COMANDO DA AERONÁUTICA

CENTRO DE INVESTIGAÇÃO E PREVENÇÃO DE ACIDENTES AERONÁUTICOS

FINAL REPORT
A-105/CENIPA/2023

OCCURRENCE:	**ACCIDENT**
AIRCRAFT:	**PT-KUM**
MODEL:	**170A**
DATE:	**19JUN2023**

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 considering 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 distinct 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 has been made available to the ANAC and the DECEA so that the technical-scientific analyses of this investigation can be used as a source of data and information, aiming at identifying hazards and assessing risks, as set forth in the Brazilian Program for Civil Aviation Operational Safety (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. Considering 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 June 19, 2023, accident involving the model 170A aircraft of registration marks PT-KUM. The occurrence was typified as “[SCF-PP] Powerplant failure or malfunction.”

During takeoff, the airplane sustained loss of power, and the pilot performed an emergency landing in a crop field located ahead.

There was substantial damage to the aircraft.

The pilot was slightly injured.

Being the United States of America the State of design and manufacture of the aircraft, the USA’s NTSB (National Transportation Safety Board) designated an Accredited Representative for participation in the investigation of the accident.

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GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS

ANAC	Brazil's National Civil Aviation Agency
CENIPA	Brazil's Center for the Investigation and Prevention of Aeronautical Accidents
CIV	Digital Pilot-Logbook
CMA	Aeronautical Medical Certificate
CVA	Certificate of Airworthiness
MNTE	Single-Engine Landplane Class Rating
NSCA	Command of Aeronautics' Norm
OM	Maintenance Organization
PIC	Pilot in Command
POB	Person on board
PPR	Private Pilot License - Airplane
RBAC	Brazilian Civil Aviation Regulation
SIPJ	ICAO location designator - *Aero Parque Tupã* Aerodrome, *Tupanciretã*, State of *Rio Grande do Sul*
TPP	Private Air Services Registration Category
UTC	Coordinated Universal Time

1. FACTUAL INFORMATION.

Aircraft	**Model:** 170A **Registration:** PT-KUM **Manufacturer:** Cessna Aircraft	**Operator:** Private.
Occurrence	**Date/time**: 19JUN2023 - 11:10 (UTC) **Location:** Rural area of the municipality of *Santiago*. **Lat.** 29°11'28"S **Long.** 054°33'33"W **Municipality – State:** *Santiago – Rio Grande do Sul*.	**Type(s):** [SCF-PP] Powerplant failure or malfunction

1.1. History of the flight.

At around 11:05 UTC, the aircraft took off from an unregistered aerodrome located in the municipality of *Santiago*, *Rio Grande do Sul*, bound for SIPJ (*Aero Parque Tupã* Aerodrome, in the municipality of *Tupanciretã*) on a ferry flight with 01 POB (pilot).

After takeoff, the PIC (Pilot in Command) noticed fluctuations in the engine oil pressure indication, in addition to loss of power.

An emergency landing was carried out in a crop field located ahead.

During the landing, the aircraft overturned and came to rest in an upside-down position.

The airplane sustained substantial damage.

The PIC was slightly injured.

1.2. Injuries to persons.

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

1.3. Damage to the aircraft.

There was substantial damage to the aircraft, including to the powerplant system, fuselage, tail cone, and vertical stabilizer.

Figure 1 – General view of the aircraft after the accident.

1.4. Other damage.

NIL.

1.5. Personnel information.

1.5.1. Crew's flight experience.

Hours Flown	
	PIC
Total	98:56
Total in the last 30 days	03:00
Total in the last 24 hours	00:00
In this type of aircraft	21:30
In this type in the last 30 days	03:00
In this type in the last 24 hours	00:00

Note**:** Data on the flight hours obtained from the PIC's CIV (Digital Pilot-Logbook).

1.5.2. Personnel training.

The PIC completed the PPR course (Private Pilot – Airplane) in 2023, at *Aeroclube de Eldorado do Sul*, State of *Rio Grande do Sul*.

