

Accident to the Cessna 172 registered D-EFZF

on 31 May 2019

at Tours Val de Loire (Indre-et-Loire)

Time	Around 13:50 ⁽¹⁾
Operator	Private
Type of flight	Cross-country
Persons onboard	Pilot and one passenger
Consequences and damage	Aeroplane destroyed

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

⁽¹⁾Except where otherwise indicated, times in this report are local.

Loss of control during go-around, collision with ground

1 - HISTORY OF THE FLIGHT

Note: The following information is principally based on statements by those onboard the aircraft and a video of the occurrence from a camera attached to the end of the aeroplane's right wing.

The C172 registered D-EFZF was one of three aeroplanes taking part in a cross-country flight, over several days, between Germany and France. The pilot (in the left seat) and the passenger, owner of the aeroplane (in the right seat), took off from Dijon-Longvic aerodrome (Côte-d'Or) around midday for a flight to Tours Val de Loire aerodrome (Indre-et-Loire).

On final to land on runway 20 at Tours⁽²⁾, the pilot configured the aeroplane with a flap 30° setting and indicated that he adopted a speed of around 70 kt, with engine idle. During the flare and before touchdown, there was a slight increase in power for a few seconds (point 1 of Figure 1). The pilot then flew a go-around (point 2 of Figure 1).

⁽²⁾Paved runway 2,404 m long x 45 m wide, equipped with a PAPI at 3.0° for QFU 195.

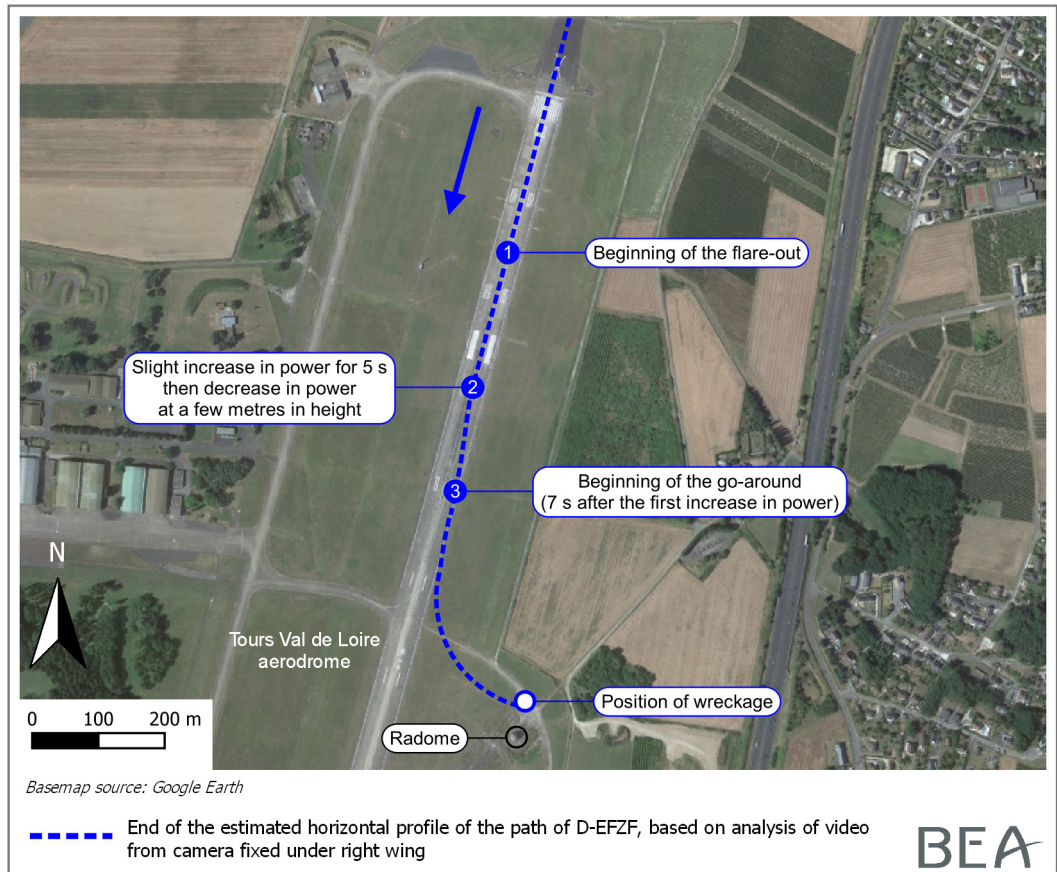


Figure 1: estimated path of D-EFZF based on video analysis

⁽³⁾ Dome protecting a radar.

The aeroplane veered left almost without gaining altitude, stalled at low height, and then collided with the terrain in the airfield grounds, close to a radome⁽³⁾ (see accident site in Figure 2).



