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PRINT DATE: 05/22/91

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL HARDWARE

NUMBER: 05-6ED-2130-X

SUBSYSTEM NAME: EPD&C - ET UMBILICAL DOORS

REVISION : 4 05/21/91

	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, LEFT AND RIGHT DOOR DRIVE-OPEN
CIRCUITS

REFERENCE DESIGNATORS: 54V76A114K15
 : 55V76A115K10
 : 56V76A116K11
 : 56V76A116K17

QUANTITY OF LIKE ITEMS: 4
 FOUR

FUNCTION:

WHEN COMMANDED, THE HYBRID RELAY CONTACT SETS CONNECT THREE PHASE AC
 POWER TO MOTORS IN THE PROPER SEQUENCE TO OPEN THE LEFT AND RIGHT
 ORBITER/EXTERNAL TANK UMBILICAL DOORS.

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FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE
NUMBER: 05-6ED-2130-04

SUBSYSTEM: EPD&C - ET UMBILICAL DOORS
LRU :AFT MCA-1
ITEM NAME: RELAY, HYBRID
REVISION# 4 05/21/91 R
CRITICALITY OF THIS FAILURE MODE:LR2

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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FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE
NUMBER: 05-6ED-2130-04

(C) MISSION:
FIRST FAILURE - NO EFFECT

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

■ (E) FUNCTIONAL CRITICALITY EFFECTS:
CASE I:

IR2, PPP, 2 SUCCESS PATHS. MISSION PHASE: DE-ORBIT

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

WHEN DOOR CLOSE COMMAND IS GIVEN, PHASE-TO-PHASE SHORT WOULD OCCUR. POSSIBLE LOSS OF CREW/VEHICLE DUE TO STRUCTURAL DAMAGE CAUSED BY THERMAL EFFECTS IF DOOR CANNOT BE CLOSED FOR SAFE RE-ENTRY.

CASE II:

IR2, PPP, 2 SUCCESS PATHS. MISSION PHASE: DE-ORBIT

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

PHASE-TO-PHASE WOULD OCCUR AFTER FIRST FAILURE. POSSIBLE LOSS OF CREW/VEHICLE DUE TO STRUCTURAL DAMAGE CAUSED BY THERMAL EFFECTS IF DOOR CANNOT BE CLOSED FOR SAFE 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 RIGHT/LEFT DOOR DRIVE BY PERFORMING DOOR OPEN/CLOSE FUNCTIONAL: VERIFYING INITIAL MCA STATUS, SENDING THE OPEN/CLOSE COMMAND BY SOFTWARE OR SWITCH CYCLE AS APPROPRIATE, VERIFYING SWITCH SCAN, AND MONITORING THREE PHASE AC CURRENT AND OPERATING TIME. TOTAL OPERATING TIMES ARE 24 SEC (MAX) FOR TWO MOTORS AND 48 SEC (MAX) FOR SINGLE MOTOR. TESTS ARE PERFORMED EVERY FLIGHT AND LRU RETEST PER TABLE V56Z00.000.

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

NUMBER: 05-6ED-2130-04

(C) INSPECTION:

REFER TO APPENDIX C, ITEM NO. 1 - HYBRID RELAY

(D) FAILURE HISTORY:

REFER TO APPENDIX C, ITEM NO. 1 - HYBRID RELAY

(E) OPERATIONAL USE:

NONE

- APPROVALS -

RELIABILITY ENGINEERING: T. AI
 DESIGN ENGINEERING : T. POCKLINGTON
 QUALITY ENGINEERING : W. R. HIGGINS
 NASA RELIABILITY :
 NASA SUBSYSTEM MANAGER :
 NASA EPO&C RELIABILITY :
 NASA QUALITY ASSURANCE :
 NASA EPD+C SSM :

M. C. Hon 7/9/91
~~W. R. Higgins~~ 7-3-91
~~W. R. Higgins~~ 7/19/91
D. M. F. 1/13/92
~~W. R. Higgins~~ 1/24/92
L. D. Gage For S. Woodard 2-7-92
~~W. R. Higgins~~ 1/8/92
F. Ploneman for F. Alanis 7 Feb 92