

COMANDO DA AERONÁUTICA
CENTRO DE INVESTIGAÇÃO E PREVENÇÃO DE
ACIDENTES AERONÁUTICOS



FINAL REPORT
A - 034/CENIPA/2014

OCCURRENCE:	ACCIDENT
AIRCRAFT:	PT- WBO
MODEL:	PA-25-235
DATE:	23FEB2017



NOTICE

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

The elaboration of this Final Report was conducted taking into account the contributing factors and hypotheses raised. The report is, therefore, a technical document which 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 in the Brazilian legal system by virtue of the 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 to 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 23FEB2017 accident with the PA-25-235 aircraft, registration PT-WBO. The accident was classified as “[LOC-I] Loss of Control in Flight”.

During a fungicide application flight on banana plantations, the plane crashed into the ground.

The aircraft had substantial damage.

The pilot suffered fatal injuries.

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



CONTENTS

GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS	5
1. FACTUAL INFORMATION.....	6
1.1 History of the flight.....	6
1.2 Injuries to persons.....	6
1.3 Damage to the aircraft.....	6
1.4 Other damage.....	6
1.5 Personnel information.....	7
1.5.1 Crew's flight experience.....	7
1.5.2 Personnel training.....	7
1.5.3 Category of licenses and validity of certificates.....	7
1.5.4 Qualification and flight experience.....	7
1.5.5 Validity of medical certificate.....	7
1.6 Aircraft information.....	7
1.7 Meteorological information.....	7
1.8 Aids to navigation.....	7
1.9 Communications.....	8
1.10 Aerodrome information.....	8
1.11 Flight recorders.....	8
1.12 Wreckage and impact information.....	8
1.13 Medical and pathological information.....	9
1.13.1 Medical aspects.....	9
1.13.2 Ergonomic information.....	9
1.13.3 Psychological aspects.....	10
1.14 Fire.....	10
1.15 Survival aspects.....	10
1.16 Tests and research.....	10
1.17 Organizational and management information.....	11
1.18 Operational information.....	12
1.19 Additional information.....	12
1.20 Useful or effective investigation techniques.....	13
2. ANALYSIS.....	13
3. CONCLUSIONS.....	14
3.1 Facts.....	14
3.2 Contributing factors.....	14
4. SAFETY RECOMMENDATION.....	14
5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN.....	15

GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS

ANAC	Brazil's National Civil Aviation Agency
CA	Airworthiness Certificate
CENIPA	Aeronautical Accident Investigation and Prevention Center
CMA	Aeronautical Medical Certificate
DCTA	Department of Science and Aerospace Technology
IAM	Annual Maintenance Inspection
METAR	Meteorological Aerodrome Report
MNTE	Airplane Single Engine Land Rating
NTSB	National Transportation Safety Board (USA)
PAGA	Agricultural Pilot Rating - Airplane
PPR	Private Pilot License – Airplane
PCM	Commercial Pilot License – Airplane
RBAC	Brazilian Civil Aviation Regulation
SAE - AG	Aircraft Registration Category of Specialized Air Service - Aero Agricultural
SACI	Integrated Civil Aviation Information System
SBJV	ICAO Location Designator – Joinville Aerodrome - SC
SIPAER	Aeronautical Accident Investigation and Prevention System
UTC	Universal Time Coordinated

1. FACTUAL INFORMATION.

Aircraft	Model: PA-25-235	Operator: Seragri Aero Agricultural Services Ltd. ME
	Registration: PT-WBO	
	Manufacturer: Piper Aircraft	
Occurrence	Date/time: 23FEB2017 – 1030 UTC	Type(s): [LOC-I] Loss of Control in Flight
	Location: Agricultural Property	
	Lat. 26°05'40"S Long. 048°53'03"W	Subtype(s): NIL
	Municipality – State: Garuva – SC	

1.1 History of the flight.

The aircraft took off from a landing area for Aero Agricultural use of the Garuva Banana Association - SC, at about 1000 (UTC), in order to carry out fungicide application in banana plantations, with a pilot on board.

With about 30 minutes of flight, the plane collided against the ground.

The aircraft had substantial damage.

The pilot suffered fatal injuries.



Figure 1 - Aircraft at the accident site.

1.2 Injuries to persons.

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

1.3 Damage to the aircraft.

The aircraft had substantial damage to the propeller, engine, wings and fuselage.

1.4 Other damage.

None.

