

COMANDO DA AERONÁUTICA
CENTRO DE INVESTIGAÇÃO E PREVENÇÃO DE
ACIDENTES AERONÁUTICOS



FINAL REPORT
A-102/CENIPA/2021

OCCURRENCE:	ACCIDENT
AIRCRAFT:	PT-JIH
MODEL:	182P
DATE:	10SET2021



NOTICE

According to the Law n^o 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 n^o 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 accident involving the 182P aircraft, registration PT-JIH, on 10 September 2021. The accident was typified as “[UNK] Undetermined”.

A few minutes after taking off from *Garimpo Carolina* (a mining area in the municipality of *Itaituba*, state of *Pará*), the aircraft crashed into the forest and caught fire.

The aircraft was destroyed by the crash and post-impact fire.

The pilot suffered fatal injuries.

Being the USA the State of aircraft design, the National Transportation Safety Board (NTSB) appointed an Accredited Representative for participation in the investigation of the accident.



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GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS

AD	Airworthiness Directive
ANAC	Brazil's National Civil Aviation Agency
CA	Airworthiness Certificate
CENIPA	Brazil's Aeronautical Accidents Investigation and Prevention Center
CMA	Aeronautical Medical Certificate
CTM	Technical Maintenance Center
CVA	Airworthiness Verification Certificate
FCDA	Airworthiness Directive Compliance Sheet
IS	Supplementary Instruction
IAM	Annual Maintenance Inspection
METAR	Meteorological Aerodrome Report
MLTE	Multi-Engine Land-Airplane Class Rating
MNTE	Single-Engine Land-Airplane Class Rating
NTSB	National Transportation Safety Board (USA)
OM	Maintenance Organization
PN	Part Number
PPR	Private Pilot License (Airplane)
RBAC	Brazilian Civil Aviation Regulation
SACI	Civil Aviation Information Integrated System
SAR	ANAC's Airworthiness Superintendence
SB	Service Bulletin
SBIH	ICAO A/D designator – <i>Itaituba</i> Aerodrome, state of <i>Pará</i>
SERIPA I	First Regional Service for the Investigation and Prevention of Aeronautical Accidents
SIGWX	Significant Weather Chart
TPP	Private Air Service Aircraft Registration Category
UTC	Universal Time Coordinated

1. FACTUAL INFORMATION.

Aircraft	Model: 182P Registration: PT-JIH Manufacturer: Cessna Aircraft.	Operator: Private
Occurrence	Date/time: 10SET2021 - 13:43 UTC Location: Next to <i>Garimpo Carolina</i> Lat. 05°23'38"S Long. 057°10'14"W Municipality – State: <i>Itaituba</i> – state of <i>Pará</i>	Type(s): [UNK] Unknown or undetermined

1.1. History of the flight.

At about 13.40 UTC, the aircraft took off from the unregistered airstrip of *Garimpo Carolina*, *Itaituba*, state of *Pará*, bound for the unregistered airstrip of *Garimpo Mutum*, *Itaituba*, state of *Pará*, on a cargo transport flight with 01 POB (the pilot).

After takeoff, the aircraft banked to the left and, a few minutes later, crashed into the forest, bursting into flames.

The aircraft was destroyed by the post-impact fire, and the pilot suffered fatal injuries.



Figure 1 - Wreckage of the aircraft after the impact with a tree.

1.2. Injuries to persons.

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

1.3. Damage to the aircraft.

The aircraft was destroyed by the crash and post-impact fire.

1.4. Other damage.

NIL.

1.5. Personnel information.

1.5.1. Crew's flight experience.

	PIC
Total	82:40
Total in the last 30 days	00:00
Total in the last 24 hours	00:00
In this type of aircraft	31:20
In this type in the last 30 days	00:00
In this type in the last 24 hours	00:00

N.B.: the data relating to the hours flown by the pilot was extracted from the PIC's Pilot digital Logbook of the Integrated Civil Aviation Information System (SACI) of Brazil's National Civil Aviation Agency (ANAC).

