# COMANDO DA AERONÁUTICA

## CENTRO DE INVESTIGAÇÃO E PREVENÇÃO DE ACIDENTES AERONÁUTICOS

# FINAL REPORT
# A-543/CENIPA/2015

| | |
|---|---|
| **OCCURRENCE:** | **ACCIDENT** |
| **AIRCRAFT:** | **PR-JGM** |
| **MODEL:** | **AS350B2** |
| **DATE:** | **15JULY2011** |

# 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 Report does not resort to any proof production procedure for the determination of civil or criminal liability, and is in accordance with item 3.1, 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 accident involving the AS350B2 aircraft, registration PR-JGM, on 15 July 2011. The accident was classified as controlled flight into terrain – CFIT.

Approximately 5 minutes after taking off, the aircraft crashed into a hill located at a distance of 2.5 NM from the helipad.

All the aircraft occupants perished in the crash site.

The helicopter was completely destroyed.

An accredited representative of the French *Bureau d'Enquetes et d'Analyses pour la Securité de l'Aviation* (BEA), France, state of design, was designated for participation in the investigation.

## CONTENTS

## GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS

| | |
|---|---|
| APA | Aeronautical Propulsion Division |
| ANAC | Brazil's National Civil Aviation Agency |
| BAPM | Military Police Aviation Battalion |
| BASM | Santa Maria Air Base |
| CCF | Aeronautical Medical Certificate |
| CENIPA | Aeronautical Accident Investigation and Prevention Center |
| CFIT | Controlled Flight into Terrain |
| CHT | Technical Qualification Certificate |
| CINDACTA | Integrated Air Defense and Air Traffic Control Center |
| CIV | Pilot's Flight Logbook |
| CM | Registration Certificate |
| DCTA | Department of Science and Airspace Technology |
| IAE | Aeronautics and Space Institute |
| IFR | Instrument Flight Rules |
| METAR | Routine Aerodrome Met Report |
| NM | Nautical Miles |
| PCH | Commercial Pilot License (helicopter category) |
| PPH | Private Pilot License (helicopter category) |
| QAV-1 | Aviation Kerosene |
| REDEMET | Command of Aeronautics' Meteorology Network |
| RBHA | Brazilian Aeronautical Homologation Regulation |
| RCC-CW | *Curitiba* Search and Rescue Center |
| RS | Safety Recommendation |
| SBJV | ICAO location designator – *Joinville* Airport |
| SBNF | ICAO location designator – *Navegantes* Airport |
| SERIPA | Regional Aeronautical Accident Investigation and Prevention Service |
| SIPAER | Aeronautical Accident Investigation and Prevention System |
| SNHH | ICAO location designator – Helibrás Helipad |
| UTC | Universal Time Coordinated |
| TPP | Private Air Services |
| VEMD | Vehicle Engine Management Display |
| VFR | Visual Flight Rules |

## 1. FACTUAL INFORMATION.

| | | |
|---|---|---|
| **Aircraft** | **Model:** AS 350 B2<br>**Registration:** PR-JGM<br>**Manufacturer:** HELIBRÁS | **Operator:**<br>*Nanete Textil Ltda*. |
| **Occurrence** | **Date/time:** 15JULY2011/ 12:25 UTC<br>**Location:** *Ribeirão das Almas*<br>**Lat.** 26º33'00"S **Long.** 049º05'05"W<br>**Municipality – State:** *Jaraguá do Sul* – State of *Santa Catarina* | **Type(s):**<br>Controlled Flight Into Terrain |

### 1.1 History of the flight.

At 12:22 UTC, the helicopter took off on a transport flight from *Jaraguá do Sul* to *Navegantes*, both in the State of *Santa Catarina*, with the pilot and two passengers on board.

At approximately 12:25 UTC, the aircraft collided with a hill located at 2.5 NM from the departure site.

### 1.2 Injuries to persons.

| Injuries | Crew | Passengers | Others |
|---|---|---|---|
| Fatal | 1 | 2 | - |
| Serious | - | - | - |
| Minor | - | - | - |
| None | - | - | - |

### 1.3 Damage to the aircraft.

The aircraft was destroyed.

### 1.4 Other damage.

None.