1.5 Personnel information.

1.5.1 Crew's flight experience.

Hours Flown	Pilot
Total	Unknown
Total in the last 30 days	23:35
Total in the last 24 hours	00:30
In this type of aircraft	Unknown
In this type in the last 30 days	23:35
In this type in the last 24 hours	00:30

N.B.: The data relating to the flown hours were obtained through the records of the airplane's flight logbook. Other flight experience logs were not found.

1.5.2 Personnel training.

The pilot took the PPR course, in 1987 and the PCM course, in 1989. These information were obtained from the ANAC's SACI.

1.5.3 Category of licenses and validity of certificates.

The pilot had the PCM License and had valid MNTE and PAGA Ratings.

1.5.4 Qualification and flight experience.

The pilot was qualified and had experience in that kind of flight.

1.5.5 Validity of medical certificate.

The pilot had valid CMA.

1.6 Aircraft information.

The aircraft, serial number 25-5401, was manufactured by Piper Aircraft, in 1971, and was registered in the SAE-AG category.

The aircraft had valid Certificate of Airworthiness (CA).

The airframe, engine and propeller logbooks records were updated.

The last inspection of the aircraft, the "100 hours/IAM" type was performed on 08NOV2016 by the Blumenau Aeroclub maintenance organization - SC, having flown 50 hours and 40 minutes after the inspection.

The last overhaul of the aircraft, the "1,000-hour" type was performed on 04NOV2015 by the REMASUL maintenance organization in São José - SC, having flown 182 hours after the inspection.

1.7 Meteorological information.

The conditions were favorable for the visual flight.

The METAR of the Joinville Aerodrome (SBJV), nine nautical miles away from the scene of the accident, had the following information:

METAR SBJV 230900Z 00000KT 6000 FEW010 BKN100 22/22 Q1013=

METAR SBJV 231000Z 30001KT 7000 NSC 23/22 Q1013=

METAR SBJV 231100Z 00000KT CAVOK 25/24 Q1013=

It was found that the conditions were favorable for visual flight with visibility over 7km, without significant clouds. The wind was calm.

1.8 Aids to navigation.

Nil.

1.9 Communications.

Nil.

1.10 Aerodrome information.

The occurrence took place outside the Aerodrome.

1.11 Flight recorders.

Neither required nor installed.

1.12 Wreckage and impact information.

The vegetation at the site of the accident was a little damaged by the aircraft, denoting that the collision against the ground was with a pitch down attitude at approximately 80° (Figure 2).



Figure 2 - View of the location of the aircraft collision and impacts on the vegetation.

The propeller was completely buried in the ground, corroborating the hypothesis of a practically vertical collision (Figure 3).



Figure 3 - View of the engine with the propeller buried in the ground.

1.13 Medical and pathological information.

1.13.1 Medical aspects.

When they visited the company's base, the Investigators received a box of drugs that supposedly belonged to the pilot (Figure 4).

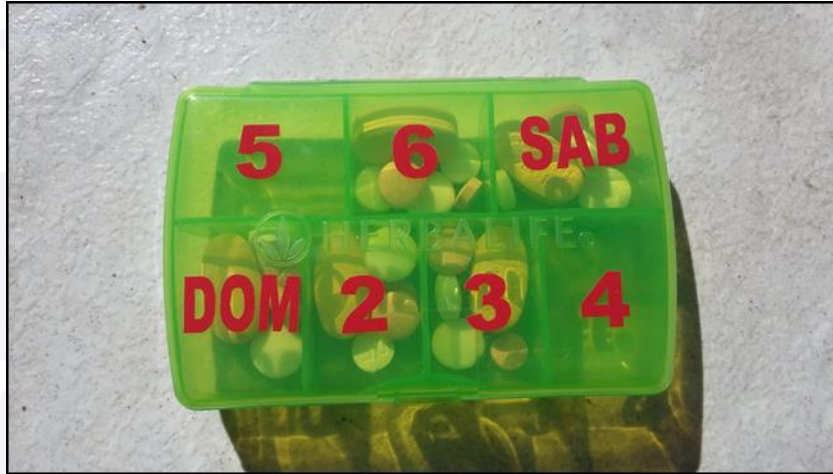


Figure 4 - Box with medications.

In this box, with compartments for each of the days of the week, there were six different types of tablets. The drugs were distributed in five of the seven compartments. The spaces on Wednesday and Thursday were empty, leading to the belief that the pilot had consumed its contents.