1.5.3. Category of licenses and validity of certificates.

The PIC held a PPR license and a valid MNTE rating (Single-Engine Land Airplane).

1.5.4. Qualification and flight experience.

The PIC was qualified for the type of flight.

According to his CIV records, the pilot completed his training in January 2023. Since then, he had flown exclusively the PT-KUM airplane, meeting the recent experience requirements.

1.5.5. Validity of medical certificate.

The PIC held a valid CMA (Aeronautical Medical Certificate).

1.6. Aircraft information.

The SN 18956 airplane was manufactured by Cessna Aircraft in 1949 and registered under the Private Air Service (TPP) category.

The CVA (Certificate of Airworthiness) was valid.

The records of the airframe, engine, and propeller logbooks were out of date. The completion of the "50-hour" inspection, as required by the aircraft maintenance manual, was not recorded in the logbooks.

The most recent inspections, "100-hour" type, as well as the CVA issuance, were performed on August 12, 2022, by the *SANAGRI Manutenção de Aeronaves* Maintenance Organization (OM) (COM 0210-01/ANAC), located in the municipality of *Santo Ângelo*, *Rio Grande do Sul*. After the referred inspection, the aircraft flew 89 hours and 6 minutes.

The aircraft was originally certified with an engine lubrication oil cooling system that used two front openings in the cowling through which ram air was directed to a component called *oil cooler equipment*. This system provided cooling for the engine oil.

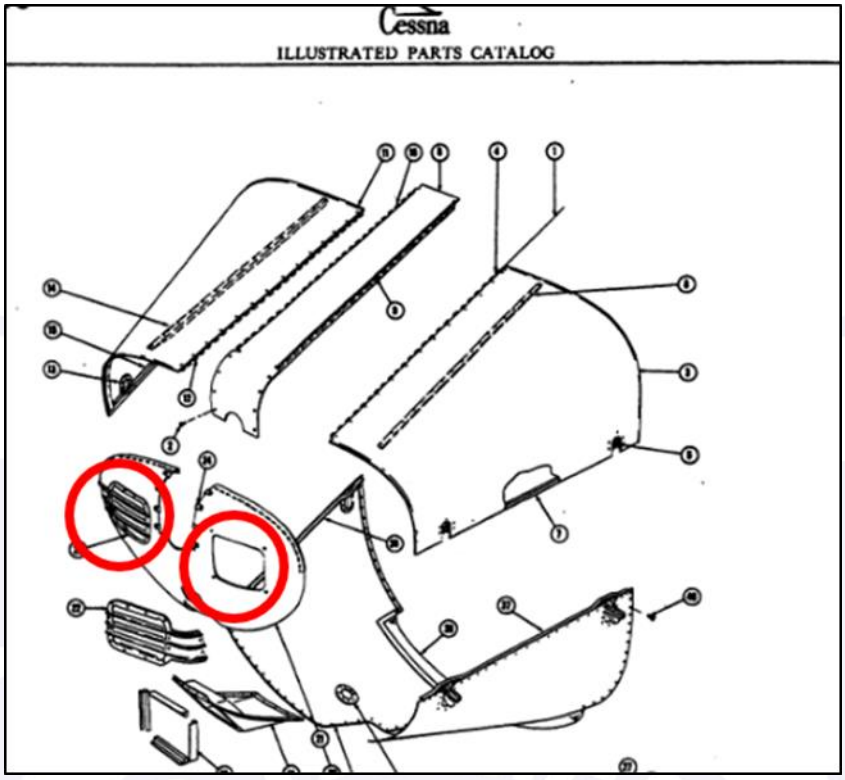

Figure 2 – Engine cowling, highlighting the front openings.
Source: Cessna Aircraft Company 170A Model Illustrated Parts Catalog.