### 1.5 Personnel information.

### 1.5.1 Crew's flight experience.

| Hours Flown | |
|---|---|
| | Pilot |
| Total | 964:00 |
| Total in the last 30 days | 06:40 |
| Total in the last 24 hours | 00:05 |
| In this type of aircraft | Unknown |
| In this type in the last 30 days | 06:40 |
| In this type in the last 24 hours | 00:05 |

**N.B.:** Data obtained from the Pilot's most recent Flight Logbook. It was not possible to determine the total hours flown in this type of helicopter because the previous Flight Logbooks of the pilot were not found.

### 1.5.2 Professional formation.

The pilot did his Private Pilot course (helicopter category) at *Hellipoint Escola de Helicópteros*, *São Paulo*, in 1998.

### 1.5.3 Category of licenses and validity of certificates.

The pilot held a Commercial Pilot license (helicopter category), and a valid H350 type-aircraft technical qualification.

### 1.5.4 Qualification and flight experience.

The pilot had qualification and enough experience for conducting the flight in accordance with visual flight rules, but was not IFR-rated.

### 1.5.5 Validity of medical certificate.

The pilot held a valid Aeronautical Medical Certificate (CCF).

### 1.6 Aircraft information.

The aircraft (SN7021) was manufactured by Helibrás in 2011, and was registered in the category of Private Air Services (TPP).

The airworthiness certificate was valid.

The records of the airframe and engine logbooks were out-of-date.

The last inspection ("30 hours" type) was done on 15 March 2011 by the *Copters Manutenção Aeronáutica* workshop in São Paulo, State of São Paulo. The aircraft flew 66 hours and 35 minutes after the inspection.

The aircraft had not undergone any overhauls yet.

On the day of the accident, the helicopter had a total of 98 hours and 10 minutes of flight.

This type of helicopter was homologated to operate just under VFR.

### 1.7 Meteorological information.

On 15 July 2011, the meteorological conditions in the period from 12:00 to 13:00 UTC in the region of *Jaraguá do Sul* presented low layers of nebulosity between 600 and 700 ft. and another layer at 1,300 ft., with visibility restrictions, which maintained the area of interest in IMC. There weren't, however, cumulonimbus clouds nor areas of instability.


Figure 1 – Distances from *Nanete* Helipad to the aerodromes of SNJV and SBNF.

### 1.8 Aids to navigation.

Nil.

### 1.9 Communications.

There were no RT exchanges between the helicopter and the ATC units of *Joinville* and *Navegantes*.

### 1.10 Aerodrome information.

Not applicable.

### 1.11 Flight recorders.

Neither required nor installed.

### 1.12 Wreckage and impact information.

The accident occurred at a distance of 2.5 NM from the takeoff point (helipad of the *Nanete Têxtil Ltda.* Company) in a mountainous area.

Figure 2- Location where the helicopter crashed

The first impact with the trees on the hill occurred at an angle of approximately 45º at an elevation of 1,700 ft.

After the impact with the trees, the helicopter turned 120º to the left in relation to its longitudinal axis.

Figure 3 – View of the trajectory and impact of the helicopter with the ground.

After the impact with the ground, the helicopter continued moving 15 more meters before stopping. Most of the wreckage remained concentrated, except for the fuel tank, which was found near the point of impact with the ground.

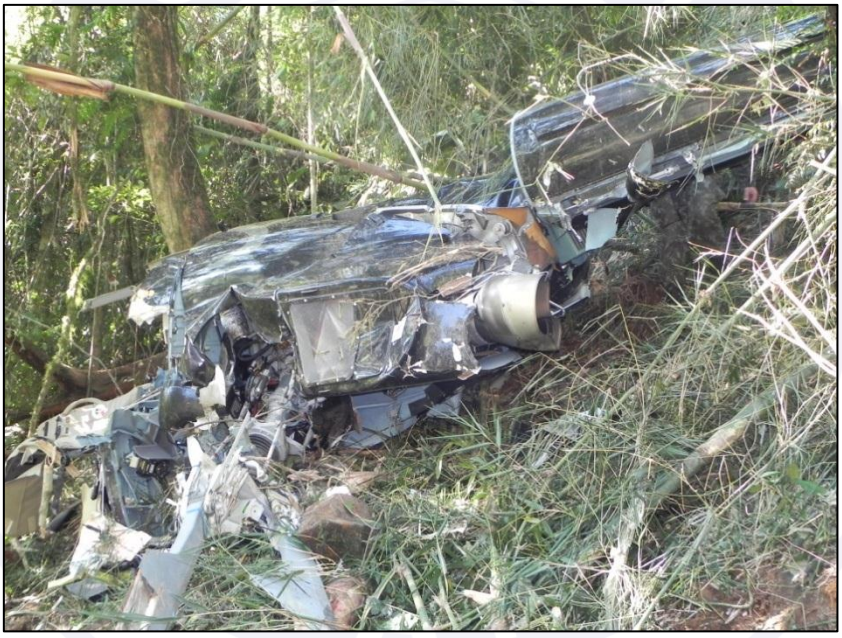

Figure 4 – Location where the helicopter stopped.

