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INVESTIGATION REPORT

Accident
to the Robin DR400-180R registered F-HKZZ and to the Schleicher Ka 6E registered F-CDRM
on 2 September 2020
at Bagnères-de-Luchon aerodrome (Haute-Garonne)

Time	Around 15:20[1]
Operator	Aéroclub de Luchon
Type of flight	Glider towing
Persons on board	F-HKZZ: pilot F-CDRM: pilot
Consequences and damage	Aeroplane pilot severely injured, aeroplane destroyed Glider pilot injured, glider slightly damaged

This is a courtesy translation by the BEA of the Final Report on the Safety Investigation published in August 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.

Glider higher than tug plane during towed take-off, loss of control of aeroplane and collision with ground

1 - HISTORY OF THE FLIGHT

Note: The following information is principally based on statements and FLARM data from the aeroplane and the glider.

The aeroplane pilot took off from runway 01 at Bagnères-de-Luchon aerodrome to tow the glider.

Shortly after take-off, at a height estimated by the witnesses to be about 50 m, the tow cable slackened before suddenly becoming taut again. The glider entered a nose-up attitude and rose to become higher than the aeroplane, which slowed the aeroplane and caused it to take a nose-down attitude.

The glider pilot and the aeroplane pilot released the tow cable simultaneously.

The glider pilot made a tight manoeuvre to the right and landed on the runway on the reciprocal QFU. At the same time, the aeroplane collided with the runway.

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2 - ADDITIONAL INFORMATION

2.1 Meteorological information

The meteorological conditions estimated by Météo-France at Bagnères-de-Luchon aerodrome at the time of the accident were as follows: northerly wind of 20 km/h gusting up to 40 km/h, CAVOK, temperature 21°C.

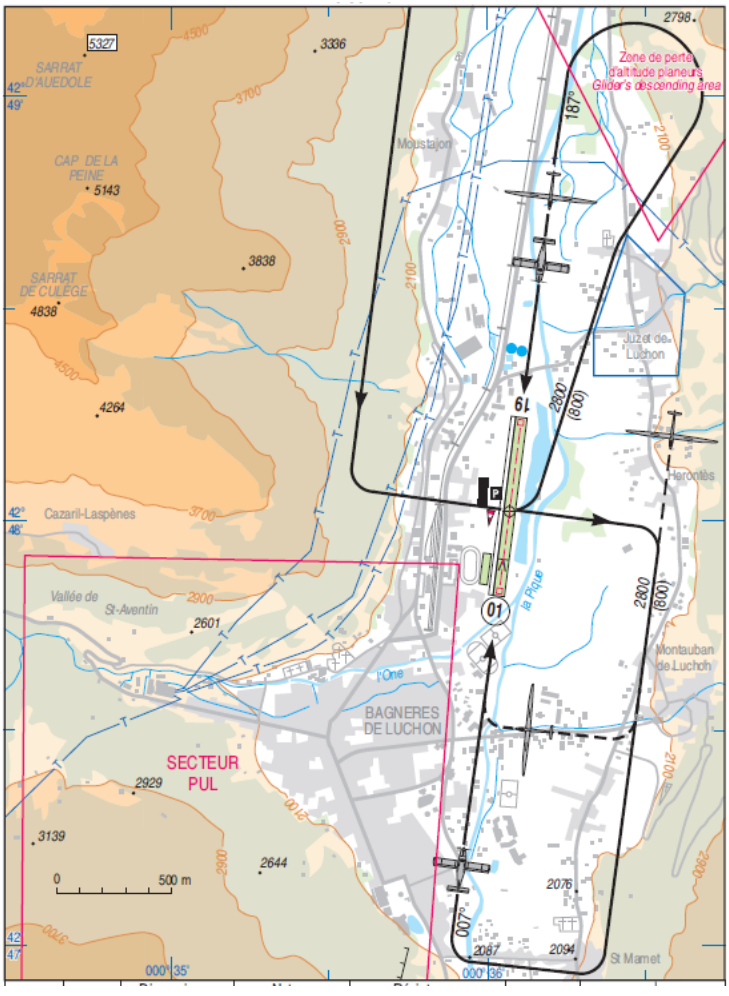
Witnesses reported that the meteorological conditions at the aerodrome were similar to previous days, with a valley breeze blowing from the north of about 20 km/h and gusts up to 30 km/h, associated with thermal uplifts. The runway was tree-lined, with turbulence in the air over it.

