

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



**FINAL REPORT**  
**A - 008/CENIPA/2019**

<b>OCCURRENCE:</b>	<b>ACCIDENT</b>
<b>AIRCRAFT:</b>	<b>PR-MJA</b>
<b>MODEL:</b>	<b>PA-25-235</b>
<b>DATE:</b>	<b>12JAN2019</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 Final Report was provided to ANAC and DECEA so that the technical-scientific analyzes of this investigation can be used as a source of data and information, aiming at the identification of hazards and risk assessment, as established in the Brazilian's Program Operational Safety of Civil Aviation (PSO-BR).*

*This Report does not resort to any proof production procedure for the determination of civil or criminal liability, and is in accordance with Appendix 2, Annex 13 to the 1944 Chicago Convention, which was incorporated in the Brazilian legal system by virtue of the Decree nº 21713, dated 27 August 1946.*

*Thus, it is worth highlighting the importance of protecting the persons who provide information regarding an aeronautical accident. The utilization of this report for punitive purposes maculates the principle of “non-self-incrimination” derived from the “right to remain silent” sheltered by the Federal Constitution.*

*Consequently, the use of this report for any purpose other than that of preventing future accidents, may induce to erroneous interpretations and conclusions.*

**N.B.: This English version of the report has been written and published by the CENIPA with the intention of making it easier to be read by English speaking people. Taking into account the nuances of a foreign language, no matter how accurate this translation may be, readers are advised that the original Portuguese version is the work of reference.**

## SYNOPSIS

This is the Final Report of the 12JAN2019 accident with the PA-25-235 aircraft model, registration PR-MJA. The accident was classified as “[LALT] Low Altitude Operations”.

After the take-off, the plane crashed into the water, in a dam located in the extension of the landing area for aerial agricultural use from which it had departed.

The aircraft had substantial damage.

The pilot died.

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



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**GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS**

ANAC	Brazil's National Civil Aviation Agency
CA	Airworthiness Certificate
CENIPA	Aeronautical Accident Investigation and Prevention Center
CIV	Pilot's Flight Logbook
CMA	Aeronautical Medical Certificate
CSN	Cycles Since New
CSO	Cycles Since Overhaul
GPS	Global Positioning System
IAM	Annual Maintenance Inspection
IS	Supplementary Instruction
MGSO	Safety Management Manual
MNTE	Airplane Single Engine Land Rating
NSCA	Aeronautics Command System Standard
NTSB	National Transportation Safety Board (USA)
PAGA	Agricultural Pilot Rating
PCM	Commercial Pilot License – Airplane
PPR	Private Pilot License – Airplane
RADAR	Radio Detection and Ranging
RBAC	Brazilian Civil Aviation Regulation
SAE-AG	Aircraft Registration Category of Specialized Air service – Aerial Agricultural
SINDAG	National Union of Agricultural Aviation Companies
TSN	Time Since New
TSO	Time Since Overhaul
UTC	Universal Time Coordinated

## 1. FACTUAL INFORMATION.

<b>Aircraft</b>	<b>Model:</b> PA-25-235	<b>Operator:</b> <i>Aerodinâmica Aviação Agrícola Ltd.-ME</i>
	<b>Registration:</b> PR-MJA	
	<b>Manufacturer:</b> Piper Aircraft	
<b>Occurrence</b>	<b>Date/time:</b> 12JAN2019 - 1930 UTC	<b>Type(s):</b> "[LALT] Low Altitude Operations"
	<b>Location:</b> Santa Rita Farm	
	<b>Lat.</b> 27°41'57" <b>Long.</b> 052°43'42"W	
	<b>Municipality – State:</b> Campinas do Sul – RS	
		<b>Subtype(s):</b> Nil

### 1.1 History of the flight.

The aircraft took off from the agricultural landing area at the Santa Rita Farm, Campinas do Sul - RS, at 1930 UTC, in order to spray pesticide on a soy crop, with a pilot on board.

After the take-off, the pilot commanded a turn to the right and, in the sequence, started another to the left.

