BEA
Bureau d'Enquêtes et d'Analyses
pour la sécurité de l'aviation civile

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SAFETY INVESTIGATION REPORT

Accident to the SONACA S200 registered F-HGRA on Saturday 5 October 2024 at Espira-de-l'Agly

Time	Around 19:50[1]
Operator	Aeropyrénées
Type of flight	Instruction
Persons on board	Instructor and student pilot
Consequences and damage	Aeroplane 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 in initial climb, forced landing, during an instruction flight

1 HISTORY OF THE FLIGHT

Note: the following information is principally based on statements, radio communication recordings, radar data, security camera data and data from the on-board computers.

During a training session in carrying out aerodrome circuits and emergency procedures, the instructor simulated an engine failure in initial climb from runway 33 of Perpignan - Rivesaltes aerodrome. At around 700 ft[2], when the after take-off actions had been carried out, he set the engine power control to full idle.

The student pilot started carrying out the expected actions but the instructor cut short the exercise in order to improve the sequence. After gaining some altitude, the instructor started the exercise again. The student pilot reduced the pitch attitude of the aeroplane and directed the flight path towards an obstacle-free area. At a height that he thought to be 300 ft, the instructor indicated that they had arrived at the end of the exercise and took the controls. Despite power control inputs, he was unable to increase the engine speed. He changed the fuel tank selection and activated the electric auxiliary pump. A short time later, the propeller stopped. The instructor carried out a forced landing. During the landing, the wing struck a pine tree and the aeroplane came to a stop in a ditch.

[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.

