

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- NON-CIL HARDWARE
NUMBER:M5-6SS-0126 -X

SUBSYSTEM NAME: ISS DOCKING SYSTEM

REVISION: 0

02/27/88

PART DATA

	PART NAME	PART NUMBER
	VENDOR NAME	VENDOR NUMBER
LRU	:PANEL A6A3	V828-730150
SRU	:ZENER DIODE	JANTX1N5611

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
 ZENER DIODE, TRANSIENT SUPPRESSION, 43.7 VOLT, 3 WATT

REFERENCE DESIGNATORS: 36V73A7A3A8CR5
 36V73A7A3A8CR6
 36V73A7A3A8CR11
 36V73A7A3A8CR12
 36V73A7A3A9CR5
 36V73A7A3A9CR6
 36V73A7A3A9CR11
 36V73A7A3A9CR12

QUANTITY OF LIKE ITEMS: 8
 (EIGHT)

FUNCTION:
 PROTECTS MAIN BUS FROM MOTOR TRANSIENTS.

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

FAILURE MODES EFFECTS ANALYSIS FMEA – NON-CIL FAILURE MODE
NUMBER: M5-6SS-0125-01

REVISION#: 0 02/27/98

SUBSYSTEM NAME: ISS DOCKING SYSTEM
 LRU: PANEL A6A3
 ITEM NAME: ZENER DIODE

CRITICALITY OF THIS
 FAILURE MODE: 1R3

FAILURE MODE:
 SHORT (END TO END)

MISSION PHASE: OO ON-ORBIT

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

CAUSE:

A) STRUCTURAL FAILURE (MECHANICAL STRESS, VIBRATION), B) CONTAMINATION, C)
 ELECTRICAL STRESS, D) THERMAL STRESS, E) PROCESSING ANOMALY

CRITICALITY 1R1 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:
 NONE

MASTER MEAS. LIST NUMBERS: NONE

CORRECTING ACTION: NONE

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CORRECTING ACTION DESCRIPTION:

DESIGN FAULT TOLERANCE: REDUNDANT MOTOR OF AFFECTED PMA 2/3 HOOKS GROUP WILL CONTINUE TO DRIVE THE HOOKS.

- FAILURE EFFECTS -

(A) SUBSYSTEM:

A SHORT END-TO-END FAILURE OF THE REVERSE-BIASED ZENER DIODE WILL CAUSE THE FORWARD BIASED ZENER DIODE TO CONDUCT OR OVERSTRESS AND FAIL SHORT (END TO END) RESULTING IN TRIPPING THE UPSTREAM CIRCUIT BREAKER REMOVING ALL POWER TO AFFECTED PMA 2/3 HOOKS GROUP MOTOR.

(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 FOUR FAILURES:

- 1) REVERSED-BIASED ZENER DIODE FAILS SHORT (END TO END). THIS WILL CAUSE THE UPSTREAM CIRCUIT BREAKER TO TRIP OPEN AND REMOVE ALL POWER TO AFFECTED PMA 2/3 HOOKS GROUP MOTOR.
- 2) ONE OR MORE HOOKS IN THE ACTIVE MECHANISM FAIL TO CLOSE COMPLETELY.
- 3) LOSS OF REDUNDANT MOTOR OF SAME PMA 2/3 HOOKS GROUP - RESULTS IN LOSS OF PMA 2/3 UNDOCKING CAPABILITY.
- 4) 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:

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

AFTER THE FOURTH 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 (FIFTH 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:
DESIGN FAULT TOLERANCE: REDUNDANT PMA 2/3 HOOKS "OPEN" MOTOR CIRCUIT IS OPERATIONAL. AFTER LOSS OF NOMINAL UNDOCKING CAPABILITY WITH THE PMA 2/3 HOOK MOTORS, THE CREW CAN INITIATE ODS PASSIVE HOOK PYROS FOR UNDOCKING.**

HAZARD REPORT NUMBER(S): ORBI 401

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

- APPROVALS -

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