BEA
Bureau d'Enquêtes et d'Analyses
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SAFETY INVESTIGATION REPORT

Accident to the TECNAM - P92 S ECHO identified 01VA on 30 September 2021 at Saint-Rambert-d'Albon

Time	Around 18:25[1]
Operator	Private
Type of flight	Local
Persons on board	Pilot and passenger
Consequences and damage	Pilot and passenger fatally injured, microlight destroyed
This is a courtesy translation by the BEA of the Final Report on the Safety Investigation published in October 2022. As accurate as the translation may be, the original text in French is the work of reference.	

Reduction in engine power in initial climb, right turn, stall

1 HISTORY OF THE FLIGHT

Note: the following information is principally based on statements.

At around 18:00, the pilot, accompanied by one passenger who was also a pilot, took off from unpaved runway 01 at Saint-Rambert-d'Albon aerodrome for a local flight bound for Vienne aerodrome. On returning at around 18:35, the pilot lined up on final[2] for runway 01. A witness[3] then heard a decrease in engine speed while the microlight was in initial climb. He saw the microlight turn to the right and stall during the turn. The microlight collided with the ground approximately 300 m north-east of the northern end of the runway.

2 ADDITIONAL INFORMATION

2.1 Examination of site and wreckage

The wreckage was located at the bottom of a basin, in a quarry located on the eastern edge of Saint-Rambert-d'Albon aerodrome (see Figure 1 below). It was complete and not dispersed.

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

[2] Last radar detection point.

[3] The witness did not see the microlight land, and the investigation could not determine whether the aeroplane performed a touch-and-go or a go-around.

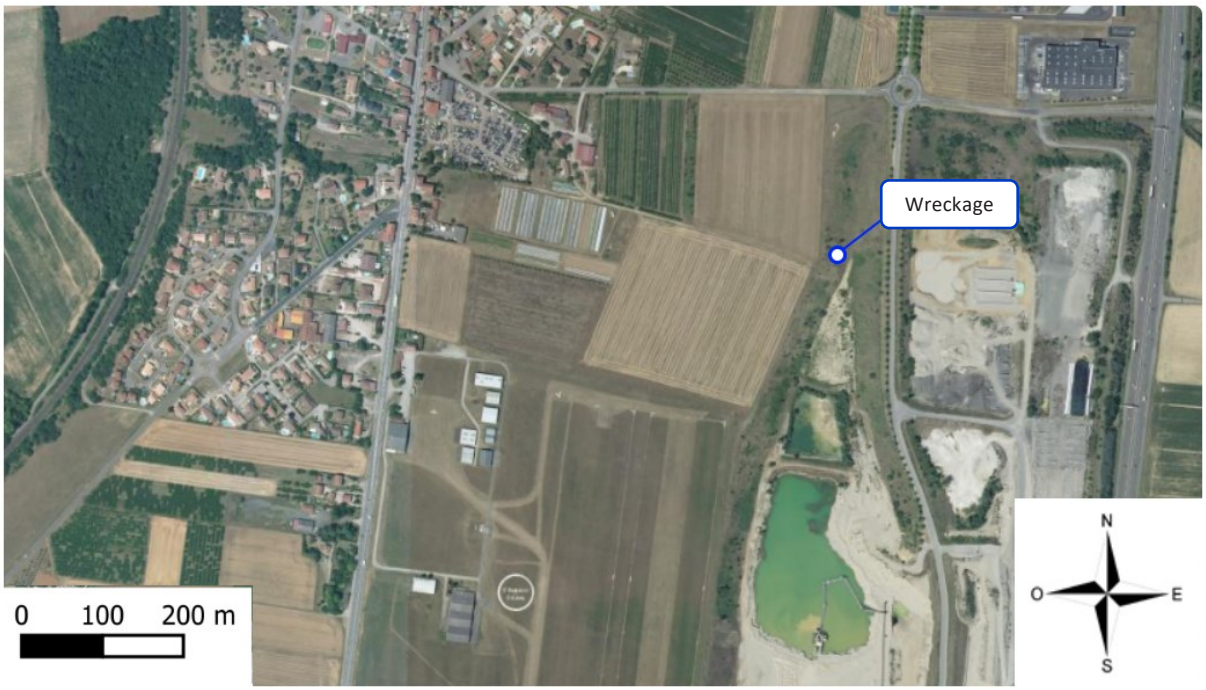

Figure 1: general view of accident site (source: Google Earth, annotated by the BEA)

All of the damage observed on the fuselage, wings, elevator and landing gear was caused by the collision with the ground. It was consistent with an initial impact with a nose-down attitude and a right bank angle. The right wing and the front part of the fuselage were strongly compressed during the initial impact, probably on the western slope of the basin. The microlight then bounced and leaned on its left wing before coming to stop at the bottom of the basin.

