Accident to the EUROPA registered **F-PHRC** on Saturday 27 May 2023 at Montans

Time	Around 11:20[1]
Operator	Private
Type of flight	Local
Persons on board	Pilot and passenger
Consequences and damage	Pilot fatally injured, passenger seriously 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.	

Missed approach, loss of control, collision with ground

1 HISTORY OF THE FLIGHT

Note: the following information is principally based on statements and EFIS GNSS[2] data.

The pilot, accompanied by his wife, took off from Toulouse-Lasbordes aerodrome (Haute-Garonne) at around 11:00. He reported on the tower frequency his intention to carry out a local flight. He left the frequency five minutes later. At around 11:20, he flew over Gaillac-Lisle-sur-Tarn aerodrome.

A pilot and her instructor, on board a Cap 10 on the apron at Gaillac, close to the threshold of runway 25, saw the aeroplane established on final 25, stable and with the landing gear and flaps extended. They heard no radio message from the pilot on the A/A frequency. The aeroplane flew over the runway in an east-to-west direction at a height of a few metres. It seemed to them that the pilot wanted to land, but that his aiming point was too long. The pilot of the Cap 10 indicated that the aeroplane only gained a small amount of height during the missed approach. Other witnesses saw the aeroplane turn onto the LH base leg and around 20 s later, turn left again, before disappearing behind a row of trees. The aeroplane collided with the ground with a high nose-down attitude.

2 ADDITIONAL INFORMATION

2.1 Site and wreckage information

The wreckage was lying in an obstacle-free field situated two kilometres to the south of Gaillac-Lisle-sur-Tarn aerodrome. It was grouped over approximately 15 m on a north-to-south axis.

[1] Except where otherwise indicated, the times in this report are in local time.
[2] The glossary of abbreviations and acronyms frequently used by the BEA can be found on its web site.

BEA

Figure 1: site and wreckage (Source: BEA)

The power plant had separated from the firewall and was at an angle of 90° (to the left) with the airframe. The fuel tank still held fuel.

The three propeller blades had ruptured at the blade root. The electric propeller pitch-change motor was damaged and had separated from the hub.

The cockpit was destroyed. The left wing was separate from the rest of the wreckage. Marks on the ground indicated that it was the first part of the aeroplane to have contacted the ground.

It was not possible to determine with certitude, the position of the landing gear. The flaps seemed to be extended.

2.2 Aircraft information

2.2.1 General

F-PHRC was an amateur-build aeroplane provided in kit form by Europa Aircraft. It was a two-seat aircraft with retractable landing gear, equipped with a Rotax 912 UL engine providing a specified maximum power of 59.6 kW (80 hp) at a rating of 5,800 rpm, and an Arplast model PV50 constant-speed three-blade propeller (automatic pitch-change). This propeller was composed of composite blades and an aluminium alloy hub.

The landing gear consisted of a centre main wheel situated towards the front (bicycle) and of two retractable outriggers situated under the wings. A control simultaneously retracted and extended the centre landing gear, the outriggers and the flaps.

F-PHRC was equipped with an avionics suite including an EFIS and an autopilot.

It was not equipped with an AOA protection warning system (stall warning). The minimum stall speed (in the landing configuration) of F-PHRC was 44 kt with zero bank at maximum weight.

2.2.2 Propeller governor

The propeller speed was automatically controlled (CSC-1 governor developed by Smart Avionics). This governor situated on the instrument panel controlled a DC electric motor which changed the propeller pitch according to the rotation speed desired.

Figure 2: CSC-1 governor screen (source: Smart Avionics)

The observations made of this propeller pitch-change system confirmed that at the time of the impact:

- the propeller blades were in the coarse-pitch position;
- the pitch-change and parameter checking system was functional;
- the pilot had all the information on the governor screen situated in the cockpit (RPM (engine rating), MODE (operating mode), % PITCH (propeller pitch) and MAP (manifold pressure);
- the electric ground was not tight on the metal mount of the electric motor, resulting in random operation of the propeller pitch-change electric motor. The ground fault prevented the operation of the pitch-change motor and thus any variation in the propeller pitch, irrespective of the operating mode selected on the governor (OFF, CRS, CLM or MAN).

Figure 3: ground conductor lug not tight (source: BEA)

2.3 Pilot information

The 90-year-old pilot held an aeroplane private pilot licence issued in 1994, converted into a PPL in 2011, along with a valid SEP (T) rating. He had logged approximately 1,800 flight hours, including 1,700 hours as pilot-in-command. He had totalled around 36 h in the previous 12 months.

He held a valid class 2 medical certificate with a VML limitation[3]. He was the owner and main user of the aeroplane. He maintained it.

2.4 Meteorological information

The estimated meteorological conditions were a variable wind of 2 kt, CAVOK, temperature 24°C, QNH 1017 hPa.

2.5 Aerodrome information

Gaillac - Lisle-sur-Tarn aerodrome is an uncontrolled aerodrome open to public air traffic. It has an unpaved runway measuring 1,124 m x 60 m. The Landing Distance Available (LDA) on runway 25 is 1,012 m. The Take-Off Distance (TODA) is reduced to 1,022 m due to the presence of obstacles in the climb-out area.

