

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE
NUMBER: 06-3D-0501 -X**

SUBSYSTEM NAME: ATCS - RADIATORS AND FLOW CONTROL
REVISION: 1 12/02/97

PART DATA

	PART NAME	PART NUMBER
	VENDOR NAME	VENDOR NUMBER
LRU	: RADIATOR AND FLOW CONTROL ASSY	MC203-0002-XXXX 224-00XX-XXX
LRU	: FWD RADIATOR RH	MC203-0002-0012 224-00010-109
LRU	: MID-FWD RADIATOR RH	MC203-0002-0019 224-00015-113
LRU	: MID-AFT RADIATOR RH	MC203-0002-0022 224-00020-109
LRU	: AFT RADIATOR RH	MC203-0002-0028 224-00025-109
LRU	: FWD RADIATOR LH	MC203-0002-0032 224-00030-109
LRU	: MID-FWD RADIATOR LH	MC203-0002-0039 224-00035-113
LRU	: MID-AFT RADIATOR LH	MC203-0002-0041 224-00040-109
LRU	: AFT RADIATOR LH	MC203-0002-0048 224-00045-109

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
SPACE RADIATOR PANEL ASSEMBLY.

REFERENCE DESIGNATORS:

QUANTITY OF LIKE ITEMS: 8
FOUR PER LOOP;
EIGHT PER VEHICLE

FUNCTION:
PROVIDES HEAT REJECTION SURFACES FOR FREON COOLANT LOOPS WITH RADIATOR PANELS DEPLOYED. USED DURING ORBITAL OPERATIONS. FOUR PANELS ON LOOP 1 (LEFT SIDE OF VEHICLE) AND FOUR PANELS ON LOOP 2 (RIGHT SIDE OF VEHICLE).

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NORMAL ATCS ENTRY, THE RADIATORS ARE COLD SOAKED PRIOR TO DOOR CLOSURE AND ARE USED FOR THERMAL CONTROL AFTER FLASH EVAPORATOR GPC SHUTDOWN.

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LRU: RADIATOR AND FLOW CONTROL ASSY

ITEM NAME: AFT RADIATOR LH

CRITICALITY OF THIS
FAILURE MODE: 1R2FAILURE MODE:
EXTERNAL LEAKAGEMISSION PHASE: LO LIFT-OFF
OO ON-ORBITVEHICLE/PAYLOAD/KIT EFFECTIVITY: 102 COLUMBIA
103 DISCOVERY
104 ATLANTIS
105 ENDEAVOURCAUSE:
CORROSION, MECHANICAL SHOCK, VIBRATION, SPACE DEBRIS PUNCTURES RADIATOR.

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:
PROBABLE LOSS OF MISSION FIRST FAILURE.

(B) INTERFACING SUBSYSTEM(S):

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FIRST FAILURE WILL CAUSE RADIATOR ISOLATION AND LOSS OF RADIATOR COOLING FOR ASSOCIATED COOLANT LOOP.

(C) MISSION:
PROBABLE LOSS OF MISSION AFTER FIRST FAILURE..

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

(E) FUNCTIONAL CRITICALITY EFFECTS:
PROBABLE LOSS OF MISSION AFTER FIRST FAILURE:
(1) EXTERNAL LEAK RADIATOR ARRAY RESULTING IN LOSS OF FREON FOR THAT LOOP WITH SUBSEQUENT LOSS OF ASSOCIATED COOLANT LOOP.

POSSIBLE LOSS OF CREW/VEHICLE AFTER TWO FAILURES:
(1) EXTERNAL LEAK RADIATOR ARRAY RESULTING IN LOSS OF FREON FOR THAT LOOP WITH SUBSEQUENT LOSS OF ASSOCIATED COOLANT LOOP.
(2) LOSS OF REDUNDANT COOLANT LOOP. (NOTE: RADIATOR ISOLATION HAS BEEN DESIGNED TO ISOLATE RADIATORS IN 5 SECONDS OR LESS THAT MAY NOT BE SUFFICIENT TIME TO SAVE THE COOLANT LOOP FOR A MASSIVE LEAK THEREFORE RADIATOR ISOLATION IS NOT USED AS A LEG TO REDUCE CRITICALITY.)

-DISPOSITION RATIONALE-

(A) DESIGN:
DESIGN PROOF AND BURST PRESSURE FOR THE PANELS ARE 1.5 AND 2.0 TIMES THE MAXIMUM OPERATING PRESSURE. RADIATOR PANELS AND INTERPANEL PLUMBING ARE DESIGNED FOR 400 MISSION LIFE. TUBES ARE 6061-T6 AL WHICH IS COMPATIBLE WITH FREON 21.

(B) TEST:
QUALIFICATION TEST - THE RADIATOR PANELS AND INTER-PANEL PLUMBING WAS LIFE TESTED FOR AN EQUIVALENT OF 400 MISSIONS (FOUR LIFETIMES). VIBRATION TESTED AT 3 G**2/HZ FOR Y AND Z AXES, AND 1G2/HZ FOR X AXIS, FOR 48 MIN/AXIS. SHOCK TESTED AT +/- 20 G EACH AXIS.

ACCEPTANCE TEST - ATP VERIFIES THERE IS NO LEAKAGE.

GROUND TURNAROUND TEST
OMRSD - FCL'S ARE LEAK CHECKED PRIOR TO EACH FLIGHT. FREON CHEMICAL ANALYSIS PER SE-S-0073 DURING SERVICING.

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(C) INSPECTION:

RECEIVING INSPECTION

RAW MATERIAL IS VERIFIED BY INSPECTION. VISUAL INSPECTION/ID PERFORMED.
PARTS PROTECTION IS VERIFIED BY INSPECTION.

CONTAMINATION CONTROL

SYSTEM FLUID SAMPLES PERIODICALLY ANALYZED FOR CONTAMINATION AND VERIFIED BY INSPECTION. CONTAMINATION CONTROL PROCESSES AND CORROSION PROTECTION PROVISIONS ARE VERIFIED BY INSPECTION. FORMAL CONTAMINATION CONTROL PLAN IS VERIFIED BY INSPECTION. INSPECTION VERIFIES CLEANLINESS TO LEVEL 300.

ASSEMBLY/INSTALLATION

MANUFACTURING, INSTALLATION AND ASSEMBLY OPERATIONS ARE VERIFIED BY INSPECTION ON SHOP TRAVELER MIPS. MATERIAL AND EQUIPMENT CONFORMANCE TO CONTRACT REQUIREMENTS ARE VERIFIED BY INSPECTION. PROCESSING EQUIPMENT CONTROLS ARE VERIFIED BY INSPECTION.

CRITICAL PROCESSES

WELDING IS VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION X-RAY EXAMINATION OF FUSION WELDS IS VERIFIED BY INSPECTION.

TESTING

FUNCTIONAL TEST IS MONITORED BY INSPECTION TO VERIFY FLOWRATE IS WITHIN SPECIFIED LIMITS.

HANDLING/PACKAGING

PROPERLY MONITORED HANDLING AND STORAGE ENVIRONMENTS ARE 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 -

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

F4
: D.F. MIKULA
: K.E. RYAN
: L. T. HARPER
: S. N. NGUYEN
:

USA/orkuter

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Nanette Ceiba 11-28-98

Suzanne Little 1/4/99
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