COMANDO DA AERONÁUTICA

CENTRO DE INVESTIGAÇÃO E PREVENÇÃO DE ACIDENTES AERONÁUTICOS

FINAL REPORT
A-064/CENIPA/2022

OCCURRENCE:	**ACCIDENT**
AIRCRAFT:	**PR-CTD**
MODEL:	**PA-25-235**
DATE:	**17MAI2022**

NOTICE

According to the Law nº 7565, dated 19 December 1986, the Aeronautical Accident Investigation and Prevention System – SIPAER – is responsible for the planning, guidance, coordination, and execution of the activities of investigation and prevention of aeronautical accidents.

The elaboration of this Final Report was conducted considering the contributing factors and hypotheses raised. The report is, therefore, a technical document which reflects the result obtained by SIPAER regarding the circumstances that contributed or may have contributed to triggering this occurrence.

The document does not focus on quantifying the degree of contribution of the distinct factors, including the individual, psychosocial or organizational variables that conditioned the human performance and interacted to create a scenario favorable to the accident.

The exclusive objective of this work is to recommend the study and the adoption of provisions of preventative nature, and the decision as to whether they should be applied belongs to the President, Director, Chief or the one corresponding to the highest level in the hierarchy of the organization to which they are being forwarded.

This Final Report has been made available to the ANAC and the DECEA so that the technical-scientific analyses of this investigation can be used as a source of data and information, aiming at identifying hazards and assessing risks, as set forth in the Brazilian Program for Civil Aviation Operational Safety (PSO-BR).

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

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

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

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

SYNOPSIS

This Final Report pertains to the accident involving the PR-CTD aircraft, model PA-25-235, which occurred on May 17, 2022, and was classified as “[LOC-I] Loss of Control In-flight.”

Following takeoff, during a positioning maneuver for the application of agricultural product, control was lost and the airplane collided with trees near the runway.

The aircraft sustained substantial damage.

The pilot suffered fatal injuries.

An Accredited Representative of the National Transportation Safety Board (NTSB) – United States of America, the State of manufacture of the aircraft’s engine – was appointed for participation in the investigation of the accident.

Being Argentina the State of manufacture of the aircraft involved, an Accredited Representative of JST (*Junta de Seguridad en el Transporte*) was appointed for participation in the investigation of the accident.

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GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS

ANAC	Brazil's National Civil Aviation Agency
CENIPA	Center for the Investigation and Prevention of Aeronautical Accidents
CIV	Digital Pilot-Logbook
CMA	Aeronautical Medical Certificate
CVA	Certificate of Airworthiness
DCTA	Department of Science and Aerospace Technology
DECEA	Department of Airspace Control
GRSO	Operational Safety Risk Management
IAE	Institute of Aeronautics and Space
IFRA	Instrument Flight Rating – Airplane
MLTE	Multi-Engine Landplane Class Rating
MNTE	Single-Engine Landplane Class Rating
NTSB	USA's National Transportation Safety Board
PAGA	Ag-Pilot Rating - Airplane
PCM	Commercial Pilot License - Airplane
PIC	Pilot in Command
PPR	Private Pilot License - Airplane
PSO-BR	Brazilian Civil Aviation Safety Program
RBAC	Brazilian civil Aviation Regulation
SAE-AG	Private Specialized Public Air Service Registry Category – Aeroagricultural
SBPG	ICAO location designator - *Comandante Antônio Amilton Beraldo* Aerodrome, *Ponta Grossa*, State of *Paraná*
SIPAER	Brazil's Aeronautical Accidents Investigation and Prevention System
SISN	ICAO location designator - Fazenda Valiosa Aerodrome, *Brasilândia de Minas*, State of *Minas Gerais*
UTC	Coordinated Universal Time

1. FACTUAL INFORMATION.

Aircraft	**Model:** PA-25-235 **Registration:** PR-CTD **Manufacturer:** *LAVIASA.*	**Operator:** *Elo Forte Aviação Agrícola Ltda.*
Occurrence	**Date/time**: 17MAI2022 – 11:00 (UTC) **Location:** *Fazenda Valiosa* **Lat.** 17°04'13"S **Long.** 045°52'28"W **Municipality – State:** *Brasilândia de Minas – Minas Gerais*.	**Type(s):** [LOC-I] Loss of control - inflight

1.1. History of the flight.

The aircraft took off from SISN (*Fazenda Valiosa* Aerodrome, *Brasilândia de Minas*, State of *Minas Gerais*) on a local flight for application of agricultural pesticides, with 01 POB (pilot).

