COMANDO DA AERONÁUTICA

CENTRO DE INVESTIGAÇÃO E PREVENÇÃO DE ACIDENTES AERONÁUTICOS

FINAL REPORT
A-120/CENIPA/2023

OCCURRENCE:	**ACCIDENT**
AIRCRAFT:	**PS-GVR**
MODEL:	**AT-502B**
DATE:	**12AGO2023**

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 an AT-502B aircraft, registered as PS-GVR, which occurred on August 12, 2023. The occurrence was classified as “[LALT] Low Altitude Operation.”

During an agricultural pesticide application flight, the aircraft collided with a power transmission line cable. The pilot then executed a forced landing in a plantation area.

The aircraft sustained substantial damage, while the pilot remained uninjured.

Being Canada the State of Engine Design, the Canadian TSB (Transportation Safety Board) appointed and Accredited Representative 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
ANAC	Argentina's *Administración Nacional de Aviación Civil*
CASA	Australia's Civil Aviation Safety Authority
CIV	Digital Pilot-Logbook
CMA	Aeronautical Medical Certificate
CVA	Certificate of Airworthiness
DECEA	Brazilian Air Force's Department of Airspace Control
FAA	USA's Federal Aviation Administration
NTSB	USA's National Transportation Safety Board
MNTE	Single-Engine Landplane Class Rating
NASDARF	USA's National Association of State Departments of Agriculture Research Foundation
PAGA	Agricultural Pilot Rating - Airplane
PCM	Commercial Pilot License - Airplane
PIC	Pilot in Command
PPR	Private Pilot License - Airplane
PSO-BR	Brazilian Civil Aviation Safety Program
SERIPA V	Cenipa's Fifth Regional Office for the Investigation and Prevention of Aeronautical Accidents
SINDAG	Brazil's National Agricultural Aviation Companies' Union
RBAC	Brazilian Civil Aviation Regulation
SACI	Integrated Civil Aviation Information System
SIPAER	Brazil's Aeronautical Accidents Investigation e Prevention System
SSCW	ICAO location designator - *Fazenda Centro-Oeste* Aerodrome, *Nova Maringá*, State of *Mato Grosso*
TPP	Private Air Services Registration Category
TSB	*Canada's Transportation Safety Board*
UTC	Coordinated Universal Time

1. FACTUAL INFORMATION.

Aircraft	**Model:** AT-502B **Registration:** PS-GVR **Manufacturer:** Air Tractor.	**Operator:** Private.
Occurrence	**Date/time**: 12AGO2023 - 20:30 (UTC) **Location:** *Fazenda Centro Oeste* **Lat.** 13°23'16"S **Long.** 057°09'26"W **Municipality – State:** *Nova Maringá – Mato Grosso.*	**Type(s):** [LALT] Low altitude operations

1.1. History of the flight.

At 20:03 UTC, the aircraft took off from SSCW (Fazenda Centro Oeste Aerodrome, Nova Maringá, State of Mato Grosso) for a local agricultural pesticide application flight, with one person on board (POB) – the pilot.

Twenty-seven minutes into the flight, the aircraft collided with a power transmission line cable. As a result of the impact, it lost part of the rudder and the vertical stabilizer.

Following the collision, the pilot attempted to land on runway 16 at SSCW. He made three unsuccessful landing attempts at Fazenda Centro Oeste Aerodrome before opting for a forced landing in a cotton plantation.

The aircraft sustained substantial damage, whereas the pilot remained uninjured.

Figure 1 – Left-side view of the aircraft after coming to a complete stop.

1.2. Injuries to persons.

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

1.3. Damage to the aircraft.

The aircraft sustained substantial damage. Upon impact with the transmission cable, it lost part of the rudder and vertical stabilizer (Figure 2).

Figure 2 – View of the vertical stabilizer.

During the forced landing, the aircraft sustained damage to the right main landing gear and right wingtip, as well as dents on the right flap and aileron, wrinkling on the upper surface of the right wing, dents on the trailing edge of the right elevator, and a fracture with separation of the tailwheel assembly.

