

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE
NUMBER: 06-3D-0506 -X**

SUBSYSTEM NAME: ATCS - RADIATORS AND FLOW CONTROL
REVISION: 0 12/05/97

PART DATA

| | PART NAME | PART NUMBER |
|-----|-------------------------------|----------------------|
| | VENDOR NAME | VENDOR NUMBER |
| LRU | 3/4" LINE W/VISCO JET ORIFICE | VOLA4336730H |

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
ANTI HYDRAULIC LOCK ORIFICE (ORIFICE#1).

REFERENCE DESIGNATORS:

QUANTITY OF LIKE ITEMS: 2
ONE PER EACH COOLANT LOOP

FUNCTION:

PROVIDES PRESSURE RELIEF FOR FREON IN LINE BETWEEN RADIATOR FLOW CONTROL ASSEMBLY, CHECK VALVE, AND ISOLATION VALVE WHEN VALVE CONFIGURATIONS MAY CAUSE HYDRAULIC LOCKUP.

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LRU: 3/4" LINE WITH VISCO JET ORIFICE

ITEM NAME: 3/4" LINE WITH VISCO JET ORIFICE

CRITICALITY OF THIS
FAILURE MODE: 1R2

FAILURE MODE:

CLOGS

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) FAIL |
| | B) PASS |
| | C) PASS |

PASS/FAIL RATIONALE:

A)

THE CLOG FAILURE IS NOT DETECTABLE DURING NORMAL GROUND PROCESSING WITHOUT DISASSEMBLY OF THE SYSTEM.

B)

AFTER A COMPLETE CLOGGING OF ORIFICE, ENVIRONMENTAL HEAT GAIN WITH SUBSEQUENT HYDRAULIC LOCKUP IS ASSUMED TO BE AN AUTOMATIC CONDITION LEADING TO HARDWARE FAILURE (LINE OR VALVE RUPTURE). THE HARDWARE FAILURE IS DETECTABLE ON ORBIT WITH EXISTING INSTRUMENTATION.

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:

A COMPLETELY CLOGGED ORIFICE MAY CAUSE HYDRAULIC LOCKUP, LINE RUPTURE, AND LOSS OF THE EFFECTED COOLANT LOOP.

(B) INTERFACING SUBSYSTEM(S):

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FIRST FAILURE MAY AUTOMATICALLY RESULT IN LOSS OF A COOLANT LOOP AND VEHICLE POWER DOWN.

(C) MISSION:

FIRST FAILURE MAY AUTOMATICALLY RESULT IN LOSS OF ASSOCIATED COOLANT LOOP AND EARLY MISSION TERMINATION.

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

FIRST FAILURE MAY AUTOMATICALLY RESULT IN LOSS OF ASSOCIATED COOLANT LOOP AND REDUCED COOLING TO THE VEHICLE.

(E) FUNCTIONAL CRITICALITY EFFECTS:

POSSIBLE LOSS OF CREW/VEHICLE TWO FAILURES:

(1) ORIFICE CLOGS CAUSING HYDRAULIC LOCKUP FOR COOLANT LOOP RESULTING IN EVENTUAL RUPTURE OF FREON COOLANT LINE WITH RESULTANT LOSS OF COOLANT LOOP

(2) REDUNDANT COOLANT LOOP FAILS CAUSING LOSS OF ALL VEHICLE COOLING AND POSSIBLE LOSS OF CREW/VEHICLE.

-DISPOSITION RATIONALE-

(A) DESIGN:

LINE MOUNT, 73000 LOHM RATE, 0.015" MIN PASSAGE SIZE, 0.01" SCREEN, 3000 PSI MAX OPERATING PRESSURE, ALL 304L CRES CONSTRUCTION MATERIAL, 41 G WEIGHT. SELECTED TO PROVIDE MINIMUM POSSIBLE FLOW WHILE MEETING PRESSURE RELIEF REQUIREMENT AND LARGE ENOUGH TO AVOID BEING CLOGGED BY CONTAMINATION. MINIMUM PASSAGE SIZE OF 381 MICRON (0.015") IS 5.9 TIMES LARGER THAN THE 65 MICRON LARGEST FILTER SIZE IN THE FCL, MINIMIZING THE PROBABILITY OF CLOGGING BY CONTAMINATION. THE COOLANT WILL FLOW THROUGH THE ORIFICE IN BOTH DIRECTIONS THUS PERMITTING SELF CLEANING.

(B) TEST:

NONE.

(C) INSPECTION:

NONE

(D) FAILURE HISTORY:

NO APPLICABLE FAILURE HISTORY.

(E) OPERATIONAL USE:

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ON-BOARD ALARMS, FREON INLET PRESSURE AND ACCUMULATOR QUANTITY WILL PROVIDE INDICATION OF HARDWARE FAILURE IF HYDRAULIC LOCKUP OCCURS AND COOLANT LINE IS RUPTURED. IF THIS OCCURS THEN 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 | : D.F. MIKULA | <i>D.F. Mikula</i> |
| SS & PAE ENGINEER | : K.E. RYAN | <i>K.E. Ryan</i> |
| ECLSS-ATCS | : L. T. HARPER | <i>L.T. Harper</i> |
| BNA SSM | : S. N. NGUYEN | <i>S.N. Nguyen</i> |
| JSC MOD | : P. HASBROUX | <i>P. Hasbroux</i> |
| JSC NASA SRQA | : | <i>John Klasko 3/3/99</i> |
| JSC NASA SSM | : | <i>John Klasko 3/3/99</i> |
| JSC/SAM | : | <i>John Klasko 3/4/99</i> |
| JSC/PROJECT MANAGER | : J. STONE | <i>J. Stone 3/5/99</i> |
| <i>USA/Orbiter</i> | | <i>4/0</i> |
| | | <i>Suzanne Riddle 3/4/99</i> |