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Service d'enquête suisse sur les accidents SESA  
Servizio d'inchiesta svizzero sugli infortuni SISI  
Swiss Accident Investigation Board SAIB

Aviation Division

# **Final Report No. 2147 by the Swiss Accident Investigation Board SAIB**

concerning the accident involving the  
Cirrus SR20 aircraft, registration HB-KHA

on 2 July 2006

in Val Tremola, Airolo/TI municipalit 

**Ursachen**

Der Unfall ist darauf zurückzuführen, dass der Pilot das Flugzeug so tief in ein enges Tal steuerte, dass weder eine Umkehrkurve noch der Überflug des Passes möglich war, sodass es zu einer Kollision mit dem Gelände kam.

Zum Unfall haben beigetragen:

- Unzureichende Kenntnisse im Gebirgsflug.
- Überschätzen der Flugleistungen.

## General information on this report

This report contains the Swiss Accident Investigation Board's (SAIB) conclusions on the circumstances and causes of the accident which is the subject of the investigation.

In accordance with Art 3.1 of the 10<sup>th</sup> edition, applicable from 18 November 2010, of Annex 13 to the Convention on International Civil Aviation of 7 December 1944 and Article 24 of the Federal Air Navigation Act, the sole purpose of the investigation of an aircraft accident or serious incident is to prevent accidents or serious incidents. The legal assessment of accident/incident causes and circumstances is expressly no concern of the accident investigation. It is therefore not the purpose of this investigation to determine blame or clarify questions of liability.

If this report is used for purposes other than accident prevention, due consideration shall be given to this circumstance.

The definitive version of this report is the original in the German language.

All times in this report, unless otherwise indicated, are stated in local time (LT). At the time of the accident, Central European Summer Time (CEST) applied as local time in Switzerland. The relation between LT, CEST and coordinated universal time (UTC) is:  
LT = CET = UTC + 2 hours

# Final Report

## Synopsis

Owner	Propair Ltd, 4102 Binningen, Switzerland
Operator	Motorfluggruppe Basel, 4030 Basel, Switzerland
Manufacturer	Cirrus Design Corporation, 4515 Taylor Circle, Duluth, MN 55811, Minnesota (USA)
Aircraft type	Cirrus SR20
Country of registration	Switzerland
Registration	HB-KHA
Location	Val Tremola, Airolo/TI municipality Coordinates: 686 770 / 156 250 (swiss grid) N 46° 33' 06" E 08° 34' 12" Elevation 2030 m AMSL (6660 ft AMSL)
Date and time	2 July 2006, 15:15 LT

## Investigation

The accident occurred on 2 July 2006 at 15:15 LT and was two minutes later reported to the Ticino cantonal police. At 15:19 LT, the Rega operations centre alerted the bases of Locarno and Erstfeld. The Aircraft Accident Investigation Bureau (AAIB) opened an investigation on the same day at 17:00 LT in collaboration with the Ticino cantonal police.

## Summary

On 2 July 2006, at 15:09 LT, the pilot took off in the single-engine Cirrus SR20 aircraft registration HB-KHA from runway 11 of Ambri aerodrome on a flight to Basel-Mulhouse. Six minutes after take-off the aircraft collided with the terrain approximately five hundred metres south of the St Gotthard pass, approximately one hundred metres below the pass summit in the area of Val Tremola. The pilot and the passenger suffered serious injuries. The aircraft was destroyed.

## Causes

The accident is attributable to the fact that the pilot flew the aircraft into a narrow valley so low that neither a 180 degree turn nor clearing the pass was possible, resulting in a collision with the terrain.

The following factors contributed to the accident:

- Insufficient knowledge of mountain flying.
- Overestimation of the aircraft's flight performance.

In the context of the investigation, no safety recommendations were issued. This accident, together with other accidents, led to greater clarification of the dangers which result from the non-deployment of ballistic rescue systems in the course of the accident. The results of these investigations, along with corresponding safety recommendations, were published in an additional report.

## 1 Factual information

### 1.1 Pre-history and history of the flight

#### 1.1.1 General

The description of the pre-history and history of the flight is based on statements of the pilot and the passenger, plus the recordings of the multifunction flight display (MFD) and the data stored in the transponder.

#### 1.1.2 Pre-history

The pilot had reserved the Cirrus SR20 aircraft, registration HB-KHA, for 2 July 2006 at the "Motorfluggruppe Basel". On this day he intended to take part in the Ambri fly-in. Prior to departure from Basel-Mulhouse airport, he had HB-KHA refuelled with 100 litres of AVGAS. At 10:43 LT, he took off on the flight to Ambri, accompanied by a female passenger. At 11:34 LT he landed in Ambri. This was his first flight to the Ambri mountain aerodrome. He had not previously made an introductory flight with a flight instructor, as is recommended on the approach chart (VAC) for Ambri.

##### 1.1.2.1 Flight preparations

In the pilots' office in Ambri, the pilot had at his disposal an internet terminal with the AMIE system (AIS MET Information Environment). For the flight from Ambri to Basel, the pilot did not submit an ATC flight plan and did not complete a flight notification in Ambri.

##### 1.1.2.2 History of the flight

On 2 July 2006, the pilot took off in the single-engine Cirrus SR20 aircraft, registration HB-KHA, at 15:09 LT from runway 11 of Ambri aerodrome. After take-off the pilot made the first turn earlier than published in the VAC when he turned left in the direction of the Gotthard pass approximately 1.5 km after the end of the runway (cf. Annex 2).

