

**FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL HARDWARE
NUMBER:M5-6SS-0112 -X**

SUBSYSTEM NAME: ISS DOCKING SYSTEM

REVISION: 0 02/27/98

PART DATA

	PART NAME	PART NUMBER
	VENDOR NAME	VENDOR NUMBER
LRU	:PANEL A8A3	V828-730150
SRU	:TOGGLE SWITCH	MC452-0102-7801

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:

SWITCH, TOGGLE, 3 POLE/2 POSITION, MAINTAINED ON - PYRO POWER MAIN A AND MAIN C CONTROL CIRCUIT

REFERENCE DESIGNATORS: 36V73A7A3S3
36V73A7A3S4

QUANTITY OF LIKE ITEMS: 2
TWO

FUNCTION:

PROVIDE MANUAL ACTIVATION OF THE PYROTECHNIC LOGIC AND FIRE CIRCUITS
ROUTED TO THE PFCU.

REFERENCE DOCUMENTS: 1) VS70-953103, INTEGRATED SCHEMATIC - 53PA, PFCU
POWER DISTRIBUTION CONTROL CIRCUIT

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SUBSYSTEM NAME: ISS DOCKING SYSTEM

LRU: PANEL A6A3

ITEM NAME: TOGGLE SWITCH

CRITICALITY OF THIS

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) N/A
	C) PASS

PASS/FAIL RATIONALE:

A)

B)

PYROTECHNIC SEPARATION CLASSIFIED AS STANDBY REDUNDANCY.

C)

CORRECTING ACTION: NONE

CORRECTING ACTION DESCRIPTION:

DESIGN FAULT TOLERANCE: REDUNDANT PYROTECHNIC SEPARATION CIRCUIT REMAINS OPERATIONAL.

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- FAILURE EFFECTS -

(A) SUBSYSTEM:

LOSS OF CAPABILITY TO ACTIVATE ONE OF THE TWO PFCU FIRE CIRCUITS.

(B) INTERFACING SUBSYSTEM(S):

DEGRADED REDUNDANCY FOR PYROTECHNIC SEPARATION CAPABILITY. LOSS OF ONE OF TWO PYROTECHNIC SEPARATION "FIRE" CURRENT BUSES. LOSS OF ONE OF TWO LOGIC BUSES TO THE PFCU.

(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 THREE FAILURES:

- 1) SWITCH FAILS - DEGRADED REDUNDANCY FOR PYROTECHNIC SEPARATION.
- 2) ONE OF THE TWELVE HOOKS FAILS TO OPEN (REF. FMEA M5-ISS-BM001-04).
LOSS OF NOMINAL UNDOCKING CAPABILITY.
- 3) SWITCH IN THE REDUNDANT CIRCUIT FAILS OPEN - LOSS OF PFCU LOGIC. LOSS OF
NOMINAL AND 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), ADDITIONAL FAULT TOLERANCE IS PROVIDED TO THE SYSTEM.

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

- TIME FRAME -

**FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL FAILURE MODE
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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:
DESIGN FAULT TOLERANCE: REDUNDANT PYROTECHNIC SEPARATION CIRCUIT
REMAINS OPERATIONAL. AFTER THE SECOND 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 -

SS&PAE
DESIGN ENGINEERING

: T. K. KIMURA
: C. J. ARROYO

J. Kimura 4-13-98
C. J. Arroyo