During this maneuver, the plane crashed into the water, in the dam located in the extension of the landing area for aerial agricultural use.

The aircraft had substantial damage.

The pilot died.

### 1.2 Injuries to persons.

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

### 1.3 Damage to the aircraft.

The aircraft had substantial damage. The left main landing gear came off the plane and there was damage to the fuselage and wings.

The aircraft remained submerged in the dam for almost 24 hours.

### 1.4 Other damage.

None.

### 1.5 Personnel information.

#### 1.5.1 Crew's flight experience.

Flight Hours	Pilot
Total	750:00
Total in the last 30 days	08:25
Total in the last 24 hours	00:00
In this type of aircraft	17:00
In this type in the last 30 days	08:25
In this type in the last 24 hours	00:00

**N.B.:** The data related to the flown hours were obtained through the CIV's records.



### 1.5.2 Personnel training.

The pilot took the PPR course at the Erechim Aeroclub – RS, in 2013.

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

The pilot had the PCM License and valid MNTE and PAGA Ratings.

### 1.5.4 Qualification and flight experience.

The pilot was qualified but had little experience in the type of flight. That was his first year as an agricultural pilot and he had flown 17 hours in the crashed model after being hired.

### 1.5.5 Validity of medical certificate.

The pilot had valid CMA.

### 1.6 Aircraft information.

The aircraft, serial number 25-2636, was manufactured by Piper Aircraft, in 1964, and it was registered in the SAE-AG category.

The aircraft had valid Airworthiness Certificate (CA).

The airframe, engine and propeller logbook records were outdated.

The last entry of the flown hours in Part I - "Monthly Usage Records" of the airframe logbook was dated October 2018. In addition, there were previous entries in which the ANAC code of the responsible for them was not included.

In the opening term of the engine and propeller logs, the ANAC code and the legible name of the person responsible for its signature had not been registered. The hours flown monthly have not been entered in these logbooks since March 2018.

The last inspection of the aircraft, of the "IAM" type, was carried out on 19NOV2018 by the maintenance organization REMASUL *Aviação e Manutenção de Aeronaves*, in São José - SC, with 13 hours and 25 minutes flown after the inspection.

The last most comprehensive inspection of the aircraft, the "500 hours" type, was carried out on 23OCT2017, also by REMASUL *Aviação e Manutenção de Aeronaves*, with 41 hours flown after the inspection.

### 1.7 Meteorological information.

It was found that the weather conditions were favorable for the visual flight, with visibility above 10 km and no significant cloudiness in the region where the flight would take place. The wind was between 08 and 10 kt (Figures 1 and 2).

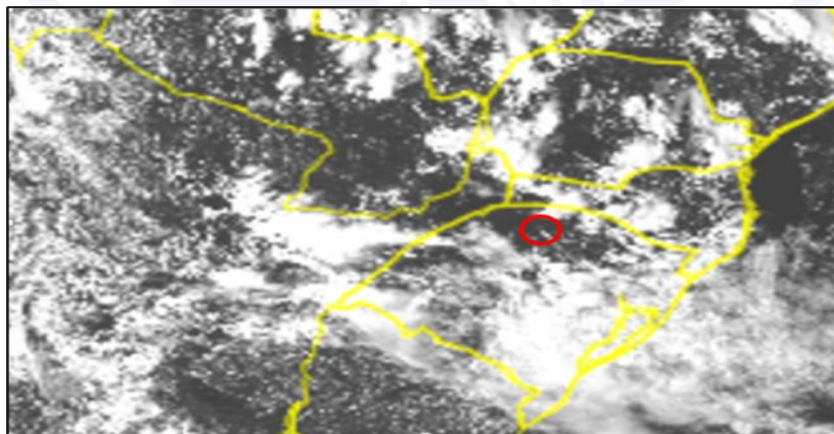


Figure 1 - Visible Satellite Image from 12JAN2019 at 1900 UTC. Highlighted in red, the region of the accident.

