

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-6-B031-02**

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 SWITCHING FUNCTION**

**MISSION PHASE:
OO ON-ORBIT**

VEHICLE/PAYLOAD/KIT EFFECTIVITY: 104 ATLANTIS

**CAUSE:
SINGLE POINT FAILURES - GEAR/SHAFT JAMS, MOTOR SEIZES, FIXER LOCKED,
CONNECTOR CONTAMINATED, PIVOT POINT BREAKS OR JAMS**

DUAL POINT FAILURES - COMBINATIONS OF A & B TYPE FAILURES:

A TYPE FAILURES (NOMINAL SYSTEM)

1. GEAR BREAKS
2. SHAFT BREAKS

B TYPE FAILURES (EVA MANUAL B/U)

1. GEAR BREAKS
2. SHAFT BREAKS

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

215

ORIGINAL

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

REMARKS/RECOMMENDATIONS:

MANUAL BACKUP SWITCHING REQUIRES AN EVA TO ACCOMPLISH. SINGLE POINT FAILURES ARE PRESENT IN THE DESIGN THAT WOULD PRECLUDE BOTH THE NOMINAL AND MANUAL BACKUP SWITCHING CAPABILITIES. PYRO CONTROL IS NOT SWITCHED.

- FAILURE EFFECTS -

(A) SUBSYSTEM:

LOSS OF NOMINAL SWITCHING BOX CAPABILITY.

(B) INTERFACING SUBSYSTEM(S):

WORST CASE, SWITCHING MECHANISM HANGS UP BETWEEN DOCKING MECHANISM POSITIONS.

(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 THREE FAILURES.

FIRST FAILURE (LOSS OF SWITCHING FUNCTION) - WORST CASE, SWITCHING MECHANISM HANGS UP BETWEEN DOCKING MECHANISM POSITIONS. INABILITY TO INITIATE NOMINAL UNLATCHING OPERATIONS.

SECOND 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.

THIRD FAILURE (INABILITY TO PERFORM EVA TO MANUALLY SWITCH CONNECTORS OR REMOVE 96 BOLTS) - COMPLETE LOSS OF ALL UNDOCKING CAPABILITY.

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- TIME FRAME -

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

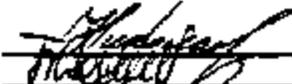
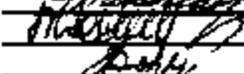
TIME REQUIRED TO IMPLEMENT CORRECTIVE ACTION LESS THAN TIME TO EFFECT? YES

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

HAZARDS REPORT NUMBER(S) : ORSI 401A

HAZARD DESCRIPTION:
INABILITY TO SEPARATE ORBITER AND MIR.

- APPROVALS -

PRODUCT ASSURANCE ENGR .	:	M. NIKOLAYEVA	:	
DESIGN ENGINEER	:	R. TUKAVIN	:	
DESIGN ENGINEER	:	A. DONCHENKO	:	