After takeoff, control of the aircraft was lost, and it collided with trees located near the runway and subsequently with the ground.

Figure 1 – General view of the aircraft at the accident site.

1.2. Injuries to persons.

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

1.3. Damage to the aircraft.

The aircraft sustained separation of the right wing and severe damage throughout its structure, with significant deformation to the forward section and wrinkling on the underside of the fuselage.

1.4. Other damage.

NIL.

1.5. Personnel information.

1.5.1. Crew's flight experience.

HOURS FLOWN	
	PIC
Total	954:35
Total in the last 30 days	Unknown
Total in the last 24 hours	Unknown
In this type of aircraft	Unknown
In this type in the last 30 days	Unknown
In this type in the last 24 hours	Unknown

Note: Flight hour data obtained through the records of the pilot's CIV (digital Individual Pilot-Logbook).

1.5.2. Personnel training.

The Pilot in Command (PIC) did his PPR course (Private Pilot – Airplane) in 2013, at *Aeroclube de Barretos*, State of *São Paulo*.

1.5.3. Category of licenses and validity of certificates.

The PIC held a PCM license (Commercial Pilot – Airplane). His ratings for MNTE (Single-Engine Land Airplane), MLTE (Multi-Engine Land Airplane), and IFRA (Instrument Flight – Airplane) had expired in April 2022, September 2021, and September 2020, respectively.

He held a valid rating for PAGA (Agricultural Pilot – Airplane).

1.5.4. Qualification and flight experience.

Records from the pilot's digital logbook (CIV) indicated that he did the PAGA course between August and October 2020, operating from SBPG (*Comandante Antônio Amilton Beraldo* Aerodrome, Ponta Grossa, PR).

The latest record entered in the said logbook dated October 22, 2020 – approximately 18 months prior to this accident.

The operator did not provide any information or records regarding the PIC's operational background. Therefore, it was not possible to determine whether he met the established criteria concerning recent experience.

The pilot was not qualified to conduct the flight.

1.5.5. Validity of medical certificate.

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

1.6. Aircraft information.

Lavia Argentina S.A. manufactured the serial number 25-3896, model PA-25-235, aircraft in 1966. It was registered under the Private Registry Category – Specialized Public Air Service – Agricultural Aviation (SAE-AG).

The aircraft had a valid CVA (Certificate of Airworthiness).

The records of the airframe, engine, and propeller logbooks were out of date. The latest entry in Part I – Monthly Utilization Records of the airframe and engine logbooks dated from December 2020. There were no entries in the propeller logbook presented to the Investigation Committee.

The latest existing entry in the flight logbook presented dated from March 7, 2022.

On May 11, 2022, the operator, *Elo Forte Aviação Agrícola Ltda*. carried out the latest inspections of the aircraft, types “100-hour” and “CVA renewal,” in *Paracatu*, State *of Minas Gerais*.

It was not possible to determine the number of flight hours accumulated after the referred inspections.

1.7. Meteorological information.

No meteorological information was available for the location where the accident occurred.

Witnesses who observed the aircraft's takeoff reported that the weather conditions were favorable for conducting the operation under the proposed flight rules.

1.8. Aids to navigation.

NIL.

1.9. Communications.

NIL.

1.10. Aerodrome information.

The accident occurred off-aerodrome.

1.11. Flight recorders.

Not required and not installed.

1.12. Wreckage and impact information.

The airplane collided with the ground in a densely forested area located near a stream, where trees were approximately 10 meters tall.

The terrain was predominantly flat and swampy.

The wreckage was concentrated.

Impact marks on the trees extended for about 20 meters in the direction of the aircraft’s approach (Figure 2).

Figure 2 – View of the PR-CTD aircraft's impact marks
in a direction opposite to its movement.

The forward fuselage was destroyed. The engine and propeller ended up partially buried in the ground, suggesting that the aircraft struck the terrain with a steep angle of impact.

The right wing had separated from the fuselage at its root, and rested near the wreckage. The left wing sustained severe damage but remained attached to the aircraft. The flaps were in a retracted position.

Figure 3 – View of the right wing separated from the aircraft,
near the wreckage.

The extent of the destruction made it impossible to inspect equipment and instruments.

There was damage to the cockpit due to rescue efforts.

