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Bureau d'enquête sur les accidents d'aviation BEAA  
Ufficio d'inchiesta sugli infortuni aeronautici UIIA  
Uffizi d'investigaziun per accidents d'aviatica UIAA  
Aircraft Accident Investigation Bureau AAIB

# **Final Report No. 1922 by the Aircraft Accident Investigation Bureau**

concerning the accident

to the aircraft Piper PA-46-350P JetProp, D-EMDB

on 7 April 2004

in the Pradatsch area, Municipality of Madulain/GR

approx. 12 km NE of St. Moritz

**Ursachen**

Der Unfall ist darauf zurückzuführen, dass das Flugzeug beim Versuch, für den Anflug in Sa-medan unter die Wolken zu gelangen, ausser Kontrolle geriet und mit dem Boden kollidierte.

Die Überschreitung der maximal zulässigen Masse und die hecklastige Beladung des Flugzeugs könnten zum Unfall beigetragen haben.

## General Information regarding this Report

This report contains conclusions by the AAIB about circumstances and causes of the investigated accident.

In accordance with Annex 13 of the Convention on International Civil Aviation, dated 7 December 1944, as well as article 24 of the Swiss Air Navigation Law, the sole purpose of the investigation of an aircraft accident or serious incident is to prevent future accidents or serious incidents. The legal appreciation of the circumstances and causes of the accident/serious incident is explicitly not object of the investigation. It is therefore also not the purpose of this report to determine blame or clarify questions of liability.

If this report be used for other purposes than for accident prevention these circumstances have to be duly taken in account.

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

Unless otherwise indicated, all times in this report are indicated in Swiss local time (LT), corresponding at the time of the accident to Central European Summer Time (CEST). The relationship between LT, CEST and universal time co-ordinated (UTC) is as follows:  $LT = CEST = UTC + 2 \text{ h}$ .

The masculine form is used in this report regardless of gender for reasons of data protection.

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## Final Report

Owner	Phoenix Kapitaldienst GmbH, Frankfurt am Main, Germany
Operator	Phoenix Kapitaldienst GmbH, Frankfurt am Main, Germany
Aircraft type	Piper PA-46-350P JetProp
Country of registration	Germany
Registration	D-EMDB
Location	In the Pradatsch area, golf course, Madulain/GR, approx. 12 km NE of St. Moritz
Date and time	7 April 2004, 11:21 LT

### General

#### Brief description

On the flight from Egelsbach/D to Samedan/CH the pilot reported "on top" over Samedan and requested landing clearance. The pilot was flying in an easterly direction, where the cloud cover was broken in places. A few minutes later, eyewitnesses saw the aircraft crash vertically in an uncontrolled attitude.

#### Investigation

The REGA rescue crew arrived at the site of the accident 10 minutes after the crash and the emergency doctor confirmed the deaths of the five occupants of the aircraft. The investigation began the same day at 15:45 LT in cooperation with the Grisons cantonal police and the fire brigade.

The accident is attributable to the fact that during an attempt to get below the clouds for the approach to Samedan, control of the aircraft was lost and it crashed into the ground.

Exceeding the maximum permissible mass and the tail-heavy condition of the aircraft may have contributed to the accident.

## 1 Factual Information

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

#### 1.1.1 Pre-flight history

The aircraft was bought as a Piper PA-46-350P Malibu. In the autumn of 2001 the piston engine was replaced by a turboprop. The turboprop was replaced at the end of 2003. The aircraft was stationed in Egelsbach (DE). Apart from technical flights and ferry flights, it was used by only two pilots, who were each responsible for its preparation. No other persons were employed for this purpose.

In the previous three weeks, the aircraft was flown exclusively by the pilot involved in the accident.

#### 1.1.2 History of flight

Before the flight involved in the accident, the pilot himself had loaded and prepared the aircraft. According to the statement of the official on duty, neither the pilot nor the passengers were behaving conspicuously.

The flight plan envisaged a VFR-IFR-VFR flight from Egelsbach (EDFE), south of Frankfurt, to Samedan (LSZS) in the Engadine. After take-off, the flight was to proceed under VFR (visual flight rules) to the waypoint RID and then to waypoint GERSA under IFR (instrument flight rules). From GERSA it was then planned to continue flying to Samedan under VFR again. The total duration of the flight was indicated in the flight plan as 75 minutes, and the endurance was indicated as 4 hours and 30 minutes.

