CIAIAC
Comisión de Investigación
de Accidentes e Incidentes
de Aviación Civil

TECHNICAL REPORT
A-030/2000

Accident to aircraft
SCHLEICHER ASW 22,
registration GB-499,
in Peñalara, San
Ildefonso (Segovia),
on 4 August 2000

MINISTERIO
DE FOMENTO

Technical report

A-030/2000

Accident to aircraft SCHLEICHER ASW 22, registration GB-499, in Peñalara, San Ildefonso (Segovia), on 4 August 2000

MINISTERIO DE FOMENTO
SECRETARÍA GENERAL DE TRANSPORTES
COMISIÓN DE INVESTIGACIÓN DE ACCIDENTES E INCIDENTES DE AVIACIÓN CIVIL

Edita: Centro de Publicaciones
Secretaría General Técnica
Ministerio de Fomento ©

NIPO: 161-03-011-0
Depósito legal: M. 23.129-2003
Imprime: Centro de Publicaciones

Diseño cubierta: Carmen G. Ayala

COMISIÓN DE INVESTIGACIÓN DE ACCIDENTES E INCIDENTES DE AVIACIÓN CIVIL

Tel.: +34 91 597 89 60
Fax: +34 91 463 55 35
E-mail: ciaiac@mfom.es
http://www.mfom.es/ciaiac
C/ Fruela, 6
28011 Madrid (España)

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 and its causes and consequences.

In accordance with the provisions of Law 21/2003 and Annex 13 to the Convention on International Civil Aviation, the investigation has exclusively a technical nature, without having been targeted at the declaration or assignment of blame or liability. The investigation has been carried out without having necessarily used legal evidence procedures and with no other basic aim than preventing future accidents.

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

This report has originally been issued in Spanish language. This English translation is provided for information purposes only.

Table of contents

Abbreviations

00 °C	Degrees Celsius
00° 00’ 00”	Degrees, minutes, seconds
E	East
ft	feet
G	Acceleration of gravity
h	Hours
hh:mm	Time in hours and minutes
km	Kilometres
kt	Knot
LT	Local time
m	Metres
MHz	Megahertzs
min	Minutes
N	North
NE	North-east
NNE	North-north-east
NW	North-west
S	South
SE	South-east
SSE	South-south-east
SW	South-west
UTC	Universal Time Coordinated
Vm	Mean speed
V_{NE}	Never exceed speed
W	West

Synopsis

The single-seat glider Schleicher ASW 22, registration GB-499, was making a local flight in the vicinity of the Fuentemilanos aerodrome, Segovia, around 19:00 hours local time, in visual weather conditions suitable for this type of flight.

At 19:30 the aerodrome received alerts about an aircraft accident, which was confirmed to have affected the above-mentioned glider.

The wreckage of the aircraft was found in a mountainous zone rising to an elevation of 2,428 m, at a level of 2,000 m. The glider had descended until colliding with the hillside, flying in the direction of the slope, apparently in slow flight and in a stall situation with the wings completely level.

It is considered that the pilot may have found himself trapped between the hills with little height and speed.

The pilot was killed in the accident as a result of the violent impact of the glider's underside against the ground. The glider was destroyed.

1. FACTUAL INFORMATION

1.1. History of the flight

On 4 August 2000, around 19:00 hours local time[1], the single-seat glider, make Schleicher ASW 22, registration GB-409, was making a local flight in the vicinity of the Fuentemilanos aerodrome in the province of Segovia. It had taken off at approximately 17:00 hours local time, towed by an aeroplane up to release height.

The weather conditions were visual and suitable for this type of flight. Sunset time was 21:30, and the aerodrome expected the glider to return before sunset. However, at 19:30, the aerodrome was informed of the existence of a crashed glider in the vicinity of the Puerto del Reventón pass.

