

COMANDO DA AERONÁUTICA
CENTRO DE INVESTIGAÇÃO E PREVENÇÃO DE
ACIDENTES AERONÁUTICOS



FINAL REPORT
A - 018/CENIPA/2013

OCCURRENCE:	ACCIDENT
AIRCRAFT:	PT-OGL
MODEL:	208
DATE:	25JAN2013



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 25JAN2013 accident with the 208 aircraft, registration PT-OGL. The accident was classified as “[USOS] Undershoot/Overshoot - Undershoot”.

During the final approach to landing at the *Centro Nacional de Paraquedismo* (SDOI), Boituva - SP, after the pilot reduced power for landing, the propeller would have gone into reverse pitch without being commanded to do so. The aircraft crashed into a ravine near the runway 06 threshold, stopping 78 meters ahead.

The aircraft had substantial damage.

He pilot suffered minor injuries.

An Accredited Representative of the Transportation Safety Board (TSB) - Canada, was designated for participation in the investigation.



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GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS

ANAC	Brazil's National Civil Aviation Agency
CA	Airworthiness Certificate
CI	Investigation Team
CIV	Pilot's Flight Logbook
CMA	Aeronautical Medical Certificate
FIAM	Annual Maintenance Inspection Form
IAE	Aeronautics Space Institute
IAM	Annual Maintenance Inspection
KCAS	Calibrated Airspeed
LPQA	Parachute Launcher Pilot Rating - Airplane
METAR	Aviation Routine Weather Report
MNTE	Airplane Single Engine Land Rating
N/S	Serial Number
PAMA-AF	Afonso Aeronautical Material Organization
PLA	Airline Pilot License – Airplane
P/N	Part Number
PPR	Private License – Airplane
RBAC	Brazilian Civil Aviation Regulation
SDOI	ICAO Location Designator - Centro Nacional de Paraquedismo, Boituva - SP
TPP	Registration Category of Private Service - Aircraft
TSB	Transportation Safety Board - Canada
UTC	Universal Time Coordinated
VFR	Visual Flight Rules

1. FACTUAL INFORMATION.

Aircraft	Model: 208	Operator: Wellborn <i>Partic. Societárias</i> Ltd.
	Registration: PT-OGL	
	Manufacturer: Cessna Aircraft	
Occurrence	Date/time: 25JAN2013 -1740 UTC	Type(s): [USOS] Undershoot/Overshoot
	Location: <i>Centro Nacional de Paraquedismo</i>	
	Lat. 23°17'53"S Long. 047°41'31"W	Subtype(s): Undershoot
	Municipality – State: Boituva – SP	

1.1 History of the flight.

The aircraft took off from the *Centro Nacional de Paraquedismo* (SDOI), located in the municipality of Boituva - SP, at about 1713 (UTC), in order to perform a local parachute launching flight. At the time of the accident, there was only the pilot on board.

In the short final approach, after the pilot reduced power to land, the propeller would have gone into reverse pitch, without being commanded. As a result, the aircraft crashed into a ravine near the runway 06 threshold, stopping 78 meters ahead.

The aircraft had substantial damage. The pilot suffered minor injuries.

1.2 Injuries to persons.

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

1.3 Damage to the aircraft.

The landing gear, of the fixed type, broke during the impact against the ravine (Figure 1).



Figure 1 - Overview of the aircraft, with damage to the propeller, flaps and landing gear.

The two engine access doors were pulled out of their original position. The weather radar fairing was broken, as well as part of the left windshield. (Figure 2).



Figure 2 - Damage to the propeller, engine and left windshield.

The flaps were lowered and presented kneading (Figure 3).



Figure 3 - Damage to the flaps.

There was kneading near the left wing tip and the left horizontal stabilizer. The trims of the elevators were symmetrical and positioned in neutral.

1.4 Other damage.

None.

1.5 Personnel information.

1.5.1 Crew's flight experience.

Flight Hours	Pilot
Total	14.000:00
Total in the last 30 days	65:00
Total in the last 24 hours	03:48
In this type of aircraft	3.000:00
In this type in the last 30 days	65:00
In this type in the last 24 hours	03:48

N.B.: The data related to the flown hours were informed by the pilot, except for the total hours, which were obtained through the Pilot's Flight Logbook (CIV) records.

