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PRINT DATE: 01/10/90

SHUTTLE CRITICAL ITEMS LIST - ORBITER

NUMBER: 06-101-0123-X

SUBSYSTEM NAME: ARS - ARPCS

REVISION : 2 01/09/90

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU :	EMERGENCY O2 CONTROL PANEL CARLETON TECHNOLOGIES	MC250-0002-0120 2735-0001
SRU :	VALVE, CHECK	2662-0001-15

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

FUNCTION:

CHECK VALVE, EMERGENCY O2 REGULATOR OUTLET

PROVIDES PROTECTION AGAINST REVERSE FLOW AND PROVIDES FORWARD FLOW PATH
AT THE OUTLET OF THE EMERGENCY OXYGEN REGULATOR.

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SHUTTLE CRITICAL ITEMS LIST - ORBITER

NUMBER: 06-101-0123-03

REVISION# 2 01/09/90

SUBSYSTEM: ARS - ARPCS
LRU : EMERGENCY O2 CONTROL PANEL
ITEM NAME: VALVE, CHECK

CRITICALITY OF THIS
FAILURE MODE: 1/1

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

MISSION PHASE:

PL PRELAUNCH
LO LIFT-OFF
OO ON-ORBIT
OD DE-ORBIT
LS LANDING SAFING

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

CAUSE:

MECHANICAL SHOCK, VIBRATION, CORROSION, CONTAMINATION, MATERIAL DEFECT,
SEAL MATERIAL DEGRADATION

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

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

PASS/FAIL RATIONALE:

A)
B)
C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:

UNCONTROLLED O2 FLOW INTO CABIN.

(B) INTERFACING SUBSYSTEM(S):

POSSIBLE HIGH PPO2 UNTIL CORRECTING ACTION (C/A) TAKES EFFECT.
POSSIBLE FLAMMABILITY LIMIT VIOLATION.

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(C) MISSION:

ABORT DECISION: OPA RESULTS IN LOSS OF BOTH OXYGEN FLOW PATHS TO LES.

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

GROSS EXTERNAL LEAKAGE RESULTS IN INADEQUATE O2 SUPPLY TO LES STATIONS. THE LOSS OF LES SUPPORT CAPABILITY MAY RESULT IN LOSS OF CREW IF LEAK RATE PROHIBITS LES SYSTEM PRESSURIZATION AND LES ARE REQUIRED. NOTE - IN AN 8.0 PSIA HOLE IN CABIN CONTINGENCY MODE, AN EXTERNAL LEAK ALLOWING FLOW INTO THE CABIN MAY NOT BE CATASTROPHIC SINCE THERE IS A POSSIBILITY OF SAFELY BREATHING THE CABIN AIR, INTO WHICH THE O2 IS LEAKING, BY RAISING LES VISORS. THE WORST CASE FAILURE WOULD BE IN THE CASE OF A CONTAMINATED CABIN ATMOSPHERE, WHEN LEAKAGE PREVENTS ADEQUATE FLOW TO LES STATIONS AND CABIN AIR MAY NOT BE SAFE FOR BREATHING.

(E) FUNCTIONAL CRITICALITY EFFECTS:

NONE

 - DISPOSITION RATIONALE -

(A) DESIGN:

VALVE BODY IS MADE OF 17-4 PH CONDITION C CRES, WHICH IS PRECIPITATION HARDENED CORROSION RESISTANT STEEL WHICH HAS A HIGH STRENGTH TO WEIGHT RATIO. CHECK VALVE HAS SILASTIC 675 SILICONE RUBBER MOLDED INTO THE 17-4 PH CONDITION A POPPET WITH THE BACK PRESSURE LOADS BEING BORNE BY METAL TO METAL CONTACT AND THE ELASTOMER FUNCTIONING AS AN UNBROKEN GAS SEAL ACROSS THE VALVE. 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. INLET PORT IS PROTECTED BY A 10 MICRON FILTER. ALL OTHER STATIC SEALS ARE ALSO SILASTIC 675.

(B) TEST:

ACCEPTANCE TEST - PROOF PRESSURE 1885 PSIG, LEAK TESTED FOR 1.0 SCCM MAX LEAKAGE AT 900 PSIG.

