

Interim Report

Identification

Type of Occurrence:	Accident
Date:	14 December 2017
Location:	Near Waldburg
Aircraft:	Airplane
Manufacturer / Model:	Cessna Aircraft Company / C510
Injuries to Persons:	Three persons fatally injured
Damage:	Aircraft destroyed
Other Damage:	Damage to forests
State File Number:	BFU17-1604-CX
Published:	March 2018

Factual Information

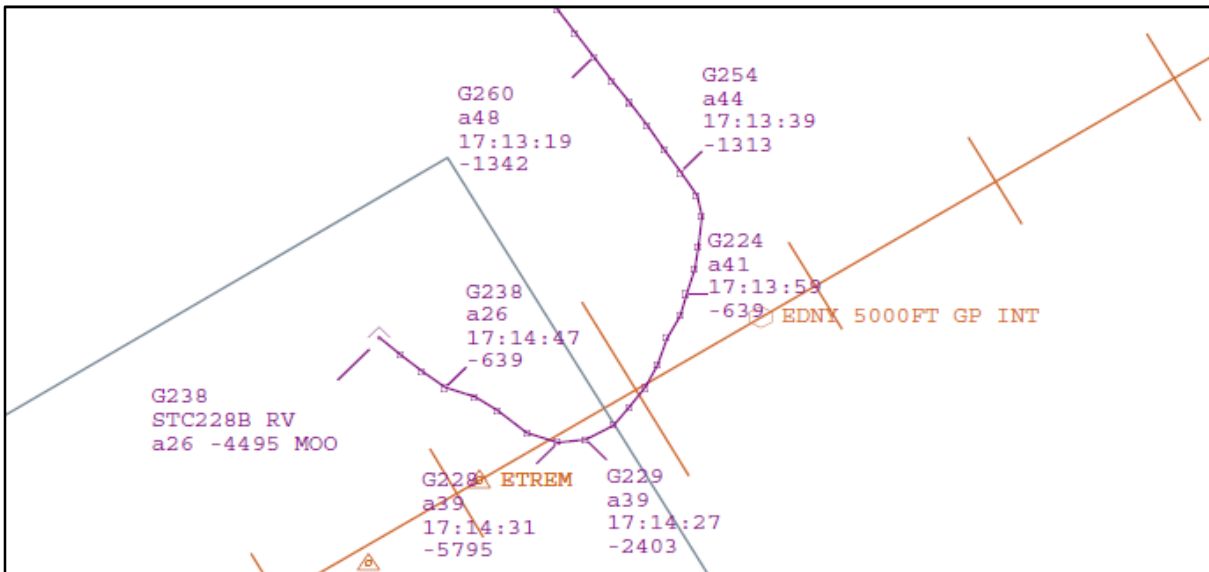
During interception of the instrument approach ILS RWY 24 for a landing at Friedrichshafen Airport (EDNY) the airplane suddenly lost altitude, collided with trees, and crashed into a forest.

History of the Flight

On the morning of the day of the accident, two pilots flew with a C510 Mustang from Friedrichshafen Airport (EDNY) to Egelsbach Airfield (EDFE). Take-off was at

0851 hrs¹. Two crew members and one passenger were on board. At 1743 hrs the crew, including the same passenger, took off for the return flight to Friedrichshafen. The flight path took them south past Mannheim, Stuttgart, and Mengen-Hohenengen. The maximum flight altitude was Flight Level (FL) 210. At 1759 hrs, north-west of Stuttgart, Center Langen instructed the crew to descend to FL 170. At 1801 hrs, west of Stuttgart toward the way-point HEUSE, Center Langen issued the instruction to descend to FL 150. At 1803 hrs the crew was instructed to change frequency to Swiss Radar, who instructed the crew to descend to FL 110. At 1805 hrs the crew established radio contact with Zurich Arrival. By giving vectors Zurich Arrival guided the airplane to the announced ILS RWY 24 Friedrichshafen. At about 1806 hrs a heading of 140° and descent to FL 90 was instructed. At about 1810 hrs Zurich Arrival instructed the crew to descend to 6,000 ft AMSL. At about 1811 hrs they were instructed to descend to 5,000 ft AMSL and at 1812 hrs to turn right to 150° and further descent to 4,000 ft AMSL.

At 1813:28 Zurich Arrival instructed: [...] *right heading two one five, cleared for the ILS approach two four, report established.* The crew acknowledged correctly.



Approach to the extended runway centre line

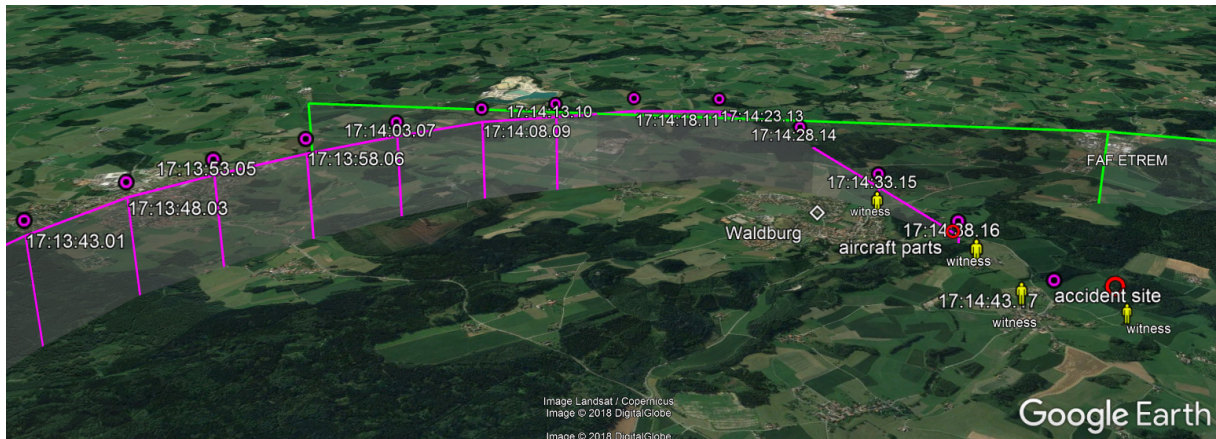
Source: SkyGuide

Then the radar controller noticed that the aircraft, during interception with about 240 KIAS, slightly overshoot the extended runway centre line and entered a high rate of descent. He repeatedly called the aircraft, but the crew did not respond any more.

¹ All times local, unless otherwise stated.

Witnesses near Waldburg saw and heard an airplane in low altitude. One witness heard the accident and saw a short but intense fire in a forest about 1.5 km west of Waldburg. He called the rescue personnel.

At about 1814 hrs the airplane had contact with trees in a forest west of Waldburg. Then it flew with high speed and a flat angle in another forest approximately 1,000 m away. The three occupants suffered fatal injuries and the aircraft was destroyed.



Overview: Witnesses' position, initial contact with trees, accident site

Source: Google Earth/BFU

Personnel Information

Pilot in Command

The 45-year-old Pilot in Command (PIC) held an Austrian Commercial Pilot Licence (CPL(A)) issued in accordance with Part-FCL, including ATPL(A) theory and MCC, initially issued in 2009. The licence listed the type ratings as PIC for C510, EMB 500/505 (MPO), SEP (Land), TMG, Night (A), and Instrument Rating (IR) and flight instructor rating. All ratings were valid.

