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SAFETY INVESTIGATION REPORT

Accident to the ROBIN - DR400 - 120 registered F-GBUY on 18 November 2022 at Couhé-Vérac

Time	Around 15:55[1]
Operator	Aéroclub de Couhé-Brux et du Civraisien
Type of flight	Local
Persons on board	Pilot and one passenger
Consequences and damage	Pilot and passenger fatally injured, aeroplane destroyed
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.	

Collision with vegetation on final approach

1 HISTORY OF THE FLIGHT

Note: the following information is principally based on statements as well as radar data.

The pilot, accompanied by one passenger, took off from Couhé-Vérac aerodrome at 15:30 for a local flight. She had initially planned to perform a cross-country flight bound for Saint-Jean-d'Angély - Saint-Denis-du-Pin aerodrome (Charente-Maritime), but had changed her mind due to adverse weather conditions.

At approximately 15:50 (see **Figure 1**, point 2), she took a northerly route to fly back towards her departure aerodrome. At 15:54 (see **Figure 1** and **Figure 2**, point 3), about 500 m from the threshold of runway 02, she turned right to join the start of the downwind leg, in a left-hand circuit for runway 20.

Several witnesses on the ground reported that a dark cloud mass was moving towards the site from the north-west at that time and that rain began to fall on the aerodrome. A few minutes later, a shower, described by the witnesses as heavy and short, moved over the aerodrome.

