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INVESTIGATION REPORT

Accident to the SCHEMPP HIRTH - VENTUS 2B registered F-CIJT

on 19 August 2020
at Saint-André-les-Alpes (Alpes-de-Haute-Provence)

Time	16:53[1]
Operator	Private
Type of flight	Local slope soaring flight
Persons on board	Pilot
Consequences and damage	Pilot fatally injured, glider destroyed

This is a courtesy translation by the BEA of the Final Report on the Safety Investigation published in December 2021. 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 slope soaring flight, collision with the terrain

1 - HISTORY OF THE FLIGHT

Note: the following information is principally based on the OGN[2] aircraft tracking data, the FLARM[3] GNSS data, the glider's Oudie IGC computer, as well as on statements and the emergency services' phone communication recordings.

[2] Open Glider Net.

[3] Computer to assist with the detection of obstacles and traffic in the surrounding area.

The pilot took-off from Fayence-Tourrettes aerodrome (Var) at around 11:25. At around 16:30, a first witness - a glider instructor who was near the Castillon Lake nautical base (Position A in Figure 2) - observed the glider through binoculars for several minutes: the pilot seemed to be having difficulties finding uplifts. He saw the glider flying more or less at the same altitude as the Crémon ridge (its highest point reaching an altitude of around 1,760 m) before losing around 200 m. The pilot flew south towards Teillon mountain several times before coming back to use the uplifts under the Crémon ridge. The first witness indicated that the pilot had maintained a fairly constant altitude, alternating figures-of-eight and spirals, but had seemed to have difficulties centring the glider in the uplifts. He managed to climb again to be level with the ridge and then headed east before the witness lost sight of the glider.

About 10 minutes later, a second witness (Position B of Figure 2) saw the glider flying at low height, near the crest of the Grau ridge. The glider then headed towards the ridge, making two or three turns. It disappeared behind the ridge in the direction of the village of Angles (Var) and the witness heard a thud. He alerted the emergency services at around 17:00. The wreckage and the pilot were found at around 20:40.

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2 - ADDITIONAL INFORMATION

2.1 Site and wreckage

The wreckage was located at an altitude of 1,089 m in an area of forest on the western slope of the terrain, 40 m below the Grau ridge (see Figure 1). The glider struck the vegetation with a low horizontal speed, on a nose-down path, before the nose of the glider collided with the ground. The examination of the wreckage indicated that the glider was complete before the impact. The front part of the fuselage was destroyed (longitudinally compressed); the instrument panel was destroyed, and the instruments could not be examined. The high level of energy upon impact meant the pilot's chances of survival were slim.

The glider was equipped with an emergency parachute that was found deployed out of its housing. The ballistic charge was probably triggered by the structural distortions of the glider as it collided with the ground. The sound heard by the second witness was probably the sound of the parachute's ballistic charge being activated. The emergency locator transmitter selector switch was in the "OFF" position.

The pressure gauge indicating the pressure in the oxygen cylinder found in the wreckage was on "0". The oxygen system was destroyed and could not be tested. The amount of oxygen in the cylinder could not be determined. According to the rescuers, the pilot was not wearing his oxygen cannulas, but these were found by the rescue team in the wreckage. The EDSO2D1 "*on-demand*" oxygen delivery selector switch was in the OFF position, however this position may have been changed upon impact.

The position of the air brakes and the landing gear could not be determined. The examination of the flight controls did not reveal any anomaly.

