FAILURE MODES EFFECTS ANALYSIS (FMEA) – CRITICAL HARDWARE
NUMBER: 06-1C-0116-X

SUBSYSTEM NAME: ARS - ARPCS

REVISION: 9 01/12/94

		PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	:	N2/O2 CONTROL PANEL CARLETON TECHNOLOGIES	MC250-0002-1001 2720-0001
SRU	:	VALVE, CHECK	2662-0001-13

PART DATA

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

FUNCTION:
OXYGEN CHECK VALVE AND FILTER (1.6)

ALLOWS GAS FLOW IN ONE DIRECTION WHICH PREVENTS COMPLETE LOSS OF DISTRIBUTION SYSTEM FROM ANY EXTERNAL LEAKAGE UPSTREAM OF CHECK VALVE. PROVIDES FOR FILTERING OF ALL OXYGEN COMING FROM THE PRSD CRYO OXYGEN SYSTEMS TO PROTECT DOWNSTREAM COMPONENTS.

PRINT DATE: 01/12/94

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE
NUMBER: 06-1C-0118-04

REVISION# 9 01/12/94 R

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

CRITICALITY OF THIS FAILURE MODE: 1/1

FAILURE MODE:
EXTERNAL LEAKAGE
AUX O2 TANK NOT INSTALLED

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

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

PASS/FAIL RATIONALE:
A)

B)

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:
LEAKAGE OF OXYGEN INTO CABIN UNTIL ASSOCIATED PRSD SUPPLY VALVE IS CLOSED.

(B) INTERFACING SUBSYSTEM(S):
INCREASED PPO2 UNTIL PRSD VALVE IS CLOSED. LOSS OF ONE O2 SOURCE TO AIRLOCK AND LES.

(C) MISSION:

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POSSIBLE EARLY MISSION TERMINATION AS ONLY ONE OXYGEN SOURCE REMAINS FOR CABIN, AIRLOCK AND LES REQUIREMENTS.

(D) CREW, VEHICLE, AND ELEMENT(S):
LOSS OF ONE O2 SUPPLY SYSTEM RESULTS IN INSUFFICIENT OXYGEN FLOW TO LES SYSTEM. LOSS OF THIS EMERGENCY SYSTEM MAY RESULT IN LOSS OF CREW/ VEHICLE.

(E) FUNCTIONAL CRITICALITY EFFECTS:
NONE

-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 A 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.

(B) TEST:
ACCEPTANCE TEST - PROOF PRESSURE 1885 PSIG, LEAK TESTED FOR 1.0 SCCM MAX LEAKAGE AT 900 PSIG.

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 - SYSTEM LEAK TEST IS PERFORMED AT 925 - 950 PSIG, 10 SCCM MAX LEAKAGE.

OMRSD - SYSTEM LEAK TEST IS PERFORMED BEFORE THE FIRST REFLIGHT OF EACH ORBITER AND AT INTERVALS OF FIVE FLIGHTS, AT 900 - 950 PSIG, 70 SCCM MAX SYSTEM LEAKAGE. INFLIGHT CHECKOUT DURING EACH MISSION WILL VERIFY NO GROSS EXTERNAL LEAKAGE.

(C) INSPECTION:
RECEIVING INSPECTION
RAW MATERIAL VERIFIED BY INSPECTION FOR MATERIAL AND PROCESS CERTIFICATION.

CONTAMINATION CONTROL

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CLEANLINESS LEVEL 300A PER MAO110-301 AND 100 ML RINSE TEST VERIFIED BY INSPECTION. SYSTEM GAS SAMPLES ASSOCIATED WITH RESERVICING ARE ANALYZED FOR CONTAMINATION.

ASSEMBLY/INSTALLATION
DIMENSIONAL CHECK INCLUDING MIPS FOR PERPENDICULARITY AND CONCENTRICITY ARE PERFORMED AND VERIFIED BY INSPECTION. TIG WELD SCHEDULES VERIFIED BY INSPECTION. VISUAL INSPECTION USING 10X MAGNIFICATION ON SEAL RING VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION
RADIOGRAPHIC AND PENETRANT INSPECTION OF WELDS VERIFIED BY INSPECTION.

CRITICAL PROCESSES
TIG WELD, PARTS PASSIVATION AND HEAT TREATMENT VERIFIED BY INSPECTION. SOLDER CONNECTIONS VERIFIED BY INSPECTION.

TESTING
ATP IS VERIFIED BY INSPECTION.

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

(D) FAILURE HISTORY:
NO FAILURE HISTORY.

(E) OPERATIONAL USE:
CONSIDERATION WILL BE GIVEN TO DEPRESSURIZING THE CABIN TO 10.2 PSIA FOR CREW SIZES OF FIVE OR MORE (REDUCED PRESSURE REDUCES O2 FLOW RATE REQUIREMENT TO ACCEPTABLE LEVELS).

- APPROVALS -

EDITORIALLY APPROVED : RI
EDITORIALLY APPROVED : JSC
TECHNICAL APPROVAL : VIA CR

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