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Swiss Transportation Safety Investigation Board STSB

# **Final Report No. 2415**

## **by the Swiss Transportation Safety Investigation Board**

concerning the accident involving the air-  
craft Cessna 208 “Caravan”, D-FLIC,

on 30. März 2022

Grüehorn, in the Säntis massif (SG)

## General information on this report

The sole purpose of an investigation into an aircraft accident or serious incident is to prevent further accidents or serious incidents from occurring. It is expressly not the purpose of the safety investigation and this report to establish blame or determine liability.<sup>1</sup>

Should this report be used for purposes other than those of accident prevention, this statement should be given due consideration.

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

All information, unless otherwise indicated, relates to the time of the accident.

All times in this report, unless otherwise indicated, are stated in Coordinated Universal Time (UTC). At the time of the accident, Central European Time (CET) applied as Local Time (LT). The relation between LT, CET and UTC is:

LT = MEZ = UTC + 2 hour.

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<sup>1</sup> Article 3.1 of the 12th edition of annex 13, effective from 5 November 2020, to the Convention on International Civil Aviation of 7 December 1944 which came into force for Switzerland on 4 April 1947, as amended on 18 June 2019 (SR 0.748.0);

Article 24 of the Federal Act on Civil Aviation of 21 December 1948, as amended on 1 May 2022 (CAA, SR 748.0);

Article 1, point 1 of Regulation (EU) No. 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation and repealing Directive 94/56/EC, which came into force for Switzerland on 1 February 2012 pursuant to a decision of the Joint Committee of the Swiss Confederation and the European Union (EU) and based on the agreement of 21 June 1999 on air transport between Switzerland and the EU (Air Transport Agreement); as well as

Article 2, paragraph 1 of the Ordinance of 17 December 2014 on the Safety Investigation of Transportation Incidents, as amended on 1 February 2015 (OSITI, SR 742.161);

## Summary

### Overview

Aircraft type	Cessna 208 "Caravan"
Manufacturer	Cessna Aircraft Co., Wichita KS (USA)
Country of registration	Germany
Registration	D-FLIC
Operator	Gladwings GmbH, Düsseldorf (D)
Owner	Sky Lease GmbH, Düsseldorf (D)
Location	North flank of the Grühorn in the Säntis massif (SG), 2073 m/M 742 309 / 234 215 (Swiss Grid 1903) N 47° 14' 36.6" / E 009° 19' 06" (WGS <sup>2</sup> 84)
Date and time	30. März 2022, 10:23 UTC
Type of operation	Private
Flight rules	Visual Flight Rules (VFR)
Point of departure	Airport Siegerland, Germany (EDGS)
Destination	Airport Arezzo, Italy (LIQB)
Flight phase	Cruise
Type of accident	Controlled Flight into Terrain (CFIT)

### Investigation

The investigation was opened on 1 April 2022. The STSB informed the states of Germany, Canada and the United States of America about the accident. They appointed accredited representatives to cooperate in the investigation.

The investigation was supported by on-site evidence, radar and ADS-B<sup>3</sup> flight path recordings, radiotelephony recordings and photographs. This final report will be published by the STSB.

### Synopsis

The aircraft was on a ferry flight over the Alps. During the cruise flight, it collided with the terrain following the planned route.

### Causes

The accident in which the aircraft collided with the terrain was due to the continuation of a visual flight under instrument meteorological conditions.

### Safety recommendations and safety advice

The final report does not provide any safety recommendations or safety advice.

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<sup>2</sup> WGS: World Geodetic System, global reference system for geodesy and navigation

<sup>3</sup> ADS-B: Automatic Dependent Surveillance-Broadcast, system for continuous and unencrypted transmission of aircraft position and other flight data.

