

**COMANDO DA AERONÁUTICA**  
**CENTRO DE INVESTIGAÇÃO E PREVENÇÃO DE**  
**ACIDENTES AERONÁUTICOS**



**FINAL REPORT**  
**A - 522/CENIPA/2016**

|                    |                  |
|--------------------|------------------|
| <b>OCCURRENCE:</b> | <b>ACCIDENT</b>  |
| <b>AIRCRAFT:</b>   | <b>PR-NAX</b>    |
| <b>MODEL:</b>      | <b>PA-28-181</b> |
| <b>DATE:</b>       | <b>26DEC2012</b> |



## 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 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 26DEC2012 accident with the PA-28-181 aircraft, registration PR-NAX. The accident was classified as “[LOC-I] Loss of Control in-Flight”.

The aircraft performed air navigation instruction with approach and go-around procedure at the Carlos Prates (SBPR), Curvelo (SNQV) and Pará de Minas (SNPA) Aerodromes.

During a go-around procedure at SNPA, the aircraft started to turn left, losing altitude, colliding against the ground, near the runway, on a pasture area of the Milena Farm.

The aircraft was consumed by the fire and was totally destroyed.

The two occupants, Instructor and Student suffered fatal injuries.

An Accredited Representative of the National Transportation Safety Board (NTSB) - USA, (State where the aircraft was designed) was designated for participation in the investigation.



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**GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS**

|            |   |
|------------|---|
| ANAC       | Brazil's National Civil Aviation Agency                                   |
| AVGAS      | Aviation Gasoline   |
| CA         | Airworthiness Certificate   |
| CB         | Cumulonimbus  |
| CMA        | Aeronautical Medical Certificate  |
| IFRA       | Instrument Flight Rating - Airplane                                       |
| INVA       | Flight Instructor Rating - Airplane                                       |
| METAR      | Aviation Routine Weather Report   |
| MNTE       | Airplane Single Engine Land Rating  |
| NTSB       | National Transportation Safety Board (USA)                                |
| PCM        | Commercial Pilot License – Airplane                                       |
| PPR        | Private Pilot License – Airplane  |
| PRI        | Private Aircraft Registration Category – Instruction                      |
| SBPR       | ICAO Location designator - Carlos Prates Aerodrome, Belo Horizonte - MG   |
| SERIPA III | Third Regional Aeronautical Accident Investigation and Prevention Service |
| SIGWX      | Significant Weather   |
| SIPAER     | Aeronautical Accident Investigation and Prevention System                 |
| SNPA       | ICAO Location designator - Pará de Minas Aerodrome - MG                   |
| SNQV       | ICAO Location designator – Curvelo Aerodrome - MG                         |
| SPECI      | Selected Special Aeronautical Weather Report                              |
| TC         | Towering Cumulus  |
| UTC        | Universal Time Coordinated  |
| VTI        | Initial Technical Inspection  |

## 1. FACTUAL INFORMATION.

|            |  |   |
|------------|--|---|
| Aircraft   | <b>Model:</b> PA-28-181  | <b>Operator:</b><br>Net Aviation <i>Escola de Aviação Civil</i> Ltd.                    |
|            | <b>Registration:</b> PR-NAX  |   |
| Occurrence | <b>Manufacturer:</b> Piper Aircraft  | <b>Type(s):</b><br>“[LOC-I] Loss of Control in-Flight”<br><br><b>Subtype(s):</b><br>NIL |
|            | <b>Date/time:</b> 26DEC2012 - 2040 UTC   |   |
|            | <b>Location:</b> Milena Farm   |   |
|            | <b>Lat.</b> 19°50'10"S <b>Long.</b> 044°35'11"W<br><b>Municipality – State:</b> Pará de Minas – MG |   |

### 1.1 History of the flight.

The aircraft took off from Carlos Prates Airfield (SBPR), Belo Horizonte - MG, at 1915 (UTC), in order to conduct a closed circuit of air navigation instruction, with approach and go-around procedure at the Curvelo (SNQV) and the Pará de Minas (SNPA) Aerodromes - MG, Brazil, with an expected return to SBPR, with an Instructor (IN) and a Student (ST) on board.

During a go-around procedure at SNPA, the aircraft started to turn left, losing altitude, colliding against the ground, near the runway, on a pasture area of the Milena Farm.

