

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE**NUMBER: 05-6J-2037 -X****SUBSYSTEM NAME:** EPD&C - MAIN PROPULSION SYSTEM**REVISION:** 1 08/02/00

PART DATA

	PART NAME	PART NUMBER
	VENDOR NAME	VENDOR NUMBER
LRU	: PANEL R4	V070-730278
SRU	: SWITCH, TOGGLE	ME452-0102-7257

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:

SWITCH, TOGGLE (2 POLES, 3 POSITIONS, LEVER LOCKED), LO2 INBOARD FILL/ DRAIN VALVE CONTROL.

REFERENCE DESIGNATORS: 32V73A4S7**QUANTITY OF LIKE ITEMS:** 1**FUNCTION:**

PROVIDES MANUAL CONTROL OF THE LO2 INBOARD FILL AND DRAIN VALVE (PV10).

FAILURE MODES EFFECTS ANALYSIS FMEA -- CIL FAILURE MODE

NUMBER: 05-6J-2037-03

REVISION#: 1 08/02/00

SUBSYSTEM NAME: EPD&C - MAIN PROPULSION SYSTEM

LRU: PANEL R4, SWITCH S7

CRITICALITY OF THIS

ITEM NAME: LO2 I/B F/D VALVE TOGGLE SWITCH (PV10)

FAILURE MODE: 1R2

FAILURE MODE:

FAILS CLOSED, CONTACT-TO-CONTACT SHORT, POLE-TO-POLE SHORT, PREMATURE TRANSFER.

MISSION PHASE:

PL PRE-LAUNCH
LO LIFT-OFF

VEHICLE/PAYLOAD/KIT EFFECTIVITY:

102 COLUMBIA
103 DISCOVERY
104 ATLANTIS
105 ENDEAVOUR

CAUSE:

PIECE PART STRUCTURAL FAILURE, CONTAMINATION, MECHANICAL SHOCK, VIBRATION, THERMAL STRESS

CRITICALITY 1/1 DURING INTACT ABORT ONLY? YES

RTLS RETURN TO LAUNCH SITE

REDUNDANCY SCREEN

A) PASS
B) PASS
C) PASS

PASS/FAIL RATIONALE:

A)

-

B)

-

C)

-

- FAILURE EFFECTS -

(A) SUBSYSTEM:

ONE ROLLER/SPRING OF MANUAL SWITCH BREAKS AND SHORTS ACROSS CONTACTS.
CASE 1 AND 3: ACROSS OPEN CONTACTS PROVIDING AN INADVERTENT OPEN COMMAND AND CLOSE INHIBIT COMMAND.

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CASE 2: ACROSS CLOSE CONTACTS PROVIDING AN INADVERTENT CLOSE COMMAND AND OPEN INHIBIT COMMAND.

(B) INTERFACING SUBSYSTEM(S):

NO EFFECT - FIRST FAILURE. BISTABLE FEATURE WILL MAINTAIN FILL/DRAIN VALVE POSITION.

(C) MISSION:

NO EFFECT - FIRST FAILURE. POSSIBLE LOSS OF CREW AND VEHICLE AFTER SECOND FAILURE:

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

SAME AS C.

(E) FUNCTIONAL CRITICALITY EFFECTS:

CASE 1:

1R/2 2 SUCCESS PATHS. TIME FRAME – LOADING/ASCENT

- 1) CONTACT-TO-CONTACT SHORT ACROSS SWITCH OPEN CONTACTS PROVIDING INADVERTENT OPEN COMMAND AND CLOSE INHIBIT COMMAND.
- 2) PREMATURE OPEN COMMAND B OR HDC III OUTPUT.

RESULTS IN PREMATURE OPENING OF FILL/DRAIN VALVE. POTENTIAL WATER HAMMER EFFECT OF APPROXIMATELY 700 PSI (AT 1G). FAILURE RESULTS IN POSSIBLE RUPTURE OF THE LO2 FILL/DRAIN LINE, AFT OVERPRESS AND FIRE/EXPLOSIVE HAZARD. POSSIBLE LOSS OF CRITICAL ADJACENT FUNCTIONS DUE TO CRYOGENIC EXPOSURE. DISPLACED GAS MAY ENTER ONE OR MORE SSME'S. POSSIBLE SHUTDOWN OF ONE OR MORE SSME'S.

REF. CIL 03-1-0310-04.

