

CRITICAL ITEMS LIST (CIL)

SYSTEM:	Propulsion/Mechanical	FUNCTIONAL CRIT:	1
SUBSYSTEM:	LO2 Propellant Feed	PHASE(S):	a, b
REV & DATE:	J, 12-19-97	HAZARD REF:	P.06, P.10
DCN & DATE:			S.11
ANALYSTS:	J. Attar/H. Claybrook		

FAILURE MODE: Loss of Filtering Capability

FAILURE EFFECT: a) Loss of mission and vehicle/crew due to fire/explosion as a result of debris ingestion into engines.
 b) Loss of mission and vehicle/crew due to fire/explosion as a result of debris ingestion into engines.
 Loss of mission due to premature engine shutdown.

TIME TO EFFECT: Seconds

FAILURE CAUSE(S): A: Structural Failure of Screen
 B: Structural Failure of Ring Assembly
 C: Fracture of Attachment Hardware

REDUNDANCY SCREENS: Not Applicable

FUNCTIONAL DESCRIPTION: The LO2 screen is a four segment 800 micron mesh filter bolted to the outlet of the LO2 tank which prevents debris ingestion by the Orbiter main engines.

<u>FMEA ITEM CODE(S)</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY</u>	<u>EFFECTIVITY</u>
2.1.5.1	PD4800176-030	Propellant Screen Assy	4	LVT-54 & Up

REMARKS:

CRITICAL ITEMS LIST (CIL)
CONTINUATION SHEET

SYSTEM: Propulsion/Mechanical
SUBSYSTEM: LO2 Propellant Feed
FMEA ITEM CODE(S): 2.1.5.1

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RATIONALE FOR RETENTION

DESIGN:

- A, B: The LO2 propellant screen assembly consists of four screen segments and provides 800 micron filtration from the ET LO2 tank to the Orbiter main engines. Each screen segment is fabricated from wire mesh (22 x 22 x .015 dia) welded between two ring frames. The screen mesh is fabricated in a square weave pattern using 304L CRES wire and the frames are fabricated from 321 CRES. The screen assembly is attached to the bottom of the LO2 aluminum anti-vortex baffle assembly. Vitrolube is applied to the screen frame surfaces to allow slippage and to prevent buckling when subjected to cryogenic temperatures. Compatibility testing is specified for oxygen service (WSP-045-237, Wintec). The assembly has been designed to meet the required ultimate safety factor of 1.4, the required yield safety factor of 1.1, (ET Stress Report 826-2188 and Wintec Stress Analysis, SA9-783) and other operating and nonoperating requirements defined by PD4800176. Materials selected in accordance with MMC-ET-6E16 and controlled per MESA Approved Vendor Product Assurance Plan assures conformance of composition, material compatibility and properties. Fusion welding is specified and is controlled by WSF-008-237 (Wintec).
- 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 Screen Assembly is qualified by similarity to the SMT configuration (minor frame outout dimensional changes were incorporated). Reference COQ MMC-ET-TM06-043.

Development/Qualification: One screen segment was subjected to testing which included proof load and bubble point for acceptance, vibration, bubble point, proof load (1.58 psid), ultimate load (1.63 psid), and burst tests (20 psid). The outlet screen deformed approximately 3/4 inch with a uniform doming in an outward direction at 1.38 psid during acceptance test with no adverse effect on the initial bubble point. The screen deformed to a height of 6.75 inches with a differential pressure of 20 psi. The outlet screen did not burst or rupture. (Reference TR349 and T-77-118, Wintec).

Qualification: Screen testing was specified to include two full duration MPYA firings. This was accomplished after 8F7-02 at which time the screens had accumulated a total of 22.4 minutes of firing time. Bubble testing was performed and was within requirements for filtration. There was no evidence of damage or permanent deformation (MMC-3542-80-007).

MPYA Firings/Tankings: The above screen assemblies were reinstalled and have accumulated 62.5 minutes of firing time (including the 22.4 minutes noted above), 27 cryogenic cycles and 24 pressurization cycles. There was no evidence of structural failure resulting from these exposures.

Acceptance:

Vendor - (Screen Assembly):

- B: Perform proof load and bubble point tests (ATP 9-783-11, Wintec).

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RATIONALE FOR RETENTION

INSPECTION:

Vendor Inspection - Lockheed Martin Surveillance:

- A: Witness assembly (drawing 9-783-11, Wintec).
- A-C: Verify materials selection and verification controls (MMC-ET-SE16, Standard drawing 26L17 and drawings 20-1852 and 19-1973, Wintec).
- B: Inspect welding (WTS 68.06 and drawing 9-783-11, Wintec).

Lockheed Martin Procurement Quality Representative:

- A, B: Witness proof pressure, bubble point test and visual inspection for structural integrity (ATP 9-783-11, Wintec).

MAF Quality Inspection:

- C: Verify installation and witness torque (drawing 80922011900).

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.