2.6 Read-out of recorded data

2.6.1 GNSS data

The examination of the GNSS computer made it possible to confirm the flight path described by the witnesses along with the altitude and speeds[4] of the manoeuvres.

[3] Presbyopic optical correction.
[4] Given the atmospheric conditions, the recorded ground speed can be equated with an airspeed.

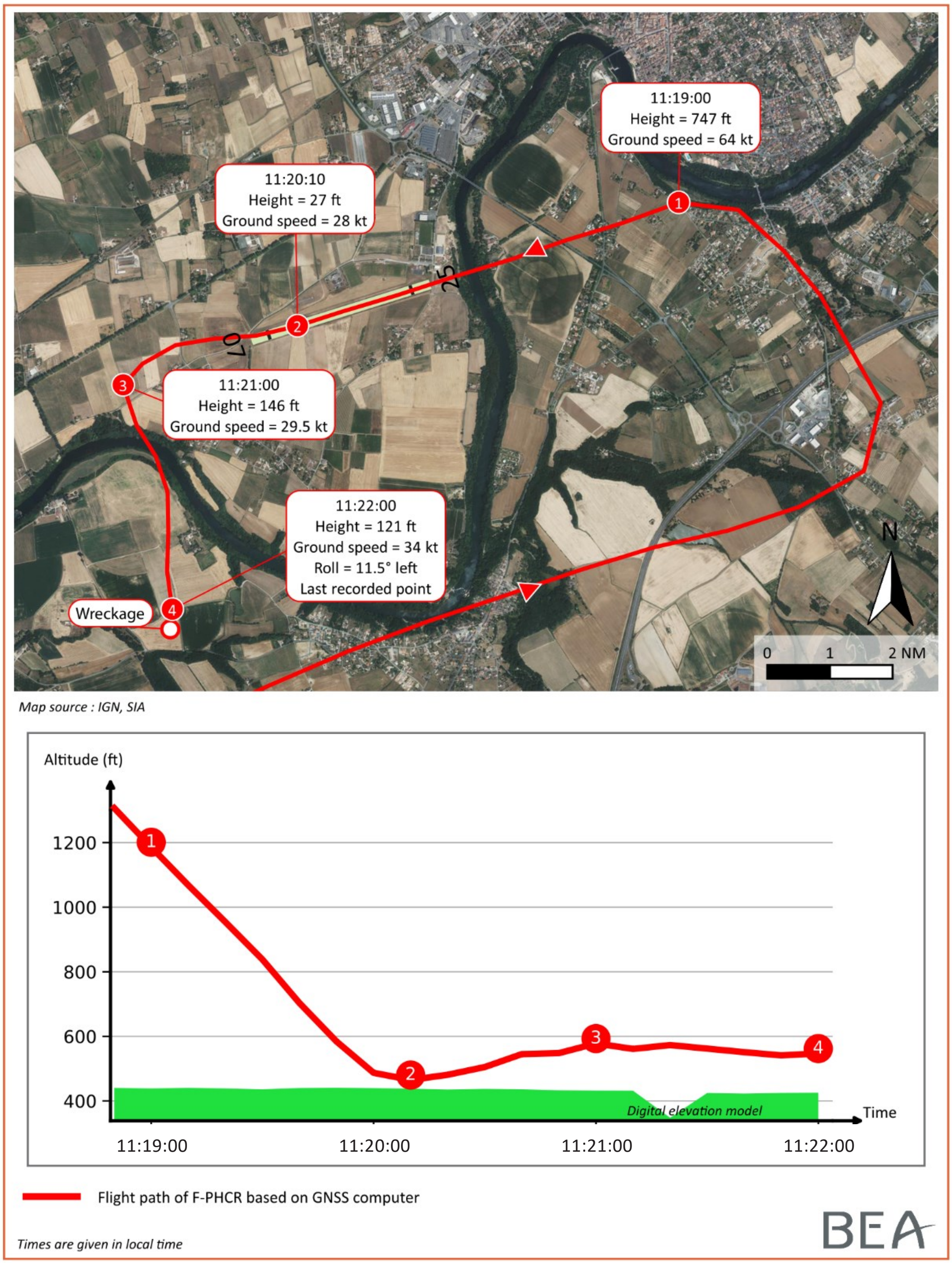

Figure 4: flight path based on GNSS computer data

2.6.2 Examination of EFIS

The parameters of the EFIS computer (model: DYNON AVIONICS EFIS-D10A) were recorded every ten seconds.