1.4. Other damage.

The collision damaged a power transmission cable belonging to *Aliança de Energia Elétrica S.A.*, the public electricity transmission concessionaire, resulting in the emergency shutdown of Circuit Two of the 230 kV *Brasnorte/Nova Mutum* Transmission Line.

Figure 3 – View of the transmission cable after the collision.

1.5. Personnel information.

1.5.1. Crew's flight experience.

Hours Flown	
	PIC
Total	3,300:00
Total in the last 30 days	42:00
Total in the last 24 hours	04:00
In this type of aircraft	880:00
In this type in the last 30 days	42:00
In this type in the last 24 hours	04:00

RMK: Flight hour information was obtained from the aircraft logbook, the pilot's Digital Logbook (CIV) available in the Civil Aviation Integrated Information System (SACI) of the ANAC (National Civil Aviation Agency), and complemented by information provided by the pilot.

1.5.2. Personnel training.

The PIC (Pilot in Command) did his PPR course (Private Pilot – Airplane) in 2007.

1.5.3. Category of licenses and validity of certificates.

The PIC held a PCM License (Commercial Pilot – Airplane) with valid ratings for MNTE (Single-Engine Landplane) and PAGA (Agricultural Pilot – Airplane).

1.5.4. Qualification and flight experience.

Records from the digital CIV indicated that the pilot had been operating the AT-502B aircraft (registration PS-GVR) since April 2023, and frequently used SSCW aerodrome for local flights.

A significant portion of the PIC's operational history was built while working for the operator of the accident aircraft. As of the accident date, he had accumulated 880 flight hours on that aircraft model.

The pilot was familiar with the accident location and had a total of 3,300 flight hours, the vast majority of which in agricultural aviation operations.

He was qualified and experienced in this type of flight.

1.5.5. Validity of medical certificate.

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

1.6. Aircraft information.

The AT-502B aircraft (serial number 502B-3406) was manufactured by Air Tractor in 2023 and registered under the Private Aerial Services (TPP) category.

The airplane's CVA (Certificate of Airworthiness) was valid.

The records of the airframe, engine, and propeller logbooks were up to date.

The most recent "100-hour" inspection was performed on June 19, 2023, *by SOMA - Serviços Oficina e Manutenção Aeronáutica Ltda.*, in *Primavera do Leste*, State of *Mato Grosso*. The aircraft flew 86 hours and 25 minutes after the referred inspection.

At the time of the accident, the aircraft had a total of 285 flight hours.

1.7. Meteorological information.

The weather conditions were above the minimum required for the operation under the proposed flight rules.

1.8. Aids to navigation.

NIL.

1.9. Communications.

NIL.

1.10. Aerodrome information.

Not applicable.

1.11. Flight recorders.

Not required and not installed.

1.12. Wreckage and impact information.

The aircraft was flying on a 063° heading when it collided with a power transmission line cable in the rural area of *Nova Maringá*, State of *Mato Grosso* (Figure 4).

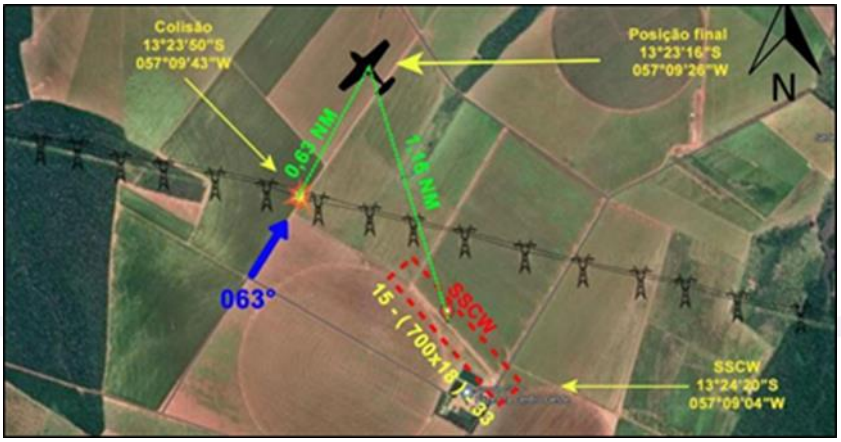

Figure 4 – Sketch of the impact site and wreckage location.

