



Accident to the Guimbal "CABRI" G2 registered F-HRCR

on 31 January 2019

at Pierrevert (Alpes-de-Haute-Provence)⁽¹⁾

⁽¹⁾Altitude 375 m.

⁽²⁾Unless otherwise stated, all times given in this report are in local time.

Time	Around 12:45 ⁽²⁾
Operator	Aix Hélicoptères
Type of flight	Cross country
Persons on board	Pilot and one passenger
Consequences and damage	Pilot and passenger injured, helicopter destroyed
This is a courtesy translation by the BEA of the Final Report on the Safety Investigation published in February 2020. As accurate as the translation may be, the original text in French is the work of reference.	

Loss of yaw control on final, collision with ground, roll-over

1 - HISTORY OF THE FLIGHT

The pilot, accompanied by a passenger, took off at about 11:30 from Aix-Les-Milles aerodrome (Bouches-du-Rhône), bound for a helipad⁽³⁾ located on a golf course in Pierrevert (Alpes-de-Haute-Provence). After passing south of his destination, he flew east before heading towards the helipad. He did not overfly the helipad but made a wide right turn to land facing the northwest. On final, at a height of about 30 m, the helicopter suddenly began yawing to the left. The helicopter rotated several times losing height, then hit the ground and rolled over.

2 - ADDITIONAL INFORMATION

2.1 Examination of the site and the wreckage

The wreckage was located approximately 150 m upwind from the touchdown area. Between the wreckage and the helipad are two trees, measuring ten and six metres in height respectively. The wreckage was lying on its right side. The front right part of the cockpit was destroyed. Some components of the helicopter were strewn across a radius of ten metres around the wreckage.

The failures observed on the aircraft's tail-boom were caused by its collision with the ground. As a result of the accident, a fuel system union broke upon impact and fuel spilled on the ground.

The collective pitch lever was close to the maximum high position.

The examinations of the flight controls, the main rotor, the Fenestron and the governor⁽⁴⁾ did not identify any failures that contributed to the accident.

⁽⁴⁾Power controller.

2.2 Helicopter Information

2.2.1 General

The Guimbal CABRI G2 is equipped with a Fenestron whose manoeuvrability has been demonstrated with a 35 kt wind in all directions. The three-blade main rotor rotates clockwise⁽⁵⁾. At the time of the accident, the helicopter was within the weight and balance envelope and was not at its power limit with respect to its configuration and altitude.

2.2.2 Yaw control during approach

The F-HRCR helicopter flight manual included service letter SL12-001 A, “Yaw Control in Approach”⁽⁶⁾, which was issued by the manufacturer Hélicoptères Guimbal⁽⁷⁾. This document alerts pilots to the specific characteristics of helicopters equipped with a Fenestron, such as the Cabri G2.

The service letter states, for example, that, when approaching the ground, if the pilot does not maintain a zero sideslip when reducing speed, this tends to cause the helicopter to depart in left yaw, requiring the pilot to apply a quick and large right pedal input. A significant aggravating factor is a crosswind coming from the right.