1.5.2 Personnel training.

The pilot took the PPR course at the Guaratinguetá Aeroclub - SP, in 1988.

1.5.3 Category of licenses and validity of certificates.

The pilot had the PLA License and had valid MNTE and LPQA 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 CMA.

1.6 Aircraft information.

The aircraft, serial number 20800102, was manufactured by Cessna Aircraft, in 1986 and it was registered in the TPP category.

The aircraft had valid Airworthiness Certificate (CA).

The engine and propeller logbooks records were outdated.

The aircraft airframe logbook was not presented. In the flight logbook, only the flights of days 18, 19, 21 and 25JAN2013 were included.

Although the most recent inspection service order was submitted to the Investigation Team, it was not included in any of the aircraft logbooks.

The last inspection of the aircraft, the "IAM" type, was carried out on 10MAY2012 by the TAF *Táxi Aéreo Fortaleza* Ltd. maintenance organization, in Fortaleza – CE, with the aircraft having flown 68 hours and 20 minutes after the inspection.

The last maintenance intervention, the "MINOR" type, was performed on 25JAN2013 by the maintenance organization REMAER *Aviação e Comércio* Ltd., in Sorocaba - SP, with the aircraft having flown 01 hour and 25 minutes after the intervention.

In the FIAM, from 10MAY2012, there was the inspection and weighing of the portable fire extinguisher Part Number (P/N) RT-A1200, S/N S733900, but it did not work when the firefighter tried to use it.

1.7 Meteorological information.

There was no meteorological service in the locality, however the conditions were favorable to the visual flight.

The METAR of the Campinas Aerodrome (SBKP), 40 nautical miles away from the site of the accident, had the following information:

METAR SBKP 251700Z 30007KT 9999 SCT035 FEW050TCU 30/20 Q1010

1.8 Aids to navigation.

Nil.

1.9 Communications.

Nil.

1.10 Aerodrome information.

The aerodrome was private, ran by the Boituva City Hall and operated under Visual Flight Rules (VFR) in the daytime.

The runway was made of dirt, with thresholds 06/24, dimensions of 700m x 30m, with elevation of 2,051ft.

Near the runway 06 threshold, there was a ravine that was below the level of the runway. Threshold 24 was next to a highway.

1.11 Flight recorders.

Neither required nor installed.

1.12 Wreckage and impact information.

The impact occurred in the ravine before the runway 06 threshold of the *Centro Nacional de Paracaidismo* (SDOI) - SP, with no evidence of previous impact. The wreckage distribution was of the concentrated type.

After the impact, the aircraft dragged along the runway, in the same direction as the landing, 78 meters ahead, turning approximately 90° in relation to the axis of the runway to the right, stopping completely (Figure 4).



Figure 4 - Overview from threshold 06.

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 after the aircraft full stop.

1.15 Survival aspects.

The abandonment of the aircraft was made by the left door.

A local firefighter, who accompanied the operations, assisted in abandonment.

The rescue came fast and took the pilot to the hospital with minor injuries.

The fire extinguisher of the aircraft was activated, but it did not work because it was unloaded.

1.16 Tests and research.

The Pratt & Whitney engine, model PT6A-114, N/S PCE-17045, was inspected at the IAE and inspected at the Pratt & Whitney shop in Sorocaba - SP. Subsequently, the engine was sent to the PAMA-AF, where it was tested in the test bench.

At the Pratt & Whitney shop in Sorocaba - SP, a visual inspection and subsequent inspection of the tubes, fuel and lubrication connections and the pneumatic sections were performed. After the inspection, including in the internal part with the use of the borescope, no abnormality was found.

According to the document issued by Pratt & Whitney Canada (Factual Notes) that reported general aspects of the engine conditions, a clearance at the carbon block working on the Beta ring (0,032 inches) was observed. This indicated that the wear was beyond the maximum limit of 0,010 inches allowed by the aircraft manufacturer.

Also according to Factual Notes:

“The beta valve is spring loaded outward such that oil flow is reduced to the propeller goes to feather with any disconnect or excessive wear in beta linkage, including wear of carbon block. The engine showed no other anomalies that would affected normal operation.”

The Beta valve is driven by the feathering spring, so that the reduction of the oil flow resulting from the disconnection or excessive wear on the Beta bond, including carbon block wear, would tend to lead the propeller to the feather pitch. In the opposite direction, the engine oil pressure moves the propeller to the minimum pitch (maximum RPM).