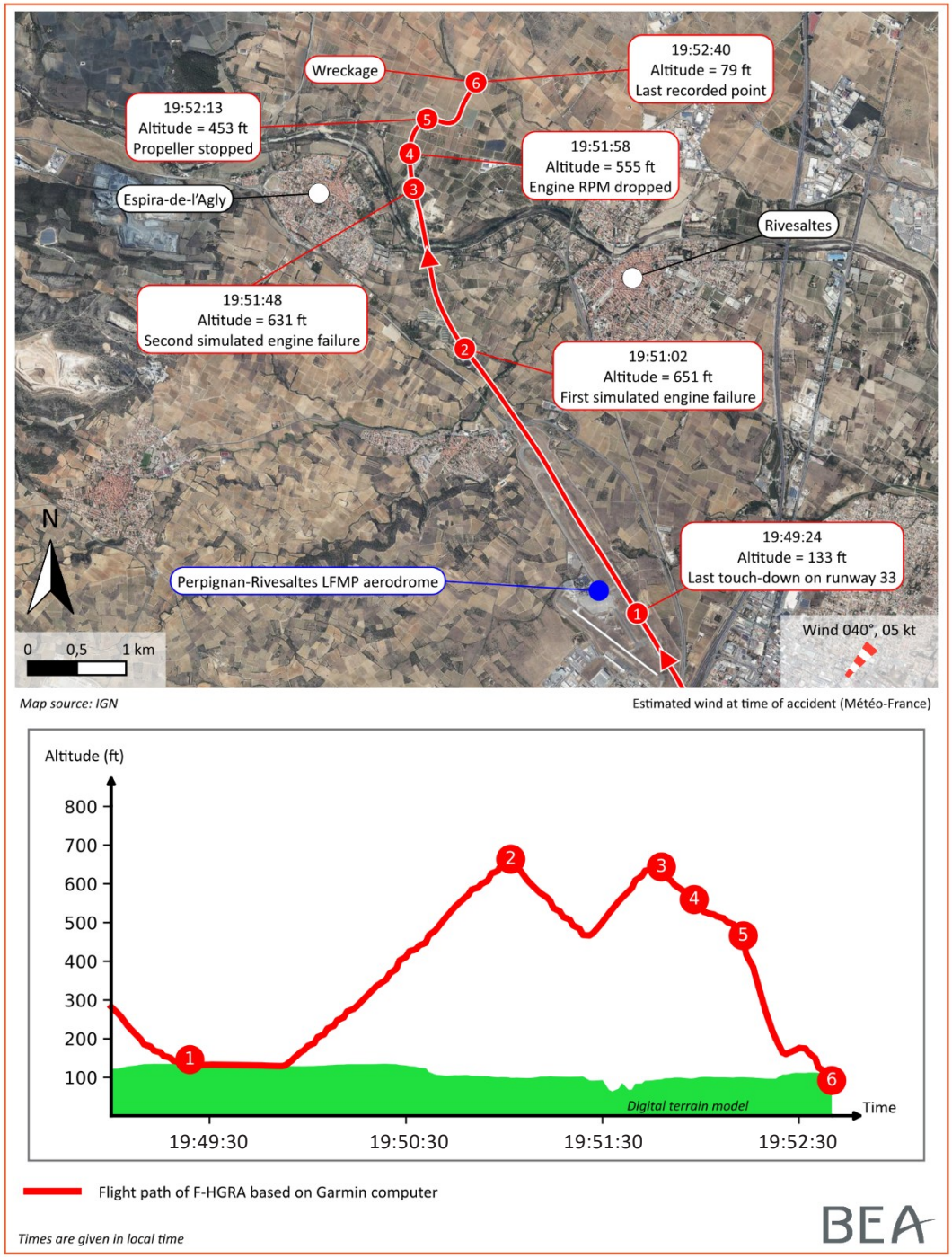

Figure 1: flight path of F-HGRA

2 ADDITIONAL INFORMATION

2.1 Occupant information

2.1.1 Student pilot

The 18-year-old student pilot had started his training to obtain an aeroplane Private Pilot Licence (PPL (A)) in 2024. He had logged 5 flight hours, including 3 hours on the SONACA S200.

2.1.2 Instructor

The 27-year-old instructor held an aeroplane Commercial Pilot Licence (CPL(A)) and an instructor rating. He had logged 780 flight hours, including 40 hours on the SONACA S200.

The instructor indicated that in the previous circuit, he had demonstrated what was expected in the scope of an engine failure exercise in initial climb. He had stopped the exercise at around 300 ft and the student pilot had continued the aerodrome circuit.

He added that for this new failure exercise, he expected the student pilot, after observing the decrease in power, to take a nose-down attitude and direct the aeroplane's flight path towards an obstacle-free area. He had decided to take back the controls once these actions had been carried out.

At around 700 ft, he reduced power by means of the throttle lever. As the student pilot had not carried out all the expected actions, the instructor cut short the exercise. After discussions with the student pilot, they started the exercise again. At the end of this new exercise, at a height of around 300 ft, the instructor took the controls and made an input on the throttle lever. Although the lever was in the full throttle position, he observed that the engine speed did not increase. He made two more inputs on the lever without effect. He then switched on the auxiliary pump, changed the fuel tank selection and transmitted a distress message. A short time later, the propeller stopped. He then prepared a forced landing. The instructor did not manage to land on the selected surface. The aeroplane glided further than he had planned.

2.2 Meteorological information

Météo-France estimated that the meteorological conditions on the accident site were: wind from 040° of 5 kt, CAVOK, temperature 17°C, dew point temperature 11°C, QNH 1012 hPa.

Sunset was at 19:22. Witnesses on the ground and in flight indicated that the light conditions were not adverse for the flight.

2.3 Site and wreckage information

The aeroplane was lying on its back in a dry river bed. It had struck several trees before turning over in the river bed.

The analysis of a security camera recording showed that in the 15 s prior to the landing, the aeroplane was descending with a stabilized flight path. There was no loss of control. The aeroplane flew over an obstacle-free area and then finished its run on ground where there were scattered bushes more than two metres high.

The damage observed on the wreckage was the result of the impact with the vegetation and the aeroplane turning over onto its back.

The flaps were extended to the landing position. The auxiliary pump switch was set to ON.

Figure 2: wreckage of F- HGRA on accident site (source: BEA)

2.4 Aircraft information

The aeroplane was fitted with a turbocharged Rotax 914 engine equipped with an additional alternator and supplied with fuel by means of two auxiliary pumps.

F-HGRA had previously experienced an engine shutdown on the runway when power was increased after a touch-and-go. At the manufacturer's request, the carburettors were sent to Avirex[3] for overhaul.

2.5 Examination of computers

Flight data from the Garmin GI275 computer and engine parameters recorded by the JPI EDM900 were read out and analysed.

In the graph below, the parameters from the GI275 are shown in blue, while those from the EDM900 are shown in red.

Note: the GI275 and EDM900 recordings were synchronized in terms of time, although the accuracy of this remains limited.

[3] Official Rotax engine service centre (avirex.fr).

