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

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SAFETY INVESTIGATION REPORT

Accident to the Jodel D140 registered F-BMFV on Friday 28 February 2025 on the Vallée Blanche glacier

Time	Around 11:30[1]
Operator	Aéroclub de Megève
Type of flight	Local
Persons on board	Pilot and passenger
Consequences and damage	Pilot and passenger injured, aeroplane substantially damaged
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.	

Flight on backside of power curve, loss of control, collision with surface of a glacier, in mountains

1 HISTORY OF THE FLIGHT

Note: the following information is principally based on statements, a photo taken by the passenger of the aeroplane and the aeroplane's FLARM data.

The pilot, accompanied by a passenger, took off at around 11:00 from Megève mountain airfield for a flight in the Mont Blanc massif. He followed Chamonix valley and then entered the Mer de Glace at 11:25 (see **Figure 1**, point 1).

The aeroplane was flying at an altitude of approximately 9,800 ft, climbing towards the Col du Midi pass, located about ten kilometres away, and which rises towards an altitude of 11,615 ft (3,540 m). The ground speed was approximately 165 km/h.

At 11:27:40 (point 2), the aeroplane reached an altitude of 10,600 ft (height of 1,000 m) overhead Tacul glacier. The average vertical speed was approximately 320 ft/min, and the ground speed was approximately 155 km/h. The ground speed would then gradually decrease until the end of the flight. From this position, the slope of the terrain ahead of the aeroplane became a lot steeper (rising slope gradient of approximately 20%).

At 11:28 (point 3), the ground speed was 130 km/h. The pilot considered that the aeroplane was no longer climbing as planned, which he interpreted as an engine power anomaly. The aeroplane's performance did not appear sufficient to reach the Col du Midi pass. He explained that he had decided against carrying out a left-hand turn and then a right-hand turn before continuing (before Gros Rognon summit) towards Vallée Blanche to make an emergency landing there.

[1] Except where otherwise indicated, the times in this report are in local time.

At 11:29:25, (point 4), the ground speed was approximately 110 km/h. A photo of the aeroplane's instrument panel taken by the passenger showed that the indicated airspeed was approximately 112 km/h and the vertical speed slightly above 500 ft/min during the climb.

At 11:29:45 (point 5), the aeroplane's ground speed reached approximately 90 km/h, its altitude peaked at 11,340 ft (a height of 400 ft), and the vertical speed dropped suddenly. The aeroplane then descended approximately 70 m for about ten seconds before colliding with the ground. The two occupants struck the aeroplane's instrument panel upon impact. A witness raised the alarm, triggering a helicopter rescue operation.

