

**SHUTTLE CRITICAL ITEMS LIST - ORBITER**

SUBSYSTEM : ATMOSPHERIC REVIT.                      FMEA NO 06-1A -1121 -4                      REV: 07/08/88

ASSEMBLY : AIRLOCK W/NO TUNNEL ADAPTER				CRIT. FUNC: 1R
P/N RI : MC250-0004-0007				CRIT. HDW: 2
P/N VENDOR: 2767-0001-1 CARLETON	VEHICLE	102	103	104
QUANTITY : 1	EFFECTIVITY:	X	X	X
:	PHASE(S):	PL	LO	OO X DO LS
:				

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

PREPARED BY:		APPROVED BY:		APPROVED BY (NASA):
DES    S. CASTILLO		DES <i>[Signature]</i>		SSM <i>[Signature]</i>
REL    D. RISING		REL <i>[Signature]</i>		REL <i>[Signature]</i>
QE     W. SMITH		QE <i>[Signature]</i>		QE <i>[Signature]</i>

**ITEM:**  
PRESSURE GAUGE, DIFFERENTIAL PAYLOAD BAY/AIRLOCK (TUNNEL ADAPTER)  
(PAYLOAD SIDE)

**FUNCTION:**  
PROVIDES STATUS OF THE HATCH DIFFERENTIAL PRESSURE BETWEEN THE PAYLOAD BAY AND AIRLOCK/TUNNEL SO THAT THE CREWMEN IN THE PAYLOAD BAY CAN ASCERTAIN CONDITIONS BEFORE OPENING THE HATCH. GAUGE MEASURES BETWEEN PLUS 20 AND MINUS 20 PSID.  
HML V64P0106A, V64P0125A

**FAILURE MODE:**  
EXTERNAL AND INTERNAL LEAKAGE

**CAUSE(S):**  
MECHANICAL SHOCK, VIBRATION, CORROSION, POROSITY

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

(A) LOSS OF CABIN AIR WHEN THE AIRLOCK/TUNNEL ADAPTER IS PRESSURIZED.

(B) INCREASED USE OF OXYGEN/NITROGEN SUPPLY.

(C) POSSIBLE LOSS OF PLANNED EVA'S.

(D) SECOND ASSOCIATED FAILURE (LEAKAGE OF OTHER DELTA PRESSURE GAUGE IN OUTER HATCH) CAN CAUSE LOSS OF EVA CREWMAN (DUE TO INABILITY TO REPRESSURIZE AIRLOCK) OR LOSS OF EMERGENCY EVA CAPABILITY AND RESULT IN POSSIBLE LOSS OF CREW/VEHICLE.

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

(A) DESIGN  
THE PRESSURE GAUGE CONSISTS OF A BOURDON TUBE, LINKAGE ASSEMBLY, AND INDICATOR WINDOW, ALL HOUSED IN AN ALUMINUM ENCLOSURE.

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THE BOURDON TUBE, FABRICATED OF BERYLLIUM COPPER, RESEMBLES A CLOCK-SPRING, ONE END OF WHICH IS FIXED TO A PRESSURE PORT WHILE THE OTHER END IS FREE TO MOVE UNDER THE INFLUENCE OF POSITIVE OR NEGATIVE PRESSURE.

THE LINKAGE ASSEMBLY AMPLIFIES THE MOTION OF THE FREE END OF THE BOURDON TUBE TO APPROXIMATELY 72 DEGREE SWING OF THE POINTER. LINKAGE JOURNALS ARE SUPPORTED BY JEWEL BEARINGS FOR MINIMUM RESISTANCE AND MAXIMUM RELIABILITY.

THE INDICATOR WINDOW, SECURELY ATTACHED TO THE HOUSING AND BEZEL, IS FABRICATED OF GLASS WITH A TRANSPARENT POLYPROPYLENE TAPE COVERING TO INSURE THAT ANY GLASS FRAGMENTS RESULTING FROM ACCIDENTAL BREAKAGE OF THE WINDOW WILL BE FULLY CONTAINED AND WILL NOT HAMPER NORMAL OPERATION OF THE GAUGE.

