

**COMANDO DA AERONÁUTICA**  
**CENTRO DE INVESTIGAÇÃO E PREVENÇÃO DE**  
**ACIDENTES AERONÁUTICOS**



**FINAL REPORT**  
**A - 063/CENIPA/2017**

<b>OCCURRENCE:</b>	<b>ACCIDENT</b>
<b>AIRCRAFT:</b>	<b>PR-LPW</b>
<b>MODEL:</b>	<b>172N</b>
<b>DATE:</b>	<b>14APR2017</b>



## 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 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 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 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 14APR2017 accident with the 172N aircraft, registration PR-LPW. The accident was classified as “[CTOL] Collision with Obstacle during Take-Off and Landing”.

During a local flight near the Aerodrome, the aircraft crashed into a tree lined 400 meters away from the runway threshold.

The aircraft had substantial damage.

The pilot and passenger suffered fatal injuries.

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



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## GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS

CA	Airworthiness Certificate
CENIPA	Aeronautical Accident Investigation and Prevention Center
CIV	Pilot's Flight Logbook
CMA	Aeronautical Medical Certificate
IFR	Instrument Flight Rules
IFRA	Instrument Flight Rating - Airplane
INVA	Flight Instructor Rating
MLTE	Airplane Multi Engine Land Rating
MNTE	Airplane Single Engine Land Rating
NTSB	National Transportation Safety Board (USA)
PCM	Commercial Pilot License – Airplane
PPR	Private Pilot License – Airplane
SERIPA IV	Fourth Regional Aeronautical Accident Investigation and Prevention Service
SIPAER	Aeronautical Accident Investigation and Prevention System
SN	Serial Number
SSCL	ICAO Location Designator – Cassilândia Aerodrome - MS
TPP	Registration Category of Private Service - Aircraft
UTC	Universal Time Coordinated
VFR	Visual Flight Rules

## 1. FACTUAL INFORMATION.

<b>Aircraft</b>	<b>Model:</b> 172N <b>Registration:</b> PR-LPW <b>Manufacturer:</b> Cessna Aircraft	<b>Operator:</b> Private
<b>Occurrence</b>	<b>Date/time:</b> 14APR2017 - 2045 UTC <b>Location:</b> Outside of the Aerodrome <b>Lat.</b> 19°08'37"S <b>Long.</b> 051°41'09"W <b>Municipality – State:</b> Cassilândia – MS	<b>Type(s):</b> [CTOL] Collision with Obstacle during Take-Off and Landing <b>Subtype(s):</b> NIL

### 1.1 History of the flight.

The aircraft took off from the Cassilândia Aerodrome (SSCL) - MS, at about 2035 (UTC), to conduct a local flight, with a pilot and a passenger on board.

With about ten minutes of flight, the aircraft apparently returned to landing.

The plane crashed into a tree lined 400 meters away from the runway threshold.

The aircraft had substantial damage. The crewmember and the passenger suffered fatal injuries.

### 1.2 Injuries to persons.

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

### 1.3 Damage to the aircraft.

The plane crashed into a tree with considerable energy. The aircraft had substantial damage. The engine got detached from the airframe and was thrown ahead (Figure 1).

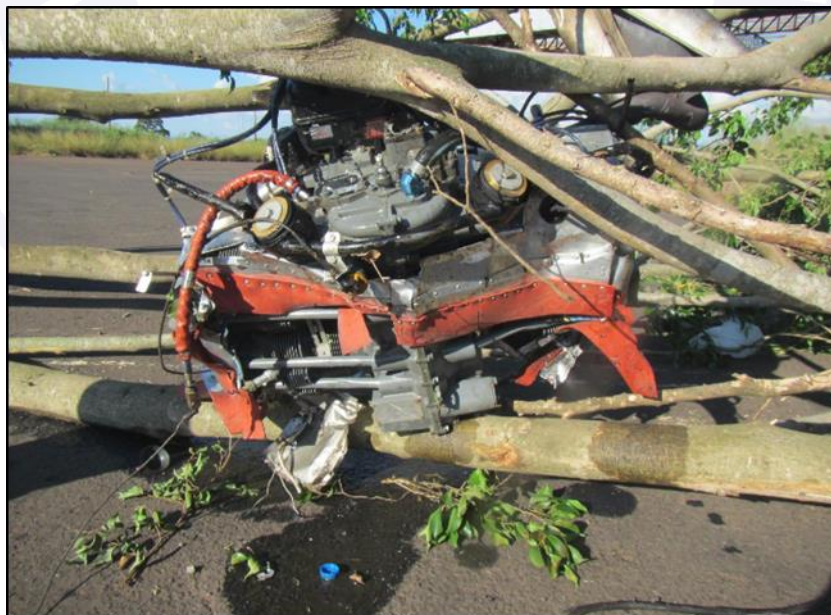


Figure 1 - Engine that got detached from the aircraft.