CASE 2:

1R/2 2 SUCCESS PATHS. TIME FRAME – LOADING

- 1) CONTACT-TO-CONTACT SHORT ACROSS SWITCH CLOSE CONTACTS OR PREMATURE TRANSFER TO CLOSE PROVIDING CLOSE COMMAND AND OPEN INHIBIT COMMAND.
- 2) LOSS OF GROUND OPEN COMMAND (CLOSE INHIBIT).

RESULTS IN PREMATURE CLOSURE OF FILL/DRAIN VALVE. TERMINATION OF PROPELLANT LOADING WHICH MAY CAUSE A PRESSURE SPIKE AND POSSIBLE RUPTURE OF ORBITER FILL/DRAIN LINE AND/OR GSE INTERFACE/FACILITY LINES. POSSIBLE AFT COMPARTMENT OVERPRESSURIZATION AND FIRE/EXPLOSION HAZARD. POSSIBLE LOSS OF ADJACENT CRITICAL FUNCTIONS DUE TO CRYOGENIC EXPOSURE.

CRITICALITY 1/1 FOR RTLS ABORT.

OPEN INHIBIT COMMAND PREVENTS LO2 DUMP. FAILURE TO ADEQUATELY DUMP LO2 MAY CAUSE VIOLATION OF MAXIMUM DOWNWEIGHT FOR HEAVY MANIFESTED PAYLOADS.

REF. CIL 03-1-0310-06.

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CASE 3:

1R/2 2 SUCCESS PATHS. TIME FRAME – ANY DETANK.

- 1) CONTACT-TO-CONTACT SHORT ACROSS SWITCH OPEN CONTACTS PROVIDING INADVERTANT OPEN COMMAND AND CLOSE INHIBIT COMMAND.
- 2) FAILURE OF GROUND TO DETECT LOSS OF CLOSE SOLENOID POWER AND INHIBIT SLAM OPENING OR INBOARD VALVE AT INITIATION OF DETANK.

RESULTS IN POSSIBLE WATER HAMMER IN FILL./DRAIN LINE AND GSE INTERFACE/GSE FACILITY LINES. POSSIBLE RUPTURE, AFT OVERPRESSURIZATION, FIRE/EXPLOSION HAZARD, AND POSSIBLE LOSS OF CRITICAL ADJACENT FUNCTIONS DUE TO CRYOGENIC EXPOSURE.

REF. CIL 03-1-0310-04.

-DISPOSITION RATIONALE-

(A) DESIGN:

REFER TO APPENDIX A, ITEM NUMBER 1 - TOGGLE SWITCH.

(B) TEST:

REFER TO APPENDIX A, ITEM NUMBER 1 - TOGGLE SWITCH

GROUND TURNAROUND TEST

ANY TURNAROUND CHECKOUT IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

(C) INSPECTION:

REFER TO APPENDIX A, ITEM NUMBER 1 - TOGGLE SWITCH.

(D) FAILURE HISTORY:

REFER TO APPENDIX A, ITEM NUMBER 1 - TOGGLE SWITCH

CURRENT DATA ON TEST FAILURE, FLIGHT FAILURE, UNEXPLAINED ANOMALIES, AND OTHER FAILURES EXPERIENCED DURING GROUND PROCESSING ACTIVITY CAN BE FOUND IN THE PRACA DATABASE.

(E) OPERATIONAL USE:

FLIGHT - NO CREW ACTION CAN BE TAKEN.

GROUND -

CASE 1: FOR PAD ABORT IF A MAJOR LEAK IS DETECTED, CLOSE 17-INCH DISCONNECT (PD1).

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CASE 2: TERMINATE LOADING.

CASE 3: DO NOT INITIATE DETANK UNTIL CLOSE POWER IS RESTORED.

- APPROVALS -

S&R ENGINEERING	: W.P. MUSTY	:/S/ W.P. MUSTY
S&R ENGINEERING ITM	: P. A. STENGER-NGUYEN	:/S/ P.A. STENGER-NGUYEN
DESIGN ENGINEERING	: ANDY RIZVI	:/S/ ANDY RIZVI
MPS SUBSYSTEM MGR.	: TIM REITH	:/S/ TIM REITH
EPD&C SUBSYSTEM MGR.	: LAITH COTTA	:/S/ LAITH COTTA
MOD	: WILLIAM LANE	:/S/ WILLIAM LANE
USA SAM	: MIKE SNYDER	:/S/ MIKE SNYDER
USA ORBITER ELEMENT	: SUZANNE LITTLE	:/S/ SUZANNE LITTLE
NASA SR&QA	: BILL PRINCE	:/S/ BILL PRINCE