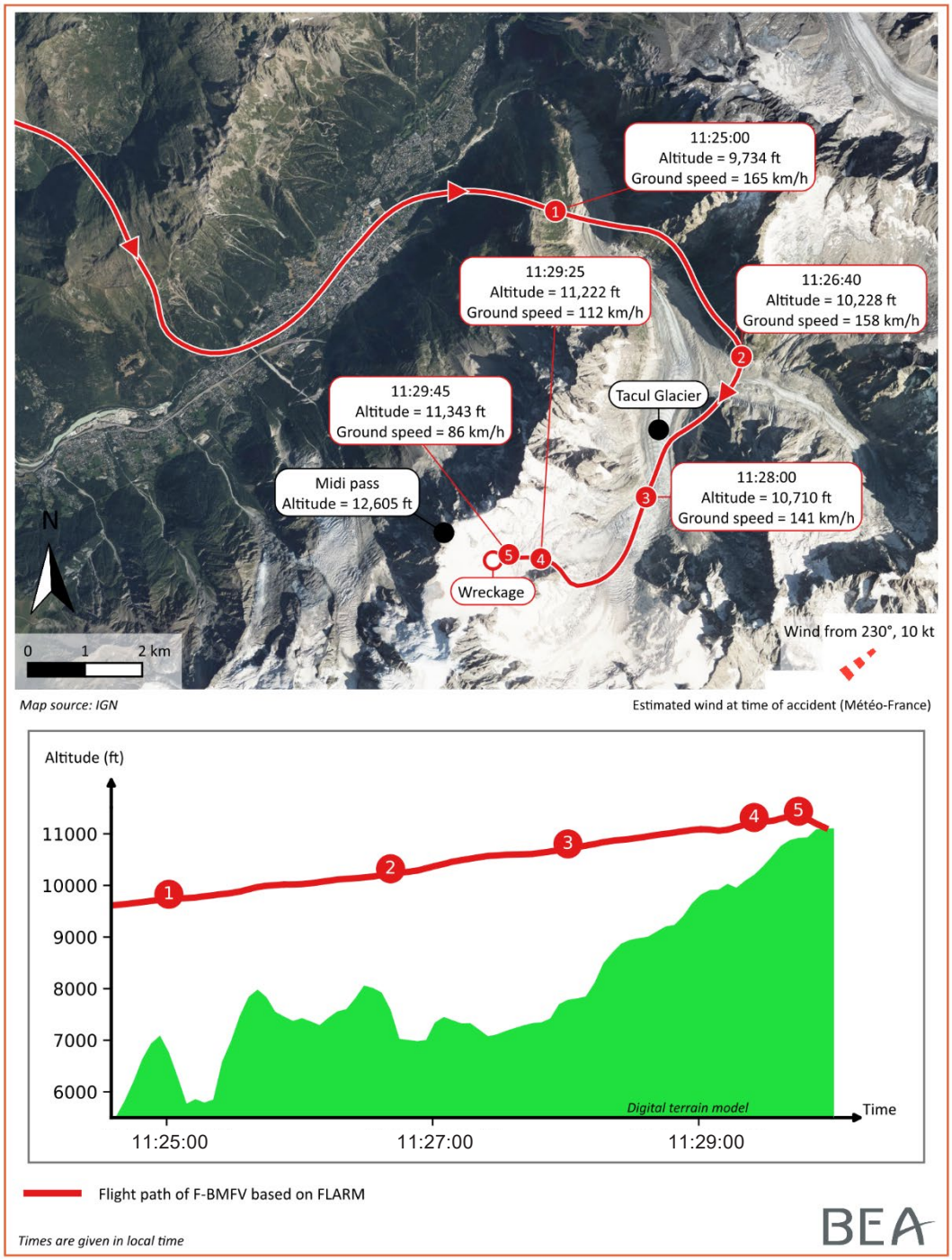

Figure 1: flight path and vertical profile of path of F-BMFV

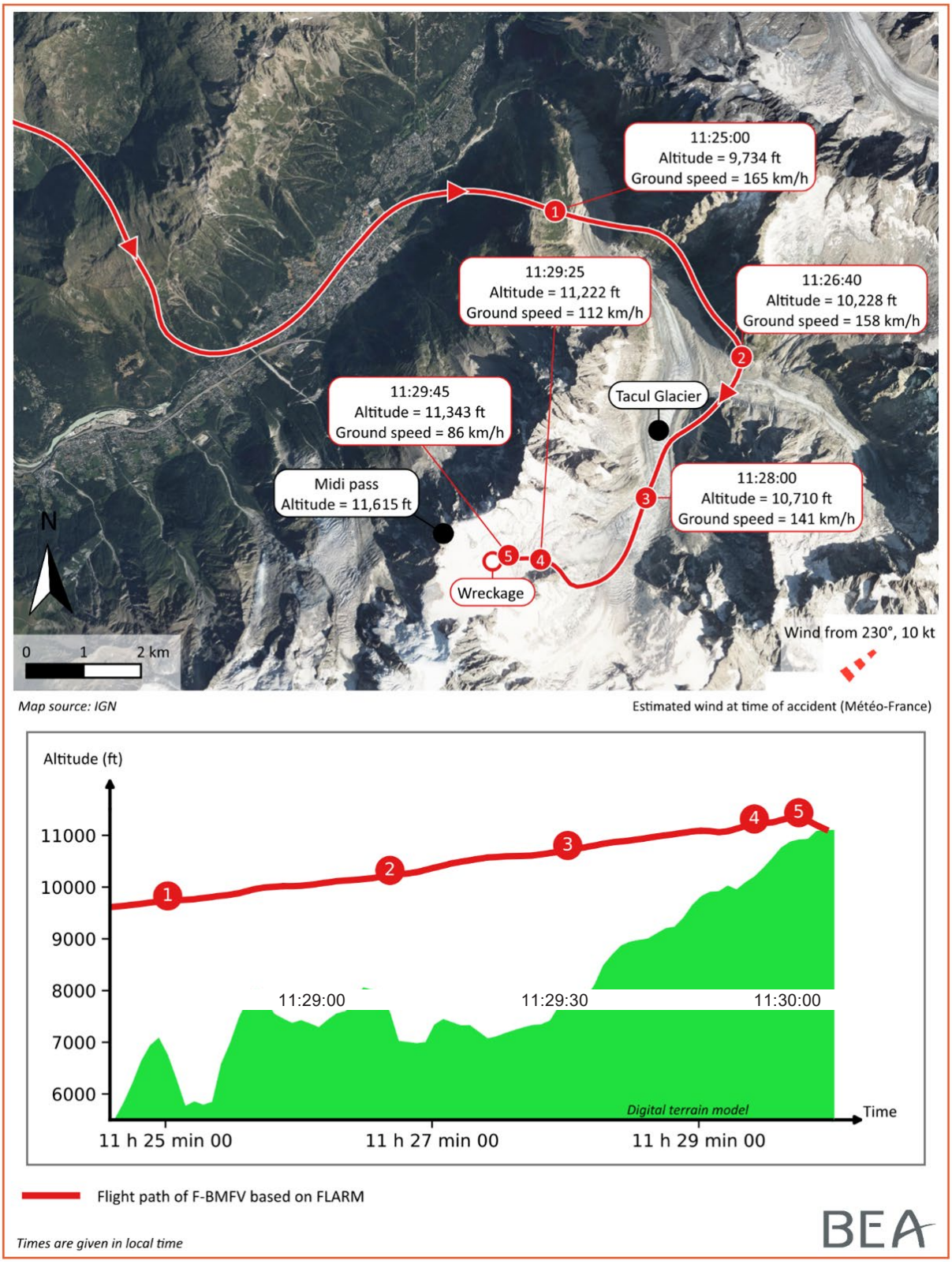