The engine did not show other anomalies that would affect the normal operation.

At the PAMA-AF test bench, the engine was tested for 39 minutes and no control parameters, including those of the propeller, were exceeded. The engine was shut down and the propeller governor was removed for bench testing.

The propeller governor showed normal operation without allowing reverse entry. This was verified in the test bench of the engine and in the individual specific bench test.

According to the tests, the engine propeller had a characteristic of impact without power as the moment the aircraft crashed into the ground. Two blades were folded close to the root and indicated that there was an immediate stop caused by the weight of the aircraft above them (Figure 5).

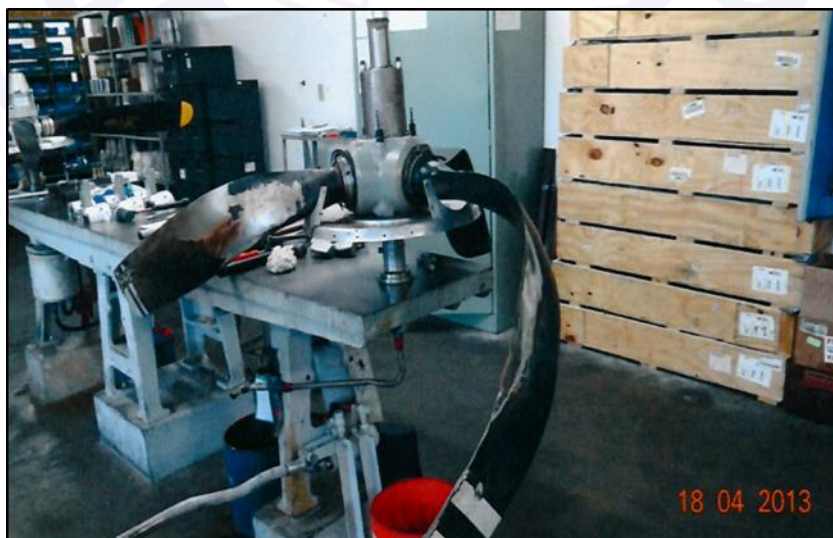


Figure 5 - Overview of the propeller.

The result of exams, tests and researches concluded that the engine:

"... it was operational and developed power. It was performed test bench and the engine was accelerated and decelerated sharply several times. It was then verified that all control parameters, both engine and propeller, were not exceeded. The propeller governor was removed and tested on specific bench. During the test, nothing was identified that would allow the reverse to enter without being commanded."

1.17 Organizational and management information.

Nil.

1.18 Operational information.

Section 105.3 - General Rules of the RBAC 105, in force, established that:

...

(d) The pilot-in-command of an aircraft may only authorize a person to perform a parachute jump from his aircraft if:

- (1) there is NOTAM valid for the operation;
- (2) he is qualified as a parachute launcher pilot in accordance with RBHA 61 or RBAC that replaces it;
- (3) the aircraft is in its regularized situation before the ANAC and has no restrictions that may affect this operation; and

...

According to information obtained from the ANAC, the PT-OGL aircraft was not authorized for parachute launching flights.

The aircraft was considered within the limits of weight and balance.

The pilot was operating in Boituva since 2011, flying the 208 model aircraft. That day, he had already made nine more landings in the locality.

Section 4 - Normal Procedures for Model 208 recommended the following procedures for performing Short Field Landing (Figure 6):

SECTION 4 NORMAL PROCEDURES	CESSNA MODEL 208B G1000
SHORT FIELD LANDING	
1. WING FLAPS Handle	FULL
2. Airspeed	78 KIAS
Refer to Landing Distance charts in Section 5 for speeds at reduced weights.	
3. POWER Lever. . . .	REDUCE to IDLE (after clearing obstacles)
4. Touchdown	MAIN WHEELS FIRST
5. POWER Lever.	BETA RANGE AFTER TOUCHDOWN
NOTE	
Use of reverse thrust will reduce the landing roll by approximately 10% (see Section 5).	
6. Brakes	MAXIMUM (while holding elevator control full aft)
7. WING FLAPS Handle	RETRACT (for maximum brake effectiveness)

Figure 6 - Procedures for short-field landing.

