PRINT DATE: 01/10/90

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 06-1C-1501-X

SUBSYSTEM NAME: ARS - ARPCS

REVISION : 2 01/10/90

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU :	VALVE, O2 SUPPLY CARLETON TECHNOLOGIES	MC250-0004-0006 1-4-00-51-27

- 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.

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 06-1C3-1501-01

REVISION# 2 02/07/90

SUBSYSTEM: ARS - ARPCS
LRU :VALVE, O2 SUPPLY
ITEM NAME: VALVE, O2 SUPPLY

CRITICALITY OF THIS FAILURE MODE:1/1

■ FAILURE MODE:
FAILS CLOSED; RESTRICTED FLOW

MISSION PHASE:
LO LIFT-OFF
DO DE-ORBIT

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

■ CAUSE:
MECHANICAL SHOCK, VIBRATION, CORROSION, CONTAMINATION, PHYSICAL BINDING/JAMMING

■ 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:
ONE LES SUPPLY CANNOT BE USED TO PROVIDE OXYGEN FOR CREW.

■ (B) INTERFACING SUBSYSTEM(S):
ONE INTERFACE UNAVAILABLE FOR LES HOOKUP.

■ (C) MISSION:
NO EFFECT.

■ (D) CREW, VEHICLE, AND ELEMENT(S):
LOSS OF O2 FLOW TO ONE LES COULD RESULT IN LOSS OF CREW/VEHICLE IF LES IS REQUIRED DURING A MISSION PHASE THAT PREVENTS CREWMEMBER FROM SWITCHING TO AN ALTERNATE LES QD.

■ (E) FUNCTIONAL CRITICALITY EFFECTS:
NONE.

- 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. THE VALVE SEAT IS MOLDED OF VESPEL SP-1, WHICH EXHIBITS HIGH MECHANICAL STRENGTH, LOW WEAR RATE, AND SEALING COMPLIANCE WITHOUT PERMANENT DISTORTION. 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 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. 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.

■ (B) TEST:
ACCEPTANCE TEST PER ATP 2930-1. PROOF PRESSURE TESTED AT 1875 PSIG. INTERNAL LEAK TEST REQUIREMENT 5.0 SCCM MAX LEAKAGE AT 1250 PSIG.

CERTIFICATION TEST - CERTIFIED BY SIMILARITY TO IDENTICAL VALVES (O2 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 - FLOW TEST AT EACH OF THE EIGHT QD'S VERIFIES FULLY OPEN FLOW PATH.

OMRSD - FLOW IS VERIFIED PRIOR TO FIRST REFLIGHT OF EACH ORBITER AND EVERY FIVE FLIGHTS. MAX REQUIRED FLOW (5.5 LB/HR) IS VERIFIED AFTER LRU REPLACEMENT. EACH CREWMAN'S VALVE IS OPEN FOR LAUNCH; FLOW IS VERIFIED AT CREW INGRESS AND AT APPROXIMATELY T - 2 MINUTES IN EACH COUNTDOWN WHEN VISORS ARE CLOSED.

(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 BY INSPECTION. SPRING FORCES VERIFIED BY INSPECTION. DIMENSIONAL CHECKS PERFORMED BY INSPECTION. MIPS FOR CONCENTRICITY AND PERPENDICULARITY VERIFIED BY INSPECTION. 10X VISUAL INSPECTION ON SEAL RING VERIFIED BY INSPECTION.

CRITICAL PROCESSES
TIG WELD SCHEDULE, PASSIVATED PARTS, ANODIZING AND HEAT TREATMENT VERIFIED BY INSPECTION. SOLDER CONNECTIONS VERIFIED BY INSPECTION TO BE PER NHB5300.4(3A). POTTING VISUALLY VERIFIED BY INSPECTION. APPLICATION OF LUBRICANT ON SEAL RING VERIFIED BY TECHNICIAN.

NONDESTRUCTIVE EVALUATION
WELDS ARE VISUALLY EXAMINED BY 20X AND X-RAY AND PENETRANT INSPECTED.

TESTING
ATP VERIFIED BY INSPECTION.

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

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■ (D) FAILURE HISTORY:
NO FAILURE HISTORY APPLICABLE TO FAILED CLOSED/RESTRICTED FLOW FAILURE MODE. THE MANUAL SHUTOFF VALVE HAS SUCCESSFULLY BEEN USED THROUGH THE SHUTTLE PROGRAM FOR THIS FAILURE MODE.

■ (E) OPERATIONAL USE:
NONE.

- APPROVALS -

RELIABILITY ENGINEERING	D. R. RISING DR	
DESIGN ENGINEERING	K. KELLY KK	3/6/90
QUALITY ENGINEERING	M. SAVALA MS 3/6/90	
NASA RELIABILITY		5/10/90
NASA SUBSYSTEM MANAGER		5/11/90
NASA QUALITY ASSURANCE		5-3-90