Figure 2: end of flight path and vertical profile of path of F-BMFV

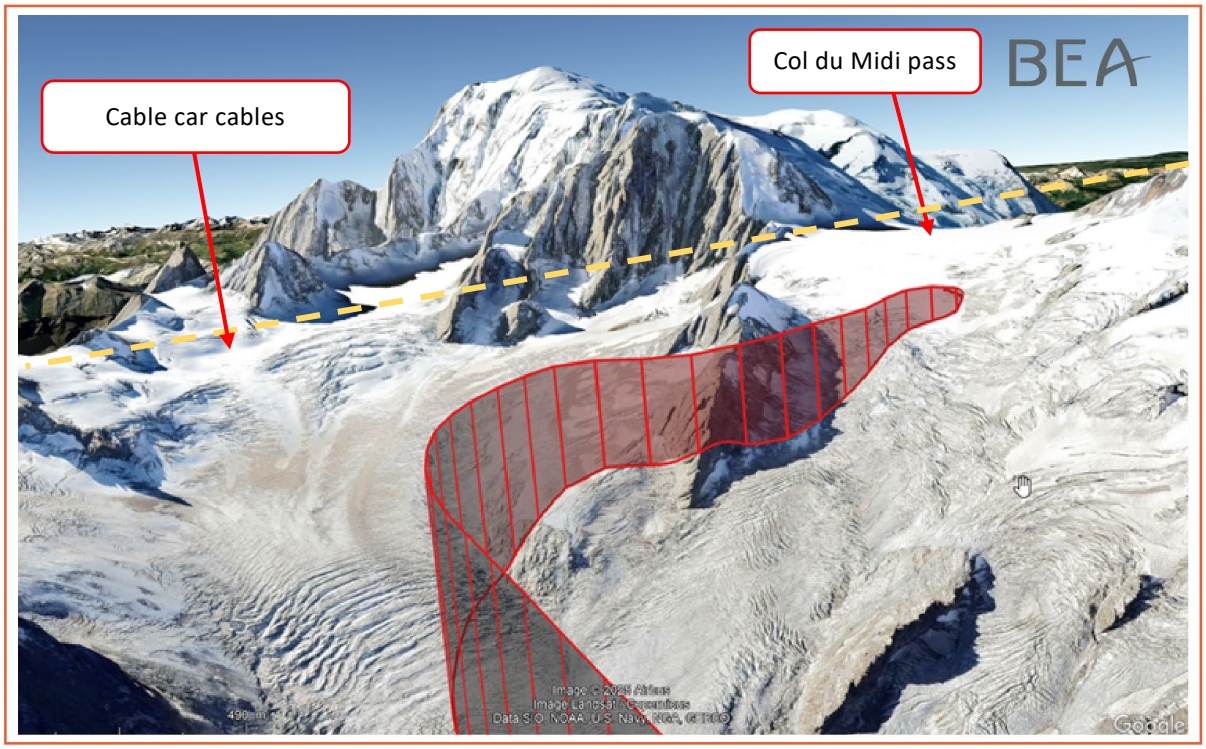

Figure 3: end of flight of F-BMFV (geographic background: Google Earth)