Take-off took place in Egelsbach at 10:09 LT. At 10:37 LT, the pilot contacted Swiss Radar Lower Sector North on frequency 136.150 MHz as follows: *"... level two one zero inbound Trasadigen"*. He was instructed to continue flying in the direction of GERSA. At 10:45 LT, the pilot contacted Radar Lower Sector South, on frequency 128.050 MHz, and continued flying as far as LUKOM. Based on an instruction from air traffic control, the aircraft left flight level 210 and descended to flight level 170. The pilot was instructed to continue flying direct to Samedan. At 11:10 LT, the pilot changed from instrument flight rules to visual flight rules and signed off from Lower Sector South. He attempted to contact Samedan. Initially, the communication was poor. After several attempts, he made contact at 11:15 LT on the Samedan aerodrome frequency. At 11:18 LT, the pilot reported that he was over the aerodrome and wanted to fly to the east to get below the cloud ceiling. No further radiocommunication took place.

Shortly afterwards, witnesses saw the aircraft fall out of the clouds in an uncontrolled attitude. The aircraft crashed into the ground in a flat spin and with practically no forward motion.

**1.2 Injuries to persons**

	<b>Crew</b>	<b>Passengers</b>	<b>Third parties</b>
Fatally injured	1	4	---
Seriously injured	---	---	---
Slightly injured or uninjured	---	---	---

**1.3 Damage to aircraft**

The aircraft was destroyed.

**1.4 Other damage**

Considerable crop damage was caused at the point of impact. Running out kerosene caused contamination of the soil.

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

Person	German citizen, born 1937
Licence	Private pilot's licence PPL(A), issued by Luftfahrt Bundesamt Deutschland (LBA), period of validity of the licence until 01.02.2009
Ratings:	
Registered aircraft classes	SEP, validity until 01.02.2005
Registered aircraft types	PA46, validity until 01.02.2005 SP(A) IR, validity until 01.02.2005
Medical fitness certificate	Class 2: must wear multifocal spectacles (VML)
Last medical examination	09.01.2004

**1.5.1.1 Flying experience**

Total:	Approx. 2770 hours
on the accident type, piston-engined version:	Approx. 842 hours
on the JetProp version, total:	Approx. 308 hours
on the JetProp version during the last 90 days:	Approx. 24 hours

- 1.5.2 Passengers
- Front right: German citizen, born 1944, no flying experience
- Centre right: German citizen, born 1932, no flying experience
- Rear left: German citizen, born 1964, no flying experience
- Rear right: German citizen, born 2002

## 1.6 Aircraft information

Manufacturer	Piper Aircraft Corporation, USA
Type	Piper PA46-350P JetProp In autumn 2001, the aircraft was converted from piston engine to turboprop engine by means of a supplemental type certificate (STC 00541 SE).
Characteristics	Six-seater single-engined aircraft with pressurised cabin
Year / serial No.:	1988 / 4622004
Engine	Pratt & Whitney Canada PT6A-35, S/N PCE-RR0051
Propeller	Hartzell HC-E4N-31, S/N HH 1263
Equipment	Equipped for flights under instrument flight rules and additionally with 2 GPS plus weather radar and storm-scope
Operating hours	On 01.04.2004: 2473:52 hours
Airworthiness certificate	L 19273 issued on 09.05.1994 by Luftfahrt Bundesamt (LBA) Braunschweig
Maintenance	50 hour check on 01.04.2004 Last annual check and 100 hour check on 27 February 2004
Fuel	Jet A-1
Endurance	Indicated on the ATC flight plan: 4½ hours corresponding to approx.: 151 gal. At the time of the accident: approx. 104.0 gal = 697 lb corresponding to approx. 3¼ hours

Calculation of mass on take-off and at the time of the accident:

<b>Mass</b>	<b>lb</b>	<b>Mass</b>	<b>lb</b>
<i>Revised Empty Mass</i>	3189	<i>Start + Taxi + Runup</i>	-18
<i>Passengers</i>	641	<b>Takeoff Mass</b>	<b>5022</b>
<i>Baggage</i>	198	<i>Climb</i>	- 80
<i>Fuel 151.1 USG</i>	1012	<i>Flight</i>	- 228
<b>Ramp Mass</b>	<b>5040</b>	<b>Mass at the time of the accident</b>	<b>4714</b>