Among other things, the pilot stated the following about the subsequent history of the flight [translated from German]:

"(...) the aircraft initially climbed well at 700 to 1100 feet per minute. In the Airolo area, I turned right into the valley towards the Gotthard. From there on, the aircraft was no longer climbing. The vertical speed varied from 0 to -200 feet per minute. I did not notice any turbulence. (...) I saw the road at virtually the same height as I was flying. It became clear to me that I could not clear the pass and I pulled to the left to gain space and time and thus height. Nonetheless, I tried to climb a little, but the stall warning sounded immediately. I pressed forward in order to prevent the airspeed falling below approximately 70 KIAS. (...) I did not see the high-voltage lines."

In addition, he stated [translated from German]:

"I did not consider the Tremola valley in any detail before the flight. I familiarised myself generally with the topography of the Alps. (...) The main valley is relatively wide. Before one turns right into the Tremola Valley, one does not see that this valley is relatively narrow. I realised this when I was already in the Valley."

After passing under two high-voltage lines, the aircraft collided with the terrain at 15:15 LT approximately five hundred metres south of the St Gotthard pass, approximately one hundred metres below the pass summit. The pilot and the passenger suffered serious injuries. The aircraft was destroyed. Fire did not break out.

**1.2 Injuries to persons**

Injuries	Crew	Passengers	Total number of occupants	Others
Fatal	0	0	0	0
Serious	1	1	2	0
Minor	0	0	0	0
None	0	0	0	Not applicable
Total	1	1	2	0

**1.3 Damage to aircraft**

The aircraft was destroyed.

**1.4 Other damage**

There was no other damage.

**1.5 Personnel information****1.5.1 Pilot**

Person	French citizen, born 1958
Licence	Private pilot licence (PPL(A)), issued by the Federal Office of Civil Aviation (FOCA) on 15 May 2002
Ratings	Class rating for single-engine piston (SEP) and touring motor glider (TMG) Night flight NIT(A)
Medical fitness certificate	Class 2, restrictions: VDL (shall wear corrective lenses and carry a spare set of spectacles), valid from 5 March 2006 till 5 March 2008
Last medical examination	3 February 2006
Commencement of pilot training	1992 in South Africa. Private pilot licence (PPL) issued by the Republic of South Africa on 25 May 1992. On 29 September 1993 the Federal Republic of Germany issued a German PPL on the basis of the South African PPL. On 25 July 1994: American PPL issued by the United States authority (FAA). On 15 May 2002: issue of a Swiss PPL by the FOCA on the basis of the German PPL.

**1.5.1.1 Flying experience**

Total	315:06 hours
on the accident type	23:36 hours
during the last 90 days	17:15 hours
of which on the accident type	17:15 hours
during the last 24 hours	1:06 hours
of which on the accident type	1:06 hours

## 1.5.1.2 Pre-history of the pilot

At the request of the Fricktal flying school, from which the pilot previously leased aircraft, he completed an Alpine initiation with a flight instructor on 27 August 2003. According to the flight instructor's statement he told the pilot after the flight that the exercise would have to be repeated due to unsatisfactory performance. There are no indications that such a repeat has taken place.

According to the chief flight instructor's statement, the pilot was involved in an incident with the DA40 aircraft, registration HB-SDJ, on 16 September 2005. Although he recognised propeller revolutions of 2200 RPM instead of 2600 RPM during take-off, he took off from Schupfart on a flight to Bad Ragaz and flew back from there with the same restriction. After his report that the engine had low RPM, the mechanic found, according to the chief flight instructor's statement, the propeller adjustment cable was broken.

## 1.5.2 Passenger

Person German citizen, born 1969

## 1.6 Aircraft information

Registration	HB-KHA
Type	Cirrus SR20
Characteristics	Single-engine, four-seater, low-wing aircraft of composite material with fixed landing gear
Manufacturer	Cirrus Design Corporation, 4515 Taylor Circle, Duluth, MN 55811, Minnesota (USA)
Year of manufacture	2005
Serial number	1557
Owner	Propair Ltd, 4102 Binningen
Operator	Motorfluggruppe Basel, 4030 Basel
Engine	TCM IO-360-ES6B Teledyne Continental Motor, s/n 360042, year of manufacture 2005, 200 HP
Propeller	Three-blade variable-pitch propeller, TRW Hartzell Propellers PHC-J3YF-1RF, s/n FP 4017 B, year of manufacture 2005
Equipment	Acc. to equipment list: 2 VHF NAV-COM GPS Garmin GNS-430, 1 audio panel Garmin GMA-340, Garmin GTX-330 Mode S, 1 ELBA ACK E-01 ELT, Honeywell KGP 560 terrain awareness and warning system (TAWS), Avidyne Entegra EX5000C MFD with EMax TM Engine Instrumentation, Electronic Approach Chart and Flight Director. The TAWS had been deactivated by the pilot before the flight.
Operating hours:	Airframe 210:41 hours Engine 210:41 hours Propeller 210:41 hours
Max. permitted take-off mass	1361 kg

Mass and centre of gravity	Mass and centre of gravity were within the permitted limits
Maintenance	The last 100-hour check was carried out on 28 June 2006 at 206:34 operating hours
Fuel grade	Aviation fuel AVGAS 100LL
Fuel	Two wing tanks give a tank capacity of 229 l, of which 212 l are usable.  At the time of the accident, the Avidyne Entegra EX5000C MFD onboard computer registered an available fuel quantity of 139 l. At an average consumption of 40 litres per hour, this corresponds to a possible flight duration of 3:30 hours.
Acceptance test	The acceptance test was carried out by the FOCA on 7 November 2005 at 43:40 operating hours
Airworthiness certificate	Issued by the FOCA on 8 November 2005, valid till revoked
Registration certificate	Issued by the FOCA on 28 December 2005
Certification	VFR day / VFR night