His class 1 medical certificate, without restrictions, was last issued on 12 October 2017 and valid until 18 October 2018.

According to his pilot log book he had a total flying experience of about 2,816 hours, of which about 1,953 hours were flown in accordance with Instrument Flight Rules (IFR) and about 246 hours at night. According to the operator the pilot had a flying experience of about 2,000 hours on C510.

The last Operator Proficiency Check (OPC) was documented on 4 October 2017 during a simulator session; the last Line Check (LPC) on 30 March 2017. On 23 March 2017 the pilot had completed an e-course based Upset Prevention and Recovery Training (UPRT).

The day of the accident was the fourth day of flight duty after eleven days off duty time. On the evening of 13 December 2017 at 2148 hrs he landed with the aircraft in question at Friedrichshafen Airport after an extended flying duty.

Co-pilot

The 49-year-old co-pilot held an Austrian Commercial Pilot Licence (CPL(A)) issued in accordance with Part-FCL, including ATPL(A) theory and MCC, initially issued in 2008. The licence listed the type rating C510 as co-pilot valid until 31 July 2018.

His class 1 medical certificate, with the restriction VDL (correction for defective distant vision) was last issued on 24 August 2017 and valid until 23 September 2018.

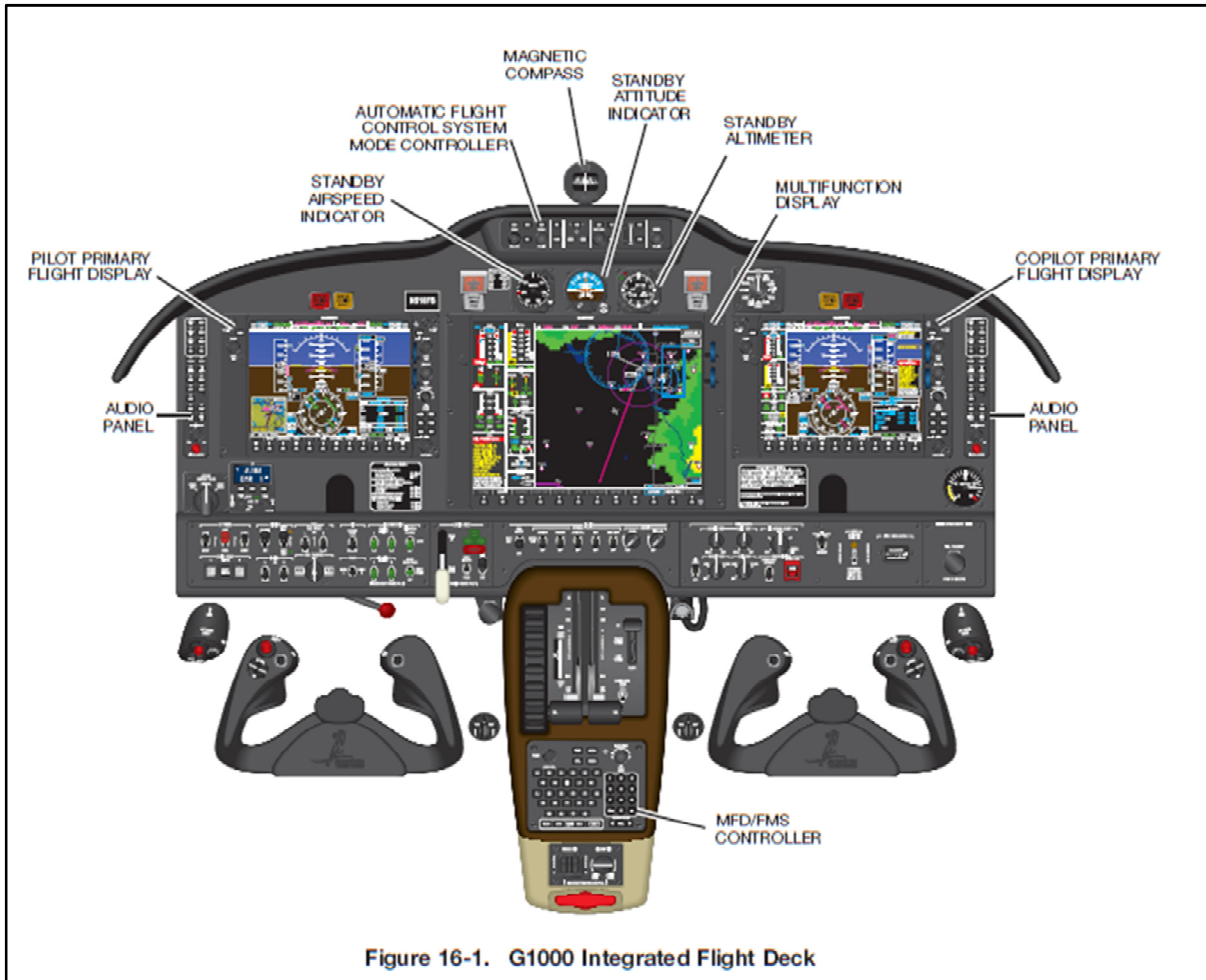
According to the operator the co-pilot had a total flying experience of about 800 hours. On 24 July 2017 he had completed a 14-day EASA initial pilot course C510 including 20 hours simulator flight training. According to his C510 type rating checkflight protocol on 24 July 2017 he had a total flying experience as PIC of 371 hours. According to his flight duty and rest period record he had a flying experience of about 140 hours after acquiring the C510 type rating. The operator stated the co-pilot was still in the supervision phase after acquiring his type rating. On 29 July 2017 the pilot had completed an e-course based Upset Prevention and Recovery Training (UPRT).

The day of the accident was the first day of flight duty after eight days off duty.

Aircraft Information

The C510 of Cessna Aircraft Company is a light Jet (VLJ) in all-metal construction. In 2006 the type certificate was issued in accordance with CS 23 /FAR 23. The airplane is a low-wing aircraft with T-tail configuration and equipped with two PW 615F-A engines manufactured by Pratt & Whitney Canada Inc. Maximum take-off mass is 3,921 kg. The airplane is certified for single-pilot operation.

It is equipped with an integrated Garmin G-1000 avionic system. The system has three monitors which display the flight instruments, the engine and system monitoring and includes the flight control, navigation, and communications systems. Part of the G-1000 is a caution and warning system including the Engine Indication and Crew Alerting System (EICAS).

