BEA
Bureau d'Enquêtes et d'Analyses
pour la sécurité de l'aviation civile

www.bea.aero

SAFETY INVESTIGATION REPORT

Accident to the ROBIN DR400-160 registered F-GLKL on Tuesday 30 July 2024 at Buigny-Saint-Maclou

Time	Around 17:50[1]
Operator	Aéroclub d'Abbeville - Buigny - Baie de Somme
Type of flight	Introductory flight
Persons on board	Pilot and three passengers
Consequences and damage	Aeroplane 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.	

Staying on the backside of the power curve during take-off, collision with ground, post-impact fire, during an introductory flight

1 HISTORY OF THE FLIGHT

Note: the following information is principally based on statements made by the pilot and passengers.

The pilot planned to carry out a half-hour flight over the Bay of Somme, departing from Abbeville aerodrome, with three passengers, in the scope of an introductory flight.

The pilot lined up at the threshold of runway 31[2], applied full thrust on brakes and then started to take off. He indicated that the run was nominal and that the aeroplane reached the expected speed (80 km/h) at the reference[3] he had chosen to decide whether to continue or reject the take-off. He took the weight off the nose gear at this reference point and then rotated once the speed of 100 km/h had been reached. The aeroplane rose, according to him, around ten metres. He then observed that the speed was no longer increasing and that the aeroplane was sinking. He checked that the power control was fully pushed forward and held the wings horizontal while limiting the pitch.

[1] Except where otherwise indicated, the times in this report are in local time.
[2] Unpaved runway measuring 570 m x 80 m, limited to 550 m (see paragraph 0).
[3] A windsock used by the paramotor pilots situated alongside runway 31 (see **Figure 1**).

RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité

June 2026 BEA2024-0305

After flying at a low height, over the road situated after the end of the runway, the aeroplane struck the ground in a field and came to a stop on its nose after approximately ten metres. The passenger sat in the front seat saw flames coming from the front right-hand side of the aeroplane. The pilot tried to open the canopy but it blocked after sliding approximately 30 cm forward. The four occupants managed to evacuate through this opening before the aeroplane was completely destroyed by fire.

2 ADDITIONAL INFORMATION

2.1 Site and wreckage information

The wreckage was lying around 250 m from the end of the runway in a field of low-growing crops with deep furrows. Debris, notably fairing debris, was scattered over approximately ten metres upstream of the wreckage in the direction of the aeroplane's arrival path.

There was no perimeter fence or high vegetation between the end of the runway and the road.