About the contents of the box, four drugs were identified: XigDuo XR® 10/1000 mg, Carduran XL® 4 mg, Enblex® and Atacand® 16 mg.

On the date of his last medical examination to issue the Aeronautical Medical Certificate (CMA), on 27APR2016, the pilot declared using the following medications: Atacand®, Nebilet®, Carduran® and Enblex®.

There was no information in the form on the use of oral hypoglycemic agents. However, the fasting glycemia of the pilot was altered (140mg / dL) with glycated hemoglobin of 5.7%.

The widow confirmed that the commander was diabetic and hypertensive, stating that the diseases were controlled. Considering that the box of medicines found by the owner of the company belonged to the pilot, it could be inferred that the use of the oral hypoglycemic was initiated at some time after the last medical examination.

It occurs that the combination of XigDuo XR® 10/1000 and Nebilet® medications is not recommended for pilots as it can mask the body's reaction to hypoglycaemia and jeopardize the safety of the operation.

Still during the interviews, the pilot was reported to ingest sugary and aerated drinks daily in large quantities. This habit could lead to hypoglycemia or hyperglycemia in a diabetic individual, which would affect cognition and, consequently, his psychomotor ability.

The commander also had a deficiency in the left upper limb as a result of a previous fracture. This deficiency, possibly, had no influence on the crash, as the pilot flew an aircraft adapted to his needs.

1.13.2 Ergonomic information.

Nil.

1.13.3 Psychological aspects.

The pilot was 57, he was born in Porto Alegre and lived in Brusque with his wife. He had no children.

His first Rating as a pilot was obtained in 1987. He worked as an agricultural pilot in the Northern, Southeastern and Southern regions of Brazil.

In 1998, he suffered a plane crash and had a sequel to his left arm (pseudoarthrosis). Due to this limitation, he did not fly for 17 years and during that time, he worked as a mechanical designer.

Over these years, the commander expressed the desire to return to flight and found that he could do so, even with his physical limitations. He performed readaptation, renewed his Aeronautical Medical Certificate (CMA) and received a favorable result in his last psychological evaluation, in 2016.

The pilot was described as a cheerful, communicative person who loved flying. He worked in the morning and spent the rest of his time with his wife. They used to do physical activity together, language courses, church attendance, social gatherings with friends and family, and travel.

Colleagues described him as an experienced pilot. They also said that he was motivated by the return to air activity. He liked to be called a commander, and showed pride in being a pilot.

In 2015, he was hired by Seragri Aero Agricultural Services Ltd., which operated in the region of Luiz Alves - SC. The company had two aircraft, two pilots, one of which was the owner, and three other administrative staff.

The owner had previously worked with the pilot and offered him the opportunity.

In relation to his piloting profile, they said that he "pulled a lot", "always flew in the red", "without a margin of defense". According to reports, he had difficulty receiving criticism, including from his boss, even coming to discuss sometimes.

They said he was authoritarian with other employees and he was arrogant. The commander was also described as "flustered" to accomplish his missions. They said that some customers had already complained about his service, requiring it to be repeated.

Co-workers said that at certain times he was in good spirits, and in others he expressed irritability and impatience.

In addition, interviewees reported a certain level of difficulty of the company owner in exercising leadership over him, because they were friends for a long time. The pilot demonstrated difficulty in receiving feedback and little flexibility for changes.

1.14 Fire.

There was no fire.

1.15 Survival aspects.

The aircraft was located because of an air search conducted by the Military Fire Brigade of the Santa Catarina State.

The pilot perished at the site of the accident.

1.16 Tests and research.

The Investigation Team asked the DCTA to conduct tests on the Lycoming engine O-540-B2B5, N / S L-10530-40, which equipped the aircraft.

The analysis of the propeller blades showed a slight folding forward, impact marks on the leading edge of one of them, as well as transversal hazards in the other, indicating that the engine was working at the moment of impact (Figure 5).



Figure 5 - Impact marks on the leading edge and transversal hazards on the back of the blade.

During the analysis of the engine, it was found that the screw and stud used for the fixing of the left magneto drive gear and valve control shaft had abnormal wear during the vibration engine operation.

With the detachment of the stud, the shaft remained fixed only by the screw, which did not allow the release of the gear (Figure 6). If the screw breaks, the shaft would release the gear, which could leave its housing and cause the engine to stop synchronizing, which would cause it to stop immediately.



Figure 6 - Detail of the absence of the fixation stud of the left magneto drive gear and the valve control.

