

FAILURE MODES EFFECTS ANALYSIS (FMEA) - CIL HARDWARE

NUMBER: 05-6BA-2243-IM -X

SUBSYSTEM NAME: EPD&C - LANDING GEAR CONTROL

REVISION: 6

04/09/92

PART DATA

	PART NAME	PART NUMBER
	VENDOR NAME	VENDOR NUMBER
LRU	: PANEL L4	V070-730273
SRU	: CIRCUIT BREAKER	MC454-0026-2030

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
CIRCUIT BREAKER (3 AMPS), LANDING GEAR SENSORS

REFERENCE DESIGNATORS: 31V73A4CB59
31V73A4CB62

QUANTITY OF LIKE ITEMS: 2
TWO, ONE PER PROXIMITY SWITCH SENSOR ELECTRONIC PACKAGE

FUNCTION:
PROVIDES CIRCUIT PROTECTION AND SWITCHING "ON" 115 VAC (AC2 PHASE-A AND AC3 PHASE-A) POWER INPUT TO PROXIMITY SWITCH SENSOR ELECTRONIC PACKAGES.

FAILURE MODES EFFECTS ANALYSIS FMEA -- CIL FAILURE MODE

NUMBER: 05-6BA-2243-IM-01

REVISION#: 7 07/01/99

SUBSYSTEM NAME: EPD&C - LANDING GEAR CONTROL

LRU: PANEL L4

CRITICALITY OF THIS

ITEM NAME: CIRCUIT BREAKER

FAILURE MODE: 1R2

FAILURE MODE:

FAILS OPEN, FAILS TO CONDUCT, FAILS TO CLOSE

MISSION PHASE: DO DE-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY:

102	COLUMBIA
103	DISCOVERY
104	ATLANTIS
105	ENDEAVOUR

CAUSE:

STRUCTURE FAILURE, CONTAMINATION, VIBRATION, MECHANICAL SHOCK, PROCESSING ANOMALY, THERMAL STRESS

CRITICALITY 1M DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN

A) PASS
B) PASS
C) PASS

PASS/FAIL RATIONALE:

A)

B)

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:

FIRST FAILURE - UNABLE TO PROVIDE AC POWER TO ONE OF THE PROXIMITY SWITCH ELECTRONIC PACKAGES

(B) INTERFACING SUBSYSTEM(S):

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FIRST FAILURE - NO EFFECT

(C) MISSION:

FIRST FAILURE - NO EFFECT

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

FIRST FAILURE - NO EFFECT

(E) FUNCTIONAL CRITICALITY EFFECTS:

THE FOLLOWING ARE THE CRITICAL CHANNELS AND FAILURE EFFECTS ASSOCIATED WITH BOTH PROXIMITY SWITCH ELECTRONIC PACKAGES (NO. 1 AND NO. 2):

PROXIMITY SWITCH ELECTRONIC PACKAGE NO. 1:

CHANNEL 1 : 1R3, PPP

REFERENCE FMEA'S: 05-6BA-2400-IM-1, 05-6BB-2096-IM-3

FIRST FAILURE - 50% OF BRAKING CAPABILITY IS ENABLED.

2ND-3RD FAILURE - ("HYD SYS BRAKE ISOL VALVE" SWITCH AND CHECK VALVE FAIL CLOSED RESULTING IN UNCOMMANDED BRAKE PRESSURE) POSSIBLE LOSS OF CREW/VEHICLE DUE TO TIRE DAMAGE AT TOUCHDOWN.

CHANNEL 8 :

REFERENCE FMEA'S : 05-6BA-2407-IM-1, 05-6BB-2107-IM-1

CASE 1 : 1R2, PPP

1ST & 2ND FAILURES

- (ANTI-SKID SWITCH FAILS FOLLOWED BY THIS CHANNEL FAILS OFF AFTER APPROACH/LANDING INTERFACE) FLIGHT CONTROL WILL BE AFFECTED SINCE WEIGHT-ON-WHEELS IS ERRONEOUSLY CONFIRMED. TESTING AT AMES LABORATORY HAS FOUND THAT THIS SCENARIO WILL RESULT IN DEGRADATION OF AEROSURFACE CONTROL WHICH MAY RESULT IN LOSS OF CREW/VEHICLE.

CASE 2 : 1R3, PPP

FIRST FAILURE

- 100% OF BRAKING CAPABILITY IS ENABLED.

2ND-3RD FAILURE

- ("HYD SYS BRAKE ISOL VALVE" SWITCH AND CHECK VALVE FAIL CLOSED RESULTING IN UNCOMMANDED BRAKE PRESSURE) POSSIBLE LOSS OF CREW/VEHICLE DUE TO TIRE DAMAGE AT TOUCHDOWN.

CHANNEL 3, 6 : 1R3, PPP

REFERENCE FMEA'S : 05-6BA-2575-IM-1, 05-6BA-2410-IM-1

FIRST FAILURE

- UNABLE TO UNLOCK THE UPLOCK HOOKS VIA ASSOCIATED PIC.

