

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- NON-CIL HARDWARE
NUMBER:M5-6SS-0100 -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	:CIRCUIT BREAKER	MC454-0026-2030

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:

CIRCUIT BREAKERS, 3 AMP - ISS DOCKING SYSTEM 1 POWER CONTROL CIRCUIT (MAIN "B" - ESS 1BC) - ISS DOCKING SYSTEM 2 POWER CONTROL CIRCUIT (MAIN "C" - ESS 2CA)

REFERENCE DESIGNATORS: 36V73A7A3CB1
36V73A7A3CB6

QUANTITY OF LIKE ITEMS: 2
TWO

FUNCTION:

PROVIDE OVERLOAD PROTECTION FOR THE ORBITER MAIN B - ESS 1BC, AND THE MAIN C - ESS 2CA BUSES FROM THE ISS DOCKING SYSTEMS 1 AND 2 POWER ENABLE CIRCUITS.

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

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SUBSYSTEM NAME: ISS DOCKING SYSTEM

LRU: PANEL A6A3

ITEM NAME: CIRCUIT BREAKER

CRITICALITY OF THIS

FAILURE MODE: 1R3

FAILURE MODE:

FAILS OPEN, FAILS TO CONDUCT, FAILS TO CLOSE

MISSION PHASE: OO ON-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY:	103	DISCOVERY
	104	ATLANTIS
	105	ENDEAVOUR

CAUSE:

A) 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 (AVONICS ONLY)? NO

REDUNDANCY SCREEN	A) PASS
	B) PASS
	C) PASS

PASS/FAIL RATIONALE:

A)

B)

C)

METHOD OF FAULT DETECTION:

VISUAL CUE FROM DS1 AND DS2. VISUAL INSPECTION OF VESTIBULE DOCKING LIGHTS
 AND TRUSS DOCKING LIGHTS AVAILABLE. VESTIBULE DE-PRESSURIZATION VALVE
 FUNCTIONAL STATUS AVAILABLE.

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CORRECTING ACTION: NONE

CORRECTING ACTION DESCRIPTION:

DESIGN FAULT TOLERANCE: TWO OF THREE REDUNDANT ISS DOCKING MECHANISM LOGIC POWER BUS SOURCES REMAIN TO PROVIDE POWER TO THE DOCKING SYSTEM CIRCUITS.

- FAILURE EFFECTS -

(A) SUBSYSTEM:

LOSS OF CAPABILITY TO ACTIVATE ONE OF THE TWO ISS DOCKING SYSTEM POWER CIRCUITS.

(B) INTERFACING SUBSYSTEM(S):

CASE 1: LOSS OF PANEL A6A3 MAIN A POWER.

ISS DOCKING FUNCTIONS LOST DUE TO CB1 (SYSTEM 1 POWER CONTROL CIRCUIT) FAILURE INCLUDE: VESTIBULE DE-PRESSURIZATION VALVE FUNCTIONAL CAPABILITY (MAIN "A" BRANCH); TRUSS FORWARD DOCKING LIGHT ENABLE; VESTIBULE PORT DOCKING LIGHT ENABLE; PANEL "A" BUS (PARTIAL) ENABLE FOR THE ISS DOCKING MECHANISM PANEL A6A2

CASE 2: LOSS OF PANEL A6A3 MAIN B POWER.

ISS DOCKING FUNCTIONS LOST DUE TO CB6 (SYSTEM 2 POWER CONTROL CIRCUIT) FAILURE INCLUDE: VESTIBULE DE-PRESSURIZATION VALVE FUNCTIONAL CAPABILITY (MAIN "B" BRANCH); TRUSS AFT DOCKING LIGHT ENABLE; VESTIBULE STARBOARD DOCKING LIGHT ENABLE; PANEL "B" BUS (PARTIAL) ENABLE FOR THE ISS DOCKING MECHANISM PANEL A6A2.

(C) MISSION:

FIRST FAILURE - NO EFFECT. DEGRADATION OF PANEL BUS REDUNDANCY. DEGRADED DOCKING LIGHTS REDUNDANCY.

(D) CREW, VEHICLE, AND ELEMENT(S):

FIRST FAILURE - NO EFFECT. DEGRADATION OF ISS DOCKING MECHANISM LOGIC BUS REDUNDANCY.

(E) FUNCTIONAL CRITICALITY EFFECTS:

POSSIBLE LOSS CREW/VEHICLE AFTER THREE FAILURES:

- 1) ONE CIRCUIT BREAKER FAILS OPEN - DEGRADATION OF PANEL BUS REDUNDANCY. TWO REDUNDANT ISS DOCKING MECHANISM LOGIC POWER BUS SOURCES REMAIN OPERATIONAL.
- 2) CONTACTOR OF REDUNDANT CIRCUIT INADVERTENTLY OPENS AFTER DOCKING - LOSS OF PANEL BUSES. ONE ISS DOCKING MECHANISM LOGIC BUS POWER SOURCE REMAINS OPERATIONAL.

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- 3) ONE OF TWO MAIN C - LOGIC 2 AND 3 BUSES CIRCUIT BREAKERS OR DIODES FAILS OPEN - LOSS OF ALL UNDOCKING CAPABILITY. LOSS OF TWO OF THREE ISS DOCKING MECHANISM LOGIC BUSES DISABLES NOMINAL AND PYROTECHNIC SEPARATION SYSTEMS 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.

AFTER THE THIRD FAILURE, THE CREW WOULD PERFORM IFM TO COMPLETE ALL REQUIRED APDS MOTOR DRIVE FUNCTION. IF UNABLE TO PERFORM THE IFM (FOURTH 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 (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: 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 TO PROVIDE POWER TO THE DOCKING SYSTEM CIRCUITS. ALSO, AFTER THE THIRD FAILURE, THE CREW CAN 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.

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- APPROVALS -

SS&PAE
DESIGN ENGINEERING

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

: *J. Kimura 4-13-98*
: *[Signature]*
