FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL HARDWARE
NUMBER:M8-1SS-E041 -X

SUBSYSTEM NAME: ECLSS - EMU POTABLE & WASTE WATER SYSTEM
REVISION: D 04/08/97

PART DATA

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	:VALVE, MICROBIAL CHECK	SED42100926-306

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
EMU POTABLE WATER SUPPLY MICROBIAL CHECK VALVE

QUANTITY OF LIKE ITEMS: 1
ONE

FUNCTION:
INSTALLED IN THE POTABLE WATER SUPPLY LINE TO THE EXTERNAL AIRLOCK (EMU'S) AND SPACE STATION, THE MICROBIAL CHECK VALVE ADDS IODINE TO THE WATER TO CONTROL BACTERIA GROWTH IN POTABLE WATER SUPPLY.

REFERENCE DOCUMENTS: VS28-643001

FAILURE MODES EFFECTS ANALYSIS FMEA – NON-CIL FAILURE MODE
NUMBER: M8-1SS-E041-01

REVISION#: 0 04/17/98
SUBSYSTEM NAME: ECLSS - EMU POTABLE & WASTE WATER SYSTEM
LRU: EMU POTABLE WATER MICROBIAL CHECK VALVE **CRITICALITY OF THIS**
ITEM NAME: VALVE, POTABLE WATER MICROBIAL CHECK **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

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 THE AW82D PANEL PRESSURE GAUGE. INDICATION FROM 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:
SINCE EMU POTABLE WATER TANKS ARE FILLED PRIOR TO LAUNCH, CREW COULD UTILIZE AN EMU THAT CONTAINS 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. FOR LOSS OF POTABLE WATER TRANSFER TO EMU'S AND ISS, CREW COULD EITHER: (1) TAP OFF POTABLE WATER IN THE GALLEY FOR USE BY 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 TO SERVICE BOTH EMU'S. WORST CASE SCENARIO IS WHEN RESTRICTED POTABLE WATER FLOW OCCURS PRIOR TO FILLING BOTH EMU'S. THIS WATER IS USED FOR DRINKING AND COOLING PURPOSES. 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):
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 BOTH 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.

(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 (CHECK VALVE CLOGS) - WORST CASE IF FAILURE OCCURS FOLLOWING AN INITIAL EVA. THEN LOSS OF WATER SUPPLY FOR COOLING ALL EMU'S

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

LOSS OF POTABLE WATER TRANSFER TO STATION
FIRST FAILURE (CHECK VALVE CLOGS) - 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 POTABLE 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

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.

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HAZARD REPORT NUMBER(S): FF-09

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

- APPROVALS -

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