FAILURE MODES EFFECTS ANALYSIS (FMEA) -- NON-CIL HARDWARE
NUMBER: M5-6MR-B031- X

SUBSYSTEM NAME: ORBITER DOCKING SYSTEM
REVISION: 0

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	CONNECTOR SWITCHING BOX (CSB)	CJ1110.642522.001

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 STAND-BY. 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

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FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL FAILURE MODE
NUMBER: M5-6-B031-03

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:
CONTINUOUS CYCLING BETWEEN CONNECTOR POSITIONS

MISSION PHASE:
OO ON-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY: 104 ATLANTIS

CAUSE:
CONTAMINATED POSITION INDICATION SENSOR, FEEDBACK CIRCUITRY FAILURE

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:
SWITCHING BOX MECHANISM POSITION AND CONNECTOR MATING INDICATION ANOMALY (BOTH ON STANDARD SWITCH PANEL AND IN TELEMETRY DATA).

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) CUT POWER TO ACTIVE SWITCH BOX ACTUATOR MOTOR AND THEN UTILIZE SECOND MOTOR TO PERFORM FUNCTION; (2) IMPLEMENT MANUAL SWITCHING (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.

ORIGINAL

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REMARKS/RECOMMENDATIONS:
POSITION SENSOR HAS REDUNDANT CONTACT SETS. NOMINALLY IT TAKES APPROXIMATELY 12 SECONDS TO CYCLE BETWEEN CONNECTOR POSITIONS. PYRO CONTROL IS NOT SWITCHED. FAILURE CANNOT OCCUR UNTIL AFTER THE DOCKING MODULE IS CONNECTED.

- FAILURE EFFECTS -

(A) SUBSYSTEM:
DOCKING MECHANISM CONTROL IS ALTERNATELY SWITCHED BETWEEN UPPER AND LOWER DOCKING MECHANISMS.

(B) INTERFACING SUBSYSTEM(S):
INABILITY TO CONTROL EITHER DOCKING MECHANISM USING NOMINAL OPERATIONS.

(C) MISSION:
NO EFFECT FIRST FAILURE. POSSIBLE LOSS OF MISSION FOLLOWING THIRD FAILURE.

(D) CREW, VEHICLE, AND ELEMENT(S):
NO EFFECT FIRST FAILURE. FAILURE TO SEPARATE ORBITER FROM MIR FOLLOWING FOURTH FAILURE COULD RESULT IN LOSS OF CREW AND VEHICLE.

(E) FUNCTIONAL CRITICALITY EFFECTS:
POSSIBLE LOSS OF CREW OR VEHICLE AFTER FOUR FAILURES.

FIRST FAILURE (CONTINUOUSLY CYCLES BETWEEN CONNECTOR POSITIONS IN ONE CIRCUIT) - NO EFFECT.
SECOND FAILURE (CONTINUOUSLY CYCLES BETWEEN CONNECTOR POSITIONS IN THE SECOND CIRCUIT) - DOCKING MECHANISM CONTROL IS UNOBTAINABLE ON EITHER DOCKING MECHANISM.
FOURTH FAILURE (FAILURE WITHIN PYRO SUBSYSTEM) - LOSS OF CAPABILITY TO IMPLEMENT PYRO SEPARATION - L[illegible]S OF ALL UNDOCKING CAPABILITY.

DESIGN CRITICALITY (PRIOR TO O[illegible]TIONAL DOWNGRADE, DESCRIBED IN F): N/A

(F) RATIONALE FOR CRITICALITY CATEGORY DOWNGRADE:
NONE. CRITICALITY UNCHANGED. WORKAROUNDS ADD TO REDANDANCY.

THIRD FAILURE (INABILITY TO PERFORM EVA TO MANUALLY SWITCH CONNECTORS OR REMOVE 96 BOLTS) - LOSS OF UNDOCKING CAPABILITY FROM APDS CONTROL PANEL AND LOSS OF CAPABILITY TO SEPARATE DOCKING BASE FROM AIRLOCK.

219 ORIGINAL

PRINT DATE: 01/04/96

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- NON-CIL FAILURE MODE
NUMBER: M5-6MR-B031- 03

- 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

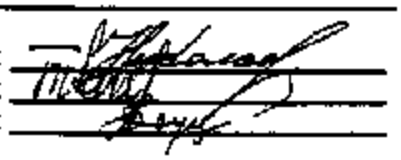
RATIONALE FOR TIME TO CORRECTING ACTION VS TIME TO EFFECT:
CREW WOULD HAVE SUFFICIENT TIME TO PERFORM EVA.

HAZARDS REPORT NUMBER(S) : ORBI 401A

HAZARD DESCRIPTION:
INABILITY TO SEPARATE ORBITER AND MIR.

- APPROVALS -

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



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