

COMANDO DA AERONÁUTICA
CENTRO DE INVESTIGAÇÃO E PREVENÇÃO DE
ACIDENTES AERONÁUTICOS



FINAL REPORT
A - 148/CENIPA/2018

| | |
|--------------------|-------------------|
| OCCURRENCE: | ACCIDENT |
| AIRCRAFT: | PR-RFB |
| MODEL: | C90A |
| DATE: | 15SEPT2018 |



NOTICE

According to the Law nº 7565, dated 19 December 1986, the Aeronautical Accident Investigation and Prevention System – SIPAER – is responsible for planning, guiding, coordinating, and executing the investigation and prevention activities of aeronautical accidents.

The elaboration of this Final Report was conducted by taking into account the contributing factors and hypotheses raised. Therefore, the report is a technical document that reflects the result obtained by SIPAER regarding the circumstances that contributed or may have contributed to triggering this occurrence.

The document does not focus on quantifying the degree of contribution of the different factors, including the individual, psychosocial or organizational variables that conditioned the human performance and interacted to create a scenario favorable to the accident.

The exclusive objective of this work is to recommend the study and the adoption of provisions of preventative nature, and the decision as to whether they should be applied belongs to the President, Director, Chief, or the one corresponding to the highest level in the hierarchy of the organization to which they are being forwarded.

This Report does not resort to any proof production procedure for the determination of civil or criminal liability, and is in accordance with Appendix 2, Annex 13 to the 1944 Chicago Convention, which was incorporated into the Brazilian legal system by Decree nº 21713, dated 27 August 1946.

Thus, it is worth highlighting the importance of protecting the persons who provide information regarding an aeronautical accident. The utilization of this report for punitive purposes maculates the principle of “non-self-incrimination” derived from the “right to remain silent” sheltered by the Federal Constitution.

Consequently, the use of this report for any purpose other than that of preventing future accidents may induce erroneous interpretations and conclusions.

N.B.: This English version of the report has been written and published by the CENIPA with the intention of making it easier to be read by English speaking people. Taking into account the nuances of a foreign language, no matter how accurate this translation may be, readers are advised that the original Portuguese version is the work of reference.

SYNOPSIS

This is the Final Report of the 15SEPT2018 accident with the C90A aircraft model, registration PR-RFB. The accident was classified as “[CFIT] Controlled Flight Into Terrain”.

The aircraft took off from the Hercílio Luz Aerodrome (SBFL), Florianópolis - SC, to the Serafin Enoss Bertaso Aerodrome (SBCH), Chapecó - SC, with a flight plan under Instrument Flight Rules (IFR) with a pilot on board.

The climb and cruise flight at FL 200 went smoothly.

After obtaining information that the SBCH Aerodrome was operating in visual conditions, the PR-RFB informed the Chapecó Aerodrome Flight Information Service (AFIS-CH) that it would descend to the traffic altitude.

During the descent, the aircraft crashed into the terrain at 23.92 NM away from SBCH, at an altitude of 3,195 ft. At the time of the accident, there was a dense fog that covered the entire region.

The aircraft was destroyed, and the pilot died on the spot.

An Accredited Representative of the National Transportation Safety Board (NTSB) - USA, (State where the aircraft was designed and manufactured) was designated for participation in the investigation.

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GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS

| | |
|---------|------------------------------------------------------------------------------------------|
| ACC-CW | Area Control Center - Curitiba |
| AFIS-CH | Aerodrome Flight Information Service - Chapecó |
| ANAC | Brazil's National Civil Aviation Agency |
| APP-FL | Approach Control - Florianópolis |
| BCFG | Fog Banks |
| BKN | Broken (5-7 oktas) |
| BR | Wet Fog |
| CA | Airworthiness Certificate |
| CAVOK | Ceiling and Visibility OK |
| CENIPA | Aeronautical Accident Investigation and Prevention Center |
| CFIT | Controlled Flight Into Terrain |
| CFP | Federal Council of Psychology |
| CMA | Aeronautical Medical Certificate |
| CVR | Cockpit Voice Recorder |
| DLA | Delay |
| DME | Distance Measuring Equipment |
| FAP | Pilot's Evaluation Form |
| FEW | Few (1 and 2 oktas) |
| FL | Flight Level |
| GNDC | Ground Control |
| GNSS | Global Navigation Satellite System |
| IAF | Initial Approach Fix |
| IAM | Annual Maintenance Inspection |
| IFR | Instrument Flight Rules |
| IFRA | Instrument Flight Rating - Airplane |
| IML | Legal Medical Institute |
| INPSAU | Health Inspection |
| METAR | Meteorological Aerodrome Report |
| MLTE | Airplane Multi-Engine Land Rating |
| MSA | Minimum Sector Altitude |
| NOTAM | Notice to Airmen |
| PLA | Airline Pilot License – Airplane |
| RADAR | Radio Detection And Ranging |
| RNAV | Area Navigation |
| SBCA | ICAO Location Designator - Coronel Adalberto Mendes da Silva Aerodrome, Cascavel - PR |
| SBCH | ICAO Location Designator - Serafin Enoss Bertasso Aerodrome, Chapecó - SC |

