CRITICAL ITEMS LIST (CIL)

SYSTEM:	Propulsion/Mechanical	FUNCTIONAL CRIT:	1
SUBSYSTEM:	LO2 Penetrations	PHASE(S):	a, b
REV & DATE:	J, 12-19-97	HAZARD REF:	S.07, S.11
DCN & DATE:			
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 Surface Defects
D: Fracture of One Manhole Cover Bolt

REDUNDANCY SCREENS: Not Applicable

FUNCTIONAL DESCRIPTION: Prevents leakage of LO2/GO2 between the manhole cover and the manhole fitting at the LO2 aft dome.

FMEA ITEM CODE(S)	PART NO.	PART NAME	QTY	EFFECTIVITY
2.9.2.1	55L11-7T	Naflex Seal	1	LWT-54 & up

REMARKS: .

SYSTEM:	Propulsion/Mechanical	REV & DATE:	J, 12-19-97
SUBSYSTEM:	LO2 Penetrations	DCN & DATE:	
FMEA ITEM CODE(S):	2.9.2.1		

RATIONALE FOR RETENTION

DESIGN:

A-C: The Naflex seal is installed between the LO2 tank aft dome manhole fitting and cover. The seal 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 sealing surface 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. Coating material compatibility testing is specified for oxygen service (NHB 8060.1).

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 specifications per MMC Standard 26L2.

TEST:

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

Qualification: MMMA 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 manhole location throughout the test program and have accumulated 62.5 minutes of firing time 27 cryogenic cycles and 42 pressurization cycles. There was no evidence of leakage due to operation or environment.

Acceptance:

Vendor:

D: Attachment bolts are procured and tested to the standard drawing (26L2).

MAF:

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

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RATIONALE FOR RETENTION

INSPECTION:

Vendor Inspection - Lockheed Martin Surveillance:

B, D: Verify materials selection and verification controls (MMC-ET-SE16 and standard drawings 55L11 and 26L3).

MAF Quality Inspection:

A: Inspect (visually) seal surfaces for freedom of nicks, radial scratches or other imperfections during installation (drawing 80911001204).

A, C, D: Verify installation and witness torque (drawing 80911001204).

C: Inspect surface flatness finish and dimensions (drawings 80911001205 and 80912610000).

C: Inspect sealing surfaces for freedom of nicks, radial scratches or other imperfections during installation (acceptance drawing 82620000001).

A-D: Verify leak test ports clear prior to assembly (STP2012).

A-D: Witness seal leakage test (MMC-ET-TM04k).

B: Verify oxygen compatibility test report (NHB8060.1)

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.