

**FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL HARDWARE  
NUMBER:M5-6SS-0606 -X**

**SUBSYSTEM NAME: ISS DOCKING SYSTEM**

**REVISION: 0 02/27/98**

**PART DATA**

	<b>PART NAME</b>	<b>PART NUMBER</b>
	<b>VENDOR NAME</b>	<b>VENDOR NUMBER</b>
LRU	:AW18H PANEL	VO75-730151
SRU	:TOGGLE SWITCH	ME452-0102-7803

**EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:**  
TOGGLE SWITCH, 3 POLE, 3 POSITION, CENTER OFF - EXTERNAL AIRLOCK EMU 1 AND 2  
MODE (POWER-OFF-CHARGE)

**REFERENCE DESIGNATORS:** 84V73A133S3  
84V73A133S5

**QUANTITY OF LIKE ITEMS:** 2  
(TWO)

**FUNCTION:**  
ALLOWS CHARGING OF EXTRAVEHICULAR MOBILITY UNIT (EMU) BATTERY OR  
SWITCHES POWER DIRECTLY TO EMU.

**REFERENCE DOCUMENTS:** 1) VS70-960099, INTEGRATED SCHEMATIC - 80DF1,  
AECS EXTRAVEHICULAR MOBILITY UNIT/EXT AIRLOCK

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LRU: AW18H PANEL

ITEM NAME: TOGGLE SWITCH

CRITICALITY OF THIS

FAILURE MODE: 1R3

## FAILURE MODE:

FAILS CLOSED IN THE "POWER" OR "CHARGE" POSITION, CONTACT-TO-CONTACT SHORT,  
POLE-TO-POLE 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 ANOMALLY, 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)

CORRECTING ACTION: NONE

## CORRECTING ACTION DESCRIPTION:

DESIGN FAULT TOLERANCE: REMAINING BATTERY CHARGER CAN BE USED TO CHARGE  
THE EMU'S. CREW WILL ALSO BE ABLE TO PERFORM EVA'S USING THE SPARE  
BATTERIES.

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**- FAILURE EFFECTS -**

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**(A) SUBSYSTEM:**

SWITCH FAILS CLOSED IN "POWER" POSITION - CANNOT CHARGE TWO EMU BATTERIES SIMULTANEOUSLY.

SWITCH FAILS CLOSED IN "CHARGE " POSITION - CANNOT PROVIDE POWER TO ONE OF TWO EMU POWER CONNECTIONS FOR PRE-BREATHE.

**(B) INTERFACING SUBSYSTEM(S):**

SWITCH FAILS CLOSED IN "POWER" POSITION - CANNOT CHARGE TWO EMU BATTERIES SIMULTANEOUSLY.

SWITCH FAILS CLOSED IN "CHARGE " POSITION - CANNOT PROVIDE POWER TO TWO EMU'S SIMULTANEOUSLY FOR PRE-BREATHE.

**(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) SWITCH FAILS CLOSED IN "POWER" POSITION - LOSS OF CAPABILITY TO CHARGE BATTERIES FOR ONE EMU.
- 2) SECOND SWITCH FAILS CLOSED IN "POWER" POSITION - LOSS OF CAPABILITY TO CHARGE BATTERIES FOR ALL EMU'S. WORSE CASE IF FAILURE OCCURS FOLLOWING AN INITIAL EVA WHERE SUBSEQUENT EVA MUST BE PERFORMED USING ONE EMU WITH THE SPARE BATTERY PACK.
- 3) LOSS OF THE SPARE BATTERY PACK FOR BOTH EMU'S - LOSS OF BOTH EMU'S WOULD PRECLUDE SUBSEQUENT EVA CAPABILITIES.
- 4) A FAILURE NECESSITATING AN EVA TO PREVENT A POTENTIAL CATASTROPHIC SITUATION - INABILITY TO PERFORM A CONTINGENCY EVA TO CORRECT A CRIT 1 CONDITION COULD RESULT IN LOSS OF CREW/VEHICLE.

**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 (FAILURE NECESSITATING AN EVA TO PREVENT A POTENTIAL CATASTROPHIC SITUATION) - INABILITY TO PERFORM CONTINGENCY EVA (FIFTH FAILURE) TO CORRECT A CRIT 1 CONDITION COULD RESULT IN LOSS OF CREW AND VEHICLE.

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**- TIME FRAME -**

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**TIME FROM FAILURE TO CRITICAL EFFECT: DAYS**

**TIME FROM FAILURE OCCURRENCE TO DETECTION: DAYS**

**TIME FROM DETECTION TO COMPLETED CORRECTING ACTION: N/A**

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

**RATIONALE FOR TIME TO CORRECTING ACTION VS TIME TO EFFECT:  
AFTER THE FIRST FAILURE, THE SECOND POWER SUPPLY AND BATTERY CHARGER SERVICE POINT REMAINS OPERATIONAL ON THE SERVICE CONNECTION UNIT. THE CREW CAN ALTERNATE THE EMU'S ON THIS OPERATIONAL SERVICE POINT TO CHARGE THE BATTERIES.**

**HAZARD REPORT NUMBER(S): NONE**

**HAZARD(S) DESCRIPTION:  
NONE**

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**- APPROVALS -**

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**SS&PAE  
DESIGN ENGINEERING**

**: T. K. KIMURA  
: C. J. ARROYO**

**: J. Kimura 4-13-98  
: [Signature]**