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SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 06-1C1-0105-X

SUBSYSTEM NAME: ARS - ARPCS

REVISION : 2 01/09/90

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	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
■ LRU :	N2/AUX O2 SUPPLY PANEL CARLETON TECHNOLOGIES	MC250-0002-2020 2721-0001
■ SRU :	VALVE, LATCHING	2566-0001-3

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- EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:  
AUXILIARY OXYGEN ISOLATION VALVE (ITEM 1.16)
- REFERENCE DESIGNATORS: REF DES 40V61A16LV5
- QUANTITY OF LIKE ITEMS: 1
- FUNCTION:  
PROVIDES VALVE CONTROL FOR TANK ISOLATION OR OXYGEN FLOW WHEN THE AUX O2 TANK IS INSTALLED. WHEN THE TANK IS NOT INSTALLED THE VALVE REMAINS CLOSED.  
THE LISTED FAILURE EFFECTS ARE FOR THE CASE WHEN THE AUX O2 TANK IS NOT INSTALLED. THE FAILURE EFFECTS FOR THE CASE OF THE TANK BEING INSTALLED WILL BE ADDRESSED IN THE MISSION KIT FMEA ON A MISSION BY MISSION BASIS.

SHUTTLE CRITICAL ITEMS LIST - ORBITER

NUMBER: 06-101-0105-03

REVISION# 2 01/09/90

SUBSYSTEM: ARS - ARPCS  
LRU :R2/AUX O2 SUPPLY PANEL  
ITEM NAME: VALVE, LATCHING

CRITICALITY OF THIS  
FAILURE MODE:1R2

FAILURE MODE:  
EXTERNAL LEAKAGE

MISSION PHASE:

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

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

CAUSE:  
MECHANICAL SHOCK, VIBRATION, CORROSION

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

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

PASS/FAIL RATIONALE:

- A)
- B) THIS VALVE IS PART OF A STANDBY SYSTEM WHICH IS DESIGNED TO ALLOW THE INSTALLATION OF AN AUXILIARY O2 TANK.
- C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:  
NO EFFECT.

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- (B) INTERFACING SUBSYSTEM(S):  
NO EFFECT.
- (C) MISSION:  
NO EFFECT
- (D) CREW, VEHICLE, AND ELEMENT(S):  
NO EFFECT.
- (E) FUNCTIONAL CRITICALITY EFFECTS:  
GROSS INTERNAL LEAKAGE OF THE 1.88 EMERGENCY OXYGEN SELECTOR VALVE COMBINED WITH THIS FAILURE MAY RESULT IN LOSS OF LES OXYGEN; POSSIBLE LOSS OF CREW/VEHICLE.

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- DISPOSITION RATIONALE -  
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- (A) DESIGN:  
THE VALVE IS AN INTERMITTENT DUTY, 28 VOLT DC MOTOR OPERATED, LATCHING VALVE WHICH COMPRISES A VALVE PLUNGER, LATCHING MECHANISM, MOTOR ASSEMBLY AND VALVE POSITION INDICATION. VALVE HOUSING MATERIAL IS 6061-T651 ALUMINUM ALLOY, WHICH IS ANODIZED FOR CORROSION RESISTANCE. VALVE BODY AND FITTINGS ARE PH 13-8 CONDITION A CRES, WHICH IS PRECIPITATION HARDENED CORROSION RESISTANT STEEL AND HAS A HIGH STRENGTH TO WEIGHT RATIO. A NICKEL BELLOWS IS UTILIZED AS A DYNAMIC SEAL WHICH CONSIDERABLY REDUCES FRICTION, STICKING AND WEAR. BAL-SEALS ACT AS BACKUP TO BELLOWS LEAKAGE. STATIC SEALS ARE SILASTIC 675 SILICONE RUBBER, WHICH HAS GOOD RESISTANCE TO ENVIRONMENTAL EXPOSURE, FLEXING AND FATIGUE. IT ALSO HAS LOW FLAMMABILITY AND OUTGASSING. THE OZONE RESISTANCE OF SILICONE RUBBER IS EXCELLENT. PLUNGER MOVEMENT IS INITIATED BY A SCREW-DRIVEN ACTUATOR WHICH IS DRIVEN BY THE GEAR MOTOR OUTPUT SHAFT. BELLEVILLE SPRING LATCHING PROVIDES POSITIVE DETENTING. THE VALVE STEM IS HIGHLY POLISHED FOR EASE OF OPERATION (REDUCED FRICTION PROTECTS SEALS). THE VALVE STEM HAS REDUNDANT SEALS WHICH GIVE ADDED PROTECTION AGAINST EXTERNAL LEAKAGE. VALVE INLET/OUTLET PORTS ARE FILTER PROTECTED TO 25 MICRONS.
- (B) TEST:  
ACCEPTANCE TEST - PER ATP 2666-37. PROOF PRESSURE TEST AT 4975 +/- 25 PSIG. EXTERNAL LEAKAGE TEST AT 3325 +/- 25 PSIG FOR 15 MINUTES MINIMUM, 0.4 SCCM MAX LEAKAGE. INTERNAL LEAKAGE TESTS (FORWARD AND REVERSE) AT 75 +/- 5 PSIG AND 3325 +/- 25 PSIG, 2.5 SCCM MAX LEAKAGE.  
  
