FAILURE MODES EFFECTS ANALYSIS (FMEA) -- NON-CIL HARDWARE
NUMBER:M8-1SS-E039A -X

SUBSYSTEM NAME: ECLSS - EMU POTABLE & WASTE WATER SYSTEM
REVISION: 0 02/12/98

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 POTABLE WATER SUPPLY LINES AND FITTINGS

QUANTITY OF LIKE ITEMS: 1
ONE SET PER SUBSYSTEM

FUNCTION:
PROVIDES A SINGLE SUPPLY PATH OF POTABLE WATER FROM THE MID DECK SHUTOFF VALVE TO THE EXTERNAL AIRLOCK EMU ECLSS PANEL. WITHIN THE ECLSS PANEL THIS SINGLE PATH SPLITS INTO TWO PATHS, PROVIDING POTABLE WATER TO EACH OF TWO EMU INTERFACE MECHANICAL FITTINGS. WATER IS USED FOR DRINKING AND EMU COOLING PURPOSES.

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

FAILURE MODES EFFECTS ANALYSIS FMEA -- NON-CIL FAILURE MODE
NUMBER: M8-1SS-E039A-02

REVISION#: 0 04/17/98
SUBSYSTEM NAME: ECLSS - EMU POTABLE & WASTE WATER SYSTEM
LRU: EMU POTABLE WATER SUPPLY 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, CONTAMINATION, MECHANICAL SHOCK

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

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

PASS/FAIL RATIONALE:
A)

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

C)

METHOD OF FAULT DETECTION:
VISUAL OBSERVATION - INCREASED TIME IN FILLING EMU POTABLE WATER TANK.
INSTRUMENTATION - EMU POTABLE WATER SUPPLY PRESSURE ANOMALY ON AW82D PANEL PRESSURE GAUGE. REDUCED OR LOSS OF WATER PRESSURE TO EMU'S CAN ALSO BE OBTAINED FROM THE ISSA POTABLE WATER SUPPLY PRESSURE TRANSDUCER.

CORRECTING ACTION: MANUAL

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CORRECTING ACTION DESCRIPTION:
IF RESTRICTED FLOW OCCURS ON A LINE OR FITTING IN THE ECLSS PANEL, CREW COULD UTILIZED REDUNDANT POTABLE WATER PATH TO SERVICE ALL EMU'S. SINCE EMU TANKS ARE FILLED PRIOR TO LAUNCH, CREW COULD UTILIZE AN EMU THAT CONTAINS POTABLE WATER TO PERFORM AN EVA. TO REDUCE THE USE OF EMU POTABLE WATER CREW COULD MANEUVER ORBITER/ISS SUCH THAT EVA CREWMEMBERS ARE NOT EXPOSED TO THE SUN DURING AN EVA. SINCE RESTRICTED FLOW COULD RESULT IN LOSS OF WATER TRANSFER TO EMU'S AND ISS, CREW COULD: (1) TAP OFF POTABLE WATER IN THE GALLEY FOR USE BY THE EMU'S AND FOR TRANSFER TO ISS; OR (2) TRANSFER BOTTLES OF POTABLE WATER FROM ORBITER TO ISS. ANOTHER OPTION IS TO SERVICE SPACE STATION WITH POTABLE WATER DURING A SECOND SHUTTLE MISSION.

REMARKS/RECOMMENDATIONS:
A SINGLE PATH PROVIDES POTABLE WATER TO THE ECLSS PANEL AND TWO PATHS ARE PROVIDED WITHIN THE ECLSS PANEL TO SERVICE BOTH EMU'S. WORST CASE SCENARIO IS WHEN RESTRICTED POTABLE WATER FLOW OCCURS IN THE SINGLE PATH, PRIOR TO FILLING ALL EMU'S. THIS WATER IS USED FOR EMU DRINKING AND COOLING PURPOSES AND FOR TRANSFER TO THE SPACE STATION. THE EMU POTABLE WATER TANK IS FULL PRIOR TO LAUNCH.

- FAILURE EFFECTS -

(A) SUBSYSTEM:
REDUCED OR LOSS OF POTABLE WATER TO AFFECTED EMU MECHANICAL FITTINGS.

