



## Accident to the ROBIN - DR400 – 120 registered F-GIKZ

on 12 September 2020

at Arcachon - La Teste-de-Buch (Gironde)

<sup>(1)</sup> Except where otherwise indicated, the times in this report are in local time.

<b>Time</b>	Around 14:30 <sup>(1)</sup>
<b>Operator</b>	Aéroclub du Bassin d'Arcachon
<b>Type of flight</b>	Local
<b>Persons on board</b>	Pilot and three passengers
<b>Consequences and damage</b>	Pilot and passengers fatally injured, aeroplane destroyed

This is a courtesy translation by the BEA of the Final Report on the Safety Investigation published in September 2021. As accurate as the translation may be, the original text in French is the work of reference.

### Take-off outside weight and balance envelope, flying on backside of power curve during initial climb, loss of control in flight, collision with the ground, fire

#### 1 - HISTORY OF THE FLIGHT

*Note: the following information is principally based on a video taken by one of the passengers on board the aeroplane, a video taken by a witness on the ground at the airport, statements, as well as radiocommunication recordings.*

Shortly before 14:30, the pilot informed the AFIS officer at Arcachon - La Teste-de-Buch airport, over the radio, that he was at the Bravo holding point and that he was entering runway 07 without backtracking to take off (see [Figure 1](#)).

Wheel lift-off occurred around 500 m after the alignment (point [3](#) [Figure 1](#)), at an indicated airspeed of 110 km/h and with a significant variation in nose-up attitude. During the rotation, the pilot turned around to speak to the passenger seated to his right and his attention was not on the flight parameters.

The stall warning sounded for three seconds. It sounded regularly for several seconds, intermittently and for the remainder of the take-off recorded on the onboard video.

In the 10-second period that followed wheel lift-off during which the instrument panel was visible on the onboard video footage, the attitude was held between 10° and 15° nose-up and the engine speed was greater than 2,300 rpm<sup>(2)</sup>. The aircraft reached a height of approximately 60 ft whilst its speed decreased to around 100 km/h.

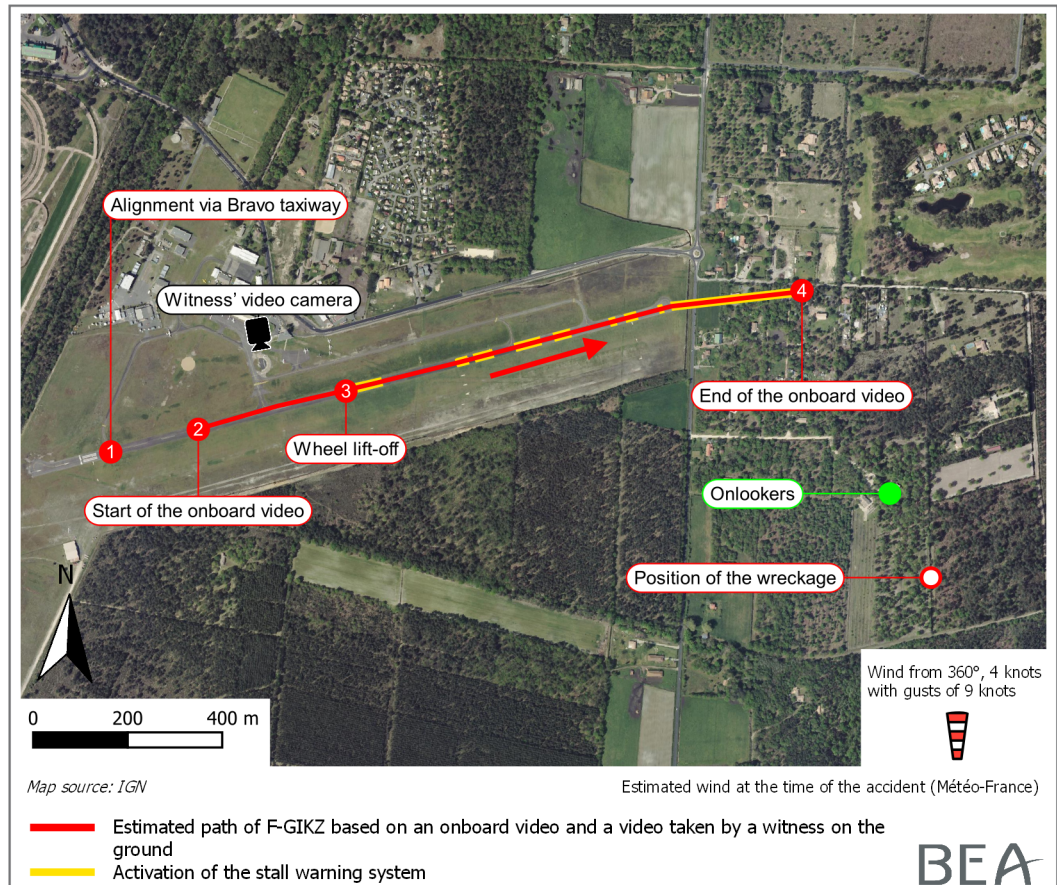
The path was globally held on the runway centreline and the onboard video footage showed that the engine effects were not countered and that the flight was asymmetrical during the initial climb.

