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INVESTIGATION REPORT

Accident to the amateur-built microlight gyroplane identified 85ALT

on 6 April 2018
at Flavacourt (Oise)

Time	17:30[1]
Operator	Private
Type of flight	Local flight
Persons on board	Pilot
Consequences and damage	Pilot fatally injured, aircraft destroyed

This is a courtesy translation by the BEA of the Final Report on the Safety Investigation published in April 2020. As accurate as the translation may be, the original text in French is the work of reference.

[1] Unless otherwise stated, all times given in this report are in local time.

Loss of control during take-off, collision with the ground, during a flight after modification of the aircraft

1 - HISTORY OF THE FLIGHT

Note: the following information is mainly based on a video of the accident as well as on statements.

The pilot took off from runway 14[2] of Flavacourt microlight platform for a check flight following installation of a full cockpit canopy and a modification to the tail assembly carried out by himself. As soon as the wheels left the ground, the gyroplane yawed to the right and then gained height. It turned and progressively banked to the right as it climbed. The gyroplane then suddenly rolled to the left and onto its back, fell and hit the ground approximately 300 m to the right of the threshold of runway 14.

[2] Unpaved 400 m x 40 m runway.

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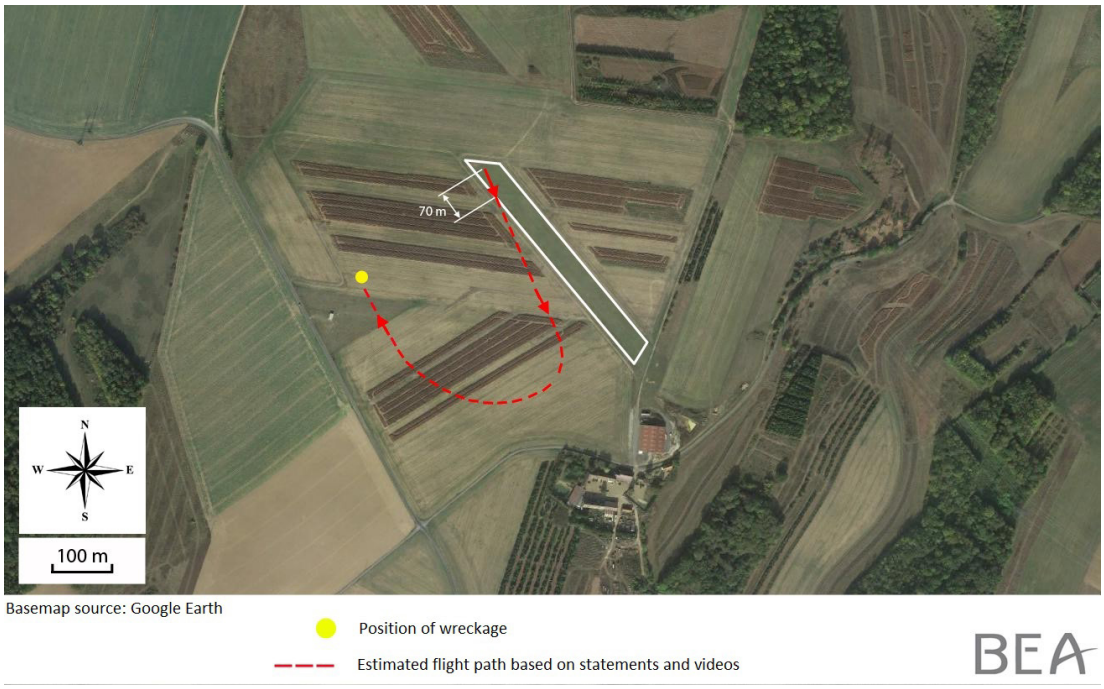

Figure 1: position of the wreckage

2 - ADDITIONAL INFORMATION

2.1 Site and wreckage information

The pieces of the wreckage were grouped together in a field suitable for a forced landing. The microlight hit the ground with a nose-down attitude and on its right side.

Damage to the cockpit canopy and the tail assembly resulted from the loss of control and the collision with the ground. No technical failures that could explain the accident were found. In particular, the continuity of the controls was confirmed.

2.2 Pilot information

The 60-year-old pilot held a microlight pilot licence that was issued in 1994 and had obtained the following class ratings:

- paramotor in 1994;
- fixed wing in 2012;
- gyroplane in 2013.

He had held an instructor rating for the paramotor class since 2003.

According to the statements given, the pilot had significant flying experience amounting to several thousand flight hours, mainly in paramotors. It was not possible to estimate his total experience in gyroplanes. He had logged approximately 20 hours on his 85ALT. He had also previously owned another amateur-built gyroplane.

The pilot conducted paramotor training and introductory flights for a company he had founded. He had purchased the 85ALT to provide gyroplane introductory flights, particularly when the meteorological conditions were not suitable for paramotor flights.

2.3 Information on the gyroplane

The 85ALT was an amateur-built gyroplane[3] assembled by a gyroplane pilot in 2015 from:

- a two-seater tandem airframe with an open cockpit copied from the AutoGyro MTO-03;
- an 8.35 m diameter Air Copter rotor[4];
- a BMW in-line 4-cylinder K1200RS engine delivering 130 hp at 8,750 revolutions per minute and equipped with a reduction gearbox;
- a three-blade composite propeller[5] rotating clockwise seen from behind.

The builder of the 85ALT sold the gyroplane to the pilot involved in the accident in July 2016. He stated that the microlight had logged around 100 flight hours at that time. He said that the gyroplane's behaviour was standard, although its yaw control required significant rudder inputs. He added that he had shifted the rotor attachment laterally to take into account the direction of rotation of the BMW power plant, which is the opposite to the Rotax 912 and 914 engines that usually equip gyroplanes. In addition, this BMW engine is about 20 kilograms heavier than the Rotax 912 engine.