2 ADDITIONAL INFORMATION

2.1 Site and wreckage information

The wreckage was located at an altitude of 3,404 m on the Vallée Blanche glacier, to the south-east and approximately 1 km from the Col du Midi pass. The cables of the cable car linking Helbronner (Italy), the summit of Gros Rognon, and the Aiguille du Midi were located about 100 m higher up than the wreckage and at a horizontal distance of approximately 200 m.

The wreckage was complete and oriented south-east (137°). No marks were visible in the snow around the wreckage. It was resting on its forward fuselage, with a slight nose-down attitude. Photos transmitted to the BEA, taken just after the accident, as well as witness statements, indicated that the nose of the aeroplane was buried roughly 10 cm in soft snow.

The examination found that the aeroplane probably struck the ground at a low horizontal speed and in a left-hand roll.

Only the landing gear and wings sustained damage as a result of the impact with the ground. The blades of the propeller were intact. Snow was present in the nose cowling. The flight controls were continuous and the flaps were retracted. The controls connected to the engine were all pushed forward (corresponding to maximum richness, maximum engine power and carburettor heat inactive). However, they may have been moved by the first responders. The engine underwent a detailed inspection and bench testing. No malfunctions that could have contributed to the accident were identified.

Lastly, the fuel sample taken from the aeroplane's front fuel tank had nominal physico-chemical characteristics for Avgas 100 LL type fuel.

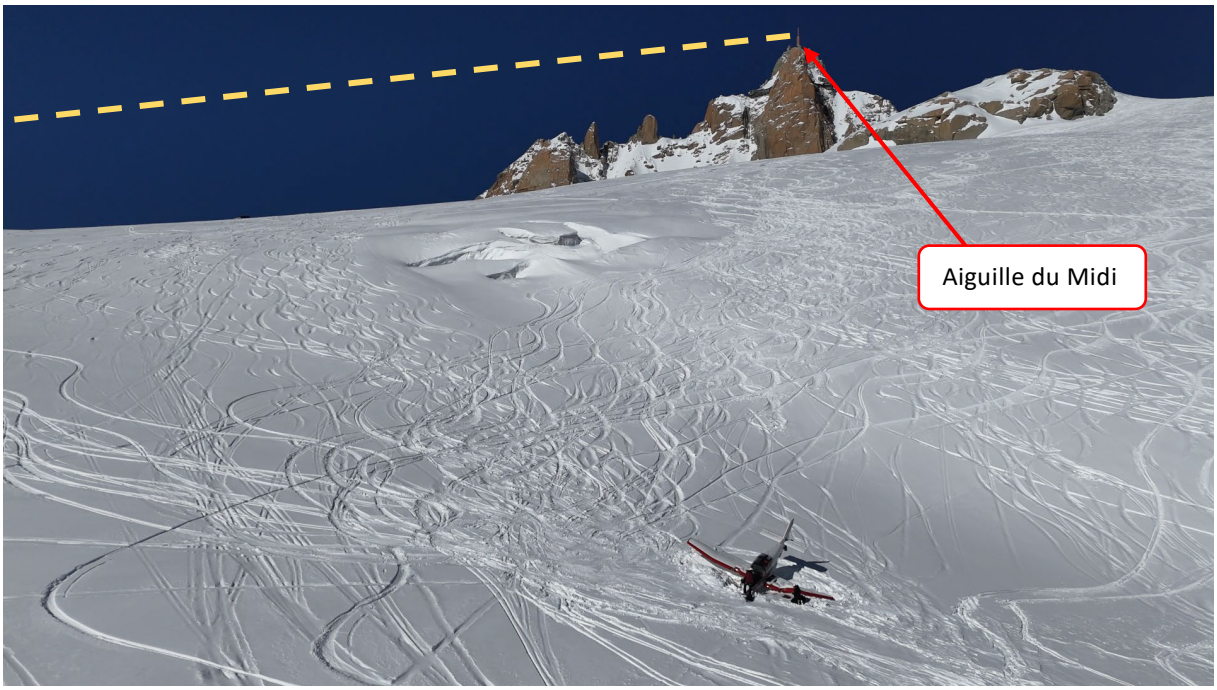

Figure 4: photo taken by drone of accident site (source: BEA)