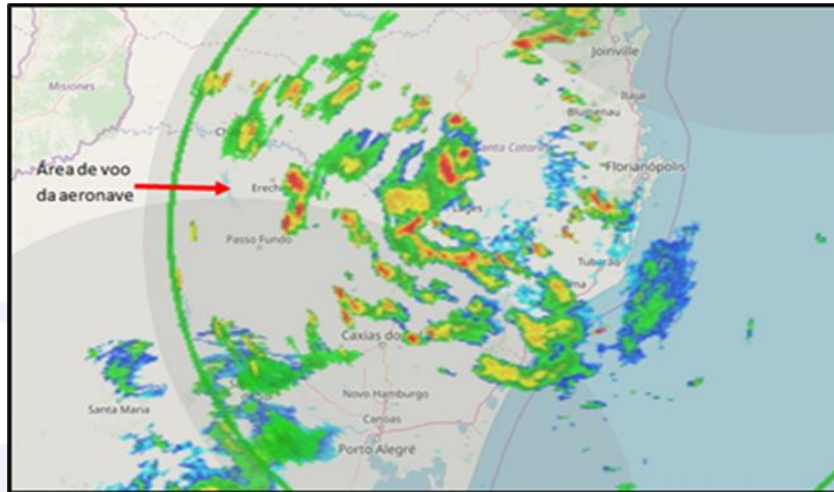


Figure 2 - Maxxcappi meteorological RADAR image of 12JAN2019 at 1932 UTC.

### 1.8 Aids to navigation.

Nil.

### 1.9 Communications.

Nil.

### 1.10 Aerodrome information.

The landing area for aerial agricultural use applied for the operation was compatible with the aircraft model.

There was a dam located at the end of the runway and the plantation where the spraying was being carried out was located in the west sector, to the left of the take-off head used by the pilot on the day of the accident (Figure 3).



Figure 3 - View of the dam from the landing area for aerial agricultural use.

### 1.11 Flight recorders.

Neither required nor installed.



## 1.12 Wreckage and impact information.

The aircraft crashed into the water in a left curve and with considerable speed. The left main landing gear wheel was torn off and the wing tip on that same side had impact marks (Figures 4 and 5).

After that, the plane tipped over and submerged on its back. The debris remained concentrated.

The landing gear was of the fixed type and the flaps were fully retracted.

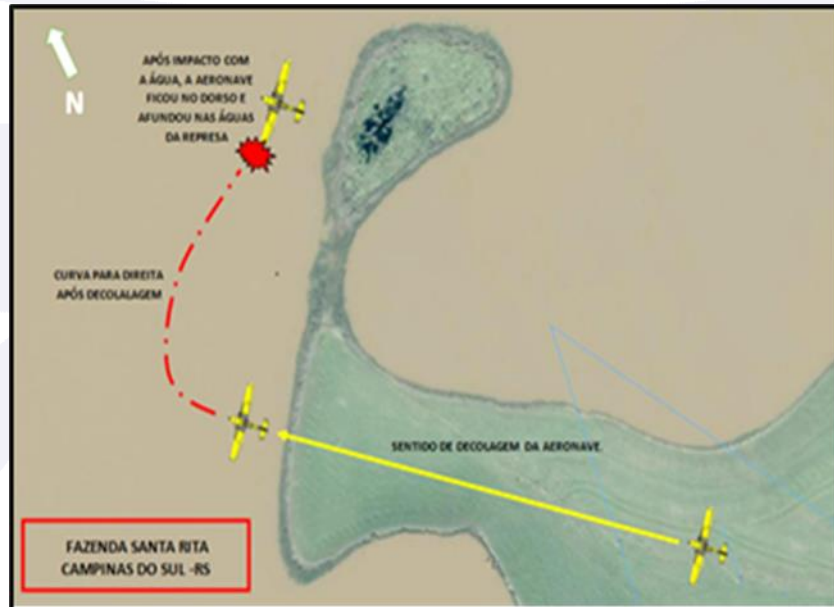


Figure 4 - Sketch of the estimated trajectory of the aircraft.



Figure 5 - View of the aircraft after being removed from the dam.

