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INVESTIGATION REPORT

Accident to the ITV WINGS BOXER 2M identified 83AWI

on 14 December 2020
at Fréjus (Var)

Time	Around 12:05[1]
Operator	Private
Type of flight	Local
Persons on board	Pilot
Consequences and damage	Pilot fatally injured, microlight destroyed

This is a courtesy translation by the BEA of the Final Report on the Safety Investigation published in January 2022. As accurate as the translation may be, the original text in French is the work of reference.

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

Loss of control in flight at low height over an urban area, collision with a pontoon

1 - HISTORY OF THE FLIGHT

Note: the following information is principally based on statements and recordings from the port's security cameras.

The pilot took off at around 11:30 from a field located near Fréjus microlight base (see Figure 1). He accompanied two other paramotor pilots, one of whom was the instructor who had supervised his training. The three pilots met above the mouth of the Argens river, took the direction of Saint-Aygulf (Var), then headed towards Saint-Raphaël (Var) by flying along the coast and passing a first time above Port-Fréjus (Var).

The first two paramotors flew side by side, followed by the 83AWI pilot, at a height estimated by witnesses to be between 150 and 300 m[2].

Shortly before Saint-Raphaël, the three pilots turned around. Around noon, as they were flying over Port-Fréjus again, witnesses saw the 83AWI paramotor rapidly lose height while making spirals above the port, then collide with a pontoon.

[2] According to the ICAO 1/500,000 scale map, the regulatory height for flying over Fréjus-Saint-Raphaël, including Port-Fréjus, is 5,000 ft AGL (approximately 1,500 m).

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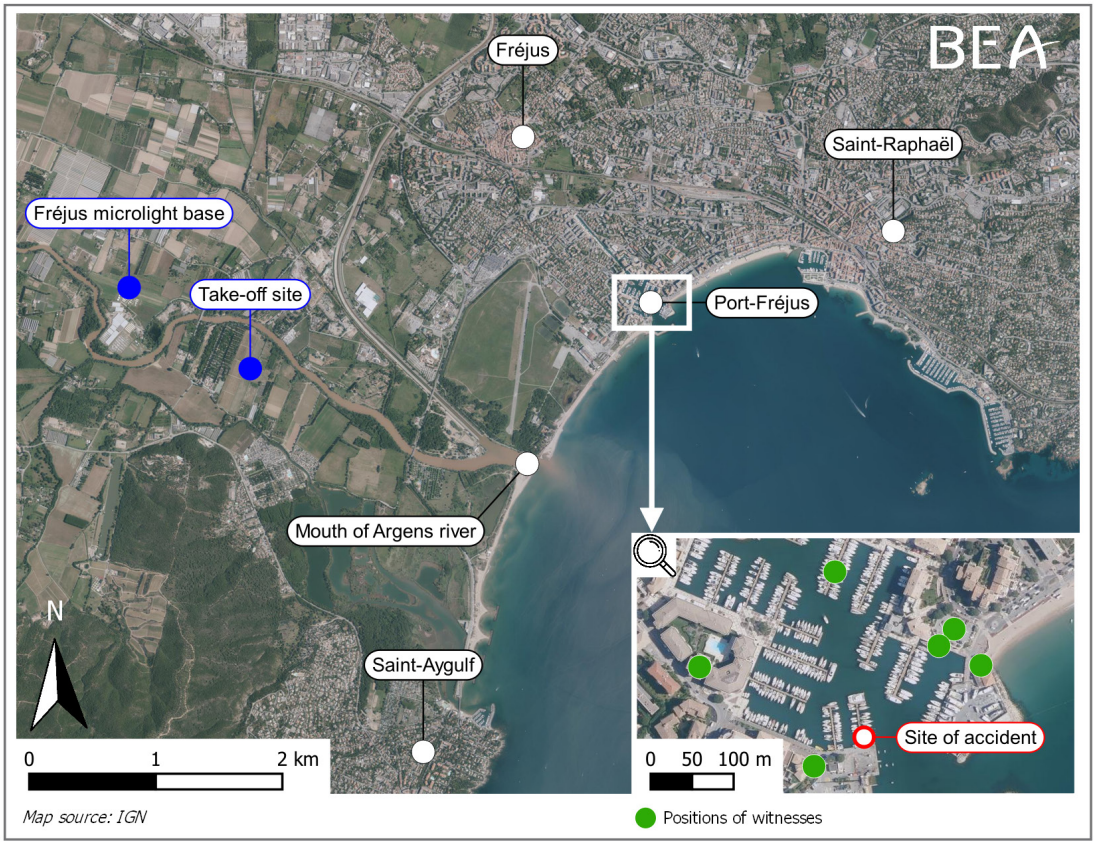


