SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 06-1C3-1512-X

SUBSYSTEM NAME: ARS - ARPCS

REVISION : 2 02/07/90

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

QUANTITY OF LIKE ITEMS: 1

FUNCTION:
SHUTOFF VALVE, DIRECT OXYGEN

PROVIDES ON-OFF CONTROL OF 900 PSI OXYGEN TO DIRECT O2 RESTRICTOR. USED DURING 8.0 PSI CONTINGENCY OPERATIONS TO MAINTAIN AN O2/N2 MIXTURE WHILE 8 PSI REGULATOR FLOWS N2.

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 06-1C3-1512-03

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:
INTERNAL LEAKAGE, FAILS OPEN

MISSION PHASE:
LO LIFT-OFF
OO ON-ORBIT
DO DE-ORBIT

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

■ CAUSE:
MECHANICAL SHOCK, VIBRATION, CORROSION, CONTAMINATION

■ 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:
UP TO 10 LB/HR FLOW DIRECTLY INTO CABIN RATHER THAN TO LES QD'S.

■ (B) INTERFACING SUBSYSTEM(S):
NO EFFECT.

■ (C) MISSION:
NO EFFECT.

■ (D) CREW, VEHICLE, AND ELEMENT(S):
INSUFFICIENT O2 FLOW TO LES, WHICH CAN RESULT IN LOSS OF CREW/VEHICLE IF LES FLOW IS REQUIRED.

■ (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.

OMRSD - INTERNAL LEAK TEST PERFORMED BEFORE FIRST REFLIGHT OF EACH ORBITER. SYSTEM LEAK TEST PERFORMED EVERY FIFTH FLIGHT AT 900-950 PSIG, 70 SCCM MAX LEAKAGE, IN-FLIGHT CHECKOUT FOR MEASURABLE 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 BY INSPECTION. SPRING FORCES VERIFIED BY INSPECTION. DIMENSIONAL CHECKS PERFORMED BY INSPECTION. MIPS FOR CONCENTRICITY AND PERPENDICULARITY. 10X 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 NHB5300.4(3A). POTTING VISUALLY VERIFIED BY INSPECTION. APPLICATION OF LUBRICANT ON SEAL RING VERIFIED BY TECHNICIAN.

NONDESTRUCTIVE EVALUATION
LEAK TEST IS VERIFIED BY INSPECTION.

TESTING
ATP VERIFIED BY INSPECTION.

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

■ **(D) FAILURE HISTORY:**
NO FAILURE HISTORY APPLICABLE TO INABILITY TO CLOSE/INTERNAL LEAKAGE FAILURE MODE. THE MANUAL SHUTOFF VALVE HAS SUCCESSFULLY BEEN USED THROUGH THE SHUTTLE PROGRAM FOR THIS FAILURE MODE.

■ **(E) OPERATIONAL USE:**
IF THE LES IS REQUIRED, THERE IS NO POSSIBLE CORRECTIVE ACTION. CURRENT

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FOF AND CREW TRAINING COVER THE CORRECTIVE ACTION (LEAK ISOLATION) FOR THE HIGH O2 CONCENTRATION EFFECT OF THIS FAILURE.
TBS.

- APPROVALS -

RELIABILITY ENGINEERING	O. R. RISING ORR	E. Ochoa
DESIGN ENGINEERING	K. KELLY KK	
QUALITY ENGINEERING	M. SAVALA MS	O. J. Buttner 3/6/90
NASA RELIABILITY	TD	[illegible] 5/10/90
NASA SUBSYSTEM MANAGER		[illegible] 5/11/90
NASA QUALITY ASSURANCE		[illegible] 4-13-90