

FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL HARDWARE
NUMBER: M5-6SS-8020-X

SUBSYSTEM NAME: E - DOCKING SYSTEM

REVISION: 0 DEC, 1996

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	: ENERGIA POWER PANEL RSC-E	MC621-0087-0009 SLTYU.468312.001
SRU	: CIRCUIT BREAKER	AZ2-2 (P:3,619,242 TU)

PART DATA

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:

PNL A8A3, CIRCUIT BREAKER (4.2 AMPS TRIPPING CURRENT,) APDS (+Ap, +Bp, +Cp)
PFCU LOGIC BUS CONTROL

REFERENCE DESIGNATORS: 36V73A8A3F2
36V73A8A3F6
36V73A8A3F10

QUANTITY OF LIKE ITEMS: 3
(THREE)

FUNCTION:

PROVIDE PROTECTION, CONTROL AND DISTRIBUTION FOR THE APDS PYROTECHNIC SEPARATION LOGIC BUSES (+Ap, +Bp, +Cp). THESE BUSES ARE PROVIDED TO THE PYROTECHNIC FIRING CONTROL UNIT (PFCU). WITHIN THE PFCU, THE BUSES ARE DISTRIBUTED TO CONFIGURE THE PYROTECHNIC SEPARATION ELEMENTS (ACTIVE AND PASSIVE HOOKS). IN ADDITION, THE BUSES ARE ENERGIZED WHEN PYROTECHNIC CIRCUIT CHECKOUT IS REQUIRED.

FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL FAILURE MODE
NUMBER: M5-655-B020-01

REVISION# D DEC, 1996

SUBSYSTEM NAME: E - DOCKING SYSTEM
LRU: MC621-0087-0009
ITEM NAME: CIRCUIT BREAKER

CRITICALITY OF THIS
FAILURE MODE: 1R3

FAILURE MODE:
FAILS OPEN, FAILS TO CONDUCT, INADVERTENTLY OPENS, FAILS TO TRANSFER

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 1R1 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 SYSTEM IS CONSIDERED STAND-BY.

C)

METHOD OF FAULT DETECTION:

DISPLAYS AND TELEMETRY DATA "PYROTECHNIC BUS STATUS (+Aa, +Bp, +Cp)" AND
"PYRO CIRCUIT PROTECTION OFF" INDICATIONS IN THE D&C PANEL.

MASTER MEAS. LIST NUMBERS: V53X0796E
V53X0797E
V53X0798E

CORRECTING ACTION:

CREW WOULD PERFORM EVA TO REMOVE 96 BOLTS FROM THE DOCKING BASE TO
SEPARATE THE ORBITER FROM ISS.

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL FAILURE MODE
NUMBER: M5-6SS-B020-01**

- FAILURE EFFECTS -

(A) SUBSYSTEM:

DISABLES PROTECTION, CONTROL AND DISTRIBUTION FOR ONE OF THREE APDS
PYROTECHNIC BUSES (+Ap, +Bp, +Cp)

(B) INTERFACING SUBSYSTEM(S):

DEGRADED PYROTECHNIC BUS REDUNDANCY.

(C) MISSION:

NO EFFECT.

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

FIRST FAILURE - NO EFFECT.

(E) FUNCTIONAL CRITICALITY EFFECTS:

SHUTTLE MECHANISM CONTROL: POSSIBLE LOSS OF CREW OR VEHICLE AFTER THREE
FAILURES.

1) ONE OF THREE CIRCUIT BREAKERS FAILS OPEN. DEGRADED PYROTECHNIC BUS
REDUNDANCY. 2) ONE OF TWO REMAINING ASSOCIATED CIRCUIT BREAKERS FAILS
OPEN. DISABLES TWO OF THREE PYROTECHNIC BUSES. LOSS OF CAPABILITY TO
IMPLEMENT PYROTECHNIC SEPARATION. 3) ONE OF TWELVE HOOKS FAILS TO OPEN
(REF. M5-1SS-BM001-04.). LOSS OF CAPABILITY TO IMPLEMENT NOMINAL SEPARATION.

DESIGN CRITICALITY (PRIOR TO OPERATIONAL DOWNGRADE, DESCRIBED IN F):

(F) RATIONALE FOR CRITICALITY CATEGORY DOWNGRADE:

ALTHOUGH THE CRITICALITY REMAINS UNCHANGED AFTER WORKAROUNDS
CONSIDERATION (ALLOWED PER CR S050107W), THEY ARE PROVIDING ADDITIONAL
FAULT TOLERANCE TO THE SYSTEM.

AFTER THE THIRD FAILURE, THE CREW WOULD PERFORM EVA TO REMOVE 96 BOLTS 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 -

TIME FROM FAILURE TO CRITICAL EFFECT: DAYS

TIME FROM FAILURE OCCURRENCE TO DETECTION: HOURS

TIME FROM DETECTION TO COMPLETED CORRECTIVE ACTION: HOURS

TIME REQUIRED TO IMPLEMENT CORRECTIVE ACTION LESS THAN TIME TO EFFECT? YES

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NUMBER: M5-6SS-8020-01

RATIONALE FOR TIME TO CORRECTING ACTION VS TIME TO EFFECT:
CREW WOULD HAVE SUFFICIENT TIME TO PERFORM EVA.

HAZARDS REPORT NUMBER(S) : ORBI 401A

HAZARD DESCRIPTION:
INABILITY TO SEPARATE ORBITER AND ISS.

- APPROVALS -

PRODUCT ASSURANCE ENGR : M. NIKOLAYEVA
DESIGN ENGINEER : B. YAKULIN


