METHOD: LBW101

PARAMETER: Aircraft LB Interface

MIL-STD-1760 PARAGRAPH: 5.1.1.3

PURPOSE: This method verifies that the aircraft LB interface provides a noninverting signal connection, inverting signal connection, and a shield connection.

PARAMETER TYPE: ( ) ELECTRICAL ( ) PROTOCOL (X) PHYSICAL

VALIDATION TECHNIQUE: ( ) TEST (X) ANALYSIS ( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the ASI supplies the required connection.

APPARATUS: N/A

VALIDATION METHOD: Evaluate the aircraft's TDP to determine if the ASI provides the required connections.

NOTES:

1. Reference: Design Principles and Practices for Implementation of MIL-STD-1760 in aircraft and stores (Technical Report ASD-TR-87-5028).

FIGURE A26 - Aircraft Validation Requirement
(Method LBW101)

METHOD: LBW102

PARAMETER: Transfer Requirements

MIL-STD-1760 PARAGRAPH: 5.1.1.3.1

PURPOSE: This method verifies that the aircraft provides the LB distribution network necessary to support bidirectional signal transfer from any ASI to applicable aircraft equipment.

PARAMETER TYPE: ( ) ELECTRICAL ( ) PROTOCOL (X) PHYSICAL

VALIDATION TECHNIQUE: ( ) TEST (X) ANALYSIS ( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the LB distribution network provides the necessary connectivity to support signal transfer from any ASI applicable aircraft equipment to any ASI.

APPARATUS: N/A

VALIDATION METHOD: Evaluate the aircraft's TDP to determine if the aircraft LB distribution network provides the necessary connectivity to support bidirectional signal transfer from any ASI to applicable air vehicle equipment.

NOTES:

1. This method verifies that the aircraft provides the required MIL-STD- 1760 connectivity only; other validation methods verify electrical performance of the aircraft LB distribution network.

2. Reference: Design Principles and Practices for Implementation of MIL- STD-1760 in aircraft and stores (Technical Report ASD-TR-87-5028), paragraph 5.1.1.3.1, page 314.

FIGURE A27 - Aircraft Validation Requirement
(Method LBW102)

METHOD: LBW103

PARAMETER: Output Voltage

MIL-STD-1760 PARAGRAPH: 5.1.1.3.2.1 and 5.1.1.3.2.3

PURPOSE: This method verifies that the output voltage of the aircraft's LB interface is within the specified limits under maximum loading conditions (see Note 1).

PARAMETER TYPE: (X) ELECTRICAL ( ) PROTOCOL ( ) PHYSICAL

VALIDATION TECHNIQUE: (X) TEST ( ) ANALYSIS ( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the LB output voltage measured at the ASI is within the range of -12 to +12 V. Both line-to-line and line-to-ground voltages shall be within this limits.

APPARATUS:

a. 70 Ω load
b. Signal analyzer (0 Hz to 50 KHz)
c. Oscilloscope
d. Test cabling connecting the test equipment to the ASI
e. Other ASI peculiar test equipment, as required

VALIDATION METHOD: Initiate LB transmission to the ASI. Connect the 70 Ω load resistor across the output ASI LB interface and use the signal analyzer to verify that the output voltage is within the ±12 V limits and that the frequency spectrum is within the required 0 Hz to 50 KHz frequency range.

NOTES:

1. This method is applicable for all aircraft generated LB signals.

2. Signal characteristic: ±12.0 V maximum, 0 Hz to 50 KHz, 150 mA maximum.

3. Reference: Design Principles and Practices for Implementation of MIL-STD-1760 in aircraft and stores (Technical Report ASD-TR-87-5028), paragraph 5.1.1.3.2, page 314.

FIGURE A28 - Aircraft Validation Requirement
(Method LBW103)

METHOD: LBW104

PARAMETER: Input Current

MIL-STD-1760 PARAGRAPH: 5.1.1.3.2.1

PURPOSE: This method verifies that the aircraft's LB load current level at the ASI does not exceed the specified value of 150 mA line-to-line and line-to-ground.

PARAMETER TYPE: (X) ELECTRICAL ( ) PROTOCOL ( ) PHYSICAL

VALIDATION TECHNIQUE: (X) TEST ( ) ANALYSIS ( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the LB input load current level is within the range of 0 to 150 mA over the frequency range of 0 Hz to 50 KHz.

APPARATUS:

a. Oscilloscope
b. Current probe
c. Swept frequency source (0 Hz to 50 KHz)
d. Audio sine wave generator (0 Hz to 50 KHz)
e. 80 ohm load
f. Test cabling connecting the test equipment to the ASI
g. Other ASI peculiar test equipment, as required

VALIDATION METHOD: Establish an aircraft LB network configuration to support the desired test setup.