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

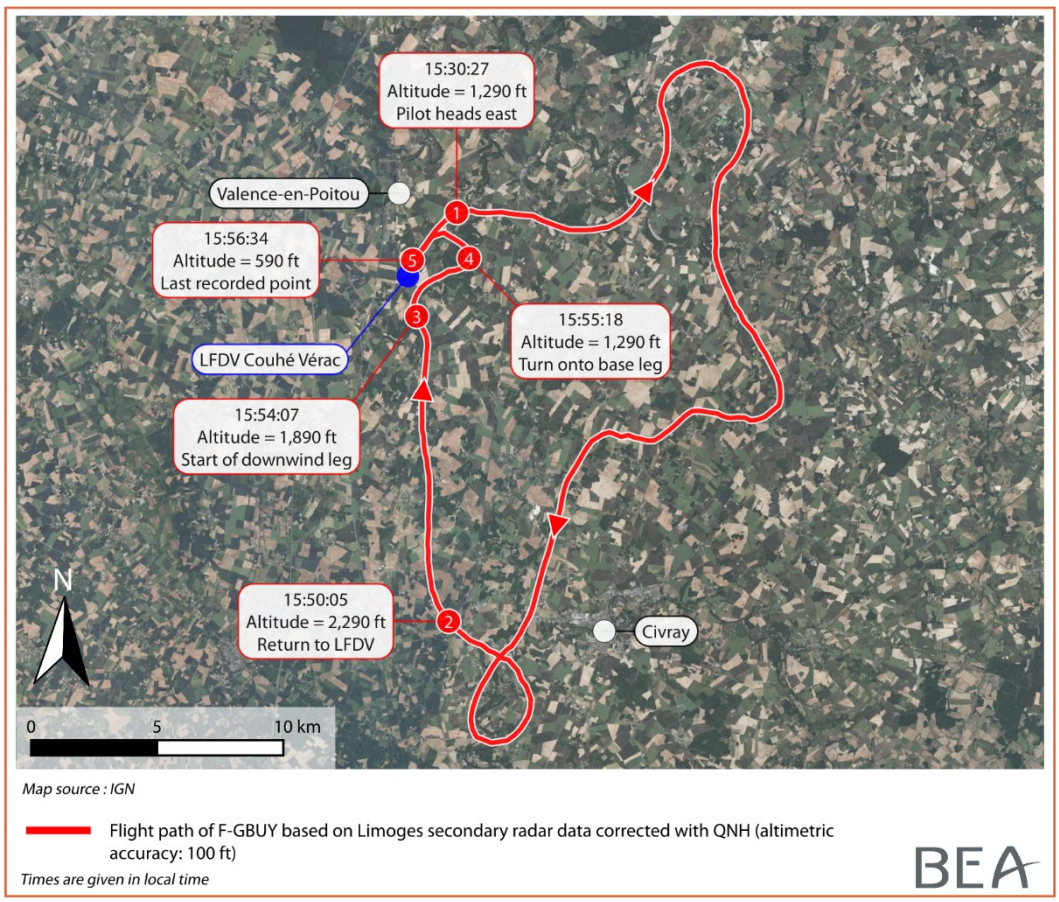

Figure 1: path of F-GBUY for the entire flight

The pilot flew the downwind leg along a path deviating from the extended runway and then turned onto the base leg at 15:55 (see **Figure 1** and **Figure 2**, point 4). On final, the aeroplane's path was not aligned with the runway. The pilot continued her descent. The aeroplane collided with chestnut trees bordering a path located around 50 m to the right of the edge of runway 20.

