

PAGE: 1

PRINT DATE: 01/10/90

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 06-107-1501-X

SUBSYSTEM NAME: ARS - ARPCS

REVISION : 2 01/10/90

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU :	VALVE, O2 SUPPLY CARLTON TECHNOLOGIES	MC250-0004-0006 1-A-00-51-27

■ EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:

■ QUANTITY OF LIKE ITEMS: 8
ONE PER DISCONNECT

■ FUNCTION:
MANUAL SHUTOFF VALVE, LES O2 BREATHING STATIONS

PROVIDES FOR ON-OFF CONTROL OF OXYGEN SUPPLY IN THE CREW COMPARTMENTS
FLIGHT DECK AND MID DECK TO EACH ONE OF THE EIGHT LAUNCH/ESCAPE SUITS
(LES) QUICK DISCONNECTS.

PAGE: 10

PRINT DATE: 01/10/90

SHUTTLE CRITICAL ITEMS LIST - ORBITER

NUMBER: 06-103-1501-03

REVISION# 2 01/10/90

SUBSYSTEM: ARS - 199CS
LRU : VALVE, O2 SUPPLY
ITEM NAME: VALVE, O2 SUPPLY

CRITICALITY OF THIS
FAILURE MODE: 1/1

■ FAILURE MODE:
EXTERNAL LEAKAGE (GROSS)

MISSION PHASE:

PL PRELAUNCH
LO LIFT-OFF
CO ON-ORBIT
DO DE-ORBIT
LS LANDING SAFING

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

CAUSE:

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

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.

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 06-103-1501-03

(C) MISSION:

ABORT DECISION. LES/AIRLOCK O2 SUPPORT HAS BEEN LOST IF LEAKAGE IS SIGNIFICANT. CABIN O2 MAKE-UP CAPABILITY IS STILL AVAILABLE.

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

VALVE BODY IS MADE OF 6061-T6 ALUMINUM ANODIZED FOR CORROSION RESISTANCE. FITTINGS ARE MADE OF 17-4 PH CONDITION A CRES, WHICH IS PRECIPITATION HARDENED CORROSION RESISTANT STEEL AND HAS A HIGH STRENGTH TO WEIGHT RATIO. STATIC SEALS ARE MADE OF SILASTIC 675 SILICONE RUBBER. POPPET IS PRESSURE COMPENSATED THROUGH THE USE OF DYNAMIC SEALS AT EACH END, WHICH SLIDE ON THE VALVE STEM. VALVE STEM IS HIGHLY POLISHED FOR EASE OF OPERATION (REDUCED FRICTION PROTECTS SEALS). DYNAMIC SEALS ARE ALSO SILASTIC 675 SILICONE AND ARE LUBRICATED WITH BRAYCO LUBE. 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 AND NO RUBBER IS SUPERIOR TO IT. BRAYCO LUBE IS COMPATIBLE WITH LOW AND HIGH PRESSURE GO2. INLET/ OUTLET PORTS ARE FILTER PROTECTED TO 25 MICRONS. CONSTANT SEAT FORCES DUE TO BELLEVILLE CLOSING SPRING ELIMINATE EXCESS SEAL AND SEAT WEAR. OPERATING FORCE IS 4.5 POUNDS MAXIMUM AND IS INDEPENDENT OF PRESSURE LOADS. THE MOST PROBABLE LEAK (TWO CUT O-RINGS WORST CASE) IS ESTIMATED AT 100 SCCM (0.175 LB/HR).

(B) TEST:

ACCEPTANCE TEST - ATP ON VALVE INCLUDES PROOF TEST AT 380 PSIG FOR A MINIMUM OF 5 MINUTES (1.55 TIMES MAXIMUM OPERATING PRESSURE), EXTERNAL LEAKAGE NOT TO EXCEED 0.2 SCCM GN2 WITH AN INLET PRESSURE OF 110 PSIG FOR A MINIMUM OF 15 MINUTES.

CERTIFICATION TEST - CERTIFIED BY SIMILARITY TO IDENTICAL VALVES (02

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 06-1C3-1501-03

ISOLATION VALVE AND NITROGEN CROSSOVER VALVE) ON O2/N2 CONTROL PANEL AND TO SIMILAR TYPE VALVES USED ON APOLLO PROGRAM. LIFE CYCLE TESTING - THE VALVES WERE SUBJECTED TO 150 OPEN/CLOSE CYCLES AT A PRESSURE OF 300 PSIG, AND TESTED FOR EXTERNAL LEAKAGE PRE AND POST LIFE CYCLE TESTING. COMPONENT BURST PRESSURE TESTED AT 490 PSIG FOR A MINIMUM OF 5 MINUTES (2 TIMES MAXIMUM OPERATING PRESSURE). O2 ISOLATION VALVE AND N2 CROSSOVER VALVE WERE 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 - 20 G TERMINAL SAWTOOTH PULSE OF 11 MS DURATION IN EACH DIRECTION OF THREE ORTHOGONAL AXES. ATP TO VERIFY LEAKAGE PERFORMED AFTER SHOCK AND VIBRATION TESTING, NOT TO EXCEED 0.2 SCCM AT PRESSURE OF 110 PSIG.

IN-VEHICLE TESTING - AFTER INSTALLATION THE EMERGENCY BREATHING SYSTEM IS OVERPRESSURE TESTED AT 220-230 PSIG.

OMRSD - 900, 100 PSI O2 EMERGENCY BREATHING SYSTEM 1 & 2 LEAK CHECK IS PERFORMED PRIOR TO FIRST REFLIGHT AND EVERY FIVE FLIGHTS AT 900-950 PSI; 70 SCCM MAXIMUM LEAKAGE. INFLIGHT CHECKOUT DURING EACH MISSION VERIFIES NO GROSS EXTERNAL LEAKAGE.

(C) INSPECTION:

RECEIVING INSPECTION

RAW MATERIAL VERIFIED BY INSPECTION AT SUPPLIER.

CONTAMINATION CONTROL

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

ASSEMBLY/INSTALLATION

TORQUES VERIFIED BY INSPECTION. SPRING FORCES VERIFIED BY INSPECTION. DIMENSIONAL CHECKS PERFORMED BY INSPECTION. MIPS FOR CONCENTRICITY AND PERPENDICULARITY. LOX VISUAL INSPECTION ON SEAL RING VERIFIED BY INSPECTION.

CRITICAL PROCESSES

INLET FILTER WELD VERIFIED BY INSPECTION. PARTS PASSIVATION AND ANODIZING VERIFIED BY INSPECTION. HEAT TREATMENT VERIFIED BY INSPECTION. SOLDER CONNECTIONS VERIFIED BY INSPECTION TO BE PER NH85300.4(3A). POTTING VISUALLY VERIFIED BY INSPECTION. APPLICATION OF LUBRICANT ON SEAL RING VERIFIED BY TECHNICIAN.

NONDESTRUCTIVE EVALUATION

LEAK TEST IS VERIFIED BY INSPECTION.

TESTING

