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INVESTIGATION REPORT

Accident to the Ekolot KR-030 Topaz identified 70HZ

on 21 February 2021
at Saint-Florentin - Chéu aerodrome (Yonne)

Time	Around 17:10[1]
Operator	Private
Type of flight	Local
Persons on board	Pilot and passenger
Consequences and damage	Pilot fatally injured, passenger injured, microlight destroyed

This is a courtesy translation by the BEA of the Final Report on the Safety Investigation published in February 2022. As accurate as the translation may be, the original text in French is the work of reference.

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

Engine failure in initial climb, aerodrome circuit at low height, steep bank turn and collision with the ground during landing

1 - HISTORY OF THE FLIGHT

Note: the following information is principally based on the passenger's statement.

The pilot, accompanied by a passenger, took off from runway 07L for a local flight. In the initial climb, they perceived that the engine was sputtering. The pilot turned left to fly an aerodrome circuit at low height. Above the hangars of the aerodrome, at low height, the pilot increased the bank angle. While he was attempting to level the wings, the microlight collided with the ground during the landing, in the middle of runway 07C.

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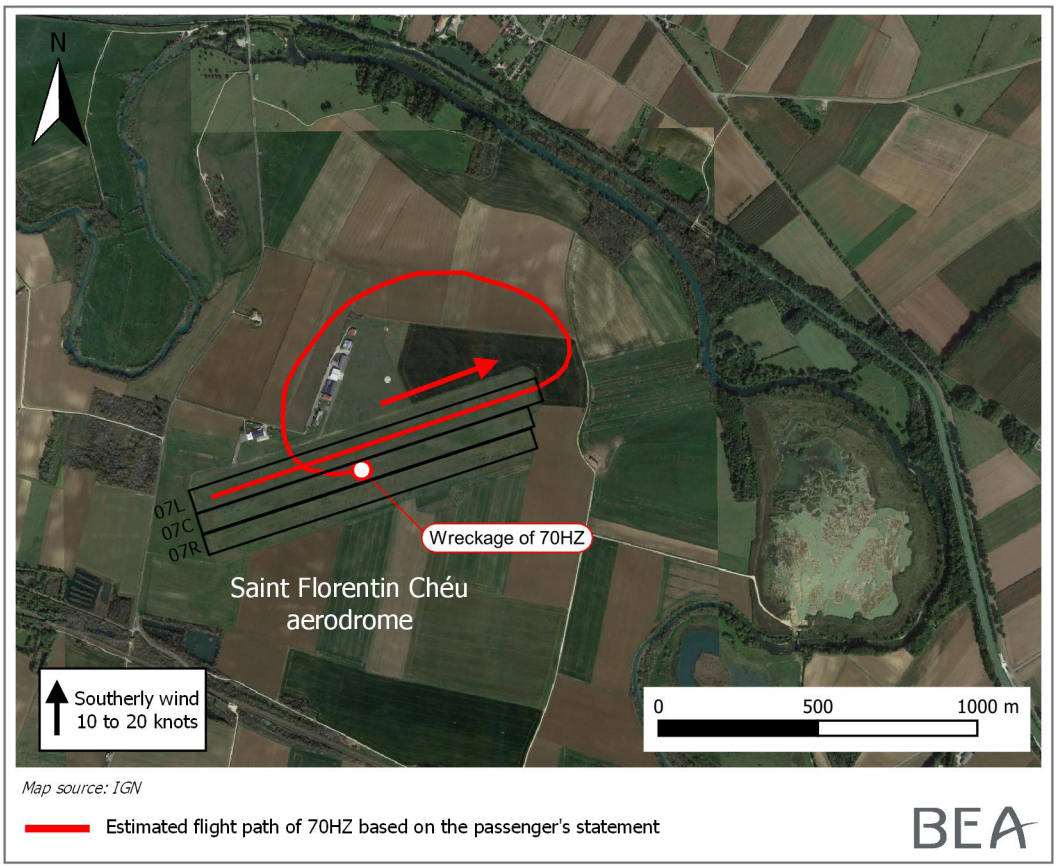

Figure 1: Estimated path according to the passenger's statement

2 - ADDITIONAL INFORMATION

2.1 Meteorological information

On the day of the accident, the weather conditions were suitable for a VFR flight. The wind was coming from the south at about 10 kt, with gusts up to 20 kt, the temperature was 18°C.

2.2 Aerodrome information

The Saint-Florentin - Chéu aerodrome has three adjacent parallel runways, all unpaved:

- runway 07L/25R, measuring 1,120 x 90 m, for aeroplanes and microlights;
- runway 07C/25C, measuring 1,050 x 80 m, for gliders;
- runway 07R/25L, measuring 1,035 x 80 m, reserved for glider winch launching.