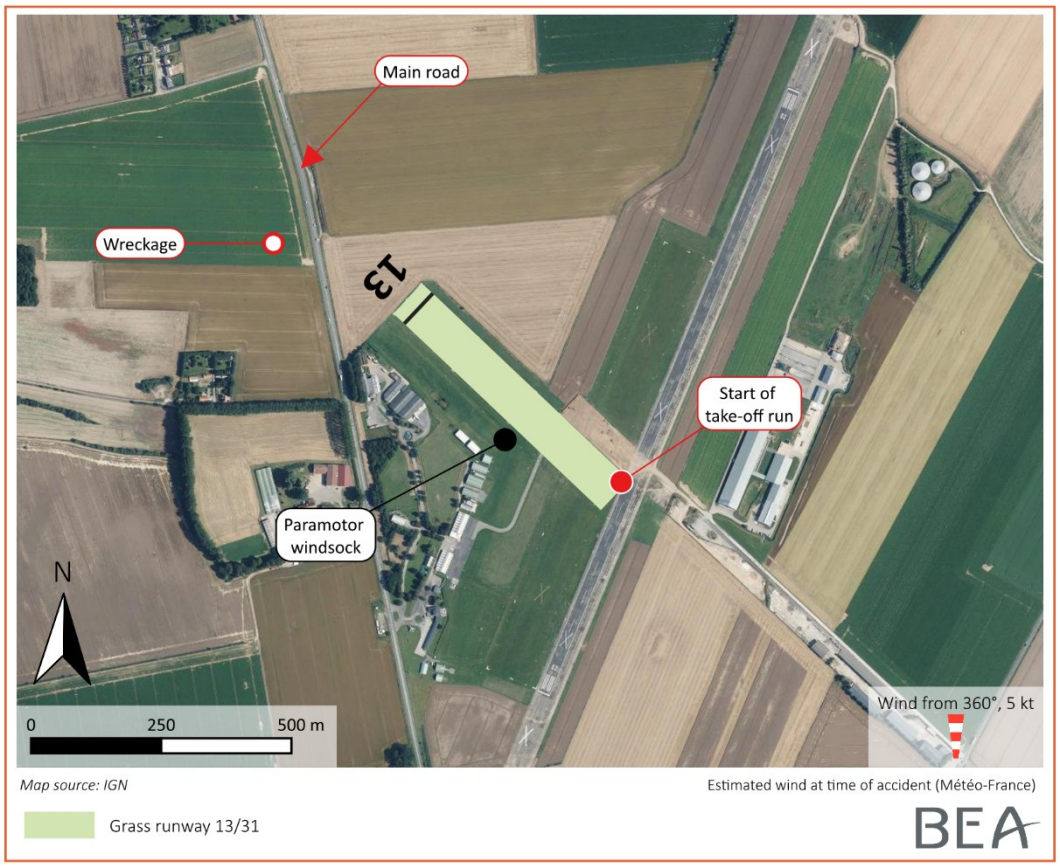
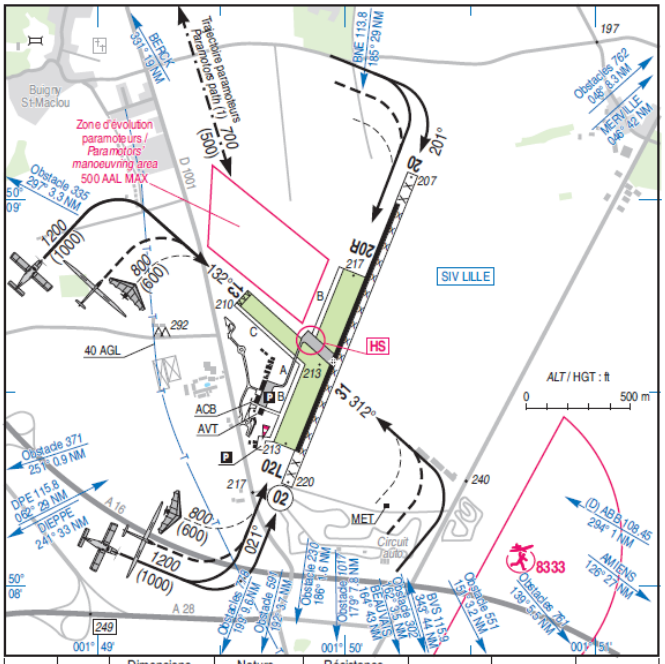


Figure 1: position of wreckage

Given the statements gathered, the information collected during the investigation and the damage to the aeroplane caused by the fire, no detailed examination of the wreckage was carried out. In particular, neither the configuration of the flaps nor the position of the elevator trim were determined.

2.2 Aerodrome information

Abbeville aerodrome situated at an altitude of 220 ft[4] has three runways, two main runways 02/20 and a third runway 13/31.



RWY	QFU	Dimensions *Dimension*	Nature *Surface*	Résistance *Strength*	TODA	ASDA	LDA
02 20	021 201	1250 x 23	Revêtue *Paved*	5 / 8 / 19	1250 1250	1250 1250	1250 1250
02 L 20 R	021 201	900 x 100	Non revêtue *Unpaved*	-	900 900	900 900	900 900
13 31	132 312	570 x 80	Non revêtue *Unpaved*	-	570 570	570 570	540 570

Figure 2: excerpt from Abbeville VAC in force the day of the accident (source: SIA)

Paved runway 02/20 was closed in 2022 after an area had sunk and then the unpaved runway 02/20 was also closed in December 2023. Furthermore, in order to repair the latter, runway 13/31 had been shortened by 20 m level with threshold 31, reducing the distance available to 550 m. The day of the accident, only runway 13/31 could be used and subject to the authorization of the operator[5]. The grass of the runway was short.