Upon impact with the transmission cable, part of the vertical stabilizer and rudder were torn off. The rudder and the severed section of the vertical tail assembly were found a few meters from the main wreckage concentration site.

After three landings attempts at SSCW, the PIC performed a forced landing in a cotton plantation.

The aircraft approached the landing site on a 145° heading. Upon initial ground contact, it traveled 237 meters, veered left, and came to a stop on a 343° heading (Figure 5).

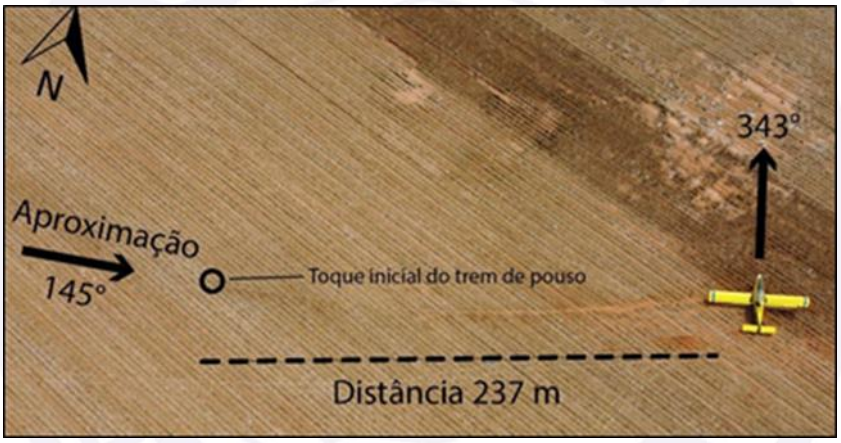

Figure 5 – Aircraft trajectory during landing.

During ground roll, the right wingtip, flap, right aileron, and right elevator made contact with the terrain, resulting in damage to these surfaces. The tailwheel also fractured and separated.

The wreckage was located 1.16 NM from the aerodrome and, except for the sections severed upon impact with the transmission line, remained concentrated.

1.13. Medical and pathological information.

1.13.1. Medical aspects.

There was no evidence that physiological factors or incapacitation affected the pilot's performance.

1.13.2. Ergonomic information.

Upon analyzing the characteristics of the pesticide application area, the Investigation Committee verified that there were multiple power transmission towers in the vicinity. The application paths crossed transversely over the cables supported by these towers.

According to information provided by DECEA (Department of Airspace Control) on its website, sunset at SSCW on the date of the occurrence was at 21:42 UTC.

Thus, considering that the aircraft was flying on a 063° heading when it collided with the transmission cable, the sun was behind the pilot, meaning it did not directly impair forward visibility. However, given the time of operation, light conditions were reduced (Figure 6).

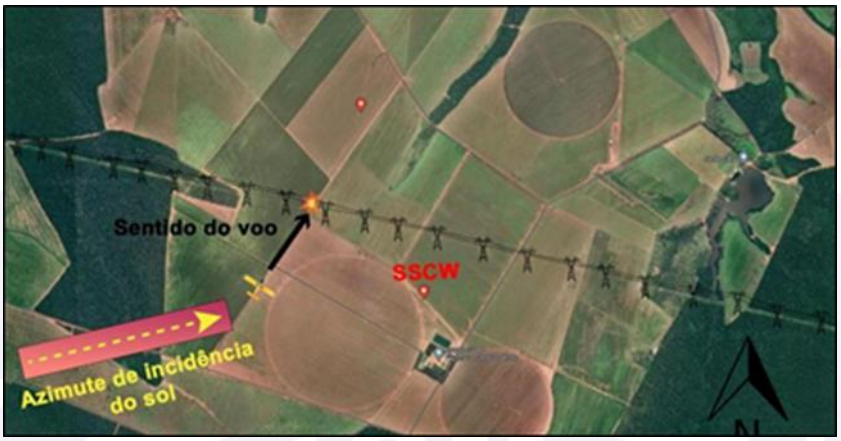

Figure 6 – Diagram showing the approximate sun azimuth at the time of the accident.
Source: Adapted from Google Maps.

1.13.3. Psychological aspects.

The PIC was employed by the owner of *Fazenda Centro Oeste*, who was also the owner of the aircraft. They had a good interpersonal relationship.