The fuselage was damaged to its full extension. The landing gear had considerable damage.

The cabin was destroyed and the aircraft instrument panel and its equipment had severe damage. The wings had significant damage, but did not detach from the rest of the structure. The wreckage of the aircraft remained attached to the tree branches (Figure 2).



Figure 2 - Aircraft after the occurrence.

#### 1.4 Other damage.

None.

#### 1.5 Personnel information.

##### 1.5.1 Crew's flight experience.

Flight Hours	Pilot
Total	437:00
Total in the last 30 days	03:42
Total in the last 24 hours	00:00
In this type of aircraft	Unknown
In this type in the last 30 days	00:00
In this type in the last 24 hours	00:00

**N.B.:** The data related to the flown hours were obtained through the Pilot's Individual Logbook records.

##### 1.5.2 Personnel training.

The pilot took the PPR course at the Goiás Aeroclub – GO, in 2012.

##### 1.5.3 Category of licenses and validity of certificates.

The pilot had the PCM License and had valid MNTE, MLTE, INVA and IFRA Ratings.

### 1.5.4 Qualification and flight experience.

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

### 1.5.5 Validity of medical certificate.

The pilot had valid CMA.

### 1.6 Aircraft information.

The aircraft, serial number 17273506, was manufactured by Cessna Aircraft, in 1980 and it was registered in the TPP category.

The aircraft had valid Airworthiness Certificate (CA).

The airframe, engine and propeller logbooks records were updated.

The last inspection of the aircraft, the "100hours" type, was carried out on 08JUL2016 by the *Águia Aviação e Manutenção* maintenance organization, in Goiânia - GO.

The aircraft engine used a carburetor to mix gasoline and air in the correct proportion before sending them to the cylinders. To do this, it forced the air through a narrow, conical passage called the Venturi.

When the air accelerated inside the Venturi, its pressure decreased. Subsequently, the fuel, when injected into this rapid stream of air at low pressure, evaporated, and the resulting mixture of fuel in a gaseous state and air flowed into the cylinders.

Fuel vaporization and the change in the induced pressure by the Venturi, caused together intense cooling - in some cases up to 20°C. If this reduction causes the air temperature to drop below the freezing point, and the mixture air contains sufficient moisture, ice may begin to form on the internal walls of the carburetor.

As ice accumulates, it tended to block the passage of air and fuel mixture into the engine, leading to a reduction in power. If the situation is not remedied, the engine could lose power completely.

The aircraft was equipped with a heating system that used the engine's own heat to prevent ice from forming in the carburetor.

According to the Cessna 172N Pilot's Operating Handbook, Section 3 - Emergency Procedures, a gradual loss of RPM could be caused by ice formation in the carburetor. In this case, the pilot should position the carburetor heat switch to the ON position (Figure 3).

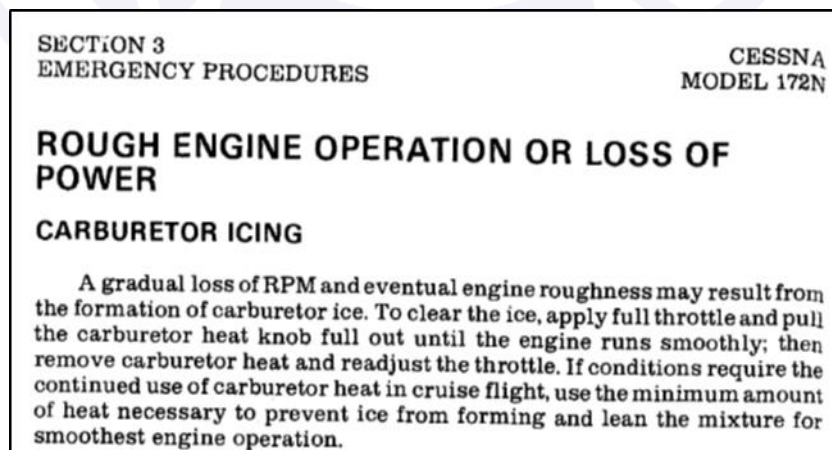


Figure 3 - Cessna 172N Pilot's Operating Handbook Excerpt.



### 1.7 Meteorological information.

According to the gathering of local information, the weather conditions were favorable for the flight.

### 1.8 Aids to navigation.

Nil.

### 1.9 Communications.

Nil.

### 1.10 Aerodrome information.

The occurrence took place outside of the Aerodrome.

### 1.11 Flight recorders.

Neither required nor installed.

### 1.12 Wreckage and impact information.

The impact occurred in the final for SSCL runway 13. The aircraft crashed into a tree and remained in that position.



Figure 4 - Location of the occurrence.

Fuel was scattered around the place where the aircraft crashed, signaled by the vegetation color.

