

**FAILURE MODES EFFECTS ANALYSIS (FMEA) – CIL HARDWARE**  
**NUMBER: 06-3D-0509 -X**

**SUBSYSTEM NAME:** ATCS - RADIATORS AND FLOW CONTROL  
**REVISION:** 0 01/12/98

**PART DATA**

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	<b>PART NAME</b>	<b>PART NUMBER</b>
	<b>VENDOR NAME</b>	<b>VENDOR NUMBER</b>
LRU	: VALVE, ISOLATION CARLETON TECHNOLOGIES	ME284-0603 2632-1001-5

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**EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:**  
FREON LOOP ISOLATION VALVE CONTROL

**REFERENCE DESIGNATORS:**

**QUANTITY OF LIKE ITEMS:** 2  
ONE PER LOOP

**FUNCTION:**  
PROVIDES MEANS OF ISOLATING FREON FLOW FROM THE RADIATOR ARRAY IN THE  
EVENT OF AN EXTERNAL LEAK IN THAT ARRAY.

**FAILURE MODES EFFECTS ANALYSIS FMEA -- CIL FAILURE MODE**

**NUMBER: 06-3D-0509- 01**

**REVISION#: 0 12/05/97**

**SUBSYSTEM NAME: ATCS - RADIATORS AND FLOW CONTROL**

**LRU: VALVE, ISOLATION**

**CRITICALITY OF THIS**

**ITEM NAME: VALVE, ISOLATION**

**FAILURE MODE: 1R2**

**FAILURE MODE:  
EXTERNAL LEAKAGE**

**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.**

**CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO**

**REDUNDANCY SCREEN       A) PASS  
  B) PASS  
  C) PASS**

**PASS/FAIL RATIONALE:**

A)

B)

C)

**- FAILURE EFFECTS -**

**(A) SUBSYSTEM:  
FIRST FAILURE WILL CAUSE LOSS OF ONE FREON COOLANT LOOP AND PROBABLE  
LOSS OF MISSION.**

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**(B) INTERFACING SUBSYSTEM(S):**  
FIRST FAILURE WILL CAUSE POSSIBLE SHUTDOWN OF EFFECTED SYSTEMS DUE TO REDUCED COOLING CAPACITY.

**(C) MISSION:**  
PROBABLE LOSS OF MISSION AFTER FIRST FAILURE:  
(1) EXTERNAL LEAK IN ISOLATION VALVE.

**(D) CREW, VEHICLE, AND ELEMENT(S):**  
POSSIBLE LOSS OF CREW/VEHICLE AFTER TWO FAILURES:  
(1) EXTERNAL LEAK ISOLATION VALVE,  
(2) LOSS OF REDUNDANT COOLANT LOOP.

**(E) FUNCTIONAL CRITICALITY EFFECTS:**  
PROBABLE LOSS OF MISSION AFTER ONE FAILURE:  
(1) EXTERNAL LEAK ISOLATION VALVE WILL CAUSE LOSS OF FREON FROM COOLANT LOOP WITH SUBSEQUENT LOSS OF THAT LOOP.

POSSIBLE LOSS OF CREW/VEHICLE AFTER TWO FAILURES:  
(1) EXTERNAL LEAK ISOLATION VALVE CAUSING LOSS OF FREON FROM COOLANT LOOP AND SUBSEQUENT LOSS OF COOLANT LOOP.  
(2) LOSS OF REDUNDANT COOLANT LOOP CAUSES LOSS OF ALL VEHICLE COOLING..

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**-DISPOSITION RATIONALE-**

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**(A) DESIGN:**  
WELDED CONSTRUCTION WITH BELLOWS FOR DYNAMIC SEALS. VALVE HOUSING AND SEAT ARE MADE OF STAINLESS STEEL, WHICH IS COMPATIBLE WITH FREON 21. THERE IS A 65 MICRON FILTER IN THE RADIATOR ISOLATION VALVE.

**(B) TEST:**  
QUALIFICATION TEST - QUALIFICATION TESTED FOR 100 MISSION LIFE. VIBRATION TESTED AT 0.4 G\*\*2/HZ FOR 30 MIN/AXIS, SHOCK TESTED AT +/- 20 G EACH AXIS, AND 10000 CYCLE VALVE LIFE TEST.

ACCEPTANCE TEST - VALVE FUNCTIONAL TEST IS PERFORMED DURING ATP.

GROUND TURNAROUND TEST

FREON COOLANT LOOPS ARE LEAK CHECKED PRIOR TO EACH FLIGHT.

**(C) INSPECTION:**

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**RECEIVING INSPECTION**

RAW MATERIAL CERTIFICATIONS ARE VERIFIED BY INSPECTION.

**CONTAMINATION CONTROL**

CONTAMINATION CONTROL PROCESSES, CONTAMINATION CONTROL PLAN AND CORROSION PROTECTION PROVISIONS ARE VERIFIED BY INSPECTION. FLUID SYSTEM IS VERIFIED BY INSPECTION TO BE FREE OF CONTAMINATION.

**ASSEMBLY/INSTALLATION**

MANUFACTURING, INSTALLATION AND ASSEMBLY ARE VERIFIED BY INSPECTION. DIMENSIONS AND SURFACE FINISHES VERIFIED BY INSPECTION.

**NONDESTRUCTIVE EVALUATION**

X-RAY EXAMINATION OF FUSION WELDS IS VERIFIED BY INSPECTION. ULTRASONIC INSPECTION OF RAW MATERIAL VERIFIED. DYE PENETRANT EVALUATION OF MACHINED PARTS VERIFIED.

**CRITICAL PROCESSES**

PASSIVATION, HEAT TREATING, WELDING AND BRAZING ARE VERIFIED BY INSPECTION.

**TESTING**

VIBRATION, FLOW RATE AND PRESSURE DROP REQUIREMENTS ARE VERIFIED BY INSPECTION DURING ATP. LEAKAGE DURING PROOF PRESSURE AND HELIUM LEAK CHECK TESTS IS VERIFIED BY TESTING. INSULATION RESISTANCE AND DIELECTRIC STRENGTH TEST ARE VERIFIED BY TESTING DURING ATP.

**HANDLING/PACKAGING**

HANDLING AND STORAGE ENVIRONMENTS ARE VERIFIED BY INSPECTION. PARTS PROTECTION VERIFIED BY INSPECTION.

**(D) FAILURE HISTORY:**

NO FAILURE HISTORY.

**(E) OPERATIONAL USE:**

ON-BOARD ALARMS, FREON INLET PRESSURE AND ACCUMULATOR QUANTITY, WILL PROVIDE INDICATION OF HARDWARE FAILURE. FREON PUMP WILL BE TURNED OFF AND LOSS OF ONE FREON LOOP POWERDOWN WILL BE PERFORMED. ENTRY AT NEXT PRIMARY LANDING SITE.

**- APPROVALS -**

SS & PAE MANAGER  
SS & PAE ENGINEER  
ECLSS-ATCS

For: D.F. MIKULA  
: K.E. RYAN  
: L. T. HARPER

*[Handwritten signatures]*  
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BNA SSM  
JSC MOD  
JSC RDE

: S. N. NGUYEN  
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*USA/Arhiter*

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Nanette Ceira 11-20-98

*Suzanne Little 1/4/99*  
*[Signature] 1/18/99*