COMANDO DA AERONÁUTICA

CENTRO DE INVESTIGAÇÃO E PREVENÇÃO DE ACIDENTES AERONÁUTICOS

FINAL REPORT
A - 140/CENIPA/2013

OCCURRENCE:	**ACCIDENT**
AIRCRAFT:	**PT-LKG**
MODEL:	**58**
DATE:	**03AUG2013**

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 03AUG2013 accident with the 58 aircraft model, registration PT-LKG. The accident was classified as “[SCF-PP] System/Component Failure or Malfunction Powerplant – Engine Failure in Flight and [LOC-I] Loss of Control in Flight”.

During the take-off run on RWY 36 of the *Comandante Rolim Adolfo Amaro* Aerodrome (SBJD), Jundiaí - SP, the control tower observed smoke coming out of the left engine. The anomaly was reported to PT-LKG.

The pilot requested a return for landing, but on the traffic circuit for RWY 36, the aircraft crashed into the ground and exploded, being consumed by the flames.

The aircraft was destroyed.

The pilot and passengers died on the spot.

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

ANAC	Brazil's National Civil Aviation Agency
ANP	National Agency of Petroleum, Natural Gas and Biofuels
AVGAS	Aviation Gasoline
CA	Airworthiness Certificate
CAVOK	Ceiling and Visibility OK
CMA	Aeronautical Medical Certificate
CRM	Crew Resource Management
DCTA	Department of Science and Airspace Technology
IAE	Aeronautics Space Institute
IAM	Annual Maintenance Inspection
IFRA	Instrument Flight Rating - Airplane
METAR	Aviation Routine Weather Report
MLTE	Airplane Multi Engine Land Rating
NM	Nautical Miles
NTSB	National Transportation Safety Board (USA)
POH	Pilot's Operating Handbook
PPR	Private Pilot License – Airplane
QNH	Reduced Pressure at Sea Level by the Vertical Gradient of the Standard Atmosphere
RAB	Brazilian Aeronautical Registry
RBAC	Brazilian Civil Aviation Regulation
RBHA	Brazilian Aeronautical Certification Regulation
RE	Test Report
RI	Investigation Report
ROTAER	Auxiliary Air Route Manual
SACI	Integrated Civil Aviation Information System
SBJD	ICAO Location Designator - Comandante Rolim Adolfo Amaro Aerodrome, Jundiaí - SP
SN	Serial Number
SSBT	ICAO Location Designator - Santa Ilídia Farm Aerodrome, Batayporã - MT
TPP	Registration Category of Private Service - Aircraft
TWR-JD	Comandante Rolim Adolfo Amaro Aerodrome Control Tower, Jundiaí - SP
UTC	Universal Time Coordinated
VFR	Visual Flight Rules

1. FACTUAL INFORMATION.

Aircraft	**Model:** 58 **Registration:** PT-LKG **Manufacturer:** Beech Aircraft	**Operator:** Private
Occurrence	**Date/time:** 03AUG2013 - 1524 UTC **Location:** Out of the Aerodrome **Lat.** 23°10'54"S **Long.** 046°56'37"W **Municipality – State:** Jundiaí – SP	**Type(s):** [SCF-PP] System/Component Failure or Malfunction Powerplant and [LOC-I] Loss of Control in Flight **Subtype(s):** Engine Failure in Flight

1.1 History of the flight.

The aircraft took off from the Comandante Rolim Adolfo Amaro Aerodrome (SBJD), Jundiaí – SP, to the Santa Ilídia Farm Aerodrome (SSBT), Batayporã – MT, at about 1520 UTC, in order to carry personnel, with a pilot and three passengers on board.

After being informed by the Jundiaí Control Tower that there was smoke coming out of the left engine, the pilot requested to return for landing without declaring emergency.

During the traffic circuit, the aircraft crashed against the ground and exploded.

The aircraft was destroyed.

The crewmember and the passengers suffered fatal injuries.

1.2 Injuries to persons.

Injuries	Crew	Passengers	Others
Fatal	1	3	-
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.: It was not possible to verify the amount of flight hours performed by the pilot.

1.5.2 Personnel training.

The pilot took the PPR course at the Piracicaba Aeroclub – SP, in 1982.

1.5.3 Category of licenses and validity of certificates.

The pilot had the PPR License and his MLTE Rating was overdue since July 2013. His IFRA Rating was valid.

1.5.4 Qualification and flight experience.

The pilot was not qualified and it was not possible to verify if he had experience in the kind of flight.

1.5.5 Validity of medical certificate.

The pilot had valid CMA.

1.6 Aircraft information.

The aircraft, serial number TH-1348, was manufactured by Beech Aircraft, in 1982 and it was registered in the TPP category.

The aircraft had valid Airworthiness Certificate (CA).

Although the most recent inspection service order (12JUL2013) was presented to the Investigation Team, it was not on any of the aircraft logbooks, so it was considered that the airframe, engines and propellers logbooks were outdated.

The last inspection of the aircraft, the “50 hours” type, was performed on 27JUN2012 by the *Conal Avionics Eletrônica de Aeronaves* Ltd. maintenance organization, In Sorocaba - SP, having flown 41 hours and 25 minutes after the inspection.

The last inspection of the aircraft, the “IAM/100 hours” type, was performed on 12JUL2013 by the maintenance organization *Conal Avionics Eletrônica de Aeronaves* Ltd., in Sorocaba - SP.

As the flight report was not found, it was observed that according to the inspections/revisions performed on the aircraft, most maintenance of controlled items such as engine, propeller, propeller governor and magnetos was performed on time, or that is, due date, not flight hours. This data denoted the little movement of the aircraft.

From the analysis of the logbooks, from March 2003 to June 2012, the aircraft performed an average of 47 hours per year, which reinforced the inspections by time and not by flight hours.

Although it did not fly much, after the documentary investigation of the aircraft, it was noticed that the maintenance interventions were carried out as recommended by the aircraft manual and the ANAC.

1.7 Meteorological information.

The METAR of the SBJD provided the following information:

METAR SBJD 031500Z 31005KT CAVOK 25/05 Q1020

1.8 Aids to navigation.

Nil.

1.9 Communications.

According to the communication audio transcriptions between the PT-LKG and the Air Traffic Control, it was verified that the crew kept contact, through radio, with the TWR-JD and that there was no technical communication equipment abnormality during the flight

After the take-off, the Control Tower informed having seen smoke coming out of the left engine. The PT-LKG crew, then, reported that it was going to return and that it was on the downwind leg. From this moment on, there was no more communication.

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 happened at a highway lateral, in an overpass access road, 2,5 NM away from SBJD, with no evidence of previous impact. The wreckage distribution was the concentrated type.

From the footage of a Security Company camera, located close to the occurrence site, the aircraft was flying with a pitch down attitude of, approximately, 15° and a lateral inclination to the left of, approximately, 45° in relation to the ground (Figure 1).

Figure 1 – Image captured from the video. Moment when the aircraft appears in the footage before colliding against the ground.

Following, the impact of the left wing tip occurred in high speed. After that, the whole aircraft crashed against the ground and fell apart. There was an explosion that consumed almost all the aircraft (Figures 2 and 3).

Figure 2 - Image captured from the video right after the aircraft touches its left wing tip against the ground.

Figure 3 - Image captured from the video at the moment the aircraft explodes, after the collision of the left wing tip against the ground.

The retractable landing gear was in the retracted position. It was not possible to check the positions of the flaps or the trim tabs.

The degree of destruction and carbonization of the aircraft was quite high (Figure 4).

Figure 4 - General view of the wreckage, after the fire extinction.

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.

The fire started as soon as the aircraft collided with the ground and almost completely consumed it. The engines could still be taken for exams, tests and research.

1.15 Survival aspects.

There were no survivors.

1.16 Tests and research.

After the impact, the aircraft caught fire and thus there was no possibility to perform examinations or tests, nor find evidence that could have contributed to the malfunction or mechanical failure of any aircraft system, except in the propellers and in the engines.

Figure 5 - Photo of the aircraft wreckage.

An engineer from the DCTA, the Chief Investigator and a representative from Teledyne Continental Motors attended engine examinations.

The APA examinations, made by the DCTA, pointed out that the right engine was operating normally, with power development. On the left engine, it was observed that the injector nozzles presented total or partial obstruction. This may have directly contributed to the failure observed by the control tower that culminated in the accident.

Continental Engine IO-520-CB (9), serial number 576088 (right).

The engine had severe external damage caused by the fire, but it could be said that it operated normally.

The spark plugs were normal, the fuel filter and fuel distributor were unobstructed, the lubrication system operated normally and without fillings, the engine oil pump was also in full working condition. The engine cylinders and pistons had no evidence of individual or collective malfunction.

The magnetos could not be examined because the action suffered by the fire made such verification impossible.

The nozzles were also checked. Only cylinder nozzle 5 had partial obstruction.

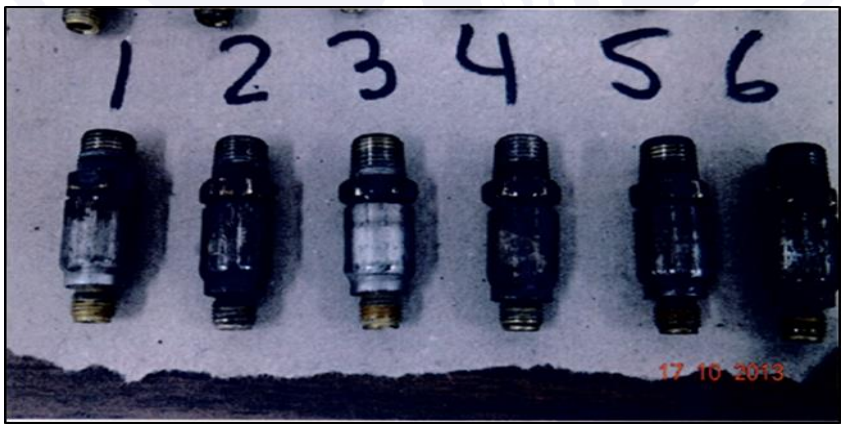

Figure 6 - Overview of the right engine nozzles.

Continental Engine IO-520-CB (9), serial number 576099 (left).

The engine had severe external fire damage. The spark plugs were normal, the lubrication system operated normally and without fillings, the engine oil pump also had its shaft intact and no evidence of failure. The engine cylinders and pistons had no evidence of individual or collective malfunction.

The fuel distributor and fuel pump were damaged by fire.

The magnetos could not be examined, as the damage caused by the fire made such action impossible.

The six nozzles (Figure 7) were also checked, and five of them presented partial or total obstruction to the fuel passage. It was identified the presence of polyethylene terephthalate, which is found in the black fibers of the fuel hose.

In addition, two propeller blades had characteristics that the engine was not developing power at the moment of impact.

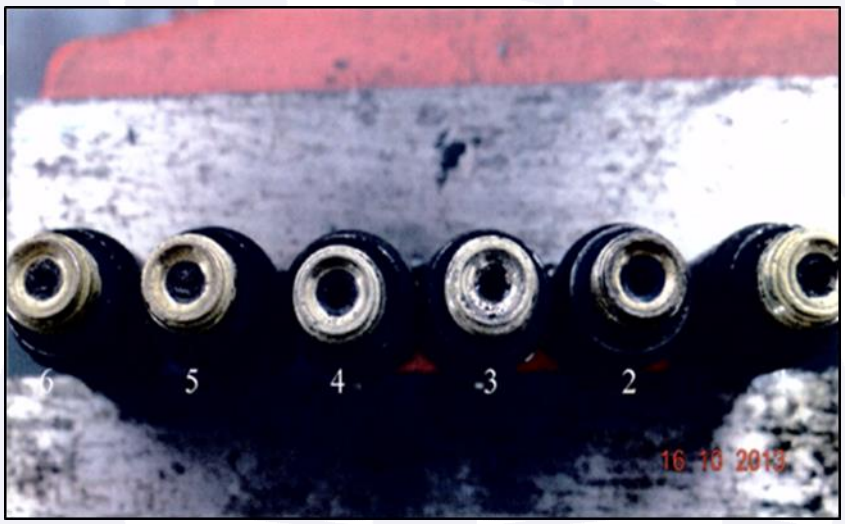

Figure 7 - Overview of the left engine nozzles.

After analyzing the fuel sample taken from the same point from which the aircraft was refueled, the following conclusion was reached:

> "After physical and chemical tests have been carried out, and according to what is recommended by the ANP, that sample was in compliance with the predicted specifications."

