

CRITICAL ITEMS LIST (CIL)

SYSTEM:	Propulsion/Mechanical	FUNCTIONAL CRIT:	1
SUBSYSTEM:	LO2 Propellant Feed	PHASE(S):	a, b, c
REV & DATE:	J, 12-19-97	HAZARD REF:	P.06, P.07,
DCN & DATE:			P.09, S.07,
ANALYSTS:	J. Attar/H. Claybrook		S.11

FAILURE MODE: Leakage

FAILURE EFFECT:

- a) Loss of mission and vehicle/crew due to fire/explosion.
- b) Loss of mission and vehicle/crew due to fire/explosion.
Loss of mission due to premature engine shutdown.
- c) Loss of mission and vehicle/crew due to ET/Orbiter collision.
(Results only from Failure Cause A)
Loss of life due to ET impact outside designated footprint.

TIME TO EFFECT: Seconds

FAILURE CAUSE(S):

- A: Structural Failure of Hardline Component
- B: Flange Mating Surface Defects
- C: Fracture of One Disconnect Bolt

REDUNDANCY SCREENS: Not Applicable

FUNCTIONAL DESCRIPTION: The aft elbow feedline section contains the helium inject boss and transports LO2 from the aft flex section to the ET/Orbiter disconnect.

<u>FMEA ITEM CODE(S)</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY</u>	<u>EFFECTIVITY</u>
2.1.13.1	80921011911-009	LO2 Feedline, Aft Elbow	1	LWT-54 & Up

REMARKS:

CRITICAL ITEMS LIST (CIL)
CONTINUATION SHEET

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RATIONALE FOR RETENTION

DESIGN:

- A: The 17 inch diameter aft elbow is a machined casting with integral fixed flange and provisions to facilitate installation of the elbow to the aft crossbeam. The elbow assembly is machined from an A357-T6 aluminum casting and has been designed to meet the required ultimate safety factors (1.4 for loads and 1.5 for pressure only) and the required yield safety factors (1.1 for loads and 1.25 for pressure only) (ET Stress Report 826-2188). Material selected in accordance with MMC-ET-SE16 and controlled per MMA Approved Vendor Product Assurance Plan assures conformance of composition, material compatibility and properties. Radiographic and mechanical properties inspection requirements are in accordance with MIL-C-6021 and STM-Q-255.
- B: Mating surface flatness, waviness and finish are specified on engineering drawings to assure performance within the capability of the seal.
- C: Attachment fasteners were selected from the Approved Standard Parts List (ASPL 826-3500), installed per STP2014 and torqued using values specified on engineering drawings.

TEST:

The LO2 aft elbow is qualified. Reference COQ MMC-ET-TM06-108.

Qualification: Testing of one elbow assembly included proof loads, one pressure test and leakage for acceptance, operating life test (five cryogenic cycles with LN2 at 61,450 lbs at 310 psig) and ultimate load test (87,800 lbs axial load at 387 psig). There was no evidence of structural failure and leakage. Acceptance criteria was no leakage with elbow pressurized at 79 psig (MMC-ET-RA09-103).

MPTA Firings/Tankings: An aft elbow assembly identical to LWT except for flange thickness and instrumentation bosses has accumulated 62.5 minutes of firing time 27 cryogenic cycles, and 42 pressurization cycles. There was no evidence of structural damage.

Acceptance:

Vendor - (Elbow Assembly):

- A, B: Perform proof load/pressure test and leakage rate test (TP4254, WYLE).

MAF - (Elbow Assembly):

- B: Perform seal leakage test after installation (MMC-ET-TM04k).

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INSPECTION:

Vendor Inspection - Lockheed Martin Surveillance:

- A: Verify x-ray results (drawing 80921011910).
- A, C: Verify material selection and verification controls (MMC-ET-SE16, drawing 80921011910 and Standard drawing 26L2).
- A, B: Penetrant inspect after machining (STP2501, Type 1, Method A).
- B: Inspect mating surface flatness, finish and dimensions (drawing 80921011911).

Lockheed Martin Procurement Quality Representative:

- A, B: Witness proof load/pressure and leakage test (TP4254, WYLE).

MAF Quality Inspection:

- B: Inspect (visually) sealing surfaces for freedom of nicks, radial scratches or other imperfections during installation (drawing 80921011913).
- B: Witness seal leakage test (MMC-ET-TM04k).
- C: Verify installation and witness torque (drawing 80921011009).

Launch Site:

- A-C: Visually monitor LO2 feedline system for no leakage (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.