

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - CIL HARDWARE
NUMBER:05-3A-B24-1 -X**

**SUBSYSTEM NAME: MULTIFUNCTION ELECTRONIC DISPLAY SUBSYSTEM
REVISION: 1 12/05/97**

PART DATA

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	:PANEL C2A2	V070-730280
SRU	:SWITCH, TOGGLE	ME452-0102-7201

**EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
SWITCH, "CRT" SELECT 2P2P, TOGGLE**

REFERENCE DESIGNATORS: 35V73A2A2S7
35V73A2A2S8

QUANTITY OF LIKE ITEMS: 2
TWO

FUNCTION:
PROVIDES MEANS FOR SWITCHING COMMANDER'S KEYBOARD FROM IDP1 TO IDP3 OR
PILOT'S KEYBOARD FROM IDP2 TO IDP3.

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SUBSYSTEM NAME: MULTIFUNCTION ELECTRONIC DISPLAY SUBSYSTEM

LRU: PANEL C2A2

CRITICALITY OF THIS

ITEM NAME: SWITCH, TOGGLE

FAILURE MODE: 1R2

FUNCTIONAL CRITICALITY/

REQUIRED FAULT TOLERANCE/ACHIEVED FAULT TOLERANCE:1/2/0

FAILURE MODE:

FAILS CLOSED, PREMATURE CLOSURE

MISSION PHASE:

- PL PRE-LAUNCH
- LO LIFT-OFF
- OO ON-ORBIT
- DO DE-ORBIT
- LS LANDING/SAFING

VEHICLE/PAYLOAD/KIT EFFECTIVITY:

102	COLUMBIA
103	DISCOVERY
104	ATLANTIS
105	ENDEAVOUR

CAUSE:

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

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN

- A) N/A
- B) N/A
- C) N/A

PASS/FAIL RATIONALE:

A)

B)

C)

- FAILURE EFFECTS -

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(A) SUBSYSTEM:

TWO INTEGRATED DISPLAY PROCESSOR'S (IDP'S) WILL RESPOND TO A KEYBOARD ENTRY IF EITHER S7 OR S8 FAILS CLOSED IN A POSITION WHICH ALLOWS BOTH IDP'S TO ACCEPT KEYBOARD ENTRY.

(B) INTERFACING SUBSYSTEM(S):

IF EITHER S7 OR S8 FAILED CLOSED, IT WOULD ALLOW TWO IDP'S (IDP1 & 3 OR IDP 2 & 3 RESPECTIVELY) TO ACCEPT/PROCESS THE SAME KEYSTROKES, RESULTING IN KEYBOARD COMMANDS POSSIBLY BEING PROCESSED BY UNINTENDED GPC SPEC FUNCTIONS. DISTINCT COMBINATIONS OF ACTIVE SPECS COULD RESULT IN LOSS OF CREW/VEHICLE.

(C) MISSION:

POTENTIAL LOSS OF CREW/VEHICLE.

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

FIRST FAILURE: NO EFFECT

(E) FUNCTIONAL CRITICALITY EFFECTS:

TWO IDP'S WILL SIMULTANEOUSLY ACCEPT DATA ENTRIES FROM THE SAME KEYBOARD, AND COMMUNICATE WITH THEIR RESPECTIVE GPC'S. ENTRIES TO AN UNINTENDED ACTIVE GPC SPEC COULD BE ACCEPTED BY THE CONTROLLING GPC AS VALID DATA. IF SPECIFIC ITEM ENTRIES WERE EXECUTED INADVERTENTLY, AT THE PROPER TIME, AND WHERE APPLICABLE IN THE RIGHT ORDER, AND WITH SUFFICIENT MAGNITUDE/PRECISION, IT COULD RESULT IN LOSS OF CREW/VEHICLE. THE FOLLOWING ARE EXAMPLES OF ONE AND TWO ITEM ENTRIES RESPECTIVELY WHICH REPRESENT POSSIBLE SCENARIOS:

EXAMPLE (1)