1.17 Organizational and management information.

Nil.

1.18 Operational information.

Calculations indicated that the aircraft was within the weight and balance limits specified by the manufacturer.

To estimate takeoff weight, the following data were considered:

- necessary fuel supply to fly 5 hours and 30 minutes of autonomy: 362kg;

- basic weight of the aircraft on the weight and balance sheet: 1.820kg; and

- estimated occupant weight: 250kg.

Adding these weights, remembering that there were 4 people on board, result in 2,432kg. The ramp and take-off weights foreseen in the aircraft Pilot's Operating Handbook

(POH) were of 2,465kg and 2,454kg respectively. Thus, it could be inferred that the aircraft was within the maximum allowable takeoff weight.

According to the takeoff climb gradient graphs (Figures 8 and 9) and the climb gradient (Figures 10 and 11), both with a dead engine and a maximum takeoff weight (5,400 lbs), a ratio could be maintained in 200ft/min, or a positive gradient of 2%, if the pilot maintained the expected speeds of 94kt and 100kt, respectively.

The temperature of 25°C, taken from the SBJD METAR, and the Aerodrome altitude of 2,483ft, taken from the ROTAER, were used.

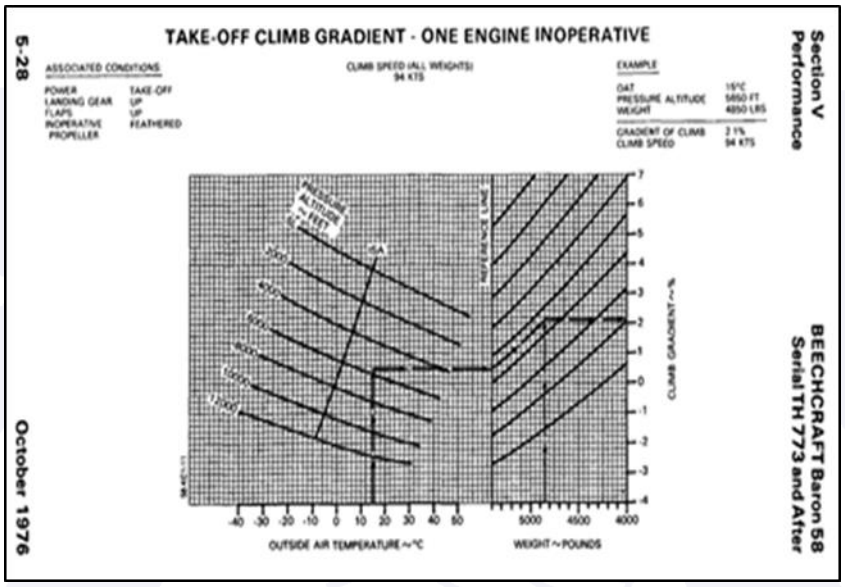

Figure 8 – Take-off climb gradient graph.

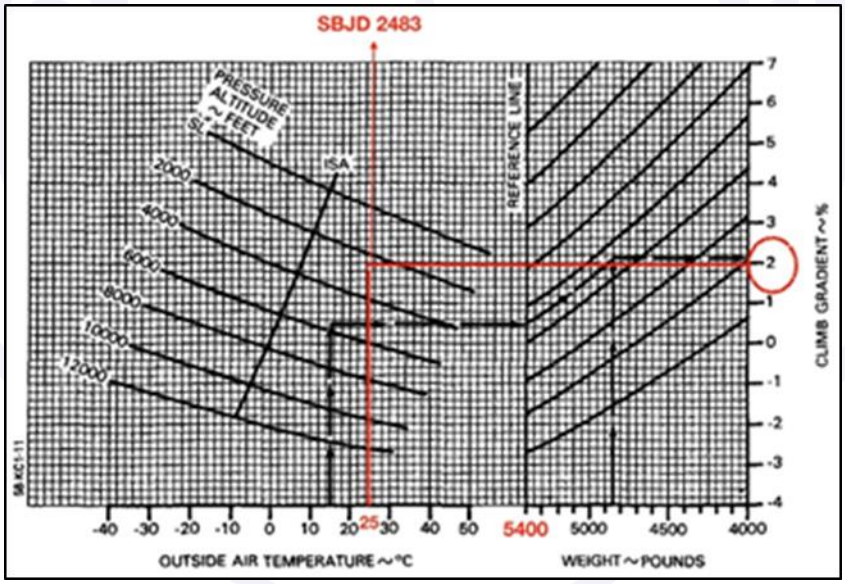

Figure 9 - Calculation of climb gradient on takeoff.