| | |
|----------|---------------------------------------------------------------------------|
| SBFL | ICAO Location Designator - Hercílio Luz Aerodrome, Florianópolis - SC |
| SBPA | ICAO Location Designator - Salgado Filho Aerodrome, Porto Alegre - RS |
| SBPF | ICAO Location Designator - Lauro Kurtz Aerodrome, Passo Fundo - RS |
| SERIPA V | Fifth Regional Aeronautical Accident Investigation and Prevention Service |
| SIGMET | Significant Meteorological Information |
| SN | Serial Number |
| SPECI | Selected Special Aeronautical Weather Report |
| TPP | Registration Category of Private Service - Aircraft |
| TRW-FL | Control Tower of the Florianópolis Aerodrome - SC |
| UTC | Universal Time Coordinated |
| VFR | Visual Flight Rules |
| VHF | Very High Frequency |
| VMC | Visual Meteorological Conditions |
| VOR | VHF Omnidirectional Radio Range |

1. FACTUAL INFORMATION.

| | | |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| Aircraft | Model: C90A Registration: PR-RFB Manufacturer: Raytheon Aircraft | Operator: <i>Gambatto Veículos Ltd.</i> |
| Occurrence | Date/time: 15SEPT2018 - 1500 UTC Location: Rural Zone Lat. 27°03'27" S Long. 052°13'31" W Municipality – State: Ipumirim – SC | Type(s): “[CFIT] Controlled Flight Into Terrain” Subtype(s): Nil |

1.1 History of the flight.

The aircraft took off at 1400 (UTC), from the Hercílio Luz Aerodrome (SBFL), in the municipality of Florianópolis - SC, to the Serafin Enoss Bertaso Aerodrome (SBCH), in the municipality of Chapecó - SC, with a flight plan by IFR - Instrument Flight Rules, and a pilot on board.

During the descent for visual landing on Chapecó, the plane collided with the ridge of an elevation.

The aircraft was destroyed, and the pilot died on the spot.

1.2 Injuries to persons.

| Injuries | Crew | Passengers | Others |
|----------|------|------------|--------|
| Fatal | 1 | - | - |
| Serious | - | - | - |
| Minor | - | - | - |
| None | - | - | - |

1.3 Damage to the aircraft.

The aircraft was destroyed.

1.4 Other damage.

None.

1.5 Personnel information.

1.5.1 Crew's flight experience.

| Flight hours | Pilot |
|-----------------------------------|---------|
| Total | Unknown |
| Total in the last 30 days | 15:05 |
| Total in the last 24 hours | 00:00 |
| In this type of aircraft | Unknown |
| In this type in the last 30 days | 15:05 |
| In this type in the last 24 hours | 00:00 |

N.B.: The pilot's CIV was not found.

The entry of hours flown in the electronic CIV was incomplete but totaled 128 hours and 41 minutes in MLTE Type Rating aircraft and 219 hours and 45 minutes total in airplanes, between February 2012 and September 2017.

It was found that between November 1998 and March 2015, the pilot had accumulated a total of 2,675 flight hours

1.5.2 Personnel training.

The ANAC records indicate that the pilot obtained his PPR license in October 1987, but it was not possible to identify the training school.

1.5.3 Category of licenses and validity of certificates.

The pilot had the PLA License and had valid MLTE and IFRA Ratings.

1.5.4 Qualification and flight experience.

The electronic CIV records indicated that the pilot operated the C90A aircraft, registration PR-RFB since August 2017 and that he had the SBCH Aerodrome as a frequent destination. In the thirty days before the accident, he performed seven flights to SBCH.

Much of the pilot's operational history was developed when he worked for the Santa Catarina State Government, between November 1998 and March 2015. In that period, the crewmember accumulated a total of 2,675 hours of flight, of which 2,121 hours were as co-pilot and 554 as commander.

Under these conditions, he flew the following aircraft models: PAT4, EMB-820C Carajá, E121 Xingu, PA31T Chyenne, and C550 Citation II.

The pilot's FAP, in possession of the Santa Catarina State Government, was not found. The FAP provided by the ANAC did not reveal any deficiencies in the handling of the aircraft during the verification flights.

1.5.5 Validity of medical certificate.

The pilot had a valid CMA.

1.6 Aircraft information.

The aircraft, serial number LJ-1546, was manufactured by Raytheon Aircraft in 1999 and was registered in the TPP Category.

The Certificate of Airworthiness (CA) was valid.

The airframe, engines, and propellers' logbook records were updated.

The last inspection of the aircraft, the "IAM + Phases 3 and 4" type, was carried out on 18MAY2018, by the maintenance organization *Aeromecânica* Ltd., in Ponta Grossa - PR.

It was not possible to quantify the hours flown after the inspection, due to the burning of the aircraft logbook in the accident.

1.7 Meteorological information.

The aircraft took off at 1400 (UTC) on 15SEPT2018, therefore, the aeronautical information that the pilot had available at the beginning of the flight, in relation to the destination Aerodrome (SBCH), was as follows:

METAR SBCH 151300Z 23004KT 1200 BCFG BR BKN002 BKN100 17/17 Q1016=

SPECI SBCH 151305Z 25004KT 2000 BR FEW002 SCT020 BKN100 17/17 Q1015=

SPECI SBCH 151320Z 26004KT 5000 2000N BR BKN020 BKN100 18/17 Q1016=

As of 1300 (UTC), the METAR indicated visibility restricted to 1,200 meters with the presence of BCFG and BR, with a cloud layer constituting a ceiling at 200 and 10,000 ft (BKN).