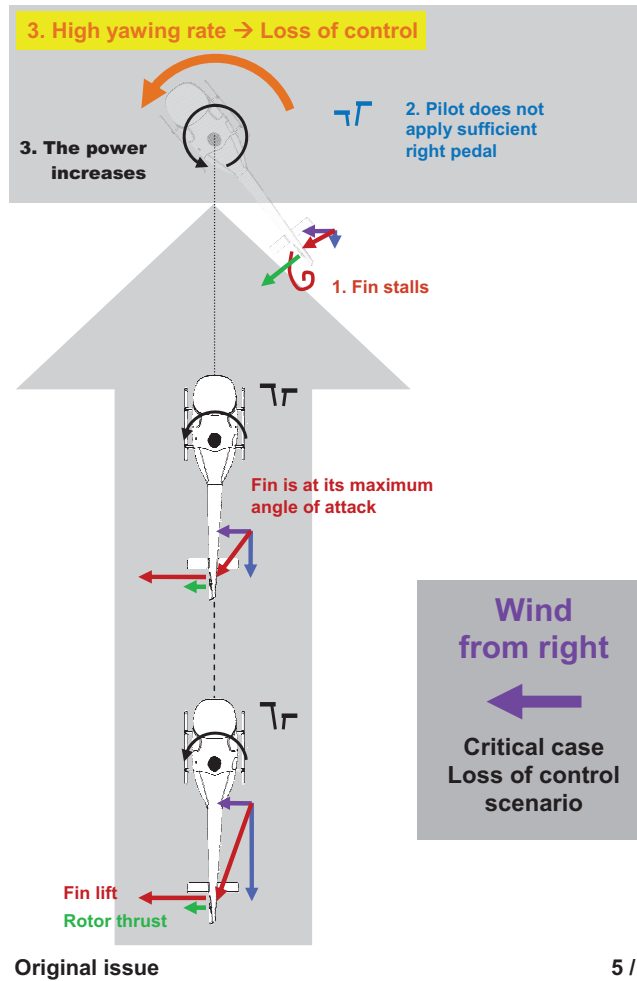
The pilot may, in such cases, be surprised by the departure in yaw and instinctively raise the collective lever to counter a possible descent of the helicopter, thereby accelerating the yaw to the left. If he reacts too slowly, allowing the helicopter to yaw left, he will experience additional leftward acceleration as the Fenestron passes through the wind due to the windvane effect. The combination of these factors can cause a mild to severe departure in yaw if the pilot is slow to apply enough right pedal.

This departure can always be stopped by a full right pedal input.

⁽⁵⁾ The main rotor on the ROBINSON R22 and R44 rotates anti-clockwise.

⁽⁶⁾ <https://extranet.guimbal.com/link/F1Sx57TKVP7MMY5>

⁽⁷⁾ Published in June 2012.



5 / 10

Source: Guimbal

Figure 1: critical case: loss of control scenario with wind coming from right

⁽⁸⁾ Date at which commercialisation of the CABRI G2 started.

Over the period 2008⁽⁸⁾-2018, the BEA has identified 12 occurrences involving GUIMBAL Cabri G2 helicopters and uncontrolled departures in yaw. Of these, at least three occurrences mentioned insufficient right pedal input by the pilot and at least two events indicated inappropriate reactions by the pilot, who pulled on the collective lever.

The risk of experiencing an uncontrolled departure in yaw is similar with a conventional tail rotor or a Fenestron. However, with a Fenestron, the response curve is different and the amount of pedal deflection is greater.

2.3 Meteorological information

The meteorological conditions estimated by Météo-France at the accident site were as follows: mean wind of 3 knots from 060°, gusts from the north-east less than 10 knots near the ground, visibility greater than 10 km, broken clouds, temperature +3°C. These wind conditions were very similar to the critical case presented in the service letter.

⁽⁹⁾ He obtained his Cabri G2 rating after a three-hour training course at a flying school at Aix-les-Milles aerodrome, followed by a further five hours or so of study of the specific features of the Fenestron.

⁽¹⁰⁾ European Aviation Safety Agency.

2.4 Pilot

The pilot had held a PPL(H) helicopter private pilot licence since July 2017. He had held the R44 rating since July 2017, the R22 rating since September 2017 and the Cabri G2 rating since October 2018⁽⁹⁾. He had logged a total of 244 flight hours, of which 157 hours on the R44, 71 hours on the R22 and about 15 hours on type. In the previous three months, he had flown 15 hours, of which about 10 hours on type.

He had completed additional training in landing in confined areas in July and August 2017, during which he acquired practical experience in how to perform a reconnaissance of an off-airfield touchdown area and how to estimate wind direction and strength. He then completed the Robinson R22 safety course in February 2018. He had already landed on this helipad four or five times in the past.

2.5 Survival aspects

The certification specifications for small rotorcraft are defined in CS27 drawn up by EASA⁽¹⁰⁾. Each of the F-HRCR's seats was equipped with an energy-absorbing device that complied with specifications. The device functioned in accordance with the certification specifications.

CS27 stipulates in particular that *"Each occupant's seat must have a combined safety belt and shoulder harness with a single-point release."* Both occupants had their seat belts fastened. These belts were of the four-point type with a shoulder harness and lap belt buckle. The lap belt buckle is unlocked by rotating it, which releases the harness' outer strap. The buckle remains attached to the harness' inner strap. The user must then pass his arm from the inside to the outside to free himself from the shoulder of the harness.

