

CRITICAL ITEMS LIST (CIL)

SYSTEM:	Propulsion/Mechanical	FUNCTIONAL CRIT:	1
SUBSYSTEM:	GH2 Pressurization	PHASE(S):	a, b, c
REV & DATE:	J, 12-19-97	HAZARD REF:	P.06, P.07, S.04, S.06, S.11
DCN & DATE:			
ANALYSTS:	J. Attar/H. Claybrook		

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 or LH2 tank structural failure.  
 c) Loss of mission due to premature engine shutdown caused by loss of NPSP.  
 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 Attachment Bolt

REDUNDANCY SCREENS: Not Applicable

FUNCTIONAL DESCRIPTION: Transports GHe/GH2 during prelaunch and GH2 during ascent to maintain LH2 tank ullage pressure requirements.

<u>FMEA ITEM CODE(S)</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY</u>	<u>EFFECTIVITY</u>
2.7.4.1	PD4800205-080	Mid Fixed Line	1	LWT-54 & Up

REMARKS:

CRITICAL ITEMS LIST (CIL)  
CONTINUATION SHEET

SYSTEM: Propulsion/Mechanical  
SUBSYSTEM: GH2 Pressurization  
FMEA ITEM CODE(S): 2.7.4.1

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RATIONALE FOR RETENTION

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DESIGN:

- A: The Mid Fixed Line Assembly consists of fixed flanges, straight tube sections and a fixed support bracket. The line is installed to a fixed support mounting bracket located on the LH2 tank at STA 1593. The line assembly is fabricated from ARMCO 21-6-9 CRES and is an all welded configuration. Emphasis has been placed on joint geometry to enhance weld integrity. The line assembly has been designed to meet the required ultimate safety factors (1.4 for loads and 1.5 for pressure) and the required yield safety factors (1.1 for loads and 1.25 for pressure) (ET Stress Report 826-2188 and ET10-SR-0002, Arrowhead). The line assembly also meets the other operational and nonoperational requirements defined per PD4800205. Materials selected in accordance with MMC-ET-SE16 and controlled per MMMA Approved Vendor Product Assurance Plan assures repetitive conformance of composition, material compatibility and properties. Fusion welding specifications, processes, and quality controls are in accordance with MPS-MPQ-103 (Arrowhead).
- B: Flange mating seal 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 Mid Fixed Line Assembly is qualified. Reference COQ MMC-ET-TM06-085.

Qualification: Testing of one line assembly included proof load/operating pressure and leakage (no bubbles helium at 300 psig) for acceptance, an electrical bonding (for impedance) test and an ultimate load test at 920 PSIG internal pressure and 18,600 lbs axial load. There was no evidence of collapse, rupture or deformation (MMC-ET-RA09-94). PD4800205-080 is qualified by analysis/similarity to PD4800205-020.

Acceptance.

Vendor - (Line Assembly):

- A: Perform proof loads/operating pressure test and leakage test (ATP 14205-380, Arrowhead).

MAF - (Line Assembly):

- B: Perform dual seal leakage rate test for flange joints after installation (MMC-ET-TM04k).
- C: Attachment bolts are procured and tested to standard drawing 26L2.

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INSPECTION:

Vendor Inspection - Lockheed Martin Surveillance:

- A, C: Verify materials selection and verification controls (MMC-ET-SE16, Arrowhead drawings 14205-69, 14205-63, 14205-19, 14205-97, 14205-57, and standard drawing 26L2).
- A: Inspect welding (MPS-MPQ-103, Arrowhead).
- A: Penetrant inspect welding (MIL-I-6866, Type I, Method A, Group VI).
- A: Verify X-Ray results (OCI-16-057, Arrowhead).
- B: Inspect mating surface flatness, finish and dimensions (drawing 14205-69 and 14205-63, Arrowhead).

Lockheed Martin Procurement Quality Representative:

- A, B: Witness proof loads/operating pressure and leakage tests (ATP 14205-380, Arrowhead).

MAF Quality Inspection:

- B: Inspect sealing surfaces for freedom of nicks, radial scratches or other imperfections (acceptance drawing 82620000001).
- B, C: Verify installation and witness torque (drawing 80921021009).
- B, C: Witness seal flange leakage tests (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.