FAILURE MODES EFFECTS ANALYSIS (FMEA) -- NON-CIL HARDWARE
NUMBER:M5-6SS-0920 -X

SUBSYSTEM NAME: ISS DOCKING SYSTEM
REVISION: 0 02/27/98

PART DATA

	PART NAME / **VENDOR NAME**	**PART NUMBER** / **VENDOR NUMBER**
LRU	:PANEL ML86B	VO70-730362
SRU	:CIRCUIT BREAKER	MC454-0026-2030

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
CIRCUIT BREAKER, 3 AMP - EXTERNAL AIRLOCK STRUCTURAL HEATER CONTROL - ZONES 1, 2, AND 3

REFERENCE DESIGNATORS: 80V73A130CB109
80V73A130CB111

QUANTITY OF LIKE ITEMS: 2
(TWO)

FUNCTION:
CONTROLS POWER TO THE PATCH HEATERS AND PROVIDES OVERLOAD PROTECTION FOR THE ML86B PANEL BUS A(B) FROM THE A3K5 CONTACTOR IN MID PCA 1(2).

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

FAILURE MODES EFFECTS ANALYSIS FMEA – NON-CIL FAILURE MODE
NUMBER: M5-6SS-0920-01

REVISION#: 0 02/27/98

SUBSYSTEM NAME: ISS DOCKING SYSTEM
LRU: PANEL ML86B
ITEM NAME: CIRCUIT BREAKER

CRITICALITY OF THIS FAILURE MODE: 1R3

FAILURE MODE:
FAILS OPEN, FAILS TO CONDUCT, FAILS TO CLOSE

MISSION PHASE: OO ON-ORBIT

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

CAUSE:
A) 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) PASS
C) PASS

PASS/FAIL RATIONALE:
A)

B)

C)

METHOD OF FAULT DETECTION:
A REVIEW OF HEATER CIRCUIT TELEMETRY DATA CAN BE PERFORMED TO VERIFY THAT THE CIRCUIT BREAKER IS OPEN. ALSO, AN FDA ALARM ACTIVATES IF A HEATER CIRCUIT FAILS OFF AND ANY OF THE ZONE TEMPERATURE SENSORS DROP BELOW THE FDA LOWER TEMPERATURE LIMIT.

MASTER MEAS. LIST NUMBERS: V64S0163E

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- NON-CIL FAILURE MODE
NUMBER: M5-6SS-0920-01

V64S0164E
V64T0135A
V64T0136A
V64T0137A

CORRECTING ACTION: MANUAL

CORRECTING ACTION DESCRIPTION:
CREW WILL ACTIVATE REDUNDANT HEATER CIRCUIT.

- FAILURE EFFECTS -

(A) SUBSYSTEM:
FIRST FAILURE - LOSS OF POWER TO ONE HEATER CIRCUIT IN EACH ZONE. REDUNDANT HEATER CIRCUITS IN EACH ZONE CONTROL 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 TWO FAILURES (WHILE DOCKED TO ISS):
1) CIRCUIT BREAKER FAILS OPEN - LOSS OF POWER TO ONE HEATER CIRCUIT IN EACH ZONE. REDUNDANT HEATER CIRCUITS IN EACH ZONE ARE THEN ACTIVATED TO CONTROL TEMPERATURE WITHIN LIMITS.
2) GENERAL PURPOSE RELAY TO REDUNDANT HEATER CIRCUIT FAILS OPEN - LOSS OF POWER TO ALL HEATER CIRCUITS. POTENTIAL CONDENSATION ON EXTERNAL AIRLOCK WALLS RESULTS IN WATER IN EXTERNAL AIRLOCK. WATER MIGRATION TO KEEL AREA COULD RENDER RUSSIAN AVIONICS INOPERATIVE, RESULTING IN LOSS OF NOMINAL AND PYROTECHNIC UNDOCKING CAPABILITY.

DESIGN CRITICALITY (PRIOR TO DOWNGRADE, DESCRIBED IN (F)): 1R2

(F) RATIONALE FOR CRITICALITY DOWNGRADE:
WORKAROUNDS ARE AVAILABLE TO MITIGATE THE RISK. THEREFORE, CRITICALITY IS DOWNGRADED FROM 1R2 TO 1R3.

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AFTER THE SECOND FAILURE, THE CREW WOULD PERFORM EVA TO REMOVE 96 BOLTS FROM THE DOCKING BASE TO CIRCUMVENT THE WORST CASE "DESIGN CRITICALITY" EFFECT. IF UNABLE TO PERFORM EVA (THIRD 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:
FDA ALARM WILL ACTIVATE IF ANY OF THE TEMPERATURE SENSORS DROP BELOW THE FDA LOWER TEMPERATURE LIMIT.

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	: