BEA
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SAFETY INVESTIGATION REPORT

Accident to the Tomark SRO Viper SD4 identified 69AHM on Thursday 8 June 2023 at Pouilloux

Time	Around 16:50[1]
Operator	AQUILAIR Aircraft
Type of flight	Cross country
Persons on board	Pilot and one 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. As accurate as the translation may be, the original text in French is the work of reference.	

Engine shutdown in initial climb, loss of control in turn, collision with ground, fire

1 HISTORY OF THE FLIGHT

Note: the following information is principally based on statements.

Arriving from Villefranche – Tarare aerodrome, the pilot, accompanied by a passenger, landed on Montceau-les-Mines – Pouilloux aerodrome at around 16:25. After a stop of about 30 min, the pilot and the passenger got back into the cockpit for the return flight.

The pilot took off from runway 09. Witnesses mentioned that in initial climb, at a height of between 150 and 200 ft[2], the microlight's engine shut down. They then saw the microlight slightly veer to the RH side and then make a LH turn. During the turn, the microlight stalled, pitched down and collided with the ground. A fire then broke out.

2 ADDITIONAL INFORMATION

2.1 Eyewitnesses

2.1.1 Aerodrome mechanic

The witness specified that in addition to being a mechanic, he also held a valid LAPL licence and had totalled 150 flight hours.

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

He saw the pilot start up and carry out the engine tests which he perceived as nominal. He remembered that the microlight held for around 30 to 40 s at the threshold of runway 09. He indicated that he did not observe any other particular points during the take-off of 69AHM.

During the initial climb, he saw the microlight start a slight RH turn before making a more marked LH turn. He emphasized that the microlight's angle of attack increased more and more and that it entered a stall-spin.

2.1.2 Witnesses on ground

These witnesses were located around 400 m from the end of runway 09. They saw a microlight in initial climb which slightly veered to the RH side and towards their position. They considered that this was a usual flight path.

They mentioned that when the microlight passed close to their position, they heard the engine shut down and then immediately afterwards an attempt to restart it. They indicated that at the same time, the microlight started to turn and lean towards the LH side, in the direction of the fields. They then saw the microlight pitch down and descend towards the ground at a high speed.

They indicated that they contacted the emergency services and that some of them went to the accident site to provide assistance.

2.2 Microlight information

The VIPER SD-4 is a fixed-wing microlight with a 100-hp ROTAX 912 ULS engine and a DUC composite three-blade propeller. The microlight is equipped with an airframe parachute.

AQUILAIR Aircraft, the company which owned 69AHM from January 2022, was a flight training school which also proposed revenue sightseeing flights.

A 100-hour scheduled inspection was carried out on 28 February 2023, the microlight had totalled 622 hours.

The engine failure after take-off procedure described in the flight manual indicates setting the fuel selector to the "closed" position.

3.2.2 Engine failure after take off

- Airspeed .....adjust to 120 km/h (65 kts)
- Ignition switch ACS .....switch off
- Main fuel valve .....close
- Flaps.....extend as necessary
- Carry out an emergency landing
- Instruments.....switch off after landing
- Section switches.....switch off after landing
- Master switch .....switch off after landing
- Harness .....release (after the aircraft stops)
- Canopy.....open and get out

CAUTION

- If the engine fails under or at 50 m (160 ft), carry out landing in the direction of the flight (with diverting, if there are obstacles in the direction of the flight).
- If the engine fails above 50 m (160 ft), choose landing in the direction of a free area without obstacles and land against the wind, if possible.

Figure 1: excerpt from Flight Manual (source: Tomark SRO)

2.3 Site and wreckage information

The wreckage was situated in a field to the north-east of Montceau-les-Mines aerodrome, at 555 m from the end of runway 09. There were no marks in the vegetation around the wreckage in connection with the accident.

Figure 2: satellite view of the accident site (source: Géoportail, annotations BEA)

The various verifications carried out on the wreckage found that the microlight had a very high nose-down attitude (nearly vertical) and high energy on its impact with the ground.

The fire resulting from the impact very substantially damaged the nose and centre section of the microlight.

The flight controls were continuous in the parts that could be examined. However, due to the damage linked to the post-impact fire, it was not possible to carry out a complete examination of the flight controls, in particular in the forward section of the microlight.

The fuel selector was found in the "OFF" position. It was mechanically functional and it is not likely that the impact could have modified its position (see paragraph 2.4).

A fuel sample was taken. The results of the examination indicate that it was solely composed of SP98 unleaded gasoline for cars, with no signs of contamination.

The airframe parachute had not been activated by the persons on board.

2.4 Information on the fuel system

The fuel system includes two fuel tanks built into the wings each with a capacity of 35 l and equipped with a fuel-level float.