Figure 1: View of general situation

2 - ADDITIONAL INFORMATION

2.1 Examination of site and wreckage

The accident site was in the marina of Port-Fréjus which is equipped with fixed concrete pontoons. Many pleasure boats with masts up to seven metres high are moored there. The port is enclosed within a densely populated urbanised area with numerous buildings several tens of metres high.

The damage observed on the wing, power unit and harness resulted from the collision or the intervention by the emergency services. The examination of the rigging line controls showed that they were continuous and in good condition and that the wing was in perfect condition. The harness settings were consistent with the pilot being correctly positioned and harnessed; no anomaly was found on the harness.

The examination of the engine showed a good general condition. The engine functional test confirmed that its performance was within the manufacturer's specifications.

The examination of the trim settings[3] showed that, at the time of the accident, the wing was trimmed with a nose-down setting. A slightly asymmetric setting between the left and right trims was observed.

[3] The trims allow the pilot to change the wing setting to vary the speed.

2.2 Microlight information

2.2.1 General

The 83AWI paramotor, owned by the pilot, was composed of a harness not equipped with a reserve parachute and of an ITV Wings BOXER 2M wing, approved by the DGAC for "*school and beginner*" use, compatible with the power output of the VITTORAZI ATOM 80 engine. The wing was equipped with trim risers. It was not equipped with speed bars[4].

[4] These two systems are used to vary the speed. The speed bar is used with the feet while the trims are set manually. In both cases, it is a matter of varying the wing setting by changing the length of the risers.

According to the wing manufacturer's user's manual[5], flying in turbulent conditions should be avoided at all costs. In case of turbulence, speed must be reduced. This way:

- the angle of attack is increased, which reduces the risk of closure due to the leading edge adopting a negative angle-of-attack;
- the pendular effect will be dampened;
- the re-inflation of the wing, in case of deflation, is facilitated.

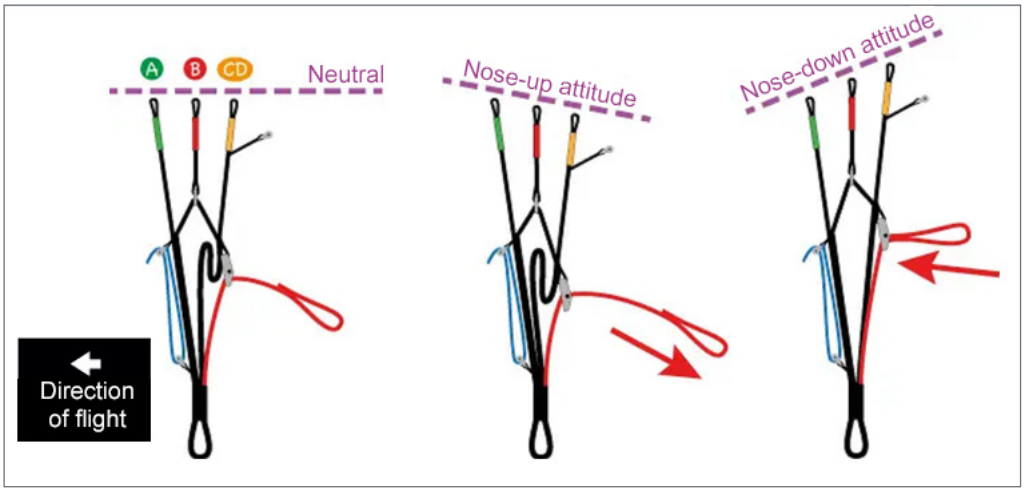
[5] Edition 1 dated September 2017.