However, since this shaft was still in its normal operating position, this deficiency did not cause a fault in the engine.

Also, the evidence found in the analysis of the propeller indicated that the engine had normal operation at the moment the aircraft collided.

1.17 Organizational and management information.

Nil.

1.18 Operational information.

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

The periodic inspections were performed by certified maintenance organization and recorded in the airframe, propeller and engine logbooks.

The pilot was qualified and had experience in the type of flight to be performed. Despite having spent 17 years away from the air activity, due to a deficiency in the left upper limb (pseudoarthrosis), since June 2015 he has been performing air services continuously.

Due to the deficiency already mentioned, the aircraft's lever was adapted so that the pilot could use it properly. According to acquaintances and the owner of the company, the commander was satisfied with the new lever. There were no reports of difficulties with its use. According to information from the owner, the modification was not approved by the ANAC, as it was not considered a modification that would interfere with the airworthiness of the airplane.

The crop in which the pulverization service was performed was situated on the slope of a hill and required constant attention from the pilot, as it was necessary to get around the elevation for repositioning between the spray passages. However, the degree of difficulty was not as high as in other areas of the pulverization region, located on rough terrain (Figure 7).

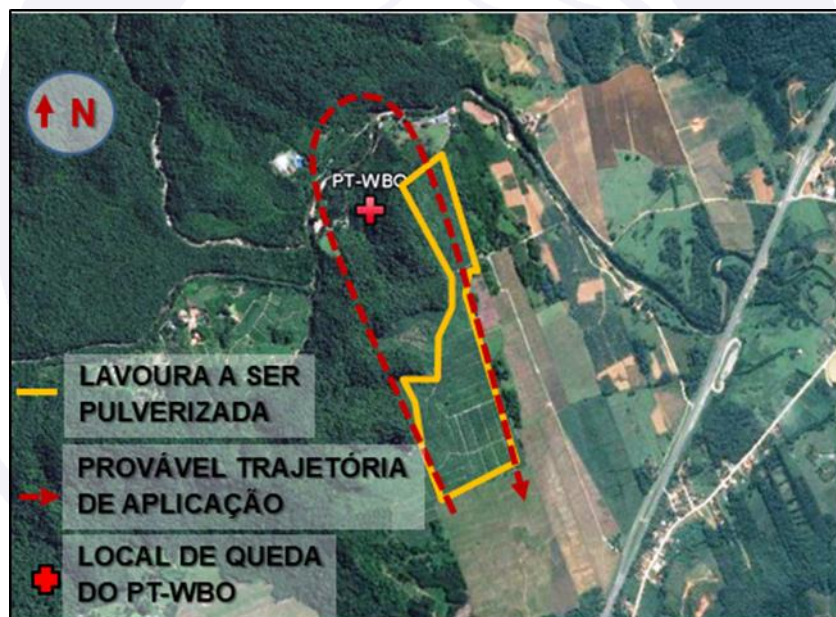


Figure 7 - Sketch with the location of the accident.

The owner of the company and other employees considered the pilot bold. He had the habit of performing aggressive maneuvers during the reversals and of applying excessive aerodynamic loads on the aircraft, and he was sometimes advised to be more cautious during his flights. The commander claimed, however, that this was "his way" to fly and that he would not change his pilot technique.

1.19 Additional information.

The Brazilian Civil Aviation Regulation (RBAC) No. 67, which dealt with the Requirements for the Granting of Aeronautical Medical Certificates, for the Accreditation of

Physicians and Clinics and for the agreement with Public Entities, prevised in its section 67.85 metabolic, nutritional and endocrinological requirements , letter (d), the following:

"[...]

67.85 metabolic, nutritional and endocrinological requirements

[...]

(d) the candidate must not have a blood glucose lower than 50mg / dl or greater than 140mg / dl, confirmed after two replicates, on different days.

"[...]"

1.20 Useful or effective investigation techniques.

Nil.

2. ANALYSIS.

It was a flight of fungicide application in banana farming.

In June 2015, the pilot performed the entire process of rehabilitation in a single-engine aircraft, he revalidated his agricultural pilot rating and took back the air activity that had been interrupted due to a pseudoarthrosis on the left arm.

Due to this deficiency, the company made an adaptation in the levers of the aircraft, so that the commander felt more comfortable during the piloting. This modification was not approved by the ANAC, contrary to RBAC 21, Sections 21.93, 21.95 and 21.97. No evidence was found that the new lever contributed in any way to the accident.

