

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : EPD&C - MAIN PROP.

FMEA NO 05-6J -2038 -3

REV: ^{5/5}04/25/88

ASSEMBLY : D & C PANEL R4
 P/N RI : ME452-0102-7356
 P/N VENDOR:
 QUANTITY : 1
 : ONE
 :

VEHICLE 102 103 104
 EFFECTIVITY: X X X
 PHASE(S): PL X LO X OO DO LS

CRIT. FUNC: 1
 CRIT. HDW: 1

REDUNDANCY SCREEN: A- B- C-

PREPARED BY:

APPROVED BY:

APPROVED BY (NASA):

DES *J. BROWN*

DES *R. Brown*

EPDC SSM *Conc'd for cr. st.*

REL F DEFENSOR *g*

REL *McLaren Cl. Hore 5-6-88*

MPS SSM *5-12-88*

QE *g* D MASAI

QE *J. J. Cowen 5-6-88*

EPDC REL *Howe, Howard, & Styles*

MPS REL *Present of time critical*

QE *J. J. Cowen*

ITEM:

TOGGLE SWITCH (THREE POLES, THREE POSITIONS, LEVER LOCKED), LH2 INBOARD FILL/DRAIN, TOPPING, AND HIGH POINT BLEED VALVES. (PV12, 13, 22).

FUNCTION:

PROVIDES MANUAL CONTROL OF POWER TO LH2 INBOARD FILL/DRAIN, TOPPING, AND HIGH POINT BLEED VALVES. 32V73A4S9.

FAILURE MODE:

FAILS CLOSED, CONTACT-TO-CONTACT SHORT, POLE-TO-POLE SHORT-"OPEN" COMMAND CONTACTS.

CAUSE(S):

PIECE PART STRUCTURAL FAILURE, CONTAMINATION, VIBRATION, MECHANICAL SHOCK, PROCESSING ANOMALY.

EFFECT(S) ON:

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

(A) INADVERTENT SWITCH OPEN COMMAND TO LH2 FILL/DRAIN, TOPPING, AND/OR HIGH POINT BLEED VALVE OPEN SOLENOIDS.

(B) PREMATURE OPENING OF THE FILL/DRAIN, TOPPING, AND/OR HIGH POINT BLEED VALVES. MDM CLOSE COMMANDS ARE INEFFECTIVE AS LONG AS THE SWITCH OPEN COMMANDS ARE PRESENT.

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~~DEF~~ 5-17

(C,D) POSSIBLE LOSS OF CREW/VEHICLE.

CASE I: PRELAUNCH

LCC REQUIRES HIGH POINT BLEED VALVE (PV22) TO BE CLOSED AT T-10 SECONDS (ONE TIME VERIFICATION). AFTER T-10 SECONDS FAILURE 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.

CASE II: DURING ENGINE OPERATION

FAILURE WILL RESULT IN OPENING OF INBOARD FILL/DRAIN VALVE (PV12). LH2 WILL ENTER FILL LINE. DISPLACED GAS MAY ENTER ENGINE CAUSING POSSIBLE PUMP CAVITATION AND UNCONTAINED ENGINE DAMAGE. POSSIBLE SHUTDOWN OF ONE OR MORE SSMEs. LOSS OF REDUNDANCY TO PROTECT AGAINST OVERBOARD LEAKAGE OF PROPELLANT.

DISPOSITION & RATIONALE:

(A) DESIGN (B) TEST (C) INSPECTION (D) FAILURE HISTORY (E) OPERATIONAL USE

(A-D) FOR DISPOSITION AND RATIONALE:

REFER TO APPENDIX A, ITEM NO. 1 - TOGGLE SWITCH.

(B) GROUND TURNAROUND TEST

COPPER PATH VERIFICATION, V41ABO.121A EVERY FLIGHT.

(E) OPERATIONAL USE

NO CREW ACTION CAN BE TAKEN.

INSERT

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INSERT FOR CIL 05-6J-2038-3
EFFECTS SECTION (C,D)

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.