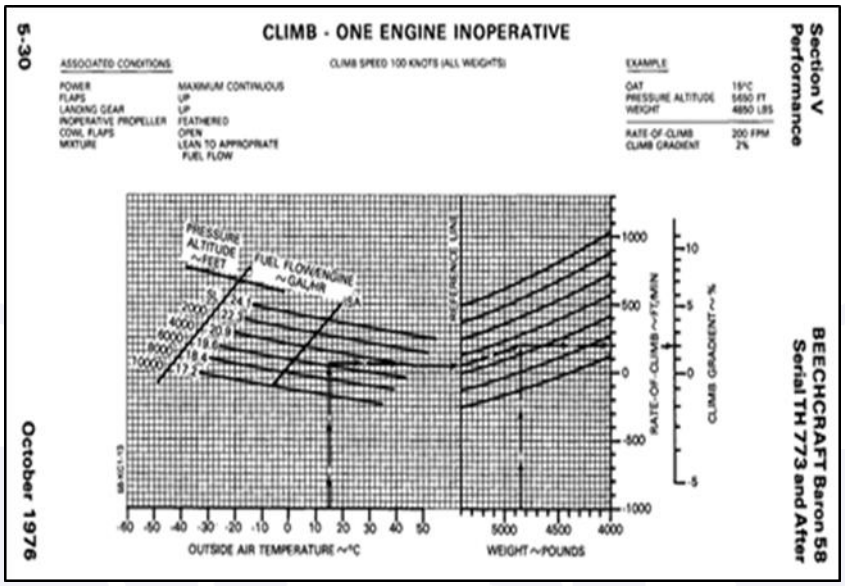

Figure 10 - Climb en-route gradient graph.

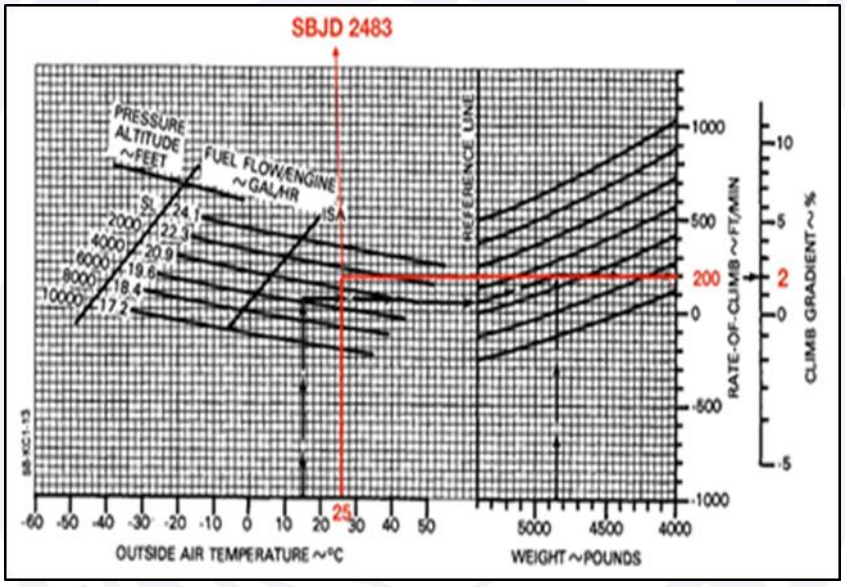

Figure 11 - Calculation of the ratio and gradient of climb en-route.

1.19 Additional information.

The pilot was the son of the aircraft owner.

The POH stated that if the aircraft were not able to climb, it would be better to reduce the power of the good engine and try to land ahead, than forcing a climb and losing control (Figure 13).

> If you do find yourself in a position of not being able to climb, it is much better to reduce the power on the good engine and land straight ahead than try to force a climb and lose control.

Figure 12 - POH extract.

