FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE
                              NUMBER: 05-5-B15-1 -X

SUBSYSTEM NAME: DATA PROCESSING SYSTEM (DPS)
                                        REVISION: 7   04/15/96

PART DATA

	PART NAME	PART NUMBER
	VENDOR NAME	VENDOR NUMBER
LRU	: PANEL O6	V070-730389
SRU	: SWITCH, TOGGLE	ME452-0102-7306

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
SWITCH GENERAL PURPOSE COMPUTER (GPC) OUTPUT, TOGGLE 3P3P, "BACKUP-NORMAL-TERMINATE"

REFERENCE DESIGNATORS: 33V73A6S35
                           33V73A6S36
                           33V73A6S37
                           33V73A6S38
                           33V73A6S39

QUANTITY OF LIKE ITEMS: 5
FIVE ON PANEL O6

FUNCTION:
PROVIDES THE MEANS FOR HARDWARE INHIBITING GPC COMMANDING ON FROM THE
FLIGHT CRITICAL (FC) DATA BUSES, (SWITCH IN "TERMINATE" POSITION). IN THE
"NORMAL" POSITION THE GPC IS NOT INHIBITED FROM COMMANDING ON THE FC
BUSES AND THE DESIGNATED BFS GPC WILL NOT ENGAGE. IN THE "BACKUP"
POSITION THE HIGHEST (1-5) SELECTED GPC IS ASSIGNED TO THE BACKUP FLIGHT
SYSTEM (BFS) AND ENABLES BACKUP FLIGHT CONTROLLER (BFC) TO ENGAGE.

FAILURE MODES EFFECTS ANALYSIS FMEA -- CIL FAILURE MODE
NUMBER: 05-5-B15-1- 01

REVISION#:   8   04/04/96

SUBSYSTEM NAME: DATA PROCESSING SYSTEM (DPS)
LRU: PANEL O6   **CRITICALITY OF THIS**
ITEM NAME: SWITCH, TOGGLE   **FAILURE MODE: 1R2**

FAILURE MODE:
PREMATURE AND ERRONEOUS OPERATION CHANGES FROM "NORMAL" TO
"TERMINATE", "TERMINATE" TO "NORMAL", OR "NORMAL" TO "BACKUP".
FAILS OPEN, PREMATURE OPEN, SHORT TO CASE (GROUND).

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? YES
         AOA   ABORT ONCE AROUND
         RTLS   RETURN TO LAUNCH SITE
         TAL   TRANS-ATLANTIC LANDING

REDUNDANCY SCREEN   A) PASS
                        B) FAIL
                        C) PASS

PASS/FAIL RATIONALE:
A)

B)
FAILS SCREEN B BECAUSE CERTAIN FAILURE MODES ARE NOT DETECTABLE UNTIL BFS
ENGAGE IS ATTEMPTED.

C)

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- FAILURE EFFECTS -

(A) SUBSYSTEM:
PRIMARY AVIONICS SOFTWARE SYSTEM (PASS). LOSS OF ONE GPC.

BFS: LOSE CAPABILITY TO SELECT/ENGAGE. LOSS OF BFS GUIDANCE NAVIGATION
AND CONTROL (GN&C), POST ENGAGE.

(B) INTERFACING SUBSYSTEM(S):
FAILURE EFFECTS FOR EACH MODE ARE AS FOLLOWS:
1) NORMAL TO TERMINATE - THE PRIMARY AVIONIC SOFTWARE SYSTEM (PASS) GPC
CORRESPONDING TO THE FAILED SWITCH WILL BE UNABLE TO TRANSMIT ON ITS
ASSIGNED FLIGHT CRITICAL BUSES. EQUIVALENT TO GPC LOSS OF OUTPUT;
2) NORMAL TO BACKUP - WITH NOMINAL GPC ASSIGNMENT (I.E., GPC 5 DESIGNATED
BACKUP), THE PASS GPC CORRESPONDING TO THE FAILED SWITCH WILL BE UNABLE
TO TRANSMIT ON ITS ASSIGNED FLIGHT CRITICAL BUSES. WITH OFF-NOMINAL GPC
ASSIGNMENT (I.E., GPC1, 2, 3, OR 4 DESIGNATED BACKUP), BFS WILL BE LOST IF THE
NUMBER OF THE FAILED SWITCH IS GREATER THAN THE NUMBER OF THE DESIGNATED
BFS GPC
3) TERMINATE TO NORMAL - SINCE TERMINATE IS USED IN AN OFF-NOMINAL
CONDITION, A PRIOR GPC FAILURE WOULD HAVE OCCURRED IN ORDER FOR
TERMINATE TO BE INVOKED THE EFFECT OF THE SWITCH FAILING INTO NORMAL
POSITION WOULD DEPEND ON THE EFFECT OF THE PRIOR GPC FAILURE.
4) ERRONEOUS OPERATION (POWER SHORT TO TERMINATE CONTACT) - SAME AS
FAILURE INTO TERMINATE POSITION.

