Accident to the HUMBERT AVIATION - TETRAS 912 CS identified 88SY on Sunday 26 May 2024 at Saint-Oger

Time	Around 10:30[1]
Operator	Private
Type of flight	Local
Persons on board	Pilot
Consequences and damage	Pilot 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.	

Steep banked turn in descent, collision with vegetation and then the ground

1 HISTORY OF THE FLIGHT

Note: the following information is principally based on the microlight's GNSS[2] data.

The pilot took off at 09:50 from Épinal – Dogneville aerodrome to carry out a local flight (see **Figure 1**, Point 1).

The pilot carried out the first twenty minutes of flight at an altitude of around 3,000 ft. He then climbed to an altitude of around 4,500 ft (Point 2), before descending to around 3,000 ft (Point 3). When he was at 3,200 ft (Point 4), he turned right. During the turn, the microlight rapidly lost altitude (Point 5) and collided with the vegetation and then the ground.

[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.

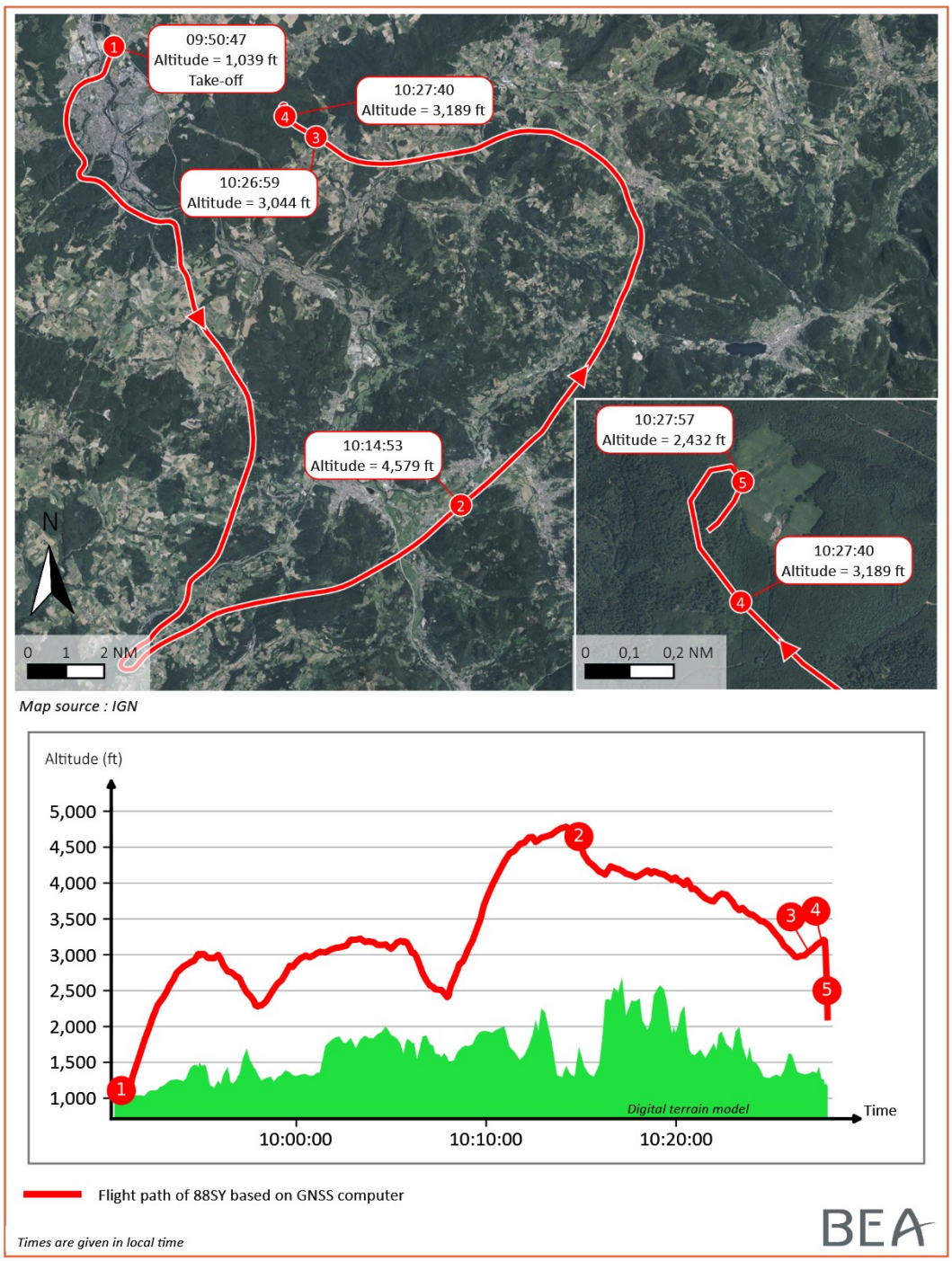

Figure 1: flight path of 88SY

2 ADDITIONAL INFORMATION

2.1 Meteorological information

The Météo-France estimations concerning the flight conditions indicated a south-south-westerly wind of 8 to 10 kt with a maximum instantaneous speed of 15 to 18 kt. Visibility was greater than 10 km and the sky was very cloudy with 5 to 7 oktas of altocumulus at a height of around 10,000 ft.

The weather conditions were compatible with the VFR flight carried out by the pilot.

2.2 Microlight information

The microlight identified 88SY was a Tétras built by Humbert Aviation. This is a fixed-wing microlight with high wings and a tricycle landing gear. It was equipped with a 100 hp Rotax 912 ULS engine. The maximum authorized operating speed is 210 km/h. The stall speed with the flaps retracted and the wings level is 76 km/h.

The microlight was equipped with an airframe parachute.

The examination of the maintenance documentation found that the aircraft was regularly checked. The oil changes were carried out every 100 h, the last oil change was on 8 March 2023. The microlight had totalled 715 flight hours.

2.3 Pilot information

The 57-year-old pilot held a fixed-wing microlight pilot licence with passenger carrying privileges issued in 2016. He also held a paramotor microlight pilot licence obtained in 2015. The manager of the company which owned the microlight was a microlight instructor. He had trained the pilot in 2015. Since then, the pilot had regularly hired the microlight, flying 20 h to 30 h a year.