QUALIFICATION TESTING - PER OTP 2721-3. RANDOM VIBRATION SPECTRUM 20 TO 80 HZ INCREASING AT 6 DB/OCTAVE TO 0.03 G\*\*2/HZ, CONSTANT AT 0.03 G\*\*2/HZ FROM 80 TO 300 HZ, DECREASING AT 6 DB/OCTAVE FROM 300 TO 2000

## SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 06-1C1-0105-03

HZ FOR 48 MINUTES IN EACH OF THREE ORTHOGONAL AXES. SINUSOIDAL VIBRATION SWEEP - FROM 5 TO 35 HZ AT ONE OCTAVE PER MINUTE SWEEP RATE. LIFE CYCLE TEST - PRESSURIZED BETWEEN 1500 AND 3300 PSIG; MINIMUM 50 CYCLES. DESIGN SHOCK - 20 G TERMINAL SAWTOOTH PULSE OF 11 MS DURATION IN EACH DIRECTION OF THREE ORTHOGONAL AXES. ATP TO VERIFY NO LEAKAGE IS PERFORMED AFTER SHOCK AND VIBRATION TESTING.

IN-VEHICLE TESTING - LINES ARE OVERPRESSURE TESTED WITH COMPONENTS INSTALLED AT 4125-4325 PSIG. JOINTS ARE LEAK TESTED AT 2900-3000 PSIG. 1 X 10 EXP -7 SCCS GHE MAX LEAKAGE.

OMRSD - V61AS0.031 - 3300 PSI O2 SYSTEM MANIFOLD LEAK TEST WAS PERFORMED PRIOR TO THE FIRST REFLIGHT OF EACH VEHICLE AND WOULD BE PERFORMED UPON LRU REPLACEMENT OR O2 TANK INSTALLATION.

## ■ (C) INSPECTION:

RECEIVING INSPECTION

RAW MATERIAL CERTIFICATIONS VERIFIED BY INSPECTION.

CONTAMINATION CONTROL

CLEANLINESS TO LEVEL 300 OF MA0110-301 VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

DIMENSIONAL CHECKS PERFORMED BY INSPECTION. MIPS FOR CONCENTRICITY AND PERPENDICULARITY. DIAMETER AND THREADS ON LOWER BELLOWS VERIFIED BY INSPECTION. VISUAL, DIMENSIONAL, BELLOWS RATES AND CHECK FOR BELLOWS DAMAGE PERFORMED BY INSPECTION. 10X INSPECTION ON SEAL RING IS VERIFIED. NICKEL FINISH ON BELLOWS IS VERIFIED BY INSPECTION.

CRITICAL PROCESSES

PASSIVATED PARTS AND ANODIZING VERIFIED BY INSPECTION. HEAT TREATMENT VERIFIED BY INSPECTION. SOLDER CONNECTIONS VERIFIED BY INSPECTION IN ACCORDANCE WITH NHBS300.4(3A). APPLICATION OF LUBRICANT ON SEAL RING VERIFIED BY INSPECTION. TIG WELD SCHEDULE VERIFIED BY INSPECTION.

NONDESTRUCTIVE ANALYSIS

RADIOGRAPHIC AND PENETRANT INSPECTION OF WELD VERIFIED BY INSPECTION. LEAK TEST IS VERIFIED BY INSPECTION.

TESTING

ATP VERIFIED BY INSPECTION.

HANDLING/PACKAGING

HANDLING, PACKAGING, STORAGE AND SHIPPING PROCEDURES ARE VERIFIED.

## ■ (D) FAILURE HISTORY:

ONE RELATED FAILURE HAS OCCURRED:

AC3739-010, 8/20/82. DURING TEMPERATURE CYCLE TESTING OF AN N2/AUX O2

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SUPPLY PANEL AT THE SUPPLIER TO DETERMINE THE CAUSE OF ANOTHER FAILURE, THE POPPETS OF TWO N2 LATCHING VALVES FAILED TO CLOSE UPON COMMAND DURING A LOW TEMPERATURE EXCURSION (-65 F). CAUSE WAS WATER IN THE BELLOW/POPPET ASSEMBLIES. CORRECTIVE ACTION - ASSEMBLY INSTRUCTION WAS AMENDED TO INCLUDE A VACUUM BAKE AT 180 F FOR ONE HOUR PRIOR TO INSTALLING TEFLON SECONDARY SEALS AND TESTING AT -65 F. SPECIAL WARNING INSTRUCTIONS WERE ISSUED TO CLEANING PERSONNEL TO EXCLUDE WATER FROM THE BELLOWS ASSEMBLY CLEANING PROCEDURE.

- (E) OPERATIONAL USE:  
NONE.

- APPROVALS -

RELIABILITY ENGINEERING: *Leah* D. R. RISING : *[Signature]*  
 DESIGN ENGINEERING : M. PRICE *[Signature]* FOR D.L. SANDERFIELD  
 QUALITY ENGINEERING : M. SAVALA *ms* : *[Signature]* 2/6/90  
 NASA RELIABILITY : : *[Signature]* 4/19/90  
 NASA SUBSYSTEM MANAGER : : *[Signature]* 4/19/90  
 NASA QUALITY ASSURANCE : : *[Signature]*