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	MC621-0067-0009 SLIYU.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.

PRINT DATE: 17.02.97

FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL FAILURE MODE
NUMBER: M5-6SS-B003- 02

REVISION# 0 FEBDEC, 1997S

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:
THE STATUS OF THE APDS SYSTEM BUSES IS DISPLAYED ON THE PANEL.

MASTER MEAS. LIST NUMBERS: V53X0785E

CORRECTING ACTION:
WORKAROUNDS ARE AVAILABLE TO SEPARATE THE ORBITER FROM ISS:
1) DISABLE ONE OF THE APDS LOGIC BUSES TO RECOVER FUNCTION;
2) PERFORM IFM TO DRIVE CAPTURE LATCHES HOOKS OPEN;
3) PERFORM EVA TO REMOVE 96 BOLTS FROM THE DOCKING BASE.

FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL FAILURE MODE
NUMBER: M5-6SS-B003-02

• FAILURE EFFECTS •

(A) SUBSYSTEM:
LOSS OF SWITCH CONTROL CAPABILITY FOR THE APDS "POWER-OFF" COMMAND.

(B) INTERFACING SUBSYSTEM(S):
UNWANTED "POWER OFF" COMMAND TO THE PSU.

(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 FAILURE.
1) ONE OF TWO ASSOCIATED SWITCHES FAILS CLOSED (MULTIPLE CONTACTS) DURING THE AUTOMATIC DOCKING SEQUENCE (AFTER CAPTURE, BUT PRIOR TO HOOKS ENGAGED.) ENABLES TWO OF THREE COMMAND CHANNELS. UNWANTED "POWER OFF" COMMAND TO THE PSU. TEMPORARY LOSS OF CAPABILITY TO COMPLETE DOCKING AND OPEN CAPTURE LATCHES TO SEPARATE. CREW COULD PERFORM AN APDS LOGIC BUS DROP TO RECOVER DOCKING/UNDOCKING FUNCTION. 2) UNABLE TO DISABLE THE LOGIC BUS, LOSS OF NORMAL UNDOCKING CAPABILITY.

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 PERFORM EVA TO REMOVE 96 BOLTS TO CIRCUMVENT THE WORST CASE "DESIGN CRITICALITY" EFFECT. IF UNABLE TO PERFORM EVA (FOURTH 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

FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL FAILURE MODE
NUMBER: M5-6SS-B003-02

RATIONALE FOR TIME TO CORRECTING ACTION VS TIME TO EFFECT:
CREW WOULD HAVE SUFFICIENT TIME TO PERFORM 96 BOLT EVA OR DISABLE AFFECTED BUS.

HAZARDS REPORT NUMBER(S) : ORBI 401A

HAZARD DESCRIPTION:
INABILITY TO SEPARATE ORBITER AND ISS.

- APPROVALS -

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