2.2 Aerodrome information

Bagnères-de-Luchon aerodrome is located in a mountainous area and the surrounding mountains require adapted runway circuits (see Figure 1).

The aerodrome operator is the Luchon flying club.

Unpaved runway 01/19 measures 750 m long and 50 m wide. A 25 m-wide taxiway is located at the edge of the runway, to the west. To the west of this runway, an area clear of obstacles measuring more than 300 m long and approximately 45 m wide from the threshold of runway 01 is used for paraglider landings.



Source: AIS

Figure 1: Extract from the VAC chart

2.3 Examination of site and wreckage

The aeroplane wreckage was located on runway 01, 55 m from the end of the runway and 15 m from the east edge of the runway. The tow cable was located approximately 100 m before the wreckage, also on the runway. The tow cable used was 46 m long.

All of the damage observed resulted from the aeroplane's collision with the ground and the emergency services' operation. The aeroplane collided with the ground with a slight left bank angle and came to a stop within a few metres. The flight and engine control linkages were continuous. The position and continuity of the elevator trim control linkage could not be established.

The examination of the wreckage was unable to determine with certainty the position of the flaps, as the stresses borne by the aeroplane during the collision with the ground may have altered their position and that of the control.

Damage to the glider was limited to minor damage to the canopy.

2.4 Aircraft information

2.4.1 Aeroplane

The Flight Manual states:

- A rotation speed of 100 km/h.
- An optimum climb speed depending on the characteristics of the glider: between 110 km/h for gliders with a low wing loading and medium lift-to-drag ratio, and more than 130 km/h for gliders with a high wing loading and high lift-to-drag ratio.

2.4.2 Glider

The Schleicher Ka 6E is a light, single-seat glider with a medium lift-to-drag ratio, made of wood and canvas. It has only one hook for towing and winching, located near the landing gear.

It is generally towed at a speed of about 110 km/h. The glider instructors contacted by the BEA stated that a high tow speed may render this glider unstable on the pitch axis. This could be related to its one-piece horizontal tail, which has a larger moving surface than tail units consisting of a stabilizer and an elevator.

As this glider had three co-owners, it was only operated by pilots with sufficient experience and training who were approved by the co-owners. This was the case for the glider pilot. Following the accident, the flying club executive committee requested that the glider be used only by its co-owners in the future.

2.5 Pilot information

2.5.1 Aeroplane pilot

The 22-year-old pilot held a sailplane pilot licence (SPL) issued in 2018 and a Private Pilot Licence - Aeroplanes (PPL(A)) issued in 2016. He obtained the Brevet de Base (BB, basic version of the LAPL, restricted to French airspace only) in 2014.

He had logged approximately 210 flight hours in an aeroplane, nearly 130 hours of which as pilot-in-command, and around 75 hours of which in a glider, from Bagnères-de-Luchon aerodrome.

He completed his glider towing rating training on 24 August 2020. The day-long training course included:

- a 25-minute dual flight with three landings and no tow;
- a 55-minute dual flight with seven tows;
- a 40-minute supervised solo flight with six tows.

This training was supplemented by a 30-minute dual flight the following week.

He had completed a total of 37 tows, 22 of which as pilot-in-command, all with F-HKZZ. Within the context of obtaining this rating, the pilot was supervised by two instructors.

He had towed F-CDRM twice before.

On the day of the accident, he had completed three tows in the morning and three in the afternoon, approximately one hour before the towing operation of the accident flight. These tows involved gliders made of composite materials, which are more efficient than F-CDRM.

2.5.2 Glider pilot

The 36-year-old pilot held a sailplane pilot licence (SPL) issued in 1999. She had logged 255 flight hours, 172 hours of which as pilot-in-command, with towed and winch take-offs.

She had logged eight flight hours in F-CDRM, during three flights performed in August. As she was not signed off for winch take-off on this type of glider, only towed take-offs had been carried out.

