SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :PURGE, VENT & DRAIN FMEA NO 01-5 -332405-1 REV:09/24/87

ASSEMBLY :WCCS
P/N RI :MC284-0437
P/N VENDOR:
QUANTITY :10
:TEN
:

CRIT. FUNC: 1R
CRIT. HDW: 2

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

REDUNDANCY SCREEN: A-PASS B-N/A C-PASS

PREPARED BY:
DES F A FERRIS
REL J S MULLEN
QE

APPROVED BY:
DES
REL
QE

APPROVED BY (NASA):
SSM
REL
QE

ITEM:
VALVE, RELIEF, ASCENT AND DESCENT.

FUNCTION:
THESE VALVES OPEN TO ALLOW WINDOW CAVITY VENTING IN THE EVENT OF BLOCKAGE OF THE DESICCANT CANISTER ASSEMBLY. THEY ACT TO PREVENT BACKFLOW OF AMBIENT ATMOSPHERE INTO THE OUTER WINDOW CAVITIES.

FAILURE MODE:
FAILS TO OPEN

CAUSE(S):
CONTAMINATION, GALLING.

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

(A,B,C) NONE. TWO INDEPENDENT MEANS OF VENTING THE WINDOW CAVITIES EXIST. THIS VALVE WILL ONLY BE CALLED UPON TO OPERATE IN THE EVENT THAT THE DESICCANT/FILTER ASSEMBLIES ARE BLOCKED.

(D) IF THE DESICCANT IS BLOCKED, AND THE RELIEF VALVE FAILS TO OPEN, THE THERMAL PANE WILL RUPTURE WITH POTENTIAL LOSS OF CREW/VEHICLE.

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

(A) DESIGN
THIS VALVE SERVES AS A STANDBY COMPONENT TO PROVIDE A REDUNDANT VENT PATH FOR THE DESICCANT CANISTER ASSEMBLY. THE VALVE IS PRESSURE ACTUATED BY MEANS OF A SPRING RESTRAINED POPPET. THE MAXIMUM VALVE OPERATING BURST PRESSURE IS 1.32 PSID. A SIMILAR VENDOR VALVE WAS SUBJECTED TO 520 PSID BURST WITH NO EVIDENCE OF VALVE DAMAGE WHICH IS A FACTOR OF SAFETY (F.O.S.) OF 394. THE F.O.S. IS 6 BY ANALYSIS FOR THE ULTIMATE CRUSH PRESSURE OF 16.2 PSID.

(B) TEST

THE VALVE WAS SUBJECTED TO A SPECIFICATION RANDOM VIBRATION ENVIRONMENT - FOR THE EQUIVALENT OF 400 MISSION EXPOSURE. THE VALVE SUBSEQUENTLY PASSED FUNCTIONAL DESIGN CRACKING PRESSURE TESTS. THE VALVE IS SUBJECTED TO PROOF PRESSURE, EXTERNAL LEAKAGE, INTERNAL LEAKAGE, CRACKING PRESSURE, DROP, AND EVACUATED PRESSURE DURING ACCEPTANCE TEST PER ACCEPTANCE TEST TM473. EACH TURNAROUND, THE VALVE IS FUNCTIONALLY RETESTED (CRACKING PRESSURE) PER THE OMRSD.

(C) INSPECTION

RECEIVING INSPECTION
RAW MATERIAL VERIFIED BY INSPECTION BY MEANS OF SUPPLIER CERTIFICATIONS.

CONTAMINATION CONTROL
INSPECTION PROVIDES CLEANLINESS VERIFICATION THAT VALVE HAS BEEN CLEANED TO LEVEL 300. PASSIVATION IS VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION
TORQUING OPERATIONS AND LUBRICATION OF SEALS AND THREADS ARE VERIFIED BY INSPECTION. SPRING, SPRING GUIDE, POPPET, AND "O" RING INSTALLATION ARE VERIFIED BY INSPECTION.

(D) FAILURE HISTORY
ONE CHECK VALVE HAS FAILED TO OPEN WITHIN THE SPECIFIED CRACKING PRESSURE RANGE OF 0.4 TO 0.6 PSID. THE CAUSE OF THE FAILURE WAS DETERMINED TO BE LOSS OF O-RING SEAL LUBRICANT DUE TO OUT-GASSING AND/OR MIGRATION OF THE LUBRICANT AFTER LONG DURATION USAGE OR EXTENDED STORAGE. A REQUIREMENT IN THE LIMITED SHELF LIFE SPECIFICATION CALLS FOR PERIODIC LUBRICATION OF THE O-RING SEALS TO PREVENT FURTHER FAILURES. REFERENCE CORRECTIVE ACTION RECORD (CAR) AC7706.

(E) OPERATIONAL USE
OPERATIONAL EFFECTS - DURING THE ASCENT PHASE, IF ALL REDUNDANCY TO THIS FUNCTION IS LOST, THE THERMAL PANE WILL RUPTURE AND AN RTLS WILL BE DECLARED DEPENDING ON THE FLIGHT STATE. CREW ACTION - NONE. MISSION CONSTRAINT - NONE.