

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :ATMOSPHERIC REVIT. FMEA NO 06-1C -0203 -3 REV:01/06/88

ASSEMBLY :ATMOS VENTING CONTROL					CRIT. FUNC:	
P/N RI :MC250-0002-0090					CRIT. HDW:	1
P/N VENDOR:2874-0001-3 CARLETON	VEHICLE	102	103	104		
QUANTITY :1	EFFECTIVITY:	X	X	X		
:TWO BUTTERFLY VALVES	PHASE(S):	PL	LO X	OO X	DO X	LS
: IN ONE HOUSING						

PREPARED BY:	DES M. PRICE <i>WLP</i>	REL N. L. STEISLINGER <i>NLS</i>	QE W. J. SMITH	REDUNDANCY SCREEN:	A-	B-	C-
APPROVED BY:	DES <i>Michael...</i>	REL <i>...</i>	QE <i>...</i>	APPROVED BY (NASA):	SSM	REL	QE

ITEM:
BLEED VALVE - CABIN PRESSURE, MOTOR OPERATED

FUNCTION:
PROVIDES FOR VENTING THE CREW COMPARTMENT THROUGH THE AFT BULKHEAD FOLLOWING A 2 PSID PRELAUNCH PRESSURE TEST. THESE TWO VALVES (CABIN VENT AND VENT ISOLATION) WORK IN SERIES TO ALLOW 16-20 LB/MIN OF AIR TO FLOW OUT OF THE CABIN. VALVE IS MOUNTED ON THE XO 576 BULKHEAD, WITH A SINGLE O-RING SEAL (REF. FMEA 01-4-CS44-1).

FAILURE MODE:
EXTERNAL LEAKAGE (CRACKED VALVE BODY)

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

EFFECT(S) ON:

- (A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE
- (A) EXCESSIVE LOSS OF CABIN ATMOSPHERE.
- (B) INCREASED USE OF N2/O2 MAKE-UP GASES.
- (C) ABORT DECISION - MISSION TERMINATION BASED ON MAGNITUDE OF LEAK.
- (D) POSSIBLE LOSS OF CREW/VEHICLE IF EQUIVALENT HOLE SIZE IS GREATER THAN 0.45 INCH, IN THE VALVE BODY DOWNSTREAM OF THE CABIN VENT VALVE. RETURN REQUIRED WITH EMERGENCY 8.0 PSIA CABIN PRESSURE MAINTENANCE.

DISPOSITION & RATIONALE:

- (A) DESIGN (B) TEST (C) INSPECTION (D) FAILURE HISTORY (E) OPERATIONAL USE
- (A) DESIGN
THE PORTION OF THE VALVE CONSIDERED AS CRITICALITY 1/1 IS THE VALVE BODY DOWNSTREAM OF THE CABIN VENT VALVE. THE VALVE BODY IS MADE OF A356.0-T61 ALUMINUM ALLOY, TEFLON PENETRATED HARD ANODIZED (NITUFF COATING). MOUNTING FLANGE IS 0.19 INCH THICK. THE VALVE BODY WALL THICKNESS IS 1/16 INCH. FOUR TRIANGULAR FINS BETWEEN FLANGE ATTACH POINTS AND VALVE BODY PROVIDE STRUCTURAL RIGIDITY. THERE IS A SINGLE O-RING SEAL ON THE VALVE STEM WHICH HAS A DIRECT OVERBOARD LEAK PATH; WORST CASE LEAKAGE IF CRACK PROPAGATION RESULTING IN SIGNIFICANT EXTERNAL LEAKAGE; CONSIDERED HIGHLY UNLIKELY. A - OUT...

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : ATMOSPHERIC REVIT. FMEA NO 06-1C -0203 -3 REV:01/06/88

THE SEAL WERE OMITTED ENTIRELY WOULD BE APPROXIMATELY 0.16 LB/HR. THE VALVE WEIGHS 2.39 LB. IT IS INSTALLED ON THE XO 576 BULKHEAD OVER THE WCS, BEHIND A CLOSEOUT PANEL WHERE IT CANNOT BE INADVERTENTLY DAMAGED BY PERSONNEL. 32 RMS FINISH ON MOUNTING FLANGE MINIMIZES LEAKAGE AT BULKHEAD.

(B) TEST

ACCEPTANCE TEST - PER ATP 2874-3. PROOF PRESSURE 24 PSIG, LEAKAGE (INTERNAL AND EXTERNAL) 1 SCCM MAX AT 16.7 PSIG.