Figure 5: photos of F-BMFV and from BMFV (source: BEA)

2.2 Pilot information

The 46-year-old pilot held an aeroplane Private Pilot Licence (PPL (A)) obtained in 1996. He had logged 400 flight hours, including 228 hours solo. On the Jodel D140, since becoming a member of Megève flying club in 2018, he had totalled:

- 40 flight hours including 2 hours solo: one flight in 2020 and one of 20 min in January 2025, during which he had renewed his “ski” authorization for the mountain airfield;
- in the 3 months prior to the accident, 6 flight hours (5 instruction hours) during which he had flown in the Mont-Blanc massif and to Méribel mountain airfield.

He did not have any other mountain flight experience than that mentioned above.

2.3 Meteorological information

The 11:00 data from the Aiguille du Midi weather station (3,852 m) indicated wind from 250° of 10 kt, with gusts of 15 kt and a temperature of -13 °C (ISA -3 °C). The aeroplane was thus downwind of the terrain but it was not possible to determine the influence of this on the climb performance.

The data provided by Météo-France and the images on the webcam installed on Aiguille du Midi showed that the sky was clear with the presence of a few very high clouds.

2.4 Aircraft information

2.4.1 General

F-BMFV is a Jodel D140 C, a low-wing monoplane constructed of wood and fabric, with conventional landing gear. It is equipped with a Lycoming O-360-A3A engine producing 180 hp (in standard atmospheric conditions at sea level) and a two-blade, fixed-pitch metal propeller. The aeroplane can carry up to five people with luggage. On the day of the accident, it was equipped with skis. Each seat was equipped with a lap belt but no shoulder straps. Given the aircraft's year of manufacture[2], regulations do not require the seats to be equipped with three-point restraint systems.

The maximum take-off weight is 1,200 kg. The aeroplane's flight manual specifies an indicated stall speed of 92 km/h with flaps retracted and a maximum climb rate (Vx) of 135 km/h.

The stall warning is a warning light. F-BMFV was not equipped with an artificial horizon

The aeroplane was maintained by the Megève flying club. The airframe had totalled approximately 16,000 operating hours and the engine 1,200 hours since its last overhaul. According to the airworthiness documents consulted, maintenance was carried out in accordance with the manufacturer's requirements and recommendations. The maintenance check reports do not show any technical anomalies observed during the last maintenance operations.

2.4.2 Weight and balance

The pilot had approximately 100 l of fuel for the flight. After a flight time of 20 min, with an estimated fuel consumption of 40 l/h, the weight of the on-board fuel at the time of the accident was approximately 60 kg. The combined weight of the pilot and passenger was estimated at 160 kg. According to the weight report dated February 2023, the aeroplane's empty weight with skis is 702 kg.

At the time of the accident, the aeroplane's weight was therefore estimated at 920 kg. The aeroplane was in the centre of gravity envelope recommended by the manufacturer.

2.4.3 Performance

2.4.3.1 Engine performance at altitude

As the power output of a piston engine is proportional to the mass of the air-fuel mixture entering the cylinders, it depends on the density of the ambient air. Mountain pilots often note that a naturally-aspirated piston engine loses approximately 10% of its power for every 3,000 feet of altitude, which translates to over 30% by the end of the F-BMFV flight.

However, the power drop can be even greater if the air-fuel mixture is incorrectly adjusted.

[2] European regulations require a seat belt with a torso restraint system for each flight crew seat, with a single release, on aircraft whose first certificate of airworthiness was issued on or after 25 August 2016.

2.4.3.2 Climb performance

The vertical speed also decreases as the aircraft climbs, by around 5 to 7% for every 1,000 ft.

According to the chart in Section 5 of the aeroplane flight manual[3], in standard ISA temperature conditions, at an altitude of 11,000 ft and a weight of 900 kg, the aeroplane's climb performance in a configuration without skis is around 590 ft/min.