A large amount of agricultural product was found within a 10-meter radius from the aircraft's final position, indicating that no jettisoning had occurred prior to impact.

1.13. Medical and pathological information.

1.13.1. Medical aspects.

NIL.

1.13.2. Ergonomic information.

NIL.

1.13.3. Psychological aspects.

The investigative elements related to psychological aspects are consolidated in the factual data under sections 1.17 (Organizational and Management Information) and 1.18 (Operational Information).

The decision to adopt this approach for the occurrence in question resulted from the fact that the human factors were intrinsically linked to the information presented in those sections, with psychological evidence emerging organically from the documented context. Therefore, keeping them integrated with the other factual elements contributes to a comprehensive understanding of the accident.

1.14. Fire.

No evidence of inflight or post-impact fire emerged.

1.15. Survival aspects.

NIL.

1.16. Tests and research.

Considering the condition of the right wing-to-fuselage attachment fittings, the trusses from both wings were sent for analysis at the Institute of Aeronautics and Space (IAE) of the Department of Science and Aerospace Technology (DCTA).

Figure 4 – View of the material sent for analysis.

In Figure 5, it is possible to observe the upper truss component of the right wing, along with a detail of its fracture surface. The surface in question exhibited widespread corrosion.

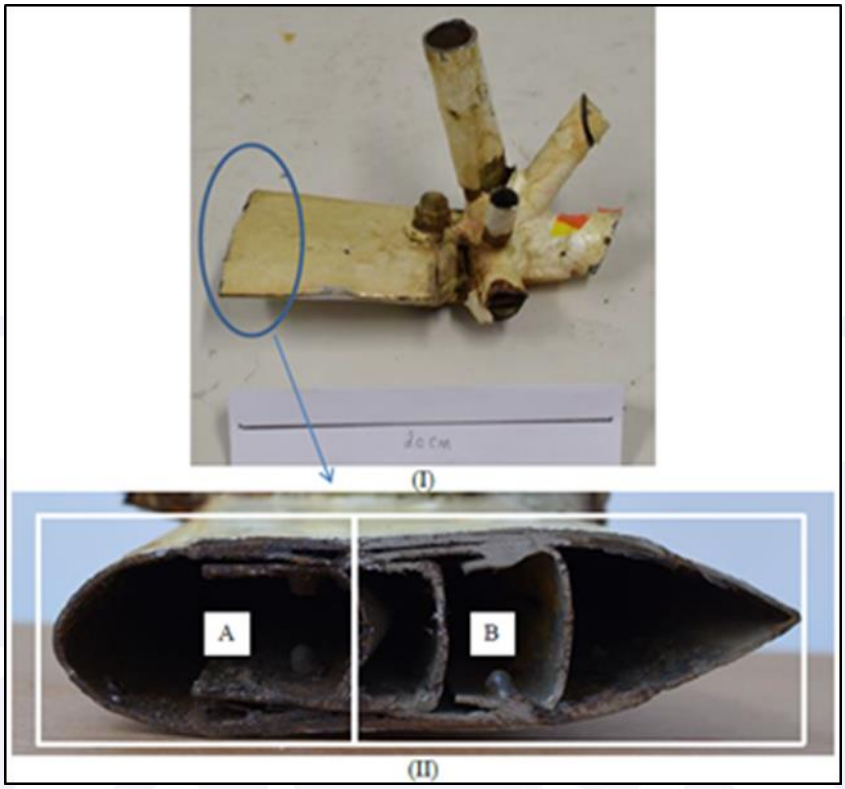

Figure 5 – View of the upper truss of the right wing.

Figure 6 shows a detailed view of the corroded surface (A), which appeared to predate the accident due to the extent of the damage. Corrosion on the internal side of the structure indicated the passage of fluids – liquid or gaseous – from the external to the internal area.

