

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL HARDWARE
NUMBER: M8-1SS-E037 -X**

SUBSYSTEM NAME: ECLSS - EMU LIQUID COOLING SYSTEM

REVISION: 1

10/22/97

PART DATA

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	:LINES & FITTINGS	M072-643401
LRU	:LINES & FITTINGS	M072-643403
LRU	:LINES & FITTINGS	V828-643050
SRU	:LINES & FITTINGS MULTIPLE SOURCES	MULTIPLE P/N'S

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:

EMU LIQUID COOLING SUPPLY/RETURN LINES, FEEDTHRU'S, QUICK DISCONNECTS, FITTINGS, AND COUPLINGS

QUANTITY OF LIKE ITEMS: 1
ONE SET PER SUBSYSTEM

FUNCTION:

PROVIDES TWO INDEPENDENT SUPPLY AND RETURN PATHS OF LIQUID COOLANT BETWEEN THE MID DECK FLUID CONNECTIONS AND EXTERNAL AIRLOCK EMU INTERFACE FOR COOLING EMU'S.

REFERENCE DOCUMENTS: VS28-643001
V828-643050
V828-643051
M072-643403

FAILURE MODES EFFECTS ANALYSIS FMEA - NON-CIL FAILURE MODE

NUMBER: M8-1SS-ED37-02

REVISION#: 0 04/08/97

SUBSYSTEM NAME: ECLSS - EMU LIQUID COOLING SYSTEM

LRU: EMU LIQUID COOLING SUPPLY/RETURN LINES

CRITICALITY OF THIS

ITEM NAME: LINES, FEEDTHRU'S, QD'S, & FITTINGS

FAILURE MODE: 1R3

FAILURE MODE:

RESTRICTED FLOW (CLOGGED)

MISSION PHASE: OO ON-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY:	103	DISCOVERY
	104	ATLANTIS
	105	ENDEAVOUR

CAUSE:

CORROSION, CONTAMINATION, MECHANICAL SHOCK

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN	A) PASS
	B) PASS
	C) PASS

PASS/FAIL RATIONALE:

A)

B)

C)

METHOD OF FAULT DETECTION:

VISUAL OBSERVATION - INCREASED TIME IN COOLING AFFECTED EMU.

INSTRUMENTATION - EMU LIQUID COOLING PRESSURE ANOMALY IN AFFECTED COOLANT LOOP.

CORRECTING ACTION: MANUAL

CORRECTING ACTION DESCRIPTION:

CREW COULD UTILIZE REDUNDANT COOLANT LOOP TO COOL EMU'S. (DUE TO THE TIME IT TAKES TO COOL ONE EMU, IT MAY NOT BE FEASIBLE TO COOL ALL EMU'S FROM A SINGLE COOLANT LOOP.)

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REMARKS/RECOMMENDATIONS:

EACH COOLANT LOOP IS DEDICATED TO A SINGLE EMU. A PLANNED EVA REQUIRES THE USE OF A MINIMUM OF THREE EMU'S (FOR THREE EVA CREWMEMBERS) WHILE A CONTINGENCY EVA REQUIRES A MINIMUM OF TWO EMU'S (FOR TWO EVA CREWMEMBERS).

- FAILURE EFFECTS -

(A) SUBSYSTEM:

REDUCED OR LOSS OF LIQUID COOLING TO AFFECTED EMU MECHANICAL FITTING (SUPPLY PATH) OR FROM AFFECTED EMU MECHANICAL FITTING (RETURN PATH).

(B) INTERFACING SUBSYSTEM(S):

LOSS OF CAPABILITY TO COOL AN EMU USING AFFECTED LIQUID COOLING LOOP.

(C) MISSION:

COOLING OF EMU'S FROM A SINGLE PORT WOULD RESULT IN PREPARING ONLY ONE EMU AT A TIME FOR EVA. LOSS OF PLANNED EVA CAPABILITIES FOLLOWING SIMILAR FAILURE IN REDUNDANT COOLING LOOP RESULTING IN LOSS OF MISSION OBJECTIVES ASSOCIATED WITH A PLANNED EVA.

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

INABILITY TO PERFORM CONTINGENCY EVA FOLLOWING SECOND FAILURE COULD RESULT IN LOSS OF CREW AND VEHICLE.

(E) FUNCTIONAL CRITICALITY EFFECTS:

FIRST FAILURE (ONE LIQUID COOLANT LOOP IS CLOGGED) - INABILITY TO COOL EMU FROM ONE PORT RESULTING IN ONLY ONE EMU PORT AVAILABLE FOR EMU SERVICING. NO EFFECT, REDUNDANT COOLANT LOOP AVAILABLE.

SECOND FAILURE (SECOND LIQUID COOLANT LOOP IS CLOGGED) - LOSS OF CAPABILITY TO UTILIZE ALL EMU'S RESULTING IN LOSS OF EVA CAPABILITIES. - CRITICALITY 2R3 CONDITION.

THIRD FAILURE (FAILURE NECESSITATING AN EVA TO PREVENT A POTENTIAL CATASTROPHIC SITUATION) - INABILITY TO PERFORM CONTINGENCY EVA TO CORRECT A CRIT 1 CONDITION COULD RESULT IN LOSS OF CREW AND VEHICLE - CRITICALITY 1R3 CONDITION.

DESIGN CRITICALITY (PRIOR TO DOWNGRADE, DESCRIBED IN (F)): 1R3

(F) RATIONALE FOR CRITICALITY DOWNGRADE:

NONE. ALL REDUNDANCY HAS BEEN CONSIDERED WHEN DETERMINING THE 1R3 CRITICALITY OF THIS FAILURE MODE.

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- TIME FRAME -

TIME FROM FAILURE TO CRITICAL EFFECT: HOURS

TIME FROM FAILURE OCCURRENCE TO DETECTION: SECONDS

TIME FROM DETECTION TO COMPLETED CORRECTING ACTION: MINUTES

IS TIME REQUIRED TO IMPLEMENT CORRECTING ACTION LESS THAN TIME TO EFFECT?
YES

RATIONALE FOR TIME TO CORRECTING ACTION VS TIME TO EFFECT:
CREW HAS SUFFICIENT TIME TO UTILIZE REDUNDANT COOLANT LOOP BEFORE
PROBLEM BECOMES CATASTROPHIC.

HAZARD REPORT NUMBER(S): FF-09

HAZARD(S) DESCRIPTION:
INABILITY TO SAFELY PERFORM EVA.

- APPROVALS -

SS & PAE
DESIGN ENGINEER

: M. W. GUENTHER
: K. J. KELLY