It was not possible to gather other data on the hours flown by the PIC until the moment of the accident, nor whether he had flown other types of aircraft.

1.5.2. Personnel training.

The Pilot in Command (PIC) did his PPR course (Private Pilot - Airplane) at the *Aeroclube de Pará de Minas*, state of *Minas Gerais*, in 2014.

1.5.3. Category of licenses and validity of certificates.

The PIC held a PPR license (Private Pilot - Airplane), and had valid MNTE (Single-Engine Land-Airplane) and MLTE (Multi-Engine Land-Airplane) ratings.

1.5.4. Qualification and flight experience.

It was not possible to obtain data on the pilot's recent experience to determine whether he was qualified; however, according to reports, he had experience in the type of flight.

1.5.5. Validity of medical certificate.

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

1.6. Aircraft information.

The serial number 18262688 aircraft was manufactured by Cessna Aircraft in 1974, and was registered in the Private Air Service (TPP) Registration Category.

The aircraft Airworthiness Certificate (CA) was valid.

The airframe, engine, and propeller logbooks were out of date.

The aircraft logbook was not presented to the Investigation Committee, and the operator reported not having copies of the flight records.

The last inspections of the aircraft (types "50H/100H/CVA" and "50h/100h/500h/1,000h Lubrication") were carried out on 09 February 2021 by *Tiarte Comércio e Importação de Aeronaves Ltda.* maintenance organization of *Manaus*, state of *Amazonas*.

The last engine overhaul [Teledyne Continental Motors (TCM) O-470-R engine (SN 451946)] was performed by *Vavá Manutenção de Aeronaves Ltda.* maintenance organization on 18 March 2008, in *São José do Rio Preto*, state of *São Paulo*.

The magnetos were replaced by the *Sol Serviços e Importação de Aeronaves Eireli* maintenance organization (OM) on 05 April 2017, in *Várzea Grande*, state of *Mato Grosso*. The OM also replaced the cabling and the igniters, which were the components included in the Informative Map of Component Control and Maintenance of the accident engine.

Due to lack of access to the aircraft logbook data, it was not possible to verify the hours flown after the inspection, after the engine overhaul, and after replacement of the components.

During the investigation, one found non-conformities in the Secondary Records of Compliance with Airworthiness Directives of the maintenance organization that were related to the occurrence, since some of the items were applicable to the aircraft model in question, as described below.

In the notes of the Airworthiness Guidelines Control Information Map - Airframe (Figures 2 and 3), one verified the following non-conformities:

- in the Airworthiness Directive (AD) 79-08-03, dealing with the Electrical System, the service was listed as not applicable to the aircraft's serial number; however, in the Regulatory Information of the directive, this AD applied to the occurrence aircraft model;
- the OM presented an Airworthiness Directive Compliance Form (FCDA) of AD 83-13-01 related to the Sticker (placard) - Inappropriate Sealing of the Fuel Cap, classifying it as applicable and complied with, as opposed to what was released by the same OM in its Airworthiness Guidelines Control Information Map - Airframe, in which it was considered as not applicable to the aircraft serial number;
- in the AD 96-12-22, dealing with the Engine Oil Filter Adapter, the inspection was considered as not applicable to the aircraft serial number. However, in the Regulatory Information of the directive, the applicability is given by Part Numbers of the Engine Oil Filter Adapter Assembly installed, but not limited to Cessna Aircraft Company series aircraft models 100, 200, 300 and 400 (all part numbers of the series) certified in any category, equipped with at least one Teledyne Continental Motors (TCM) engine. As it was not possible to verify the part number of the Engine Oil Filter Adapter Assembly installed in the aircraft, it was also not possible to verify whether the requirement was applicable;
- there was information of compliance with the AD 97-01-03 by the *João Martins Importação de Aeronaves Ltda.* (JOMMA) maintenance organization; however, the correct information would be the AD 97-01-13, which dealt with Fuel Hoses, Oil and Hydraulics;
- similarly, the Service Bulletin (SB) to which AD 97-01-03 referred was listed as CAB96-15 (applicable to the Cessna 208 aircraft), but the appropriate reference for the aircraft serial number was SEB96-15;
- in the AD 98-14-03, dealing with Transponders, it was considered as not applicable since the equipment installed in the aircraft was the Collins Aerospace TDR950. According to the Component Control and Maintenance Information Map of the *Tiarte Comércio e Importação de Aeronaves Ltda* maintenance organization, the aircraft had the KT 76A Transponder and, for this reason, the referred AD was to be applied, showing inconsistency in the Secondary Records of Airworthiness Directives Compliance when compared to the Component Control Information Map; and
- There was no information as for the compliance with the AD 2008-10-02 (Inspection of the Alternative Static Air Source Selector Valve, Part Number (PN) 2013142-18). Such inspection aimed at ensuring that the identification plate (placard) of the number of the piece did not obstruct the entrance of the valve, prescribed for Cessna Aircraft Company series aircraft 172, 175, 180, 182, 185, 206, 207, 208, 210 and 303. In addition, it was not possible to verify the PN of the Alternate Static Air Source Selector Valve installed on the aircraft.

MAPA DA SITUAÇÃO DE CUMPRIMENTO DE “DA”

1. AERONAVE MARCAS: PT-JIH

2. DADOS TÉCNICOS DA AERONAVE								
3. FAB.: CESSNA			4. MODELO: 182P			5. Nº DE SÉRIE: 182-62688		
6. TSN: 5.362,3 h			7. TSO: 3,8 h			8. ANO DE FABRICAÇÃO: 1974		
CUMPRIMENTO								
9. AD Nº	10. BS-Outros	11. Cat.	12. Frequência	13. Data	14. Hs/Cic/Os	15. Reg. Primário	16. Vencimento	17. F/Obs.
79-08-03	43.13-1A	N/A	N/A	19-jul-14	4.888,5 h	FCDA	N/A	N/A, ao Número de Série da Aeronave
79-10-14R1	SE77-6	N/A	N/A	19-jul-14	4.888,5 h	FCDA	N/A	N/A, ao Número de Série da Aeronave
79-25-07	SE79-59	N/A	N/A	19-jul-14	4.888,5 h	FCDA	N/A	Verificada pela Oficina HAR3 LTDA e considerada OK.
81-15-03	N/A	N/A	N/A	19-jul-14	4.888,5 h	FCDA	N/A	N/A, por não possuir instalado STC SA693CE e SA71GL.
83-13-01	SE 80-59	N/A	N/A	12-out-17	3.305,3 h	FCDA	N/A	N/A, ao S/N da Aeronave.

Figure 2 – Airworthiness Directives Control Information Map – Airframe.

MAPA DA SITUAÇÃO DE CUMPRIMENTO DE “DA”

1. AERONAVE MARCAS: PT-JIH

2. DADOS TÉCNICOS DA AERONAVE								
3. FAB.: CESSNA			4. MODELO: 182P			5. Nº DE SÉRIE: 182-62688		
6. TSN: 5.362,3 h			7. TSO: 3,8 h			8. ANO DE FABRICAÇÃO: 1974		
CUMPRIMENTO								
9. AD Nº	10. BS-Outros	11. Cat.	12. Frequência	13. Data	14. Hs/Cic/Os	15. Reg. Primário	16. Vencimento	17. F/Obs.
96-12-22	N/A	N/A	N/A	19-jul-14	4.888,5 h	FCDA	N/A	N/A, ao S/N da Aeronave.
97-01-03	CAB96-15	N/A	N/A	19-jul-14	4.888,5 h	FCDA	N/A	Cumprida pela JOMMA
98-14-03	SB KT 76A-7	N/A	N/A	19-jul-14	4.888,5 h	FCDA	N/A	N/A, ao Transponder TDR950 Instalado

Figure 3 – Airworthiness Directives Control Information Map - Airframe.