## 1 Factual information

### 1.1 Flight preparations and history of flight

#### 1.1.1 Pre-flight history

On 29 March 2022, the day before the accident, the pilot was flying the single-engine turboprop aircraft Cessna 208 "Caravan", registered as D-FLIC, from the landing site Aviosuperficie Costa d'Argento (La Parrina – Grosseto), located in Tuscany, to the Siegerland airport (EDSG). He flew over the Säntis massif under visual flight rules at an altitude of approximately 8200 ft AMSL<sup>4</sup> and on the same route as on the day of the accident, namely on the direct connecting line between the waypoints PELAD and DEGES provided for flights under instrument flight rules.<sup>5</sup>

#### 1.1.2 History of flight

On 30 March 2022 at 09:02 UTC, the pilot took off alone on board the D-FLIC from the German airport Siegerland (EDSG) on a visual flight to the airport Arezzo (LIQB) in Italy. At 10:19 UTC, he passed the waypoint DEGES at 5400 ft AMSL (cf. figure 1). He was in radio contact with FIC<sup>6</sup> Zurich, which had instructed him to remain under the Zurich terminal area (TMA). This airspace has a lower limit of 7500 ft AMSL at DEGES.

After passing DEGES, the pilot flew as planned in the direction of waypoint PELAD and at 10:19:31 UTC the FIC informed him that the maximum permitted altitude for visual flights without authorisation to enter controlled airspace was now flight level 130: *"D-IC, report Bad Ragaz and now maximum flight level 130 possible"*. The pilot replied with *"Roger, will report [unreadable] can you confirm start um higher?"* and wanted to make sure that he could now climb, which the FIC confirmed at 10:19:43 UTC with *"D-IC affirm, you may continue climb up to maximum flight level 130"*. The pilot then replied: *"Roger, copied"*.

The rate of climb averaged around 550 ft/min. At 10:23 UTC, the aircraft collided with the northern flank of the Grühorn in the Säntis massif at an altitude of 6800 ft AMSL on an unchanged flight path and flying in clouds (cf. figure 2). The pilot was killed and the aircraft destroyed.

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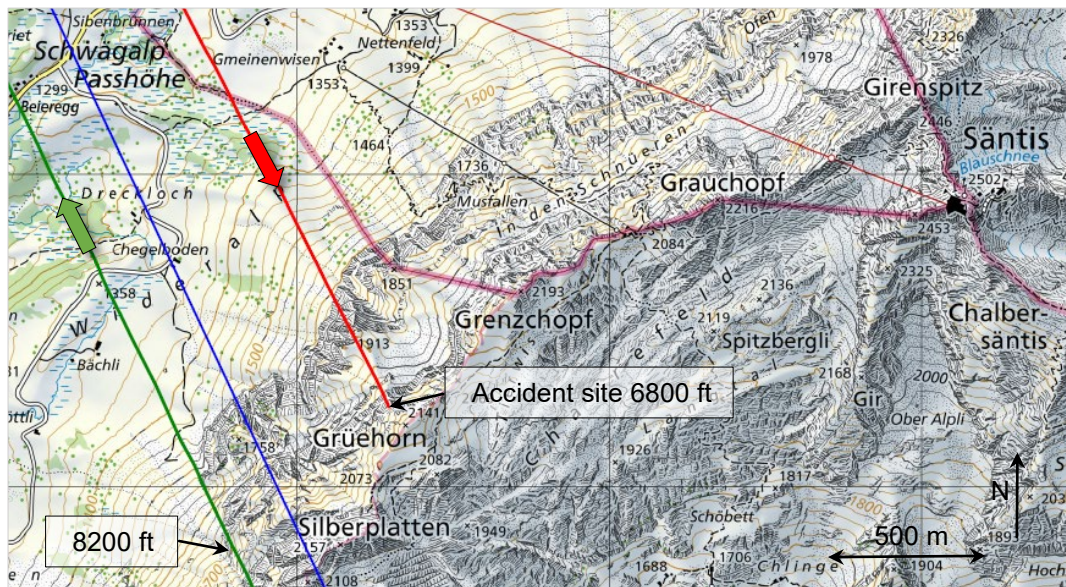
<sup>4</sup> AMSL: Above Mean Sea Level

<sup>5</sup> The waypoint PELAD is located at N 46° 35' 56" E 009° 43' 33" near Bergün (GR), the waypoint DEGES at N 47° 24' 45" E 009° 12' 07" near Flawil (SG). The waypoints are used for flight planning and navigation for flights according to Instrument Flight Rules (IFR).