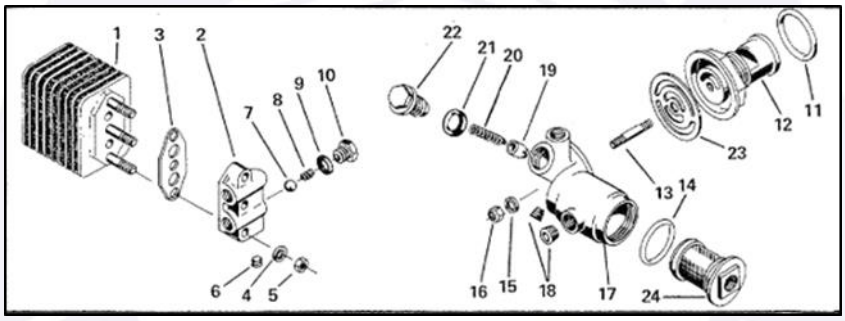

Figure 3 – Oil cooling equipment.
Source: Continental Aircraft Engine Model O-300 Illustrated Parts Catalog.

During the investigation, it was verified that the PT-KUM airplane was equipped with a heat exchanger (radiator) installed at the front of the engine, which was different from the component originally certified in the aircraft manufacturer's design. According to reports, this was an alternative cooling system installed at the request of a previous owner.

There was no identification on the mentioned item, nor any records regarding its manufacturing date, installation on the aircraft, or any maintenance activities performed on the component.

Figure 4 – Frontal view of PT-KUM. In highlight, the item found after the engine cowling was removed.

1.7. Meteorological information.

The weather conditions at the location of departure and along the route were above the minima required for conducting the operation under the proposed flight rules.

1.8. Aids to navigation.

The location of operations did not feature navigation aids.

1.9. Communications.

NIL.

1.10. Aerodrome information.

Not applicable.

1.11. Flight recorders.

Not required and not installed.

1.12. Wreckage and impact information.

The emergency landing was performed in an open area used as a crop field.

While landing, the aircraft overturned and came to rest in an upside-down position.

The wreckage remained concentrated.

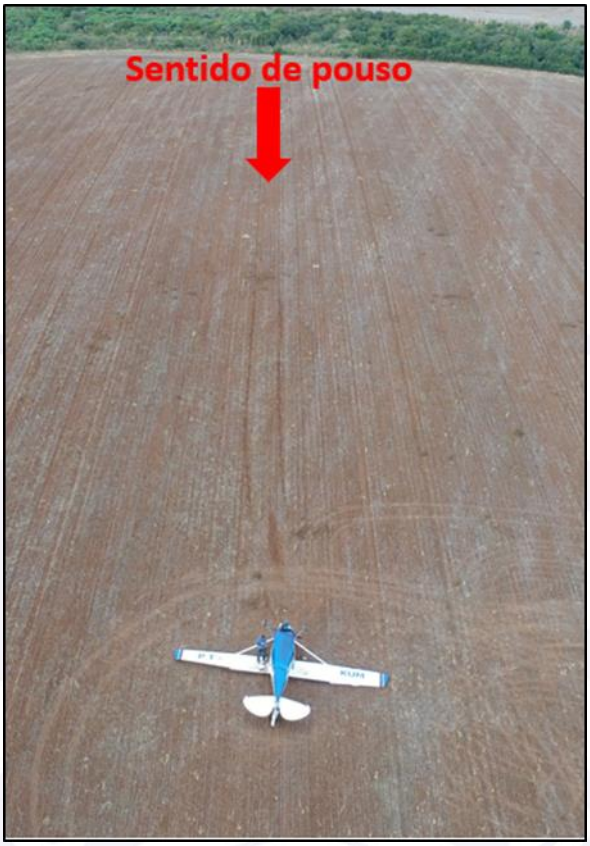

Figure 5 – Aerial view of the aircraft.

1.13. Medical and pathological information.

1.13.1. Medical aspects.

NIL.

1.13.2. Ergonomic information.

NIL.

1.13.3. Psychological aspects.

NIL.

1.14. Fire.

No fire occurred.

1.15. Survival aspects.

NIL.

1.16. Tests and research.

The item installed on the aircraft was identified as an additional component of the cooling system of the engine lubrication oil.

A visual inspection of the component revealed a sectioned area where signs of oil leakage were observed.

