COMANDO DA AERONÁUTICA

CENTRO DE INVESTIGAÇÃO E PREVENÇÃO DE ACIDENTES AERONÁUTICOS

FINAL REPORT
A - 027/CENIPA/2019

OCCURRENCE:	**ACCIDENT**
AIRCRAFT:	**PT-AIG**
MODEL:	**GC-1A**
DATE:	**06FEB2019**

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 Final Report was provided to ANAC and DECEA so that the technical-scientific analyzes of this investigation can be used as a source of data and information, aiming at the identification of hazards and risk assessment, as established in the Brazilian's Program Operational Safety of Civil Aviation (PSO-BR).

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 06FEB2019 accident with the GC-1A aircraft model, registration PT-AIG. The accident was classified as “[LOC-I] Loss of Control in Flight”.

While performing an aerobatic maneuver, the plane lost control and crashed into the ground.

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 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
CA	Airworthiness Certificate
CENIPA	Aeronautical Accident Investigation and Prevention Center
CTA	Aeronautics Technical Center
CG	Center of Gravity
CIV	Pilot's Flight Logbook
CMA	Aeronautical Medical Certificate
CST	Supplemental Type Certification
DCTA	Department of Science and Airspace Technology
IAM	Annual Maintenance Inspection
IS	Supplementary Instruction
METAR	Aviation Routine Weather Report
MNTE	Airplane Single Engine Land Rating
NTSB	National Transportation Safety Board (USA)
OM	Maintenance Organization
PPR	Private Pilot License – Airplane
RBAC	Brazilian Civil Aviation Regulation
RBHA	Brazilian Aeronautical Certification Regulation
SBBG	ICAO Location Designator – Bagé Aerodrome, RS
SSFC	ICAO Location Designator - Safra Aerodrome, Dom Pedrito - RS
SERIPA V	Fifth Regional Aeronautical Accident Investigation and Prevention Service
SIPAER	Aeronautical Accident Investigation and Prevention System
TPP	Registration Category of Private Service - Aircraft
UTC	Universal Time Coordinated
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions

1. FACTUAL INFORMATION.

Aircraft	**Model:** GC-1A **Registration:** PT- AIG **Manufacturer:** Globe Aircraft	**Operator:** Private
Occurrence	**Date/time:** 06FEB2019 – 2110 UTC **Location:** Rural Area **Lat.** 31°02'01"S **Long.** 054°37'23"W **Municipality – State:** Dom Pedrito – RS	**Type(s):** "[LOC-I] Loss of Control in Flight" **Subtype(s):** Nil

1.1 History of the flight.

The aircraft took off from the Safra Aerodrome (SSFC), Dom Pedrito - RS, at about 2100 UTC, in order to carry out a local flight, with a pilot and a passenger on board.

With about ten minutes of flight, during the performance of an aerobatic maneuver, the plane lost control and crashed into the ground.

The aircraft had substantial damage.

The pilot and the passenger died.

1.2 Injuries to persons.

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

1.3 Damage to the aircraft.

The aircraft had substantial damage to its entire structure.

Figure 1 - Situation of the PT-AIG aircraft after the accident.

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 obtain data related to the pilot's flown hours. In his electronic CIV there were only 02 flight hours.

1.5.2 Personnel training.

The pilot took the PPR course in 1986.

1.5.3 Category of licenses and validity of certificates.

The pilot had the PPR License and had valid MNTE Rating.

1.5.4 Qualification and flight experience.

There were no records that the pilot had gone through a formal qualification process to perform aerobatics, nor about his experience in this type of flight.

1.5.5 Validity of medical certificate.

The pilot had valid CMA.

1.6 Aircraft information.

The aircraft, serial number 88, was manufactured by Globe Aircraft, in 1947, and it was registered in the TPP category.

The aircraft had valid Airworthiness Certificate (CA).