Source: BEA

Figure 1: Aerial view of the site and the position of the wreckage from a drone

2.2 Read-out of data from the computers

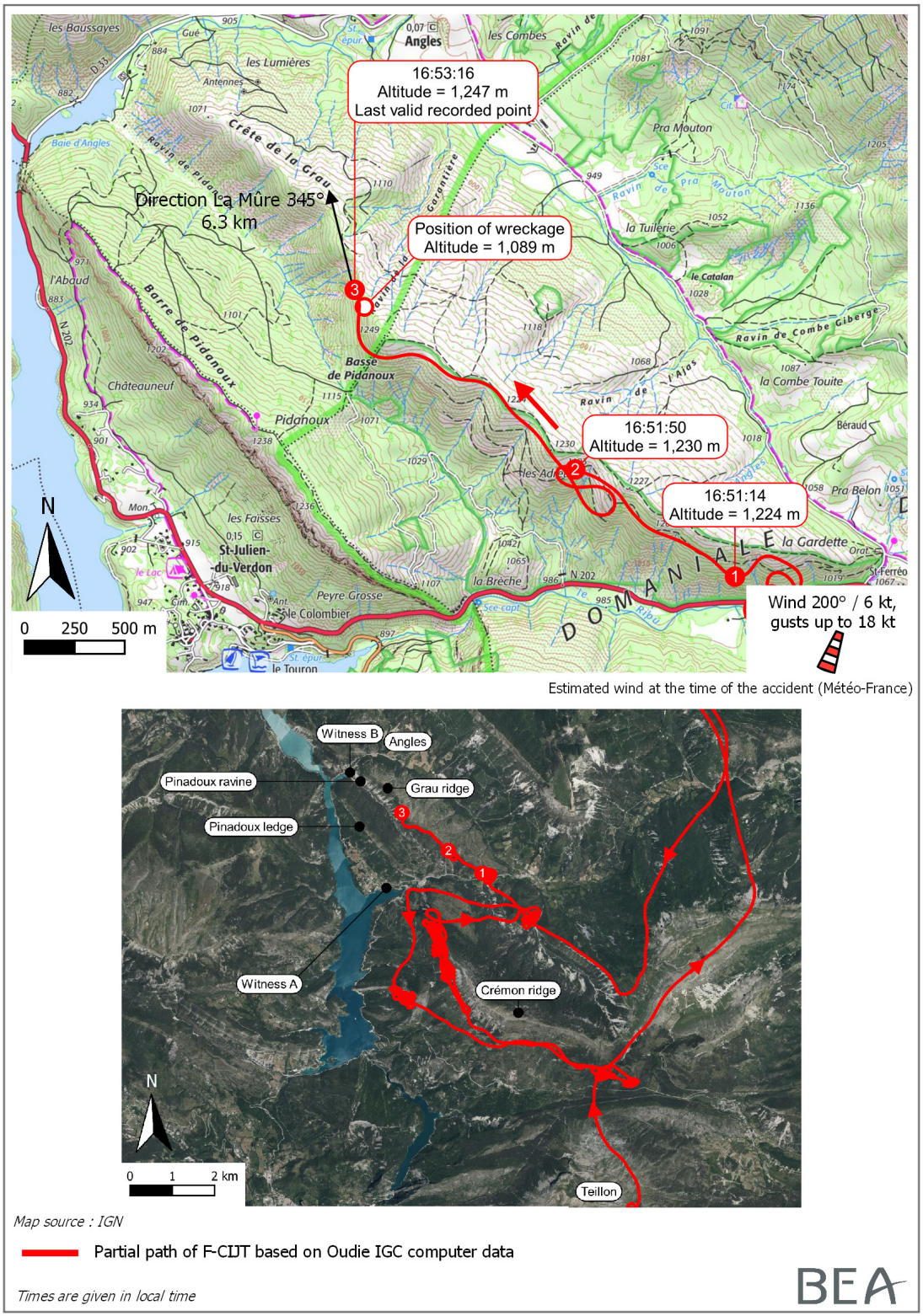


Figure 2: F-CIJT's flight path

The glider was equipped with a conventional FLARM and a portable GNSS computer (Oudie IGC) which record GNSS positions in a non-volatile memory. Reconstruction of the path was possible based on this data (see Figure 2). The last valid point of the path was recorded at 16:53:16. Nevertheless, when the computer stops abnormally, it is possible to lose up to two minutes of data.

On the return leg to the departure aerodrome, the pilot followed more or less the same route as on the outbound leg, and flew at an altitude of 2,800 m in the Allos Valley. According to the chief-pilot of the Association Aéronautique Provence Côte d'Azur (AAPCA), this altitude is not sufficient to reach the aerodrome directly from this position. As he was unable to cross the Teillon located south of his path, it seems that the pilot tried, unsuccessfully, to bypass it to the west. He turned around and came back to use the uplifts on the western slope of the Crémon, then above terrain located east of the Crémon. At about 16:50, he entered the valley located between the Pidanoux ledge and the Grau ridge at an altitude of 1,200 m (see Point ❶ in Figure 2). From this moment on, the pilot was no longer in the vicinity[4] of the La Mûre safe landing area[5], even with a lift-to-drag ratio of 35. The area overflown by the glider was wooded, and from the altitude at which it was flying, it could not reach any area suitable for an off-airfield landing.

