

FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL HARDWARE
NUMBER: M5-6SS-0127 -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	:HYBRID RELAY	MC455-0135-0002

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:

HYBRID RELAY - GROUP 1/2 HOOKS, MOTORS M6/7/8/9 OPEN COMMAND RELAY

REFERENCE DESIGNATORS: 36V73A7A3K1
 36V73A7A3K3
 36V73A7A3K5
 36V73A7A3K7

QUANTITY OF LIKE ITEMS: 4
 (FOUR)

FUNCTION:

WHEN ENERGIZED, CONNECTS POWER TO ONE OF TWO REDUNDANT HOOK MOTORS TO OPEN PMA 2/3 HOOKS. WHEN THE "OPEN" RELAY IS DE-ENERGIZED, IT CONNECTS THE TERMINALS OF THE MOTOR TOGETHER TO DISSIPATE ANY ENERGY STORED IN THE MOTOR.

REFERENCE DOCUMENTS: 1) VS70-953103, INTEGRATED SCHEMATIC - 53JA, 53JC, 53JE, 53JG; PMA 2/3 PASSIVE MECHANISM GROUP 1/2, SYS A/B HOOKS CONTROL

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LRU: PANEL A6A3
ITEM NAME: HYBRID RELAY

**CRITICALITY OF THIS
 FAILURE MODE: 1R3**

FAILURE MODE:
 FAILS OPEN, FAILS TO CONDUCT, INADVERTENTLY OPENS, FAILS TO TRANSFER

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, 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) N/A
C) PASS

PASS/FAIL RATIONALE:

A)

B)

SCREEN B IS "N/A" BECAUSE THE HYBRID RELAY IS CONTAINED WITHIN A STANDBY SYSTEM.

C)

METHOD OF FAULT DETECTION:

ONE GROUP OF HOOKS TAKES TWICE THE NORMAL TIME TO OPEN.

MASTER MEAS. LIST NUMBERS: NONE

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CORRECTING ACTION: NONE

CORRECTING ACTION DESCRIPTION:

DESIGN FAULT TOLERANCE: REDUNDANT PMA HOOK MOTOR WILL OPEN AFFECTED GROUP OF HOOKS AT HALF THE SPEED AND TWICE THE NORMAL TIME.

- FAILURE EFFECTS -

(A) SUBSYSTEM:

LOSS OF ABILITY TO CONNECT POWER TO ONE OF THE TWO REDUNDANT HOOK MOTORS TO OPEN PMA 2/3 HOOKS.

(B) INTERFACING SUBSYSTEM(S):

INABILITY TO OPEN AFFECTED GROUP OF PMA 2/3 HOOKS USING ASSOCIATED MOTOR. REDUNDANT PMA HOOK MOTOR WILL OPEN AFFECTED GROUP OF HOOKS AT HALF THE SPEED AND TWICE THE NORMAL TIME.

(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) RELAY FAILS OPEN - UNABLE TO OPERATE ONE PMA HOOK MOTOR. REDUNDANT PMA HOOK MOTOR WILL OPEN AFFECTED GROUP OF HOOKS AT HALF THE SPEED AND TWICE THE NORMAL TIME.
- 2) ONE OR MORE HOOKS IN THE ACTIVE MECHANISM FAIL TO CLOSE COMPLETELY.
- 3) RELAY POWERING REDUNDANT MOTOR CIRCUIT FAILS OPEN - UNABLE TO OPEN ONE GROUP OF PMA HOOKS. LOSS OF PMA 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: DAYS**TIME FROM FAILURE OCCURRENCE TO DETECTION: MINUTES****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 -

SS&PAE
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