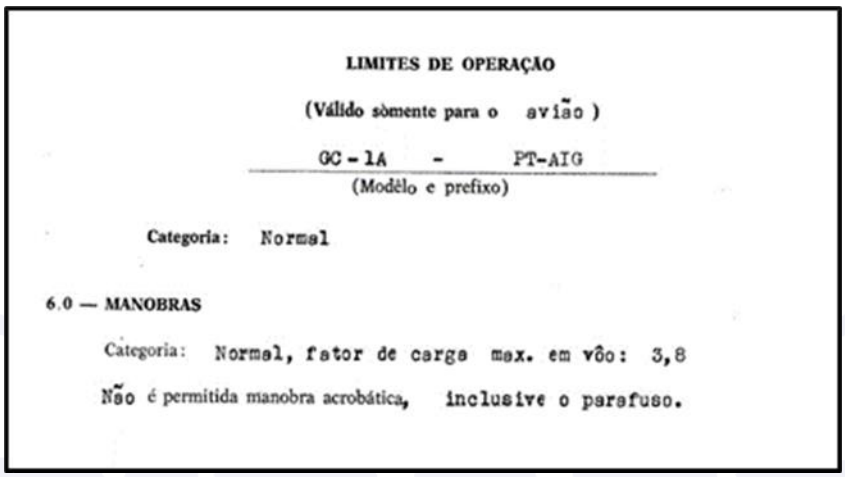
The airframe, engine and propeller logbook records were updated.

The last inspections of the aircraft, the "IAM and 100 hours" type were carried out on 15OCT2018 by the maintenance organization *Manutenção de Aeronaves* Ltd. (MANAV), in Penápolis - SP, with the aircraft having flown 4 hours after the inspections.

In 1962, the aircraft underwent modifications to its powertrain, which were analyzed by the Homologation Commission of the CTA.

As a result of this new approval, as of 13NOV1962, the PT-AIG began to have its limits established in the Operation Limits Sheet (Annex 7 of document H01-04-01152-07), contained in the CST M6211-02, issued by the CTA.

According to this Annex, the aircraft was certified in the normal category and could not perform aerobatic maneuvers, including spin (Figure 2).



LIMITES DE OPERAÇÃO

(Válido sòmente para o avião)

GC - 1A - PT-AIG

(Modêlo e prefixo)

Categoria: Normal

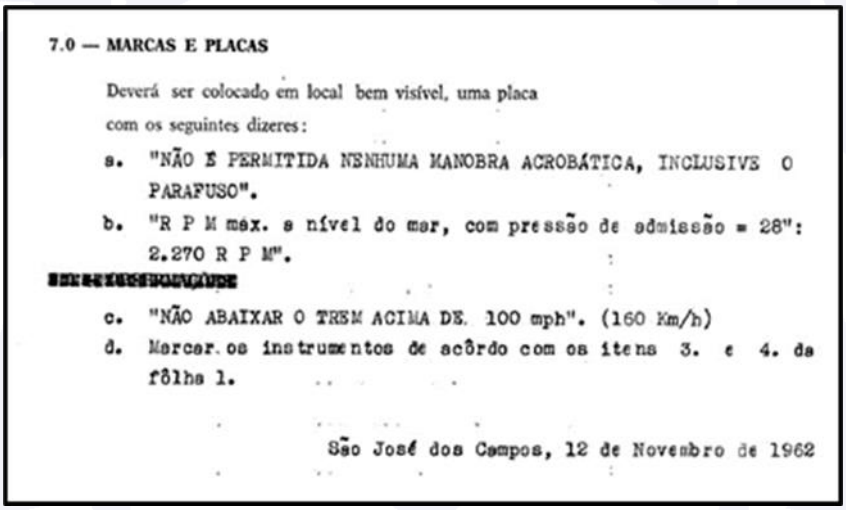
6.0 — MANOBRAS

Categoria: Normal, fator de carga max. em vôo: 3,8

Não é permitida manobra acrobática, inclusive o parafuso.

Figure 2 - Extract from the PT-AIG Operating Limits Sheet.

The same document required that a plate be affixed, in a visible place, containing this prohibition (Figure 3).



7.0 — MARCAS E PLACAS

Deverá ser colocado em local bem visível, uma placa com os seguintes dizeres:

a. "NÃO É PERMITIDA NENHUMA MANOBRA ACROBÁTICA, INCLUSIVE O PARAFUSO".

b. "R P M máx. a nível do mar, com pressão de admissão = 28": 2.270 R P M".