Discrepancies were also present in the notes on the Engine Airworthiness Guidelines Control Information Map (Figure 4), as described below:

- there was no information regarding compliance with the AD 2012-03-06, which addressed the verification of installation of the Servo Fuel Injector with AVStar Fuel Systems, Inc. (AFS) diaphragm (PN AV2541801 or AV2541803) showing inconsistency in the records; and
- There was information on the compliance with the Airworthiness Directive (DA) 76-12-04. However, such directive was not in the list of Airworthiness Directives of the Airworthiness Superintendence (SAR) of the National Civil Aviation Agency (ANAC), applicable to the Teledyne Continental Motors O-470-R engine model.

MAPA DA SITUAÇÃO DE CUMPRIMENTO DE “DA”
1. MOTOR N/S: 951.946

2. DADOS TECNICOS DA AERONAVE								
3. FAB.: CESSNA			4. MODELO: 182P			5. Nº DE SÉRIE: 182-62688		
6. TSN.: 5.362,3 h			7. TSO: 3,8 h			8. ANO DE FABRICAÇÃO: 1974		
9. DADOS TECNICOS DO MOTOR								
10. FAB.: CONTINENTAL			11. MODELO: O-470-R			12. N/S: 951.946		
13. TSN.: 5.362,3 h			14. TSO: 1.175,9 h			15. TSLI: N/A		
CUMPRIMENTO								
16. AD N°	17. BS/Outros	18. Cat.	19. Freqüência.	20. Data	21. Hs/Cie/Os	22. Reg. Primário	23. Vencimento	24. P/Obs.
AD N°								
DA N°								
76-12-04	SL2 1A	A/T	N/A	06-jul-17	5.046,9 h	FCDA	N/A	N/A, ao modelo do Motor.
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Figure 4 – Engine Airworthiness Directives Control Information Map.

The item 5.6.2 of the ANAC Supplementary Instruction (SI) no. 43.9-003, Revision B, reads:

The update of Part I of the airframe, engine, and propeller logbooks must be effectuated by the fifth day of the following month, whenever there is a change in the operating times mentioned in paragraphs 4.4 and 4.5 of this Supplementary Instruction. Thus, if an aircraft, engine or propeller operates after an inactive period longer than one month, such inactivity must be mentioned in a single line in the Monthly Control of the Part-I field of the respective logbooks. Ex: Hours from 04/30/02 to 09/30/02 were not totaled – reason: IAM.

1.7. Meteorological information.

The Enhanced Satellite Image of 10Sep2021 13:40 UTC did not show significant formations capable of restricting horizontal or slant visibility at the time of the accident.

The METARs of SBIH (Aerodrome of *Itaituba*, state of *Pará* - nearest location with METAR service available, at a distance of 98 nm to the accident site), contained the following information:

METAR SBIH 101300Z 0000KT 9999 FEW018 30/26 Q1014=

METAR SBIH 101400Z 07007KT 9999 FEW020 32/26 Q1014=

The 09:52 UTC SIGWX of 10 September 2021 (valid until 00:00 UTC of 11Sep2021) contained information of cloudy weather (5 to 7 oktas). Cumulus and Stratocumulus clouds with base at level 020 and tops at level 060. Altostratus and Altocumulus clouds with base at level 080, tops at level 120, and low clouds (1 to 2 oktas), featuring Towering Cumulus with base at FL 025 and tops at FL 220.

Furthermore, observers on the ground reported that the weather was consistent with VFR flights.

1.8. Aids to navigation.

NIL.

1.9. Communications.

NIL.

1.10. Aerodrome information.

The occurrence was outside of aerodrome area.