These three runways provide an overall width of 250 m.

2.3 Microlight information

2.3.1 General

70HZ is a class 3, fixed high-wing microlight, equipped with a Rotax 912 UL carburettor type engine delivering a power of 80 hp. It was equipped with an airframe parachute and did not have a stall warning system[(2)]. The pilot was its owner since July 2020.

[(2)] It is not a regulatory requirement.

2.3.2 Performance

The microlight user manual specifies that with the flaps in position 1 (+15°) at the maximum allowable weight and in standard atmospheric conditions:

- the rotation speed is approximately 70 km/h;
- the climb speed is 99 km/h, up to a height of 50 m.

Once the flaps are retracted, the climb speed is 123 km/h.

It also specifies that the landing distance required on a grass runway after flying over a 15 m obstacle is approximately 200 m with the flaps in position 2 (+40°) at an approach speed of 92 km/h.

The stall speeds in level flight are (at the weight of 525 kg):

- 64 km/h with the flaps in position 0;
- 63 km/h with the flaps in position 1.

The stall speed is higher in a turn:

- +20% with a 45° bank angle;
- +40% with a 60° bank angle.

The French importer specified that at the end of the runway, in the conditions of the day, taking into account the expected performance, the microlight had to have a height ranging between 200 and 300 ft.

2.4 Information about persons on board microlight

2.4.1 Pilot

The 70-year-old pilot held a microlight pilot certificate issued in 2006 with passenger carrying privileges. According to his statements to the insurance company, he had flown approximately 500 flight hours and according to witnesses, he had flown 80 hours in 2020. He had carried out two flights the day before the accident.

2.4.2 Passenger

The 66-year-old passenger held a microlight pilot certificate issued in 2020. He had flown 100 flight hours and was the owner of a class 3 microlight. Both pilots were friends and members of the same microlight club, based at the aerodrome.

2.5 Examination of site, wreckage and engine

The wreckage was lying upside down in the middle of runway 07C. The marks left by the wreckage in the ground were parallel to the runway and were present for about 20 m. There were marks in the ground from the propeller's rotation for about ten metres.

The microlight collided with the ground with a nose-down attitude greater than 30° and a small left bank angle. All of the damage observed was caused when the microlight collided with the ground.

The flight and engine control linkages were continuous. The flap position was close to position 1 (+15°).

There were no friction points in the moving parts of the engine. There was fuel (including in the carburettors). The fuel filter was free of impurities. The coolant and oil levels were within the prescribed limits. Their colour did not raise any questions.

During the engine examination, it was observed that two connectors of the ignition circuit were disconnected:

- the connector at a non-genuine electronic ignition unit;
- the connector between this unit and the generator.

In both cases, the relevant sockets were correctly equipped with a locking stud. These studs were found broken and no longer ensured a good connection. This damage did not result from the accident.

The previous owner of the microlight stated that the pilot had recently replaced one of the two genuine Rotax electronic ignition units with another brand of ignition unit.

2.6 Statements

2.6.1 Pilot's partner

The pilot's partner said that during a flight she had made with him the day before from Pont-sur-Yonne aerodrome, the engine had sputtered once. This had not worried the pilot who had said that if it happened again, he would return to the departure aerodrome.

2.6.2 Passenger

The passenger indicated that when he arrived at the aerodrome, the pilot was performing an aerodrome circuit. At the end of this, the passenger boarded for a local flight. The pilot did not mention any technical problem.

At the holding point on runway 07L, the pilot performed the before take-off checks. He did not make any verbal before take-off briefing.

During the initial climb, towards the end of the runway, the engine misfired. According to the passenger, the engine was not delivering its full power. The pilot operated the throttle control without being able to regain power. The pilot did not indicate his intentions at this point.

The passenger estimated that the bank angle in the turn increased and was more than 45° above the hangars, at a height of about ten metres according to him. He felt a loss of lift and that the microlight was stalling. He said to the pilot to make a flat turn. The pilot indicated that he was off balance due to the wind.

2.7 Engine failure at take-off

Engine shut-down is included in the flight training programme and is practiced on a regular basis. On the other hand, partial power loss is rarely mentioned, especially during the before take-off briefing, whereas experience shows that it is more frequent and more difficult to manage, because the pilot must estimate the level of residual performance available to him and the remaining engine operating time in order to choose his action plan.

