

FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL HARDWARE
NUMBER: M5-6SS-8011-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 SLYU.468312.001
SRU	: PUSH BUTTON SWITCH	PKZ-4 (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 'OPEN HOOKS' COMMAND.

REFERENCE DESIGNATORS: 36V73A8A35B4-B1
36V73A8A35B4-B2

QUANTITY OF LIKE ITEMS: 2
(TWO)

FUNCTION:

PROVIDE THE "OPEN HOOKS" COMMAND STIMULI TO CLOSE THE APPROPRIATE
CONTACTS IN THE DSCU TO IMPLEMENT THE "OPEN HOOKS" FUNCTION. THE "OPEN
HOOKS" SIGNAL IS ROUTED BY THE DSCU TO THE PACU-1 AND PACU-2 TO ENABLE THE
MOTORS (M6, M7, M8, AND M9) WHICH IMPLEMENT THE OPENING OF THE STRUCTURAL
LATCHES (HOOKS 1 & 2) FOR SEPARATION FROM THE ISS. (NOMINAL HOOKS OPENING
IS NOT PLANNED TO FULL ASSEMBLY)

FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL FAILURE MODE
NUMBER: M5-6SS-B011-01

REVISION# 0 FEBDEC, 1997

SUBSYSTEM NAME: E - DOCKING SYSTEM
LRU: MCB21-0087-0009
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: ME-6SS-B011-01**

- FAILURE EFFECTS -

(A) SUBSYSTEM:

PARTIAL LOSS OF SWITCH CONTROL CAPABILITY FOR THE APDS "OPEN HOOKS" 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:

SHUTTLE MECHANISM CONTROL: POSSIBLE LOSS OF CREW OR VEHICLE AFTER FIVE FAILURES.

1) ONE OF TWO "HOOKS OPEN" SWITCHES FAILS OPEN. NO EFFECT. DEGRADED COMMAND IMPLEMENTATION REDUNDANCY FOR MANUAL BACK-UP SEPARATION.
2) ASSOCIATED "HOOKS OPEN" SWITCH FAILS OPEN. LOSS OF MANUAL BACK-UP SEPARATION CAPABILITY. 3) ONE OF TWO ASSOCIATED "UNDOCKING" SWITCHES FAILS OPEN. DEGRADED NOMINAL SEPARATION COMMAND IMPLEMENTATION REDUNDANCY.
4) SECOND ASSOCIATED "UNDOCKING" SWITCH FAILS OPEN. LOSS OF NOMINAL SEPARATION CAPABILITY. 5) 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 S050107W), THEY ARE PROVIDING ADDITIONAL FAULT TOLERANCE TO THE SYSTEM.

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

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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 401A

HAZARD DESCRIPTION:
INABILITY TO SEPARATE ORBITER AND ISS.

- APPROVALS -

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