#### 1.6.1 Additional information according to flight manual

<u>Airspeed for Normal Operation Cirrus SR20</u>	<u>KIAS</u>
<i>Takeoff Rotation: Short Field, Flaps 50%</i>	65
<i>Enroute Climb, Flaps Up: Normal, SL</i>	105
<i>Enroute Climb, Flaps Up: Normal, 10 000'</i>	95
<i>Best Angle of Climb, SL</i>	81
<i>Best Angle of Climb, 10 000'SL</i>	85
<i>Best Rate of Climb, SL</i>	96
<i>Best Rate of Climb, 10 000'SL</i>	91
<i>Landing Approach, Normal Approach, Flaps Up</i>	85
<i>Landing Approach, Normal Approach, Flaps 50%(16°)</i>	80
<i>Landing Approach, Normal Approach, Flaps 100%(32°)</i>	75
<i>Stall Speed, Flaps Up, Bank Angle 0°</i>	65
<i>Stall Speed, Flaps Up, Bank Angle 30°</i>	70

#### 1.6.2 Rescue system

The Cirrus SR20 aircraft registration HB-KHA was equipped with a Ballistic Parachute System. This rescue system, designated the Cirrus Airframe Parachute System (CAPS) is designed so that in a life-threatening emergency the aircraft together with its occupants can be brought to the ground on a parachute at a rate of descent of 1500 feet per minute. If necessary, the pilot can activate a pyrotechnic charge using a control lever in the cockpit; this ejects a parachute using a rocket propulsion system.

To increase strength and improve the aerodynamic properties, the single-shell fuselage of the Cirrus SR20 is mainly made of composite materials. The lower fireproof bulkhead is inclined at 20° to increase impact resistance (forward: 9.0 g; lateral: 1.5 g; downward: (6.0 g).



### 1.6.3 Seats and safety belts

The seats of the Cirrus SR20 are composed of a honeycomb structure made of aluminium which is deformed on impact and thus absorbs some of the downward forces. The seat and seat belt system is designed for an extreme load of 19 g vertical and 26 g forward.

The two front seats of the Cirrus SR20 HB-KHA were equipped with inflatable shoulder straps (AmSafe aviation inflatable restraints - AAIR) made by AMSAFE, which perform the function of an airbag.

An inflatable chamber is integrated into the outer shoulder straps. An electronic control unit which is mounted below the cabin floor contains an impact sensor, a battery and a circuit to determine deceleration of the aircraft. If the system detects an impact, it sends a signal to the inflator module, which is attached to the seat frame. Gas which is released from the pressure tank in the inflator module inflates the air chambers built into the belts to protect the occupants in the front seats. After activation of the system, the pressure is released again, so as not to impede the occupants as they exit the aircraft.

### 1.6.4 Technical condition of the aircraft

The pilot had reported no technical problems before the accident.

Also after the accident the pilot reported no technical faults and stated that HB-KHA provided the performance listed in the manual.

No evidence of pre-existing technical defects which could have contributed to the accident were recorded on the installed Avidyne Entegra EX5000C MFD with EMax TM Engine Instrumentation.

## 1.7 Meteorological information

### 1.7.1 General

The information in chapters 1.7.2 to 1.7.9 was provided by MeteoSwiss and is translated from German.

### 1.7.2 General meteorological situation

An area of high pressure over the Baltic and a weak area of low pressure over the Iberian peninsula determined the nature of the weather in Switzerland. Dry air from the east meant the sky was mostly cloudless on the northern side of the Alps; the few clouds which were present over the Alps and the southern side of the Alps were created by the inflow of somewhat moister air from the south-east."

### 1.7.3 GAFOR

The accident site is on GAFOR route 72 (Biasca - Goldau). The following forecast was made for this route:

GAFOR valid from 12-18 UTC:

Route 72: O, O, O

### 1.7.4 SWC, Windcharts

SWC, Windcharts valid 12 UTC

The Significant Weather Chart issued by the London WAFC (FL100 - FL450) shows no restrictions in the area of the accident.

On the FL100 wind chart, wind was forecast at approximately 330 degrees and 10 kt, as well as a temperature of plus 5 °C.

#### 1.7.5 Aviation weather forecast

Aviation weather forecast for Switzerland, valid from 12-18 UTC:

No restrictions were forecast.

#### 1.7.6 Synoptic reports (Synop) for 12:00 UTC

*Andermatt (1442 m AMSL, 4730 ft AMSL): Wind -, 1/8 6000 ft AGL (10 730 ft AMSL), 50 km, 19 °C / 09 °C*

*Piotta-Airolo (1007 m AMSL, 3303 ft AMSL): 090/10, 2/8 5000 ft AGL (8303 ft AMSL), 30 km, 25 °C / 13 °C*

#### 1.7.7 Automatic measurement network (ANETZ / ENET)

Measurements at 13:10 UTC:

Gütsch (2287 m AMSL, 7503 ft AMSL): 340/7, gusting to 12 kt, 14 °C / 11 °C

Piotta (1007 m AMSL, 3303 ft AMSL): 100/9, gusting to 13 kt, 26 °C / 13 °C, QNH 1019

#### 1.7.8 Weather at the time and location of the accident

The following information on the weather at the time and location of the accident is based on a spatial and chronological interpolation of the observations of different weather stations.