Based on the physical evidence and on the marks of impact of the helicopter rotor with the trees and with the ground, it is possible to affirm that the helicopter engine was developing power at the moment of the accident.

**1.13 Medical and pathological information.**

**1.13.1 Medical aspects.**

No evidence was found that problems of physiological nature or incapacitation could have affected the flight crew performance.

### 1.13.2 Ergonomic information.

Nil.

### 1.13.3 Psychological aspects.

The pilot started his professional formation in 1998 by doing the PPH in *São Paulo*. In 2001, he did the Robinson R22 course, with classes in *Joinville* and *Curitiba*.

He worked in *João Pessoa* and *Maceió* as captain of Robinson R44 helicopters between 2004 and 2007, and of *Esquilo* AS350B helicopters between 2007 and 2009.

In Jaraguá do Sul, he began an experience contract with an entrepreneur who owned a helicopter, and this contract lasted until the day of the accident.

The pilot appeared to be highly motivated for the flying activity, and saw it as a means of helping his family financially. He was considered careful with his work, but, according to information gathered, would be under pressure for conducting the flights requested, even if the conditions were not the best, and adopted a posture of servility.

According to information collected, the aircraft owner showed characteristics of authoritarianism, impatience, strictness, and did not like to be countered. In view of this scenario, the pilot gave in to pressure, making changes to his flight planning, despite the contingent risks involved. The pilot also did personal administrative services for his boss, but there was not an open communication channel between the two of them.

On the day of the accident, the pilot was advised 20 minutes in advance that the flight was destined for *Navegantes*. While preparing the aircraft for the flight, the pilot would have been mistreated by his boss on account of the hangar conditions, and heard him harshly demand from him provisions in that respect. This situation would have occurred in the presence of other people.

According to an observer who was near the helipad, the pilot made a departure that was different from the ones he had seen before: he made the aircraft climb quickly, clearing the natural obstacles and high tension wires on the path of departure.

### 1.14 Fire.

No signs of either in-flight or post-impact fire.

### 1.15 Survival aspects.

The search was made with the help of a Blackhawk helicopter of the 5$^{th}$/8$^{th}$ Aviation Group of Santa Maria Air Base (BASM), an *Esquilo* helicopter of the 2$^{nd}$ Company of the Military Police Aviation Battalion (BAPM) of Joinville, and an Agusta helicopter of the Malwee enterprise of *Jaraguá do Sul*, in coordination with RCC-CW (Curitiba Search and Rescue Center).

According to accounts, one of the passengers was used to not wearing his seat belt on trips. In the Initial Action after the accident, the body of this passenger was found at a distance of 25 meters from the point of impact.

### 1.16 Tests and research.

The marks made on the vegetation and on the ground were an indication that the helicopter was developing power at the moment of impact.

The aircraft components analyzed presented twists and ruptures characteristic of impact with power.


Figure 5 – Connecting shaft between the engine and the main box showed rupture close to the point of attachment to the main box.

