

FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL HARDWARE
NUMBER:M5-6SS-0906 -X

SUBSYSTEM NAME: ISS DOCKING SYSTEM

REVISION: 0 02/27/98

PART DATA

	PART NAME	PART NUMBER
	VENDOR NAME	VENDOR NUMBER
LRU	:TEMPERATURE SENSOR ROSEMOUNT	ME449-0160-0005 146ET

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:

TEMPERATURE SENSOR, 0-160 DEG F - WATER LINE HEATERS, ZONE 1, TEMP A/B AND
 ZONE 2, TEMP B/C/D

REFERENCE DESIGNATORS: 40V64MT16
 40V64MT17
 40V64MT18
 40V64MT19
 40V64MT20

QUANTITY OF LIKE ITEMS: 5
 (FIVE)

FUNCTION:
 MONITOR TEMPERATURE OF WATER LINES.

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

FAILURE MODES EFFECTS ANALYSIS FMEA - NON-CIL FAILURE MODE

NUMBER: M5-6SS-0906-01

REVISION#: 0 02/27/98

SUBSYSTEM NAME: ISS DOCKING SYSTEM

LRU: N/A

ITEM NAME: TEMPERATURE SENSOR

CRITICALITY OF THIS

FAILURE MODE: 1R3

FAILURE MODE:

ERRONEOUS OUTPUT

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)

METHOD OF FAULT DETECTION:

FOR ERRONEOUS OUTPUT DURING FLIGHT: NONE

FOR ERRONEOUS OUTPUT - GROUND TURNAROUND TEST: REMOVE POWER FROM HEATER CIRCUITS USING THE CIRCUIT BREAKERS. MONITOR THE TEMPERATURE SENSOR OUTPUTS.

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL FAILURE MODE
NUMBER: M5-6SS-0906-01**

CORRECTING ACTION: NONE

CORRECTING ACTION DESCRIPTION:

DESIGN FAULT TOLERANCE: SECOND TEMPERATURE SENSOR WILL MONITOR THE WATER LINE TEMPERATURE.

- FAILURE EFFECTS -

(A) SUBSYSTEM:

ERRONEOUS OR LOSS OF TEMPERATURE READING

(B) INTERFACING SUBSYSTEM(S):

FIRST FAILURE - NO EFFECT

(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 FIVE FAILURES:

- 1) **ERRONEOUS OUTPUT OF TEMPERATURE SENSOR - LOSS OF CAPABILITY TO MONITOR THE ACTUAL TEMPERATURE OF THE WATER LINES WITH THIS SENSOR. NO EFFECT, BOTH ENERGIZED HEATER STRINGS ARE OPERATING PROPERLY TO HEAT THE WATER LINES.**
- 2) **ERRONEOUS OUTPUT OF SECOND TEMPERATURE SENSOR. LOSS OF ABILITY TO MONITOR THE ACTUAL TEMPERATURE OF THE WATER LINES. FDA ALARM WILL NOT BE TRIPPED IF LOWER AND UPPER TEMPERATURE LIMITS ARE EXCEEDED.**
- 3) **THERMOSTAT OF ONE ENERGIZED HEATER STRING FAILS OPEN - LOSS OF ONE HEATER STRING.**
- 4) **THERMOSTAT OF SECOND ENERGIZED HEATER STRING (2 OF 3 HEATER STRINGS ARE NORMALLY ENERGIZED) FAILS OPEN - LOSS OF BOTH HEATERS RESULTING IN FREEZING AND SUBSEQUENT BURSTING OF THE WATER LINES - LOSS OF NOMINAL WATER SUPPLY TO EMU'S. WORST CASE IF FAILURE OCCURS FOLLOWING AN INITIAL EVA. THEN LOSS OF WATER SUPPLY TO BOTH EMU'S WOULD PRECLUDE SUBSEQUENT EVA CAPABILITIES.**
- 5) **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.**

**FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL FAILURE MODE
NUMBER: M5-6SS-0906-01**

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 FIFTH FAILURE (FAILURE NECESSITATING AN EVA TO PREVENT A POTENTIAL CATASTROPHIC SITUATION) - INABILITY TO PERFORM CONTINGENCY EVA (SIXTH 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

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:

DESIGN FAULT TOLERANCE: CONTROL AND OVERTEMPERATURE THERMOSTATS OF SECOND HEATER STRING MAINTAIN WATER LINE TEMPERATURE WITHIN LIMITS.

HAZARD REPORT NUMBER(S): NONE

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

- APPROVALS -

SS&PAE
DESIGN ENGINEERING

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

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