1.11. Flight recorders.

Neither required nor installed.

1.12. Wreckage and impact information.

The impact occurred in a region of forest to the northwest of the unregistered airstrip of *Garimpo Carolina*, at a distance of approximately at 0.68 nm (Figure 5).



Figure 5 – Croquis showing the turn after takeoff, the intended route and the wreckage site.

The wreckage of the aircraft remained concentrated, and there were no marks of destruction of trees caused by the crash in the surroundings of the crash-site.

In the center of the area, there was a fallen tree with marks consistent with being struck by the falling aircraft. At the lower part of the tree trunk, there was a piece of the right-hand wing-strut of the plane “fitted” in a slot opened vertically. The rest of that wing was on the ground, with its leading edge facing downwards (Figure 6).



Figure 6 – Wreckage of the aircraft close to the impacted tree.

It was not possible to determine the heading of the aircraft before the impact, nor the dynamic of the impact against the terrain.

After the impact, the aircraft caught fire, together with its powerplant, which received severe damage. The propeller blade, seen in Figure 7, presented a backward bending, compatible with collision against obstacles.



Figure 7 – Aircraft powerplant and one of the propeller blades in highlight.

The high level of damage to the aircraft prevented the verification of cabin equipment, instruments, and selectors.

All structural components and control surfaces (fuselage, landing gear, horizontal stabilizer, elevator, vertical stabilizer, rudder, wings, flaps and ailerons) were destroyed.

1.13. Medical and pathological information.

1.13.1. Medical aspects.

There was no evidence that issues of physiological nature or disability might have affected the pilot's performance.

1.13.2. Ergonomic information.

NIL.

1.13.3. Psychological aspects.

The 37-year-old pilot involved in the occurrence was born in *São Simão*, state of *Goiás*. He started his private pilot training in 2014.

In search of work options, he first arrived in the region of *Itaituba* in June 2018, and a second time in March 2020, when he remained operating as a freelancer without a formal employment relationship.

According to information gathered, the pilot was often hired by several operators in the region, including the owner of the PT-JIH, for provision of support to mining activities. He had been prioritizing flights for the operator of the accident aircraft for approximately a year and a half, and they had made friends with each other. Besides, he informally provided guidance to other pilots who flew that airplane in the locality.

There were reports that his professional objective was to spend one year flying in mining areas and, later, open a workshop in the locality for purposes of providing aircraft maintenance services.

His personal profile was described as sociable, helpful, optimistic and dreamy. He was said to have a stable relationship with his family. The pilot was enjoying a good period both in his personal and financial life, living a happy and rewarding moment. His intention was to build his residence in the city of *Itaituba*.

According to accounts, the night before the accident, he had had a good night's sleep, with about eight hours of rest.

On the day of the accident, he got up at around 07:45 am (local time) to start his activities.

According to information, he maintained a good routine, had a healthy diet at home, made no use of medication, and no alterations were reported that could have affected his performance as a pilot.

There were accounts that his workday in support of the mining activity would typically start at 12:00 UTC and finish at the sunset. Furthermore, the accommodation and food conditions offered at the base of operations were good and appropriate.

Thus, the investigation found no concrete data to show that psychological issues might have affected his piloting performance.

His operational profile was characterized as having a confident posture, albeit excessive sometimes, with an extroverted temperament, someone who acted confidently, mastering the aircraft, and who focused on accomplishing his missions.

1.14. Fire.

The post-impact fire consumed the aircraft.

1.15. Survival aspects.

The pilot, only occupant of the aircraft, perished in the crash.

1.16. Tests and research.

NIL.

1.17. Organizational and management information.

The very operator was the one responsible for the management and control actions related to the aircraft. The last inspection was performed on 09 February 2021 at an approved maintenance organization of the municipality of *Manaus*, state of *Amazonas*.