The damage observed on the aileron, elevator and rudder controls was caused by the collision with the ground. The control linkages were then continuous. Due to the damage to the flap control, it was not possible to determine the continuity of the flap control from the servo actuator. Moreover, the position of the flaps at the time of the impact with the ground could not be determined.

The fuel system was continuous from the tanks up to the engine fuel filter. Both fuel valves were in the "open" position. The left-wing tank was ripped open. The right-wing tank contained a low amount of fuel. However, given its position and the break in the fuel hose downstream of the valve, it is very likely that fuel leaked out after the accident.

No fuel contamination was detected at the filter.

The propeller blade failures may be consistent with a propeller that was not rotating at the time of the impact with the ground.

The parachute was not activated by the pilot.

The pilot's headset found in the wreckage of the microlight was equipped with an ANR[4] system.

[4] Active Noise Reduction.

2.2 Examination of engine and fuel system

The engine was removed and examined at the BEA. Starting with the fuel filter, the following observations were made on the fuel system and the injection system:

- The tab that locks the wiring harness plug to the fuel injection electronic control unit (ECU) was found broken with the plug disconnected. When this plug is disconnected, the engine immediately shuts down. Given the damage observed to the wiring harness, the tab breakage and the plug disconnection most likely occurred during the collision with the ground.
- The seal between the top of the filter and the strainer was pinched and protruded outside the filter. In this configuration, a substantial fuel leakage occurs when the filter strainer fills. A test was carried out by the BEA to determine the flow rate of this fuel leak. With no pumps (by gravity), the leakage was 1.4 to 1.5 l/min, i.e. an average of 90 l/h. With the pumps running, the leakage was 0.2 to 0.3 l/min, i.e. an average of 15 l/h.

Figure 2: fuel filter, with pinched seal (source: BEA)

According to the manufacturer of the injection kit, an air leak on the part of the system between the fuel filter and the surge tank[5] may have a major impact on engine operation. Taking into account the pump's output, if air is sucked in, an engine malfunction may occur very quickly. This malfunction would result in a considerable loss of power, combined with strong vibrations and a possible knocking phenomenon.

The damage observed on the ignition system was probably the result of stresses borne by the different items of equipment when the microlight collided with the ground.

The engine lubrication and cooling systems were continuous.

[5] A tank that is part of the injection system and is located upstream of the two pumps.

2.3 Meteorological conditions

The meteorological conditions observed at the aerodrome at the time of the accident were as follows: northerly wind of approximately 10 kt, CAVOK.

2.4 Pilot experience

The 76-year-old pilot owned the microlight. He held a fixed-wing microlight pilot licence issued in 2011 as well as passenger carrying privileges since 2012. He had logged approximately 450 flight hours, 360 hours of which from March 2016 on the Tecnam P92 identified 01VA, and 7 hours of which in the previous three months.

2.5 Microlight information

The Tecnam P92 Echo is a fixed high-wing microlight equipped with a ROTAX 912 UL engine.

The engine's fuel supply system had been modified using the conversion to electronic injection kit for Rotax 912 and 912 s engines developed and manufactured by LAD AERO. This kit is equipped with an ECU. The injection system has two pumps (main pump and backup pump). The main pump operates continuously when the engine is started.

The microlight has two wing tanks, each with a capacity of 30 l. The fuel valves (one per tank) are located in the cockpit on either side of the windscreen post.

2.6 Information about procedures

The pilot recorded in his logbook the quantities of fuel consumed or refuelled as well as the microlight's hourly consumption. As of 15 June 2021, he had calculated a consumption of approximately 14.3 l/h. The notes "*Reste jerrican 23 l*" (remaining 23 l in the jerrycan) and "*25 l 100LL*" indicated that the pilot refuelled indiscriminately from pumps at aerodromes or from jerrycans. The last note in the logbook corresponded to the flight of 22 September 2021, with a hour meter indication of 4190.12 h.

The pre-flight section in the microlight's flight manual regarding the engine stipulates that once the engine upper cowling is removed, the operator must open both fuel valves and check the fuel system for leaks, check the condition of the fuel filter and bleed the system[6] to remove any water and deposits. This operation does not require the fuel filter to be opened[7].