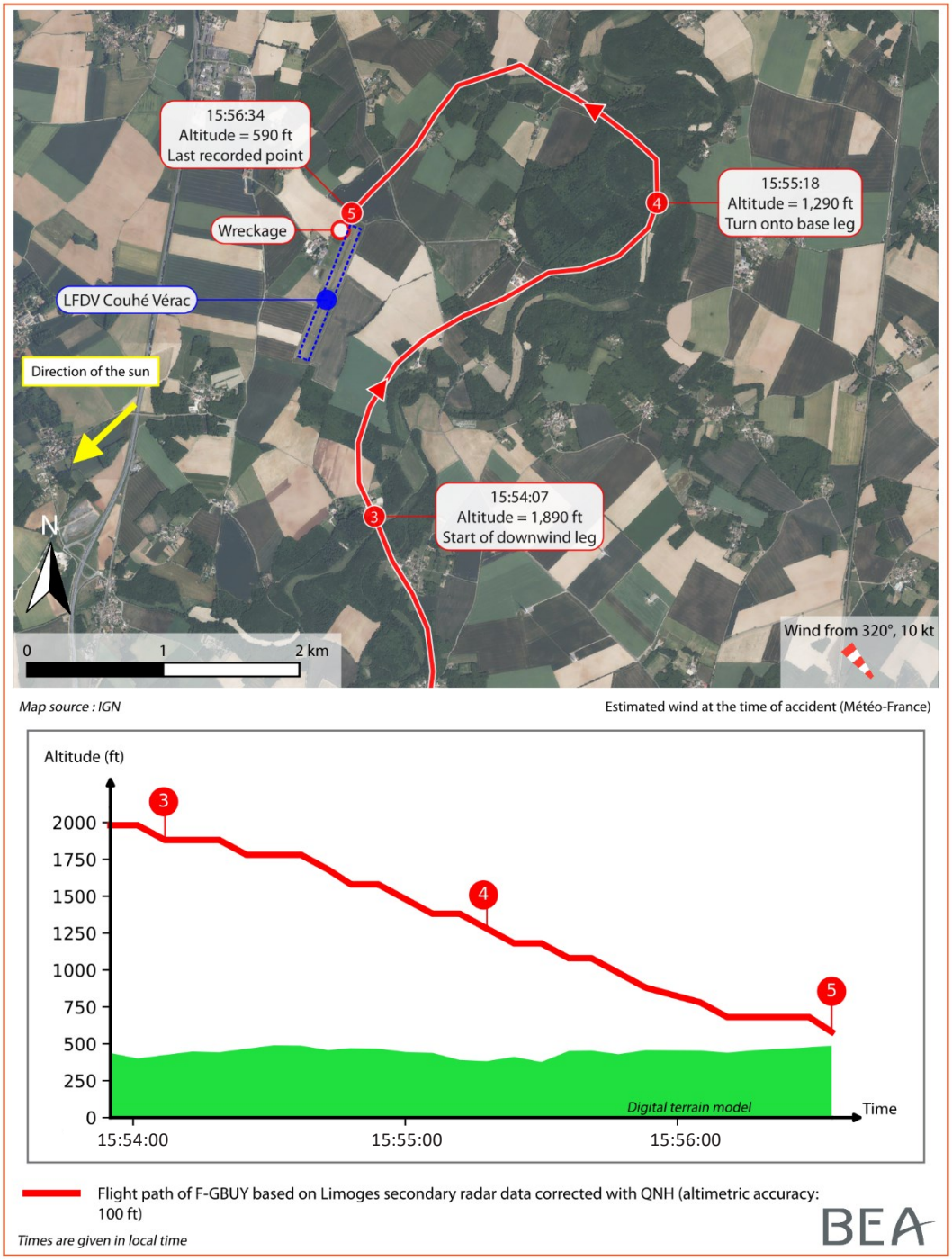

Figure 2: path of F-GBUY for the end of the flight

2 ADDITIONAL INFORMATION

2.1 Persons on board information

The 71-year-old pilot held a Private Pilot Licence - Aeroplanes (PPL(A)) issued in March 2007, along with a valid Single-Engine Piston (SEP) class rating. Her class 2 medical certificate included the requirement to wear corrective lenses. She also held a microlight pilot licence, along with a fixed-wing microlight rating with passenger-carrying privileges. She had logged 324 flight hours in aeroplanes, 5 hours and 10 minutes of which in the previous three months and 1 hour and 35 minutes of which during the previous month. All of these hours were flown on DR400s.

She was a member of the Aéroclub de Couhé-Brux et du Civraisien flying club. Her relatives indicated that she only wore her glasses for reading and near vision, but that she did not use them for flying.

The 73-year-old passenger also held a PPL(A) issued in 1989, along with a valid SEP class rating. His class 2 medical certificate included the requirement to wear corrective lenses and carry a spare set of spectacles in the cabin. He also held a microlight pilot licence issued in 1994, along with paramotor, fixed-wing and flex-wing microlight ratings with passenger-carrying privileges. He had logged approximately 1,150 flight hours.

The club's instructors described him as an experienced pilot and they regularly asked him to fly as a passenger with less experienced pilots of the club.

2.2 Aeroplane information

F-GBUY was a DR400-120, a four-seater aeroplane equipped with a Lycoming O-235-L2A engine delivering 118 hp. DR400s have a forward-sliding canopy and, like most light aircraft, do not have a windshield wiper system.

Figure 3: view of the canopy of F-GBUY (source: flying club)

The study of the maintenance documents did not find any element that might have contributed to the occurrence of the accident.

During the accident flight, the aeroplane's weight and balance were within the limits recommended by the manufacturer.

The last flight recorded in the logbook was a 45-minute local flight performed immediately before the accident flight. The exact quantity of fuel in the tanks before this flight could not be determined with accuracy. Fifty litres of fuel were added before the flight preceding the accident flight. The flight time between refuelling and the accident was approximately 1 h and 10 min. The average consumption of the DR400-120 mentioned in the flight manual is approximately 25 l/h. There was very probably enough fuel in the tanks for the accident flight.

2.3 Aerodrome information

Couhé-Vérac aerodrome is open to public air traffic. It has a main grass runway measuring 1,040 x 80 m, oriented 02/20[2], and a parallel microlight strip, also grass, measuring 507 x 20 m.