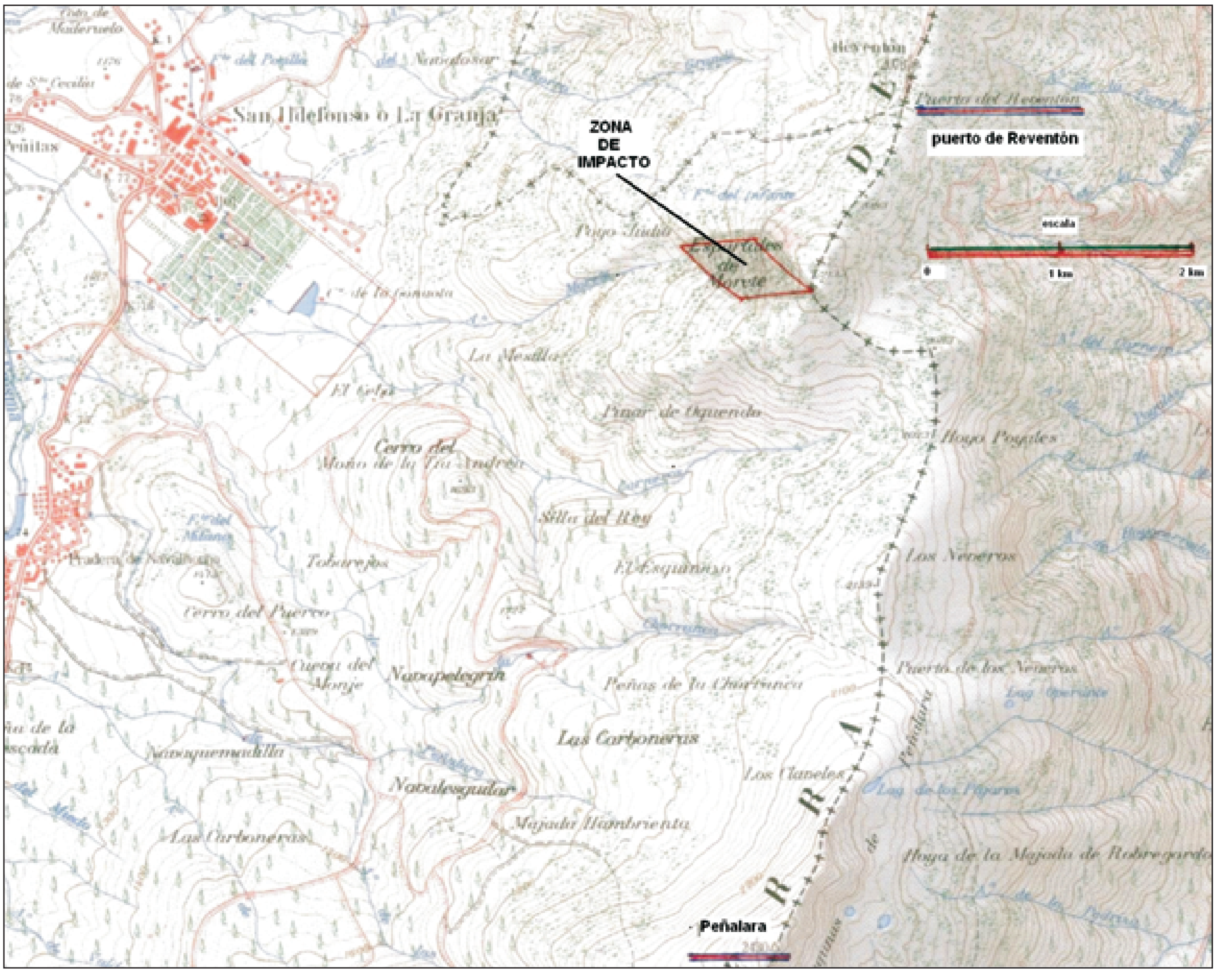


Figure 1. Accident Zone

[1] All time references in the document are expressed as local time (LT). To establish the equivalent in Universal Time Coordinated (UTC), it is necessary to subtract two hours.

Other aircraft in flight confirmed the accident and the aircraft was identified. The aerodrome staff alerted the Search and Rescue Service (SAR), which located the crashed glider. A unit of the Civil Guard of Segovia proceeded to the accident site and found the wreckage of the aircraft and the pilot's body inside the cockpit. Due to the steepness of the terrain, the difficult access and the late hour, the rescue tasks were postponed until the following day. At first light on 5 August, the pilot's body was rescued and transported by helicopter to the mortuary of Segovia.

The glider had crashed into the NW side of the range at a level of some 2,000 m elevation, in direction W, that is, the direction of its maximum downward slope. Figure 1 shows a general map of the zone.

1.2. Injuries to persons

Injuries	Fatal	Serious	Minor/none
Crew	1		
Passengers			
Others			

1.3. Damage to aircraft

The aircraft was destroyed.

1.4. Other damage

No other damage worthy of mention was caused.

1.5. Personnel information

1.5.1. *Pilot*

Age/Sex:	62 years/Male
Nationality:	United Kingdom
Licence:	Glider Pilot
Number:	33032
Date of issue:	1961
Date of expiry:	01-06-2001

The pilot arrived at Fuentemilanos on 02-08-2000, with his glider, by road.

