

FAILURE MODES EFFECTS ANALYSIS (FMEA) — CRITICAL HARDWARE

NUMBER: 05-6ED-2028-X

SUBSYSTEM NAME: EPD&C - ET UMBILICAL DOORS

REVISION : 2 08/06/90

1412

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU :	PANEL R2	V070-730277
SRU :	SWITCH, TOGGLE	ME452-0102-7203

PART DATA

- EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
SWITCH, TOGGLE, HERMETICALLY SEALED, 2P3P - LEFT AND RIGHT ORBITER
EXTERNAL TANK (ORB/ET) UMBILICAL DOOR DRIVE
- REFERENCE DESIGNATORS: 32V73A2S49
: 32V73A2S51

QUANTITY OF LIKE ITEMS: 2
TWO

FUNCTION:
PROVIDES THE CREW WITH THE CAPABILITY TO REMOTELY OPERATE THE LEFT AND
RIGHT ORB/ET UMBILICAL DOORS. SWITCH POSITIONS ARE "OPEN", "OFF", AND
"CLOSE". FOLLOWING ET SEPARATION, THE SWITCH IS OPERATED TO CLOSE THE
DOOR. DOOR CLOSURE IS A PREREQUISITE TO SAFE RE-ENTRY.

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE
NUMBER: 05-6ED-2028-02

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SUBSYSTEM: EP&C - ET UMBILICAL DOORS
LRU :PANEL R2
ITEM NAME: SWITCH, TOGGLE

REVISION# 2 08/06/90 R

CRITICALITY OF THIS
FAILURE MODE:1R2

- FAILURE MODE:
FAILS CLOSED, CONTACT-TO-CONTACT SHORT, POLE-TO-POLE SHORT

MISSION PHASE:
DO DE-ORBIT

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

- CAUSE:
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)
- C)

- FAILURE EFFECTS -

- (A) SUBSYSTEM:
FIRST FAILURE - NO EFFECT
- (B) INTERFACING SUBSYSTEM(S):
FIRST FAILURE - NO EFFECT
- (C) MISSION:
FIRST FAILURE - NO EFFECT

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- (D) CREW, VEHICLE, AND ELEMENT(S):
FIRST FAILURE - NO EFFECT
- (E) FUNCTIONAL CRITICALITY EFFECTS:
AFTER SECOND FAILURE (GPC/MANUAL MODE SWITCH FAILS IN MANUAL MODE POSITION), DOOR DRIVE WOULD FUNCTION AGAINST CENTERLINE LATCHES CAUSING DAMAGE TO LINKAGE MECHANISM AND POSSIBLY RESULTED IN INABILITY TO CLOSE DOOR (DOOR LINKAGE MAY NOT WITHSTAND STALL TORQUE WITHIN 8 1/2 DEGREES FROM OPEN POSITION). POSSIBLE LOSS OF CREW/VEHICLE IF DOOR CANNOT BE CLOSED RESULTING IN STRUCTURAL DAMAGE DUE TO THERMAL EFFECTS DURING RE-ENTRY.

- DISPOSITION RATIONALE -

- (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

VERIFY SWITCH FUNCTION FOR OPEN/CLOSE OF RIGHT/LEFT ET DOORS BY:
VERIFYING INITIAL MCA STATUS, SENDING THE OPEN/CLOSE COMMAND BY SWITCH CYCLE AS APPROPRIATE, VERIFYING SWITCH SCAN, AND MONITORING THREE PHASE AC CURRENTS AND OPERATING TIME. TOTAL OPERATING TIMES ARE 24 SEC (MAX) FOR TWO MOTORS AND 48 SEC (MAX) FOR SINGLE MOTOR. TESTS ARE PERFORMED INFLIGHT FOR DUAL MOTOR OPERATION, EVERY FLIGHT FOR SINGLE MOTOR, AND LRU RETEST PER TABLE V56Z00.000.

(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:

AFTER FIRST FAILURE, THE CREW WILL PERFORM THE DOOR CLOSURE AND SUBSEQUENT LATCHING WITH THE GPC SOFTWARE THROUGH A KEYBOARD ITEM ENTRY.

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- APPROVALS -

RELIABILITY ENGINEERING:	T. AI	:	<u>T. AI</u>	8/2/90
DESIGN ENGINEERING	: J. KRAGER	:	<u>J. Krager</u>	8-11-90
QUALITY ENGINEERING	: W. R. HIGGINS	:	<u>W. R. Higgins</u>	8-29-90
NASA RELIABILITY	:	:	<u>W. R. Higgins</u>	8-29-90
NASA SUBSYSTEM MANAGER	:	:	<u>W. R. Higgins</u>	10/21/90
NASA EPD&C RELIABILITY	:	:	<u>R. M. Balaban</u>	10/25/90
NASA QUALITY ASSURANCE	:	:	<u>J. Krager</u>	10-24-90
NASA EPD&C SUBSYS MGR	:	:	<u>R. M. Balaban</u>	9/28/90
		:	<u>W. R. Higgins</u>	10/26/90