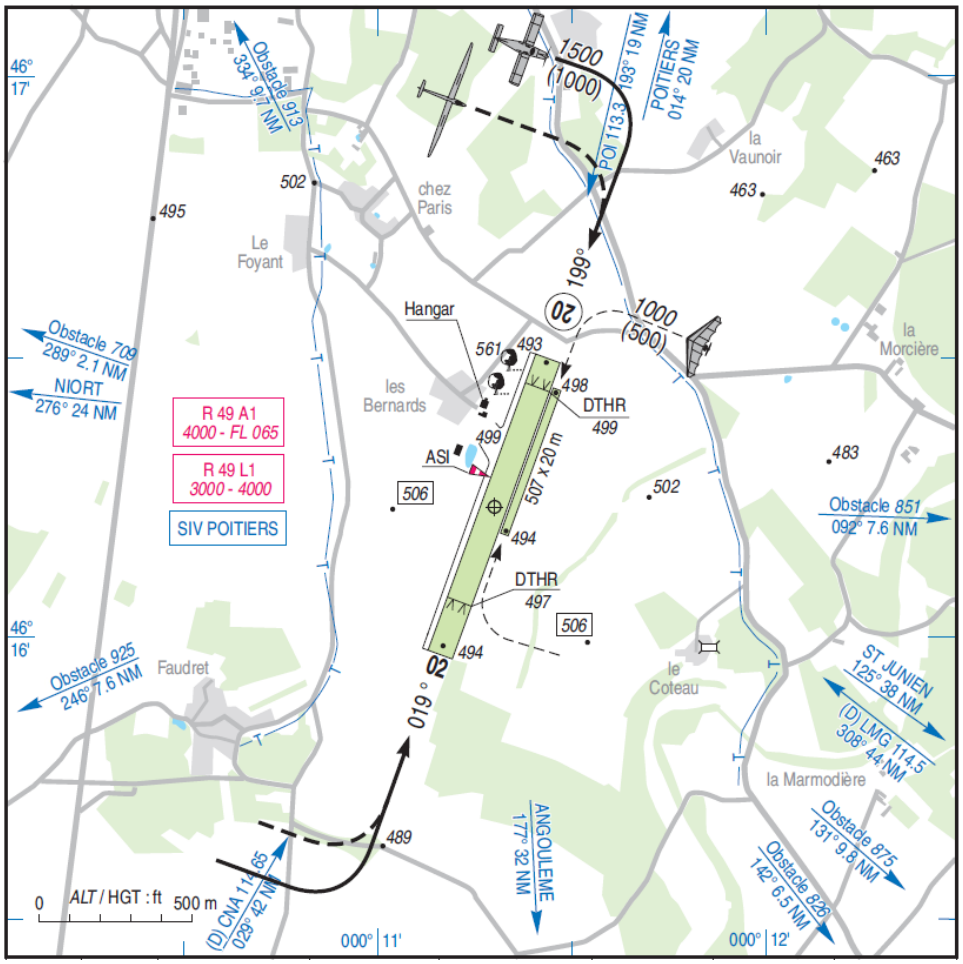

Figure 4: VAC chart for Couhé-Vérac (source: AIS)

The threshold of runway 20 is displaced by 101 m and marked with chevrons.

[2] QFU 019°/199°. Preferred QFU: 199° due to the displaced threshold.

The row of trees with which F-GBUY collided (see para. 2.5) is indicated on the VAC chart, on the right side of the runway. The altitude of the highest of these tree tops is reported to be 561 ft, i.e. 62 ft above the altitude of the displaced threshold of runway 20. The French civil aviation safety directorate (DSAC) carried out an audit at Couhé-Vérac aerodrome in 2021, which did not identify any discrepancies concerning these trees.

The aeroplane aerodrome circuit is made to the west of the runway at a height of 1,000 ft (i.e. an altitude of 1,500 ft), while the microlight aerodrome circuit is located to the east at a height of 500 ft (i.e. an altitude of 1,000 ft).

The club instructors who were questioned stated that the instructions are to try to observe traffic segregation between aeroplanes and microlights, but they added that some aeroplane pilots sometimes make their aerodrome circuit on the microlight side, when there is no interfering traffic, which enables them to keep sight of the runway on their side.

The area of approximately 400 m located before runway 20 is composed of farmland, as are the areas on either side of the runway at threshold 20. On the day of the accident, these plots were green due to the rainy conditions that prevailed since mid-November, and brown in areas where the soil was ploughed.

Figure 5: views of runway 20 on 19 November 2022 from a drone (source: GTA)

Based on the photos taken with a drone in good light and visibility conditions the day after the accident (see **Figure 5**), the approach end of the runway and displaced threshold markings, the runway side boundaries and the taxiway adjacent to the runway appeared to be barely visible with few contrasting elements for a pilot on approach. The grass runway barely contrasted with the surrounding plots.