Calculation of centre of gravity on take-off and at the time of the accident:

<b>Item</b>	<b>lb</b>	<b>CG</b>	<b>in-lb</b>
<i>Revised Empty Mass</i>	3189	137.36	438041.04
<i>Pilot + Pass. Front</i>	310	135.50	42005.00
<i>Center Passenger</i>	147	177.00	26019.00
<i>Rear Passengers</i>	184	218.75	40250.00
<i>Fwd Baggage</i>	44	88.60	3898.40
<i>Rear Baggage</i>	154	248.23	38227.42
<i>Fuel Header 11.1 Gal</i>	74	88.60	6556.40
<i>Rest Fuel Wing Start: 140 - 3 Gal</i>	918	150.31	137984.58
<b>Takeoff</b>	<b>5020</b>	<b>145.73</b>	<b>732981.84</b>
<i>Climb + Flight 44 Gal</i>	-295	150.31	-44341.45
<b>At the time of the accident</b>	<b>4725</b>	<b>145.75</b>	<b>688640.39</b>

MTOM 4300 lb

On take-off, the take-off mass was 5020 lb and the centre of gravity was approximately 146 inches.

The result shows that the mass of the aircraft at the time of the accident was outside the envelope.

Extract from the JetProp LLC AFM supplement:

"(...)

*3.33 Intentional spins are prohibited in this airplane. If a spin is inadvertently entered, immediately reduce power to idle, apply full rudder opposite to the direction of rotation and move the control wheel to full forward position while neutralizing the ailerons. (...)*

*4.41 Failure to maintain coordinated flight during power on stalls will markedly increase the tendency to enter a spin. Also, any delay in recovering from a power on stall will markedly increase the tendency to enter a spin. (...)"*

## 1.7 Meteorological information

### 1.7.1 General

The information in sections 1.7.2 to 1.7.5 was provided by MeteoSwiss.

### 1.7.2 General weather situation

An area of intense high pressure had built up over the Atlantic, whilst a low-pressure area had formed from southern Europe, via eastern Europe and as far as northern Europe. In between, relatively humid polar air extending to high altitudes was being conveyed towards the area of the Alps by a west to north-west upper air current.

## 1.7.3 Aviation weather forecast

Aviation weather forecast for Switzerland for Wednesday 7 April 2004, valid from 06:00 to 12:00 UTC (extract):

The depression covering almost all of Europe had filled somewhat. The centre, with a core pressure of 998 hPa, lay over Denmark. It drives humid, high-altitude polar air towards central Europe on west-north-westerly winds.

Clouds (amount, base, ceiling), visibility, weather in the Grisons:

In Nordbünden 5-7/8 base 5000-6000 ft/MSL, occasional snow showers at 3-5/8 base about 3000 ft/MSL.

From Mittelbünden to the Engadin 4-6/8 base 6000-7000 ft/MSL, isolated snow showers at 3-5/8 base about 4000 ft/MSL.

Visibility over 10 km, in snow showers 1-4 km.

Hazards:

Alpine crossings mostly in clouds. Moderate turbulence in the Alps and on the south side of the Alps. In the late morning and at midday, individual Cb/storm cells possible. Widely varying cloud base, changing rapidly, because of showers.

## 1.7.4 GAFOR

GAFOR Switzerland (extract):

06-12 UTC: 82 MDM – 83 XXM – 92 XXM (issued 06:43 LT)

09-15 UTC: 82 MMM – 83 XXX – 92 XXX (issued 10:53 LT)

GAFOR routes	GAFOR criteria	
Route 82 = Weesen – Ragaz	Ceiling > 2000 ft and/or visibility > 8 km	Open (O)
Route 83 = Ragaz – Biasca	Ceiling > 1500 ft and/or visibility > 5 km	Marginal (M)
Route 92 = Ragaz – Samedan	Ceiling > 1000 ft and/or visibility > 2 km	Difficult (D)
	Ceiling < 1000 ft and/or visibility < 2 km	Closed (X)

## 1.7.5 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.

Clouds	Base, 6-7/8 at approx. 9500 ft AMSL Top at approx. 10 500 ft AMSL
Visibility	About 15 km
Wind	North wind at 2 to 5 kt, gusting to approx. 10 kt
Temperature/dewpoint	-01 °C / -08 °C

Atmospheric pressure	QNH LSZH 1010 hPa, QNH LSZA 1004 hPa	
Hazards	Passes from the north in cloud. Locally isolated snow showers with correspondingly reduced visibility.	
Position of the sun	Azimuth: 137°	Elevation: 43°
Wind and temperature in the free atmosphere at 10 000 ft AMSL	280° approx. 18 kts	-14 °C / -17 °C

#### 1.7.6 Weather according to eyewitnesses

Samedan Tower:

*"D-DB we have broken clouds at approximately 4000 feet above the ground, visibility is 15 kilometres."*

Eyewitness No. 1: no information on the weather.

