



Schweizerische Eidgenossenschaft  
Confédération suisse  
Confederazione Svizzera  
Confederaziun svizra

Swiss Confederation

Büro für Flugunfalluntersuchungen  
Bureau d'enquête sur les accidents d'aviation  
Ufficio d'inchiesta sugli infortuni aeronautici  
Uffizi d'investigaziun per accidents d'aviatica

Aircraft accident investigation bureau

# **Final Report No. 1874 by the Aircraft Accident Investigation Bureau**

concerning the accident

of the aircraft Beech Super King Air 300LW, D-ICBC

on 14 February 2002

on the Piz Sarsura (20 km NE of Samedan aerodrome),  
Zernez municipality

This report has been prepared solely for the purpose of accident/incident prevention. The legal assessment of accident/incident causes and circumstances is no concern of the investigation (art. 24 of the Air Navigation Law). The masculine form is used exclusively in this report regardless of gender for reasons of data protection.

## Ursachen

Der Unfall ist darauf zurückzuführen, dass die Besatzung des Flugzeugs D-ICBC anlässlich des Anfluges nach Sichtflugregeln auf den Flugplatz Samedan bei kritischen Wetterbedingungen und unter Anwendung einer ungeeigneten Flugtaktik die räumliche Orientierung verlor und das Flugzeug dabei mit dem Gelände kollidierte.

## Final Report

Owner	KRONOSPAN GmbH, D-32839 Steinheim- Sandebeck, Germany
Keeper	KRONOSPAN GmbH, D-32839 Steinheim- Sandebeck, Germany
Aircraft type	Beech Super King Air 300LW
Country of manufacture	USA
Country of registration	German Federal Republic
Registration	D-ICBC
Location	Vadret da Sarsura (Sarsura glacier) below Piz Sarsura; Zernez municipality GR
Date and time	14 February 2002 at 16:20 UTC <sup>1</sup>

### General

#### Brief description

The Beech Super King Air 300W aircraft registration D-ICBC took off from Poznan-Lawiza (EPPO) in Poland with a two-man crew on a flight to Samedan (LSZS), in order to continue its flight the next day with one passenger.

The aircraft had taken off fully refuelled and reached the Italian airspace border in the planned air corridor M736 at flight level 250.

After the crew of D-ICBC had cancelled the IFR flight plan and then made radio contact with Samedan, the aircraft left flight level 170 for the final approach and turned onto the extended centreline of runway 21 in Samedan.

Thereby the aircraft collided with the elevated terrain of the Sarsura glacier at an elevation of 9640 ft AMSL. Both pilots were fatally injured. The aircraft was destroyed.

---

<sup>1</sup> All times in this report are in the coordinated universal time (UTC) format. At the time of the accident, Central European Time (CET) applied as local time (LT) for the region of Switzerland. The relation between LT, CET and UTC is:  $LT = CET = UTC + 1 \text{ h}$ .

## Investigation

The accident took place on 14 February 2002 at 16:20 UTC. After the Samedan aerodrome controller had twice called the aircraft to no avail, he alarmed ACC Zurich. A search was initiated and the aircraft was found the next day.

The AAIB opened an investigation on 15 February 2002. On 16 February 2002, two AAIB investigators with two rescue specialists from the Swiss Alpenclub (SAC) flew to the site of the accident for an initial inspection. The wreck could not be recovered until 26 March 2002 because of the weather conditions.

## 1 Factual Information

### 1.1 History of flight

#### 1.1.1 Pre-flight history

The aircraft Beech Super King Air 300LW with the registration D-ICBC was being used as a business aircraft by the Kronospan company. It was stationed in a hangar on Lawica aerodrome near the city of Poznan in Poland. The aircraft was privately operated by the Polish subsidiary Polspan in Szczecinek (PL). Polish pilots were employed. The German Federal Ministry for Transport, Construction and Housing had recognised the pilots for operation of the aircraft D-ICBC.

One pilot was specified as the minimum crew for the aircraft D-ICBC. However, the Polspan company generally operated the aircraft with 2 crew members. For the investigation it was assumed that the pilot on the left was commander and pilot flying, as no records are available to give an indication of a different allocation of tasks. In the journey log book, the pilot on the left had previously been entered as commander for the flight on 14 February from EPP0 to LSZS.

The aircraft was in regular use and was operated alternately by two out of three pilots. Twenty-three flights had already been made in February 2002. The commander of the aircraft involved in the accident had started his flying duty on 11 February and since then had completed five flights as commander and four flights as second pilot.

Most of the flights took place on routes which were flown often and which were related to the business of the Kronospan company. The flight to and from Samedan was a mission to collect a member of the managing director's family, as his own aircraft was not available at the time.

#### 1.1.2 History of the flight

D-ICBC was refuelled in Poznan to its maximum capacity of 2040 litres. An ATC flight plan was filed for an IFR flight. After the RENTA waypoint, VFR had actually been entered, but the crew had not filed the flight plan as a Y flight plan, as is prescribed for flights which begin under IFR rules and then end as a VFR flight. However, the flight plan was entered and transmitted as a Y flight plan by the competent unit in Brussels. Take-off time was scheduled for 14:20 UTC. Take-off actually took place at 14:35 UTC.

No details are known about the history of the first part of the flight. The aircraft reached the border with Italian airspace in the planned air corridor M736 at flight level 250. The crew reported at 15:54:14 UTC to Padua ACC, sector LOW NORD on frequency 125.900 MHz:

*"..ua Buongiorno D-ICBC, Flightlevel 250, appro...approaching LIZUM Point"*

The air traffic controller instructed the crew to fly "*LIZUM, LUSIL direct*". The crew confirmed "*LIZUM .... direct DBC*". On enquiring, they received the information that they would be able to descend in about 10 miles. On the radar plot it can be seen that the aircraft did not fly as required direction LUSIL, but turned onto a heading of approximately 240° and was flying in the direction of Samedan.

At 15:59:18 UTC, the clearance to flight level 170 was given; which is the lowest IFR flight level (minimum enroute altitude – MEA) in this area.

