FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL HARDWARE
NUMBER:M5-6SS-0911 -X

SUBSYSTEM NAME: ISS DOCKING SYSTEM

REVISION: 0 02/27/98

PART DATA

	PART NAME **VENDOR NAME**	**PART NUMBER** **VENDOR NUMBER**
ASSY	:DOCKING BASE	VO76-000003
LRU	:HEATER	ME363-0060-0003

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
HEATER, 54 WATT - EXTERNAL AIRLOCK DOCKING BASE, VESTIBULE, ZONES 1, 2, AND 3

REFERENCE DESIGNATORS:
40V64HR33
40V64HR34
40V64HR35
40V64HR36
40V64HR37
40V64HR38

QUANTITY OF LIKE ITEMS: 6
(SIX)

FUNCTION:
PROVIDES REQUIRED HEAT TO PREVENT CONDENSATION ON DOCKING BASE WALLS

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

FAILURE MODES EFFECTS ANALYSIS FMEA -- NON-CIL FAILURE MODE
NUMBER: M5-6SS-0911-01

REVISION#: 0 02/27/98

SUBSYSTEM NAME: ISS DOCKING SYSTEM
LRU: DOCKING BASE
ITEM NAME: HEATER

CRITICALITY OF THIS FAILURE MODE: 1R3

FAILURE MODE:
FAILS OPEN

MISSION PHASE: OO ON-ORBIT

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

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

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

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

REDUNDANCY SCREEN
A) PASS
B) PASS
C) PASS

PASS/FAIL RATIONALE:
A)

B)

C)

METHOD OF FAULT DETECTION:
REVIEW OF HEATER CIRCUIT TELEMETRY DATA

MASTER MEAS. LIST NUMBERS:
V64T0133A
V64T0134A

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CORRECTING ACTION: MANUAL

CORRECTING ACTION DESCRIPTION:
CREW WILL ACTIVATE REDUNDANT HEATER CIRCUIT.

- FAILURE EFFECTS -

(A) SUBSYSTEM:
FIRST FAILURE - LOSS OF ONE HEATER CIRCUIT IN ZONE. REDUNDANT HEATER CIRCUIT IN ZONE CONTROLS TEMPERATURE WITHIN LIMITS.

(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 THREE FAILURES:
1) HEATER ELEMENT FAILS OPEN - LOSS OF HEATING IN THE AFFECTED ZONE. THE ASSOCIATED CIRCUIT BREAKER (A) IS OPENED AND THE REDUNDANT HEATER CIRCUIT BREAKER (B) IS CLOSED TO RESTORE HEATING IN THE AFFECTED ZONE.
2) GENERAL PURPOSE RELAY (B) IN REDUNDANT HEATER CIRCUIT FAILS OPEN - LOSS OF POWER TO REDUNDANT HEATERS IN ALL THREE ZONES.
3) CIRCUIT BREAKER (A) FAILS OPEN DURING ATTEMPT TO RE-ENERGIZE THE REMAINING INTACT (A) HEATERS RESULTING IN LOSS OF ALL HEATING CAPABILITY. POTENTIAL CONDENSATION ON EXTERNAL AIRLOCK WALLS RESULTS IN WATER IN EXTERNAL AIRLOCK. WATER MIGRATION TO KEEL AREA COULD RENDER RUSSIAN AVIONICS INOPERATIVE AFTER DOCKING, RESULTING IN LOSS OF NOMINAL AND PYROTECHNIC UNDOCKING CAPABILITY.

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 THIRD FAILURE, THE CREW WOULD PERFORM EVA TO REMOVE 96 BOLTS FROM THE DOCKING BASE TO CIRCUMVENT THE WORST CASE "DESIGN CRITICALITY"

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EFFECT. IF UNABLE TO PERFORM EVA (FOURTH FAILURE), POSSIBLE LOSS OF CREW/VEHICLE DUE TO LOSS OF ALL UNDOCKING CAPABILITY.

- 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: POSSIBLE LOSS OF VESTIBULE HEATING AFTER THREE FAILURES. AFTER THE THIRD FAILURE, THE CREW CAN PERFORM EVA TO REMOVE 96 BOLTS FROM THE DOCKING BASE TO UNDOCK.

HAZARD REPORT NUMBER(S): ORBI 401

HAZARD(S) DESCRIPTION:
INABILITY TO SAFELY SEPARATE ORBITER FROM A MATED ELEMENT

- APPROVALS -

SS&PAE	: T. K. KIMURA	: T Kimura 4-13-98
DESIGN ENGINEERING	: C. J. ARROYO	: