

CRITICAL ITEMS LIST (CIL)

SYSTEM: Propulsion/Mechanical FUNCTIONAL CRIT: 1R
 SUBSYSTEM: Helium Inject PHASE(S): a
 REV & DATE: J, 12-19-97 HAZARD REF: P.02, P.06
 DCN & DATE:
 ANALYSTS: J. Attar/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
 B: Disengagement of Union
 REDUNDANCY SCREENS: Screen A: PASS
 Screen B: N/A - Item nonfunctional in flight.
 Screen C: PASS
 FUNCTIONAL DESCRIPTION: Connects the helium inject tube assembly (I/T and LH2 tank cable tray).

<u>FMEA ITEM CODE(S)</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY</u>	<u>EFFECTIVITY</u>
2.4.31.1	MS24393-J6	Union	1	LWT-54 & up

REMARKS:

CRITICAL ITEMS LIST (CIL)
CONTINUATION SHEET

SYSTEM: Propulsion/Mechanical
SUBSYSTEM: Helium Inject
FMEA ITEM CODE(S): 2.4.31.1

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RATIONALE FOR RETENTION

DESIGN:

The union connects tube assemblies located in the electrical LH2 cable trays that transport GHe from the Intertank umbilical carrier plate to the LO2 feedline.

A: The union is fabricated from 304 CRES and was selected for usage based on operational experience and its capability to meet ET requirement for Class 3 threads and leakage performance. The union is designed to meet the required ultimate (4.0) and yield (1.25) safety factors for pressure (ET Stress Report 826-2188). 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. Procurement of unions is governed by material, fabrication, processing, and inspection specification per standard MS24392. Installation loads are sufficient to provide screening for major flaws.

B: The union was selected from the Approved Standard Parts Lists (ASPL 826-3500) and installed and torqued as 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. Bulkhead union 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 Union is certified. Reference HCS MMC-ET-TM08-L-P015.

Acceptance:

MAF - (Vehicle Assembly):

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

INSPECTION:

MAF Quality Inspection:

A, B: Witness leakage test (MMC-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.