

COMANDO DA AERONÁUTICA
CENTRO DE INVESTIGAÇÃO E PREVENÇÃO DE
ACIDENTES AERONÁUTICOS



FINAL REPORT
IG-013/CENIPA/2016

OCCURRENCE:	SERIOUS INCIDENT
AIRCRAFT:	PR-CVL
MODEL:	AT- 402B
DATE:	18JAN2016



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 18JAN2016 serious incident with the AT 402B aircraft, registration PR-CVL. It was classified as (SCF-PP) "System/Component Failure or Malfunction (Powerplant)".

During the return flight, after the application of agricultural input, the aircraft's engine had power loss, locking in idle.

The pilot made a precautionary landing in a pasture field.

The aircraft had no damage.

The pilot left unharmed.

An Accredited Representative of TSB - Transportation Safety Board, Canada (State where the engine was designed/manufactured), was designated for participation in the investigation.

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GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS

ANAC	National Civil Aviation Agency
CA	Airworthiness Certificate
CENIPA	Aeronautical Accident Investigation and Prevention Center
CG	Center of Gravity
CIV	Pilot's Flight Logbook
CMA	Aeronautical Medical Certificate
DCTA	Aeronautics Science and Technology Department
FCU	Fuel Control Unit
IAE	Aeronautics and Space Institute
IAM	Annual Maintenance Inspection
MNTE	Airplane Single Engine Land Rating
PAGA	Agricultural Pilot Rating
PCM	Commercial Pilot License - Airplane
PN	Part Number
PPR	Private Pilot License - Airplane
RS	Safety Recommendation
SAE AG	Aircraft Registration Category of Public Specialized Air Service - Agricultural
SIPAER	Aeronautical Accident Investigation and Prevention System
SN	Serial Number
TPP	Registration Category of Private Aircraft Service
UTC	Universal Time Coordinated
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions

1. FACTUAL INFORMATION.

Aircraft	Model: AT 402B Registration: PR-CVL Manufacturer: AIR TRACTOR	Operator: CEAL Agricultural Aviation Ltd.
Occurrence	Date/time: 18JAN2016 - 2125 UTC Location: Pontal do Tigre Settlement - Alegria Ranch Lat. 23°08'28"S Long. 053°30'49"W Municipality – State: <i>Querência do Norte</i> - PR	Type(s): (SCF-PP) "System/Component Failure or Malfunction (Powerplant)" Subtype(s): Nil.

1.1 History of the flight.

The aircraft took off from the runway of CEAL Agricultural Aviation Ltd., located in the city of Querência do Norte - PR, with a pilot on board, at about 2100 (UTC), in order to launch agricultural input.

During the return flight, the aircraft had loss of power, slowing down.

The pilot made a precautionary landing on a cattle pasture field.

The aircraft was not damaged. The pilot left unharmed.



Figure 1 - Overview of the aircraft.



Figure 2 - Overview of the aircraft.

1.2 Injuries to persons.

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

1.3 Damage to the aircraft.

Nil.

1.4 Other damage.

Breaking of a flat wire fence in the cattle pasture field.

1.5 Personnel information.

1.5.1 Crew's flight experience.

	Pilot
Total	951:55
Total in the last 30 days	20:40
Total in the last 24 hours	00:30
In this type of aircraft	377:30
In this type in the last 30 days	20:40
In this type in the last 24 hours	00:30

N.B.: The Data on the flown hours were obtained from the Pilot's Flight Logbook (CIV) records.

1.5.2 Personnel training.

The pilot took the Private Pilot Course – Airplane (PPR) at *Aeroclub de Toledo* - PR, in 2006.

1.5.3 Category of licenses and validity of certificates.

The pilot had the Commercial Pilot License – Airplane (PCM) and had valid MNTE and Agricultural Pilot (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 Aeronautical Medical Certificate (CMA).

1.6 Aircraft information.

The aircraft, serial number 402B-1221, was manufactured by AIR TRACTOR, in 2009 and it was registered on the SAE-AG category.

The aircraft had valid Certificate of Airworthiness (CA).

The airframe, engine and propeller Logbook records were updated.

The last inspection of the aircraft, the "100 hours/IAM" type was carried out on 29APR2015, by FÊNIX AVIAÇÃO LTD., in Arapongas - PR, having flown 55 hours and 40 minutes after the inspection.

The last revision of the aircraft, the "300 hours" type was carried out on 10OCT2011, by FÊNIX AVIAÇÃO LTD., in Arapongas - PR, having flown 347 hours after the revision.

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.

Nil.

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.

Nil.

1.16 Tests and research.

Due to the hypothesis that there was a failure in the engine's Fuel Control Unit (FCU), which could have caused the engine to lock in low rotation (48% Ng), this component was removed from the aircraft for examination, test and bench test in an approved aeronautical engineering and maintenance company.

This procedure was performed by the technicians of the IAE of the DCTA and was attended by a technical representative of the manufacturer of the aircraft engine (Pratt & Whitney).

Initially the FCU was inspected, presenting no cracks, kneading or axle warping, and then installed in bench for testing.

In the initial test, it was verified that the fuel flow did not correspond to the angle of the lever of the FCU, being the attention directed towards the aneroid capsule (bellows) of the FCU.

In the leak test performed on the capsule, no abnormality was observed. In the second specific pressure test, it was found that it was inoperative. Finally, the FCU was reassembled with another aneroid capsule that was operational and the fuel flow reached the limits set by the manufacturer.

Therefore, in the performed examinations, the inoperativeness of the aneroid capsule (bellows) of the engine's FCU that equipped the aircraft AT-402B PR-CVL was concluded. This caused a blockage in the fuel flow, stagnating its flow in idle condition, which forced the pilot to make the forced landing.

The Pratt & Whitney Canada (P & WC) shop in Brazil also conducted an investigation into the FCU of the aircraft and found that there were micro-cracks in the aneroid capsule and confirmed leakage in that component (FCU acceleration area), as reported by the company's support representative.

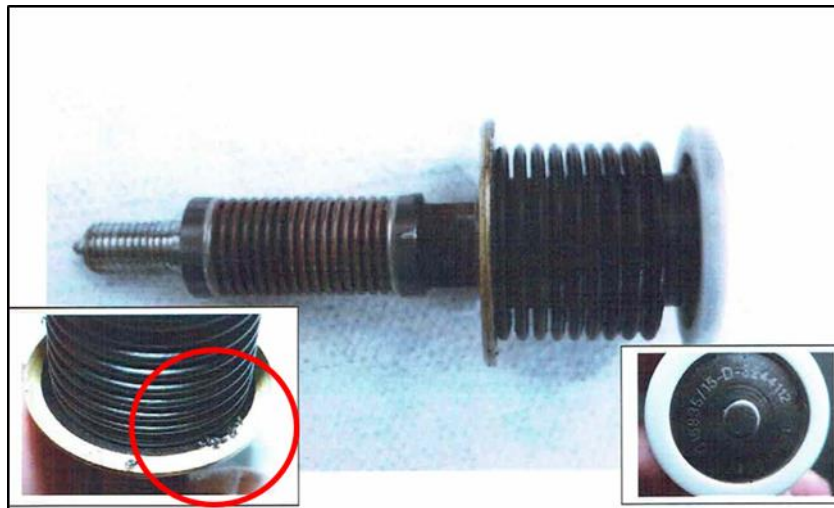


Figure 3 - View of the FCU aneroid capsule. On the right, it is shown its identification and on the left side, it is shown the contamination.

The Pratt & Whitney report found that the aneroid capsule was in contact with the inner wall of its housing (vacuum chamber) and suggested that the micro-cracks were associated with the vibration of this component, but the report was not conclusive as to the source of that vibration.

1.17 Organizational and management information.

Nil.

1.18 Operational information.

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

On the flight in question, the pilot was returning to its operational base after agricultural input application with all normal flight parameters until then, when the engine suddenly failed, idling, 3km away from the application area and 7km from the landing strip.

According to the pilot, the indications of the torque instruments, ITT and Ng dropped rapidly until they reached the minimum flow mark at idle (48% Ng).

The pilot stated that he advanced all three levers (power, pitch and mix) and turned on the fuel pump, but got no response from the engine. At this point, realizing that he would no longer reach the runway of his base, he decided to divert to the right of his route and proceeded to approach an emergency landing by performing the Forced Landing procedure provided in Section 3 - Emergency Procedure AIRPLANE FLIGHT MANUAL for AIR TRACTOR MODEL AT-402B, 2002.

The landing took place in a grazing area with high grass, two touches to the ground and total stop of the aircraft after only 135 meters.

1.19 Additional information.

The FCU SN C75190 had undergone an Overhaul at a service center designated by the manufacturer, returning to service on 16OCT2015, having been installed in the aircraft's engine on 23DEC2015.

It was not possible to determine, objectively, if there were any deficiencies in these general revision services of the FCU, and the contribution of this aspect to the occurrence is undetermined.

By the closing of this Final Report, the Senior Field Support Representative P & WC in São Paulo - SP, was still seeking to determine why the "bellows" presented this leak.

1.20 Useful or effective investigation techniques.

Nil.

2. ANALYSIS.

The initial analysis of the occurrence, taking into account the malfunction of the in-flight engine component, led to the suspicion of failure of the aircraft's powertrain fuel control unit (FCU), which could have caused the engine power to low rotation locking (48% Ng).

Based on this hypothesis, the engine fuel control unit (FCU) was removed from the aircraft by the SERIPA V research team for examination, test and bench test.

This analysis verified the inoperativeness of the FCU aneroid capsule (bellows) of the engine that equipped the AT-402B PR-CVL aircraft. This caused a blockage in the flow, stagnating the fuel flow in idle condition, which forced the pilot to make a forced landing.

After its replacement, the FCU presented normal functioning, when it was submitted to bench test.

The Pratt & Whitney Canada (P & WC) shop in Brazil, in turn, conducted its own analysis on the aircraft's FCU and confirmed the leakage in the bellows (FCU acceleration area).

The Pratt & Whitney report was inconclusive as to the origin of the vibration that caused the cracks in the aneroid capsule.

It was not possible to determine, objectively, if there were any deficiencies in the general revision services of the FCU, and the contribution of this aspect to the occurrence was undetermined.

In this case, it was concluded that there was a failure of the engine with low power locking (48% Ng), due to the failure of the FCU aneroid capsule, which stagnated the fuel flow in the idle condition, which forced the pilot to make an emergency landing in an unsuitable place.

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 on 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 and engines logbook records were updated;
- g) on return of an agricultural input application flight, there was an engine failure in flight;
- h) the engine of the aircraft was with power locked and in idle condition;
- i) the pilot performed an emergency landing on a pasture field;
- j) the technical report found that the aneroid capsule of the FCU of the engine was inoperative;
- k) the capsule failure caused the stagnation of power in idle condition;
- l) the aircraft had no damage; and
- m) the pilot was unharmed.

3.2 Contributing factors.

- **Aircraft maintenance – undetermined.**

The IAE / DCTA Report found that the FCU aneroid capsule ("bellows") of the engine that fitted the aircraft resulted in a blockage in the fuel flow and stagnation of the fuel flow in the idle condition (Ng a 48%).

It was not possible to determine, objectively, if there were any deficiencies in the general revision services of the FCU, being indeterminate the contribution of this aspect to the occurrence.

4. SAFETY RECOMMENDATION.

A measure of preventative/corrective nature issued by a SIPAER Investigation Authority or by a SIPAER-Link within respective area of jurisdiction, aimed at eliminating or mitigating the risk brought about by either a latent condition or an active failure. It results from the investigation of an aeronautical occurrence or from a preventative action, and shall never be used for purposes of blame presumption or apportion of civil, criminal, or administrative liability.

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):

IG-013/CENIPA/2016 - 01

Issued on 12/04/2018

Follow the survey carried out by Pratt & Whitney Canada (P & WC), in order to verify the need to issue corrective actions, aiming to ensure adequate compliance with applicable airworthiness requirements.

5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN.

Nil.

On December 4th, 2018.