



## Accident to the BELL 47 G2 registered F-GBOO

on 26 April 2020

at Sète - Domaine Listel (Hérault)

<sup>(1)</sup> Except where  
otherwise indicated,  
the times in this  
report are in  
local time.

<b>Time</b>	Around 11:50 <sup>(1)</sup>
<b>Operator</b>	Giragri 17
<b>Type of flight</b>	Spraying flight, mosquito control
<b>Persons on board</b>	Pilot
<b>Consequences and damage</b>	Helicopter destroyed, pilot injured
This is a courtesy translation by the BEA of the Final Report on the Safety Investigation published in August 2021. As accurate as the translation may be, the original text in French is the work of reference.	

## Loss of yaw control during a spraying flight, collision with ground and fire

### 1 - HISTORY OF THE FLIGHT

*Note: the following information is principally based on statements and data contained in the pilot's tablet.*

On the day of the accident, the pilot of F-GBOO began his morning at 07:15 with spraying operations in the commune of Vendres (Hérault). He treated several plots and made four rotations of about fifteen minutes each. He continued with the Listel sector (Commune of Sète) where he conducted three rotations of a duration equivalent to the preceding ones. Between each rotation, the pilot landed on a prepared helipad near the spraying areas, where he refuelled and refilled the treatment tanks with larvicide.

At 11:49, the pilot took off from the helipad to reach the next plot to be treated, located approximately five kilometres to the northeast. In straight flight, at a height of about 20 m, the pilot reported that he heard a noise (like something going off track) coming from the rear of the cockpit and that the helicopter began to yaw to the right, and even a full left pedal input did not enable him to regain control of the path. He stated that he alternately applied left and right pedals to check their effectiveness and noted a variation in yaw rotation speed (increase when right pedal was applied and decrease when left) without being able to stop the movement. He explained that the helicopter rotated several times (he estimated at least ten times), before crashing on its left side into a field of reeds. His low flying height made it difficult to perform an autorotation.

Despite his injuries, the pilot managed to escape from the airframe before the right-hand fuel tank caught fire. The fire then spread to the entire engine compartment and main gearbox (MGB).

## 2 - ADDITIONAL INFORMATION

### 2.1 Flight context

Two days earlier, two aircraft from the Delta 2 company crashed in the Narbonne area during a mosquito control spraying mission. Entente Inter Départementale Méditerranée (EID), which was in charge of this mission, then contacted Giragri 17 to continue it. The accident flight was part of this mission. The social context was particular because of the lockdown related to the COVID-19 pandemic. As a result, recreational aviation was prohibited. However, public interest flights were authorized.