NOTES:

1. Reference: Design Principles and Practices for Implementation of MIL-STD-1760 in aircraft and stores (Technical Report ASD-TR-87-5028).

FIGURE A29 - Aircraft Validation Requirement
(Method LBW104)

METHOD: LBW105

PARAMETER: Shield Ground

MIL-STD-1760 PARAGRAPH: 5.1.1.3.2.4

PURPOSE: This method is applicable for measuring continuity between the low bandwidth stub shield and aircraft structure GND.

PARAMETER TYPE: (X) ELECTRICAL ( ) PROTOCOL ( ) PHYSICAL

VALIDATION TECHNIQUE: (X) TEST ( ) ANALYSIS ( ) INSPECTION

VALIDATION CRITERIA: The ASI is considered to have passed if the DC resistance between the low bandwidth stub shield and the aircraft structure GND is less than 1 Ω (see Note 1).

APPARATUS:

a. A continuity measuring device such as an ohmmeter.
b. Test cabling connecting the test equipment to the ASI.
c. Other ASI peculiar test equipment, as required.

VALIDATION METHOD: Measure the resistance between the ASI's low bandwidth shield connection and structure GND contact using an ohmmeter.

NOTES:

1. MIL-STD-1760 does not specify a resistance value for "continuity". Therefore, use a DC resistance of 1 Ω or less as a definition of "continuity".

2. Structure GND is contact "T" in the ASI primary connector.

FIGURE A30 - Aircraft Validation Requirement
(Method LBW105)

METHOD: REL101

PARAMETER: Use of Release Consent

MIL-STD-1760 PARAGRAPH: 5.1.1.4

PURPOSE: This method verifies that the aircraft correctly uses the REL consent interface as a safety critical command INL.

PARAMETER TYPE: ( ) ELECTRICAL (X) PROTOCOL ( ) PHYSICAL

VALIDATION TECHNIQUE: ( ) TEST (X) ANALYSIS ( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the AEIS uses the REL consent signal only to transfer an enable/inhibit signal for granting consent to the store to act on safety critical commands transmitted over the digital data MUX interface (see Note 1).

APPARATUS: N/A

VALIDATION METHOD: Evaluate the aircraft's TDP to determine that the AEIS uses the REL consent signal only as an enable command to the mission store to accept safety critical commands over the data bus. The TDP includes drawings, software listings, technical manuals and ICDs.

NOTES:

1. Examples of improper use of the REL consent signal include:

    a. Direct firing of electroexplosive devices solely as a result of the activation of REL consent.
    b. Activation of irreversible functions in the mission store on detection of REL consent in conjunction with application of a specific power line.

2. REL consent is a 28 V DC signal provided by the AEIS under hardware/software control. The mechanization of the store determines how this signal is used. The aircraft has no control over a store designer who has connected an EED to REL consent. No requirement should be placed on the aircraft for improper use of the REL consent signal relative to the store's intended use of the signal.

FIGURE A31 - Aircraft Validation Requirement
(Method REL101)

METHOD: REL102

PARAMETER: Transfer Requirements

MIL-STD-1760 PARAGRAPH: 5.1.1.4.1

PURPOSE: This method verifies that the aircraft provides the REL consent interface at each ASI.

PARAMETER TYPE: (X) ELECTRICAL ( ) PROTOCOL ( ) PHYSICAL

VALIDATION TECHNIQUE: (X) TEST (X) ANALYSIS ( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if REL consent is available at each ASI and, when in the inhibited state, REL consent at an ASI is electrically isolated from the REL consent signal at all other ASIs. The required isolation is 100 kΩ minimum at DC.

APPARATUS:

a. Suitable instrument to measure DC resistance at 30 V DC.
b. Test cabling connecting the test equipment to the ASI.
c. Other ASI peculiar test equipment, as required.

VALIDATION METHOD:

a. Evaluate the aircraft's TDP to determine that REL consent is available at each ASI.
b. Command inhibited REL consent at all ASIs. Use the resistance measuring instrument to measure the DC resistance (at 30 V DC) from the REL consent connection at an ASI to the REL consent connection at all other ASIs.
c. Repeat until the isolation between all REL consent combinations of ASIs has been determined.

NOTES: N/A

FIGURE A32 - Aircraft Validation Requirement
(Method REL102)

METHOD: REL103

PARAMETER: Output Voltage

MIL-STD-1760 PARAGRAPH: 5.1.1.4.2.1

PURPOSE: This method verifies that the logic levels to the REL consent interface are within the specified limits of MIL-STD-1760.

