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PRINT DATE: 08.12.96

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL HARDWARE
NUMBER: M5-6SS-8013-X**

SUBSYSTEM NAME: E - DOCKING SYSTEM

REVISION: 0 DEC. 1996

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	: ENERGIA POWER PANEL RSC-E	MC821-0087-0009 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 OFF' COMMAND.**

**REFERENCE DESIGNATORS: 36V73ABA3SB5-B1
36V73ABA3SB5-B2**

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

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

FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL FAILURE MODE
NUMBER: M5-6SS-B013-01

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 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)

PYROTECHNIC SEPARATION SYSTEM IS CONSIDERED STAND-BY.

C)

METHOD OF FAULT DETECTION:
~~PYROTECHNIC BUS STATUS (A, B, C) AND "PYRO CIRCUIT PROTECTION OFF"~~
INDICATIONS IN THE D&C PANEL AND TELEMETRY.

MASTER MEAS. LIST NUMBERS: V53X0765E NONE
V53X0766E

CORRECTING ACTION:
AFTER THIRD 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: M5-6SS-8013-01

- FAILURE EFFECTS -

(A) SUBSYSTEM:

LOSS OF SWITCH CONTROL CAPABILITY FOR THE APDS 'PYRO CIRCUIT PROTECTION OFF' COMMAND.

(B) INTERFACING SUBSYSTEM(S):

LOSS OF COMMAND REDUNDANCY.

(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 THREE FAILURES.

1) ONE OF TWO ASSOCIATED 'PYRO CIRCUIT PROTECTION OFF' SWITCHES FAILS OPEN. DEGRADED COMMAND IMPLEMENTATION. 2) REMAINING ASSOCIATED 'PYRO CIRCUIT PROTECTION OFF' SWITCH FAILS OPEN. LOSS OF CAPABILITY TO DISABLE THE PYROTECHNIC COMMAND CIRCUIT PROTECTION. LOSS OF PYROTECHNIC SEPARATION CAPABILITY. 3) ONE OF TWELVE HOOKS FAILS TO OPEN (REF. M8-1SS-8M001-04.) LOSS OF CAPABILITY TO IMPLEMENT NOMINAL 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 S05D107W), THEY ARE PROVIDING ADDITIONAL FAULT TOLERANCE TO THE SYSTEM.

AFTER THE THIRD FAILURE, THE CREW WOULD 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: HOURS

TIME FROM DETECTION TO COMPLETED CORRECTIVE ACTION: MINUTES

TIME REQUIRED TO IMPLEMENT CORRECTIVE ACTION LESS THAN TIME TO EFFECT?
YES

FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL FAILURE MODE
NUMBER: M5-6SS-8013- 01

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

