SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :EPD&C - MAIN PROP. FMEA NO 05-6J -2033 -1 REV:06/20/88

ASSEMBLY :AFT PCA - 4, 5, 6
P/N RI :MC455-0129-0001
P/N VENDOR:
QUANTITY :6
:SIX
:

CRIT. FUNC: 1R
CRIT. HDW: 3

VEHICLE EFFECTIVITY:	102	103	104
	X	X	X

PHASE(S): PL 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	
REL	F DEFENSOR	REL	J Kamura 6/27/88	MPS SSM	
QE	D MASAI	QE	D J Conner 6/27/88	EPDC REL	
				MPS REL	
				QE	

ITEM:
RELAY, GENERAL PURPOSE, GH2/GO2 FLOW CONTROL VALVE (LV53/54/55/56/57/58), CLOSE SOLENOID.

FUNCTION:
PROVIDES OUTPUT TO SIGNAL CONDITIONER FROM EITHER PRIMARY OR STANDBY ULLAGE PRESSURE TRANSDUCER.
54V76A134K1, K2. 55V76A135K1, K2. 56V76A136K1, K2.

FAILURE MODE:
OPEN, FAILS TO CONDUCT, INADVERTENTLY OPENS, FAILS TO TRANSFER.

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) LOSS OF NO. 4 TRANSDUCER CAPABILITY. NO EFFECT UNLESS PRIMARY TRANSDUCER FAILS.

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

(E) CASE I: LO2/LH2 "LOW" FAILURES.

1R/3, 2 SUCCESS PATHS AFTER FIRST FAILURE.
TIME FRAME - ASCENT.
1) PRELAUNCH, PRIMARY ULLAGE TRANSDUCER FAILS WITH ERRONEOUS LOW OUTPUT AND IS REPLACED WITH NO. 4 TRANSDUCER.
2) RELAY FAILS OPEN AFTER LIFTOFF, RETURNING CONTROL OF ASSOCIATED FLOW CONTROL VALVE TO FAULTY PRIMARY TRANSDUCER. VALVE IS COMMANDED OPEN.
3) INADVERTENT DEACTUATION OF SECOND FLOW CONTROL VALVE CLOSE SOLENOID.

RESULTS IN EXCESSIVE ULLAGE PRESSURE CAUSING ET VENT VALVE TO RELIEVE EXCESS PRESSURE. POTENTIAL FIRE/EXPLOSION HAZARD EXTERIOR TO THE VEHICLE. POSIBLE VIOLATION OF THE ET MAXIMUM STRUCTURAL CAPABILITY REQUIREMENTS. POSSIBLE LOSS OF CREW/VEHICLE.

CASE II: LH2 "HIGH" FAILURES.

1R/3, 2 SUCCESS PATHS AFTER FIRST FAILURE.
TIME FRAME - ASCENT.
1) PRELAUNCH, PRIMARY ULLAGE TRANSDUCER FAILS WITH ERRONEOUS HIGH OUTPUT AND IS REPLACED WITH NO. 4 TRANSDUCER.
2) RELAY FAILS OPEN AFTER LIFTOFF, RETURNING CONTROL OF ASSOCIATED FLOW CONTROL VALVE TO FAULTY PRIMARY TRANSDUCER. VALVE IS COMMANDED CLOSED.
3) INADVERTENT ACTUATION OF SECOND FLOW CONTROL VALVE CLOSE SOLENOID.

RESULTS IN INSUFFICIENT PRESSURIZATION GAS TO MAINTAIN LH2 ULLAGE PRESSURE IN THE REQUIRED FLIGHT CONTROL BAND (32-34 PSIA). POSSIBLE VIOLATION OF TANK MINIMUM STRUCTURAL CAPABILITY REQUIREMENTS AND UNCONTAINED SSME SHUTDOWN DUE TO LOW NPSP. POSSIBLE LOSS OF CREW/VEHICLE.

CASE III: LO2 "HIGH" FAILURES.

1R/3, 2 SUCCESS PATHS AFTER FIRST FAILURE.
TIME FRAME - ASCENT.
1) PRELAUNCH, PRIMARY ULLAGE TRANSDUCER FAILS WITH ERRONEOUS HIGH OUTPUT AND IS REPLACED WITH NO. 4 TRANSDUCER.
2) RELAY FAILS OPEN AFTER LIFTOFF, RETURNING CONTROL OF ASSOCIATED FLOW CONTROL VALVE TO FAULTY PRIMARY TRANSDUCER. VALVE IS COMMANDED CLOSED.
3) INADVERTENT ACTUATION OF SECOND FLOW CONTROL VALVE CLOSE SOLENOID.

LOSS OF ET LO2 ULLAGE PRESSURE WILL RESULT IN VIOLATION OF TANK MINIMUM STRUCTURAL CAPABILITY REQUIREMENTS. MASS OF LO2 AND VEHICLE ACCELERATION SHOULD BE SUFFICIENT TO MAINTAIN PROPER ENGINE NPSP, DELAYING UNCONTAINED SSME SHUTDOWN DUE TO LOW NPSP UNTIL LATE IN POWERED FLIGHT. POSSIBLE LOSS OF CREW/VEHICLE.

FAILS B SCREEN BECAUSE NO INSTRUMENTATION IS AVAILABLE TO DETECT FAILURE.

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

(A-D) DISPOSITION AND RATIONALE:
REFER TO APPENDIX C, ITEM NO. 2 - GENERAL PURPOSE RELAY.

(B) GROUND TURNAROUND TEST
PRESS CNTL REDUNDANCY W/ET SIM V41ACO.030B,D,F; V41ACO.060B,D,F EVERY FLIGHT

(E) OPERATIONAL USE
NO CREW ACTION CAN BE TAKEN FOR LOSS OF GO2 ULLAGE PRESSURE CONTROL OR FAILURES WHICH RESULT IN EXCESSIVE GH2 ULLAGE PRESSURE. THE FOLLOWING ACTIONS CAN BE TAKEN FOR LOW GH2 ULLAGE PRESSURE:

LH2 ULLAGE PRESSURE IS ON SYSTEMS MANAGEMENT (SM) ALERT. CREW WILL OPEN THE LH2 FLOW CONTROL VALVES (VIA COCKPIT SWITCH S53 ON PANEL R2) FOR A LOW LH2 ULLAGE PRESSURE CONDITION.

IF THE LH2 NPSP DROPS BELOW THE PRE-FLIGHT ACCEPTED LEVELS (PER FLIGHT RULES), THE CREW WILL MANUALLY THROTTLE THE ENGINES TO KEEP THE NPSP HIGH ENOUGH TO PREVENT LH2 TURBOPUMP CAVITATION.