2.6 Statements

2.6.1 Aeroplane pilot

The pilot explained that during running at take-off, he had observed the glider taking off in the rear-view mirror. According to him, the glider had gained more height than usual (more than two or three metres). It seemed to him that the glider was unstable. After the aeroplane had rotated at 100 km/h, he had felt yawing movements to the right, to the left and downward, which he had initially attributed to turbulence and thermals, as was usually the case. He stated that, to avoid putting the glider pilot in difficulty during the take-off phase, he had not wanted to release the cable, and that he had not considered the situation to be dangerous. He added that when he had looked in the rear-view mirror again, he had no longer been able to see the glider. He had then seen it through the canopy on the right side, higher up. He had no memory of the rest of the path.

The pilot stated that, for the initial climb, he adopts a towing speed of about:

- 110 km/h to 115 km/h at most for light gliders made of wood and canvas, such as F-CDRM;
- 130 km/h for other gliders made of composite materials, which are more efficient.

The pilot added that he had received different information on the aeroplane's parameters, in particular on towing speeds, from his two instructors during his towing training, and from other pilots who were members of the flying club. He specified that there was no club checklist on board the aeroplane, unlike other flying clubs he had frequented. He completed his checklist from memory, without indicating the speed for towing.

He added that he was used to carrying out take-offs with the flaps in the "take-off" position and that the flying club mechanic had verbally advised him to slightly reduce the engine speed before the end of the runway to remain within the recommended range. He had no memory of the actions he had taken during the take-off.

2.6.2 Glider pilot

The pilot stated that the take-off run had been nominal and that the glider had left the ground before the aeroplane. She had applied a nose-down action with the stick to maintain a height of two or three metres, according to her. The trim was set to the nose-down position. After the aeroplane had taken off, she had found that the glider was going fast, with an indicated airspeed of over 130 km/h. She stated that she had previously discussed with the aeroplane pilot the towing speed of 110-115 km/h to be adopted on initial climb. At a height of approximately 20 m, she said that there had been a lot of turbulence, a little more than usual, and that the glider was moving a lot. The glider was slightly higher than the tug plane, but the stick was fully forward. She explained that she had had the intention of warning the aeroplane pilot of the high speed over the radio, but that she had not had sufficient time to do so. She added that the glider had suddenly adopted a nose-up attitude, that she had slid out of her seat, and that her head had hit the canopy hard. She specified that she had been strapped in properly. She had no longer been able to see the aeroplane. She had pulled on the tow cable release handle. She had then been able to stabilise the glider after a right turn and she had landed on the runway on the reciprocal QFU at high speed.

2.6.3 Onlookers

Several witnesses, including two instructors, saw the accident. They explained that the tow cable had slackened before suddenly becoming taut again. The glider had then adopted a nose-up attitude and had risen, becoming around 10 metres higher than the tug plane. According to them, the glider had slowed the aeroplane down and had caused it to take a nose-down attitude. The aeroplane pilot had released the cable and had then attempted to perform a pull-up manoeuvre, but given the low height, the aeroplane had collided flat with the ground.

One of the witnesses, who is a glider and tug pilot, also stated that the glider had been moving a lot after take-off.

No witnesses reported observing any engine malfunction during the take-off phase.

2.7 Examination of the FLARMs

Both aircraft were equipped with FLARM computers, from which the data could be extracted. The FLARM data was supplemented by OGN[(2)] data.

The ground speed was calculated from the recorded latitudes and longitudes. The speeds of the two aircraft were consistent with each other.

[(2)] Open Glider Network, a community system that receives data from FLARM computers in real time using a network of ground reception antennas.

This indicates that:

- The combination reached a ground speed of about 110 km/h shortly after take-off.
- The ground speed of the combination then decreased to 90 km/h approximately 10 seconds later, at a height of around 60 m.
- When the aeroplane reached a height of around 80 m, its ground speed significantly decreased to less than 70 km/h in a few seconds; the glider's speed was then around 100 km/h and increasing.
- The glider reached a maximum height of around 160 m.

2.8 Being higher than the tug plane

Being higher than the tug plane is a situation addressed in glider pilot training as well as in tug pilot training.

In October 2020, after the accident, the French civil aviation safety directorate (DSAC) and the French Gliding Federation (FFVP) produced the following videos about being higher than the tug plane:

- https://securitedesvols.aero/productions/culture-aero/haute-tension
- https://www.youtube.com/watch?v=c3tpCoMEg_g

The first video recalls in particular that when the tow hook is placed in the glider's nose, the glider's deviations from the path induce corrective forces that tend to bring the glider back in line. A tow hook placed close to the landing gear (i.e. close to the centre of gravity) is not conducive to path correction.