The DSAC 2021 audit identified a discrepancy concerning the runway side markings, which at that time were missing or had faded. In response to this discrepancy, the aerodrome operator carried out work to restore these markings. However, the colour of these new markings was identified as "sand" by the DSAC, which does not comply with the applicable regulations[3] requiring white markings.

[3] Order of 28 August 2003 pertaining to conditions of approval of aerodromes and aerodrome operating procedures (Version in force on the day of the accident).

2.4 Meteorological information

Concerning the meteorological conditions, there was a low-pressure situation in the Couhé-Vérac region. An unstable westerly flow at surface level was present with a moderately active rear zone and scattered showers.

The meteorological conditions estimated by the French met office, Météo-France, at Couhé-Vérac aerodrome at around 16:00 were as follows:

- wind from 320° of 10 kt with gusts up to 25 kt;
- ground visibility between 2,000 m and 3,000 m;
- cloud cover: cumulonimbus clouds extending from 2,000 ft to 20,000 ft for one octat, towering cumulus (TCU) at 3,000 ft for seven octats, overcast sky (OVC) at 10,000 ft;
- temperature 10°C, dew point temperature 8°C;
- QNH 1009;
- possible presence of moderate turbulence.

The radar picture showed a rainfall episode moving over the aerodrome between 15:45 and 16:00 (see **Figure 6**). This disturbance arrived from the north-west of the aerodrome.

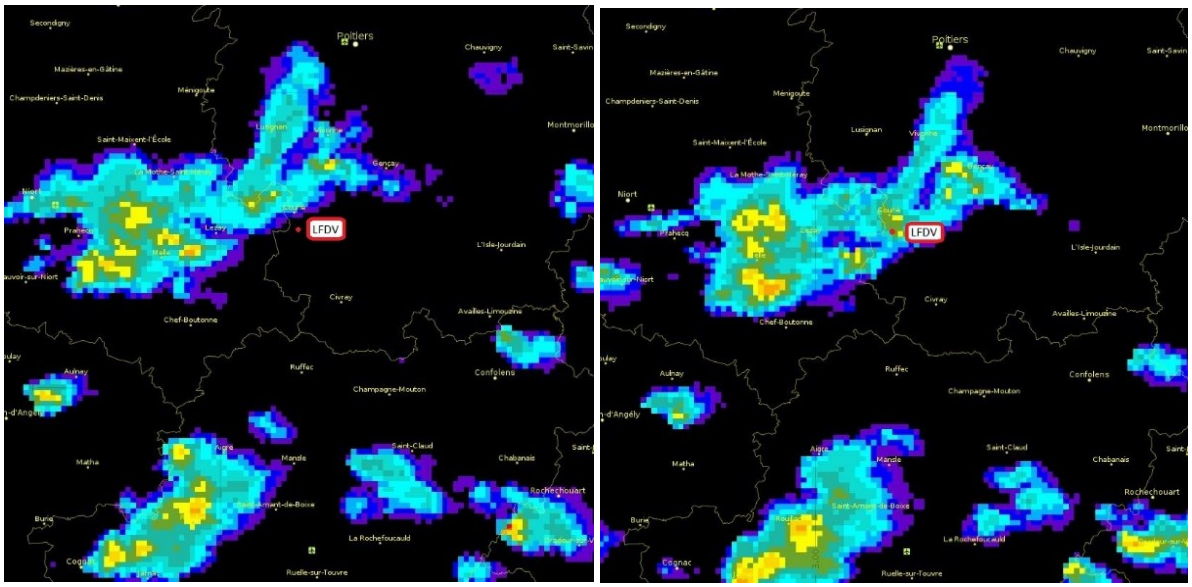

Figure 6: estimated instantaneous rainfall based on radar reflectivity at 15:45 and 16:00 (source: Météo-France)

A *wunderground* automatic weather station had been installed by the aerodrome's flying club. This station was not approved by Météo-France. According to the data extracted from this station, at the approximate time of the accident, the wind direction and intensity respectively varied between 240° and 280° and between 6 and 12 kt. The rainfall data recorded also indicated that a shower occurred between approximately 15:54 and 16:24.

