CIAIAC

COMISIÓN DE INVESTIGACIÓN DE ACCIDENTES E INCIDENTES DE AVIACIÓN CIVIL

# Report A-022/2010

Accident involving an Alexander Schleicher ASW 27-18E, registration D-KANR, in Castejón de Sos (Huesca), on 7 July 2010

GOBIERNO DE ESPAÑA

MINISTERIO DE FOMENTO

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## Foreword

This report is a technical document that reflects the point of view of the Civil Aviation Accident and Incident Investigation Commission (CIAIAC) regarding the circumstances of the accident object of the investigation, and its probable causes and consequences.

In accordance with the provisions in Article 5.4.1 of Annex 13 of the International Civil Aviation Convention; and with articles 5.5 of Regulation (UE) n° 996/2010, of the European Parliament and the Council, of 20 October 2010; Article 15 of Law 21/2003 on Air Safety and articles 1, 4 and 21.2 of Regulation 389/1998, this investigation is exclusively of a technical nature, and its objective is the prevention of future civil aviation accidents and incidents by issuing, if necessary, safety recommendations to prevent from their reoccurrence. The investigation is not pointed to establish blame or liability whatsoever, and it's not prejudging the possible decision taken by the judicial authorities. Therefore, and according to above norms and regulations, the investigation was carried out using procedures not necessarily subject to the guarantees and rights usually used for the evidences in a judicial process.

Consequently, any use of this report for purposes other than that of preventing future accidents may lead to erroneous conclusions or interpretations.

This report was originally issued in Spanish. This English translation is provided for information purposes only.

# Table of contents

# Abbreviations

| | |
|---|---|
| 00° | Sexagesimal degrees |
| 00 °C | Degrees centigrade |
| E | East |
| FAI | Federation Aeronautique Internationale |
| GPS | Global Positioning System |
| GS | Ground speed |
| ft | Feet |
| h | Hour(s) |
| hp | Horsepower |
| IAS | Indicated airspeed |
| IGC | International Gliding Commission |
| JAR | Joint Aviation Regulations |
| kg | Kilogram(s) |
| km | Kilometer(s) |
| km/h | Kilometer/hour |
| L | Lift |
| m | Meter(s) |
| m/s | Meter/second |
| mb | Millibar |
| MHz | Megahertz |
| min | Minute(s) |
| mm | Millimeter |
| N | North |
| NE | Northeast |
| NW | Northwest |
| QNE | Standard pressure at sea level |
| QNH | Barometric pressure at sea level |
| RFAE | Real Federación Aeronáutica Española (Spanish Royal Aviation Federation) |
| S | South |
| SW | Southwest |
| UTC | Coordinated Universal Time |
| VFR | Visual Flight Rules |
| VHF | Very High Frequency |
| W | West |
| WGS | World Geodetic System |

## Synopsis

| | |
|---|---|
| Owner and operator: | Private |
| Aircraft: | Alexander Schleicher Gmbh & Co. ASW 27-18E |
| Date and time of accident: | 7 July 2010; 15:52[1] local time |
| Site of accident: | Castejón de Sos (Huesca) |
| Persons onboard: | 1, killed |
| Type of flight: | General Aviation – Other – Airshow/race |
| **Date of approval:** | 31th May 2012 |


### Summary of accident

Over the course of the fourth day of the 2010 national Spanish gliding championships, an ASW 27-18E aircraft, registration D-KANR, was flying near a hillside at an altitude of 2,200 m and crashed into the ground as it started a turn to the right. The pilot was killed as a result of the accident and the sailplane was destroyed. At the time of the accident visibility was very good with light winds, few clouds and moderate updrafts.

The flight data were recorded by a logger[2] onboard the aircraft and which, after being recovered, allowed investigators to reconstruct the flight until a few seconds before the accident.

An analysis of the data revealed that the main cause of the accident was a loss of control due to an aerodynamic stall while turning toward the updraft that the pilot was seeking.


[1] All times in this report are local unless otherwise specified. To obtain UTC, subtract two hours from local time.
[2] Logger: Electronic device that records readings provided by a GPS sensor.

# 1. FACTUAL INFORMATION

## 1.1. History of the flight

From 3 to 10 July 2010, the Spanish national gliding championships were being held at the Santa Cilia aerodrome in Jaca (Huesca), located on the southern foothills of the Pyrenees. The championships were organized by the Real Federación Aeronáutica Española (RFAE), a member of the Federation Aeronautique Internationale (FAI). The competition adhered to the procedures and directives of the International Gliding Commission (IGC) as stipulated in Sporting Code 3. Some 44 pilots of different nationalities were taking part.

