

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



**FINAL REPORT**  
**A - 172/CENIPA/2016**

<b>OCCURRENCE:</b>	<b>ACCIDENT</b>
<b>AIRCRAFT:</b>	<b>PT-ICU</b>
<b>MODEL:</b>	<b>58</b>
<b>DATE:</b>	<b>23DEC2016</b>



## **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 23DEC2016 accident with the 58 aircraft, registration PT-ICU. The accident was classified as “[UNK] Undetermined”.

About five minutes from the Tabatinga Aerodrome (SBTT), the pilot declared an emergency by radio and proceeded to attempt an emergency landing in a forest area in the *Nossa Senhora de Aparecida* Indigenous Community - AM.

During the landing, there were several collisions against the local vegetation and the aircraft caught fire.

The aircraft was totally destroyed.

The two pilots and one passenger died at the site of the accident.

A second passenger suffered minor injuries.

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

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**GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS**

AMR	DCTA's Materials Division
ANAC	Brazil's National Civil Aviation Agency
CA	Airworthiness Certificate
CMA	Aeronautical Medical Certificate
DCTA	Department of Science and Airspace Technology
IAC	Civil Aviation Instruction
IAM	Annual Maintenance Inspection
IFR	Instrument Flight Rules
IFRA	Instrument Flight Rating - Airplane
MLTE	Airplane Multi Engine Land Rating
MTOW	Maximum Take-Off Weight
PCM	Commercial Pilot License - Airplane
PPR	Private Pilot License – Airplane
PrTrnO	Operations Training Program
RBAC	Brazilian Civil Aviation Regulation
SBTF	ICAO location designator – Tefé Aerodrome - AM
SBTT	ICAO location designator – Tabatinga Aerodrome - AM
SERIPA VII	Seventh Regional Aeronautical Accident Investigation and Prevention Service
TPX	Aircraft Registration Category of Non-Regular Public Air Transportation
UTC	Universal Time Coordinated



## 1. FACTUAL INFORMATION.

Aircraft	<b>Model:</b> 58	<b>Operator:</b> Parintins Air Taxi Ltd.
	<b>Registration:</b> PT-ICU	
	<b>Manufacturer:</b> Beech Aircraft	
Occurrence	<b>Date/time:</b> 23DEC2016 - 1730 UTC	<b>Type(s):</b> [UNK] Undetermined
	<b>Location:</b> Nossa Senhora de Aparecida Indigenous Community	
	<b>Lat.</b> 04°13'27"S <b>Long.</b> 069°49'01"W	<b>Subtype(s):</b> NIL
	<b>Municipality – State:</b> Tabatinga – AM	

### 1.1 History of the flight.

The aircraft took off from the Tefé Aerodrome (SBTF) - AM, to the Tabatinga Aerodrome (SBTT) - AM, at about 1545 (UTC) to transport personnel, with two pilots and two passengers on board.

About five minutes from the Tabatinga Aerodrome (SBTT), the pilot declared an emergency by radio and proceeded to attempt an emergency landing in a forest area in the Nossa Senhora de Aparecida Indigenous Community - AM.

During the landing, there were several collisions against the local vegetation and the aircraft caught fire.

The aircraft was totally destroyed.

The two pilots and one passenger died at the site of the accident.

A second passenger suffered minor injuries.

### 1.2 Injuries to persons.

Injuries	Crew	Passengers	Others
Fatal	2	1	-
Serious	-	-	-
Minor	-	1	-
None	-	-	-

### 1.3 Damage to the aircraft.

The aircraft was destroyed (Figure 1).



Figure 1 - The red arrow identifies the right wing, the yellow arrow identifies the

left wing, the blue arrow identifies part of the fuselage and the green arrow indicates where the right engine was found.

#### 1.4 Other damage.

None.

#### 1.5 Personnel information.

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

Hours Flown		
	Pilot	Copilot
Total	1.250:05	798:25
Total in the last 30 days	17:55	26:30
Total in the last 24 hours	00:00	00:00
In this type of aircraft	241:00	02:50
In this type in the last 30 days	15:30	02:50
In this type in the last 24 hours	00:00	00:00

**N.B.:** The Data related to the flown hours were obtained from the Operator.

##### 1.5.2 Personnel training.

The pilot took the Private Pilot course – Airplane (PPR) at Bragança Paulista - SP, in 2008.

