

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE  
NUMBER: 05-6G-2128 -X**

**SUBSYSTEM NAME: EPD&C - HYDRAULICS (02-6)**

**REVISION: 2      10/07/91**

**PART DATA**

	<b>PART NAME</b>	<b>PART NUMBER</b>
	<b>VENDOR NAME</b>	<b>VENDOR NUMBER</b>
LRU	: PANEL R4	V070-730278
SRU	: SWITCH, TOGGLE	ME452-0102-7105

**EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:**  
SWITCH, TOGGLE, 1 POLE 3 POSITION, MOMENTARY - LANDING GEAR EXTEND ISOLATION VALVE

**REFERENCE DESIGNATORS: 32V73A4S32**

**QUANTITY OF LIKE ITEMS: 1**  
ONE

**FUNCTION:**  
PROVIDES FOR MANUAL SELECTION OF "OPEN/CLOSE" POSITION FOR THE LANDING GEAR EXTEND ISOLATION VALVE (SYSTEM 1).

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SUBSYSTEM: EPD&C - HYDRAULICS (02-6)  
LRU :PANEL R4  
ITEM NAME: SWITCH, TOGGLE

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CRITICALITY OF THIS  
FAILURE MODE:1R2

- FAILURE MODE:  
SWITCH FAILS ~~CLOSED~~ IN VALVE "OPEN" POSITION

MISSION PHASE:  
LD LIFT-OFF  
DO DE-ORBIT

- VEHICLE/PAYLOAD/KIT EFFECTIVITY: 105 ENDEAVOUR 102 COLUMBIA

- CAUSE: *103 Discovery*  
*104 Atlantis*  
PIECE PART STRUCTURAL FAILURE, CONTAMINATION, VIBRATION, MECHANICAL SHOCK, PROCESSING ANOMALY

- CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

- REDUNDANCY SCREEN A) PASS
- B) PASS
- C) PASS

PASS/FAIL RATIONALE:

- A)
- B) VALVE HAS POSITION INDICATION
- C)

- FAILURE EFFECTS -

- (A) SUBSYSTEM:  
LOSS OF FUNCTION CONTROL
- (B) INTERFACING SUBSYSTEM(S):  
PREMATURE OPENING OF LANDING GEAR EXTEND ISOLATION VALVE
- (C) MISSION:  
NO EFFECT

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- (D) CREW, VEHICLE, AND ELEMENT(S): <sup>1</sup>  
FIRST FAILURE - HYDRAULICS SUPPLY TO EXTEND VALVE AND RETRACT VALVE 2.  
NO IMPACT WITHOUT SUBSEQUENT FAILURE.

- (E) FUNCTIONAL CRITICALITY EFFECTS:  
FOR THE SWITCH FAILED IN THE VALVE "OPEN" POSITION, THE SECOND FAILURE IS THE LANDING GEAR EXTEND VALVE 1 FAILING OPEN CAUSING PREMATURE DEPLOYMENT OF LANDING GEAR. POSSIBLE LOSS OF CREW/VEHICLE DUE TO (1) ET IMPACT BY LANDING GEAR DURING ASCENT OR (2) CONTROL PROBLEMS, STRUCTURAL DAMAGE AND AERO HEATING PROBLEMS DURING ENTRY. ALSO, POSSIBLE LOSS OF CREW/VEHICLE WITH THREE FAILURES (THIS FAILURE, PLUS LEAK DOWNSTREAM OF VALVE, PLUS LOSS OF SECOND HYDRAULIC SYSTEM).

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- DISPOSITION RATIONALE -  
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- (A) DESIGN:  
REFER TO APPENDIX A, ITEM NO. 1 - TOGGLE SWITCH
- (B) TEST:  
REFER TO APPENDIX A, ITEM NO. 1 - TOGGLE SWITCH  
  
GROUND TURNAROUND TEST  
V58APO.015, "BRAKE & EXTND HYD ISO VLV SWITCH VERIF" (PERFORMED PRIOR TO EACH FLIGHT OR FOR LRU REPLACEMENT). VERIFY VALVE RESPONDS TO SWITCH COMMANDS.
- (C) INSPECTION:  
REFER TO APPENDIX A, ITEM NO. 1 - TOGGLE SWITCH
- (D) FAILURE HISTORY:  
REFER TO APPENDIX A, ITEM NO. 1 - TOGGLE SWITCH
- (E) OPERATIONAL USE:  
FIRST FAILURE - NONE. SECOND FAILURE RESULTING IN PREMATURE GEAR DEPLOY - NONE. IF IT OCCURS AFTER MACH 1, CREW MAY BE ABLE TO MANAGE VEHICLE ENERGY SUFFICIENTLY TO REACH THE RUNWAY.

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

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- APPROVALS -

RELIABILITY MANAGER	:	M. C. HOVE	:	<i>M. C. Hove</i> 10-24-91
RELIABILITY ENGINEERING	:	T. K. KIMURA	:	<i>T. Kimura</i> 10-8-91
DESIGN MANAGER	:	G. M. ANDERSON	:	<i>G.M. Anderson</i> 11-16-91
DESIGN ENGINEERING	:	G. A. FINNEMAN	:	<i>G.A. Finneman</i> 10/11/91
SUBSYSTEM MANAGER	:	B. J. VAN METER	:	<i>B.J. Van Meter</i>
QUALITY MANAGER	:	R. M. SPURLOCK	:	<i>R.M. Spurlock</i> 10/24/91
QUALITY ENGINEERING	:	W. R. HIGGINS	:	<i>W.R. Higgins</i> 10/24/91
NASA RELIABILITY	:		:	<i>Richard L. ...</i> 2/3/92
NASA SUBSYSTEM MANAGER	:		:	<i>Joseph M. Scinto</i> 2/4/92
NASA EPD&C RELIABILITY	:		:	<i>M. Saleem Durrani</i> 12/3/91
NASA QUALITY ASSURANCE	:		:	<i>KO S. ...</i> 11/13/91
NASA EPD&C SUBSYS MGR	:		:	<i>Richard ...</i> 12-3-91