

CRITICAL ITEMS LIST (CIL)

SYSTEM:	Propulsion/Mechanical	FUNCTIONAL CRIT:	1
SUBSYSTEM:	LH2 Penetrations	PHASE(S):	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: 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 Manhole Cover Bolt

REDUNDANCY SCREENS: Not Applicable

FUNCTIONAL DESCRIPTION: Prevents leakage of GHe/GH2 during prelaunch and GH2 during ascent between the manhole cover and the forward dome cap manhole fitting.

<u>FMEA ITEM</u> <u>CODE(S)</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY</u>	<u>EFFECTIVITY</u>
2.10.2.1	SSL11-7T	Naflex Seal	1	LWT-54 & Up

REMARKS:

CRITICAL ITEMS LIST (CIL)
CONTINUATION SHEET

SYSTEM: Propulsion/Mechanical
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RATIONALE FOR RETENTION

DESIGN:

A-C: The Naflex seal is installed between the LH2 tank forward dome manhole fitting and cover. The Naflex seal design has been used on Saturn IC, II, and IVB vehicles and meets ET pressurization system operating requirements. The configuration utilizes a cantilevered deflection-loaded primary seal and a simple gasket type secondary seal. Deflection of the primary seal provides the initial contact load to accomplish sealing at the primary seal-flange interface. The secondary seal provides a barrier and means for measuring leakage across the primary seal.

Seal 55L11-7T is made from ring forged Inconel. The seal is coated with teflon to provide optimum sealing and prevent leakage attributed by flange surface finish imperfections. Tighter dimensional tolerances were imposed on 55L11 sealing surfaces to reduce rejection rate during flange joint acceptance leak test. Internal fluid pressure assists in maintaining seal joint contact under operating conditions.

A: Improper handling and installation leads to leakage which is detected by test. If the flange joint is disassembled, seal reuse/replacement is specified and controlled by STP2012.

B: Procurement of seals is governed by material, fabrication, processing and inspection specifications per MMC Standard 55L11.

C: Flange seal leakage monitoring is accomplished by a detection port incorporated on each flanged joint. Mating surface flatness, waviness and finish are specified on engineering drawings to assure performance within the capability of the seal.

D: Flange bolts were selected from the Approved Standard Parts List (ASPL 826-3500), installed per STP2014 and torqued using values specified on engineering drawings. Procurement of fasteners is by material, fabrication, processing, test and inspection specification per MMC Standard 26L3.

TEST:

The Naflex Seal is certified. Reference HCS MMC-ET-TM08-L-P011.

Qualification: MMA conducted a study that compared the Naflex seal performance at ET environments with past usage environments experienced by the seal. The study concluded that the seal design is qualified by similarity for all ET environments.

The 55L11 was qualified by analysis and similarity to the 55L6.

MPTA Firings/Tankings: Multiple seals have been used at the forward manhole location throughout the test program and have accumulated 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:

D: Attachment bolts are procured and tested to standard drawing 26L3.

MAF:

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

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INSPECTION:

Vendor Inspection - Lockheed Martin Surveillance:

- B: Verify materials selection and verification controls (MMC-ET-SE16 and standard drawings 55L11 and 26L3).
- C: Inspect surface flatness, finish and dimensions (drawing 80914081488).

MAF Quality Inspection:

- A: Inspect (visually) seal surfaces for freedom of nicks, radial scratches or other imperfections during installation (drawing 80914081490).
- A, C, D: Verify installation and witness torque (drawing 80914081490).
- C: Inspect sealing surfaces for freedom of nicks, radial scratches or other imperfections (drawing 82620000001).
- C: Inspect surface flatness, finish and dimensions, (drawing 80914110990).
- A-D: Verify leak test ports clear prior to assembly (STP2012).
- A-D: Witness seal 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.