

COMANDO DA AERONÁUTICA
CENTRO DE INVESTIGAÇÃO E PREVENÇÃO DE
ACIDENTES AERONÁUTICOS



FINAL REPORT
A - 014/CENIPA/2021

OCCURRENCE:	ACCIDENT
AIRCRAFT:	PT-WUU
MODEL:	T188C
DATE:	31JAN2021



NOTICE

According to the Law n° 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 by taking into account the contributing factors and hypotheses raised. The report is, therefore, 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 n° 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 31JAN2021 accident with the T188C aircraft model, registration PT-WUU. The accident was classified as “[LOC-I] Loss of Control in Flight”.

The aircraft was carrying out the application of agricultural pesticides.

When performing the maneuver known as reverse turn, after the spraying, in order to reposition the aircraft for the last pass, the plane lost height and collided with the ground.

There was no evidence that the aircraft's engine or other systems failed.

The aircraft was destroyed.

The crewmember suffered fatal injuries.

An Accredited Representative of the National Transportation Safety Board (NTSB) - USA, (State where the aircraft was manufactured/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.....	8
1.8 Aids to navigation.....	8
1.9 Communications.....	8
1.10 Aerodrome information.....	9
1.11 Flight recorders.....	9
1.12 Wreckage and impact information.....	9
1.13 Medical and pathological information.....	10
1.13.1 Medical aspects.....	10
1.13.2 Ergonomic information.....	10
1.13.3 Psychological aspects.....	10
1.14 Fire.....	11
1.15 Survival aspects.....	11
1.16 Tests and research.....	11
1.17 Organizational and management information.....	11
1.18 Operational information.....	12
1.19 Additional information.....	13
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
CIV	Pilot's Flight Logbook
CMA	Aeronautical Medical Certificate
CST	Supplementary Type Certification
IAM	Annual Maintenance Inspection
IMC	Instrument Meteorological Conditions
MNTE	Airplane Single-Engine Land Rating
NTSB	National Transportation Safety Board (USA)
PAGA	Agricultural Pilot Rating
PIC	Pilot in Command
PPR	Private Pilot License – Airplane
RBAC	Brazilian Civil Aviation Regulation
SACI	Integrated Civil Aviation Information System
SAE	Public Specialized Air Service Aircraft Registration Category
SERIPA I	First Regional Aeronautical Accident Investigation and Prevention Service
SIGWX	Significant Weather
TCU	Towering Cumulus
TPP	Private Air Service Aircraft Registration Category
UTC	Universal Time Coordinated

1. FACTUAL INFORMATION.

Aircraft	Model: T188C Registration: PT-WUU Manufacturer: Cessna Aircraft	Operator: <i>Aero Agrícola Linear Ltd.</i>
Occurrence	Date/time: 31JAN2021 - 2100 UTC Location: Colorado Farm Lat. 06°38'07"S Long. 051°45'08"W Municipality – State: São Félix do Xingu – PA	Type(s): “[LOC-I] Loss of Control in Flight” Subtype(s): Nil

1.1 History of the flight.

The aircraft took off from the landing area for agricultural use at Colorado Farm, located in the Municipality of São Félix do Xingu - PA, at around 2030 (UTC), to carry out a local flight for the application of agricultural pesticides, with a pilot on board.

After the spraying, when performing a reverse turn, in order to reposition the aircraft for the last pass, the plane lost height and collided with the ground.



Figure 1 - Aircraft after the occurrence.

The aircraft was destroyed, and the crewmember suffered fatal injuries.

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	Unknown
Total in the last 24 hours	Unknown
In this type of aircraft	Unknown
In this type in the last 30 days	Unknown
In this type in the last 24 hours	Unknown

N.B.: The pilot's CIV as well as other information related to the aircraft's logbook, was not found.

In the digital CIV, 537 hours and 10 minutes of total flight time and 459 hours and 6 minutes of flight time were recorded in the model of the crashed aircraft.

1.5.2 Personnel training.

The pilot had the PPR License in 2011.

1.5.3 Category of licenses and validity of certificates.

The PIC had a PCM License and had valid MNTE and PAGA Ratings.

1.5.4 Qualification and flight experience.

It was not possible to confirm whether the pilot had recent experience, given that the last flight record released on the Digital CIV was dated 30OCT2020.

1.5.5 Validity of medical certificate.

The pilot had a valid CMA.

1.6 Aircraft information.

The aircraft, serial number T18803349T, was manufactured by Cessna Aircraft in 1978 and was enrolled in the SAE-AG - S05 category.