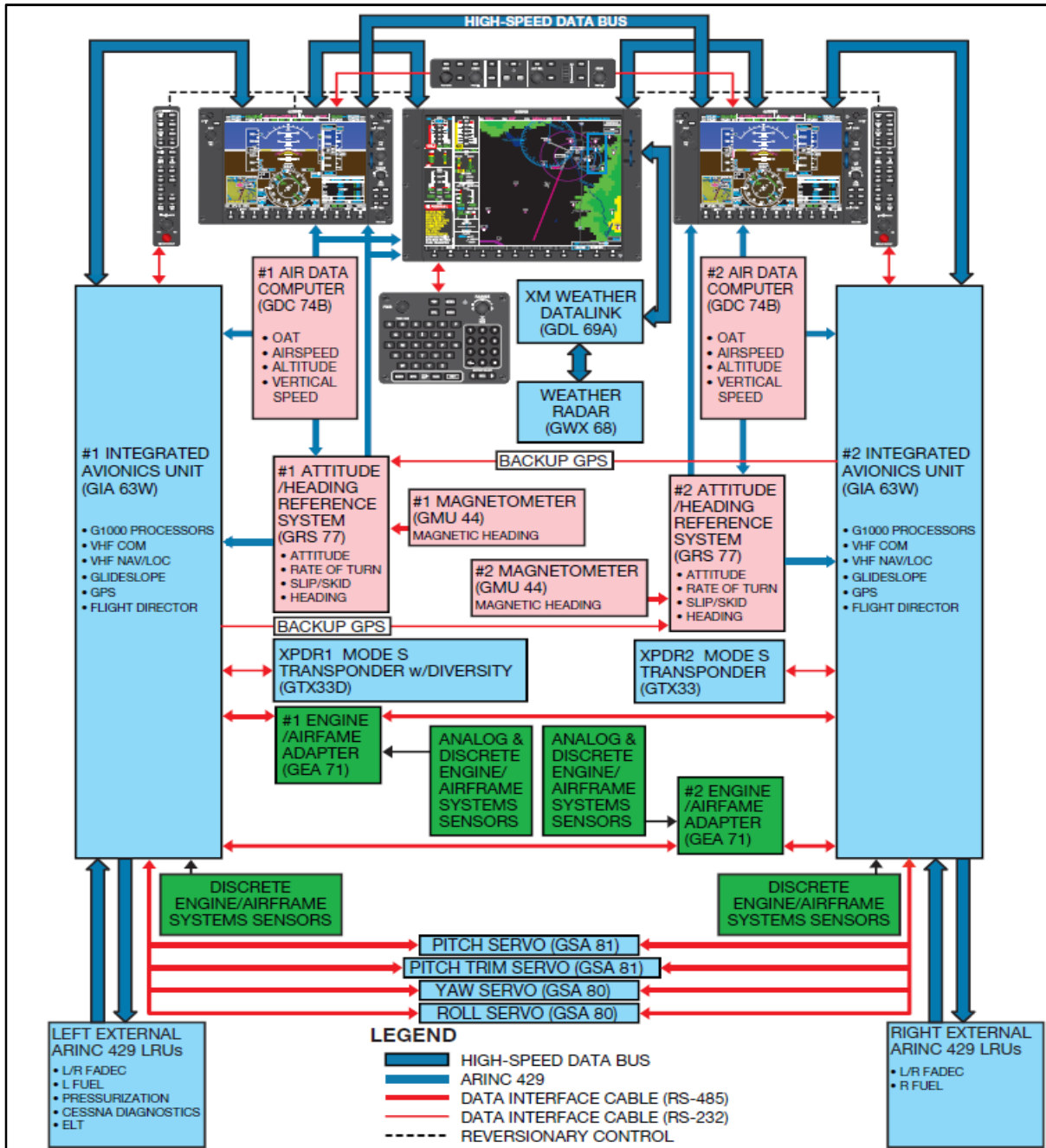


Overview cockpit and panels

Source: Cessna

The Garmin G-1000 comprises the Automatic Flight Control System (AFCS) which ensures a flight path and automatic attitude control. The AFCS includes the following basic functions: *Flight Director, Autopilot, Yaw Damper, Manual Electric Pitch Trim*. A total of four flight-control servos are actuated.

The essential functions are redundantly designed. The flight director control is limited to: *Pitch $\pm 20^\circ$, Vertical Acceleration 0.1g, Bank Angle 30° , Bank Rate $5^\circ/\text{second}$.*

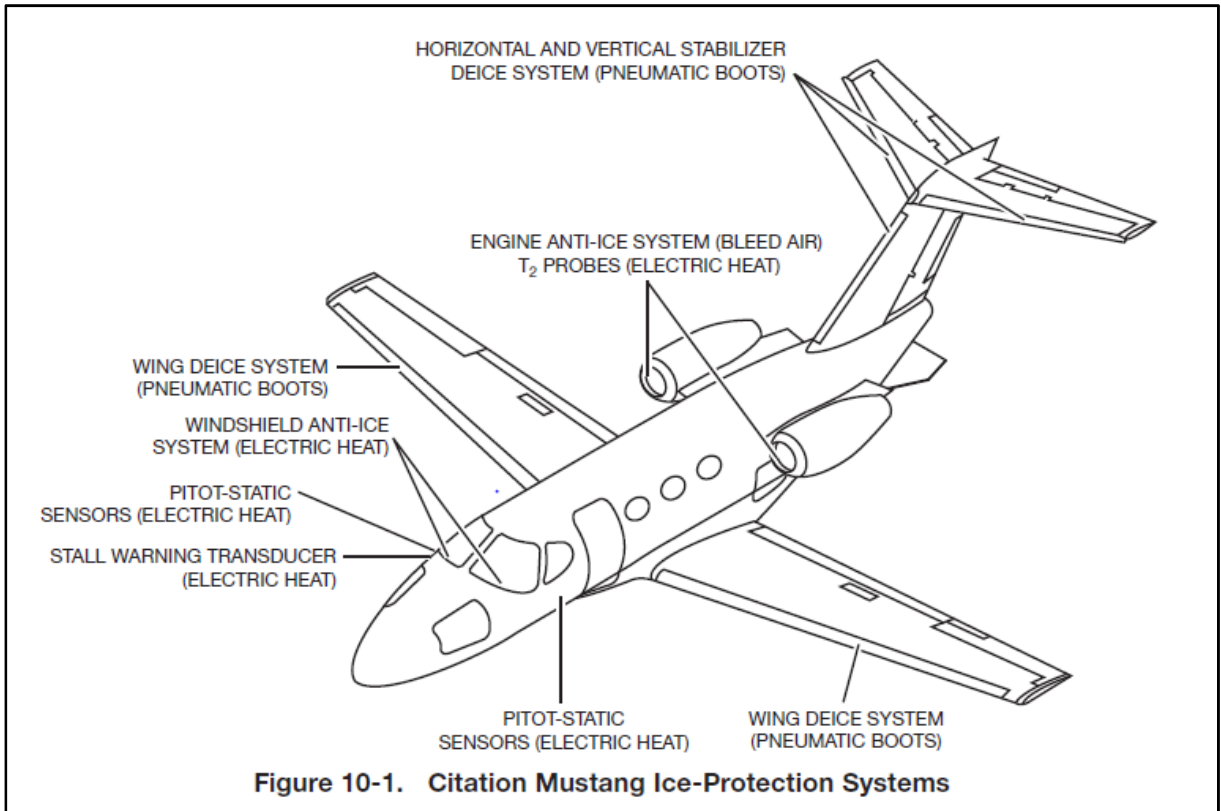


Garmin G-1000 integration in C510

Source: Cessna

In addition to the Garmin G-1000 avionic the aircraft is equipped with standby emergency instruments including artificial horizon, speed indicator, and altimeter.