The investigation committee observed that there were non-conformities in the controls of the aircraft's secondary records. In addition, such controls were unsatisfactory, since the records logged in Part I of the Monthly Control of the Utilization of Airframe, Engine, and Propeller Logbooks were out of date. Records were missing in Part III - Secondary Records of Airworthiness Directives, Major Modifications, and Major Repairs of the Airframe and Engine Logbooks. Besides, there were various discrepancies in the Maps of Compliance with Airframe and Engine Airworthiness Directives.

Some of the primary records related to compliance with Airworthiness Directives applicable to the aircraft/engine model were not presented, and were mistakenly listed as not applicable in the Airworthiness Directives Control Information Map - Airframe and Engine.

It was not possible to keep track of the due compliance with some of the ADs through the Airworthiness Directive Compliance Sheets (FCDA), considered the primary record of compliance with an AD, since the company did not make them available.

The Section 91.417(a)(2)(v) of the Brazilian Civil Aviation Regulation no. 91 (RBAC-91), Amendment no. 3, reads:

Except for work performed pursuant to the sections 91.411 and 91.413 of these Regulations, each owner or operator must retain, for the periods set forth in paragraph (b) of this section, the following records:

(2) records containing the following information:

(v) The current status of applicable airworthiness directives and safety directives, including, for each one of them, the method of compliance, the number and the date of revision of the airworthiness directive or safety directive. If the airworthiness directive or safety directive requires periodic action, the time and date of the next action is required;

(...)

With respect to oversight conducted by the aircraft owner/operator, the section 91.405(b) of the RBAC-91, Amendment no. 3, reads:

must ensure that maintenance personnel have made appropriate notes in the aircraft maintenance records indicating that the aircraft has been approved for return to service.

1.18. Operational information.

Information was obtained that the aircraft operated on unregistered airstrips, since it was based at *Garimpo Carolina* (05°24'12"S 057°09'54"W), municipality of *Itaituba*, state of *Pará*, place of residence of the operator. Additionally, the aircraft performed constant flights bound for *Mutum Garimpo*, also located in *Itaituba*, in support of the mining activity in that locality.

On the day of the accident, the aircraft took off for a flight between the two unregistered airstrips.

As for the use of unregistered airstrips, the section 91.102(d) of RBAC-91, Amendment no. 3, reads:

Utilization of a Brazilian aerodrome is only allowed when such aerodrome is registered, and the operator determines that it is appropriate for the type of aircraft involved, and for the proposed operation.

The data obtained in the investigation indicated that it was the first flight of the day and that it had the purpose of transporting cargo related to mining activities.

With regard to the prerogatives of the Private Pilot license holder, the RBAC-61 listed the following restrictions:

61.85 Prerogatives of the private pilot license holder, and conditions required to exercising them

(a) The prerogatives of the private pilot license holder are limited to acting, without remuneration, as pilot-in-command or second-in-command of an aircraft of the category appropriate to his/her license and who conducts flights without remuneration and without any type of commercial use.

(b) Exercise of the prerogatives related to a private pilot license during nighttime is conditioned to the attendance by the by the license holder of nighttime flight dual command training, which includes takeoffs, landings and navigation.

(c) The exercise of the prerogatives of the private pilot license on international flights is conditioned to the fulfillment, by the holder, of the requirements established in section 61.10 of these Regulations.

The aircraft fueling was done by means of gravity, and the airstrip assistant reported that it was filled with approximately 120 liters of aviation gasoline before the takeoff that preceded the accident.

According to information, the cargo consisted of food stored in the cabin, and that there were no flammable liquids on board. However, it was not possible to determine the weight and balance of the aircraft at the time of the occurrence.

The airplane took off at around 13:40 UTC, heading towards the northeast sector. According to observers, the aircraft turned left shortly after takeoff, and they did not see it any longer.

According to other pilots operating at *Garimpo Carolina*, such take-off profile was the routine for purposes of separation from traffic utilizing another unregistered airstrip located in the extension of the departure sector.