THE UNIVERSAL POINTING DISPLAY/SPEC (MODE DISPLAY FOR MM201) CONTAINS THREE SINGLE ITEM ENTRIES, 4 KEYSTROKES EACH THAT CAN MANEUVER THE ORBITER. IF ANY OF THE THREE WERE EXECUTED UNINTENTIONALLY ON ORBIT, WITH DAP IN "AUTO", AN UNINTENDED MANEUVER COULD RESULT. IF THIS UNINTENDED MANEUVER OCCURRED DURING PROXIMITY OPERATIONS OR DURING EVA, THE CONTACT OF THE ORBITER WITH A PAYLOAD OR EVA MEMBER WOULD RESULT IN CATASTROPHIC DAMAGE TO THE PAYLOAD BAY DOOR AND/OR EVA MEMBER.

EXAMPLE (2)

THE OVERRIDE DISPLAY (SPEC 051) CONTAINS TWO DIRECTLY EXECUTABLE ITEM (6 KEYSTROKES TOTAL) ENTRIES THAT, IF EXECUTED IN THE PROPER ORDER, WOULD INITIATE A TAL OR ATO ABORT (THE FIRST ENTRY SPECIFIES THE TYPE OF ABORT, THE SECOND ENTRY INITIATE THE ABORT). INITIATION OF A TAL ABORT TOO EARLY OR TOO LATE (OUTSIDE OF THE OPERATIONAL ENVELOPE) HAS THE POTENTIAL TO RESULT IN LOSS OF CREW/VEHICLE.

DESIGN CRITICALITY (PRIOR TO DOWNGRADE, DESCRIBED IN (F)): 1/1

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(F) RATIONALE FOR CRITICALITY DOWNGRADE:

THE CREW TRAINING CATALOG (SFOG-FL-0258) DOCUMENTS THAT IT IS MANDATORY FOR ALL CREWS TO TRAIN FOR THIS FAILURE. THE TRAINING OBJECTIVE ALERTS THE CREW TO MONITOR THE SCRATCH PAD LINES OF BOTH CRT SPEC. PAGES TO PRECLUDE THE ADVERSE EFFECTS OF THIS FAILURE.

-DISPOSITION RATIONALE-

(A) DESIGN:

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

(B) TEST:

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

GROUND TURNAROUND TEST

ANY TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

(C) INSPECTION:

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

(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 DATABASE.

(E) OPERATIONAL USE:

TO PROTECT AGAINST THIS FAILURE, CREW TRAINING WILL INCORPORATE POLICY SPECIFYING MDU USE DURING ALL MISSION PHASES WHERE SPEC/OPS DISPLAYS ARE ON MDU'S COMMON TO A SINGLE KEYPAD. THE PRACTICE CONVEYS THAT BOTH MDU SCRATCH PAD LINES WILL BE CHECKED TO ASSURE THAT DUPLICATE ENTRIES HAVE NOT OCCURED BEFORE DEPRESSION OF THE TERMINATOR KEY (EXEC, PRO, ETC.). IN OTHER WORDS, THE CREW WILL MONITOR BOTH CRT SCRATCH PAD LINES WHEN ENTERING KEYSTROKES TO A FORWARD KEYBOARD THAT HAS BOTH ASSOCIATED IDP'S TURNED "ON" AND ASSIGNED TO AN OPERATING GPC. THE CREW IS TRAINED TO RECOGNIZE MULTIPLE SCRATCH PAD LINE ENTRIES ON THE CRT (DPS MDU) SPL, AND PROPERLY ISOLATE THE IDP (DEU) /CRT(MDU).

- APPROVALS -

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NUMBER: 05-3A-B24-1-02

PAE MANAGER : P.A. STENGER-NGUYEN
 PRODUCT ASSURANCE ENGR : N.D. NGUYEN
 DPS SYSTEM : G.L. PRICE
 MEDS SYSTEM : M.B. WARNER
 MEDS HARDWARE : R.M. SITAPARA
 NASA SSMA :
 NASA SUBSYSTEM MANAGER :
 NASA MOD :

P.A. Stenger-Nguyen 5/12/98
N.D. Nguyen 5/17/98
G.L. Price 5/18/98
M.B. Warner 5/19/98
Ramin Sitapara 5/18/98
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James Newhouse 5/20/98
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