

**FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL HARDWARE
NUMBER:M5-6SS-0122A -X**

SUBSYSTEM NAME: ISS DOCKING SYSTEM

REVISION: 0

02/27/98

PART DATA

| | PART NAME | PART NUMBER |
|-----|--------------------|----------------------|
| | VENDOR NAME | VENDOR NUMBER |
| LRU | :PANEL A6A3 | V828-730150 |
| SRU | :CIRCUIT BREAKER | MC454-0026-2030 |

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
CIRCUIT BREAKER, 3 AMP - PMA 2/3 GROUP 1/2 SYSTEM A/B CLOSE

REFERENCE DESIGNATORS: 36V73A7A3CB18
36V73A7A3CB20
36V73A7A3CB22
36V73A7A3CB24

QUANTITY OF LIKE ITEMS: 4
(FOUR)

FUNCTION:

PROVIDES POWER TO "CLOSE" CONTROL CIRCUITS IN ORDER TO LATCH GROUP 1 OR GROUP 2 HOOKS ON THE INTERNATIONAL SPACE STATION PRESSURIZED MATING ADAPTER 2/3 (PMA 2/3). PROVIDES OVERLOAD PROTECTION TO THE ORBITER MAIN A(B) BUS.

REFERENCE DOCUMENTS: 1) V570-953103, INTEGRATED SCHEMATIC - 53JA, 53JC, 53JE, 53JG; PMA 2/3 PASSIVE MECHANISM GROUP 1/2, SYS A/B HOOKS CONTROL

**FAILURE MODES EFFECTS ANALYSIS FMEA – NON-CIL FAILURE MODE
NUMBER: M5-6SS-0122A-02**

REVISION#: 0 02/27/98

SUBSYSTEM NAME: ISS DOCKING SYSTEM
LRU: PANEL A6A3
ITEM NAME: CIRCUIT BREAKER

CRITICALITY OF THIS
FAILURE MODE: 1R3

FAILURE MODE:
FAILS CLOSED (FAILS TO OPEN MECHANICALLY)

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

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)

MASTER MEAS. LIST NUMBERS: NONE

CORRECTING ACTION: MANUAL

CORRECTING ACTION DESCRIPTION:
CREW WILL PERFORM CIRCUIT DE-ENERGIZATION.

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REMARKS/RECOMMENDATIONS:

CIRCUIT BREAKER CANNOT FAIL CLOSED BY ITSELF. CIRCUIT BREAKER CAN ONLY FAIL CLOSED IF THERE IS HUMAN INTERVENTION. IT IS ASSUMED THAT ALL COMPONENTS ARE GOOD PRIOR TO LIFT-OFF.

- FAILURE EFFECTS -

(A) SUBSYSTEM:

LOSS OF ABILITY TO MANUALLY REMOVE BUS POWER FROM PMA 2/3 PASSIVE MECHANISM WITH THE CIRCUIT BREAKER.

(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 SEVEN FAILURES:

- 1) CIRCUIT BREAKER FAILS CLOSED (FAILS TO OPEN MECHANICALLY) - LOSS OF ABILITY TO MANUALLY DE-ENERGIZE THE CIRCUIT.
- 2) AT LEAST ONE ODS HOOK FAILS TO CLOSE - NECESSITATES THE CLOSURE OF PMA 2/3 HOOKS.
- 3) THE "CLOSE" LIMIT SWITCH FAILS OPEN - DOES NOT PROVIDE INHIBIT TO REMOVE POWER TO THE AFFECTED PMA 2/3 HOOKS MOTOR.
- 4) ASSOCIATED SWITCH FAILS CLOSED IN THE "CLOSE" POSITION - AFFECTED MOTOR RUNS CONTINUOUSLY.
- 5) UPSTREAM ASSOCIATED POWER CONTACTOR IN THE MPCA FAILS CLOSED - LOSS OF ABILITY TO REMOVE POWER TO THE CONTINUOUSLY RUNNING PMA 2/3 HOOKS MOTOR - LOSS OF MOTOR DUE TO OVERHEATING.
- 6) LOSS OF REDUNDANT MOTOR TO SAME PMA 2/3 HOOKS GROUP - LOSS OF NOMINAL UNDOCKING CAPABILITY USING PMA 2/3 HOOKS.
- 7) ONE ODS PASSIVE HOOK PYRO FAILS TO FIRE - LOSS OF ODS PYROTECHNIC UNDOCKING CAPABILITY.

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

(F) RATIONALE FOR CRITICALITY DOWNGRADE:

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ALTHOUGH THE CRITICALITY REMAINS UNCHANGED AFTER WORKAROUNDS CONSIDERATION (ALLOWED PER CR S050107W), THEY ARE PROVIDING ADDITIONAL FAULT TOLERANCE TO THE SYSTEM.

AFTER THE SEVENTH 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 (EIGHTH FAILURE), POSSIBLE LOSS OF CREW/VEHICLE DUE TO LOSS OF ALL UNDOCKING CAPABILITY.

- TIME FRAME -

TIME FROM FAILURE TO CRITICAL EFFECT: MINUTES

TIME FROM FAILURE OCCURRENCE TO DETECTION: SECONDS

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:
THE ASSOCIATED POWER CONTACTOR IN THE MPCA CAN BE OPENED IN THE EVENT OF A CONTINUOUSLY RUNNING PMA 2/3 HOOKS MOTOR.**

HAZARD REPORT NUMBER(S): ORBI 401

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

- APPROVALS -

SS&PAE
DESIGN ENGINEERING

: T. K. KIMURA
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