

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL HARDWARE

NUMBER: 05-6EE-2015-X

1494

SUBSYSTEM NAME: EPD&C - ADP DEPLOY & HTR (02-4E)

REVISION : 3 08/31/90

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU :	FWD PCA 1	V070-763320
LRU :	FWD PCA 2	V070-763340
LRU :	FWD PCA 3	V070-763360
SRU :	RELAY, GENERAL PURPOSE	MC455-0129-0002

PART DATA

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
RELAY (12 AMP), GENERAL PURPOSE - AIR DATA PROBE (ADP), LEFT AND RIGHT
SENSOR HEATER POWER CIRCUIT

REFERENCE DESIGNATORS: 81V76A22K4
: 81V76A22K5
: 82V76A23K4
: 82V76A23K5
: 82V76A23K9
: 82V76A23K10
: 83V76A24K4
: 83V76A24K5

QUANTITY OF LIKE ITEMS: 8
EIGHT

FUNCTION:
PROVIDES CONTROL OF POWER TO HEATERS FOR THE LEFT AND RIGHT AIR DATA
SENSOR ASSEMBLIES.

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE
NUMBER: 05-6EE-2015-02

REVISION# 3 08/31/90 R 1437

SUBSYSTEM: EPD&C - ADP DEPLOY & HTR (C2-4E)
LRU : FWD PCA 1
ITEM NAME: RELAY, GENERAL PURPOSE

CRITICALITY OF THIS
FAILURE MODE: 1R3

FAILURE MODE:
SHORTS CONTACT-TO-CONTACT

MISSION PHASE:
DC DE-ORBIT
LS LANDING SAFING

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

- 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) FAIL
C) PASS

PASS/FAIL RATIONALE:
A)
B)
"B" SCREEN FAILS SINCE THE FIRST FAILURE IS NOT READILY DETECTABLE
DURING FLIGHT.
C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:
LOSS OF SERIES REDUNDANCY - ONE CONTACT SET OF ONE OF THE TWO SERIES
RELAYS FROM ONE MAIN DC BUS PROVIDES CONTINUOUS CONTINUITY TO THE
AFFECTED HEATER CIRCUIT.

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

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NUMBER: 05-6EE-2015-02

1495

(C) MISSION:
NO EFFECT - FIRST FAILURE

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

(E) FUNCTIONAL CRITICALITY EFFECTS:
POSSIBLE LOSS OF CREW/VEHICLE AFTER TWO OTHER FAILURES (SECOND SERIES RELAY FAILS ON, UPSTREAM TYPE II HYBRID DRIVER FAILS ON - CAUSING THE HEATERS FOR ONE ADP TO FAIL ON WHICH MAY CAUSE DAMAGE TO THE PROBE WHEN IT IS IN THE STOWED POSITION) DUE TO THE LOSS OF CAPABILITY TO OBTAIN AIR PRESSURE DATA REQUIRED FOR SAFE DESCENT. PROPER LIMIT SWITCH INDICATIONS WITH ERRONEOUS DATA TO ADP CAN CAUSE A SIDE-TO-SIDE DILEMMA AND THE SOFTWARE DOWNMODES TO USING DEFAULT GAINS.

- DISPOSITION RATIONALE -

(A) DESIGN:
REFER TO APPENDIX C, ITEM NO. 2 - GENERAL PURPOSE RELAY

(B) TEST:
REFER TO APPENDIX C, ITEM NO. 2 - GENERAL PURPOSE RELAY

GROUND TURNAROUND TEST
"RH ADP HTR CK", TESTS RIGHT HAND ADP HEATER RELAYS FOR SYSTEMS 1 AND 2.
"LH ADP HTR CK," TESTS LEFT HAND ADP HEATER RELAYS FOR SYSTEMS 1 AND 2.

TESTS LISTED ABOVE ARE TO BE PERFORMED FOR THE NEXT FLIGHT FOR ALL VEHICLES AND INTERVALS OF TEN FLIGHTS THEREAFTER OR AFTER LRU REPLACEMENT WITH PROBE DEPLOYED AND ASSOCIATED SWITCHES IN THE PROPER POSITIONS.

(C) INSPECTION:
REFER TO APPENDIX C, ITEM NO. 2 - GENERAL PURPOSE RELAY

(D) FAILURE HISTORY:
REFER TO APPENDIX C, ITEM NO. 2 - GENERAL PURPOSE RELAY

(E) OPERATIONAL USE:
THE PROBE FAILURE CAUSES A SIDE-TO-SIDE DILEMMA AND THE SOFTWARE DOWNMODES TO USING DEFAULT GAINS. THE CREW MUST MAINTAIN PITCH ATTITUDE WITHIN THETA LIMITS DISPLAYED ON CRT. CRT DISPLAYS ALPHA, MACH, AND ALTITUDE FROM EACH ADTA TO THE CREW. IF THE NAV DERIVED ALPHA, MACH, AND ALTITUDE DISPLAYED ON DEDICATED DISPLAYS (AMI, AVVI)

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NUMBER: 05-6EE-2015-02

1489

ARE CORRECT, THE CREW CAN COMPARE THE AOTA DATA WITH THE NAV DERIVED DATA TO RESOLVE THE DILEMMA.

- APPROVALS -

RELIABILITY ENGINEERING:	T. K. KIMURA	:	<i>T. K. Kimura 01 Nov 9. 1990</i>
DESIGN ENGINEERING	: J. KRAGER	:	<i>J. Krager 4/13/90</i>
QUALITY ENGINEERING	: E. GUTIERREZ	:	<i>E. Gutierrez 10/12/90</i>
NASA RELIABILITY	:	:	<i>T. K. Kimura 10/12/90</i>
NASA SUBSYSTEM MANAGER	:	:	<i>J. Krager 10/12/90</i>
NASA EPD&C RELIABILITY	:	:	<i>E. Gutierrez 11-10-90</i>
NASA QUALITY ASSURANCE	:	:	<i>RO B. [unclear] 10/11/90</i>
NASA EPD&C SUBSYS MGR	:	:	<i>[unclear] 10/22/90</i>