During the last two minutes of flight which were recorded, the glider was slope soaring in a north-westerly direction, at an altitude of between 1,235 m and 1,250 m, and it used uplifts, making a figure-of-eight on the western slope of the Grau ridge (see Point ❷ in Figure 2). At the end of the path recording, the glider was overhead a ravine located at the edge of a forest (see Point ❸ in Figure 2). It was then in the vicinity of the La Mûre safe landing area again.

2.3 Meteorological information

According to the French met office, Météo-France, between 16:00 and 17:00, the air mass below 2,000 m was dry and unstable in the low levels due to daytime heating.

The meteorological conditions estimated by Météo-France at the accident site were as follows: 200° wind at 6 kt, gusting up to 18 kt, moderate slope breeze with gusts, moderate turbulence at the surface, visibility greater than 8 km, broken (BKN) cumulus at an altitude of 1,800 m.

The first witness indicated that there was a 30 km/h wind at the Castillon Lake shortly before the accident. The emergency services officer who found the glider indicated that there was a strong gusty wind at the Grau ridge.

2.4 Pilot information

2.4.1 Licence and experience

The 58-year-old pilot held a glider pilot licence issued in November 2015. He had started his training in July 2015 and had completed it in full with the AAPCA. According to the AAPCA chief-pilot, the specificities of slope soaring flight were systematically addressed in the student pilots' training, during theoretical and practical sessions. The "*local flight*" limitation had been removed from the pilot's licence on 9 October 2019. The last dual flight had been performed by the pilot on 5 July 2020. His last medical examination was on 1 August 2020. He was the owner of the glider. At the time of the accident, he had logged at least 475 flight hours in a glider, 98 hours of which in the previous three months and 91 hours of which on type.

[4] A glider is in the vicinity of an aerodrome or a safe landing area when the altitude and distance between the area and the glider enable the latter to land there under all circumstances, in particular if the pilot can no longer find uplifts. In practice, a lift-to-drag ratio of 10 is taken for a beginner pilot; it is 20 for an experienced pilot in a glider with a lift-to-drag ratio of 30, or even 30 or 35 if the pilot is flying a competition glider.

[5] Area referenced in the Alps safe landing area guide.

According to an instructor who had flown with the pilot several times, the pilot mostly performed short flights because he had a tendency to get tired in flight.

Two days before the accident flight, after approximately one hour and thirty minutes of flight, he had made an off-airfield landing in the commune of Séranon (Alpes-Maritimes) due to the deterioration in weather conditions.

2.4.2 Medical and pathological information

The toxicological analysis of the blood samples taken from the pilot's body did not reveal the presence of any substance likely to have impaired his faculties. The hypothesis of a pilot incapacitation could not be ruled out. It was not possible to determine whether the pilot died immediately as a result of the impact or shortly after the accident.

2.5 Use of supplemental oxygen and hypoxia

Part-SAO[6], which consists of Regulation (EU) 2018/1976 of 14 December 2018[7], came into force on 9 July 2019.

In particular, the SAO.OP.150 and AMC.OP.150 paragraphs specify that the pilot-in-command shall assess the oxygen requirements of all persons on board and, if not, ensure that all occupants use supplemental oxygen any time the pressure altitude is higher than 10,000 ft (3,048 m).

The *Manuel du pilote vol à voile*[8] specifies that the altitude at which hypoxia can occur is about 1,500 m.

Analysis of the recorded flight data shows that the pilot flew for about 2 hours and 30 minutes above an altitude of 1,500 m and 1 hour and 20 minutes above an altitude of 2,450 m. The investigation could not establish whether or not the pilot received supplemental oxygen during the flight.

2.6 Glider information

The glider had been built in 2007 and had logged approximately 2,850 flight hours. The pilot was the owner of the glider. He carried out the maintenance operations himself under his Part-66 licence.

The Glider Flight Manual states that in case of a stall, the loss of altitude varies according to the glider's attitude (in a straight line or turning) and can be as much as roughly 60 m until recovery, or even 140 m, in the event of entering a spin.