When the engine upper cowling is removed for the pre-flight inspection, it is possible to see and access the fuel filter attached to the firewall. As a consequence, the seal pinching could have been detected. Given the flow rate of the leak observed during the tests carried out by the BEA (1.4 to 1.5 l/min with the pump stopped), the pilot should have noticed the flow of fuel at the time of bleeding, or he should at least have detected a strong smell of fuel during the pre-flight inspection. If the pilot only opened the valves at start-up and closed them again just after the engine shut-down, he had no way of visually detecting the leak during the pre-flight inspection. Only a calculation of the average consumption over the last flight(s) could have warned him.

6 The bleed is located on the fuel filter (low point of the fuel system).
7 Or fuel strainer.

The pilot had not reported any abnormal engine operation during the previous flights. It is highly unlikely that he undertook this flight while being aware of an engine problem.

2.7 Microlight's maintenance

Maintenance of a microlight may be performed by the owner. The maintenance manual can be used as a guide to define the maintenance tasks and their intervals. The microlight manufacturer's maintenance manual indicates an interval of 100 h for most inspections.

The manual specifies that the fuel filter should be bled daily, but the fuel filter inspection (which requires the filter to be opened) is not defined, although the opening procedure is described and indicates that particular care should be taken not to pinch the seal when reassembling the strainer.

The fuel filter fastening system is a quick-release clip with a locking knob that allows the strainer to be easily installed and removed when inspecting the fuel filter. This filter is inspected with the fuel valves in the "closed" position to prevent any gravity fuel flow from the tanks. The investigation was unable to determine whether the pilot used to disassemble the fuel strainer and if so, how often.

The microlight owner's logbook indicated the following maintenance operations:
- 12 July 2020: 100-hour inspection;
- 24 May 2019: maintenance. Idle adjustment -2° propeller pitch.

The mechanic who had occasionally performed maintenance operations on the aircraft since 2016, indicated that he performed the following tasks:
- 15 January 2021: parachute repositioning following an overhaul;
- 20 October 2020: installation of the "Silent Hektik" voltage regulator to replace the original regulator (DUCATI);
- 4 July 2020: 100-hour inspection;
- February 2019: installation of the LAD AERO injection kit.

He did not perform any overhaul in 2021.

The accident occurred approximately 45 h after the last "100-hour inspection" performed in 2020.

2.8 Additional information

The microlight was detected on the radar (above 800 ft, approximately) from 18:03, after take-off from Saint-Rambert-d'Albon aerodrome. The radar plot showed that the pilot headed towards Vienne aerodrome before returning to the departure aerodrome. The last radar detection point was recorded at 18:35, when the microlight was south of Saint-Rambert-d'Albon aerodrome.

The hour meter indication recorded in the logbook on 22 September 2021 was 4,190.12. The indication after the accident was 4,190.90. i.e. 46 min of engine operation, which is consistent with the flight time determined from the radar plot.

The last refuelling of 46 l took place on 8 August 2021, and the pilot performed three flights[8] for a total duration of 2 h and 58 min before the accident flight. Taking into account the average fuel

[8] 17 August, 16 and 22 September 2021.

consumption of the microlight, the quantity of fuel consumed during these three flights was approximately 43 l. Assuming that the pilot had filled the fuel tank[9] (i.e. 70 l) when refuelling on 8 August, the pilot undertook the accident flight with approximately 27 l, three of which were unusable. During the 46-min flight, the fuel consumed by the engine was approximately 11 l, and the fuel lost due to the leak was estimated to be 12 l[10], i.e. a total quantity of 23 l.

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 carried out a local flight of around 46 min. A fuel leak during the flight due to the incorrect positioning of the fuel strainer seal meant that the fuel tanks progressively drained in an abnormal way (average engine consumption plus leak). In initial climb, the engine power decreased. The pilot turned right. During the turn, the microlight stalled and collided with the ground.

If the fuel strainer seal had been incorrectly positioned during a previous flight, the pilot would have been able to detect the consequences. However, the latter did not report any abnormal engine operation or over-consumption of fuel. It is therefore very likely that the fuel strainer was opened and its seal incorrectly repositioned prior to the accident flight, either during the pre-flight inspection or following the penultimate flight.

The investigation could not determine whether the pilot was aware of the reduction in engine power and whether the turn observed by the witness was a standard aerodrome circuit or an attempt to join the aerodrome for a landing on the reciprocal QFU.

Contributing factors

The use of an ANR headset may have contributed to impairing the pilot's perception of the reduction in engine noise and to delaying his detection of the engine malfunction.

The pilot's inadequate monitoring of the microlight's airspeed during the turn may have contributed to the microlight's low-height stall.

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

[9] Provided that the tanks were filled to capacity.

[10] With the pump operating.