[redacted]

c. "NÃO ABAIXAR O TREM ACIMA DE 100 mph". (160 Km/h)

d. Marcar os instrumentos de acôrdo com os itens 3. e 4. da fôlha 1.

São José dos Campos, 12 de Novembro de 1962

Figure 3 - Marks and plates required for the operation of the PT-AIG aircraft.

During the beginning of the field investigation, it was verified that the aforementioned plate was properly applied to the aircraft panel (Figure 4).

Figure 4 - Plate affixed to the aircraft panel.

1.7 Meteorological information.

The METAR at the Bagé Aerodrome (SBBG), 37 nautical miles away from the accident site, had the following information:

METAR SBBG 061900Z 12006KT 9999 SCT033 30/15 Q1013.

It was found that, in the region of the accident, conditions were favorable for visual flight, with visibility above 10km and absence of clouds below 5,000ft.

1.8 Aids to navigation.

Nil.

1.9 Communications.

Nil.

1.10 Aerodrome information.

The occurrence took place out of the Aerodrome.

1.11 Flight recorders.

Neither required nor installed.

1.12 Wreckage and impact information.

The first impact occurred 50 meters from the place of total stop. The distribution of the wreckage was of the concentrated type. After this first collision with the ground, the aircraft tipped over and stopped in the opposite direction of the flight path (Figure 5).

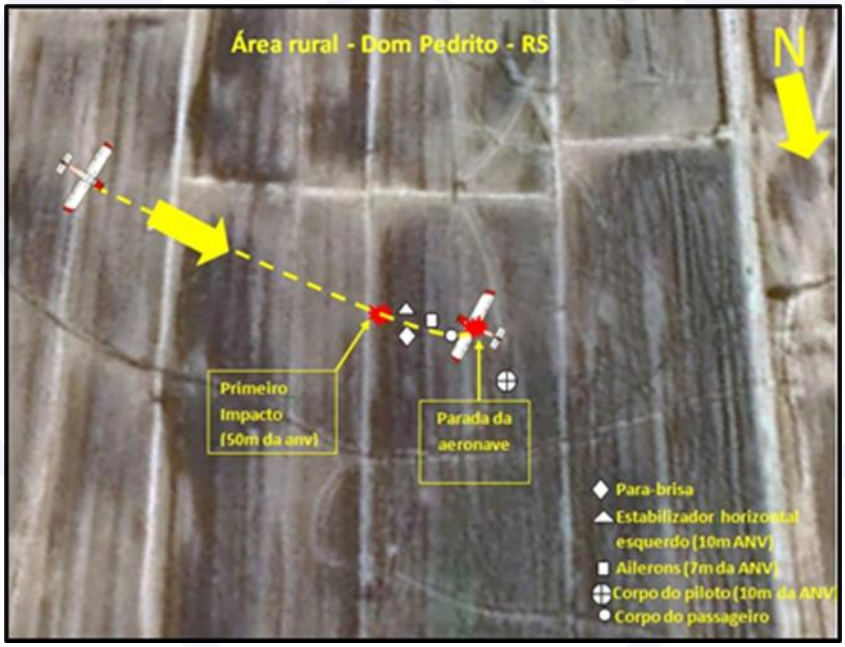


Figure 5 - Sketch of the final trajectory and position of the aircraft wreckage.

1.13 Medical and pathological information.

1.13.1 Medical aspects.

There was no evidence that physiological or incapacitation considerations affected the pilot's performance.

1.13.2 Ergonomic information.

Nil.

1.13.3 Psychological aspects.

The pilot was 51 years old and worked in the administrative area of his agricultural aviation company, which had been operating for 25 years in the region. In addition to working in the administrative part of the company, he informally helped with aircraft maintenance, although he was not trained as a mechanic.

During the weekdays, the pilot stayed at the company's headquarters, in Dom Pedrito, and on the weekends, he traveled to the city where his family lived. Due to the distance, he traveled by plane, which was conducted by another pilot from his company.

According to reports from people around him, the pilot had a lot of knowledge about aircraft, he was dedicated to his work and advised mechanics and pilots, being considered a reference in aviation.

He was described as a spontaneous person, reserved about his personal life and problems, calm in his interpersonal relationship, who usually showed good humor, focused on everything he wanted to do and was self-confident, conveying the idea that nothing affected him.