2.7 Specific aerological conditions of slope effect

The technical document, Safety in Mountain Flying[9] (first edition, December 2011 published with the French Gliding Federation (FFVP)) recalls that the evolution of the air masses in mountains is complex. Local phenomena, linked to the shapes of mountains and to the interactions between winds, valley breezes, the nature of the ground, etc. are sometimes more important than the general meteorological situation. This results in situations that evolve unpredictably and sometimes for the worse. Particular caution should be paid to invisible lines of downdrafts provoked by near or distant mountains.

[6] Sailplane Air Operations.

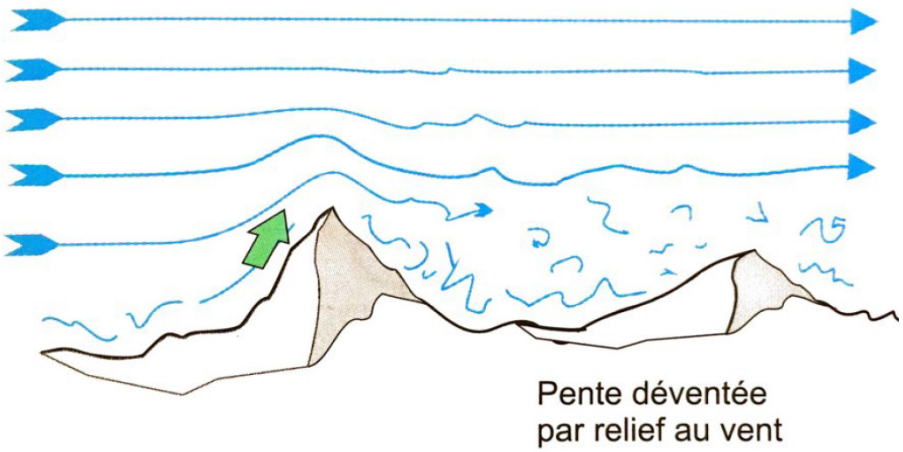
[7] Commission Implementing Regulation (EU) 2018/1976 of 14 December 2018 laying down detailed rules for the operation of sailplanes as well as for the flight crew licensing for sailplanes pursuant to Regulation (EU) 2018/1139 of the European Parliament and of the Council (Version in force on the day of the accident).

[8] Glider pilot manual, Editions Cépaduès - 14th edition, October 2019 (available in French).

[9] https://fr.calameo.com/read/004721610addbfe6fb876

The *Manuel du pilote vol à voile* states that a slope, theoretically conducive to a slope effect, may be downwind of another fairly close terrain. In this case, the slope can be "*masked*" from an aerological point of view. The uplifts are weak and irregular, or even non-existent[10]. In the same way, the mountain wave induced by a windward terrain can destroy the slope effect on the leeward terrain. Therefore, the pilot should not hesitate to cancel the purpose of the flight. Good anticipation of the decision to turn around is essential.

[10] See Figure 3.



Source: Manuel du Pilote vol à voile, published by Cépaduès

Figure 3: Slope shielded from the wind by a windward terrain

The Grau ridge was located downwind to the east of the Pidanoux ledge, another terrain reaching 1,238 m at its highest point. At the time of the accident, the Grau ridge was probably "*masked*" from an aerological point of view (shielded from the wind) and the uplifts were probably weak and irregular.

Moreover, the *Manuel du pilote vol à voile* states that the thermal convection phenomenon increases dynamic uplift in some areas, but cancels it in others, which results in an irregular slope effect.

The ravine over which the pilot was flying at the end of the flight corresponded to the end of the wooded area he had just flown over and was made up of light-coloured rocks, which could generate significant thermal convection at this location.

Moreover, if there is a convective phenomenon below a downdraft zone, this can increase the glider's destabilisation. This aerological phenomenon is known as "*displaced thermals*"[11].

[11] This phenomenon is detailed in the book, "*Dancing with the Wind*" (published by Topfly).

In 2021, the BEA published a study concerning the 28 glider accidents recorded during 2020[12]. In particular, it appears that when using uplifts close to the terrain, the safety margins are reduced and the height of the manoeuvres do not always enable the pilot to regain control of the glider in the event of loss of control. In this study, five accidents, resulting in three persons fatally injured, one person seriously injured, and two persons injured, were directly related to an insufficient safety margin in relation to the terrain.

