FAILURE MODES EFFECTS ANALYSIS (FMEA) – CIL HARDWARE
NUMBER:M5-6SS-0804 -X

SUBSYSTEM NAME: ISS DOCKING SYSTEM

REVISION: 0 02/27/98

PART DATA

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	:MO13Q PANEL	VO75-730377
SRU	:RESISTOR	RWR80S1211FR

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
RESISTOR, WIRE WOUND, 1.21K, 2W - VOLTAGE DIVIDER CIRCUIT, EXTERNAL AIRLOCK WATER SHUTOFF VALVE OPEN/CLOSE POSITION INDICATION

REFERENCE DESIGNATORS: 80V73A143A1R1

QUANTITY OF LIKE ITEMS: 1
(ONE)

FUNCTION:
CIRCUIT PROVIDES VOLTAGE DROP FROM 28VDC TO 5VDC FOR MDM INPUT - EXTERNAL AIRLOCK WATER SHUTOFF VALVE OPEN/CLOSE INDICATION.

REFERENCE DOCUMENTS: 1) VS70-640109, SCHEMATIC DIAGRAM - AIRLOCK ENVIRONMENTAL CONTROL SUBSYSTEM

FAILURE MODES EFFECTS ANALYSIS FMEA – CIL FAILURE MODE
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SUBSYSTEM NAME: ISS DOCKING SYSTEM
LRU: MO13Q PANEL
ITEM NAME: RESISTOR

CRITICALITY OF THIS FAILURE MODE: 1R3

FAILURE MODE:
SHORT (END TO END)

MISSION PHASE: OO ON-ORBIT

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

CAUSE:
A) STRUCTURAL FAILURE (MECHANICAL STRESS, VIBRATION), B) CONTAMINATION, C) ELECTRICAL STRESS, D) THERMAL STRESS, E) PROCESSING ANOMALY

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

CRITICALITY 1R2 DURING INTACT ABORT ONLY (AVIONICS ONLY)? NO

REDUNDANCY SCREEN
A) FAIL
B) N/A
C) PASS

PASS/FAIL RATIONALE:
A)
SCREEN "A" FAILS BECAUSE RESISTOR FAILING SHORT (END TO END) IS NOT CAPABLE OF BEING CHECKED OUT DURING NORMAL GROUND TURNAROUND WITH NO VEHICLE DESIGN MODIFICATION.

B)
SCREEN "B" IS "N/A" BECAUSE AT LEAST TWO REMAINING PATHS ARE READILY DETECTABLE IN FLIGHT.

C)

METHOD OF FAULT DETECTION:
NONE

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CORRECTING ACTION: NONE

CORRECTING ACTION DESCRIPTION:
DESIGN FAULT TOLERANCE: FAIL SHORT OF THE RESISTOR WILL NOT CAUSE A PROBLEM. IT WILL TAKE A SECOND FAILURE (DOWN STREAM DEVICE SHORT TO GROUND) TO TRIP A CIRCUIT BREAKER TO LOSE POWER TO THE EXTERNAL AIRLOCK WATER SHUTOFF VALVE.

- FAILURE EFFECTS -

(A) SUBSYSTEM:
FIRST FAILURE - NO EFFECT

(B) INTERFACING SUBSYSTEM(S):
FIRST FAILURE - NO EFFECT

(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) RESISTOR SHORT (END TO END) - LOSS OF CURRENT LIMITING CAPABILITY TO EXTERNAL AIRLOCK WATER SHUTOFF VALVE POSITION INDICATION CIRCUIT.
2) LIMIT SWITCH OF WATER SHUTOFF VALVE SHORTS TO CASE (GROUND) CAUSING THE UPSTREAM CIRCUIT BREAKER TO TRIP. THE WATER SHUTOFF VALVE FAILS IN THE LAST POSITION (OPEN) - LOSS OF ABILITY TO CLOSE AFFECTED EMU AND ISS WATER SUPPLY.
3) EXTERNAL LEAKAGE OF POTABLE WATER DOWNSTREAM OF SHUTOFF VALVE.
4) POTABLE WATER TANK OUTLET VALVE FAILS OPEN - LOSS OF ABILITY TO SHUT OFF WATER SUPPLY FROM TANK RESULTING IN WATER IN EXTERNAL AIRLOCK. WATER MIGRATION TO KEEL AREA COULD RENDER RUSSIAN AVIONICS INOPERATIVE AFTER DOCKING, RESULTING IN LOSS OF NOMINAL AND PYROTECHNIC UNDOCKING CAPABILITY.

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

(F) RATIONALE FOR CRITICALITY DOWNGRADE:

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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 CAN DISCONNECT THE QD LOCATED AT THE MICROBIAL CHECK VALVE TO STOP THE LEAK. IF UNABLE TO PERFORM WORKAROUND TO DISCONNECT QD (FIFTH FAILURE) AND WATER MIGRATES TO THE EXTERNAL AIRLOCK KEEL AREA AND RENDERS THE RUSSIAN AVIONICS INOPERATIVE, THE CREW WOULD PERFORM EVA TO REMOVE 96 BOLTS FROM THE DOCKING BASE 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: SECONDS

TIME FROM DETECTION TO COMPLETED CORRECTING ACTION: MINUTES

IS TIME REQUIRED TO IMPLEMENT CORRECTING ACTION LESS THAN TIME TO EFFECT?
N/A

RATIONALE FOR TIME TO CORRECTING ACTION VS TIME TO EFFECT:
NONE

HAZARD REPORT NUMBER(S): OR2I 401

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

-DISPOSITION RATIONALE-

(A) DESIGN:
REFER TO APPENDIX E, ITEM NO. 3 - WIRE WOUND RESISTOR

(B) TEST:
REFER TO APPENDIX E, ITEM NO. 3 - WIRE WOUND RESISTOR

GROUND TURNAROUND TEST
ANY TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

(C) INSPECTION:

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REFER TO APPENDIX E, ITEM NO. 3 - WIRE WOUND RESISTOR

(D) FAILURE HISTORY:
CURRENT DATA ON TEST FAILURES, FLIGHT FAILURES, UNEXPLAINED ANOMALIES, AND OTHER FAILURES EXPERIENCED DURING GROUND PROCESSING ACTIVITY CAN BE FOUND IN THE PRACA DATA BASE.

(E) OPERATIONAL USE:
NONE

- APPROVALS -

SS&PAE	: T. K. KIMURA	: T.K. Kimura 3-23-98
SS&PAE MANAGER	: C. A. ALLISON	: C.A. Allison 3-25-98
DESIGN ENGINEERING	: C. J. ARROYO	: C. Arroyo 3/26/98
NASA SUBSYSTEM MANAGER	:	: [illegible] 4-3-98
NASA SSMA	:	: [illegible] 4/2/98
NASA EPD&C SUBSYS MGR	:	: [illegible] 3/31/98
NASA EPD&C SSMA	:	: [illegible] 3/30/98
JSC MOD	:	: [illegible] 4/3/98