At 1305 (UTC), a SPECI was issued indicating an increase in visibility to 2,000 meters, wet fog, and FEW clouds at 200 ft.

At 1320 (UTC), a new SPECI was issued, indicating an increase in visibility to 5,000 meters with a restriction of 2,000 meters in the Northern sector of the Aerodrome, wet fog and cloud layer constituting a ceiling at 2,000 and 10,000 ft.

Figure 1 shows the visible satellite image at 1300 (UTC), in which one can observe the cloudiness over the state of Santa Catarina - SC.

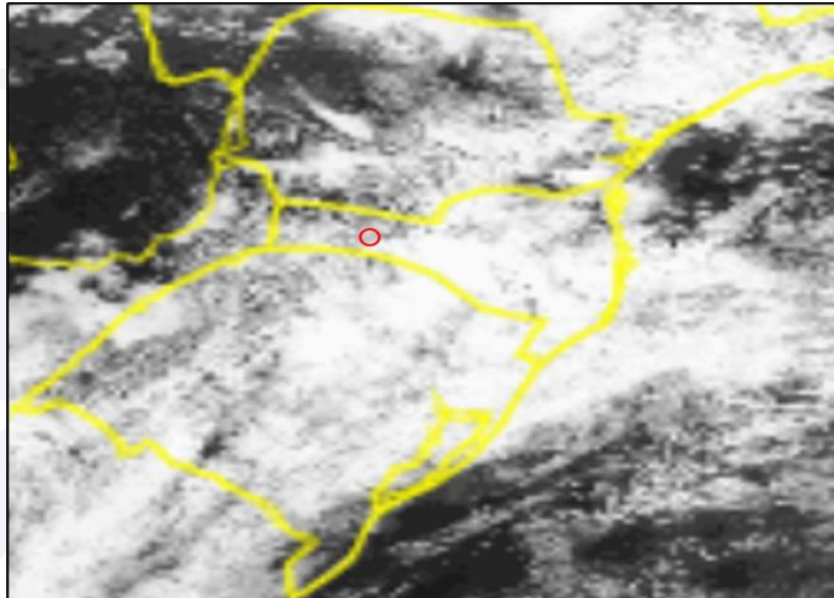


Figure 1 - Satellite image visible at 1300 (UTC) highlighting the accident region.

At 1500 (UTC), the weather conditions at the destination Aerodrome were as follows:

METAR SBCH 151500Z 28010KT 9999 BKN020 20/15 Q1015

The METAR at 1500 (UTC) indicated a significant improvement in the meteorological conditions with visibility above 10,000 meters and a cloud layer constituting a ceiling at 2,000 ft.

At the time of the accident, there was a stationary low-pressure center in the Atlantic Ocean, East of the states of Santa Catarina and Paraná.

There were forecasts of thunderstorms, turbulence, and ice in the region, according to the SIGMET, issued by the Meteorological Center of Curitiba.

Figure 2 shows the visible satellite image at 1500 (UTC), in which one can observe the cloudiness present over the state of Santa Catarina.

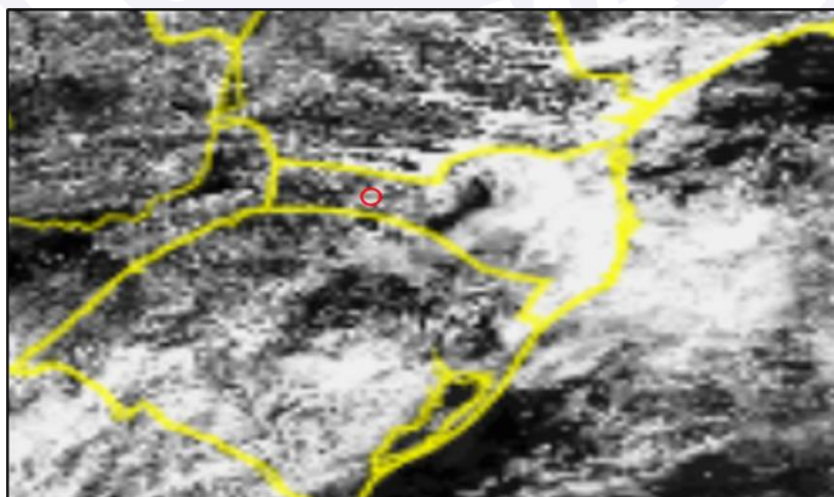


Figure 2 - Satellite image at 1500 (UTC). The accident area is highlighted.

Local observers and the rescue team reported that, at the time of the accident, there was a dense fog that covered the entire region close to the occurrence.

1.8 Aids to navigation.

The SBCH Aerodrome had two instrument approach procedures for runway 11. One of the procedures was marked out by a VOR, as shown in Figure 3.

