SYSTEM:	Propulsion/Mechanical	FUNCTIONAL CRIT:	1R
SUBSYSTEM:	Helium Inject	PHASE(S):	a
REV & DATE:	J, 12-19-97	HAZARD REF:	P.02, P.06
DCN & DATE:			
ANALYSTS:	E. Flauss/H. Claybrook		

FAILURE MODE: Leakage

FAILURE EFFECT: a) Loss of mission and vehicle/crew due to geysering followed by water hammer effect results in leakage of LO2 feedline and loss due to fire/explosion.

TIME TO EFFECT: Minutes

FAILURE CAUSE(S): Structural Failure of Filter Case

REDUNDANCY SCREENS: Screen A: PASS
Screen B: N/A - Item nonfunctional in flight.
Screen C: PASS

FUNCTIONAL DESCRIPTION: Provides filtration for helium inject system to prevent blockage of the flow control orifice.

FMEA ITEM CODE(S)	PART NO.	PART NAME	QTY	EFFECTIVITY
2.4.18.1	48L1-1	Filter	2	LWT-54 & Up

REMARKS:

SYSTEM:	Propulsion/Mechanical	REV & DATE:	J, 12-19-97
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FMEA ITEM CODE(S):	2.4.18.1		

RATIONALE FOR RETENTION

DESIGN:

The filter is utilized in the helium inject system upstream of the check valves to preclude foreign particle entry into the valves. The filter consists of a filter element, an element support assembly and housing. The assembly is totally fabricated from 304L CRES and is designed to meet the required proof (1.5) and burst (2.0) safety factors (Standard 48L1). Material selected in accordance with MMC-ET-SE16 and controlled per MMMA Approved Vendor Product Assurance Plan assures conformance of composition, material compatibility and properties. Procurement of filter assemblies is governed by material, fabrication, processing and inspection specification per MMMA standard 48L1.

Redundancy Description:

The helium inject system on the ET and Orbiter SSME bleed provide LO2 conditioning that will prevent geysering. The systems are considered to be redundant and loss of helium injection is assessed criticality 1R.

Effect of First Redundancy Loss:

(Helium Injection) - Flow of LO2 from the tank to the SSME's by the active engine bleed system provides a cooling effect within the feedline and geysering will not occur. Filter leakage resulting in loss of helium injection will be detected by the facility flowmeter and the action taken is LO2 stop flow.

Effect of Second Redundancy Loss:

(SSME Bleed) - For worst case (no helium injection, stop flow, and engine bleeds closed) geysering will occur in approximately 100 minutes. Action is taken to safe (off load) the ET.

TEST:

The filter is qualified as a subassembly of the helium inject filter/check valve assembly. Reference COQ MMC-ET-TM06-099.

Qualification: Qualification testing was performed partially at the filter assembly level and filter check valve assembly level. The latter assembly includes a filter connected in series with two downstream check valves and appropriate sealing elements. The filter was subjected to testing that included bubble point, proof pressure, leakage, flow and vibration. There was no evidence of helium bubbles at 3000 psig (MMC-ET-RA09-80).

MPTA Firings/Tankings: Two helium inject filter/check valve assemblies have been installed on MPTA. One assembly has accumulated 62.5 minutes of firing time and 27 cryogenic cycles. The second assembly has accumulated 22.5 minutes of firing time and 9 cryogenic cycles. There was no evidence of leakage due to operation or environment.

Acceptance:

Vendor - (Filter/Check Valve Assembly):

Perform proof pressure and leakage tests (TM545 Circle Seal).

MAF - (Vehicle Assembly):

Perform leakage test (MMC-ET-TM04k).

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INSPECTION:

Vendor Inspection - Lockheed Martin Surveillance:

Verify materials selection and verification controls (MMC-ET-SE16, and standard drawing 48L1).

Lockheed Martin Procurement Quality Representative:

Witness proof pressure and leakage test (TM545, Circle Seal).

Verify installation and witness torque (drawing 80921011935).

MAF Quality Inspection:

Verify installation and witness torque (drawings 80921011941).

Witness 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.