The influence of the skis on the aeroplane's performance was not indicated in the flight manual. However, according to pilots with a lot of experience in flying the D140 in the mountains, the presence of skis reduces climb performance by around 20% resulting in a performance of around 470 ft/min.

2.4.3.3 Evolution of horizontal and vertical speeds during flight

The data downloaded from the FLARM were used to calculate[4] the ground speed and vertical speed.

During the first two minutes in climb, the horizontal (ground) speed was around 150-160 km/h, higher than the aeroplane's best angle-of-climb speed (135 km/h).

The photo taken by the passenger at 11:29:25 showed that the indicated airspeed on the airspeed indicator was around 112 km/h. The ground speed calculated using the FLARM data was 110 km/h at this time. Given the straight flight path between (4) and (5), it can be considered that the aeroplane's indicated airspeed was close to the ground speed for this portion of the flight path.

The evolution of the ground speed and the vertical speed is evidence of the aeroplane progressively entering flight on the backside of the power curve during the climb.

In particular, it can be seen that:

- the vertical speed varies around 300-400 ft/min during the climb and then suddenly drops in the last seconds of the flight;
- the horizontal (ground) speed which at this point, roughly corresponds to the indicated airspeed, progressively decreases to around 90 km/h, at which point the vertical speed drops.

[3] Performance obtained by a test pilot on a new aeroplane.

[4] The reliability and accuracy of the data recorded by the FLARM depends on several factors and decreases during dynamic phases of the flight. The values shown are given for information purposes only, in particular the ground speed, estimated based on the differentiation of the latitude and longitude geographical coordinates.