According to information from the SACI, the CVA was valid until 26OCT2021.

The airframe, engine, and propeller logbooks were not presented by those responsible for the aircraft and it was not possible to evaluate the logbooks regarding the update, latest inspections, and technical records.

During the investigation process, it was found that the aircraft had an incident in December 2020 that damaged the landing gear and propeller. However, this information had not been notified to the competent authorities.

According to data from the aircraft's Full Content Certificate, the pilot acquired the plane on 27DEC2017, and it was registered in the TPP Category.

On 29OCT2020, it was registered in the RAB the leasing of the aircraft between the owner and *Aero Agrícola Linear* Ltd:

the grantor of the leasing provides the said aircraft to the borrower for use in providing specialized air service in crop protection, for the period of 10 (ten) years.

In this process, the aircraft changed from TPP category to S05. Besides being the aircraft's owner, the pilot was also the managing partner of the aerial agricultural company.

In the investigation field action, there was evidence that the aircraft operated with Ethanol fuel and that the engine had been modified to use this fuel without a CST process.

Although it was not presented any documentation proving that the engine could operate with Ethanol, evidence was found that the engine was adapted to use this fuel (Figure 2).

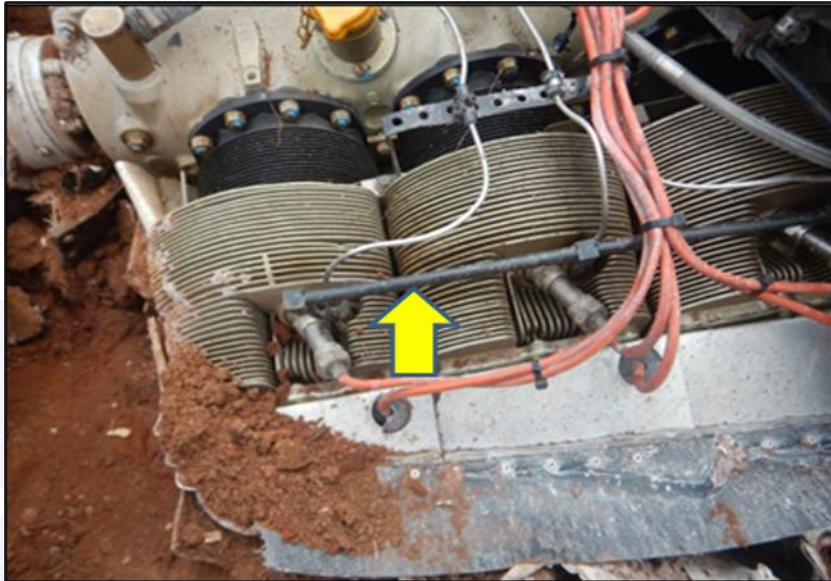


Figure 2 - Evidence that the aircraft engine was modified in the fuel supply system. Highlighted, the piping used to convert the engine to Ethanol.

It is noteworthy that, despite the evidence verified regarding the modification of the engine for operation with Ethanol, the OM Lima *Aeropeças* (COM 1905-31/ANAC) issued the CVA update, on 26OCT2020, indicating that the aircraft was inspected for airworthiness and documentation.

With the issuance of this CVA update, the technical manager of the maintenance company certified that, on that date (approximately 90 days before the accident), the aircraft engine (model: TSIO-520-T, SN: 515294) was not modified to Ethanol.

It was verified that the engine found at the accident site was the same model and had the same serial number as the one registered in the CVA update certified by Lima *Aeropeças*.

It should be noted that the certificates were not presented, which, according to the prescription of the IS No. 137.201-001, Revision C, Use of Ethanol in Agricultural Aircraft, prove the suitability of the engine to the aforementioned instruction.

In this context, at the time of the accident, the aircraft would not comply with what was established by the ANAC and could not be operating using Ethanol.

1.7 Meteorological information.

The SIGWX chart generated on 31JAN2021 at 1800 (UTC), valid until 1800 (UTC) on 01FEB2021, illustrated the presence of few TCU clouds based at 3,000 ft and undefined top.

According to reports from people at the scene, the weather was favorable for the visual flight.

1.8 Aids to navigation.

Nil.

1.9 Communications.

Nil.

1.10 Aerodrome information.

The occurrence took place out of the Aerodrome.

1.11 Flight recorders.

Neither required nor installed.