1.6. Aircraft information

1.6.1. *Airframe*

The ASW 22 is a high-performance single-seat glider with a gliding coefficient of the order of 55 and a minimum descent speed of 0.41 m/s. It has a wingspan of 24 m and an aspect ratio of 38.3. It has a trailing-edge flap with positive and negative angle positions and aerodynamic brakes. Its wings can carry water ballast, which must be jettisoned before landing.

In accordance with its certificate of airworthiness, it is classified as semi-aerobatic, with permitted manoeuvres of loop, tight turns (3.5 g), chandelles, stalls and spins. Barrel rolls and inverted flying are not permitted.

Its registration data are:

Make:	Schleicher
Model:	ASW 22
Serial number:	22030
Date of manufacture:	1983
Registration:	GB-499
M.T.O.W.:	750 kg. Maximum water 250 kg
Owner:	Private
Operator:	Private

1.6.2. *Certificate of Airworthiness*

Number:	3209
Type:	Normal/Semi-aerobatic
Date of issue:	18-04-1986
Date of renewal:	05-2000
Date of expiry:	05-2001

1.7. Meteorological information

General situation

The general situation was characterised by the presence of an anticyclone centred between the Azores and Galicia and spreading across all of the Iberian Peninsula. During the day, in the province of Segovia, winds were gentle from the NE with cloudy intervals and mild temperatures with maxima around 25 °C.

Observatory of Segovia

The synoptic report corresponding to 20:00 hour local time indicated:

Wind:	020°/06 kt, from the NNE, with intensity of 6 kt
Visibility:	30 km
Temperature:	20.6 °C
Cloud:	Scarce, one-eighth of the sky, between 1,500 and 2,000 m

Conditions at altitude

Flight level	Wind (kt)	Temperature (°C)
020	022°/12	22
050	023°/13	13
100	330°/14	3

That is to say, at altitude 5,000 ft (1,500 m), the wind from the NNE had an intensity of 13 kt and at altitude 10,000 ft (3,000 m) its intensity was 14 kt and its direction from the NW.

Position of the sun

At 19:00 hours the sun was at the geographical azimuth of 270° and at a height of 26°.

1.8. Aerodrome information

Name:	Aeródromo de Fuentemilanos
Location:	Fuentemilanos (Segovia)
Point of reference:	
— Latitude:	N 40° 52′ 35″
— Longitude:	W 04° 16′ 08″
— Elevation:	3,260 ft (1,000 m)

Category:	Private–Gliding
Runway:	34–16 asphalted. Dimensions 3,280 × 98 ft (1,000 × 30 m)
TWR:	123.4 and 123.5 MHz

The aerodrome is privately owned and used, and is dedicated to gliding.

1.9. Flight recorders

The aircraft was equipped with a LOGGER recorder which enables its flight trajectory to be reconstructed. On examination it was found that the memory log was empty.

1.10. Communications

The aircraft had a VHF transceiver for traffic communication with the aerodrome and other aircraft.

No communications were maintained with the aircraft before the accident.

1.11. Wreckage and impact information

1.11.1. *Topography*

The accident site is located on the NW side of the Peñalara massif, with maximum elevation 2,428 m, in the Guadarrama Range. The massif, with its string of peaks oriented NNE-SSW, has the Lozoya Valley to the SE and the Northern Castilian Plateau to the NW.

The point of impact, close to the Puerto del Reventón pass, is 27 km from the Fuentemilanos aerodrome in a W direction. The elevation of the point of impact is 2,000 m, at a level some 40 m below the height of the crest of the massif at that latitude, and some 280 m from it horizontally in a W direction. The surface of the terrain has a slope of some 12° and is covered with rocks and scrub.

The co-ordinates of the accident site are:

— Latitude: N 40° 53′ 40″
— Longitude: W 003° 57′ 10″

To the E of the accident site, on the other side of the range, lies the Lozoya Valley, a long, narrow valley with no fields suitable for emergency landings.

Appendix A shows topographic maps of the zone and a detailed map of the site.

1.11.2. *Wreckage of the glider*

The wreckage of the glider was grouped together and in a normal attitude and configuration, its nose pointing W in favour of the slope of the hillside.

The wings and the central and rear fuselage were joined together and showed slight damage, except for the left wingtip, which had broken off at its assembly joints and was resting two metres behind the rest of the wing (see Appendix B, Photograph 1).