On the basis of the available information, it is possible to conclude that the following weather conditions prevailed at the time and location of the accident:

Weather/cloud	1/8 at 8000 ft AMSL	
Visibility	Over 30 km	
Wind	North wind at 6 – 10 kt, gusting to 15 kt	
Temperature/dewpoint	15 °C / 11 °C	
Atmospheric pressure:	QNH LSZH 1018 hPa, QNH LSZA 1016 hPa	
Hazards:	None detectable	

#### 1.7.9 Astronomical information

Position of the sun: Azimuth: 229° Elevation: 59°

Lighting conditions Daylight

#### 1.7.10 Wind conditions in the Gotthard region

On this afternoon a distinct valley wind circulation prevailed in the Alpine region. At the altitude of the Alpine ridge, there was a north north-westerly wind at a speed of approximately 10 kt.

### 1.8 Aids to navigation

Not applicable.

### 1.9 Communication

Not applicable.

**1.10 Aerodrome information**

Not applicable.

**1.11 Flight recorders**

The devices mentioned below recorded data which could be used to reconstruct the history of the flight.

**1.11.1 Avidyne FlightMax Entegra EX5000C**

The Cirrus SR20 aircraft registration HB-KHA was equipped with a multi-purpose Avidyne FlightMax Entegra EX5000C display with a display of engine data. The following engine values can be displayed and recorded: manifold pressure (MP), revolutions per minute (RPM), fuel flow (FF) and fuel used, exhaust gas temperature (EGT) and cylinder head temperature (CHT).

This system records the flight path coordinates as well as various values entered by the pilot. These include, among others: the baroset, the heading bug or the altitude pre-select.

The aircraft was also equipped with the electronic approach charts option. This option displays navigation and approach charts on a screen.

**1.11.2 Transponder**

The duration of the flight and the transponder code set by the pilot could be taken from the display of the Garmin GTX-330 mode S transponder. (Flight time: 00:05:40, Transponder code: 7000).

**1.12 Wreckage and impact information****1.12.1 Wreckage**

The aircraft was destroyed. The front part of the fuselage exhibited major damage on the left side. The left wing was damaged at the leading edge and on the underside. The right wing was damaged at the leading edge. The tip of the left wing was also damaged, whilst the tip of the right wing remained intact. Both ailerons were undamaged. The engine block and the tail were separated from the fuselage.

The type of deformation of the propeller blades allows the conclusion that the engine was delivering power at the time of the collision with the terrain. The recorded engine data from the FlightMax Entegra EX5000C MFD confirm this.

In addition, the following findings were made on the wreckage:

- After the accident, several switches in the cockpit of the Cirrus SR20, HB-KHA, were operated by the rescuer team. It is certain that the fuel selector and the ignition switch were placed in the OFF position by the rescuer team.
- The throttle was blocked in the full power position.
- The mixture control was pulled out 1 cm.
- The altimeter showed 6460 ft at a QNH of 1024.
- The pre-selected altitude was set to 7500 ft.
- The heading bug was on 125°.
- The flaps were retracted.
- The safety pin to secure the CAPS release was removed.

- The aircraft was equipped with an emergency locator beacon aircraft (ELBA), model ACK E-01, which functioned in the accident.
- The passenger's AMSAFE seatbelt had not been triggered on impact.

#### 1.12.2 Impact

On impact with the rocky slope, the aircraft was pitched up and was banked approximately 30° to 40° to the right. First, the right elevator surface came into contact with a rock and the corresponding trim tab was torn off. Five metres further on, the main landing gear touched the ground for the first time; 25 metres further on the aircraft collided with a rock wall before slipping back approximately five metres and a few metres to the right.

#### 1.12.3 Site of the accident

The site of the accident is in an alpine, treeless area at the end of a narrow valley, which ends in a caldera approximately 320 metres in diameter. The slope at the point of impact is irregularly raked, grass-covered and interspersed with rocks. The average gradient is approximately 30°. Along the extended flight path the ground is rocky and rises almost vertically. Three high-voltage power lines run through the area. Two of these lines cross the valley 100 metres west of the site of the accident. At their lowest point, the lines are approximately 70-100 metres above the ground. The distance between the masts is approximately 320 metres.

Accident location	Val Tremola, Airolo/TI municipality
Swiss coordinates	686 770 / 156 250
Latitude	N 46° 33' 06"
Longitude	E 08° 34' 12"
Elevation	2030 m AMSL 6660 ft AMSL
Location	10 km north-north-west of Ambri aerodrome
Map of Switzerland	Sheet no. 1251, Val Bedretto, scale 1:25,000

### 1.13 Medical and pathological information

The blood alcohol test was negative. There are no indications that the pilot was suffering any health problems at the time of the accident.

### 1.14 Fire

Fire did not break out.

### 1.15 Survival aspects

#### 1.15.1 General

The accident was survivable only by chance.

#### 1.15.2 Emergency transmitter

The aircraft was equipped with an ACK E-01 emergency locator beacon aircraft (ELBA). The device was installed and transmitted a location signal.

**1.16 Tests and research****1.16.1 AMSAFE safety belts**

It was found that the passenger's AMSAFE seatbelt was not triggered on impact because the plug was not connected to the crash sensor. During the 100-hour check on 28 June 2006, the seats had to be dismantled and the plug of the seat belts became disconnected from the crash sensors.

**1.16.2 Ballistic rescue system**

The aircraft was equipped with a ballistic rescue system (Cirrus Airframe Parachute System – CAPS). This parachute system is triggered by a pyrotechnic charge. A manufacturer's representative is required for deactivation of the system.

