



Accident to the REIMS CESSNA F 150 M registered F-BXNO

on 20 June 2020

at Montbéliard Courcelles (Doubs)

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

Time	Around 17:00 ⁽¹⁾
Operator	Aéroclub du Pays de Montbéliard
Type of flight	Cross-country
Persons on board	Pilot and one passenger
Consequences and damage	Aeroplane substantially damaged
This is a courtesy translation by the BEA of the Final Report on the Safety Investigation published in July 2021. As accurate as the translation may be, the original text in French is the work of reference.	

Fuel exhaustion during approach, collision with vegetation on short final, collision with the ground

1 - HISTORY OF THE FLIGHT

Note: the following information is principally based on statements, radio communication recordings and data from the GNSS application installed on a tablet.

The pilot, accompanied by one passenger, took off at around 15:00 under a VFR flight plan from Grenoble Le Versoud aerodrome (Isère) bound for Montbéliard Courcelles aerodrome (Doubs). This was the return flight within the context of a club excursion.

At 16:56, the pilot started the descent to 2,000 ft in order to directly join the downwind leg for runway 26⁽²⁾. A parachute dropping operation was in progress at the uncontrolled aerodrome.

At the beginning of the downwind leg, the engine power suddenly decreased. The pilot pushed the throttle lever to increase the power but his input had no effect. He announced over the frequency that he had run out of fuel and decided to make a forced landing on the reciprocal QFU on runway 08.

The aeroplane hit the top of a tree located at the edge of the aerodrome at low speed, then fell practically vertically to the ground within the aerodrome.

⁽²⁾ Paved runway 08/26, measuring 1,700 m long

2 - ADDITIONAL INFORMATION

2.1 Accident site and wreckage information

The photograph below shows the position of the aeroplane shortly after the accident. The BEA examined the wreckage in a hangar at Montbéliard aerodrome.



Source: <http://www.crash-aerien.news/forum/crash-cessna-150-a-courcelles-les-montbeliard-t41310.html>

Aeroplane shortly after the accident

Damage to the fuselage, wings and landing gear resulted from the impact with the vegetation and subsequent collision with the ground.

The examination of the propeller confirmed that the engine was shut down and was not delivering power when the aeroplane made contact with the ground. The examination also revealed that the engine was rotating freely and that all of its components were in place. No external damage was observed. The borescope inspection of the engine cylinders did not reveal any anomaly.

No trace of fluid, oil or fuel was observed in the engine bay. The engine-related control linkages were continuous and operational.

The right-hand tank was empty. The left-hand tank contained approximately 15 litres of Avgas 100LL fuel.

No pollution was observed in the fuel system. All hoses were in place. The tank vent (located on the left side) was not clogged. Downstream of the tanks, the presence of fuel was only identified in the carburettor bowl, approximately 50 ml. The capacity of this bowl is approximately 150 ml.

The tests carried out on the carburettor and on the two magnetos did not reveal any malfunction.

2.2 Pilot and passenger information

2.2.1 Pilot of the previous flight

The pilot of the previous flight, who held a Private Pilot Licence - Aeroplane (PPL(A)), had made the outbound flight from Montbéliard Courcelles aerodrome bound for Grenoble Le Versoud aerodrome, with a stopover at Annemasse (Haute Savoie). He had logged 1,480 flight hours, nine hours of which in the CESSNA 150 in the last 90 days. He had logged 280 flight hours in this aeroplane.

With the graduated rod, he had measured the amount of fuel to be approximately 100 litres when the aeroplane departed from Montbéliard, and he added that prior to take-off from Annemasse, he had observed with the graduated rod that there were 70 litres remaining. The second stage of the cross-country flight lasted 62 minutes and he estimated that the amount of fuel upon arrival was 50 litres. He had then handed over the aeroplane's documents to the pilot undertaking the return flight and had notified him of the estimated amount of fuel remaining on board.

2.2.2 Pilot of the accident flight

The pilot held a Private Pilot Licence - Aeroplane (PPL(A)) issued in August 2013 and he had logged 459 flight hours, 11 hours of which in the CESSNA 150 in the last 90 days. He had logged a total of around 22 flight hours in this aeroplane. The lockdown period due to the COVID-19 health crisis did not enable him to fly from mid-February to mid-May 2020.

