



FINAL REPORT

**Investigation into the accident of EC-130 B4 Helicopter, Nationality and Registration
 Mark S2-AHW of ATL Aviation Ltd, Occurred on 11 October 2018
 at Godagari, Rajshahi, Bangladesh**



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Investigation into the accident of EC-130 B4 Helicopter, Nationality and Registration Mark S2-AHW of ATL Aviation Ltd, Occurred on 11 October 2018 at Godagari, Rajshahi, Bangladesh

This accident investigation has been performed in accordance with Civil Aviation Act 2017, in conformity with Annex 13 to the Chicago Convention on International Civil Aviation. The delegation of investigating authority was accorded initially by the Chairman CAA Bangladesh to the Head of Aircraft Accident Investigation Group of Bangladesh (AAIG-BD), vide Office Order CAAB/CS/32/AAIC-BD/01/MASTER, dated 22 June 2016. Meanwhile the Government of Bangladesh has formed an Independent Aircraft Accident Investigation Committee in Bangladesh, abbreviated as AAIC-BD, which has taken over the responsibility to continue with the investigation. The IIC of the investigation remains the same person, who has been re-designated as the Head of AAIC-BD.

The Head of AAIC-BD received a Mandatory Occurrence Report (MOR) sent by the Operator narrating about the Accident of one EC-130 B4 helicopter, Nationality and Registration Mark S2-AHW of ATL Aviation Ltd on 11 October 2018 at Godagari, Rajshahi, Bangladesh. The helicopter took off from Godagari of Rajshahi with PIC plus six passengers on board. Immediately after take-off at around 60-70 feet height the helicopter made a sharp swing to the right with nose down attitude with a puff of smoke coming out of exhaust, apparently with suspected engine failure. The helicopter crash landed at the nearest building which was under construction. The helicopter was damaged beyond economic repair. Pilot and all passengers survived with very minor injuries.

The Head of the Aircraft Accident Investigation Committee of Bangladesh (AAIC-BD) initiated the investigation through appointing himself as IIC and forming an Aircraft Accident Investigation Team (AAIT). The AAIT has completed the Investigation and has submitted this report to the Office of the AAIC-BD.

Earlier, the AAIG-BD circulated to appropriate States/Administrations/Organizations and published the 'Preliminary Investigation Report' of this accident in CAAB website, www.caab.gov.bd on 15-10-2016 for the consumption of public, as per the requirement of ICAO Annex 13 Chapter 7.2. The draft final investigation report was issued in order to present the final status of the investigation on the aforementioned accident.

This final report has been compiled after having received comments from external States and Agencies in accordance with the requirements of ICAO Annex 13. The drafting of the report was delayed beyond normal time and no interim report has been published due to some official constraints and the existing COVIT-19 pandemic situation. This Report will be published in www.caab.gov.bd soon after the dispatch of the Report to States and Agencies as per ICAO Annex 13 Standard 6.4.

The sole objective of this investigation is to prevent aircraft accidents and incidents. It is not the purpose of this activity to apportion blame or liability.

The information contained in this report has been derived from the factual information and evidences gathered during the ongoing investigation of the occurrence

The AAIC-BD reiterates that, in the event new evidence appears in future that requires changes to the information depicted in this report, the investigation will be reopened as per Standard 5.3 of ICAO Annex 13. However, this draft final report represents the complete investigation, which will be made public in due course of time, in conformity with ICAO Annex 13.

Head
Office of AAIC-BD
Ministry of Civil Aviation & Tourism
3rd Floor, CAAB Headquarters, Kurmitola, Dhaka, Bangladesh.
29 October 2020

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TABLE OF CONTENTS			
SL	Chapter	Subject	
1	N/A	Introduction with Subject Title	
	N/A	Table of Contents	
	Title		1.1 Name of Operator
			1.2 Name of Manufacturer
			1.3 Aircraft Model
			1.4 Aircraft Nationality
			1.5 Aircraft Registration Marks
			1.6 Place of Occurrence
	1.7 Date of Occurrence		
2.	Synopsis	Synopsis (Para 2.1 to 2.3)	
3.	Body	Factual Information (Para 3.1 to 3.13)	
		4. Analysis (Para 4.1 to 4.7)	
		5. Contributing Factors	
		6. Conclusions	
		7. Safety Recommendations	
4.	Appendices	Stored in File	

