



# **ATTACHMENT 1**

**AIRWORTHINESS GROUP CHAIRMAN'S FACTUAL REPORT**

**CEN13FA121**

**Turbomeca Engine Investigation Report No. A-2013-001  
(6 pages)**

<b>INVESTIGATION REPORT</b>	<b>Preliminary</b> <input type="checkbox"/> <b>Final</b> <input checked="" type="checkbox"/>
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**Accident**                       **Incident**

<b>Reference</b>	CEN13FA121	<b>Commercial File</b>	
<b>Accident / Incident report</b>	A-2013-001	<b>Preliminary Information report A(I)</b>	

Data				
<b>Date of occurrence</b>	<b>Occurrence place</b>	<b>Operator</b>		
02JAN13	Seminole, OK, USA	Air Methods Corporation		
<b>Aircraft type</b>		<b>S/N</b>	<b>Registration</b>	
Eurocopter EC130		4694	N334AM	
<b>Engine type</b>		<b>S/N</b>	<b>TSN</b>	<b>TSO</b>
Arriel 2B1		46247	1135	N/A

Accessories				
Designation, P/N	S/N	Work performed	TSN	TSO
P/N: 70BMF01020	8014	Data Download	1135	N/A

**Circumstances reported to TURBOMECA**

It was reported that, at the beginning of an EMS mission, the aircraft experienced a power loss three minutes after take-off and crashed into a field.

**Conclusion**

The purpose of the exam was to check engine operation on the test cell and perform a DECU download. The engine operated correctly with the exception of the Hydro Mechanical Unit (HMU) which had to be replaced with a slave test unit in order to start the engine. The original HMU caused a flame from the exhaust during the starting sequence from what appeared to be a stuck open metering valve however the problem could not duplicated on the HMU test bench. The engine ran normally with the exception of a noise caused by the bent axial blades and was able to exceed 100% torque value. The DECU download was successful with no faults were recorded during the accident flight.

VALIDATION		APPROVAL	
DATE		DATE	
01FEB13	DVO / TEA	28FEB13	DVO / TEA

**SUMMARY**

**1 HISTORY**

**1.1 TECHNICAL DOCUMENTATION**

*Modular composition:*

Modules	S/N	TSN	TSO	CSN	CSO	Remarks
70BMO12010	06415	1135	N/A			
70BMO22010	07626	1135	N/A			
70BMO32020	01190	1135	N/A	2533		
70BMO41720	06595	1135	N/A	1147		
70BMO52000	10520	1135	N/A			
Items	P/N	S/N	Remarks			
HMU	0292860960	1036	Checked on LRUS Test Bench			

*Remarks:*

**1.2 UPDATED CIRCUMSTANCES**

On January 2, 2013, about 1245 central standard time, a Eurocopter EC130 B4 helicopter, N334AM, experienced a hard landing following a loss of engine power near Seminole, Oklahoma. The commercial pilot and three crew members were seriously injured. The helicopter sustained substantial damage. The helicopter was owned and operated by Air Methods, Centennial, Colorado, under the provisions of 14 Code of Federal Regulations Part 91 as a positioning flight. Visual meteorological conditions prevailed and a company visual flight rules flight plan was filed, and activated. The flight departed from the Seminole Regional Airport (KSRE), Seminole, Oklahoma, at 1242, and was en route to a hospital in Okemah, Oklahoma. According to initial statements, shortly after takeoff, the helicopter's engine stopped producing power. The pilot performed an autorotation to a field and during the landing, touched down hard. The helicopter remained in the upright position. After on-scene documentation, the wreckage was removed for further examination. At 1235, an automated weather reporting facility located at the Shawnee Municipal Airport (KSNL), Shawnee, Oklahoma, reported wind from 280 degrees at 8 knots, visibility 10 miles, a clear sky, temperature 39 degrees Fahrenheit (F), dew point 32 F, and a barometric pressure of 30.25 inches of mercury.

**1.3 RESULTS OF FIELD INVESTIGATION (ACCIDENT)**

The engine as found appeared to be relatively undamaged. The exhaust pipe was distorted from a blade strike. The rear engine mount and linking tube was deformed consistent with a downward impact. All fuel, oil, air, and electrical connectors were securely fastened. The EBCAU was removed and the key was at 12 o'clock indicating the neutral position / normal flight mode. DECU connections were checked and found secure. Bell mouth intake was removed to inspect the axial compressor. 5 blades showed deformation consistent with ingestion of ice/snow/water. The engine was

removed from the airframe and kept in an undisturbed condition in order to complete a test cell run at the factory.

**Additional note:** During the onsite investigation the emergency fuel lever was found to be pulled. After receiving the audio files between the pilot and com center it was discovered that the pilot had pulled the emergency fuel shutoff and shutdown power after the impact.

## 2 REVIEW OF INVESTIGATION

### 2.0.1 List of attendees

- ▶ 1. Jason Aguilera IIC NTSB
- ▶ 2. Dan Thompson FAA
- ▶ 3. Matt Rigsby FAA
- ▶ 4. Michael Koenes AMC
- ▶ 5. Michael Benton AMC
- ▶ 6. Don Lambert AMC
- ▶ 7. Seth Buttner AEC
- ▶ 8. Bryan Larimore TM-USA

### 2.1 ENGINE EXAMINATION

#### 2.1.1 Findings on arrival

Boroscope of HP turbine and Centrifugal compressor was performed with no remarkable findings.



