

## FAILURE MODES EFFECTS ANALYSIS (FMEA) - CIL HARDWARE

NUMBER: M5-6SS-8008-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 SLYTJL468312.001
SRU	: PUSH BUTTON SWITCH	PKZ-8 (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 "CLOSE LATCHES" COMMAND.

REFERENCE DESIGNATORS: 36V73A8A3SB2-B5  
 36V73A8A3SB2-B6

QUANTITY OF LIKE ITEMS: 2  
 (TWO)

FUNCTION:  
 PROVIDE THE "CLOSE LATCHES" COMMAND STIMULI TO CLOSE THE APPROPRIATE  
 CONTACTS IN THE DSCU TO IMPLEMENT THE "CLOSE LATCHES" FUNCTION.  
 NOMINALLY, THE LATCHES ARE OPENED AND CLOSED AS PART OF THE AUTOMATIC  
 DOCKING SEQUENCE. THE "CLOSE LATCHES" SIGNAL IS ROUTED BY THE DSCU TO THE  
 LATCH ACTUATOR CONTROL UNIT (LACU) TO ENABLE THE CIRCUITS WHICH INITIATE  
 THE CLOSE LATCH MOTIONS. ONE MOTOR FOR EACH LATCH (M1, M2, AND M3.)

FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL FAILURE MODE  
NUMBER: M5-6SS-8008-02

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/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 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:

"LATCHES OPEN" AND "LATCHES CLOSED" INDICATIONS IN THE D&C PANEL

MASTER MEAS. LIST NUMBERS:      V53X0783E

CORRECTING ACTION:

WORKAROUNDS ARE AVAILABLE TO SEPARATE THE ORBITER FROM ISS:

1) DISABLE ONE OF THE APDS LOGIC BUSES TO PREVENT IMPLEMENTATION OF AN UNWANTED COMMAND:

2) CREW WILL UTILIZE MANUAL UNBLOCKING DEVICE TO OPEN CAPTURE LATCHES:

3) PERFORM IFM TO DRIVE CAPTURE LATCHES OPEN;

4) PERFORM EVA TO REMOVE 86 BOLTS FROM THE DOCKING BASE.

FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL FAILURE MODE  
NUMBER: M5-SSS-8008-02

**- FAILURE EFFECTS -**

**(A) SUBSYSTEM:**

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

**(B) INTERFACING SUBSYSTEM(S):**

UNWANTED 'CLOSE LATCHES' COMMAND.

**(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 THREE FAILURES.

1) 'CLOSE LATCHES' SWITCH FAILS CLOSED. TEMPORARY LOSS OF CAPABILITY TO ELECTRICALLY OPEN THE CAPTURE LATCHES. CREW WOULD PERFORM AN APDS LOGIC BUS DROP TO RECOVER DOCKING FUNCTIONS. 2) UNABLE TO DISABLE THE AFFECTED APDS LOGIC BUS TO PREVENT AN IMPLEMENTATION OF AN UNWANTED COMMAND. IF UNABLE TO DISABLE THE LOGIC BUS OR REMAINING ASSOCIATED SWITCH FAILS CLOSED RESULTING IN LOSS OF CAPABILITY TO ELECTRICALLY OPEN THE CAPTURE LATCHES. 3) MANUAL UNBLOCKING DEVICE FAILS TO RELEASE (1 OF 3.) LOSS OF CAPABILITY TO RELEASE THE LATCHES MANUALLY.

**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 SECOND FAILURE, THE CREW WOULD PERFORM IFM TO DRIVE THE CAPTURE LATCHES OPEN. ~~IF UNABLE TO PERFORM THE IFM (THIRD FAILURE) THEN IMPLEMENT THE MANUAL RELEASE OF CAPTURE LATCH. IF LOSS OF IFM MANUAL UNBLOCKING DEVICE CAPABILITY (FOURTH FAILURE) THEN PERFORM EVA TO REMOVE B6 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: HOURS

TIME FROM DETECTION TO COMPLETED CORRECTIVE ACTION: MINUTES

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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 USE IFM OR PERFORM EVA.

HAZARDS REPORT NUMBER(S) : DRBI 401A

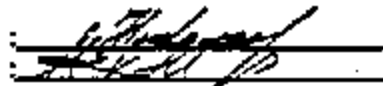
HAZARD DESCRIPTION:  
INABILITY TO SEPARATE ORBITER AND ISS.

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- APPROVALS -

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

  
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