For the approximate calculation of the total distance for landing, using the technique for short-field landing, for a weight of 7,000 lbs, altitude of 2,000ft, air temperature of 30° C, speed of 50ft of 71kt, it was used the data in the Section 5 table - Performance, Without Cargo Pod Short Field Landing Distance (Figure 7):

CESSNA
MODEL 208B G1000

SECTION 5
PERFORMANCE

**WITHOUT CARGO POD
SHORT FIELD LANDING DISTANCE**

CONDITIONS:

Flaps **FULL**

Zero Wind

Maximum Braking

PROP RPM Lever **MAX**

Paved, Level, Dry Runway

POWER Lever **IDLE** after clearing
obstacles. **BETA** range (lever
against spring) after touchdown.

Refer to Sheet 1 for appropriate notes applicable to this chart.

7000 Pounds:

Speed at 50 Feet:

71 KIAS

Pressure Altitude Feet	20°C		30°C		40°C	
	Grnd Roll Feet	Total Dist To Clear 50 Foot Obst	Grnd Roll Feet	Total Dist To Clear 50 Foot Obst	Grnd Roll Feet	Total Dist To Clear 50 Foot Obst
Sea Level	795	1575	825	1615	850	1650
2000	855	1660	885	1705	915	1745
4000	920	1755	950	1800	985	1845
6000	990	1855	1025	1905	1060	1950
8000	1070	1965	1105	2020	1145	2070
10,000	1155	2085	1195	2140	---	---
12,000	1250	2215	1290	2275	---	---

Figure 7 - Calculation of the landing distance.

Considering the conditions highlighted in the table in Figure 7, the required landing distance, freeing obstacles at 50ft, would be 1,705ft or 520m.

The runway of the *Centro Nacional de Paraquedismo* was 700m long, equivalent to 2,296ft.

Also according to the respective manual, the calibrated speeds (KCAS) of stall would respectively be:

Flaps Up, Idle Power - 78kt; and

Flaps Full, Idle Power - 61kt.

According to the aircraft's manual, the engine was controlled by four separate controls, including the power lever.

The 208 power lever had the following positions: MAX, IDLE, BETA and REVERSE.

The course of the lever between the IDLE and MAX positions enabled the pilot to select the output power of the engine. The BETA band made it possible to control the pitch of the propeller from idle to REVERSE.

1.19 Additional information.

Nil.

1.20 Useful or effective investigation techniques.

Nil.

2. ANALYSIS.

It was a local parachute launching flight, in which only the pilot was on board at the time of the accident.

At the time of the accident, the PT-OGL aircraft was not authorized by the ANAC for parachute launching flights, that is, the pilot could not have authorized the jump from this aircraft.

The pilot was qualified and had experience in model 208 and in that type of operation, having previously performed nine landings on that day.

Meteorological conditions favored the type of flight, not constituting a contributing factor to the event.

The aircraft airframe logbook was not presented.

Although the fact that the engine and propeller logbooks were outdated, there was no contribution of these factors to the event.

The aircraft was considered within the limits of weight and balance.

According to the pilot, in the short final approach on runway 06, after reducing the power for landing, the propeller would have gone into reverse pitch without being commanded.

As a result, the aircraft touched a ravine, before the threshold of runway 06, stopping 78 meters ahead, with substantial damage.

In order to establish a possible cause and effect relationship between the reported and the actual occurrence, it is necessary to clarify details about the operation of the model 208.

According to the aircraft manual, the engine was controlled by four separate controls, including the power lever.

The power lever controlled the thrust of the engine in the range between maximum takeoff power, idle speed and reverse pitch. To do this, the power lever had the following positions: MAX, IDLE, BETA and REVERSE.

The course of the lever between the IDLE and MAX positions enabled the pilot to select the output power of the engine. The BETA band allowed the pilot to control the pitch of the propeller from the idle to the maximum reverse.

In this sense, in order for the reverse to be activated, it was necessary to control the power lever, by the pilot, from the BETA band to the REVERSE.

As it was reported a possible entry in the reverse mode, without any command, the Pratt & Whitney engine, model PT6A-114, N/S PCE-17045, was sent to the IAE for exams.

Inspections and tests were carried out at the premises of the Pratt & Whitney shop in Sorocaba - SP, and at the PAMA-AF, where it was tested at the test bench.

After the inspection at the Pratt & Whitney shop, no abnormality was found that could justify the pilot's report.