The event scheduled for 7 July, the fourth day of the championship, covered a distance of 322.7 km. The start point for the event was in Aisa, located some 15 km NE of the airfield. The path proceeded to the first turn point at Bono, located 111 km away to the east. The second leg measured 42 km and headed to the SW toward the second turn point at the Monasterio de Santa Justa y Pastor. The third turn point was the Escales dam, 45 km away and from there, the last leg back to Santa Cilia measured 125 km and finished at the finish point in Javierregay, in the vicinity of the airfield. The participants used a logger to document their passage through the start, turn and finish points. The gliders had to use mountain and thermal updrafts to remain aloft. The flights were regarded as mountain flights, since the flight path took the gliders across mountainous regions with peaks in excess of 3,000 m.

Seventeen gliders started the race and five of them completed the flight in four or five hours. Another ten gliders completed the course partway, attaining different scores. Flying conditions were suitable for visual flight with slight winds and weak to moderate thermal updrafts. The maximum surface temperature forecast was 31 °C.

The Schleicher ASW 27-18R glider, registration D-KANR, was towed aloft by a small airplane at 13:06. The towline was released at an altitude of some 800 m above the field, starting its free flight. The glider remained in the area to gain altitude before passing over the start point (Aisa) at 14:46 and proceeding to the first turn point at Bono.

The first leg took the pilots between the southern foothills of the Pyrenees and the towns of Jaca, Sabiñanigo and Ainsa, crossing the mountain massifs of the Ordesa National Park and Monte Perdido and later of the Montes Malditos, home to the 3,403-m high Aneto Peak. The gliders flew over the Canfranc, Puértolas and Benasque valleys and the La Peña Montañesa (2,295 m), Peña Madrid (2,250 m) and Cotiella (2,912 m) mountains (see Figure 1).

After passing over Castejón de Sos, the flight ended abruptly when the glider impacted violently against the SW flank of Pico Cebolles (2,749) at coordinates 42°31’55.3”N

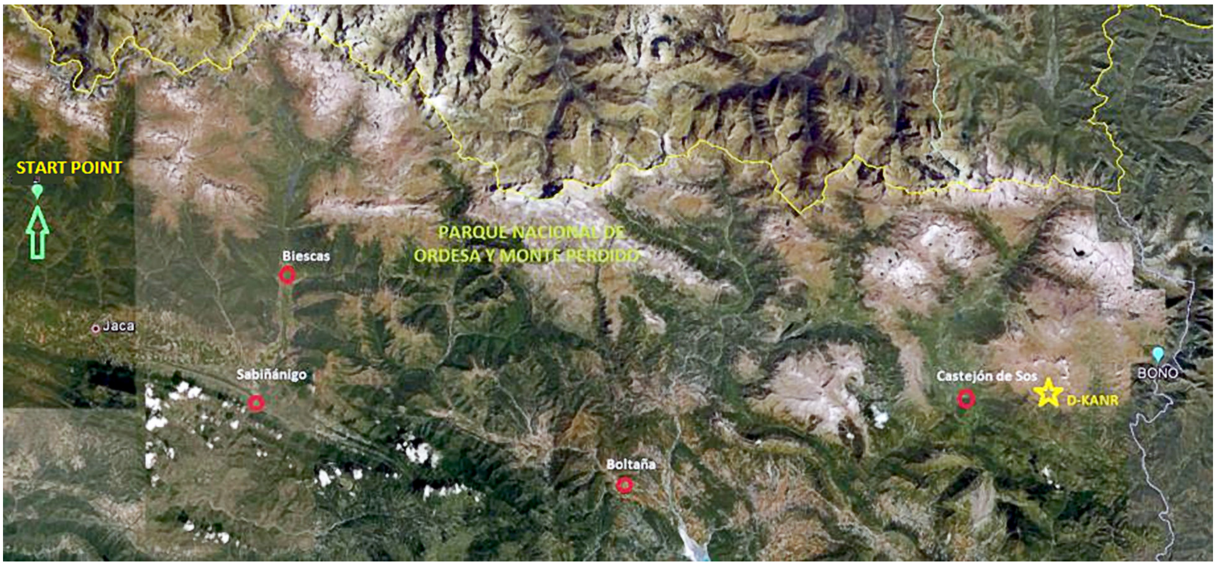


Figure 1. Orography of the terrain

000°33'55.3"E. The impact point was at an elevation of 2,160 m and some 12 km before the turn point at Bono. The pilot died as a result of the hard impact with the terrain.