There were divergences in the reports about the pilot's life moment at the time of the accident. Some information indicated that he would be facing conflicts in his personal and family life. However, other people have not confirmed this information.

As for his routine as a pilot, he flew the PT-AIG more frequently during off-season periods, when he performed aerobatic maneuvers and used to take passengers on his flights.

According to information from other professionals in his area, he had informal aerobatic instructions and did not have a high frequency of flights. According to the perception of the interviewees, he still needed operational improvement, although he demonstrated confidence in his performance.

On the day of the accident, the pilot had spent the morning in the city and returned to the company, located in a rural area, where there would be a celebration at night. Upon arriving at the headquarters, he asked the aircraft to be refueled so that he could fly, accompanied by an eight-year-old passenger.

1.14 Fire.

There was no fire.

1.15 Survival aspects.

There were no survivors.

The force of the impact overcame the resistance of the pilot's and passenger's seat belts, so they were thrown out of the aircraft.

1.16 Tests and research.

The Lycoming engine, model O-320-A2B, serial number L-41808-27A, that equipped the aircraft was disassembled and inspected at the Aeronautical Maintenance Shop - OMAER. The work was accompanied by representatives of the SERIPA V and the DCTA.

The propeller had severe damage from the impact of the aircraft against the ground (Figure 6).

Figure 6 - Front view of the engine.

The crankcase and the carburetor broke during the collision and parts of them came off, which made it impossible to carry out functional tests on the carburetor.

During the engine disassembly, no abnormality that could compromise its operation was observed. All of its internal components had lubricating oil residue. The oil filter was free of filings.

The magnetos were bench-tested and showed arcing at all output terminals to the ignition cables.

One of the spark plugs on cylinder number 1 had been ripped out of its housing. The thread to which it was screwed showed damage from denting and signs that an overload process had occurred. Thus, it is concluded that its detachment occurred at the moment of the collision of the aircraft with the ground.

One of the propeller blades had a forward bend at its end, indicating normal engine operation with power development (Figure 7).

Figure 7 - Views of the propeller.

1.17 Organizational and management information.

The aircraft belonged to a family member of the pilot, was used recreationally for irregular aerobatic flights and was parked in Dom Pedrito - RS, at the headquarters of the agricultural aviation company on his property.

In his routine, he performed bureaucratic work at this company and the PT-AIG flights happened sporadically.

1.18 Operational information.

Based on the data obtained in the course of the investigation, it was calculated that, at the time of the accident, the aircraft had 99 liters of fuel (aviation gasoline), equivalent to 71.28 kg, on board. This weight, added to its basic weight (1,304lb or 591.38kg), plus 145kg for the occupants (110kg for the pilot and 35kg for the passenger) made a total of 807.66kg.

Thus, the plane was above the maximum takeoff weight, which was 777kg.

Considering that the allowed ride from the Center of Gravity (CG) was 29.6" to 34.7", it was calculated that it was 33.52" at the time of the accident, so that, although the PT-AIG was above the maximum weight, his CG was within the limits specified in the CST M6211-02.

Observers reported that, after the take-off, the aircraft climbed to about 3,000ft, performed three loopings (aerobatics describing a full circle in the vertical plane) in sequence, a low north-south pass and a tonneau (maneuver in which the aircraft makes a complete turn around the longitudinal axis) at low altitude.

According to the collected reports, during the performance of these aerobatics, the characteristic sound of applying power was heard, and then the impact against the ground occurred.

A video recorded by observers showed the aircraft at low altitude, on its back, in a downward trajectory, followed by a strong “pull” (Figure 8).

Figure 8 - Aircraft in abnormal attitude before the impact.

1.19 Additional information.

The RBHA No. 91 in force at the time of the occurrence provided, in its Subpart D - Special Flight Operations, section 91.303 – Aerobatic flights, Air Demonstration, Air Competition and General Air Events, letter (a), the following:

> RBHA 91 SUBPART D - SPECIAL FLIGHT OPERATIONS
>
> 91,303 - AEROBATIC FLIGHTS, AIR DEMONSTRATION, AIR COMPETITION AND AIR EVENTS IN GENERAL
>
> (a) Aerobatic flights may only be performed on aircraft holding a standard or special certificate of airworthiness and in compliance with design limitations.