## 1.13 Medical and pathological information.

### 1.13.1 Medical aspects.

Coworkers reported that, on the morning of the accident, the pilot seemed calm and, apparently, in adequate physical and emotional conditions to carry out the flight.

According to the expert report, the cause of death was drowning asphyxia.

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

### **1.13.2 Ergonomic information.**

Nil.

### **1.13.3 Psychological aspects.**

The pilot was 25 years old, single and from the countryside of Rio Grande do Sul.

He worked for almost two years at the Erechim Aeroclub as a theoretical instructor, flight instructor and tow pilot of gliders and worked at Aerodynamic *Aviação Agrícola* Ltd. three months ago. At the time of this accident, he was flying his first year as an agricultural pilot.

During the interviews conducted, the pilot was described as a sociable, dedicated, calm person, attached to his family and who got along well with his coworkers.

According to the collected reports, he showed concern to maintain good health, nutrition and rest routine.

In the performance of the air activity, he was considered a skilled pilot who flew lower than other more experienced ones, during the application of agricultural defensives, even though he was in his first year as an agricultural pilot.

On the day of the accident, the pilot had flown over an area where some farmers were present and these people praised him, saying that he was flying better than the company owner by making the passes very close to the plantation.

According to the information provided to investigators, the pilot was very happy and declared that he wanted to celebrate that moment in his life.

Company employees said that, on the day of the accident, the weather was good, that the operating area was “great” (flat and free of obstacles) and with a “beautiful view”. They reported that this was the first time the pilot had operated in an area like that.

According to reports, on the day of the accident, a more experienced pilot from the company, who supervised the flights of the others, had held a briefing, before the beginning of the operation, in which they discussed the necessary precautions when flying over water and regarding the use of the GPS - Global Positioning System, in order to carry out a safe operation and how to avoid disorientation in flight over the dam.

### **1.14 Fire.**

There was no fire.

### **1.15 Survival aspects.**

The pilot was removed lifeless from the dam by divers from the Fire Department 24 hours after the accident. The body was stuck to the aircraft through the seat belt.

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

The Lycoming O-540-B2B5 engine, serial number L-7169-40, that powered the aircraft was examined and disassembled for analysis. Externally, he did not show severe damage resulting from the accident (Figure 6).



Figure 6 - View from the top of the engine.

There was water in its interior due to the fact that it remained submerged in the dam.

Examination and tests performed on the ignition system showed that both magnetos were functioning normally and that the spark plugs did not show discrepancies such as excessive wear or evidence of overtemperature and detonation.

In the same way, the carburetor disassembly did not reveal any condition that could have led to an inadequate fuel supply to the engine.

There was no sign of swarf contamination in the lubrication system and all moving internal components had lubricating oil residue, indicating proper system operation.

The cylinders and pistons also had no abnormalities, such as signs of detonation, fractures, jammed valves or overheating.

One of the propeller blades had a backward bending. Considering an impact against a liquid surface, the observed deformations did not follow a defined pattern that could indicate the power regime at the time of the accident. However, superficial transversal scratches were identified on the other blade, which indicated that the engine was running at the moment the aircraft hit the water (Figure 7).