2.3 Meteorological information

Météo-France indicated that the day of the occurrence was marked by the persistence of a very hot air mass across the entire country. This was the first heat wave of 2024, and on the day of the occurrence, 90% of France was experiencing temperatures exceeding 30°C. The night of 30-31 July was the fourth hottest night across the country since measurements began in 1947[6].

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

[5] The accident pilot had received the authorization by the operator to carry out the flight.

[6] https://meteofrance.com/actualites-et-dossiers/actualites/premiere-vague-de-chaleur-de-lannee.

The visibility conditions were good with few clouds. The Abbeville Météo-France weather station reading[7] indicated for 18:00:

- mean wind from 360° of 5 kt;
- visibility greater than 10 km;
- a temperature of 33°C under shelter at 1.50 m from the ground;
- QNH 1014 hPa.

This station also has several unsheltered temperature probes. Between 17:30 and 18:00, the probe situated at 50 cm from the ground recorded a mean temperature of 38°C. This measurement is intrinsically more affected by the nature of the ground as well as the height and quality of the grass. However, it may be representative of the conditions actually encountered during take-off.

A glider instructor had carried out a flight of around half an hour just before the accident. He then carried out a towed take-off from runway 31, a few minutes before the take-off of F-GLKL. He indicated that during the two take-offs, he had not felt any particular aerological conditions.

2.4 Aircraft information

2.4.1 General information

F-GLKL was a Robin DR400-160 built in 1992. It was equipped with a 160-hp Lycoming O-320-D21 engine and a Sensenich 74DM6S5-2-64 propeller. When configured for take-off (flaps 1), the take-off speed indicated in the flight manual is 100 km/h and the initial climb speed, 130 km/h.

The engine was installed new on F-GLKL in October 2023. At the time of the accident, it had logged around 115 operating hours. The propeller had been overhauled in May 2022.

2.4.2 Take-off performance

Based on the information gathered from the pilot and passengers, the BEA estimated the weight of the aeroplane on take-off as being between 965 and 970 kg for a maximum permissible weight of 1,050 kg. The aeroplane was in the weight and balance envelope recommended by the manufacturer.

According to the flight manual, for a weight of 970 kg and in the conditions of the day, i.e. an altitude of 220 ft and a temperature of 33°C (standard temperature (ISA) +18.5 °C), the run distance was around 280 m and the take-off distance 565 m on a paved runway. According to the flight manual, for a grass runway, an additional 15% should be added to this figure which increases the take-off distance to around 650 m.

No performance was indicated in the flight manual for temperatures in excess of 35°C such as those measured by the unsheltered temperature probe. In the absence of manufacturer information, other methods can be used to assess the degradation in take-off performance, in particular those using the Koch diagram. For example, the tool recommended by the FFPLUM indicates an extra take-off distance of 29% at 33°C and 37% at 38°C.

[7] Although there are no more Abbeville aerodrome METAR, the readings of the weather station located on the aerodrome are available on websites such as https://www.infoclimat.fr/.

The pilot explained that he calculated the take-off performance based on his estimation of the fuel quantity and the weight indicated by each passenger, i.e. a total weight slightly above 950 kg. He justified his decision to carry out the flight by having under-estimated the temperature at 25 °C (ISA +10 °C) and a calculation error in taking the standard temperature. He had estimated the take-off distance as being 554 m on a grass runway.

In the conditions of the day, the density altitude, which corresponds to the pressure altitude corrected with the temperature, was around 2,400 ft. This means that the take-off conditions were equivalent to those for a take-off from an altitude of 2,400 ft in standard conditions. The FFA training commission has published a Practical Rules document (*Règle pratique*) with respect to high temperatures. In this document, it is specifically indicated that air density decreases as the temperature increases and that less dense air leads to a degradation in performance, and thus greater take-off distances and lower climb performance.