The accident was immediately reported by an eyewitness who called Aragón emergency services at 16:00.

## 1.2. Injuries to persons

| Injuries | Crew | Passengers | Total in the aircraft | Others |
|---|---|---|---|---|
| Fatal | 1 | | 1 | |
| Serious | | | | |
| Minor | | | | Not applicable |
| None | | | | Not applicable |
| TOTAL | 1 | | 1 | |

## 1.3. Damage to aircraft

The aircraft was destroyed by the impact with the ground.

## 1.4. Other damage

There was no additional damage.

## 1.5. Personnel information

### 1.5.1. *Pilot*

| | |
|---|---|
| Age: | 50 |
| Nationality: | Italian |
| Flying license: | Glider license |
| • Initial issue date: | 23/01/1990 |
| • Valid until: | 10/02/2011 |

Valid medical certificate.

Flying experience:

- The pilot had taken part in the Italian championships, finishing seventh in the 18 m class in 2009.
- He was a member of the Italian Federation's glider team and had ample mountain flying experience.
- Expert racing pilot in excellent physical shape.
- Through June 2010, he had a total of 3,184 flight hours, of which approximately 330 had been on the type.

## 1.6. Aircraft information

The Alexander Schleicher GMBH & Co. ASW 27-18E glider is a mid-wing, high-performance competition sailplane of the FAI-18 meter class with a T-shaped empennage. It has flaps, retractable gear, water ballast tanks and a carbon fiber fuselage. It has a small, two-cylinder, 18-hp retractable engine made by SOLO that drives a propeller with two 1.2-m diameter blades. The engine allows the glider to remain aloft in unfavorable updraft conditions but is not designed to let the airplane take off unassisted.

### 1.6.1. *Airworthiness certificate*

| | |
|---|---|
| Country of issue: | Germany |
| Number: | 34043 |
| Issue date: | 11/04/2008 |
| Expiration date: | 01/12/2010 |

### 1.6.2. *Maintenance record*

Based on the aircraft's documentation, it had around 335 flight hours. The maintenance records indicate that a 100-hour inspection had been performed on 2/12/2009 with 330 h on the aircraft.

There were no known defects awaiting correction nor had it undergone any major repairs in the two years since its manufacture.

### 1.6.3. *Technical and aerodynamic characteristics*

This glider has a maximum takeoff weight of 600 kg and an empty equipped weight of around 280 kg. It can reach its maximum authorized operating weight if its wing and fuselage water tanks are filled. In competition, water is normally used as ballast to increase the wing load and to achieve high gliding coefficients at elevated speeds.

The ASW 27-18E's flaps are operated via a 7 position lever. Positions 1, 2 and 3 correspond to negative flaps and are used to glide at high speeds. Position 4, neutral flaps, is for circular flight, and positions 5 and 6 are for thermal flight. The L position (number 7) is used for landing.

The stall speed associated with a weight of 533 kg is 80 km/h for neutral flaps (4) and 77 km/h with flaps in setting 5.

The flight manual contains some instructions and procedures for low-speed flight, stalls and spins (Section 4.5.3):

- "In a stall, the glider may experience wing drop. This reaction is more pronounced if the center of gravity is aft and the flaps are in a positive position. With positive flaps and the center of gravity toward the rear, the drop in altitude may be as high as 70 m and the nose angle up to 50° below the horizon."
- "Particularly with water ballast, the glider accelerates quickly when autorotation stops, making it necessary to flare properly to exit the dive. The drop in altitude with water ballast may be as high as 150 m."

Sections 3.1, 3.4 and 3.5 in the flight manual contain the procedures for recovering from a stall and a spin.

### 1.6.4. *Stall warning*

Paragraph JAR 22.207 (c) of the glider certification regulations used to certify the aircraft require flight performance characteristics such that when the glider's flight speed is reduced close to its stall speed, the buffeting produced by airflow separation will warn the pilot of the impending stall.

Due to this high-performance sailplane's laminar wing profile, it is not in strict compliance with the requirement that the stall warning must begin at a speed between 1.05 and 1.1 Vs1 (stall speed). Its certification is thus based on the alternate criterion that a warning be present 2 to 5 seconds prior to a stall when the control lever is properly positioned to yield a 2-km/h deceleration.

### 1.6.5. *Weight and balance before the flight*

As a requirement to take part in the championship, the glider was weighed on the morning of 7 July 2010. The results were as follows:

| | |
|---|---|
| • Weight on main wheel: | 421.0 kg |
| • Weight on tail wheel: | 41.9 kg |
| • Pilot weight: | 70.3 kg |
| TOTAL WEIGHT: | 533.2 kg |

The weights recorded by the scales included all the accessories and loads such as parachute, batteries, ballast water, etc., that were inside the sailplane.

