

FAILURE MODES EFFECTS ANALYSIS (FMEA) - CIL HARDWARE
NUMBER: MS-6MB-2211-G -X

SUBSYSTEM NAME: ELECTRICAL POWER GENERATION - CRYO, GENERIC
REVISION: 9 04/15/96

PART DATA

PART NAME	PART NUMBER
VENDOR NAME	VENDOR NUMBER
LRU : H2/O2 CONTROL BOXES	V070-764470
SRU : CONTROLLER, HYBRID DRIVER	MC477-0261-0002

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:

CONTROLLER, HYBRID DRIVER (HDC), TYPE I - LO2 TANKS 1 THRU 9, HEATERS "A" AND "B" "AUTO" MODE CONTROL

- REFERENCE DESIGNATORS:
- 40V76A141AR17
 - 40V76A142AR17
 - 40V76A143AR17
 - 40V76A144AR17
 - 40V76A217AR17
 - 40V76A218A1AR17
 - 40V76A218A2AR17
 - 40V76A218A3AR17
 - 40V76A218A4AR17

QUANTITY OF LIKE ITEMS:
ONE PER H2/O2 CONTROL BOX

FUNCTION:
ENABLES THE LO2 "AUTO" MODE OUTPUT HYBRID DRIVER CONTROLLER DURING INDEPENDENT "AUTO" MODE TANK HEATER OPERATIONS FOR LO2 TANKS 1 THRU 9.

FAILURE MODES EFFECTS ANALYSIS FMEA -- CIL FAILURE MODE

NUMBER: M5-6MB-2211-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, HYBRID DRIVER

FAILURE MODE: 1R3

FAILURE MODE:

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

MISSION PHASE: OO ON-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) FAIL
	C) PASS

PASS/FAIL RATIONALE:

A)

B)

FAILS SCREEN "B" BECAUSE HDC FAILED "ON" CANNOT BE DETECTED IN FLIGHT WHEN OPERATING WITH ONLY ONE TANK SET ACTIVATED. THIS HDC IS NORMALLY "ON" FOR SINGLE TANK OPERATION.

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:

PROVIDES CONTINUOUS "ON" SIGNAL TO ONE OF TWO "AND" INPUTS OF SERIES HDC DRIVER WHICH CONTROLS DC POWER TO THE AFFECTED HEATERS THROUGH A RPC.

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(B) INTERFACING SUBSYSTEM(S):
SAME AS (A)

(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 LO2 TANKS 1 THRU 5) 1) HDC (AR17) FAILS "ON", 2) CONTROL PRESSURE CONDITIONER (CPC) FAILS "ON" (CREW ACTION REQUIRED TO SWITCH TO MANUAL CONTROL), 3) ASSOCIATED TANK HEATER SWITCH FAILS IN THE "AUTO" POSITION - HEATER OF AFFECTED TANK FAILED "ON", 4) RELIEF PORT PLUGGED, . . .

(FOR LO2 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. 1 - HYBRID DRIVER

(B) TEST:
GROUND TURNAROUND TEST
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.

(TANKS 1-5) HDC IS FUNCTIONALLY VERIFIED IN FLIGHT WHEN LO2 TANK HEATERS ARE OPERATED IN PAIRS IN "AUTO" MODE. PERFORM GROUND TURNAROUND TEST IF VALID VERIFICATION IS UNOBTAINABLE IN FLIGHT OR AFTER LRU REPLACEMENT.

FAILURE MODES EFFECTS ANALYSIS (FMEA) – CIL FAILURE MODE

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(TANKS 6-9) LO2 TANK HEATER AUTO CIRCUIT INTEGRATION TEST PERFORMED PRIOR TO FIRST EDO FLIGHT, AFTER LRU REPLACEMENT, OR PRIOR TO NEXT EDO FLIGHT IF TIME BETWEEN CHECKOUT EXCEEDS 36 MONTHS.

(C) INSPECTION:

REFER TO APPENDIX B, ITEM NO. 1 - HYBRID DRIVER

(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 PRAGA 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):

1. AN ATTEMPT WILL BE MADE TO DEACTIVATE AN O2 HEATER BY PERFORMING A CURRENT LEVEL DETECTOR TEST. IF REQUIRED, THE HEATER CAN STILL BE USED MANUALLY BY OPERATION OF THE CURRENT LEVEL DETECTOR SWITCH (TEST/RESET FOR HEATER OFF/ON).
2. PULL CIRCUIT BREAKER POWERING THE CPC CIRCUIT.
3. AN O2 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.
4. THE CREW CAN PERFORM THE PROCEDURE "CRYO TANK HEATER FUSE REMOVAL" LOCATED IN THE INFLIGHT MAINTENANCE (IFM) CHECKLIST. THE PROCEDURE WILL OPEN THE AFFECTED PANEL (R1, A11 OR A15) AND REMOVE THE TWO AFFECTED FUSES THAT ALLOW CONTROL BUS POWER TO THE DOWNSTREAM RPC'S IN THAT HEATER CIRCUIT. TAKING THE HEATER SWITCH TO OFF, PULLING THE CPC CIRCUIT BREAKER, AND TRIPPING THE ASSOCIATED CURRENT LEVEL DETECTORS WILL BE PERFORMED PRIOR TO DROPPING MAIN BUS OR CONTROL BUS POWER. EITHER PROCEDURE 3 OR 4 WILL BE GIVEN THE SAME PRIORITY IN TROUBLESHOOTING - I.E. BOTH ARE UNDESIRABLE AND MAY/WILL HAVE AFFECTS ON ADDITIONAL ORBITER SYSTEMS.

- APPROVALS -

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