The Cessna C510 is certified for flights in icing conditions. Conventional methods are used for ice protection. The engine inlet cowls are heated with bleed air. The wings and the tail section are equipped with pneumatic de-ice boots. Die cockpit windows, the sensors for the dynamic and static pressure, the stall warning sensor, the angle of attack sensor and the T2 engine sensors are heated electrically.



Anti-icing at the C510

Source: Cessna

Except during take-off, approach or landing, in icing conditions a minimum flying speed of 160 KIAS is recommended in order to prevent ice accretion behind the de-ice boots, on the lower surface of the wings and on the horizontal stabiliser. If the de-ice boots are activated the stall warning is automatically set to high.

STALL SPEEDS - KCAS

CONDITIONS:
STALL WARNING - HIGH
 Anti-Ice - OFF or ON
 Landing Gear - UP or DOWN
 Engines - IDLE THRUST

ANGLE OF BANK DEG	FLAP SETTING - UP WEIGHT - LBS													
	8645	8400	8200	8000	7800	7600	7400	7200	7000	6800	6600	6400	6200	6000
0	102	100	99	98	97	95	94	93	92	90	89	88	86	85
10	102	101	100	99	97	96	95	94	92	91	90	88	87	86
20	105	103	102	101	100	98	97	96	95	93	92	90	89	88
30	109	108	106	105	104	103	101	100	99	97	96	94	93	91
40	116	114	113	112	110	109	108	106	105	103	102	100	99	97
50	127	125	124	122	121	119	118	116	114	113	111	109	108	106
60	144	142	140	138	137	135	133	131	130	128	126	124	122	120

Source: Cessna

The technical documentation of the aircraft involved (CESCOM 10 – Aircraft Status Report, CESCOM 20 – Projected Maintenance Due, CESCOM 100 - Long Range Projected Maintenance, Master AD/SI Report, Aircraft Maintenance Program C510 of

the operator) was made available to the BFU for evaluation purposes. The aircraft had the manufacturer's serial number 510-0049, year of manufacture 2007, and was registered in Austria. The latest Airworthiness Review Certificate (ARC) was issued on 8 May 2017 and valid until 8 May 2018. The last Release to Service was issued on 5 December 2017 at a total operating time of 3,606:43 hours. Since then no dysfunctions had been recorded in the aircraft log book. The pilots, who had flown the aircraft since, stated that there had been no problems or system malfunctions. At the time of the accident total operating time had been about 3,633 hours. The aircraft had been maintained by a maintenance organisation, certified in accordance with EASA Part 145, at Linz Airport.

According to the last weight report of 28 April 2016 the basic empty weight was about 2,442 kg / 5,385 lbs. On the morning of the day of the accident at Friedrichshafen Airport the airplane was refuelled with 800 l Jet A1 fuel. According to the entry in the aircraft log book at take-off at Friedrichshafen Airport 2,100 lbs fuel were on board; at take-off in Egelsbach there were still 1,500 lbs. With three persons on board and under consideration of fuel consumption for about 30 minutes flying time, the mass at the time of the accident was about 3,195 kg / 7,043 lbs. At take-off at Egelsbach Airfield and during the entire flight centre of gravity was within the prescribed limits. The minimum final approach speed (Vref) with anti-ice ON and flaps 15° for a mass of 7,500 lbs was 109 KIAS and 119 KIAS for "Landing with ice on wing leading edge".

Meteorological Information

The BFU charged the Deutsche Wetterdienst (German meteorological service provider, DWD) with the compilation of a weather expertise. The DWD compiled a preliminary synopsis of the weather conditions on the flight path from EDFE to EDNY (IFR) between 1700 and 1900 hrs:

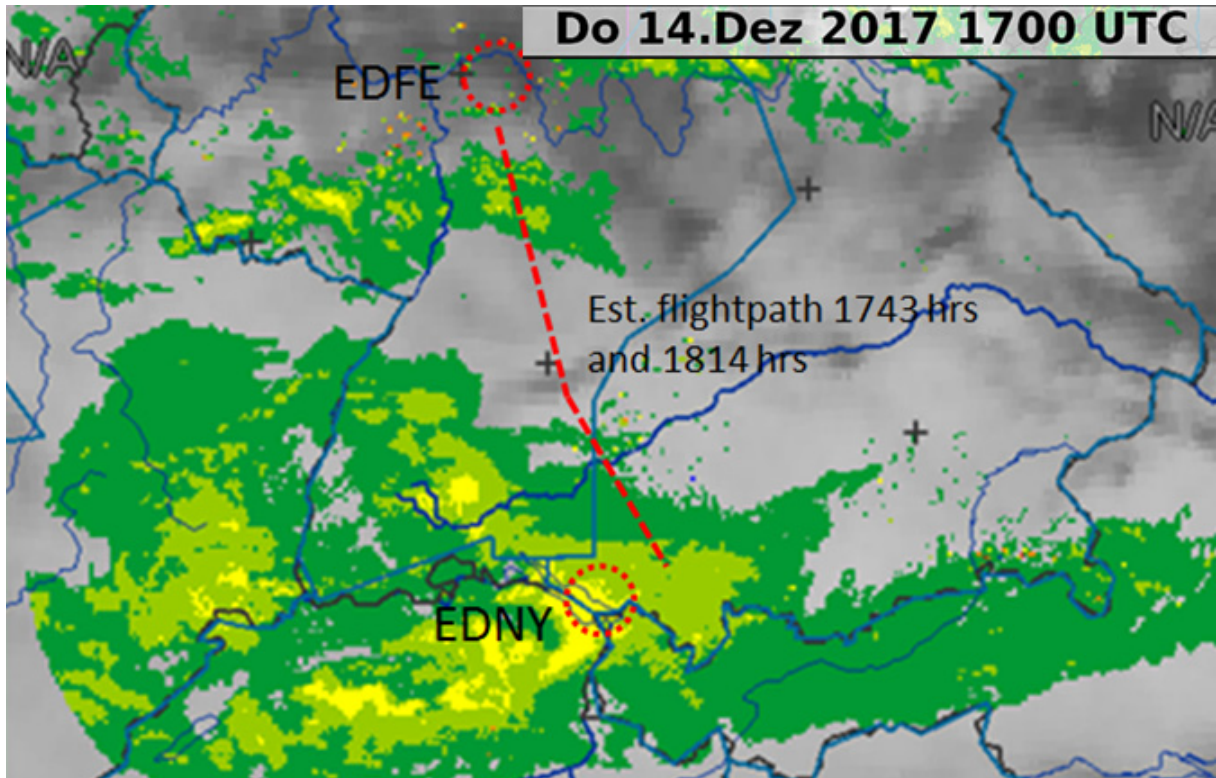
Weather Conditions:

On the morning of 14 December 2017 a cold front crossed the south of Germany from north-west to south-east and finally covered the Alps. On the rear side high-reaching unstable layered cold air was guided to the middle and south of Germany with a western to south-western current.

Wetter conditions on the flight path EDFE - EDNY between 1700 and 1900 hrs:

At 1700 hrs an area with shower-like precipitation, in the mountains as snow and in the valleys as rain, was lying over Germany in a line Berlin - Erfurt - Frankfurt -

Saarbrücken. South of it to the Danube there were heavier layered clouds and almost no precipitation. Between the Danube and Lake Constance the clouds thickened and from France and Switzerland new precipitation moved in. No lightning reports were registered.