It could not be determined whether the glider was balanced for the weighing, and thus no way to ascertain its exact center of balance. The weight on the back wheel suggests, however, that the center of gravity was slightly aft within the allowed balance range so as to optimize performance.

Item 5.3.4 in the flight manual discusses the effect of the center of gravity on performance and longitudinal stability and recommends C.G. positions between 290 and 310 mm for experienced pilots. The absolute aft limit is 330 mm.

## 1.7. Meteorological information

Conditions on that day were dominated by a high-pressure area centered above the Pyrenean range. The QNH pressures in the area of the flights were between 1,115 and 1,116 mb.

The forecast flying conditions were:

- Stable conditions with excellent visibility. Clear skies except for some cumulus clouds developing over the summits in the high parts of the central Pyrenees.
- Weak winds in the valleys from the S, while winds above the crests were from the W and NW.

- Possible turbulence resulting from shearing between the wind from the W-NW and the wind in the valley from the SW.
- Weak or moderate thermals with tops slightly above the crests.

## 1.8. Aids to navigation

Not applicable. The flight was being conducted under visual flight rules.

## 1.9. Communications

The aircraft taking part in the race were equipped with VHF transceivers. The communications procedures were established by race organizers and relied on two channels, with race related communications on the 122.80-MHz frequency and operational takeoff and landing communications on the 123.50-MHz frequency.

There were no radio communications between the accident aircraft and other stations in the air or on the ground after the glider departed toward the first turn point at Bono.

## 1.10. Flight recorders

The glider was equipped with two loggers, as required to certify flights in sports competitions and skills tests pursuant to the competition rules in the FAI's Sporting Code Section 3.

The main recorder in the aircraft was a Filser LX 8000F, S/N 27070, which was built into the instrument panel. There was also a portable Colibri recorder onboard.

The data from the LX 8000F recorder, which are presented in this section, were recovered. Those from the Colibri were not due to the condition of this device after the crash.

The GPS and barometric sensors in the logger provide the glider's geographical position, its GPS altitude and its barometric altitude, adjusted to a QNE of 1,013.25 mb.

The source position and altitude data, an error code that determines the accuracy of the data recorded and other parameters were recorded in the internal solid-state memory of the device in an IGC-format computer file (International Gliding Commission).

The device was set to record data every four seconds. These data can be used to obtain average horizontal and vertical speeds. The flight path taken can also be plotted on maps that rely on the same Datum WGS-84 cartographic system as that used to record the data.

The altitude data were calculated taking into account the fact that the barometric altitude recorded by the logger for the aerodrome was 623 m, versus its actual 684-m elevation, meaning there was a 61-m offset in the altimeter.

The data taken from the logger allowed investigators to reconstruct the flight paths and profiles shown in the sections below.

### 1.10.1. *Flight paths and general flight data provided by the Filser LX 8000F*

Figure 2 shows in red the flight path taken by the glider as outlined by the points recorded until just before the end of the flight. Also shown is the route specified for this flight.

The flight started at approximately 14:46 when the glider crossed the starting line at point Aisa.

The barographic diagram in Figure 3 shows the altitude profile in time with an approximate indication of the elevation of the terrain being flown over by the glider.

The graph below shows the trend in the glider's ground speed (GS) during the successive circular flight phases and while transitioning between thermals (Figure 4).