The pilot was well aware of the region in which he performed the pulverization services and was very experienced in the airplane, which favored a bold piloting technique with the execution of curves with great wing inclination and excessive application of aerodynamic loads during the reversals.

Based on the evidence gathered at the accident site, as well as the technical report of the powertrain, it was possible to rule out the possibility of a mechanical failure of the aircraft. The engine was running normally at the time of the accident. There was also no evidence of structural failure of the aircraft.

He continued to use medications to treat diabetes and hypertension, consuming six tablets a day, including the XigDuo XR® 10/1000 and Nebilet®, which was not recommended for pilots as a whole, since it could mask the reaction from the body to hypoglycemia, leading to risks to the operation.

There was evidence that the commander initiated drug treatment for diabetes after the revalidation of his CMA, but did not consult with a specialist in aerospace medicine who could advise him about the use of these drugs.

On the occasion of the CMA revalidation on 27 APR2016, it was found that fasting blood glucose levels were altered (140 mg / dL). Regarding this result, although letter 67.85 (d) of RBAC No. 67 prevised the repetition of the exam to confirm the diagnosis of diabetes, this was not apparent from the commander's medical records.

Despite being diagnosed with diabetes and using medication to treat it, the pilot did not have disciplined eating habits. He reportedly ingested sugary and carbonated drinks in large quantities daily.

Excessive consumption of food with a high glycemic index by diabetics could cause hypoglycemia or hyperglycemia, affecting his cognition and, consequently, his psychomotor capacity.

Thus, based on the clinical information of the pilot, there is a possibility that he may have presented an in-flight hypoglycemic syndrome by associating XigDuo XR® 10/1000 and Nebilet® medicines with a high glyceic index diet.

The association of these two drugs, whose prescription together was not recommended for pilots, could mask the body's reaction to hypoglycaemia, possibly caused by inadequate diet.

As a consequence, the pilot may have suffered a decrease in his cognitive ability, with prejudice to the psychomotor ability, fundamental for the accomplishment of the intended flight that, by its own characteristics, required total attention.

Finally, the bold and aggressive piloting profile associated with decreased cognitive ability may have contributed to a loss of control during the reversal and contour maneuver of the obstacles surrounding the crop.

3. CONCLUSIONS.

3.1 Facts.

- a) the pilot had valid Aeronautical Medical Certificate (CMA);
- b) the pilot had valid MNTE and PAGA Ratings;
- c) the pilot was qualified and had experience in that kind of flight;
- d) the aircraft had valid Airworthiness Certificate (CA);
- e) the aircraft was within the limits of weight and balance;
- f) the airframe, engine and propeller logbook records were updated;
- g) weather conditions were favorable for the flight;
- h) it was made a modification at the elevator lever of the aircraft, without the ANAC's approval.
- i) the aircraft took off for the application of fungicide in a banana plantation;
- j) in the interval between the application passes, while getting around a hill, the aircraft collided against the ground;
- k) the aircraft had substantial damage; and
- l) the pilot suffered fatal injuries.

3.2 Contributing factors.

- **Inappropriate diet – undetermined.**

The excessive consumption of food with a high glyceic index by diabetics could cause hypoglycemia or hyperglycemia, affecting his cognition and, consequently, his psychomotor capacity.

- **Piloting judgment – undetermined.**

The bold style of piloting may have led the pilot to misjudge some maneuver during the flight and compromised the control of the aircraft.

- **Medicine intake – undetermined.**

The pilot used XigDuo XR® 10/1000 and Nebilet® medicines. The administration of these drugs together is not recommended for pilots as it could mask the body's reaction to hypoglycaemia, bringing risks to the operation.

4. SAFETY RECOMMENDATION.

A proposal of an accident investigation authority based on information derived from an investigation, made with the intention of preventing 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 the 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-034/CENIPA/2017 - 01

Issued on 04/08/2019

Disseminate the lessons learned in the present investigation, in order to alert the Brazilian civil aviation pilots to the risks arising from drug interactions that are incompatible with air activity, as well as modifications made to the aircraft without the proper knowledge and approval of the ANAC.

A-034/CENIPA/2017 - 02

Issued on 04/08/2019

Act in conjunction with the Medical Clinics accredited by this Agency, in order to emphasize the importance of guiding the Brazilian civil aviation crew on the risks arising from drug interactions incompatible with the air activity.

5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN.

None.

On April 8th, 2019.