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

SUBSYSTEM NAME: E - DOCKING SYSTEM

REVISION: 0   FEBDEC. 19976

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU :	DSCU RSC-E	MC621-0067-1002 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) – NON-CIL FAILURE MODE
NUMBER: M5-6SS-B026- 14

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

REVISION# 0 FEBDEC, 19975

CRITICALITY OF THIS
FAILURE MODE: 1R3

FAILURE MODE:
INADVERTENT ACTIVATION OF ONE OF THREE CAPTURE LATCHES CLOSE SIGNAL.

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) 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) DISABLE ONE OF THE APDS LOGIC BUSES TO RECOVER FUNCTION;
2) CREW WILL UTILIZE THE MANUAL UNBLOCKING DEVICE TO OPEN THE CAPTURE LATCHES.
32) PERFORM IFM TO DRIVE CAPTURE LATCHES HOOKS OPEN;
49) PERFORM EVA TO REMOVE 96 BOLTS FROM THE DOCKING BASE.

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- NON-CIL FAILURE MODE
NUMBER: M5-6SS-B028-14

- FAILURE EFFECTS -

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

B) INTERFACING SUBSYSTEM(S):
INADVERTENT ACTIVATION OF ONE OF THREE LATCHES CLOSE COMMANDS TO THE
ACU.

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 FOUR FAILURES.
1) ONE INADVERTENT LATCH CLOSE COMMAND. 2) SECOND INADVERTENT CLOSE
LATCHES COMMAND.   ALL THREE CAPTURE LATCHES ARE TEMPORARILY CLOSED
SIMULTANEOUSLY. THE CREW WOULD PERFORM AN APDS LOGIC BUS DROP TO
RECOVER DOCKING FUNCTIONS. 3) INABILITY TO DISABLE THE AFFECTED APDS LOGIC
BUS. 4) LOSS OF MANUAL UNBLOCKING DEVICE (1 OF 3) CAPABILITY RESULTING IN LOSS
CAPABILITY TO RELEASE THE CAPTURE LATCHES FOR VEHICLE 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 S0S0107W), THEY ARE PROVIDING ADDITIONAL
FAULT TOLERANCE TO THE SYSTEM.

AFTER THE FOURTH ~~THIRD~~ FAILURE, THE CREW WOULD PERFORM IFM TO DRIVE THE
CAPTURE LATCH OPEN. IF UNABLE TO PERFORM THE IFM (FIFTH ~~FOURTH~~ FAILURE)
THEN CREW WILL ~~IMPLEMENT THE MANUAL RELEASE OF CAPTURE LATCH. IF LOSS OF
MANUAL UNBLOCKING DEVICE CAPABILITY (FIFTH FAILURE) THEN~~ PERFORM   EVA TO
REMOVE 96 BOLTS TO CIRCUMVENT THE WORST CASE "DESIGN CRITICALITY" EFFECT.
IF UNABLE TO PERFORM EVA (SIXTH 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

FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL FAILURE MODE
NUMBER: M5-6SS-B025- 14

RATIONALE FOR TIME TO CORRECTING ACTION VS TIME TO EFFECT:
CREW WOULD HAVE SUFFICIENT TIME TO PERFORM IFM OR 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   :