He had made the outbound flight in DR400 and he reported that the flight preparation and the joint briefing carried out with all persons involved in the excursion had taken place as usual without any particular event being noted.

Before departing from Grenoble Le Versoud, the pilot indicated that he had measured 50 litres of fuel with a graduated rod, an amount that he considered to be enough for approximately two-and-a-half flight hours. This flying range had been estimated to be sufficient to perform the return flight of an estimated duration of one hour and forty-five minutes, with a final reserve fuel of 30 minutes⁽³⁾. He added that within the club and to facilitate the calculations, 20 l/h is accepted to be the average consumption. He also stated that the fuel gauges had been inoperative for a long time on this aeroplane and that the aeroplane was not equipped with a low fuel warning system. All members of the flying club who are type rated on this aeroplane were aware of this situation.

He remembered having flown to an altitude of between 5,500 ft and 6,000 ft with an engine speed of 2,500 rpm. He stated that during the descent to 2,000 ft towards Montbéliard aerodrome, a parachute dropping operation had been taking place and that the pilot of the drop aeroplane had informed him that runway 26 was in use.

At the beginning of the downwind leg for runway 26, the engine power had suddenly decreased (1,700 rpm displayed). The pilot had increased the power. This action had had no effect. He had checked the speed, the mixture setting and the magneto selection. He had changed the path to align with the threshold of runway 08, which was closer. He had maintained gliding speed and had announced a fuel exhaustion over the radio. During the approach, the engine had shut down completely and the propeller had stopped moving.

⁽³⁾The regulatory final reserve fuel for aeroplanes equipped with piston engines is the amount of fuel required for a 30-minute flight by day and a 45-minute flight by night.

He stated that he had targeted an aiming point corresponding to the threshold turnaround bay of runway 08, but that the glide path, passing over trees, did not enable him to reach it. He had then eased the stick forwards to increase the speed and perform a pull-up manoeuvre. During the manoeuvre, he had heard the stall warning. The aeroplane had then hit the top of a tree and fallen practically vertically in the grass within the aerodrome.

The pilot said that he had not been injured but that he had felt some back pain.

2.2.3. Passenger seated in the right front seat

The passenger's statement corroborates the pilot's statement. During the return cross-country flight, whilst they were flying over the Swiss-French border, he remembered that they had slightly changed the heading to avoid the rain, before starting the descent to 2,000 ft. He also stated that he had felt slight engine sputtering and then the engine speed had started to decrease. Despite the full power requirement, he stated that the engine speed in cruise flight had been 2,500 rpm and that the drop in rpm had occurred gradually.

2.3 Meteorological information

On the day of the accident, the region was under overcast sky with localised showers over the Vosges and the Jura. Outside of the showers, visibility was greater than 10 km. The wind was light when the aeroplane took off from Grenoble Le Versoud aerodrome and landed at Montbéliard Courcelles aerodrome. In cruise flight at 5,000 ft, the average wind was 040° for 10 kt.

2.4 Aeroplane information

The REIMS CESSNA F 150 M is equipped with a Continental ROLLS ROYCE O-200 A engine. The last maintenance inspection (50-hour inspection) was on 3 June 2020 and several flights were performed between this inspection and the accident.

The engine is supplied by two "Long Range" tanks, one in each wing. Each tank has a capacity of 72 litres, amounting to a total capacity of 144 litres, 11.5 litres of which cannot be used. The fuel is channelled by gravity to a valve and filter before being supplied to the carburettor. The supply valve is operated by means of a two-position selector switch (ON/OFF). The aircraft is not equipped with an audio alarm or warning light indicating a low fuel level.

Each tank is equipped with a gauge combined with a pointer indicator on the dashboard. A graduated rod is used to measure the total amount remaining in each tank, including unusable fuel.

The performance chapter of the flight manual states that for a flight performed at an altitude of 5,000 ft and with a 75% engine power (i.e. 2,700 rpm), the fuel consumption is 21.2 l/h. The consumption is 17.0 l/h at the same altitude, at 2,500 rpm. The flight manual also cautions that this data results from actual tests conducted with an aircraft in excellent flight condition. The manual points out that during the flight preparation, it is advisable to allow for a large safety margin regarding the reserve fuel upon arrival, as the figures given do not take into account factors such as wind, navigational errors, piloting technique, run-up or climb.

