

SHUTTLE CRITICAL ITEMS LIST - ORBITER

JBSYSTEM : EPD&C - MAIN PROP. FMEA NO 05-6J -2048 -2 REV:06/16/88

ASSEMBLY : AFT LCA - 1, 3				CRIT. FUNC: 1R
P/N RI : MC477-0263-0002				CRIT. HDW: 3
P/N VENDOR:		VEHICLE	102 103 104	
QUANTITY : 4		EFFECTIVITY:	X X X	
: FOUR		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 <u>J BROWN</u>	DES <u>J. Brown</u>	EPDC SSM <u>[Signature]</u>
REL <u>F DEFENSOR</u>	REL <u>J. Kamala</u>	MPS SSM <u>[Signature]</u>
QE <u>DND MASAI</u>	QE <u>J. Brown</u>	EPDC REL <u>[Signature]</u>
		MPS REL <u>[Signature]</u>
		QE <u>[Signature]</u>

ITEM:

CONTROLLER, HYBRID DRIVER (HDC), TYPE III, LH2 RTLS REPRESSURIZATION VALVES OPEN SOLENOID (LV74/75).

FUNCTION:

CONDUCTS POWER TO OPEN SOLENOID OF LH2 RTLS REPRESSURIZATION VALVE. HDC IS IN SERIES WITH A DIODE AND A RPC IN EACH CIRCUIT. 54V76A121ARJ1(45), J3(100), 56V76A123ARJ6(F'), J11(C).

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 INADVERTENT ACTUATION OF OPEN SOLENOID.

(B) NO EFFECT - FIRST FAILURE. SERIES RPC PREVENTS INADVERTENT POWER TO LH2 RTLS REPRESSURIZATION VALVE OPEN SOLENOID.

(C,D) NO EFFECT - FIRST FAILURE.

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- (E) CASE I: 1R/3, 2 SUCCESS PATHS AFTER FIRST FAILURE.
TIME FRAME - ENGINE OPERATION.
- 1) HDC FAILS "ON".
 - 2) SERIES RPC FAILS "ON", RESULTING IN OPENING OF ONE OF TWO SERIES RTLS REPRESS VALVES.
 - 3) SERIES VALVE (LV74/75) FAILS TO REMAIN CLOSED.

LH2 RELIEF ISOLATION VALVE (FV8) WILL NOT PROVIDE REDUNDANT ISOLATION SINCE HELIUM WILL FORCE THE VALVE FLAPPER OPEN BEFORE THE LH2 RELIEF VALVE (RV6) WILL RELIEVE. RESULTS IN HELIUM ENTERING THE FEEDLINE MANIFOLD. THIS MAY CAUSE MULTIPLE UNCONTAINED ENGINE FAILURES DUE TO HELIUM BUBBLE INGESTION AND TURBOPUMP CAVITATION.

POSSIBLE LOSS OF CREW/VEHICLE.

CASE II: 1R/3, 2 SUCCESS PATHS AFTER FIRST FAILURE.

TIME FRAME - PRE LAUNCH, ASCENT, ENTRY.

- 1) HDC FAILS "ON".
- 2) SERIES RPC FAILS "ON", RESULTING IN OPENING OF ONE OF TWO SERIES RTLS REPRESS VALVES.
- 3) LINE LEAKAGE BETWEEN LV74 AND LV75.

DURING ASCENT, PNEUMATIC HELIUM SUPPLY WILL BE LOST. ESCAPING HELIUM MAY OVERPRESSURIZE THE AFT COMPARTMENT. RESULTS IN LOSS OF HELIUM FROM THE PNEUMATIC HELIUM SUPPLY.

DURING ENTRY, VENT DOORS ARE CLOSED TO PREVENT INGESTION OF RCS AND APU GASES. RUPTURE DURING THE TIME PERIOD THAT THE VENT DOORS ARE CLOSED MAY RESULT IN OVERPRESSURIZATION OF AFT COMPARTMENT. VENT DOORS ARE OPENED WHEN VEHICLE VELOCITY DROPS BELOW 2400 FT/SEC.

POSSIBLE LOSS OF CREW/VEHICLE.

CASE III: 1R/3, 3 SUCCESS PATHS AFTER FIRST FAILURE.

TIME FRAME - POST MECO.

- 1) HDC FAILS "ON".
- 2) SERIES RPC FAILS "ON", RESULTING IN OPENING OF ONE OF TWO SERIES RTLS REPRESS VALVES.
- 3) LINE LEAKAGE BETWEEN LV74/LV75.
- 4) CHECK VALVE CV30 FAILS TO CHECK.

AT MECO, THE LH2 FEEDLINE RELIEF ISOLATION VALVE (FV8) OPENS. HYDROGEN FROM THE LH2 MANIFOLD WILL LEAK THROUGH THE RUPTURE. POSSIBLE LOSS OF ADJACENT CRITICAL FUNCTIONS DUE TO CRYOGENIC EXPOSURE, AFT FUSELAGE FIRE/EXPLOSION, AND OVERPRESSURIZATION HAZARD.

POSSIBLE LOSS OF CREW/VEHICLE.

FAILS B SCREEN DUE TO SERIES CIRCUIT CONFIGURATION.

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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

COMPLETE ELECTRICAL VERIF V41AAO.120B, V41AAO.125B EVERY FLIGHT.

(E) OPERATIONAL USE

PNEUMATIC ACTUATION HELIUM BOTTLE PRESSURE IS ON A DEDICATED DISPLAY IN COCKPIT. CREW ACTION IS TO FOLLOW NORMAL LEAK ISOLATION PROCEDURE. PRIOR TO MECO, ISOLATION VALVES (LV7/LV8) WILL BE REOPENED AND THE LEFT ENGINE HELIUM CROSSOVER VALVE (LV10) WILL BE OPENED.

EFFECTIVE FOR OI-8D SOFTWARE, CR89397B "MPS PNEUMATIC SYSTEM FDA AND DISPLAY - BFS" ADDS PNEUMATIC TANK, REGULATOR, AND ACCUMULATOR PRESSURE TO THE S/M ALERT FDA SYSTEM AND ADDS THE 3 PRESSURE MEASUREMENTS TO THE BFS SYSTEM SUMMARY DISPLAY. THIS ALLOWS THE FLIGHT CREW TO RESPOND TO A PNEUMATIC HELIUM SYSTEM LEAK INDEPENDENT OF GROUND CONTROL.