The copilot took the Private Pilot course – Airplane (PPR) at GF Aviation School - DF, in 2011.

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

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

The copilot had the PCM License and had valid MLTE and IFRA Ratings.

##### 1.5.4 Qualification and flight experience.

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

The copilot had experience in that kind of flight but he was not qualified in that aircraft's model.

##### 1.5.5 Validity of medical certificate.

The pilots had valid Aeronautical Medical Certificates (CMA).

#### 1.6 Aircraft information.

The aircraft, serial number TH 174, was manufactured by Beech Aircraft, in 1971, and it was registered in the TPX category.

The aircraft had valid Certificate of Airworthiness (CA).

The airframe, engines and propeller logbook records were updated.

The last inspection of the aircraft, the "100 hours" type, was carried out on 20DEC2016 by the PARINTINS MNT DE ANV COM E SERVIÇOS shop, in Manaus – AM, having flown 2 hours and 50 minutes after the inspection.

The last overhaul of the aircraft, the "IAM" type, was carried out on 29JAN2016 by the PARINTINS MNT DE ANV COM E SERVIÇOS shop, in Manaus – AM, having flown 571 hours and 30 minutes after the overhaul.

**1.7 Meteorological information.**

The conditions were favorable for the visual flight.

**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 aircraft was moved by the police authority before the arrival of the first action team to remove the bodies.

It is estimated that the aircraft initially collided against the treetops, about 25m high, in a downward trajectory. Thereafter, it collided against the ground at an angle of approximately 30° and disintegrated in fan form for about 10m.

The occupants and most of the aircraft were concentrated near the area where the impact had hit the ground, so that only the right engine was found away, about 15m, in the middle of the dense forest.

There was fire after the impact.

**1.13 Medical and pathological information.****1.13.1 Medical aspects.**

No evidence was found that problems of physiological nature could have affected the flight crew performance.

**1.13.2 Ergonomic information.**

Nil.

**1.13.3 Psychological aspects.**

No evidence was found that problems of physiological nature or incapacitation could have affected the flight crew performance.

**1.14 Fire.**

There was a fire after the impact, which almost completely consumed the structure of the aircraft.

Only the right engine, which was found about 15m distant from the wreckage, was not hit by the fire.

**1.15 Survival aspects.**

The only survivor was taken out of the accident area at the time the aircraft caught fire, suffering only minor burns.

After the impact, the other occupants remained inside the aircraft and died because of the subsequent fire, which prevented the removal of the victims by the people there.

**1.16 Tests and research.**



The aircraft engines were transported to an approved shop in Goiânia - GO, in order to be disassembled and analyzed.

During the external inspection, it was observed that the fire did not affect the Continental, IO-520-C-CB model, n/s 571510, after the aircraft fall (Figure 2).



Figure 2 - Front view of the right engine, with no signs of fire. Local people removed one of the blades.

The engine presented kneading in the crankcase due to impact against obstacles.

In the fuel supply system nothing was found that could obstruct the fuel passage to feed the cylinders.

The fuel filter was clean. The fuel pump of this engine was not bench tested because it had two connections that broke in the accident. After dismantling, no contamination, excessive wear or signs of locking of its axis have been found.

In the engine lubrication system, no malfunction was observed which could jeopardize its operation.

The magnetos of the ignition system could be bench tested. In the test, it was observed that the left magneto showed normal functioning.

The right magneto was flashing intermittently. It was dismantled and, on inspection, it was observed that the platinum was burnt. It was also verified that the capacitor wire was with its protection damaged (Figure 3).



Figure 3 - Overview of the right engine's right magneto. The highlights show the damaged capacitor cable and the burnt platinum contacts.

The primary coil winding of the magneto was with the resistance below the one specified by the Maintenance Manual, System Support Manual, S-1200 Magneto Ignition System, Chapter 7, Section 7.2.6 Inspect Coil.

It was further found that Pin-Dowel 19x.50LG, PN630873, that supported Bushing-Idler, PN630871, which was connected to Idler Gear, PN629360, magneto-drive gear, was loose, with wear marks. The hole where it was installed was oval, also showing work marks and wear of the bushing on the housing.