After the impact, the aircraft was consumed by fire and was totally destroyed.

The two crewmembers suffered fatal injuries.



Figure 1 - Sketch of the air navigation instruction circuit of the PR-NAX aircraft.

### 1.2 Injuries to persons.

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

### 1.3 Damage to the aircraft.

The aircraft was consumed by fire and was totally destroyed.

### 1.4 Other damage.



None.

## 1.5 Personnel information.

### 1.5.1 Crew's flight experience.

| Flight Hours                      |        |         |
|-----------------------------------|--------|---------|
|                                   | Pilot  | Student |
| Total                             | 504:05 | 46:45   |
| Total in the last 30 days         | 50:15  | 04:55   |
| Total in the last 24 hours        | 06:05  | 01:25   |
| In this type of aircraft          | 91:25  | 39:00   |
| In this type in the last 30 days  | 17:30  | 04:55   |
| In this type in the last 24 hours | 06:05  | 01:25   |

**N.B.:** The data related to the flown hours were obtained through the statement from third parties related to the operating company and family members.

### 1.5.2 Personnel training.

The pilot took the PPR course at the NET Aviation *Escola de Aviação Civil* - MG, in 2009.

The student took the PPR course at the NET Aviation *Escola de Aviação Civil* - MG, in 2012.

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

The pilot had the PCM and valid MNTE, IFRA and INVA Ratings.

The student had the PPR, was in training to obtain the PCM, and had valid MNTE Rating.

### 1.5.4 Qualification and flight experience.

The pilot was qualified and had experience in that kind of flight.

The student had little experience in that kind of flight.

### 1.5.5 Validity of medical certificate.

The pilots had valid CMAs.

## 1.6 Aircraft information.

The aircraft, serial number 2843460, was manufactured by Piper Aircraft, in 2001, it was registered in the PRI category and had a total of 511 hours and 50 min of flight.

The aircraft had valid Airworthiness Certificate (CA).

On 17OCT2012, Brazilian airframe, engine and propeller logbooks were opened due to the importation of the aircraft from the United States of America. Such logbooks records were updated.

The manufacturer of the aircraft established maintenance inspections of 50h, 100h, 500h and 1000h.

In addition to such inspections, some special inspections were required, according to some predefined criteria, considering the types of components installed in the aircraft, covering inspections by flight hours, defined time (calendrical) and by operation standard or operating environment.

- Special hour flight inspections included intervals of 200h, 300h, 400h, 500h, 1000h, 1600h, 2000h, 2700h and 6000h;

- Special time-specific inspections (calendrical) included intervals of 30 days, 90 days, 4 months, 12 months, 2 years, 3 years, 6 years, 7 years, 8 years, 10 years, 12 years and 20 years;
- Special inspection by operation standard comprised maintenance tasks, depending on operation with high level of dust contamination or in environment with industrial pollution.

On 17NOV2012, in the Maintenance Organization *Tecnologia Brasileira de Aeronáutica* (TBA) S/A, in Pará de Minas - MG, all the inspections prevised in the manufacturer's maintenance manual were carried out, as well as the special inspections for flight hours and calendaricals, limiting to those that did not exceed the year of manufacture of the aircraft, besides excluding the inspection by operation standard.

According to the maintenance records, inspection items of 200 hours, 400 hours, 500 hours, 1000 hours, 2000 hours, 30 days, 90 days, 4 months, 12 months, 2 years, 3 years, 6 years and 7 years were fulfilled.

The purpose of conducting so many inspections at the same time was to prepare the aircraft for the Initial Technical Inspection (VTI) of nationalization, held on 20NOV2012 by an accredited representative of the ANAC, in the city of Pará de Minas - MG.

After the aforementioned inspections and VTI, the aircraft flew 20 hours and 40 minutes until the moment of the accident.

The Textron Lycoming engine, model O-360-A4M, serial number L-38122-36A, was installed in the aircraft since new and had the same total hours of operation of the aircraft airframe.

### **1.7 Meteorological information.**

The crew used the meteorological information available at the Pampulha Aerodrome (SBBH), Belo Horizonte - MG, 38 NM away from SNPA, before the flight.

