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PRINT DATE: 06/01/94

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - CRITICAL HARDWARE**  
**NUMBER: 05-6-2293C -X**

**SUBSYSTEM NAME: ELECTRICAL POWER DISTRIBUTION & CONTROL**

**REVISION: 7 05/26/94**

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	<b>PART NAME</b>	<b>PART NUMBER</b>
	<b>VENDOR NAME</b>	<b>VENDOR NUMBER</b>
LRU	: AFT PCA 4, 5, 6	VO70-765280
SRU	: FUSE, HIGH CURRENT	ME451-0016-2100

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**PART DATA**

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**EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:**  
FUSE F6, 100A, HIGH CURRENT - LOCATED ON AFT PCA 6

**REFERENCE DESIGNATORS:** 56V75A136F6

**QUANTITY OF LIKE ITEMS:** 1  
ONE

**FUNCTION:**  
CONDUCTS ORBITER MAIN BUS C CURRENT AND PROVIDES OVERCURRENT PROTECTION FROM AFT POWER CONTROLLER ASSEMBLY (APCA) 6 TO AFT LOAD CONTROLLER ASSEMBLY (ALCA) 3.

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**SUBSYSTEM NAME: ELECTRICAL POWER DISTRIBUTION & CONTROL**

LRU: AFT PCA 4, 5, 6

**CRITICALITY OF THIS**

**ITEM NAME: FUSE, HIGH CURRENT**

**FAILURE MODE: 1R2**

**FAILURE MODE:**

**FAILS OPEN, FAILS TO CONDUCT**

**MISSION PHASE:**

PL - PRELAUNCH  
 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:**

STRUCTURAL FAILURE, CONTAMINATION, VIBRATION, MECHANICAL SHOCK,  
 PROCESSING ANOMALY, THERMAL STRESS

**CRITICALITY 1/1 DURING INTACT ABORT ONLY? YES**

TAL  
 ATO

**REDUNDANCY SCREEN** A) PASS  
 B) PASS  
 C) PASS

**PASS/FAIL RATIONALE:**

**A)**

"A" SCREEN PASSES BECAUSE FUSE FAIL OPEN IS DETECTABLE DURING GROUND  
 TURNAROUND TEST

**B)**

"B" SCREEN PASSES BECAUSE FUSE FAIL OPEN IS DETECTABLE DURING FLIGHT FROM  
 AVAILABLE MEASUREMENT INDICATION

**C)**

"C" SCREEN PASSES BECAUSE REDUNDANT FUSES ARE PHYSICALLY ISOLATED FROM  
 EACH OTHER

**- FAILURE EFFECTS -**

**(A) SUBSYSTEM:**

INABILITY TO CONDUCT MAIN BUS C POWER FROM APCA 6 TO ALCA 3

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**(B) INTERFACING SUBSYSTEM(S):**

LOSS OF POWER REDUNDANCY TO AUXILIARY POWER UNIT (APU) TANK/FUEL LINE 3A HEATERS AND OTHER CRITICAL LOADS.

**(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 FAILURES:

FIRST FAILURE (FUSE OPENS) WOULD CAUSE LOSS OF MAIN BUS C POWER TO APU TANK/FUEL LINE 3A HEATERS. THIS WOULD RESULT IN LOSS OF REDUNDANT 3A HEATERS. NO EFFECT SINCE 3B HEATERS WILL PROVIDE HEATING.

SECOND FAILURE (LOSS OF REDUNDANT TANK/FUEL LINE HEATERS) DUE TO FUEL (HYDRAZINE) FREEZING AND LINE RUPTURE UPON THAWING.  
(REFERENCE CRITICAL FMEA: 05-6N-2059-01)

CRITICALITY 1 FOR TAL AND ATO ABORTS FOR LOSS OF MAIN BUS C POWER TO RIGHT OMS ENGINE PURGE VALVES 1 AND 2. INABILITY TO OPEN ONE OF THE SERIES ENGINE PURGE VALVES WILL PRECLUDE THE FLOW OF REGULATED GN2 INTO THE ENGINE'S FUEL (MMH) COOLING PASSAGES. INTERNAL SPRING FORCES WILL CLOSE THE VALVES WHEN ELECTRICAL POWER IS REMOVED FROM THE VALVE. MISSION RULES REQUIRE MINIMUM 10 MINUTE COAST TIME FOR RESTART OF AN UNPURGED ENGINE. POST-MAIN ENGINE CUTOFF (POST-MECO) ABORT DUMP TIMELINE DOES NOT ALLOW 10 MINUTE COAST. RESIDUAL FUEL IN THE REGION JACKET MAY ALTER THE START TRANSIENT CAUSING ENGINE HARDSTART OR ENGINE DETONATION. INABILITY TO RESTART AN UNPURGED ENGINE POST-MECO MAY RESULT IN LOSS OF CREW/VEHICLE DUE TO EXCESSIVE VEHICLE DOWNWEIGHT OR UNCONTROLLABLE X OR Y-AXIS VEHICLE CENTER OF GRAVITY. THE PURGE VALVE IS NOT MONITORED IN THE COCKPIT. HOWEVER, A PURGE OPERATION CAN BE INFERRED BY MONITORING THE GN2 TANK PRESSURE.  
(REFERENCE CRITICAL FMEA: 05-6L-2209-1)

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**-DISPOSITION RATIONALE-**

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**(A) DESIGN:**

REFER TO APPENDIX D, ITEM NO. 3 - FUSE, HIGH CURRENT

**(B) TEST:**

REFER TO APPENDIX D, ITEM NO. 3 - FUSE, HIGH CURRENT

**GROUND TURNAROUND TEST**

ANY GROUND TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

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**(C) INSPECTION:**  
REFER TO APPENDIX D, ITEM NO. 3 - FUSE, HIGH CURRENT

**(D) FAILURE HISTORY:**  
FAILURE HISTORY IS TRACKED IN THE PRACA SYSTEM.

**(E) OPERATIONAL USE:**  
FOR LOSS OR MAIN BUS C POWER TO APU TANK/FUEL LINE 3A HEATERS:  
FIRST FAILURE - MANUALLY SWITCH TO ALTERNATE HEATER. SECOND FAILURE -  
ATTEMPT ATTITUDE THERMAL CONDITIONING.

FOR LOSS OF MAIN BUS C POWER TO RIGHT OMS ENGINE PURGE VALVES 1 AND 2:  
SCHEDULE AT LEAST TEN MINUTES BETWEEN BURNS OF AFFECTED ENGINE. ALLOWS  
FUEL IN COOLING CHANNELS TO DISPERSE, ELIMINATION HAZARD. ENGINE STILL  
USABLE FOR NORMAL MISSION OPERATIONS.

**- APPROVALS -**

PAE MANAGER : K. PRESTON  
PRODUCT ASSURANCE ENGR : T. KIMURA  
DESIGN ENGINEERING : J. GULSBY  
NASA SSMA :  
NASA SUBSYSTEM MANAGER :

*K.L. Preston 6/1/94*  
*T. Kimura 6/1/94*  
*J. Gulsby 6/1/94*  
*4-11-95*  
*Ed P 9-11-95*  
FOR FMEA PLAN 3