At 16:02:03 UTC, the crew of D-ICBC was asked whether they were flying direct to Samedan. This was confirmed by them. They were then requested to report as soon as they wished to change from instrument flight rules to visual flight rules.

At 16:05:16 UTC, the crew change from instrument flight rules to visual flight rules and were requested to contact Samedan Tower on frequency 135.325 MHz, which they did after a brief delay.

The Samedan air traffic controller informed the crew that runway 21 was in use and that the QNH was 1012 hPa. He additionally requested them to report as soon as they flew into the valley.

After leaving flight level 170, the aircraft turned slightly to the right onto a course of approximately 265° and maintained its continuous descent. At 16:11:25 UTC, the aircraft passed flight level 130 and began to turn slowly to the left. This turn brought the aircraft precisely onto the extended centre line of runway 21 in Samedan. The aircraft was last captured by the radar at 16:15:24. The last flight level indicated on the secondary radar was FL 101.

A little later, the aircraft collided with the elevated terrain of the Sarsura glacier at an elevation of 9640 ft AMSL. Both pilots were killed immediately. The aircraft was destroyed.

## 1.2 Injuries to persons

	Crew	Passengers	Third parties
Fatally injured	2	---	---
Seriously injured	---	---	---
Slightly injured or uninjured	---	---	---

## 1.3 Damage to the aircraft

The aircraft was destroyed.

## 1.4 Other damage

Contamination of the glacier by kerosene.

## 1.5 Personnel information

### 1.5.1 Commander

Person	†Polish citizen, born 1957
Licence	Senior Commercial Pilot Licence issued by the Polish Ministry of Transport, validity date 16.06.2002
Ratings	IFR
Registered aircraft types	TS8; TS11; Lim-2; Lim-5; Mig-21; AN-26; PA34; BE30
Medical certificate	Class 1
Last medical examination	17.12.2001, findings: fit
Flying experience	4158:40 h total
on the accident type	1835:10 h
during the last 90 days	84:45 h, all on the type involved in the accident

#### 1.5.1.1 Flying time

On 11 February 2002 the commander made four flights and on 13 February 2002 five flights. On these flights he acted both as commander and as second pilot. On this day the commander landed at 18:10 UTC. On the day of the accident, take-off was scheduled for 14:20 UTC.

### 1.5.2 Second pilot

Person	†Polish citizen, born 1949
Licence	Airline Transport Pilot Licence issued by the Polish Ministry of Transport, validity date 14.03.2002
Ratings	IFR; Flight Instructor (aeroplane instructor rating I)
Aircraft types flown	TS8; Lim-2; Lim-5; UTMiG-15; Mig-21; AN-2; PZL-104; I-22; PA34; YAK-40; BE30
Medical certificate	Class 1
Last medical examination	14.12.2001, findings: fit

**1.6 Aircraft information**

## 1.6.1

## General

Type	Beech Super King Air 300LW
Manufacturer	Raytheon Aircraft Company
Registration	D-ICBC
Characteristics	Conventional aircraft; twin-engined, cantilever low-wing, fully metal construction with T-tail
Year of construction	1993
Serial number	FA-227
Engine	2 turbo-prop engines, Pratt & Whitney Canada, Model PT6A-60A
Propeller	2 propellers, Hartzell 4-blade, HC-B4MP-3B (hub) with M10476NK (blades)
Equipment	Equipped for flights under instrument flight rules and additionally with FMS and radio altimeter
Approval	Transport of persons class 2
Operating hours	4141:05 h
Mass and centre of gravity	<p>The empty weight and centre of gravity of the aircraft were determined by weighing on 30 November 2001 and were 8939 lbs with an arm of 181.2 inches (basic empty weight).</p> <p>Aircraft D-ICBC was authorised for a maximum permitted take-off mass of 12,500 lbs.</p>
Airworthiness certificate	No. L 19660 issued on 10 January 1995 by the Luftfahrtbundesamt (LBA) Braunschweig
Maintenance	<p>Last phase II inspection on 30.11.2001 by aerodata Braunschweig</p> <p>Last annual check on 01.10.2001 by aerodata Braunschweig</p>
Fuel	Capacity 539 US gallons; Jet A; Jet A-1; Jet B; JP-4; JP-5; JP-8



1.6.2 Engine number 1 (left)

Serial number	PCE 95725
Operating time since new	3973 h
Flying cycles since new	3580
Operating time since installation	477 h
Flying cycles since installation	343

1.6.3 Engine number 2 (right)

Serial number	PCE 95723
Operating time since new	3985 h
Flying cycles since new	3585
Operating time since installation	321 h
Flying cycles since installation	210

1.6.4 Equipment

The following systems were available to the pilots for navigation and communication:

- Single FMS (B-RNAV) Universal UNS 1 M
- Single EFIS Collins EFIS-85B
- Dual VHF COM Collins VHF-22C
- Dual VOR/ILS Collins VIR-32
- Dual DME Collins DME-42
- Single ADF Collins ADF-60A
- Dual Transponder Collins TDR-94
- Single Radio Altimeter Collins ALT-50A
- Single Weather Radar System Collins TWR-805
- Dual Compass System Collins DGS-65
- Single Flight Director / Autopilot System Collins APC-65
- Single ELT Artex 110-6
- Intercom System

### 1.6.5 Mass and centre of gravity

The aircraft had been weighed on 30 November 2001 by the maintenance company. The values established for the empty weight and the centre of gravity had been entered in the aircraft flight manual (AFM).

According to information from the operator, the aircraft had been fully refuelled before the flight to Samedan. The calculations which were made showed that the aircraft was 418 lbs overloaded on take-off from Poznan. The centre of gravity was within the prescribed limits.

From the available documentation, it can be calculated that at the time of the accident the aircraft had a mass of approximately 11,600 lbs and that the centre of gravity was at an arm of 190.4 inches. Thus at the time of the accident the mass and centre of gravity were within the limits laid down in the aircraft flight manual.