Witnesses present at the aerodrome at the time of the accident described variable weather conditions, with alternating periods of sunshine, clouds or even showers. Some of them specified that at the time of the accident, a shower had just begun at the aerodrome.

Several witnesses stated that the pilot prepared her flight as usual, by logging on to the SOFIA-Briefing[4] website. For requests concerning Couhé-Vérac aerodrome, this website provides the METAR reports at aerodromes located nearby, i.e. Poitiers-Biard and Angoulême-Brie-Champniers airports. It can also be used to consult the SIGWX and WINTEM charts. The investigation was unable to determine the information that the pilot consulted on this website when preparing the flight.

The 15:00 automatic METAR report provided by the Poitiers weather station, located approximately 21 NM away, gave the following information:

- wind from 280° of 11 kt;
- visibility greater than 10 km;
- cloud cover: broken cloud layer (BKN) at 3,900 ft, 4,600 ft and 5,200 ft with cumulonimbus clouds;
- temperature 13°C, dew point temperature 4°C;
- showers temporarily reducing visibility to 3,000 m.

The amendment, at 14:36, to the 12:00 TAF forecast for Poitiers, gave the following information:

- wind from 250° of 7 kt;
- CAVOK;
- between 14:00 and 16:00, moderate probability of temporarily reduced visibility at 3,000 m with rain showers and a broken (BKN) cumulonimbus cloud layer with a base at 2,500 ft.

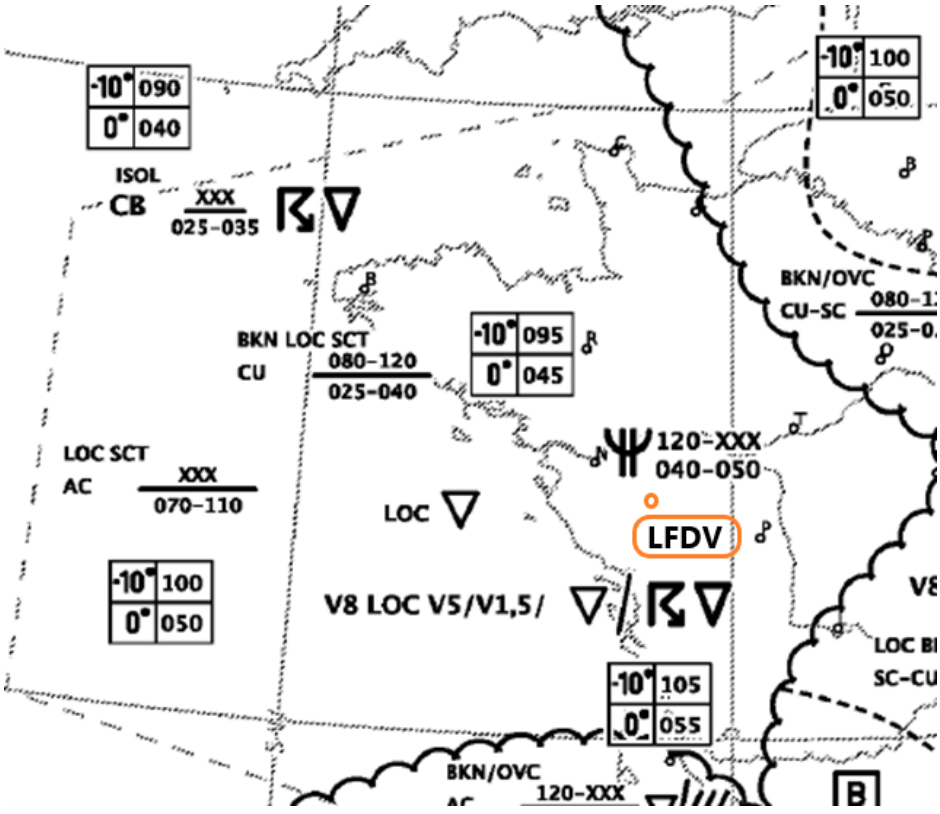

Figure 7: excerpt from the SIGWX chart for 18 November 2022 at 16:00 (source: Météo-France)

[4] Service dedicated to pilots and provided by the DGAC. SOFIA-Briefing is designed to help them prepare their flights as well as to file and monitor their flight plans.