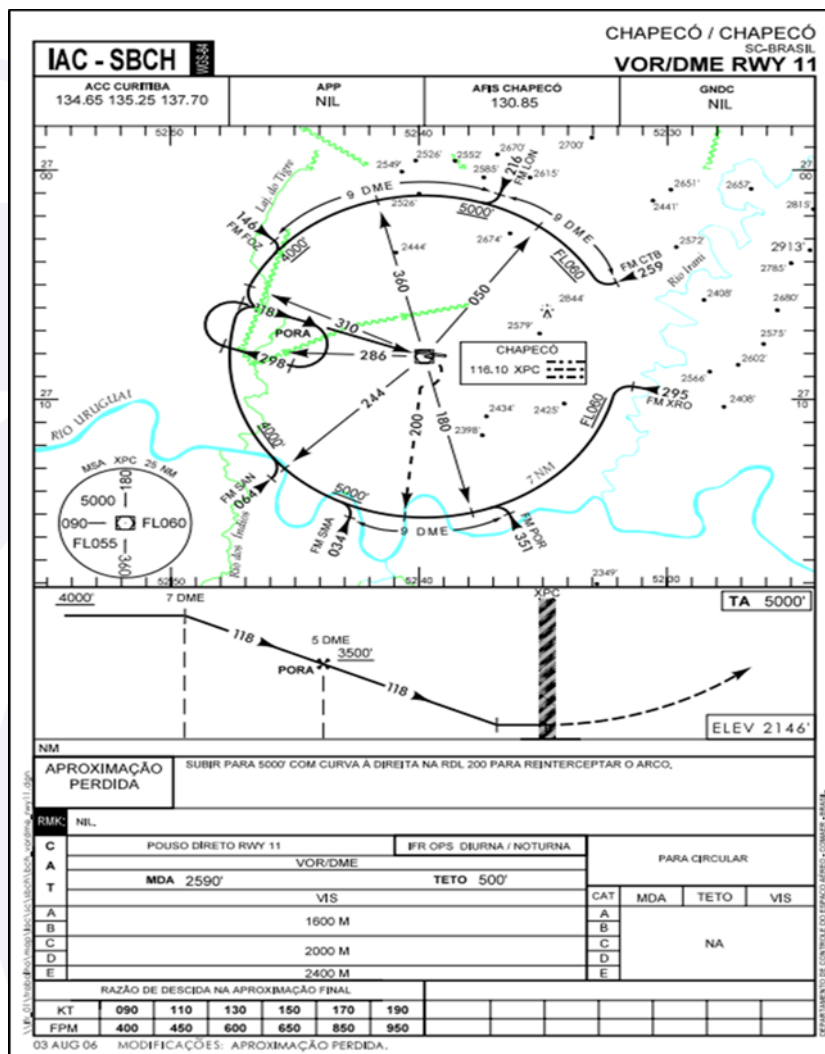


Figure 3 - VOR/DME RWY 11 approach procedure from SBCH.

The VOR/DME RWY 11 procedure prevised its start in an arc marked out by DME at 9 NM, with a minimum flight level of 060 for aircraft coming from SBFL.

Likewise, the MSA, predicted up to 25 NM from SBCH, was FL060.

The second procedure was an RNAV, RNAV RWY 11, which prevised its start at the IAF, with a minimum altitude of 5,000 ft. The predicted MSA up to 25 NM of SBCH, for this procedure, was 5,000 ft (Figure 4).

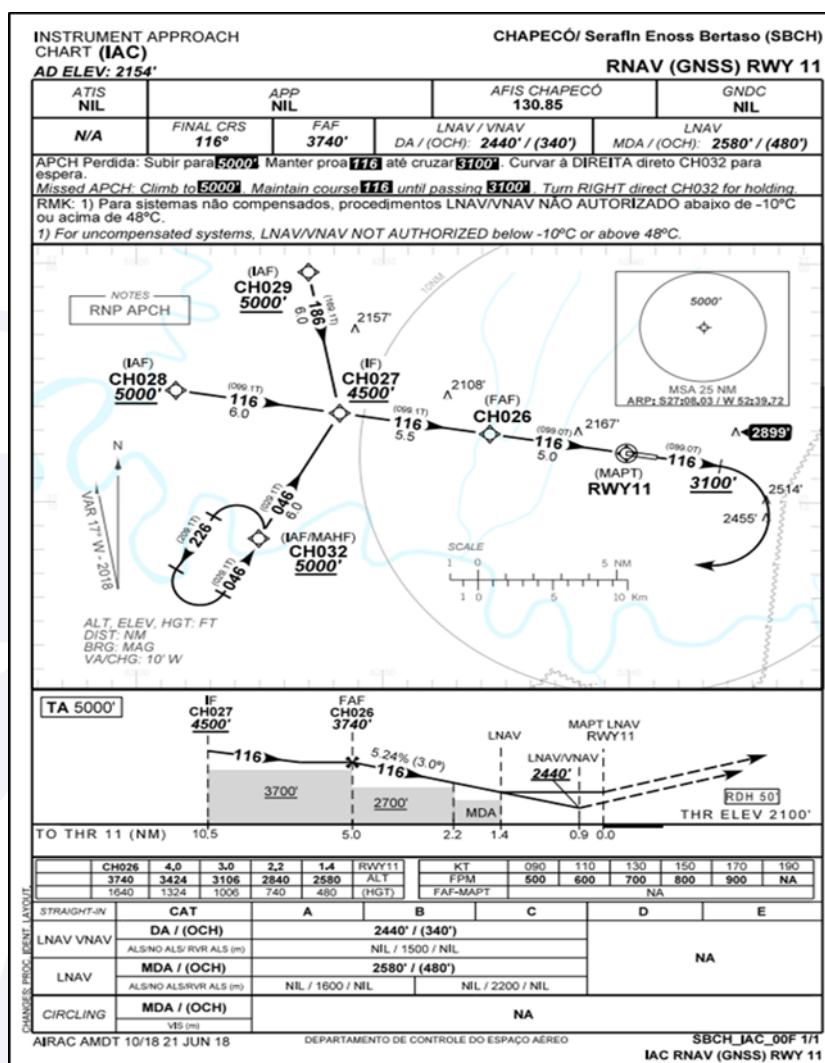


Figure 4 - SBCH RNAV RWY 11 Approach Procedure.