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- SECOND FAILURE - (REDUNDANT PIC) UNABLE TO UNLOCK THE UPLOCK HOOKS VIA PIC
THIRD FAILURE - (LOSS OF HYDRAULIC SYSTEM NO. 1) POSSIBLE LOSS OF CREW/VEHICLE DUE TO INABILITY TO EXTEND LANDING GEARS.

NOTE: CHANNEL 2 IS USED FOR INDICATION ONLY; CHANNELS 5, 7, 9, AND 10 ARE NOT BEING USED.

LOSS OF OUTPUT OF CHANNEL 4 WOULD RESULT IN FIRING OF THE UNLATCH PYRO ONE SECOND AFTER THE "DOWN" COMMAND IS ISSUED REGARDLESS OF THE STATE OF THE UPLOCK HOOKS (LOCK OR UNLOCK). THIS IS CRITICALITY 3/3 FAILURE.

PROXIMITY SWITCH ELECTRONIC PACKAGE NO. 2:

CHANNEL 1 : 1R3, PPP
REFERENCE FMEA'S : 05-6BA-2400-IM-1, 05-6BB-2096-IM-3

- FIRST FAILURE - 50% OF BRAKING CAPABILITY IS ENABLED.
2ND-3RD FAILURE - ("HYD SYS BRAKE ISOL VALVE" SWITCH AND CHECK VALVE FAIL CLOSED RESULTING IN UNCOMMANDED BRAKE PRESSURE) POSSIBLE LOSS OF CREW/VEHICLE DUE TO TIRE DAMAGE AT TOUCHDOWN.

CHANNEL 3 :
REFERENCE FMEA'S : 05-6BA-2407-IM-1, 05-6BB-2107-IM-1

- CASE 1 : 1R2, PPP
1ST & 2ND FAILURES - (ANTI-SKID SWITCH FAILS FOLLOWED BY THIS CHANNEL FAILS OFF AFTER APPROACH/LANDING INTERFACE) FLIGHT CONTROL WILL BE AFFECTED SINCE WEIGHT-ON-WHEELS IS ERRONEOUSLY CONFIRMED. TESTING AT AMES LABORATORY HAS FOUND THAT THIS SCENARIO WILL RESULT IN DEGRADATION OF AEROSURFACE CONTROL WHICH MAY RESULT IN LOSS OF CREW/VEHICLE.

CASE 2 : 1R3, PPP
FIRST FAILURE - 100% OF BRAKING CAPABILITY IS ENABLED.
2ND-3RD FAILURE - ("HYD SYS BRAKE ISOL VALVE" SWITCH AND CHECK VALVE FAIL CLOSED RESULTING IN UNCOMMANDED BRAKE PRESSURE) POSSIBLE LOSS CREW/VEHICLE DUE TO TIRE DAMAGE AT TOUCHDOWN.

CHANNEL 2, 6 : 1R3, PPP
REFERENCE FMEA'S : 05-6BA-2575-IM-1, 05-6BA-2410-IM-1

- FIRST FAILURE - UNABLE TO UNLOCK THE UPLOCK HOOKS VIA ASSOCIATED PIC.
SECOND FAILURE - (REDUNDANT PIC) UNABLE TO UNLOCK THE UPLOCK HOOKS VIA PIC.

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THIRD FAILURE - (LOSS OF HYDRAULIC SYSTEM NO. 1) POSSIBLE LOSS OF CREW/VEHICLE DUE TO INABILITY TO EXTEND LANDING GEARS.

NOTE: CHANNELS 7 AND 8 ARE USED FOR INDICATION ONLY; CHANNELS 5, 9, AND 10 ARE NOT BEING USED.

LOSS OF OUTPUT OF CHANNEL 4 WOULD RESULT IN FIRING OF THE UNLATCH PYRO ONE SECOND AFTER THE "DOWN" COMMAND IS ISSUED REGARDLESS OF THE STATE OF THE UPLOCK HOOKS (LOCK OR UNLOCK). THIS IS CRITICALITY 3/3 FAILURE.

-DISPOSITION RATIONALE-

(A) DESIGN:

REFER TO APPENDIX D, ITEM NO. 1 - CIRCUIT BREAKER

(B) TEST:

REFER TO APPENDIX D, ITEM NO. 1 - CIRCUIT BREAKER

GROUND TURNAROUND TEST

ANY TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

(C) INSPECTION:

REFER TO APPENDIX D, ITEM NO. 1 - CIRCUIT BREAKER

(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 DATA BASE.

(E) OPERATIONAL USE:

CORRECTIVE ACTION IN THE EVENT OF A FAILURE IS NONE

- APPROVALS -

EDITORIALLY APPROVED
TECHNICAL APPROVAL

: BNA
: VIA APPROVAL FORM

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