Ephemeris

On 18 November 2022, the sun set at 17:22 at an azimuth of 242°. At the time of the accident, the sun was located at an azimuth of 225.5° and its elevation above the horizon was 11.66°. These coordinates correspond to a position of the sun 25° to the right of the centreline for a pilot on approach to runway 20, at a relatively low height above the horizon.

2.5 Site and wreckage

The wreckage was found dispersed at the foot of a row of chestnut trees bordering a path. These trees are shown on the aerodrome's VAC chart (see **Figure 4**).

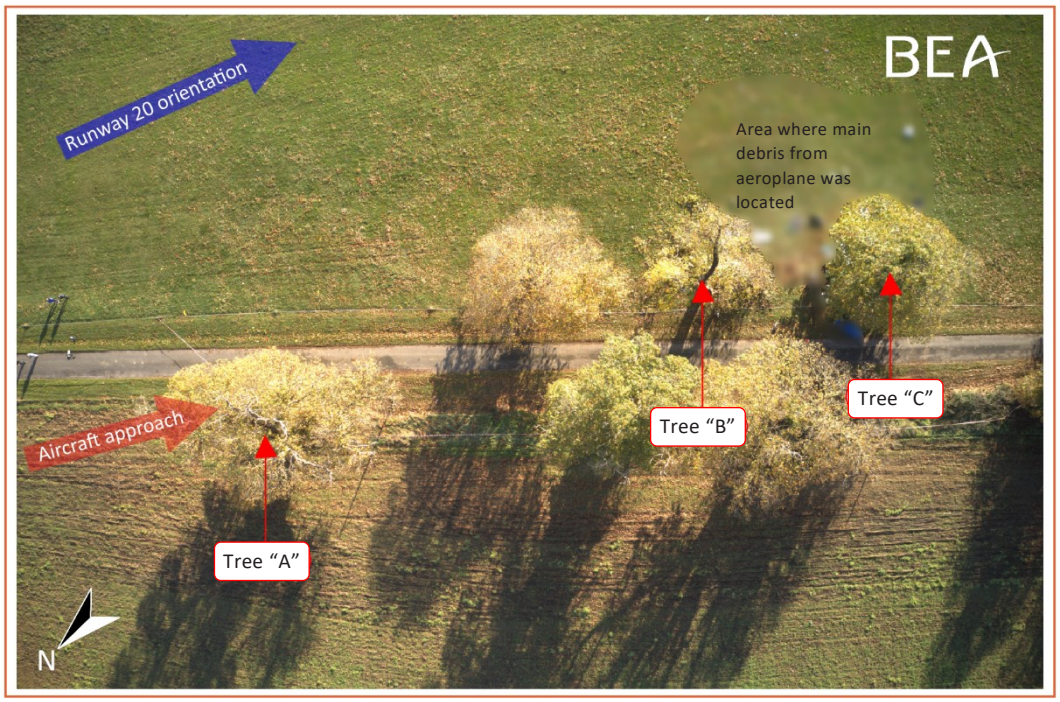

Figure 8: view of the accident site from a drone (source: BEA)

Several trees showed marks resulting from the collision with the aeroplane:

- tree "A", which was the first to be struck by the aeroplane (see **Figure 8**), had branches damaged at the top (at a height of around 20 m);
- tree "B", located about 30 m further on, had very large branches (50 cm) torn off. The impact with the tree seemed to have occurred at a height of around 10 m;
- tree "C", located about 10 m further on, at the foot of which most of the wreckage was laying.

The damage observed on the trees and the torn off branches indicated that the aeroplane struck the vegetation with a high level of kinetic energy. The propeller blades also showed marks resulting from contact with wood and/or bark.

The flight control linkages were checked. They were continuous before the aeroplane hit the ground. All of the observed failures resulted from the accident.

