

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- NON-CIL HARDWARE
NUMBER:M5-6SS-0901 -X

SUBSYSTEM NAME: ISS DOCKING SYSTEM

REVISION: 0 02/27/98

PART DATA

	PART NAME	PART NUMBER
	VENDOR NAME	VENDOR NUMBER
LRU	THERMOSTAT (TEMP CONTROL)	ME380-0017-0015

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
 THERMOSTAT, TEMPERATURE CONTROL (50 - 70 DEG. F) - EXTERNAL AIRLOCK WATER
 LINE HEATERS (ZONES 1 AND 2)

REFERENCE DESIGNATORS: 40V64TS7
 40V64TS8
 40V64TS9
 40V64TS10
 40V64TS11
 40V64TS12

QUANTITY OF LIKE ITEMS: 6
 (SIX)

FUNCTION:
 WHEN TEMPERATURE DROPS BELOW A LOWER LIMIT, THERMOSTAT ELECTRICALLY
 CONNECTS HEATER CIRCUITS. WHEN TEMPERATURE RISES ABOVE AN UPPER LIMIT,
 THERMOSTAT DISCONNECTS HEATER CIRCUIT.

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

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SUBSYSTEM NAME: ISS DOCKING SYSTEM

LRU: N/A

CRITICALITY OF THIS

ITEM NAME: THERMOSTAT (TEMPERATURE CONTROLLING)

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:

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LOSS OF FUNCTION OF THE CONTROLLING THERMOSTAT TO OPEN AT UPPER SET TEMPERATURE. OVER TEMPERATURE THERMOSTAT (IN SERIES WITH TEMPERATURE CONTROL THERMOSTAT) WILL OPEN IF TEMPERATURE INCREASES TO APPROXIMATELY 15 DEGREES ABOVE CONTROLLING THERMOSTAT UPPER LIMIT.

(B) INTERFACING SUBSYSTEM(S):
FIRST FAILURE - NO EFFECT

(C) MISSION:
FIRST FAILURE - NO EFFECT

(D) CREW, VEHICLE, AND ELEMENT(S):
NO EFFECT

(E) FUNCTIONAL CRITICALITY EFFECTS:

POSSIBLE LOSS OF CREW/VEHICLE AFTER FOUR FAILURES:

- 1) TEMPERATURE CONTROL THERMOSTAT FAILS CLOSED - NO EFFECT. OVER TEMPERATURE THERMOSTAT (IN SERIES WITH TEMPERATURE CONTROL THERMOSTAT) WILL OPEN IF TEMPERATURE INCREASES TO APPROXIMATELY 15 DEGREES ABOVE CONTROLLING THERMOSTAT UPPER LIMIT.
- 2) OVER TEMPERATURE 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 WATER SUPPLY TO EMU'S. WORST CASE OF FAILURE OCCURS FOLLOWING AN INITIAL EVA. THEN LOSS OF WATER SUPPLY TO REFILL THE EMU SUBLIMATORS 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.

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- TIME FRAME -

TIME FROM FAILURE TO CRITICAL EFFECT: HOURS

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 OVER TEMPERATURE
THERMOSTAT FAILS CLOSED - CREW MEMBER CAN REMOVE POWER FROM HEATER
STRING BY OPENING CIRCUIT BREAKER.

HAZARD REPORT NUMBER(S): NONE

HAZARD(S) DESCRIPTION:
N/A

- APPROVALS -

SS&PAE
DESIGN ENGINEER

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

: J. Kimura 4-13-98
: [Signature]