PRINT DATE: 10.12.96

FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL HARDWARE
NUMBER: M5-6SS-B014-X

SUBSYSTEM NAME: E - DOCKING SYSTEM

REVISION: 0 APR, 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-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 "PYRO CIRCUIT PROTECTION ON" COMMAND

REFERENCE DESIGNATORS: 36V73A8A3SB5-B3
36V73A8A3SB5-B4

QUANTITY OF LIKE ITEMS: 2
(TWO)

FUNCTION:
PROVIDE THE "PYRO CIRCUIT PROTECTION ON" COMMAND STIMULI TO CLOSE THE APPROPRIATE CONTACTS IN THE PYROTECHNIC FIRE CONTROL UNIT (PFCU.)

PRINT DATE: 11.02.97

FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL FAILURE MODE
NUMBER: M5-6SS-B014- 02

REVISION# 0 FEB06C, 1997C

SUBSYSTEM NAME: E - DOCKING SYSTEM
LRU: MC621-0067-0009
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) 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:
1) CREW WILL PERFORM A PYRO LOGIC BUS DROP TO RECOVER PYROTECHNIC SEPARATION CAPABILITY.
2) ~~AFTER FIFTH FAILURE,~~ CREW WOULD PERFORM EVA TO REMOVE 96 BOLTS FROM THE DOCKING BASE TO SEPARATE THE ORBITER FROM ISS.

FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL FAILURE MODE
NUMBER: MS-6SS-B014-02

- FAILURE EFFECTS -

(A) SUBSYSTEM:
LOSS OF SWITCH CONTROL CAPABILITY FOR THE APDS "PYRO CIRCUIT PROTECTION ON" CIRCUITS.

(B) INTERFACING SUBSYSTEM(S):
UNWANTED "PYRO CIRCUIT PROTECTION ON" COMMAND TO THE PFCU. NO EFFECT ON SYSTEM OPERATION. THIS COMMAND CAN BE OVERRIDDEN BY THE "PYRO CIRCUIT PROTECTION OFF" SWITCH WHEN PYROTECHNIC SEPARATION IS REQUIRED.

(C) MISSION:
NO EFFECT.

(D) CREW, VEHICLE, AND ELEMENT(S):
FIRST FAILURE - NO EFFECT.

(E) FUNCTIONAL CRITICALITY EFFECTS:
SHUTTLE MECHANISM CONTROL: POSSIBLE LOSS OF CREW OR VEHICLE AFTER FIVE FAILURES.
1) ONE OF TWO ASSOCIATED "PYRO CIRCUIT PROTECTION ON" SWITCHES FAILS CLOSED. 2) ONE OF TWELVE HOOKS FAILS TO OPEN (REF. M8-1SS-SM001-04.) LOSS OF CAPABILITY TO IMPLEMENT NOMINAL SEPARATION. 3) SINGLE SWITCHING DEVICE WITHIN THE PFCU FAILS TO TRANSFER RESULTING IN LOSS OF "PYRO CIRCUIT PROTECTION ON" OVERRIDE REDUNDANCY. 4) ASSOCIATED SWITCHING DEVICE WITHIN THE PFCU FAILS TO TRANSFER RESULTING IN TEMPORARY INABILITY TO SEPARATE VEHICLES. CREW WOULD PERFORM A PYRO LOGIC BUS DROP TO RECOVER PYROTECHNIC SEPARATION CAPABILITY. 5) REMAINING ASSOCIATED "PYRO CIRCUIT PROTECTION ON" FAILS CLOSED. LOSS OF PYROTECHNIC SEPARATION CAPABILITY.

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 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: HOURS

TIME FROM DETECTION TO COMPLETED CORRECTIVE ACTION: MINUTES

FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL FAILURE MODE
NUMBER: M5-6SS-B014-02

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 PERFORM EVA.

HAZARDS REPORT NUMBER(S) : ORBI 401A

HAZARD DESCRIPTION:
INABILITY TO SEPARATE ORBITER AND ISS.

- APPROVALS -

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