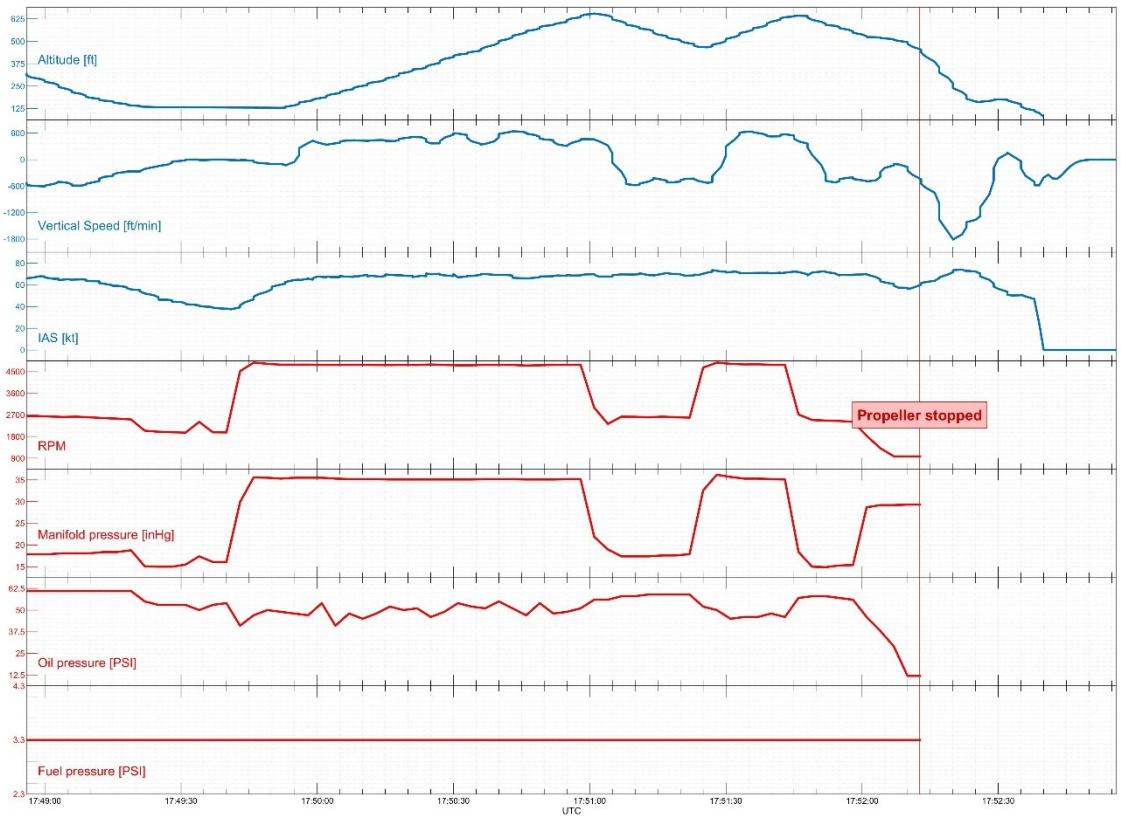

Figure 3: flight and engine parameters of F-HGRA

The analysis of the engine data recorded by the Engine Data Monitor (EDM) indicated nominal and stable fuel pressure and flow rates until the recording stopped. This finding rules out the hypothesis of the fuel system having dried out.

The Manifold Absolute Pressure (MAP) and engine speed (RPM) curves show a consistent trend until a gradual decrease in speed. After the final take-off, the data suggests an initial power reduction, followed by a power increase with climb, and then a second reduction. This data is consistent with the execution of the two successive failure exercises.

Several seconds after the second reduction, the decrease in engine speed below idle, correlating with the manifold pressure rising towards the atmospheric pressure, indicates that the engine was no longer delivering power.

A windmilling[4] phenomenon is identifiable for several seconds, until the Indicated AirSpeed (IAS) decreases, causing the propeller to stall and, consequently, the EDM recording to stop.

2.6 Additional engine examinations

The wreckage was transferred to the BEA for further examination. The generally good condition of the airframe and powerplant was such that, after a visual inspection and purging of the oil system, the engine was restarted in the presence of Avirex mechanics.

[4] Propeller driven by the relative wind.

The engine operated normally throughout the tests. No malfunctions were observed with respect to the turbocharger, fuel system, ignition, fuel pumps, or starter. Some minor deviations were noted with respect to the carburettor choke and idle control settings, without this affecting the overall operation of the engine.

Dynamic power increases, performed with the engine warm, revealed no lag or difficulty for the engine in reaching the required speed.

The tests carried out did not reproduce the absence of a power increase described by the occupants and identified during the analysis of the recorded data.

3 CONCLUSIONS

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

Scenario

After taking off and cutting short the first exercise, the instructor reduced power with the throttle lever in order to simulate an engine failure. The student pilot carried out the expected actions. When the instructor increased power, the engine did not respond to the power control inputs. The instructor switched on the auxiliary pump and changed the fuel tank selection but these actions were ineffective.

The instructor focused on maintaining the glide speed until landing. He was surprised by the aeroplane's lift-to-drag ratio and was unable to land in the planned obstacle-free area. During the landing, the aeroplane struck obstacles.

The investigation was unable to identify why the engine speed did not increase despite the presence of fuel and the engine continuing to rotate.

Safety lessons

In March 2021, the BEA published a study, "Reduction in engine power at take-off".

In its conclusion, the BEA emphasized that "[…] *all fatal injuries were the result of a loss of control in flight. The occupants are generally exposed to more energy during an impact caused by a loss of control in flight than during a controlled collision with obstacles in flight and, of course, always more than during a hard landing and/or a landing on a rough surface or surface with obstacles.*

These losses of control in flight most often occur when making a significant change to the heading, indeed when attempting to turn around, during which the stall speed increases significantly. These manoeuvres are undertaken by pilots with various backgrounds, all under stress and possibly in the presence of other factors, such as equipment issues.

This observation leads us to issue a reminder of the importance of maintaining sufficient speed, which must take precedence over any other concern (dealing with a failure, avoiding an obstacle, searching for a clear area, etc."