The front fuselage, which includes the cockpit, was split and displaced to the left (see Appendix B, Photograph 2), with the keel broken. The instrument panel was displaced, and intact, although the logger had been separated from its anchorages. The forward part of the fuselage, touching a granite rock a metre in height, had split and opened like a pointed arch half a metre in length.

The tail had suffered a blow in the lower corner of the rudder at an angle of approximately 30° (see Appendix B, Photograph 1). The tailplane was out of alignment, leaning slightly to the right.

The main landing wheel was retracted, as were the aerodynamic brakes. The flaps were in a slightly negative position (see Appendix B, Photograph 3) and there was no ballast in the wings.

All of the damage observed in the aircraft was caused by the impact, and no pre-accident damage was appreciated.

1.11.3. *Tracks and traces*

No tracks or traces of movement of the glider along the ground were observed in the vicinity of the point of impact.

1.12. Medical and pathological information

The forensic medical report established that death was caused by a powerful blow to the hip which broke the pelvis and the head of the right femur, causing internal bleeding. There were no other injuries to the lower or upper limbs, or to the head, thorax or abdomen.

1.13. Survival aspects

Given the characteristics of the accident, the pilot's possibilities of survival were practically nil.

1.14. Tests and research

It was not considered necessary to investigate possible failures due to defects in the structure or materials, because in both cases they were the effect, not the cause, of the crash.

1.15. Additional information

1.15.1. *General information on gliding*

In the sport of gliding, a distinction can be made between competitive flights and long-distance flights in general on one hand, and local training flights on the other. In the former, the desire to achieve high speeds, to break records, etc., leads to the use of water ballast in the wings and negative flap positions in fast glides to improve the average speed. To carry out these flights, pilots tend to take advantage of the central hours of the day, corresponding to the periods of greatest thermal activity in the atmosphere.

In familiarisation and training flights, in contrast, the glider often does not travel far from the aerodrome from which it operates and to which it tends to return. The aim of the flight may be to remain in the air for as long as possible or to survey or visit a particular area, among others. The early hours of the day are normally used only for pure gliding from the tow release point, due to the absence of thermals at these times. The central hours of the day can be very turbulent. The late hours of the day often offer suitable conditions for peaceful, enjoyable flying. In these flights water ballast is not usually carried.

Taking advantage of thermal upcurrents, the glider can gain height in spiral flight, normally with minimum descent speeds. In this phase, the aircraft circles above the same piece of ground or drifts slightly with the wind. Climbs of 1,500 m of height gain are very frequent. The pilot can also make use of orographic upcurrents, caused by the wind striking a hillside at a perpendicular angle, flying and turning to windward above the crests of hill ranges.

In a second phase, in straight-line gliding, the glider flies in the desired direction with the speed provided by the most efficient gliding mode. Normally the glider takes longer to complete the first climbing phase than the second gliding phase. In more conservative flying, the pilot limits himself to the distance given by the height achieved multiplied by the gliding coefficient, also taking into account any obstacles he may find in his path and the possibility of height losses.

Flights in high mountain zones are subject to strong turbulence and powerful upcurrents and downcurrents.

2. ANALYSIS

As no damage was appreciated in the structure and controls of the aircraft prior to impact and the weather conditions were suitable for visual flying, the analysis focuses on the execution of the flight.

2.1. Intended flight

According to the available information, the pilot had arrived at the Fuentemilanos base by road with his glider two days earlier.

The pilot had had sufficient rest time, but perhaps not enough time to familiarise himself with the surroundings. No information is available on his experience in high mountain flying. On the date of the accident, he presumably took off with the intention of surveying the zone and training. Taking off at 17:00 hours, his intention could not have been to make a long-distance flight. He probably did not load ballast water.

The prevailing wind from the NNE, 6 kt at ground level and 13 kt at altitude, was not ideal for orographic hillside flying due to its low intensity and direction parallel to the mountain range.

2.2. Probable flight

MAP 1, General map, in Appendix A, shows the area where the flight took place; because of its long duration, some two hours, it may well have gone beyond the limits shown.

With the wind from the NNE, the tow plane and glider took off from runway 34. After a few minutes of flight, the tow plane released the glider over a point close to the aerodrome for it to begin free flight. After gaining height, the pilot probably approached the mountain range, some 10 km away. The more height he gained, the farther he would have travelled from the Fuentemilanos aerodrome: at only 2,000 m altitude, 1,000 m above the airfield, he may have been 50 km from it, given the performance of this glider, and even farther if he had flown towards the NW, because the tail wind would have assisted the return flight.