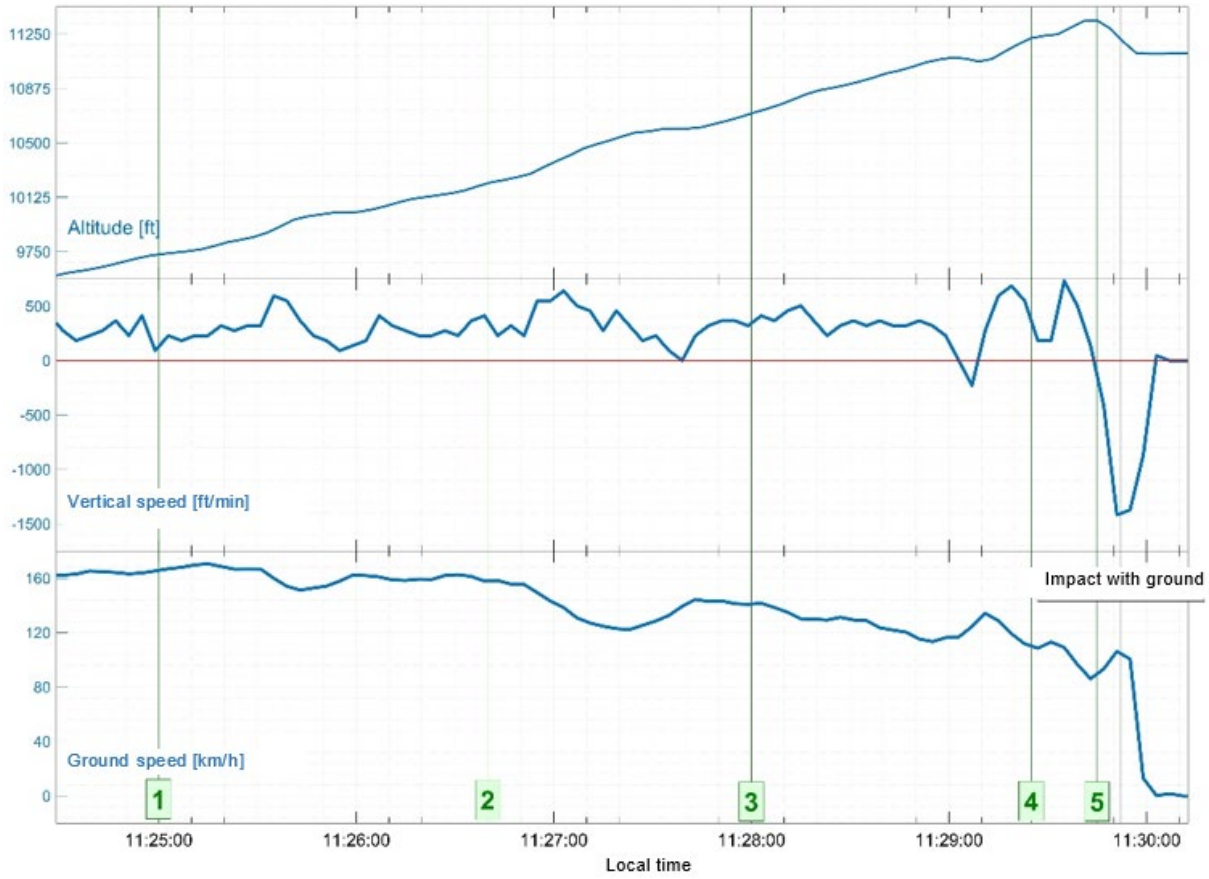

Figure 6: ground speed and vertical speed of F-BMFV according to time, calculated using FLARM data

2.5 Megève flying club information

The training manager in Megève flying club explained that the conventional circuit in the Mont-Blanc massif, taught to student pilots during instruction flights, includes flight over various glaciers (Tour, Argentière, Talleffre, Leschaux and Tacul) at around 10,000 ft, without flying over the Vallée Blanche and the Aiguille du Midi. This sector is considered dangerous due to the presence of cable car cables. In the rare cases where Aiguille du Midi is flown over, it is customary to climb to about 14,000 ft before entering the Mer de Glace. The training manager indicated that he did not understand the pilot's reasons for following his flight path.

He had authorized the pilot to fly in the massif the same morning based on the following information:

- the meteorological conditions were ideal;
- the pilot had renewed his "ski" authorization to use the mountain airfield in the previous days;
- he had carried out several instruction flights in the previous weeks, including one in the Mont-Blanc massif.

More generally, he considered that the pilot had acquired the necessary experience and skills for this type of flight, given his seniority in the flying club.

All the flying club pilots were aware of the dangers of flight in mountainous terrain, in particular, the absence of a natural horizon in the terrain, and were trained in piloting techniques (passing over a pass, holding pitch attitude, monitoring speed). Flight on the backside of the power curve was explained and shown by the instructors during the first mountain instruction flights.

After the accident, Megève flying club installed three-point restraining systems in addition to the original lap belts on all its aeroplanes.

2.6 Statements

2.6.1 Pilot's statement

The pilot stated that he had waited for the training manager to arrive at the flying club before undertaking his flight to obtain his advice on a flight in the Mont-Blanc massif.

He explained his chosen flight path by a desire not to get too close to the peaks when flying over the glaciers, judging flight in the valley to be less dangerous.

He explained that one to one and a half minutes before the accident, on approaching the terrain, the aeroplane was not climbing as it should have. It seemed to him that the aeroplane's performance had progressively degraded. He associated this with a drop in engine power and then a total power loss. He indicated that he adjusted the mixture, checked the quantity of remaining fuel and the position of the selector and then put the aeroplane into a slight descent. He added that he had not perceived any warning light on the instrument panel nor detected any noise that could be associated with a loss of power or a malfunction.

He indicated that he first envisaged making a left-hand U-turn but he decided against this due to the proximity of the terrain. He then turned to the right with the initial intention of making a U-turn. He felt the aeroplane buffeting during this manoeuvre and thus preferred to attempt an emergency landing. He specified that he had not felt the aeroplane stall. However, he did not exclude the possibility of the aeroplane having stalled at a low height, during the flare for example. In his opinion, his difficulties in perceiving the ascending slope in the landing area may explain the collision with the ground. The cable car cables in the sector did not, in his opinion, represent a danger during this flight and for landing.

The pilot indicated that in his instruction flights, he was regularly made aware of visual perceptions in mountainous terrain and the need to hold the pitch attitude. He explained that the conventional Mont-Blanc massif circuit carried out with the Megève flying club instructors included a circuit of the various glaciers and not a direct flight path from the Mer de Glace to the Col du Midi pass. He added that he had already crossed the Col du Midi pass during instruction flights. He thought that the altitude at which he entered the valley would allow him to safely cross the Col du Midi pass.

He believed that he did not have, before the accident, sufficient knowledge about flight on the backside of the power curve. In his opinion, this situation was not sufficiently addressed and explained in instruction in the various flying clubs he had known.

