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PRINT DATE: 04.12.96

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

NUMBER: M5-6SS-8006-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 SLTU.468312.001
SRU	: PUSH BUTTON SWITCH	PKZ-8 (AGO.380.212.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 "APDS CIRCUIT PROTECTION OFF" COMMAND.

REFERENCE DESIGNATORS: 36V73A8A3SB2-B1
36V73A8A3SB2-B2

QUANTITY OF LIKE ITEMS: 2
(TWO)

FUNCTION:
PROVIDE THE "APDS CIRCUIT PROTECTION OFF" COMMAND STIMULI TO ENERGIZE THE APPROPRIATE RELAYS IN THE DOCKING SYSTEM CONTROL UNIT (DSCU). THE SWITCH IS USED AS A PROTECTIVE DEVICE WHICH PREVENTS THE IMPLEMENTATION OF INVOLUNTARY (OUT OF SEQUENCE) CRITICAL COMMANDS INTO THE DSCU. THE "APDS CIRCUIT PROTECTION OFF" SWITCH PREVENTS UNWANTED-EXECUTION OF THE FOLLOWING COMMANDS: "RING OUT," "UNDOCKING," "OPEN LATCHES," AND "OPEN HOOKS."

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

NUMBER: M5-6SS-B006-01

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 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:

WORKAROUNDS ARE AVAILABLE TO SEPARATE THE ORBITER FROM ISS:

1) IFM TO DRIVE HOOKS OPEN;

2) INITIATION OF PYROBOLT SEPARATION;

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

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL FAILURE MODE
NUMBER: M5-SSS-B006-01**

- FAILURE EFFECTS -

(A) SUBSYSTEM:

PARTIAL LOSS OF SWITCH CONTROL CAPABILITY FOR THE APDS "APDS CIRCUIT PROTECTION OFF" 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 THREE FAILURES.

1) ONE OF TWO ASSOCIATED SWITCHES FAILS. DISABLES ONE OF THREE PANEL COMMAND SIGNALS. NO EFFECT. DEGRADED MANUAL COMMAND REDUNDANCY. 2) THE SECOND ASSOCIATED SWITCH FAILS OPEN. LOSS OF CAPABILITY TO DISABLE THE APDS CIRCUIT PROTECTION. LOSS OF EXECUTION CAPABILITY FOR THE "RING OUT", "UNDOCKING", "OPEN LATCHES", AND "OPEN HOOKS" COMMANDS. LOSS OF MANUAL DOCKING AND NOMINAL UNDOCKING CAPABILITY. 3) ONE PYROBOLT FAILS TO INITIATE. LOSS OF CAPABILITY TO IMPLEMENT PYROTECHNIC SEPARATION. LOSS OF NOMINAL AND 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 S050107W), THEY ARE PROVIDING ADDITIONAL FAULT TOLERANCE TO THE SYSTEM.

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

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TIME FROM DETECTION TO COMPLETED CORRECTIVE ACTION: HOURS

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 USE IFM OR PERFORM EVA.

HAZARDS REPORT NUMBER(S) : ORBI 401

HAZARD DESCRIPTION:
INABILITY TO SEPARATE ORBITER AND ISS.

- APPROVALS -

PRODUCT ASSURANCE ENGR
DESIGN ENGINEER

: M. NIKOLAYEVA
: B. VAKULIN

