

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL HARDWARE

47

NUMBER: M4-1BG-FLO30-X

SUBSYSTEM NAME: ELECTRICAL POWER GENERATION - CRYO, GENERIC

REVISION : 1 11/12/91

PART NAME
VENDOR NAME

PART NUMBER
VENDOR NUMBER

SRU : FILTER) H2
WINTEC) H2
MC286-0054-0001
24267-605

Fm

PART DATA

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
FILTER, H2

- REFERENCE DESIGNATORS: 40V45FLO30
- : 40V45FLO40
- : 40V45FL500
- : 40V45FL560
- : 40V45FL660
- : 40V45FL663
- : 40V45FL873
- : 40V45FL883
- : 40V45FL893

QUANTITY OF LIKE ITEMS: 1
ONE PER TANK

FUNCTION:
PROTECTS THE FCP'S FROM ANY PARTICULATE CONTAMINATION WHICH MAY BE
PRESENT IN H2 TANKS.

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE
NUMBER: M4-1BG-FLO30-01

SUBSYSTEM: ELECTRICAL POWER GENERATION - CRYO, GENERIC REVISION# 1 11/12/91 R

ITEM NAME: FILTER, H2 CRITICALITY OF THIS FAILURE MODE: 1R2

■ FAILURE MODE:
PLUGGED OR RESTRICTED

MISSION PHASE:
LO LIFT-OFF
CO CY-ORBIT
DO DE-ORBIT
LS LANDING SAFING

■ VEHICLE/PAYLOAD/KIT EFFECTIVITY: 102 COLUMBIA
: 103 DISCOVERY
: 104 ATLANTIS
: 105 ENDEAVOUR

■ CAUSE:
CONTAMINATION.

■ CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

■ REDUNDANCY SCREEN A) PASS
B) PASS
C) PASS

PASS/FAIL RATIONALE:

- A)
- B)
- C)

- FAILURE EFFECTS -

■ (A) SUBSYSTEM:
SUBSYSTEM DEGRADATION - LOSS OF CAPABILITY TO DISTRIBUTE CONSUMABLES FROM ONE H2 SUPPLY TANK.

■ (B) INTERFACING SUBSYSTEM(S):
REDUCED QUANTITY OF H2 CONSUMABLES AVAILABLE FOR FUEL CELL POWERPLANT OPERATION.

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NUMBER: M4-18G-FLO30-01

- (C) MISSION:
MINIMUM DURATION MISSION INVOKED.
- (D) CREW, VEHICLE, AND ELEMENT(S):
NO EFFECT AFTER FIRST FAILURE.
- (E) FUNCTIONAL CRITICALITY EFFECTS:
FUNCTIONAL CRITICALITY EFFECTS - COMPLETE BLOCKAGE MAY RESULT IN LOSS OF CREW/VEHICLE IF COMBINED WITH A FAILED CLOSED TANK RELIEF VALVE (TANK RUPTURE).

- DISPOSITION RATIONALE -

- (A) DESIGN:
DURING DEVELOPMENT TESTS, SUMP CAPACITY INCREASED FROM 0.204 CU IN. TO 0.944 CU IN. TO ADD TO CONTAMINANT CAPACITY. 12 MICRON ABSOLUTE FILTER ELEMENT REPLACED EVERY 25 MISSIONS OR AS DETERMINED BY SYSTEM CHECKOUT.
- (B) TEST:
QUALIFICATION TEST VERIFIED PRESSURE DROP LESS THAN 15 PSI AFTER INTRODUCTION OF 4 GRAMS OF AC FINE DUST AT MAXIMUM SYSTEM FLOW RATES.

ACCEPTANCE TEST VERIFIES LEVEL 200A CLEANLINESS BY PARTICLE COUNT AND NON-VOLATILE RESIDUE (NVR); BUBBLE POINT AND PRESSURE DROP ARE WITHIN TOLERANCE. DURING PANEL MODULAR ASSEMBLY, FILTER PERFORMANCE IS FURTHER VERIFIED.

CMRSQ: PRSD FILTER FLOW VERIFIED IN-FLIGHT.
- (C) INSPECTION:
RECEIVING INSPECTION
MATERIAL CERTIFICATIONS AND TEST REPORTS ARE REVIEWED TO VERIFY THAT MATERIAL COMPOSITION, DIMENSIONS, AND SURFACE CONDITIONS COMPLY WITH DESIGN REQUIREMENTS.

CONTAMINATION CONTROL
ACCOMPLISHMENT OF PREASSEMBLY CLEANING, VAPOR DEGREASING, AND ULTRASONIC CLEANING IS VERIFIED. PIECE PART CLEANLINESS IS CERTIFIED TO LEVEL 200A (MA0110-301) BY A NVR AND PARTICLE COUNT (50 ML FLUSH THROUGH A MILLIPORE FILTER); PIECE PARTS ARE INSPECTED FOR BURRS. COMPONENT ASSEMBLY, PACKAGING, AND SUBSEQUENT SUBASSEMBLY INSTALLATION ARE ACCOMPLISHED IN 100,000 CLASS CLEANROOM ENVIRONMENTS. COMPLETED ASSEMBLY IS VERIFIED TO LEVEL 200A.

ASSEMBLY/INSTALLATION

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NO HALOGENATED OR SULFONATED SOLVENTS OR METHYL ALCOHOL ALLOWED DURING ANY PROCESSING OF MESH PACK OR ELEMENT ASSEMBLY.

TESTING
 ATP VERIFIES LEVEL 200A CLEANLINESS.

HANDLING/PACKAGING
 PACKAGING IS INSPECTED FOR INTEGRITY AND COMPLIANCES WITH MATERIAL HANDLING REQUIREMENTS.

- (D) FAILURE HISTORY:
 THERE HAVE BEEN NO ACCEPTANCE TEST, QUALIFICATION TEST, FIELD OR FLIGHT FAILURES ASSOCIATED WITH THIS FAILURE MODE.
- (E) OPERATIONAL USE:
 REDUNDANT TANK HEATERS ENABLED TO SUPPLY REACTANTS TO THE FUEL CELLS. FOR A COMPLETELY PLUGGED FILTER, CREW WILL DEACTIVATE ASSOCIATED TANK HEATERS IN RESPONSE TO HIGH PRESSURE FAULT ANNUNCIATION.

 - APPROVALS -

RELIABILITY ENGINEERING:	M. D. WEST	:	<u>M. D. West</u> = <i>[Signature]</i>
DESIGN ENGINEERING	: M. M. SCHEIERN	:	<u>M. M. Scheiern</u>
QUALITY MANAGER	: O. J. BUTTNER	:	<u>O. J. Buttner</u>
NASA RELIABILITY	:	:	<u>[Signature]</u>
NASA SUBSYSTEM MANAGER	:	:	<u>[Signature]</u> 4/19/92
NASA QUALITY ASSURANCE	:	:	<u>[Signature]</u> 4/1/92 HTP