2.6.2 Passenger statement

The passenger remembered that he could see Aiguille du Midi ahead of him. He heard the pilot announce a power problem and indicate that the aeroplane was unable to climb correctly. He remembered that at this time the engine was operating. He could not recall any specific noise or warning light. He was not able to remember the end of the flight as he lost consciousness on impact.

2.7 Flight on the backside of the power curve training

Investigations into accidents in the past five years that occurred while flying in the mountains, have often revealed that a gradual transition to the backside of the power curve, without the pilot detecting or reacting appropriately to this, contributed to the accident. These accidents largely involved flatland pilots with limited knowledge and experience of mountain flying. The accident to F-BMFV demonstrates that a pilot trained in a flying club specializing in mountain flying can also find themselves in this situation.

Discussions between the BEA and the aviation community (FFA, flying clubs, pilots) seem to show that the teaching of flight on the backside of the power curve, with respect to both theory and practise, varies from one flying club to another. The concept is generally only addressed during the initial training for a private pilot's license, when learning slow, level flight. Therefore, the risks of transition to flight on the backside of the power curve in mountain flying do not appear to be sufficiently understood by some pilots, particularly those accustomed to flying in flatland areas.

Recently, the FFA developed a training program dedicated to mountain flying, primarily intended for pilots from lowland flying clubs and to be given by mountain instructors (MI) or flight instructors (FI) with a mountain rating. Although the implementation details are still being finalized, the FFA offered this training program to all its affiliated flying clubs in the summer of 2025. At the time of writing, 77 flying clubs had responded positively. Flight on the backside of the power curve is one of the items explained.

3 CONCLUSIONS

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

Scenario

During a mountain flight, the pilot entered the valley leading to the Col du Midi pass at an altitude that would not allow him to cross the pass on a direct flight path, with a sufficient safety margin, given the climb performance of the aeroplane. As the terrain steepened, the pilot progressively increased the aeroplane’s pitch attitude which led to a decrease in the indicated airspeed and climb performance, characteristic of flight on the backside of the power curve. The pilot probably mistook the effects of flight on the backside of the power curve for a progressive and then total decrease in engine power due to a malfunction. He then rejected the flight and carried out an emergency landing on the glacier. The speed of the aeroplane continued to decrease until reaching a speed close to the stall speed. The vertical speed then dropped and the aeroplane descended around 70 m in approximately ten seconds before colliding with the surface of the glacier with a low horizontal speed. The presence of fresh, abundant snow probably significantly dampened the impact with the ground and contributed to the survivability of the accident.

Contributing factors

The following factors may have contributed to flight on the backside of the power curve and this not being detected by the pilot:

- absence of flight preparation, in particular determining the minimum altitude required when entering the valley, in order to cross the pass with a sufficient safety margin, given the planned flight path;
- the combination of limited solo mountain flying experience and a flight path which had not been flown in an instruction flight;
- insufficient assimilation of the specificities of mountain flying and the main associated risks despite instructor actions to raise awareness, and not identified during the dual flights.

Safety lessons

Risk of flight on the backside of the power curve in mountainous region

When flying in the mountains, the pilot no longer has the natural horizon as an external visual reference. When faced with an ascending slope, an inexperienced pilot may have a tendency to gradually increase the aeroplane's pitch attitude, sometimes unconsciously. In some cases, despite a high nose-up attitude and a positive vertical speed (approximately 300 ft/min in the case of the F-BMFV), the pilot may believe, when the slope of the terrain over which they are flying increases steeply (approximately 20% for the F-BMFV), that the aeroplane is descending with a nose-down attitude. Furthermore, in winter, the presence of a uniform blanket of snow on the terrain can increase the difficulty in judging the slope.

The increase in pitch attitude leads to a decrease in airspeed, gradually bringing the aeroplane onto the backside of the power curve. Increasing the angle of attack increases induced drag, and consequently, the power required to maintain stable flight increases, while the power used for climb is already at its maximum. When the power required exceeds the power output, stable flight is no longer maintained; the aeroplane enters the critical backside of the power curve zone.

The only way to exit the backside of the power curve is to decrease the angle of attack and therefore the pitch attitude in order to accelerate, which, when flying in the mountains at low height, forces the pilot to approach the terrain.

Furthermore, the symptoms of flight on the backside of the power curve can be mistakenly attributed by the pilot to a lack of engine power.