

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL HARDWARE

NUMBER: 05-6EB-2005-X

SUBSYSTEM NAME: EPD&C - PAYLOAD BAY DOORS

REVISION : 2 05/16/90

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU :	MID MCA-4	V070-764500
LRU :	MID MCA-1	V070-764520
LRU :	MID MCA-2	V070-764530
LRU :	MID MCA-1	V070-764610
LRU :	MID MCA-2	V070-764620
LRU :	MID MCA-4	V070-764640
SRU :	RELAY, HYBRID	MC455-0135-0001
SRU :	RELAY, HYBRID	MC455-0135-0002

PART DATA

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
RELAY, HYBRID, PAYLOAD BAY DOOR DRIVE MOTOR CONTROL

REFERENCE DESIGNATORS: 40V76A117K42
: 40V76A117K54
: 40V76A118K10
: 40V76A118K12
: 40V76A120K10
: 40V76A120K22
: 40V76A120K31
: 40V76A120K43

QUANTITY OF LIKE ITEMS: 8
8, 2/PLBD DRIVE MOTOR

FUNCTION:
HYBRID RELAY WITH MANUAL "OPEN/CLOSE" STIMULI APPLIED AND WITHOUT INHIBITS, TWO RELAYS, ONE FOR OPEN AND THE OTHER FOR CLOSE, CONNECT 3 PHASE AC POWER TO PAYLOAD BAY DOORS DRIVE MOTORS.

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FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE
NUMBER: 05-6EB-2005-02

SUBSYSTEM: EPD&C - PAYLOAD BAY DOORS
LRU :MID MCA-4
ITEM NAME: RELAY, HYBRID

REVISION# 2 07/16/90 R

CRITICALITY OF THIS
FAILURE MODE:1R2

- FAILURE MODE:
CLOSED, FAILS TO OPEN, PREMATURELY CLOSES

MISSION PHASE:

OO ON-ORBIT
DO DE-ORBIT

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

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

CRITICALITY I/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 - MOTOR OPERATES IN THE OPENED OR CLOSED DIRECTION.
MECHANICAL STOP PREVENTS DOOR FROM BEING FURTHER OPENED OR CLOSED BUT
MOTOR CONTINUES TO OPERATE. PROLONGED MOTOR SPINNING WILL EVENTUALLY
CAUSE DAMAGE TO MOTOR AND/OR TRIP AC CIRCUIT BREAKER. IF A SIMULTANEOUS
GPC COMMAND IN THE OPPOSITE DIRECTION IS SENT PRIOR TO MOTOR BURN OUT,
A PHASE TO PHASE SHORT ON THE AC SYSTEM WILL OCCUR AND TRIP THE CIRCUIT

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BREAKER.

- (B) INTERFACING SUBSYSTEM(S):
FIRST FAILURE - LOSS OF REDUNDANCY TO PLBD DOOR DRIVE FUNCTION
- (C) MISSION:
FIRST FAILURE - NO EFFECT
- (D) CREW, VEHICLE, AND ELEMENT(S):
FIRST FAILURE - NO EFFECT
- (E) FUNCTIONAL CRITICALITY EFFECTS:
SECOND FAILURE (HYBRID RELAY FAILURE IN ASSOCIATED REDUNDANT CIRCUIT) WILL CAUSE LOSS OF POWER PATHS TO BOTH PAYLOAD BAY DOOR DRIVE MOTORS. FAILURE TO CLOSE PAYLOAD BAY DOORS WOULD RESULT IN UNSAFE CONFIGURATION FOR ENTRY (1R2). FAILURE TO OPEN PAYLOAD BAY DOORS WOULD RESULT IN LOSS OF MISSION (2R3).

- DISPOSITION RATIONALE -

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

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

VERIFY POWER PATHS TO PAYLOAD BAY DOOR DRIVE MOTORS BY: REVERIFYING INITIAL MCA STATUS, SENDING THE OPEN/CLOSE COMMAND BY SOFTWARE OR SWITCH CYCLE AS APPROPRIATE, VERIFYING LIMIT-SWITCH OR TALKBACK STATUS WHERE AVAILABLE (E.G., READY-TO-LATCH DOOR INDICATIONS), AND MONITORING AC CURRENTS AND DOOR/LATCH OPERATING TIMES. TESTS ARE PERFORMED INFLIGHT (GROUND CHECKOUT IF VALID FLIGHT DATA IS UNAVAILABLE) FOR DUAL MOTOR OPERATION, ALTERNATE FLOW FOR SINGLE MOTOR OPERATION (ODD FLOW: MOTOR 1 TO OPEN & MOTOR 2 TO CLOSE, AND VICE VERSA FOR EVEN FLOW), AND LRU RETEST PER TABLE V37Z00.000.

(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:
REMOVE POWER TO AFFECTED MOTOR BEFORE PLBE OPERATIONS. AFTER MULTIPLE FAILURES, EVA CAPABILITY EXISTS TO CLOSE PAYLOAD BAY DOORS.

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 - APPROVALS -

RELIABILITY ENGINEERING:	T. AI	: <i>[Signature]</i> 6/22/90
DESIGN ENGINEERING	: T. BANHIDY	: <i>[Signature]</i>
QUALITY ENGINEERING	: W. R. HIGGINS	: <i>[Signature]</i>
NASA RELIABILITY	:	: <i>[Signature]</i>
NASA SUBSYSTEM MANAGER	:	: <i>[Signature]</i> 8/23/90
NASA QUALITY ASSURANCE	:	: <i>[Signature]</i> 1 AUG 90
NASA EPDC SUBSYS MGR	:	: <i>[Signature]</i> for F. [Signature] 7/20/90
NASA EPDC Reliability	:	: L. D. Cogan for S. Woodard 8/22/90