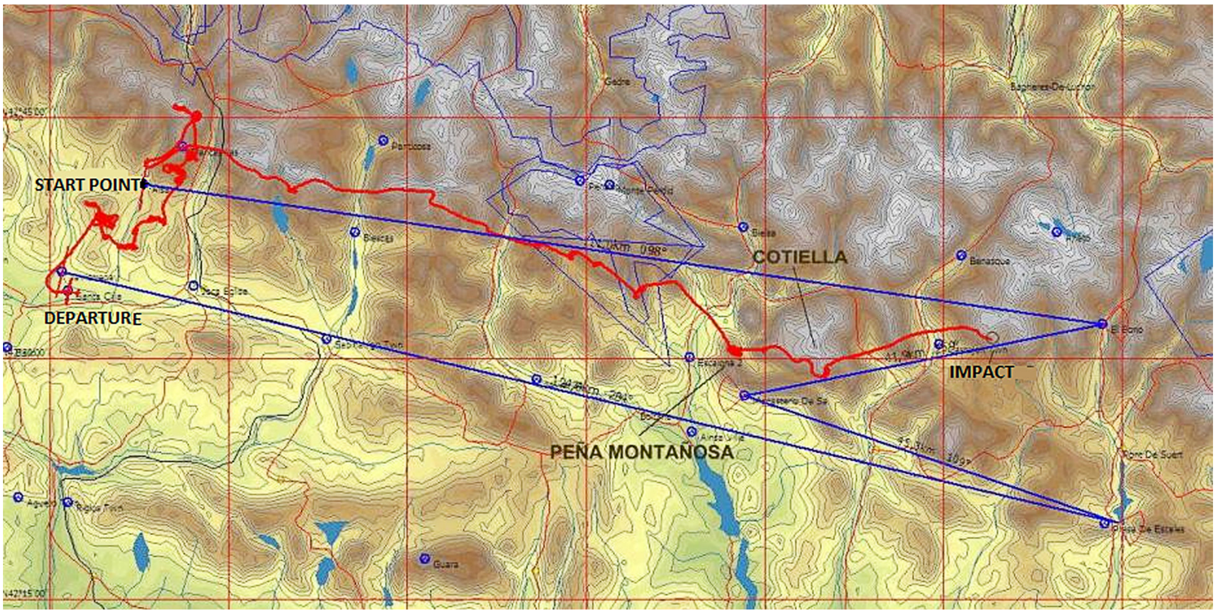


Figure 2. Aircraft flight path


Figure 3. Barogram of the flight

Figure 4. Diagram of the aircraft's GS

Figure 5 shows the last phase of the flight in greater detail, with the climb over the south face of the Cotiella, the crossing of the Benasque Valley, flying over Castejón de Sos, and the arrival at the SW flank of Cebolles Peak.

The data show that the thermals encountered during the flight were normally flown in right turns at an IAS of 105 km/h and tracing out circles of between 250 and 300 m in diameter.

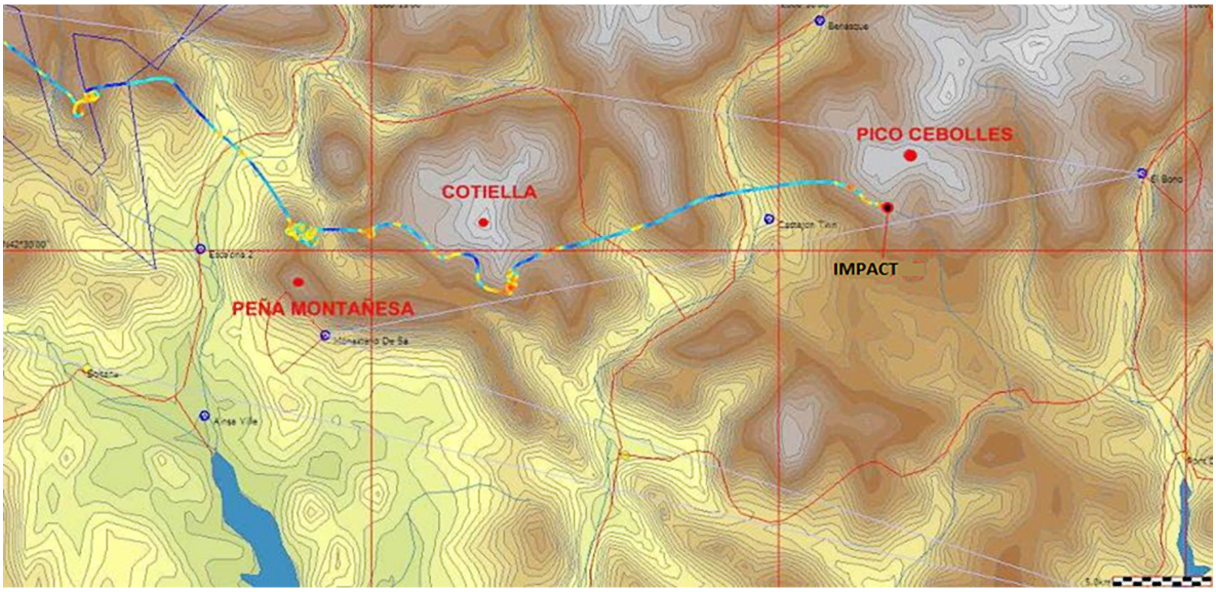


**Figure 5.** Final 35 minutes of the flight path

The transitions between circular and straight flight were done at an average GS of 133 km/h (123 km/h IAS).