Precipitation radar image including the flight path

Source: DWD, adapted by BFU

At 1800 hrs the area with the shower-like precipitation had moved farther south-east and was now lying between the Rhine-Main area and Stuttgart area. South of Stuttgart, the new precipitation area now encompassed the entire south-west of Germany with slight to moderate rain - in higher locations as snow. No lightning reports were registered.

Until 1900 hrs the precipitation areas only moved slowly towards the east. The intensity had lessened in the south-west of Germany. In addition, in the border area between France and Switzerland lightning reports are visible.

Visibility and Clouds:

Outside of precipitation the meteorological visibility was 20 - 70 km. In rain it was locally reduced to 5 - 10 km and in snow to below 1 - 3 km.

The ceiling in the area of the shower-like precipitation in the northern area of the flight path was observed between 2,000 and 4,000 ft AMSL. The maximum ceiling

was at FL240 for the layered clouds and the partially embedded TCU/CB. In the area south of it with no precipitation the ceiling was at 4,000 to 6,000 ft AMSL. In the south-west of Germany it decreased to 3,000 to 4,000 ft AMSL in the beginning precipitation. Here the ceiling partially reached up to FL300. In addition, in the areas with precipitation local clouds with a basis between 1,000 and 1,500 ft AGL were observed even below the ceiling.

Freezing Level and Icing Conditions:

Freezing level was 2,500 to 3,000 ft AMSL in the north and the middle part of the flight path, where cooler air had entered already. In the area of the precipitation in the south of the flight path it was between 3,000 and 4,000 ft AMSL.

In general, icing conditions above the freezing level prevailed at the entire flight path, because mostly there were heavy layered clouds. Without precipitation there were probably only slight icing conditions up to FL140 - 150. Heavier and higher-reaching icing conditions prevailed in the northern part of the flight path due to convective clouds and in the south due to compact layered clouds with the gathering frontal precipitations. There regional moderate and/up to heavy icing conditions between freezing level and maximum FL100 occurred. The accident site was affected too.

Wind and Turbulence:

Surface wind came from the south-west and had a mean value of 10 - 15 kt; in higher locations 20 - 25 kt. Between 1600 UTC and 1800 UTC maximum wind speed in the valleys was between 15 and 25 kt and in the mountains between 30 and 40 kt.

Altitude winds along the flight path were measured as follows:

FL050 250-260° 45-50 KT

FL100 260-270° 45-60 KT

FL180 260-270° 60-65 KT

FL240 270-280° 70-85 KT

In normal layered clouds it is probable that regional slight turbulence occurred. In the area of the mostly embedded convective clouds slight to moderate and moderate turbulence is probable - with TCU/CB up to heavy turbulence. In the compact frontal clouds in the south of the flight path regional moderate turbulence is probable.

According to the aviation routine weather report (METAR) of 1750 hrs of Friedrichshafen Airport (ATIS Yankee), valid at the time of the accident, the following weather conditions prevailed: Visibility of more than 9,999 m, slight rain, wind from

200° with 8 kt, scattered clouds (SCT) at 1,700 ft, overcast (OVC) at 2,500 ft, temperature 5°C, dewpoint 1°C, and barometric air pressure (QNH) was 1,001 hPa.

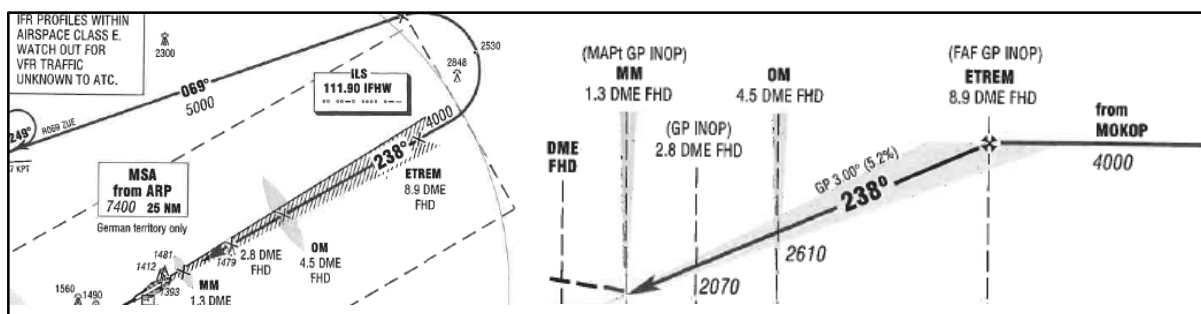
A captain of a transport aircraft told the BFU that he had observed heavy icing at his aircraft between FL 150 and FL 70 during the approach to Stuttgart at about 1800 hrs. In a short time 2 to 3 cm ice accretion had formed on the ice indicator at the windshield. Between 1757 hrs and 1804 hrs the accident aircraft passed Stuttgart airspace in descent from FL 210 to FL 170.

About 45 minutes after the accident a Beechcraft 1900 airplane landed at Friedrichshafen. The de-icing personnel at Friedrichshafen stated that the nose, the wings, and the tail section of this airplane had been covered with massive layers of clear ice. Prior to the next take-off it had to be de-iced with de-icing fluid of about 70° for an unusually long period of time. Four times as much de-icing fluid, 400 l, had been needed.

Approximately 10 minutes prior to the accident another airplane, also a C510, of the company involved landed at Friedrichshafen. This PIC told the BFU that between FL 70 and FL 50 it had been pretty windy and "auch etwas bockig (also somewhat turbulent)". During the descent on the ILS 24 the wind had perceptibly lessened and the flying been easy to handle. Slight icing had appeared during descent from 7,000 ft AMSL. Only a slight strip of ice had appeared on the wing leading edge. He did not use the de-ice boots. During the approach there had been snow and sleet. But the airplane had already been clear of clouds at about 3,500 ft AMSL and the runway lighting in sight early on.

Aids to Navigation

Friedrichshafen Airport (EDNY) is equipped with several instrument approach procedures for the approach directions 06 and 24. The instrument approach procedure ILS/LOC 24 requires an approach to the Final Approach Fix (FAF) ETREM at 4,000 ft AMSL with a heading of 238°.



ILS 24 Approach profile

Source: DFS

Radio Communications

Radio transmissions were recorded. The transmissions with Center Langen und Swiss Radar were made available to the BFU as transcripts for investigation purposes. Radio transmissions with Zurich Arrival were also provided as audio recording.

The crew never mentioned any technical problems or flight operations limitations during the entire radio transmissions.

At 1813:41 hrs radio communications ended. Based on the audio recording, representatives of the operator identified the co-pilot as the pilot conducting the radio transmissions.

Aerodrome Information

Friedrichshafen Airport is located at the Bodensee (Lake Constance), east of the city centre Friedrichshafen. Aerodrome elevation is 1,368 ft AMSL.

The airport has one asphalt runway with the orientation 060°/240° (06/24). It has a length of 2,356 m and a width of 45 m.