The passenger was unable to release herself or extract herself from the wreckage, which was lying on its right side, due to her injuries. The straps of the harness, which were taut under her weight, constrained her and prevented the buckle from unlocking. A person that had come to lend assistance was also unable to turn the buckle and had to cut the straps to get the passenger out of the wreckage. The pilot, who had lost consciousness, also had to be evacuated from the wreckage by the witnesses before the emergency services arrived.

2.6 Witness statements

2.6.1 Pilot

The pilot explained that he did not remember either the loss of control on final or the accident itself. He asked the passenger to help him assess the strength and direction of the wind on the ground, but could not remember whether he had confirmed the wind or not.

He indicated that, in December 2018, he had landed on the helipad in a Cabri with a passenger. He explained that, on that day, there was a Mistral wind and that the wind was north-north-easterly in direction. He had been surprised by a change in wind direction when he flared the helicopter on the helipad. On final of the accident flight, he had intended, before losing control of the helicopter, to turn to the right to land into the wind.

He stated that he felt significantly less at ease in the Cabri than he did in the R44, and may not have applied sufficient right pedal input to counter the helicopter's departure in left yaw. He could not remember the substance of Guimbal's service letter. The investigation was unable to determine whether this was due to post-traumatic shock as a result of the accident.

2.6.2 Passenger

She explained that, upon arriving in the vicinity of Pierrevert, the pilot asked her to assist him in locating the golf course and assessing the wind. She explained that she was unable to find any significant indications on the ground. On final, the helicopter suddenly began to spin around and then hit the ground. After the accident, she explained that the taut straps prevented her from opening the buckle.

2.6.3 Witness on the ground

An employee of the golf course reported that, on final, the helicopter suddenly entered a flat rotation to the left. After one or two turns, the tail boom began to drop. The helicopter completed at least four more turns and then the tail boom touched the ground, with the airframe tilted slightly to the right.

After the accident, he assisted the two occupants of the helicopter because there was a leak and a strong smell of fuel. He attempted to free the passenger but was unable to unlock her seat-belt buckle. To free the passenger and then the pilot, he had to use a knife to cut the four straps on each seat.

2.7 Information about the helipad

The helipad is located on the green of one of the golf courses. There was no windsock to indicate the wind direction⁽¹¹⁾. According to the golf course manager, helicopters had been landing on the golf course for about three years. Pilots had to call ahead to get clearance⁽¹²⁾. No instructions were given to the pilots when they called. When the pilots came for the first time, the flag on the green was removed and a person on the ground gave hand signals to indicate where to land. The touchdown area was not mentioned on the golf course's website and there were no instructions for its use. There was no flight register.

2.8 Read-out of flight recorder data

The helicopter was equipped with a Multi-Purpose Display (MPD)⁽¹³⁾. The read-out of the data recorded by the MPD did not reveal any failures that could explain the accident.

A portable electronic tablet was recovered. It was possible to reconstruct the flight path of the occurrence (see Figure 1) using the data recorded in the MACH7 application.

⁽¹¹⁾ This is not a requirement for helipads. It is the pilot's responsibility to estimate the wind.

⁽¹²⁾ The pilot had called at about 10:45 to ask where to land. He had indicated that he would land next to the golf course restaurant.

⁽¹³⁾ Glass cockpit-type avionics system installed on the instrument panel and designed to display flight and engine data. It records in particular sensor failures from the last flight without dating them, and also logs refuelling performed on the last flights.

