SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :ATMOSPHERIC REVIT. FMEA NO 06-1C -0110 -2 REV:08/10/88

ASSEMBLY :ATMOS MAKEUP CONTROL
P/N RI :MC250-0002-2020
P/N VENDOR:2729-0001-9 CARLETON
QUANTITY :1
:ONE PER SUBSYSTEM
:

CRIT. FUNC: 1R
CRIT. HDW: 2

VEHICLE EFFECTIVITY:	102	103	104
	X	X	X

PHASE(S): PL X LO X OO X DO X LS X

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

PREPARED BY:
DES M. PRICE
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APPROVED BY:
DES
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APPROVED BY (NASA):
SSM
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ITEM:
RELIEF VALVE, AUXILIARY O2 DISTRIBUTION

FUNCTION:
WHEN THE AUXILIARY OXYGEN STORAGE TANK IS INSTALLED, THIS VALVE RELIEVES AUXILIARY OXYGEN SYSTEM OVERPRESSURE DOWNSTREAM OF REGULATOR AT 1250 PSIG IN CASE OF REGULATOR MALFUNCTION SO THAT EXCESSIVE PRESSURE IS NOT SENT TO THE LES OR AIRLOCK. THE LISTED FAILURE EFFECTS ARE FOR THE CASE WHEN THE HIGH PRESSURE OXYGEN STORAGE TANK IS NOT INSTALLED. WHEN TANK IS NOT INSTALLED THE RELIEF VALVE PERFORMS NO DYNAMIC FUNCTION. THE FAILURE EFFECTS FOR THE CASE OF THE TANK BEING INSTALLED WILL BE ADDRESSED IN THE MISSION KIT FMEA ON A MISSION BY MISSION BASIS.

FAILURE MODE:
INABILITY TO CLOSE, INTERNAL OR EXTERNAL LEAKAGE
AUX O2 TANK NOT INSTALLED

CAUSE(S):
MECHANICAL SHOCK, VIBRATION, CORROSION, CONTAMINATION, PHYSICAL BINDING/JAMMING

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

(A) NO EFFECT. WHEN AUXILIARY OXYGEN STORAGE TANK IS NOT INSTALLED THIS RELIEF VALVE SERVES NO DYNAMIC FUNCTION.

(B,C,D) NO EFFECT. RELIEF VALVE IS ISOLATED FROM THE PRESSURE SOURCE BY A CLOSED ISOLATION VALVE.

(E) FUNCTIONAL CRITICALITY EFFECT - GROSS LEAKAGE OF BOTH THIS VALVE AND THE ISOLATION VALVE WOULD RESULT IN LOSS OF LES SUPPORT AND O2 SYSTEMS CROSS-TIE CAPABILITY OPTIONS. SCREEN B IS N/A BY DEFINITION FOR STANDBY REDUNDANCY OF RELIEF VALVES.

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

(A) DESIGN
THE VALVE BODY IS MADE OF ALUMINUM ALLOY 6061. THE RELIEF VALVE UTILIZES A SPRING-LOADED POPPET OF 17-4 PH STAINLESS STEEL PER AMS5643. THE POPPET SLIDES ON A SILASTIC 675 SILICONE RUBBER RING WHICH HAS EXCELLENT RESISTANCE TO OXYGEN, OUTGASSING, AND FATIGUE. THEY ELIMINATE THE FRICTION AND WEAR ASSOCIATED WITH PISTON TYPE SEALS. THE OUTLET, WHICH IS CONNECTED TO A COMMON OVERBOARD RELIEF LINE, IS PRESSURE BALANCED SUCH THAT BACK-PRESSURE IN THE LINE WILL HAVE NO EFFECT ON THE RELIEF VALVE SETTINGS. THE INLET AND OUTLET PORTS ARE FILTER PROTECTED TO 25 MICRONS.

(B) TEST
ACCEPTANCE TEST - PROOF PRESSURE OF 1885 PSIG IN WHICH THE PRESSURE IS MAINTAINED FOR 3 MINUTES. EXTERNAL LEAK TESTED FOR 1.0 SCCM MAX LEAKAGE AT 900 PSIG FOR A MINIMUM OF 15 MINUTES. INTERNAL LEAK TESTED FOR 2.5 SCCM MAX LEAKAGE AT 900 PSIG FOR A MINIMUM OF 5 MINUTES. ATP ON N2/O2 SUPPLY PANEL AS AN ASSEMBLY INCLUDES EXAMINATION OF PRODUCT, RADIOGRAPHIC INSPECTION, PROOF PRESSURE AT 4945 +/- 5 PSIG FOR A MINIMUM OF 3 MINUTES, AND EXTERNAL LEAKAGE TEST (DECAY TEST USING GN2) AT 3300 +/- 20 PSIG WITH NITROGEN SYSTEM AT A LOWER PRESSURE - ENTIRE PANEL LEAKAGE IS LIMITED TO 5.8 SCCM MAX. THE RELIEF VALVE OPERATION WAS VERIFIED AT A CRACKING PRESSURE OF 1250 PSIG MAX AND A RESEAT PRESSURE OF 1075 PSIG MAX.