Flight Recorder

The airplane was not equipped with a Flight Data Recorder (FDR) or a Cockpit Voice Recorder (CVR). There were no legal requirements for such equipment to be fitted.

The flight path from Egelsbach to Friedrichshafen was recorded by the radar of the air traffic service provider. Radar recordings of the German and Swiss air traffic control units and the Bundeswehr (German Armed Forces) were made available to the BFU for evaluation purposes.

The aircraft broadcast position and flight data (e.g. roll angle, ground speed, true airspeed, indicated airspeed, barometric altitude, altitude selected altitude) via the Automatic Dependent Surveillance – Broadcast (ADS-B). The Swiss air traffic control unit recorded this data in different time intervals.

frame time	mode C	roll angle	ground speed	true airspeed	magnetic heading	indicated airspeed	barometric altitude rate	MCP/FCU selected altitude	barometric pressure setting
	FL	deg	kt	kt	deg	kt	ft/min	ft	mb
17:13:25.37	50.25	1.055	254	254	149.414	242	-1248	4000	1001
17:13:28.18	49.5	0.879	250	256	149.59	243	-1216	4000	1001
17:13:30.63	49				149.766	242	-1248	4000	1001
17:13:33.19	48.5	2.109	246	252	149.941	240	-1184	4000	1001
17:13:35.84	48				150.82	240	-1184	4000	1001
17:13:38.19	47.5	24.258	240	252	155.039	239	-1312	4000	1001
17:13:41.11	47				159.258	238	-1376	4000	1001
17:13:43.20	46.5	25.137	232	246	165.762	235	-1088	4000	1001
17:13:46.40	46.25				169.98	236	-768	4000	1001
17:13:48.22	45.75	25.137	226	246	174.902	234	-800	4000	1001
17:13:51.66	45.5				-179.648	235	-832	4000	1001
17:13:53.23	45	24.258	224	246	-174.551	235	-800	4000	1001
17:13:56.90	44.75				-169.805	237	-768	4000	1001
17:13:58.23	44.5	16.523	224	248	-166.465	237	-640	4000	1001
17:14:02.16	44.25				-163.125	241	-480	4000	1001
17:14:03.29	44	10.723	226	252	-161.191	242	-512	4000	1001
17:14:07.37	43.75				-158.73	244	-480	4000	1001
17:14:08.30	43.75	12.48	228	254	-157.5	243	-544	4000	1001
17:14:12.69	43.5				-152.93	243	-384	4000	1001
17:14:13.31	43.25	20.391	226	254	-150.469	243	-288	4000	1001
17:14:17.97	43.25	32.871	226	252	-143.613	241	-96	4000	1001
17:14:18.31	43.25	38.672	224	250	-140.625	240	-256	4000	1001
17:14:23.26	42.25				-127.617	243	-1824	4000	1001
17:14:23.33	42	51.855	228	254	-124.102	243	-2400	4000	1001
17:14:28.34	38	59.766	244	266	-101.074	257	-5792	4000	1001
17:14:28.51	38.25				-105.117	256	-5440	4000	1001
17:14:33.36	31.75	27.598	264	268	-74.004	263	-7904	4000	1001
17:14:33.76	31.75				-75.938	264	-7904	4000	1001
17:14:38.37	28.75		266	154		148	96	4000	1001
17:14:39.01	28.5					206	-1248	4000	1001
17:14:43.34	29		232	146		142	-640	4000	1001
17:14:44.25	29					142	-640	4000	1001

Excerpt ADS-B data until the end of the transmission

Source: SkyGuide

On the Multi Function Display (MFD), central display in the cockpit, the Garmin G-1000 can save flight parameters to SD memory cards. At the accident site a total of four SD memory cards were found. They were mechanically damaged. Currently the BFU is attempting to read-out any possible data.

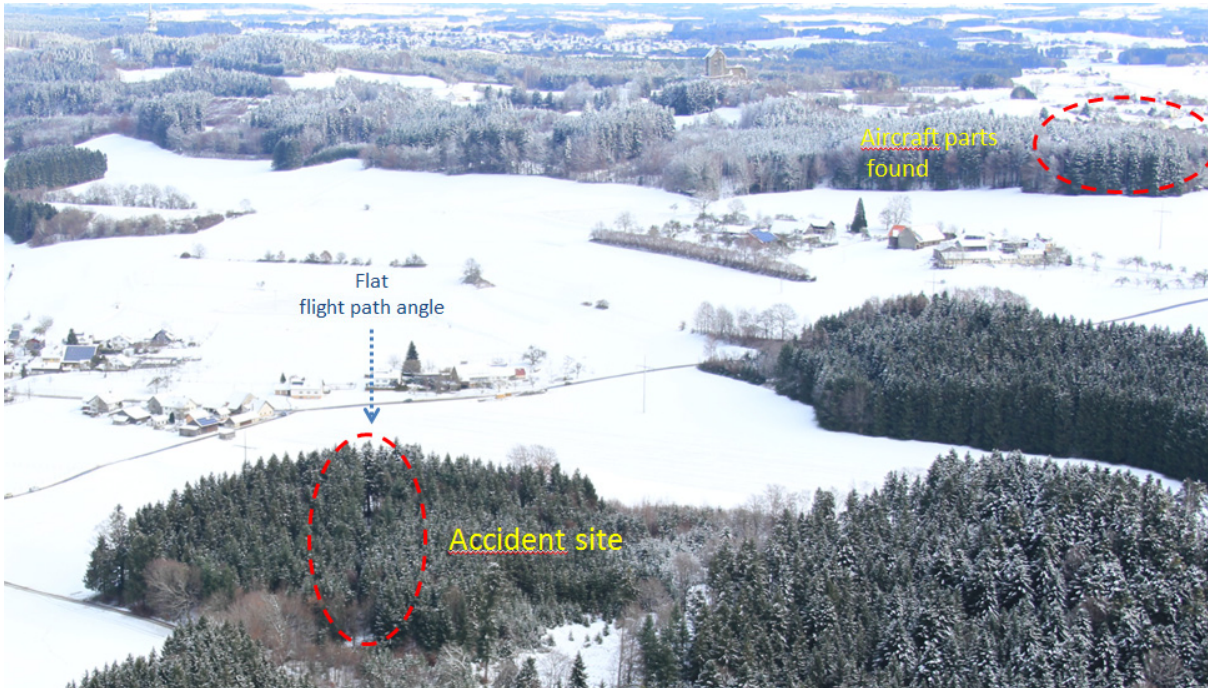
Both engines were equipped with one Electric Control Unit (EEC) each. The EEC saves engine parameters as snapshots whenever errors occur or threshold values are exceeded. Both EECs were sent to the engine manufacturer in Canada. They were read-out under supervision of the Transportation Safety Board of Canada (TSB). It was determined that during the accident the EEC of the right engine had recorded an error (Loss of Interpowerplant Communications). At the time of the error engine N2 was 70% (idle speed) and anti-ice was on. The left engine had not triggered any storage in the EEC. The engine manufacturer stated that during the analysis of the EECs no indications for malfunctions of the two engines during the accident flight were found.

The BFU charged the responsible air traffic service provider to find out whether other aircraft had been in the vicinity of the accident airplane. It was determined that no other aircraft, which could have caused wake turbulences, had been in the vicinity.