| Time (h:m:s) | Altitude (corrected, m) | Height above impact point (m) | Speed (km/h) | Course | Climb rate (m/s) |
|---|---|---|---|---|---|
| 15:51:17 | 2,186 | 26 | — | — | — |
| 15:51:21 | 2,210 | 50 | 142.83 | 106 | — |
| 15:51:25 | 2,214 | 54 | 125.08 | 111 | –3.67 |
| 15:51:29 | 2,200 | 40 | 126.64 | 128 | –3.11 |
| 15:51:33 | 2,185 | 25 | 142.22 | 140 | 0.37 |
| 15:51:37 | 2,182 | 22 | 147.74 | 143 | 0.82 |
| 15:51:41 | 2,182 | 22 | 146.60 | 142 | –0.33 |
| 15:51:45 | 2,186 | 26 | 145.88 | 137 | 0.79 |
| 15:51:49 | 2,194 | 34 | 144.55 | 124 | 1.62 |
| 15:51:53 | 2,202 | 42 | 142.10 | 106 | 1.31 |
| 15:51:57 | 2,202 | 42 | 141.05 | 100 | –0.29 |
| 15:51:1 | 2,200 | 40 | 143.28 | 106 | 0.12 |
| 15:52:5 | 2,198 | 38 | 140.63 | 111 | –1.24 |
| 15:52:9 | 2,206 | 46 | 144.27 | 113 | 3.02 |
| 15:52:13 | 2,223 | 63 | 138.10 | 106 | 2.54 |
| 15:52:17 | 2,243 | 83 | 109.33 | 132 | –2.00 |
| **Impact** | **2,160** | **0** | | **315** | |

Based on the information from the final data points, upon arriving at the hillside where the impact took place, the aircraft's climb rate went from –3.67 m/s to +3 m/s. At that point, the aircraft climbed 17 m first with respect to the reference point (point of impact) and then 20 m, while the speed dropped by some 30 km/h.

## 1.11. Wreckage and impact information

The accident site (Figure 6) is at an elevation of 2,160 m. The hillside starts in the Benasque Valley and ends in the mountain pass of Arca de Morus. At the site of the accident, the gradient is 40°. The ground was moist and the impact site was covered in grass and low-lying vegetation.

The sailplane's nose made a crater that was 1.2 m in diameter and 40 cm deep. The right wing's leading edge struck the ground, opening a 25-cm deep and 7-cm wide gash. The left wing, however, did not leave any impact marks. The marks revealed a trajectory that was almost perpendicular to the ground on a heading of 315°.

The main wreckage was on a dirt road that was immediately left of the impact point. The left wing was some 20 m away from where the nose had impacted. The fuselage, with the empennage, was to the left and close to the impact site. The two main fragments of the right wing were halfway between the main wreckage and the debris from the left wing. The right wing was broken in two. The portion of the spar near the root was still joined to the left wing by its attachment pins. The skin in this section of the wing had delaminated and separated from the spar.

The debris was confined to a circle with a 25-m radius. Figure 7 shows the debris field.