QUALIFICATION TESTING - PER QTP 2874-1, LIFE CYCLE AND THERMAL VACUUM WERE CERTIFIED BY SIMILARITY TO THE POSITIVE PRESSURE RELIEF VALVE. RANDOM VIBRATION SPECTRUM - 20 TO 150 HZ INCREASING AT 6 DB/OCTAVE TO 0.09 G**2/HZ, CONSTANT AT 0.09 G**2/HZ FROM 150 TO 900 HZ, DECREASING AT 9 DB/OCTAVE FROM 900 TO 2000 HZ FOR 48 MINUTES PER AXIS. LEAKAGE RATE MONITORED DURING VIBRATION LIMITED TO 1.0 SCCM MAX. SINUSOIDAL VIBRATION - 5 - 25 HZ AT AN ACCELERATION AMPLITUDE OF PLUS OR MINUS 0.25 G PEAK IN THREE ORTHOGONAL AXES; DURATION CONTROLLED BY A ONE OCTAVE PER MINUTE SWEEP RATE. DESIGN SHOCK - THREE 20 G TERMINAL PEAK, 11 MS DURATION SHOCK PULSES IN THREE ORTHOGONAL AXES. BURST PRESSURE IS 33.4 +/- 0.15 PSIG FOR 3 MINUTES MINIMUM; LEAKAGE NOT TO EXCEED 100 SCCM. FACTOR OF SAFETY - 2. ATP TO VERIFY LEAKAGE IS PERFORMED AFTER SHOCK AND VIBRATION TESTING.

IN-VEHICLE TESTING - 3.2 PSID CABIN LEAK TEST.

MRSD - 3.2 PSID CABIN LEAK TEST PERFORMED BEFORE FIRST REFLIGHT OF EACH ORBITER. A 2 PSID CABIN INTEGRITY TEST IS PERFORMED BEFORE EACH LAUNCH. FLIGHT DATA WILL BE UTILIZED DURING EACH MISSION TO ASSESS OCCURRENCE OF ANY EXCESSIVE EXTERNAL LEAKAGE.

(C) INSPECTION

RECEIVING INSPECTION

RAW MATERIAL VERIFIED BY INSPECTION FOR MATERIAL AND PROCESS CERTIFICATION.

CONTAMINATION CONTROL

CLEANLINESS LEVEL 200A PER MAC110-301 AND 100 ML RINSE TESTS VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

TORQUES VERIFIED BY INSPECTION. DIMENSIONAL CHECKS PERFORMED BY INSPECTION. 10X VISUAL INSPECTION ON SEAL RING. MIPS ARE INCLUDED IN THE ASSEMBLY PROCEDURE.

CRITICAL PROCESSES

SOLDER CONNECTIONS VERIFIED BY INSPECTION IN ACCORDANCE WITH NHB5300.4(3A). POTTING VISUALLY VERIFIED BY INSPECTION. BRAYCOTE LUBRICANT ON SEAL RING VERIFIED BY TECHNICIAN. ANODIZING AND HEAT TREATMENT VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION

WELDS ARE PENETRANT INSPECTED AND VERIFIED BY INSPECTION.

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :ATMOSPHERIC REVIT. FMEA NO 06-1C -0203 -3 REV:01/06/88

TESTING

ATP VERIFIED BY INSPECTION.

HANDLING/PACKAGING

HANDLING, PACKAGING, STORAGE AND SHIPPING PROCEDURES ARE VERIFIED.

(D) FAILURE HISTORY

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

(E) OPERATIONAL USE

1. CREW ACTION

PERFORM CREW MODULE LEAK TROUBLESHOOTING AND APPROPRIATE FOLLOW-UP ACTION (E.G. POWERDOWN).

2. TRAINING

STANDARD ECLSS TRAINING COVERS THE EFFECT OF DECREASING CABIN PRESSURE AND THE NECESSARY ACTION DICTATED BY THE SIZE OF THE LEAK (E.G. POWERDOWN, MISSION TERMINATION).

3. OPERATIONAL CONSIDERATION

A. TIME REMAINING IN MISSION IS PROPORTIONAL TO THE N2 QUANTITY REMAINING ON BOARD AND LEAK RATE.

B. REFERENCE LOSS/FAILURE FLIGHT RULES.

C. CURRENT FLIGHT DATA FILE PROCEDURES COVER THE FAILURE AND FOLLOW-ACTIONS.

D. VALVES ARE UNPOWERED DURING ON-ORBIT.