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PRINT DATE: 01/09/90

SHUTTLE CRITICAL ITEMS LIST - ORBITER

NUMBER: 06-101-0125-X

SUBSYSTEM NAME: ARS - ARPCS

REVISION : 2 01/09/90

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	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU :	N2/O2 CONTROL PANEL CARLETON TECHNOLOGIES	MC250-0002-1001 2720-0001
SRU :	VALVE, RELIEF & REG, O2	1-4-00-58-13

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- QUANTITY OF LIKE ITEMS: 2  
ONE PER FLOW PATH  
TWO PER PANEL

- FUNCTION:  
SHUTOFF VALVE, OXYGEN SUPPLY, MANUAL

SHUTS OFF OXYGEN FLOW TO 100 PSI OXYGEN SUPPLY PRESSURE REGULATOR IN CASE OF MALFUNCTION DOWN STREAM. THE VALVE WILL BE OPEN UNTIL A MALFUNCTION IS ENCOUNTERED. THE SHUT OFF VALVE IS INTEGRAL TO THE REGULATOR AND RELIEF VALVE ASSEMBLY.

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SHUTTLE CRITICAL ITEMS LIST - ORBITER

NUMBER: 06-1C1-0125-03

REVISION# 2 01/09/90

SUBSYSTEM: ARS - ARPCS  
LRU :N2/O2 CONTROL PANEL  
ITEM NAME: VALVE, RELIEF & REG, O2

CRITICALITY OF THIS  
FAILURE MODE: 1/1

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FAILURE MODE:  
EXTERNAL LEAKAGE (UPSTREAM OF POPPET AS WORST CASE)

MISSION PHASE:  
PL PRELAUNCH  
LO LIFT-OFF  
OO ON-ORBIT  
DO DE-ORBIT  
LS LANDING SAFING

■ VEHICLE/PAYLOAD/KIT EFFECTIVITY: 102 COLUMBIA  
: 103 DISCOVERY  
: 104 ATLANTIS  
: 105 ENDEAVOUR

CAUSE:  
MECHANICAL SHOCK, VIBRATION, CORROSION

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

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REDUNDANCY SCREEN A) N/A  
B) N/A  
C) N/A

PASS/FAIL RATIONALE:

A)

B)

C)

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- FAILURE EFFECTS -  
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(A) SUBSYSTEM:  
LEAKAGE OF OXYGEN INTO CABIN UNTIL ASSOCIATED PRSD SUPPLY VALVE IS  
CLOSED.

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**(B) INTERFACING SUBSYSTEM(S):**

INCREASED PPO2 UNTIL PRSD VALVE IS CLOSED. LOSS OF ONE O2 SOURCE TO AIRLOCK AND LES.

**(C) MISSION:**

POSSIBLE EARLY MISSION TERMINATION AS ONLY ONE OXYGEN SOURCE REMAINS FOR CABIN, AIRLOCK AND LES REQUIREMENTS.

**(D) CREW, VEHICLE, AND ELEMENT(S):**

LOSS OF ONE O2 SUPPLY SYSTEM RESULTS IN INSUFFICIENT OXYGEN FLOW TO LES SYSTEM. LOSS OF THIS EMERGENCY SYSTEM MAY RESULT IN LOSS OF CREW/VEHICLE.

**(E) FUNCTIONAL CRITICALITY EFFECTS:**

NONE

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 - DISPOSITION RATIONALE -  
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**(A) DESIGN:**

VALVE BODY IS MADE OF 6061-T6 ALUMINUM ANODIZED FOR CORROSION RESISTANCE. POSITIVE OPEN/CLOSED OPERATION. BELLEVILLE SPRING LOADED TOGGLE DETENT ASSURES FULL OPEN OR CLOSED VALVE POSITION. INLET/OUTLET PORTS ARE FILTER PROTECTED TO 25 MICRONS. POPPET IS PRESSURE COMPENSATED THROUGH THE USE OF SILASTIC 675 SILICONE RUBBER DYNAMIC SEALS AT EACH END OF THE POPPET. SILASTIC 675 SILICONE RUBBER HAS GOOD RESISTANCE TO ENVIRONMENTAL EXPOSURE, FLEXING AND FATIGUE. IT ALSO HAS LOW FLAMMABILITY AND OUTGASSING. THE OZONE RESISTANCE OF SILICONE RUBBER IS EXCELLENT. THE 17-7 PH COLD DRAWN TO CONDITION C CRES POPPET WORKS AGAINST THE VESPEL-SP-1 SEAT WHICH IS UTILIZED FOR OXYGEN COMPATIBILITY AND LEAK-FREE OPERATION. 17-4 PH IS PRECIPITATION HARDENED CORROSION RESISTANT STEEL WHICH HAS A HIGH STRENGTH TO WEIGHT RATIO. THE MOST PROBABLE LEAK (TWO CUT O-RINGS WORST CASE) IS ESTIMATED AT 100 SCCM (0.0175 LB/HR).