The examination of the data, limited by their low sampling rate, showed that:

- the final approach was carried out with a recorded speed of between 60 and 65 kt and a recorded vertical speed of between -600 and -900 ft/min;
- at 11:20:10 (see Figure 4, point 2), the minimum recorded height overhead the runway (last third) was 27 ft (i.e. an altitude of 465 ft) and the speed close to 49 kt; the pilot then increased power;

- at 11:20:20, the speed reached 51 kt and the vertical speed increased to 130 ft/min;
- at 11:20:30, the speed stabilized at around 48 kt, the vertical speed increased to 190 ft/min; the recorded pitch attitude was close to 15°;
- at 11:21 (see point 3), at a height of around 150 ft, the pilot turned left onto the crosswind leg with a slight bank, in level flight;
- at 11:22 (see point 4, last recorded position), the speed[5] was 46 kt, the pitch attitude close to 17°, the vertical speed practically zero, the pilot was in the process of turning left (bank angle of 11°) onto the downwind leg.

2.7 Detection of the anomaly and management of the flight path

2.7.1 Statement

The passenger specified that no anomaly prior to the missed approach was verbalised by the pilot. During the go-around, he did however observe that the performance of his aeroplane was not what he expected: he indicated in the form of a question that he did not understand why the aeroplane was not climbing.

After the accident, the pilot's son brought to the BEA's attention that the pilot had had questions about an intermittent failure of the propeller pitch-change governor without having determined what caused it.

2.7.2 Detection of failure

When an aeroplane is equipped with a constant-speed propeller, the propeller has to be set to the fine pitch at the latest, during the final approach in order to prepare for a possible missed approach and to have optimal climb performance.

On the pitch-change governor equipping F-PHRC, the pitch was set using the mode selector (see Figure 2, green MODE button) which the pilot had to press to display the indication CLM (climb) on the digital screen.

In descent, during this mode change, a variation in the propeller and engine speed is probably perceptible even though power is often moderate during this flight phase.

The propeller speed indicator is not included in the pilot's primary visual scan during the approach phase, which makes it difficult to detect a governor fault.

2.7.3 Management of flight path in event of degraded performance

The pilot realised that the climb performance of his aeroplane was not as expected. The analysis of the parameters found that the pitch attitude adopted by the pilot during this approach was well above that adopted for the missed approach carried out at the same aerodrome two months previously (between +2 and +5° more).

The pilot nevertheless tried to carry out an aerodrome circuit at low height, while keeping this high pitch attitude, without any acceleration capability (staying on backside of the power curve).

[5] The stall speed Vs0 is 44 kt with zero bank.

On observing a degradation in performance preventing the aeroplane from gaining altitude, pilots will often react by pitching up in order to increase their distance from the ground and obstacles, to the detriment of acceleration. During a turn, the bank increases the load factor and decreases in proportion, the available speed margin above stall.

3 CONCLUSIONS

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

Scenario

The pilot carried out a missed approach after having tried to land and exceeding his aiming point. During the missed approach, the aeroplane neither accelerated nor gained height. The examinations found that the control of the propeller pitch-change electric motor was faulty (see paragraph 2.2.2). This malfunction, not detected by the pilot, very probably prevented the propeller from changing to the full fine-pitch setting, thus degrading the aeroplane's climb performance.

The pilot then lost control while manoeuvring at low height with a low speed and high-pitch attitude.

Contributing factors

The malfunctioning governor was difficult to detect by the pilot before carrying out the missed approach and no operational procedure encouraged him to check its operating condition. He therefore did not envisage differing his landing or choosing a suitable alternative aerodrome.

When he observed that the climb performance was not that expected, the pilot did not change his strategy and manoeuvred the aeroplane at low speed until the loss of control.

Safety lessons

Degraded performance

When a pilot detects a performance that is different to that which is expected, changing the action plan is difficult.

The reaction to a major failure (total loss of engine power) is a critical occurrence which pilots train for in their basic and recurrent training. By contrast, when there is not a total loss of power or degradation in performance, pilots may have difficulties in taking a decision, for example carrying out a precautionary landing which would risk damaging the aircraft that they are flying.

In addition, understanding the partial failure can use the pilots' resources to the detriment of monitoring the flight parameters (notably the speed).

A study by the ATSB illustrates this message by describing examples and methods for minimizing the risk.

The BEA has published a study on its website regarding Reduction in engine power at take-off. The lessons learned from this study can be transposed to a failure that significantly reduces performance during a missed approach.

Detecting a pitch-change governor anomaly

Unlike constant-speed propellers controlled by hydraulic actuators, those managed by electric motors do not have a degraded operating mode which sets the propeller to full fine pitch (inertial protection) if there is a governor fault.

The regulations do not impose constraints regarding a governor failure mode on manufacturers producing propellers to be installed on "Annex 1" aircraft[6] not complying with a certification code or specific technical conditions.

Not being able to change the propeller setting during a go-around is a critical situation if this condition is not detected sufficiently early.

An operational procedure to check for the correct operation of the propeller governor, at the latest before the final descent, would allow pilots to adapt their landing strategy if there is a fault by selecting for example, an aerodrome with a longer runway and/or without obstacles in its climb-out area.

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

[6] Aircraft excluded from the European regulations, as coming under one of the categories defined in Annex 1 of regulation (EU) 2018/1139 and solely covered by French regulations, case of F-PHRC.