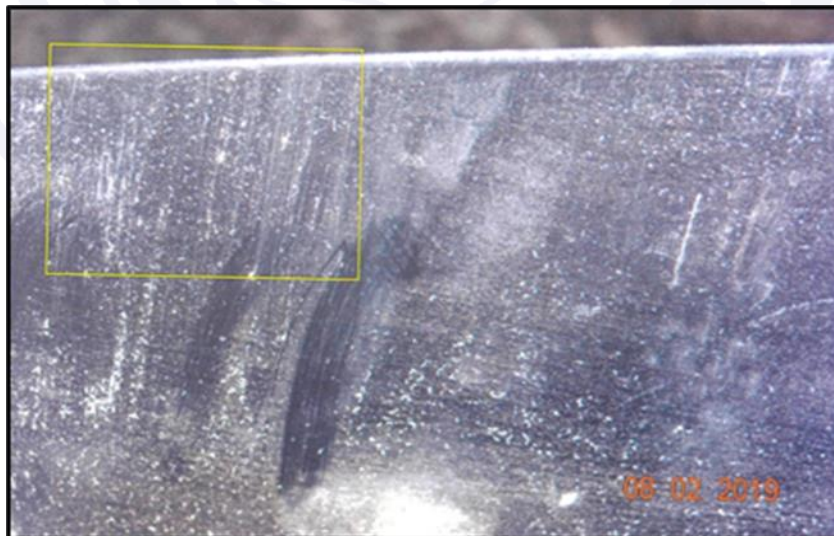


Figure 7 - Superficial transverse scratches on the propeller blade.

Examination of the wreckage also made it possible to verify the continuity of the command cables, which did not show any sign of disconnection or rupture.



### 1.17 Organizational and management information.

Aerodynamic *Aviação Agrícola* Ltd. was based in the municipality of Erechim - RS, and operated since 2007 in plantations throughout the Southern region of the country. It had six planes in its fleet and seven pilots.

The hiring of the pilot involved in this accident was made by appointment, without carrying out a selection process.

Aerodynamics held, between 30SEPT2018 and 16OCT2018, a training prior to the start of flights with the two newly hired pilots, which was given by a more experienced pilot.

According to investigators, the company assigned the more experienced pilots to the spraying areas considered the most difficult to fly, and they supervised the younger ones.

Since 2011, the company has had a sequence of occurrences (accidents and serious incidents), the last of which was an accident, on 19JAN2018, with the PR-JAO aircraft. In the accident history, available in the Final Report No. A-012/CENIPA/2018, it appears that, after performing a curve to frame the application axis, the aircraft collided with the ground.

In the Final Report produced by the CENIPA, the following Safety Recommendation was issued:

To the National Civil Aviation Agency (ANAC), it is recommended:

A-012/CENIPA/2018 – 01

Issued on: 06/25/2018

Work with the Aerodynamic *Aviação Agrícola* Ltd., in order to reassess the adequacy of the Safety Management Manual (MGSO) adopted by that operator, and in order to verify if the instructions contained in this document are being complied with by the company's crew.

In response to the Recommendation, the ANAC informed that it was considered fulfilled and that "the technical area sustained, in an order dated 20FEB2019, that the aerial agricultural operator in question has been adopting the necessary measures to raise the awareness of its crew".

### 1.18 Operational information.

It was a flight ruled by the RBAC No. 137, which dealt with the Certification and Operational Requirements for Aerial Agricultural Operations.

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

On the day of this occurrence, the company's Chief Pilot was flying in the same area of the accident. According to reports, a briefing was held between the two pilots, addressing the characteristics of the flight area and dividing the spraying sectors for each aircraft.

After the take-off, the pilot involved in this accident made a right turn, despite the spraying area being in the West sector, therefore, to the left of the take-off head.

### 1.19 Additional information.

Regarding the heights used in spraying flights, the Guide for Safe Aerial Application, made available by the SINDAG on its website on the internet, had in its paragraph 4.3 Flight Height, the following information:

#### 4.3 Flight height

The flight height immediately determines how far the drop will have to travel to the target. Add to the height the occurrence of winds, which deflect the drops laterally, and too high heights can lead to an excessive loss or displacement of drops, due to evaporation or the longer lateral path, resulting from the longer time of staying in the air. On the other hand, reduced heights cause a loss of efficiency due to the smaller width of the deposition band. Thus, the operator must remain aware of meteorological conditions and droplet deposition to establish an appropriate height

for the operation and, if necessary, undertake adjustments to the equipment such as those that define the size of the droplets produced. In general, larger drops have a higher deposition speed and, therefore, when used with adequate flight height, they are less influenced by atmospheric factors. As a good parameter to control the efficiency of the adjustment measures of the spraying parameters, the density control can be performed (see item 5.1.5)<sup>1</sup>.

Despite this study, in Brazil, the belief that aerial agricultural applications should be performed as close to the crop as possible was still common.

