

CRITICAL ITEMS LIST (CIL)

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: Blockage
 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): Foreign Obstruction
 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.

<u>FMEA ITEM CODE(S)</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY</u>	<u>EFFECTIVITY</u>
2.4.18.2	48L1-1	Filter	2	LWT-54 & Up

REMARKS:

CRITICAL ITEMS LIST (CIL)
CONTINUATION SHEET

SYSTEM: Propulsion/Mechanical
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FMEA ITEM CODE(S): 2.4.18.2

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RATIONALE FOR RETENTION

DESIGN:

The filter is utilized in the helium inject system upstream of the check valves to preclude foreign particle entry to the valves. The filter consists of a filter element, an element support assembly and housing. The filter element provides 25 micron filtration and produces a maximum delta pressure drop of 10 PSI at rated flow. The launch facility provides 25 micron filtration and gas sampling for particles no greater than 100 microns. Usage of filters in two parallel paths provides for greater protection against system contamination. Component cleanliness is in accordance with STP5008.

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 assembly blockage in one of two flow paths will have no effect on helium system operation. Filter assembly blockage in both flow paths 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 structural damage or degradation in filtration (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 has been no evidence of blockage or loss of filtration capability.

Acceptance:

Vendor - Filter Assembly:

Perform bubble point test for LWT-54 thru 73 (ATP 14228-645, Wintec).

MAF - (Vehicle Assembly):

Perform flow test (MMC-ET-TM04k).

Launch Site:

Perform flow test (OMRSD File IV).

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INSPECTION:

Vendor Inspection - Lockheed Martin Surveillance:

Inspect (visually) filter case and elements for imperfections during assembly (drawing P10-211 Circle Seal and 14228-645 Wintec).

Lockheed Martin Procurement Quality Representative:

Witness bubble point test for LWT-54 thru 73 (ATP 14228-645, Wintec).

Verify cleanliness for LWT-74 & Up (ATP 14228-645, Wintec).

MAF Quality Inspection:

Witness flow test (MMC-ET-TM04k).

Launch Site:

Witness flow test (OMRSD File IV).

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.