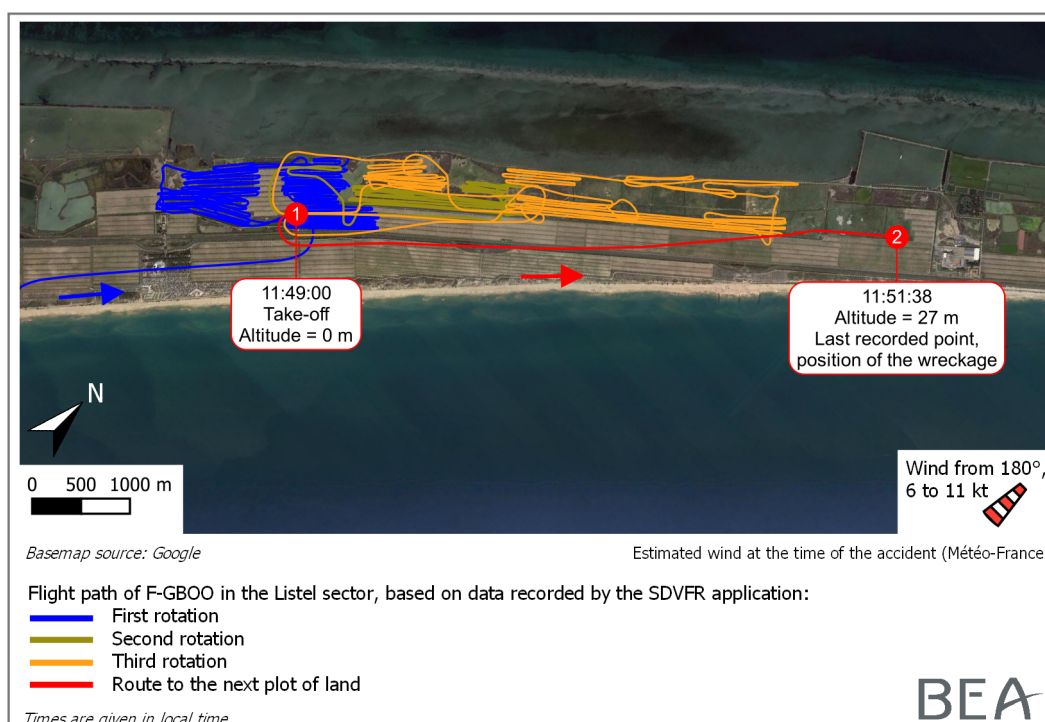
### 2.2 Helicopter information

The Bell 47G-2 is a light helicopter equipped with a counter-clockwise rotating see-saw two-blade main rotor and a Lycoming VO-435-A1 piston engine. It is equipped with two interconnected tanks and has a maximum fuel capacity of 162 litres, 155 litres of which are usable.

The F-GBOO was equipped with “Simplex” spraying equipment for mosquito control, including two tanks for larvicide (total capacity 208 litres) and two spray booms.

The maximum take-off weight of the helicopter is 1,111 kg. The empty weight of F-GBOO is 777 kg, including the 78 kg of the Simplex. The larvicide tanks were full and the fuel tanks contained approximately 70 litres. Under these conditions, the weight of F-GBOO approached the maximum weight indicated in the flight manual.

### 2.3 Flight path



F-GBOO path

The data from the GNSS computer installed on board F-GBOO as well as those from the pilot's tablet (SDVFR application) was used to reconstruct the accident flight path almost up to the loss of control, without the yaw rotations being visible. The recorded track confirms the path described by the pilot.

## 2.4 Estimated meteorological conditions on accident site

- ☐ wind from 180° of 6 to 11 kt (values recorded by the Sète station located approximately 6 km away);
- ☐ visibility: greater than 20 km;
- ☐ temperature and dew point: 19 °C/14 °C;
- ☐ QNH: 1,010 hPa;
- ☐ clouds: broken cumulus at low level;
- ☐ phenomena: sea breeze, light to moderate turbulence.

## 2.5 Examination of the wreckage

On the ground, the wreckage, not dispersed, was found in a field covered with rushes about 1.5 m high. The condition of the helicopter structure appeared to be consistent with a low level of energy upon collision with the ground and a steep left bank angle. The forces generated by the contact of a blade with the ground were such that they led to the failure of the MGB attachment.

The elevator, rudder and collective pitch controls were continuous. The continuity of the cyclic pitch control could not be checked.

The functionality of the rudder control was checked. The main rotor drive belts broke due to overload.

On impact, the front part of the drive line to the tail rotor separated from the MGB due to the failure of the MGB; the central part of the tail rotor drive failed suddenly due to overload. The drive line was probably continuous before contact with the ground. There was little damage to the tail rotor.

The engine was substantially damaged by the fire that occurred on the ground. The throttle control was jammed near the idle position. The free wheel and clutch had no damage or specificity. It is probable that these systems were operational before contact with the ground.

No mechanical failures were observed during the wreckage examination that could explain the loss of yaw control.

## 2.6 Pilot information

The 58-year-old pilot, who held a valid Commercial Pilot Licence - Helicopters (CPL(H)) at the time of the accident, had logged 3,175 flight hours, 3,100 hours of which in a Bell 47. The majority of these hours involved agricultural work and spraying. He had logged approximately 26 hours in the last 90 days.

Although the day's work started early, the pilot indicated that he had not felt any particular signs of fatigue. There was no particular pressure relating to the spraying activity that would have justified taking a risk. He was not performing any manoeuvres when he lost control.

### 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

The pilot took off from the prepared helipad after having refilled the tanks with larvicide and additional fuel. The helicopter was then close to the maximum take-off weight. The F-GBOO pilot made a short, straight, low-level transition from the refuelling site to the next plot to be treated. During this straight-line flight, the pilot lost yaw control and the helicopter rotated several times about the yaw axis before crashing into a field of rushes. The investigation did not bring to light any mechanical failure that could explain a yaw control failure of the helicopter.

The helicopter was roughly flying in a north-easterly direction, with a right-hand tailwind of about 10 knots and in light to moderate turbulence. It was heavy, close to maximum weight, and moving slowly. These conditions were conducive to an unanticipated yaw (commonly referred to as loss of tail rotor effectiveness (LTE)).

Although the scenario of a technical failure cannot be completely ruled out, the scenario of a loss of yaw control due to an unanticipated yaw is also possible.

This phenomenon is described in the DSAC document referenced below (available in French only):

[https://www.ecologie.gouv.fr/sites/default/files/Symposium2012\\_HE1.pdf](https://www.ecologie.gouv.fr/sites/default/files/Symposium2012_HE1.pdf)