<sup>(2)</sup> The spectral analysis of the videos confirmed that the engine speed was greater than 2,300 rpm during take-off.

Witnesses on the ground saw the aeroplane fly by near their house on an unusual path, at low height and with a steep nose-up attitude and low speed. Several of the witnesses heard the sound of an engine operating at high speed.

The pilot transmitted an emergency "MAYDAY" message over the radio without specifying the nature of the emergency.

The aeroplane collided with the trees, then with the ground within the boundaries of a private property, and a fire broke out.



Source: BEA

Figure 1: Estimated path of the aeroplane based on video footage

## 2 - ADDITIONAL INFORMATION

### 2.1 Site and wreckage information

The wreckage was found in a wooded area, near the airport (see Figure 1). The aeroplane struck the top of a 12 m-tall tree and came to a stop approximately 20 m from the tree in a ditch approximately 2 m deep. The wreckage was complete and not dispersed. The examination of the wreckage indicated that the aeroplane had probably hit the ground with a nose-down attitude on a downward slope.

Except for the flight control cables, several metallic structural components, cockpit components and the engine, the wreckage was completely consumed by the fire. The flight control linkages of the three control axes, as well as that of the elevator trim were continuous before the impact with the ground. The position of the elevator trim and the flaps could not be determined<sup>(3)</sup>.

<sup>(3)</sup> The videos did not enable the position of the flaps to be established either.

The engine was removed to be examined thoroughly at the BEA. Due to its damage, the examination consisted of disassembling and visually observing the different engine components. All of the observations made were associated with normal operating wear or consequences of the accident and the post-impact fire. No failure that could explain a partial or total loss of engine power was observed.

The examinations at the site and of the wreckage indicated that the aeroplane was on a downward slope with a high vertical speed and a low horizontal speed.

These examinations led to the conclusion that the aeroplane was probably in loss of control when it struck the top of a tree.

## 2.2 Survival aspects

Several people witnessed the accident. They reached the wreckage quickly and called the fire brigade. The latter arrived at the site within 20 minutes of the accident.

The passengers were dead and the pilot was found in a critical but conscious condition, a few dozen metres from the wreckage. He was responsive to those first on the scene. After making sure that the people he was talking to had understood that there were four people on board, he tried to explain what had happened and stated the following:

- he had lost power;
- he had heard a “bam”;
- despite his actions on the stick, the aeroplane had not seemed to respond to his inputs.

The pilot died from his injuries whilst being attended to by the emergency services.

The aeroplane’s 406 MHz emergency locator transmitter triggered during the accident. Independently of local emergency operations, the Aeronautical Rescue Coordination Centre (ARCC) of Lyon Mont Verdun called those listed as contacts in the French emergency locator transmitter register. The contact details were those of the former owner of the aeroplane and the F-GIKZ flying club could not be reached by the ARCC.

## 2.3 Airport information

Arcachon - La Teste-de-Buch airport is equipped with two parallel runways 07/25, one paved and the other unpaved. The airport’s reference point is located at an altitude of 52 ft.

From the Bravo taxiway, the length of runway available for take-off is around 1,230 m on paved runway 07. The runway width is 20 m.

At the end of runway 07, there is little free space to make an emergency landing due to obstacles and vegetation.