The instructor had carried out a training flight with the pilot on a Dynamic (WT9) in February. He had approved him again for solo flight on the Tétras three months earlier in a runway circuit. The Dynamic, which the pilot usually flew, was also equipped with an airframe parachute.

The results of the autopsy did not reveal any medical factors likely to have contributed to the occurrence of the accident. Given the force of the impact when the microlight collided with the ground, the accident was incompatible with the survival of an occupant.

2.4 Examination of site and wreckage

The wreckage was situated in Saint-Oger forest. The trees were about twenty meters tall in this area. The marks left in the vegetation by the passing microlight indicated that the flight path was near vertical.

During the on-site examination, there was a smell of fuel. The engine was buried in the ground.

The airframe parachute was out of its housing. It had not been deployed. The ballistic system had very probably been activated by the deformation of the microlight structure on impact with the ground.

Figure 2: accident site (source: BEA)

The wreckage was removed for examination on the BEA's premises. Part of the propeller was found a few metres from the wreckage. The position and rupture observed on this part of the blade seemed to indicate that the engine was providing power.

This observation led to a detailed examination of the microlight structure to determine if a structural failure could have been the cause of a loss of control. The examination did not find any unusual element which could explain the accident.

2.5 Steep banked turn and spiral dive

The analysis of the data recorded by the GNSS receiver made it possible to determine the following points:

- at the start of the right-hand turn, the airspeed, estimated using the flight path and Météo-France wind data, was of the order of 85 to 90 kt (see **Figure 3**, Point Ⓐ). The altitude slightly increased from 3,000 ft to 3,200 ft;
- the altitude stayed globally constant for 10 s (up to Point Ⓑ), while the estimated bank (based on the ground speed and rate of turn) increased beyond 30°;
- the altitude then rapidly decreased, passing from 3,200 ft to 2,100 ft (Point Ⓒ, last recorded point considered as valid) in 9 s, while the estimated bank reached 70°. The flight path indicated a tightening of the right-hand turn. The average vertical speed was around – 8,000 ft/min during the descent. It was estimated that the impact occurred around 5 s later.