1.12 Wreckage and impact information.

The aircraft impacted the ground in a pitched down attitude (between 70° and 80°) and without wing tilt. The impact was concentrated at a point without displacement on the ground (Figure 3).



Figure 3 – Situation of the PT-WUU wreckage.

The rear part of the aircraft was accommodated horizontally, breaking the fuselage in the region of the cockpit and in the station for fixing the engine mounts.

Before impact, the aircraft maintained a heading of 060°, keeping in that direction after the collision. Observers reported not seeing any loose parts coming off the plane in flight, and a scan was performed in the area corresponding to the aircraft's trajectory before impact, and no component was found.

According to reports, the aircraft's engine remained running after the impact, even though it was partially buried in the ground.

The fixed-type landing gear was destroyed and separated from the aircraft. The flaps were up, coinciding with the command in the cockpit.

It was found that the pilot's seat was loose and that the helmet fastening strap was broken.

The aircraft's loss of control, and the collision was witnessed by the farm manager, the pilot's assistant technician, and by employees of the aerial agricultural company.

During the field action, it was observed that the land had been plowed for planting, and it was noticeable that the uncompacted soil contributed to the propeller and part of the engine penetrating the land (Figure 4).



Figure 4 - Engine partially buried, with two propeller blades torn from the fixing hub.

Two of the three propeller blades were torn off the hub. However, they were located just below the engine, buried in the ground (Figure 5).



Figure 5 - Propeller with two blades torn from the hub.

1.13 Medical and pathological information.

1.13.1 Medical aspects.

Nil.

1.13.2 Ergonomic information.

Nil.

1.13.3 Psychological aspects.

The pilot involved in this occurrence was 31 years old at the time of the accident and was born in Mato Grosso - MT.

According to information collected, the pilot had been in aviation since 2011 and was the managing partner of the company for which he operated.

During the investigation, it was not possible to obtain information from the relatives and representatives of the aircraft operator that could show that psychological issues had affected the crewmember's performance.

The reports obtained during the investigation showed that, on the day of the occurrence, the pilot started his routine at 1130 (UTC), maintained good interaction with people, and appeared to be in good physical condition without showing any discomfort.

1.14 Fire.

There was no fire.

1.15 Survival aspects.

There was no survivor.

1.16 Tests and research.

The aircraft's engine was complete with all its accessories, with no evidence of fluid leaks.

The presence of fuel was verified in the engine supply lines from the servo injector to the fuel distributor spider. In the same way, the presence of fuel, in a relevant amount, was verified on the left wing of the aircraft.

No signs of external damage were identified in the rear section, in the accessories box and on the right and left side sections that could be considered pre-existing to the accident or contributing to the occurrence.

Two of the three propeller blades were torn off the hub. However, they were just below the engine, buried in the ground. There were reports that the engine remained running after the impact.

Evidence points to a normal engine operating condition.

1.17 Organizational and management information.

Throughout the investigation process, no data, technical information, and maintenance records of the aircraft were made available, as well as information on the management and operation of the aerial-agricultural company, which was managed by the pilot of the occurrence.

The pilot was a partner and manager of Aero Agrícola Linear Ltd., which was in the certification phase for agricultural operation, having received from the ANAC the certificate of compliance until phase 3 (documentary verification). Phases 4 and 5 were still pending, and for the company's certification, it was necessary to present at least one aircraft registered in the SAE category.

According to requirements established in the RBAC 137, the company could only operate after obtaining the COA and the authorization to operate:

137.5 Certification, authorization, and prohibition

- (a) The company that intends to provide SAE in the aerial agricultural modality (commercial use) must obtain and maintain a valid COA and respective EO before starting such operations.
- (b) The issuance or renewal of the authorization to operate an SAE company in the aerial agricultural modality is conditioned to the presentation of a valid COA issued in accordance with these Regulations.
- (c) The COA holder may only carry out commercial aerial agricultural operations in accordance with this Regulation after the publication, by the ANAC, of the authorization to operate.
- (d) No one may carry out commercial aerial agricultural operations without an appropriate COA, respective EO, and without authorization to operate issued by the ANAC in its name or its representative or violation of the provisions of such documents.

The pilot's technical assistant maintained a formal employment relationship with the Aero Agrícola Linear Ltd. company, performing all the necessary backing and logistical support for the operation, transporting fuel (Ethanol) to the farm, supporting the pilot in fueling, and performing other related tasks with air activity.