PARAMETER TYPE: (X) ELECTRICAL ( ) PROTOCOL ( ) PHYSICAL

VALIDATION TECHNIQUE: (X) TEST ( ) ANALYSIS ( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if:

a. The enable state voltage is greater than or equal to 19.0 V DC and less than or equal to a maximum for 28 V DC as defined by MIL-STD-704.
b. The inhibit state voltage is less than or equal to 1.5 V DC.
c. Aircraft voltage spikes comply with MIL-E-6051.

APPARATUS:

a. Aircraft power
b. Voltage measuring/recording instrument such as a storage oscilloscope.
c. Test cabling connecting the test equipment to the ASI.
d. Other ASI peculiar test equipment, as required.

VALIDATION METHOD:

a. Connect the voltage measuring instrument between the REL consent connection and the 28 V DCP #2 return of an ASI.
b. Initiate REL consent enable to the ASI. Use the voltage measuring instrument to measure the output voltage level, transients, and spikes at the REL consent connection referenced to 28 V DCP #2 return.
c. Initiate REL consent inhibit to the ASI. Use the voltage measuring instrument to measure the output voltage level, transients, and spikes at the REL consent connection referenced to 28 V DCP #2 return.
d. Repeat for all ASIs.

NOTES:

1. Software may be written for the AEIS to provide a discrete control for the REL consent interface.

2. The test must simulate a weapon/store that uses the REL consent interface.

3. This test can be run concurrent with the tests identified in METHOD REL104.

FIGURE A33 - Aircraft Validation Requirement
(Method REL103)

METHOD: REL104

PARAMETER: Output Current

MIL-STD-1760 PARAGRAPH: 5.1.1.4.2.2

PURPOSE: This method verifies that the aircraft is capable of sourcing the REL consent load current.

PARAMETER TYPE: (X) ELECTRICAL ( ) PROTOCOL ( ) PHYSICAL

VALIDATION TECHNIQUE: (X) TEST (X) ANALYSIS ( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if:

a. The aircraft is capable of providing the required enable voltage levels to store loads ranging between 5 and 100 mA during the REL consent enable state.
b. The short circuit current does not exceed the maximum overcurrent limit defined by MIL-STD-1760, Figure 7.

APPARATUS:

a. Aircraft power
b. Resistor decade box variable between 190 Ω and 5.6 kΩ.
c. Voltage and current measuring/recording instrument such as a storage oscilloscope.
d. Test cabling connecting the test equipment to the ASI.
e. Other ASI peculiar test equipment, as required.

VALIDATION METHOD (see Note 1):

a. For verification by test:

    (1) Connect the resistor decade box (adjusted for a nominal current level) between the REL consent connection and the 28 V DCP #2 return.
    (2) Connect the voltage/current measuring instrument as required.
    (3) Initiate REL consent enable to the ASI. Adjust the decade box for the required current levels (5.0 mA and then 100 mA); measure the enable voltage.
    (4) Repeat for all ASIs.

b. For verification by analysis:

    (1) Use the aircraft's TDP to verify that the aircraft maximum overload current levels defined by MIL-STD-1760, Figure 7, are not exceeded.

NOTES:

1. This test may be done concurrent with the tests identified in METHOD REL103.

2. This test may be done in conjunction with method REL105.

FIGURE A34 - Aircraft Validation Requirement
(Method REL104)

METHOD: REL105

PARAMETER: Stabilization Time

MIL-STD-1760 PARAGRAPH: 5.1.1.4.2.3

PURPOSE: This method verifies that the aircraft REL consent stabilization time is within the limits of MIL-STD-1760.

PARAMETER TYPE: (X) ELECTRICAL ( ) PROTOCOL ( ) PHYSICAL

VALIDATION TECHNIQUE: (X) TEST ( ) ANALYSIS ( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the voltage at the ASI reaches steady state levels within 3 ms during transition between enable and inhibit states.

APPARATUS:

a. Resistor decade box adjustable between 320 Ω and 3.8 kΩ.
b. Voltage measuring/recording instrument such as a storage oscilloscope.
c. Test cabling connecting the test equipment to the ASI.
d. Other ASI peculiar test equipment, as required.

VALIDATION METHOD:

a. Connect the resistor decade box, adjusted to 320 Ω, between the REL consent connection and the 28 V DCP #2 return.
b. Connect the voltage measuring instrument as required.
c. Initiate REL consent enable to the ASI. Measure the stabilization time between inhibit and enable.
d. Initiate REL consent inhibit to the ASI. Measure the stabilization time between enable and inhibit.
e. Repeat steps a through d with a resistor decade box adjusted to 3.8 kΩ.
f. Repeat for all ASIs.

NOTES:

1. This method may be done in conjunction with method REL 104.

FIGURE A35 - Aircraft Validation Requirement
(Method REL105)