Eyewitness No. 2, in Madulain, approximately 500 m north of the accident location:

*"Visibility conditions were good."*

Eyewitness No. 3: no information on the weather.

Eyewitness No. 4, in Guardaival, approximately 850 m north-west of the accident location:

*"Visibility was good where the aircraft was."*

Eyewitness No. 5: no information on the weather.

Eyewitness No. 6: no information on the weather.

Eyewitness No. 7, in Chamues-ch, approximately 1200 m south-west of the accident location:

*"At this time the weather was fairly clear, there were a lot of clouds with a blue sky in places."*

Eyewitness No. 8, in S-chanf, approximately 4 km north-east of the accident location:

*"At this time, where I was in S-chanf, there was a very strong, gusting north wind. I also noted that very heavy snow clouds were pushing into the upper Engadine from Val Susauna and from the Albula pass. The plane in question was not in these snow clouds, where he might have been hampered. Although there was light blizzard, half the sky was free of clouds. There was no fog at this time. There was bad weather only on the northern side."*

## 1.8 Aids to navigation

The first leg of the flight took place under instrument flight rules (IFR) and was handled by the corresponding air traffic control units. After the change to visual flight rules, navigation aids were no longer involved.

## 1.9 Communication

At 10:37:30 LT, the pilot made contact first with Swiss Radar Lower Sector North (N RE) and later with Lower Sector South (S RE):

10:37:30 D-EMDB *Swiss Radar good morning Delta Echo Mike Delta Bravo level two one zero inbound Trasadingen.*

10:37:37 N RE *Delta Echo Mike Delta Bravo "guten Morgen" identified proceed Trasadingen GERSA.*

10:37:42 D-EMDB *Trasadingen GERSA Delta Delta Bravo*

10:45:15 N RE *Delta Echo Mike Delta Bravo contact Radar on one two eight decimal zero five "tschüss".*

10:45:21 D-EMDB *One two eight zero five "tschüss" Delta Bravo.*

Change of frequency from 136.150 MHz to 128.050 MHz

10:45:33 D-EMDB *Swiss Radar good morning Delta Echo Mike Delta Bravo level two one zero inbound Trasadingen.*

10:45:42 S RE *Delta Echo Mike Delta Bravo "guten Tag" radar contact.*

10:56:30 S RE *Delta Delta Bravo from present inbound LUKOM descend flight level one seven zero.*

10:56:36 D-EMDB *(cut out) ...KOM one seven zero Delta Delta Bravo.*

10:56:39 S RE *That's correct and confirm the point you've been cleared is LUKOM.*

10:56:44 D-EMDB *The point is LUKOM Delta Delta Bravo.*

11:00:50 D-EMDB *Swiss Radar Delta Delta Bravo after LUKOM direct Samedan?*

11:00:55 S RE *Yes, but at flight level one seven zero.*

11:00:59 D-EMDB *Okay, so I descending now to flight level one seven zero is correct?*

11:01:03 S RE *That's correct.*

11:04:23 D-EMDB *Delta Delta Bravo overhead äh ... LUKOM and äh ... level one seven zero.*

11:04:32 S RE *(unreadable) direct äh ... Samedan.*

11:04:35 D-EMDB *Direct Samedan, thank you.*

11:07:38 S RE *Delta Delta Bravo next report when ready to cancel IFR.*

11:07:43 D-EMDB *Delta Delta Bravo*

11:10:02 D-EMDB *Swiss Radar Delta Delta Bravo is able to cancel IFR.*

11:10:07 S RE *Roger Delta Delta Bravo IFR is cancelled at time zero niner (eleven LT) one zero, the QNH Zurich is one zero one zero, QNH Ticino one zero zero four, you may leave the frequency bye-bye.*