In this case, the chief mechanic of the Cirrus Design Corporation Europe came to Ambri two days after the accident to disarm the pyrotechnic charge of the rescue system. An employee of the Swiss Army competency centre for ordnance disposal in Thun also took part in this action.

This type of rescue system is a recent development and it is expected that such equipment will increasingly be used in modern aircraft. In an effort to identify the dangers for rescue workers and to be able to make recommendations for dealing with such a system safely, the Swiss Accident Investigation Board (SAIB) decided to undertake additional clarifications. Since the manufacturer has only issued instructions for dealing with the system after an accident, without dealing with the aspects of a possible fire scenario, extensive clarifications were obtained in cooperation with a government explosives laboratory; these were published in a separate report together with further details and recommendations.

**1.17 Organisational and management information**

The operator of the aircraft was the "Motorfluggruppe Basel". They required in the rental agreement that the pilot take a basic course and an initiation with a flight instructor designated by the flying club. The pilot completed the initiation on the Cirrus SR20 aircraft, registration HB-KHA, on 13 March 2006.

**1.18 Additional information**

Not applicable.

**1.19 Useful or effective investigation techniques**

Not applicable.

## **2 Analysis**

### **2.1 Technical aspects**

#### **2.1.1 General**

The investigation produced no indications of any pre-existing technical faults which might have contributed to the accident.

The engine was delivering power at the time of contact with the terrain. According to the Cirrus SR20 flight manual, the Teledyne Continental IO-360-ES6B engine develops a maximum power of 200 HP at 2700 RPM at sea level in standard atmosphere. According to the manufacturer's information, the same engine at an altitude of 2000 m AMSL under standard conditions develops between 20 and 25 percent less power.

On the basis of the data recorded in the multifunction flight display, it can be concluded that minor horizontal wind speeds prevailed at the time of the accident. Weak downdrafts cannot be excluded.

#### **2.1.2 Safety aspects**

The construction and equipment of the aircraft in the area of the fuselage, the seats and the safety belts are designed to provide a high degree of protection of the occupants in the event of a major impact. This was confirmed in the present accident.

### **2.2 Human and operational aspects**

On the morning of 2 July 2006, the pilot flew to Ambri aerodrome for the first time. After taking off on the return flight in the afternoon, he turned left just 1.5 km after the end of the runway, in the direction of the St. Gotthard pass. According to the visual approach chart, a flight path should be selected which follows the valley for approximately 5.5 km before the left turn (cf. Annex 2). Thus, the pilot refrained from flying down the valley in the Leventina in order to gain altitude.

After passing Airolo, he flew into the narrow Val Tremola much too low. The pilot stated that he had seen the road to the pass at his altitude when he flew into the valley. At its mouth, the Val Tremola is only just about 500 metres wide and at an altitude corresponding to the pass road the end of the valley cannot be seen. At that point in time, it was already impossible to safely make a 180 degree turn.

When the pilot realised that he would not be able to clear the pass, according to his statement he had no choice other than to attempt an emergency landing on the terrain ahead of him. He did not notice that he had passed under two high-voltage power lines.

The chosen flight tactic, to fly low into a valley while climbing, without the possibility of making a 180 degree turn at any time, was dangerous and shows a lack of knowledge of mountain flying.

### 3 Conclusions

#### 3.1 Findings

##### 3.1.1 Technical aspects

- Investigation of the airframe and engine found no evidence of pre-existing defects.
- The pilot and the passenger were secured with four-point safety belts made by AMSAFE which withstood the impact.
- The pilot's AMSAFE seatbelt worked normally, whereas the passenger's belt was not triggered because the corresponding plug was not connected to the crash sensor.

##### 3.1.2 Crew

- The pilot was in possession of the necessary licences for the flight.
- The blood alcohol test was negative.
- There are no indications that the pilot was suffering any health problems at the time of the accident.
- The pilot completed an Alpine initiation on 27 August 2003. According to the flight instructor's statement, the pilot's performance was unsatisfactory and the flight would have had to be repeated. There are no indications that such a repeat has taken place.
- On 13 March 2006, the pilot completed the initiation on the Cirrus SR20 aircraft registration HB-KHA in Basel.
- On 2 July 2006, the pilot landed and took off for the first time at Ambri aerodrome.
- The terrain awareness and warning system (TAWS) was disabled by the pilot before the flight.

##### 3.1.3 History of the flight

- The pilot took off from runway 11 in Ambri and approximately 1.5 km after the end of the runway turned left in the direction of the St. Gotthard pass.
- The Ambri visual approach chart envisages a departure path which follows the valley for approximately 5.5 km before a left turn is initiated.
- The aircraft flew into the Val Tremola at the height of the road to the pass.
- The aircraft passed under two high-voltage power lines and collided with the terrain.
- The weather conditions had no influence on the accident.

### 3.2 Causes

The accident is attributable to the fact that the pilot flew into a narrow valley so low that neither a 180 degree turn nor clearing the pass was possible, resulting in a collision with the terrain.

The following factors contributed to the accident:

- Insufficient knowledge of mountain flying.
- Overestimation of aircraft's flight performance.

