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PRINT DATE: 13.02.97

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

NUMBER: M5-6SS-B026-X

SUBSYSTEM NAME: E - DOCKING SYSTEM

REVISION: 0 FEBDEC. 19976

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	<b>PART NAME VENDOR NAME</b>	<b>PART NUMBER VENDOR NUMBER</b>
LRU	: DSCU RSC-E	MC621-0087-1002 33Y.5212.005

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**PART DATA**

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**EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:**

LINE REPLACEABLE UNIT (LRU) DSCU - DOCKING SYSTEM CONTROL UNIT.

REFERENCE DESIGNATORS: 45V53A2A2

QUANTITY OF LIKE ITEMS: 1  
(ONE)

**FUNCTION:**

THE DSCU IS USED TO IMPLEMENT THE AUTOMATED DOCKING SEQUENCE AND TO RECEIVE AND PROCESS THE COMMANDS FROM THE APDS CONTROL PANEL. THE UNIT PROVIDES TELEMETRY TO THE DCU<sub>s</sub> AND STATUS INDICATION TO THE APDS CONTROL PANEL.

**OUTPUT FUNCTIONS:**

1. PROVIDES HI-ENERGY DAMPERS POWER AND CONTROL FOR THE -HARD-DOCKING MECHANISM.
2. PROVIDES HI-ENERGY AND LOW-ENERGY DAMPERS POWER AND CONTROL (FOR THE "SOFT" DOCKING MECHANISM).
3. PROVIDES CONTROL FOR DOCKING RING EXTENSION AND RETRACTION.
4. PROVIDES FIXERS POWER AND CONTROL.
5. PROVIDES HOOKS OPENING AND CLOSING CONTROL.
6. PROVIDES CAPTURE LATCHES OPENING AND CLOSING CONTROL.
7. PROVIDES TELEMETRY TO THE DCU<sub>s</sub> AND STATUS INDICATION TO THE APDS PANEL.
8. PROVIDES LOW LEVEL AXIAL SLIP CLUTCH LOCKING DEVICE POWER AND CONTROL (FOR THE "SOFT" DOCKING MECHANISM).

FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL FAILURE MODE  
NUMBER: MS-6SS-B028-12

REVISION# 0 DEC, 1996

SUBSYSTEM NAME: E - DOCKING SYSTEM  
LRU: MC621-0087-1002  
ITEM NAME: DSCU

CRITICALITY OF THIS  
FAILURE MODE: 1R3

FAILURE MODE:  
INADVERTENT LATCHES OPEN ACTIVATION SIGNAL (ONE OF THREE)

MISSION PHASE:  
OO ON-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY: 103 DISCOVERY  
104 ATLANTIS  
105 ENDEAVOUR

CAUSE:  
MULTIPLE INTERNAL COMPONENT FAILURES

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)  
N/A - AT LEAST TWO REMAINING PATHS ARE DETECTABLE IN FLIGHT.

C)

METHOD OF FAULT DETECTION:  
NONE.

MASTER MEAS. LIST NUMBERS: NONE.

CORRECTING ACTION:  
AFTER THE SECOND FAILURE, THE CREW WOULD FIRE RCS JETS TO AVOID COLLISION  
BETWEEN THE ORBITER AND ISS.

- FAILURE EFFECTS -

(A) SUBSYSTEM:  
DEGRADATION OF REDUNDANCY AGAINST INADVERTENT LATCH OPEN COMMANDS.

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL FAILURE MODE  
NUMBER: M5-6SS-8028-12**

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

INADVERTENT ACTIVATION OF ONE OF THREE LATCHES OPEN COMMANDS TO THE LACU.

**(C) MISSION:**

NO EFFECT.

**(D) CREW, VEHICLE, AND ELEMENT(S):**

FIRST FAILURE - NO EFFECT.

**(E) FUNCTIONAL CRITICALITY EFFECTS:**

WORST CASE SHUTTLE OR PMA-MECHANISM CONTROL: POSSIBLE LOSS OF CREW OR VEHICLE AFTER TWO FAILURES.

1) ONE INADVERTENT LATCH OPEN COMMAND. NO EFFECT. 2) SECOND INADVERTENT OPEN LATCHES COMMAND. ALL THREE LATCHES OPEN: INADVERTENTLY DURING JAMPING OR RING RETRACTION.

**DESIGN CRITICALITY (PRIOR TO OPERATIONAL DOWNGRADE, DESCRIBED IN F):****F) RATIONALE FOR CRITICALITY CATEGORY DOWNGRADE:**

CRITICALITY DOWNGRADED FROM 1R2 TO 1R3 DUE TO ADDITIONAL FAULT TOLERANCE PROVIDED BY WORKAROUNDS ALLOWED PER CR S050107W.

AFTER THE SECOND FAILURE, THE CREW WOULD FIRE RCS JETS TO ENABLE, THEREBY CIRCUMVENT THE WORST CASE "DESIGN CRITICALITY" EFFECT. IF UNABLE TO PERFORM THE WORKAROUND (THIRD FAILURE), POSSIBLE LOSS OF CREW/VEHICLE DUE TO AN INADVERTENT COLLISION BETWEEN THE ORBITER AND ISS.

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- TIME FRAME -

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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 FIRE RCS JETS.

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL FAILURE MODE  
NUMBER: M5-6SS-B028-12**

**HAZARDS REPORT NUMBER(S) : ORBI 402B**

**HAZARD DESCRIPTION:  
UNCONTROLLED/INADVERTENT COLLISION BETWEEN ORBITER AND ISS.**

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**- APPROVALS -**

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

*[Handwritten signatures]*

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