The fuel control selector is placed between the two seats. Four positions can be selected: right, left, both (to draw from the two tanks) and off.

Figure 3: view of fuel selector in Viper SD4 cockpit in "left" position (source: Aquilair Aircraft)

To select the fuel tank(s), the pilot just has to turn the selector to the desired position. However, to set the selector to OFF, a vertical pin has to be raised before being able to turn the selector. Two actions are therefore necessary to set the selector to OFF.

Closing the fuel supply to the engine will cause it to shut down after it has used the remaining fuel contained in the fuel system after the fuel tanks. This residual quantity is not known. Following the accident, the school instructor carried out a ground test in which the fuel was cut off by setting the selector (valve) to OFF on a VIPER SD-4. With the selector set to OFF, the engine, running at 3,200 rpm, operated for around two to three minutes before it shut down. The flight manual recommends a power of 5,300 rpm for take-off and 5,100 rpm for the climb. The instructor specified that the microlight was not equipped with a warning light in the event of the pilot starting up the engine with the fuel selector set to OFF.

The school instructor indicated that the pilot had fully replenished the fuel tanks at Villefranche – Tarare. When taking off with full fuel tanks, the instructor teaches student pilots to select the left tank and then to change tanks every 30 min. Student pilots are also taught not to set the fuel selector to OFF after a flight to avoid departing with the fuel tanks closed.

The instructor mentioned that when the fuel tanks are full, there may be a slight fuel leak through the vent situated on the rear of the left wing, near the step. He specified that this phenomenon can be accentuated by fuel, which has not been used by the engine, returning in the left wing. He added that all the pilots and student pilots are informed of this phenomenon during a practical lesson given in the training.

2.5 Pilot information

The 19-year-old pilot held a fixed-wing microlight pilot certificate since October 2021, obtained at AQUILAIR Aircraft and passenger carrying privileges since November 2022. He had totalled 28 flight hours all on type, including 1 hour 51 minutes in the previous 30 days and 3 hours 31 minutes in the previous three months.

According to his instructor, the pilot was very conscientious when preparing his flights and had had a linear progression throughout all the training. He also specified that in the training given, it is recommended, in the case of an engine failure on take-off or in initial climb, to push the stick forward, to continue straight ahead with a 45° cone free of any obstacles and to carry out an emergency landing without making any attempt to return to the runway.

He mentioned that the pilot was at ease when practising the engine failure after take-off exercises. The instructor indicated that the vital actions (A.C.H.E.V.E.R)[3] were present in the aeroplane's cockpit and that each pilot is trained to refer to them before taking off. Thus, each pilot must, among other things, check the following items concerning fuel:

- sufficient fuel level;
- valve open;
- fuel pressure;
- standby pump test.

[3] Checklist to be carried out before taking off: *A: accrochage ; C: commandes ; H: hélice ; E: essence ; V: vérifications ; E: environnement ; R: radio* (fastened, controls, propeller, fuel, checks, environment, radio).

2.6 Meteorological information

The meteorological conditions estimated by Météo-France at the time of the accident were as follows:

- south-easterly wind of 5 kt;
- visibility greater than 10 km;
- scattered clouds, cumulus at 2 130 m;
- temperature 29 to 30°C.

3 CONCLUSIONS

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

Scenario

In initial climb, the pilot experienced an engine shutdown. He then carried out a manoeuvre probably with a view to returning to land on the runway. During the turn, the microlight stalled and then collided with the ground.

The fuel selector was found in the "OFF" position. This position does not seem to be consistent with the decision to return to the aerodrome; what is more, the school instructors do not teach cutting off the fuel in the event of an engine failure in initial climb. It therefore seems unlikely that the pilot modified the fuel selection during the management of the engine shutdown.

The pilot had probably set the selector to the OFF position at the end of the previous flight and then forgot to open the fuel supply during the before-flight actions. In the absence of a warning, the pilot probably took off with the fuel supply closed and the engine shut down after using the remaining quantity of fuel contained in the system.

The investigation was unable to determine why the pilot tried to come back to the runway rather than continuing on the extended axis of the runway, where the environment was suitable for an emergency landing.

Safety lessons

Management of total or partial engine shutdown in initial climb

An engine shutdown is an integral part of the pilot training program. It is an exercise that is regularly practised. In the event of a partial or total engine shutdown in initial climb, and when the environment on the extended axis allows it, the strategy of landing straight ahead limits the risk of loss of control. In 2021, the BEA published a study, Reduction in engine power at take-off. The study states that the fatal accidents that occurred in this context have all been the result of a loss of control in flight, and a large proportion of these losses of control occurred during a significant heading change or even during an attempted turn-around.

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