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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

| | PART NAME VENDOR NAME | PART NUMBER VENDOR NUMBER |
|-----|----------------------------------|--------------------------------------|
| LRU | : DSCU RSC-E | MC621-0087-1002 33Y.5212.005 |

PART DATA

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_s 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_s 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) - CIL FAILURE MODE

NUMBER: M5-656-B028 - 03

REVISION# 0 DEC, 1996

SUBSYSTEM NAME: E - DOCKING SYSTEM

LRU: MC621-0087-1002

ITEM NAME: DSCU

**CRITICALITY OF THIS
FAILURE MODE: 2R3**

FAILURE MODE:

**LOSS OF REDUNDANT (ONE OF THREE) CONTROL SIGNALS FOR EITHER DOCKING RING
EXTENSION OR RETRACTION.**

MISSION PHASE:

OO ON-ORBIT

**VEHICLE/PAYLOAD/KIT 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) N/A
 C) FAIL**

PASS/FAIL RATIONALE:

A)

B)

N/A - AT LEAST ONE REMAINING PATH IS DETECTABLE IN FLIGHT.

C)

REDUNDANT FUNCTIONS ROUTED THROUGH THE SAME CONNECTOR.

METHOD OF FAULT DETECTION:

NONE.

MASTER MEAS. LIST NUMBERS: NONE

- FAILURE EFFECTS -

(A) SUBSYSTEM:

DEGRADATION OF REDUNDANCY FOR RING EXTENSION OR RETRACTION.

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - CIL FAILURE MODE
NUMBER: M5-6SS-B028 - 03**

(B) INTERFACING SUBSYSTEM(S):

FIRST FAILURE - NO EFFECT. LOSS OF ONE OF THREE REDUNDANT CONTROL SIGNALS TO THE DMCU FOR CONTROL OF EXTENSION OR RETRACTION OF THE DOCKING RING MECHANISM.

(C) MISSION:

FIRST FAILURE - NO EFFECT.

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

NO EFFECT.

(E) FUNCTIONAL CRITICALITY EFFECTS:

SHUTTLE OR PMA1 MECHANISM CONTROL: POSSIBLE LOSS OF MISSION AFTER TWO FAILURES.

1) LOSS OF ONE OF THREE REDUNDANT CONTROL SIGNALS - NO EFFECT. 2) LOSS OF SECOND CONTROL SIGNAL - LOSS OF CAPABILITY TO MOVE RING TO PERFORM DOCKING.

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 PERFORM IFM TO DRIVE THE RING MOTORS. IF UNABLE TO PERFORM THE IFM (THIRD FAILURE), LOSS OF DOCKING CAPABILITY RESULTING IN LOSS OF MISSION OBJECTIVE.

-DISPOSITION RATIONALE-

(A) DESIGN:

REFER TO APPENDIX X7, ENERGIA HARDWARE.

(B) TEST:

REFER TO APPENDIX X7, ENERGIA HARDWARE.

DSCU CIRCUIT OPERATION IS VERIFIED DURING GROUND CHECKOUT. ANY TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

(C) INSPECTION:

REFER TO APPENDIX X7, ENERGIA HARDWARE.

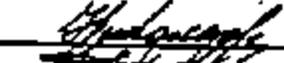
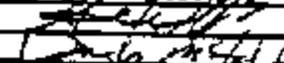
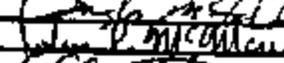
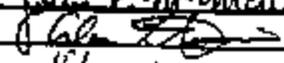
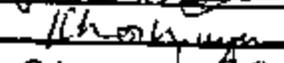
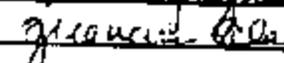
(D) FAILURE HISTORY:

REFER TO APPENDIX X7, ENERGIA HARDWARE.

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NUMBER: M5-6SS-B028 - 03

(E) OPERATIONAL USE:
AFTER THE THIRD FAILURE, THE CREW PERFORM JFM TO DRIVE THE RING MOTORS.

- APPROVALS -

| | | | | |
|-----------------------------|---|---------------|---|---|
| PRODUCT ASSURANCE ENGR | : | M. NIKOLAYEVA | : |  |
| DESIGN ENGINEER | : | B. VAKULIN | : |  |
| NASA SSMA | : | | : |  |
| NASA SUBSYSTEM MANAGER | : | | : |  |
| JSC MOD | : | | : |  |
| NASA EPDC SSMA | : | | : |  |
| NASA EPDC SUBSYSTEM MANAGER | : | | : |  |