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PRINT DATE: 03/10/95

FAILURE MODES EFFECTS ANALYSIS (FMEA) - CRITICAL HARDWARE  
NUMBER: 05-6J-2055A -X

SUBSYSTEM NAME: EPD&C MAIN PROPULSION SYSTEM

REVISION: 03/03/95

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	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	: PANEL R4	VO70-730278
SRU	: SWITCH, TOGGLE	ME452-0102-7153

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**PART DATA**

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**EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:**

| TOGGLE SWITCH (1 POLE, 2 POSITION) - LH2 OUTBOARD FILL AND DRAIN VALVE CONTROL

REFERENCE DESIGNATORS: 32V73A4S8

QUANTITY OF LIKE ITEMS: 1

| ONE PER LH2 OUTBOARD FILL/DRAIN VALVE

**FUNCTION:**

PROVIDES MANUAL CONTROL OF POWER TO THE OPEN AND CLOSE SOLENOIDS OF THE LH2 OUTBOARD FILL/DRAIN VALVE.

**FAILURE MODES EFFECTS ANALYSIS (FMEA) – NONCRITICAL FAILURE MODE**  
NUMBER: 05-6J-2055A - 01

SUBSYSTEM NAME: EPD&C MAIN PROPULSION SYSTEM  
LRU: PANEL R4

REVISION# 03/03/95

ITEM NAME: SWITCH, TOGGLE  
CRITICALITY OF THIS FAILURE MODE: 1R3

**FAILURE MODE:**  
FAILS OPEN, FAIL TO TRANSFER TO OPEN, SHORT-TO-CASE (GROUND)

**MISSION PHASE:**  
LO LIFT-OFF  
OO ON-ORBIT

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

**CAUSE:**  
PIECE PART STRUCTURAL FAILURE, CONTAMINATION, VIBRATION, MECHANICAL SHOCK, PROCESSING ANOMALY, THERMAL STRESS

**CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO**

**REDUNDANCY SCREEN** A) PASS  
B) PASS  
C) PASS

**PASS/FAIL RATIONALE:**  
A)  
B)  
C)

**CORRECTING ACTION:**  
IF THE LH2 OUTBOARD FILL AND DRAIN VALVE FAILS TO OPEN DURING DUMP, THE CREW WILL MANUALLY OPEN THE RTLS DUMP VALVES FOR THE DURATION OF OPS 1 TO PROVIDE ADDED DUMP CAPABILITY. REFERENCE FLIGHT RULE 5-65B.

**REMARKS/RECOMMENDATIONS:**  
NONE

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - NONCRITICAL FAILURE MODE  
NUMBER: 05-6J-2055A - 01**

**- FAILURE EFFECTS -**

**(A) SUBSYSTEM:**

LOSS OF MANUAL SWITCH COMMAND TO POWER OPEN SOLENOID.

**(B) INTERFACING SUBSYSTEM(S):**

LOSS OF MANUAL CAPABILITY TO OPEN THE LH2 OUTBOARD FILL/DRAIN VALVE. NOTE - SEQUENCING DURING DUMP AND VACUUM INERT IS BY AUTOMATIC SOFTWARE COMMAND.

**(C) MISSION:**

NO EFFECT - FIRST FAILURE

**(D) CREW, VEHICLE, AND ELEMENT(S):**

NO EFFECT - FIRST FAILURE

**(E) FUNCTIONAL CRITICALITY EFFECTS:**

1R/3, 3 PATH SCENARIO: TIME FRAME - POST LH2 DUMP STOP.

- 1) SWITCH FAILS OPEN - LOSS OF ABILITY TO MANUALLY OPEN THE LH2 OUTBOARD FILL AND DRAIN VALVE (PV11).
- 2) LH2 OUTBOARD FILL AND DRAIN VALVE (PV11) FAILS TO OPEN BY AUTOMATIC SOFTWARE COMMAND TO PERFORM DUMP AND VACUUM INERT.
- 3) LH2 MANIFOLD RELIEF VALVE (RV6) FAILS TO RELIEVE.

SWITCH FAILURE IN THE OPEN SOLENOID VALVE ELECTRICAL CIRCUIT WILL LEAD TO LOSS OF ABILITY TO MANUALLY OPEN THE LH2 OUTBOARD FILL AND DRAIN VALVE DURING DUMP AND VACUUM INERT IF THE VALVE FAILS TO OPEN AUTOMATICALLY BY SOFTWARE COMMAND (I.E. DUE TO AN MDM COMMAND PATH FAILURE). LH2 OUTBOARD FILL AND DRAIN VALVE FAILING TO OPEN DURING LH2 DUMP AND VACUUM INERT RESULTS IN EXCESS LH2 RESIDUALS CAUSING THE LH2 MANIFOLD PRESSURE TO RISE TO RELIEF PRESSURE. FAILURE OF THE LH2 MANIFOLD RELIEF VALVE WILL RESULT IN OVERPRESSURIZATION AND RUPTURE OF THE LH2 MANIFOLD, AFT COMPARTMENT OVERPRESSURIZATION, AND FIRE/EXPLOSIVE HAZARD. POSSIBLE LOSS OF CRITICAL ADJACENT COMPONENTS DUE TO CRYO EXPOSURE. POSSIBLE LOSS OF CREW/VEHICLE.

**- APPROVALS -**

PRODUCT ASSURANCE ENGR : T. K. KIMURA  
DESIGN ENGINEERING : J. L. PECK

*J. Kimura 3/10/95*  
*J. L. Peck 3/3/95*