<sup>6</sup> FIC: Flight Information Centre



**Figure 1:** Planned flight path (blue) and flight path recording (red) of the D-FLIC, shown on the aeronautical map of Switzerland (source of map: Federal Office of Topography).



**Figure 2:** Planned flight path between DEGES and PELAD (blue), flight path recording (red) and flight path recording of the previous day (green with indication of flight altitude), shown on a topographic map of Switzerland (source of map: Federal Office of Topography).

## 1.2 Injuries to persons

### 1.2.1 Injured persons

Injuries	Crew members	Passengers	Total of occupants	Other
Fatal	1	0	1	0
Serious	0	0	0	0
Minor	0	0	0	0
None	0	0	0	Not applicable
Total	1	0	1	0

### 1.3 Aircraft damage

There aircraft was destroyed.

### 1.4 Other damage

There was no third-party damage.

### 1.5 Personnel information

#### 1.5.1 Pilot

Person	Italian citizen, born 1959	
Licence	Private Pilot Licence Aeroplane (PPL(A)) according to the European Union Aviation Safety Agency (EASA), issued by the Italian regulatory authority <i>Ente Nazionale per l'Aviazione Civile</i> (ENAC).	
Ratings	Cessna Single Engine Turbine (SET) last validated on 8 March 2019, valid until 30 April 2023.	
	Pilatus PC6 SET, last validated on 4 July 2020, valid until 31 July 2022.	
	Single Engine Piston (SEP), last validated on 8 September 2021, valid until 30 September 2023.	
	Instrument Rating (IR) for Single Engine Single Pilot (SE SP), last validated on 7 February 2014, valid until 7 February 2015.	
Flying experience	Total	ca. 6700 h
	On type	ca. 1800 h
	During the last 90 days	ca. 70 h
	On type	more than 4 h

There are no indications for health impairments of the pilot during the accident flight (cf. also chapter 1.13)

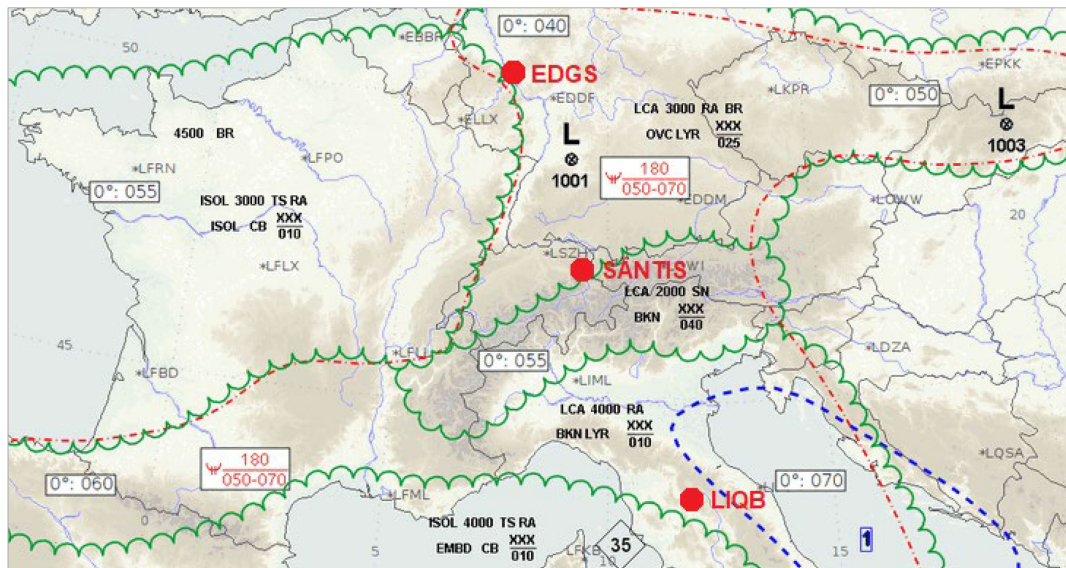
### 1.6 Aircraft information

The D-FLIC was a single-engine turboprop aircraft of the type Cessna 208 "Caravan" built in 1998. The aircraft was equipped to drop parachutists. It had been flown from Arezzo to Siegerland on 29 March 2022 to carry out maintenance work. These were certified on 30 March 2022. The aircraft was certified for operation under visual flight rules. There are no indications of technical defects.