[12] https://bea.aero/en/bilans-etudes-1/enseignements-2020/planeurs/

2.8 Search And Rescue (SAR) operations

2.8.1 Specific missions and resources of the Aeronautical Rescue Coordination Centre (ARCC Lyon)

Since September 2015, the aeronautical SAR mission in Metropolitan France, which is the responsibility of the French Air and Space Force, has been ensured by a single Aeronautical Rescue Coordination Centre called the ARCC Lyon. The latter may call on dedicated airborne resources belonging to the French Air and Space Force as well as airborne resources belonging to the Civil Defence, the French National Gendarmerie, the Border police, the Emergency Medical Services and the French Navy. Outside maritime zones, coordination of the emergency services with the airborne resources is the responsibility of the ARCC Lyon, while ground resources are coordinated by the prefecture.

When an emergency locator transmitter sends a signal, this signal is received by the satellites and transmitted to the Cospas-Sarsat French Mission Control Centre (FMCC) ground stations, which calculate the associated position. The information is then transferred to the ARCC Lyon.

In addition, as soon as it receives a notification concerning the activation of an emergency locator transmitter or a phone alert concerning the probable occurrence of an accident, the ARCC Lyon conducts an investigation with different entities (flying clubs, En-route Control Centre, CODIS[13], CORG[14], etc.) to find out if they have received any statements in connection with this event. The ARCC Lyon has a unique capacity in France for reconstructing the paths of missing aircraft by merging all the data from civilian and military radars. It may also request civil air traffic organisations to complete this radar data. In addition, the ARCC Lyon has access to aircraft tracking software tools (for example, OGN[15], flight radar 24, live.glider.org, glidertracker.org, etc.). These tools enable the ARCC Lyon to reconstruct the aircraft path on a map and to determine a probable accident area by extrapolating the latest data of the aircraft path. The ARCC Lyon then determines whether the probable accident area is a ground, maritime or mixed area, which prefecture has jurisdiction and the closest resources and most efficient ways to provide a quick response. It then defines the ground search areas to be prioritised, in coordination with the competent authorities and according to the information gathered during the investigation.

[13] Departmental fire and rescue operational centre.

[14] Gendarmerie operational intelligence centre.

[15] Issue 15 published in September 2020 of the FFVP's "*Actions Vitales*" magazine presents the OGN system in detail and describes how to find a missing glider using this system.

2.8.2 Description of the Alpes-de-Haute-Provence SATER Plan

Following a proposal by the ARCC Lyon - which is the only aeronautical contact for the prefectures for Metropolitan France in the event of SAR operations - or on their own initiative, the prefect activates the ORSEC[16] SATER[17] measures.

The specific SATER provisions aim to locate the wreckage of an aircraft or the distress radio signal as quickly as possible in order to assist the aircraft occupants. These provisions come under the direction of the prefect in each department and are defined in a plan that is updated every five years. The implementation of these provisions is not related to the type of aircraft or the potential number of victims.

[16] *Organisation de la Réponse de Sécurité Civile* (Civil Defence emergency management).

[17] *Sauvetage Aéro-Terrestre* (Aero-terrestrial rescue).

The plan stipulates that following an alert, even if it is vague, the ARCC Lyon must be notified by any person who knows about it as soon as possible in order to clarify the situation, to determine the probable accident area and to coordinate the airborne resources. Based on the probable accident area, operations can be initiated by triggering one of the four phases that allow for the gradual ramp-up of search and rescue resources (Alpha, Limited Bravo, Bravo, Charlie). The Charlie phase corresponds to ground searches performed to find the wreckage of an accident aircraft once the probable area of the air accident has been located.

The operation is closed as soon as the aircraft and the occupants have been located and the emergency services have reached the accident area. If the searches are unsuccessful, it is the French Air and Space Force's responsibility, through the ARCC Lyon, to decide to abort the search, in agreement with the prefectoral authorities.

2.8.3 History of F-CIJT search operations

The witness account reported at around 17:00 to the firefighters of Saint-André-les-Alpes fire station (Alpes-de-Haute-Provence) was vague. They questioned Saint-André-les-Alpes paragliding school, who had no knowledge of an accident, then, at 17:40, they alerted the CODIS 04. The CODIS 04 had not received any information about an air accident or the activation of an emergency locator transmitter from the ARCC Lyon, and took this as being confirmation that it was not an actual accident. The CODIS 04 nevertheless decided to have two firefighters from the fire station carry out a reconnaissance in an all-terrain vehicle and on foot at the place indicated by the witness so as to remove any doubt, but it did not inform the prefecture or the ARCC Lyon, and the SATER plan (see paragraph 2.8.2) was not activated.