2.4.3 Canopy opening system

The DR400 canopy is opened by unlocking the handle and sliding it forward. This handle is situated overhead in the centre of the canopy.

In the event of an emergency situation, the canopy is equipped with a release system that can be activated by means of two levers situated each side of the cockpit, on the armrests, close to the instrument panel. When the two levers are raised and the handle is in the “unlocked” position, the canopy is released from its rails and can be raised. However, if the canopy is slid forward by more than ten centimetres, the release levers are no longer in the pilot’s field of vision and may be difficult to access and use, in particular during an emergency evacuation.

Figure 3: photo of release lever from left seat with canopy closed (left-hand side), open by 8 cm (middle) and open by 30 cm (right-hand side) (source: BEA)

2.5 Pilot information and statement

2.5.1 Licences and experience

The 71-year-old pilot held an Airline Transport Pilot Licence obtained in 1984. After stopping his activity as airline pilot in November 2013, he did not pilot for several years. He then joined the Abbeville flying club and after a flight test, obtained the SEP rating in September 2018.

At the date of the accident, the pilot had logged around 19,000 flight hours, including around 600 hours on light aeroplanes and 300 hours since September 2018. In the twelve months preceding the accident, the pilot had logged approximately 34 flight hours, including 15 hours in 2024 as pilot-in-command on the DR400-160 and the DR400-120.

The pilot had carried out:

- in 2023, around 40 introductory flights or flights in the scope of extended cost-sharing;
- in 2024, 14 introductory flights, including 4 during open day events.

2.5.2 Pilot statement

The pilot indicated that the day of the occurrence, he had been left a message by the president of the flying club for him to carry out an introductory flight for three passengers. Due to the restrictions on Abbeville aerodrome, the aeroplane was regularly operated out of Eu - Mers – Le Tréport aerodrome where it was parked at that time. Unable to contact the passengers to propose that they took off from Mers, the president took the pilot by car to Mers so that he could ferry F-GLKL to Abbeville.

The pilot informed the passengers that, given the day's conditions, it was going to be a bit "tight". He specified that he did explain to the passengers that if the aeroplane had not reached 80 km/h level with the windsock used by the paramotor pilots, he would not continue the take-off and one of the passengers would have to disembark to permit the introductory flight to be carried out.

He specified that it was the first time that he had taken off from this runway with three passengers.

After carrying out a safety briefing with the passengers during which he covered how to release the canopy in an emergency, he taxied to the threshold of runway 31. He specified that he lined up at the beginning of the runway in order to have a maximum distance. He took off with the flaps in position one and by applying thrust on brakes. He added that during the engine checks and on increasing engine power, the engine parameters were nominal. He did not observe any anomaly during the take-off run. When he passed level with the windsock used by the paramotor pilots, corresponding to roughly mid-runway, the aeroplane had reached 80 km/h. He therefore continued the take-off, took the weight off the nose gear by making a nose-up input and then rotated at 100 km/h, limiting the increase in pitch attitude to accelerate to 110-120 km/h. He did not manage to reach this speed and the aeroplane sunk. The pilot felt what seemed to be a loss of lift. He specified, however, that the speed remained stable at 110 km/h. Being too low to let the stick move forward and accelerate, he held full power and the wings flat without increasing the pitch attitude. The aeroplane touched down in this configuration. The deceleration was very sudden and the aeroplane came to a halt on its nose.

The pilot then switched off the magnetos and closed the fuel valve when the front passenger informed him that he could see flames on the front right side of the aeroplane. He tried to open the canopy but it blocked after sliding approximately 30 cm. He then wanted to close the canopy to reach the levers for the emergency release but the canopy was blocked in both directions. He and the passengers nevertheless managed to evacuate the aeroplane through the available opening. The pilot specified that the three passengers were slim. Once the passengers were at a distance from the wreckage and safe, the pilot returned to the aircraft to recover the aircraft documents despite the fire. The pilot specified that he moved away when the smoke blackened.