On the day of the accident (a Saturday), the pilot had already performed two previous takeoffs, accumulating three flight hours, and was finishing his work shift with the application passes he was conducting at the time of the occurrence.

He stated that after the flight, he had planned to return home, which was located approximately 180 km from *Fazenda Centro Oeste*.

It was determined that agricultural aviation operations involving flights below power transmission cables were a common practice in that area.

1.14. Fire.

There was no evidence of fire, either in-flight or post-impact.

1.15. Survival aspects.

NIL.

1.16. Tests and research.

NIL.

1.17. Organizational and management information.

NIL.

1.18. Operational information.

The operation was conducted under Brazilian Civil Aviation Regulation n° 137 (RBAC-137), Amendment 04, which governs the certification and operational requirements for agricultural aviation operations.

The aircraft had a fuel capacity of 644 liters and was loaded with 500 liters at the time of the accident. The hopper had a capacity of 1,893 liters and contained 140 liters at the time.

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

Fazenda Centro Oeste was intersected by a power transmission line with high-voltage towers approximately 25 meters high. These towers supported cables spanning 500 meters, with the lowest cable approximately 12 meters above the ground (Figure 7).

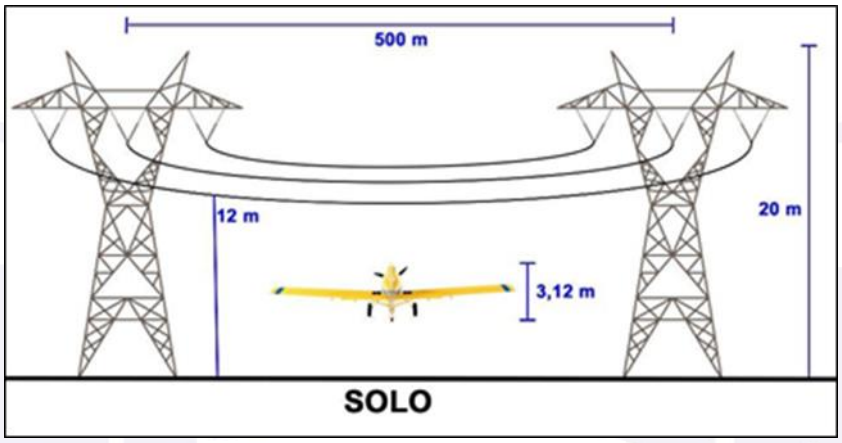

Figure 7 – Diagram of the transmission towers and cable layout.

The pilot was familiar with the location and the power grid layout. The application area belonged to the aircraft operator.

On the day of the occurrence, the PIC had already logged three hours across two flights prior to the accident flight.

Takeoff from SSCW Aerodrome occurred at 20:03 UTC, with the objective of applying pesticides over an area of approximately 140 hectares.

According to collected reports, during this flight, the PIC began the operation with spray passes on a northeast/southwest course (approx. 240° heading), which were perpendicular to the transmission line. He was flying with the sun in front and passing under the transmission cables.

After the pass preceding the collision, the pilot was maneuvering the aircraft for another pass when it struck the lowest cable of the power line.

According to the PIC's statement, at that moment, his attention was focused on stabilizing the aircraft along the correct axis, which is why he did not perceive his proximity to the transmission cables.

After the collision, the pilot realized he was having difficulty controlling the aircraft and decided to proceed to SSCW Aerodrome, located 0.86 NM from the impact site.

By making left turns, he aligned the aircraft for an approach to runway 15 (Figure 8).

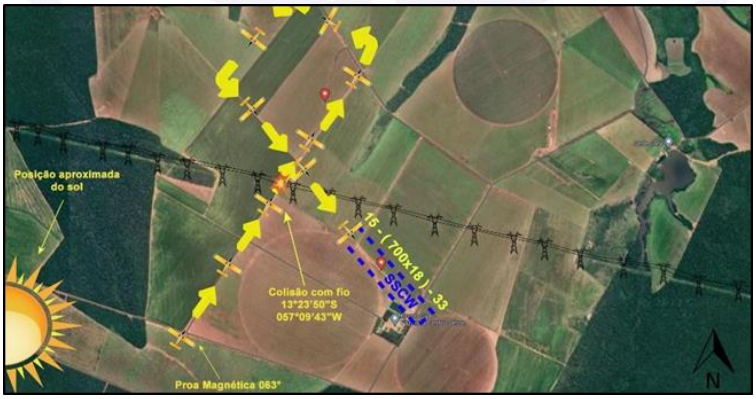

Figure 8 – Diagram showing the trajectory from the impact point with the transmission line to the approach at SSCW. Source: Adapted from Google Maps.