The same Subpart D of the RBHA 91 defined, also in section 91.303, letter (g), item (5), the aerobatic flight as follows:

> RBHA 91 SUBPART D - SPECIAL FLIGHT OPERATIONS
>
> 91,303 - AEROBATIC FLIGHTS, AIR DEMONSTRATION, AIR COMPETITION AND AIR EVENTS IN GENERAL [...]
>
> [...]
>
> (g) For the purposes of this section, the following definitions apply:
>
> [...]
>
> (5) Aerobatic flight is one that involves the intentional performance of aerial maneuvers that involve sudden changes in altitude, flights in abnormal attitudes or abnormal variations in speed, not necessary for normal flight.

The RBAC No. 61 - Amendment No. 03, which dealt with Licenses, Ratings and Certificates for Pilots, established the requirements for licenses, theoretical knowledge, flight instruction, flight experience and proficiency for the granting of licenses of aerobatics pilot.

As of the issue of Amendment No. 4, published on 19SEPT2014, this regulation no longer includes the requirements established until the Amendment No. 03.

At the time of the accident, Amendment No. 11 of RBAC 61 was in force and it did not mention requirements for rating in aerobatics.

Likewise, IS No. 61-006, which established the procedures for the entry of endorsements in pilots' flight records, did not mention qualification standards that ensured the necessary experience for them to be able to perform aerobatics.

The ANAC's website, however, had the following information regarding the practice of aerobatics:

> Aerobatics
>
> Aerobatics is the execution of intentional maneuvers that involve sudden changes in altitude or acceleration of an aircraft other than normal flight. This sport has as objectives the individual leisure of the practitioner and demonstrations in shows and air championships.
>
> Rating
>
> The ANAC does not issue a specific license for the practice of aerobatics.
>
> Judging the proficiency of pilots and their ability to perform certain maneuvers is the responsibility of the Director of Operations of the event or air show.

Thus, at the time of the accident, there were no license, rating, training, experience and proficiency verification requirements established by the ANAC for the practice of this type of activity.

1.20 Useful or effective investigation techniques.

Nil.

2. ANALYSIS.

It was a private flight, in which the pilot performed aerobatic maneuvers.

The Globe Swift aircraft (PT-AIG) was manufactured by Globe Aircraft in 1947, and was registered in the TPP Category.

In 1962, the aircraft underwent modifications in its powertrain. At the time, it was certified for the normal category and the new established limits did not allow the performance of acrobatic maneuvers. Such limits and restrictions were displayed on a plate affixed to the aircraft panel.

On the date of the accident, the aircraft had its CA valid and its airframe, engine and propeller logbook records were updated.

From the examinations carried out on the engine that equipped the aircraft, it was concluded that the severe damages presented were due to the impact that had occurred and that the analyzed components indicated that the propeller was operational and developed power normally.

Therefore, the possibility that an engine failure contributed to the failure of the maneuver that preceded the loss of control was discarded. This conclusion is corroborated by the reports that the characteristic sound of the engine being accelerated just before the collision with the ground was heard.

However, considering the modification made to the airplane in 1962, the category in which it was certified and the new limits established for its operation, the performance of aerobatic maneuvers during the flight in which this accident occurred characterized the violation of restrictions specified in the CST M6211-02, issued by the CTA, which may have contributed to this accident.

In addition, although the PT-AIG was within the specified balance limit, the fact that the aircraft was approximately 30kg above the maximum takeoff weight may also have contributed to the loss of control during low altitude aerobatics.

Thus, the inadequate evaluation of parameters related to the operation of the aircraft, such as the limitations established for its operation, as well as its abilities to perform aerobatic maneuvers at low altitude with the heavy aircraft, led the pilot to put the plane in an attitude in which he was unable to avoid crashing into the ground.

The pilot was considered a reference in aviation by many people, technically advising several colleagues in the area in different demands. Their behavior patterns and ways of relating, described in the reports, indicated a person focused on activities and self-confidence.

Given this profile, it is possible that he has developed an inadequate attitude in relation to the assessment of the risks involved in the flights he used to perform with the PT-AIG, which may have resulted in overconfidence, complacency, exhibitionism and failure to observe operational limits and contributed to this accident.

