PRINT DATE: 13.02.97

FAILURE MODES EFFECTS ANALYSIS (FMEA) – CIL HARDWARE
NUMBER: M6-6SS-B028-X

SUBSYSTEM NAME: E - DOCKING SYSTEM

REVISION: 0 FEB/DEC. 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 DCUs 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 DCUs 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: M5-6SS-B028- 15

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 ONE OF THREE RING OUT STOP CONTROL SIGNALS.

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) FAILS

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 OUT STOP ACTIVATION.

(B) INTERFACING SUBSYSTEM(S):
LOSS OF ONE OF THREE RING OUT STOP SIGNALS TO THE DMCU.

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE
NUMBER: M5-6SS-B028- 15

(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 RING OUT STOP CONTROL SIGNAL TO THE DMCU - NO EFFECT.
2) LOSS OF SECOND ASSOCIATED RING OUT STOP CONTROL SIGNAL TO THE DMCU - LOSS OF CAPABILITY TO RETRACT RING. POSSIBLE DOCKING RING MOTOR OVERHEATING WHICH MAY PRECLUDE DOCKING OPERATIONS.

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 SECOND FAILURE, CREW COULD PERFORM AN IN-FLIGHT MAINTENANCE TO DRIVE THE RING MOTORS DIRECTLY FROM THE FEED-THROUGH CONNECTORS IN THE EXTERNAL AIRLOCK, USING THE ORBITER BREAKOUT BOX. 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.

PRINT DATE: 17.12.96

FAILURE MODES EFFECTS ANALYSIS (FMEA) – CIL FAILURE MODE
NUMBER: M5-6SS-B028- 15

(E) OPERATIONAL USE:
AFTER SECOND FAILURE, CREW COULD PERFORM AN IN-FLIGHT MAINTENANCE TO DRIVE THE RING MOTORS DIRECTLY FROM THE FEED-THROUGH CONNECTORS IN THE EXTERNAL AIRLOCK, USING THE ORBITER BREAKOUT BOX.

- APPROVALS -

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