The pilot probably climbed to a greater height and flew over the peak of the Peñalara (elevation 2,428 m) and then, crossing over to the eastern slope, entered the Lozoya Valley. On returning, flying W with the sun in his face, he would see the crest of the Peñalara massif which he had to cross to return to the aerodrome. Although he had sufficient height to reach it, it may have been very limited for crossing the ridge. The pilot may have been afraid of finding himself trapped in the valley. At that time, around 19:00, sunset was still two and a half hours away.

Flying W towards the mountain, the pilot would have headed for a gentle pass with elevations of 2,139 m on either side and elevation of the crest at that point of 2,040 m. It is considered that the rising slope of the hillside, the irregular horizon and the facing sun may have made the pilot lose the sensation of speed, or that his flying height was so marginal that he practically scraped over the peaks without a reserve of speed.

2.3. Flight before impact

In the absence of reliable information from eye witnesses or flight recorders, the glider's final trajectory can only be estimated from the arrangement of the wreckage and the type and degree of damage it displays, also taking into account that changes may have occurred as a result of the rescue tasks. The working hypothesis is that, some two hours after take-off, the glider flew in a straight line, at low speed and with little height, over the crest line of the hills, where it may have encountered a leeward downcurrent on changing from one slope to the other. The pilot's instinctive reaction of pulling on the control stick on approaching the ground may have put the glider into a situation of totally symmetric stall. The pilot had not deployed the undercarriage or the brakes, as he was not attempting an emergency landing. The absence of water ballast permitted slow flying. The slightly negative flap position is coherent with an intention by the pilot of flying faster to leave the valley quickly, but the flaps may also have been moved on impact. If the flaps really were in negative position, this condition would favour stalling at higher speed. (Appendix A, Profile, shows the profile of the hillsides and the probable flight before impact, following the route shown in Map 2, Detailed map, in the same Appendix).

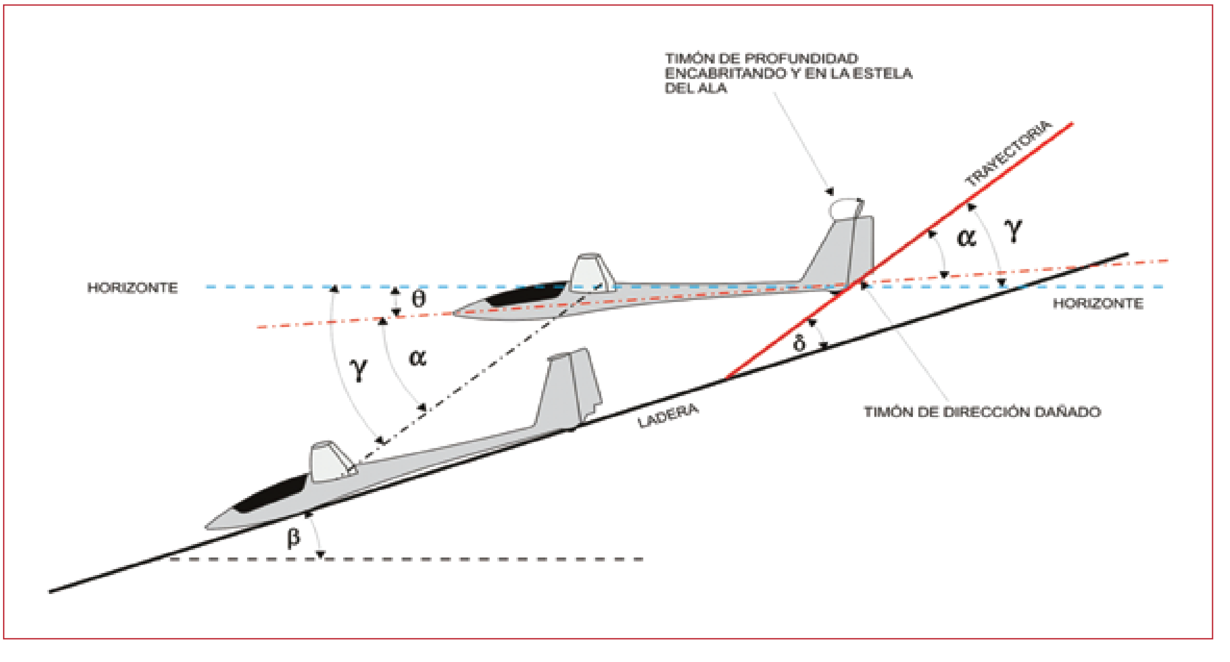


Figure 2. Diagram of final trajectory

The aircraft thus entered a downward trajectory with a greater angle to the horizontal than that of the slope of the hillside. The angle of attack of the wing, with the control stick of the elevator pulled all the way back, would remain stable and at a value close to that of the trajectory, reduced by the aircraft's pitch angle with respect to the horizontal plane (see Figure 2). It is believed that the incidence of the slipstream of the wing on the tail would contribute to maintaining the glider in stall.

