FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL HARDWARE
NUMBER:M8-1MR-E040 -X

SUBSYSTEM NAME: ECLSS - EMU POTABLE & WASTE WATER 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
LRU	:LINES & FITTINGS	V828-643051
SRU	:LINES & FITTINGS MULTIPLE SOURCES	MULTIPLE P/N'S

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
EMU WASTE WATER RETURN LINES AND FITTINGS

QUANTITY OF LIKE ITEMS: 1
ONE SET PER SUBSYSTEM

FUNCTION:
PROVIDES A DUAL CONTROLLED RETURN PATH OF WASTE WATER, WITHIN THE ECLSS PANEL. THIS DUAL PATH CONVERGES INTO A SINGLE RIGID LINE, INTERNAL TO THE AIRLOCK, THAT EXTENDS TO THE MID DECK FLUID CONNECTIONS.

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

FAILURE MODES EFFECTS ANALYSIS FMEA – NON-CIL FAILURE MODE
NUMBER: M8-1SS-E040-02

REVISION#: 0 04/08/97

SUBSYSTEM NAME: ECLSS - EMU POTABLE & WASTE WATER SYSTEM
LRU: EMU WASTE WATER RETURN LINES **CRITICALITY OF THIS**
ITEM NAME: LINES & 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, MECHANICAL SHOCK, EXCESSIVE VIBRATION

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN
A) PASS
B) N/A
C) PASS

PASS/FAIL RATIONALE:
A)

B)
N/A - ALL REDUNDANCY IS IN STANDBY UNTIL REQUIRED.

C)

METHOD OF FAULT DETECTION:
NONE UNTIL EMU'S ARE CONNECTED TO ECLSS PANEL. THEN RESTRICTED FLOW CAN BE DETECTED THROUGH VISUAL OBSERVATION (INCREASED TIME IN SERVICING ALL EMU'S) AND THROUGH INSTRUMENTATION (DELTA PRESSURE INDICATION BETWEEN EMU GAS AND WATER PRESSURE READINGS).

CORRECTING ACTION: MANUAL

CORRECTING ACTION DESCRIPTION:
CREW COULD CONTINUE TO UTILIZE EMU'S WITH OLD WATER OR USE OTHER AVAILABLE EMU'S TO PERFORM EVA. IF FAILURE OCCURRED ON ECLSS PANEL

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HARDWARE, CREW COULD UTILIZE REDUNDANT WASTE WATER RETURN PATH TO SERVICE ALL EMU'S.

REMARKS/RECOMMENDATIONS:
WITHIN THE ECLSS PANEL DUAL WASTE WATER RETURN PATHS ARE PROVIDED TO SERVICE THE EMU'S. THESE TWO PATHS CONVERGE INTO A SINGLE LINE INSIDE THE ECLSS PANEL TO THE ORBITER WASTE WATER REMOVAL SYSTEM. FAILURE WOULD NOT BE DETECTED UNTIL AN EMU IS ATTACHED TO THE WASTE WATER TRANSFER PORT. WORST CASE SCENARIO IS WHEN RESTRICTED WASTE WATER FLOW OCCURS ON THE SINGLE PATH FOLLOWING INITIAL EVA. THERE ARE FOUR EMU'S AVAILABLE TO PERFORM AN EVA. 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:
NO EFFECT UNTIL EMU IS CONNECTED FOLLOWING AN EVA. THEN REDUCED OR LOSS OF WASTE WATER FLOW TO THE ORBITER WASTE WATER SYSTEM FROM THE EMU'S.

(B) INTERFACING SUBSYSTEM(S):
WORST CASE IF FAILURE OCCURS ON SINGLE PATH - NO EFFECT UNTIL EMU IS CONNECTED FOLLOWING AN EVA. THEN INABILITY TO REMOVE WASTE WATER COULD RESULT LOSS OF CAPABILITY TO UTILIZE AFFECTED EMU'S FOR SUBSEQUENT EVA'S. IF FAILURE OCCURS ON ECLSS PANEL - FIRST FAILURE MAY INCREASE TIME REQUIRED TO COMPLETE EVA SINCE ALL EMU'S WILL BE SERVICED FROM ONLY ONE WASTE WATER RETURN PATH. INABILITY TO REMOVE WASTE WATER FROM ALL EMU'S FOLLOWING SIMILAR FAILURE OF REDUNDANT PATH.

(C) MISSION:
NO INITIAL EFFECT. INABILITY TO REMOVE WASTE WATER FROM EMU'S, WHEN REQUIRED, COULD LIMIT USE OF AFFECTED EMU'S IN PERFORMING A SECOND PLANNED EVA.

(D) CREW, VEHICLE, AND ELEMENT(S):
INABILITY TO UTILIZE EMU'S, WHEN REQUIRED, COULD RESULT IN LOSS OF EVA CAPABILITY. POTENTIAL LOSS OF CREW AND VEHICLE IN THE EVENT A CONTINGENCY EVA IS REQUIRED TO CORRECT A POTENTIAL CRIT 1 CONDITION.

(E) FUNCTIONAL CRITICALITY EFFECTS:
FIRST FAILURE (RESTRICTED FLOW OF WASTE WATER) - WORST CASE IF FAILURE OCCURS ON SINGLE PATH FOLLOWING AN INITIAL EVA. THEN LOSS OF CAPABILITY TO REMOVE WASTE WATER FROM THE EMU'S WOULD PRECLUDE SUBSEQUENT EVA

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CAPABILITIES. POTENTIAL LOSS OF CONTINGENCY EVA OPERATIONS. - CRITICALITY 1R2 CONDITION.

DESIGN CRITICALITY (PRIOR TO DOWNGRADE, DESCRIBED IN (F)): 1R2

(F) RATIONALE FOR CRITICALITY DOWNGRADE:
SECOND FAILURE (UNABLE TO PERFORM WORKAROUND TO MANEUVER ORBITER/ISS) - EVA CREWMEMBERS WOULD BE EXPOSED TO THE SUN DURING AN EVA REQUIRING EMU SUBLIMATORS TO BE ON RESULTING IN AN INCREASED AMOUNT OF WASTE WATER. LOSS OF CAPABILITY TO REMOVE THIS WASTE WATER FROM EMU'S WOULD PRECLUDE SUBSEQUENT EVA'S.
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.

- TIME FRAME -

TIME FROM FAILURE TO CRITICAL EFFECT: DAYS

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 WOULD HAVE SUFFICIENT TIME MANEUVER ORBITER/ISS SUCH THAT EVA CREWMEMBERS ARE NOT EXPOSED TO THE SUN BEFORE LOSS OF EMU WASTE WATER REMOVAL BECOMES CATASTROPHIC.

HAZARD REPORT NUMBER(S): FF-09

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

- APPROVALS -

SS & PAE	:	M. W. GUENTHER	:
DESIGN ENGINEER	:	S. CASTILLO	: