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INVESTIGATION REPORT

Accident to the AEROSPATIALE - AS350 - B1 registered F-GNLM

on 26 July 2020
at Clermont-Ferrand (Puy-de-Dôme)

Time	Around 14:50[1]
Operator	Private
Type of flight	Cross-country
Persons on board	Pilot and five passengers
Consequences and damage	Helicopter damaged

This is a courtesy translation by the BEA of the Final Report on the Safety Investigation published in February 2021. As accurate as the translation may be, the original text in French is the work of reference.

[1] Except where otherwise indicated, the times in this report are in local time.

Loss of yaw control on entering hover, before take-off

1 - HISTORY OF THE FLIGHT

Note: the following information is principally based on data from the HELISAFE computer, statements and the aerodrome's surveillance camera.

The pilot, accompanied by five passengers, took off from Aix-Les-Milles aerodrome (Bouches-du-Rhône) bound for Toussus-le-Noble aerodrome (Yvelines) making a stop at Clermont-Ferrand airport (Puy-de-Dôme). Having refuelled at Clermont-Ferrand, and re-embarked his passengers, the pilot started the engine. On entering hover[2], the helicopter turned rapidly[3] around its yaw axis several metres from the ground. After approximately two turns, the pilot, who was unable to stop the rotation, lowered the collective pitch control to bring the helicopter to the ground. The helicopter landed hard and bounced before coming to a stop. After the pilot shut down the engine, all of the occupants evacuated the helicopter.

[2] In ground effect.
[3] Counterclockwise.

2 - ADDITIONAL INFORMATION

2.1 Examination of the helicopter

Several examinations were performed (on site then in the workshop). The continuity of the flight control linkages and the operation of the servocontrols and the yaw trim were checked. The mechanical connection between the engine and the tail rotor was checked; the engine was supplying power to the tail rotor at the time of the accident. No anomaly likely to explain the loss of yaw control was detected.

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Source: BEA

Damage to the helicopter

The external visual examination of the engine revealed no anomaly.

A Helisafe computer was installed on board. The analysis of the saved data confirmed that the engine was supplying power at the time of the accident.

The helicopter was equipped with dual controls (cyclic pitch, collective pitch and pedals) during this flight and on previous flights.

The weight and balance of the helicopter shows that it was near[4] the maximum permissible take-off weight (MTOW 2,200 kg) and within the permissible balance envelope.

[4] The weight of the helicopter (with fuel, luggage, pilot and passengers) was estimated to be 2,160 kg.

2.2 Pilot experience

The pilot held a Private Pilot Licence - Helicopters (PPL(H)) issued in 2013 and had logged approximately 470 flight hours, 200 of which in the R44 and 270 in the AS350. The AS350 type rating was obtained in 2017. In 2020, the pilot logged 52 flight hours in the AS350, two-and-a-half hours of which in the 24 hours preceding the accident.

2.3 Pilot's statement

The pilot explained that he had refuelled with 274 l of fuel at Clermont-Ferrand, which enabled him to have a full tank[5] for the last stage of the journey. He had then embarked five passengers[6]. According to him, the stop had lasted around 30 minutes. He specified that the female passenger who had made the previous flight in the front left seat had moved to allow the second female passenger to sit in this seat for this flight.

[5] 540 l.

[6] Three men and two women.

He stated that he started up the engine and had received authorisation from the controller to make his way to runway 27 via taxiway C3. On entering hover, the helicopter started to turn to its left around the yaw axis. He specified that the rotation accelerated rapidly and that the helicopter banked and rolled left. By reflex, he pulled on the collective pitch control to gain height. He thought that he had pushed the right pedal fully forward to counter the rotation but the action on the pedal was either ineffective or blocked. After approximately two turns, according to the pilot, realising that he was unable to regain control, he decided to bring the helicopter to the ground. He stated that the impact was violent and that the helicopter bounced before coming to a stop on its skids. He shut down the engine and stopped the rotor prior to ordering the evacuation of the helicopter.

The pilot stated that he knew that the anemometer at the aerodrome was unavailable. When he boarded the helicopter, he noted that the wind was very light but that there was a storm to the west of the aerodrome.