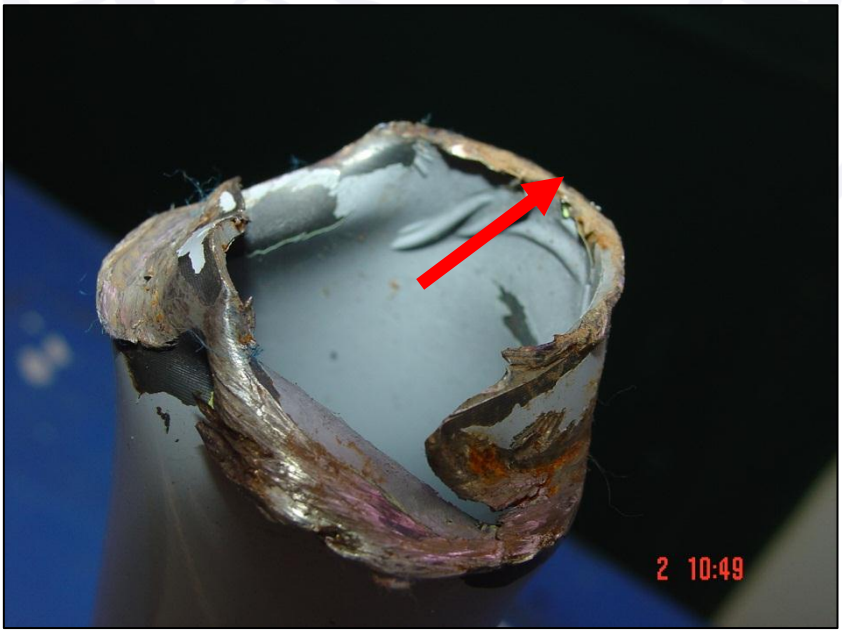


Figure 6 – Point of rupture in the shaft. In the inner part, there are signs of wrinkling at an angle of 45º, and signs of rupture due to torque effort coming from the engine.

The engine was sent to *Turbomeca do Brasil* in *Xerém*, State of *Rio de Janeiro*, for analysis, and a technical report was issued by the Aeronautical Propulsion Division (APA) of the Aeronautics and Space Institute (IAE) of the Department of Science and Airspace Technology (DCTA).

According to this report, there was evidence that the engine was operating and developing power at the moment of collision of the aircraft with the trees.

**1.17 Organizational and management information.**

The aircraft was a helicopter for private operation.

The first flight of the pilot with this type of helicopter was on 27 January 2011 in the Helibrás helipad of *Itajubá* (SNHH), State of *Minas Gerais*, for training and re-exam purposes.

The helicopter started operations in the *Nanete Têxtil Ltda*. Company on 28 January 2011.

There was a small organizational structure aimed at the operation of the helicopter. In addition to the management performed by the very pilot, the company had a helipad still under construction and a hangar for storing tools and support equipment for the helicopter maintenance and operation.

The management of the aircraft and of the hangar was carried out by the owner. The hangar had two rooms, one for the owner and the other for the pilot. A computer was available to the pilot for obtaining meteorological information, making mission planning, contacting airports and control towers, in addition to other administrative activities.

There was a mechanic who controlled the helicopter airworthiness status, and assisted the pilot during landings and departures. However, he was not an employee hired by the company.

There were neither means and/or methods for supervising the pilot's and mechanic's activities, nor a flight safety structure capable of providing support to the planning of the flights.

The investigation commission received accounts of high degree of interference from the aircraft owner on the operational performance of the pilot and on the management of operational issues related to the helicopter, something which hindered the decision-making process.

**1.18 Operational information.**

According to interviewees, the meteorological conditions in the region were rather degraded as far as the conduction of VFR flights was concerned.

On the day of the accident, the pilot arrived at the company at about 08:00 local time, registered his entry at work, went to the hangar, connected the external source supply to the helicopter, and switched on the internal battery.

The mechanic did the pre-flight, drained the tanks, and verified the transmission and tail rotor chip detector. He also informed having checked the plugs and the *vehicle engine management display* (VEMD), a piece of equipment that informs whether the helicopter exceeds a given engine parameter. No discrepancies were found in the inspections carried out by the mechanic.

According to this mechanic, the pilot had said that the owner advised him with a 20-minute advance that they would fly to Navegantes (SBNF).

The notification of the flight to the AIS Office of SBNF was made by the pilot via telephone. Departure was scheduled for 09:00 local time, on a VFR flight at a proposed altitude of 1,500 ft.

The helicopter had a fuel load of 270 liters in the tanks (QAV-1), and would transport two passengers (the owner of the aircraft and the master builder).

Also according to the mechanic, the owner of the company seemed to be very upset and would not cease to speak on his cell-phone. The master builder boarded the helicopter with the help of the mechanic and sat in the front to the left of the pilot. Soon after, the owner boarded the aircraft and sat in the seat behind the pilot's.

The helicopter took off at 09:22 local time from the unregistered helipad located on the patio of the *Nanete Têxtil Ltda*. Company in *Jaraguá do Sul*, probably destined for *Ilhota*, a town near *Navegantes*, where the company owner had a property under construction.

The helicopter made a pronounced turn to the left after taking off, something which drew the mechanic's attention for not being compatible with other takeoffs which he had seen before.

About 09:25 local time, workers that were doing maintenance in a high tension wire network near the mountainous region of the locality, saw the helicopter entering and leaving fog patches and, a little later, heard a loud noise.

