

PAGE: 1

PRINT DATE: 06.12.96

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL HARDWARE**

NUMBER: M5-6SS-B012-X

SUBSYSTEM NAME: E - DOCKING SYSTEM

REVISION: 0 DEC. 1996

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	: ENERGIA POWER PANEL RSC-E	MC621-0067-0009 SLTYU.468312.001
SRU	: PUSH BUTTON SWITCH	PKZ-4 (AGO.360.212.TU)

**PART DATA**

**EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:**  
PUSH-BUTTON SWITCHES (TWO DOUBLE POLE SWITCHES UNDER A SINGLE COVER  
CAP.) TWO POLE, MOMENTARY - APDS "OPEN LATCHES" COMMAND.

REFERENCE DESIGNATORS: 36V73ABA3SB4-B3  
36V73ABA3SB4-B4

QUANTITY OF LIKE ITEMS: 2  
(TWO)

**FUNCTION:**

PROVIDE THE "OPEN LATCHES" COMMAND STIMULI TO CLOSE THE APPROPRIATE  
CONTACTS IN THE DSCU TO IMPLEMENT THE "OPEN LATCHES" FUNCTION. THE "OPEN  
LATCHES" SIGNAL IS ROUTED BY THE DSCU TO THE LATCH ACTUATION CONTROL UNIT  
(LACU) WHICH IMPLEMENTS THE OPERATION OF THE THREE CAPTURE LATCHES (M1,  
M2, AND M3.)

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

NUMBER: M5-6SS-B012-02

REVISION# 0 FEBDEC, 1997

SUBSYSTEM NAME: E - DOCKING SYSTEM

LRU: MC621-0087-0009

ITEM NAME: PUSH BUTTON SWITCH

CRITICALITY OF THIS

FAILURE MODE: 1R3

## FAILURE MODE:

FAILS CLOSED (MULTIPLE CONTACTS WITHIN ONE SWITCH,) SHORTS TO GROUND

## MISSION PHASE:

OO ON-ORBIT

VEHICLE/PAYLOAD/WT 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) PASS  
                                  C) PASS

## PASS/FAIL RATIONALE:

A)

B)

C)

## METHOD OF FAULT DETECTION:

NONE

MASTER MEAS. LIST NUMBERS:      NONE

## CORRECTING ACTION:

AFTER THE SECOND FAILURE, THE CREW WOULD FIRE RCS JETS TO AVOID COLLISION BETWEEN THE ORBITER AND ISS.

## - FAILURE EFFECTS -

## (A) SUBSYSTEM:

LOSS OF SWITCH CONTROL CAPABILITY FOR THE APDS 'OPEN LATCHES' CIRCUITS.

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**(B) INTERFACING SUBSYSTEM(S):**  
UNWANTED "OPEN LATCHES" COMMAND TO THE DSCU.

**(C) MISSION:**  
FIRST FAILURE - NO EFFECT.

**(D) CREW, VEHICLE, AND ELEMENT(S):**  
NO EFFECT.

**(E) FUNCTIONAL CRITICALITY EFFECTS:**  
**WORST CASE, SHUTTLE OR PMA-MECHANISM CONTROL: POSSIBLE LOSS OF CREW OR VEHICLE AFTER TWO FAILURES.**  
1) ONE OF TWO ASSOCIATED "OPEN LATCHES" SWITCHES FAILS CLOSED. ENABLES TWO OF THREE PANEL COMMAND SIGNALS. 2) ONE OF TWO "APDS CIRC PROT OFF" SWITCHES FAILS CLOSED. THREE CAPTURE LATCHES INADVERTENTLY OPEN DURING DYNAMIC CAPTURE OPERATION.

**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 FIRE RCS JETS TO ENABLE THEREBY CIRCUMVENT THE WORST CASE "DESIGN CRITICALITY" EFFECT. IF UNABLE TO PERFORM THE WORKAROUND (THIRD FAILURE), POSSIBLE LOSS OF CREW/VEHICLE DUE TO AN INADVERTENT COLLISION BETWEEN THE ORBITER AND ISS.

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**- TIME FRAME -**

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**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

**RATIONALE FOR TIME TO CORRECTING ACTION VS TIME TO EFFECT:**  
CREW WOULD HAVE SUFFICIENT TIME TO FIRE RCS JETS.

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NUMBER: M5-6SS-B012-02

HAZARDS REPORT NUMBER(S) : ORBI 402B

HAZARD DESCRIPTION:

UNCONTROLLED/NADVERTENT COLLISION BETWEEN ORBITER AND ISS.

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- APPROVALS -

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DESIGN ENGINEER : B. VAKULIN

*[Handwritten signatures]*