### 1.7 Meteorological information

#### 1.7.1 Overview

The forecast of flight-threatening weather phenomena available as Low Level Significant Weather Chart (LL-SWC) of the German Weather Service (*Deutscher Wetterdienst* – DWD), valid for Wednesday, 30 March 2022, 10:00 UTC, predicted low-lying clouds with high-level tops covering the mountains and localised precipitation with limited visibility for the entire flight route. In addition, icing conditions were to be expected on the flight levels (FL) between FL 50 to FL 70 and FL 180 (cf. figure 3).



**Figure 3:** Forecast of weather phenomena dangerous to flight for the time 10:00 UTC, shown on the Low Level Significant Weather Chart (LL-SWC) of the German Weather Service (*Deutscher Wetterdienst – DWD*). The Siegerland departure airport (EDGS), the accident site at Sântis and the Arezzo destination airport (LIQB) are shown in red.

### 1.7.2 Aviation weather in Switzerland

Switzerland was on the front side of an extensive low-pressure zone that extended from Scandinavia to the Iberian Peninsula. Humid air was brought to the Alpine region with a south-westerly high-altitude current. According to the MeteoSwiss aviation weather forecast, the following weather conditions were to be expected in the area of the Pre-Alps and Alps:

*"8/8 with base 7000-9000 ft AMSL, including partly 2-4/8 with base around 6000 ft AMSL. Some precipitation at times. Snowline around 5000 ft AMSL. Visibility with snowfall partly 3-5 km, otherwise mostly above 8 km."*

### 1.7.3 Aerodrome weather reports

Shortly before the time of the accident, the following meteorological aerodrome reports (METAR) were valid at Zurich (LSZH) and St. Gallen-Altenrhein (LSZR) aerodromes near the accident site and at Samedan aerodrome (LSZS) near the waypoint PELAD:

*"LSZH 301020Z 21009KT 7000 -RA FEW010 SCT015 BKN031 09/07 Q1003 NOSIG"<sup>7</sup>*

*"LSZR 301020Z 28013KT 9999 FEW040 OVC070 11/07 Q1003 NOSIG"*

*"LSZS 301020Z 24004KT 800 -SN VV005 01/01 Q1003"*

### 1.7.4 Pictures from the cockpit

The pilot took a photo of the aircraft's instrument panel during the accident flight and sent the photo by mobile phone. The picture shows a position near the VHF Omnidirectional Radio Beacon (VOR) Sulz with the designator SUL near Stuttgart

