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**FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL HARDWARE
NUMBER: M5-6SS-8003-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	: 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 "POWER-OFF" COMMAND.**

**REFERENCE DESIGNATORS: 36V73A8A3SB1-B3
36V73A8A3SB1-B4**

**QUANTITY OF LIKE ITEMS: 2
(TWO)**

**FUNCTION:
PROVIDE THE "POWER-OFF" COMMAND TO THE POWER SWITCHING UNIT (PSU.) THE
PSU PROVIDES THE LOGIC BUSES TO THE DSCU, DMCU, PACU, AND THE LACU. THESE
LOGIC BUSES ARE REQUIRED TO IMPLEMENT ALL DOCKING AND UNDOCKING
OPERATIONS.**

FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL FAILURE MODE
NUMBER: M5-6SS-B003-01

REVISION# 0 FEBDEC, 1997

SUBSYSTEM NAME: E - DOCKING SYSTEM
LRU: MCE21-0087-0009
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 1/1 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:
THE SECOND FAILURE WOULD BE DETECTED DURING SYSTEM POWER DOWN.

MASTER MEAS. LIST NUMBERS: V53X0785E

CORRECTING ACTION:

WORKAROUND ARE AVAILABLE TO SEPARATE THE ORBITER FROM ISS:

1. IFM TO DRIVE THE HOOKS OPEN;

2. INITIATION OF PYROBOLT SEPARATION;

3. PERFORM EVA TO REMOVE 86 BOLTS FROM THE DOCKING BASE.

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL FAILURE MODE
NUMBER: MS-SS-B003-01**

- FAILURE EFFECTS -

(A) SUBSYSTEM:

PARTIAL LOSS OF SWITCH CONTROL CAPABILITY FOR THE APDS 'POWER-OFF' CIRCUITS.

(B) INTERFACING SUBSYSTEM(S):

NO EFFECT.

(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 SIX FAILURES.

1) ONE OF TWO ASSOCIATED SWITCHES FAILS OPEN - NO EFFECT. 2) SECOND ASSOCIATED SWITCH FAILS OPEN. LOSS OF NOMINAL CAPABILITY TO POWER OFF. 3) ONE OF THREE 'APDS POWER' CIRCUIT BREAKERS FAILS CLOSED. REDUCED UPSTREAM CAPABILITY TO POWER OFF. 4) ONE OF TWO REMAINING 'APDS POWER' CIRCUIT BREAKERS FAILS CLOSED. REDUCED UPSTREAM CAPABILITY TO POWER OFF. 5) MULTIPLE CIRCUIT BREAKERS FAIL CLOSED IN THE A7A3 PANEL WHICH WOULD PRECLUDE POWER DOWN. CONTINUOUS POWER TO THE AVIONICS BOXES COULD CAUSE COMPONENTS TO OVERHEAT RESULTING IN LOSS OF NOMINAL UNDOCKING CAPABILITY. 6) ONE PYROBOLT FAILS TO INITIATE. LOSS OF CAPABILITY TO IMPLEMENT PYROTECHNIC 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 5050107W), THEY ARE PROVIDING ADDITIONAL FAULT TOLERANCE TO THE SYSTEM.

AFTER THE FIFTH FAILURE, THE CREW WOULD PERFORM IFM TO DRIVE THE HOOKS OPEN. IF UNABLE TO PERFORM THE IFM (SIXTH FAILURE) THEN IMPLEMENT THE PYROTECHNIC SEPARATION. IF UNABLE TO PERFORM THE PYROTECHNIC SEPARATION (SEVENTH FAILURE) THEN PERFORM EVA TO REMOVE 96 BOLTS TO CIRCUMVENT THE WORST CASE 'DESIGN CRITICALITY' EFFECT. IF UNABLE TO PERFORM EVA (EIGHTH 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