2.7.1 Microlight pilot safety memo

The Microlight pilot safety memo available on the French Microlight Federation (FFPLUM) website, sets out the various take-off failure scenarios and the importance of the before take-off briefing:

Figure 2: Excerpt from the Microlight pilot safety memo

It encourages pilots to wake up their cognitive memory with a before take-off briefing. If there is a failure before rotation, the pilot is advised to reject the take-off. If there is a minor failure or unsuitable weather after rotation, the pilot is advised to carry out a runway circuit at low height without rushing, and then land again. If there is an engine failure after rotation, the pilot must hold the speed, fly straight ahead, with a heading change not exceeding 30°, with fuel and power OFF. It warns pilots never to attempt to turn around during an initial climb.

In June 2018, the FFPLUM published a video on its YouTube channel covering the topic of a failure on take-off. It insists on controlling the flight path and in particular, managing the speed until touchdown during the emergency landing.

2.7.2 Microlight pilot manual

In the paragraph relating to a failure on take-off, the Microlight pilot manual stipulates that to save a few precious seconds in such a situation, the pilot should imagine, at each take-off, that he is faced with an engine failure and ask himself the question: From where I am, at the altitude I am at, what would be my decision to land?

- The first action to take in the event of a failure on take-off, is to maintain speed. During the initial climb, the microlight often has a steep nose-up attitude, and if the propeller thrust suddenly disappears, the pilot must bring the nose down in a very short time to avoid stalling.

- The second rule is to estimate the spare altitude in order to decide on the orientation of the flight path. In this situation, unless the pilot is very high, the turns are deceptive. The pilot may think that the turn will allow him to reach a favourable area, but by turning, he will degrade the performance of the aircraft. He also risks a stall on the wing and/or ground contact in a banked position. The pilot should bear in mind that his chances will be better landing with wings level even on a poorly paved area than if a wing hits the ground of a very open area.

For each situation a safety height can be defined. If the failure occurs before the pilot has reached this height, the only option is to land ahead, on the airfield or on an adjacent field. If the failure occurs at a sufficient height, the pilot can consider making a turn and possibly returning to the airfield. He must remember that this manoeuvre is difficult and very dangerous near the ground.

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 residual power of the engine, following sputtering during the initial climb to 300 ft, led the pilot to perform a circuit at low height to return to the runway to land as soon as possible. At the end of the manoeuvre, the pilot tightened his turn to align with the runway centreline. The microlight then found itself with a tailwind component while the pilot tried to level the wings. This action, combined with the effects of the wind, reduced his margin in relation to the stall. The pilot then lost control of the microlight, which collided with the ground.

A disconnection of an electronic ignition unit may have been the cause of the engine power variations.

Contributing factor

The pilot's haste to return to the runway to land probably led him to make a very short aerodrome circuit and a final turn at very low height with an excessive bank angle, which did not enable him to control his landing.

Safety lessons

Minor incidents and engine failures
When an engine failure occurs during the initial climb, the pilot must, despite the effect of surprise and stress, quickly decide on an action plan:

- He can make a forced landing ahead of the aircraft, in particular in the case of a major failure which excludes the possibility of climbing, or even levelling off.
- He can perform a runway circuit adapted to the environment and circumstances, especially in the case of a minor failure. This assumes that the available power can maintain level flight with a sufficient margin.

In the latter case, the pilot must be aware that the situation may deteriorate at any time. He will therefore be obliged to amend his action plan.

Maintaining the correct speed according to the selected bank angles will allow the pilot to keep control during manoeuvres.

BEA study

In the first quarter of 2021, the BEA published on its website, a study on the Reduction in engine power at take-off. This study draws the following conclusions:

"One main fact is established by the study of this sample: all fatal injuries were the result of a loss of control in flight. The energy to which the occupants were exposed during an impact resulting from a loss of control in flight was generally greater than during a controlled collision with obstacles in flight and, of course, always greater than during a hard landing and/or on a rough surface or surface with obstacles.

These losses of control in flight most often occurred when the pilot made a major change to the heading, or even an attempted turn-around, during which the stall speed increased significantly. These manoeuvres were undertaken by pilots with various backgrounds, all under stress and possibly in the presence of other factors, such as concerns about equipment.

Based on this observation, pilots are reminded of the importance of maintaining sufficient speed; any other concern (dealing with a failure, avoiding an obstacle, searching for a clear area, etc.) must be considered as secondary.

With this in mind, it seems appropriate to promote take-off briefings that are as detailed as possible, rather than allowing generic briefings to continue, when such briefings actually take place. The relevance of these briefings to the conditions of the day and the location will depend on the information collected during flight preparation."

This study also recalls that:

"The before take-off briefing covers the actions to be taken under normal conditions and those to be taken if a failure occurs during take-off. The information listed during the take-off briefing is stored in the short-term memory. This memory directly and rapidly provides the information necessary for immediate action."