11:10:17 D-EMDB *Delta Delta Bravo good-bye.*

The pilot made contact with Samedan Tower at 11:10:40 LT. However, communication was not comprehensible until 11:15 LT. The pilot's voice appeared to be confident and calm:

11:15:00 D-EMDB *Samedan Tower D-EMDB guten Tag.*

Tower *D-EMDB grüezi*

D-EMD *BD-DB we cancel IFR up to your field and how is the weather condition?*

11:15:15 Tower *D-DB we have broken clouds at approximately 4000 feet above the ground, visibility is 15 kilometres.*

D-EMDB *D-DB we call you overhead the field.*

11:15:30 Tower *Roger*

11:15:58 D-EMDB *DB which runway is in use?*

Tower *RWY in use is 03*

11:16:08 D-EMDB *D-DB*

11:18:21 D-EMDB *DB overhead your field and we proceed to the east for cloud breaking.*

Tower *Roger, the QNH is 1003 report below clouds ready for approach.*

11:18:30 D-EMDB *DB*

There were no further reports from the pilot. A few minutes later, the aircraft crashed into the ground.

## 1.10 Aerodrome information

Samedan (LSZS) aerodrome is at an elevation of 1707 m/asl. The concrete runway has the designation 03/21. Runway 03 which was in use, has a landing distance of 1800 m. No electronic approach aids are installed at Samedan aerodrome.

An aerodrome control unit is in operation at Samedan aerodrome on a part-time basis and the airspace is Category G.

Annex 4.2 shows the topographical position of the runway.

The aerodrome installations were not involved in the accident.

## 1.11 Flight recorders

A flight data recorder was not prescribed and was not installed. The aircraft, however, was equipped with a "Shadin Engine Trend Monitoring System", which recorded certain engine and flight parameters. It was possible to read out these parameters from the damaged device (see section 1.16 and Annex 4.3).

## 1.12 Wreckage and impact information

### 1.12.1 The site of the accident

Zuoz golf course in the Pradatsch area, municipality 7523 Madulain/GR  
Coordinates: 46°34'93"N / 9°56'20"E (791.772 / 162.165), elevation 1680 m/asl  
Sheet No. 1237, National map of Switzerland 1:25 000, Albula Pass

The aircraft came down in a grassed area within the golf course, only a few metres from a minor road (see Annex 4.1).

Considerable crop damage was caused to the terrain at the point of impact. Running out kerosene caused contamination of the soil. The affected grass had to be removed over an area of approximately 200 m<sup>2</sup>.

### 1.12.2 The wreck

The aircraft hit the ground in a practically horizontal attitude and remained on the spot. The traces on the ground did not indicate any forward motion at all. The fuselage broke into three main sections on impact. The wings were deformed but still attached to the central section of the fuselage.

## 1.13 Medical and pathological information

The bodies of the pilot and the front-seat passenger underwent an autopsy.

No indications of any effects of drugs, pharmaceuticals or alcohol were found.

There were no indications of any physical impairment before the accident; death was attributable to the force of the impact.

## 1.14 Fire

Fire did not break out, despite the large amount of kerosene which leaked out.

## 1.15 Survival aspects

The accident was not survivable.

## 1.16 Tests and research

Among other things, the examination of the wreck produced the following results:

No pre-existing damage could be found on the control cables, links or bearings of flap controls, ailerons, rudder or elevators.

All cables were intact and connected. A single exception was a pitch trim cable which was cut on impact.

No pre-existing damage was found on the turbine.

The "Shadin Engine Trend Monitoring System" (ETM) records engine parameters at specific intervals (power check report), data on engine start and on take-off as well as any exceedance of certain pre-set parameters. With regard to the recordings of any exceedance, certain parameters are recorded only if they are within a defined range. Thus, for example, speeds below 60 kt are recorded as "NOT AVAIL."

