SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :ORBITAL MANEUVER FMEA NO 03-3 -1006 -2 REV: 3/20/86

ASSEMBLY :PRESSURIZATION SUBSYSTEM
P/N RI :MC621-0059
P/N VENDOR:73P620004-1003
QUANTITY :4
:TWO PER POD
:

CRIT. FUNC: 1R
CRIT. HDW: 2

VEHICLE EFFECTIVITY:	102	103	104
	X	X	X

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

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

PREPARED BY:		APPROVED BY:	APPROVED BY (NASA):
DES	D W CARLSON	DES	SSM
REL	C M AKERS	REL	REL
QE	W J SMITH	QE	8-26-86

ITEM:
VALVE, VAPOR ISOLATION, SOLENOID, NORMALLY CLOSED, SPRING LOADED. (LV404, 406, 504, 506).

FUNCTION:
VALVES ARE USED TO FURTHER INHIBIT OXIDIZER VAPOR MIGRATION THROUGH THE CHECK VALVE, THEREBY PREVENTING CORROSION OR DAMAGE OF UPSTREAM COMPONENTS OR VAPOR CROSSOVER TO FUEL SIDE. THE SIGNAL TO EITHER HELIUM ISOLATION VALVE ALSO GOES TO BOTH VAPOR ISOLATION VALVES (RPC'S) TO ALLOW HELIUM FLOW FROM EITHER REGULATOR PATH. (PARALLEL REDUNDANT VALVES PROVIDED).

FAILURE MODE:
FAILS CLOSED, FAILS TO OPEN, FAIL TO REMAIN OPEN, RESTRICTED FLOW.

CAUSE(S):
ELECTRICAL FAILURE - COIL SHORT, (BELLOWS LEAK, PROPELLANT VAPOR EXPOSURE), JAMMING OF POPPET, CONTAMINATION, SPRING, PLUGGED ORIFICE/FILTER, SHOCK, VIBRATION.

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

(A,B) LOSS OF REDUNDANCY (ONE OF 2 FLOW PATHS).

(C) NO EFFECT.

(D) NO EFFECT.

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(E) FUNCTIONAL CRITICALITY EFFECT - POSSIBLE CREW/VEHICLE LOSS. FAILED CLOSED OF REDUNDANT FLOW PATHS WOULD RESULT IN MIXTURE RATIO PROBLEMS & INABILITY TO UTILIZE/DEPLETE PROPELLANT WITH RESULTANT INABILITY TO DEORBIT OR MAINTAIN SAFE C.G. FOR ENTRY. RESTRICTED FLOW OF INDIVIDUAL VALVES NOT DETECTABLE (BOTH VALVES USED FOR ALL OMS BURNS).

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

(A) DESIGN
THE FACTOR OF SAFETY FOR PROOF PRESSURE IS 1.5 AND 2.0 FOR BURST PRESSURE. FLOW INDUCED OSCILLATION ANALYSIS WAS INCONCLUSIVE; NO TEST WAS CONDUCTED. WAIVER NO.83 TO JSC 077700, VOLUME 10, PAR 3.2.2.1.1B (LEVEL II) APPROVED USE OF THIS ITEM. PROPELLANT COMPATIBLE MATERIALS ARE UTILIZED IN THE FLUID PORTION OF THE VALVE. MANUAL ISOLATION VALVES PROVIDE ADDITIONAL VAPOR MIGRATION PROTECTION DURING INACTIVE GROUND PERIODS. THE ELECTRICAL CAVITY IS ISOLATED FROM THE FLUID SECTION BY A BELLOWS ASSEMBLY. PARALLEL FLOW PATHS ARE PROVIDED. A 100-MICRON FILTER IS PROVIDED TO LIMIT THE POSSIBILITY OF CONTAMINATION CAUSING LEAKAGE, JAMMING MOVING PARTS OR PLUGGING PILOT CONTROL ORIFICES. THE COIL LEAD AND MAGNET WIRES ARE ENCAPSULATED BY POTTING AND A FIXTURE IS USED DURING ASSEMBLY TO ENSURE THAT INSULATION IS NOT DAMAGED BY THE EXIT NOTCH WHEN THE COIL SLEEVE IS PRESSED ONTO THE COIL.