QUALIFICATION TEST - THE TEST SPECIMEN WAS SUBJECTED TO A BURST PRESSURE LEVEL OF 6650 PSIG INLET AND 2500 PSIG OUTLET FOR 3 MINUTES. LIFE CYCLE TESTING - 2500 CYCLES AT 900 PSIG. BENCH HANDLING SHOCK PER MIL-STD-810 METHOD 516.7, PROCEDURE V. RANDOM VIBRATION 84 MINUTES/AXIS, INCREASING AT 6 DB/OCTAVE FROM 20 - 80 HZ, CONSTANT AT .023 G**2/HZ FROM 80 - 300 HZ, DECREASING AT 6 DB/OCTAVE FROM 300 TO 2000 HZ. TRANSIENT VIBRATION ONE OCTAVE/MINUTE SWEEP RATE 5 TO 35 HZ AT ACCELERATION AMPLITUDE OF +/- .25G PEAK IN EACH AXIS. ATP TO VERIFY LEAKAGE IS PERFORMED AFTER SHOCK AND VIBRATION TESTING.

IN-VEHICLE TESTING - OVERPRESSURE (1070 - 1255 PSIG) AND LEAK (925 - 950 PSIG, 1 X 10 EXP -7 SCCS GHE MAX) TESTS ARE PERFORMED. RELIEF VALVE CRACK, RESEAT AND RESEAT LEAKAGE ARE TESTED.

OMRSD - RELIEF VALVE CRACK, RESEAT AND RESEAT LEAKAGE (15 SCCM MAX) ARE TESTED AS A CONTINGENCY FOR LRU REPLACEMENT AND AT INTERVALS OF 10 FLIGHTS IF AUXILIARY O2 TANK IS INSTALLED.

(C) INSPECTION

RECEIVING INSPECTION
RAW MATERIALS ARE VERIFIED BY INSPECTION FOR MATERIAL AND PROCESS CERTIFICATION.

CONTAMINATION CONTROL
CORROSION PROTECTION PROVISIONS AND CONTAMINATION CONTROL PLAN ARE VERIFIED BY INSPECTION. CLEANLINESS LEVEL 200A PER MAO110-301 AND 100 ML RINSE VERIFIED BY INSPECTION.

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SUBSYSTEM :ATMOSPHERIC REVIT. FMEA NO 06-1C -0110 -2 REV:08/10/86

ASSEMBLY/INSTALLATION
BELLEVILLE SPRING FORCES AND TORQUES ARE VERIFIED. DIMENSIONAL CHECKS ARE PERFORMED BY INSPECTION. MIPS FOR CONCENTRICITY AND PERPENDICULARITY. VISUAL INSPECTION USING 10X MAGNIFICATION ON SEAL RING.

NONDESTRUCTIVE EVALUATION
BRAZING AND WELDING X-RAYS ARE VERIFIED BY INSPECTION.

CRITICAL PROCESSES
HEAT TREAT AND ANODIZING ARE VERIFIED BY INSPECTION. LUBRICANT APPLICATION ON SEAL RING VERIFIED BY INSPECTION. POTTING VISUALLY VERIFIED BY INSPECTION.

TESTING
ATP IS VERIFIED BY INSPECTION.

HANDLING/PACKAGING
PACKAGING, HANDLING, STORAGE AND SHIPPING PROCEDURES ARE VERIFIED BY INSPECTION.

(D) FAILURE HISTORY
ONE FAILURE: A7735-010, 9/17/77. DURING H2/AUX O2 SUPPLY PANEL SUPPLIER QTP SINUSOIDAL VIBRATION TEST, 4.5 SCCM LEAKAGE WAS OBSERVED; SHOULD BE 0 SCCM. LEAKAGE WAS TRACED TO THE ITEM 1.26 RELIEF VALVE. A PIECE OF WIRE WAS FOUND IN THE SEAT WHICH PREVENTED COMPLETE CLOSURE. THE WIRE WAS TRACED TO THE STAINLESS STEEL FILTER SCREEN WHICH HAD BEEN DISLODGED AND BROKEN; IN A PREVIOUS TEST, GAS WAS INADVERTENTLY INTRODUCED INTO TEST PORT 37, AND SUBSEQUENT VIBRATION CAUSED A PIECE OF THE FILTER SCREEN WIRE TO LODGE IN THE RELIEF VALVE. CORRECTIVE ACTION - THE FILTER DISC WAS CHANGED TO A LARGER ONE AND A BACKUP PLATE WAS ADDED BEHIND THE FILTER DISC TO SUPPORT THE FILTER AND PRECLUDE OVER-FLEXURE IN THE EVENT OF OVERPRESSURIZATION.

(E) OPERATIONAL USE
TBS.