

PAGE: 1

PRINT DATE: 01/10/90

SHUTTLE CRITICAL ITEMS LIST - ORBITER

NUMBER: 06-101-0123-X

SUBSYSTEM NAME: ARS - ARPCS

REVISION : 2 01/09/90

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	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU :	EMERGENCY O2 CONTROL PANEL CARLETON TECHNOLOGIES	MC250-0002-0120 2735-0001
SRU :	VALVE, CHECK	2662-0001-15

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QUANTITY OF LIKE ITEMS: 2  
ONE PER FLOW PATH  
TWO PER PANEL

**FUNCTION:**

CHECK VALVE, EMERGENCY O2 REGULATOR OUTLET

PROVIDES PROTECTION AGAINST REVERSE FLOW AND PROVIDES FORWARD FLOW PATH  
AT THE OUTLET OF THE EMERGENCY OXYGEN REGULATOR.

PAGE: 2

PRINT DATE: 01/10/90

SHUTTLE CRITICAL ITEMS LIST - ORBITER

NUMBER: 06-1C1-0123-01

REVISION# 2 01/09/90

SUBSYSTEM: ARS - ARPCS  
LRU : EMERGENCY O2 CONTROL PANEL  
ITEM NAME: VALVE, CHECK

CRITICALITY OF THIS  
FAILURE MODE: LR2

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FAILURE MODE:  
CLOSED

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

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO  
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REDUNDANCY SCREEN A) PASS  
B) FAIL  
C) PASS

PASS/FAIL RATIONALE:  
A)

B)  
SCREEN B FAILS BECAUSE BOTH EMERGENCY REGULATOR INLET VALVES ARE  
NORMALLY OPEN; ONE OF THE TWO FLOW PATHS FAILING CLOSED IS THEREFORE  
UNDETECTABLE.

C)  
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- FAILURE EFFECTS -  
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(A) SUBSYSTEM:  
LOSS OF REDUNDANCY.

## SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 06-1C/0123-01

**(B) INTERFACING SUBSYSTEM(S):**

NO EFFECT. REDUNDANT FLOW PATH WILL MEET LES OXYGEN REQUIREMENTS.

**(C) MISSION:**

NO EFFECT. REDUNDANT FLOW PATH WILL MEET LES OXYGEN REQUIREMENTS.

**(D) CREW, VEHICLE, AND ELEMENT(S):**

NO EFFECT. REDUNDANT FLOW PATH WILL MEET LES OXYGEN REQUIREMENTS.

**(E) FUNCTIONAL CRITICALITY EFFECTS:**

FAILURE OF REDUNDANT FLOW PATH RESULTS IN LOSS OF LES O2 SYSTEM. THE LOSS OF LES SUPPORT CAPABILITY MAY RESULT IN LOSS OF CREW/VEHICLE IN THE EVENT THE LES ARE REQUIRED.

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

VALVE BODY IS MADE OF 17-4 PH CONDITION C CRES, WHICH IS PRECIPITATION HARDENED CORROSION RESISTANT STEEL WHICH HAS A HIGH STRENGTH TO WEIGHT RATIO. CHECK VALVE HAS SILASTIC 675 SILICONE RUBBER MOLDED INTO THE 17-4 PH CONDITION A POPPET WITH THE BACK PRESSURE LOADS BEING BORNE BY METAL TO METAL CONTACT AND THE ELASTOMER FUNCTIONING AS AN UNBROKEN GAS SEAL ACROSS THE VALVE. 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. INLET PORT IS PROTECTED BY A 10 MICRON FILTER. ALL OTHER STATIC SEALS ARE ALSO SILASTIC 675. THE POPPET GUIDE IS TEFLON COATED FOR SMOOTH NON-BINDING OPERATION. SPRING IS OF 17-7 PH CONDITION C CRES.

**(B) TEST:**

ACCEPTANCE TEST - PROOF PRESSURE 1885 PSIG FOR A MINIMUM OF 3 MINUTES. EXTERNAL LEAK TEST AT 1250 PSIG; 0.2 SCCM MAX LEAKAGE. INTERNAL LEAK TEST AT 1250 PSIG; 0.2 SCCM MAX LEAKAGE.

QUALIFICATION TEST - QUALIFICATION TEST - LIFE CYCLE TESTING - 1000 CYCLES AT 875 PSIG. BURST PRESSURE IS 2500 PSIG. SUBJECTED TO THE FOLLOWING AS PART OF THE EMERGENCY O2 CONTROL PANEL. DESIGN SHOCK - 20G TERMINAL SAWTOOTH PULSE OF 11 MS DURATION IN EACH DIRECTION OF THREE ORTHOGONAL AXES. RANDOM VIBRATION SPECTRUM ENVELOPE - 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. ATP TO VERIFY LEAKAGE IS PERFORMED AFTER SHOCK AND VIBRATION TESTING.

IN-VEHICLE TESTING - LES SYSTEM FLOW VERIFICATION TEST PROVES OPEN

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## FLOW PATH TO LES QO'S.

EMERGENCY BREATHING SYSTEM REGULATOR TEST IS PERFORMED BEFORE THE FIRST REFLIGHT OF EACH ORBITER AND EVERY FIFTH FLIGHT. FLOW REQUIREMENT IS 34.7 LB/HR MINIMUM. LES MANUAL VALVES CHECKOUT (SAME EFFECTIVITY) VERIFIES FLOW.

**(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 AND DIMENSIONAL CHECKS PERFORMED BY INSPECTION. MIPS ARE INCLUDED IN THE ASSEMBLY PROCEDURE. 4X VISUAL INSPECTION ON SEAL RING. ALL SURFACES REQUIRING CORROSION PROTECTION ARE CERTIFIED. POPPET, SPRING INLET TUBE, INLET AND OUTLET HOUSING ARE VERIFIED BY INSPECTION.

CRITICAL PROCESSES  
INLET FILTER WELD IS VERIFIED BY INSPECTION. APPLICATION OF LUBRICANT ON SEAL RING VERIFIED BY TECHNICIAN. HEAT TREATMENT AND PARTS PASSIVATION VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION  
LEAK TEST IS VERIFIED BY INSPECTION.

TESTING  
ATP VERIFIED BY INSPECTION. BUBBLE POINT AND DELTA P TEST OF INLET FILTER VERIFIED BY INSPECTION.

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

**(D) FAILURE HISTORY:**  
NO FAILURE HISTORY APPLICABLE TO CLOSED FAILURE MODE. THE CHECK VALVE HAS SUCCESSFULLY BEEN USED THROUGH THE SHUTTLE PROGRAM CONSIDERING THIS FAILURE MODE.

**(E) OPERATIONAL USE:**

1. CREW ACTION  
NONE

2. TRAINING

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 06-1C1-0123-01

NONE

3. OPERATIONAL CONSIDERATION

FAILURE OF THE CHECK VALVE IS NOT DETECTABLE EITHER ON BOARD OR THROUGH GROUND MONITORING UNLESS THERE IS A SUBSEQUENT FAILURE.

- APPROVALS -

RELIABILITY ENGINEERING:	O. R. RISING	:	<u>[Signature]</u>
DESIGN ENGINEERING	: K. KELLY	:	<u>[Signature]</u>
QUALITY ENGINEERING	: M. SAVALA	:	<u>[Signature]</u> 3/14/90
NASA RELIABILITY	:	:	<u>[Signature]</u> 5/10/90
NASA SUBSYSTEM MANAGER	:	:	<u>[Signature]</u> 5/11/90
NASA QUALITY ASSURANCE	:	:	<u>[Signature]</u> 4-13-90