

CRITICAL ITEMS LIST (CIL)

SYSTEM:	Propulsion/Mechanical	FUNCTIONAL CRIT:	1
SUBSYSTEM:	LH2 Penetrations	PHASE(S):	a, b
REV & DATE:	J, 12-19-97	HAZARD REF:	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.

TIME TO EFFECT: Seconds

FAILURE CAUSE(S): A: Scratched/Nicked/Misaligned  
B: Deterioration  
C: Flange Mating Surface Defects  
D: Fracture of One Feedthru Plate Bolt

REDUNDANCY SCREENS: Not Applicable

FUNCTIONAL DESCRIPTION: Prevents leakage of LH2 between feedthru plate and longeron.

<u>FMEA ITEM CODE(S)</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY</u>	<u>EFFECTIVITY</u>
2.10.9.1	55L2-6	Raco Seal	1	LWT-54 & Up

REMARKS:

CRITICAL ITEMS LIST (CIL)  
CONTINUATION SHEET

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SUBSYSTEM: LH2 Penetrations  
FMEA ITEM CODE(S): 2.10.9.1

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RATIONALE FOR RETENTION

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DESIGN:

The Raco seal is installed between the electrical feedthru plate and the LH2 tank longeron. The seal is fabricated by Furon and is similar to seals that were qualified and used on Atlas, Centaur, and Saturn IC, II and IVB vehicles. The design consists of a U shaped circular spring with a teflon jacket. The spring force assisted by media pressure is adequate to provide a seal between the teflon jacket and adjacent mating surfaces.

- A: Improper handling and installation leads only to leakage which is detected by test. If the flange joint is disassembled, seal replacement is specified and controlled by STP2012.
- B: Procurement of seals is governed by material, fabrication, processing, test and inspection specifications per MMC Standard drawing 55L2.
- C: Mating surface flatness, waviness, and finish are specified on engineering drawings to assure performance within the capability of the seal.
- D: 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 Raco Seal is certified. Reference HCS MMC-ET-TM08-L-P007.

Qualification: Thirty Raco seals, six samples of five different sizes ranging from 4 inches to 17 inches diameter, were leakage tested after being subjected to pressure temperature cycling, vibration, proof pressure and burst pressure. Testing included two samples that were subjected to 62 psig at LH2 temperature without degradation of performance. The tests show that the seals are capable of preventing major leakage under ET operating conditions. Leakage measured during exposure was significantly less than allowable (MMC-ET-RA09-4).

MPTA Firings/Tankings: Seals have been used between the electrical feedthru cover and longeron throughout the test program that included 62.5 minutes of firing time, 23 cryogenic cycles and 47 pressurization cycles. There was no evidence of leakage due to operation or environment.

Acceptance:

Vendor:

- A, C: Perform dimensional fit and leakage tests (ATP004, Furon).
- D: Attachment bolts are procured and tested to Standard drawing 26L2.

MAF:

- A-D: Perform seal leakage tests after installation (MMC-ET-TM04k).

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INSPECTION:

Vendor Inspection - Lockheed Martin Surveillance:

- A-C: Verify material selection and verification controls (MMC-ET-SE16 and standard drawings 55L2 and 26L2).
- C: Inspect critical sealing surface dimensions, surface flatness and finish (drawings 80934003726 and 80914800987).

Lockheed Martin Procurement Quality Representative:

- A, C: Witness dimensional fit and leakage tests (ATP004, Furon).

MAF Quality Inspection:

- A: Inspect (visually) seal surfaces for freedom of nicks, radial scratches or other imperfections during installation and torque (drawing 80934003719).
- A-C: Verify installation and witness torque (drawing 80934003719).
- C: Inspect sealing surfaces for freedom of nicks, radial scratches or other imperfections during installation (acceptance drawing 82620000001).
- A-C: Verify leak test ports clear prior to assembly (STP2012).
- A-D: Witness seal leakage test (MMC-ET-TM04k).

Launch Site:

- A-C: Monitor (visually) during ET loading 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.