The SBBH METAR, at 1800 (UTC), presented wind with 300° of direction and intensity of 4kt, unlimited visibility and the presence of scattered clouds (SCT) at 4,000ft and few clouds (FEW) at 4,500ft , but with Towering Cumulus formations (TCU):

1800 METAR SBBH 261800 30004KT 9999 SCT040 FEW045TCU 31/15 Q1014

Later, at 1828 (UTC), a SPECI was issued, alerting the crews to the significant meteorological changes at the aerodrome, which presented wind with 240° of direction and 20kt of intensity, visibility of 3,000 meters, rain with thunders and the presence of scattered clouds (SCT) at 4,000ft and few clouds (FEW) at 4,500ft of the cumulonimbus (CB) type:

1828 SPECI COR SBBH 261828 24020KT 3000 TSRA SCT040 FEW045CB 30/17 Q1014

The SIGWX chart of 1800 (UTC) in South America, showed the proximity of cumulonimbus (CB) cloud formations from the locations of SNQV, SNPA and SBPR, as highlighted in Figure 2.



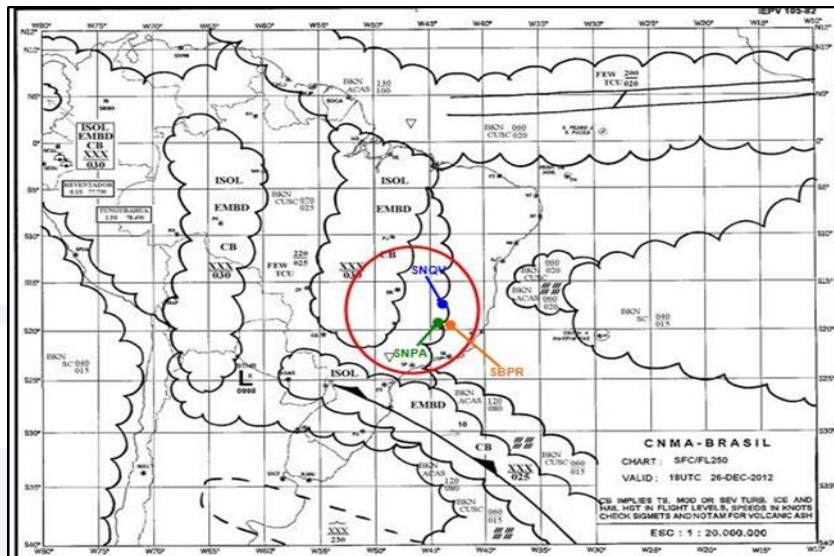


Figure 2 - SIGWX chart.

People at SNPA Aerodrome confirmed that at the time of the accident, the wind was very strong, with gusts and many dark clouds were approaching.

### 1.8 Aids to navigation.

Nil.

### 1.9 Communications.

Nil.

### 1.10 Aerodrome information.

The occurrence took place outside the Aerodrome.

### 1.11 Flight recorders.

Neither required nor installed.

### 1.12 Wreckage and impact information.

According to a witness who was in SNPA, the aircraft started to turn left after the go-around procedure, losing altitude and colliding with the ground, in the vicinity of the Aerodrome.



Figure 3 - Diagram of the trajectory of the aircraft and coordinates of the place of the occurrence.

The first impact heading of the aircraft on the ground occurred at the 025° head. The left wing collided against the ground, causing the aircraft to roll to the left, up to it was upside down, while moving ahead.

Then, the second impact was about 10 meters from the first one, when the aircraft collided upside down moving on the ground, up to its full stop.

After the total stop, approximately 45 meters from the first impact, the wreckage got concentrated, upside down and the aircraft caught fire. One leg of the landing gear detached from the aircraft, stopping about 3 meters from the wreckage (Figure 4).



Figure 4 - Trajectory of the aircraft after the collision against the ground, leg of the landing gear that detached from the aircraft after the impact (foreground) and concentration of the wreckage (background).

The aircraft engine was found with fractures caused by shaft torsion and was not analyzed on bench afterwards, because of the level of destruction of the component.

One of the propeller blades had typical deformations of a low speed, wide angle and soft ground impact (Figure 5).



Figure 5 - Deformation in one of the aircraft propeller blades with evidence of wide angle impact and against soft ground.



### **1.13 Medical and pathological information.**

#### **1.13.1 Medical aspects.**

The cadaveric reports concluded that the Instructor of the aircraft died by polytrauma, while receiving the first aid in hospital, near the place of the occurrence.

The student died due to polytrauma and carbonization at the accident site.

