

**FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL HARDWARE
NUMBER:M5-6SS-0105 -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
LRU	:MID PCA-2	VO70-764430
LRU	:MID PCA-3	VO70-764450
SRU	:FUSE	MC451-0018-1000

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:

FUSE, SUB-MINIATURE, 10 AMP - SYSTEM 1 POWER MAIN A, AND SYSTEM 2 POWER MAIN B CONTROL.

REFERENCE DESIGNATORS: 40V76A25F36
40V76A25F38
40V76A25F39
40V76A25F40
40V76A26F36
40V76A26F38
40V76A26F39
40V76A26F40
40V76A27F25
40V76A27F26
40V76A27F27
40V76A27F28

QUANTITY OF LIKE ITEMS: 12
TWELVE

FUNCTION:

PROVIDE DISTRIBUTION AND CIRCUIT PROTECTION FOR THE PANEL MAIN A, PANEL MAIN B, AND PANEL MAIN C ISS DOCKING MECHANISM LOGIC POWER CIRCUITS.

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REFERENCE DOCUMENTS: 1) VS70-953103, INTEGRATED SCHEMATIC - 53A, MAIN
A/MAIN B SYSTEM POWER AND APDS LOGIC BUSES

FAILURE MODES EFFECTS ANALYSIS FMEA - NON-CIL FAILURE MODE

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SUBSYSTEM NAME: ISS DOCKING SYSTEM

LRU: MID PCA-1, 2, 3

ITEM NAME: FUSE

CRITICALITY OF THIS

FAILURE MODE: 1R3

FAILURE 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)

N/A - AT LEAST TWO REMAINING PATHS ARE DETECTABLE IN FLIGHT.

C)

METHOD OF FAULT DETECTION:

FIRST FAILURE IS NOT DETECTABLE BECAUSE IT IS MASKED BY THE PARALLEL POWER SOURCE. FAILURE WOULD BE DETECTABLE AFTER FAILURE OF THE PARALLEL POWER SOURCE.

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CORRECTING ACTION: NONE

CORRECTING ACTION DESCRIPTION:

DESIGN FAULT TOLERANCE: REDUNDANT ISS DOCKING MECHANISM LOGIC POWER BUS SOURCES REMAIN OPERATIONAL.

- FAILURE EFFECTS -

(A) SUBSYSTEM:

LOSS OF ONE PARALLEL FUSE. DEGRADATION OF ISS DOCKING MECHANISM LOGIC BUS PROTECTION REDUNDANCY.

(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) FIRST FUSE FAILS OPEN. NO EFFECT.
- 2) SECOND FUSE IN SAME POWER LEG FAILS OPEN - PARTIAL LOSS OF ISS DOCKING MECHANISM LOGIC REDUNDANCY FOR ONE OF THREE BUSES. REDUNDANT PATHS REMAIN OPERATIONAL.
- 3) MPCA CONTACTOR OF SECOND REDUNDANT POWER CIRCUIT FAILS OPEN OR SHORTS TO GROUND - LOSS OF ISS DOCKING MECHANISM LOGIC REDUNDANCY.
- 4) ONE OF TWO MAIN LOGIC CIRCUIT BREAKERS OR DIODES OF THIRD REDUNDANT POWER CIRCUIT IN PANEL A6A3 FAILS OPEN - LOSS OF ALL UNDOCKING CAPABILITY. FAILURE OF TWO OF THREE ISS DOCKING MECHANISM LOGIC BUSES DISABLES NOMINAL AND PYROTECHNIC SEPARATION SYSTEMS CONTROL. LOSS OF ISS DOCKING MECHANISM PANEL CONTROL.

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.

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AFTER THE FOURTH FAILURE, THE CREW WOULD PERFORM IFM TO COMPLETE ALL REQUIRED APDS MOTOR DRIVE FUNCTION. IF UNABLE TO PERFORM THE IFM (FIFTH FAILURE) THEN PERFORM EVA TO REMOVE 96 BOLTS FROM THE DOCKING BASE TO CIRCUMVENT THE WORST CASE "DESIGN CRITICALITY" EFFECT. IF UNABLE TO PERFORM EVA (SIXTH 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: 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: TWO OF THREE REDUNDANT ISS DOCKING MECHANISM LOGIC POWER BUS SOURCES REMAIN OPERATIONAL AFTER THE SECOND FAILURE TO PROVIDE POWER TO THE DOCKING SYSTEM CIRCUITS. AFTER THE FOURTH FAILURE, THE CREW WOULD BE ABLE TO PERFORM IFM TO COMPLETE ALL REQUIRED APDS MOTOR DRIVE FUNCTIONS.**

HAZARD REPORT NUMBER(S): ORBI 401

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

- APPROVALS -

SS&PAE : T. K. KIMURA
DESIGN ENGINEERING : C. J. ARROYO

J. Kimura 4-13-98