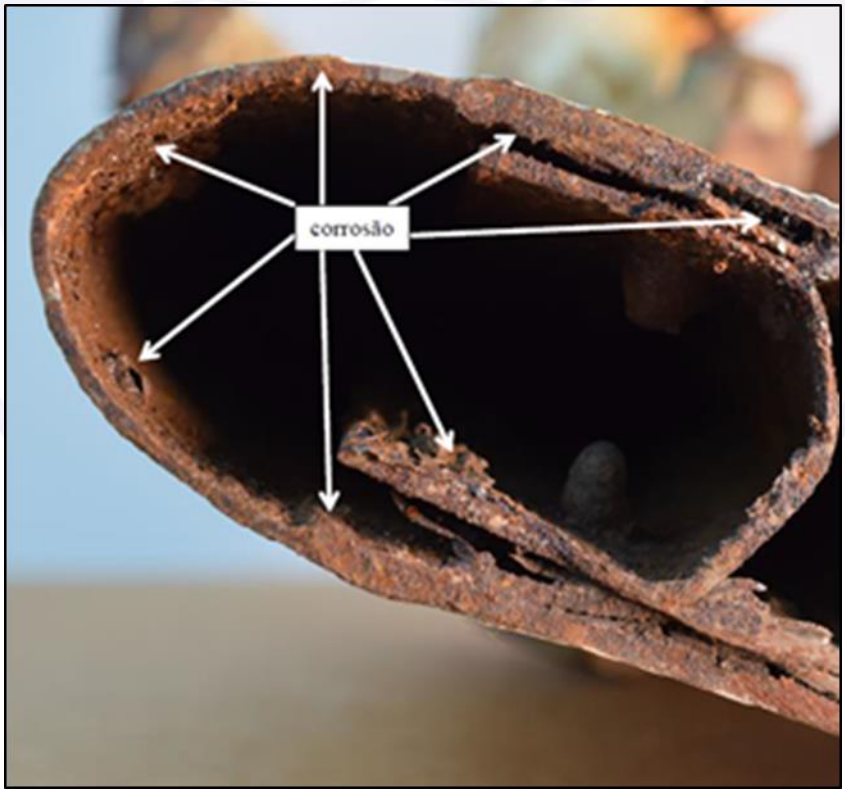

Figure 6 – Close-up view of region (A) shown in Figure 5.

Examination of the lower right wing fitting revealed a fracture with typical characteristics of failure due to overload (Figure 7).

