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PRINT DATE: 09/21/90

S050260E  
ATTACHMENT  
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FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL HARDWARE

NUMBER: 06-1A-1122-X

SUBSYSTEM NAME: ARS - AIRLOCK

REVISION : 2 09/21/90

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	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU :	EQUALIZATION VALVE CARLETON TECHNOLOGIES	MC250-0004-0012 2763-0001-9

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PART DATA

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QUANTITY OF LIKE ITEMS: 2  
TWO ON OUTER HATCH

FUNCTION:  
EQUALIZATION VALVE, AIRLOCK (TUNNEL)/PAYLOAD BAY HATCH

PROVIDES FOR EQUALIZING PRESSURE ACROSS THE PAYLOAD BAY/AIRLOCK (TUNNEL) HATCH. EACH VALVE OPERATES INDEPENDENTLY WITH POSITIVE DETENTS AT TWO FLOW POSITIONS. VALVE CAN BE ACTUATED FROM EITHER SIDE OF HATCH.

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : ATMOSPHERIC REVIT. FMEA NO 06-1A -1122 -4 REV: 01/19/86

ASSEMBLY : AIRLOCK W/WD TUNNEL ADAPTER CRIT. FUNC: 1  
 P/N RI : MC250-0004-0012 CRIT. HDW: 1  
 P/N VENDOR: 2763-0001-9 CARLETON VEHICLE 102 103 104  
 QUANTITY : 2 EFFECTIVITY: X X X  
 : TWO ON OUTER HATCH PHASE(S): PL LO OO X DO LS

PREPARED BY: DES D. L. SANDERSFELD REL N. L. STEISLINGER QE W. J. SMITH  
 REDUNDANCY SCREEN: A- B- C-  
 APPROVED BY: *[Signature]* APPROVED BY (NASA): *[Signature]*  
 SSM *[Signature]* REL *[Signature]* QS *[Signature]*

ITEM: EQUALIZATION VALVE AIRLOCK(TUNNEL)/PAYLOAD BAY HATCH

FUNCTION: PROVIDES FOR EQUALIZING PRESSURE ACROSS THE PAYLOAD BAY/AIRLOCK(TUNNEL) HATCH. EACH VALVE OPERATES INDEPENDENTLY WITH POSITIVE DETENTS AT TWO FLOW POSITIONS. VALVE CAN BE ACTUATED FROM EITHER SIDE OF HATCH.

FAILURE MODE: EXTERNAL LEAKAGE

USE(S): MECHANICAL SHOCK, VIBRATION, CORROSION, POROSITY

- EFFECT(S) ON:
- (A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE
  - (A) EXCESSIVE LOSS OF CABIN AIR WHEN THE AIRLOCK AND TUNNEL ARE PRESSURIZED.
  - (B) INCREASED USE OF OXYGEN/NITROGEN SUPPLY.
  - (C) ABORT DECISION - EXCESSIVE USE OF NITROGEN MAY LIMIT MISSION DURATION.
  - (D) POSSIBLE LOSS OF EVA CREWMAN. INABILITY TO REPRESSURIZE AIRLOCK FOR RETURN TO CABIN BECAUSE OF EXCESSIVE LEAKAGE. LOSS OF EMERGENCY EVA CAPABILITY.

DISPOSITION & RATIONALE:

- (A) DESIGN (B) TEST (C) INSPECTION (D) FAILURE HISTORY (E) OPERATIONAL USE
- (A) DESIGN  
 UNIT IS FLANGE MOUNTED WITH A SINGLE SILASTIC-675 SILICONE RUBBER O-RING WHICH COMPENSATES FOR ROUGHNESS OF FLANGE, PREVENTING EXTERNAL LEAKAGE. HOUSING IS FABRICATED OF A356.0-T61 ALUMINUM ALLOY AND IS X-RAYED TO DETECT CRACKS.

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :ATMOSPHERIC REVIT.

FMEA NO 06-1A -1122 -4

REV:01/19/8

(B) TEST

QUALIFICATION TEST FOR 100 MISSION LIFE: ACCELERATION OF 5 G FOR FIVE MINUTES PER AXIS. SINUSOIDAL VIBRATION -5 TO 35 HZ AT +/- 0.25 G PEAK PER AXIS. RANDOM VIBRATION - 0.09 G\*\*2/HZ FOR 48 MINUTES PER AXIS. DESIGN SHOCK - 20 G PER AXIS. THERMAL VACUUM/THERMAL CYCLE - WITH VALVE CLOSED AND CAP ON, UNIT EXPOSED TO + 120 TO +130 F AND VACUUM OF 1 X 10<sup>-6</sup> TORR FOR 24 HOURS. LOW/HIGH TEMP CYCLE - HELD AT -40 TO -50 F FOR 3 HOURS AND AT +120 TO 130 F FOR 3 HOURS. OPERATING LIFE - OPERATING OFF/NORMAL/EMERGENCY POSITIONS WITH 15 PSIG APPLIED FOR 800 CYCLES. LEAKAGE MONITORED DURING OR AFTER THESE TESTS LIMITED TO 5 SCCM MAX.

ACCEPTANCE TEST - PROOF PRESSURE 25 PSIG GN2, WITH VALVE OPEN AND CLOSED LEAK CHECK AT 15 PSIG, 5 SCCM MAX - VALVE OPEN AND CLOSED AND REVERSE LEAKAGE.

IN-VEHICLE TESTING - 3.2 PSID CABIN LEAK TEST.

OMRSD - GROSS LEAKAGE TEST AT 2 PSID BEFORE EACH FLIGHT.

(C) INSPECTION

RECEIVING INSPECTION

MATERIALS VERIFIED AT RECEIVING INSPECTION. ALUMINUM HOUSING CASTINGS ARE HYDROSTATIC PROOF PRESSURE TESTED AT 32 PSID.

CONTAMINATION CONTROL

CORROSION PROTECTION PROVISIONS AND CONTAMINATION CONTROL PLAN VERIFIED BY INSPECTION. CLEANLINESS LEVELS AND 100 ML RINSE TESTS VERIFIED.

ASSEMBLY/INSTALLATION

MANUFACTURING PROCESSES, INSTALLATION AND ASSEMBLY VERIFIED BY INSPECTION. TORQUES VERIFIED BY INSPECTION. DIMENSIONAL CHECKS PERFORMED BY INSPECTION. INSPECTION PERFORMS MIPs FOR CONCENTRICITY AND PERPENDICULARITY.

NONDESTRUCTIVE EVALUATION

ALUMINUM HOUSING CASTINGS ARE X-RAYED AND DYE PENETRANT INSPECTED TO DETECT CRACKS, VERIFIED BY INSPECTION.

CRITICAL PROCESSES

PASSIVATED PARTS AND HEAT TREATMENT VERIFIED BY INSPECTION. MECHANICAL SOLDERING OF DEBRIS SCREEN VERIFIED BY INSPECTION. ANODIZATION OF ALUMINUM PARTS VERIFIED BY INSPECTION.

TESTING

ATP VERIFIED BY INSPECTION.

HANDLING/PACKAGING

PARTS PROTECTION VERIFIED BY INSPECTION.

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :ATMOSPHERIC REVIT.

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REV:01/19/88

(D) FAILURE HISTORY

NO FAILURES.

(E) OPERATIONAL USE

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