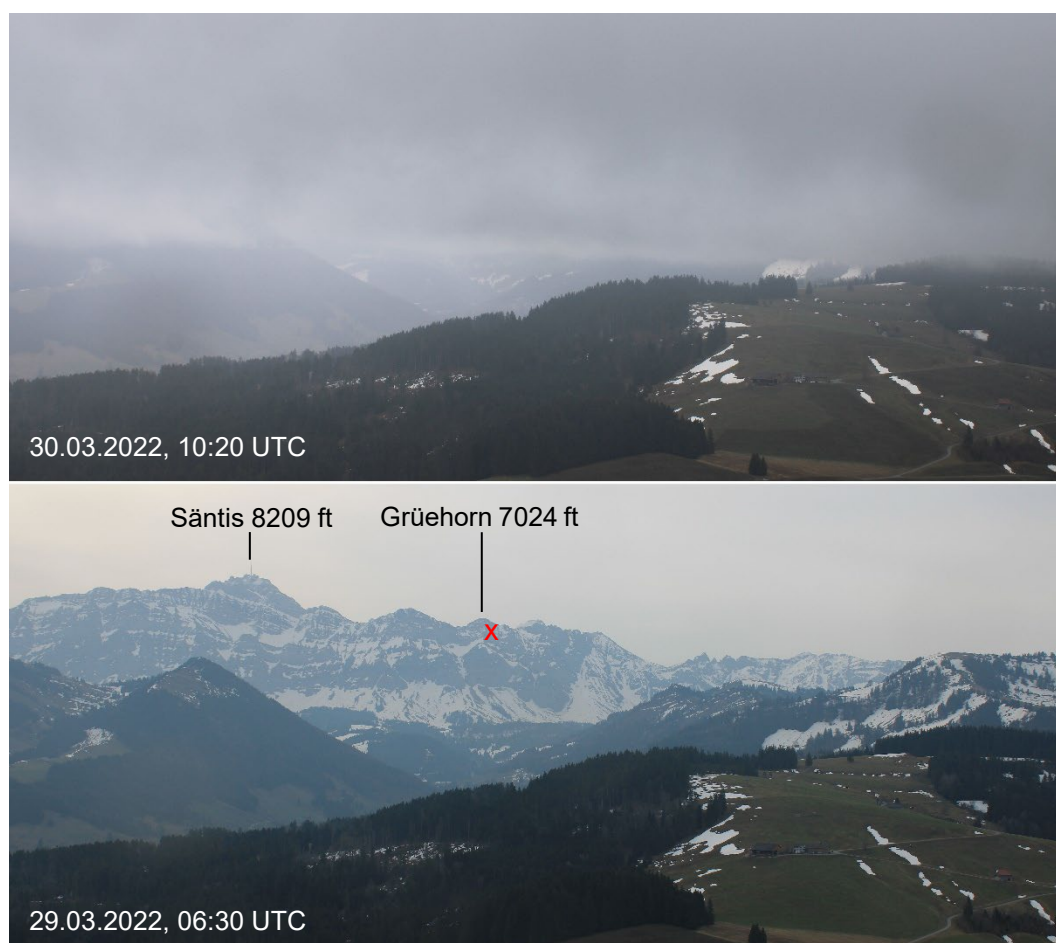
<sup>7</sup> Decoded, this message means: Aerodrome weather report for Zurich Airport on the 30th of the month at 10:20 UTC, wind from 210° at 9 kt, visibility 7000 m, light rainfall, 1/8-2/8 clouds at 1000 ft Above Airport Elevation (AAE), 3/8-4/8 clouds at 1500 ft AAE, 5/8-7/8 clouds at 3100 ft AAE, temperature 9 °C, dew point 7 °C, QNH 1003 hPa, no significant change expected for the following 2 hours.

and was taken at 09:58 UTC. It also shows an activated autopilot and an altimeter reading of 6840 ft at a setting of 29.64 in Hg<sup>8</sup>, corresponding to 1004 hPa.

Along with the instrument panel photograph, the pilot sent a picture showing a view out of the left cockpit window. This shows that the aircraft was in instrument meteorological conditions at the time of the photograph and had some ice on the leading edge of the wing. The time of this photograph could not be determined.

#### 1.7.5 Webcams images

Webcam images show the Säntis and Schwägälp sites in the immediate vicinity of the accident site (cf. Figure 2) in cloud at the time of the accident. The webcam on the 3960 ft high Hochhamm was just below the base of a cloud cover. The location of this webcam is 10 km northwest of the accident site (cf. figure 4).



**Figure 4:** Webcam images taken from the Hochhamm mountain inn at 3960 ft, looking south-east. Above is the photo taken on the day of the accident at 10:20 UTC shortly before the accident (looking in the direction of flight), below for comparison the photo taken the day before at 06:30 UTC when the D-FLIC flew over the area shown in the photo in the opposite direction. The accident site on the Gruehorn (red cross) is 10 km away from the webcam.

#### 1.8 Aids to navigation

The D-FLIC was equipped to fly by instruments. It had a Garmin GNS 530 navigation device, a Flymap L navigation device and a weather radar. A tablet computer

<sup>8</sup> In Hg: Inches of mercury. Anglo-Saxon unit of measurement for pressure, 29.92 in Hg equals 1013.25 hPa.



was also mounted above the instrument panel, which, like the two aforementioned navigation devices, displayed the aircraft's position in a map view (moving map).

## **1.9 Communications**

The radio communication between the pilot and the FIC Zurich was handled in a target-oriented manner, but had occasional communication difficulties and required some queries on both sides.

## **1.10 Aerodrome information**

Not applicable

## **1.11 Flight recorders**

A flight data recorder (FDR) or a cockpit voice recorder (CVR) were neither required nor installed in the aircraft. The available flight path recordings originate from ground-based radar stations and ADS-B receivers.