Flying westwards, the pilot may have been dazzled by the sun, which was at a bearing of 270° and an angle of 26° over the horizon.

2.4. Impact

In its downward flight, the glider's first contact with the ground may have been with the tail. The scraping of the rudder against a rock or the scrub would indicate the direction of the trajectory in the damage displayed by this control surface, perhaps also influenced by a pitching movement. The angle of cut would approximately indicate the aircraft's angle of attack.

The total symmetry of the flying attitude immediately before the impact is indicated by the absence of significant breakage in the wings and fuselage. If the aircraft had hit the ground with a certain banking angle of the wings, yaw or sideslip, or any rate of roll, this would have caused more significant damage. The glider immediately came to a halt in the scrub due to its low speed, without leaving traces on the ground.

The main impact was a violent collision with the underside of the front fuselage. The keel of the fuselage broke and the pilot received the impact directly in the hip; the undercarriage, not being deployed, did not cushion the impact.

It can also be concluded that there were no great longitudinal accelerations and that the impact against the rock, next to which the nose came to rest, occurred at the end of the crash and caused only a slight inertial displacement of the instrument panel. The pilot's lower limbs, occupying the interior of the prow, did not suffer any injuries.

2.5. Discussion

Attention must be paid to the variation of the wind conditions at higher altitudes. At level 100, that is, some 3,000 m, the winds were turning in from the NW. It is very possible that the winds recorded at the Segovia observatory were different from those in the mountains. These wind differences may have led to turbulences and changing conditions during the trajectory followed by the glider.

According to the hypothesis, the glider flew over the crest of the mountain range towards the east. On returning across the mountains, there cannot have been a first contact on the ridge because this would have left traces on the nose, tail or fuselage of the glider, but it may have crossed the ridge with very little height clearance and already in stall.

Although the pilot may have had some difficulty in reaching the NW hillside from the Lozoya Valley side, at the moment when he crossed the crest in a W direction, he was in flight and at a height of over 1,000 metres above the plain, where the aerodrome lay 27 km away. With a gliding coefficient of 55 and 1,000 m height, he could theoretically have glided for 55 km.

This gliding coefficient corresponds to a gliding angle of approximately 1°. It is surprising that, the slope of the hillside being 12°, and flying in its favour, the glider could have crashed into it. For this to occur, in addition to the possible encounter with a leeward downcurrent, we have to assume that the pilot was still pulling on the elevator control stick. If he had slackened the stick he would have escaped from the stall quickly if he still had some remaining height. It may be assumed that the pilot, flying downhill and seeing the ground suddenly approaching, instinctively pulled the stick back and kept it in this position until the last moment.

The assumption that the glider hit the rocky hillside at low speed, similar to stalling speed, is based on the absence of traces of displacement and braking on the ground and the absence of major structural damage to the wings, rear fuselage and tail.

3. CONCLUSIONS

3.1. Findings

- The weather conditions of visibility and cloud were suitable for making the type of flight which the pilot is assumed to have intended.
- The prevailing wind was gentle and from the NNE, parallel to the crest of the mountain range.
- The position of the sun relative to the glider was facing and at a low angle.
- No defects in the aircraft prior to those caused by the accident were found.
- The flight took place over high mountain zones.
- The glider was flying stably in its plane of symmetry moments before the impact. It made no lateral movements.
- The horizontal and vertical components of its speed when the impact occurred were low.
- The glider crashed in a rocky area at 2,000 m altitude.
- The glider received the main impact in the underside of the front fuselage.

