

PAGE: 1

PRINT DATE: 15.12.96

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

NUMBER: M5-6SS-B026-X

SUBSYSTEM NAME: E - DOCKING SYSTEM

REVISION: 0 DEC, 1996

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	: LACU RSC-E	MC621-0087-1004 33Y.5212.007

PART DATA

**EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
LINE REPLACEABLE UNIT (LRU) LATCH ACTUATOR CONTROL UNIT (LACU) - CAPTURE
LATCH MOTORS LOGIC AND POWER CONTROL.**

REFERENCE DESIGNATORS: 45V53A1A2

**QUANTITY OF LIKE ITEMS: 1
(ONE)**

FUNCTION:

**PROVIDES CAPTURE LATCHES ACTUATORS CONTROL. THE UNIT PROVIDES LATCH
MOTOR CONTROL VIA COMMANDS FROM THE DSCU FOR AUTOMATIC SEQUENCE
IMPLEMENTATION, OR COMMANDS FROM THE CONTROL PANEL FOR MANUAL
OPERATIONS.**

OUTPUT FUNCTIONS:

- 1) LATCH MOTOR CONTROL: PLUS/MINUS POWER FOR LATCH CLOSING/OPENING.**
- 2) LATCHES "OPEN" FEEDBACK SIGNAL TO INITIATE AUTOMATIC "RING IN"
OPERATION (AFTER HOOK CLOSURE.)**
- 3) SIGNALS TO THE DCU AND CONTROL PANEL FEEDBACKS THROUGH THE DSCU:
MOTORS ON, LATCHES CLOSED/OPEN.**

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

NUMBER: M5-6SS-8026-01

REVISION# 0 FEBDEC, 1997

SUBSYSTEM NAME: E - DOCKING SYSTEM

LRU: MC621-0087-1004

ITEM NAME: LATCH ACTUATION CONTROL UNIT

CRITICALITY OF THIS

FAILURE MODE: 1R3

FAILURE MODE:

LOSS OF MOTOR CONTROL FOR ALL CAPTURE LATCH FUNCTIONS.

MISSION PHASE:

00 ON-ORBIT

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

CAUSE:

INTERNAL COMPONENT FAILURE(S)

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:

WORKAROUNDS ARE AVAILABLE TO SEPARATE THE ORBITER FROM ISS:

1) CREW WILL UTILIZE THE MANUAL UNBLOCKING DEVICE TO OPEN THE CAPTURE LATCHES.

2) IFM TO DRIVE CAPTURE LATCHES OPEN;

3) EXTENDING THE DOCKING RING IS ANOTHER WORKAROUND TO SEPARATE IF ONLY ONE OF THREE CAPTURE LATCHES REMAINED CLOSE;

4) PERFORM EVA TO REMOVE 96 BOLTS FROM THE DOCKING BASE.

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

NUMBER: M5-6SS-BC26-01

- FAILURE EFFECTS -

(A) SUBSYSTEM:

DEGRADATION OF REDUNDANCY FOR CAPTURE LATCH MOTOR CONTROL

(B) INTERFACING SUBSYSTEM(S):

NO EFFECT.

(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 OF THREE CAPTURE LATCHES CONTROL SIGNALS. DEGRADED REDUNDANCY. 2) SECOND ASSOCIATED CAPTURE LATCHES CONTROL SIGNAL RESULTING IN LOSS OF CAPABILITY TO OPEN CAPTURE LATCHES. 3) MANUAL UNBLOCKING DEVICE FAILS TO RELEASE (1 OF 3.) LOSS OF CAPABILITY TO RELEASE THE LATCHES MANUALLY.

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 THIRD FAILURE, THE CREW WOULD PERFORM IFM TO DRIVE THE CAPTURE LATCHES OPEN. IF UNABLE TO PERFORM THE IFM (FOURTH FAILURE) THEN CREW WOULD EXTEND RING TO SEPARATE. IF UNABLE TO EXTEND THE DOCKING RING (FIFTH FAILURE) THEN PERFORM EVA TO REMOVE 98 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?

:S

PAGE: 4

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

HAZARDS REPORT NUMBER(S) : ORB: 401A

HAZARD DESCRIPTION:
INABILITY TO SEPARATE ORBITER AND ISS.

- APPROVALS -

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


