

CRITICAL ITEMS LIST (CIL)

SYSTEM: Propulsion/Mechanical
 SUBSYSTEM: LO2 Propellant Feed
 REV & DATE: J, 12-19-97
 DCN & DATE:
 ANALYSTS: J. Attar/H. Claybrook

FUNCTIONAL CRIT: 1
 PHASE(S): a, b
 HAZARD REF: P.06, P.10

FAILURE MODE: Blockage

FAILURE EFFECT: a) Loss of mission and vehicle/crew due to LO2 pump cavitation resulting in engine explosion.
 b) Loss of mission and vehicle/crew due to LO2 pump cavitation resulting in engine explosion.
 Loss of mission due to premature engine shutdown.

TIME TO EFFECT: Seconds

FAILURE CAUSE(S): Foreign Obstruction

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>
2-1.5.2	PD4800176-030	Propellant Screen Assy	4	LWT-34 & Up

REMARKS:

CRITICAL ITEMS LIST (CIL)
CONTINUATION SHEET

SYSTEM: Propulsion/Mechanical
SUBSYSTEM: LO2 Propellant Feed
FMEA ITEM CODE(S): 2.1.5.2

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RATIONALE FOR RETENTION

DESIGN:

The LO2 propellant screen diameter of 56 inches with a frontal area of 2190 square inches and filter screen open area of 48% provides 800 micron filtration and ample contamination capacity. Major blockage of the screen is minimized by contamination control inside the tank of 1000 microns in accordance with STP5011. Origination of blockage is controlled by component contamination control in accordance with STP5008 during the tank cleaning process. The screen is 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 SA9-783, Wintec) and other operating and nonoperating requirements specified by PD4800176.

TEST:

The screen assembly is qualified by similarity to the SWI configuration (minor frame cutout dimensional changes were incorporated). Reference CCG MMC-ET-TM06-043.

Development-Contamination: Tests were performed to define flow/delta P characteristics as a function of screen mesh type and to determine the effect of contamination on pressure loss. Tests showed that the 22 x 22 x .018 diameter (mesh weave configuration) screen utilizing a flat geometry met the flow and contamination requirements of PD4800176 (MMC-3541-75-453).

Development/Qualification: One screen segment was subjected to testing which included proof load and bubble point for acceptance, vibration, bubble point, proof load (1.38 psid), ultimate load (1.63 psid), and burst tests (20 psid). The outlet screen deformed approximately 3/4" with a uniform doming in an outward direction at 1.58 psid during acceptance test with no adverse effect on the initial bubble point. The screen deformed to a height of 6-3/4 inches with a differential pressure of 20 psi. The outlet screen did not burst or rupture (Ref TR349 and 1-77-118, Wintec).

Qualification: Screen testing was specified to include two full duration MPTA firings. This was accomplished after SF7-02 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).

MPTA 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.

INSPECTION:

Vendor Inspection - Lockheed Martin Surveillance:

Inspect cleaning (VSR-4045, Wintec) and packaging (ATP 9-783-11, Wintec).

MAF Quality Inspection:

Inspect for no damage or contamination during installation (drawing 80922011900).

Inspect (visually) Aft Dome for freedom of contamination and damage during post installation shakedown inspection (MPP 80902000SCL for LWT-54 thru 68 and 80922011900 for LWT-69 & up).

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.