Wreckage and Impact Information

The airplane had contact with trees in the area west of Waldburg, in a forest called Frankenberg. The left wing tip and parts of the rudder were found in this forest.

Then the airplane entered a forest, near Sieberatsreute, approximately 1,000 m away in a flat angle. The airplane caused a crash aisle of about 130 m which had the direction of about 240°. Several trees had been cut off and uprooted along this crash aisle. The terrain in the area of the accident site had an elevation of approximately 2,300 ft AMSL.



Overview initial contact with objects and accident site

Source: Police, adapted by BFU

The airplane was destroyed during the path through the forest. Wreckage parts were distributed over an area of approximately 130 m by 50 m. Remarkable was that numerous wreckage parts lay reversed left to right, i.e. parts of the right aircraft side were found left of the accident trace and vice versa (see Appendix: Wreckage Distribution)

At the beginning of the crash aisle individual trees had caught fire. The smell of fuel was noticeable at the entire accident site.

After the accident site had been documented the wreckage was salvaged and transported to BFU facilities in Braunschweig for further investigation.

With the support of an expert of the aircraft manufacturer the wreckage was displayed and investigated. It was determined that all control surfaces were present and all rudder joints had been severed by overload. All control rods and control cables from the cockpit controls to the control surfaces were examined and analysed. It was determined that at the time of the accident landing gear and flaps had been retracted. The speed brakes had also been retracted. The trim tabs on the aileron

and rudder were in neutral positions. The investigation of the wreckage parts did not reveal any technical deficiencies prior to the accident.

Medical and Pathological Information

A postmortem examination was performed on the two pilots and the passenger. All three persons died of severe multiple trauma. The toxicological examination determined that neither of the two pilots suffered from impairments due to medications, drugs, or alcohol. The passenger had a slight to moderate alcohol level at the time of death.

Fire

At the accident site, at the beginning of the crash aisle, several trees showed signs of fire. The central part of the wing, including a part of the right wing and the retracted right main landing gear, had burnt.

Witnesses saw a short blaze in the forest which disappeared after a short time.

Survival Aspects

Due to the high speed when entering the forest and the destruction of the fuselage the accident was non-survivable.

The ELT Artex 406 emergency locator transmitter had deployed. The antenna had been torn off and the ELT signal was not intercepted.

Organisations and their Procedures

According to the application for change of registration dated 16 January 2017 and the proof of transfer of operator dated 12 January 2017, two companies were operator of the aircraft involved.

The two pilots were employed at the company, who marketed and conducted the flights. The company was based in Bregenz, Austria. The focal point of the company was the marketing of flights with two C510 aircraft from Friedrichshafen Airport. The PIC involved was the director of this company and called "head pilot". Since 2 June 2017 this company no longer held an Air Operator Certificate (AOC).

The second company, based in Vienna, Austria, was responsible for the aeronautical scope in order to conduct passenger transport flights. It held an AOC. This company

managed the pilots' files, the flight duty and rest period records, and the technical documentation of the aircraft. The PIC was listed in the crew list of the Operation Manual (OM) dated 19 July 2017. He had the rating to conduct line check flights. The co-pilot was not listed in the crew list.

The OM Part A 8.3.11.2 Icing Conditions stipulated the following:

Inflight

Prior to entering areas with a risk of icing all anti-icing-de-icing equipment shall be switched on.

Known areas of severe icing shall be avoided. When severe icing is nevertheless encountered, every effort shall be made in order to find altitudes or areas with less icing, i.e. keep the rate-of-descent-climb high in order to cut down the time spent in these conditions.

Approach and Landing

When ice has accumulated, stalling speeds are considerably higher than normal and a stall may be entered without warning.

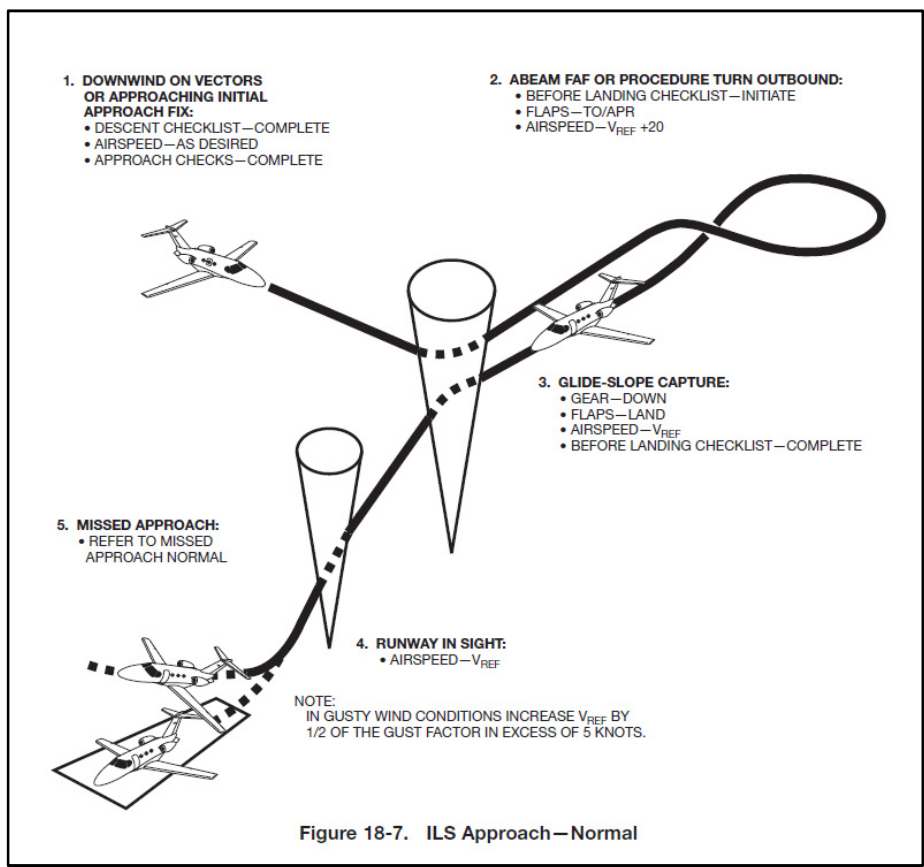
Therefore, in such a condition it is recommended to increase the airspeed according to PIC's discretion, taking into account all relevant factors, in particular the available runway length.

Make wider turn [...]

The OM Part B Precision Approach (ILS Approach) described the following:

Approach

1. Pilots should organize their flight in a way allowing to leave the initial approach fix (IAF) with a speed which permits cruise speed. This speed should be maintained until approx.. 12 NM from the threshold. For this part of the approach an indicated airspeed of 210 kt \pm 10 kt is recommended as long as performance does not require a lower speed.
2. The subsequent part of the approach until short before the IAF should be flown at a speed of 170 kt. \pm 10kt. in which should be intercepted at an altitude of not less than 2000 ft. above the touchdown zone (or as published)
3. The aircraft should be shortly before or above the OM, at this time the gear should be down, the flaps in landing position and the safe approach speed should be stabilized.