Supplemental Instruction (IS) No. 43.9-003 Revision A, in force on the date of the occurrence, which dealt with the Airframe, Engine and Propeller Logbooks, provided, in its sub-item 5.2.4 Part I - Monthly Use Control, letter E, the following:

5.2.4 Part I - Monthly Use Control: All airframe, engine and propeller logbooks must contain, right after the Opening Term, Part I, which constitutes the place for the Monthly Use Control. The content of Part I must contain, at least, what is established on pages 26, 34 and 42 of this IS, with other information deemed pertinent may be added, and aims to record the following:

e) For airframe: Time Since New (TSN), Cycles Since New (CSN), Code and Initials of the person who transcribed the data in the "Full Control" field. For engine: Time Since New (TSN), Cycles Since New (CSN), Time Since Overhaul (TSO), Cycles Since Overhaul (CSO), Code and Initials of the person who transcribed the data in the "Full Control" field. For propeller: Time Since New (TSN), Time Since Overhaul (TSO), Code and Initials of the person who transcribed the data in the "Full Control" field, as applicable.

## **1.20 Useful or effective investigation techniques.**

Nil.

## **2. ANALYSIS.**

It was a flight for the application of agricultural pesticide in a soybean crop conducted under the rules of the RBAC 137.

Considering that the information gathered on meteorological conditions in the region indicated good visibility, absence of significant clouds and winds not exceeding 10 kt, it was concluded that these factors had no role in the occurrence of this accident.

Examinations conducted on the aircraft's engine showed that it had no evidence of malfunction, indicating that the propeller was operational at the time of the accident.

This conclusion is supported by the transversal scratches found in one of the propeller blades, which were an indication that the engine was in operation at the moment the aircraft collided with the surface of the water.

The absence of signs of disconnection or rupture of the command cables also allowed eliminating the possibility of loss of control due to failure of the flight commands.

Thus, there was no evidence of any failure conditions or malfunctions of systems and/or components of the aircraft that could have affected its performance or its control in flight.

On the other hand, the reports that the pilot was considered skillful and daring for flying lower than his more experienced colleagues, during the application flights; of praise directed at him by farmers who believed that this conduct represented efficiency in the operation; and that the pilot would have expressed his excitement and desire to celebrate that moment; suggest a state of high motivation, which may have led him to takeoff with the intention of making a low flight over the dam.

<sup>1</sup> *Guia para Aplicação Aérea Segura*. Available on <https://sindag.org.br/estudos-cientificos-e-boas-praticas/>. Consultation on 02SEPT2021.



This hypothesis is corroborated by the fact that a right turn was made after the take-off, despite the fact that the spraying area is located in the West sector, to the left of the departure head, as well as the evidence, observed in the wreckage, that the aircraft was turning left and with considerable speed at the moment of the collision with the water.

In this context, it is possible that the pilot's actions were conducted under a state of overconfidence and impulsiveness that led him to adopt inappropriate postures such as exhibitionism and failure to observe aspects related to the operation conducted, which reduced the flight safety levels to point of allowing a controlled flight collision with water.

This enthusiasm with his life moment and operational performance may have resulted in difficulties in projecting sensations related to external stimuli and affected important cognitive functions, such as the perception regarding the risks inherent in performing maneuvers at low heights over water.

Such a scenario may also have impaired the pilot's ability to adequately assess his abilities to control the aircraft, as well as the behavior of the aircraft under those conditions (loaded for application flight), and caused him to touch the surface of the dam.

Likewise, the fact that the pilot has little experience in the type of flight, being in his first season, and having flown only 17 hours in the crashed model, may have negatively influenced his performance during the maneuver that resulted in this occurrence.

The analysis of the entire context of this occurrence also suggests that the concepts and processes related to the identification of hazards, the management of associated risks, and the guarantee of operational safety, established in the operator's MGSO, may not have been properly understood and applied to the flight in which this accident occurred.