#### **1.13.2 Ergonomic information.**

Nil.

#### **1.13.3 Psychological aspects.**

Nil.

### **1.14 Fire.**

After the impact on the ground, the aircraft caught fire, due to a source of ignition (spark) coming from the dynamics of the impact.

The fire was fed with the fuel remaining from the tanks and consumed the structure of the aircraft, leaving the fuselage and almost all of the wings destroyed.

### **1.15 Survival aspects.**

There were no survivors.

### **1.16 Tests and research.**

Research was performed on the aircraft, engine and propeller technical documentation, observing compliance with all applicable airworthiness inspections and guidelines, without showing any indications of installed components in disagreement with the regulations.

### **1.17 Organizational and management information.**

Nil.

### **1.18 Operational information.**

The aircraft was within the weight and balance limits specified by the manufacturer.

After the take-off from SBPR, at 1915 (UTC), the aircraft proceeded to the air navigation instruction flight, with an estimated time of 1 hour and 40 minutes. The en-route instruction included procedures of approach, touch and go and go-around procedure in the air, at the locations of SNQV, SNPA and, finally, SBPR.

The basic weight of the aircraft was of 1,819lb and the maximum takeoff weight of 2,550lb.

The maximum capacity of the fuel tanks was of 50 gallons (189 liters) of Aviation Gasoline (AVGAS), and the aircraft had been fueled with 114 liters of AVGAS before the start of the flight.

The average consumption of the model was of 45 liters per hour and the time flown en-route was of approximately 1 hour and 15 minutes, until the moment of the accident.

Considering the average consumption of the model and the total time flown, it can be said that the aircraft consumed about 56 liters of fuel. Therefore, the amount of fuel remaining in the aircraft tanks at the time of the occurrence was approximately of 58 liters of AVGAS.

Converting all the parameters and considering the approximate weight of the crew (150kg / 330lb), the basic weight of the aircraft (1,819lb) and the approximate remaining

fuel (58 liters / 92lb), the total weight of the aircraft was of 2,241lb at the moment of occurrence.

According to reports from people present at SNPA at the time of the occurrence, after the go around procedure, the aircraft started a left turn, with loss of height, coming to collide against the ground, in a pasture area of the Milena Farm, near the runway.

### 1.19 Additional information.

Due to meteorology being strongly present in the dynamics of the accident, it is important to cite some information about the meteorological phenomenon known as windshear.

Near the ground, storms sometimes create rapid changes in wind speed and direction, resulting in the phenomenon known as windshear, which is a violent downward current of air, which has divergent winds after touching the ground.

The intensity and speed with which the phenomenon occurs become a great danger to aircraft in flight. This is due to the shear caused by its gust front, with a wide accident history involving fatalities in the approach during the final phase of the flight - precisely because the phenomenon happens at low altitudes.

The phenomenon usually occurs at runway level up to a height of 500 meters above ground level, although occurrences at higher altitudes have also been observed, due to local topography.

Descending gusts associated with cumulonimbus clouds are very dangerous for aerodrome landing and take-off operations. Intense downward flows, also associated with wind shear, cause loss of aerodynamic sustainability and there are records of many air crashes due to these downward wind bursts (Figure 6).