At around 19:00, the two firefighters reported to the CODIS 04 that they had not found anything. The CODIS 04 decided to abort the search. On the way back down to the valley, they saw a white spot under the Grau ridge and climbed back to investigate. They discovered the wreckage and the fatally injured pilot at approximately 20:40, i.e. 3 hours and 40 minutes after the statement was received.

At the same time, and separately from the above, the AAPCA chief-pilot, who had not seen the pilot return, telephoned the ARCC Lyon at around 20:10, using the gliding centre's to-do instructions. The glider was equipped with a FLARM, so the ARCC Lyon retrieved the last known position of the glider from the OGN GLIDERNET system operator at around 20:15. The latter indicated that the system's detection was good in this valley and that the position of the wreckage was almost certain (see Figure 4), since the glider's signal was still being received and was stationary.

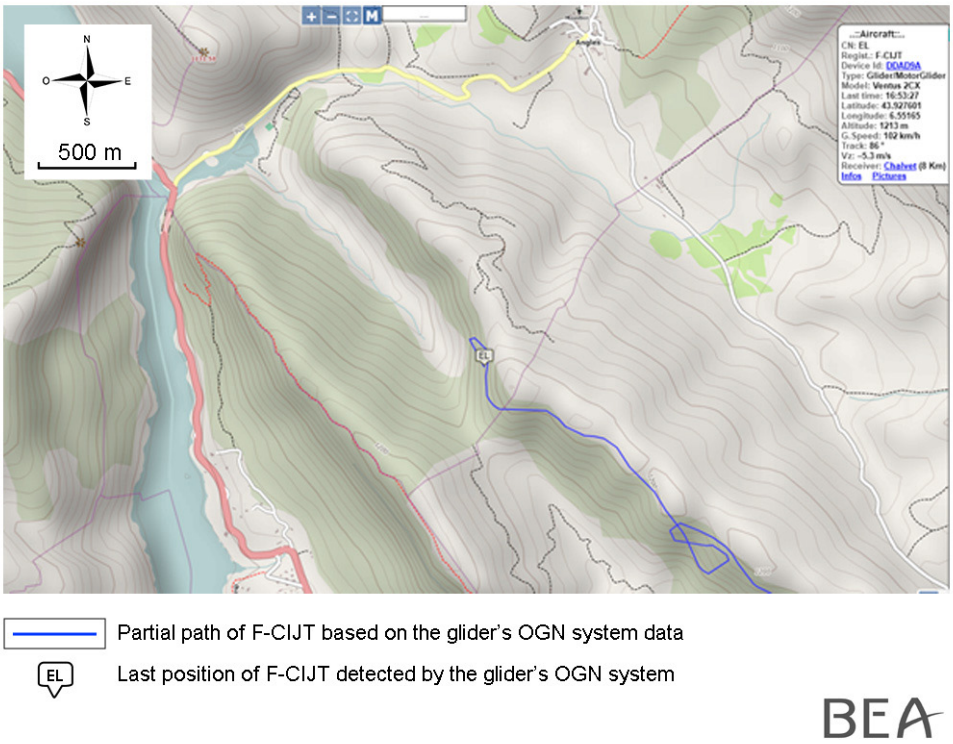


Figure 4: Path and last position transmitted by the OGN operator to the ARCC Lyon

At 20:30, the ARCC Lyon initiated a SAR operation focused on this position. At around 20:35, it issued a request for the use of the helicopter from the Dignes Gendarmerie Air Section and at 20:40, suggested a SATER C phase to the Alpes-de-Haute-Provence prefecture (see definition in paragraph 2.8.2).

At around 20:55, the CODIS 04 informed the ARCC Lyon that the firefighters from Saint-André-les-Alpes had found the wreckage. The CODIS then notified the prefecture at 21:00.

At around 21:10, the ARCC Lyon suggested closing the SATER C phase. The helicopter arrived at the accident site at 21:25, i.e. 1 hour and 15 minutes after the chief-pilot directly alerted the ARCC Lyon.