(C) MISSION:
NO EFFECT FIRST FAILURE

(D) CREW, VEHICLE, AND ELEMENT(S):
NO EFFECT FIRST FAILURE.

(E) FUNCTIONAL CRITICALITY EFFECTS:
CRITICALITY 1R2 BECAUSE OF THE FOLLOWING REASONS

FOR ASCENT/ENTRY.
THIS FAILURE COUPLED WITH AN UNDETECTED FLIGHT CONTROL SYSTEM (FCS)
FAILURE IN THE NULL (ZERO OUTPUT) POSITION (E G., IN THE AEROSURFACE
AMPLIFIER (ASA) OR ASCENT THRUST VECTOR CONTROLLER (ATVC)), COULD RESULT
IN THE TWO HEALTHY PATHS BEING VOTED OUT. THIS COULD RESULT IN A VOTING
DILEMMA IN THE FCS (E.G., "FORCE FIGHT" IN THE SERVO ACTUATORS. REFERENCE
FMEA 05-1-FC6042-1 AND 05-1- FC6542-1).

FOR ASCENT:
DURING INTACT ABORT (RTLS, TAL OR AOA). CRITICALITY 1 IF UNABLE TO PURGE AFT
FUSELAGE COMPARTMENTS OF POST MECO GAS MIXTURE (BY OPENING HELIUM BLOW

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DOWN VALVE) RESULTING IN POSSIBLE FIRE/EXPLOSION AND MAY RESULT IN LOSS OF
VEHICLE & CREW ((FLIGHT AFT) FA3 OR FA4 MULTIPLEXER DEMULTIPLEXER (MDM)).

ALL PHASES:
LOSS OF OUTPUT FROM ONE INERTIAL MEASUREMENT UNIT (IMU) OR A FLIGHT
FORWARD (FF) MDM CHANNEL PROCESSING IMU DATA, FOLLOWED BY FAILURE OF
ANOTHER IMU OR FF MDM WITH ERRONEOUS OUTPUT SUCH THAT THE AVERAGE OF
THE TWO REMAINING CHANNELS IS CORRUPTED, WILL LEAD TO INCORPORATION OF
FAULTY IMU DATA BY ALL COMPUTERS AND POSSIBLE LOSS OF VEHICLE/CREW.

FOR BFS:
AFTER LOSS OF PASS DUE TO GENERIC FAILURE(S), BFS ENGAGE IS REQUIRED. ANY
SUBSEQUENT FAILURE IN THE BFS LEADS TO INABILITY TO CONTROL THE VEHICLE AND
RESULTS IN LOSS OF CREW/VEHICLE.

-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: ALL 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:
PRIOR TO THE FAILURE OF THE SWITCH FROM NORMAL TO TERMINATE OR BACKUP ON
A PASS GPC, FLIGHT CRITICAL STRINGS ARE DISTRIBUTED AMONG THE OPERATING
GNC SET IN ACCORDANCE WITH FLIGHT RULE GUIDELINES IN AN ATTEMPT TO LIMIT
EXPOSURE TO A FAILURE. FOLLOWING THE FAILURE OF THE SWITCH FROM NORMAL
TO TERMINATE OR BACKUP ON A PASS GPC, THE FC STRINGS ARE REDISTRIBUTED
ACCORDING TO FLIGHT RULE GUIDELINES IN AN ATTEMPT TO LIMIT EXPOSURE TO THE
NEXT FAILURE. NO SPECIAL CREW TRAINING IS REQUIRED

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- APPROVALS -

EDITORIALLY APPROVED	: RI	
EDITORIALLY APPROVED	: JSC	: _3-1-96_
TECHNICAL APPROVAL	: VIA APPROVAL FORM	: 96-CIL-013_05-5