Another discrepancy found in this engine was observed in the removal of the cylinders. The piston of the engine cylinder 1 had a fracture on its side, between the compression ring and the oil scraper ring, as shown on Figure 4, letter A.

In the cylinder piston 5, it was observed that the compression ring was broken inside its housing, according to Figure 4, letter B.

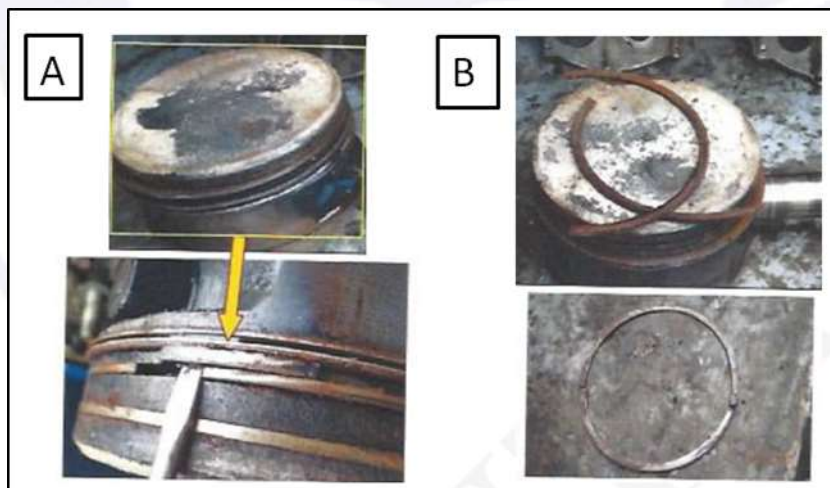


Figure 4 - A) Broken wall of the cylinder 1 piston, between the scraper ring and the oil-distributing ring. B) Broken cylinder compression ring 5.

Despite these discrepancies, no scratches were found on the cylinder liners and no evidence was found that there was not a proper fuel ignition in the chamber.

Evidence of carbonized oil on the inner side of the pistons was considered normal. Such analysis was corroborated by the engine manufacturer's representative, who also added that the carbonized oil could be the result of the type of lubricating oil used and how



the engine was being operated. He further emphasized that this fact would not be a reason for stopping the engine.

Individually, the reported discrepancies should not cause problems in the engine's operation and it could be inferred that it operated even with the discrepancies found in the pistons.

The discrepancies found and related to the ignition system would also not be grounds for this engine to stop working, but would justify an increase in lubricating oil consumption, spark plug charring or even a power deficiency.

The right engine propeller showed evidence that it was powerless at the moment of collision against the obstacle. The spinner presented localized kneading. The propeller had one of the blades pulled out of the hub, and this blade had no other damage like deformation or impact marks on its leading edge, bending or fracture at its end. The other blades were folded backwards.

During the external inspection, it was observed that the left engine Continental, model IO-520-CB (7), n/s 299088R, was exposed to the fire that occurred after the fall of the aircraft.



Figure 5 – Left engine view.

All of its external components showed evidence of long exposure to fire. It was also observed that it was jammed and had kneading in the crankcase due to the impact against obstacles.

In the engine lubrication system, no malfunction was observed which could jeopardize its operation. The engine jam was caused by the carbonization of the lubricating oil that was housed between the trunnions and the rear bearings, which occurred during the post-impact fire.

It was not possible to perform a functional test on the fuel system of this engine. An injector nozzle was broken, and it was not possible to remove it from its housing. The others were inspected and it was verified that they were unobstructed. The distributor was burned internally, making no analysis possible.

It was noted that at the junction of the mechanical fuel pump with the accessories section there was a rubber o-ring, contrary to the Teledyne Continental Motor X30624 Maintenance Manual, IO520CB - Fuel Injection System Parts Listing, figure 69-109, where a Gasket-Fuel Pump Adapter, item no. 9, PN649982 was provided.

In addition to the previous discrepancy, it was found that the fuel pump was stuck. This was dismantled, having its axis removed with the aid of a press.

In order to know whether the binding occurred before or after the accident, an analysis was requested from the DCTA's Materials Division (AMR). The result indicated that there was increase in the microstructure of the shaft due to the long post-impact fire exposure, which suggested that the binding occurred after the accident.

