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PRINT DATE: 04/23/92

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL HARDWARE

NUMBER: M4-1BG-LV012-X

SUBSYSTEM NAME: ELECTRICAL POWER GENERATION - CRYO, GENERIC

REVISION : 1 04/23/92

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
■ SRU :	SOLENOID VALVE, ECLSS O2	MC284-0429-4101
■	EATON CONSOLIDATED CONTROLS	74405-4101

PART DATA

- EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
SOLENOID VALVE, ECLSS O2
- REFERENCE DESIGNATORS: 40V45LV012
: 40V45LV022
- QUANTITY OF LIKE ITEMS: 2
ONE PER O2 MANIFOLD ASSY
- FUNCTION:
PROVIDES CAPABILITY TO ISOLATE O2 TO ECLSS PRIMARY OR SECONDARY PATH.

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE

NUMBER: M4-1BG-LV012-02

SUBSYSTEM: ELECTRICAL POWER GENERATION - CRYO, GENERIC

REVISION# 1 11/12/91 R

ITEM NAME: SOLENOID VALVE, ECLSS O2

CRITICALITY OF THIS
FAILURE MODE: 1/1

- FAILURE MODE:
FAILS CLOSED

MISSION PHASE:

PL	PRELAUNCH
LO	LIFT-OFF
OO	ON-ORBIT
DO	DE-ORBIT
LS	LANDING SAFING

- 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) N/A
- B) N/A
- C) N/A

PASS/FAIL RATIONALE:

- A)
- B)
- C)

- FAILURE EFFECTS -

- (A) SUBSYSTEM:
SUBSYSTEM DEGRADATION - SYSTEM CAN NO LONGER PROVIDE O2 TO THE
ECLSS THROUGH BOTH SUPPLY LINES.

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- (B) INTERFACING SUBSYSTEM(S):
DEGRADATION OF INTERFACE FUNCTION - 40 LB/HR EMERGENCY O2 FLOW DELIVERY CAPABILITY TO ECLSS WILL BE LIMITED TO 20 LB/HR.
- (C) MISSION:
MINIMUM DURATION MISSION INVOKED.
- (D) CREW, VEHICLE, AND ELEMENT(S):
LOSS OF ONE OF TWO ECLSS O2 SUPPLY LINES WILL RESULT IN INSUFFICIENT FLOW TO THE LAUNCH/ENTRY SUIT (LES). LOSS OF THIS EMERGENCY SYSTEM MAY RESULT IN LOSS OF CREW/VEHICLE.
- (E) FUNCTIONAL CRITICALITY EFFECTS:
SAME AS (D)

- DISPOSITION RATIONALE -

- (A) DESIGN:
VALVE IS MAGNETICALLY LATCHED OPEN. 50 MICRON ABS FILTER AT THE INLET. VALVE CONTAINS NO SOFT GOODS IN CONTACT WITH THE FLUID. MOVING PARTS ARE GOLD PLATED TO REDUCE FRICTION. HOUSING IS CONSTRUCTED OF CRES 304 TO PREVENT CORROSION. ALL VALVE COMPONENTS ARE COMPATIBLE WITH WORKING FLUIDS. VALVE IS MOUNTED WITH BODY AXIS PERPENDICULAR TO VEHICLE X-AXIS TO MINIMIZE VIBRATION EFFECTS. THIS FAILURE MODE IS ON CAUTION AND WARNING. VALVE IS DESIGNED TO OPEN WITH A MINIMUM OF 18 VOLTS (NOMINAL ORBITER BUS VOLTAGE IS 28 VOLTS).
- (B) TEST:
QUALIFICATION TEST VERIFIED NORMAL OPERATION DURING SHOCK (20 G) AND VIBRATION (0.1 G SQ/HZ MAXIMUM RANDOM, +/- 0.25 G PEAK SINUSOIDAL) AND THERMAL OPERATING LIFE TEST (TOTAL OF 3000 CYCLES FROM -284 TO +220 DEG F AT OPERATING PRESSURE).

ACCEPTANCE TEST VERIFIES FUNCTIONAL OPERATION OF MAGNETIC LATCHES AND THAT PRESSURE DROP IS WITHIN LIMITS. VALVE IS VERIFIED CLEANED TO LEVEL 200A BY PARTICLE COUNT AND NON-VOLATILE RESIDUE. VALVE IS FURTHER VERIFIED DURING PANEL MODULAR ASSEMBLY AND SUBSYSTEM CHECKOUT.

OMRSD: VALVE OPERATION VERIFIED EVERY TURNAROUND.
- (C) INSPECTION:
RECEIVING INSPECTION
MATERIAL AND PROCESS CERTIFICATION DOCUMENTS ARE REVIEWED FOR COMPLIANCE WITH PROGRAM REQUIREMENTS.

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE

NUMBER: M4-18G-LV012-02

ASSEMBLY/INSTALLATION

ALL DETAIL PARTS ARE INSPECTED UNDER 40X MAGNIFICATION FOR SURFACE FINISH BURRS AND DAMAGE. THREAD LUBRICATION, TORQUING AND LOCKWIRE IS VERIFIED BY INSPECTION. DOCUMENTATION IS REVIEWED TO VERIFY RECORDING OF SHIM AND GAP DIMENSIONS USED TO OBTAIN AND MEASURE ARMATURE STROKE.

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

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

■ (D) FAILURE HISTORY:

THERE HAVE BEEN NO ACCEPTANCE TEST, QUALIFICATION TEST, FIELD OR FLIGHT FAILURES ASSOCIATED WITH THIS FAILURE MODE.

■ (E) OPERATIONAL USE:

GROUND WOULD NOTIFY THE CREW TO ATTEMPT TO OPEN THE VALVE.

- APPROVALS -

RELIABILITY ENGINEERING: M. D. WEST
DESIGN ENGINEERING : M. M. SCHEIERN
QUALITY MANAGER : O. J. BUTTNER
NASA RELIABILITY :
NASA SUBSYSTEM MANAGER :
NASA QUALITY ASSURANCE :

: M. D. West
: M. M. Scheiern
: O. J. Buttner
: John R. Stovall
: Francis T. Lopez 04/1/92
: William J. Buttner