FAILURE MODES EFFECTS ANALYSIS (FMEA) – CRITICAL HARDWARE
NUMBER: 05-6ED-2128-X

SUBSYSTEM NAME: EPD&C - ET UMBILICAL DOORS
REVISION: 5 08/24/93

		PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	:	AFT MCA-1	V070-765410
LRU	:	AFT MCA-2	V070-765420
LRU	:	AFT MCA-3	V070-765430
LRU	:	AFT MCA-3	V070-765600
LRU	:	AFT MCA-2	V070-765620
LRU	:	AFT MCA-1	V070-765630
SRU	:	RELAY, HYBRID	MC455-0135-0001
SRU	:	RELAY, HYBRID	MC455-0135-0002

PART DATA

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
RELAY, HYBRID, 4 POLE, NON-LATCH, CENTERLINE LATCHES - DEPLOY CIRCUITS

REFERENCE DESIGNATORS: 54V76A114K5
54V76A114K6
54V76A114K10
54V76A114K11
55V76A115K17
55V76A115K18
56V76A116K5
56V76A116K6

QUANTITY OF LIKE ITEMS: 8
EIGHT

FUNCTION:
TWO HYBRID RELAYS ARE USED IN SERIES TO CONNECT THREE-PHASE AC POWER TO EACH CENTERLINE LATCH ACTUATOR DRIVE FOR DEPLOY OPERATIONS.

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE
NUMBER: 05-5ED-2128-04

REVISION# 4 05/21/91 R

SUBSYSTEM: EPD&C - ET UMBILICAL DOORS
LRU :AFT MCA-1
ITEM NAME: RELAY, HYBRID

CRITICALITY OF THIS FAILURE MODE:1R2

FAILURE MODE:
SHORT POLE-TO-POLE

MISSION PHASE:
DO DE-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) PASS
C) PASS

PASS/FAIL RATIONALE:
A)

B)

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:
FIRST FAILURE - PHASE-TO-PHASE SHORT WOULD OCCUR CAUSING AC CIRCUIT BREAKER TO TRIP RESULTING IN LOSS OF AC POWER TO ALL DOOR AND LATCH FUNCTIONS OF ASSOCIATED MCA

(B) INTERFACING SUBSYSTEM(S):
FIRST FAILURE - INABILITY TO USE ASSOCIATED MOTOR

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(C) MISSION:
FIRST FAILURE - NO EFFECT

(D) CREW, VEHICLE, AND ELEMENT(S):
FIRST FAILURE - NO EFFECT

(E) FUNCTIONAL CRITICALITY EFFECTS:
CASE I:

1R2, PPP, 2 SUCESS PATHS. MISSION PHASE: DE-ORBIT

1) HYBRID RELAY SHORTS POLE-TO-POLE (SOURCE SIDE)
2) LOSS OF REDUNDANT MOTOR

POSSIBLE LOSS OF CREW/VEHICLE DUE TO INABILITY TO STOW (UNLATCH) CENTERLINE LATCHES WHICH PRECLUDES DOOR CLOSURE CAUSING UNSAFE CONFIGURATION FOR RE-ENTRY.

CASE II:

1R2, PPP, 2 SUCCESS PATHS. MISSION PHASE: DE-ORBIT

1) HYBRID RELAY SHORTS POLE-TO-POLE (MOTOR SIDE)
2) LOSS OF REDUNDANT MOTOR

WHEN STOW COMMAND IS GIVEN, PHASE-TO-PHASE SHORT WOULD OCCUR CAUSING AC CIRCUIT BREAKER TO TRIP. POSSIBLE LOSS OF CREW/VEHICLE DUE TO INABILITY TO STOW (UNLATCH) CENTERLINE LATCHES WHICH PRECLUDES DOOR CLOSURE CAUSING UNSAFE CONFIGURATION FOR RE-ENTRY.

- DISPOSITION RATIONALE -

(A) DESIGN:
REFER TO APPENDIX C, ITEM NO. 1 - HYBRID RELAY

(B) TEST:
REFER TO APPENDIX C, ITEM NO. 1 - HYBRID RELAY

GROUND TURNAROUND TEST
VERIFY HYBRID RELAY FUNCTION THAT CONNECTS AC BUSES TO EACH CENTERLINE LATCH DRIVE MOTOR BY: VERIFYING INITIAL MCA STATUS, SENDING THE LATCH/RELEASE COMMAND BY SOFTWARE OR SWITCH CYCLE AS APPROPRIATE, VERIFY SWITCH SCAN, AND MONITORING THREE PHASE AC CURRENTS AND OPERATING TIME. TOTAL OPERATING TIMES ARE 6 SEC (MAX) FOR TWO MOTORS AND 12 SEC (MAX) FOR SINGLE MOTOR. TESTS ARE PERFORMED INFLIGHT FOR

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DUAL MOTOR OPERATION, EVERY FLIGHT FOR SINGLE MOTOR, AND LRU RETEST PER TABLE V56Z00.000.

(C) INSPECTION:
REFER TO APPENDIX C, ITEM NO. I - HYBRID RELAY

(D) FAILURE HISTORY:
REFER TO APPENDIX C, ITEM NO. 1 - HYBRID RELAY

(E) OPERATIONAL USE:
NONE

- APPROVALS -

RELIABILITY ENGINEERING	T. AI	7-9-91
DESIGN ENGINEERING	T. POCKLINGTON	7-3-91
QUALITY ENGINEERING	W. R. HIGGINS	7/10/91
NASA RELIABILITY		1/17/92
NASA SUBSYSTEM MANAGER		1/28/92
NASA EPD&C RELIABILITY		for S. Woodard 2-7-92
NASA QUALITY ASSURANCE		1/8/92
NASA EPD&C SUBSYS MGR		for E. Adams 7 Feb 92