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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: 06-1C-0125-02

REVISION: 0 W 11/16/88

SUBSYSTEM: ARS - ARPCS

LRU :N2/O2 CONTROL PANEL

ITEM NAME: VALVE, RELIEF & REG, O2

CRITICALITY OF THIS

FAILURE MODE:1R2

FAILURE MODE:

INABILITY TO CLOSE, INTERNAL LEAKAGE

MISSION PHASE:

PL PRELAUNCH  
LO LIFT-OFF  
OO ON-ORBIT  
DO DE-ORBIT  
LS LANDING SEQUENCE

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

CAUSE:

CONTAMINATION, MECHANICAL SHOCK, VIBRATION, CORROSION, PHYSICAL BINDING/JAMMING

CRITICALITY 1/1 DURING ANY MISSION PHASE OR ABORT? N

REDUNDANCY SCREEN A) PASS

B) N/A

C) PASS

A)

B)

SCREEN B IS N/A BECAUSE VALVE IS NORMALLY OPEN, IN STANDBY, TO BE CLOSED IN ORDER TO ISOLATE A DOWNSTREAM FAILURE.

## SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 06-1C-0125-02

C)

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- FAILURE EFFECTS -  
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## (A) SUBSYSTEM:

LOSS OF ABILITY TO ISOLATE ONE 100 PSI O<sub>2</sub> ~~REGULATOR/RELIEF VALVE~~ <sup>SYSTEM</sup>

## (B) INTERFACING SUBSYSTEM(S):

NO EFFECT.

## (C) MISSION:

NO EFFECT.

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

NO EFFECT.

## RATIONALE FOR CRITICALITY:

FUNCTIONAL CRITICALITY EFFECT - INLET VALVE INTERNAL LEAKAGE, COMBINED WITH DOWNSTREAM FAILURE OF GROSS EXTERNAL LEAKAGE, CAUSES LOSS OF LES SYSTEM AND POSSIBLE LOSS OF CREW/VEHICLE.

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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).

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**(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 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 - INTERNAL LEAK TEST IS PERFORMED.

OMRSD - INTERNAL LEAK TEST IS PERFORMED AT 900 - 950 PSIG, 10 SCCM MAX LEAKAGE, AT INTERVALS OF FIVE FLIGHTS.

**(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 MA0110-301 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.

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(D) FAILURE HISTORY:

ONE FAILURE HAS OCCURRED:

AB6553-010. PRIOR TO STS 1 THE 1.7 VALVE LEAKED INTERNALLY. THOUGHT TO CAUSED BY A CONTAMINANT HOLDING THE POPPET OPEN.

(E) OPERATIONAL USE:

TBS.

- APPROVALS -

RELIABILITY ENGINEERING: N. L. STEISSLINGER:  
 DESIGN ENGINEERING : M. PRICE  
 QUALITY ENGINEERING : S. MOR  
 NASA RELIABILITY :  
 NASA SUBSYSTEM MANAGER :  
 NASA QUALITY ASSURANCE :

*7/8*  
*MM*  
 [Handwritten signatures and dates]  
 11/20/81