3.2. Causes

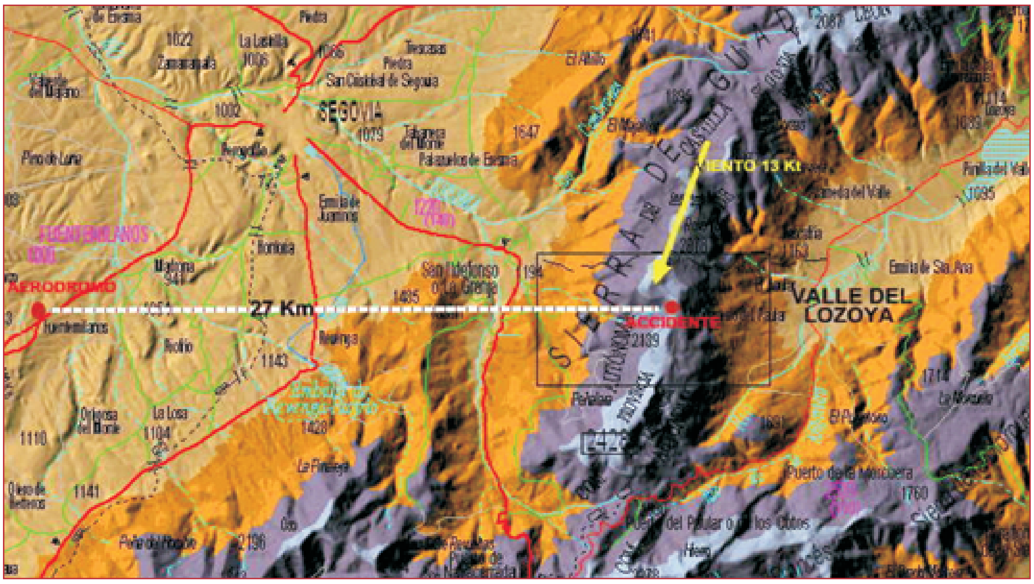
- The cause of the accident was maintaining a very low flying speed, which may have made the aircraft to stall on crossing the crest of the mountains.
- The trajectory of the flight may have been influenced by possible downcurrents on crossing from one slope of the mountains to the other.
- The dazzle of the sun, the irregular horizon and the perception of speed with respect to the ground may have made the pilot lose the sensation of flying speed.
- The probable decision to fly into a closed valley with a difficult exit, with insufficient height, may have been the initial cause of events.

4. SAFETY RECOMMENDATIONS

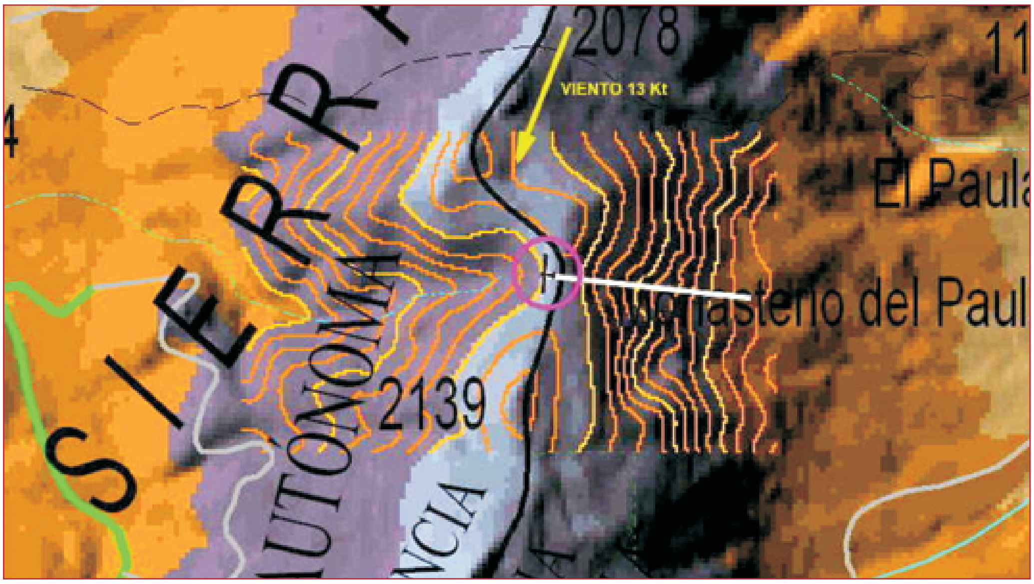
None.