Source: owner of the aeroplane

Figure 2: accident site

2 - ADDITIONAL INFORMATION

2.1 Pilot information and statement

The day of the accident, the German 59-year old pilot held a private pilot licence for aeroplanes which was issued in September 1987. He indicated that he had logged 367 flight hours of which 107 hours on type. In the three months preceding the accident, he had logged four flight hours, all on type.

The following information is based on the pilot's statement:

He explained that he met the owner of the aeroplane a few months previously but that before this trip, they had never flown together. As this three-day excursion was made up of several legs, they took it in turns to be the pilot-in-command of the aeroplane. The day before the accident, the pilot had flown one of the legs in Germany as pilot-in-command. The day of the accident, he was pilot-in-command for the Dijon-Tours flight in the left seat while the owner was responsible for the radio communications in the right seat. He specified that the weather was warm, the meteorological conditions were good⁽⁴⁾ and that the flight proceeded without difficulty to Tours.

On final for runway 20 at Tours aerodrome, he indicated that he had stabilized the speed at 70 kt and that the flaps were set to the landing position (30°). He added that after the flare and despite the reduction in power, he had the impression that the aeroplane was flying above the runway without touching down, as if it was floating on a cushion of hot air. He thought that this effect was caused by the hot air just above the paved runway heated by the sun. He then decided to abort the landing and applied full power. At the same time, the passenger called for a "go-around". He estimated his speed at around 65 kt and the available runway length at 1,500 m.

The pilot's intention was to then gain speed above the runway before progressively retracting the flaps. A few seconds after the go-around, he observed a variation in the nose-up attitude and pushed the wheel to keep level flight for acceleration. While having to continually increase the input pressure to stop the aeroplane climbing, he observed a veering to the left and realised that he was no longer above the runway. He did not remember if he retracted the flaps.

The pilot saw that the passenger was also holding the controls. Surprised, he stopped pushing the wheel and making inputs on the pedals, saying to himself that the passenger, owner of the aircraft and with more experience than him, wanted to carry out the manoeuvre himself. He thought that the owner wanted to perhaps quickly veer left to join the aerodrome circuit. He passively accompanied the movement of the wheel without applying an opposing force.

As the nose-up attitude and left bank continued to increase, the pilot then asked himself whether he should counter the inputs. He refrained from doing this as there was a risk of colliding with the ground given their low height

He indicated that on seeing the speed decrease, he shouted at the owner to stop pulling as they were losing speed but the owner did not react. The aeroplane suddenly tipped onto its left side and collided with the ground.

⁽⁴⁾The METAR recorded at 12:00 UTC at Tours Val de Loire indicated a variable wind of 4 kt, a temperature of 23 °C and visibility above 10 km.

The two occupants were unharmed, they got out of the plane and observed that the flaps were retracted. The pilot cannot remember if he actually retracted them during the go-around and questioned whether they were retracted by inadvertence when they evacuated the aeroplane.

He specified that during the briefing before the start of the trip, he had agreed with the owner that if the latter had to take the controls of the aeroplane, then he was to announce this using a pre-defined phraseology. He had not heard this call during the occurrence flight.

In his opinion the aeroplane had had no technical problem. He did not remember touching the trim during the go-around.

2.2 Passenger and owner of aeroplane information and statement

The day of the accident, the German 59-year old passenger held a private pilot licence for aeroplanes. He indicated that he had logged 1,228 flight hours of which 1,132 hours on type. In the three months preceding the accident, he had logged nine flight hours, all on type. He was the owner of the aeroplane.

The following information is based on the passenger's statement:

He explained that the two flights for that day had been planned in the morning. On the first flight (accident flight) from Dijon aerodrome to Tours aerodrome, he was the passenger and ensured the radio communications and navigation using his electronic tablet. He had pushed his seat back so as to be more comfortable as he was tall. He indicated that he could use the tablet attached to the wheel though he was not in a position to fully act on the controls, for example he could not touch the pedals with his feet. He explained that up to the approach to Tours aerodrome, the flight had been problem free with favourable meteorological conditions.

He indicated that he thought that the aeroplane was too high during the flare so he called for "Power – Stabilize". Seeing that the aeroplane was not stabilizing for landing, he asked the pilot to perform a go-around. He perceived the increase in power and the nose up reaction but did not know if the pilot had applied full power.

A few instants later, the pitch increased, the aeroplane banked and veered left. He indicated that he could not take the aeroplane controls as he was too far from them. He therefore let the pilot continue the manoeuvre and stayed silent until the last moment. He specified that he did not make inputs on the controls except at the very end when, nevertheless, he tried to push the wheel to lower the aeroplane's nose. He had not felt any resistance in the controls and did not hear any reaction from the pilot.

The owner of the aeroplane indicated that when there is a second qualified pilot in the right seat, the latter should be ready to take the controls at any moment and that this seat should be positioned accordingly, which was not his case during the accident flight.

Lastly, he did not agree with the pilot's version indicating that he had taken the controls during the go-around, this he had done at the very end just before stalling by making inputs on the wheel.

⁽⁵⁾ Due to the operational aspect of the accident, the BEA did not examine the wreckage.