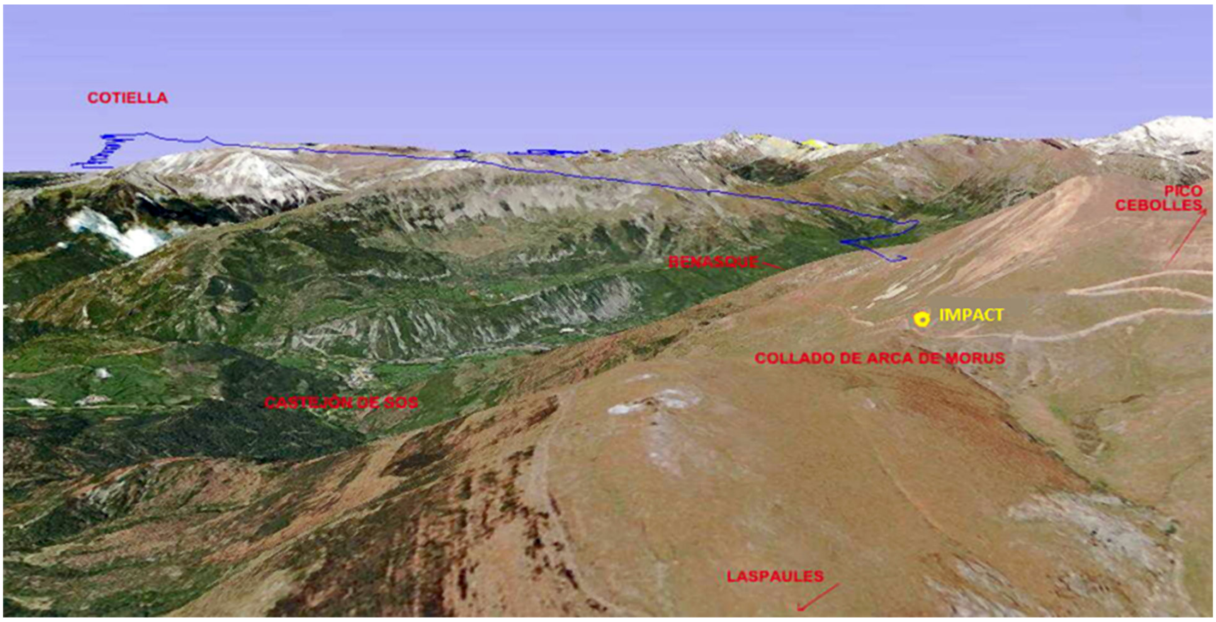


**Figure 6.** Diagram of the aircraft's flight path

Figure 7. Debris field

An analysis of the debris revealed that the landing gear and the engine were retracted. The positions of the flaps and other control surfaces could not be determined.

There were no signs that the aircraft had struck the terrain or vegetation prior to impact.

There were no drag marks on the ground, indicative of the aircraft's reduced horizontal speed at the time of impact.

## 1.12. Medical and pathological information

The most relevant finding in the forensic analysis was the impossibility of obtaining samples for toxicological screens due to contamination and to the insufficient amount of bodily fluids available.

There were no signs prior to the flight that pilot impairment could have contributed to the accident.

## 1.13. Survival aspects

Even though the accident was immediately reported to emergency services by an eyewitness near the site, the violence of the impact made survival impossible.

## 1.14. Tests and research

### 1.14.1. *Eyewitness statements*

The sole eyewitness to the accident was a person familiar with the area and who was in the Arcas de Morus pass, above the hillside impacted by the aircraft. His statement indicates that he noticed the glider due to the aerodynamic noise it was making, which was followed by a loud sound. Two minutes before the accident he had also heard the passing of two gliders flying together at a very low altitude toward the south.

He proceeded to the accident site and noticed that one of the airborne gliders was making circles above the site.

No other pilots taking part in the race made any statements regarding the presence of turbulence in the accident area.

# 2. ANALYSIS

## 2.1. Aspects involving the flight and the race

The weather on 7 July 2010 was favorable for VFR flights, with very good visibility, weak winds and few clouds. In terms of updrafts, no exceptional conditions were forecast but the moderate updrafts should have been sufficient to enable the full or partial completion of that day’s stage.

The diagram and barogram of the accident flight show that after departing from Aisa, the pilot took advantage of thermals mostly by turning to the right at speeds of about 125 km/h, tracing out circles measuring some 275 m in diameter, resulting in bank angles of between 40° and 45°.

The last updraft used by the pilot near Cotiella Peak over a hillside oriented to the SW, probably mirrored the updraft conditions that were present over the flank of Cebolles Peak, on the other side of the Benasque Valley. The pilot crossed the valley at 166 km/h, approached the hillside and continued to fly parallel to it to the SE, toward the Arcas de Morus pass. The point where the pass narrows is an ideal spot for updrafts since warm thermals would be pushed up there as the winds aloft from the W and NW turned to the SW and the winds were squeezed up from the valley below.

The data from the logger outfitted on the glider were unavailable in the vicinity of the pass. In the final minute the glider’s course had been parallel to the hillside, which was only a few dozen meters away. Its speed was 140 km/h and it was on a course of about 110°.

Between 12 and 4 seconds before the recording ended, the glider climbed to 80 m above the impact point as its speed dropped from 140 to 110 km/h. The last valid data point, recorded at 15:52:17, also showed that the glider was starting a turn to the right.

## 2.2. Analysis of possible causes

The aircraft’s high dive angle and high speed at the time of impact indicate that the aircraft was unstable and was neither flying in a normal straight-line glide or in a circular updraft.

This instability could have been caused by a mechanical failure of the rudder, though given the fact that the glider had been flying normally for an hour and a half prior to the accident, such a failure seems unlikely.

The on-site investigation did not show any signs of a minor collision or of a wingtip striking the ground or of the glider striking a bird and causing the aircraft to become unstable and causing the final impact. This cause is thus also ruled out.

The possibility that the pilot lost control as a result of an aerodynamic stall must thus be considered.