The magnetos on this engine were also affected by exposure to fire. Its internal components were melted by heat and this prevented any kind of functional testing or analysis.

Therefore, in this engine there were doubts about the operation of the fuel and ignition systems.

The left engine propeller also showed evidence that the engine did not develop power at the time of the collision against obstacles.

The spinner presented localized kneading. The propeller had the three blades folded back and presented no other damage as impact marks on its leading edges, deformations or fractures at its ends.

#### **1.17 Organizational and management information.**

Nil.

#### **1.18 Operational information.**

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

In the event in question, the aircraft was a model 58, belonging to Group III - Multi-engine airplanes, with conventional engines, approved in the normal category, with nine or less passengers and not more than 5,670 kg of Maximum Take-Off Weight (MTOW).

This class complied with item 3.2 of the Civil Aviation Instruction (IAC) 135-1002, allowing the ground school to be performed in a generic way, in the "Multiengine" modality, including all the aircraft of the company within this particular group (Group III).

In this sense, the copilot, carried out this generic training, focused on the EMB-810C aircraft, during his initial training, upon joining the company in 2015.

According to documentation presented by the company, the copilot had all the necessary qualifications and training to fly the EMB-810C, including being commander of this aircraft's model.

However, it was stated in the EMB-810C Operational Training Program (PrTrnO) 2014, Revision 2, 30OCT2014, Section 3 - Training Programs - Initial Equipment Training - 2.1:

"The solo curriculum for class aircraft is a generic training, which can be taught jointly to all company-grade aircraft, provided that differences in aircraft systems, equipment and procedures are included in the respective solo curriculum."

It consisted in Section 5 - Training Programs - Transition Training:

"Target audience: training required for a crewmember who has been previously trained and qualified for a specific function and who is being assigned to the same function in a different type of equipment, from the same group of aircraft, of PARINTINS AIR TAXI LTD.

Example: A crewmember who has been previously trained and qualified for the function of a SENECA's commander (Group III aircraft) and being assigned to the same function (commander) on the BE58 aircraft (also belonging to aircraft Group III)."

In accordance with the Brazilian Civil Aviation Regulation (RBAC) No. 135, Subpart E - Flight Crew Requirements, Section 135.245:

"(a) Except as provided in paragraph (b) of this section, no certificate holder may employ a person and no one may serve as the second in command of an aircraft, unless that person holds at least one commercial pilot license, be qualified for IFR flight and for the aircraft, and has completed the appropriate training program for the aircraft and for the on-board function approved for the certificate holder.

(b) ..."

A survey was carried out in relation to the other crewmembers who operated the aircraft during the last 60 days prior to the accident. It was verified that none of the copilots received the necessary training to perform aircraft model 58 copilot's role.

#### **1.19 Additional information.**

The Investigation team estimated, based on reports from people and supply notes, that there were still 418 pounds of fuel remaining in the aircraft.

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

Nil.

### **2. ANALYSIS.**

This was a personnel transport flight between the SBTF and SBTT Aerodromes when, during the attempted forced landing near *Nossa Senhora de Aparecida* Indigenous Community - AM, the aircraft collided against the forest and caught fire.

The aircraft was totally destroyed, three occupants died on the spot and a fourth one had minor injuries.

The Continental engines models IO-520-CB (n/s 299088R) and IO-520-C-CB (n/a 571510) respectively, which equipped the aircraft, were inspected and later dismantled for internal component verification.

In the examinations, tests and researches, it was evidenced that both engines were stopped the instant the aircraft was involved in the accident.

On the left engine, n/s 299088R, doubts remained as to the operation of fuel and ignition systems. Both systems were consumed by fire, making it impossible to perform any type of functional analysis or test.

On the right engine, n/s 571510, three discrepancies were found, with different consequences for the operation of this engine:

- a fracture was found in the cylinder body 1, between the compression ring and the oil scraper ring;
- the piston compression ring of cylinder 5 has been found broken when the piston of this cylinder was removed; and
- the right magneto showed intermittent sparking during its functional test. It was observed that the protection of the capacitor wire was broken and this allowed the spark to escape, in addition to that, its platinum was burnt.

Individually, the discrepancies reported should not cause problems in the operation of the engine, and it can be inferred that it could operate with the discrepancies found in the pistons.

