

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE  
NUMBER: 05-6-2237 -X

SUBSYSTEM NAME: ELECTRICAL POWER DISTRIBUTION & CONTROL  
REVISION: 0 05/03/88

PART DATA

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PART NAME	PART NUMBER
VENDOR NAME	VENDOR NUMBER
LRU : PANEL C3A7	V070-730285
SRU : SWITCH, TOGGLE	ME452-0102-7352

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EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:  
SWITCH, TOGGLE, LEVER LOCK, 3P2P - EXTERNAL TANK SEPARATION SELECT

REFERENCE DESIGNATORS: 35V73A3A7S3

QUANTITY OF LIKE ITEMS: 1  
ONE

FUNCTION:  
PROVIDES CAPABILITY FOR CREW TO SELECT EITHER "AUTO" (GPC CONTROL) OR  
"MANUAL" (CREW CONTROL) MODE FOR SEPARATION FROM THE EXTERNAL TANK.

## FAILURE MODES EFFECTS ANALYSIS FMEA -- CIL FAILURE MODE

NUMBER: 05-6-2237- 03

REVISION#: 0 08/13/99

SUBSYSTEM NAME: ELECTRICAL POWER DISTRIBUTION &amp; CONTROL

LRU: PANEL C3A7

CRITICALITY OF THIS

ITEM NAME: SWITCH, TOGGLE

FAILURE MODE: 1R2

## FAILURE MODE:

TWO "MANUAL" POLES FAIL CLOSED, ONE "AUTO" POLE FAILS OPEN, ONE "AUTO" POLE SHORTS TO GROUND, AND ONE POLE "AUTO" REMAINS INTACT (CLOSED)

MISSION PHASE: LO LIFT-OFF

VEHICLE/PAYLOAD/KIT EFFECTIVITY:	102	COLUMBIA
	103	DISCOVERY
	104	ATLANTIS
	105	ENDEAVOUR

## CAUSE:

PIECE PART STRUCTURAL FAILURE, CONTAMINATION, VIBRATION, MECHANICAL SHOCK, PROCESSING ANOMALY

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN	A) PASS
	B) PASS
	C) PASS

## PASS/FAIL RATIONALE:

A)

B)

PASSES "B" SCREEN BECAUSE ET SEPARATION MODE SELECT SWITCH IS INSTRUMENTED AND DISPLAYED TO GROUND FLIGHT OPERATIONS PERSONNEL THE CREW CAN RESPOND IN A TIMELY MANNER TO MANUALLY INITIATE ET SEPARATION.

C)

## - FAILURE EFFECTS -

## (A) SUBSYSTEM:

FAILURE OF TWO "MANUAL" POLES TO THE CLOSED POSITION AND TWO "AUTO"

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POLES IN THE OPEN POSITION WILL RESULT IN SWITCH REDUNDANCY MANAGEMENT (RM) SELECTION OF THE "MANUAL" POSITION.

**(B) INTERFACING SUBSYSTEM(S):**  
INHIBIT OF AUTOMATIC ET SEPARATION

**(C) MISSION:**  
FIRST FAILURE - NO EFFECT.

**(D) CREW, VEHICLE, AND ELEMENT(S):**  
SAME AS (C)

**(E) FUNCTIONAL CRITICALITY EFFECTS:**  
1. TWO "MANUAL" POLES FAIL CLOSED, ONE "AUTO" POLE FAILS OPEN, ONE "AUTO" POLE SHORTS TO GROUND, AND ONE "AUTO" POLE REMAINS INTACT (CLOSED)  
2. MPS LH2 MANIFOLD PRESSURE TRANSDUCER FAILS BETWEEN 60 AND 90 PSIA