The airport’s VAC chart indicates as a specific instruction for take-offs from runway 07 that it is advisable to use the entire length of the runway, and to alter the heading by 020° to the right at the end of the runway, and at 300 ft minimum. This measure aims in particular to minimise sound nuisances for residents at the end of the runway.

## 2.4 Context and type of flight

The pilot had offered to make a donation to one of his acquaintances who was a member of a non-profit making bikers association that campaigns against child abuse. The donation was to take the form of a flight around the Bassin d’Arcachon.

On the day of the accident, at the beginning of the afternoon, a convoy made up of several bikers and a limousine transporting the passengers (two sisters aged nine and their father) arrived at Arcachon airport, where the latter met with the pilot and found out they were going to take an aeroplane flight over the Bassin.

The aeroplane had been booked for a private flight by the pilot. This did not constitute an introductory flight, commonly referred to as a *sightseeing flight*. The applicable regulation<sup>(4)</sup> defines an introductory flight as any flight against remuneration or other valuable consideration consisting of an air tour of short duration, offered by an approved training organisation or an organisation created with the aim of promoting aerial sport or leisure aviation.

The flying club, to which the aeroplane belonged and of which the pilot was a member, had not been informed of the specific context of this flight. In addition, this flying club makes introductory flights in line with specific procedures. The accident pilot was not on the list of pilots who performed introductory flights at the flying club. These pilots had to comply with the regulatory requirements with respect to a minimum total number of flight hours (200 flight hours on the aircraft category) and with respect to recency (25 flight hours in the last 12 months on the aeroplane class or type) in addition to undergoing specific training and a passenger briefing in particular.

## 2.5 Pilot information

The 43-year-old pilot held a Private Pilot Licence - Aeroplanes (PPL(A)) issued in December 2012. He had logged around 180 flight hours, 100 hours of which as pilot-in-command. He flew exclusively in the DR400s (120hp, 140hp or 180hp) owned by the Aéroclub du Bassin d’Arcachon where he had taken his initial training. His last flight with an instructor was on 7 July 2019, and his last SEP renewal flight was on 11 November 2018. He was used to flying with passengers.

In the last three months, he had logged around six flight hours and had made seven take-offs and landings. On the day of the accident, he was therefore able to carry passengers in accordance with the applicable European AIRCREW regulation<sup>(5)</sup>.

## 2.6 Meteorological information

Météo-France stated that at the time of the accident, there was slight high pressure in hot and dry air, a wind from 360° of 4 knots with gusts up to 9 knots, a visibility greater than 10 km and a clear cloudless sky, a temperature on the ground in the shade of 28.4°C and a QNH of 1,021 hPa.

<sup>(4)</sup> [Order of 18 August 2016 concerning the elements left to the discretion of the competent national authority by Commission Regulation No 965/2012 laying down technical requirements and administrative procedures related to air operations.](#)

<sup>(5)</sup> [Regulation \(EU\) No 1178/2011 of 03 November 2011 laying down technical requirements and administrative procedures related to civil aviation aircrew](#)

## 2.7 Aircraft information

### 2.7.1 General

The DR400/120 registered F-GIKZ was purchased second-hand by the flying club in 2012 and the accident pilot carried out part of his initial training in it. It was equipped with a 4-cylinder Lycoming O-235-L2A engine delivering 120 hp and a SENSENICH 72 CK S6-0-56 high-pitch propeller.

The last maintenance inspection was on 27 August 2020 and consisted of the performance of a 50-hour inspection. The engine was overhauled in September 2019.

### 2.7.2 Use

The aeroplane was certified to carry four people. The maximum permissible take-off and landing weight of the aeroplane was 900 kg.

Several instructors, including the instructor who carried out the final part of the accident pilot's initial training, emphasised that a verbal instruction at the flying club advised against carrying four adults on board the DR400/120.

The stall speed at the maximum weight indicated in the flight manual with the flaps in the 1st detent position is 88 km/h. The flight manual specifies that the stall warning system triggers 10 to 15 km/h before stall occurs.

The take-off procedure in the flight manual in particular indicates the following:

- take off with flaps in 1st detent position;
- apply full throttle;
- control the engine speed (minimum of 2,200 rpm);
- take off cleanly at around 90 - 100 km/h;
- level off to gain speed;
- start of climb at around 120 km/h.

Depending on the desired rate of climb, the climb speed is between 130 and 150 km/h.