Furthermore, the manual points out that in the event of a wing closure, the reopening is very generally spontaneous and immediate. Nevertheless, even though this has not been shown during the tests, it cannot be excluded that after a massive closure which causes a turn, if nothing is done, it could degenerate into auto-rotation. To correct for this, the pilot should transfer his weight to the inflated side and brake smoothly on the outside of the turn.

2.2.2 Principles of trim operation and use

This is a system that allows you to vary the wing setting in flight and lock the risers in a specific position. This system is usually located on the rear risers. Most of the time, the system only allows the pilot to give the wing a nose-down setting by releasing the rear risers[6] (see Figure 2).

[6] Source: https://www.pilotage-parapente.com/manuel-de-pilotage



Source: paraglider flight manual

Figure 2: Principle of trim operation

The wing manufacturer's user's manual states that the major disadvantage of this system is that the pilot must manually change the setting. So, if there is a flight incident, he must deal with a wing that stays in the faster setting and is therefore more sensitive to closures, as well as to closures that reopen with more difficulty, sharper stall dives, faster entry into autorotations, etc.

The 7th edition of the Microlight pilot's handbook published by CEPADUES explains that although this system is used to gain a little speed, it also induces a lot of instability and makes the wing more sensitive to front closures. It states that changing the setting angle is not recommended or is risky due to profile distortion.

2.3 Pilot information

2.3.1 Experience

The 52-year-old pilot owned the paramotor. He held a microlight pilot certificate along with a paramotor rating issued on 8 December 2020. He had logged 3 hours and 50 minutes of flight in paramotors , all on type, around 2 hours of which in the previous three months. He also held a Private Pilot Licence - Aeroplanes (PPL(A)) issued in 1989 and a SEP rating which had expired in 2007. He had logged 93 flight hours in aeroplanes.

He had started his paramotor training on 15 May 2020 at Les Ailes du Soleil paramotor club. As the pilot held an aeroplane pilot licence, the instructor had given him a tailored theoretical training programme. The pilot had carried out nine solo circuit flights at Fayence aerodrome (Var), each lasting ten minutes, in June, then six ten-minute flights in October. On 19 October, he had carried out a solo navigation flight, lasting about 25 minutes, and successfully completed ground exercises for the issuance of the pilot certificate with the authorization to fly solo. From October 30 to December 15, he had not flown due to the national lockdown related to the COVID-19 epidemic in France. The day prior to the accident, he had flown, at his request, a supervised solo aerodrome circuit with the same instructor, followed by a 23-minute local flight.

According to the instructor, he had learnt, during his training, what to do in case of flight incidents (engine failure, front or asymmetric closure, stall, turbulence, twist, etc.), only on the ground on a gantry. The instructor stated that the pilot had never flown in turbulent conditions.

2.3.2 Medical information

The medical examinations did not reveal any element likely to explain the accident.

2.4 Meteorological information

2.4.1 Météo-France analysis

The meteorological conditions estimated by the French met office, Météo-France, at the time of the accident were as follows: light north-westerly wind from ground level to an altitude of 100 m, becoming easterly from 200 m but remaining light, visibility 10 km, broken clouds with a base above an altitude of approximately 760 m (2,500 ft), temperature 11°C, probable light turbulence at an altitude between 150 m and 200 m.

According to the Météo-France analysis based on data from the Fréjus weather station, a wind front[7] from the east crossed the commune of Fréjus between 12:00 and 12:30, and a clear shift to an easterly wind was recorded from an altitude of 100 m to ground level. This wind front was accompanied by gusts reaching 6 to 11 kt with the possible presence of low intensity wind shear.

[7] Rapid change in wind direction, without a clear change in speed.

