

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- 01

REVISION# 0 FEB06, 1997

SUBSYSTEM NAME: E - DOCKING SYSTEM
LRU: MC621-0087-0009
ITEM NAME: PUSH BUTTON SWITCH

CRITICALITY OF THIS
FAILURE MODE: 1R3

FAILURE MODE:
FAILS OPEN (MULTIPLE CONTACTS WITHIN ONE SWITCH)

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)

N/A - AT LEAST TWO REMAINING PATHS ARE DETECTABLE IN FLIGHT.

C)

METHOD OF FAULT DETECTION:

NONE.

MASTER MEAS. LIST NUMBERS: NONE

CORRECTING ACTION:

WORKAROUNDS ARE AVAILABLE TO SEPARATE THE ORBITER FROM ISS:

1) CREW WILL UTILIZE MANUAL UNBLOCKING DEVICE TO OPEN CAPTURE LATCHES;

24) IFM TO DRIVE CAPTURE LATCHES HOOKS OPEN;

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

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

NUMBER: M5-6SS-8012- 01

- FAILURE EFFECTS -

(A) SUBSYSTEM:

PARTIAL LOSS OF SWITCH CONTROL CAPABILITY FOR THE APDS "OPEN LATCHES" COMMAND.

(B) INTERFACING SUBSYSTEM(S):

NO EFFECT. LOSS OF COMMAND REDUNDANCY.

(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 FOUR FAILURES.

1) ONE OF TWO ASSOCIATED SWITCHES FAILS. DISABLES ONE OF THREE PANEL COMMAND SIGNALS. DEGRADED MANUAL COMMAND REDUNDANCY. 2) THE SECOND ASSOCIATED SWITCH FAILS OPEN. LOSS OF PANEL CAPABILITY TO SUPPLY THE "OPEN LATCHES" COMMAND TO THE LACU. 3) AUTOMATIC DOCKING SEQUENCE FAILS RESULTING IN LOSS OF NOMINAL CAPABILITY TO OPEN LATCHES. 4) MANUAL UNBLOCKING DEVICE FAILS TO RELEASE (1 OF 3). INABILITY TO USE MANUAL LATCH/UNBLOCKING DEVICE TO OPEN CAPTURE LATCHES.

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 IFM TO DRIVE THE CAPTURE LATCH OPEN. IF UNABLE TO PERFORM THE IFM (FOURTH FAILURE) THEN IMPLEMENT THE MANUAL RELEASE OF CAPTURE LATCH. IF LOSS OF MANUAL UNBLOCKING DEVICE CAPABILITY (FIFTH FAILURE) THEN PERFORM EVA TO REMOVE 96 BOLTS TO CIRCUMVENT THE WORST CASE "DESIGN CRITICALITY" EFFECT. IF UNABLE TO PERFORM EVA (SIXTH 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

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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 OPEN LATCHES.

HAZARDS REPORT NUMBER(S) : ORBI 401A

HAZARD DESCRIPTION:
INABILITY TO SEPARATE ORBITER AND ISS.

- APPROVALS -

PRODUCT ASSURANCE ENGR
DESIGN ENGINEER

: M. NIKOLAYEVA
: B. VAKULIN