On the date of the accident, there was no NOTAM, indicating the inoperativeness of any navigation aid required for SBCH procedures.

1.9 Communications.

According to the transcripts of the communication audios between the PR-RFB and the control agencies, it was found that the pilot maintained radio contact with the GND-FL, with the TWR-FL, and with the APP-FL, all from Florianópolis.

The PR-RFB also established contact with the ACC-CW and with the AFIS-CH.

No technical abnormalities of communication equipment were observed during the flight until the moment of the accident.

In order to support the analysis of the sequence of events that preceded the accident, the Investigation Team highlighted some communications between the PR-RFB and the AFIS-CH. Two other aircraft (PR-GCC and PR-NRN) that were flying in the region also coordinated with the AFIS-CH.

To record the times described in this field, the UTC recorded by the communication equipment was used as a reference.

The initial contact between the PR-RFB and the AFIS-CH took place at 14h26min57s.

At 14:26:57, the PR-RFB reported that it was flying at FL200, at 125 NM, on the magnetic heading 281°.

The AFIS-CH reported visual operation at the Aerodrome with 206° wind with 8 kt, temperature 20°C, and altimeter setting of 1016 hPa.

The PR-RFB reported that it would land on runway 29.

At 14:50:17, the PR-RFB informed AFIS-CH that it was leaving FL200, already cleared by the ACC-CW, for the traffic altitude, at 47 NM, on the magnetic heading 275°.

The PR-RFB reported that it estimated the landing at 15:08.

At 14:55:05, the PR-GGC was flying from Cascavel - PR (SBCA) to Passo Fundo - RS (SBPF) and started coordinating with the PR-NRM that was flying from Porto Alegre - RS (SBPA) to SBCH. The PR-GGC asked about the conditions on the route to the PR-NRM.

PR-NRN reported that it was passing FL125 on descent and that there were some cumulus clouds but no turbulence.

The PR-GGC informed that it was making detours and that it would start the descent to SBPF.

The PR-NRN reported: "Down there, it's fine, don't worry. Erechim is CAVOK too, Passo Fundo was really good too [...]".

At 14:56:20, the PR-NRN reported: "Chapecó... the November Romeo November now cleared by the center, is making a little detour to divert a cumulus, it is returning to the route. Chapecó estimates the traffic circuit in another three minutes".

At 14:56:30, the AFIS-CH asked: "Fox Bravo copied?".

The PR-RFB reported: "Copied, it's ten minutes out".

1.10 Aerodrome information.

The occurrence took place 23.92 NM away from the Aerodrome.

1.11 Flight recorders.

The aircraft was equipped with a Fairchild CVR, model A100S, SN 02366.

The CVR was sent to the CENIPA facilities to read the communications held by the crewmember in the cockpit.

In order to support the analysis of the sequence of events that preceded the accident, the Investigation Team highlighted some excerpts from the recorded audio.

To record the times described in this field, the UTC recorded by the CVR was used as a reference.

There was a lag of 01min33s between the CVR recording and the AFIS-CH recordings.

At 14:31:21, the aircraft was controlled by the ACC-CW and this questioned the PR-RFB: "What's wrong?".

The PR-RFB reports: "I have a formation here on the side, here on the left".

At 14:42:40, the pilot verbalizes: "It ended (...) Tense" (sic).

In the following the last communications between the PR-RFB and the AFIS-CH, in the moments before the collision of the aircraft, the CVR recorded the following audios:

At 14:58:03, the AFIS-CH asked: "Fox Bravo copied?".

At 14:58:05, the PR-RFB reported: "Copied, it's ten minutes out".

At 14:58:10, the pilot says: "Uhm, yes, if it was easier, I'll be at twenty-nine miles, on the magnetic two-seven-four".

At 14:58:26, an "Altitude Alert" is audible in the aircraft cabin.

At 14:59:15, the pilot verbalizes “Ê-TCHA” (sic).

At 15:00:15, the recording ends.

1.12 Wreckage and impact information.

The impact occurred out of the Aerodrome, in a mountainous and wooded region. The distribution of the wreckage was linear (Figure 5).



Figure 5 - Aerial view of the wreckage.

Figure 6 illustrates the approximate trajectory of the aircraft before impact.



Figure 6 - Approximate impact trajectory.

The first impact occurred against the trees, in a pitch-down attitude (approximately 10°) and with leveled wings. The second impact occurred against the ground (Figure 7).



Figure 7 - Bottom view of the wreckage.

After the second impact, there was a fire that consumed practically the entire aircraft, except the tail cone and the vertical and horizontal stabilizers, which were partially preserved (Figure 8).



Figure 8 - View of the aircraft tail assembly.

The degree of destruction and carbonization of the aircraft prevented the verification of much of the equipment and instruments.

