

CRITICAL ITEMS LIST (CIL)

SYSTEM: Electrical  
 SUBSYSTEM: LH2 Depletion System  
 REV & DATE: J, 12-19-97  
 DCN & DATE:  
 ANALYSTS: R. Lunden/A. Oser

FUNCTIONAL CRIT: 1  
 PHASE(S): b  
 HAZARD REF: E.01, P.06

FAILURE MODE: Fails Open  
 FAILURE EFFECT: b) Loss of mission and vehicle/crew due to main engine(s) being destroyed.  
 TIME TO EFFECT: Seconds  
 FAILURE CAUSE(S):  
 A: Faulty Pin  
 B: Broken Wire  
 C: Connector Separates  
 D: Broken Weld Clip (LWT-54 thru 88) (FMEA Item Code 3.6.2.1 only)  
 E: Defective Scrim Cloth Bond (LWT-89 & Up) (FMEA Item Code 3.6.2.1 only)

REDUNDANCY SCREENS: Not Applicable

FUNCTIONAL DESCRIPTION: Harnesses route the excitation current and return functions between the ET/Orbiter interface and each level sensor.

<u>FMEA ITEM CODE(S)</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY</u>	<u>EFFECTIVITY</u>
3.6.2.1	80934003704-029 (302W02 P1/Splices)	Harnesses	1	LWT-54 & Up
3.6.3.1	80931003704-420 (305W01 P1/J23/J33) -520	Harnesses	1	LWT-54 thru 88
			1	LWT-89 & Up

REMARKS: These harnesses are grouped since the failure mode and Rationale for Retention are the same.

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CONTINUATION SHEET

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RATIONALE FOR RETENTION

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DESIGN:

Engineering Process Specifications, STP6508 establishes the requirements to be met for fabrication and installation of airborne electrical interconnecting wire and cable assemblies. Harness assemblies produced as specified in STP6508 will meet the applicable requirements of MIL-W-81600 and 40M39582A.

The wire is procured from vendors that have qualification approval from Lockheed Martin. The vendors meet material specifications STM E659 and E658.

For additional weight savings on SLWT, spare wires were eliminated from the harnesses.

The level sensor leads are furnished with the sensor. One end of the lead is terminated in the sensor, the other end is terminated in a splice at MAF.

- A: The connector is designed with alignment tolerances to ensure proper insertion. Pins have rounded tips and the insert is designed with a tapered entry to guide the male contact for a firm mating and to preclude bent pins.
- B: Electrical wires, cables, and bundles are routed to avoid abrasion, cutting or piercing of the insulation by contact with rough surfaces or sharp edges along the mounting surfaces. Sufficient slack is provided for installed harnesses to avoid strain on the conductors within the harnesses, termination points, and associated connectors.
- C: The connector is designed with a positive locking mechanism that ensures a positive lock for the coupling ring when the plug is fully mated with the receptacle and an audible sound is indicated when the coupling ring is seated in the positive lock position.
- D: A series of 24 equally spaced (about 7.6" apart) 2219 aluminum alloy "T" clips (1.50" x 0.75" x 0.40") are fillet welded to the LH2 tank aft dome from the electrical feedthru connector location to the LH2 depletion sensor location. These clips are located beside a weld land between the +Z and +Y axis. Two fillet welds on the long sides attach each clip to the aft dome.
- E: For LWT-89 & UP the welded clips holding the ECO sensor wires to the LH2 aft dome are replaced by 24 adhesive scrim cloth bonds. Instrumentation wiring was bonded to the internal surfaces of the MPTA LH2 tank without any known problems. Adhesive bonding was also utilized on earlier flight LH2 tanks to reinforce the ECO wire attachment clips when the clips were spot welded instead of the present fillet welds.

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TEST:

The harness and harness components are certified. Reference MCS's MMC-ET-TM08-L-E039 (3.6.2.1), MMC-ET-TM08-L-E051 (3.6.3.1).

Vendor:

Piece parts for the electrical system are procured and tested to approved Lockheed Martin Drawing 81L2, Specifications E658 and E659 and Government Specification 40M39569.

MAF:

- A: Perform Contact Retention Test, FMEA Item Code 3.6.3.1 only (STP6501).
- A: Perform crimp tool certification test (STP6504 for pins and sockets and STP6503 for splices).
- A-C: Perform DC Resistance Test of harness from end to end termination points (STP6508 and TM04k).
- A-C: Perform DC Resistance Test (TM04k).

Launch Site:

- A-C: Perform Harness and Level Sensor Test (OMRSD File II and IV).

INSPECTION:

Vendor:

Surveillance by Lockheed Martin Procurement Quality is performed to ensure compliance with specifications.

MAF Quality Inspection:

- A: Verify Certification of crimping tool (STP6504 for pin and sockets and STP6503 for splices).
- A: Witness Contact Retention Test, FMEA Item Code 3.6.3.1 only (STP6501).
- A: Inspect connector, pins or sockets for freedom of damage, are not broken, bent, misaligned or corroded, and the connector is free of foreign material (STP6501).

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INSPECTION: (cont)

- A-C: Witness DC Resistance Test of harness from end to end termination points (STP6508 and TM04k).
- A-C: Witness DC Resistance Test (TM04k).
- B: Inspect for proper crimp configuration and freedom of physical damage (STP6504 for pins and sockets and STP6503 for splices).
- B: Inspect the installed harness per the installation requirements (STP6508; add STP6514 for FMEA Item 3.6.2.1 at LWT-89 & Up).
- C: Witness connector mating (STP6501).
- D: Verify weld dimensions (STP5501).
- D: Inspect for freedom of cracks in the base metal and weld (STP5501).
- E: Verify hardness and bond integrity tests for LWT-89 & Up (STP6514).
- E: Verify proper surface preparation for LWT-89 & Up (STP6514).
- E: Verify minimum cure time for LWT-89 & Up (STP6514).

Launch Site:

- A-C: Witness sensor DC Resistance Test in dry condition (OMRSD File IV).
- A-C: Witness sensor changes from dry to solid wet condition at completion of slow fill (OMRSD File II).

FAILURE HISTORY:

Current data on test failures, unexplained anomalies and other failures experienced during ground processing activity can be found in the PRACA data base.