**1.19 Additional information.**

The investigation commission verified the existence of discrepancies between the coordinates of the place from which the helicopter took off and the coordinates of the helipad that was being built in the company headquarters by the aircraft owner/operator and that were informed to the inspecting agencies (CINDACTA II and ANAC).

The two places are separated by a distance of 660 meters, as can be seen in Figure 7.

The commission verified that the physical characteristics of the location were in discordance with the pertinent legislation governing this type of operation (Brazilian Aeronautical Homologation Regulation 91 – RBHA 91 – item 91.327).

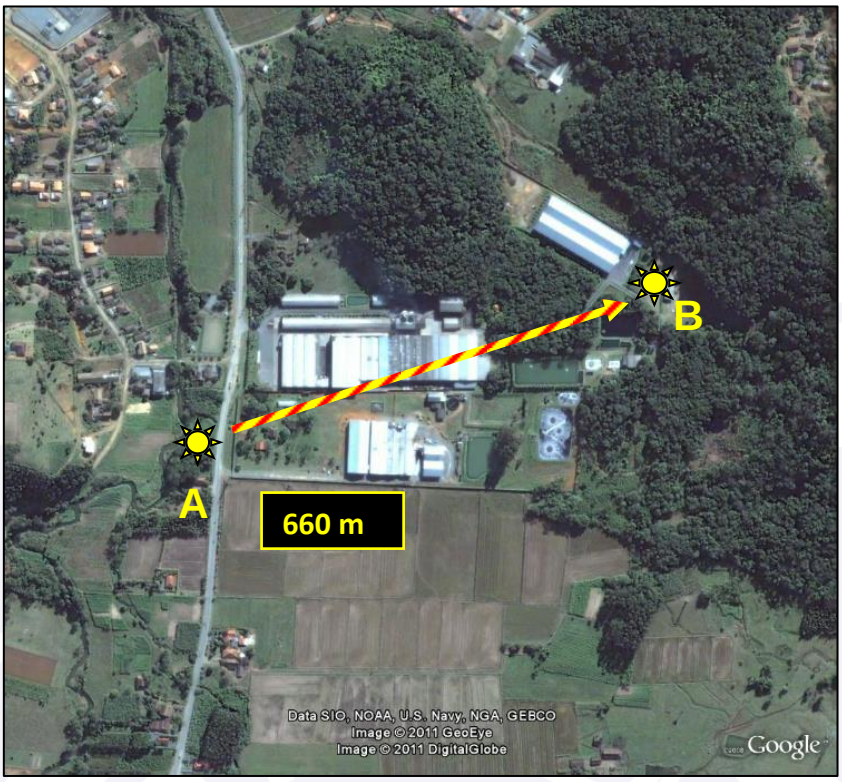


Figure 7 – Discrepancies in the location of the *Nanete* company helipad (A - registered / B - real).

In the location where the takeoff took place and that was being utilized by the operator since 28 January 2011 (point B of Figure 7), the commission observed the presence of obstacles which could violate the Basic Plan of the Helipad Protection Zone, as well as the ground infrastructure (signage, accessibility, pavement) among other physical characteristics.

Figure 8 – Obstacles in the location utilized for the takeoff.

Figure 9 – Obstacles in the helipad of the *Nanete* company.

According to all indications, this location was being utilized by the operator without being registered before the inspecting agency. Since the operator did not forward the term of notification reporting the completion of the construction work to the inspecting agency, it is possible that such work had not been finished yet.

**1.20 Useful or effective investigation techniques.**

Nil.

## 2. ANALYSIS.

The analyses, together with the evidence collected in the post-accident field investigation, ruled out the possibility of aircraft failure in the occurrence in question.

Neither was the pilot IFR-rated nor was the helicopter homologated for IFR flights.

The analysis of the meteorology showed that there were important restrictions for a VFR flight, since the horizontal and vertical visibility was compromised by a layer of nebulosity at 1,300 ft. and a lower second layer between 600 and 700 ft.

In spite of the availability of resources to the pilot, such as the aeronautical meteorology network (REDEMET), phone contact with ATC units, etc., it seems that the pilot did not utilize them during the planning of the en-route phase of the flight and of the destination and alternate airports.

Since the interpersonal relationship between the pilot and the aircraft owner was not good and, on account of the pressure exerted by the latter on the former, it is possible that the pilot could be under stress, something which might hinder his capability of concentration and evaluation of the operational risks contained in the context of flight, such as lack of planning, adverse meteorological conditions, and the fact that he was not IFR-rated.

