BEA
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SAFETY INVESTIGATION REPORT

Accident to the MAGNI GYRO M16 Tandem Trainer identified 12CO on Saturday 14 August 2021 at Arceau-Arcelot

Time	Around 09:30[1]
Operator	Private
Type of flight	Instruction
Persons on board	Instructor and student pilot
Consequences and damage	Instructor fatally injured, student pilot seriously 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.	

Loss of altitude, collision with ground, post-impact fire, in instruction

1 HISTORY OF THE FLIGHT

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

The student pilot and the instructor were carrying out an instruction flight on a gyroplane from Arceau-Arcelot private microlight strip. The student pilot was in the front seat. He actioned the throttle lever during the take-off (see paragraph 2.2) and with his hands resting on the controls, felt the inputs made by the instructor sat in the rear seat.

During the initial climb, the instructor turned right. Shortly after coming out of the turn, the gyroplane seemed to have difficulties in gaining altitude and even in holding level flight. The instructor continued south-east as the gyroplane progressively lost height. The gyroplane flew over the A31 motorway and then collided with the ground in a quarry 2.5 km south-east of the microlight strip and caught fire. The two occupants managed to evacuate the aircraft but were seriously injured by the fire.

The instructor would die from his injuries.

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

2 ADDITIONAL INFORMATION

2.1 Meteorological information

The weather conditions measured by the Météo-France Dijon - Longvic weather station situated 13 km south-west of the accident site and at a similar altitude to that of the accident, indicated a mean wind of 3 kt[2] and a temperature of 23°C at 09:00 and 25°C at 10:00. The atmospheric pressure was 1020 hPa.

The Météo-France Beire-le-Châtel weather station situated at around 8 km from the accident site, recorded a temperature of 22°C at 09:00 and 25°C at 10:00.

2.2 Gyroplane information

2.2.1 General Characteristics

12CO was a MAGNI GYRO M16 Tandem Trainer gyroplane equipped with a Rotax 914UL engine providing 115 hp. Maximum power is reached with the help of a turbo and can only be provided for five minutes maximum. The pilot has to pass a detent to move the throttle lever to the stop and have the engine provide 115 hp otherwise the detent limits the travel of the throttle lever and the power to 100 hp. Only the throttle lever for the front seat is equipped with this detent. Thus, this design means that full engine power is only supposed to be controlled from the front seat[3].

This two seat tandem gyroplane is equipped with dual flight controls. However, the instruments[4] are only present in the front seat. According to the flight manual, the instruments are visible from the rear seat as the latter is higher than the front seat. The FFPLUM gyroplane specialist indicated that despite this, it was sometime difficult for an instructor sat in the rear to see the instruments, particularly if the person in the front seat was tall[5].

The M16 is equipped with a 72-l fuel tank built into the rear seat.

The performance indicated in the flight manual is a cruise speed of 144 km/h, best rate-of-climb speed of 110 km/h, best angle-of-climb speed of 90 km/h and a minimum speed of 65 km/h. The rate of climb is 625 ft/min for the maximum weight and the operating ceiling is at an altitude of 4,500 m. The maximum weight is 450 kg.

2.2.2 Specific characteristics of 12CO

The student pilot had purchased 12CO two weeks before the accident.

Following this purchase, a workshop had carried out inspection and maintenance work at the beginning of August 2021. The mechanic who had carried out the maintenance work performed a 30-min flight. The accident flight was the third flight after this return to service flight.

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[2] The glossary of abbreviations and acronyms frequently used by the BEA can be found on its web site.

[3] The student pilot affirmed that on this microlight, it was possible to control power from the rear seat. In the case of abnormal wear, the front seat detent may no longer fully carry out its role. It then becomes possible to control full power from the rear seat.

[4] The 12CO was equipped with the following instruments: rotor rpm counter, altimeter, airspeed indicator, compass, engine monitoring computer, fuel level indicator and vertical speed indicator.

[5] The student pilot indicated that the instructor was the same height as him.

2.2.3 Weight and balance

12CO had an empty weight of 274 kg. Taking into account the weight of the persons on board (around 200 kg) and a fuel load of 40 l, the estimated weight of the gyroplane on the day of the accident was around 500 kg, i.e. an excess weight of 50 kg.

The balance was in the envelope defined by the manufacturer.

