set of minimal verification requirements that can be added to but not subtracted from as that would mean that the AEIS may not meet the requirements of the "Standard".

4.4 Test Conditions:

Except as specified in the detailed AEIS test plan, validation tests are expected to be conducted under the following ambient conditions:

a. Temperature: Room ambient
b. Altitude: Normal ground
c. Vibration: None
d. Humidity: Room ambient up to 90% relative humidity (noncondensing)
e. Power supply: AC: 115 $\pm$ 3.0 V AC RMS, 400 $\pm$ 7 Hz
DC: 27.5 $\pm$ 2.0 V DC