The traffic circuits at SSCW were performed with left turns through the northern sector.

The PIC attempted three landings but was unsuccessful. He then decided to find a suitable plantation area for a forced landing.

The landing was executed on a 145° heading, and the aircraft traveled 237 meters before coming to a stop on a 343° heading.

1.19. Additional information.

The Best Practices Guide for Agricultural Aviation Operations[2], updated in 2023, was developed by ANAC based on data from serious incidents and aviation accidents in the agricultural aviation sector between 2015 and 2020.

The data analysis revealed that the primary contributing factor in agricultural aircraft occurrences was pilot judgment, which appeared in 62% of the investigative reports produced by the Center for Investigation and Prevention of Aeronautical Accidents (CENIPA).

Other key aspects highlighted in the study included:

- a high number of in-flight loss of control events, where stall entry was identified as a relevant factor in accidents;
- power lines as the most frequent obstacles; (emphasis added.)
- the need to follow prescribed maintenance procedures;
- the importance of evaluating the takeoff and landing areas; and
- the correct assessment of flight parameters, such as aircraft weight and balance and required runway length.

The guide also incorporated internationally adopted operational procedures, through an analysis of the regulatory approaches from aviation authorities, such as the Federal Aviation Administration (FAA), the Civil Aviation Safety Authority (CASA) – Australia, and the *Administración Nacional de Aviación Civil* (ANAC) – Argentina, concerning agricultural aviation operations.

Additionally, valuable insights were drawn from:

- The Guide for Safe Aerial Application (2021) from the National Union of Agricultural Aviation Companies (SINDAG).
- The Manual of Best Practices for Agricultural Aviation (2016) from the Fifth Regional Service for Investigation and Prevention of Aeronautical Accidents (SERIPA V).
- The Aerial Applicator's Manual from the National Association of State Departments of Agriculture Research Foundation (NASDARF) – USA.

The Appendix B of the guide produced by the ANAC specifically addressed collision prevention with power lines, identifying hazards and mitigation actions.

1.20. Useful or effective investigation techniques.

NIL.

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[2] Available on https://www.gov.br/anac/pt-br/assuntos/regulados/aeroagricolas/arquivos/GUIAdeBoasPrticasparaOperaesAeroagrcolas_web.pdf. Access on 02DEC2024.

2. ANALYSIS.

This was an agricultural pesticide application flight conducted over a cotton plantation under the requirements established by RBAC 137, Amendment 04.

Takeoff and landing operations were carried out from *Fazenda Centro Oeste* Aerodrome (SSCW), located in *Nova Maringá*, State of Mato Grosso. The farm, aircraft, and application area were all owned by the operator of PS-GVR.

Since the meteorological conditions met the minimum requirements for conducting the operation under the proposed flight rules, and no transient weather phenomena were reported, weather conditions were ruled out as a contributing factor in this accident.

The PIC was qualified for the flight and had significant experience, both in the aircraft model and type of operation (3,300 total flight hours, including 880 on the AT-502B). Additionally, he was familiar with the region and aware of the power transmission line crossing *Fazenda Centro Oeste*.

Investigations revealed that during the accident flight, the pilot began the operation with spray passes on a northeast/southwest track (approx. 240° heading), perpendicular to the power transmission line. He was flying with the sun in front and passing under the power cables.

Upon analyzing the application area and the positioning of the primary obstacle affecting the operation (the transmission line), it was determined that the chosen spray run direction placed the aircraft on a flight path that inevitably intersected the power lines, leading to the collision.

A safer alternative would have been to conduct the spray passes parallel to the transmission line, thereby avoiding the need to cross it and eliminating the necessity of performing a steep turn (“balloon”) near the obstacle.

