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PRINT DATE: 04/09/91

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL HARDWARE

NUMBER: 05-61A-2028-X

S050270A
ATTACHMENT -
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SUBSYSTEM NAME: EPD&C - REMOTE MANIP. ARM

REVISION : 2 04/02/91

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
■ LRU	: PANEL ABA2	V082-730150
■ SRU	: SWITCH, TOGGLE	ME452-0102-7403

PART DATA

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
SWITCH, TOGGLE 4 POLE 3 POSITION RMS POWER

REFERENCE DESIGNATORS: 36V73A8A254

QUANTITY OF LIKE ITEMS: 1
ONE

FUNCTION:
PROVIDES THE MANUAL PRIMARY/BACKUP CAPABILITY TO REMOTELY CONTROL
POWER FROM THE 28VDC MAIN A AND B BUSES AND 115VAC AC1 AND AC2 BUSES TO
SYSTEM 1 AND 2.

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FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE
NUMBER: 05-6IA-2028-09

SUBSYSTEM: EPC&C - REMOTE MANIP. ARM
LRU :PANEL ABA2
ITEM NAME: SWITCH, TOGGLE

REVISION# 2 07/23/90 R

CRITICALITY OF THIS
FAILURE MODE:1/1

■ FAILURE MODE:
CONTACT-TO-CONTACT SHORT, SHORT-TO-CASE (GROUND), POLE-TO-POLE SHORT

MISSION PHASE:
00 ON-GRBIT

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

PASS/FAIL RATIONALE:

A)
B)
C)

- FAILURE EFFECTS -

■ (A) SUBSYSTEM:
WORST CASE FAILURE MAY ALLOW FREE FLOATING SPRING AND ROLLER TO SPAN SUFFICIENT CONTACTS SUCH THAT WHEN PRIMARY POWER SELECTED MAIN A DC WOULD BE SHORTED TO AC1 PHASE A OR WHEN BACKUP POWER SELECTED MAIN B DC WOULD BE SHORTED TO AC2 PHASE A.

(B) INTERFACING SUBSYSTEM(S):
WORST CASE FAILURE WILL RESULT IN BLOWN DC FUSES AND TRIPPED AC CIRCUIT

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BREAKERS. THIS WILL PREVENT THE RMS FROM BEING OPERATED IN EITHER THE PRIMARY OR BACKUP POWER MODES AND, IF NOT PREVIOUSLY RELEASED, WILL PREVENT RELEASE OF THE RMS SHOULDER BRACE. THE BRAKES WILL COME ON AND SAFING WILL BE INDICATED. NO ARM RELATED DATA WILL BE DISPLAYED ON THE D&C PANEL. END EFFECTOR TALKBACKS WILL BE BARBER POLE. IF FAILURE OCCURS DURING OPERATION, ARM WILL STOP, ALL PRIME MODES WILL BE LOST, AND END EFFECTOR PRIME MODES WILL BE LOST. IF CAPTURING A PAYLOAD, INCOMPLETE RIGIDIZATION CAN OCCUR RESULTING IN UNEXPECTED MOTION.

- (C) MISSION:
WORST CASE FAILURE WILL CAUSE LOSS OF MISSION DUE TO LOSS OF ABILITY TO UNCRADLE OR DRIVE A PREVIOUSLY UNCRADLED RMS.
- (D) CREW, VEHICLE, AND ELEMENT(S):
FAILURE COULD RESULT IN LOSS OF CREW OR VEHICLE DUE TO UNEXPECTED RMS OR PAYLOAD MOTION DUE TO INCOMPLETE RIGIDIZATION.

(E) FUNCTIONAL CRITICALITY EFFECTS:

- 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

CIRCUITS VERIFIED ON-LINE PER PARAGRAPHS:

- V54AND.012 "PORT MM A (PRIMARY) POWER VERIF"
 - V54AND.013 "PORT MM B (BACKUP) POWER VERIF"
- PRIOR TO MECHANICAL ARM INSTALLATION,
- V54ATO.001 "CONFIGURATION AND CHECKOUT"
 - V54ATO.016 "PORT ARM FLAG VERIF"
 - V54ATO.182 "RELEASE VERIF"
 - V54ATO.184 "BACKUP RELEASE VERIF"
 - V54ATO.350 "SINGLE/DD SWITCH VERIF"
 - V54ATO.354 "BACKUP DRIVE SWITCH VERIF"
 - V54ATO.368 "PRIMARY ILLUMINATION CONTROL VERIF"
 - V54ATO.370 "BACKUP ILLUMINATION VERIF"

FOR EVERY RMS FLIGHT, AND LRU RETEST PER TABLE V54Z00.000.

- (C) INSPECTION:
REFER TO APPENDIX A, ITEM NO. 1 - TOGGLE SWITCH ✓

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- (D) FAILURE HISTORY:
REFER TO APPENDIX A, ITEM NO. 1 - TOGGLE SWITCH

(E) OPERATIONAL USE:
FAILURE WILL RESULT IN TRIPPED AC CIRCUIT BREAKERS AND BLOWN DC FUSES. ONCE THE DC FUSES ARE BLOWN, THE AC CIRCUIT BREAKERS MAY BE RESET TO RELEASE THE RMS SHOULDER BRACE IF REQUIRED. A VALIDATED (IFM) PIN KIT PATCH MAY BE INSTALLED TO REGAIN PRIME DC POWER TO THE PORT RMS IF REQUIRED. INSTALLATION OF THE (IFM) PIN KIT WILL NOT RESTORE BACKUP MODE. IF DESIRED, A SEPARATE (IFM) PIN KIT PATCH MAY BE INSTALLED TO RELEASE THE RMS SHOULDER BRACE.

WORST CASE FAILURE WILL REQUIRE EVA OR JETTISON OF RMS TO ALLOW PLB DOOR CLOSURE FOR SAFE ENTRY.

I: provide PAYLOADS SHOULD BE CAPTURED/RELEASED IN POSITIONS WHERE INCOMPLETE RIGIDIZATION OR RELEASE WILL NOT ALLOW THE PAYLOAD TO ROTATE INTO ORBITER STRUCTURE.

- APPROVALS -

RELIABILITY ENGINEERING:	T. AI	:	<u>JA. H. Alton</u>
DESIGN ENGINEERING	: D. SOVEREIGN	:	<u>DS. J. [unclear]</u>
QUALITY SUPERVISOR	: J. COURSEN	:	<u>J. Courson 9-10-90</u>
NASA RELIABILITY	: J. GIGAN	:	<u>J. Gigan 9/28/90</u>
NASA SUBSYSTEM MANAGER	: G. GIANN	:	<u>G. Giann 10/10/90</u>
NASA EPD&C RELIABILITY	:	:	<u>M. S. [unclear] 9/28/90</u>
NASA QUALITY ASSURANCE	:	:	<u>K.O. [unclear] 9/10/90</u>
NASA EPD&C SUBSYS MGR	: F. ALANIS	:	<u>[unclear] 10-16-90</u>
NASA RMS Operations	: D. PALLEREN	:	<u>D. Palleren</u>