Phase	PF	PNF
Cleared for approach	<ul style="list-style-type: none"> orders "Approach Check" Selects APP mode on Flight Director Mode Selector Panel LOCALIZER, GLIDESLOPE ARMED 	<ul style="list-style-type: none"> reads "Approach Check" <p>CHECKED</p>
Speed below 180 KIAS	FLAPS APPROACH	<ul style="list-style-type: none"> checks speed, selects Flaps APR, when Flap travel has completed: <p>FLAPS APPROACH SET</p>
Localizer capture	LOCALIZER CAPTURED <ul style="list-style-type: none"> reduces speed to 160 - 180 KIAS 	CHECKED
1 dot below Glide path	GEAR DOWN	<ul style="list-style-type: none"> checks speed, selects Gear down, when three green indicated: GEAR DOWN
Established on Glide path	GLIDESLOPE CAPTURED FLAPS LAND <ul style="list-style-type: none"> reduces speed to VREF - VREF + 10 <p>SET GO AROUND ALTITUDE BEFORE LANDING</p>	<p>CHECKED</p> <ul style="list-style-type: none"> checks speed, selects Flaps LAND, when Flap travel has completed: <p>FLAPS LAND SET</p> <ul style="list-style-type: none"> sets go-around altitude on Altitude pre-selector ALTITUDE_SET reads "Before Landing Check"

Passing Outer Marker or equivalent position	<i>OUTER MARKER</i>	<ul style="list-style-type: none"> crosschecks Altimeters and QNH compares altitude to value on approach chart calls out any deviations, and calls out minimum <i>MINIMUM IS FEET</i>
Passing 500 ft AGL	<i>500</i>	<i>500</i>
100 ft above minimum	<i>APPROACHING MINIMUM</i>	<i>CHECKED</i>
At minimum	<i>MINIMUM</i>	
Whenever sufficient visual reference is attained	<i>RUNWAY IN SIGHT</i> <i>or</i> <i>APPROACH LIGHTS IN SIGHT</i>	<i>CHECKED</i>
If no sufficient visual cues	<i>GO AROUND</i> <ul style="list-style-type: none"> continue with missed approach procedure 	<ul style="list-style-type: none"> continue with missed approach procedure

Additional Information

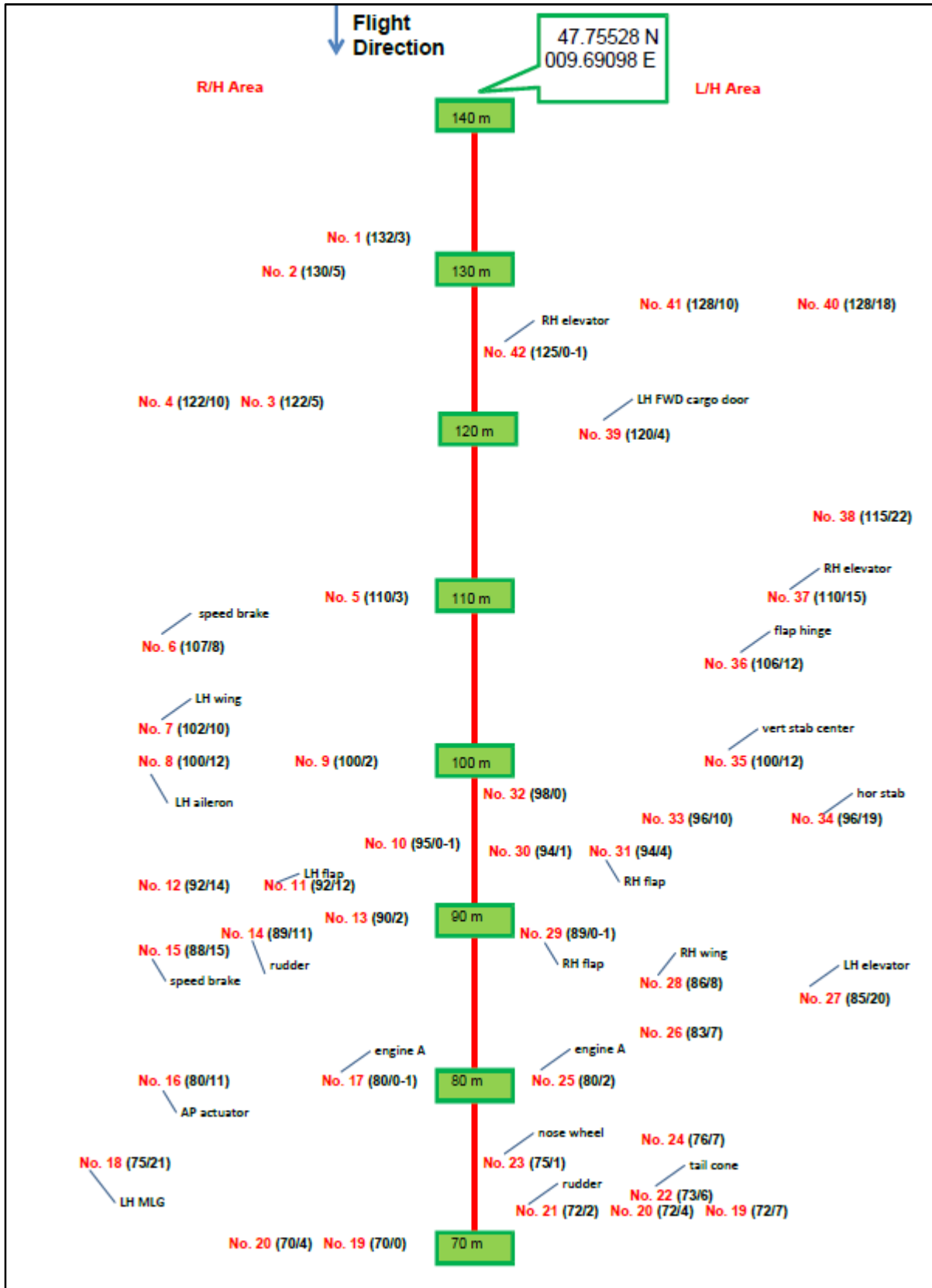
Due to the accident the radar data recordings of the airplane involved of the last six approaches to Friedrichshafen prior to the accident were requested. These showed that the approaches during intercept to the localizer were flown with 220 to 240 kt ground speed and each time the extended runway centre line was overshoot.

Investigator in charge: Axel Rokohl

Field Investigation: Thomas Kostrzewa, Axel Rokohl

Appendices

Wreckage distribution at the accident site



This investigation is conducted in accordance with the 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 the Federal German Law relating to the investigation of accidents and incidents associated with the operation of civil aircraft (*Flugunfall-Untersuchungs-Gesetz - FIUUG*) of 26 August 1998.

The sole objective of the investigation is to prevent future accidents and incidents. The investigation does not seek to ascertain blame or apportion legal liability for any claims that may arise.

This document is a translation of the German Investigation Report. Although every effort was made for the translation to be accurate, in the event of any discrepancies the original German document is the authentic version.

Published by:

Bundesstelle für
Flugunfalluntersuchung

Hermann-Blenk-Str. 16
38108 Braunschweig

Phone +49 531 35 48 - 0
Fax +49 531 35 48 - 246

Mail box@bfu-web.de
Internet www.bfu-web.de