2.2.4 Backside of power curve in gyroplane

Generally speaking, a gyroplane, like an aeroplane, can fly on the backside of the power curve. This means that when the gyroplane's speed decreases, the rotor's angle-of-attack increases, with a consequent increase in drag. The engine then has to provide extra power to compensate for this drag. If the speed is too low, the power required for level flight exceeds the power that can be delivered by the engine, and the gyroplane loses altitude.

2.3 Site and wreckage information

As the gyroplane had been destroyed by the fire following the collision with the ground, the examinations of the wreckage were limited. Nevertheless, it was possible to determine that the microlight struck the ground on a near-vertical flight path, with a slightly nose-up attitude and small roll. The examination of the airframe, rotor head, rotor, control rods and pre-rotator system revealed no anomalies prior to the collision with the ground.

An in-depth examination of the power plant found abnormally high wear on the gearbox, possibly due to high vibration levels. However, due to the extensive damage caused by the fire, it was not possible to draw any conclusions about the operation and performance of the power plant prior to the collision with the ground.

2.4 Instructor and student pilot information

The 72-year-old instructor held a microlight pilot licence with the fixed-wing rating obtained in 2003 and the gyroplane rating obtained in 2016. He obtained his gyroplane instructor rating in July 2017. The investigation was not able to determine the instructor's total and recent experience.

The 59-year-old student pilot held a microlight pilot licence with the flex-wing rating obtained in 2016. He had logged approximately 240 flight hours on flex-wings. He had not followed theoretical training on the operation of a gyroplane. He stated that the accident flight was his second flight on a gyroplane. He had carried out his first flight two days earlier with the same instructor. For this first flight, he was sat in the rear seat.

2.5 Instruction flight information

The Order of 24 July 1991 on the conditions of use of civil aircraft in general aviation[6] only states in the appendix, paragraph 2.10.1 Flight instruction that no-one may give flight instruction on board an aerodyne not equipped with dual main flight controls if the main controls are not easily accessible from both seats.

It is therefore possible, with aircraft with a tandem seat configuration, to carry out an instruction flight without the seat occupied by the instructor being equipped with instruments.
The FFPLUM told the BEA that it was common practice for instruction flights to be carried out

[6] Version in force on the day of the accident.

without instruments in the instructor's seat. Nevertheless, the instructor must be able to see the instruments of the student pilot's seat.

2.6 Statements

2.6.1 Student pilot's statement

The student pilot indicated that, for the accident flight, it had been agreed that he would be in the front seat, would manage the engine power and would have his hands resting on the controls, to feel the instructor's actions on these controls.

On take-off, the student pilot passed the detent and set the throttle lever to the forward stop, so that the engine would deliver its full power. He specified that the instructor took off and accelerated horizontally before continuing the climb and making a RH turn. According to him, they were at a height of about 40 m on coming out of the first turn, and the gyroplane was no longer climbing. He explained that he then told the instructor that the gyroplane was not gaining altitude, and that they should land. The instructor replied that there was nothing to worry about. The student pilot stated that the gyroplane was gradually descending and that he asked the instructor to turn around and land, to which the instructor did not reply. They then flew south-east over the motorway. When overhead a quarry and facing a bridge over the motorway, which they could not fly over at their altitude, the instructor pitched up the gyroplane before it collided with the ground.

The student pilot added that the power lever had remained in the 115 hp position, and that a speed of around 100 km/h was maintained until the nose-up manoeuvre, a few seconds before the collision. He added that he had monitored the engine and rotor speeds, and that they were nominal throughout the flight.

2.6.2 Other statements

A witness close to the accident site reported seeing the gyroplane passing at a low height in descent and hearing the sound of the engine. He mentioned that the gyroplane slowed down as it pitched up, then fell and collided with the ground before bursting into flames.

3 CONCLUSIONS

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

Scenario

The instructor, accompanied by the student pilot, took off from the microlight strip at around 09:30. During the flight, although, according to the student pilot, the engine, rotor and speed parameters were nominal, the gyroplane gradually lost altitude until it collided with the ground.

The gyroplane's excess load and the meteorological conditions on the day of the occurrence reduced its performance. However, this degraded performance does not on its own, explain the loss of altitude described by the student pilot.

The flight path described by the student pilot seems to correspond to flight on the backside of the power curve. However, in the absence of additional data to the student pilot's statement, the investigation was unable to confirm this hypothesis.

The investigation was also unable to understand why the instructor did not seem to react to this abnormal situation.