## 1.7 Meteorological information

### 1.7.1 General weather situation

A small-scale low-pressure area which extended from the western Mediterranean to central France was driving humid air from the south-west towards the Alps. A warm front extended from central France over southern Germany as far as the Balkans.

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

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

Weather/cloud	<p>According to the radar image, the southern edge of the precipitation zone over southern Germany extended about as far as the Oberstdorf locality. According to observation station reports and weather radar, the Engadine was free from precipitation. On ridges and crests, weak snow showers could be triggered by lift.</p> <p>In the area of the accident, 2-4/8, base at 6500 ft AMSL, 8/8 base at 8000-9000 ft AMSL</p> <p>In the upper Engadine, 2-4/8, base at 9000 ft AMSL, 8/8 base at 12 000 ft AMSL</p> <p>In the lower Engadine, 8/8 base at 8000-9000 ft AMSL</p> <p>Over Innsbruck (A) 3/8 base 3800 ft AMSL, 7/8 base 12 900 ft AMSL</p> <p>Over Kufstein (A), 8/8 base around 3000 ft AMSL</p>
Visibility	<p>In the Engadine about 15 km, in the area of the accident diffuse visibility, probably even fog</p>

Wind	150 degrees, 8-12 knots
Temperature/dewpoint	-6 °C / -8 °C; altitude of zero degree level: 6000 ft AMSL
Atmospheric pressure	QNH Samedan 1012 hPa QNH LSZH 1014 hPa QNH LSZA 1015 hPa
Risks	Diffuse visibility conditions above snow-covered surfaces
Position of the sun	Azimuth: 244°                      Elevation: 6°
Comments	In association with the warm front over southern Germany, a zone with weak precipitation extended from the Black Forest over Lake Constance as far as Kufstein.
GAFOR	The aviation weather forecast for general aviation (GAFOR) Switzerland on 14 February 2002, valid from 12:00 UTC to 18:00 UTC, was as follows for the relevant routes:  92 Bad Ragaz – Lenzerheide – Julierpass – Samedan with a reference altitude of 7500 ft AMSL: MXX  93 Samedan – Malojapass – Menaggio – Lugano with a reference altitude of 6200 ft AMSL: XXX

### 1.7.3 Weather according to witness statements

Witness A in the area of Susch (translated):

*"...The sky was completely overcast, i.e. 8/8. There were clouds, no fog. The cloud cover was at a height of about 2000 m above sea level. From the Flüelapass in the Val Susascu and from the Val Sarsura a snow front was pushing towards the valley.... In the valley, visibility was good, no adverse effects. In the Piz dal Ras area, as I said, a snow front was pushing towards the valley. Visibility in this locality was minimal... In the upper Engadine direction, the valley was indeed overcast but the cloud base was above the peaks of the mountains."*

Witness B in the area of Scuol (flown over by the aircraft approximately 7 minutes before the accident; translated):

*"..I tried to catch sight of the aircraft, but couldn't see it because of the layer of fog above me... Because of the noise, I knew that it was not flying very high. I estimate its altitude was between 2500 and 3000m asl... From my position I could see the Chamanna Naluns (2370 m asl). The full cover of fog was only a little above this point. I estimate that this was at approximately 2400 – 2500 metres. The cover extended over the entire lower Engadine... Visibility below the fog base was more than 10 km."*

A pilot who had landed in Samedan approximately 1 hour after the accident reported that there had been a closed cloud layer over the Zurich sector at FL 130. This pilot then made an approach to Samedan aerodrome under visual flight rules. In the process he observed a snow shower in the direction of Zernez. According to his information, the valley above Samedan was for the most part clear.

#### 1.7.4 Aerodrome weather forecast and aerodrome weather report

A collection of aerodrome weather reports (METAR) and aerodrome weather forecasts (TAF) for Innsbruck, Zurich, Milan Malpensa and Milan Linate was found in the aircraft. In addition, the phrase "*REPORT MISSING SA LSZS=*" was marked on this printout. The reason for this circumstance is that the weather observed at Samedan aerodrome is not disseminated. Actual weather data and a forecast could only be acquired by contacting Samedan aerodrome.

### 1.8 Aids to navigation

Not relevant.

### 1.9 Communication

Radiocommunication was investigated from the hand-over to Padua ACC up to the time of the accident. Radiocommunication with Padua ACC sector LOW NORD took place on frequency 125.900 MHz. The crew was cleared to flight level 170, which is the lowest IFR flight level (minimum enroute altitude – MEA) in this area. The crew was requested to report as soon as they wished to change to visual flight rules. After the crew had changed to visual flight rules, they were requested to contact Samedan Tower on 135.320 MHz.

After contact was made, the aerodrome controller informed the crew of the QNH and the runway in use. He also instructed the crew to report again as soon as they would fly into the valley.

The crew confirmed the runway and the QNH. There was no further report from the crew of D-ICBC. The Samedan aerodrome controller called the aircraft two more times, but did not receive an answer.

According to the aerodrome controller's statements, "the pilots' tone was calm and without any audible nervousness".

### 1.10 Aerodrome information

Destination airport Samedan LSZS

Samedan aerodrome is located at 1707 m/M (5600 ft AMSL) in a valley surrounded by high mountains. The maximum elevation figure on the ICAO Switzerland chart is specified as 11 800 ft AMSL. Samedan aerodrome is also located in a zone of magnetic interference. The aerodrome does not have an instrument landing system and can be approached under visual flight rules only.

The runway length is 1800 m and the runway orientation corresponds to a magnetic heading of 208/028°. It must be noted in this context that the orientation of the runway does not correspond perfectly to the geographical orientation of the valley. In particular, until after Zernez, which is about 25 km from the threshold of the runway, the valley runs in a north-easterly direction of approximately 045° and near Zernez abruptly changes direction to the north (see Annex 1).

## 1.11 Flight recorders

Not installed; not required.

## 1.12 Wreckage and impact information

### 1.12.1 The site of the accident

The aircraft impacted the gently inclined Sarsura glacier without any substantial bank angle and at a small angle. At the site of the accident, the depth of the slightly compressed snow was approximately 2 m (approximately 60 cm of fresh snow).