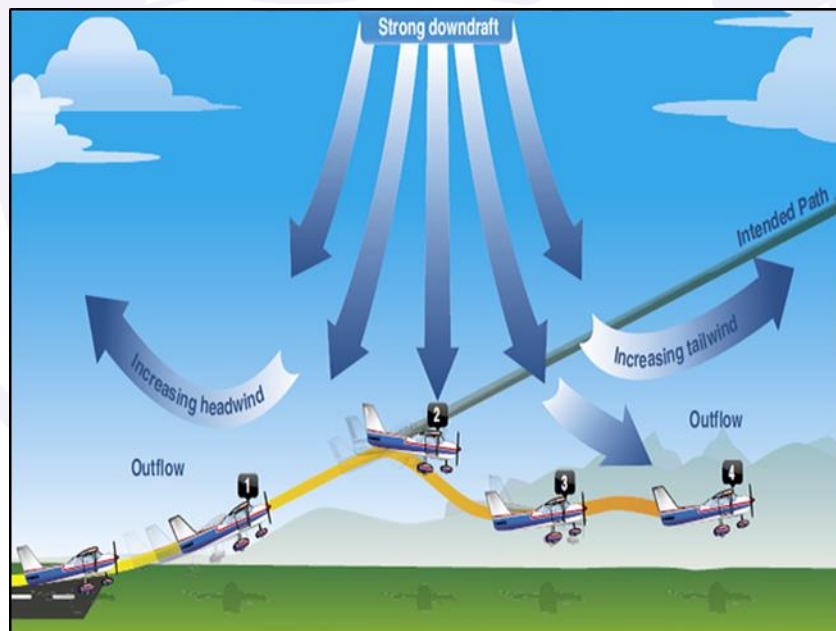


Figure 6 - Windshear.

Source: <http://www.wfmz.com/weather/what-is-wind-shear/614971087>

### 1.20 Useful or effective investigation techniques.

Nil.

## 2. ANALYSIS.

This was a closed circuit air navigation instruction flight, with touch and go and go-around procedures, at the SNQV, SNPA Aerodromes and predicted return to the SBPR Aerodrome.

The estimated total flight time was of 1 hour and 40 minutes with an instructor and a student aboard.

The instructor had a PCM license and had valid MNTE, IFRA and INVA Ratings, accumulating a total of 504 flight hours, with 91 hours being in the same model of the aircraft involved in the accident.

The student in instruction had the PPR license and 46 total flight hours, with 39 hours in the same model of the aircraft involved in the accident.

The maximum capacity of the aircraft tanks was of 189 liters of fuel. Before the flight, the aircraft was fueled with 114 liters of AVGAS, enough for the flight of 1h40min, considering the average engine consumption of the aircraft of 45 liters per hour.

Considering the time of flight accomplished by the aircraft until the moment of the accident, of 1 hour and 5 minutes, it was concluded that the aircraft consumed about 56 liters of AVGAS, remaining with approximately 58 liters in the tanks.

The aircraft weight was estimated at the time of the accident, using the approximate weight of the crew (150kg / 330lb), fuel remaining in the tanks (58liters / 92lb) and the basic weight of the aircraft (1,819lb). This resulted in a total aircraft weight of 2,241lb at the time of the occurrence, quite below the maximum take-off weight of 2,550lb.

Therefore, it was inferred that the aircraft was within the limits of weight, balance and CG specified by the manufacturer.

Similarly, no irregularities were found in the technical documentation of the aircraft and its components. All flight logbooks were updated, with up-to-date inspections and applicable airworthiness directives met.

The torsional fractures found on the engine shaft and the deformations produced in one of the blades indicated that the engine developed power at the moment of the impact against the ground.

Prior to takeoff, the crew used the available meteorological information from SBBH, 38 NM away from SNPA, which were favorable for the visual flight. The METAR of 1800 (UTC) indicated wind with direction of 300° and 4kt of intensity, unlimited visibility and the presence of scattered clouds at 4,000ft and few clouds at 4,500ft, but with Towering Cumulus (TCU) formations.

However, soon after the SBBH METAR was issued, there was a significant change in meteorological conditions, to the point of issuing a SPECI message at 1828 (UTC), indicating a wind of 240° direction and 20kt of intensity, visibility of 3,000 meters, rain with thunderstorms and the presence of scattered clouds (SCT) at 4,000ft with few clouds (FEW) at 4,500ft cumulonimbus (CB). Such weather conditions were unfavorable for the visual flight.

Despite the existence of norms and regulations that established the crew's need to be aware of the weather conditions, the crew may not have been informed of the weather changes contained in the SPECI message, since during the air training the meteorological briefing was performed 1 hour before takeoff, that is, in this case, at 1800 (UTC).

The weather forecast contained in the SPECI message has been confirmed at the aerodromes in the region. People at SNPA confirmed that at the time of the accident, was very strong, with gusts, and there were many dark clouds approaching that locality.

It is possible that the crew noticed the deteriorating weather conditions during the en-route flight, with an increasing number of cumulonimbus clouds, as well as having had the opportunity to abort the instruction mission to return to the departure aerodrome or to accomplish an intermediate landing immediately.

However, it was not possible to identify any initiative of the crew in this sense during the investigative work, culminating in the possibility that they judged the conditions still appropriate for the visual flight. This compromised flight safety as a result of continued navigation instruction flight in adverse weather conditions.

