

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

SUBSYSTEM NAME: ISS DOCKING SYSTEM

REVISION: 0 02/27/98

PART DATA

	PART NAME	PART NUMBER
	VENDOR NAME	VENDOR NUMBER
LRU	THERMOSTAT (OVER TEMP)	MC452-0147-0015

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-0902-01

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 OPEN, FAIL TO CLOSE

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 ABILITY TO ENERGIZE AFFECTED HEATER STRING

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(B) INTERFACING SUBSYSTEM(S):

FIRST FAILURE - NO EFFECT. THE SECOND ENERGIZED HEATER CIRCUIT 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) FIRST TEMPERATURE CONTROL THERMOSTAT FAILS OPEN - NO EFFECT. SECOND ENERGIZED HEATER CIRCUIT PROVIDES REQUIRED HEAT.
- 2) SECOND TEMPERATURE CONTROL THERMOSTAT FAILS OPEN - TEMPERATURE OF WATER LINES DECREASES BELOW LOWER TEMPERATURE LIMIT. CREW ALERTED BY FDA ALARM. CREW MEMBER MUST SWITCH IN THIRD HEATER STRING.
- 3) THIRD TEMPERATURE CONTROL THERMOSTAT FAILS OPEN - LOSS OF CAPABILITY TO HEAT WATER LINES. WATER IN LINES MAY FREEZE RESULTING IN 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 S050107W), 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.

- TIME FRAME -

TIME FROM FAILURE TO CRITICAL EFFECT: DAYS

TIME FROM FAILURE OCCURRENCE TO DETECTION: HOURS

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TIME FROM DETECTION TO COMPLETED CORRECTING ACTION: HOURS

**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 INDICATING WATER LINE TEMPERATURE BELOW LOWER LIMIT AFTER
SECOND TEMPERATURE CONTROLLING THERMOSTAT FAILS OPEN WILL ALERT CREW TO
SWTCH IN THIRD HEATER STRING.**

HAZARD REPORT NUMBER(S): NONE

**HAZARD(S) DESCRIPTION:
N/A**

- APPROVALS -

SS&PAE
DESIGN ENGINEER

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