THE UNIT IS FLANGE MOUNTED WITH A SINGLE SILASTIC 675 SILICONE RUBBER O-RING WHICH COMPENSATES FOR ROUGHNESS OF THE FLANGE, PREVENTING EXTERNAL LEAKAGE. THE FLANGE IS MADE OF 6061-T6 ALUMINUM WITH A 32/FINISH IN BOTTOM OF O-RING GROOVE.

### (B) TEST

QUALIFICATION TEST FOR 100 MISSION LIFE: SINUSOIDAL VIBRATION - 5 TO 32 HZ AT +/- 0.25 G PEAK PER AXIS. RANDOM VIBRATION - 0.09 G<sup>2</sup>/HZ FOR 48 MINUTES PER AXIS. DESIGN SHOCK - 20 G PER AXIS. ACCELERATION OF 5 G IN EACH DIRECTION ALONG EACH OF THREE MUTUALLY PERPENDICULAR AXES. THE ACCELERATION WAS MAINTAINED FOR 5 MINUTES IN EACH OF THE SIX DIRECTIONS. TEMPERATURE TEST FOR 6 HOURS AT -100 AND AT +120. WINDOW IMPACT TEST - ONE INCH SPHERICAL STEEL BALL DROPPED FIVE TIMES ON CENTER OF GAUGE WINDOW FROM A HEIGHT OF 4 FT. BURST PRESSURE TEST AT 32 PSI (TWICE OPERATING PRESSURE) FOR 5 MINUTES. LEAK TEST AT 20 PSI GHE, 6 X 10<sup>-4</sup> SCCM MAX.

ACCEPTANCE TEST - PROOF PRESSURE 30 PSI GM2 FOR 3 MINUTES, BOTH POSITIVE AND NEGATIVE DELTA-P. LEAK CHECK AT 20 PSIG GHE, 6 X 10<sup>-4</sup> SCCM MAX.

IN-VEHICLE TESTING - 3.2 PSID CABIN LEAK CHECK.

CHRSO - 2 PSID LEAK CHECK DURING LAUNCH COUNTDOWN.

### (C) INSPECTION

#### RECEIVING INSPECTION

RECEIVING INSPECTION VERIFIES MATERIAL AND PROCESS CERTIFICATIONS.

#### CONTAMINATION CONTROL

CORROSION PROTECTION PROVISIONS AND CONTAMINATION CONTROL PLAN VERIFIED BY INSPECTION. CLEANLINESS TO LEVEL 200A VERIFIED BY INSPECTION.

#### ASSEMBLY/INSTALLATION

MANUFACTURING PROCESSES, INSTALLATION AND ASSEMBLY VERIFIED BY INSPECTION. VISUAL INSPECTION OF SEAL RING USING 10X MAGNIFICATION. INTERNAL O-RINGS VERIFIED BY INSPECTION. FASTENER INSTALLATION WITH ADHESIVE VERIFIED BY INSPECTION. DIMENSIONS AND SURFACE FINISHES VERIFIED BY INSPECTION.

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**NONDESTRUCTIVE EVALUATION**

HELIUM LEAK TESTING IS VERIFIED BY INSPECTION.

**CRITICAL PROCESSES**

MECHANICAL SOLDER CONNECTIONS VERIFIED BY INSPECTION. MECHANICAL SOLDERING USES FLUX ONLY IN COMPONENT "TINNING"; THE FLUX IS REMOVED BEFORE THE SOLDER IS REFLOWED AND THE JOINT IS MADE. SOLDERING TO PLUG FREE END OF THE BOURDON TUBE IS VERIFIED BY INSPECTION. SILVER BRAZE PLUG TO SEAL A PRESSURE PASSAGE IS VERIFIED BY INSPECTION. HEAT TREATMENT AND BENDING OF BERYLLIUM COPPER BOURDON TUBE IS VERIFIED BY INSPECTION. PASSIVATION IS VERIFIED BY INSPECTION.

**TESTING**

ATP VERIFIED BY INSPECTION.

**HANDLING/PACKAGING**

PARTS PROTECTION VERIFIED BY INSPECTION.

**(D) FAILURE HISTORY**

NO APPLICABLE FAILURE HISTORY.

**(E) OPERATIONAL USE**

CREW SHOULD PERFORM CABIN LEAK PROCEDURE WHICH WILL RESULT IN ISOLATION OF AIRLOCK.