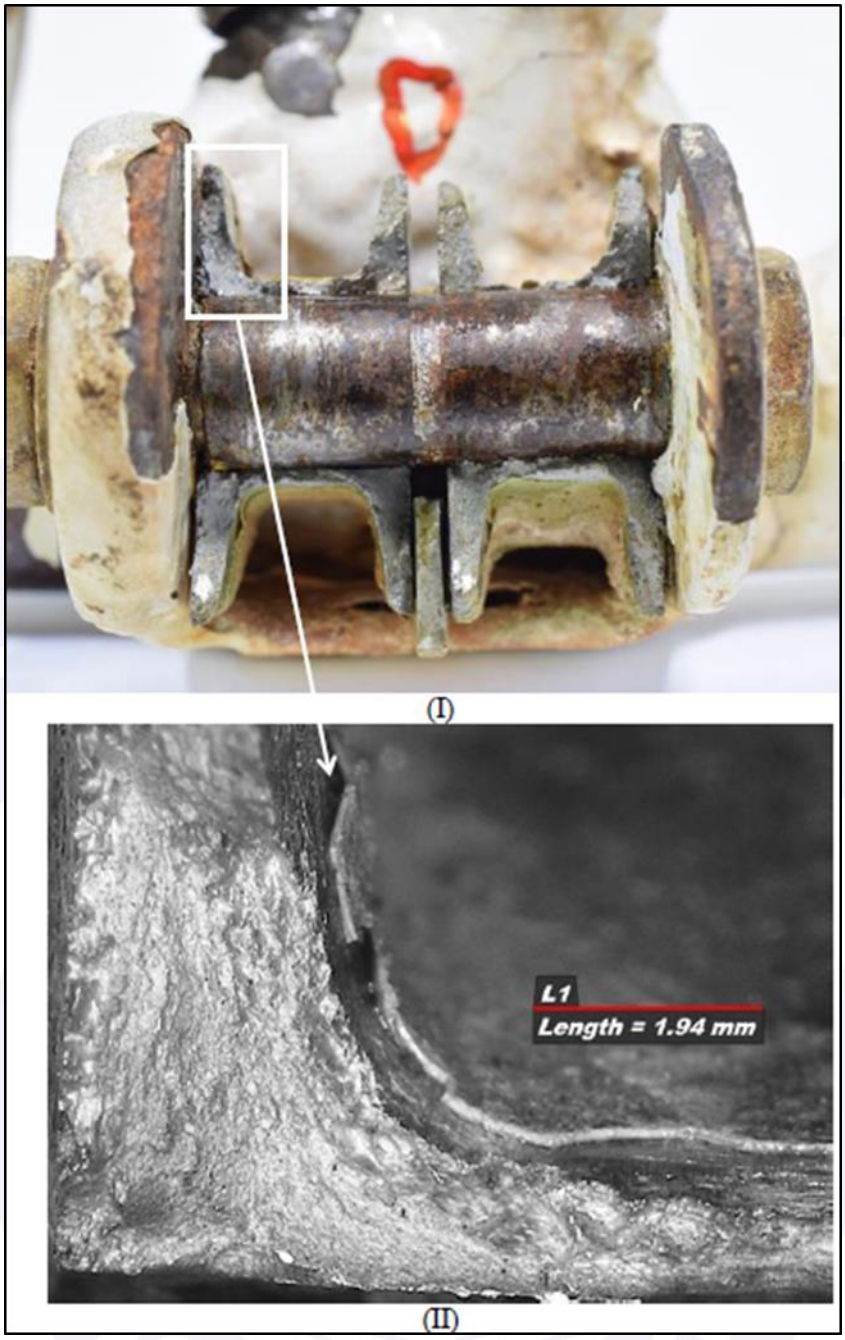

Figure 7 – View of the lower truss and the lower fitting of the right wing.

Welds were also observed on the lower truss of the right wing, where overlapping tubes of different thicknesses had been applied and welded. No entries were found in the aircraft's airframe logbook that could be associated with this condition, referring either to acceptable technical data with repair instructions or to the execution of the service itself.

A longitudinal cut allowed for the measurement of differences in thickness between the welded tubes (Figure 8).

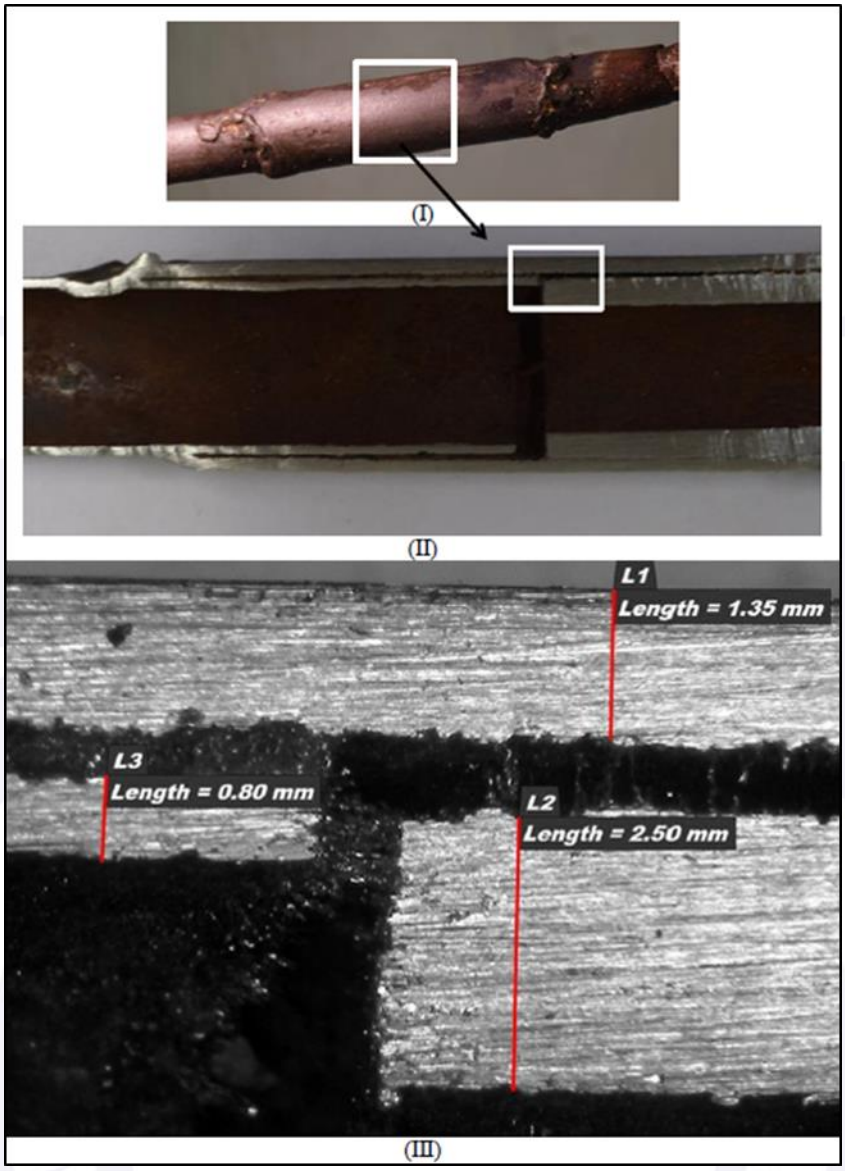

Figure 8 – Internal view of the right lower truss tube showing the thickness of the welded tubes.

