

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE
NUMBER: 06-3D-0505 -X**

SUBSYSTEM NAME: ATCS - RADIATORS AND FLOW CONTROL
REVISION: 0 12/02/97

PART DATA

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	: VALVE,CHECK CIRCLE SEAL	MC284-0472-0034 P200-180

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
FREON LOOP, RADIATOR ISOLATION, VALVE, CHECK.

REFERENCE DESIGNATORS:

QUANTITY OF LIKE ITEMS: 2
ONE PER LOOP

FUNCTION:
PREVENTS BACKFLOW OF FREON INTO THE RADIATORS WHEN ISOLATION VALVE IS IN RADIATOR BYPASS POSITION.

FAILURE MODES EFFECTS ANALYSIS FMEA -- CIL FAILURE MODE

NUMBER: 06-3D-0505- 02

REVISION#: 0 12/05/97

SUBSYSTEM NAME: ATCS - RADIATORS AND FLOW CONTROL

LRU: VALVE, CHECK

ITEM NAME: VALVE, CHECK

**CRITICALITY OF THIS
FAILURE MODE: 1R3**

FAILURE MODE:

FAILS OPEN

MISSION PHASE:

LO LIFT-OFF
OO ON-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY:

102 COLUMBIA
103 DISCOVERY
104 ATLANTIS
105 ENDEAVOUR

CAUSE:

VIBRATION, MECHANICAL SHOCK, CORROSION, CONTAMINATION.

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN

A) PASS
B) FAIL
C) PASS

PASS/FAIL RATIONALE:

A)

B)

CANNOT ISOLATE FAIL OPEN OF VALVE BECAUSE NORMAL POSITION FOR VALVE IS OPEN.

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:

NO EFFECT FIRST FAILURE.

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(B) INTERFACING SUBSYSTEM(S):
NO EFFECT FIRST FAILURE.

(C) MISSION:
NO EFFECT FIRST FAILURE.

(D) CREW, VEHICLE, AND ELEMENT(S):
NO EFFECT FIRST FAILURE.

(E) FUNCTIONAL CRITICALITY EFFECTS:
PROBABLE LOSS OF MISSION AFTER TWO FAILURES: (1) EXTERNAL LEAK IN RADIATORS OF A COOLANT LOOP, AND (2) CHECK VALVE FAILS OPEN FOR ASSOCIATED COOLANT LOOP ALLOWING FREON TO BACKFLOW INTO LEAKING RADIATOR ARRAY FAILING THE ASSOCIATED COOLANT LOOP. POSSIBLE LOSS OF CREW/VEHICLE AFTER ONE ADDITIONAL FAILURE: LOSS OF REDUNDANT COOLANT LOOP.

-DISPOSITION RATIONALE-

(A) DESIGN:
THE CHECK VALVE IS A POPPET TYPE, SPRING LOADED AND PRESSURE ASSISTED TO THE CLOSED POSITION. THE POPPET AND SPRING ARE CONTAINED IN A THREADED HOUSING AND END CAP. THE POPPET SEAL IS A SELF CENTERING TEFLON O-RING. THE VALVE BODY PROVIDES A GUIDE FOR THE POPPET TRAVEL. THE VALVE BODY IS DESIGNED TO A FACTOR OF SAFETY OF 2.0 PROOF AND 4.0 BURST.

THE THREADED HOUSING IS MANUFACTURED FROM 316L CRES AND THE END CAP IS INCONEL 718. THE END CAP IS THREADED INTO THE HOUSING (TORQUED TO 75 FT-LBS) AND TIG WELDED TO SEAL THE POINT.

STRUCTURAL ANALYSIS, PERFORMED BY THE CHECK VALVE SUPPLIER, INDICATES POSITIVE MARGINS OF SAFETY FOR ALL CONDITIONS OF CHECK VALVE OPERATION.