The examination of the aeroplane's logbook was not able to accurately determine the amount of fuel in the wing tanks when the aeroplane took off for the accident flight. According to the statements, the total amount of fuel at take-off was 50 litres, which corresponds to a usable amount of fuel of approximately 38.5 litres and a maximum flying range of 2 hours and 15 minutes at 5,000 feet and 2,500 rpm in the flight manual conditions, without the 30-minute reserve fuel. The flight time could not be accurately determined based on the data available. A 10-minute start-up and taxiing time plus the estimated five-minute flight time to join the first recorded point result in a total estimated flight time of approximately two hours.

2.5 Similar occurrences

A bibliographical research of the BEA and NTSB databases brought to light an occurrence of fuel exhaustion similar to F-BXNO, on a REIMS/CESSNA 150 registered N7089F⁽⁴⁾, with approximately 15 litres of fuel recovered from the tanks, a quantity slightly higher than the unusable value.

The NTSB safety report specified that in Cessna's "*Pilot Safety and Warning Supplements*" handbook, in the fuel management section, it states, "*The shape of most airplane wing tanks is such that in certain flight maneuvers, the fuel may move away from the fuel tank supply outlet. If the outlet is uncovered, fuel flow to the engine may be interrupted and a temporary loss of power might result.*"

2.6 Airworthiness

The airworthiness and registration certificates are in order and valid. The flight manual, in Section 1 General, provides a list of mandatory regulatory equipment for the use of the aeroplane in night VFR and IFR flights. It does not contain the minimum equipment list for day VFR flight.

F-BXNO is an ELA1⁽⁵⁾ aircraft for which Annex VII, Part NCO of Regulation (EU) No. 965/2012⁽⁶⁾ applies in the context of non-commercial air operations. Point NCO.GEN. 155 of Annex VII stipulates that a minimum equipment list (MEL) may be established by the operator. The MEL is a document that provides for "*the operation of the aircraft, under specified conditions, with particular instruments, items of equipment or functions inoperative at the commencement of the flight*".

In addition, point NCO.IDE.A.105 of this Annex VII requires that any of the aeroplane instruments, items of equipment or functions required for the flight must be operative, unless the aeroplane is operated in accordance with the MEL established by the operator, or unless a permit to fly has been issued in accordance with the airworthiness requirements.

In this event, the fuel indicator on the aeroplane's instrument panel was found to be inoperative by the pilot and the members of the flying club who were type rated on this aeroplane. The F-BXNO did not have a MEL, so the fuel indicator had to be operative before any flight.

AIR-OPS, NCO.OP.185, In-Flight Fuel Management, further specifies that the pilot-in-command must "*check at regular intervals that the amount of usable fuel [...] remaining in flight is not less than the fuel required to proceed*" and that the planned reserve fuel is sufficient to reach a weather-permissible aerodrome or operating site.

⁽⁴⁾ <https://www.ntsbgov.gov/layouts/ntsbaaviation/Results.aspx?queryId=b23c8af5-ca1f-491e-9594-31bff15b508d>

⁽⁵⁾ European Light Aircraft with a Maximum Take-Off Mass (MTOM) not exceeding 1,200 kg that is not classified as complex motor-powered aircraft.

⁽⁶⁾ COMMISSION REGULATION of 5 October 2012, known as AIR-OPS, [laying down technical requirements and administrative procedures related to air operations](#).

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 with a total of 50 litres of fuel, which he thought would give him the necessary flying range of two-and-a-half hours to perform the return flight of an estimated duration of one hour and forty-five minutes, with a final reserve fuel of 30 minutes. In reality, his flying range was a maximum of two hours and fifteen minutes, without the reserve fuel. During the downwind leg, after a flight time of about two hours, the unpriming of the fuel system resulted in a complete engine shut-down.

Contributing factors

The following factors may have contributed to the occurrence of the fuel exhaustion and the collision with the obstacles:

- The decision to proceed with the flight in the absence of information to alert the pilot to the low amount of fuel remaining, due to the inoperative fuel indicator and the lack of a low fuel level warning system on this aeroplane.
- An erroneous assessment, during flight preparation, of the minimum amount of fuel required to undertake the flight due to unusable fuel in the tanks.