

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : ATMOSPHERIC REVIT. FMEA NO 06-1A -1120 -4 REV: 07/08/82

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 LG OO X DO LS
:		

	REDUNDANCY SCREEN:	A-PASS	B-PASS	C-PAS:
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 AIRLOCK (TUNNEL ADAPTER)/PAYLOAD BAY (AIRLOCK)

FUNCTION:

PROVIDES STATUS OF THE HATCH DIFFERENTIAL PRESSURE BETWEEN THE AIRLOCK TUNNEL AND THE PAYLOAD BAY SO THAT THE CREWMAN IN THE AIRLOCK/TUNNEL CAN ASCERTAIN CONDITIONS BEFORE OPENING THE HATCH. GAUGE MEASURES BETWEEN PLUS 20 AND MINUS 20 PSID.

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 I OUTER HATCH) CAN CAUSE LOSS OF EVA CREWMAN DUE TO INABILITY TO REPRESSURIZE AIRLOCK AND CAUSE 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, AN INDICATOR WINDOW, ALL HOUSED IN AN ALUMINUM ENCLOSURE.

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.

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : ATMOSPHERIC REVIT. FMEA NO 06-1A -1120 -4 REV: 07/09/88

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 35 HZ AT +/- 0.25 G PEAK PER AXIS. RANDOM VIBRATION - 0.09 G²/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 F. WINDOW IMPACT TEST - ONE INCH SPHERICAL STEEL BALL DROPPED FIVE TIMES ON CENTER OF GAUGE FROM A HEIGHT OF 4 FT. BURST PRESSURE TEST AT 32 PSI (TWICE OPERATING PRESSURE) FOR 5 MINUTES. LEAK TEST AT 20 PSI GHE, 6×10^{-4} SCCM MAX.

ACCEPTANCE TEST - PROOF PRESSURE 30 PSI GN2 FOR 3 MINUTES, BOTH POSITIVE AND NEGATIVE DELTA-P. LEAK CHECK AT 20 PSIG GHE, 6×10^{-4} SCCM MAX.

IN-VEHICLE TESTING - 3.2 PSID CABIN LEAK CHECK.

OMRSD - 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.

NONDESTRUCTIVE EVALUATION

HELIUM LEAK TESTING IS VERIFIED BY INSPECTION.

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :ATMOSPHERIC REVIT.

FMEA NO 06-1A -1120 -4

REV:07/08/88

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 BRAZ 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.