

CRITICAL ITEMS LIST (CIL)

SYSTEM: Propulsion/Mechanical FUNCTIONAL CRIT: 1
 SUBSYSTEM: LH2 Propellant Feed PHASE(S): a, b
 REV & DATE: J, 12-19-97 HAZARD REF: P.07, S.06,
 DCN & DATE: S.11
 ANALYSTS: J. Kuttruff/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 Defects
 D: Fracture of One Flange Bolt

REDUNDANCY SCREENS: Not Applicable

FUNCTIONAL DESCRIPTION: The Raco seal is installed between the outlet fitting on the LH2 aft dome and the flange on the external feedline to prevent leakage of LH2.

<u>FMEA ITEM CODE(S)</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY</u>	<u>EFFECTIVITY</u>
2.5.7.1	55L2-4	Raco Seal	1	LWT-54 & Up

REMARKS:

CRITICAL ITEMS LIST (CIL)
CONTINUATION SHEET

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RATIONALE FOR RETENTION

DESIGN:

The Raco 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 and is detected by test. If the flange joint is disassembled, seal replacement is specified by Standard drawing 55L2 and controlled by STP2012.
- B: Procurement of seals is governed by material, fabrication, processing, test and inspection specifications per Standard drawing 55L2.
- C: Seal mating surface flatness, waviness, and finish are specified that assures performance within the capability of the seal. Joint fastener torques are specified and controlled.
- 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 to 17 inches in diameter, were leakage tested after being subjected to pressure temperatures cycling, vibration, proof pressure and burst pressure. Testing included 2 samples that were subjected to 62 psig at LH2 temperature without degradation of performance.

The tests showed 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 Firing/Tanking: Five seals have been installed on MPTA and have accumulated a combined 62.5 minutes of firing time, 26 cryogenic cycles, and 42 pressurization cycles. Leakage test prior to all static firings and after SF-12 was within acceptable limits of 1.34 SCIM helium at 6 psig.

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 leakage test after installation (MMC-ET-TM04k).

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INSPECTION:

Vendor Inspection - Lockheed Martin Surveillance:

- B, D: Verify materials selection and verification controls (MMC-ET-SE16 and Standard drawings 55L2 and 26L2).
- C: Inspect sealing surface dimensions (drawing 80914940986).

Lockheed Martin Procurement Quality Representative:

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

MAF Quality Inspection:

- A: Inspect seal surfaces for freedom of nicks, radial scratches or other imperfections during installation (MPP 80921011009).
- A-C: Verify leak test ports clear prior to assembly (STP2012).
- A, C, D: Witness seal flange leak tests (MMC-ET-TM04k).
- C: Inspect sealing surfaces for freedom of nicks, radial scratches or other imperfections (Acceptance drawing 82620000001).
- C, D: Verify installation and witness torque (drawing 80921011009).

Launch Site:

- A-D: Visually monitor 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.