The second video reminds viewers of the main threats that may result in the glider being higher than the tug plane and indicates the strategies to be implemented in this situation. The last video presents a simulation of a glider rising higher than the tug plane during take-off. The video explains that the risk results from the rate at which the vertical separation varies upwards and that this phenomenon is strongly accentuated if the glider is equipped with a rear hook, which contributes to the glider "kiting" as on a winch take-off (nose-up attitude). In such a situation, the inertia gained by the aeroplane can be transmitted via the cable to the glider, increasing its total energy, height and speed very rapidly. At the same time, this energy taken from the aeroplane will cause it to lose speed and therefore manoeuvrability, just when it needs it most to control its attitude.

This video also reminds viewers of the scenarios in which the cable must be released immediately:

- If the glider pilot loses sight of the tug plane.
- If the aeroplane no longer reacts normally and if the pilot has difficulty controlling the attitude.

Over the last two years, the FFVP has regularly addressed the issue of being higher than the tug plane in its magazines:

- issue 8 of "Actions vitales !" magazine published in November 2018;
- special issue "*Le retour des positions hautes*" published in January 2019;
- issue 15 of "Actions vitales !" magazine published in September 2020.

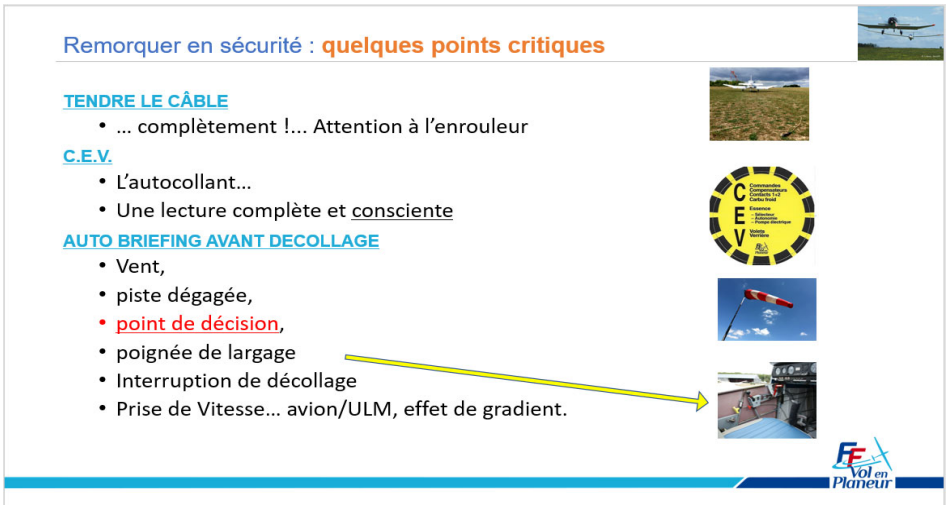
The latter magazine issue had been distributed by the president of the flying club to the members on the morning of the accident. It recalls that being higher than the tug plane during the take-off phase is particularly dangerous due to the proximity to the ground.

In February 2021, the FFVP organised a training webinar for towing pilots entitled "*Sécurité remorquage*" (Towing Safety). Approximately 500 pilots attended this webinar. It concluded with a reminder of the dangers of being higher than the tug plane.

2.9 Briefing before take-off

According to the Tug pilot's practical guide produced by the FFVP (available in French only), when in the holding position before take-off, the aeroplane pilot must observe and identify the glider to be towed and deduce the climb speed. The pilot must also take the opportunity at this moment to establish radio contact with the glider. The pilot will also be told at this time if the glider is ballasted, as well as receiving other relevant information, for example if this is the glider pilot's first solo flight, the desired release area, the planned training exercise, etc. It is at this point, therefore, that the aeroplane pilot must confirm the required towing speed. If a specific speed is to be adopted, as is the case for a Ka 6E, the information can then be shared between the pilots of the combination during the first radio contact.