In this perspective, the lack of access to the information contained in the SPECI message may have favored an inadequate evaluation of the actual conditions present at the time of the flight.

At the time of the approach and the go-around procedure at SNPA, it is possible that the aircraft encountered strong descending winds, associated with the presence of cumulonimbus clouds near the aerodrome.

This scenario may have favored the occurrence of the phenomenon known as windshear, which may have greatly hampered the control of the aircraft.

The most likely hypothesis is that the aircraft was hit by windshear, culminating in the loss of height and control of the aircraft, which, due to the low altitude being in a go-around procedure, collided with the ground, in the vicinity of the aerodrome.

The dynamics of the post-impact events and the evidences found are characterized as being typical of low speed and low angle impact, corroborating the most probable hypothesis adopted, of loss of control at low altitude, due to a possible windshear, during a go-around procedure, in which the aircraft presents reduced speeds.

### **3. CONCLUSIONS.**

#### **3.1 Facts.**

- a) the pilots had valid Aeronautical Medical Certificates (CMA);
- b) the pilot had valid MNTE, IFRA and INVA Ratings;
- c) the student was in training to obtain the PCM License and he had valid MNTE Rating.
- d) the pilot was qualified and had experience in that kind of flight;
- e) the aircraft had valid Airworthiness Certificate (CA);
- f) the aircraft was within the limits of weight and balance;
- g) the airframe, engine and propeller logbooks records were updated;
- h) before takeoff, the meteorological conditions favored the visual flight, but indicated the formation of Cumulonimbus (CB) clouds;
- i) soon after the 1800 (UTC) SBBH METAR was issued, there was a significant change in the weather;
- j) the SPECI message of 1828 (UTC) indicated deterioration of the climatic conditions, which became unfavorable for the visual flight;
- k) it was prevised in rules and regulations the need for the crew to be aware of the meteorological conditions during the air navigation flight planning;
- l) on the aviation school instruction flights, the meteorological briefing was held one hour before takeoff;



- m) people located at the SNPA Aerodrome reported that at the time of the accident, the wind was very strong, with gusts and the approach of many dark clouds;
- n) during a go-around procedure at SNPA, the aircraft started a left turn, losing altitude, colliding with the ground, near the runway, on a pasture area of the Milena Farm;
- o) the aircraft was destroyed; and
- p) the pilots suffered fatal injuries.

### 3.2 Contributing factors.

#### - Adverse meteorological conditions – undetermined.

It is possible that, at the time of the approach at SNPA, the aircraft encountered meteorological formations that favored the occurrence of windshear.

The likely hypothesis is that the crew lost control of the aircraft when it was hit by windshear. This fact culminated with the loss of height and the collision against the ground in the vicinity of the aerodrome, considering that the aircraft was in go-around procedure and flying at low altitude.

#### - Piloting judgement – undetermined.

It is possible that the instructor did not adequately assess the weather during the flight, proceeding with it under unfavorable conditions, which probably caused the occurrence of windshear during the go-around procedure.

#### - Flight planning – undetermined.

It is possible that updated weather information about the route to be flown was not considered by the crew, contributing for the flight to be carried out under adverse conditions.

#### - Decision-making process – undetermined.

The flight accomplishment under adverse weather conditions may have resulted from an inadequate assessment of the existing operating conditions, since the crew did not have updated meteorological information.

## 4. SAFETY RECOMMENDATION.

*A proposal of an accident investigation authority based on information derived from an investigation, made with the intention of preventing accidents or incidents and which in no case has the purpose of creating a presumption of blame or liability for an accident or incident. In addition to safety recommendations arising from accident and incident investigations, safety recommendations may result from diverse sources, including safety studies.*

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

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

**To the Brazil’s National Civil Aviation Agency (ANAC):**

**A-522/CENIPA/2016 - 01**

**Issued on 05/16/2019**

Conduct an audit at the Net Aviation *Escola de Aviação Civil*, in order to verify the operation and compliance of its Safety Management System, in particular as regards the assessment of meteorological conditions for the conduct of flights.

**A-522/CENIPA/2016 - 02**

**Issued on 05/16/2019**

Disclose the lessons learned in the present investigation, in order to alert the Brazilian civil aviation pilots and operators to the importance of careful assessment of meteorological conditions and their consequences when planning and executing flights.

**5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN.**

None.

On May 16<sup>th</sup>, 2019.