Thus, choosing to perform the passes transversely under the power lines, rather than adopting the more conservative option of flying parallel to them, demonstrated a complacent approach, which contributed to the aircraft's collision with the obstacle.

Additionally, inadequate preflight planning resulted in a maneuver that required the pilot to focus primarily on positioning the aircraft for the next spray pass, near the power transmission line – a circumstance that contributed to the accident.

Given the accident dynamics, there was a failure to properly assess the risks associated with performing steep turns near the power lines and flying underneath the cables, especially considering that the operation was conducted under low-light conditions, which also played a role in the occurrence.

In this context, considering the pilot’s statement that his attention at the moment of the collision was focused on stabilizing the aircraft on the correct axis, preventing him from noticing the proximity of the transmission cables, it became evident that there was a lapse in managing all the information involved at that stage of the operation. This resulted in attentional fixation on aircraft positioning and a diminished ability to divide attention, contributing to the accident.

Furthermore, given the time of the collision, it is possible that the reduced visibility of the obstacle due to low ambient light played a significant role in the accident.

The Manual of Best Practices – Agricultural Aviation, referenced in the additional information section of this report, suggests that a deeply ingrained culture in agricultural aviation encourages pilots to persist in flying under power lines. The same document also highlights the low contrast of thin power cables against the background, a condition that was aggravated in this case due to reduced lighting at the time of the operation.

Therefore, this cultural factor may have influenced the decision to fly under the cables, ultimately leading to the collision with the power transmission line near the operational area.

3. CONCLUSIONS.

3.1. Findings.

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

b) the pilot held valid ratings for MNTE (Single-Engine Land Airplane) and PAGA (Agricultural Pilot – Airplane);

c) the PIC was qualified and experienced for the flight;

d) the aircraft had a valid CVA (Certificate of Airworthiness) was valid;

e) the aircraft was within the specified weight and balance limits;

f) the records of the airframe, engine, and propeller logbooks were up to date;

g) the meteorological conditions were above the minimum requirements for conducting the flight;

h) the aircraft was performing a local agricultural pesticide application flight;

i) twenty-seven minutes into the flight, the aircraft collided with a power transmission line cable;

j) the PIC stated that after the collision, he experienced difficulties controlling the aircraft;

k) the pilot attempted three landings at SSCW, to no avail;

l) the PIC chose to perform a forced landing in a cotton plantation;

m) the aircraft sustained substantial damage; and

n) the pilot emerged uninjured.

3.2. Contributing factors.

- **Attention – a contributor**

Considering the pilot's account that, at the moment of the collision, his attention was focused on stabilizing the aircraft along the correct axis—hence failing to notice the proximity of the power transmission cables—it was determined that his ability to manage all relevant information at that stage of the operation was compromised. This resulted in inattention, fixation on positioning the aircraft, and impaired divided attention, which contributed to the accident.

- **Attitude – a contributor**

The decision to perform the passes transversely beneath the power lines, rather than adopting the more conservative approach of flying parallel to them, demonstrated a complacent attitude, which contributed to the aircraft's collision with the obstacle.

- **Workgroup Culture – undetermined**

The Manual of Best Practices – Agricultural Aviation suggested that a deeply ingrained culture among agricultural pilots encouraged the practice of "persisting in flying under power lines." It also highlighted the low visibility of thin cables against the surrounding environment—a factor further exacerbated in this case due to reduced lighting at the time of the operation. It is possible that this cultural mindset influenced the pilot's decision to fly beneath the cables, ultimately contributing to the collision with the power transmission line near the operational area.

- **Pilot Judgment – a contributor**

Analyzing the accident dynamics, there was an inadequate risk assessment in performing a steep turn near the power lines and flying underneath the cables, particularly given the low-light conditions at the time of the operation, which ended up playing a role in the occurrence.

- **Flight Planning – a contributor**

The inadequacy of preflight preparation led to a maneuver that demanded the pilot's primary attention on positioning the aircraft for the next spray pass near a power transmission line. This factor contributed to the accident.

4. SAFETY RECOMMENDATIONS

None.

5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN.

None.

On May 29th, 2025.