

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- NON-CIL HARDWARE**  
**NUMBER:05-1-12200B -X**

**SUBSYSTEM NAME:** GUIDANCE, NAVIGATION, AND CONTROL

**REVISION:** 0 06/18/01

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**PART DATA**

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	<b>PART NAME</b>	<b>PART NUMBER</b>
	<b>VENDOR NAME</b>	<b>VENDOR NUMBER</b>
	:FLT DK AVNS INSTL AREA	
LRU	:DEVICE DRIVER UNIT AEROSPACE AVIONICS INC.	MC454-0154-0001 715305-1

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**EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:**  
 DEVICE DRIVER UNIT (DDU) - PILOT STATION

**REFERENCE DESIGNATORS:** 30V73A2

**QUANTITY OF LIKE ITEMS:** 1  
 1 PILOT SIDE

**FUNCTION:**  
 PROVIDES POWER TO THE ROTATION HAND CONTROL (RHC), NOSE WHEEL STEERING (NWS) STEERING POSITION TRANSDUCER (SPT) AND STEERING POSITION AMPLIFIER (SPA), RUDDER PEDAL TRANSDUCER ASSEMBLY (RPTA), SPEEDBRAKE THRUST CONTROL (SBTC), AND BACKUP FLIGHT CONTROL (BFC).

**REFERENCE DOCUMENTS:** MCR 19029 - DEVICE DRIVER UNIT (DDU), REV 2 (11/24/99)

**FAILURE MODES EFFECTS ANALYSIS FMEA -- NON-CIL FAILURE MODE**

**NUMBER: 05-1-12200B- 02**

**REVISION#:** 0 06/18/01

**SUBSYSTEM NAME:** GUIDANCE, NAVIGATION, AND CONTROL

**LRU:** DEVICE DRIVER UNIT

**ITEM NAME:** DEVICE DRIVER UNIT

**CRITICALITY OF THIS**

**FAILURE MODE:** 1R3

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**FUNCTIONAL CRITICALITY/**

**REQUIRED FAULT TOLERANCE/ACHIEVED FAULT TOLERANCE:**1R/2/2

**FAILURE MODE:**

ERRONEOUS POWER OUTPUT FROM DEVICE DRIVER UNIT (DDU) FLIGHT CONTROL POWER SUPPLIES (A,B,C). ERRONEOUS POWER OUTPUT FROM ONE, TWO, OR THREE POWER SUPPLIES.

**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
- APPLIES TO VEHICLES THAT HAVE MEDS AND NEW DDU INSTALLED ONLY

**CAUSE:**

CONTAMINATION, VIBRATION, SHOCK, PIECE PART FAILURE, TEMPERATURE.

**CRITICALITY 1/1 DURING INTACT ABORT ONLY?** NO

**CRITICALITY 1R2 DURING INTACT ABORT ONLY (AVIONICS ONLY)?** NO

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**REDUNDANCY SCREEN**

- A) PASS
- B) PASS
- C) PASS

**PASS/FAIL RATIONALE:**

A)

B)

C)

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**MASTER MEAS. LIST NUMBERS:** V73X3011X  
V73X3012X  
V73X3013X  
V73X3051X

**CORRECTING ACTION:** MANUAL

**CORRECTING ACTION DESCRIPTION:**

THE FLIGHT CONTROL FUNCTION AND BFC ENGAGE FUNCTION MAY BE TRANSFERRED TO COMMANDER'S STATION.

**REMARKS/RECOMMENDATIONS:**

THE DEVICE DRIVER UNIT COOLING IS CONVECTIVE TO SURROUNDING MEDIA AND CONDUCTIVE THROUGH THE MOUNTING PROVISION. IT IS NOT AIR-COOLED. HENCE, IT DOES NOT HAVE CO-LOCATION PROBLEM AS WOULD THE OLD DDU'S, WHICH LOSS OF ONE COMMON AIR DUCT COULD CAUSE LOSS OF BOTH DDU'S DUE TO OVERTEMPERATURE.

NOTE: THERE IS NO SINGLE POINT FAILURE THAT CAN CAUSE ERRONEOUS OUTPUT FOR ALL THREE POWER SUPPLY OUTPUTS. IT REQUIRES AT LEAST TWO INTERNAL FAILURES TO CAUSE ERRONEOUS OUTPUT FOR ALL THREE POWER SUPPLY OUTPUTS.

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**- FAILURE EFFECTS -**

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**(A) SUBSYSTEM:**

ERRONEOUS POWER OUTPUT FROM ONE OF THREE DDU FLIGHT CONTROL POWER SUPPLIES AT PILOT'S STATION.

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

RM SOFTWARE WILL PROTECT AGAINST ERRONEOUS POWER OUTPUT FOR ONE DDU POWER SUPPLY FOR THE NWS (SPT/SPA), RHC, SBTC AND RPTA BY SWITCHING FROM 3 CHANNEL MID-VALUE SELECT TO 2 CHANNEL AVERAGING FOR THESE CONTROLLERS. HOWEVER, BFC ENGAGE CAPABILITY IS LOST AT PILOT STATION WITH ONE ERRONEOUS POWER SUPPLY OUTPUT.

**(C) MISSION:**

FIRST FAILURE - NO EFFECT.

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

FIRST FAILURE - NO EFFECT.

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**(E) FUNCTIONAL CRITICALITY EFFECTS:**

1) POSSIBLE LOSS OF CREW/VEHICLE IF UNABLE TO UTILIZE BFS WHEN REQUIRED DUE TO INABILITY TO ENGAGE BFS. REQUIRES THREE FAILURES (ERRONEOUS POWER OUTPUT FROM ONE OF THREE POWER SUPPLIES AT COMMANDER'S STATION, ERRONEOUS POWER OUTPUT FROM ONE OF THREE POWER SUPPLIES AT PILOT'S STATION, AND PASS GENERIC SOFTWARE PROBLEM).

2) POSSIBLE LOSS OF CREW/VEHICLE DURING CRITICAL FLIGHT PHASES DUE TO LOSS OF ABILITY TO CONTROL VEHICLE USING CONTROL STICK STEERING (CSS). REQUIRES FOUR FAILURES (ERRONEOUS OUTPUT FROM TWO OF THREE POWER SUPPLIES AT COMMANDER'S STATION, AND ERRONEOUS OUTPUT FROM TWO OF THREE POWER SUPPLIES AT PILOT'S STATION).

3) POSSIBLE LOSS OF CREW/VEHICLE DURING ROLLOUT DUE TO LOSS OF VEHICLE LATERAL CONTROL. REQUIRES THREE FAILURES (ERRONEOUS OUTPUT FROM TWO OF THREE PILOT DDU POWER SUPPLIES AND LOSS OF DIFFERENTIAL BRAKING).

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**- TIME FRAME -**

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

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**- APPROVALS -**

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S&R ENGINEER	: T. T. AI	:/S/ T. AI_____
DDU SSM	: R. D SMITH	:/S/ R. D. SMITH_____
FC HAND CONTROLLERS SSM	: D. HEIDMANN	:/S/ D. HEIDMANN_____