FAILURE MODES EFFECTS ANALYSIS (FMEA) -- NON-CIL HARDWARE
NUMBER:M5-6SS-0108 -X

SUBSYSTEM NAME: ISS DOCKING SYSTEM

REVISION: 0 02/27/98

PART DATA

	PART NAME **VENDOR NAME**	**PART NUMBER** **VENDOR NUMBER**
LRU	:PANEL A6A3	V828-730150
SRU	:TOGGLE SWITCH	ME452-0102-7801

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
SWITCHES, TOGGLE, 3 POLE 2 POSITION, MAINTAINED ON - PSU POWER MAIN A AND B CONTROL CIRCUIT.

REFERENCE DESIGNATORS: 36V73A7A3S9
36V73A7A3S10

QUANTITY OF LIKE ITEMS: 2
TWO

FUNCTION:
THE SWITCHES PROVIDE MANUAL ACTIVATION OF PANEL PSU POWER MAIN A AND MAIN B POWER CIRCUITS.

REFERENCE DOCUMENTS: 1) VS70-953103, INTEGRATED SCHEMATIC - 53G, MAIN A/MAIN B SUPPLY BUS POWER DISTRIBUTION

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NUMBER: M5-6SS-0108-01

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SUBSYSTEM NAME: ISS DOCKING SYSTEM
LRU: PANEL A6A3 **CRITICALITY OF THIS**
ITEM NAME: TOGGLE SWITCH **FAILURE MODE:** 1R3

FAILURE MODE:
FAILS OPEN IN THE "ON" POSITION, FAILS CLOSED IN THE "OFF" POSITION, POLE-TO-POLE SHORT, SHORT-TO-CASE (GROUND)

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) PASS
C) PASS

PASS/FAIL RATIONALE:
A)

B)

C)

METHOD OF FAULT DETECTION:
TELEMETRY CAN BE USED TO VERIFY POWER FOR THE PSU 20 AMP BUSES. INDICATION IS OBTAINED BY SECONDARY MEANS.

MASTER MEAS. LIST NUMBERS:
V53X0777E
V53X0778E
V53X0779E

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V53X0780E
V53X0786E
V53X0787E
V53X0788E
V53X0789E

CORRECTING ACTION: NONE

CORRECTING ACTION DESCRIPTION:
DESIGN FAULT TOLERANCE: REDUNDANT PSU POWER ENABLE CIRCUIT REMAINS OPERATIONAL.

REMARKS/RECOMMENDATIONS:
V53X0777E DOCKING RING DRIVE BUS 1
V53X0778E DOCKING RING DRIVE BUS 2
V53X0779E HOOKS DRIVE BUS NO. 1
V53X0780E HOOKS DRIVE BUS NO. 2
V53X0786E ELECTROMAGNETIC BRAKES 1 & 2 BUS POWER
V53X0787E ELECTROMAGNETIC FIXERS 1 & 2 BUS POWER
V53X0788E ELECTROMAGNETIC BRAKES 3 BUS POWER
V53X0789E ELECTROMAGNETIC FIXERS 3, 4, & 5 BUS POWER

- FAILURE EFFECTS -

(A) SUBSYSTEM:
LOSS OF ONE OF TWO PSU POWER BUSES.

(B) INTERFACING SUBSYSTEM(S):
DEGRADED APDS PERFORMANCE. INCREASED ACTUATOR OPERATION TIME.

(C) MISSION:
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) SWITCH FAILS OPEN. LOSS OF ONE PSU POWER ENABLE CIRCUIT. DEGRADED UNDOCKING CAPABILITY. REDUNDANT PATHS REMAINS OPERATIONAL.

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2) SWITCH IN REDUNDANT POWER LEG FAILS OPEN PRIOR TO UNDOCKING. LOSS OF REMAINING PSU POWER ENABLE CIRCUIT. LOSS OF NOMINAL UNDOCKING CAPABILITY.
3) ONE PYROBOLT FAILS TO INITIATE RESULTING IN LOSS OF CAPABILITY TO IMPLEMENT PYROTECHNIC SEPARATION. LOSS OF NOMINAL AND PYROTECHNIC SEPARATION 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 5050107W), ADDITIONAL FAULT TOLERANCE IS PROVIDED TO THE SYSTEM.

AFTER THE SECOND FAILURE, THE CREW WOULD PERFORM IFM TO DRIVE THE HOOKS OPEN. IF UNABLE TO PERFORM THE IFM (THIRD FAILURE) THEN IMPLEMENT THE PYROTECHNIC SEPARATION. IF UNABLE TO PERFORM THE PYROTECHNIC SEPARATION (FOURTH FAILURE) THEN PERFORM .EVA TO REMOVE 96 BOLTS FROM THE DOCKING BASE TO CIRCUMVENT THE WORST CASE "DESIGN CRITICALITY" EFFECT. IF UNABLE TO PERFORM EVA (FIFTH 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: MINUTES

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:
AFTER FAILURE OF THE REDUNDANT PSU POWER ENABLE CIRCUIT, THE CREW CAN PERFORM IFM TO DRIVE THE HOOKS OPEN TO UNDOCK.

HAZARD REPORT NUMBER(S): ORBI 401

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

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- NON-CIL FAILURE MODE
NUMBER: M5-6SS-0106-01

- APPROVALS -

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