The initial impact took place at an elevation of 2938 m/M, 240 metres below the eastern peak of the Piz Sarsura (3178 m/M) at coordinates 796 000 / 174 800 (sheet Zernez No. 1218 of the 1:25,000 national map of Switzerland). This point was located along the extended centreline of runway 21 of Samedan aerodrome. The distance to the threshold of runway 21 was 19 km.

The approximate direction of impact was 210°, which corresponds fairly accurately with the orientation of runway 21.

A calculation showed that the site of the accident was on an approach angle of 4° in relation to the threshold of runway 21 (see Annex 6).

The fuselage and separated structural parts of the aircraft were concentrated in the final position in a debris field.

### 1.12.2 The wreckage

#### 1.12.2.1 Findings at the site of the accident at the time of recovery

##### 1.12.2.1.1 Wings

The right wing was partially torn off from the fuselage, but lay as a compact component together with the aileron and the flap near the fuselage. The aileron position was neutral. The flaps were partially extended. The engine was torn from its mount. The engine cowl was destroyed. The wing tank was destroyed.

The left wing was torn from the fuselage and turned rearward to the left from the engine cowl. The wing was considerably rotated upward inside. The aileron and the flap were still partly hanging from the wing. The position before impact could not be determined.

##### 1.12.2.1.2 Elevator

Elevator surfaces: parts of the leading edges were undamaged.

Some of the elevator surfaces were bent as a result of multiple impacts before the aircraft came to a standstill.

The left elevator was broken in the middle and the elevator position and trim were neutral.

The right elevator was torn off near the trim tab; the elevator was up 15° and the trim was neutral.

#### 1.12.2.1.3 Rudder

The rudder was deflected 15° to the right and the trim tab was at 4° to the left. The rudder control and rudder exhibited slight to moderate damage.

#### 1.12.2.1.4 Fuselage

The cockpit area was badly damaged and the nosecone was shattered.

The fuselage tube was torn in the rear section near the pressure bulkhead.

The top of the fuselage was practically intact over the front section and damaged by the elevator assembly over the rear section.

The front section of the underside of the fuselage was badly damaged as far back as to the wings. Behind the trailing edge of the wings, the fuselage was virtually undamaged.

#### 1.12.2.1.5 Cockpit area

Various navigation aids were found in the cockpit. For Samedan, the vicinity chart of the route manual was found. No VFR approach chart for Samedan or chart for VFR navigation in the corresponding area was found.

As weather information, a printout with METAR and TAF for Innsbruck, Zurich, Milan Malpensa and Milan Linate was found. Moreover, the phrase "REPORT MISSING LSZS=" was on this printout, which indicates that the weather for Samedan was requested but the system did not contain a METAR report.

#### 1.12.2.1.6 Instruments / controls

- Pressurization panel:
  - Pitch trim: OFF
  - Rudder boost: OFF
  - Cabin press: PRESS
  - Pressurization controller: Was set to a cabin pressure of 5000 ft.
- EFIS panel: EADI ON  
EHSI / MFD ON
- Power lever box: Both power levers, position just above idle  
Both propeller levers full forward  
Both conditioning levers in low idle position  
Aileron trim 0°  
Rudder trim 0°  
Flaps lever in the APPROACH notch  
Indicator TAKEOFF AND APPROACH

#### 1.12.2.2 Findings on the wreck during the investigation

The wreck was examined after it had been recovered. In addition, a forensic examination of various instruments and equipment was carried out in order to determine the speed and attitude of the aircraft immediately before impact and to establish the operational status of the autopilot. The results of these examinations are listed under section 1.16.

The lower part of the instrument panel (subpanel) was so badly damaged that for the most part no conclusions could be reached concerning the switch positions which were found.

### 1.13 Medical and pathological information

Autopsies were performed on the commander and the second pilot. No medical or toxicological findings were made which might have contributed to the accident.

### 1.14 Fire

There was no fire.

### 1.15 Survival aspects

#### 1.15.1 Survivability of the accident

The impact with the glacier occurred at a speed of approximately 200 kt. The resulting forces were not survivable for the crew.

#### 1.15.2 Alarm and rescue

After the first contact between the crew of aircraft D-ICBC and the Samedan aerodrome controller, the latter was expecting the crew to report as soon as they flew into the valley. Since this message did not arrive, he called aircraft D-ICBC but received no reply. After the aerodrome controller had called the aircraft twice to no avail, he raised the alarm with ACC Zurich. The REGA operations centre was then informed. At this time, no signal from an emergency transmitter (ELT) was being received.

The search by the FOCA's Search and Rescue Service (SAR) could not be started until the following day because of weather conditions. Just before 13:00 LT on 15 February 2002, a FOCA SAR helicopter was able to locate the wreck on the glacier, as an ELT signal had been received in the meantime which permitted to locate the ELT. The REGA, supported by rescuers who had flown to the site of the crash in an air force Super Puma helicopter, were only able to confirm the death of the two crew members. Because of the difficult weather conditions, the bodies could only be recovered by the AAIB the next day.

Because of bad weather and substantial snowfall, it was not possible to recover the wreck on the glacier until 26 March 2002. It was possible for two AAIB investigators to dismantle the wreck and fly it into the valley, with the help of the air force salvage detachment, the SAC rescue service and a private helicopter company. The debris was loaded into containers and transported to the AAIB hangar for further examination. Examination of the components of the aircraft took place there.

## 1.16 Test and research

### 1.16.1 Forensic investigations

Forensic investigations were carried out on the following instruments and components:

- Autopilot and flight director control panel
- Various displays from the glareshield panel
- Instruments from the left instrument panel
- Instruments from the right instrument panel
- Instruments from the centre instrument panel
- Engine monitoring instruments

The statements below relate to the results of these investigations.

#### 1.16.1.1 Autopilot und flight director control panel

At the time of the accident, the indications "AP" and "TRIM" were displayed on the autopilot control panel (white display: autopilot elevator trim-in-motion).