Payerne, 5 July 2012

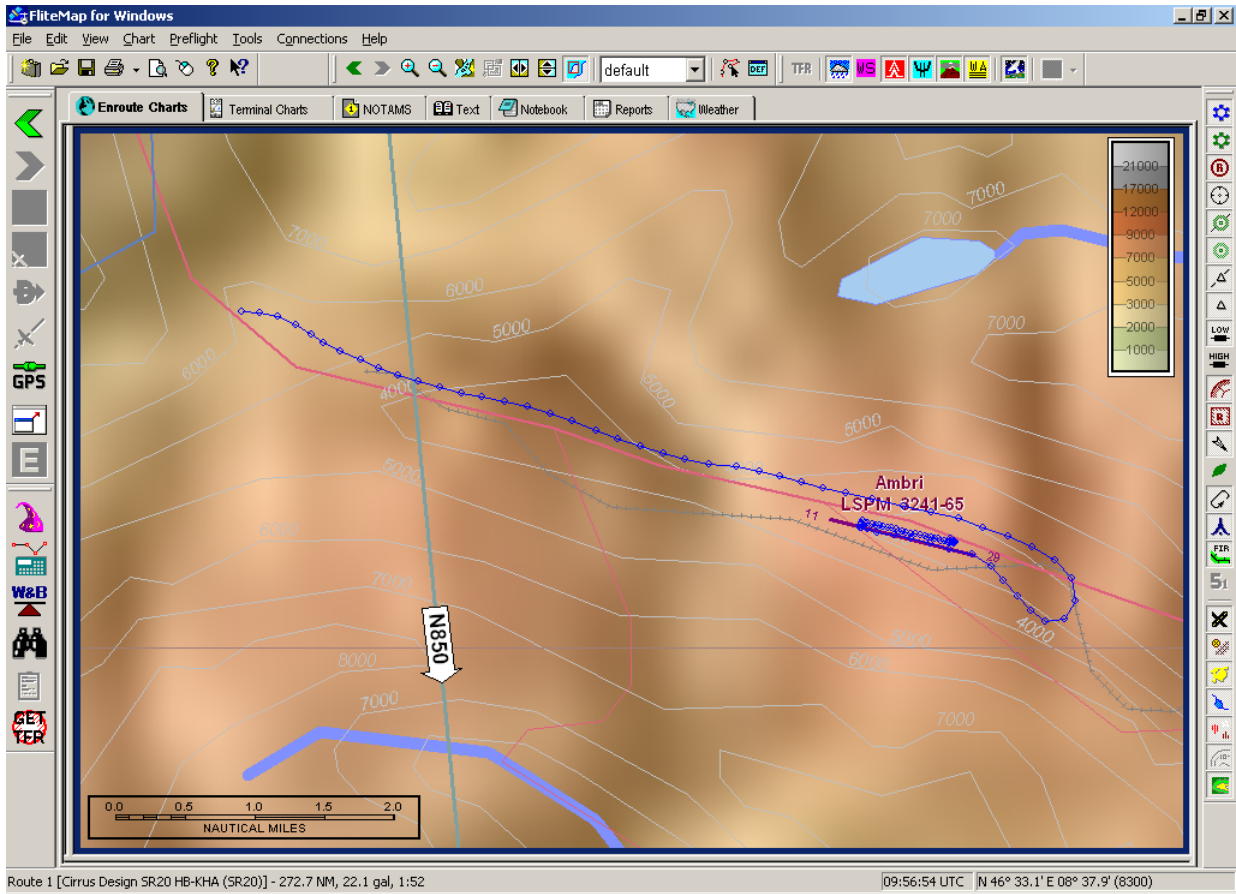
Swiss Accident Investigation Board

*This final report was approved by the management of the Swiss Accident Investigation Board SAIB (Art. 3 para. 4g of the Ordinance on the Organisation of the Swiss Accident Investigation Board of 23 March 2011).*