1.13 Medical and pathological information.

1.13.1 Medical aspects.

The information on the medical aspects was gathered through interviews with people who were close to the pilot, the result of the last INSPSAU, and the results of the cadaveric and toxicological reports.

The pilot did not fulfill a fixed schedule and the accident occurred before lunchtime.

According to family members, the pilot ate and rested properly. He did not smoke or drink in the periods before the flights. There was no evidence of self-inflicted overloads that could have compromised his psychophysical capacity in the hours before the accident flight.

Regarding the pilot's physical conditions at the time of the accident, there was no evidence of work overload, or use of alcohol, drugs, or medication. Also, there was no evidence of a performance deficiency caused by any type of physical disability or fatigue.

The pilot's death occurred as a result of the aircraft crash, having as the cause, the occurrence of hemorrhagic shock and carbonization, according to the IML's report.

1.13.2 Ergonomic information.

Nil.

1.13.3 Psychological aspects.

The pilot was 58 years old and was described as being careful about his health and passionate about aviation. It emerged that he spoke little of personal problems, used to be quieter, and isolated himself when he was unhappy with something.

According to reports from people around him, some events in his personal life were negatively affecting his emotional state and he appeared to be more introspective in the period before the accident.

He had been flying the PR-RFB aircraft for a year, carrying employees and private flights for the operator. He previously flew for nearly 20 years as a co-pilot for another operator.

According to reports, he would not have been promoted to commander in that company, among other factors, due to difficulties in cabin management and decision-making. In contrast to these reports, it was found that he had flight hours recorded as pilot-in-command on all aircraft flown for that operator.

Operationally, he was described as a skilled pilot, but who had difficulty interacting with other crewmembers, both in relationships and in flight. This difficulty was especially evident when he flew with more experienced pilots who played the role of commander.

According to reports, his decision-making tended to prioritize the fulfillment of the flight, minimizing the risks involved in the operation. There were situations in which he diverged from the direction of other crewmembers, opting for visual flight without having favorable weather conditions. Also, according to reports, there was the perception of other crewmembers that the pilot was uneasy about flying by instruments.

On the day of the accident, the pilot intended to return home, as he had a birthday celebration for himself and his stepdaughter. The audio recording of the pilot's radio conversation with the GND-FL shows that he insisted on speeding up his take-off.

1.14 Fire.

There was fire upon impact. Due to the terrain conditions, the progression of the teams on the ground was hampered and such difficulty caused a large part of the aircraft to be consumed by the flames.

1.15 Survival aspects.

Nil.

1.16 Tests and research.

Nil.

1.17 Organizational and management information.

The aircraft owner had no aviation qualifications, so the planning and execution of operations, as well as the control of maintenance, were performed solely by the pilot.

The pilot did not go through a selection process or follow-up on his performance after being hired. He was the only one hired to operate the aircraft and was also responsible for managing the aircraft maintenance, which was carried out by an outsourced shop.

1.18 Operational information.

The aircraft was within the weight and balance limits specified by the manufacturer.

The intended route, according to the IFR flight plan, provided for takeoff from SBFL at 1130 (UTC), climb to flight level 160 (FL160), initial heading at coordinate 27°10'00"S 051°33'00"W, and, after, heading to SBCH (Figure 9).

```
PRI: FF
FT: 150101
(FPL-PRRFB-IG
-BE9L/L-SDHFGR/C
-SBFL1130
-N0230F160 DCT 2710S05133W DCT
-SBCH0100 SBFL
-PBN/B1 NAV/SBAS OPR/GAMBATTO VEICULOS LTDA RMK/FROM SBFL PER/B
```

Figure 9 - PR-RFB initial flight plan data.

At 1150 (UTC), a DLA message was passed, changing the take-off time from 1130 am to 1215 pm (UTC). At 1235 (UTC), a new DLA message was issued for 1400 (UTC).

There was some delay in authorizing the taxi, due to the need to wait for other aircraft. However, the take-off took place on time. After the take-off, the pilot requested to change the final level to FL200 and direct heading to the destination. This request was authorized by the APP-FL in coordination with the ACC-CW.

During the en-route flight, the pilot showed concern about the meteorological formations, according to audio from the CVR.

At 47 NM from SBCH, the pilot reported to AFIS-CH that he had already started the descent and cleared FL200. The RADAR image at 14:54:39 (UTC) shows the PR-RFB descending, crossing FL132, on the 092° radial, 48.9 NM away from the XPC VOR (Chapecó), as shown in Figure 10.

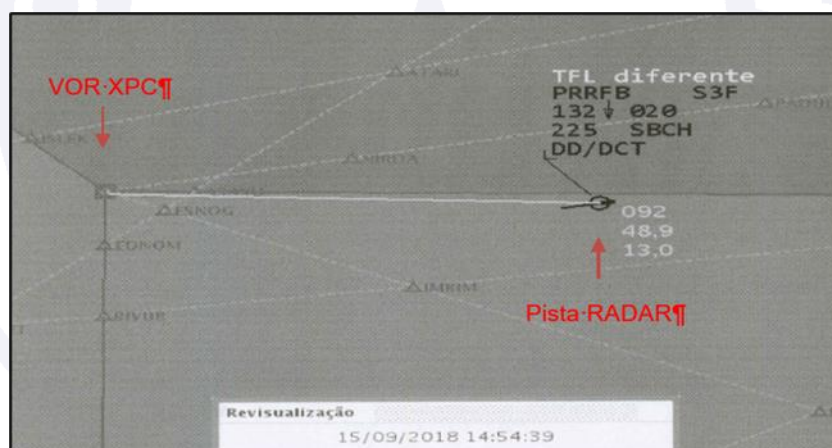


Figure 10 - RADAR image at 14:54:39 (UTC).