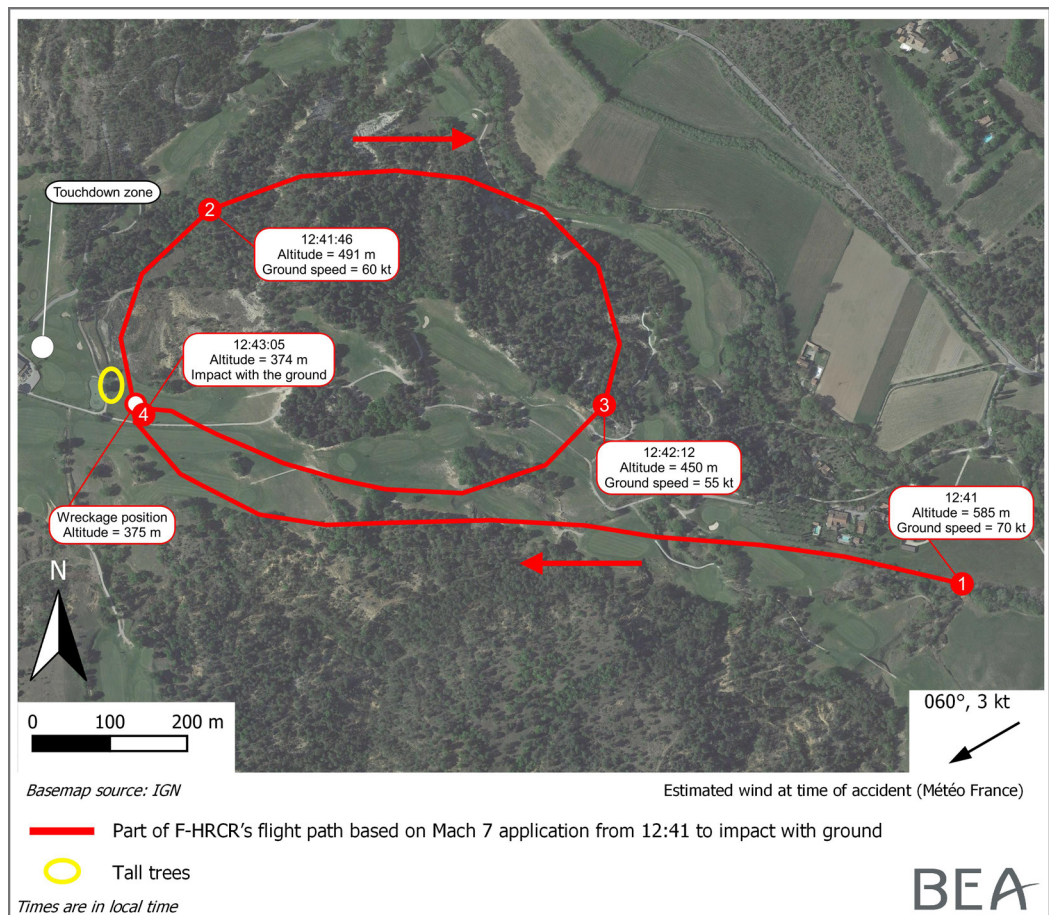


Figure 2: accident flight path

It was possible to retrieve the flight path for the December flight mentioned by the pilot. It shows that he had flown an almost identical approach along the same path, but slightly further north with, according to the pilot, a north-north-easterly wind. Unlike on the accident flight, the pilot had conducted a helipad reconnaissance that day.

3 - LESSONS AND CONCLUSION

While approaching from the west, it is likely that the pilot saw the helipad and headed southward so that he could fly back towards the helipad in a west facing direction. Having already landed on this helipad, it is probable that he wanted to directly assess the factors required to make a decision about landing (air safety, ground safety, power, wind, approach path, etc.) while making a 360° turn, and then line up for final. This practice restricted his ability to evaluate the strength and direction of the wind and his choice of existing approach paths. On final, he did not modify his flight path to avoid flying over tall trees even though the environment allowed him to do so. At this point, he was flying at a low airspeed, out-of-ground effect, with a crosswind from the right with a tailwind component. These conditions were conducive to an uncontrolled departure in yaw.

The pilot was not at ease with the Cabri G2 and more accustomed to flying helicopters with a main rotor which rotates anti-clockwise. He was probably surprised and destabilized by the departure in left yaw and probably did not counter it with sufficient speed or right pedal input. This rotational movement may then have been exacerbated either by an inappropriate reflex action by the pilot on the collective lever or pedal, or by a combination of both. The pilot was unable to stop the rotation and then lost yaw control of the helicopter, which hit the ground and rolled over.

The loss of yaw control was the result of the pilot not taking sufficient account of the wind on final and late or inappropriate action to counter it. The choice of flight path whereby the helicopter flew out-of-ground effect contributed to placing the helicopter in a position from which it was difficult to recover.