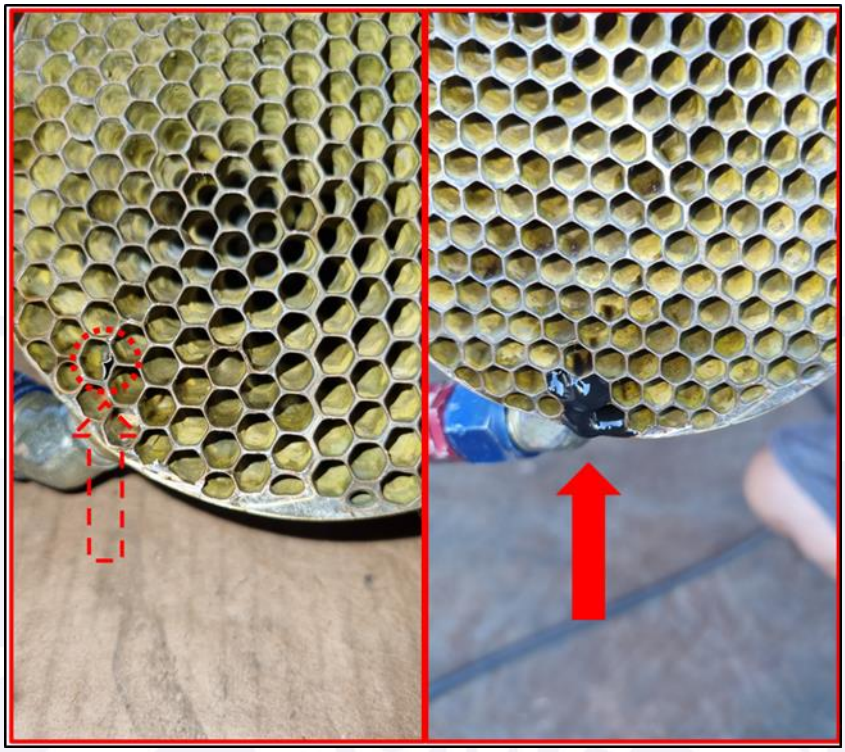

Figure 6 – Component installed on the PT-KUM airplane. In highlight, the sectioned area with oil leakage.

Figure 7 – Detail of the area with leakage.

The marking of aircraft parts and components was described in the Brazilian Civil Aviation Regulation nº 45 (RBAC-45), Amendment nº 4, dated June 24, 2020, which, in Section 45.15 - "Marking of PAA parts, OTP, and critical components," provided the following guidelines:

> 45.15 Marking of PAA parts, OTP, and critical components
>
> (a) PAA parts (Approved Aeronautical Product). Except as provided in paragraph (d) of this section, each manufacturer of replacement or modification parts under an approved aeronautical product certificate and/or production organization certificate,

> in accordance with Subpart K of the RBAC-21, must permanently and legibly mark the part with the following information:
>
> (1) The letters ANAC-PAA;
>
> (2) The name, registered trademark, symbol of the holder of the approved aeronautical product certificate, or other identification approved by the ANAC; and
>
> (3) Part number.

The item in question did not have any identification plate or markings. Similarly, the hoses connecting it to the powerplant had no identification.

1.17. Organizational and management information.

NIL.

1.18. Operational information.

It was a private ferry flight, departing from an unregistered aerodrome located in the rural area of the municipality of *Santo Ângelo*, RS, bound for SIPJ.

The use of an unregistered aerodrome was in violation of Section 91.102 of the RBAC-91, Amendment nº 3 — "General Operating Requirements for Civil Aircraft," which read:

> 91.102 – GENERAL RULES
>
> [...]
>
> (d) A Brazilian aerodrome may only be used if it is registered and if the operator determines that the aerodrome is suitable for the type of aircraft involved and for the proposed operation.
>
> [...]

The estimated flight time was about 25 minutes, maintaining a heading of 096° over a distance of 37 NM between departure and destination.

The PIC reported that during the previous flight, when landing in the rural area of *Santo Ângelo*, RS, he noticed fluctuations in the engine oil pressure indication. However, he assumed it was an instrument indication error and decided to proceed with the next flight.