Exchanges between the pilot involved in the accident and gyroplane builders/pilots revealed that the pilot had encountered landing and take-off difficulties on his first flights. He had noticed that, during take-off, the gyroplane adopted a significant nose-up attitude and ''*veered heavily*'' to the right. The pilot had to adopt a hard nose-down input during take-off. He had measured an aft centre of gravity that was significantly outside the centre of gravity envelope of gyroplanes. He had made numerous modifications to the gyroplane. The main modifications were:

- Modification to the rotor's longitudinal position to improve the centre of gravity.
- Modification to the rotor's lateral position to improve the behaviour of the gyroplane when there were engine power fluctuations.
- Addition to the tail assembly of two movable vertical fins linked to the rudder. Before the accident flight, the pilot had blocked these two fins.
- Installation of a cockpit canopy comprising aluminium posts, plexiglass and a metal roof.

It was not possible to date these modifications precisely, but, according to the statements given, it was thought that the accident flight was the first flight after the cockpit canopy had been installed. Based on the information obtained, it is unlikely that the pilot measured the centre of gravity after the latest modifications.

[3] Microlight that is neither mass produced nor assembled from a mass-produced kit.

[4] Anti-clockwise rotation seen from above.

[5] The investigation was unable to determine the make and model of the propeller.

Source : http://www.forum-autogire.com/t2568-Bois-de-la-Pierre-2016.htm

Figure 2: photo of the gyroplane before installing the cockpit canopy and modifying the tail assembly

Figure 3: image taken from the accident video

Witnesses and gyroplane pilots and builders indicated that the installation of a canopy that completely encloses the cockpit significantly modifies the behaviour of a gyroplane. They stated that, after installing a cockpit canopy on an existing airframe, a lack of yaw control had been observed and that it is difficult to counteract the engine effects. The tail assembly must therefore be modified accordingly (position, dimensions) in order to obtain sufficient control at low speed. They pointed out that a two-seater gyroplane is usually more difficult to fly with a cockpit canopy than without.

2.4 Analysis of videos of the accident

For this test flight, the pilot had fitted a camera to the leg of the main right landing gear pointing towards the tail assembly. A witness on the ground also filmed the flight.

The analysis of the sound and images from the two videos show that:

- The engine was producing power continuously until the loss of control.
- The rotation started after a take-off run of about 50 m. The nose-up attitude was very sudden.
- As soon as the wheels lifted off the ground, the microlight yawed to the right despite the deflection of the left rudder pedal.
- Once in flight, the microlight exited the lateral boundaries of the runway after travelling approximately 70 m from the beginning of the take-off run.
- During its climb, the microlight continued to make a banked turn right with the rudder still deflected to the left.
- After a turn of approximately 180°, the rudder returned to a near-neutral position and the microlight rolled left onto its back.

2.5 Meteorological conditions

The accident area was close to a weather depression and under high cloud cover. The air mass was stable, with a moderate south-easterly wind on the ground and visibility greater than 10 km.

A microlight pilot who landed on runway 14 at Flavacourt about 30 minutes before the accident indicated that the wind was blowing along the axis of the runway at a maximum of 10 kt. He did not encounter any particular meteorological phenomena.

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 information obtained suggests that the gyroplane was still being further developed and modified by the pilot. It is very likely that the microlight had an aft centre of gravity that required the pilot to apply a significant nose-down input during take-offs. In addition, the yaw control of the microlight at low speed was difficult when there were power fluctuations. These handling difficulties can be explained by the inappropriate setting of the rotor head on its shaft given the relatively heavy weight of the engine and the direction of rotation of the propeller, which is the opposite of that of a propeller driven by a Rotax 912/914 engine, which is usually installed on gyroplanes.

The last major modification made to the microlight was the addition of a cockpit canopy, which was probably motivated by the plan to take paying passengers on maiden sightseeing flights. The cockpit canopy caused a deterioration in the yaw behaviour of the microlight, which was already difficult to fly. In this configuration, the rudder probably no longer had the control to counteract engine effects during take-off, even with full rudder deflection.

During take-off, the pilot did not reduce power and the microlight climbed while continuing to veer right even though the pilot had applied left rudder. Under these conditions, the pilot lost control of his aircraft.

Safety lessons

The decree of 23 September 1998 on microlights defines a modification as major when it affects an item of the description of the microlight on the identification sheet[(6)] of the microlight. Such a modification has the effect of suspending the clearance to fly. The owner of the microlight must thus notify the authority and provide it with a declaration of conformity with the technical conditions applicable to microlights and an updated aircraft weight record.

[(6)] The identification sheet contains information such as engine type, propeller and wing surface.

The modifications made by the pilot to the 85ALT, including the addition of a cockpit canopy, are not considered to be major modifications within the meaning of this decree. However, they had critical consequences for the behaviour of the microlight, which could no longer be controlled. The pilot underestimated the consequences of these modifications. Paragraph 7.6.9 of the Directive of 21 February 2012 on microlights states that seemingly minor modifications, such as the addition of a fairing that makes the aircraft difficult to fly can have very serious consequences.

This occurrence illustrates the importance of the pilot familiarizing himself with an aircraft after significant modifications have been made, whether they are considered major or not. Amateur constructions can display specific features and it is essential during the initial flight to establish a programme explaining the purpose of the flight, its limits and to anticipate possible technical difficulties (engine failure, failure of a control surface, etc.). It may be useful to proceed in stages, first by carrying out a low-speed and then a high speed run. If the behaviour of the aircraft is satisfactory and if the runway allows it, it may also be advisable to land immediately after the wheels have left the ground in order to assess the effectiveness of the control surfaces. Then a full take-off is possible.