1. TITLE

1.1 Name of Operator	ATL Aviation Ltd
1.2 Name of Manufacturer	Airbus
1.3 Aircraft Model	EC 130 B4
1.4 Aircraft Nationality	Bangladesh
1.5 Aircraft Registration Marks	S2-AHW
1.6 Place of Occurrence	Godagari under Rajshahi District, Bangladesh
1.7 Date of Occurrence	11 October 2018

2. SYNOPSIS

2.1	The Helicopter EC 130 B4 took off on a Corporate flight from HSIA for Godagari of Rajshahi District with PIC plus four passengers on board. It landed in Godagari at 0700 UTC. The weather was cloudy with occasional heavy rain. Thereafter, the helicopter took off from Godagari at 0840 UTC with six passengers (the additional two were on board from Godagari). Immediately after take-off at around 60-70 feet height, the helicopter made a sharp swing to the right with nose down attitude with puff of smoke coming out of exhaust, apparently with suspected engine failure. The helicopter crash landed hitting the pillars of a building under construction.
2.2	The helicopter was damaged beyond economic repair.
2.3	Pilot and all passengers survived with very minor injuries. It was being operated by single crew. Six passengers were on board. All passengers and the pilot were evacuated with the assistance of the pilot and local people.

3. BODY (FACTUAL INFORMATION)

3.1 History of Flight

Date of Flight	11 October 2018
Flight Number/Call sign	Call Sign S2 AHW
Aircraft Registration	S2 -AHW

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Aircraft Type	EC 130 B4
Type of Operation	Non-Scheduled Corporate Passenger Flight
Last Point of Departure	Godagari, District-Rajshahi
Time of Departure	0840 UTC from Godagari
Point of Intended Landing	Hazrat Shahjalal International Airport, Dhaka, Bangladesh (VGHS)
Scheduled Time of Arrival	0935 UTC (1535 LT)
Time of Incident/Accident	0840 UTC (1440 LT)
Whether Day or Night	Day

3.2 Damage to Aircraft:

Helicopter was damaged beyond economic repair

3.3 Other Damages:

Nil

3.4 Personnel Information:

Pilot in Command: Age: 55 years; (DOB; 07 Nov 1963) Nationality: Bangladeshi CPL (H): No. 720, Valid till 25-11-2022 Ratings: Current on EC-130; Mandatory Checks done: 05 August 2018 Flying Experience (Total): 4883:00 Hours. Flying Experience (On type): 319:00 Hours. Duty time: Rested more than 72 Hours prior to this flight. Instructor Rating: N/A Management Post: DFO, ATL Aviation Medical Status: Class-1 (One) till 22-10-2018 CRM training: N/A	
First Officer	NA
Cabin Crew	Nil
Other Personnel	Six Passengers

3.5 Aircraft Information:

Model	EC 130 B4
Manufacturer	Airbus
Registration	S2-AHW
MSN	Corporate passenger flight
Engine Make and Model	Ariel Turbomeca 2B1
Certificate of Airworthiness	Valid Until 23 November 2018
Type of Fuel Used	JETA-1
Performance Status:	1. Takeoff weight at HSIA = 2415 kg; 2. Landing weight at Godagari = 2240 kg; 3. Takeoff weight at Godagari = 2375 kg.
The helicopter was equipped with several STC equipment as below:	
<ul style="list-style-type: none">FACET OIL FILTER (STC SH92-36)	

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- AIRFRAME FUEL FILTER (STC SH02-42)
- CARGO POD INSTALLATION (STC SH03-33)
- AFT BENCH SEAT INST. (STC SH04-28)
- R/H REAR CABIN DOOR MOD (STC SH05-43)
- FDC AEROFILTER (STC SH08-6)
- COMM/NAV SYSTEM MODIFICATION (STC SH07-50)

3.6 Meteorological Information:

Due to the cyclonic formation in the Bay of Bengal, the weather was cloudy with occasional rain experienced during proceeding flight from Dhaka to Godagari. Furthermore, during the period of stay on ground, there was continuous light rain at the landing place. During the take-off from Godagari, occasional to moderate rain was observed. Rain subsided temporarily at the time of take-off.

3.7 Aids to Navigation:

Type of Aid	Identification	Frequency
VOR/DME/ILS at HSIA	DAC	112.7 MHz

3.8 Communications:

N/A

3.09 Flight Recorders:

N/A

3.10 Fire:

There was no evidence of fire, other than the puff of smoke observed after lift-off at about 60-70 feet height.