On the lower truss of the left wing, widespread corrosion with material loss was also observed (Figure 9).

The advanced stage of the observed corrosion indicated that the corrosive process had been ongoing for a significantly long period prior to the most recent maintenance activities.

Figure 9 – View of the lower truss of the left wing showing widespread corrosion.

Regarding the powerplant, physical evidence at the accident site – such as propeller deformation consistent with rotational impact – indicated that the engine was producing power at the time of impact.

1.17. Organizational and management information.

The operator and owner of the PR-CTD aircraft was a small-sized company, certified to provide public specialized aerial service for agricultural activity, in accordance with the requirements established in the Brazilian Civil Aviation Regulation No. 137 (RBAC-137), Amendment No. 04, which addresses Certification and Operational Requirements for Agricultural Aviation Operations.

Its headquarters was located in the city of *Paracatu*, State of *Minas Gerais*.

The Investigation Committee did not have access granted by the company to the Operational Safety Risk Management (GRSO) for the area where the operation was being conducted. No evidence was submitted indicating the existence of effective action focused on operational safety.

Data obtained from the Regulatory Agency showed that the PA-25-235 model was not listed in the Operational Specifications (EO) of Elo Forte Aviação Agrícola Ltda.

Nor was it demonstrated that there was any operational control in place, specifically regarding flight hour records and the validity of the pilot's ratings.

1.18. Operational information.

This was a pesticide application flight conducted in accordance with the requirements established by RBAC 137, with only the pilot on board.

According to the weight and balance sheet provided to the Investigation Committee, dated December 2, 2015, the empty weight of the PR-CTD was 1,562 lb., and the maximum takeoff weight was 2,900 lb.

As per the interviews conducted, the aircraft had been refueled with 80 liters of ethanol and was carrying 500 liters of agricultural pesticide. The type or density of the product used during the operation was not informed. Therefore, it was not possible to determine whether the aircraft was within the weight and balance limits specified by the manufacturer.

Likewise, there were no records or any type of control regarding the fuel supplies being carried out, nor of the agricultural product used in the operation.

According to information provided to the Investigation Committee, the day's flight routine began around 08:30 UTC. Two takeoffs had been carried out prior to the flight during which this accident occurred.

According to the operation assistant, the procedures prior to takeoff proceeded as usual, and no abnormalities were observed with the aircraft or the pilot.

The operation was being conducted from the airstrip of *Fazenda Valiosa* (SISN), a dirt strip measuring 1,100 meters in length and 18 meters in width. The starting point of the application area was located approximately 0.5 NM to the left of the takeoff airstrip.

The typical flight profile flown by the PIC to enter the application circuit consisted of taking off and performing a left turn to intercept the axis of the application area for the start of the spray run.

At around 11:00 UTC, during the takeoff in which the accident occurred, the PR-CTD was seen by witnesses flying a trajectory that differed from the usual profile and at a lower altitude than in previous flights. Shortly afterward, the sound of the aircraft striking the trees was heard.

Based on the information collected and the indications observed regarding the dynamics of the occurrence, it was estimated that the airplane followed the trajectory shown in Figure 10 below.

Figure 10 – Sketch of the aircraft's trajectory. The dashed blue line shows the usual profile. The dotted red line shows an estimate of the trajectory during this accident.
Source: adapted from Google Earth.

1.19. Additional information.

With regard to crew requirements, RBAC 137 established the following:

> 137.207 Pilot Requirements
>
> (a) Only agricultural pilots licensed in accordance with RBAC No. 61 and holding a valid Aeronautical Medical Certificate (CMA), issued in accordance with RBAC No. 67, have permission to conduct agricultural aviation operations.

