PRINT DATE: 05/11/95

FAILURE MODES EFFECTS ANALYSIS (FMEA) – CRITICAL HARDWARE
NUMBER: 05-6J-2263 -X

SUBSYSTEM NAME: EPD&C MAIN PROPULSION SYSTEM
REVISION: 11/10/94

		PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	:	AFT LCA 1	MC450-0057-0001
SRU	:	CONTROLLER, HYBRID DRIVER	MC477-0263-0002

PART DATA

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
CONTROLLER, HYBRID DRIVER (HDC), TYPE III - LH2 HIGH POINT BLEED VALVE OPEN SOLENOID (LV79).

REFERENCE DESIGNATORS: 54V76A121J6 (f)
54V76A121J3 (69)

QUANTITY OF LIKE ITEMS: 2
TWO

FUNCTION:
CONDUCTS MAIN BUS POWER TO OPEN SOLENOID OF LH2 HIGH POINT BLEED VALVE. THE TWO HDCs III ARE IN SERIES.

SHUTTLE CRITICAL ITEMS LIST - ORBITER

5/5

SUBSYSTEM :EPD&C - MAIN PROP. FMEA NO 05-6J -2263 -2 REV: 04/25/88

ASSEMBLY :AFT LCA-1 CRIT. FUNC: 1R
P/N RI :MC477-0263-0002 CRIT. HDW: 2
P/N VENDOR:
QUANTITY :2
:TWO
:

VEHICLE EFFECTIVITY:	102 X	103 X	104 X

PHASE(S): PL X LO X OO DO LS

REDUNDANCY SCREEN: A-PASS B-FAIL C-PASS

PREPARED BY:		APPROVED BY:		APPROVED BY (NASA):	
DES	J BROWN	DES		EPDC SSM	
				MPS SSM	05-10-88
REL	F DEFENSOR	REL	5-6-88	EPDC REL	
				MPS REL	5/11/88
QE	D MASAI	QE	5-6-88	QE	

ITEM:
CONTROLLER, HYBRID DRIVER (HDC), TYPE III, LH2 HIGH POINT BLEED VALVE OPEN SOLENOID (LV79).

FUNCTION:
CONDUCTS MAIN BUS POWER TO OPEN SOLENOID OF LH2 HIGH POINT BLEED VALVE. THE TWO HDCs III ARE IN SERIES. 54V76A121J6(F'), J3(69).

FAILURE MODE:
INADVERTENT OUTPUT, FAILS "ON", FAILS TO TURN "OFF".

CAUSE(S):
PIECE PART FAILURE, CONTAMINATION, VIBRATION, MECHANICAL SHOCK, PROCESSING ANOMALY, THERMAL STRESS.

EFFECT(S) ON:
(A)SUBSYSTEM (B)INTERFACES (C)MISSION (D)CREW/VEHICLE (E)FUNCTIONAL CRITICALITY

(A) DEGRADATION OF REDUNDANCY AGAINST PREMATURE ACTUATION OF OPEN SOLENOID.

(B) FIRST FAILURE - NO EFFECT, SERIES HDC PREVENTS PREMATURE ACTUATION OF OPEN SOLENOID.

(C,D) FIRST FAILURE - NO EFFECT.

(E) CASE I: 1R/2, 1 SUCCESS PATH AFTER FIRST FAILURE.
TIME FRAME - PRELAUNCH.
1) HDC FAILS "ON".
2) SERIES HDC FAILS "ON" CAUSING HIGH POINT BLEED VALVE (PV22) TO OPEN.

LCC REQUIRES VALVE TO BE CLOSED AT T-10 SECONDS (ONE TIME VERIFICATION). AFTER T-10 SECONDS FAILURES WILL RESULT IN CONTINUED BLEED FLOW. BLEED DISCONNECT (PD17) IS NOT CERTIFIED FOR CLOSURE UNDER FLOW CONDITIONS AND CANNOT BE CONSIDERED AS A REDUNDANCY AGAINST OVERBOARD LEAKAGE. POSSIBLE RUPTURE OF DISCONNECT HOUSING AND/OR DOWNSTREAM BLEED SYSTEM DUE TO WATER HAMMER.

LH2 WILL DUMP OVERBOARD RESULTING IN LOSS OF PROPELLANT AND POSSIBLE PREMATURE ENGINE SHUTDOWN. POSSIBLE AFT COMPARTMENT OVERPRESS. FIRE/EXPLOSIVE HAZARD BOTH INTERIOR AND EXTERIOR TO THE VEHICLE. POSSIBLE UNCONTAINED ENGINE DAMAGE DUE TO PUMP CAVITATION. POSSIBLE VIOLATION OF ET MINIMUM STRUCTURAL REQUIREMENTS DUE TO REDUCED ULLAGE PRESSURE.

FAILS B SCREEN DUE TO SERIES CIRCUIT CONFIGURATION.

CASE II: 1R/3, 2 SUCCESS PATHS AFTER FIRST FAILURE.
TIME FRAME - ASCENT.
1) HDC FAILS "ON".
2) SERIES HDC FAILS "ON" CAUSING HIGH POINT BLEED VALVE (PV22) TO OPEN.
3) BLEED DISCONNECT (PD17) FAILS TO REMAIN CLOSED.

LH2 WILL DUMP OVERBOARD RESULTING IN LOSS OF PROPELLANT AND POSSIBLE PREMATURE ENGINE SHUTDOWN. FIRE/EXPLOSIVE HAZARD EXTERIOR TO THE VEHICLE. POSSIBLE UNCONTAINED ENGINE DAMAGE DUE TO PUMP CAVITATION. POSSIBLE VIOLATION OF ET MINIMUM STRUCTURAL REQUIREMENTS DUE TO REDUCED ULLAGE PRESSURE. POSSIBLE LOSS OF CREW/VEHICLE.

FAILS B SCREEN DUE TO SERIES CIRCUIT CONFIGURATION.

DISPOSITION & RATIONALE:
(A)DESIGN (B)TEST (C)INSPECTION (D)FAILURE HISTORY (E)OPERATIONAL USE

(A-D) FOR DISPOSITION AND RATIONALE:
REFER TO APPENDIX B, ITEM NO. 1 - HYBRID DRIVER CONTROLLER.

(B) GROUND TURNAROUND TEST
MDM COMMAND REDUNDANCY, V41AE0.081C,D EVERY FLIGHT.

(E) OPERATIONAL USE
NO CREW ACTION CAN BE TAKEN.

INSERT
DCP 5-13

INSERT FOR CIL 05-6J-2263 -2

EFFECTS SECTION (E)

IF THE LH2 BLEED VALVE FAILS TO REMAIN CLOSED BEFORE T-0 THE LH2 BLEED DISCONNECT WOULD BE CLOSING WITH A HYDROGEN FLOW OF 0.9 LBS/SEC THE LH2 BLEED DISCONNECT IS NOT CERTIFIED FOR CLOSURE UNDER FLOW. THE CLOSURE IS AT ONE "G" ACCELERATION RATE (T-0 UMBILICAL SEPARATION RATE). THE WATER HAMMER EFFECTS GENERATED DURING THIS CLOSURE HAS BEEN ANALYZED TO BE LESS THAN 60 PSIG. SYSTEM PROOF PRESSURE LEVEL IS 66 PSIG.