The PIC reported that after takeoff on the subsequent flight, he noticed oil pressure gauge fluctuations and difficulty gaining altitude. Given the situation, he decided to perform a landing in an open field located ahead. During the landing roll, the aircraft overturned and came to rest upside-down.

During the investigation, it was found that there were oil stains concentrated in the area where the aircraft aligned and subsequently accelerated for takeoff (Figure 8).

Figure 8 – Oil stains at the PT-KUM takeoff starting point.

1.19. Additional information.

The RBAC-43, Amendment nº 5, dated May 26, 2021, in force at the time of the accident, defined in its Appendices A and B the parameters for major alterations, major repairs, and preventive maintenance, as detailed below:

> RBAC 43 – APPENDIX A
>
> MAJOR ALTERATIONS, MAJOR REPAIRS, AND PREVENTIVE MAINTENANCE
>
> A43.1 Major Alterations, Major Repairs, and Preventive Maintenance
>
> (a) Major Alterations
>
> (1) Major Airframe Alterations — Alterations to the following parts and of the following types, when not listed in the approved aircraft technical specifications, are considered major airframe alterations:
>
> (i) wings;
>
> [...]
>
> (xii) alterations to the basic design of the electrical, avionics, hydraulic, fuel, oil, cooling, heating, pressurization, deicing, or exhaust systems; and
>
> [...]
>
> RBAC 43 – APPENDIX B
>
> RECORDS OF MAJOR REPAIRS AND MAJOR ALTERATIONS
>
> B43.1 Records of Major Repairs and Major Alterations
>
> (a) Except as provided in paragraphs (b) and (c) of this appendix, each person performing a major repair or major alteration must:
>
> (1) complete the ANAC's standard form in two copies;
>
> (2) provide the aircraft owner with the signed original;
>
> (3) [reserved]; and
>
> (4) retain their copy for at least 5 years.
>
> (b) For major repairs carried out in accordance with a previously approved manual or specifications, a certified maintenance organization may, instead of the provisions of paragraph (a):

(1) record it in the work order under which the repair was performed;

(2) provide the aircraft owner with the original completed work order and retain a signed copy for at least five (5) years after the date of return-to-service approval of the item;

[...]

During the investigation, no records of any kind were presented regarding the installation and/or maintenance of the device found on the aircraft.

1.20. Useful or effective investigation techniques.

NIL.

2. ANALYSIS.

It was a ferry flight between an unregistered aerodrome and SIPJ. The use of an unregistered aerodrome was in violation of Section 91.102 of the RBAC-91, Amendment nº 3. Although not contributing to the accident, it revealed improvisation and noncompliance with operational procedures.

Shortly after takeoff, the aircraft experienced loss of power and performed an emergency landing in an open field located ahead.

The 170A model was originally equipped with an engine oil cooling system consisting of two openings in the engine cowling, through which ram air was directed to the component known as the *oil cooler equipment*, thereby providing oil cooling.

It was observed that modifications had been made to the system originally developed by the manufacturer, with the installation of a heat exchanger device for engine oil cooling. The item did not have any type of identification. Furthermore, there were no records regarding its manufacturing, installation, or maintenance, in violation of the RBAC-45, which was in force at the time of the accident.

Modifications related to the engine cooling system of an aircraft are considered major airframe alterations under the RBAC-43. Therefore, to carry out such a modification, an aircraft owner in Brazil must comply with the requirements set forth in that RBAC, particularly those described in Appendices "A" and "B" of the regulation, which address major repairs and major alterations.

By the conclusion of this investigation, no records had been presented regarding the installation and/or maintenance of the heat exchanger found on the accident aircraft. Therefore, one concluded that the installation of this item, as well as the aircraft's operation under these conditions, violated the provisions of the RBAC-43, in force at the time of the accident.

The modification of a certified design through the installation of an additional component, without due compliance with applicable regulations, demonstrated failures in the aircraft maintenance services, as well as shortcomings in the handling and/or interpretation of operational requirements.