The posture of the owner may also have contributed to the pilot's difficulty to confront the pressures exerted on him, resulting in the adoption of a more passive attitude in face of conflicting or unsafe situations, mainly if one considers his need to keep the job.

Since the first impact with the trees occurred at an altitude of 1,700 ft., and, according to accounts made by observers, it is possible to affirm that the meteorological

conditions were not favorable to the continuation of a flight in VMC and that the helicopter entered IMC moments before the collision with the trees.

The pilot may have been influenced in this and other operational decisions by the pressure constantly imposed by the aircraft owner, consequently assuming an attitude of complacency in view of the interests of his boss in detriment of flight safety.

Since it was the owner who did the management of the aircraft operation, there was a lack of adequate supervision of the activities performed by the pilot. Also, there was a lack of communication channels and delegation of responsibilities in the hangar, aggravating the influence of the owner on the pilot's operational decisions.

## 3. CONCLUSIONS.

### 3.1 Facts.

a) The pilot held a valid Aeronautical Medical Certificate (CMA);

b) The pilot held a valid Technical Qualification Certificate (CHT);

c) The pilot was not IFR-rated;

d) The pilot had qualification and enough experience for conducting the flight in VMC;

e) The aircraft had a valid airworthiness certificate (CA);

f) The records of the airframe, engine, and rotor logbooks were out-of-date;

g) The aircraft was within the weight and balance limits;

h) The meteorological conditions were not favorable for VFR flights;

i) The place of departure was not in accordance with the legislation for this type of operation;

j) According to witness, the pilot was being submitted to pressure and being influenced by the aircraft owner in his making of operational decisions;

k) The impact with the trees occurred at an altitude of 1,700 ft. at a pitch-down angle of 45º;

l) The engine of the aircraft was developing power at the moment of the impact with the trees;

m) There was no evidence of mechanical failures or defects in the aircraft systems before the impact;

n) The helicopter was destroyed; and

o) All the aircraft occupants suffered fatal injuries..

### 3.2 Contributing factors.

**Attitude – a contributor**

Making a takeoff without consulting the meteorological conditions and proceeding with the flight in IMC without being IFR-rated reflects a state of complacency on the part of the pilot.

**Organizational climate – undetermined**

The type of relationship existing between the aircraft owner and the pilot was an indication of poor organizational climate, something which might be affecting the actions and behavior of the pilot in relation to the flight.

**Adverse meteorological conditions – a contributor**

The meteorological conditions were not favorable for VFR flights. The pilot was not IFR-rated, and the aircraft was not homologated for IFR flights.

**Stress – undetermined**

On account of the work conditions, it is possible that the pilot might be experiencing a state of emotional tension, due to the animosity existing in the relationship between him and the owner. Such condition would contribute to the degradation of the pilot's judgment and decisions in face of the flight conditions.

**Motivation – undetermined**

The sense of duty of the pilot toward his family may have increased his motivation to keep the job and, thus, may have compromised his critical analysis capability, since he went for a flight for which he was not qualified.

**Perception – a contributor**

The operation in adverse meteorological conditions without being IFR-rated in an aircraft not certified for IFR flights shows a reduction of the situational awareness.

**Flight planning – a contributor**

The pilot did not make use of the resources available for a good planning of his flight, since he probably was not aware of or did not pay due attention to the meteorological conditions in the region, along the route, and at the destination and alternate airports.

**Decision-making process – a contributor**

The pilot did not make an adequate evaluation of the risk, and this culminated in his decision to take off in unfavorable meteorological and operational conditions. The pilot's judgment capability may have suffered interference from the organizational context experienced by him.

**Interpersonal relationship – undetermined**

Since there was poor interpersonal relationship between the pilot and the helicopter owner, it is possible that such condition triggered a level of stress in the pilot, with repercussions in the context of flight.

## 4. SAFETY RECOMMENDATION.

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

***In consonance with the Law n°7565/1986, recommendations are made solely for the benefit of the air activity operational safety, and shall be treated as established in the NSCA 3-13 "Protocols for the Investigation of Civil Aviation Aeronautical Occurrences conducted by the Brazilian State".***

**Recommendations issued at the publication of this report:**

**To the National Civil Aviation Agency (ANAC):**

**A - 543/CENIPA/2015 - 01 Issued on 11/11/2016**

Verify the conformity of the *Nanete Têxtil Ltda.* helipad with the safety requirements for helicopter operation..

## 5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN.

None.

On November 11th 2016.