

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL HARDWARE
NUMBER:M5-6SS-0114 -X**

SUBSYSTEM NAME: ISS DOCKING SYSTEM

REVISION: 0 02/27/98

PART DATA

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	:MID PCA-1	VO70-764400
SRU	:GENERAL PURPOSE RELAY	MC455-0129-0004

**EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
GENERAL PURPOSE RELAY, 25 AMP - PYRO POWER MAIN A +Y1 LOGIC BUS SIGNAL**

REFERENCE DESIGNATORS: 40V76A25A2K2

**QUANTITY OF LIKE ITEMS: 1
ONE**

**FUNCTION:
THE CONTACTOR PROVIDES POWER DISTRIBUTION AND ACTIVATION FOR ONE OF THE
TWO LOGIC BUSES IN THE PFCU.**

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

**FAILURE MODES EFFECTS ANALYSIS FMEA -- NON-CIL FAILURE MODE
NUMBER: M5-6SS-0114-01**

REVISION#: 0 02/27/98

**SUBSYSTEM NAME: ISS DOCKING SYSTEM
LRU: MID PCA-1
ITEM NAME: GENERAL PURPOSE RELAY**

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

FAILURE MODE:

OPEN, FAILS TO CONDUCT, INADVERTENTLY OPENS, FAILS TO TRANSFER, SHORT TO
STRUCTURE (GROUND)

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)

PYROTECHNIC SEPARATION CLASSIFIED AS STANDBY REDUNDANCY.

C)

CORRECTING ACTION: NONE

CORRECTING ACTION DESCRIPTION:

DESIGN FAULT TOLERANCE: REDUNDANT PYROTECHNIC SEPARATION CIRCUIT
REMAINS OPERATIONAL.

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL FAILURE MODE
NUMBER: M5-6SS-0114-01**

- FAILURE EFFECTS -

(A) SUBSYSTEM:

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

(B) INTERFACING SUBSYSTEM(S):

DEGRADED REDUNDANCY FOR PYROTECHNIC SEPARATION CAPABILITY. LOSS OF ONE OF TWO +Y LOGIC SIGNALS 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) CONTACTOR OPENS - DEGRADED REDUNDANCY FOR PYROTECHNIC SEPARATION.
- 2) ONE OF THE TWELVE HOOKS FAILS TO OPEN (REF. FMEA M8-ISS-BM001-04). LOSS OF NOMINAL UNDOCKING CAPABILITY.
- 3) FUSE IN THE REDUNDANT CIRCUIT FAILS OPEN, LOSS OF NOMINAL UNDOCKING AND LOSS OF PFCU LOGIC RESULTING IN LOSS OF 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
NUMBER: M5-6SS-0114-01

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 THIRD FAILURE, THE CREW CAN PERFORM EVA TO REMOVE 96 BOLTS FROM THE DOCKING BASE 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