QUALIFICATION TEST - LIFE CYCLE TESTING - 1000 CYCLES AT 875 PSIG. BURST PRESSURE IS 2500 PSIG. SUBJECTED TO THE FOLLOWING AS PART OF THE EMERGENCY O2 CONTROL PANEL. DESIGN SHOCK - 20G TERMINAL SAWTOOTH PULSE OF 11 MS DURATION IN EACH DIRECTION OF THREE ORTHOGONAL AXES. RANDOM VIBRATION SPECTRUM ENVELOPE - 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. ATP TO VERIFY LEAKAGE IS PERFORMED AFTER SHOCK AND VIBRATION TESTING.

IN-VEHICLE TESTING - AFTER INSTALLATION THE EMERGENCY BREATHING SYSTEM

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IS OVERPRESSURE (220-230 PSIG) TESTED.

CMRSD - 300, 100 PSI O2 EMERGENCY BREATHING SYSTEM 1 & 2 LEAK TEST IS PERFORMED PRIOR TO THE FIRST REFLIGHT OF EACH ORBITER AND EVERY FIVE FLIGHTS AT 900-950 PSIG, TO 300M MAX LEAKAGE. ONFLIGHT CHECKOUT DURING EACH MISSION WILL VERIFY NO GROSS EXTERNAL LEAKAGE.

(C) INSPECTION:

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

CONTAMINATION CONTROL
CLEANLINESS LEVEL 200A PER MA0110-301 AND 100 ML RINSE TESTS VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION
TORQUES VERIFIED AND DIMENSIONAL CHECKS PERFORMED BY INSPECTION. MIPS ARE INCLUDED IN THE ASSEMBLY PROCEDURE. 4X VISUAL INSPECTION ON SEAL RING. ALL SURFACES REQUIRING CORROSION PROTECTION ARE CERTIFIED. POPPET, SPRING INLET TUBE, INLET AND OUTLET HOUSING ARE VERIFIED BY INSPECTION.

CRITICAL PROCESSES
INLET FILTER WELD IS VERIFIED BY INSPECTION. APPLICATION OF LUBRICANT ON SEAL RING VERIFIED BY TECHNICIAN. HEAT TREATMENT AND PARTS PASSIVATION VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION
LEAK TEST IS VERIFIED BY INSPECTION.

TESTING
ATP VERIFIED BY INSPECTION. BUBBLE POINT AND DELTA P TEST OF INLET FILTER VERIFIED BY INSPECTION.

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

(D) FAILURE HISTORY:
NO FAILURE HISTORY APPLICABLE TO EXTERNAL LEAKAGE FAILURE MODE. THE CHECK VALVE HAS SUCCESSFULLY BEEN USED THROUGH THE SHUTTLE PROGRAM CONSIDERING THIS FAILURE MODE.

(E) OPERATIONAL USE:

1. CREW ACTION
PERFORM LEAK ISOLATION AND HIGH O2 CONCENTRATION TROUBLESHOOTING.
2. TRAINING

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STANDARD ECLSS TRAINING COVERS THE GENERIC HIGH O2 CONCENTRATION EFFECT OF THIS FAILURE.

3. OPERATIONAL CONSIDERATION

- A. REQUIRES ISOLATION OF LES FROM ALL O2 SOURCES TO SECURE LEAK.
- B. PRECLUDES USE OF LES UNLESS LEAK IS SMALL ENOUGH TO PERMIT SIMULTANEOUS LES USE PLUS O2 LEAKAGE TO CABIN.
- C. REFERENCE LOSS/FAILURE FLIGHT RULES.
- D. HIGH O2 CONCENTRATION EFFECT IN CABIN WILL NOT OCCUR UNTIL LES ARE USED.

 - APPROVALS -

RELIABILITY ENGINEERING:	D. R. RISING	<i>DR</i>	:	<u><i>E. Delfino</i></u>
DESIGN ENGINEERING	: K. KELLY	<i>KK</i>	:	<u><i>[Signature]</i></u>
QUALITY ENGINEERING	: M. SAVALA	<i>MS</i>	:	<u><i>[Signature]</i></u> 3/6/90
NASA RELIABILITY	:		:	<u><i>[Signature]</i></u> 5/10/90
NASA SUBSYSTEM MANAGER	:		:	<u><i>[Signature]</i></u> 5/11/90
NASA QUALITY ASSURANCE	:		:	<u><i>[Signature]</i></u> 9-12-90