He also stated that he had told the passenger sitting in the front not to touch the controls and in particular the cyclic pitch control. He stated that he could not see the pedals or the position of the passenger's feet from his seat.

Furthermore, he stated that he had never removed or reinstalled the dual controls and that he didn't know how to remove them. He explained that he had been told that it was complicated and he had therefore never considered removing them.

After the accident, the passenger told the pilot that she could not recall the position of her feet during the take-off.

2.4 Viewing of aerodrome surveillance camera footage

The aerodrome camera shows the parking area where the helicopter was parked. It shows the aft of the helicopter (tail boom and tail rotor), some of the main rotor blades and the windsock located on the other side of the runway.

The helicopter was parked in parking area S8 and facing north-east.

Start-up to hover took approximately four minutes. During the start-up, the windsock indicated a fairly light westerly wind of around 5 kt. An increase in the wind speed as well as fluttering of the windsock (close to horizontal) was also observed which could indicate the presence of gusts lasting several seconds before hover.

On entering hover, a movement of the tail boom (departure in left yaw of the helicopter) with a right bank can be observed before the helicopter disappears from the camera's field of vision after a few seconds.

The remainder of the period of loss of control and the accident were no longer in the camera's field of vision.

2.5 Meteorological information

The meteorological conditions observed at the aerodrome based on the surveillance camera footage at the time of the accident were as follows:

- ❒ westerly wind of approximately 5 kt with gusts;
- ❒ broken clouds (altocumulus);
- ❒ visibility greater than 10 km.

As the anemometer installed at the aerodrome was not available (unavailability signalled by NOTAM), it was not possible to obtain an accurate read out of the wind at the time of the accident.

2.6 Stop of yaw rotation

During a departure in yaw rotation of the helicopter, pilots must act rapidly and appropriately to prevent loss of control and an accident. The appropriate action of the pilot on the pedals to counter the yaw rotation will not stop the rotation immediately. This delay may lead the pilot to think that their corrective action is either incorrect or ineffective due to a tail rotor failure.

While this action on the pedal will result in the reduction of the yaw rate (°/s), zeroing this rate and therefore stopping the rotation will only occur if the pilot keeps the pedal pushed fully forward.

This phenomenon of unanticipated yaw at low speed was the subject of two Safety Information Notices (SIN) published by AIRBUS HELICOPTERS in July 2019:

- SIN No 3297-S-00: For helicopters on which the main rotor rotates clockwise and on which the loss of control in yaw generally occurs to the left.
- SIN No 3298-S-00: For helicopters on which the main rotor rotates counterclockwise and on which the loss of control in yaw generally occurs to the right.

In the case of F-GNLM, the rapid rotation in the immediate vicinity of the ground led the pilot, by reflex, to want to gain height to move away from the ground. This reaction resulted in an action on the collective pitch control and led to an increase in engine power up to the maximum torque. This action accentuated the reaction torque and therefore the rotation in yaw to the left. It also reduced the power available for the tail rotor, thus the effectiveness of the pilot's action on the right pedal, and delayed the stopping of the rotation.

3 - CONCLUSIONS

The conclusions are solely based on the information which came to the knowledge of the BEA during the investigation. They are not intended to apportion blame or liability.

Scenario

On entering hover, it is likely that the pilot's insufficient action on the right pedal caused the helicopter to rotate left around the yaw axis. Taking into account the proximity to the ground and the rapid rotation, the pilot wanted to gain height by increasing the power required for the main rotor to ensure climb. This action increased the torque to be countered by the tail rotor whilst reducing its available power and therefore its effectiveness. The yawing movement to the left of the helicopter increased. Unable to regain yaw control of the helicopter, the pilot changed his mind and decided to bring the helicopter to the ground by lowering the collective pitch control.

Contributing factors

The following factors may have contributed to the occurrence of the loss of yaw control during hover:

- The pilot not controlling the position of the feet of the passenger sat in the front taking into account the presence of the dual controls, that may have hampered or prevented movement of the pedals.
- The insufficient input of the pilot on the right pedal during hover and probably with a turbulent tailwind.