The last RADAR synthesis, with data from the PR-RFB, took place at 14:55:46 (UTC), when the aircraft was descending, crossing FL120, on the 093° radial, 45 NM away from the XPC VOR, as shown in Figure 11.



Figure 11 - RADAR image at 14:55:46 (UTC).

The impact occurred 23.92 NM from VOR XPC, at an altitude of 3,195 ft. In this position, the VOR/DME RWY 11 instrument approach procedure prevised the FL060 as the minimum flight level and the SBCH RNAV (GNSS) RWY 11 procedure prevised an MSA of 5,000 ft.

Figure 12 illustrates the positions of the origin Aerodrome (SBFL), the destination Aerodrome (SBCH), and the point of impact.



Figure 12 - Positions of the departure aerodrome (SBFL), the destination aerodrome (SBCH) and the PR-RFB impact point.

1.19 Additional information.

During the research regarding the pilot's INSPSAU, it was found that he performed his last inspection at the ANAC Accredited Clinic No. 35, on 11JUN2018. On the occasion, it was found that the psychological report was invalid, without the standardization of the report required by Resolution 007/2003 of the CFP with the use of psychological tests not validated by the CFP, and descriptions of test results without connection with the conclusion of the report.

1.20 Useful or effective investigation techniques.

Nil.

2. ANALYSIS.

The C90A (PR-RFB) aircraft was registered in the TPP category and was operated by *Gambatto Veículos* Ltd. The planning and execution of operations, as well as the control of maintenance, were performed solely by the pilot.

According to maintenance records and transmissions collected from the CVR audio, there was no evidence of failure or malfunction of systems and/or components that could have affected in-flight performance or control.

The pilot had been flying for thirty-one years and had a PLA License. Despite the impossibility of specifying the number of hours flown, it is estimated that he had accumulated more than 2,700 total hours, mainly in multi-engine aircraft.

The Pilot's FAP did not reveal deficiencies in the pilot's handling of the aircraft. Despite this fact, there were reports of crewmembers from the pilot's conviviality who indicated difficulties with cabin management, decision-making, and a tendency to opt for a visual flight over flight under IFR.

The pilot frequently operated in SBCH, having performed seven flights to that location in the thirty days prior to the accident. Therefore, he was familiar with the region and the local traffic profiles.

The information about the pilot's routine did not show the preexistence of self-induced overloads that could have compromised his psychophysical capacity in the hours before the accident flight.

The CMA was valid until 03JUL2019, without restrictions. However, it was not possible to say that his psychic conditions met the minimum requirements since the psychological test performed was not in accordance with the recommendations of the CFP.

According to reports from people close to the pilot, some events in his personal life were negatively affecting his emotional state and he appeared to be more introspective in the period before the accident.

It was also found that his decision-making tended to prioritize the fulfillment of the flight, minimizing the risks involved in the operation. Thus, the pilot had a history of complacency with operational risks.

On the day of the accident, the pilot intended to return home, as he would celebrate his and his stepdaughter's birthday. The motivation, as a consequence of the date, could have influenced his decisions, with the pilot being excessively stimulated to complete the flight.

The history of risk complacency and excessive motivation may have affected the performance and the decision-making process in flight, in a way that the pilot may not have correctly evaluated important aspects for the safety of the flight.

The planned route, according to the IFR flight plan, prevised the take-off from SBFL at 1400 (UTC), climb to flight level 160 (FL160), initial heading of coordinate 27°10'00"S 051°33'00"W, and then heading of SBCH.

Regarding the preparation for the flight, it was found that there was no NOTAM that indicated the inoperability of any navigation aid required for the SBCH procedures.

The meteorological information from SBCH, available to the pilot before the take-off, indicated restricted ceiling and visibility conditions, however, with gradual improvement over time.

The take-off of SBFL took place at the time predicted by the DLA message, despite some delay in the authorization for the taxi. After the take-off, the pilot requested to climb to FL 200 and heading straight to SBCH, requests that were met by the APP-FL, in coordination with the ACC-CW.

During the en-route flight, the pilot verbalized his concern about meteorological formations, according to the CVR audio recording.

In the first contact with the AFIS-CH, at 14:27:17 (UTC), it was reported that the Aerodrome was operating under VMC, had a 260° wind with an intensity of 8 kt and an altimeter setting of 1016 hPa. Based on this information, the pilot informed that he would land on runway 29.

At 14:50:17 (UTC), the PR-RFB informed the AFIS-CH that it was clearing FL200 for the traffic altitude, 47 NM from SBCH. Despite not having requested cancellation of the IFR plan, when informed that he would descend to the traffic altitude, it was inferred that the pilot would perform the visual traffic procedure.

In the last RADAR synthesis, at 14:55:46 (UTC), the aircraft was descending, crossing FL120, on the 093° radial, 45 NM away from the XPC VOR.