The take-off performances calculated using the flight manual with the high-pitch propeller installed<sup>(6)</sup>, on a paved runway, at an altitude of 0 ft, at a temperature ISA + 20°C and at the maximum permissible take-off weight gives a running for take-off length of 285 m and a take-off length (passing 15 m of height) of 590 m.

### 2.7.3 Weight and balance

By comparing data from previous flights and the fuel station reading, the investigation determined that the pilot had filled the fuel tank (110 l) prior to the flight.

Based on statements and the photos and video footage available, it was possible to estimate the weight of the persons on board and to establish where they had been sitting in the aeroplane.

The aeroplane took off at a weight that exceeded the maximum permissible weight by around 50 kilos. A take-off exceeding the maximum permissible weight in particular causes:

- an increase in stall speed;
- a reduction in take-off performance, in particular take-off distance and rate of climb.

<sup>(6)</sup> A high-pitch propeller is conducive to better cruise performance, unlike a low-pitch propeller that is conducive to better take-off and climb performance.

The aeroplane also took off with an aft centre of gravity very probably outside of the flight envelope. A centre of gravity that is too far aft can cause longitudinal instability of the aeroplane. It is worth mentioning that the heaviest passenger was seated in the rear seat, a position that shifted the centre of gravity significantly aftward.

The pilot did not know the three passengers but had asked the association for their weights before the flight. The information provided by the association corresponded to the lower estimations of the actual weight of the passengers. However, this still gave a take-off weight in excess of the permissible maximum with 110 litres of fuel on board. The pilot had reserved the DR400/120 on 14 August on the flying club's website for the flight on 12 September. Other flying club aeroplanes were also available when he made the reservation, and in particular a more powerful DR400/180 with a higher carrying capacity. On the day of the accident, a DR400/140 was also available.

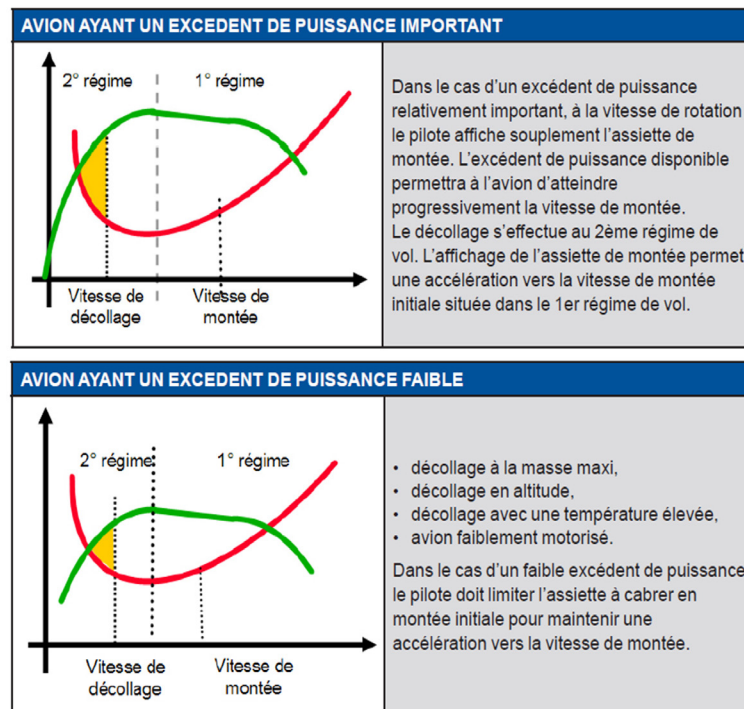
## 2.8 Backside of power curve

In partnership with the French civil aviation safety directorate (DSAC), the light aviation safety portal incorporates<sup>(7)</sup> the elements of a study conducted in 2008 by the *Institut pour l'Amélioration de la Sécurité Aérienne* (IASA) about flying on the backside of the power curve.

The VFR instructors' guide<sup>(8)</sup> published by the *École Nationale de l'Aviation Civile* (ENAC) provides the following explanations:

<sup>(7)</sup> <https://www.securitedesvols.aero/productions/les-phases-de-vol/l-envol/decollage/le-second-regime-de-vol-et-le-decollage-no>

<sup>(8)</sup> [https://www.enac.fr/sites/default/files/ins.m03.fr-guide\\_de\\_linstructeur\\_vfr.pdf](https://www.enac.fr/sites/default/files/ins.m03.fr-guide_de_linstructeur_vfr.pdf) édition du 17 novembre 2014



Source: ENAC (available in French only)

Figure 2: VFR instructors' guide  
Green curves: power output  
Red curves: power required

<sup>(9)</sup> Aircraft destroyed or substantially damaged, or occurrence that caused serious or fatal injuries to the aircraft's occupants.

