

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - CIL HARDWARE
NUMBER:M5-6SS-0123 -X**

SUBSYSTEM NAME: ISS DOCKING SYSTEM

REVISION: 0

02/27/98

PART DATA

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	:PANEL A6A3	V628-730150
SRU	:TOGGLE SWITCH	ME452-0102-7406

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:

TOGGLE SWITCH, 3 POSITION, CENTER OFF, FOUR POLE - ACTIVATES RELAY TO OPEN OR CLOSE PMA 2/3 HOOKS.

REFERENCE DESIGNATORS: 36V73A7A3S13
36V73A7A3S14

QUANTITY OF LIKE ITEMS: 2
(TWO)

FUNCTION:
ACTIVATES RELAY TO OPEN OR CLOSE PMA 2/3 HOOKS.

REFERENCE DOCUMENTS: 1) VS70-953103, 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-0123-01**

REVISION#: 0 02/27/98

SUBSYSTEM NAME: ISS DOCKING SYSTEM
LRU: PANEL A6A3
ITEM NAME: TOGGLE SWITCHCRITICALITY OF THIS
FAILURE MODE: 1R3FAILURE MODE:
FAILS OPEN

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) N/A
C) PASS**PASS/FAIL RATIONALE:**

A)

B)

SCREEN B IS "N/A" BECAUSE THE TOGGLE SWITCH IS CONTAINED WITHIN A STANDBY
SYSTEM.

C)

METHOD OF FAULT DETECTION:

ONE GROUP OF HOOKS TAKES TWICE THE NORMAL TIME TO OPEN OR CLOSE

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 ACTIVATE RELAY TO OPEN OR CLOSE THE PMA 2/3 HOOKS.

(B) INTERFACING SUBSYSTEM(S):

INABILITY TO OPEN/CLOSE 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) TOGGLE SWITCH FAILS OPEN IN THE "OP" POSITION AFTER SEALING INTERFACE. (WORST CASE) - UNABLE TO OPERATE ONE PMA HOOK MOTOR IN THE "OPEN HOOKS" DIRECTION. 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) LOSS OF REDUNDANT MOTOR. 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: HOURS

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 HOOK MOTOR WILL OPEN AFFECTED GROUP OF HOOKS AT HALF THE SPEED AND TWICE THE NORMAL TIME. AFTER THE FOURTH FAILURE, THE CREW CAN PERFORM PYROTECHNIC SEPARATION TO UNDOCK.**

HAZARD REPORT NUMBER(S): ORBI 401

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

- APPROVALS -

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C. J. Arroyo