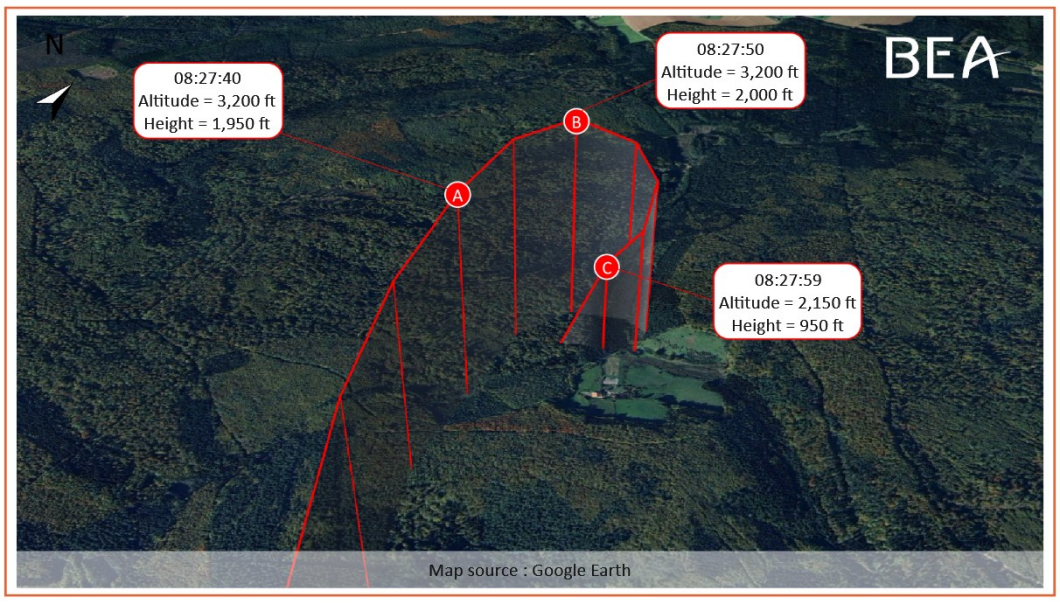

Figure 3: end of flight path of 88SY

The start of a turn, the high vertical speed and the increasing bank led to the hypothesis of entry into a spiral dive being considered. A spiral dive is a steep banked turn, in descent and at high speed.

When starting a turn, if no nose-up input is made on the elevator control to increase the pitch attitude, the vertical lift component no longer compensates the weight, the aircraft starts descending and the pitch attitude decreases. The effects on the load factor, of the decrease in pitch attitude and the turn compensate each other. The load factor is then close to 1 g. The start of descent may not be initially perceived by the pilot. In addition, the pilot, not perceiving the load factor corresponding to the start of a turn, may have a tendency to increase the pitch attitude.

Two possible scenarios were examined for the rest of the flight path:

- a spiral dive with no input on the elevator;
- a spiral dive with input on the elevator giving the illusion of holding level flight.

The flight path data for 88SY, specifically an increase in bank from 30° to 70° in 9 s, a U-turn in around 20 s and a vertical speed of the order of 8,000 ft/min, is compatible with the scenario of a controlled spiral dive with the illusion of holding level flight. In this case, the increase in load factor linked to the speed is cancelled by a reduction in pitch attitude. The altitude then rapidly drops. There is an important difference between the airspeed and ground speed: the ground speed is practically constant while the airspeed increases, essentially due to the vertical component. The bank effect compensates the effect of the increase in speed. The flight path is, in this case, centred on a single point.

In a spiral dive when the pilot turns around a point of interest, he may have a tendency to increase the bank to compensate for the widening flight path linked to the increase in speed.

3 CONCLUSIONS

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

Scenario

The pilot took off from Épinal – Dogneville on board the Tétras identified 88SY for a local flight. After a flight time of 25 min, when he was at 3,200 ft, he turned right. The available data showed a steep-bank turn in descent, compatible with entry into a spiral dive. The investigation was not able to determine if the pilot, at this point, was flying over a site of particular interest to him. It is possible that the pilot did not detect the situation in time to carry out the actions to exit a spiral dive or activate the airframe parachute.

Safety lessons

The spiral dive constitutes an insidious situation: it can amplify without the pilot clearly perceiving the deterioration in flight safety. This situation occurs when an aircraft is banked without sufficient compensation on the elevator control, leading to a reduction in the vertical component of the lift and start of descent.

Several videos or documents about this subject exist, for example the document published by the CNFAS (National council of aeronautical and sports federations).

They highlight two scenarios where this situation appears: flying over a point of interest on the ground or flying in reduced visibility conditions.

The actions to recover from a spiral dive are, in the following order, completely reduce power, adopt 0° bank and smoothly pull out to level flight.

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