

FAILURE MODES EFFECTS ANALYSIS (FMEA) - CIL HARDWARE  
NUMBER: M4-1BQ-LV031 -X

SUBSYSTEM NAME: ELECTRICAL POWER GENERATION - CRYO, GENERIC  
REVISION: 1 04/01/92

PART DATA

	PART NAME	PART NUMBER
	VENDOR NAME	VENDOR NUMBER
SRU	: SOLENOID VALVE, H2 MANIFOLD EATON CONSOLIDATED CONTROLS	MC284-0429-4210 74410-4210

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:  
SOLENOID VALVE, H2 MANIFOLD

REFERENCE DESIGNATORS: 40V45LV031  
40V45LV041

QUANTITY OF LIKE ITEMS: 2  
ONE PER H2 MANIFOLD ASSY

FUNCTION:  
PROVIDES CAPABILITY TO ISOLATE H2 MANIFOLD #1 FROM MANIFOLD #2.

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE  
NUMBER: M4-1BG-LV031-02

SUBSYSTEM: ELECTRICAL POWER GENERATION - CRYO, GENERIC REVISION# 1 R

ITEM NAME: SOLENOID VALVE, H2 MANIFOLD CRITICALITY OF THIS FAILURE MODE: 2/2

■ FAILURE MODE:  
FAILS CLOSED

MISSION PHASE:  
LD LIFT-OFF  
TO ON-ORBIT

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

■ CAUSE:  
MECHANICAL SHOCK, VIBRATION

■ CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

■ REDUNDANCY SCREEN A) ~~PASS~~ N/A  
B) ~~PASS~~ N/A  
C) ~~PASS~~ N/A

PASS/FAIL RATIONALE:

- A)
- B)
- C)

- FAILURE EFFECTS -

■ (A) SUBSYSTEM:  
FAILURE WOULD RESULT IN TANK QUANTITY AND PRESSURE IMBALANCE DUE TO UNEVEN DISTRIBUTION OF CONSUMABLES.

■ (B) INTERFACING SUBSYSTEM(S):  
NO EFFECT AFTER FIRST FAILURE.

■ (C) MISSION:  
SAME AS (B)

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FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE  
NUMBER: M4-2BG-LV031-02

- (D) CREW, VEHICLE, AND ELEMENT(S):  
SAME AS (3)
- (E) FUNCTIONAL CRITICALITY EFFECTS:  
MANIFOLD ISOLATION VALVE FAILING CLOSED ISOLATES A SINGLE TANK TO A SINGLE FUEL CELL. MISSION IS TERMINATED WHEN THE HYDROGEN IN THAT TANK IS CONSUMED.

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- DISPOSITION RATIONALE -  
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- (A) DESIGN:
- (B) TEST:  
ACCEPTANCE TEST VERIFIES FUNCTIONAL OPERATION OF MAGNETIC LATCH AND THAT PRESSURE DROP IS WITHIN LIMITS. VALVE IS VERIFIED CLEANED TO LEVEL 200 BY PARTICLE COUNT. VALVE IS FURTHER VERIFIED DURING PANEL MODULAR ASSEMBLY AND SUBSYSTEM CHECKOUT.  
  
OMRSD: VALVE OPERATION VERIFIED EVERY TURNAROUND DURING MANIFOLD PRESSURE DECAY TEST.
- (C) INSPECTION:  
ALL DETAIL PARTS ARE INSPECTED UNDER 40X MAGNIFICATION FOR SURFACE FINISH BURRS AND DAMAGE. THREAD LUBRICATION, TORQUING AND LOCKWIRE ARE VERIFIED BY INSPECTION. DOCUMENTATION IS REVIEWED TO VERIFY RECORDING OF SHIM AND GAP DIMENSIONS USED TO OBTAIN AND MEASURE ARMATURE STROKE.

CRITICAL PROCESSES

THE GOLD PLATING PROCESS IS WITNESSED AND THE PLATED ARMATURE IS VISUALLY INSPECTED UNDER MAGNIFICATION FOR PLATING DEFECTS. LEAD WIRE TO CONNECTOR SOLDERING IS VERIFIED IN ACCORDANCE WITH NHB 5300.4 (3A). VALVE SEAT WELDS ARE LEAK CHECKED UNDER FULL PROOF PRESSURE AND VISUALLY INSPECTED UNDER 20X MAGNIFICATION. ELECTRON BEAM WELD PROCESS IS VERIFIED BY SECTIONING A SAMPLE VALVE SEAT TO DETERMINE WELD INTEGRITY (20X MAGNIFICATION INSPECTION).

TESTING

ALL SPRINGS ARE LOAD TESTED AT DETAIL LEVEL AND ARE LOT TRACEABLE. LATCH FORCES ARE CALIBRATED AND VERIFIED BY INSPECTION DURING FINAL ACCEPTANCE OF THE MAGNETIC LATCH. VALVE ACCEPTANCE TEST REQUIREMENTS, INCLUDING INTERNAL/EXTERNAL LEAKAGE AND PRESSURE DROP, ARE VERIFIED BY INSPECTION. VALVE PRESSURE DROP/FLOWRATE IS VERIFIED DURING ACCEPTANCE TEST.

HANDLING/PACKAGING

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE  
NUMBER: M4-186-LV031-02

HANDLING, PACKAGING, STORAGE AND SHIPPING PROVISIONS ARE VERIFIED BY INSPECTION.

- (D) FAILURE HISTORY: *NO FAILURES FOR THIS FAILURE MODE.*
- (E) OPERATIONAL USE:

*HW*

- APPROVALS -

RELIABILITY ENGINEERING:	M. D. WEST	:	<i>M. D. West</i>
DESIGN ENGINEERING	: M. M. SCHEGERN	:	<i>M. M. Schegern</i>
QUALITY MANAGER	: D. J. BUTTNER	:	<i>D. J. Buttner</i>
NASA RELIABILITY	:	:	<i>Jim P. Storaasli</i>
NASA SUBSYSTEM MANAGER	:	:	<i>Howard P. ... 4/19/92</i>
NASA QUALITY ASSURANCE	:	:	<i>...</i>

*CREW WOULD ATTEMPT TO REDUCE  
CELL  
FUEL LOADS TO EXTEND MISSILE  
CAPABILITY.*

*HW*