In the context of the accident in question, RBAC No. 61, Amendment No. 13, which addresses Pilot Licenses, Ratings, and Certificates, specified the following in Section 61.247 – Privileges and Limitations of the Holder of an Agricultural Pilot Rating:

> 61.247 Privileges and Limitations of the Holder of an Agricultural Pilot Rating
>
> [...]
>
> (b) In order to exercise the privileges of the agricultural pilot rating, the holder must also hold the corresponding rating for the aircraft used in the agricultural operation, valid in accordance with Sections 61.19, 61.25, and 61.33 of this Regulation.
>
> [...]

Regarding risk management in agricultural aviation operations, RBAC 137 presented the following requirements in Section 137.517 – Records and Reports:

> 137.517 Records and Reports
>
> [...]
>
> (b) The COA holder must prepare and keep on file at its headquarters, for a minimum period of 5 years, and make available to INSPAC upon request, the safety risk management (GRSO) analysis reports developed for agricultural operations.
>
> (c) The COA holder must record and document aspects related to the implementation of its SGSO, operational safety processes, and GRSO cycles developed within the company.
>
> [...]

1.20. Useful or effective investigation techniques.

NIL.

2. ANALYSIS.

This was a pesticide application flight conducted under the requirements established by RBAC 137.

The airstrip on *Fazenda Valiosa* had characteristics suitable for the safe operation of the aircraft involved in the accident.

Based on reports from witnesses who visually observed the aircraft's takeoff, the weather conditions were favorable for conducting the operation under the rules applicable to the proposed type of flight.

Although the pilot held a valid PAGA rating, his MNTE rating had expired in April 2022. RBAC 61 stipulated that the agricultural pilot privileges could only be exercised if the rating corresponding to the aircraft used in the agricultural operation was also valid.

Therefore, it was not possible to determine whether the PIC possessed the full range of knowledge and skills necessary to safely operate the aircraft, as he had not undergone a proficiency check within the period established by the regulation governing that operation.

Thus, conducting the flight with an expired required rating characterized the adoption of improper postures such as complacency, overconfidence, and disregard for a requirement established by RBAC 61, whose contribution to this accident could not be adequately measured.

In this context, there was evidence of inadequate oversight by the organization's management (non-flight personnel) regarding planning and execution activities at both administrative and operational levels. This led to the aircraft being operated by an unqualified pilot, a circumstance whose contribution to this occurrence could likewise not be conclusively assessed.

Such circumstance also revealed inefficiencies in personnel and process management, particularly in terms of supervision and the structuring of organizational procedures vital to maintaining operational safety, such as the control of crew qualifications – whose role in this accident could not be properly evaluated.

Regarding the aircraft, since the type and density of the product used in the operation were not provided to the Investigation Committee, it was not possible to determine whether the aircraft was within the weight and balance limits specified by the manufacturer at the time of the accident.

Reports from witnesses indicating that the aircraft followed an unusual trajectory at a lower altitude than in previous flights suggest that an abnormal condition may have been present before the collision with the ground.

Analysis of the wreckage showed that the engine and propeller were partially buried in the ground, suggesting a steep impact angle – a situation commonly associated with in-flight loss of control.

Moreover, physical evidence at the accident site, such as propeller deformation consistent with rotational impact, indicated that the engine was operating and producing power at the time of impact.

Although the right wing was found separated from the fuselage, it was located near the wreckage concentration point, indicating that this complete separation did not occur in flight.

Component examinations performed on both wings showed that the upper truss of the right wing exhibited a fracture with a surface showing widespread corrosion. Examination of the lower fitting of that same wing revealed a fracture with typical characteristics of failure due to overload.

These pieces of evidence indicated that there was weakening of the right wing's upper truss, initiating a structural failure (partial separation) that prevented the maintenance of the aircraft's flight path and led to loss of control. With the impacts sustained during the aircraft's descent, the lower fitting of that same wing failed due to overload, resulting in the complete separation of that part of the airplane.

The widespread corrosion observed in the analyzed components indicated that the aircraft's structure had already been compromised well before the most recent maintenance activities. This condition weakened the material and could have led to imminent failure.

The presence of welds and the use of tubes with different thicknesses in the lower truss of the right wing also suggested that the wing structure had previously undergone repairs. Combined with the corrosion, this may have contributed to the partial structural collapse in flight.

These findings demonstrated that the maintenance personnel failed to identify or correct the corrosion process that had already been affecting the aircraft, a circumstance that may have contributed to the structural failure.