*Berne, 24 July 2012*

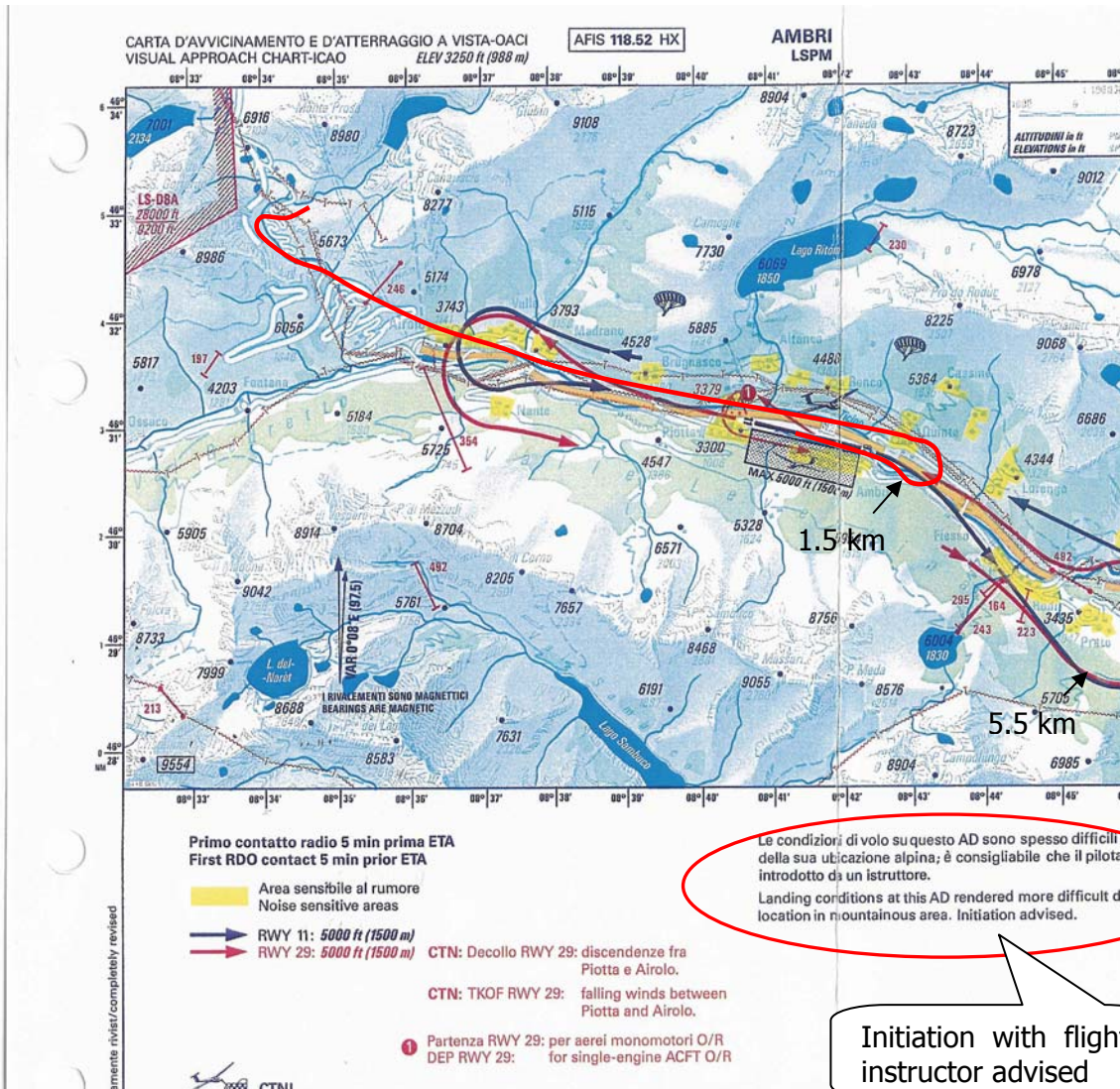


Annex 1



The flight path of HB-KHA is shown on the MFD by the blue dotted line.

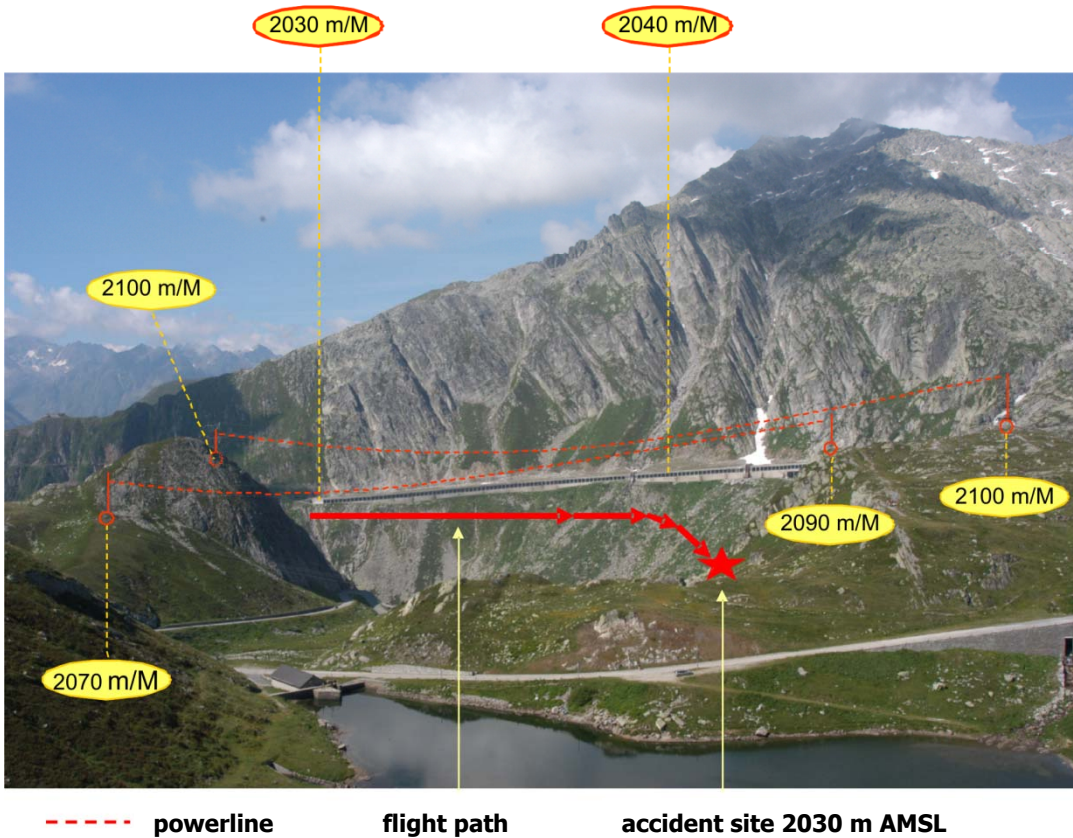
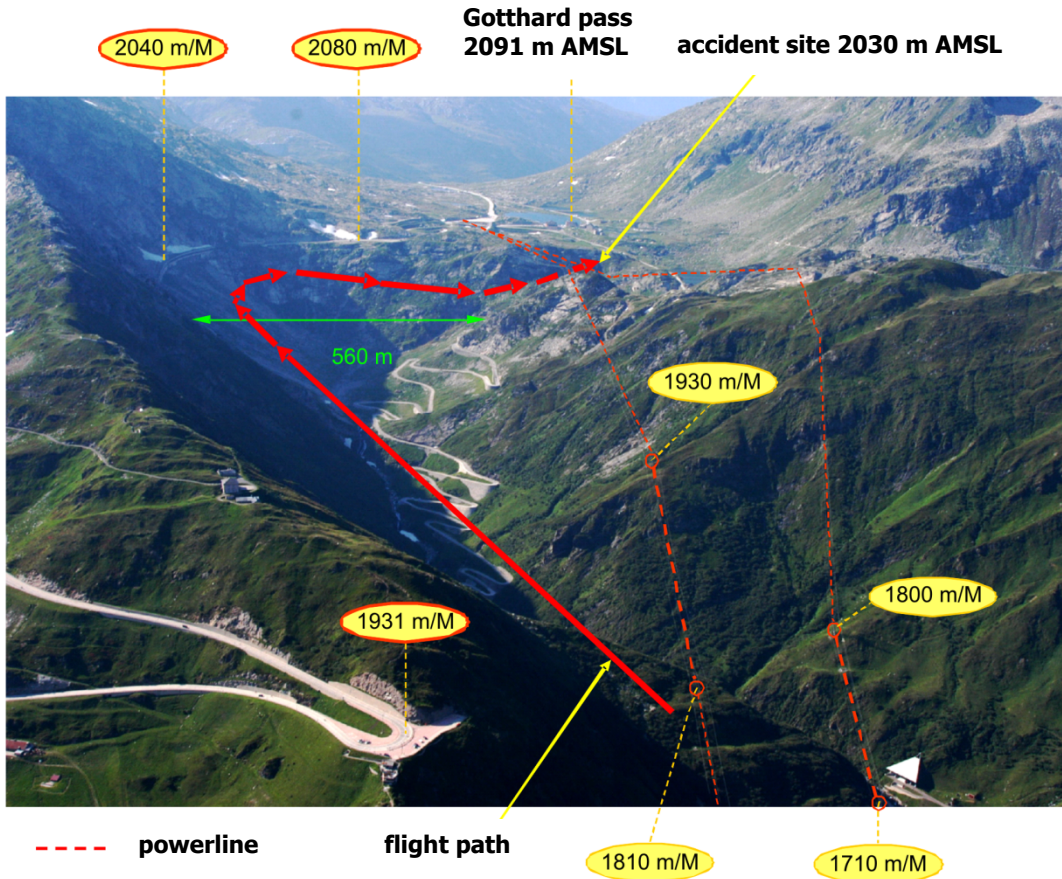
Annex 2



