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PRINT DATE: 07/23/90

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL HARDWARE

NUMBER: 05-6IA-2126-X

SUBSYSTEM NAME: EPD&C - REMOTE MANIP. ARM

REVISION : 2 07/23/90

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
■ LRU :	MID PCA 1	V070-764400
■ SRU :	CONTACTOR, GENERAL PURPOSE	MC455-0134-0002 ✓
■ SRU :	CONTACTOR, GENERAL PURPOSE	MC455-0134-0004 ✓

PART DATA

- EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
CONTACTOR, GP 125 AMP STARBOARD AND PORT REMOTE MANIPULATOR ARM

REFERENCE DESIGNATORS: 40V76A25K2
: 40V76A25K1

QUANTITY OF LIKE ITEMS: 2
TWO

FUNCTION:
UPON CREW INITIATED SWITCH COMMAND, THE CONTACTS OF CONTACTOR CONNECT
PRIMARY 28VDC MAIN BUS A TO THE SELECTED (PORT, STARBOARD) REMOTE
MANIPULATOR ARM.

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FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE
 NUMBER: 05-6IA-2126-02

REVISION# 2 07/23/90 R

SUBSYSTEM: EPO&C - REMOTE MANIP. ARM
 LRU :MID PCA 1
 ITEM NAME: CONTACTOR, GENERAL PURPOSE

CRITICALITY OF THIS
 FAILURE MODE:1R2

■ FAILURE MODE:
 | CLOSED, PREMATURE CLOSURE, FAILS TO OPEN

MISSION PHASE:
 00 ON-ORBIT

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

■ CAUSE:
 | PIECE PART FAILURE, VIBRATION, MECHANICAL SHOCK, PROCESSING ANOMALY

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN A) PASS
 B) FAIL
 C) PASS

PASS/FAIL RATIONALE:

| A)
 ■ B)
 NOT READILY DETECTABLE IN FLIGHT DURING RMS OPERATION. WILL BE
 DETECTED UPON RMS POWER DOWN FOLLOWING OPERATION.

| C)

 - FAILURE EFFECTS -

■ (A) SUBSYSTEM:
 FAILURE WILL RESULT IN AFFECTED RMS BEING CONTINUALLY POWERED
 INDEPENDENT OF POSITION OF POWER OR SELECT SWITCHES.

■ (B) INTERFACING SUBSYSTEM(S):
 | FIRST FAILURE - NO EFFECT

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- (C) MISSION:
FIRST FAILURE - NO EFFECT
- (D) CREW, VEHICLE, AND ELEMENT(S):
FIRST FAILURE - NO EFFECT
- (E) FUNCTIONAL CRITICALITY EFFECTS:
FAILURE DURING RMS OPERATIONS WILL HAVE NO EFFECT SINCE THE POWER CONTACTOR IS NOMINALLY CLOSED AT ALL TIMES THAT THE RMS IS UNCRADLED. A SUBSEQUENT FAILURE OF THE RMS POWER SWITCH (TO "OFF") DURING RMS OPERATIONS WOULD ALLOW THE MCIU, END EFFECTOR, BRAKES, AND DIRECT DRIVE CIRCUITS TO BE BACK POWERED (SNEAK CIRCUIT) BY THE PRIMARY RMS CONTROL BUS THROUGH THE FAILED POWER CONTACTOR. THE MCIU AND END EFFECTOR WOULD ONLY BE POWERED WHEN THE BRAKE SWITCH IS PLACED "ON"; HOWEVER, THE BRAKES WOULD THEN ~~BE UNPOWERED AND WOULD~~ BE CONTINUOUSLY "OFF" EVEN THOUGH THE SWITCH IS ~~PLACED~~ "ON". ADDITIONALLY, DIRECT DRIVE AND END EFFECTOR CONTROL VOLTAGES WILL BE BIASED SUCH THAT COMMANDS WILL BE EITHER UNEFFECTUAL OR REVERSED AND UNCOMMANDED OPERATIONS WILL OCCUR. POSSIBLE LOSS OF MISSION (2R3) IF DEGRADED CONTROL RESPONSE OF THE RMS OCCURRED. POSSIBLE LOSS OF CREW/VEHICLE (1R2) DUE TO INCORRECT RESPONSE OF RMS TO CONTROL INPUTS AND UNCOMMANDED MOTION IF RMS POWER SWITCH FAILED (TO OFF) DURING RMS OPERATIONS.

- DISPOSITION RATIONALE -

- (A) DESIGN:
REFER TO APPENDIX C, ITEM NO. 5 - GENERAL PURPOSE CONTACTOR
- (B) TEST:
REFER TO APPENDIX C, ITEM NO. 5 - CONTACTOR, GENERAL PURPOSE

GROUND TURNAROUND TEST
CIRCUITS VERIFIED ON-LINE PER PARAGRAPHS:
- V54AN0.012 "PORT MN A (PRIMARY) POWER VERIF"
- V54AN0.040 "STBD PRIMARY POWER DEADFACE VERIF"
- V54AN0.041 "PORT PRIMARY POWER DEADFACE VERIF"
PRIOR TO MECHANICAL ARM INSTALLATION,
- V54AT0.001 "CONFIGURATION AND CHECKOUT"
FOR EVERY RMS FLIGHT, AND LRU RETEST PER TABLE V54Z00.000.
- (C) INSPECTION:
REFER TO APPENDIX C, ITEM NO. 5 - GENERAL PURPOSE CONTACTOR ✓
- (D) FAILURE HISTORY:
REFER TO APPENDIX C, ITEM NO. 5 - GENERAL PURPOSE CONTACTOR

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(E) OPERATIONAL USE:

THE CREW WOULD NOT BE AWARE OF INITIAL FAILURE UNTIL THE RMS WAS CRADLED, BRAKES TURNED ON AND ARM Deselected AND POWERED DOWN. WHEN THE RMS IS Deselected THE MCC WILL FAIL TO LOSE THE RMS SELECTED FLAG. WHEN THE RMS IS POWERED DOWN, THE BRAKES, WILL BE GROUNDED THROUGH THE MCII AND THE ON-BOARD TALKBACK WILL TOGGLE TO OFF (EVEN THOUGH THE BRAKE SWITCH IS STILL ON).

[-] Payload

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. AJ	:	<i>TA [Signature]</i>
DESIGN ENGINEERING	: D. SOVEREIGN	:	<i>DS [Signature]</i>
QUALITY SUPERVISOR	: J. COURSEN	:	<i>JC [Signature]</i>
NASA RELIABILITY	: J. GRIHAM	:	<i>JG [Signature]</i>
NASA SUBSYSTEM MANAGER	: G. GICCA	:	<i>GG [Signature]</i>
NASA EP&C RELIABILITY	:	:	<i>M. Saffran [Signature]</i>
NASA QUALITY ASSURANCE	:	:	<i>KS [Signature]</i>
NASA EP&C SUBSYS MGR	: F. ALANIS	:	<i>FA [Signature]</i>
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