## **1.12 Wreckage and impact information**

The wreckage showed a high degree of destruction as a result of the impact speed of 167 kt (309 km/h). The wreckage was scattered in the steep and impassable terrain over an area of about 1 km in length and an elevation band of about 700 m.

## **1.13 Medical and pathological information**

An autopsy was performed on the pilot's body. This showed that he died as a result of the collision with the terrain and was not under the influence of any substance that could have impaired his ability to operate the aircraft.

## **1.14 Fire**

No traces of a fire outbreak were found.

## **1.15 Survical aspects**

The accident was not survivable.

## **1.16 Tests and research**

Not applicable

## **1.17 Organisational and management information**

Not applicable

## **1.18 Additional information**

Not applicable

## **1.19 Useful or effective investigation technique**

Not applicable

## 2 Analysis

There are no indications of technical defects that could have influenced or caused the accident. The pilot flew according to visual flight rules and following his planned route in instrument meteorological conditions (IMC).

The flight path records suggest that the majority of the flight was conducted by the aircraft's auto-pilot. As evidenced by one picture taken by the pilot himself, he was already flying in instrument meteorological conditions at least once before the accident. It is conceivable that, on the basis of the instrument flight rating for single-engine aircraft which he had held about 8 years before the accident, he felt able to continue the flight according to instruments and in instrument meteorological conditions. However, as he was not guided as an instrument flight by air traffic control and was apparently not sufficiently aware of the rising terrain ahead of him, he collided with the Säntis massif during the climb without outward visibility.

Continuing visual flights under instrument meteorological conditions is associated with considerable risks and repeatedly leads to fatal flight accidents. This is especially true for flights over mountain ranges. A comparable accident occurred, for example, on 12 September 2017 during the crossing of the Alps by a Mooney M20K<sup>9</sup> aircraft.

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<sup>9</sup> cf. [final report no. 2340](#) of the STSB on the accident of the Mooney M20K, D-EPPW, of 12 September 2017.

### **3 Conclusions**

#### **3.1 Findings**

##### 3.1.1 Technical aspects

- The aircraft was certified to fly according to visual flight rules and had instruments that allowed it to fly by instruments.
- Both the mass and centre of gravity of the aircraft were within the limits of the Aircraft Flight Manual (AFM) at the time of the accident.
- There is no evidence of pre-existing technical defects that could have caused or influenced the accident.
- The Emergency Locator Transmitter (ELT) was destroyed in the impact.

##### 3.1.2 Flight Crew

- The pilot held the necessary licences for the flight according to visual flight rules.
- There are no indications that the pilot's health was impaired during the accident flight.

##### 3.1.3 History of the of the accident

- The pilot took off from Siegerland airfield (EDSG) in Germany on a visual flight to Arezzo airfield (LIQB) in Italy.
- The aircraft passed the waypoint DEGES at 5400 ft AMSL.
- After the waypoint DEGES, the pilot started a climb towards the waypoint PELAD and collided with the Säntis massif at an altitude of 6800 ft AMSL.
- During the final phase of the flight, the aircraft flew in instrument meteorological conditions.

##### 3.1.4 General conditions

- The flight was conducted according to visual flight rules.

### 3.2 Cause

In order to achieve its objective of prevention, a safety investigation authority shall express its opinion on risks and hazards that have been identified during the investigated incident and which should be avoided in the future. In this sense, the terms and formulations used below are to be understood exclusively from the perspective of prevention. The identification of causes and contributory factors does not, therefore, in any way imply assignment of blame or the determination of administrative, civil or criminal liability.

The accident in which the aircraft collided with the terrain was due to the continuation of a visual flight under instrument meteorological conditions.

**4 Safety recommendations, safety advice and measures taken since the accident****4.1 Safety recommendations**

None

**4.2 Safety advice**

None

**4.3 Measures taken since the accident**

None

This final report was approved by the Board of the Swiss Transportation Safety Investigation Board STSB (Art. 10 lit. h of the Ordinance on the Safety Investigation of Transportation Incidents of 17 December 2014).

Bern, 14 November 2023

Swiss Transportation Safety Investigation Board