



Accident to the GUIMBAL - CABRI - G2
registered **F-HPTI**
on 3 April 2021
at Saint-Georges-de-Reneins

Time	Around 13:45 ¹
Operator	Savoie hélicoptères
Type of flight	Instruction
Persons on board	Instructor and student-pilot
Consequences and damage	Helicopter substantially damaged
This is a courtesy translation by the BEA of the Final Report on the Safety Investigation. As accurate as the translation may be, the original text in French is the work of reference.	

**Engine failure during forward movement at take-off,
emergency running landing, overturn, in instruction**

1 HISTORY OF THE FLIGHT

Note: the following information is principally based on the instructor and student-pilot statements.

The student-pilot, accompanied by an instructor, took off from a dirt track for a flight bound for the helicopter landing site of the flying club located at Marnaz (Haute-Savoie). After entering hover, he positioned the helicopter into the northerly wind, then flew forward into climb. During climb, around 15 m from the ground, a clacking noise was heard and the helicopter jolted abruptly and yawed. The instructor reacted by slightly lowering the collective pitch lever to relieve the stress on the engine. He told the student that he was taking the controls and that he planned to return to land on the dirt track. He then carried out a left U-turn and continued flying southward. To avoid having a descent rate that was too high, he planned to fly beyond the dirt track, then to make another U-turn (that was not made) before landing at the point from which they had departed facing into the wind. Near the dirt track, heading south at a height of around five metres and at a speed of just below 30 kt, the engine power decreased and a continuous aural signal sounded in the cabin. The instructor continued the descent and now decided to land in the field opposite. The front part of the skids made contact with a tarpaulin covering the field and sank into the loose soil. The helicopter tipped forward, damaging the main rotor and breaking the tail boom. The helicopter then came to a stop and tipped over onto its left side.

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



Figure: accident site (Source: BEA)

2 ADDITIONAL INFORMATION

2.1 Meteorological information

The meteorological conditions estimated by Météo-France were as follows: wind from 360° of 14 to 16 kt; gusts up to 30 kt; visibility greater than 10 km; a clear sky to few clouds; temperature of 12°C; dew point temperature of 2°C; QNH 1018 hPa.

2.2 Student-pilot information

The 27-year-old student-pilot was training for his Private Pilot Licence - Helicopters (PPL(H)).

Since starting his flights around three months earlier, he had logged 69 flight hours, 33 hours of which on the Guimbal Cabri G2, the helicopter on which he planned to take his practical PPL(H) exam.

He had made four other instruction flights with the same instructor on the day of the accident and had logged 2 hours and 36 minutes of flight.

2.3 Instructor information

The 36-year-old instructor held a Commercial Pilot Licence - Helicopters (CPL(H)) obtained in April 2017, as well as an instructor rating obtained in October 2017, an Airbus AS350/EC130 type rating obtained in April 2018 and a Guimbal Cabri G2 type rating obtained in December 2018.

He had logged 1,693 flight hours. In the three months prior to the accident, he had flown 157 hours, 86 hours of which on the Guimbal Cabri G2.

2.4 Information about the earlier flights of the student-pilot and the instructor on the day of the accident

A first flight lasting 18 min was made with an Airbus AS350 B3e.

A second flight, also lasting 18 min, was made with another Airbus AS350 B3e.

A third flight lasting 1 h 30 min, including runway circuits with a simulated tail rotor failure and autorotations, was made with F-HPTI.

A fourth flight lasting 30 min and bound for a dirt track at Saint-Georges-de-Reneins was made with F-HPTI. Upon their arrival at 12:30, the instructor and the student-pilot had lunch at the house of people who lived nearby. This was the seventh time that the instructor had flown to this location by helicopter, and the student-pilot's first time.

2.5 Student-pilot's statement

He stated that for the accident flight, the wind was steady and did not pose any particular difficulty.

He explained that the clacking noise was intermittent and that the helicopter jolted and yawed from time to time.

He added that when they flew in a southerly direction over the point initially scheduled for landing, he noticed a reduction in rotor revolutions and a continuous aural signal sounded.

2.6 Instructor's statement

He explained that there was an established northerly wind of around 20 kt and that he had not felt any gusts.

When the helicopter started to jolt and yaw, he thought a minor failure had occurred after take-off. His strategy was then to return to land on the dirt track, facing into the northerly wind.

Following the activation of the continuous aural signal, he considered that he was now facing a major failure situation and that he needed to land straight ahead, cushioning contact with the ground. He thought that the continuous aural signal could indicate one of two things:

1. the rotor revolutions were low;
2. the engine igniters were still "on" although the engine had just stopped. This aural signal normally sounds to remind pilots, who have just landed and switched off the engine, to switch off the engine igniters.