(B) INTERFACING SUBSYSTEM(S):
WORST CASE, IF FAILURE OCCURS ON SINGLE PATH - NO INITIAL EFFECT - LOSS OF POTABLE WATER SUPPLY COULD RESULT IN LOSS OF EVA CAPABILITIES SUBSEQUENT TO FIRST EVA SINCE WATER IS NOT AVAILABLE TO COOL ALL EMU'S.
IF FAILURE OCCURS ON ECLSS PANEL - FIRST FAILURE MAY INCREASE TIME REQUIRED FOR EVA PREPARATION SINCE ALL EMU'S WILL BE SERVICED FROM ONLY ONE POTABLE WATER PATH. LOSS OF EVA CAPABILITIES SUBSEQUENT TO FIRST EVA FOLLOWING SIMILAR FAILURE ON REDUNDANT PATH SINCE WATER IS NOT AVAILABLE TO COOL EMU'S

(C) MISSION:
NO INITIAL EFFECT. WORST CASE, LOSS OF CAPABILITY TO PERFORM A SECOND PLANNED EVA DUE TO LOSS OF POTABLE WATER TO ALL EMU'S. LOSS OF MISSION OBJECTIVES ASSOCIATED WITH PLANNED EVA'S SUBSEQUENT TO INITIAL EVA. LOSS OF POTABLE WATER TO STATION FOLLOWING THREE FAILURES WOULD RESULT IN LOSS OF MISSION OBJECTIVES ASSOCIATED WITH ISS WATER TRANSFER.

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(D) CREW, VEHICLE, AND ELEMENT(S):
NO EFFECT UNTIL FAILURE OCCURS AFTER INITIAL EVA. THEN INABILITY TO PERFORM A CONTINGENCY EVA TO CORRECT A POTENTIAL CRIT 1 EVENT COULD RESULT IN LOSS OF CREW AND VEHICLE.

(E) FUNCTIONAL CRITICALITY EFFECTS:
LOSS OF CONTINGENCY EVA CAPABILITIES
FIRST FAILURE (RESTRICTED FLOW OF POTABLE WATER) - WORST CASE IF FAILURE OCCURS ON SINGLE PATH FOLLOWING AN INITIAL EVA. THEN LOSS OF WATER SUPPLY FOR COOLING ALL EMU'S WOULD PRECLUDE SUBSEQUENT EVA CAPABILITIES. POTENTIAL LOSS OF CONTINGENCY EVA OPERATIONS. - CRITICALITY 1R2 CONDITION.

LOSS OF POTABLE WATER TRANSFER TO STATION
FIRST FAILURE (RESTRICTED FLOW OF POTABLE WATER) - LOSS OF CAPABILITY TO TRANSFER POTABLE WATER TO SPACE STATION. LOSS OF MISSION OBJECTIVES ASSOCIATED WITH ISS WATER TRANSFER. - CRITICALITY 2/2 CONDITION

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

(F) RATIONALE FOR CRITICALITY DOWNGRADE:
LOSS OF CONTINGENCY EVA CAPABILITIES
SECOND FAILURE (INABILITY TO TAP POTABLE WATER FROM GALLEY) - UNABLE TO RESTORE WATER FLOW TO EMU SERVICE PANEL.
THIRD 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 USE OF EMU POTABLE WATER. LOSS OF POTABLE WATER SUPPLY TO EMU'S WOULD PRECLUDE SUBSEQUENT EVA'S.
FOURTH 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.

LOSS OF POTABLE WATER TRANSFER TO STATION
SECOND FAILURE (INABILITY TO TAP POTABLE WATER FROM GALLEY) - LOSS OF WATER TRANSFER TO SPACE STATION USING EXTERNAL FLEXIBLE HOSE.
THIRD FAILURE (INABILITY TO TRANSFER POTABLE WATER BOTTLES) - LOSS OF ALL POTABLE WATER TRANSFER CAPABILITIES TO STATION RESULTING IN LOSS OF RELATED MISSION OBJECTIVES. - CRITICALITY 2R3 CONDITION

- TIME FRAME -

TIME FROM FAILURE TO CRITICAL EFFECT: DAYS

TIME FROM FAILURE OCCURRENCE TO DETECTION: SECONDS

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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 TO USE ANOTHER EMU OR MANEUVER ORBITER/ISS SUCH THAT EVA CREWMEMBERS ARE NOT EXPOSED TO THE SUN BEFORE LOSS OF EMU POTABLE WATER BECOMES CATASTROPHIC OR PERFORM ALTERNATE MEANS OF TRANSFERRING POTABLE WATER TO THE STATION BEFORE TRANSFER LOSS BECOMES CRITICAL TO COMPLETING MISSION OBJECTIVES.

HAZARD REPORT NUMBER(S): FF-09

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

- APPROVALS -

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