APPENDICES

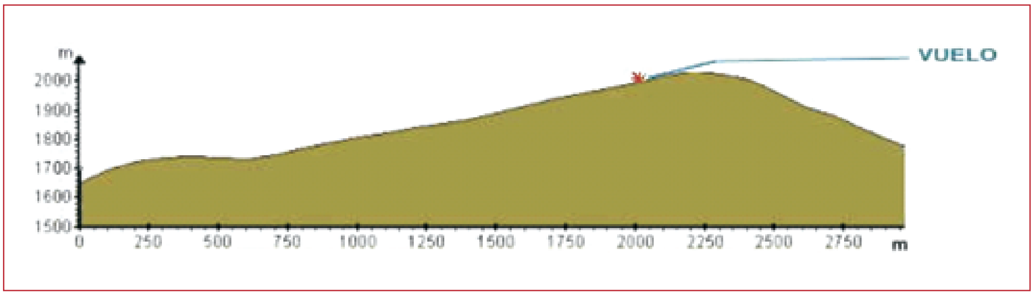
APPENDIX A
Location maps



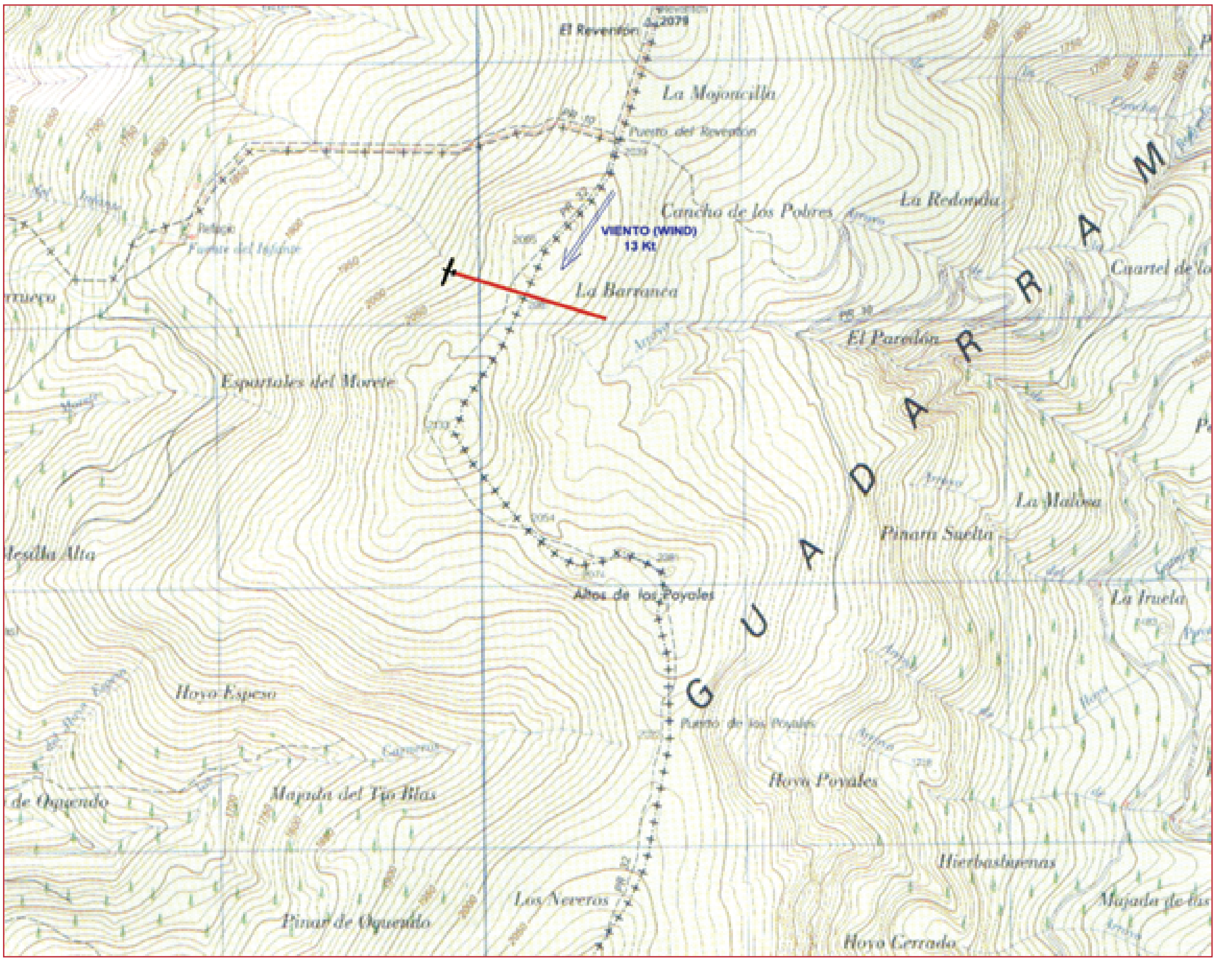
Map 1. *General map of the zone*



Map 2. *Detail of the accident site*



Profile of hillside and flight



Map 3. *Topography of the impact zone*

APPENDIX B
Photographs

Photograph 1. *Final position of the aircraft*

Photograph 2. *Wreckage of the cockpit*

Photograph 3. *Wing-fuselage joint zone. Position of flaps*