It is important to emphasize that the airworthiness verification for the purpose of issuance of the respective CVA had the purpose of checking, among other aspects, whether the aircraft had the correct documentation, whether all major repairs were conducted based on approved technical data, and whether all discrepancies were repaired in accordance with current regulations.

Furthermore, the aircraft utilization records were incomplete, with missing entries regarding the number of flight hours logged after December 2020.

These circumstances raised doubts about the actual airworthiness condition of the accident aircraft.

The fact that the company did not present evidence of having adopted effective measures to mitigate the risks associated with the agricultural operations it conducted (GRSO), in conjunction with the other latent failures identified in this investigation, demonstrated the prevalence of collective perceptions that reflected low adherence to flight safety principles and pointed to the absence of a safety culture, which may have contributed to the accident in question.

Finally, inadequate supervision was identified on the part of the organization's management over the planning and execution activities within both technical and administrative scopes, by failing to identify the inadequacy of the maintenance services performed on the aircraft and not implementing effective control over crew qualification and the production of the required GRSO, which may have played a role in the accident under investigation.

3. CONCLUSIONS.

3.1. Findings.

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

b) the pilot's MNTE and MLTE ratings had been expired since April 2022 and September 2021, respectively;

c) the pilot's PAGA rating was valid;

d) the pilot was not qualified to conduct the flight;

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

f) it was not possible to determine whether the aircraft was within the weight and balance limits specified by the manufacturer;

g) the airframe, engine, and propeller logbooks were not up to date;

h) during the takeoff in which the accident occurred, the PR-CTD was observed flying a trajectory that deviated from the usual profile and at a lower altitude than in previous flights;

i) the aircraft collided with the ground in a densely wooded area;

j) the right wing was separated from the fuselage at its root and was located near the wreckage;

k) examination of the right wing's upper truss revealed a fracture surface with a region of widespread corrosion;

l) examination of the lower fitting of the right wing revealed a fracture with typical characteristics of failure due to overload;

m) welds were observed on the lower truss of the right wing, with overlapping tubes of different thicknesses having been applied and welded;

n) on the lower truss of the left wing, widespread corrosion with material loss was observed;

o) the aircraft sustained substantial damage; and

p) the PIC suffered fatal injuries.

3.2. Contributing factors.

- **Attitude – undetermined.**

Conducting the flight with an expired required rating reflected the adoption of improper postures such as complacency, overconfidence, and disregard for a requirement established by RBAC 61. The extent of this factor's contribution to the accident could not be adequately measured.

- **Organizational culture – undetermined.**

The fact that the company did not provide evidence of implementing effective measures to mitigate the risks associated with its agricultural operations (GRSO), in conjunction with other latent failures identified in this investigation, demonstrated the predominance of collective perceptions reflecting low adherence to flight safety principles and the absence of a safety culture – circumstances that may have contributed to the accident.

- **Aircraft maintenance – a contributor.**

The presence of widespread corrosion in the aircraft's wing structural components, as well as the presence of welds and overlapping tubes of different thicknesses on the lower truss of the right wing, evidenced the performance of inadequate maintenance services that contributed to the in-flight structural failure.

- **Organizational processes – undetermined.**

There was evidence of inefficiency in personnel and process management, particularly regarding the supervision and structuring of organizational procedures essential to the maintenance of operational safety, such as crew qualification control, whose contribution to this accident could not be adequately assessed.

- **Managerial oversight – a contributor.**

There was evidence of inadequate oversight by the organization's management regarding the planning and execution of technical activities, as they failed to identify the inadequacy of the maintenance services performed on the aircraft and did not effectively control crew qualifications or the production of the required GRSO, which may have contributed to the accident under investigation.

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".

Recommendations issued at the publication of this report:

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

A-064/CENIPA/2022 - 01 **Issued on 07/03/2025**

Liaise with *Elo Forte Aviação Agrícola Ltda.*, to ensure that the operator demonstrates that its managerial oversight mechanisms ensure the quality of maintenance services performed on its aircraft, particularly with regard to the identification of corrosion processes affecting the airplanes it operates and the application of recommended corrective actions for this issue.

A-064/CENIPA/2022 - 02 **Issued on 07/03/2025**

Liaise with *Elo Forte Aviação Agrícola Ltda.*, to ensure that the operator demonstrates that its implemented organizational processes provide adequate supervision and structuring of procedures essential to the maintenance of operational safety – such as the control of qualifications of crewmembers assigned to the company's flights, as well as those related to risk management.

5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN.

None.

On July 3rd, 2025.