Among other things, it was possible to read out the following data for 07.04.2004 from the ETM:

Header	Engine
Number: 0150 Report Type: Engine Start Time: 09:57:18	Low bus volt: 18.85 V Power source: INTERNAL Start max ITT: 690 C Start number: 50 Light off speed: 22.4 % Start time: 11 SEC
Number: 0151 Report Type: Takeoff Time: 10:07:01 Latitude: N49 57.6 Longitude: E008 38.8 Dest.: JULIT Heading: 263 DEG IAS: 76 KNOTS OAT: 10 C PALT: 470 FT. DALT: 20 Ft. Gross wt: NOT AVAIL. Fuel used: 3.2 GAL Fuel rem.: 147.8 GAL	NG: 91.9 % NP: 2174 RPM Fuel flow: 48.5 GPH ITT: 621 C Torque: 1296 FT-LB SHP: 536.5 HP
Number: 0152 Report Type: Power Check Report Time: 10:26:47 OAT: -31 C PALT: 21000 FT. IAS: 176 KNOTS	Total Time: 52:14 Total Starts: 50 NP: 1987 RPM Torque: 1015 FT-LB Fuel flow: 33.8 GPH ITT: 607 C NG: 92.1 %
Number: 0153 Report Type: Power Check Report Time: 10:46:47 OAT: -32 C PALT: 20940 FT. IAS: 177 KNOTS	Total Time: 52:34 Total Starts: 50 NP: 1990 RPM Torque: 1018 FT-LB Fuel Flow: 33.9 GPH ITT: 610 C NG: 91.2 %
Number: 0154 Report Type: Power Check Report Time: 11:06:47 IAS: 176 KNOTS OAT: -23 C PALT: 16950 FT. IAS: 180 KNOTS	Total Time: 52:54 Total Starts: 50 NP: 2003 RPM Torque: 994 FT-LB Fuel Flow: 34.5 GPH ITT: 580 C NG: 89.2 %

Number: 0155 Report Type: VMO exceedance (max Operational Airspeed) Time: 11:17:34 OAT: -8 C PALT: 10390 FT. DALT: 10040 FT. IAS: 247 KNOTS Gross wt.: NOT AVAIL. Latitude: N46 35.0 Longitude: E009 55.7 AF EX #: 7 Max IAS: 247 KNOTS AF EX duration : 18 SEC Mach : .448	Torque: 60 FT-LB
Number: 0156 Report Type: Shaft horsepower exceedance Time: 11:18:17 OAT: -14 C PALT: 10530 FT. IAS: NOT AVAIL. Gross wt.: NOT AVAIL. Latitude: N46 35.0 Longitude: E009 56.4	EX number: 7 Max SHP: 654.6 HP EX duration: 9 SEC Case: FORWARD THRUST Level: 1 ITT: 753 C NG: 101.9 % NP: 2006 RPM Torque: 1714 FT-LB Fuel flow: 50.8 GPH
Number: 0157 Report Type: Torque exceedance Time: 11:18:18 OAT: -14 C PALT: 10470 FT. DALT: 9410 FT. IAS: NOT AVAIL. Gross wt.: NOT AVAIL. Latitude: N46 35.0 Longitude: E009 56.4	EX number: 8 Max TRQ: 1745 FT-LB EX duration: 9 SEC Case: FORWARD THRUST Level: 1 ITT: 754 C NG: 102.1 % NP: 1960 RPM Fuel flow: 51.5 GPH

The last three recordings are exceedances:

- 155 VMO exceedance (max operational airspeed)
- 156 Shaft horsepower exceedance
- 157 Torque exceedance

## 2 Analysis

### 2.1 Technical aspects

The examination of the airframe, control system and engine produced no indications of any pre-existing technical defects.

The flight time reserve specified in the flight plan and the large amount of kerosene which leaked out after the accident permit the conclusion that the aircraft was overloaded on take-off.

At the time of the accident, its weight was still considerably above the maximum permitted weight of 4300 lb.

For a maximum take-off mass of 4300 lb, the rearmost permissible centre of gravity is 147.1 inches behind the reference plane. It is not permissible to extrapolate this limit value for higher take-off masses. At the time of the accident, the centre of gravity was at 145.75 inches. From this it may be concluded that the aircraft was tail-heavy.

### 2.2 Human and operational aspects

The flight plan had been filed as a "Zulu" flight plan. After a take-off under visual flight rules, it was envisaged to fly from waypoint RID under instrument flight rules as follows: "IFR DCT NKR N850 GERSA DCT". D-EMDB had been cleared by the radar controller to Samedan at flight level 170.

Samedan can be approached only under visual flight rules. At 11:10 LT, the flight changed from instrument flight rules to visual flight rules after the pilot had transmitted the following report by radio: "*Swiss Radar Delta Delta Bravo is able to cancel IFR*".