In the northern sector of *Garimpo Carolina's* unregistered airstrip, more precisely on the downwind leg, there were trees and slightly higher elevations, which forced the pilots to continue with a positive rate of climb for obstacle clearance, stabilizing at an altitude of approximately 1,500 ft.

According to information, the takeoff of the PT-JIH was performed with a nose-up attitude higher than what was normally the routine, and the turn also started earlier in relation to the point where other pilots would normally do. Besides, the airplane seemed to have difficulty maintaining the climb; however, no one witnessed the moment when the aircraft went down and crashed.

According to accounts made by other pilots of the region and by ground observers, it was common for the accident pilot to perform bolder takeoffs, which consisted of excessively pitched-up attitudes, sometimes to the point of triggering the pre-stall horn.

1.19. Additional information.

NIL.

1.20. Useful or effective investigation techniques.

NIL.

2. ANALYSIS.

The aircraft was engaged on a private cargo-flight with 01 POB (the pilot).

At around 13:40 UTC, the aircraft took off from the unregistered airstrip of *Garimpo Carolina* bound for the unregistered airstrip of *Garimpo Mutum*.

According to observers, the take-off was performed with a higher than normal pitch-up attitude, and the left turn started at an earlier point in relation to the usual procedure adopted by other pilots operating in that location. Additionally, there were reports that the aircraft seemed to have difficulty gaining height and maintaining the climb.

Therefore, there is a possibility that the takeoff profile, with an excessive pitch-up attitude, may have contributed to a possible loss of lift and subsequent loss of control in flight, resulting in the occurrence.

The combination between the pilot's personal characteristics (extroverted temperament focused on the accomplishment of missions; overconfidence in his own piloting skills; and behavior of making bold takeoffs with an excessive pitch-up attitude - to the point of sometimes triggering the pre-stall horn), with the type/characteristics of the operation in question, was considered something capable of generating contributions to the occurrence.

The abovementioned aspects may have caused the pilot to become overconfident in his operational skills, in discordance with the aircraft's flight characteristics, to the detriment of operation safety.

The investigation committee verified that the wreckage remained concentrated, and that there were no noticeable clearings in the surroundings of the point of impact. In the middle of the crash site, there was a fallen tree, hit by the falling aircraft.

In the lower part of the aforementioned tree trunk, a piece of the right-side wing-strut was found fitted in a slot, opened in the vertical direction. In addition, the rest of that wing was on the ground, with the leading edge facing downward.

Thus, from the analysis of the wreckage distribution pattern, there were indications that the aircraft collided with the ground with significant energy and at an abnormal attitude, with the impact possibly having occurred when the aircraft had both a pronounced pitch-down angle and high speed.

The investigation verified that the records contained in Part-I (monthly control of utilization) of the airframe, engine, and propeller logbooks were out of date.

Such condition of the records was in opposition to the prescriptions of the item 5.6.2 of the ANAC Supplementary Instruction no. 43.9-003, Revision B.

Still in the context of documents, the investigation verified the presence of non-conformities in the CTM (Technical Maintenance Control) of the maintenance organization, since records were lacking in the Part III (Secondary Records of Airworthiness Directives, Major Modifications, and Major Repairs) of the Airframe and Engine Logbooks. In addition, there were inconsistencies in the notes of the Maps of Compliance with Airframe and Engine Airworthiness Directives.

Some of the primary records of compliance with the Airworthiness Directives applicable to the aircraft/engine model were not presented by the maintenance organization, besides the fact that they were listed as non-applicable in the Airworthiness Directives Control Information Map - Airframe and Engine.

Such condition pointed towards latent non-conformities in the logging process used by the maintenance organization. Despite being applicable to the aircraft/engine model, some ADs failed to be applied and/or logged, potentially increasing the risks for the air operations in general.