The head of the department's Fire and Rescue Service (SDIS 04) stated that the CODIS and fire station staff did not have good knowledge of the ARCC Lyon resources to locate an aircraft. The fact that the ARCC Lyon was not informed by the CODIS 04 of the possible occurrence of an accident did not enable the CODIS to benefit from the specific tools at the disposal of the ARCC Lyon that could be used to quickly determine the probable accident area. This was only done once the chief-pilot transmitted the alert to the ARCC Lyon, nearly 2 hours and 30 minutes after the accident, and the glider was found less than 70 m from the last known position sent to the ARCC Lyon by the OGN system operator (see Figure 4, above).

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

After more than five flight hours, as the pilot was not able to gain altitude to cross the Teillon massif and thus reach Fayence aerodrome, he probably decided to draw closer to the La Mûre safe landing area located north of his position. On his route, he exited the vicinity of the La Mûre safe landing area and performed slope soaring along the Grau ridge, which was then downwind of another ridge and probably subject to downdrafts. It is possible that after a succession of poor choices, the pilot lost control at low height at the edge of the ravine, where there was probably thermal convection that he tried to use at low height. The height of the glider and the distance from the slope at that time did not allow him to avoid collision with the terrain.

The investigation was unable to rule out a possible pilot incapacitation.

Contributing factors

The possibility that the pilot was tired at the end of the flight, combined with the potential occurrence of hypoxia effects, may have contributed to the pilot's loss of control of the glider.

Safety lessons

Physiological consequences of flying above 1,500 m (5,000 ft)
Flying below 3,000 m (10,000 ft) does not ensure absolute protection against the symptoms of hypoxia, which can occur as low as 1,500 m (5,000 ft). The symptoms of hypoxia can be immediate (the most common symptoms) or delayed, and include in particular, fatigue and cognitive impairments.

It is generally at the end of the flight when these impairments may produce effects, without the pilot being aware of the problem, at a time when he or she may also be subject to fatigue due to the duration of the flight. The combination of these unfavourable factors makes it more difficult for the pilot to manage the flight and take into account the aerological conditions.

Use of an emergency locator transmitter (ELT)
It is not mandatory for gliders to carry an emergency locator transmitter. However, gliders often fly in mountain areas over poorly accessible zones where dense vegetation can hide a wreckage after an accident, making it difficult to locate from the ground or from the air for the emergency services.

When a glider is equipped with an ELT, it is therefore important to turn it on before take-off so that the ELT is automatically activated upon impact in the event of collision with the terrain. The signal transmitted by the ELT then allows the ARCC Lyon to locate the accident site and to quickly initiate search and rescue operations.

Indeed, after an accident, the pilot may not be able to manually activate the ELT due to loss of consciousness or injury. In this case, the ARCC Lyon will not be alerted and search and rescue operations will be initiated later.

Aeronautical emergency call number

The number 191 is a freephone service dedicated to handling aeronautical emergency calls and is available 24/7 from a landline or a mobile phone.

Calling 191[18] allows the ARCC Lyon to initiate search and rescue operations for the occupants of aircraft in an actual or assumed distress situation, in Metropolitan France.

A new poster advertising the number 191 has been designed by the ARCC Lyon and is being distributed to emergency services.

A "SAR feedback" group involving SAR mission stakeholders was created in October 2021 by the SAR office of the French Air Navigation Service Provider (ANSP) within the French civil aviation authority (DGAC) in order to promote communication between these stakeholders and to improve the interdepartmental system, including the feedback process for operational staff, in particular with the French general directorate for civil protection and crisis management (DGSCGC).

Specific resources of the ARCC Lyon

The fact that the CODIS 04 implemented only local equipment and human resources initially, due to not having good knowledge of the specific resources available to the ARCC Lyon, caused delays in locating the wreckage. The resources available to the ARCC Lyon would have made it possible to remove any doubt about the actual occurrence of the accident and to determine its position more quickly. The ARCC Lyon can be contacted, in particular by the emergency services, even in the event of a simple doubt about the occurrence of an accident.

Following this accident, the Alpes-de-Haute-Provence prefecture decided to amend the specific SATER provisions for its department. It is planned to produce to-do instructions based on the new document in order to update the operational documentation of the services involved in search and rescue missions, so that these services systematically alert the ARCC Lyon.

The ARCC Lyon is preparing an information brochure for emergency organisations (CODIS, SAMU, CORG, etc.) to present the operational capabilities of the service.

[18] www.calameo.com/read/004721610b6190edb794f