At the time of the accident, the indications "HDG", "YAW", "ALT", "ARM" and "AP" were displayed on the flight director control panel.

#### 1.16.1.2 Various displays from the glareshield panel

In the case of the following displays located on the glareshield panel, it was possible to conclude from the forensics that at the time of the accident they were not in operation:

- Master caution LH and RH
- Master warning LH and RH
- Extinguisher push LH and RH
- Discharged LH and RH

#### 1.16.1.3 Instruments from the left instrument panel

Analysis of the turn and slip indicator showed a turn to the right around the vertical axis.

The compass selector switch was in the "gyro slave" position and was broken off at the top.

The altimeter indicator showed a value of approximately 9650 ft at the time of the accident.

From the radio magnetic indicator (RMI) it was possible to infer that the compass card was at approximately 205° at the time of the accident. The position of the two selector switches for pointers 1 and 2 could not be determined with certainty.

The following indicators incorporated in the panel "FMS HDG"; "FMS XTK"; "FMS APR"; "FMS WPT", "GPS INTEG" and "FMS MSG" were not in operation at the time of the accident.

The "CPMST" indicator was in operation at the time of the accident.



## 1.16.1.4 Instruments from the right instrument panel

Analysis of the turn and slip indicator showed a turn to the right around the vertical axis.

The compass selector switch was in the "gyro slave" position.

The altimeter display at the time of accident showed a value of approximately 9650 ft and in the pressure window a value of 1011 mb was set.

From the radio magnetic indicator (RMI) it was possible to infer that the compass card was at approximately 205° at the time of the accident. The position of the two selector switches for pointers 1 and 2 could not be determined with certainty.

The indicators for "ALT ALERT" and "DH" were in operation at the time of the accident.

## 1.16.1.5 Instruments from the centre instrument panel excluding the engine monitoring instruments

It was possible to determine the following switch positions on the radio and navigation equipment:

Equipment:	Switch position:
- COM 1 controller (LH)	ON
- COM 2 controller (RH)	ON
- NAV 1 controller (LH)	HLD
- NAV 2 controller (RH)	ON
- ATC controller (transponder)	ALT

Analysis of the altitude selector showed that it was set to a value of 9000 ft and that the "ALT ALERT" indicator was in operation at the time of the accident.

The switch positions on the weather radar panel at the time of the accident were as follows:

Switch:	Switch position:
- MODE	WX
- GAIN	CAL-1
- RANGE	TURB 50

No reliable conclusions could be reached about the other switches and controls.

Examination of the warning panel indicated that none of the warning lamps were in operation at the time of the accident.

Analysis of the caution/advisory panel showed that the following indicators were in operation at the time of the accident:

- L DC GEN
- L PROP PITCH
- R PROP PITCH
- L ENG ANTI ICE
- R ENG ANTI ICE

None of the other indicators was in operation at the time of the accident.

#### 1.16.1.6 Engine monitoring instruments

The table below shows the values of the different instruments as it was possible to determine during the investigation:

Instrument	Indication found	Indication at the time of the accident based on the forensic examination
ITT indicator LH	0	no traces
ITT indicator RH	0	no traces
Torque indicator LH	69%	79%
Torque Indicator RH	35%	40% direction end stop
Prop RPM LH	1600 RPM	1500-1600 RPM
Prop RPM RH	1900 RPM	no traces
Turbine RPM LH		no traces
Turbine RPM RH		95% not confirmed
Fuel flow indicator LH	250 PPH	200 – 300 PPH
Fuel flow indicator RH	260 PPH	no traces
Oil temperature and pressure indicator LH	Pointer moving freely	Oil pressure 120-140 PSI Oil temperature no traces
Oil temperature and pressure indicator RH	Pointer moving freely	Oil pressure no traces Oil temperature no traces

#### 1.16.1 Examination of the ELT

No ELT signal was received immediately after the accident nor was any signal received during the morning of the following day. The Cospas-Sarsat system did not receive any signal either. Not until 15 February 2002 at 11:25 (LT) did an FOCA SAR helicopter receive the signal from an ELT and a cross-bearing could be taken. However, the weather conditions precluded any approach to the site of the accident. The crew of the helicopter did subsequently manage to locate the wreck on the glacier using their direction finder.

After the wreck had been recovered, the ELT was removed and sent to the manufacturer in order to clarify the precise circumstances of the limited functionality of the ELT.

Examination of the ELT revealed no technical problems and the ELT functioned perfectly even at low temperatures.

**1.17 Organisational and management information**

The aircraft D-ICBC is owned by the company Kronospan GmbH in Steinheim-Sandebeck and was based in Poznan (Poland). The aircraft was operated on a private basis by the Polish subsidiary Polspan in Szczecinek.

The aircraft was flown by Polish crews. Their Polish licences were recognised by the German Federal Ministry of Transport. The relevant certificate was issued on 25 September 1997 and was valid until further notice.

**1.18 Additional information**

None

**1.19 Useful or effective investigation techniques**

No new techniques applied.

## 2 Analysis

### 2.1 Technical aspects

#### 2.1.1 Engines and propellers

The analysis by the engine manufacturer and the damage to the propellers indicated that both engines were providing power at the time of impact. Power was in the middle range.

There are no indications whatsoever of any loss of power by one of the engines.

All the damage observed was assessed to be a result of the impact of the engines and propellers.

At the time of the accident, there were no warnings in operation in connection with the engines. The two indicators (status annunciators) L PROP PITCH and R PROP PITCH lit up during the accident. This indication was triggered by the propellers which were torn off on impact.

#### 2.1.2 Flight controls

Some of the flight controls were completely destroyed. The parts of the controls which were found did not give any indication of problems or malfunctions of the control system in either the roll or pitch axis.

The flaps were set to the first position "Approach". This also corresponds to the flight phase with the appropriate reduced power setting and the descent in view of the landing in a few minutes.

#### 2.1.3 Maintenance

An inspection of the available maintenance documentation showed that the appropriate maintenance work was performed regularly on the aircraft. There are no indications in the maintenance documents or the onboard documentation of defects which had not been rectified.