(B) TEST:
ATP

EXAMINATION OF PRODUCT

AMBIENT TESTS
BODY PROOF PRESSURE (1717 PSIG)
CLOSURE DEVICE PROOF PRESSURE (1717 PSIG)
EXTERNAL LEAKAGE (850 PSIG)
INTERNAL LEAKAGE (5, 25, 100, 850 PSIG)
CRACKING AND RESEAT PRESSURE: 3 CYCLES

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CRACKING PRESSURE 0.6 PSID MAX
RESEAT PRESSURE 0.1 PSID MIN

LOW TEMPERATURE TESTS (-160 DEG F)
INTERNAL LEAKAGE (5, 25, 100, 850 PSIG)

CERTIFICATION

FLOW TEST (0.202 LB/SEC GHE)
MAX INLET PRESSURE OF 130 PSIG
PRESSURE DROP (15 PSID MAX)

CHATTER TEST (850 TO 0 PSIG)
RECORD FLOW RATE WHEN CHATTER OCCURS

CRACKING AND RESEAT PRESSURE
AMBIENT: 3 CYCLES EACH
CRACKING PRESSURE 0.6 PSID MAX
RESEAT PRESSURE 0.1 PSID MIN

INTERNAL LEAKAGE AMBIENT (0 TO 850 PSIG) LOW TEMPERATURE (-160 DEG F, 0 TO 850 PSIG)

EXTERNAL LEAKAGE (AMBIENT, 850 PSIG)

LIFE CYCLE TEST

ONE CYCLE CONSISTS OF PRESSURIZING THE INLET TO 130 PSIG, VENTING THE INLET TO AMBIENT, PRESSURIZING THE OUTLET TO 850 PSIG, AND VENTING THE OUTLET TO AMBIENT.

42,000 CYCLES (AMBIENT)

FOLLOWED BY CRACK, RESEAT, AND INTERNAL LEAKAGE TESTS (-160 DEG F)

VIBRATION (AMBIENT, 2 AXES)

RANDOM
4.4 HOURS FOR EACH OF 2 AXES

UPON COMPLETION OF VIBRATION TESTS PERFORM CRACK, RESEAT, AND INTERNAL LEAKAGE TEST.

BURST PRESSURE (3400 PSIG)

GROUND TURNAROUND TEST

TURNAROUND CHECKOUT TESTING ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

(C) INSPECTION:

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RECEIVING INSPECTION

ALL RAW MATERIALS ARE VERIFIED FOR MATERIAL AND PROCESS CERTIFICATION. RECEIVING INSPECTION VERIFIES CERTIFICATION OF SPRING HEAT TREATMENT AND PERFORMS LOAD TEST OF SPRINGS.

CONTAMINATION CONTROL

ALL PARTS AND ASSEMBLIES ARE MAINTAINED TO CLEANLINESS LEVEL OF 100A. INLET AND OUTLET ARE PROTECTED AFTER TESTS TO MAINTAIN INTERNAL CLEANLINESS.

ASSEMBLY/INSTALLATION

DIMENSIONS AND SURFACE FINISHES ARE VERIFIED BY INSPECTION. INSPECTION POINTS ARE ESTABLISHED TO VERIFY ASSEMBLY PROCESS. WELDS ARE VISUALLY VERIFIED BY 10X MAGNIFICATION.

CRITICAL PROCESSES

ALL WELDING, ELECTROPOLISHING AND PARTS PASSIVATION ARE VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION

HELIUM LEAKAGE DETECTION IS VERIFIED.

TESTING

ATP IS VERIFIED BY INSPECTION.

HANDLING/PACKAGING

PACKAGING FOR SHIPMENT IS VERIFIED BY INSPECTION.

(D) FAILURE HISTORY:

NONE.

(E) OPERATIONAL USE:

NONE.

- APPROVALS -

SS & PAE MANAGER
SS & PAE ENGINEER
ECLSS-ATCS
BNA SSM
JSC MOD
JSC RDE

USA/orbiter

✓ : D.F. MIKULA
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[Handwritten signatures and initials over horizontal lines]

Nanette Cerma 11-24-98

Suzanne Little 1/4/99
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