⁽⁶⁾ Supplemental Type Certificate (document issued by the certification authority, authorizing a modification to an aircraft or aircraft equipment item).

⁽⁷⁾ Precision Approach Path Indicator. The PAPI at Tours Val de Loire aerodrome is set at a standard slope of 3.0° (5.2 %) and is situated at a distance of 370 m from the runway threshold.

2.3 Aircraft information

The damaged aeroplane⁽⁵⁾ is a Cessna 172 model N which had been modified to model P (in particular, engine replaced with a 160 hp Lycoming O-320-D2J and flap limitation to 30° maximum) under a STC⁽⁶⁾. The propeller turns clockwise looking forward from the cockpit.

It was equipped with a camera attached to the end of the right wing. The installation was also approved by a STC.

The landing speeds given by the flight manual and the onboard checklist are the following:

- 60 to 70 kt with the flaps retracted;
- 55 to 65 kt with the flaps extended.

2.4 Analysis of camera

The data from the camera attached to the end of the right wing was analysed by the BEA. One of the films corresponded to the landing where the accident occurred. Its analysis made it possible to determine the path in Figure 1. The camera, only filming the exterior, did not permit the actions of the persons in the cockpit to be seen.

The results of the analysis of the images and the sound track are summarized in the table below:

Time	Comments
T0	The aeroplane is established on final at a distance of around 700 m from the threshold of runway 20 for a height of around 100 m. Four PAPI ⁽⁷⁾ white lights are visible, the aeroplane's approach slope is around 5° (9 %). The engine speed is around 1,500 rpm.
T0 + 22 s	Runway threshold crossed at a height of around 25 m. Red PAPI light. A second red light comes on around one second later, followed by a third red light a second later again.
T0 + 30 s	Start of flare.
T0 + 34 s	Aeroplane abeam the PAPI.
T0 + 37 s	Slight increase in engine speed for five seconds followed by a decrease in speed at a few meters in height.
T0 + 44 s	Power applied and start of go-around.
T0 + 49 s	Path bends to left. Bank angle to left increases with little gain in height.
T0 + 58 s	High left bank at low height (see Figure 3).
T0 + 1 min 02 s (i.e. 18 s after the start of the go-around)	High left bank, stall and impact with ground.
T0 + 1 min 06 s	Noise similar to the retraction of flaps for around six seconds.

Source: BEA

Table 1: chronology of sequence based on analysis of video



Figure 3: excerpt from video at T0 + 58 s

2.5 Phenomena linked to an increase in power on a single-engine aircraft

The phenomena linked to an increase in power on a single-engine aircraft can be summarized with the following elements:

<p>An acceleration in the spiralling slipstream (air flow created by the propeller turning, in this case, in a clockwise direction) which wraps itself around the structure. This air flow creates a dissymmetry in the air running over the aerodynamic surfaces. This effect causes an induced yaw and roll to the left.</p>	<p>Figure 1: Effect of spiralling slipstream (Source: http://users.skynet.be/sky92472/Ltt.htm)</p>
<p>An increase in the torque effect (the engine rotation induces a counter rotation reaction in the airframe).</p>	
<p>Generally, an increase in the engine torque that tends to pitch the nose upwards (the modification of the air flow on the horizontal stabilizer leads to a nose-up moment).</p>	

Table 2: effects linked to an increase in power on a single-engine aircraft

Thus when increasing power, the aeroplane takes a nose-up attitude and in the case of a clockwise turning propeller, banks to the left and sideslips to the right.

Some of these effects may be amplified when there are significant variations in the engine rpm while at low speed, notably in the case of a go-around. However, they can be easily controlled by using the roll, pitch and yaw controls at the right moment in order to maintain the aeroplane's attitude and path.

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

On final for runway 20 at Tours Val de Loire aerodrome, the C172 was on a high approach slope. The flare was long and the power was slightly increased for a short time. At this stage, and in particular with respect to the runway length available, it was still possible to continue the landing. However, believing that the aeroplane was still too high with respect to the runway, the owner then asked the pilot in the left seat to perform a go-around. The latter had, at the same moment, started to abort the landing by applying full engine power.

The statements show that the situation was confused in the cockpit and that they both thought that the other person had the controls, without either of them actually piloting the aeroplane. The situation was not clarified by the occupants. The go-around procedure was partially applied. Only an input on the power control was made. The path was not controlled, the effects of the engine were not managed and the flaps were not retracted.

Following the go-around, the engine effects linked to the increase in power had an immediate impact on the aeroplane. The latter started to veer left with a slight nose-up attitude. The aeroplane stalled and collided with the ground, close to a radome.

Contributing factors

The following factors may have contributed to the confusion as to who was the person flying in this dynamic phase:

- The absence of clarification as to each person's role during the go-around.
- The reversed authority gradient between the pilot flying and the passenger in the right seat who was the owner of the aeroplane and had more experience than the pilot.