### 2.2 Human and operational aspects

Samedan aerodrome did not have an instrument landing system and could only be approached under visual flight rules. This required a transition from a flight under instrument flight rules to a flight under visual flight rules. This transition might not be possible under poor weather conditions under certain circumstances.

From the documentation available to the investigating authorities, it was not apparent that the crew had previously made flights to Samedan. The crew often flew to Salzburg, which is also surrounded by elevated terrain but which had an instrument approach.

In the cockpit of the aircraft, no documentation was found as it would be required for approaches under visual flight rules, such as, for example, the ICAO chart of Switzerland and the corresponding visual approach charts for Samedan. Only the vicinity chart from the route manual used by the crew was found. Moreover, the site of the accident is located outside the mapped section of this chart (see Annex 3).

The visual flight documentation contains much information which facilitates or enables the crew to assess the geographical and topographical conditions. If they had used the ICAO chart, among other things, the crew would have been able to realise that they had already descended below the maximum elevation figure for the entire area over which they were flying. Moreover, from the ICAO chart it would have been possible to realise that the runway direction did not correspond to the orientation of the valley and that there was terrain at an elevation of over 3000 m/M on the extended centreline of the runway being approached (see Annexes 1 and 2).

It is questionable how a complete flight preparation would have been carried out without such documentation. In addition, no weather documentation for Samedan was found on board.

Analysis of the radar plots permits the conclusion that the crew were following the extended centreline of the runway using their navigation equipment and were continuously descending as they did so.

The extent to which the crew had the necessary visual references during this phase of the approach to Samedan according to visual flight rules must remain open.

In this context, it must be borne in mind that the visibility and weather conditions described by the witnesses presumably allowed a degree of visibility, but that because of the time of day and the precipitation this might have created a deceptive impression of a descent between two mountains. Subsequently the rising glacier, with a covering of fresh snow, might not have been recognised.

The visual flight tactics for the descent adopted by the crew in unknown terrain under critical weather conditions indicates limited experience of flying in mountains.

### **3 Conclusions**

#### **3.1 Findings**

- The pilot was in possession of a senior commercial pilots licence, issued by the Polish authorities.
- There are no indications of any health problems affecting the pilot during the flight involved in the accident.
- The aircraft was admitted for traffic.
- The investigation produced no indications of any pre-existing technical faults which might have caused the accident.
- The mass and centre of gravity at the time of the accident were within the prescribed limits.
- As weather information, only METAR and TAF for Innsbruck, Zurich, Milan Malpensa and Milan Linate were found.
- No documentation for visual approaches to Samedan were found in the aircraft.
- In the documentation which was available to the investigators, it was not evident that any of the crew members had previously flown to Samedan.

#### **3.2 Causes**

The accident is caused by the fact that the crew on its approach according to visual flight rules to Samedan aerodrome, under critical weather conditions and applying inappropriate flying tactics lost the situational awareness and thereby the aircraft D-ICBC collided with the terrain.

**Appendices**

- Appendix 1 Section of the ICAO chart for Switzerland
- Appendix 2 VFR area chart and visual approach chart VAC 9 Samedan from AIP
- Appendix 3 Vicinity chart 19-1 LSZS 14 Sept. 2001
- Appendix 4 View of the accident site
- Appendix 5 View of the wreck
- Appendix 6 Profile of the terrain
- Appendix 7 skyguide radar plot

Berne, 28 December 2005

Aircraft Accident Investigation Bureau

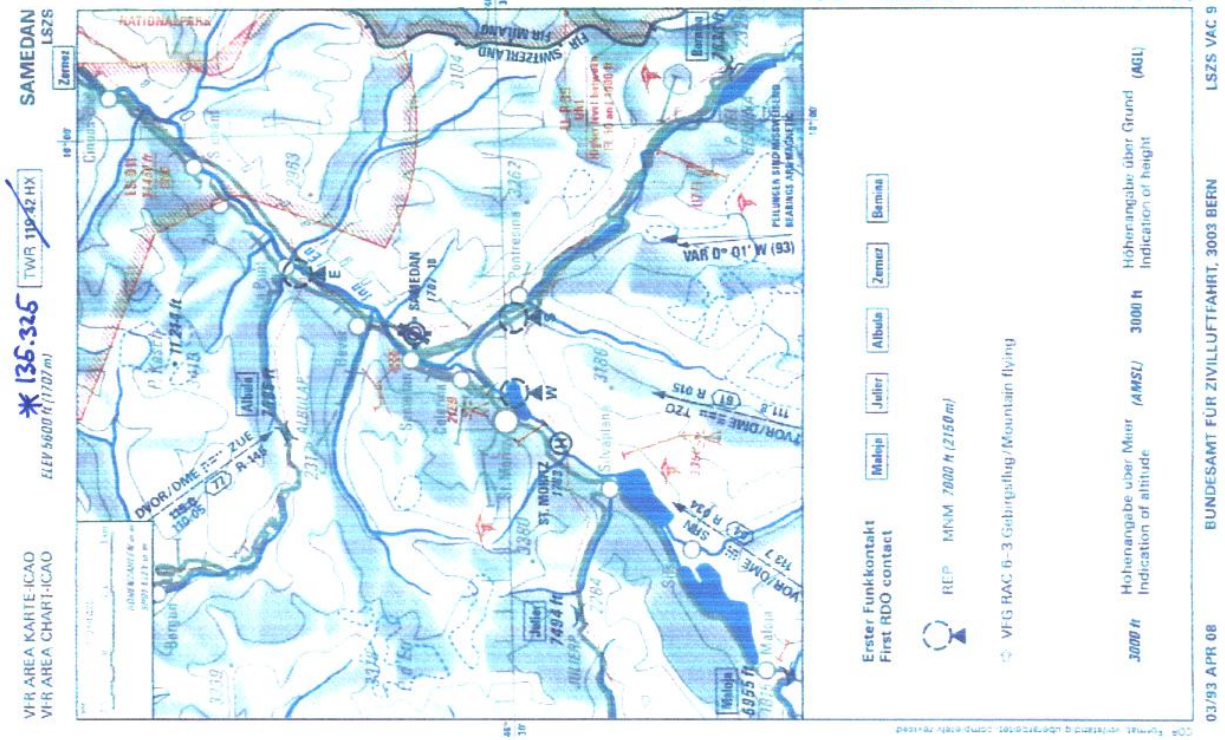
**This report has been prepared solely for the purpose of accident/incident prevention. The legal assessment of accident/incident causes and circumstances is no concern of the investigation (Art. 24 of the Air Navigation Law). The masculine form is used exclusively in this report regardless of gender for reasons of data protection.**