A pilot who maintains a low climb speed with a steep attitude can therefore find themselves in a situation in which the aeroplane does not have enough power to accelerate to the power required curve and continue the climb. In the presence of an obstacle in the path, the pilot's instinctive reaction may be to increase the attitude to attempt to fly over the obstacle. This action, which increases the angle of attack, exacerbates the phenomenon (watch the IASA's video: <https://vimeo.com/210931589#t=6m30s>).

In a dynamic situation, this phenomenon may be perceived by the pilot as a partial loss of engine power.

## 2.9 Similar occurrences

An analysis of the BEA's database of accidents<sup>(9)</sup> at take-off to light aeroplanes (weight < 5.7 t) for the period 2000-2020 shows that 23 similar accidents occurred (including that of F-GIKZ) with a take-off being continued on the backside of the power curve:

- Sixteen accidents resulted in the aeroplane being destroyed, seven of these were fatal. In these last seven cases, all of the aeroplane's occupants died.
- Thirteen accidents ended with a loss of control or stall of the aeroplane. The seven fatal accidents were included in these.
- Eleven accidents occurred in a context where the weight and balance envelope had been exceeded and five of these resulted in fatal injuries.

## 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 pilot took off from Arcachon - La Teste-de-Buch airport to take passengers he did not know on a flight that he had gifted to an association. This flight was made as a private flight.

The flight was undertaken with the aeroplane outside the weight and balance envelope, which degraded its performance at take-off and made it more difficult to pilot.

From rotation, the pilot adopted a steep nose-up attitude that he maintained for the initial climb. The aeroplane remained on the backside of the power curve and the final path with a tailwind may have made it more difficult to exit it. The aeroplane probably stalled at low height over pine trees, struck the top of a tree and then hit the ground.

### Contributing factors

The following factors may have contributed to the pilot staying on the backside of the power curve in climb up to loss of control in flight:

- Insufficient preparation which resulted in the undertaking of a flight with the weight and balance outside of the flight envelope.
- The adoption and maintenance of a steep nose-up attitude from rotation and continued during the climb.
- A lack of concentration of the pilot and a lot of attention paid to the passengers during take-off, to the detriment of flight management and the monitoring of parameters (in particular speed, attitude and flight symmetry).

## Safety lessons

### Carrying of passengers in a specific flight context

Carrying out introductory flights with passengers is not to be underestimated. This type of flight requires additional resources for the pilot, in particular when the context of the flight is out of the ordinary.

Monopolised by looking after the passengers, pilots can neglect aspects of flight preparation (in particular choice of aeroplane, fuel load, and positioning of the passengers for weight and balance). For the same reasons, the pilot's attention during the flight can be disturbed by questions from passengers or by the desire to satisfy their curiosity, to the detriment of monitoring the flight parameters such as recommended speed and attitude, as well as flight symmetry.

Only a strict compliance with the usual procedures, in particular during the critical flight phases such as take-off, enables the pilot to fly with an acceptable level of safety.

The French Aeronautical Federation (FFA) therefore published a check-list pertaining to the carrying of passengers<sup>(10)</sup>. This check-list also comprises a section on introductory flights that provides additional safety guarantees/requirements, in particular in terms of the total minimum and recent experience of the pilot, as well as the procedures to be implemented to assist passengers.

### Registering of emergency locator transmitters

It is important that flying clubs and aircraft owners provide the French register of emergency locator transmitters, on the CNES website (<https://registre406.cnes.fr>), with all information required and any amendments to this information (in particular the people to be contacted in the event of an emergency), to improve the efficiency of search missions and in the interest of any victims.

<sup>(10)</sup> [https://www.ffa-aero.fr/SITEFFAPROD\\_WEB/sarbacane/check\\_list\\_passagers.pdf](https://www.ffa-aero.fr/SITEFFAPROD_WEB/sarbacane/check_list_passagers.pdf)