

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

NUMBER: M5-6MR-8031-X

SUBSYSTEM NAME: ORBITER DOCKING SYSTEM

REVISION: 0

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	CONNECTOR SWITCHING BOX (CSB)	CJIT/O.642522.001

**PART DATA****EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:**

CONNECTOR SWITCHING BOX (CSB) - ELECTROMECHANICAL INSTRUMENT

**REFERENCE DESIGNATORS:**

QUANTITY OF LIKE ITEMS: 1

ONE

**FUNCTION:**

THE CONNECTOR SWITCHING BOX IS AN ELECTROMECHANICAL INSTRUMENT WHICH:

- 1) - SWITCHES TWO PAIRS OF KLEN-TYPE CONNECTORS VIA AN ELECTRIC OR MANUAL DRIVE. THE ELECTRIC DRIVE HAS TWO ELECTRIC MOTORS ONE OF WHICH IS STANDBY. ONE SWITCHING UNIT PROVIDES OPERATION OF ONE OF TWO ELECTRIC MOTORS;
- 2) - PASSES THROUGH ITSELF CONTROL CIRCUITS (AS PASSIVE ELEMENT).

**INPUT/OUTPUT FUNCTIONS:**

ONE INPUT (8 CONNECTORS)  
 TWO OUTPUTS (8 CONNECTORS FOR EVERYONE)  
 SWITCHING OF 254 CIRCUITS, OF WHICH: 86 CIRCUITS - TM, 168  
 CIRCUITS ARE FUNCTIONAL  
 THE TM DATA ENTERS "SHUTTLE" PANEL

ALL DOCKING MECHANISM FUNCTIONS EXCEPT FOR PYRO SEPARATION ARE TRANSFERED BY THE CONNECTOR SWITCHING BOX.

NOTE: CSB FMEA IS ONLY APPLICABLE FOR MISSIONS REQUIRING TRANSFER OF ELECTRICAL FUNCTIONS BETWEEN THE ODS DOCKING MECHANISM AND SOME OTHER MECHANISM (E.G. DMM, PMA, ETC.).

REFERENCE DOCUMENTS: ECN 104-25012A  
 CKB>=468312=001  
 33Y.5212.005.'3  
 VS70-953104  
 133Y.5212.011.'3

211

**ORIGINAL**

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

NUMBER: MS-6MR-8031-01

REVISION# 0 5/19/95

SUBSYSTEM NAME: ORBITER DOCKING SYSTEM

LRU: CONNECTOR SWITCHING BOX

ITEM NAME: CONNECTOR SWITCHING BOX

CRITICALITY OF THIS

FAILURE MODE: 1R3

## FAILURE MODE:

LOSS OF ONE MOTOR OF THE SWITCHING MECHANISM

## MISSION PHASE:

OO ON-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY: 104 ATLANTIS

## CAUSE:

MULTIPLE INTERNAL COMPONENT FAILURES

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

CRITICALITY 1R2 DURING INTACT ABORT ONLY (AVIONICS ONLY)? N/A

REDUNDANCY SCREEN      A) PASS  
    B) PASS  
    C) PASS

## PASS/FAIL RATIONALE:

A)

B)

C)

## METHOD OF FAULT DETECTION:

INFORMATION ABOUT INITIAL AND FINAL POSITION OF THE SWITCHING BOX MECHANISM IS GOING TO THE 'SHUTTLE' TM AND TO THE 'SHUTTLE' PANEL; INFORMATION ABOUT MATING OF THE CONNECTORS IS GOING TO THE 'SHUTTLE' TM.

## MASTER MEAS. LIST NUMBERS:

P27X9001Y - CONNECTOR MATE XP1 IND  
 P27X9002Y - CONNECTOR MATE XP2 IND  
 P27X9003Y - CONNECTOR MATE XP3 IND  
 P27X9004Y - CONNECTOR MATE XP4 IND  
 P27X9005Y - ODM POSITION  
 P27X9006Y - DMM1 POSITION

CORRECTING ACTION: (1) SWITCH TO BACK UP MOTOR; (2) IF MOTOR CONTROL IS LOSS PERFORM MANUAL SWITCHING FUNCTION (FOR UNDOCKING - IF TIME ALLOWS); (3) UTILIZE PYROTECHNIC SEPARATION SYSTEM IF UNABLE TO MANUALLY SWITCH; (4) IN CASE CAPABILITY TO IMPLEMENT PYROTECHNIC SEPARATION IS LOST - PERFORM EVA TO REMOVE 96 BOLTS.

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**REMARKS/RECOMMENDATIONS:**

TWO REDUNDANT MOTORS ARE PROVIDED TO CONTROL SWITCHING OF CONNECTORS. ONLY ONE MOTOR IS ACTIVATED AT A TIME. THE OTHER MOTOR IS IN STANDBY REDUNDANCY. PYRO CONTROL IS NOT SWITCHED.

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**- FAILURE EFFECTS -**

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**(A) SUBSYSTEM:**

NO EFFECT - LOSS OF MOTOR REDUNDANCY ONLY.

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

DEGRADED CONNECTOR SWITCHING BOX CAPABILITY.

**(C) MISSION:**

NO EFFECT ON MISSION.

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

NO EFFECT FIRST FAILURE.

**(E) FUNCTIONAL CRITICALITY EFFECTS:**

POSSIBLE LOSS OF CREW OR VEHICLE AFTER FOUR FAILURES.

FIRST FAILURE (ONE MOTOR FAILS TO FUNCTION) - NO EFFECT, LOSS OF REDUNDANCY ONLY.

SECOND FAILURE (SECOND MOTOR FAILS TO FUNCTION) - LOSS OF SWITCHING CAPABILITY RESULTING IN LOSS OF NOMINAL UNDOCKING CAPABILITY.

THIRD FAILURE (FAILURE WITHIN PYRO SUBSYSTEM) - LOSS OF CAPABILITY TO IMPLEMENT PYRO SEPARATION.

**DESIGN CRITICALITY (PRIOR TO OPERATIONAL DOWNGRADE, DESCRIBED IN F): N/A**

**(F) RATIONALE FOR CRITICALITY CATEGORY DOWNGRADE:**

NONE. CRITICALITY UNCHANGED. WORKAROUNDS ADD TO REDUNDANCY.

FOURTH FAILURE (INABILITY TO PERFORM EVA TO MANUALLY SWITCH CONNECTORS OR REMOVE 98 BOLTS) - COMPLETE LOSS OF ALL UNDOCKING CAPABILITY.

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**- TIME FRAME -**

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**TIME FROM FAILURE TO CRITICAL EFFECT: HOURS TO DAYS**

**TIME FROM FAILURE OCCURRENCE TO DETECTION: SECONDS**

**TIME FROM DETECTION TO COMPLETED CORRECTIVE ACTION: MINUTES TO HOURS**

**TIME REQUIRED TO IMPLEMENT CORRECTIVE ACTION LESS THAN TIME TO EFFECT? YES**

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

**HAZARDS REPORT NUMBER(S) : ORBI 401A**

**HAZARD DESCRIPTION:  
INABILITY TO SEPARATE ORBITER AND MIR.**

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**- APPROVALS -**

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DESIGN ENGINEER	:	R. TUKAVIN	:	
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