**(B) TEST:**

ACCEPTANCE TEST - PROOF PRESSURE OF 1875-1895 PSIG FOR 3 MINUTES MINIMUM. EXTERNAL LEAKAGE TEST AT 885 - 915 PSIG FOR 15 MINUTES MINIMUM, 0.3 SCCM MAX LEAKAGE. INTERNAL LEAKAGE TEST AT 885 - 915 PSIG FOR 5 MINUTES MINIMUM, 0.2 SCCM MAX LEAKAGE.

QUALIFICATION TEST - LIFE CYCLE TESTING - 1000 CYCLES AT 875 +/- 25 PSIG. BURST PRESSURE IS 2500 PSIG. SUBJECTED TO THE FOLLOWING AS PART OF THE N2/O2 CONTROL PANEL: RANDOM VIBRATION SPECTRUM - 20 TO 150 HZ INCREASING AT 6 DB/OCTAVE TO 0.03 G\*\*2/HZ AT 150 HZ, CONSTANT AT 0.03 G\*\*2/HZ FROM 150 TO 1000 HZ, DECREASING AT 6 DB/OCTAVE FROM 1000 TO 2000 HZ FOR 48 MINUTES PER AXIS FOR THREE ORTHOGONAL AXES. DESIGN

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SHOCK - 20G TERMINAL SAWTOOTH PULSE OF 11 MS DURATION IN EACH DIRECTION OF THREE ORTHOGONAL AXES. ATP TO VERIFY LEAKAGE IS PERFORMED AFTER SHOCK AND VIBRATION TESTING.

IN-VEHICLE TESTING - OVERPRESSURE TEST AT 1070 - 1255 PSIG.

OMRSD - 900 AND 100 PSI EMERGENCY BREATHING SYSTEM COMBINED GROSS EXTERNAL LEAK TEST IS PERFORMED BEFORE THE FIRST REFLIGHT OF EACH ORBITER AND AT INTERVALS OF FIVE FLIGHTS AT ~~925~~ - 950 PSIG, 70 SCCM MAX SYSTEM LEAKAGE. INFLIGHT CHECKOUT DURING EACH MISSION WILL VERIFY NO GROSS EXTERNAL LEAKAGE.

900

(C) INSPECTION:

RECEIVING INSPECTION

RAW MATERIAL VERIFIED BY INSPECTION FOR MATERIAL AND PROCESS CERTIFICATION.

CONTAMINATION CONTROL

CORROSION PROTECTION PROVISIONS AND CONTAMINATION CONTROL PLAN VERIFIED BY INSPECTION. CLEAN LEVEL 200A PER MAQ110-301 AND 100 ML RINSE VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

PARTS PROTECTION FROM DAMAGE AND CONTAMINATION VERIFIED. DIMENSIONAL CHECKS PERFORMED BY INSPECTION. SEAL RING IS VISUALLY INSPECTED BY 10X MAGNIFICATION. TORQUING AND SAFETY WIRING VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION

BRAZING AND WELDING X-RAY VERIFIED BY INSPECTION.

CRITICAL PROCESSES

HEAT TREAT AND PASSIVATED PARTS VERIFIED BY INSPECTION. APPLICATION OF LUBRICATION ON SEAL RING VERIFIED BY INSPECTION.

TESTING

ATP VERIFIED BY INSPECTION.

HANDLING/PACKAGING

HANDLING, PACKAGING, STORAGE AND SHIPPING PROCEDURES ARE VERIFIED.

(D) FAILURE HISTORY:

ONE FAILURE HAS OCCURRED:

Q1F036-010, 5/15/81. PRIOR TO STS 1 THE 1.7 VALVE HAD AN INDICATION OF STEM LEAKAGE, AND INTERNAL LEAKAGE WAS INDICATED IN FLIGHT. ANALYSIS FOUND NO INTERNAL LEAKAGE. STEM LEAKAGE WAS CAUSED BY MISLOCATION OF A COIL SPRING WHICH PREVENTED THE SHAFT SEAL FROM SEATING PROPERLY. CORRECTIVE ACTION - INSPECTION POINT WAS ADDED TO THE VALVE ASSEMBLY PROCEDURE. PANEL LEVEL ATP WAS REVISED TO UPGRADE EXTERNAL LEAK TEST.

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(E) OPERATIONAL USE:  
TBS.

- APPROVALS -

RELIABILITY ENGINEERING:	D. R. RISING	<i>DRR</i>	:	<u>                    </u>
DESIGN ENGINEERING	: K. KELLY	<i>KK</i>	:	<u>                    </u>
QUALITY ENGINEERING	: M. SAVALA	<i>MS</i>	:	<u>                    </u>
NASA RELIABILITY	:		:	<u>                    </u>
NASA SUBSYSTEM MANAGER	:		:	<u>                    </u>
NASA QUALITY ASSURANCE	:		:	<u>                    </u>

*TD* :                     

*John Sandersfeld*

*3/6/90*

*5/10/90*

*5/11/90*

*9-13-90*