(B) TEST

QUALIFICATION TESTS
(3 UNITS) - RANDOM VIBRATION - 48 MINUTES EACH AXIS (100 MISSION EQUIVALENT), SHOCK - BENCH AND OPERATIONAL USE. THERMAL - (+210 TO -30 DEG F.). ENDURANCE - 480 OPERATIONAL CYCLES (ON/OFF FLOW). BURST TEST - 10000 PSI. ALSO QUALIFIED AS PART OF POD ASSEMBLY - VIBRO-ACOUSTIC TESTING AT JSC (131 EQUIVALENT MISSIONS). HOT-FIRE TEST PROGRAM AT WSTF (24 EQUIVALENT MISSIONS).

ACCEPTANCE TEST
(EACH UNIT) - PROOF PRESSURE, FUNCTIONAL TESTS, INTERNAL LEAKAGE TESTS PERFORMED BEFORE AND AFTER OPERATING CYCLES.

GROUND TURNAROUND
V43CA0.040 PERFORMS SOLENOID ISOLATION VALVE ELECTRICAL VERIFICATION FOR THE FIRST FLIGHT.
V43CA0.070/072 PERFORMS REDUNDANT CIRCUIT VERIFICATION, ORBITER/POD, PERIODICALLY AND EVERY FLIGHT.
V43CA0.075 PERFORMS ELECTRICAL INTERFACE VERIFICATION, ORBITER/POD, ON A CONTINGENCY BASIS.
V43CF0.025 PERFORMS HELIUM SYSTEM ACTIVATION EVERY FLIGHT.
V43CF0.020 PERFORMS HELIUM SERVICING TO FLIGHT LOADS AND SYSTEM FLUIDS ARE ANALYZED FOR COMPLIANCE TO SPECIFICATION REQUIREMENTS (SE-S-0073).

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(C) INSPECTION

RECEIVING INSPECTION
MATERIALS AND PROCESSES CERTIFICATIONS VERIFIED BY INSPECTION.

CONTAMINATION CONTROL
CLEANLINESS TO LEVEL 100A VERIFIED BY INSPECTION. CORROSION PROTECTION PROVISIONS VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION
DIMENSIONAL INSPECTION OF COMPONENTS PERFORMED DURING FABRICATION. CRITICAL DIMENSION AND SURFACE FINISHES VERIFIED BY INSPECTION. MANUFACTURING, ASSEMBLY AND INSTALLATION PROCEDURES VERIFIED BY INSPECTION. INSPECTION VERIFIES THAT SEALS WERE NOT DAMAGED DURING ASSEMBLY.

CRITICAL PROCESSES
THE WELDING PROCESS AND VERIFICATION THAT WELDS MEET SPECIFICATION REQUIREMENTS ARE VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION
PENETRANT AND RADIOGRAPHIC INSPECTION OF WELDS ARE VERIFIED BY INSPECTION.

TESTING
FUNCTIONAL TESTING OF ELECTRICAL COMPONENTS AT LOWEST ASSEMBLY LEVEL VERIFIED BY INSPECTION. ATP VERIFIED BY INSPECTION. TEST EQUIPMENT AND TOOL CALIBRATION VERIFIED BY INSPECTION.

HANDLING/PACKAGING
HANDLING, PACKAGING, STORAGE AND SHIPPING REQUIREMENTS VERIFIED BY INSPECTION.

(D) FAILURE HISTORY
NO FAILED CLOSED, FAILED TO REMAIN OPEN, OR RESTRICTED FLOW CONDITION OF THE CURRENT VALVE DESIGN HAS OCCURRED.

(E) OPERATIONAL USE
CONTINUE MISSION USING PARALLEL FLOW PATH. ULLAGE BLOWDOWN IS ADEQUATE FOR DEORBIT AFTER OMS -2 FOR TYPICAL MISSIONS (APPROX 60 PERCENT ULLAGE REQUIRED FOR MAX BLOWDOWN). TYPICAL DEORBIT BURN REQUIRES LESS THAN 30 PERCENT PROPELLANT.