

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL HARDWARE**  
**NUMBER:M8-1SS-ED42 -X**

**SUBSYSTEM NAME: ECLSS - EMU POTABLE & WASTE WATER SYSTEM**  
**REVISION: 0 04/08/97**

---

**PART DATA**

---

	<b>PART NAME</b>	<b>PART NUMBER</b>
	<b>VENDOR NAME</b>	<b>VENDOR NUMBER</b>
LRU	:VALVE, SOLENOID LATCHING VALCOR ENGINEERING CORP	ME284-0518-1023 V70500-59-1

---

**EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:**  
**EMU POTABLE WATER SUPPLY SOLENOID LATCHING (SHUTOFF) VALVE**

**QUANTITY OF LIKE ITEMS: 1**  
**ONE**

**FUNCTION:**  
 PROVIDES A QUICK MEANS OF SHUTTING OFF POTABLE WATER FLOW TO BOTH EMU SERVICE PORTS. VALVE IS NORMALLY OPEN DURING EMU SERVICING.

**REFERENCE DOCUMENTS: VS28-643001**

FAILURE MODES EFFECTS ANALYSIS FMEA -- NON-CIL FAILURE MODE  
 NUMBER: M8-1SS-E042-01

REVISION#: 0 04/17/98

SUBSYSTEM NAME: ECLSS - EMU POTABLE & WASTE WATER SYSTEM  
 LRU: EMU POTABLE WATER SHUTOFF VALVE CRITICALITY OF THIS  
 ITEM NAME: VALVE, EMU POTABLE WATER SHUTOFF FAILURE MODE: 1R3

---

FAILURE MODE:  
 FAILS TO OPEN, RESTRICTED FLOW (CLOGGED)

MISSION PHASE: OO ON-ORBIT

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

CAUSE:  
 CHEMICAL REACTION, CONTAMINATION, MECHANICAL SHOCK, VIBRATION,  
 MISHANDLING OR ABUSE, INTERNAL COMPONENT FAILURE

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 FILLING EMU POTABLE WATER TANK.  
 INSTRUMENTATION - (1) SHUTOFF VALVE POSITION INDICATION ON M013Q PANEL AND  
 IN TELEMETRY DATA; (2) EMU POTABLE WATER SUPPLY PRESSURE ANOMALY ON THE  
 AW82D PANEL PRESSURE GAUGE; OR (3) REDUCED OR LOSS OF WATER PRESSURE TO  
 EMU'S CAN ALSO BE OBTAINED FROM THE ISSA POTABLE WATER SUPPLY PRESSURE  
 TRANSDUCER.

MASTER MEAS. LIST NUMBERS: V64X0156E

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL FAILURE MODE  
NUMBER: M8-1SS-E042-01**

**CORRECTING ACTION: MANUAL**

**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.

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- NON-CIL FAILURE MODE  
NUMBER: M8-1SS-E042-01**

**(E) FUNCTIONAL CRITICALITY EFFECTS:**

**LOSS OF CONTINGENCY EVA CAPABILITIES**

FIRST FAILURE (SHUTOFF VALVE FAILS TO OPEN OR CLOGS) - WORST CASE IF FAILURE OCCURS 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 (SHUTOFF VALVE FAILS TO OPEN OR 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**

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL FAILURE MODE  
NUMBER: M8-1SS-E042-01**

**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  
DESIGN ENGINEER

: M. W. GUENTHER  
: S. CASTILLO

: *M. W. Guenther*  
: *S. Castillo*