

PAGE: 1

PRINT DATE: 15.12.96

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL HARDWARE  
NUMBER: M5-6SS-8027-X**

**SUBSYSTEM NAME: E - DOCKING SYSTEM**

**REVISION: 0 DEC. 1996**

---

	<b>PART NAME VENDOR NAME</b>	<b>PART NUMBER VENDOR NUMBER</b>
<b>LRU</b>	<b>PACU RECE</b>	<b>MC621-0087-0007 33Y.5212.006</b>

---

**PART DATA**

---

**EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:  
LINE REPLACEABLE UNIT (LRU) PRESSURIZATION ACTUATION CONTROL UNIT (PACU) -  
HOOKS MOTORS LOGIC AND POWER CONTROL**

**REFERENCE DESIGNATORS: 45V53A2A1  
45V53A2A3**

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

**FUNCTION:**

**PROVIDE HOOKS DRIVE MOTOR CONTROL FOR INTERFACE PRESSURIZATION USING  
COMMANDS FROM THE DSCU DURING THE AUTOMATIC SEQUENCE OR IN THE MANUAL  
CONTROL MODE.**

**OUTPUT FUNCTIONS:**

- 1) PACU-1: PROVIDE POWER TO THE HOOKS #1 MOTORS M6 & M7.
- 2) PACU-1: PROVIDE AUTOMATIC CONTROL FEEDBACK SIGNALS TO DSCU.
- 3) PACU-1: PROVIDE HOOKS POSITION SIGNAL FOR TELEMETRY AND PANEL INDICATION.
- 4) PACU-2: PROVIDE POWER TO THE HOOKS #2 MOTORS M8 & M9.
- 5) PACU-2: PROVIDE AUTOMATIC CONTROL FEEDBACK SIGNALS TO DSCU.
- 6) PACU-2: PROVIDE HOOKS POSITION SIGNAL FOR TELEMETRY AND PANEL INDICATION.

PAGE: 2

PRINT DATE: 13.02.97

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

NUMBER: M5-6SS-6027- 01

SUBSYSTEM NAME: E - DOCKING SYSTEM

REVISION: 0 FEBDEC, 1997

LRU: M0821-0087-0007

CRITICALITY OF THIS FAILURE MODE: 1R3

ITEM NAME: PACU

**FAILURE MODE:**

LOSS OF ONE OF THREE MOTOR CONTROL SIGNALS FOR A SINGLE HOOK MOTOR.

**MISSION PHASE:**

OO ON-ORBIT

VEHICLE/PAYLOAD/NOT EFFECTIVITY: 103 DISCOVERY  
104 ATLANTIS  
105 ENDEAVOUR

**CAUSE:**

MULTIPLE INTERNAL COMPONENT FAILURES

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

CRITICALITY 1R2 DURING INTACT ABORT ONLY (AVIONICS ONLY)? NO

**REDUNDANCY SCREEN**

- A) PASS
- B) NA
- C) PASS

**PASS/FAIL RATIONALE:**

A)

B)

NA - AT LEAST TWO REMAINING PATHS ARE DETECTABLE IN FLIGHT.

C)

**METHOD OF FAULT DETECTION:**

NONE

**MASTER MEAS. LIST NUMBERS:**

NONE

**CORRECTING ACTION:**

- 1) PERFORM JPM TO DRIVE THE HOOKS OPEN.
- 2) INITIATION OF PYROBOLT SEPARATION.
- 3) PERFORM EVA TO REMOVE 86 BOLTS FROM THE DOCKING BASE.

**- FAILURE EFFECTS -**

**(A) SUBSYSTEM:**

DEGRADED CONTROL SIGNAL FOR A SINGLE MOTOR.

**(B) INTERFACING SUBSYSTEM(S):**

NO EFFECT.

PAGE: 3

PRINT DATE: 15.12.90

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-C/L FAILURE MODE  
NUMBER: MS-688-8027-01**

**(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) LOSS OF ONE CONTROL SIGNAL IN ONE PACU. 2) LOSS OF SECOND ASSOCIATED  
CONTROL SIGNAL FROM THE SAME PACU. LOSS OF BOTH MOTORS FOR THE HOOK  
SET, RESULTING IN INABILITY TO DRIVE SIX HOOKS. 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 S060197W), 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**

**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 PERFORM IFM OR EVA TO REMOVE 96  
BOLTS.**

PAGE: 4

PRINT DATE: 15.12.96

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- NON-CIL FAILURE MODE  
NUMBER: M5-6SS-B027-01

HAZARDS REPORT NUMBER(S) : ORBI 401A

HAZARD DESCRIPTION:  
INABILITY TO SEPARATE ORBITER AND ISS.

---

- APPROVALS -

---

PRODUCT ASSURANCE ENGR  
DESIGN ENGINEER

: M. NIKOLAYEVA  
: B. VAKULIN

*[Handwritten signatures]*