3.11 Test and Research:

The reviewing of the available documents and testing, decoding, research and analysis of all pertinent equipment retrieved from the aircraft, was done by an accredited team from Airbus Helicopter and Accident Investigator from Safran Helicopter Engines. The factual account of the inspection carried out by the same group. (The report is attached as Annex)

3.12 Progress of Investigation (Wreckage Examination Report)

A 42-page wreckage Examination Report by abovementioned experts is attached as Annex

3.13 Additional Information:



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During the accident-preceding 25 FH inspection at 2309:57 FH dt.29 September 2018, Engine power check/health check with inlet barrier filters (IBF) installed (refer to IBF Rotorcraft Flight Manual Supplement as necessary) was carried out and both T4 and TRQ Margin was found Good.

The damaged helicopter was recovered and brought to Dhaka. VEMD and DECU readout was performed with the assistance of the manufacturer. The entire recovery process was done under the instruction of AAIT. The VEMD (Vehicle and Engine Monitoring Display) is a multifunction screen installed on the instrument panel and designed to display flight data and engine data. The VEMD is a dual channel system. In each channel (or module), failure information, associated to flight parameters, is stored in a non-volatile memory for maintenance purposes.

The relevant VEMD data for accident investigations are:

- Flight reports
- Failure messages with associated dated parameters
- Over limit reports (over limits are not dated).

The VEMD also records the last 8 Engine Power Checks (EPC) that are performed in flight to check the engine health according to the maintenance and flight manuals (EPC are not dated).

Work performed

The event flight was identified in the VEMD. Given that neither failures nor over limits were recorded for the flight of the event in the VEMD, the BEA performed the examination of the Digital Engine Control Unit (DECU).

Designated and accredited representative for BEA, were assisted by the following technical advisors from Safran Helicopter and Airbus Helicopters.

The final VEMD examination report.

The event flight was identified in the VEMD. Given that neither failures nor over limits were recorded for the flight of the event in the VEMD, the BEA performed the examination of the Digital Engine Control Unit (DECU).

The VEMD (Vehicle and Engine Monitoring Display) is a multifunction screen installed on the instrument panel and designed to display flight data and engine data. The VEMD is a dual channel system. In each channel (or module), failure information, associated to flight parameters, is stored in a non-volatile memory for maintenance purposes.

The relevant VEMD data for accident investigations are:

- Flight reports
- Failure messages with associated dated parameters
- Over limit reports (over limits are not dated).

The VEMD also records the last 8 Engine Power Checks (EPC) that are performed in flight to check the engine health according to the maintenance and flight manuals (EPC are not dated).

Work performed:

In accordance with the procedures validated by Airbus Helicopters and the BEA, the VEMD was inspected at the BEA to check its external and internal condition. As it was in good condition, the power-up took place on May 21st 2019 at Airbus Helicopters facilities. It was first performed on a golden VEMD to ensure neither failure nor over limit was created at the power on of the computer. All the recorded data were directly displayed on its screen and were photographed.

At the end of the examination, a failure was created in the flight numbered 3300 by Airbus Helicopters specialists to ensure that the equipment was storing failures. The expected failure was written in the equipment and was displayed accordingly. The VEMD flight duration (computed in minutes) starts when the NG1 increases over 10% or the NR2 increases over 70 rpm

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and ends when the NG decreases under 10% and NR decreases under 70 rpm (“START” and “FLIGHT” engine state). Failures are only recorded in the FLIGHT engine phase.

The data relative to the last recorded flight were associated to the flight numbered 3299, which lasted 00 h 03 min. It was associated to the flight of the event. Neither failures nor over limits were recorded for the flight of the event. None were recorded for the previous 30 flights. The last Engine Power Check was good.

Conclusion:

The event flight was identified in the VEMD. Given that neither failures nor over limits were recorded for the flight of the event in the VEMD.

4. ANALYSIS

4.1 VEMD Analysis:

In order to identify if there is some failure recorded by the VEMD which should explain the engine flame out observed on the video, the reading of the VEMD has been performed on the Airbus Helicopters test bench on behalf of the BEA.

This examination has been subjected to the BEA report # BEA2018-077_tec 2 which confirmed that no failure and no over limit have been recorded during the accident flight.

4.2 Analysis of the Video:



The Helicopter with the rotor turning on ground on the helipad before take-off revealed a lot of puddles of water on ground as the result of a recent rain (monsoon season). The aircraft was parked on the helipad for two hours since the previous flight.