In the course of the investigation, it was found that the pilot had not gone through a systematized process with a view to improving the knowledge, skills and attitudes necessary for the safe conduct of the aerobatic flights he was performing.

Thus, it is possible that this condition has resulted in inadequate performance and insufficient performance in the context of the operation conducted at the time of this accident.

In addition, the informality that characterized the training process previously received by the pilot may not have given him the full knowledge, skills and other technical conditions necessary to carry out aerobatic flights with an adequate level of safety.

Regarding the pilot's personal life, the divergences in the reports in relation to his family relationship at the time of the accident did not make it possible to precisely identify whether issues of this nature were interfering in his daily life and, consequently, in his performance in flight.

Finally, considering the elements gathered in the course of this investigation, it is likely that the absence of license requirements, theoretical knowledge, flight instruction, flight experience and proficiency has facilitated the performance of aerobatic flights by a pilot not adequately prepared for this activity.

3. CONCLUSIONS.

3.1 Facts.

a) the pilot had valid CMA;

b) the pilot had valid MNTE Ratings;

c) there were no records that the pilot had gone through a formal qualification process that would enable him to perform aerobatic maneuvers, nor about his experience in this type of flight;

d) the airframe, engine and propeller logbook records were updated;

e) the aircraft had valid CA;

f) the aircraft took off above the maximum weight allowed;

g) the weather conditions were favorable for the flight;

h) the aircraft was certified in the normal category and could not perform aerobatic maneuvers, including spin;

i) at the time of the accident, there were no requirements for license, rating, training, experience and verification of proficiency established for obtaining specific license for the practice of aerobatics;

j) the pilot had not gone through a systematized process aimed at improving the knowledge, skills and attitudes necessary for the safe conduct of aerobatic flights;

k) about ten minutes of flight, during the performance of the aerobatics, the pilot lost control of the plane and it collided against the ground;

l) the aircraft's engine presented evidences that it developed power at the time of the accident;

m) the aircraft had substantial damage; and

n) the pilot and passenger had fatal injuries.

3.2 Contributing factors.

- **Attitude – undetermined.**

It is possible that the pilot has developed an inadequate attitude towards the assessment of the risks involved in the flights he used to perform with the PT-AIG, which may have resulted in overconfidence, complacency, exhibitionism and failure to observe operational limits, factors that may have contributed to this accident.

- **Training – undetermined.**

Considering that the pilot had not gone through a systematized process aimed at improving the knowledge, skills and attitudes necessary for the safe conduct of the aerobatic flights he was performing, it is possible that this condition has resulted in inadequate performance and insufficient performance in the context of operation conducted at the time of this accident.

- **External influences – undetermined.**

Regarding the pilot's personal life, the divergences in the reports in relation to his family relationship at the time of the accident did not make it possible to precisely identify whether issues of this nature were interfering in his daily life and, consequently, in his performance in flight.

- **Instruction – undetermined.**

The informality that characterized the training process previously received by the pilot may not have given him the full knowledge, skills and other technical conditions necessary to carry out aerobatic flights with an adequate level of safety.

- **Support systems – undetermined.**

Considering the elements gathered in the course of this investigation, it is likely that the absence of license requirements, theoretical knowledge, flight instruction, flight experience and proficiency has facilitated the performance of aerobatic flights by a pilot not adequately prepared for this activity.

- **Other (lack of adherence to rules or regulations established by the Brazilian Civil Aviation Authority) - a contributor.**

Performing aerobatic maneuvers with an aircraft not approved for this type of operation characterized a low adherence to operational safety principles, particularly with regard to compliance with the restrictions specified in the CST M6211-02, issued by the CTA, and entailed an operation with risks not fully measured.

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".

Nil.

5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN.

Regarding the issue of aerobatics, the following safety recommendation issued in the final report of the accident with the PT-LOK aircraft, on 23MAR2019, with the same characteristics, is under analysis within the scope of the ANAC:

A-048/CENIPA/2019 - 01

Establish qualification standards that ensure the necessary experience, theoretical knowledge and minimum practical training of pilots, so that they are considered capable of performing aerobatic flights without exposing themselves and/or third parties to intolerable risks.

On February 09th, 2022.