### 2.1.2 Engine testing

Engine was installed on Arriel 2B1 test cradle then installed on TEC02 TurboCat test cell. The first start was attempted in speed mode and a flame was observed coming from the exhaust and an emergency stop was performed by the test cell operator. The maximum T4.5 reached was 892°K (619°C). The over temp automatic safety limit on the test cell and the max starting T4.5 limit is set at 785°C. The test DECU was reset and a second start was attempted with the same results. The HMU s/n 1036 was removed and a shuttle test HMU was installed. The engine then started normally. Vibrations were within limits so the engine was accelerated to flight idle. A unusual noise could be heard most likely caused by the disruption in airflow caused by the bent axial blades. All indications appeared normal so an oil pressure check was performed at 85% Ng. The engine was then brought to ground idle and the operator shutdown the engine after a two minute cool down. The gas generator rundown time was 43 seconds. The engine was then started in position mode. The operator gradually accelerated the engine up to the point the N2 began to droop. N1 = 99.3% and torque was 89.66 daN.m (100% = 85.3 daN.m). All indications were normal other than the unusual noise. The engine was then brought back to ground idle, 2 minute cool down, shutdown, and removed from the test cell.



Engine on Test Bench

### 2.1.3 Engine disassembly

No disassembly of the engine was required.

## 2.2 EQUIPMENT / ITEMS

### 2.2.1 Testing (equipment) HMU testing

The HMU s/n 1036 was connected to the actuator command box 881 9 728 000. During power up, the actuator cycled the metering valve fully closed (normal). We commanded the system to full open and the actuator/ resolver responded correctly. We installed the unit on the bench C06 003M-001 and spot checked multiple points from 10% (closed) to 102.5% (full open). The actuator, resolver angle, and fuel flow again responded correctly. The abnormal behavior of the HMU displayed on the engine test cell could not be duplicated on the LRUS HMU test bench but was believed to be the result of the impact and not present prior to the accident.

### 2.2.2 Equipment disassembly

No disassembly of the equipment was required.

## 2.3 ADDITIONAL EXAMINATIONS (DECU)

The amounts of 43 power ups and 10 hours of operating time on the DECU between the most recent fault in the field and the faults generated on the test bench for both channels A and B seem to indicate that the memory data in the DECU was recorded at a time prior to the event.

- File 8014 Fault Context lane A 8471:
  - o First memory reading of channel A at power up number 8471.
  - o This file exhibits the last 8 faults with a snapshot of the DECU logical words and engine parameters at the moment of the fault.
  - o I put the 8 fault blocks in order from most recent (Block #4) to oldest (Block #5).
  - o Block #4 was actually caused on the test bench at power up number 8471 and total power time counter of 1680 hrs on the DECU. The "No Arinc message from helicopter" fault was caused by the maintenance access mode with the interface software on the laptop.
  - o Block #3 is therefore the most recent block and 43 power up prior to test bench check at power up number 8428. The DECU total power time counter is at 1670 hrs, so 10 hrs of power up time prior to block # 4 on the bench. A "No Arinc message from helicopter" fault was recorded in this block at 364 seconds after the DECU was energized. The logical words and engine parameters indicate that the control system was in flight mode with 89.17%N1 and 100.29%N2 at that moment.
  - o Block #2 was recorded at the same time as Block #3. The "28 volts fault" in this block could explain the loss of Arinc observed in block # 3 caused by the loss of power to the VEMD.
  - o Block #1 was recorded at power up number 8391, 37 power up number prior to block #2 and #3, at DECU total power time counter of 1661hrs.
- File 8014 Tech Occur lane A 8428:
  - o First memory reading of the last 32 faults recorded by the DECU.
  - o This file only shows the faults with no snapshot of the DECU logical words or engine parameters.
  - o There is no fault generated by the maintenance access mode in this file when the DECU is energized on the test bench. Therefore, the most recent block #1 is the last recorded fault prior to DECU power up on the test bench.
  - o Block #1 exhibits an "Helicopter Arinc" fault at power up number 8428 and 368 seconds after DECU power up. This block confirms block #3 of the fault context memory file.
  - o Block #2 was also recorded at power up 8428 and 3 seconds prior to block #1 and confirms the loss of 28 volts on the aircraft seen on block # 2 in the fault context memory file.
  - o Block #3 was recorded at power up 8048, which is 380 power up prior to block #1 and #2.
- File 8014 Fault Context lane A 8473:
  - o After first memory reading of the DECU at power up number 8471, the DECU was powered off, connector J3 was disconnected and the DECU was energized to generate faults in the memory and create a time stamp in the DECU memory. The DECU was then power off and connector J3 reconnected. The DECU was then energized again to perform memory reading.
  - o Because there are many input going to each connector on the DECU, disconnecting J3 connector generated many new faults in the blocks subsequent to block #4. The power up number in these new blocks were at 8473, confirming the 2 additional power up following the first check on the bench.

- File 8014 Fault context lane B 8473:
  - o This is the memory reading of channel B at power up number 8473 after connector J3 was disconnected on the test bench.
  - o Blocks # 6, 7, 8, 1, 2, 3 are the results of disconnecting connector J3 on the DECU test bench at total power time of 1681.6 hrs.
  - o Block #5 was recorded at DECU total power time of 1670.1 hrs and 364 seconds after power up. This block confirms the "28 volts fault" seen on channel A at 10 hrs of operating time before the DECU was energized on the test bench.
  - o Block # 4 was recorded at 1617.9 hrs, 53 hrs of operating time prior to block #5.
- File 8014 Norm:
  - o This file is a minimum functional check to show that the DECU is operational and does not declare any fault in real-time check. The last page shows that no fault are highlighted nor any bit raised to 1.

### 3 TEST RESULTS

All test documentation is attached in PDF format.