Ausschnitt ICAO Karte der Schweiz 1: 500 000

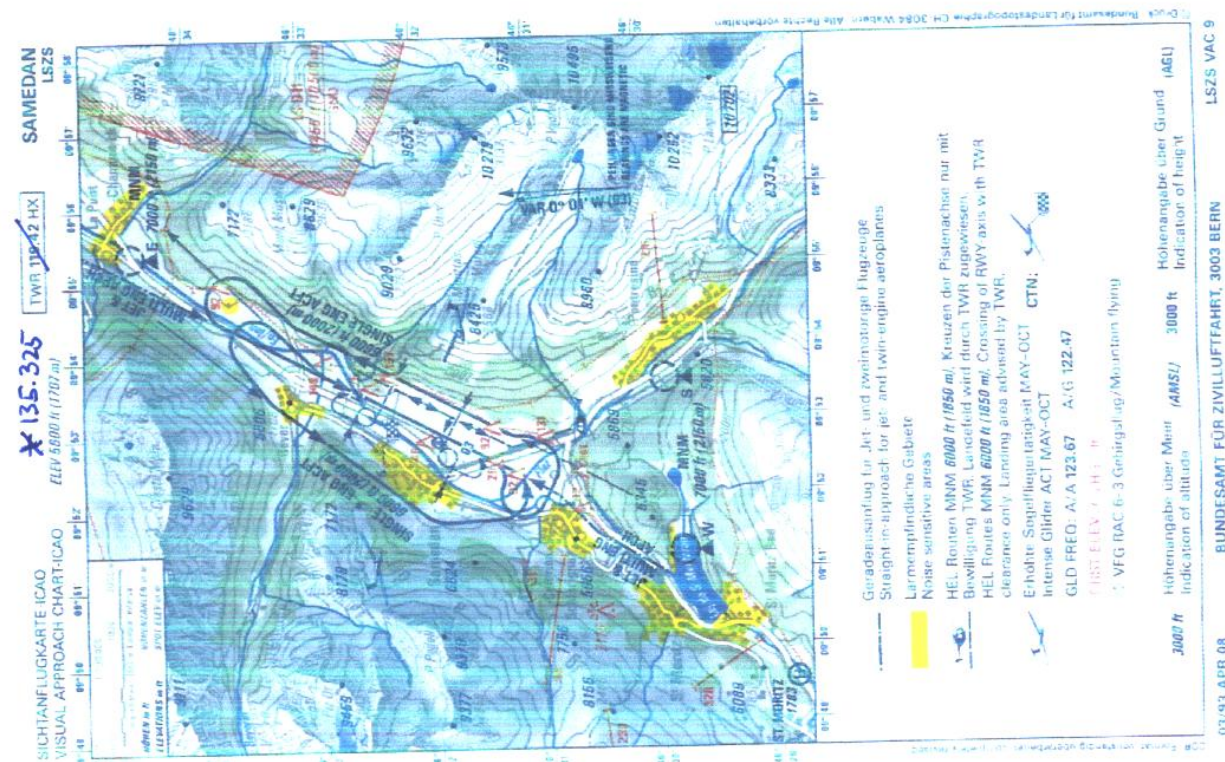




VFR Aera Karte und Sichtanflugkarte Samedan LSZS



\* Handkorrektur lt. AIP VFR AD INFO 4 (07/01 JUL 31)





