

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : EPD&C - MAIN PROP. FMZA NO 05-6J -2090 -2 REV:09 02 88

ASSEMBLY : AFT LCA - 2, 3	CRIT. FUNC: 1R
P/N RI : MC477-0263-0002	CRIT. HDW: 3
P/N VENDOR:	VEHICLE 102 103 104
QUANTITY : 2	EFFECTIVITY: X X X
:TWC	PHASE(S): PL X LO 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>[Signature]</u>	EPDC SSM <u>[Signature]</u>
REL <u>J DEFENSOR</u>	REL <u>[Signature]</u>	MPS SSM <u>[Signature]</u>
QE <u>D MASAI</u>	QE <u>[Signature]</u>	EPDC REL <u>[Signature]</u>
		MPS REL <u>[Signature]</u>
		QE <u>[Signature]</u>

ITEM:

CONTROLLER, HYBRID DRIVER (HDC), TYPE III, LO2 OVERBOARD BLEED VALVE CLOSE SOLENOID (2V76).

FUNCTION:

CONDUCTS POWER TO CLOSE SOLENOID IN EACH REDUNDANT CIRCUIT FOR LO2 OVERBOARD BLEED VALVE. HDC IS IN SERIES WITH A DIODE AND RPC IN EACH CIRCUIT. 55V76A122ARJ3(53), 56V76A122ARJ3(54).

FAILURE MODE:

INADEVERTENT OUTPUT, FAILS "ON", FAILS TO TURN "OFF".

CAUSE(S):

PIECE PART FAILURE, CONTAMINATION, VIBRATION, MECHANICAL BRUSH PROCESSING ANOMALY, THERMAL STRESS.

EFFECT(S) ON:

(A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE (E) FUNCTIONAL CRITICALITY

(A) DEGRADATION OF REDUNDANCY AGAINST INADEVERTENT ACTUATION OF CLOSE SOLENOID.

(B,C,D) NO EFFECT - FIRST FAILURE.

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SUBSYSTEM : EPD&C - MAIN PROP. FMEA NO 05-6J -2090 -2 REV:09/02-98

- (E) CASE I: 1R/3, 3 SUCCESS PATHS AFTER FIRST FAILURE.
TIME FRAME - DETANK FOLLOWING FRF OR TANKING TEST.
- 1) HDC FAILS "ON".
 - 2) SERIES RPC OR HDC I FAILS "ON" CAUSING LO2 OVERBOARD BLEED VALVE (PV19) TO CLOSE/REMAIN CLOSED.
 - 3) INBOARD OR OUTBOARD FILL & DRAIN VALVES (PV9,10) FAIL TO OPEN/REMAIN OPEN.
 - 4) ONE OF THREE PREVALVES (PV1,2,3) OR ONE OF TWO LO2 POGC VALVES (PV20,21) FAILS TO CLOSE/REMAIN CLOSED OR HELIUM INJECT FAILS TO RESUME/CONTINUE.

TO PREVENT GEYSERING, PREVALVE CLOSURE IS REQUIRED TO LIMIT HEAT SOAKBACK FROM THE MAIN ENGINES INTO THE FEED SYSTEM. FOR PREVALVE FAILURE TO CLOSE, HELIUM INJECTION IS NOT SUFFICIENT TO PREVENT GEYSERING AND OVERBOARD BLEED MUST BE INITIATED WITHIN 2 MINUTES OR FILL/DRAIN DETANK MUST BE INITIATED WITHIN 12 MINUTES.

GEYSERING MAY RESULT IN FEEDLINE RUPTURE, EXTERNAL LEAKAGE OF LO2, AND POSSIBLE AFT COMPARTMENT OVERPRESSURIZATION. FIRE/EXPLOSIVE HAZARD BOTH INTERIOR AND EXTERIOR TO THE VEHICLE. POSSIBLE LOSS OF CRITICAL ADJACENT COMPONENTS DUE TO CRYO EXPOSURE. POSSIBLE LOSS OF CREW/VEHICLE.

FAILS B SCREEN DUE TO SERIES CIRCUIT CONFIGURATION.

- CASE II: 1R/3, 2 SUCCESS PATHS AFTER FIRST FAILURE.
TIME FRAME - PROPELLANT LOADING.
- 1) HDC FAILS "ON".
 - 2) SERIES RPC OR HDC I FAILS "ON" CAUSING LO2 OVERBOARD BLEED VALVE (PV19) TO CLOSE/REMAIN CLOSED.
 - 3) ONE OF THREE PREVALVES (PV1,2,3) OR ONE OF TWO LO2 POGC VALVES (PV20,21) FAILS TO CLOSE/REMAIN CLOSED OR HELIUM INJECT FAILS TO CONTINUE.

TO PREVENT GEYSERING, PREVALVE CLOSURE IS REQUIRED TO LIMIT HEAT SOAKBACK FROM THE MAIN ENGINES INTO THE FEED SYSTEM. FOR PREVALVE FAILURE TO CLOSE, HELIUM INJECTION IS NOT SUFFICIENT TO PREVENT GEYSERING AND OVERBOARD BLEED MUST BE INITIATED WITHIN 2 MINUTES OR FILL/DRAIN DETANK MUST BE INITIATED WITHIN 12 MINUTES. FOR UNPLANNED DETANK, OPENING THE FILL AND DRAIN VALVES TO BEGIN DRAIN CANNOT BE COUNTED AS A SUCCESS PATH SINCE IT REQUIRES A CREW AND/OR GROUND ACTION.

GEYSERING MAY RESULT IN FEEDLINE RUPTURE, EXTERNAL LEAKAGE OF LO2, AND POSSIBLE AFT COMPARTMENT OVERPRESSURIZATION. FIRE/EXPLOSIVE HAZARD BOTH INTERIOR AND EXTERIOR TO THE VEHICLE. POSSIBLE LOSS OF CRITICAL ADJACENT COMPONENTS DUE TO CRYO EXPOSURE. 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 VERIFICATION V41AB0.200B EVERY FLIGHT.

(E) OPERATIONAL USE

FLIGHT: N/A

GROUND: FOR LOSS OF BLEED DURING LOADING OR INABILITY TO ACHIEVE THE BLEED FOLLOWING TANKING TEST, PERFORM OMRSD FILE II REQUIREMENTS S00E00.122 TO SAFE MPS SYSTEM. MONITOR LO2 SYSTEM TEMPERATURE REQUIREMENTS: IF EXCEEDED, CLOSE LO2 PREVALVES AND POGO VALVES AND INITIATE DRAIN.

FOR INABILITY TO REESTABLISH BLEED WITHIN TWO MINUTES AFTER FRF ENGINE SHUTDOWN, PERFORM OMRSD FILE II REQUIREMENT S00E00.890. CLOSE POGO VALVES WITHIN 30 SECONDS AND INITIATE DRAIN WITHIN 12 MINUTES. AFTER ENGINE SHUTDOWN HELIUM INJECTION IS INITIATED WITHIN 30 SECONDS AND LO2 PREVALVES ARE CLOSED AS A ROUTINE OPERATION.

OMI S1303 (LO2 SYSTEM) SEQUENCE TITLED "EMERGENCY PROCEDURE FOR MAJOR LEAK OR FIRE..." CONTAINS SAFING SEQUENCE OF EVENTS FOR MAJOR LEAKS IN THE PROPELLANT SYSTEMS.

05-6J-162