According to the CVR data, at 14:58:05 (UTC), the PR-RFB made its last contact with the AFIS-CH, informing: "Copied, it's ten minutes out".

At 14:58:26 (UTC), an "Altitude Alert" is audible in the aircraft cabin. At 14:59:15 (UTC), the PR-RFB pilot says "Ê-TCHA" and, at 15:00:15 (UTC), the recording ends.

At the time of the accident, the SBCH Aerodrome was operating under VMC. However, reports from observers at the accident site, 23.92 NM away, showed the presence of heavy fog in that region. When crossing these reports with data from meteorological analyses, it was found that the conditions, at the place and at the time of the accident, were not favorable for the visual flight.

The aircraft's wreckage was found in a region whose altitude was 3,195 ft, where weather conditions did not allow flights under Visual Flight Rules (VFR) at the time of the accident. As such, the IFR rules, which mandated a minimum altitude of 5,000 ft, should have been observed.

The pilot's profile, which prioritized the fulfillment of flights to the detriment of possible risks to the operations, as well as discomfort in performing instrument descent procedures, associated with the circumstances in which the aircraft collided with the ground, indicate that there was a failure in the decision-making process.

The choice to continue the descent without considering the IFR rules was based on an inadequate judgment of the meteorological conditions in the sector where the flight was carried out and corroborates the failure in the decision-making process.

This failure may have been influenced by events in the pilot's personal life, which negatively affected his emotional state, as well as his motivation to complete the flight and return home to celebrate his and his stepdaughter's birthday.

3. CONCLUSIONS.

3.1 Facts.

- a) the pilot had a valid CMA;
- b) the pilot had valid MLTE and IFRA Ratings;
- c) the pilot was qualified and had experience in the type of flight;
- d) the aircraft had a valid CA;
- e) the aircraft was within the weight and balance limits;
- f) the airframe, engine, and propeller logbook records were updated;
- g) at the location of the occurrence, the weather conditions were not favorable for the VFR flight;
- h) the aircraft took off from SBFL to SBCH with an IFR flight plan;

- i) at 47 NM from SBCH, the pilot did not cancel the IFR flight plan and informed the AFIS-CH that he was leaving FL200 to the traffic altitude;
- j) the aircraft descended below the minimum altitude prescribed by the IFR rules;
- k) the aircraft crashed into the ground at 23.92 NM from SBCH, at an elevation at an altitude of 3,195 ft;
- l) the aircraft was destroyed; and
- m) the pilot suffered fatal injuries.

3.2 Contributing factors.

- Attitude – a contributor.

The fact that the pilot continued the descent visually, not performing the instrument approach according to the IFR flight plan, denoted a failure to observe the real risks of this action. Thus, his attitude contributed to the inadequate approach that culminated in the collision with the ground.

- Adverse meteorological conditions – a contributor.

Even though the Aerodrome had ceiling and visibility conditions favorable for the visual flight at the time of the accident, it was found that there was dense fog covering the entire region close to the impact site and, therefore, the IFR rules, which determined an altitude minimum of 5,000 ft, should have been observed.

- Emotional state – undetermined.

Some events in the pilot's personal life were negatively affecting his emotional state. In addition, the pilot appeared to be more introspective in the period prior to the accident.

Thus, it is possible that his performance was impaired due to his emotional state.

- External influences – undetermined.

The pilot was possibly experiencing difficult events in his personal life. These events could have negatively affected his emotional state.

In this way, the pilot's way of thinking, reacting, and performing at work may have been impacted by factors external to the work.

- Motivation – undetermined.

The pilot intended to return home, as he would celebrate his birthday and that of his stepdaughter.

The audio recording of the pilot's voice with the GND-FL shows that he insisted on speeding up his take-off, indicating a possible high motivation and focused on meeting his wishes to fulfill the flight. This condition may have influenced in-flight performance.

- Decision-making process – a contributor.

The choice to continue the descent without considering the IFR rules, based on an inadequate judgment of meteorological conditions, revealed difficulties for the pilot to perceive, analyze, choose alternatives and act appropriately in that situation.

4. SAFETY RECOMMENDATION.

A proposal of an accident investigation authority based on information derived from an investigation made intending to prevent accidents or incidents and which in no case has the purpose of creating a presumption of blame or liability for an accident or incident. In addition to safety recommendations arising from accident and incident investigations, safety recommendations may result from diverse sources, including safety studies.

In consonance with Law n°7565/1986, recommendations are made solely for the benefit of the air activity operational safety, and shall be treated as established in the NSCA 3-13 “Protocols for the Investigation of Civil Aviation Aeronautical Occurrences conducted by the Brazilian State”.

Recommendations issued at the publication of this report:

To the Brazil's National Civil Aviation Agency (ANAC):

A-148/CENIPA/2018 - 01

Issued on 09/17/2021

Work with the accredited clinic N° 35, in order to verify the compliance of its processes with the provisions of the legislation in force, notably regarding the use of psychological tests validated by the CFP and in the issuance of results consistent with the conclusions of the tests performed.

A-148/CENIPA/2018 - 02

Issued on 09/17/2021

Disseminate the lessons learned in the present investigation, to alert pilots and operators of Brazilian civil aviation about the risks arising from the operation under VFR when in IMC conditions.

5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN.

None.

On September 17th, 2021.