### 1.13 Medical and pathological information.

#### 1.13.1 Medical aspects.

Not investigated.

#### 1.13.2 Ergonomic information.

Nil.

#### 1.13.3 Psychological aspects.

Not investigated.

### 1.14 Fire.

There was no fire.

### **1.15 Survival aspects.**

There were no survivors.

### **1.16 Tests and research.**

Tests were performed to investigate the model O-320-H2AD engine, Serial Number (SN) L-5081-76, to verify signs of malfunction.

Initially, severe damage was found as a result of the impact. No evidence could be found that could impair the engine operation. The oil pump, primary oil filter and the crankcase were inspected. No metal shavings were found. However, the main oil filter was not found.

The carburetor was inspected and the fuel inlet filters, throttle chamber filter, needle, gicleur and float were also checked. No abnormalities were found that could cause engine malfunction.

The left magneto was found with the center cable damaged, as a result of the impact and therefore did not sparkle. With the solution of this problem, both magnetos showed normal functioning and spark production.

When observing the cylinder and piston assemblies, it was found that the sets 1 and 3 had lead deposits, with light coloring, tending towards white, which would indicate that the engine would be working with poor fuel mixture and consequent temperature increase in the cylinders.

The valve control and crankshaft were inspected. No wear or abnormalities were found that could contribute to engine malfunction. Bearings were found to have normal working appearance, coloring and wear.

A fracture was found near the coupling flange with the propeller. The fracture profile formed a 45° angle, characteristic of overload fracture, due to impact against obstacles.

The propeller was found to be bent back at the ends of the blades, which would indicate low power impact. In the spinner, frontal kneading was observed.

### **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 flight was made for recreational purposes. The pilot and three passengers made the first flight with the intention of observing the city of Cassilândia - MS. They returned to the aerodrome and the pilot and a passenger remained on the aircraft for another flight.

Therefore, the two occupants took off again and headed for the city vertical.

Subsequently, the aircraft was observed returning to the Aerodrome in a profile indicating approach for landing, when it collided against a tree.

### **1.19 Additional information.**

It was not possible to estimate the amount of fuel on the aircraft at the time of the crash. It was found that there was fuel because of the marks on the vegetation around the crash site.

The occurrence happened close to the Easter festivities. The municipality and others nearby were involved in various festive events.

The pilot had family in the locality. He did not live in the area, but had traveled to Cassilândia to enjoy the holiday with his relatives.

There were reports that some aircraft used to take off from the Aerodrome near the scene for performing maneuvers or low flying. However, it was not possible to state that the pilot performed or used to perform this type of flight.

### **1.20 Useful or effective investigation techniques.**

Nil.

## **2. ANALYSIS.**

It was a recreational flight.

According to reports, the pilot was flying with a friend and would fly over the city. There was no intention to perform navigation.

It was not possible to state precisely which procedure was being performed at the time of the occurrence. It was assumed that the pilot was seeking to entry at the final for landing, given the position of the aircraft aligned with the final of SSCL runway 13.

There is the possibility that the aircraft engine would not be working, due to the damage found in the propeller assembly.

Considering that the exams in the aircraft engine did not show signs of malfunction or other conditions that contributed to its failure, it is hypothesized that, even though there was a previous flight, the carburetor did not warm up, which would have influenced the fuel supply.

Ice in the carburetor can form over a wide range of outdoor temperatures and relative humidity levels. While the word "freezing" usually makes us think of frigid conditions, ice in the carburetor can form in conditions with outdoor temperatures as high as 28°C and only 50% relative humidity.

As there was no other indication that the supply could have been influenced by a mechanical problem and considering that, there was evidence of fuel with poor mixture in cylinders 1 and 3, the possibility of partial carburetor obstruction by ice formation is admitted, influencing the performance of the aircraft engine.

It was assumed that the pilot did not start the carburetor heat when facing loss of RPM, as established by the Cessna 172N Pilot's Operating Handbook.

## **3. CONCLUSIONS.**

### **3.1 Facts.**

- a) the pilot had valid Aeronautical Medical Certificate (CMA);
- b) the pilot had valid MNTE, MLTE, INVA and IFRA 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 weight and balance limits;
- f) the airframe, engine and propeller logbook records were updated;
- g) according to reports, the weather conditions were favorable for the flight;
- h) the aircraft was performing a recreational flight near Cassilândia - MS;
- i) the aircraft collided with a tree on the axis of SSCL runway 13;
- j) the aircraft had substantial damage; and

k) the two occupants of the aircraft suffered fatal injuries.

### 3.2 Contributing factors.

- **Piloting judgment – undetermined.**

The possible non-use of the carburetor heating or the little knowledge about the importance of this equipment may have contributed to the occurrence.

### 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:

Nil.

### 5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN.

None.

On October 29<sup>th</sup>, 2020.