The existence of documents from the company for the acquisition of 10 thousand liters of Ethanol to operate its aircraft was reported. This fuel was stored in the supply tank maintained at the Ourilândia do Norte Aerodrome - PA as well as in the support truck at the Colorado Farm (Figure 6).



Figure 6 - Interior of the support trunk truck for supplying Ethanol on the farm.

It is noteworthy that, at the aerodrome, the tank in which the Ethanol was stored, was stamped with the identification of aviation kerosene (JET-A1) (Figure 7).



Figure 7 - Ethanol storage station of the company with the inscription of aviation kerosene (JET-A1).

1.18 Operational information.

The pilot had valid MNTE and PAGA Ratings. However, it was not possible to confirm whether the pilot had recent experience, given that the last flight record released on the Digital CIV was dated 30OCT2020.

Due to the lack of technical and operational documentation of the aircraft, it was not possible to determine whether it was within the weight and balance limits specified by the manufacturer, during take-off and at the time of the accident.

For the flight of the occurrence, it was reported that the hopper had 500 liters of adrazine and water mixture, in the proportion of 8 gallons of 20 liters of adrazine and the rest of the volume in water.

After the take-off, the aircraft performed several passes of defensive application. When repositioning for the last pass of application, the aircraft performed an upward turn to the left.

At that moment, it was reported that, during the turn, the aircraft lost lift and height, colliding with the ground.

1.19 Additional information.

Nil.

1.20 Useful or effective investigation techniques.

Nil.

2. ANALYSIS.

It was a local flight for the application of agricultural pesticides at Colorado Farm, located in the Municipality of São Félix do Xingu - PA.

The aircraft had taken off with a total of 500 liters of product in the hopper, being a mixture of adrazine diluted in water. Several passages of defensive spraying were carried out. When repositioning for the last application, the aircraft performed an upward turn to the left.

It was reported that, during the turn, the aircraft lost lift and height, colliding with the ground, that is, during the repositioning turn, the pilot's intention to speed up a new frame for the application may have occurred, tightening the turn, and generating a stall, resulting in loss of control of the aircraft.

Thus, during the investigation, it was found that, possibly, the piloting judgment and the application of the commands for the maneuver performed prior to the occurrence was inappropriate on the part of the pilot.

During the investigation, the presence of fuel was verified in the engine supply lines from the servo injector to the fuel distributor spider.

In the same way, the presence of fuel in a relevant amount was verified in the left wing of the aircraft.

According to reports, the engine continued to run after the impact.

Thus, the evidence indicated that there was no engine failure, fuel supply failure, or dry failure.

Due to the lack of technical and operational documentation for the aircraft, there was uncertainty regarding the definition of the center of gravity, as well as whether it was within the weight and balance limits determined by the manufacturer.

The evidence found during the investigation process, pointed to aspects related to the operational factor, concluding that there was a loss of control in flight.

This conclusion was reached, considering the application of the commands and the piloting judgment, with signs of a stall during the realignment maneuver, for a new pass and the consequent non-recovery of flight stability.

Regarding the reports and indications about the use of ethanol as fuel, although this condition apparently did not contribute to this occurrence, there were latent failures in the

management system and in the execution and maintenance control procedures on the OM that issued the CVA.

3. CONCLUSIONS.

3.1 Facts.

- a) the pilot had a valid CMA;
- b) the pilot had valid MNTE and PAGA Ratings;
- c) it was not possible to determine whether the pilot had recent experience in the type of flight;
- d) the aircraft had a valid CVA;
- e) it was not possible to determine whether the aircraft was within the weight and balance limits;
- f) the airframe, engine, and propeller logbook records were not presented for analysis;
- g) the logbook was not submitted for analysis;
- h) the weather conditions were favorable for the flight;
- i) after the repositioning turn, the aircraft collided with the ground;
- j) the aircraft was destroyed; and
- k) the pilot suffered fatal injuries.

3.2 Contributing factors.

- **Control skills – undetermined.**

It is possible that there was an inadequacy in the use of the controls, which may have caused the aircraft to lose lift during the recovery turn.

- **Piloting judgment – undetermined.**

During the repositioning turn, there may have been an intention to speed up a new frame for application, tightening the turn and generating a stall, causing the aircraft to lose control.

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-014/CENIPA/2021 - 01****Issued on 12/05/2022**

Work with Lima Aero peças (COM 1905-31/ANAC), so that OM observes the established requirements for issuing the CVA.

5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN.

None.

On December 5th, 2022.

