

SHUTTLE CRITICAL ITEMS LIST - ORBITER

UBSYSTEM : ATMOSPHERIC REVIT. FMEA NO 06-1C -0207 -3 REV:01/07/88

ASSEMBLY : ATMOS VENTING CONTROL CRIT. FUNC: 1R
 /N RI : MC250-0002-0075 CRIT. HDW: 2
 /N VENDOR: 2725-0001 CARLETON VEHICLE 102 103 104
 QUANTITY : 2 EFFECTIVITY: X X X
 : ONE PER VALVE PHASE(S): PL X LO X OO X DO X LS X
 : TWO PER SUBSYSTEM

REPAIRED BY: APPROVED BY: REDUNDANCY SCREEN: A-PASS B-FAIL C-PASS
 ES M. PRICE *M.P.* DES *[Signature]* APPROVED BY (NASA) *[Signature]*
 EL N. L. STEISLINGER *NLS* REL *[Signature]* SSM *[Signature]*
 E M. SAVALA QE *[Signature]* REL *[Signature]* QE *[Signature]*

ITEM: VALVE CAP - CABIN NEGATIVE PRESSURE RELIEF

FUNCTION: PROVIDES REDUNDANT SEALING FOR THE CABIN NEGATIVE PRESSURE RELIEF VALVE. CAN BE MANUALLY OPENED OR WILL AUTOMATICALLY OPEN WHEN THE NEGATIVE PRESSURE DIFFERENTIAL REACHES 0.5 PSI. THE CAP INCLUDES A FLAPPER TYPE RELIEF VALVE TO RELIEVE DELTA-P ACROSS THE CAP TO PREVENT MINOR PRESSURE FLUCTUATION FROM OPENING THE CAP. THIS CAP IS INTEGRAL TO THE NEGATIVE PRESSURE RELIEF VALVE ASSEMBLY.

FAILURE MODE: INTERNAL, EXTERNAL LEAKAGE

CAUSE(S): MECHANICAL SHOCK, VIBRATION, CORROSION, CONTAMINATION, SEAL MATERIAL DEGRADATION, MATERIAL DEFECT

EFFECT(S) ON:
 (A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE
 (A) LOSS OF ONE REDUNDANT SEAL FOR CABIN ATMOSPHERE CONTAINMENT.
 (B,C,D) NO EFFECT.
 (E) FUNCTIONAL CRITICALITY EFFECT - SECOND ASSOCIATED FAILURE, NEGATIVE PRESSURE RELIEF VALVE INTERNAL LEAKAGE, RESULTS IN LOSS OF CABIN ATMOSPHERE. SCREEN B FAILS BECAUSE FAILURE OF THE CAP CANNOT BE DETECTED UNLESS THE RELIEF VALVE ALSO LEAKS INTERNALLY.

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

(A) DESIGN
 VALVE CAP IS LIGHTLY SPRING ASSISTED AND COMPRISES A COVER HOUSING WITH INTEGRAL FLAPPER VALVE AND GUIDE SCREWS. THE SILICONE RUBBER FLAPPER VALVE WITH INTEGRAL FILTER IS DESIGNED TO PREVENT MINOR PRESSURE PERTURBATIONS FROM ACTUATING THE COVER WHILE ASSURING LEAK FREE OPERATION. VALVE CAP IS DESIGNED TO AUTOMATICALLY ACTUATE AFTER THE PRIMARY POPPET OPENS. CAP IS FABRICATED OF 6061-T6 ALUMINUM ALLOY AND

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THE FLAPPER IS MADE OF SILASTIC 675 SILICONE RUBBER. THE ALUMINUM CAP ANODIZED TO PROTECT THE SURFACE FROM CORROSION. STATIC SEALS ARE SILASTIC 675. SILASTIC 675 SILICONE RUBBER HAS GOOD RESISTANCE TO ENVIRONMENTAL EXPOSURE, FLEXING AND FATIGUE. IT ALSO HAS LOW FLAMMABILITY AND OUTGASSING. THE OZONE RESISTANCE OF SILICONE RUBBER IS EXCELLENT.

(B) TEST

ACCEPTANCE TEST - PER ATP 2725-3. REVERSE DIRECTION PROOF PRESSURE AT 25 +/- 0.1 PSIG WITH COVER ON AND POPPET OPEN; REVERSE DIRECTION PROOF PRESSURE AT 25 +/- 0.1 PSIG WITH COVER OFF AND POPPET CLOSED; LEAKAGE IN REVERSE DIRECTION AT 2 +/- 0.1 PSIG AND AT 15 +/- 0.15 PSIG WITH COVER ON AND POPPET OPEN; LEAKAGE IN THE REVERSE DIRECTION AT 2 +/- 0.1 AND AT 15 +/- 0.15 PSIG WITH COVER OFF AND POPPET CLOSED; POPPET CRACKING AND RESEAT PRESSURE MEASUREMENT; AND FLAPPER VALVE OPERATION.

QUALIFICATION TESTING - PER QTP 2725-3. LIFE CYCLE TESTING - COVER DEPLOYED AND VALVE POPPET OPENED FULL STROKE FOR 200 CYCLES. RANDOM VIBRATION SPECTRUM - 20 TO 150 HZ INCREASING AT 6 DB/OCTAVE TO 0.09 G**2/HZ AT 150 HZ. CONSTANT AT 0.09 G**2/HZ FROM 150 TO 900 HZ, DECREASING AT 9 DB/OCTAVE FROM 1000 TO 2000 HZ FOR 48 MINUTES PER AXIS FOR THREE ORTHOGONAL AXES. DESIGN SHOCK - 20 G TERMINAL PEAK, 11 MS SHOCK PULSE IN EACH DIRECTION OF THREE ORTHOGONAL AXES. BURST PRESSURE TEST - 32 PSID FOR 2 MINUTES. ATP TO VERIFY LEAKAGE IS PERFORMED AFTER SHOCK AND VIBRATION TESTING.

OMRSD - LEAK TEST IS PERFORMED DURING COUNTDOWN (2 PSID CABIN INTEGRITY TEST) ON CAP WHICH IS USED AS A BACKUP SEAL TO THE RELIEF VALVE.

(C) INSPECTION

RECEIVING INSPECTION

RAW MATERIAL VERIFIED BY INSPECTION FOR MATERIAL AND PROCESS CERTIFICATION.

CONTAMINATION CONTROL

CONTAMINATION CONTROL VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

RAW MATERIAL INSPECTED PRIOR TO MACHINING. IN-PROCESS INSPECTION FOR CRITICAL DIMENSIONS VERIFIED. MANDATORY INSPECTION POINTS ARE INCLUDED IN THE ASSEMBLY PROCEDURE.

CRITICAL PROCESSES

ANODIZING AND HEAT TREATMENT ARE VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION

X-RAY AND PENETRANT VERIFIED BY INSPECTION.

TESTING

ATP WITNESSED BY INSPECTION.

HANDLING/PACKAGING

HANDLING, PACKAGING, STORAGE AND SHIPPING PROCEDURES ARE VERIFIED.

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FAILURE HISTORY

NO FAILURE HISTORY APPLICABLE TO INTERNAL/EXTERNAL LEAKAGE FAILURE MODE.
THE RELIEF VALVE CAP HAS SUCCESSFULLY BEEN USED THROUGH THE SHUTTLE
PROGRAM FOR THIS FAILURE MODE.

(E) OPERATIONAL USE

1. CREW ACTION
NONE.

2. TRAINING
NONE.

3. OPERATIONAL CONSIDERATION
FAILURE IS UNDETECTABLE IN FLIGHT.