The pilot added that he was feeling well that day and was not affected by the heat. The pilot participates in the safety management in the club. During safety meetings for members, pilots are recommended to take a safety margin of 5 to 10% with respect to the theoretical calculations. He specified that this margin was in the context of a wet runway. However, on the day of the accident, "once he had got going," he did not take any safety margin, telling himself that he would accelerate and stop if he did not have the expected speed passing the ground reference he had set for himself.

2.6 Passengers' statements

The passengers indicated that initially only one of them was to carry out the flight. This passenger called the club the morning of the occurrence for additional information. A proposal was then made to him to carry out the flight at 17:00 with two of his relatives who were going to accompany him. The passenger called the club back in the early afternoon to indicate that they agreed to this and that they would therefore be three passengers.

The three passengers arrived at the aerodrome at around 17:30. The pilot explained the difficulties of the flight, as the runway was short and the weather was hot. The witnesses stated that initially the pilot did not want to take off with three passengers. After asking them their weight, the pilot indicated that the plane would be "a bit heavy," but that he would try anyway. The pilot also specified that if he could not take off, one passenger would have to disembark in order to carry out the introductory flight.

The pilot gave them a safety briefing (including how to release the canopy and the operation of the three-point belts) and explained some of the cockpit instruments and the checklists. One of the passengers specifically remembered the pilot mentioning the flap position. The pilot also asked them not to use their telephones during take-off.

The aeroplane "took off" at the reference selected by the pilot and then descended. Level with the field, the aeroplane nosed down. One of the witnesses thought the plane dropped to a height of approximately five meters. They felt a sharp deceleration once the aeroplane was on the ground and saw smoke as soon as it came to a stop. The pilot immediately tried to open the canopy, but it remained stuck. They managed to evacuate the aeroplane through the available opening.

2.7 Operator information

The Aéroclub d'Abbeville operates aeroplanes, gliders and microlights. It is a Declared Training Organization (DTO) and proposes introductory flights.

2.7.1 Introductory flight

In France, introductory flights are local remunerated flights conducted by training organizations or organizations created to promote recreational and sport aviation. This activity, which must remain marginal, is limited under the regulations to 8% of the total flight hours performed in a calendar year[8].

The Aéroclub d'Abbeville offers several introductory flights on its website and distributes the brochure below. The president had authorized eight pilots, including four instructors, to conduct this type of aeroplane flight. In its 2023 annual report, the club indicated having carried out nearly 1,650 flight hours across all aircraft categories, including 594 aeroplane hours, of which 43 hours were introductory flights, representing nearly 8% of the total flight hours, the maximum allowed.

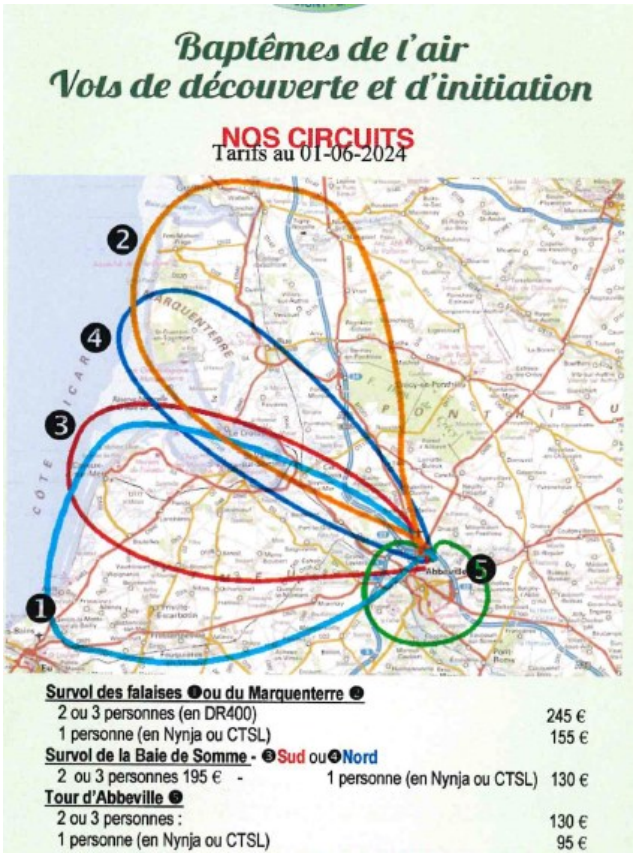


Figure 4: excerpt from flying club brochure for introductory flights (source: Aéroclub d'Abbeville)

