

FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL HARDWARE
NUMBER:M5-6SS-0126 -X

SUBSYSTEM NAME: ISS DOCKING SYSTEM

REVISION: 0 02/27/98

PART DATA

	PART NAME	PART NUMBER
	VENDOR NAME	VENDOR NUMBER
LRU	:PANEL A6A3	V828-730150
SRU	:HYBRID DRIVER CONTROLLER	MC477-0262-0002

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
 HYBRID DRIVER, TYPE II - ONE SECOND DELAY, OPEN

REFERENCE DESIGNATORS: 36V73A7A3AR1
 36V73A7A3AR3
 36V73A7A3AR5
 36V73A7A3AR7

QUANTITY OF LIKE ITEMS: 4
 (FOUR)

FUNCTION:

PROVIDES AN INHIBIT SIGNAL TO THE RELAY ONE SECOND AFTER HOOKS HAVE REACHED THEIR FULLY OPENED POSITION. THE INHIBIT SIGNAL OPENS THE RELAY, OVERRIDING THE RELAY CONTROL SIGNAL. PROVIDES ONE SECOND DELAY BETWEEN HOOKS REACHING FULLY OPENED POSITION AND HOOK MOTOR SHUT OFF.

REFERENCE DOCUMENTS: 1) VS70-953103, INTEGRATED SCHEMATIC - 53JA, 53JC, 53JE, 53JG; PMA 2/3 PASSIVE MECHANISM GROUP 1/2, SYS A/B HOOKS CONTROL

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SUBSYSTEM NAME: ISS DOCKING SYSTEM
LRU: PANEL A6A3
ITEM NAME: HYBRID DRIVER CONTROLLER**CRITICALITY OF THIS
FAILURE MODE: 1R3**FAILURE MODE:
INADVERTENT OUTPUT, FAILS "ON", FAILS TO TURN "OFF"

MISSION PHASE: OO ON-ORBIT

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

CAUSE:

A) PIECE PART FAILURE, B) CONTAMINATION, C) VIBRATION, D) MECHANICAL SHOCK, E)
PROCESSING ANOMALY, F) THERMAL STRESS

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)

SCREEN B IS "N/A" BECAUSE THE HYBRID DRIVER CONTROLLER IS CONTAINED WITHIN A
STANDBY SYSTEM.

C)

METHOD OF FAULT DETECTION:

ONE GROUP OF HOOKS TAKES TWICE THE NORMAL TIME TO OPEN

MASTER MEAS. LIST NUMBERS: NONE

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CORRECTING ACTION: NONE

CORRECTING ACTION DESCRIPTION:

DESIGN FAULT TOLERANCE: REDUNDANT PMA HOOK MOTOR WILL OPEN AFFECTED GROUP OF HOOKS AT HALF THE SPEED AND TWICE THE NORMAL TIME.

- FAILURE EFFECTS -

(A) SUBSYSTEM:

LOSS OF ABILITY TO PROVIDE AN INHIBIT SIGNAL TO THE RELAY ONE SECOND AFTER HOOKS HAVE REACHED THEIR FULLY OPENED POSITION. A CONTINUOUS INHIBIT SIGNAL IS SENT TO THE "OPEN" RELAY.

(B) INTERFACING SUBSYSTEM(S):

UNABLE TO OPERATE ONE PMA HOOK MOTOR. REDUNDANT PMA HOOK MOTOR WILL OPEN AFFECTED GROUP OF HOOKS AT HALF THE SPEED AND TWICE THE NORMAL TIME.

(C) MISSION:

FIRST FAILURE - NO EFFECT

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

FIRST FAILURE - NO EFFECT

(E) FUNCTIONAL CRITICALITY EFFECTS:

POSSIBLE LOSS OF CREW/VEHICLE AFTER FOUR FAILURES:

- 1) "OPEN" HYBRID DRIVER FAILS "ON" - UNABLE TO OPERATE ONE PMA HOOK MOTOR IN THE "OPEN HOOKS" DIRECTION. REDUNDANT PMA HOOK MOTOR WILL OPEN AFFECTED GROUP OF HOOKS AT HALF THE SPEED AND TWICE THE NORMAL TIME.
- 2) ONE OR MORE HOOKS IN THE ACTIVE MECHANISM FAIL TO CLOSE COMPLETELY.
- 3) LOSS OF REDUNDANT PMA HOOK MOTOR.
- 4) ONE ODS PASSIVE HOOK PYRO FAILS TO FIRE. LOSS OF ODS PYROTECHNIC UNDOCKING CAPABILITY.

DESIGN CRITICALITY (PRIOR TO DOWNGRADE, DESCRIBED IN (F)):

(F) RATIONALE FOR CRITICALITY DOWNGRADE:

ALTHOUGH THE CRITICALITY REMAINS UNCHANGED AFTER WORKAROUNDS CONSIDERATION (ALLOWED PER CR S050107W), THEY ARE PROVIDING ADDITIONAL FAULT TOLERANCE TO THE SYSTEM.

AFTER THE FOURTH FAILURE, THE CREW WOULD PERFORM EVA TO REMOVE 96 BOLTS FROM THE DOCKING BASE TO CIRCUMVENT THE WORST CASE "DESIGN CRITICALITY"

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EFFECT: IF UNABLE TO PERFORM EVA (FIFTH 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: HOURS

TIME FROM DETECTION TO COMPLETED CORRECTING ACTION: HOURS

**IS TIME REQUIRED TO IMPLEMENT CORRECTING ACTION LESS THAN TIME TO EFFECT?
YES**

**RATIONALE FOR TIME TO CORRECTING ACTION VS TIME TO EFFECT:
DESIGN FAULT TOLERANCE: REDUNDANT PMA 2/3 HOOKS "OPEN" MOTOR CIRCUIT IS OPERATIONAL. AFTER LOSS OF NOMINAL UNDOCKING CAPABILITY WITH THE PMA 2/3 HOOK MOTORS, THE CREW CAN INITIATE ODS PASSIVE HOOK PYROS FOR UNDOCKING.**

HAZARD REPORT NUMBER(S): ORB/ 401

**HAZARD(S) DESCRIPTION:
INABILITY TO SAFELY SEPARATE ORBITER FROM A MATED ELEMENT**

- APPROVALS -

SS&PAE : T. K. KIMURA
DESIGN ENGINEERING : C. J. ARROYO

J. Kimura 4-13-98
C. J. Arroyo