

CRITICAL ITEMS LIST (CIL)

SYSTEM:	Propulsion/Mechanical	FUNCTIONAL CRIT:	1A
SUBSYSTEM:	Helium Inject	PHASE(S):	a
REV & DATE:	J, 12-19-97	HAZARD REF:	P.02, P.06
DCN & DATE:	002, 2-28-99		
ANALYSTS:	E. Flamm/H. Claybrook		

FAILURE MODE: Leakage

FAILURE EFFECT: a) Loss of mission and vehicle/crew due to geysering followed by water hammer effect results in leakage of LO2 feedline and loss due to fire/explosion.

TIME TO EFFECT: Minutes

FAILURE CAUSE(S):
 A: Structural Failure of Tube
 B: Structural Failure of Nut Coupling
 C: Tube Mating Defects

REUNDANCY SCREENS:
 Screen A: PASS
 Screen B: N/A - Item nonfunctional in flight.
 Screen C: PASS

FUNCTIONAL DESCRIPTION: Transports ground GHe to supply a controlled flow of helium into the aft elbow of the LO2 feedline which provides propellant conditioning and prevents geysering.

<u>FMEA ITEM CODE(S)</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY</u>	<u>EFFECTIVITY</u>
2.4.1.1	80923021037-010	Tube Assy (Intertank)	1	LWT-54 & Up
2.4.2.1	80923021037-019	Tube Assy (Intertank)	1	LWT-54 & Up
2.4.3.1	80923021037-020 -029	Tube Assy (Intertank)	1 1	LWT-54 thru 85, 89-93 LWT-86 thru 88, 94 & Up
2.4.4.1	80923011902-009 -010	Tube Assy (Intertank)	1 1	LWT-54 thru 85, 89-93 LWT-86 thru 88, 94 & Up
2.4.6.1	80921011932-009	Tube Assy (LH2 Cable Tray)	1	LWT-54 & Up
2.4.7.1	80921011932-010 -010 -020	Tube Assy (LH2 Cable Tray)	3 2 1	LWT-54 thru 84, 89-93 LWT-85 thru 88, 94 & Up LWT-85 thru 88, 94 & Up
2.4.8.1	80921011932-019	Tube Assy (LH2 Cable Tray)	1	LWT-54 & Up
2.4.10.1	80921011931-009	Tube Assy (Elec Cable Tray)	1	LWT-54 & Up
2.4.11.1	80921011931-019 -040	Tube Assy (Elec Cable Tray)	1 1	LWT-54 thru 84, 89-93 LWT-85 thru 88, 94 & Up
2.4.17.1	80921011933-009	Tube Assy, Upstream Manifold to Filter	2	LWT-54 & Up

REMARKS: These items are grouped as the failure mode, causes and effects are the same.

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CONTINUATION SHEET

SYSTEM:	Propulsion/Mechanical	REV & DATE:	J, 12-19-97
SUBSYSTEM:	Helium Inject	DCN & DATE:	
FMEA ITEM CODE(S):	2.4.1.1, 2.4.2.1, 2.4.3.1, 2.4.4.1, 2.4.6.1, 2.4.7.1, 2.4.8.1, 2.4.10.1, 2.4.11.1, 2.4.17.1		

RATIONALE FOR RETENTION

DESIGN:

A, B: The tube assemblies are installed in the Intertank and cable trays and provide helium flow from the umbilical disconnect to the LO2 aft feedline elbow. The system is nonoperational during flight. The flared tubes are fabricated from 321 CRES and couplings are fabricated from 304 CRES. Material selected in accordance with MMC-ET-SE16, and controlled per MMMA Approved Vendor Product Assurance Plan assures conformance of composition, material compatibility and properties. The assemblies are designed to meet the required ultimate (4.0) and yield (1.25) safety factors for pressure (ET Stress Report 826-2188). Installation loads are sufficient to provide screening for major flaws.

C: Tube mating surfaces are specified to preclude leakage. Coupling joint torques are specified on the Engineering installation drawing.

Redundancy Description:

The helium inject system on the ET and Orbiter SSME bleed provide LO2 conditioning that will prevent geysering. The systems are considered to be redundant and loss of helium injection is assessed criticality 1R.

Effect of First Redundancy Loss:

(Helium Injection) - Flow of LO2 from the tank to the SSME's by the active engine bleed system provides a cooling effect within the feedline and geysering will not occur. Tube assembly leakage resulting in loss of helium injection will be detected by the facility flowmeter and the action taken is LO2 stop flow.

Effect of Second Redundancy Loss:

(SSME Bleed) - For worst case (no helium injection, stop flow, and engine bleeds closed) geysering will occur in approximately 100 minutes. Action is taken to safe (off load) the ET.

TEST:

The Tube Assy is certified. Reference HCS MMC-ET-TM08-L-P014.

Acceptance:

MAF - (Subassembly):

A, B: Perform proof test of tube assemblies (STP2012).

A, B: Perform leak test of tube assemblies (STP2012)(UCN J31174).

MAF - (Vehicle Assembly):

A-C: Perform leakage test (MMC-ET-TM04k).

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CONTINUATION SHEET

SYSTEM: Propulsion/Mechanical REV & DATE: J, 12-19-97
SUBSYSTEM: Helium Inject DCM & DATE:
FMEA ITEM CODE(S): 2.4.1.1, 2.4.2.1, 2.4.3.1, 2.4.4.1, 2.4.6.1,
2.4.7.1, 2.4.8.1, 2.4.10.1, 2.4.11.1, 2.4.17.1

RATIONALE FOR RETENTION

INSPECTION:

Vendor Inspection - Lockheed Martin Surveillance:

A-C: Verify materials selection and verification controls (MHC-ET-SE16, drawings 80923021037, 80923011902, 80921011932, 80921011931, 80921011933 and Standard drawing 57L8).

RAF Quality Inspection:

A, B: Witness proof pressure test (STP2012).

A, B: Witness leakage test of tube assembly (STP2012)(UCN J31174).

A-C: Verify installation and witness torque (drawings 80921011941, 80923021009, 80923011901, 80921011930, 80921011941 and 80921011934).

C: Inspect (visually) sealing surfaces for freedom of nicks, radial scratches or other imperfections during installation (drawing 80923021009, 80923011901, 80921011930 and 80921011941).

A-C: Witness leakage test (MHC-ET-TM04k).

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.