The last more comprehensive inspections of the aircraft ("50H/100H/CVA and 50H/100H/500H/1,000H Lubrication" types) were performed on 9 February 2021 and, on the occasion, the CTM produced spreadsheets with erroneous information, which were no longer reliable as to the status of compliance with the Airworthiness Directives.

It was not possible to keep track of due compliance with some of the ADs by means of the FCDAs (which are the primary record of compliance with an Airworthiness Directive), since the company did not make them available, in opposition to the prescriptions of the section 91.417(a)(2)(v) of RBAC-91.

In this way, the company failed to fulfill, in an appropriate and reliable manner, the regulatory requirements for compliance with airframe and engine Airworthiness Directives, something capable of compromising the airworthiness of the aircraft in question.

At that point, one also verified the presence of oversight failure, considering the provision contained in the section 91.405(b) of RBAC-91.

Since the powerplant was severely damaged by the post-impact fire, it was not possible to determine whether there was a failure of the *SN 451946 Teledyne Continental Motors (TCM) O-470-R* engine, as well as of the magnetos, cabling harnesses and igniters.

Although its Airworthiness Certificate was valid, it was not possible to determine whether the aircraft was, in fact, airworthy, or whether it had any discrepancies prior to the accident, when one considers that the aircraft logbook was not presented.

Upon assessment of the condition of one of the aircraft's propeller blades, the investigators observed evidence compatible with vertical travel of the aircraft until impact with the ground; however, it was not possible to determine whether the engine was developing propulsive power at the time of impact.

Considering the failures in the maintenance and airworthiness logging processes mentioned above, it is also possible to hypothesize that the aircraft loss of lift and possible loss of control in flight occurred due to a component failure.

3. CONCLUSIONS.

3.1. Findings.

- a) the pilot held a valid Aeronautical Medical Certificate (CMA);
- b) the pilot held valid Single-Engine Land-Airplane (MNTE) and Multi-Engine Land-Airplane (MLTE) ratings;
- c) it was not possible to obtain data regarding the pilot's recent experience to determine whether he was qualified; however, it was reported that he had experience in the type of flight;
- d) the aircraft had a valid Airworthiness Certificate (CA);
- e) it was not possible to verify the weight and balance limits of the aircraft;
- f) the records of the airframe, engine and propeller logbooks were out of date;
- g) there were discrepancies in the Secondary Records concerning Compliance with Airworthiness Directives;
- h) the meteorological conditions were consistent with the conduction of the flight;
- i) it was not possible to obtain the aircraft logbook records;
- j) after takeoff, the aircraft turned left, and crashed into the forest a few minutes later;
- k) it was not possible to determine whether the engine was developing power at the time of the occurrence;
- l) the aircraft caught fire after the impact;
- m) the aircraft was destroyed; and
- n) the pilot suffered fatal injuries.

3.2. Contributing factors.

- **Attitude – undetermined.**

The utilization of an unregistered airstrip in a mining area, associated with the pilot's characteristic of being overconfident in his own operational skills, may have subjected him to a condition of risk.

- **Handling of aircraft flight controls – undetermined.**

Considering the reported factors related to the profile of the takeoff just before the accident, there might have been a compromise in the control of the aircraft resulting from the amplitude of inputs on the flight controls.

- **Piloting judgment – undetermined.**

It is possible that the pilot performed an inappropriate assessment of the flight parameters both during and after takeoff, which may have led to the loss of control of the aircraft and resulting collision.

- **Managerial oversight – undetermined.**

The investigation committee verified a number of non-conformities in the secondary records logged by the maintenance organization, with a potential to affect the reliability of the aircraft systems.

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):

A-102/CENIPA/2021 - 01

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Work with *Tiarte Comércio e Importação de Aeronaves Ltda.* in order to verify that the procedures related to the managerial oversight by the referred maintenance organization comply with the applicable legislation, in view of mitigating the recurrence of non-conformities similar to those identified in this investigation.

5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN.

NIL.

On September 22th, de 2023.