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PRINT DATE: 10/30/89

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 06-1C1-0134-X

SUBSYSTEM NAME: ARS - ARPCS

REVISION : 2 10/27/89

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU :	N2/O2 CONTROL PANEL CARLETON TECHNOLOGIES	MC250-0002-1001 2720-0001
SRU :	VALVE, TOGGLE	1-4-00-51-45

QUANTITY OF LIKE ITEMS: 2
ONE PER LOOP
TWO PER SUBSYSTEM

FUNCTION:
SUPPLY VALVE,
PAYLOAD MANUAL OXYGEN

PROVIDES ON/OFF CONTROL OF 100 PSI OXYGEN TO THE PAYLOAD FROM EITHER
CRYO LOOP ONE OR TWO FOR USE IN PAYLOAD OPERATIONS.

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SUBSYSTEM: ARS - ARPCS
LRU :N2/O2 CONTROL PANEL
ITEM NAME: VALVE, TOGGLE

CRITICALITY OF THIS
FAILURE MODE:1R3

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- FAILURE MODE:
FAILS OPEN; INTERNAL LEAKAGE

MISSION PHASE:

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

- 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? X
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- REDUNDANCY SCREEN A) PASS
- B) FAIL
- C) PASS

PASS/FAIL RATIONALE:

- A)
 - B)
IF PAYLOAD DOES NOT REQUIRE O2 AND LINE IS CAPPED AT BULKHEAD, NO
PRESSURE MEASUREMENT EXISTS TO INDICATE LEAKAGE INTO PAYLOAD O2 SUPPLY
LINE.
 - C)
-

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- FAILURE EFFECTS -

- (A) SUBSYSTEM:
LOSS OF ABILITY TO STOP FLOW TO PAYLOAD O2 SUPPLY LINE.
- (B) INTERFACING SUBSYSTEM(S):
NO EFFECT.
- (C) MISSION:
NO EFFECT.
- (D) CREW, VEHICLE, AND ELEMENT(S):
NO EFFECT.
- (E) FUNCTIONAL CRITICALITY EFFECTS:
INTERNAL LEAKAGE OF THIS VALVE, COMBINED WITH INTERNAL LEAKAGE OF THE ASSOCIATED 100 PSI REGULATOR INLET VALVE AND EXTERNAL LEAKAGE IN THE PAYLOAD O2 SUPPLY LINE. ~~WOULD REQUIRE SHUTOFF OF THE PRSD-ECS VALVE~~ ~~RESULTING IN LOSS OF ONE-HALF OF THE REQUIRED LES FLOW AND POSSIBLE LOSS INSUFFICIENT~~ ~~OF CREW/VEHICLE, O2 FLOW TO LES, AND POSSIBLE LOSS OF CREW/VEHICLE IF~~ ~~LES FLOW IS REQUIRED.~~ ~~COULD RESULT.~~

- 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. BRAYCO LUBE IS COMPATIBLE WITH LOW AND HIGH PRESSURE O2. 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 (CUT O-RING) IS ESTIMATED AT 60 SCCM (0.175 LB/HR).
- (B) TEST:
ACCEPTANCE TEST - ATP ON VALVE INCLUDES PROOF TEST AT 1875 PSIG (1.6

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TIMES OPERATING PRESSURE). EXTERNAL LEAK TESTED FOR 0.2 SCCM MAX LEAKAGE AT 1250 PSIG FOR A MINIMUM OF 15 MINUTES. INTERNAL LEAK TESTED FOR 2 SCCM MAX LEAKAGE AT 1250 PSIG FOR A MINIMUM OF 15 MINUTES. ATP ON N2/O2 CONTROL PANEL AS AN ASSEMBLY INCLUDES EXAMINATION OF PRODUCT, RADIOGRAPHIC INSPECTION, PROOF PRESSURE AT 1870 +/- 20 PSIG, AND EXTERNAL LEAKAGE TEST (DECAY TEST USING GN2) AT 900 +/- 15 PSIG WITH NITROGEN SYSTEM AT A LOWER PRESSURE - ENTIRE PANEL LEAKAGE IS LIMITED TO 11.0 SCCM MAX.

QUALIFICATION TEST - COMPONENT BURST PRESSURE IS 2500 PSIG (2 TIMES OPERATING PRESSURE). 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 - 20G TERMINAL SAWTOOTH PULSE OF 11 MS DURATION IN EACH DIRECTION OF THREE ORTHOGONAL AXES. ATP TO VERIFY LEAKAGE IS PERFORMED AFTER SHOCK AND VIBRATION TESTING.

IN-VEHICLE TESTING - INTERNAL LEAK TEST IS PERFORMED AT 925 - 950 PSIG, 10 SCCM MAX LEAKAGE.

OMRSD - 900 AND 100 PSI O2 SYSTEMS 1 AND 2 EXTERNAL LEAK CHECK WAS PERFORMED WITH THIS VALVE CLOSED PRIOR TO FIRST REFLIGHT OF EACH VEHICLE AND WILL BE PERFORMED IF AN LRU IS REPLACED. MAX ALLOWABLE SYSTEM LEAKAGE IS 40 SCCM.

■ (C) INSPECTION:

RECEIVING INSPECTION

RAW MATERIAL VERIFIED BY INSPECTION FOR MATERIAL AND PROCESS CERTIFICATION.

CONTAMINATION CONTROL

CLEANLINESS LEVEL 200A PER MA0110-301 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.

NONDESTRUCTIVE EVALUATION

INSPECTION OF WELDS BY 20X VISUAL EXAM, X-RAY AND PENETRANT.

CRITICAL PROCESSES

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PARTS PASSIVATION AND ANODIZING VERIFIED BY INSPECTION. HEAT TREATMENT VERIFIED BY INSPECTION. SOLDER CONNECTIONS VERIFIED BY INSPECTION TO BE PER MHB5300.4(3A). POTTING VISUALLY VERIFIED BY INSPECTION. APPLICATION OF LUBRICANT ON SEAL RING VERIFIED BY INSPECTION. TIG WELD SCHEDULE 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 INTERNAL LEAKAGE FAILURE MODE. THE TOGGLE VALVE HAS SUCCESSFULLY BEEN USED THROUGH THE SHUTTLE PROGRAM CONSIDERING THIS FAILURE MODE.

- (E) OPERATIONAL USE:
TBS.

- APPROVALS -

RELIABILITY ENGINEERING:	D. R. RISING	:	<u>[Signature]</u>
DESIGN ENGINEERING	: K. KELLY	:	<u>[Signature]</u>
QUALITY ENGINEERING	: M. SAVALA	:	<u>[Signature]</u>
NASA RELIABILITY	:	:	<u>[Signature]</u>
NASA SUBSYSTEM MANAGER	:	:	<u>[Signature]</u>
NASA QUALITY ASSURANCE	:	:	<u>[Signature]</u>