This activity is "essential" for the financial stability of the flying club according to its president. When there was work or periods when the aerodrome was closed, the club operated its aeroplanes out of Eu-Mers-Le Tréport aerodrome in order to continue offering introductory flights. The flying club had previously informed the DSAC of this. The president clarified that he did not exert any pressure on the pilots to conduct introductory flights.

[8] However, introductory flights carried out during open days, limited to six days a year, are not taken into account for this figure. These flights must not generate profits distributed outside the organization.

Outside the framework of the DTO, the flying club also offered introductory flights in microlights. At the time of the accident, no specific regulatory requirement[9] applied to this type of flight.

2.7.2 Safety instructions for using runways

The president of the flying club was the DTO representative. He was also the safety and prevention officer and was assisted in this role by the pilot involved in the accident.
The president stated that in November 2023, following heavy rainfall, the management team sent safety instructions to pilots by email regarding the use of the main grass runway[10]. This email reiterated the requirement to complete a weight sheet before each flight and to limit the aircraft load. Pilots were also instructed to apply thrust on brakes at the physical threshold of the runway and to verify acceleration using visual references in the environment. A reference point was provided for each take-off direction, along with the instruction to reject the take-off if the aeroplane had not taken off after passing the reference point. It was specified that take-offs from runway 13/31 were prohibited.

Following the closure of the main unpaved runway, the club was forced to use runway 13/31. This short runway required special precautions, so the club organized a safety meeting in December. This meeting was led by the pilot involved in the accident. The following recommendations were notably communicated:

- take-off at full load prohibited;
- take-off with thrust on brakes, then weight off nose wheel as soon as the rudder is effective;
- rejection of take-off if a speed of 80 km/h is not reached abeam the paramotor windsock;
- introductory flights and cost-sharing flights: maximum two passengers, except if the passengers are very light;
- weight calculation mandatory;
- do not hesitate to forgo the flight.

An example of a take-off distance calculation based on weight was presented for the club's DR400-120 at this meeting.

At the request of the DSAC, the club sent a safety analysis summarizing the points discussed during the safety meeting. As the recommendations in this analysis were based on the performance of the DR400-120, the DSAC requested a supplementary analysis for the other aeroplanes operated. In his reply to this request, the club president indicated that there was no need for a specific analysis for the other aeroplanes, as their performance was better than that of the DR400-120. The president nevertheless clarified that the internal recommendations applied to all the aeroplanes. Furthermore, the page from the F-GLKL flight manual concerning take-off performance had been posted in the flying club's premises in March 2024. Several calculations had been annotated there, notably one for a take-off from a grass runway, with a weight of 950 kg and in standard temperature conditions. A distance of 555 m had been calculated for these conditions.

[9] Order of 17 February 2025 regarding the conditions for using microlights. Version in force at the date of publication.
[10] At this date, the main unpaved runway was not closed.

2.7.3 DSAC oversight

As part of the oversight of training organizations, the flying club was inspected by DSAC officers in November 2020. Furthermore, in March 2022, the DSAC conducted an assessment of the flying club's instruction standards and held a safety meeting with the club president. These oversight activities did not cover the flying club's introductory flights[11].

When the DTO was created, the flying club president was not authorized by the DSAC to act as its representative. However, during a 2022 inspection, the DSAC observed that the president was assuming a significant portion of the DTO's functions, in addition to his responsibilities as the safety liaison officer. Following an appeal to the DSAC-N, the sanction was lifted in exchange for the drafting of a safety manual.