The flight path of HB-KHA is shown in red on the VAC Ambri approach chart.



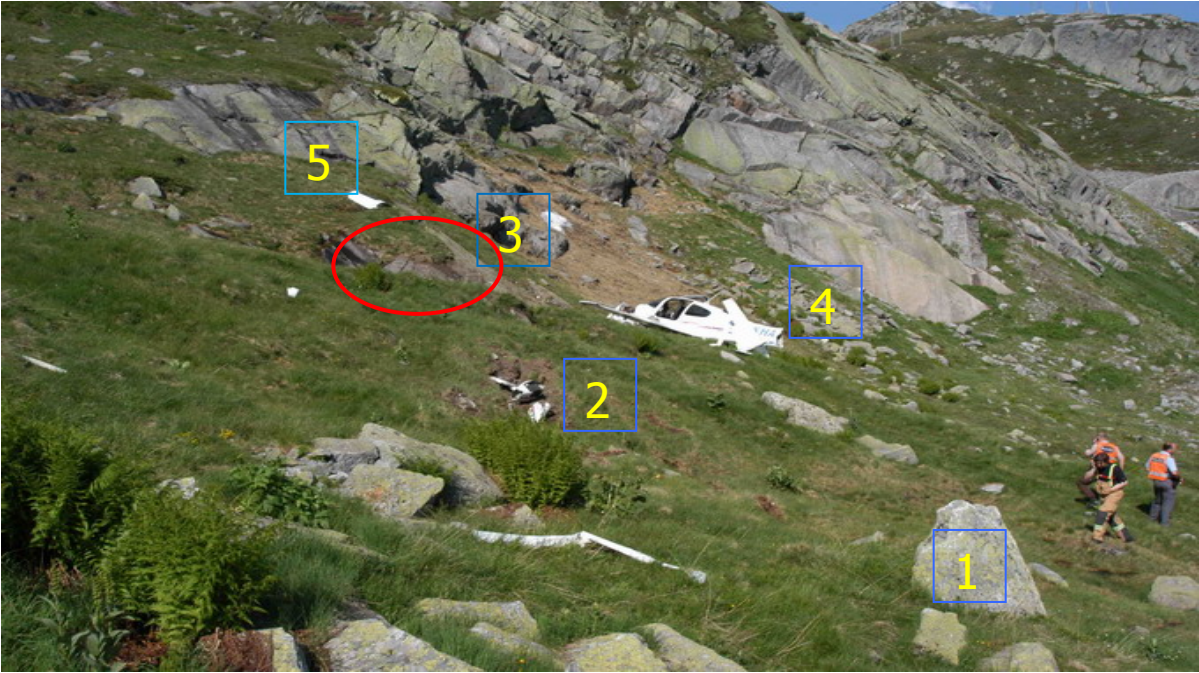
Annex 3



Remark: Altitudes given in m/M are equal to m AMSL



Annex 4



- 1 First contact with the elevator
- 2 Contact, main landing gear
- 3 Impact, rock wall
- 4 Final position
- 5 Left door

