

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE

NUMBER: M5-6MB-2177-G -X

SUBSYSTEM NAME: ELECTRICAL POWER GENERATION - CRYO, GENERIC

REVISION: 9 04/16/96

PART DATA

PART NAME	PART NUMBER
VENDOR NAME	VENDOR NUMBER
LRU : H2/O2 CONTROL BOXES	V070-764470
SRU : CONTROLLER, REMOTE POWER	MC450-0017-1050
SRU : CONTROLLER, REMOTE POWER	MC450-0017-2050
SRU : CONTROLLER, REMOTE POWER	MC450-0017-3050

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:

CONTROLLER, REMOTE POWER (RPC), 5A - LH2 TANKS 1 THRU 9 HEATER CIRCUITS
(TANKS 3 AND 4/5 RPC'S ARE 10A FOR OV102)

REFERENCE DESIGNATORS:

- 40V76A141RPC1
- 40V76A141RPC3
- 40V76A142RPC1
- 40V76A142RPC3
- 40V76A143RPC1
- 40V76A143RPC3
- 40V76A144RPC1
- 40V76A144RPC3
- 40V76A217RPC1
- 40V76A217RPC3
- 40V76A218A1RPC1
- 40V76A218A1RPC3
- 40V76A218A2RPC1
- 40V76A218A2RPC3
- 40V76A218A3RPC1
- 40V76A218A3RPC3
- 40V76A218A4RPC1
- 40V76A218A4RPC3

QUANTITY OF LIKE ITEMS:

TWO PER H2/O2 CONTROL BOX

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**FUNCTION:
INPUT RPC OF TWO RPC'S IN SERIES USED TO CONTROL POWER SUPPLIED TO EACH
OF TWO REDUNDANT LH2 TANK HEATERS.**

FAILURE MODES EFFECTS ANALYSIS FMEA - CIL FAILURE MODE

NUMBER: M5-6MB-2177-G-02

REVISION#: 9 04/16/96

SUBSYSTEM NAME: ELECTRICAL POWER GENERATION - CRYO, GENERIC

LRU: H2/O2 CONTROL BOXES

CRITICALITY OF THIS

ITEM NAME: CONTROLLER, REMOTE POWER

FAILURE MODE: 1R3

FAILURE MODE:

INADVERTENT OUTPUT, FAILS "ON", FAILS TO TURN "OFF"

MISSION PHASE:

PL	PRE-LAUNCH
LO	LIFT-OFF
OO	ON-ORBIT
DO	DE-ORBIT
LS	LANDING/SAFING

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) FAIL
	C) PASS

PASS/FAIL RATIONALE:

A)

B)

REDUNDANCY SCREEN "B" FAILS BECAUSE THE SERIES REDUNDANT RPC WILL MASK
THE FAILED "ON" RPC.

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE
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LOSS OF SERIES REDUNDANCY TO CONTROL POWER TO THE AFFECTED TANK HEATER.

(B) INTERFACING SUBSYSTEM(S):

LOSS OF INTERFACE REDUNDANCY - FAILURE OF SECOND SIMILAR RPC IN THE RELATED CIRCUITRY WILL CONTINUOUSLY ENERGIZE A LH2 TANK HEATER. EARLY DEPLETION OF LH2 AND POSSIBLE DAMAGE TO THE AFFECTED TANK IF THE THERMAL DESIGN LIMIT IS EXCEEDED. A MINIMUM TIME REQUIRED FOR TANK RUPTURE TO OCCUR EXCEEDS 35 HOURS STARTING FROM WHEN THE TANK RESIDUAL LEVELS ARE REACHED.

(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 DUE TO THE FOLLOWING SCENARIO:

(FOR LH2 TANKS 1, 2 & 4) 1) FIRST RPC FAILS SHORT, 2) SECOND SERIES RPC FAILS SHORT - LH2 TANK HEATER FAILED "ON", 3) PLUGGED RELIEF PORT, ...

(FOR LH2 TANKS 3 & 5) STEPS 1 THRU 3 ABOVE, AND 4) SECOND RELIEF PORT PLUGGED, ...

(FOR LH2 TANKS 6 THRU 9) STEPS 1 THRU 4 ABOVE, AND 5) PALLET MDCA MOTORIZED SWITCH WHICH SUPPLIES DC POWER TO THE PALLET FAILS CLOSED, ...

RESULTING IN OVERPRESSURE AND POSSIBLE TANK RUPTURE.

-DISPOSITION RATIONALE-

(A) DESIGN:

REFER TO APPENDIX B, ITEM NO. 2 - REMOTE POWER CONTROLLER

(B) TEST:

GROUND TURNAROUND TEST

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ANY TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD. THE OMRSD DATA PROVIDED BELOW IS NO LONGER BEING KEPT UP-TO-DATE. IF THERE IS ANY DISCREPANCY BETWEEN THE GROUND TESTING DATA PROVIDED BELOW AND THE OMRSD, THE OMRSD IS THE MORE ACCURATE SOURCE OF THE DATA.

GROUND TURNAROUND TEST RPC SERIES REDUNDANCY IS VERIFIED,

(TANKS 1-5) DURING ORBITER MAINTENANCE DOWN PERIOD (OMDP).

(TANKS 6-9) DURING PALLET LH2 TANK HEATER LPS AUTO TEST PERFORMED PRIOR TO FIRST EDO FLIGHT, AFTER LRU RETEST, OR PRIOR TO NEXT EDO FLIGHT IF TIME BETWEEN CHECKOUT EXCEEDS 36 MONTHS.

(C) INSPECTION:

REFER TO APPENDIX B, ITEM NO. 2 - REMOTE POWER CONTROLLER

(D) FAILURE HISTORY:

CURRENT DATA ON TEST FAILURES, FLIGHT FAILURES, UNEXPLAINED ANOMALIES, AND OTHER FAILURES EXPERIENCED DURING GROUND PROCESSING ACTIVITY CAN BE FOUND IN THE PRACA DATA BASE. THE FAILURE HISTORY DATA PROVIDED IN APPENDIX B IS NO LONGER BEING KEPT UP-TO-DATE.

(E) OPERATIONAL USE:

PER FLIGHT RULE 9-581F A CRYO HEATER THAT CONTINUES TO BE POWERED AFTER PLACING ITS CORRESPONDING SWITCH IN THE "OFF" POSITION WILL BE DEACTIVATED BY PERFORMING ONE OF THE FOLLOWING (CIL): AN H2 HEATER WILL BE DEACTIVATED BY DROPPING THE MAIN BUS THAT POWERS THE HEATER. THE MAIN BUS WILL BE BROUGHT UP FOR ENTRY IF THE TANK QUANTITY ALLOWS CONTINUOUS HEATER OPERATION WITHOUT VIOLATING HEATER TEMPERATURE LIMITS. THIS IS AN UNDESIRABLE PROCEDURE AND MAY/WILL HAVE AFFECTS ON ADDITIONAL ORBITER SYSTEMS.

- APPROVALS -

PAE MANAGER	: P. STENGER-NGUYEN :	<i>P. Stenger-Nguyen</i>
PRODUCT ASSURANCE ENGR	: J. NGUYEN :	<i>J. Nguyen</i>
DESIGN ENGINEERING	: T. D. NGUYEN :	<i>T. D. Nguyen</i>
EDITORIALLY APPROVED	: JSC :	<i>JSC</i>
TECHNICAL APPROVAL	: VIA APPROVAL FORM :	<i>96-CIL-012_M5-6MB</i>