DURING ASCENT, PRIOR TO EXTERNAL TANK SEPARATION, THE ET SEPARATION SELECT SWITCH FAILS SUCH THAT THE ROLLER AND SPRING FROM AN "AUTO" POLE BREAK OFF CONSEQUENTLY THE ROLLER SHORTS AN ADJACENT "AUTO" POLE TO GROUND AND THE SPRING CLOSSES CONTACTS ON TWO "MANUAL" POLES. THIS WILL RESULT IN A 2 OF 3 "MANUAL" VOTE AND A 1 OF 3 "AUTO" VOTE. THE SWITCH REDUNDANCY MANAGEMENT (RM) WILL SELECT THE MANUAL POSITION, RESULTING IN AUTO ET SEPARATION INHIBIT AND NO GPC FAULT MESSAGE WILL BE DISPLAYED TO THE CREW. AUTO ET SEPARATION WILL NOT OCCUR AND THE CREW MUST NOW PERFORM A KEYBOARD ENTRY USING OVERRIDE SPEC #51 ITEM 39 ENTRY TO MANUALLY INITIATE ET SEPARATION. ET SEPARATION IS DELAYED BEYOND MECO + 19.4 SECONDS BY THE PERFORMANCE OF THIS PROCEDURE. SHOULD THE MPS LH2 MANIFOLD PRESSURE TRANSDUCER FAIL BETWEEN 60 AND 90 PSIA PRIOR TO COMPLETION OF THIS ITEM ENTRY, ET SEPARATION MAY OCCUR AT THE SAME TIME THAT THE MPS DUMP IS INITIATED. THIS MAY RESULT IN ET RE-CONTACT WITH THE VEHICLE AND LOSS OF CREW/VEHICLE.

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**-DISPOSITION RATIONALE-**

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**(A) DESIGN:**  
REFER TO APPENDIX A, ITEM NO. 1 - TOGGLE SWITCH

**(B) TEST:**  
REFER TO APPENDIX A, ITEM NO. 1 - TOGGLE SWITCH

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REFER TO APPENDIX A, ITEM NO. 1 - TOGGLE SWITCH

GROUND TURNAROUND TEST

VERIFY EXTERNAL TANK SEPARATION MANUAL SWITCH POSITIONS. ACTIVATE SWITCH AND MONITOR SEPARATION "AUTO", SEPARATION "MANUAL" ENABLE, AND SEPARATION INITIATE STIMULI. TEST PERFORMED ALL FLIGHTS.

(C) INSPECTION:

REFER TO APPENDIX A, ITEM NO. 1 - TOGGLE SWITCH

(D) FAILURE HISTORY:

REFER TO APPENDIX A, ITEM NO. 1 - TOGGLE SWITCH

(E) OPERATIONAL USE:

FLIGHT CREW REQUIRED TO PROVIDE MANUAL BACKUP FOR EXTERNAL TANK SEPARATION VIA KEYBOARD ENTRY USING OVERRIDE SPEC #51 ITEM 39 ENTRY.

- APPROVALS -

SS&PA ENGINEERING	: W. MUSTY	_____
SS&PAE MANAGER	: D.F. MIKULA	_____
SUBSYSTEM MANAGER	: L. COTTA	_____
NASA MOD	: M. PATEL	_____
USA SAM	:	_____
USA ORBITER	:	_____
NASA DCE	:	_____
NASA SR&QA	:	_____

*W. Musty 6/30/99*

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- OIL FAILURE MODE  
NUMBER: 05-6-2237-03

GROUND TURNAROUND TEST  
VERIFY EXTERNAL TANK SEPARATION MANUAL SWITCH POSITIONS. ACTIVATE SWITCH  
AND MONITOR SEPARATION "AUTO", SEPARATION "MANUAL" ENABLE, AND SEPARATION  
INITIATE STIMULI. TEST PERFORMED ALL FLIGHTS.

(C) INSPECTION:  
REFER TO APPENDIX A, ITEM NO. 1 - TOGGLE SWITCH

(D) FAILURE HISTORY:  
REFER TO APPENDIX A, ITEM NO. 1 - TOGGLE SWITCH

(E) OPERATIONAL USE:  
FLIGHT CREW REQUIRED TO PROVIDE MANUAL BACKUP FOR EXTERNAL TANK  
SEPARATION VIA KEYBOARD ENTRY USING OVERRIDE SPEC #51 ITEM 39 ENTRY.

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