The sky over the aerodrome was overcast, 6-7/8, with the base at approximately 9500 ft AMSL and top at approximately 10 500 ft AMSL.

Visual flight rules must be complied with after the change from instrument to visual flying.

After his lengthy flight, which had taken place at a relatively high altitude and probably under visual flight conditions, the pilot was obliged to descend below cloud cover over the upper Engadine. He reported: "*DB overhead your field and we proceed to the east for cloud breaking*". The layer of cloud had gaps in it to the east and one can assume that the pilot was trying to get below the clouds through such a gap and carry out his approach to Samedan aerodrome.

The data from the "Shadin Engine Trend Monitoring System" showed that during this manoeuvre the aircraft had reached an excessively high speed. Shortly afterwards, at less than 60 KIAS, a power was set which was above the maximum permissible value.

Whilst the pilot wanted to manoeuvre the aircraft into the valley through a gap in the clouds, he must have realised as the overspeed warning distinctly sounded that the attitude required to do this was causing his speed to increase rapidly. The subsequent abrupt manoeuvre to pull out led to a drop in speed, down to a range below 60 kt. This manoeuvre can cause considerable acceleration which could have affected the pilot's ability to orientate himself. An unintentional and at least partial penetration into the cloud may have reinforced his spatial disorientation.

In this situation, when the pilot set power above the maximum value (over-torque), this led the aircraft to go into a spin and he lost control of the aircraft. Eyewitnesses, the traces of the impact and the damage to the airframe indicate that it was a flat spin.

As is apparent from the AFM for this aircraft type, there is a distinctly increased tendency for it to go into a spin in the event of a stall at high engine power. This tendency is accentuated if the aircraft is tail-heavy.

According to eyewitness reports, at the time of the crash the sound of the engine at high power was clearly audible. The first action needed to rectify a spin would have been to reduce power.

If it was indeed a case of a flat spin, pulling out of this would have overtaxed a pilot not trained in advanced aerobatics.

The fact that the aircraft was overloaded at the time of the accident may have had an additional negative effect on the aircraft's controllability because of the greater mass moment of inertia.

### 3 Conclusions

#### 3.1 Findings

##### 3.1.1 Technical aspects

- The investigation found no indication that a technical fault on the aircraft or on the engine was present.
- The aircraft was approved for transport.
- In the autumn of 2001, the aircraft was converted from piston engine to turboprop engine by means of a supplemental type certificate (STC 00541 SE).
- The aircraft underwent an annual check with a 100 hour check on 27.02.2004 at 2460 hours.

##### 3.1.2 Human and operational aspects

- The pilot was in possession of a private pilot's licence PPL(A) with rating for SEP, PA46 and SP(A) IR.
- The last pilot's medical examination was on 09.01.2004.
- The pilot had had 308 hours flying experience on the aircraft involved in the accident in the last 2½ years.
- On take-off, an endurance of 4½ hours was specified. Recalculation produced an actual take-off mass which was 722 lb over the MTOM.
- At the time of the accident, the mass of the aircraft was still 425 lb above the maximum take-off mass.
- The aircraft was loaded tail-heavy.
- The aircraft impacted the ground in a spin.
- There was partial cloud cover, though somewhat clearer to the east. Cloud conditions were changing relatively quickly.
- Visibility in Samedan below the clouds was good.

### 3.2 Causes

The accident is attributable to the fact that during an attempt to get below the clouds for the approach to Samedan, control of the aircraft was lost and it crashed into the ground.

Exceeding the maximum permissible mass and the tail-heavy condition of the aircraft may have contributed to the accident.

Berne, 24 November 2006

Aircraft Accident Investigation Bureau

This report contains conclusions by the AAIB about circumstances and causes of the investigated accident.

In accordance with Annex 13 of the Convention on International Civil Aviation, dated 7 December 1944, as well as article 24 of the Swiss Air Navigation Law, the sole purpose of the investigation of an aircraft accident or serious incident is to prevent future accidents or serious incidents. The legal appreciation of the circumstances and causes of the accident/serious incident is explicitly not object of the investigation. It is therefore also not the purpose of this report to determine blame or clarify questions of liability.

If this report be used for other purposes than for accident prevention these circumstances have to be duly taken in account.

Annexes

Annexe 1: Overview of the site of the accident





### Annexe 3: Graphic representation of speed and height

Information on the last five minutes according to radar recordings