During the investigation, a significant oil stain was observed at the location where the aircraft aligned for takeoff, indicating a possible oil leak from the engine. In this context, a visual inspection of the heat exchanger device found on the aircraft revealed a hole in its structure through which oil was leaking, compromising the lubrication of the aircraft's powerplant and, consequently, the performance of the engine.

It was not possible to determine when the rupture of the heat exchanger structure occurred. However, reports that the aircraft had already shown fluctuations in engine oil pressure indication suggest that the issue was present prior to the flight that resulted in the accident.

In this context, one concluded that the decision to continue operating the aircraft, despite the fluctuating oil pressure indications, demonstrated poor pilot judgment, particularly regarding the evaluation of the aircraft's operational parameters, as well as complacency, by failing to investigate the cause of the pressure variation observed during the previous flight.

Operating in noncompliance with the applicable aeronautical regulations may result in safety levels falling below the minimum acceptable levels established by the Brazilian State.

Failure to observe the minimum safety levels defined by the Brazilian State — ensured through compliance with the Brazilian Civil Aviation Regulations (RBAC) — may create latent unsafe conditions, which must be eliminated or mitigated through proper regulatory compliance.

3. CONCLUSIONS.

3.1. Findings.

a) the PIC held a valid CMA (Aeronautical Medical Certificate);

b) the PIC held a valid MNTE rating (Single-Engine Land Airplane);

c) the PIC was qualified to perform the flight;

d) the aircraft had a valid CVA (Certificate of Airworthiness);

e) the aircraft was within weight and balance limits;

f) the weather conditions were above the minima required for the flight;

g) the records of the airframe, engine, and propeller logbooks were out of date;

h) after takeoff, the aircraft experienced loss of power and performed a landing in an open field located ahead;

i) during the landing, the aircraft overturned;

j) there were no records of the "50-hour" inspection required by the maintenance manual;

k) a heat exchanger device differing from the aircraft's original model was installed in the cooling system;

l) there were no records regarding the manufacturing, installation, or maintenance activities related to the installed device;

m) the installed device had no identification markings;

n) the installation of the heat exchanger device, as performed, was in violation of the RBAC-43;

o) the lack of identification on the installed device was in violation of the RBAC-45;

p) visual inspections revealed that there was a hole in the heat exchanger device through which oil leakage occurred;

q) the aircraft sustained substantial damage; and

r) the PIC suffered minor injuries.

3.2. Contributing factors.

- **Attitude – a contributor.**

The decision to continue operating the aircraft despite fluctuating engine oil pressure indications demonstrated complacency by failing to investigate the cause of the pressure variation observed during the previous flight.

- **Piloting judgment – a contributor.**

The fact that the PIC reported observing fluctuations in oil pressure during the flight prior to the accident flight and still decided to proceed characterized an inadequate assessment of the aircraft's operational parameters.

- **Aircraft maintenance – a contributor.**

The absence of records indicating the completion of the most recent 50-hour inspection, combined with the modification of the original design due to the installation of a heat exchanger device without complying with the RBAC-43 requirements, revealed failures in the maintenance services performed on the aircraft, both by the operator and by the maintenance organizations that carried out the most recent inspections.

- **Decision-making process – a contributor.**

The fact that the PIC chose to perform the accident flight despite the oil pressure variation observed in the previous flight demonstrated difficulty in analyzing the situation, selecting alternatives, and acting appropriately when faced with factors that compromised the safety of the operation.

4. SAFETY RECOMMENDATIONS

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 consonance with the Law n°7565/1986, recommendations are made solely for the benefit of 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".

To Brazil's National Civil Aviation Agency (ANAC), it is recommended:

A-105/CENIPA/2023 - 01 Issued on 06/06/2025

Coordinate with the *SANAGRI Manutenção de Aeronaves* Maintenance Organization (COM 0210-01/ANAC), responsible for the most recent "100-hour" inspection and the issuance of the CVA for the PT-KUM aircraft, to verify whether the procedures adopted by that maintenance organization are effective in identifying the installation of components and systems that are not in compliance with the aircraft's original design and configuration.

5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN.

None.

On June 6th, 2025.