The pilot's recheck flight was made on April 2013, and in that same month, the pilot requested the revalidation of the license from the ANAC, but it had not been completed by the date of the accident.

In the security camera recording, located near the place of the occurrence, it was observed that the aircraft had left lateral displacement, not coordinated in the longitudinal axis (“crabbing”).

1.20 Useful or effective investigation techniques.

Nil.

2. ANALYSIS.

It was a passenger flight.

The pilot had his MLTE rating expired since July 2013.

However, the flight experience could not be verified, due to the lack of hour records made by the commander. Although the recheck flight was made on April 2013, and in the same month, the pilot started the revalidation process; it had not been completed by the date of the accident.

The CA was valid. Although the service order of the last IAM of the aircraft, completed on 12JUL2013, was sent to the Investigation Team, such record was not included in any logbook and it is therefore considered outdated. The logbook was not found.

Due to the degree of destruction of the aircraft, only the engines were sent for examination, testing and research. The result indicated that the right engine was running normally.

However, the left engine had five of its six nozzles partially or completely blocked with fuel hose material. Such a situation may have occurred because of premature failure, due to improper performance of preventive or corrective services on the aircraft.

Its propeller showed deformation characteristic that the engine was not developing power at the moment of impact.

The fuel sample examination was presented as being in accordance with the specifications provided by the ANP.

The aircraft was considered to be within the weight and balance limits. In this situation, it was possible to maintain a positive rate of climb, according to the graphs presented.

In the security camera footage, uncoordinated displacement in an attempt to maintain single-engine flight suggested that the pilot was possibly trying to control the aircraft, but with no success.

Thus, there is a hypothesis of a failure or loss of power of the left engine.

From this, it could be inferred that the pilot encountered an abnormal engine failure situation shortly after takeoff and, in an attempt to maintain the single-engine flight by performing return and landing traffic, was unable to maintain control of the aircraft and establish a minimum climb rate until it reaches traffic altitude, thus colliding with the ground.

3. CONCLUSIONS.

3.1 Facts.

a) the pilot had valid Aeronautical Medical Certificates (CMA);

b) the pilot’s MLTE rating was overdue since July 2013;

c) the pilot’s IFRA rating was valid;

d) the pilot was qualified and had experience in that kind of flight;

e) the aircraft had valid Airworthiness Certificate (CA);

f) calculations indicated that the aircraft was within the weight and balance limits;

g) the airframe, engines and propellers logbooks records were outdated;

h) the weather conditions were favorable for the flight;

i) the flight logbook was not found;

j) after the takeoff, the SBJD control tower reported seeing smoke coming out of the left engine;

k) the PT-LKG crewmember reported returning to SBJD;

l) during the attempted return, the aircraft collided with the ground and exploded;

m) in the tests performed, the left engine had five of the six nozzles clogged;

n) two propeller blades of the left engine had characteristics that the engine was not developing power at the moment of impact;

o) the fuel was within the expected specifications;

p) the aircraft was destroyed; and

q) the pilot and passengers suffered fatal injuries.

3.2 Contributing factors.

- **Control skills – undetermined.**

The flight condition with an engine inoperative at takeoff may have led the pilot to the misuse of the flight controls, thereby making it possible the loss of control, causing the aircraft to crash into the ground.

- **Aircraft maintenance – undetermined.**

According to the investigation report, the left engine had five of the six nozzles partially or completely blocked with fuel hose material. Such a situation may have occurred because of premature failure, due to improper performance of preventive or corrective services on the aircraft.

- **Insufficient pilot's experience – undetermined.**

As the pilot's flight records were not found, it was not possible to state that he was experienced. The condition of a take-off engine failure, without proper preparation and experience, could influence the maintenance of the aircraft control.

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:

A-140/CENIPA/2013 – 01 Issued on 07/24/2020

Work with the CONAL *Avionics e Eletrônica de Aeronaves* Ltd. Maintenance Organization, so that organization demonstrates that it owns and applies all the resources necessary for the adequate provision of maintenance services and maintenance records of BEECH AIRCRAFT, model 58, and Continental engines, model IO-520-CB, during the preventive and corrective maintenance procedures of the fuel system, notably regarding the replacement of flexible pipes regarding the traceability of parts used, as well as the possibility of contamination of this foreign material system.

5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN.

None.

On July 24th, 2020.