2.5 Analysis of the images of the port's security cameras

The analysis of the images between 11:30 and 12:05 showed that the sea surface, which had been calm until then, first became agitated off Saint-Raphaël (east of Port-Fréjus). Then this phenomenon moved westward and reached the Port-Fréjus channel at 12:01. A 180° change in wind direction at ground level was then observed.

At 12:04:46 (two or three seconds before the collision), the paramotor could be seen flying at low height, in a "*parachutal phase*"[8] (visible asymmetry on the brakes) and in a right spiral. The wing seemed to be fully inflated. The paramotor spun at least 180°. The pilot did not seem to be submitted to centrifugal force. His right hand was down, his left hand was not visible. One second before the collision with the pontoon, the wing was fully inflated, and the paramotor was banked to the right and in a steep nose-down attitude (approximately 60°). The two other paramotors flying at a greater height south-west of Port-Fréjus, closer to the sea, could also be seen on the images.

[8] Phase, outside the flight envelope, where the wing essentially keeps its shape, but the airflow no longer follows its profile. This results in zero horizontal velocity and a high rate of descent.

2.6 Statements

2.6.1 Ground witnesses

A witness stated that the first two paramotors, followed by the third, had flown over the port again at low height. He specified that the third paramotor had been flying at a height of approximately 60 m. At the same time, the wind had become stronger and gusts of wind had appeared. The witness explained that the wind front had been approaching the paramotors from behind as the 83AWI pilot was flying over the port access channel, towards the sea.

Several witnesses stated that the wing had closed 80% and that the paramotor had fallen making spirals. Other witnesses saw the pilot alternately pull the left and right control handles several times during the fall of the paramotor, before the wing re-inflated. While the microlight was at a height of approximately 20 m, they had heard an increase in engine speed, then the paramotor had made a right turn with a nose-down attitude of about 45° and had collided with the pontoon.

2.6.2 Instructor

The instructor stated that they had taken off one hour and thirty minutes later than originally planned. When they had taken off, the land breeze was less than 5 km/h. The instructor explained that they had flown at a height of approximately 300 m. He was in radio contact with the 83AWI pilot. When they had turned around at the beach of Saint-Raphaël, the latter had told him that everything was fine. During the flight, the instructor had noted a light easterly upper wind at approximately 400 or 500 m. He stated that he had flown over Port-Fréjus less than five minutes before the 83AWI pilot and that the aerological conditions were then very good, with a few cumulus clouds and no thermals.

He specified that he had not seen the accident.

2.6.3 Third paramotor pilot

The pilot of the third paramotor said it had been his first solo flight since obtaining his certificate. On this occasion, he had been supervised by the instructor who had followed him in another microlight. He stated that the 83AWI pilot had not reported any technical problems before take-off. He specified that there had been no wind and no threatening clouds during the take-off. He stated that they had flown at a height of approximately 300 m and that the 83AWI pilot had always remained in third position. He added that on the outward leg, the wind had been more from the south-east and that he had encountered slight turbulence after passing near Port-Fréjus. He stated that on the return leg, he had been flying over the sea, not over the marina, because there was no landing zone in case of problems there. He had not seen the accident. The few times he had seen the 83AWI pilot during the flight, the latter had been flying over the sea, sometimes higher, sometimes lower than him.

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

While the pilot was flying at low height above Port-Fréjus, the wind quickly changed direction with gusts appearing, possibly resulting in localised low intensity wind shear. The wing of the paramotor closed massively. The paramotor banked and adopted a steep downward path. The pilot was able to re-inflate the wing, but the low height did not allow him to start climbing before the collision with a pontoon.

Contributing factors

- The trim setting to the nose-down position may have contributed to:
  - promoting wing closure in a turbulent atmosphere;
  - delaying the re-inflation of the wing after it closed;
  - putting the wing on a steep nose-down path after it had re-inflated;
  - requiring a greater and longer pilot input to inflate the wing.
- The pilot's lack of experience and the immediate proximity to the ground may have been the cause of the disordered manoeuvres on the controls described by the witnesses.