During the training webinar on towing safety, a session entitled "*Remorquer en sécurité, quelques points critiques*" (Towing safely: some critical points) was provided. This session reminds the trainee of the content of the briefing before take-off (self-briefing):



Source: FFVP

Figure 2: Excerpt from the towing safety webinar (available in French only)

This briefing activates the pilots' short-term memory, which enables them to be responsive in the event of an unusual situation. This briefing may include a part on taking off with the glider rising higher than the tug plane and the actions to be implemented in such a situation.

2.10 Use of the runway after the accident

After the accident, the president of the flying club, who was flying in a powered glider in the area, quickly returned to the aerodrome. A person on the ground was designated to provide radio guidance to aircraft operating in the vicinity of the aerodrome, in order to enable the motorised aircraft to divert and based gliders to land short on the runway, which was partially occupied by the aeroplane wreckage and the tow cable.

The president of the flying club explained that the club's glider pilots are informed, in the event of an emergency, of the need to land on the aerodrome clear areas such as the taxiway or the clear area used for paraglider landings, in particular in the event of a winch launch incident.

A student-pilot and an instructor from another association took off in a microlight from runway 01 while first aid personnel were assisting the injured pilot who was on the runway. On return from the flight, the radio operator asked them to divert, but they proceeded to land on runway 01, which was still occupied.

The president of the flying club requested the runway closure at approximately 16:00. This was made official by NOTAM at 18:21.

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 take-off occurred with an airspeed higher than usual for a glider such as the Ka 6E (around 130 km/h). This may have induced a more dynamic and unstable performance of the glider flying in turbulent air with gusts of wind. The glider thus became more difficult to control. The glider pilot had intended to inform the aeroplane pilot of this high speed over the radio.

During the initial climb, in order to avoid rising higher than the tug plane, the glider pilot applied a nose-down action with the stick, which increased the glider's speed. The aeroplane pilot probably reduced the engine power to keep the engine in its operating range. The aeroplane's speed decreased. This decrease in speed combined with the increase in the glider's speed may have caused the tow cable to slacken.

When the cable became taut again, the glider's pitch attitude suddenly increased due to the position of the tow hook near the centre of gravity, which destabilised the pilot in her seat. It is possible that, in this phase, she unintentionally operated the stick rearward, amplifying the attitude adopted.

The glider rose around 10 metres higher than the tug plane, slowing it and causing it to take a nose-down attitude. During this sequence, the glider pilot and the aeroplane pilot released the tow cable. The aeroplane pilot initiated a pull-up manoeuvre but was unable to avoid collision with the ground. The glider pilot made a tight manoeuvre to the right and landed on the reciprocal QFU.

Contributing factors

In an operating context combining:

- Meteorological conditions with thermals, a valley breeze and gusts of wind generating turbulence in the vicinity of the runway.
- A restricted environment around Bagnères-de-Luchon aerodrome.
- A glider with a tow hook position close to the centre of gravity, which does not aid stability in the event of a deviation from the path.

The following factors may have contributed to the glider rising higher than the tug plane:

- The aeroplane pilot's lack of towing experience.
- The glider pilot's small amount of experience on type.
- The pilots not reminding each other of the required towing speed during radio contact before take-off.

The late release of the tow cable by both pilots may have contributed to the loss of control of the aeroplane.

Safety lessons

Radio contact and briefing before take-off

As for other aviation activities, glider towing may involve some kind of routine. However, operators must constantly adapt to and be mindful of important variables, such as the meteorological or aerological conditions, the type of glider being towed or the towing speed. Pilots can be reminded of the towing speed during radio contact before take-off.

The briefing before take-off reminds pilots of the actions to be carried out during this dynamic phase and activates their short-term memory, so that they can act quickly in the event of an unusual situation, such as the glider rising higher than the tug plane.

Becoming higher than the tug plane

The DSAC and the FFVP produced the following videos about becoming higher than the tug plane:

- https://securitedesvols.aero/productions/culture-aero/haute-tension
- https://www.youtube.com/watch?v=c3tpCoMEg_g

These videos remind viewers of the scenarios in which the cable must be released immediately:

- If the glider pilot loses sight of the tug plane.
- If the aeroplane no longer reacts normally and if the pilot has difficulty controlling the attitude.

Take-off and landing on an occupied and/or closed runway

As soon as the accident occurred, the president of the flying club, who is the aerodrome operator, set up a system allowing glider pilots to land safely and asking pilots of motorised aircraft to divert, in order to reduce the risk of a second accident.