The club president organized the accident flight for three passengers despite the exceptionally high temperature raising concerns about the feasibility of a safe flight from a short runway, and despite the fact that the safety guidelines drawn up by the club president and the pilot limited introductory flights to two passengers. Furthermore, the club had experienced two accidents during landings on runway 13/31 in June 2024, the previous month, which were not reported to the DSAC[12]. In addition, although affiliated with the FFA, the club had not activated the REXFFA experience feedback system. This situation illustrates a safety culture with room for improvement and raises questions about the club's actual ability to implement its safety policy.

[11] Since 2022, introductory flights have been subject to DSAC oversight during DTO inspections (excluding instruction standard assessments, which are not intended to address this type of flight).

[12] The DSAC was nevertheless informed about these two occurrences through another channel.

3 CONCLUSIONS

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

Scenario

The pilot, accompanied by three passengers, undertook a flight from a runway measuring 550 m, the sole runway in use that day. He indicated that he had reached the target speed when passing the ground reference he had fixed for himself and started rotating at the manufacturer's recommended rotation speed. The pilot, who was aware that this runway was restrictive given the weight of the aeroplane and the exceptionally high outside air temperature, probably unconsciously made a large nose-up input, leading to an increased angle of attack and drag. The proximity of the road, situated at around 200 m from the end of the runway may have also contributed to the pilot unwittingly taking a high pitch attitude. The aeroplane, at this point very probably held on the backside of the power curve, did not accelerate and then lost height. After flying over the road at a very low height, the pilot was unable to avoid collision with the ground. Although highly unlikely, the investigation was not able to exclude a decrease in power undetected by the pilot or a flap configuration error.

During the evacuation, the canopy slid forward around 30 cm before blocking very probably due to deformations of the airframe. With the canopy in this position, the pilot was unable to reach the release handles and the occupants had to evacuate the aeroplane by the available small opening before it was completely destroyed by the fire.

Contributing factors

The following factors may have contributed to the organization of an introductory flight at the aeroplane's performance limits:

- the management of the introductory flight (reservation, departure aerodrome, number of passengers) by the club president without first consulting the pilot when accepting the reservation and waiving the internal rules that the president himself had established;
- possible pressure to undertake the introductory flights to ensure the financial stability of the flying club.

The following factors may have contributed to the pilot's decision to undertake the flight:

- the difficulty of refusing to satisfy three passengers who had come to the aerodrome for an introductory flight;
- the pilot's excessive confidence in a ground reference that would allow him to decide whether the take-off could be safety continued or whether it should be rejected. This reference proved to be ineffective on a short runway in a very dynamic situation.

Safety messages

Staying on the backside of the power curve during take-off

During the take-off, the rotation takes place normally and without danger on the backside of the power curve. The excess power output then allows the aeroplane to accelerate and gradually exit the backside of the power curve.

In the event of a restrictive runway or in the presence of an obstacle, a pilot may unconsciously adopt an excessively steep nose-up attitude and thus have high angles of attack. A high angle of attack leads to increased drag. The engine power output may then become insufficient for acceleration, or even for maintaining level flight.

Light aircraft generally have small excess power and are therefore vulnerable to this phenomenon. The French CNFAS (national council of aeronautical and sports federations) has published a document, *Le second régime de vol et le décollage* which explains the risks with staying on the backside of the power curve after take-off.

Canopy emergency release

During the evacuation, the canopy partially slid forward before blocking, very probably due to deformations of the fuselage. In these conditions, the release levers were no longer in the pilot's field of vision, and the right-hand lever was difficult to access from the pilot's seat. The occupants, who were of slim build, were able to escape through the partially open canopy. The occupants of the DR400-160 registered F-GREP, involved in an accident on Saturday 26 October 2024, experienced the same situation. In this type of situation, releasing the canopy without attempting to open it beforehand would probably have facilitated evacuation. Furthermore, a passenger, informed before the flight about the canopy release procedure, could, in an emergency, operate the lever on their own.

Take-off performance for light aeroplanes

The performance levels indicated in the flight manual were demonstrated by a test pilot with a new aeroplane. A degradation in performance due to engine and propeller wear, as well as piloting skills, may increase the actual take-off distance compared to that indicated in the flight manual.

The private pilot manual published by CÉPADUÈS states that a 30% increase appears to be a reasonable value.

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