Aircraft just after take-off. Sudden right jerk and bank to the right observed (consistent with sudden loss of power).



White smoke coming from the exhaust pipe and aircraft losing altitude



Aircraft losing altitude

It is analyzed that the smoke that came out from the engine exhaust pipe is consistent with an engine flame out with fuel

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still supplied to the combustion chamber.

It may be mentioned here that, the operational procedures applied for helicopter parking in heavy rain is available. However, for short duration stay (2:00 hours) the procedures under rain was not available.'



Aircraft impacting the under-construction building area with a lot of Main Rotor Blades conicity (result of low Nr speed and high collective pitch = pilot action to maintain lift). 'During take-off roll at about 60 to 70 ft. altitude, the collective was already in higher position. Once the engine failed at that height, pilot had no other option other than quickly to raise the collective further to cushion the landing. Thereby, high collective pitch input without engine power led to low Nr.'

Few seconds after the crash a strong gust of wind is observed (umbrella roll over = result of rotor blast or weather conditions?).

4.3 Purpose of The Examination

- (a) The purpose of this examination was to perform a general wreckage examination to verify the continuity of the mechanical transmission from the engine to the Main and Tail Rotor Blades and the continuity of the controls from the cyclic, collective and pedals to the Main and Tail Rotor Blades.
- (b) After a detailed examination of the engine air intake and a functional check of the airframe fuel circuit were then performed to identify if some evidence or contributing factor should explain the engine flame out observed on the video.

4.4 Crash Site Observations



View from the front R/H side



View from the back R/H side with the evidence of tail boom impact with a Main Rotor Blade



View from the R/H side

- (a) The helicopter was lying on its belly in contact with the edge/angle of an under-construction building. The right side of the landing gear was broken as a result of the impact with the edge/angle and a concrete pillar of the under-construction building.

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- (b) The impact with the concrete pillar has also produced a tear-off of the right side of the MGB deck as shown on the photo, 'view from the R/H side'.
- (c) The helicopter was in pitch down attitude and was inclined to the right in contact in the rear part of the R/H side of the engine (cowling and exhaust pipe) with a concrete pillar which maintained the aircraft in such position.
- (d) The tail boom evidenced an impact mark with a concrete pillar on its rear L/H side but also with a Main Rotor Blade which has cut the rear transmission cowling and the tail rotor drive shaft just above the horizontal stabilizer.
- (e) The Main Rotor Blades exhibited some impact evidences with the concrete pillars and tail boom. All the observed damages were the result of the accident.
- (f) The wreckage has been transported to a hangar/warehouse for examination and for so doing the landing gear has been cut leaving the wreckage lying on its Bely in the hangar/warehouse.

4.5 Wreckage Examination

4.5.1 The following organisations were present during the wreckage examination:

- (a) CAAB and AAIC-BD
- (b) ATL Aviation Ltd
- (c) Impress Aviation Ltd
- (d) Airbus Helicopters
- (e) Safran Helicopter Engines

4.5.2 The Wreckage Examination:

- (a) The examination of the engine did not reveal any pre-crash discrepancy
- (b) The inlet barrier filter was found with its two by pass gates in open position
- (c) The gas generator and the HP Turbine were in good condition.
- (d) The Power Turbine wheel was in good condition and free to rotate.
- (e) The HMU and its shafts were in good condition.
- (f) Fuel pollution was found at the bottom of the filter, on the filter itself and on the inside wall of the bowl filter.
- (g) The EBCAU's actuator and the HMU's shaft key were found at the twelve o'clock position (not being activated).
- (h) The MGB-engine drive shaft was found in good condition.

4.6 Analysis Engine

- (a) The engine compartment's cowling was slightly damage by impact on its right side
- (b) The air intake was equipped with an inlet barrier filter.
- (c) The air intake had its bottom hole not obstructed and contained few small foreign particles.
- (d) The engine was in good condition.
- (e) The condition of the equipment of the engine (valve assembly, bleed valve, HMU) was unremarkable.
- (f) Axial and centrifugal compressors were free to rotate with no impact on the axial compressor blades.
- (g) The HP turbine was in good condition and free to rotate.
- (h) The magnetic plugs were clean.
- (i) Some fuel pollution deposit was found in the fuel filter bowl and on the filter. No pre blockage indication.
- (j) HMU removal revealed continuity on its shafts
- (k) The EBCAU's actuator and the fuel by-pass valve on the HMU were found at 12:00 o'clock position (not been activated).
- (l) The drive shaft between MGB – engine was found unremarkable.
- (m) The exhaust was slightly impacted on the right side and had some inside oil marks.