Finally, although this condition did not contribute to the occurrence, the fact that the airframe, engine, and propeller logbooks have outdated Part I records, regarding the entry of flown hours, indicated inadequate supervision of the execution activities in the administrative and technical scopes, by the management (non-crew) of the organization, a latent condition that may affect the safety of the Aerodynamic Aviação Agrícola Ltd. Operations.

The same inadequacy was identified in relation to the performance of the maintenance organization REMASUL *Aviação e Manutenção de Aeronaves* which, on 19NOV2018, did not identify the non-conformities existing in the PR-MJA logbooks when recording compliance with an IAM in the aircraft documentation.

### **3. CONCLUSIONS.**

#### **3.1 Facts.**

- a) the pilot had valid CMA;
- b) the pilot had valid MNTE and PAGA Ratings;
- c) the pilot was qualified but had little experience in the type of flight;
- d) the aircraft had valid CA;
- e) the aircraft was within the weight and balance limits;
- f) the airframe, engine and propeller were outdated;
- g) the weather conditions were favorable for the flight;
- h) the plantation where the spraying was being performed was located in the west sector, to the left of the take-off head;
- i) after the take-off, the pilot made a right turn and then started a left turn;

- j) the aircraft collided with the water turning to the left;
- k) after the impact, the aircraft tipped over and submerged on its back;
- l) the engine was running when the aircraft hit the water;
- m) the control cables did not show any sign of disconnection or breakage;
- n) the aircraft had substantial damage; and
- o) the pilot died at the accident site.

### 3.2 Contributing factors.

#### - Attitude – undetermined.

It is possible that the pilot's actions were conducted under a state of overconfidence and impulsiveness that led him to adopt inappropriate postures such as exhibitionism and non-compliance with responsibilities related to the operation conducted, which reduced the flight safety levels to the point of allowing a collision in controlled flight against water.

#### - Piloting judgment – undetermined.

The scenario of enthusiasm and high motivation may have impaired the pilot's ability to adequately assess his abilities to control the aircraft, as well as the behavior of the aircraft under those conditions (loaded for the application flight), and resulted in touching the dam surface that triggered this accident.

#### - Motivation – undetermined.

It is possible that a state of high motivation caused the pilot to take off with the intention of making the low flight over the dam during which the aircraft crashed into the water.

#### - Perception – undetermined.

The pilot's enthusiasm with his life moment and operational performance may have resulted in difficulties in projecting sensations related to external stimuli and affected important cognitive functions, such as the perception of the risks inherent in performing maneuvers at low height over water.

#### - Insufficient pilot's experience – undetermined.

The fact that the pilot has little experience in the type of flight, being in his first year as an agricultural pilot, and having flown only 17 hours in the crashed model, may have negatively influenced his performance during the maneuver that resulted in this occurrence.

## 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):**

Strengthen the work with the Aerodynamic *Aviação Agrícola* Ltd., in order to reassess the adequacy of the MGSO adopted by that operator, verifying whether the instructions contained in this document are being complied with by the company's crew.

**A-008/CENIPA/2019 - 02****Issued on 02/09/2022**

Work with the Aerodynamic *Aviação Agrícola* Ltd., so that this operator demonstrates that its management supervision mechanisms are properly implemented and functioning, particularly concerning the activities related to the maintenance technical control of the aircraft it operates.

**A-008/CENIPA/2019 - 03****Issued on 02/09/2022**

Work with the REMASUL *Aviação e Manutenção de Aeronaves*, with the objective that this maintenance organization demonstrates that its management supervision mechanisms are properly implemented and functioning, particularly regarding activities related to the maintenance technical control of the aircraft it inspects.

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

On 11MAR2019, a class was held by the Investigation Committee, in the auditorium of the Erechim Aeroclub - RS. The topics covered were: good practices in aerial training and in aerial agricultural operations; study of accidents that have occurred and their contributing factors; and psychological aspects in the context of instructional and agricultural aviation.

39 people attended the lecture, including students and instructors from the Erechim Aeroclub, as well as agricultural pilots and pilots from the Aerodynamic *Aviação Agrícola*.

On February 09<sup>th</sup>, 2022.