Such inconsistencies would justify an increase in the consumption of lubricating oil, leakage, carbonization of the spark plugs or even a loss of power, which could have contributed to the accident in question.



Discrepancies related to the ignition system also would not be grounds for the engine to stop working. However, if the right magneto failure occurred during the flight, this would result in a power deficiency and could contribute to the occurrence on 23DEC2016.

In the same way, it cannot be ruled out that there was an intentional cut off of one or both engines, due to a possible loss of power experienced by the crew.

In addition to the engine failures, it was found that the operator did not provide the transition training on the aircraft model 58 to the copilot, as envisaged in the Operational Training Program (PrTrnO) 2014, Revision 2, of 30OCT2014, Section 3 - Training Programs.

It was thus observed that, according to PrTrnO guidance, it was necessary that the ground training provided to the crew included the differences and particularities of each model of aircraft to be flown, even if these were included in the same Group.

Likewise, the Brazilian Civil Aviation Regulation (RBAC) No. 135, Subpart E - Flight Crew Requirements, Section 135.245 stated that:

"(a) Except as provided in paragraph (b) of this section, no certificate holder may employ a person and no one may serve as the second in command of an aircraft, unless that person holds at least one commercial pilot license, be qualified for IFR flight and for the aircraft, and has completed the appropriate training program for the aircraft and for the approved on-board function for the certificate holder.

In that sense, the copilot in question was not qualified to fly on the aircraft model 58.

This failure in training may have contributed to the fact that, during the probable emergency in flight, critical procedures were not performed in a proficient manner, since the copilot might not have the necessary knowledge to operate the aircraft.

Therefore, since the analyzes did not detect technical discrepancies that could cause the two engines to stop, as well as the fact that there was remaining fuel on board, this Investigation team considered inconclusive the reasons that led to the need of performing a forced landing.

### **3. CONCLUSIONS.**

#### **3.1 Facts.**

- a) the pilots had valid Aeronautical Medical Certificates (CMA);
- b) the pilots had valid MLTE and IFRA Ratings;
- c) the commander was qualified and had experience in that kind of flight;
- d) the copilot was not qualified in model 58;
- e) it was verified that the copilot did not have the transition training in the aircraft model 58;
- f) the aircraft had valid Airworthiness Certificate (CA);
- g) the weather was favorable for the visual flight;
- h) the aircraft was within the weight and balance parameters specified by the manufacturer;
- i) the airframe, engines and propellers logbook records were updated;
- j) about five minutes to the landing at the Tabatinga Aerodrome, the pilot declared emergency;

- k) the aircraft impacted against the forest;
- l) there was fire after the impact, which consumed almost all structure of the aircraft;
- m) in the conducted examinations, tests and researches it was evidenced that both engines were stopped at the moment that the aircraft was involved in the accident;
- n) the aircraft was destroyed; and
- o) the two pilots and one passenger died at the site of the accident. A second passenger suffered minor injuries.

### 3.2 Contributing factors.

#### - Instruction – undetermined.

The copilot had not complied with the appropriate training program for the aircraft, since generic training regarding differences in systems, equipment and procedures specific to the aircraft model 58 was not performed.

#### - Aircraft maintenance – undetermined.

The discrepancies found in the engines indicated that, although the maintenance interferences were considered periodic, they were not adequate, which could have allowed the occurrence of mechanical failures, which would lead to a poor functioning of the powerplants.

#### - Management planning – undetermined.

Although it was not possible to determine the contribution of this factor, there was an inadequacy in the planning carried out by the organization at its managerial level, especially with regard to the allocation of the copilot, without proper training, for the development of operational activities.

## 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-172/CENIPA/2016 - 01**

**Issued on 01/29/2019**

Act in conjunction with *Parintins Serviços e Comércio de Peças para Aviação* LTD., in order to verify the compliance of the maintenance services performed by that company, aiming to increase the levels of competence and operational safety required to perform the activities for which such organization is certified.

**A-172/CENIPA/2016 - 02**

**Issued on 01/29/2019**

Act in conjunction with Parintins Air Taxi LTD., in order to verify the full compliance of that operator with what is contained in RBAC 135, especially with regard to letter (a), item 135.245 - Pre- requirements for second-in-command, of Subpart E.

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

None.

On January 29<sup>th</sup>, 2019.