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Note: The examination of the engine did not reveal any pre-crash discrepancy

4.7 Engine Analysis-Conclusion

- (a) The inlet barrier filter was found with its two by pass gates in open position
- (b) The gas generator and the HP Turbine were in good condition.
- (c) The Power Turbine wheel was in good condition and free to rotate.
- (d) The HMU and its shafts were in good condition.
- (e) Fuel pollution was found at the bottom of the filter, on the filter itself and on the inside wall of the bowl filter. However, the investigation could not determine the effect of the pollution.
- (f) The EBCAU's actuator and the HMU's shaft key were found at the twelve o'clock position (not being activated).
- (g) The MGB-engine drive shaft was found in good condition.
- (h) Due to the observations made on the engine and the fact that fuel was still delivered (smoke on the video) after engine flame out, the HMU test is not required.

4.8 DECU Analysis

The Digital Engine Control Unit (DECU), part number 70BMF01020, s/n 1675, was on-board helicopter EC130B4 registration S2-AHW which suffered an accident in Bangladesh on 11th October 2018.

The DECU was taken to Safran HE by a representative of the Bureau d'Enquête et Analyse pour l' Aviation Civile (BEA) for data download.

The DECU aims to maintain the Power Turbine speed (N2) and hence the rotor speed (NR) at nominal value. It does so by assessing the speed (N1), and hence the power, delivered by the Gas Generator. The target N1 is obtained by modifying the fuel flow to the engine. Actions on the collective pitch lever (XPC signal) and/or Yaw pedals (XPA signal) can have an effect on the target N1 and fuel flow.

The DECU memory download did not bring out data that may be a sign of pre-crash engine fuel system failure.

5. CONTRIBUTING FACTORS

During the complete wreckage examination, the following possible contributing factors have been identified:

- (a) On the air intake FDC AEROFILTER, no evidence has been found concerning the "Differential Pressure Switch" check in the aircraft maintenance documentation. This check requested on a regular basis is required by the STC holder maintenance program. This equipment is used for the clogging monitoring of the air barrier filter and to warn the pilot. If the threshold of this pressure switch is not at the appropriate setting, this could lead to an over clogging of the air barrier filter in flight and thus a lack of air admission to the engine. AH recommends to check the pressure switch setting as required by the STC holder maintenance program. In this regard, it may be mentioned that, as per maintenance program besides pre-flight check, FDC aero filter is checked regularly during every 100 FH/12 Month inspection. As per the recommendation of the manufacturer, differential pressure switch was checked as per the laydown procedure of 1130 series ICA-1 Rev on 04 Oct 2019 and found satisfactory.
- (b) On the AIRFRAME FUEL FILTER, the fuel hose installation (from the additional fuel filter output to the fuel shut off valve installed on the firewall) was not conform to the fuel system standards. It has a routing non-conform, leading to a "high" spot on the fuel line. This kind of routing can trap some air inside the circuit. If released, this air can pass through the HMU and disturb the engine behavior: transient power losses, etc.

Note: A supplemental type certificate (STC) is a type certificate (TC) issued when an applicant has received FAA approval to modify an aeronautical product from its original design. An approval to carry out an aircraft type modification which is deemed by the Airworthiness Authority concerned to be a sufficient change to the original design of an aircraft type

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to require a specific validation. For example, an Operator might wish to install an in-flight entertainment (IFE) system on their aircraft, which would involve complicated modifications to the electricity supply system on an aircraft. Alternatively called a Supplemental Type Certificate (STC).

6. CONCLUSIONS

- (a) All the damage observed during the examination of the aircraft and the engine, are the consequences of the crash sequence.
- (b) No evidence of pre-crash failure or discrepancy has been observed during the complete examination of the aircraft and the engine.

7. SAFETY RECOMMENDATIONS

- (a) All Airworthiness directives (AD), Safety Information Notices (SIN) Information Notices (IN), Supplemental Type Certificate (STC) should be regularly monitored and Manufacturers’ Instructions shall be complied with by concerned Helicopter Operators of Bangladesh;
- (b) Euro copter Letter- Service No 1882-00-08 should be complied with by concerned Helicopter Operators of Bangladesh;
- (c) Operations procedure for parking the helicopter for short duration stay (2:00 hours) in open area under rain should be developed by all Helicopter Operators of Bangladesh.

END

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