He did not know which of the two scenarios was correct. He specified that he did not have time to look at the tachometer needles or to check the status of the oil pressure light.

He thought that, just before contact with the ground, the engine was making less noise as if idling. He added that it is possible that the engine was no longer operating when the helicopter made contact with the ground.

He explained that the skids were at the same level and that their front section made gentle contact with the ground that was completely flat in this part of the field.

He specified that the helicopter must have tipped forward due to the loose soil rather than the wind.

2.7 Helicopter information

2.7.1 Engine

The Guimbal Cabri G2 is equipped with a Lycoming O-360-J2A flat-four engine delivering 145 hp² comprising one intake valve and one exhaust valve per cylinder.

2.7.2 Maintenance

F-HPTI entered into service in December 2018 and had flown 651 flight hours at the time of the accident. The engine was the original engine and it had the same number of operating hours as the airframe.

The cylinder compression was last checked during the 50-hour maintenance inspection on 1 and 2 February 2021. The measurements were deemed acceptable and were not recorded.

The last maintenance inspection of the helicopter, performed at 100 hours, was completed on 11 March 2021 at 605 flight hours. Actions on the engine included:

- an inspection of the engine items requiring special attention as per Lycoming Service Instruction No. 1080C³;
- an inspection of the exhaust valves as per Lycoming Service Bulletin No. 388C⁴. This inspection is performed to prevent the occurrence of engine failure due to:
 1. excessive carbon build-up between the valve guide and valve stem resulting in sticking valves,
 2. broken exhaust valves which result from excessive wear (bell-mouthing) of the exhaust valve guide;
- an oil change with AERO DM 15W50 type oil (as for previous draining operations), replacement of the oil filter and an inspection of the oil suction strainer. No metal contamination was observed during these operations;
- inspection of the magnetos, which did not reveal any anomaly;
- replacement of the spark plugs.

The helicopter had logged approximately 45 flight hours between this inspection and the accident flight.

2.7.3 Flight manual

The flight manual indicates that an engine failure can be detected by:

- yaw acceleration, nose to the right;
- a decrease in the engine noise level;
- desynchronization of the tachometer needles;
- OIL P warning on the EPM and OIL P red light coming ON;
- Plasma beeper⁵;

² At maximum continuous power.

³ <https://www.lycoming.com/content/service-instruction-no-1080c>

⁴ <https://www.lycoming.com/content/service-bulletin-no-388c>

⁵ The Cabri G2 is equipped with two ignition systems, one conventional magneto system and one Plasma electronic ignition system.

- a decrease in the rotor speed and “low NR” horn, which sounds continuously when the rotor speed drops below 466 rpm.

2.8 Examination of the helicopter

One of the main rotor blades caused the tail boom to separate forward of the horizontal stabilizer at a skew angle, indicating a low rotation speed of the rotor.

The examination of the main gearbox (MGB), the rotor head and the Fenestron tail rotor did not reveal any anomaly that could have caused the accident.

Externally, the engine was clean and presented no cracks. The oil filter was clean and no metal particles were observed in the oil collected. The fuel filter was also clean.

Several cylinder compression measurements were taken without starting up the engine again. Unlike the other three cylinders, the pressure did not rise in cylinder No. 1.

The endoscopic examination of the cylinder combustion chambers did not reveal any anomaly. In particular, that of cylinder No. 1 revealed no particles, striation or abnormal debris.

Although not measured, a slight gap was detected at the two valve seats of cylinder No. 1. After removing all of the springs from the engine valves, the valve stems were moved, and there were no friction points or abnormal friction. After reinstalling the springs, the pressure in cylinder No. 1 was measured at a value similar to that of the other cylinders.

The complete tear-down of the engine by a maintenance workshop revealed:

- a marked quantity of carbon deposits on the two valve seats and on the piston of cylinder No.1;
- damage to the exhaust valves and coking of the intake valves on all the cylinders.

The workshop estimated that the valves had not seized and that the carbon deposits on cylinder No. 1 could not have caused the engine malfunction.

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

Shortly after take-off, the helicopter jolted and yawed and a clacking noise was heard. The instructor, thinking that the failure was minor, turned around to fly back to the area from which they had taken off. During this manoeuvre, the engine power reduced, possibly due to a sealing fault at the valves of one of the cylinders. The instructor then decided to make an immediate landing, with a tailwind of around 15 kt. During the running landing in a field with loose soil, punctuated with grooves and covered with a tarpaulin, the helicopter first tipped forward and then onto its side.

The BEA investigations are conducted with the sole objective of improving aviation safety and are not intended to apportion blame or liabilities.