Ansicht Unfallstelle

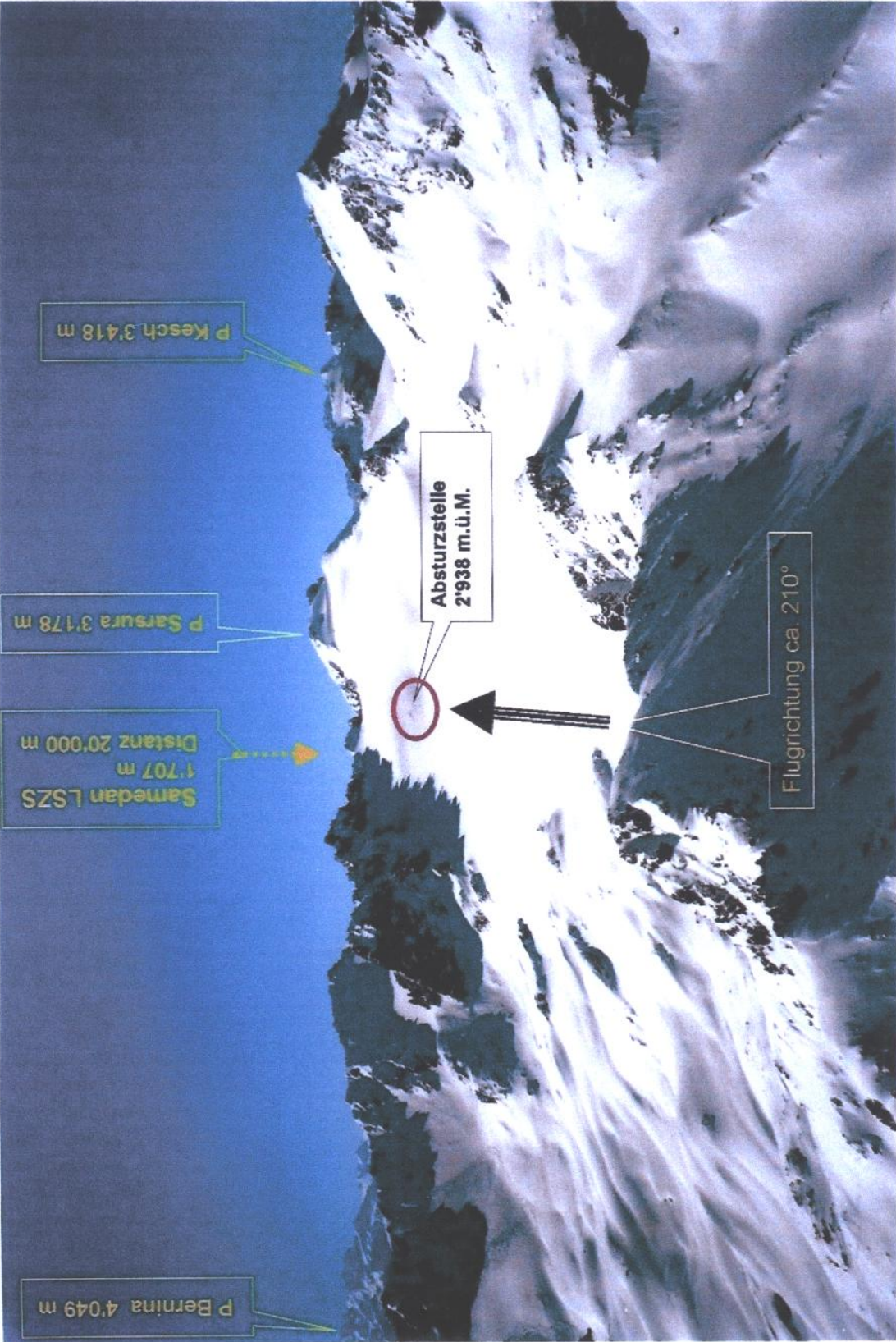
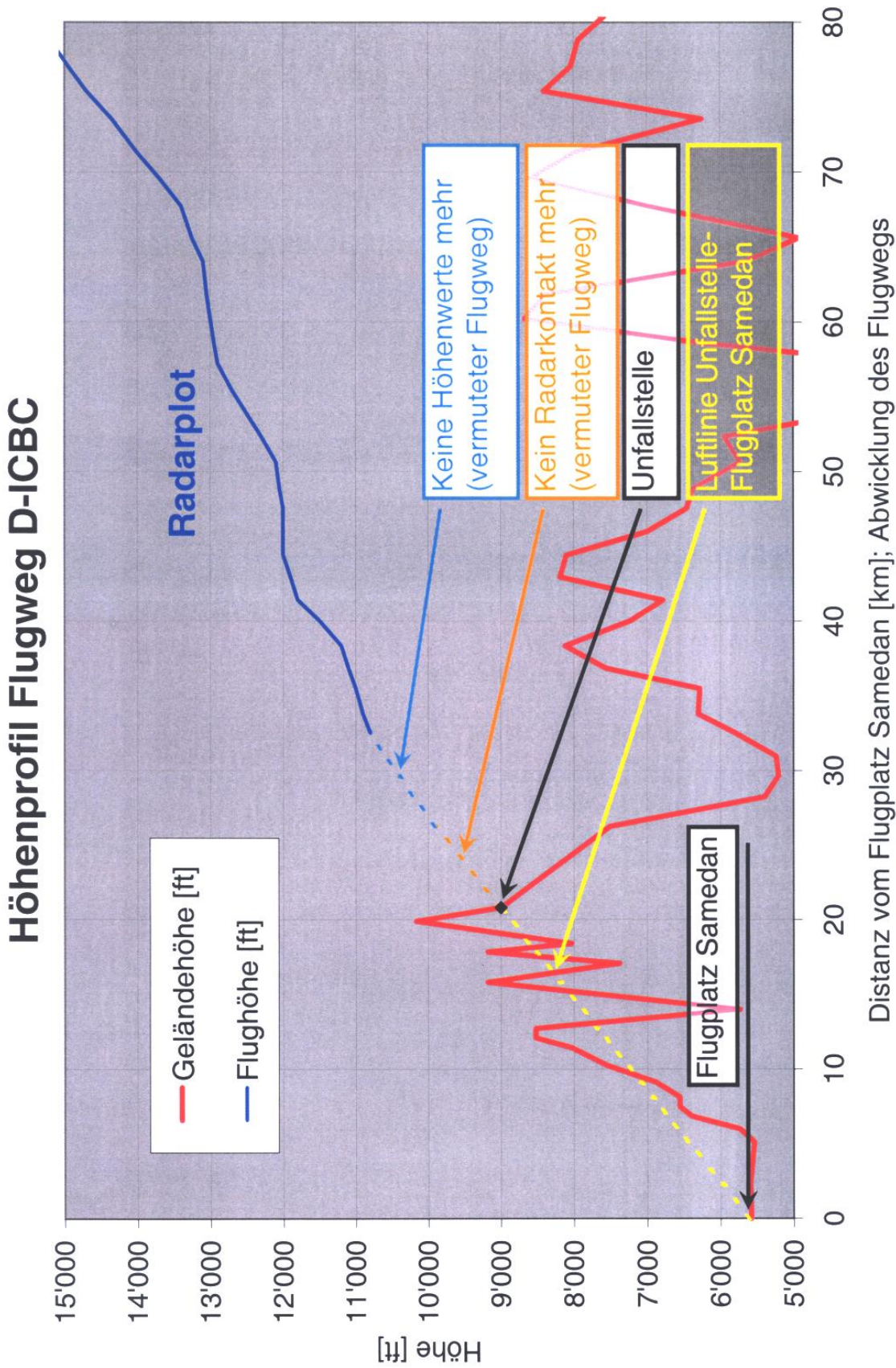


Photo Kantonspolizei GR

**Ansicht Wrack**



Geländeprofil entlang des Flugweges und der Projektion bis zur Piste 21



arcon, 29.07.2005

