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PRINT DATE: 05/22/91

## FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL HARDWARE

NUMBER: 05-6ED-2129-X

SUBSYSTEM NAME: EPD&amp;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 - CLOSE  
CIRCUITS

REFERENCE DESIGNATORS: 54V76A114K16  
: 55V76A115K9  
: 56V76A116K10  
: 56V76A116K16

QUANTITY OF LIKE ITEMS: 4  
FOUR

FUNCTION:  
WHEN COMMANDED, THE HYBRID RELAY CONTACT SETS CONNECT 3-PHASE AC POWER  
TO MOTORS IN THE PROPER SEQUENCE TO CLOSE THE LEFT AND RIGHT ORBITER/  
EXTERNAL TANK UMBILICAL DOORS.

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FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE  
NUMBER: 05-6ED-2129-01

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:1R2

FAILURE MODE:  
OPEN, FAILS TO CONDUCT, FAILS TO TRANSFER, SHORTS TO STRUCTURE (GROUND),  
SHORT PCLE-TO-PCLE

MISSION PHASE:  
DO DE-ORBIT

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

CAUSE:  
PIECE PART FAILURE, CONTAMINATION, VIBRATION, MECHANICAL SHOCK,  
PROCESSING ANOMALY, THERMAL STRESS.

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 - UNABLE TO PROVIDE POWER TO ASSOCIATED MOTOR

(B) INTERFACING SUBSYSTEM(S):  
FIRST FAILURE - LOSS OF 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:  
POSSIBLE LOSS OF CREW/VEHICLE AFTER SECOND FAILURE (LOSS OF REDUNDANT MOTOR) DUE TO STRUCTURAL DAMAGE CAUSED BY THERMAL EFFECTS IF ET DOORS CANNOT BE CLOSED FOR SAFE RE-ENTRY.

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- DISPOSITION RATIONALE -  
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(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 MOTOR BY: VERIFYING INITIAL MCA STATUS, SENDING THE OPEN/CLOSE COMMAND BY SOFTWARE OR 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 C, ITEM NO. 1 - HYBRID RELAY

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

(E) OPERATIONAL USE:  
NONE

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- APPROVALS -

RELIABILITY ENGINEERING:	T. AI	:	<u>TA McLean</u> <u>CL Neal</u> 7-9-91
DESIGN ENGINEERING	: T. POCKLINGTON	:	<u>J. M. Anderson</u> 9-3-91
QUALITY ENGINEERING	: W. R. HIGGINS	:	<u>W. R. Higgins</u> 2/10/91
NASA RELIABILITY	:	:	<u>W. R. Higgins</u> 1/27/92
NASA SUBSYSTEM MANAGER	:	:	<u>W. R. Higgins</u> 1/24/92
NASA EPD&C RELIABILITY	:	:	<u>L. D. Cooper</u> <u>F. S. Wood</u> 2-7-92
NASA QUALITY ASSURANCE	:	:	<u>K. O. Grant</u> <u>Grant</u> 1/8/92
NASA EPD&C SUBSYS MGR	:	:	<u>L. Wood</u> <u>Grant</u> 7 Feb 92