The position of the flaps could not be determined with certainty, but the presence of a mark at the "landing" detent position seemed to indicate that they were in the landing position at the time of the collision.

The engine was transported to the BEA's premises where it was examined. The observations made did not bring to light any failure indicative of a loss of power or an engine shut-down.

The fuel tank was found empty and burst open. First responders reported a strong smell of fuel and the presence of fuel impregnating many textile objects at the accident site.

2.6 Witness statement

One of the witnesses, positioned at the hangars located close to the aerodrome's windsock, stated that he saw F-GBUY fly almost overhead to join the left-hand downwind leg for runway 20. He added that a cloud, below which a dense curtain of rain was visible, was then approaching the facilities from the north-west. He specified that, apart from that, the conditions were favourable, with some fine sunny spells.

Shortly afterwards, he felt a few drops of rain and put his equipment away before walking back to the club premises. As he walked, he watched the aeroplane turn onto the base leg and initiate the descent. He specified that the rain was then heavier and that he was soon soaked. The witness stated that the aeroplane then disappeared behind the row of trees located next to the runway while on short final and that the aeroplane was, according to him, much too far to the left. He then heard the sound of an engine revving up, followed by a very loud noise, which he associated with a collision with the trees.

2.7 Vision aspects

2.7.1 Effects of ageing on vision

The older we get, the longer it takes to process light information and the higher the object detection thresholds become. Visual acuity decreases, as do retinal sensitivity, contrast sensitivity and glare resistance.

Concerning the capacity to focus, this declines to almost zero around the age of 70. At this point, wearing progressive corrective lenses when flying is absolutely necessary. In general, adaptive abilities decrease in terms of speed and strength. In particular, this results in a deterioration in the response to a stimulus in peripheral vision, as well as an increased difficulty in quickly shifting attention from one object to another (flexibility).

The BEA's report on the accident to the Airbus AS350 registered F-GIBM on 07 March 2021 at Touques (Calvados) details the effect of ageing on vision.

2.7.2 Effects of rain on visual performance

The effects on visual performance of rain falling on the windshield could not be accurately assessed or studied as part of the investigation. Similarly, it was not possible to assess the probability and possible consequences of simultaneous fogging/condensation occurring in the cockpit.

A number of studies, mentioned in particular in a 2014 article[5] on these aspects in the road transport sector, showed that the presence of rain on the windshield reduces visual performance. In particular, it can lead to shorter-distance glances, which can be interpreted as a decrease in people's capacity to anticipate or as an increase in their workload.

3 CONCLUSIONS

The conclusions are solely based on the information which came to the knowledge of the BEA during the investigation.

Scenario

At the end of a local flight, the pilot and her passenger flew back towards their departure aerodrome to land, while a rain disturbance was moving towards the aerodrome. The pilot made a left-hand circuit from the east, which is normally the indicated circuit for microlights, probably to avoid the shower coming from the north-west.

Despite this, the aeroplane probably flew through the curtain of rain during the aerodrome circuit. The pilot's acquisition of external visual references was thus impaired and the final approach path was offset to the extended runway.

The path followed by the pilot on final would have been into the sun. The investigation was unable to determine whether the sun was masked by clouds at that point or whether it may have hindered the pilot's vision.

It is possible that a go-around was initiated at very low height, but too late to avoid collision with the trees.

Contributing factors

The following factor may have contributed to the collision with the vegetation on final approach:

- the continuation of the final approach with insufficient external visual references, due in particular to adverse weather conditions, a low colour contrast between the runway and the surrounding plots and ground markings that were barely visible.

The investigation was unable to rule out a decrease in the pilot's visual performance due to ageing, - not compensated for by the wearing of corrective lenses – as being a possible contribution to the occurrence.

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

[5] *Measuring the effect of the rainfall on the windshield in terms of visual performance*. F. Bernardin, R. Bremond, V. Ledoux, M. Pinto, S. Lemonnier, V. Cavallo and M. Colomb, Accid. Anal. Prev., 63 (2014), pp. 83-88.