

FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL HARDWARE
NUMBER: M5-6SS-B019-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 SLYU.468312.001
SRU	: CIRCUIT BREAKER	Az2-5 (8>3.619.242 TU)

PART DATA

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:

PNL A8A3, CIRCUIT BREAKER (2.5 AMPS TRIPPING CURRENT,) APDS (+Ads, +Bds, +Cds)
POWER BUS CONTROL

REFERENCE DESIGNATORS: 36V73A8A3F1
36V73A8A3F5
36V73A8A3F9

QUANTITY OF LIKE ITEMS: 3
(THREE)

FUNCTION:

PROVIDE PROTECTION, CONTROL, AND DISTRIBUTION FOR THE APDS CONTROL LOGIC CIRCUITRY BUSES (+Ads, +Bds, +Cds) THESE BUSES ARE PROVIDED TO THE POWER SWITCHING UNIT (PSU.) THE PSU DISTRIBUTES THEM AS +WA, +WB, AND +WB TO THE DOCKING MECHANISM CONTROL UNIT (DMCU) FOR DOCKING RING MOTOR LOGIC CONTROL. THE PSU ALSO DISTRIBUTES THE BUSES (+WA, +WB, +WB) TO THE LATCH ACTUATOR CONTROL ASSEMBLY (LACU) FOR LOGIC CONTROL OF THE CAPTURE LATCHES. THE (+WA, +WB, +WB) BUSES ARE ALSO DISTRIBUTES TO THE PRESSURIZATION ACTUATOR CONTROL UNITS (PACUs 1 & 2) FOR LOGIC CONTROL OF THE SET HOOKS 1 & 2. ALSO, THESE BUSES ARE PROVIDED TO THE DSCU FOR COMMAND IMPLEMENTATION AND APDS ESSENTIAL AUTOMATIC AND MANUAL FUNCTIONS AND INITIALIZATION OF THE APDS SYSTEM.

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REVISION# 0 FEBDEC, 1997

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) PASS
 C) PASS

PASS/FAIL RATIONALE:

A)

B)

C)

METHOD OF FAULT DETECTION:

PANEL INDICATION FOR THE APDS POWER BUSES (+Ads, +Bds, +Cds)

MASTER MEAS. LIST NUMBERS: V53X0790E
 V53X0791E
 V53X0792E

CORRECTING ACTION:

WORKAROUNDS ARE AVAILABLE TO SEPARATE THE ORBITER FROM ISS:

11 CREW WILL UTILIZE THE MANUAL UNBLOCKING DEVICE TO OPEN THE CAPTURE LATCHES:

23) IFM TO DRIVE CAPTURE LATCHES OPEN;

32) EXTENDING THE DOCKING RING IS ANOTHER WORKAROUND TO SEPARATE IF ONLY ONE OF THREE CAPTURE LATCHES REMAINED CLOSE;

49) PERFORM EVA TO REMOVE 96 BOLTS FROM THE DOCKING BASE.

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- NON-CIL FAILURE MODE
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- FAILURE EFFECTS -

(A) SUBSYSTEM:

DISABLES PROTECTION, CONTROL AND DISTRIBUTION FOR ONE OF THE THREE APDS LOGIC POWER BUSES (+Ade, +Bde, +Cde)

(B) INTERFACING SUBSYSTEM(S):

DISABLES ONE OF THREE CAPTURE LATCHES.

(C) MISSION:

NO EFFECT.

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

FIRST FAILURE - NO EFFECT.

(E) FUNCTIONAL CRITICALITY EFFECTS:

WORST CASE, SHUTTLE MECHANISM CONTROL: POSSIBLE LOSS OF CREW OR VEHICLE AFTER TWO FAILURES.

1) ONE OF THREE CIRCUIT BREAKERS FAILS OPEN. DISABLES ONE OF THREE CAPTURE LATCHES. 2) CAPTURE LATCH MANUAL UNBLOCKING DEVICE FAILS TO RELEASE ASSOCIATED CAPTURE LATCH RESULTING IN LOSS OF NOMINAL UNDOCKING CAPABILITY. PYROTECHNIC SEPARATION CANNOT BE USED TO OPEN THE CAPTURE LATCHES.

DESIGN CRITICALITY (PRIOR TO OPERATIONAL DOWNGRADE, DESCRIBED IN F): 1R2

(F) RATIONALE FOR CRITICALITY CATEGORY DOWNGRADE:

CRITICALITY DOWNGRADED FROM 1R2 TO 1R3 DUE TO ADDITIONAL FAULT TOLERANCE PROVIDED BY WORKAROUNDS ALLOWED PER CR S050107W.

AFTER THE SECOND FAILURE, THE CREW WOULD PERFORM IFM TO DRIVE THE CAPTURE LATCHES OPEN. IF UNABLE TO PERFORM THE IFM (THIRD FAILURE) THEN CREW WOULD EXTEND RING TO SEPARATE. IF UNABLE TO EXTEND THE DOCKING RING (FOURTH FAILURE) THEN PERFORM EVA TO REMOVE 98 BOLTS 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 CORRECTIVE ACTION: HOURS

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

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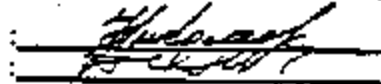
RATIONALE FOR TIME TO CORRECTING ACTION VS TIME TO EFFECT:
CREW WOULD HAVE SUFFICIENT TIME TO PERFORM IFM OR EVA.

HAZARDS REPORT NUMBER(S) : DRBI 401A

HAZARD DESCRIPTION:
INABILITY TO SEPARATE ORBITER AND ISS.

- APPROVALS -

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


Two handwritten signatures are present, one above the other, each written over a horizontal line. The top signature appears to be 'M. Nikolayeva' and the bottom one 'B. Vakulin'.