Due to the glider's high weight, the pilot conducted a flare maneuver prior to the accident to gain altitude and reduce speed to 109 km/h. At the same time he tightened the flight path into a turn to take advantage of a rising column of air. He would supposedly have lowered the flaps for the slow, circular flight. The flight manual warns of the tendency to drop a wing during slow flight with water ballast, a center of gravity toward the rear and positive flaps.

The stall speed in horizontal flight with that weight and flaps in position 5 is about 77 km/h. Maneuvering in a coordinated turn at a 45° bank angle combined with an aggressive nose-up angle and gust loading from the rising air could easily result in load factors of between 2.5 to 3 g's. The stall speed, which increases in proportion to the square root of the load factor, could in that case have been as much as 133 km/h.

An aerodynamic stall in laminar wing gliders with a T-shaped empennage is usually indicated by the buffeting that occurs when the horizontal stabilizer enters the wing's slipstream. When the aircraft's deceleration rate is very high, the warning of the impending approach to stall is, in practice, negligible. Moreover, as the tail becomes fully engulfed in the wing's slipstream, the efficiency of the elevator can be reduced.

An indication that this hypothesis did in fact play out during the flight of the accident aircraft is the low climbing ability shown in the final data recorded on the flight. In these highly aerodynamic airplanes there is a constant exchange between the kinetic energy of flight and the potential energy of gaining altitude. In the absence of an updraft, the glider must climb some 30 m when the nose is pitched up and the speed drops from 140 to 110 km/h. Considering the fact that the glider was in the middle of the updraft, a reasonable amount for it to have climbed in the final four seconds of recorded flight would have been at least 35 m, but this was not the case. The data show that it only climbed 20 m. This reduced climbing performance can be attributed to the loss of energy due to the high aerodynamic drag experienced when the glider stalled. As the stall worsened, the glider lost all lift.

If a glider stalls at altitude and there are no other gliders flying beneath it, the consequences should be minimal if it is in a thermal: the airplane simply returns to level flight after losing some altitude. When flying in the mountains, there is a potential risk of impacting the terrain if a sufficient distance above the ground is not maintained and the flight involves sudden or violent maneuvers.

The competitiveness of this type of race pushes pilots to adopt strategies such as flying with the highest weight possible to improve gliding performance or looking for the places with the best updrafts. The glider's maneuverability can be stretched to the limit to achieve optimum transitions between slow, circular flight in a thermal and straight-line cross-country flight and vice versa.

Competition, by its very nature, impels pilots to push the technical safety limits to the edge, such as by, for example, operating with maximum possible weights or shifting the center of gravity aft to better maneuver the aircraft and improve its aerodynamics, or by not setting the flaps to the proper position before reducing speed so as to maintain a clean wing configuration. In these cases, the gliders must be piloted in strict observance of all flight limitations, with gradual maneuvers that anticipate control needs so as not to induce maneuvering loads and to retain a safety margin against any unforeseen circumstances.

When flying in the mountains in the summer, updrafts are usually found in windward hillsides over which warm air rises. Normally when a pilot is crossing a valley under these conditions, he will rely on the experience gained in the last thermal and attempt to predict and anticipate where the next updraft will be found.

In keeping with this reasoning, it may be assumed that this experience would have resulted in an abundance of confidence when executing maneuvers that are being performed low above the ground. It was then that the pilot probably encountered a strong updraft, which he was probably expecting and which he had used his skill to locate. He was perhaps surprised by the intensity of the thermal given the generally weak and moderate updrafts that had been the norm on that day.

# 3. CONCLUSION

## 3.1. Findings

- The glider had a valid airworthiness certificate. There were no known defects that would have affected its airworthiness.
- The pilot had a valid license and was qualified and prepared for the type of flight. There is no indication that he was in any way impaired.
- The weather forecast was favorable for racing. Visual flight conditions prevailed, with moderate updrafts and possible turbulence.
- The airplane was flying in the mountains, taking advantage of thermal updrafts.
- The pilot had ample experience flying in the mountains.
- The glider had been loaded with water ballast and its takeoff weight was high, though within limits, to improve performance.
- At the time of the accident, the aircraft was flying very close to the side of a mountain.
- Upon entering an updraft and as the pilot was starting to turn, he lost control of the glider, which crashed frontally into the hillside from a height of about 80 m.
- There were no signs that the glider had collided or had any part of its structure touch the mountain prior to impact.
- The glider was completely destroyed.
- Due to the violence of the accident, survival was impossible.

## 3.2. Causes

An analysis of the data has determined that the main cause of the accident was a loss of control due to entering aerodynamic stall conditions while turning toward an updraft.