

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL HARDWARE**  
**NUMBER: M5-6SS-0902 -X**

SUBSYSTEM NAME: ISS DOCKING SYSTEM

REVISION: 0 02/27/98

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**PART DATA**


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	<b>PART NAME</b>	<b>PART NUMBER</b>
	<b>VENDOR NAME</b>	<b>VENDOR NUMBER</b>
LRU	THERMOSTAT (OVER TEMP)	MC452-0147-0015

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**EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:**  
 THERMOSTAT, OVER TEMPERATURE (65 - 85 DEG. F) - EXTERNAL AIRLOCK WATER LINE HEATERS

**REFERENCE DESIGNATORS:** 40V64TS13  
 40V64TS14  
 40V64TS15  
 40V64TS16  
 40V64TS17  
 40V64TS18

**QUANTITY OF LIKE ITEMS:** 6  
 (SIX)

**FUNCTION:**

WHEN TEMPERATURE RISES 15 DEGREES ABOVE THE UPPER LIMIT OF THE TEMPERATURE CONTROLLING THERMOSTAT, THE OVER TEMPERATURE THERMOSTAT ELECTRICALLY DISCONNECTS THE HEATER CIRCUITS. THE OVER TEMPERATURE THERMOSTAT IS PROVIDED TO GUARD AGAINST A TEMPERATURE CONTROL THERMOSTAT WHICH HAS FAILED CLOSED, CAUSING THE HEATER TO ALWAYS BE ON.

**REFERENCE DOCUMENTS:** 1) VS70-640109, SCHEMATIC DIAGRAM - AIRLOCK ENVIRONMENTAL CONTROL SUBSYSTEM

**FAILURE MODES EFFECTS ANALYSIS FMEA -- NON-CIL FAILURE MODE  
NUMBER: M5-6SS-0902-02**

REVISION#: 0 02/27/98

SUBSYSTEM NAME: ISS DOCKING SYSTEM

LRU: N/A

ITEM NAME: THERMOSTAT (OVER TEMPERATURE)

CRITICALITY OF THIS  
FAILURE MODE: 1R3

FAILURE MODE:  
FAIL CLOSED, FAIL TO OPEN

MISSION PHASE: OO ON-ORBIT

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

CAUSE:  
A) PIECE PART STRUCTURAL FAILURE, B) CONTAMINATION, C) VIBRATION, D)  
MECHANICAL SHOCK, E) PROCESSING ANOMALY, F) THERMAL STRESS

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

CRITICALITY 1R2 DURING INTACT ABORT ONLY (AVIONICS ONLY)? NO

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

PASS/FAIL RATIONALE:

A)

B)  
SCREEN "B" IS "N/A" BECAUSE AT LEAST TWO REMAINING PATHS ARE READILY  
DETECTABLE IN FLIGHT.

C)

**- FAILURE EFFECTS -**

(A) SUBSYSTEM:  
LOSS OF FUNCTION OF OVERTEMPERATURE THERMOSTAT TO OPEN

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL FAILURE MODE  
NUMBER: M5-6SS-0902-02****(B) INTERFACING SUBSYSTEM(S):**

FIRST FAILURE - NO EFFECT. TEMPERATURE CONTROLLING THERMOSTAT WILL CONTROL TEMPERATURE.

**(C) MISSION:**

FIRST FAILURE - NO EFFECT

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

FIRST FAILURE - NO EFFECT

**(E) FUNCTIONAL CRITICALITY EFFECTS:**

POSSIBLE LOSS OF CREW/VEHICLE AFTER FOUR FAILURES:

- 1) OVER TEMPERATURE THERMOSTAT FAILS CLOSED - NO EFFECT. TEMPERATURE CONTROLLING THERMOSTAT (IN SERIES WITH OVER TEMPERATURE CONTROL THERMOSTAT) WILL CONTROL TEMPERATURE.
- 2) TEMPERATURE CONTROL THERMOSTAT FAILS CLOSED - TEMPERATURE SENSORS INDICATE OVER TEMPERATURE CONDITION CAUSING FDA ALARM. CREW MEMBER MUST REMOVE POWER FROM HEATER STRING USING CIRCUIT BREAKER.
- 3) ASSOCIATED CIRCUIT BREAKER FAILS CLOSED - CANNOT REMOVE POWER FROM HEATER STRING RESULTING IN WATER LINES POSSIBLY OVERHEATING AND REACHING ITS BURST PRESSURE CAUSING LOSS OF NOMINAL WATER SUPPLY TO THE EMU'S. WORST CASE IF FAILURE OCCURS FOLLOWING AN INITIAL EVA. THEN LOSS OF WATER SUPPLY TO REFILL THE EMU SUBLIMATOR FOR BOTH EMU'S WOULD PRECLUDE SUBSEQUENT EVA CAPABILITIES.
- 4) A FAILURE NECESSITATING AN EVA TO PREVENT A POTENTIAL CATASTROPHIC SITUATION - INABILITY TO PERFORM A CONTINGENCY EVA TO CORRECT A CRIT 1 CONDITION COULD RESULT IN A LOSS OF CREW/VEHICLE.

**DESIGN CRITICALITY (PRIOR TO DOWNGRADE, DESCRIBED IN (F)):****(F) RATIONALE FOR CRITICALITY DOWNGRADE:**

ALTHOUGH THE CRITICALITY REMAINS UNCHANGED AFTER WORKAROUNDS CONSIDERATION (ALLOWED PER CR 8050107W), THEY ARE PROVIDING ADDITIONAL FAULT TOLERANCE TO THE SYSTEM.

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

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- TIME FRAME -

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TIME FROM FAILURE TO CRITICAL EFFECT: HOURS

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- NON-CIL FAILURE MODE  
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TIME FROM FAILURE OCCURRENCE TO DETECTION: MINUTES

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:  
FDA ALARM INDICATES OVERTEMPERATURE CONDITION AFTER SECOND THERMOSTAT  
FAILS CLOSED - CREW MEMBER CAN REMOVE POWER FROM HEATER STRING BY  
OPENING CIRCUIT BREAKER.

HAZARD REPORT NUMBER(S): NONE

HAZARD(S) DESCRIPTION:  
NONE

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- APPROVALS -

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SS&PAE  
DESIGN ENGINEER

: T. K. KIMURA  
: C. J. ARROYO

*J. Kimura 4-13-98*  
*C. J. Arroyo*