At the PAMA-AF test bench, the engine was tested for 39 minutes and no control parameters, including those of the propeller, were exceeded. The engine was shut down and the propeller governor was removed for bench testing.

The propeller governor showed normal operation without allowing reverse entry. This was verified in the engine test bench and in the individual specific bench test.

A clearance at the carbon block that worked on the Beta ring (0,032 inches) was observed. This indicated that the wear was beyond the maximum limit of 0,010 inches allowed by the aircraft manufacturer.

However, this clearance would not cause the propeller to go into reverse mode, since excessive disconnection or wear on the beta bond would tend to lead the propeller to the feather pitch.

In addition, the tests revealed that the propeller had characteristics of impact without power at the moment the aircraft collided with the ground. Two blades were folded close to the root and indicated that the immediate stop was caused by the weight of the aircraft above them.

The propeller in reverse pitch has a negative value and produces a negative traction, which uses engine power. If this had actually happened, the evidence would indicate a characteristic of damage to the propeller blades other than those found during the investigation.

Considering the length of the runway of the Centro Nacional de Paracadismo (700m) and the conditions contained in the Without Cargo Pod Short Field Landing Distance of Figure 6, it is concluded that at the time of the accident the total distance to the landing would be approximately 520m. With that, it would remain about 180m to the end of the runway.

To land at this location, it would be advisable to employ the items contained in Short Field Landing. For this, the indicated speed would be 78kt.

Considering that there was a touch on the ground outside the landing surface, before the runway, it is concluded that the procedures provided in the Short Field Landing were not performed properly, and a final landing was performed, in which the approach was made below the ideal slope and with speed close to stall with full flaps (61kt).

Considering that the reduction of the power lever for the landing should be done with the speed of 71kt, freeing obstacles at 50ft height, the hypothesis is the loss of lift, due to an inadequate piloting judgment, when the power lever was reduced to IDLE, with speed close to the stall and before the threshold.

As a result, the PT-OGL crashed into the ravine at the runway 06 threshold, causing substantial damage to the aircraft and minor injuries to the pilot.

3. CONCLUSIONS.

3.1 Facts.

- a) the pilot had valid Aeronautical Medical Certificate (CMA);
- b) the pilot had valid MNTE and LPQA Ratings;
- c) the pilot was qualified and had experience in that kind of flight;
- d) pilot had already made nine landings that day;
- e) the aircraft had valid Airworthiness Certificate (CA);
- f) the aircraft was not authorized by the ANAC, for parachute launching flights;
- g) the aircraft was within the limits of weight and balance;
- h) the weather conditions were favorable for the visual flight;
- i) the engine and propeller logbooks records were outdated;
- j) the airframe logbook was not presented to the Investigation Team;
- k) the flight logbook records were outdated;
- l) the portable fire extinguisher P N RT-A1200, N/S S733900, did not work when the firefighter tried to use it;
- m) the propeller governor was removed and tested on a specific bench, showing normal operation without allowing reverse entry;

- n) the engine was tested for 39 minutes and no control parameters, including those of the propeller, were exceeded;
- o) after the inspection of the engine, including the internal part with the borescope, no abnormality was found;
- p) a clearance at the carbon block working on the Beta ring (0.032 inches) was observed;
- q) the clearance at the carbon block working on the Beta ring could cause a change of pitch of the propeller blades to the feathering and not to the reverse;
- r) the engine propeller presented characteristics of impact without power at the moment the aircraft crashed into the ground;
- s) the PT-OGL crashed into the ravine adjacent to the threshold of runway 06;
- t) the aircraft had substantial damage; and
- u) the pilot suffered minor injuries.

3.2 Contributing factors.

- **Control skills – undetermined.**

It is likely that the pilot reduced the engine power to IDLE before the runway, with a speed close to stall. Consequently, there was loss of lift of the aircraft and collision against the ravine near the threshold of runway 06.

- **Piloting judgment – undetermined.**

The experience of the pilot in the aircraft model, the type of operation and the accomplishment of several landings during the day, may have compromised his evaluation of the aspects related to the operation of the aircraft, mainly in the judgment of the parameters related to the approach to the landing.

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-018/CENIPA/2013 - 01

Issued on 09/03/2019

Perform inspection procedures at the *Centro Nacional de Paraquedismo*, in Boituva - SP, to verify the conformity of the aircraft operating there.

5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN.

None.

On September 03rd, 2019.

