

FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL HARDWARE
NUMBER:M5-6SS-0608A -X

SUBSYSTEM NAME: ISS DOCKING SYSTEM

REVISION: 0 02/27/98

PART DATA

	PART NAME	PART NUMBER
	VENDOR NAME	VENDOR NUMBER
LRU	:AW82D PANEL	VO75-730153
SRU	:TOGGLE SWITCH	ME452-0102-7105
SRU	:TOGGLE SWITCH	ME452-0102-7605

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:

TOGGLE SWITCH, 1 POLE, 2 POSITION, MOMENTARY ON - EMU 1 AND 2 WATER SUPPLY VALVE CONTROL CIRCUIT

REFERENCE DESIGNATORS: 84V73A139S1
84V73A139S3

QUANTITY OF LIKE ITEMS: 2
(TWO)

FUNCTION:

OPEN OR CLOSE THE EXTRAVEHICULAR MOBILITY UNIT (EMU) WATER SUPPLY VALVES.
WATER IS SUPPLIED TO THE EMU'S DURING PRE-BREATHE.

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

**FAILURE MODES EFFECTS ANALYSIS FMEA - NON-CIL FAILURE MODE
NUMBER: M5-6SS-0608A-02**

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**SUBSYSTEM NAME: ISS DOCKING SYSTEM
LRU: AW82D PANEL
ITEM NAME: TOGGLE SWITCH****CRITICALITY OF THIS
FAILURE MODE: 1R3****FAILURE MODE:**

FAILS CLOSED IN THE VALVE "OPEN" POSITION, CONTACT-TO-CONTACT SHORT

MISSION PHASE: OO ON-ORBIT**VEHICLE/PAYLOAD/KIT EFFECTIVITY:**
103 DISCOVERY
104 ATLANTIS
105 ENDEAVOUR**CAUSE:**A) PIECE PART STRUCTURAL 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) PASS
C) PASS**PASS/FAIL RATIONALE:**

A)

B)

C)

METHOD OF FAULT DETECTION:VISUAL CUE. DISPLAY INDICATOR SHOWS VALVE IN OPEN POSITION AFTER SWITCH IS
MOVED TO CLOSED POSITION.**CORRECTING ACTION: NONE**

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CORRECTING ACTION DESCRIPTION:

DESIGN FAULT TOLERANCE: REDUNDANT ITEMS REMAIN OPERATIONAL TO STOP WATER FLOW (I.E. QUICK RELEASE CONNECTION CAN STOP WATER FLOW IF DISCONNECTED, UPSTREAM VALVES CAN BE CLOSED).

- FAILURE EFFECTS -

(A) SUBSYSTEM:

LOSS OF CAPABILITY TO CLOSE EMU WATER SUPPLY VALVE.

(B) INTERFACING SUBSYSTEM(S):

NO EFFECT. QUICK RELEASE CONNECTIONS ON EMU CONNECTORS PREVENT WATER FROM FLOWING IN THE PRESENCE OF THE UNCOMMANDED SWITCH "SUPPLY WATER VALVE OPEN" CONTROL SIGNAL.

(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) TOGGLE SWITCH FAILS CLOSED IN THE VALVE "OPEN" POSITION - LOSS OF ABILITY TO CLOSE AFFECTED EMU WATER SUPPLY VALVE.
- 2) QUICK RELEASE CONNECTIONS ON EMU CONNECTORS LEAKS EXTERNALLY - LOSS OF ABILITY TO STOP WATER FLOW.
- 3) EXTERNAL AIRLOCK EMU POTABLE WATER SUPPLY SHUTOFF VALVE FAILS OPEN - LOSS OF ABILITY TO SHUT OFF WATER SUPPLY.
- 4) POTABLE WATER TANK OUTLET VALVE FAILS OPEN - LOSS OF ABILITY TO SHUT OFF WATER SUPPLY - RESULTS IN WATER IN EXTERNAL AIRLOCK. WATER MIGRATION TO KEEL AREA COULD RENDER RUSSIAN AVIONICS INOPERATIVE, RESULTING IN LOSS OF NOMINAL AND 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.

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AFTER THE FOURTH FAILURE, THE CREW CAN DISCONNECT THE QD LOCATED AT THE MICROBIAL CHECK VALVE. IF UNABLE TO PERFORM WORKAROUND TO DISCONNECT THE 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: MINUTES

TIME FROM DETECTION TO COMPLETED CORRECTING ACTION: MINUTES

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

RATIONALE FOR TIME TO CORRECTING ACTION VS TIME TO EFFECT:
REDUNDANT ITEMS REMAIN OPERATIONAL TO STOP WATER FLOW (I.E. QUICK RELEASE CONNECTION CAN STOP WATER FLOW IF DISCONNECTED, UPSTREAM VALVES CAN BE CLOSED AND MICROBIAL QD CAN BE DISCONNECTED).

HAZARD REPORT NUMBER(S): ORBI 401

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

- APPROVALS -

SS&PAE
DESIGN ENGINEERING

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