COMANDO DA AERONÁUTICA

CENTRO DE INVESTIGAÇÃO E PREVENÇÃO DE ACIDENTES AERONÁUTICOS

FINAL REPORT
IG-083/CENIPA/2023

OCCURRENCE:	**SERIOUS INCIDENT**
AIRCRAFT:	**PS-CGF**
MODEL:	**AT-502B**
DATE:	**16MAI2023**

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 is the Final Report of the 16 May 2023 serious aeronautical incident with the AT-502B aircraft, registration marks PS-CGF. The occurrence was typified as “[LOG-G] Loss of control on the ground and [RE] Runway excursion”.

Control of the aircraft was lost during the landing run, and it exceeded the left-hand side limits of the airstrip (*veer off*).

The aircraft sustained slight damage.

The pilot suffered no injuries.

Being Canada the State of manufacture of the engine, the Canadian TSB (Transportation Safety Board) appointed an Accredited Representative for participation in the investigation of the occurrence.

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GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS

ANAC	Brazil's National Civil Aviation Agency
CENIPA	Brazil's Aeronautical Accidents Investigation and Prevention Center
CMA	Aeronautical Medical Certificate
CVA	Airworthiness-Verification Certificate
MNTE	Single-Engine Land Airplane Class Rating
OM	Maintenance Organization
PAGA	Agricultural Pilot Rating (Airplane)
PCM	Commercial Pilot License (Airplane)
PIC	Pilot in Command
PN	Part Number
PPR	Private Pilot License (Airplane)
RBAC	Brazilian Civil Aviation Regulation
SDW6	ICAO location designator - *Ceolin Grãos e Fibra* Aerodrome, *São Desidério*, State of *Bahia*
SIPAER	Aeronautical Accidents Investigation and Prevention System
UTC	Coordinated Universal Time
VFR	Visual Flight Rules

1. FACTUAL INFORMATION.

Aircraft	**Model:** AT-502B **Registration:** PS-CGF **Manufacturer:** *Air Tractor, Inc.*	**Operator:** Private
Occurrence	**Date/time**: 16MAI2023 - 18:00 (UTC) **Location:** SDW6 (*Ceolin Grãos e Fibra* Aerodrome). **Lat.** 13°14'43"S **Long.** 045°50'55"W **Municipality – State:** *São Desidério - Bahia*	**Type(s):** [LOC-G] Loss of control - ground [RE] Runway excursion

1.1. History of the flight.

At around 17:30 UTC, the aircraft took off from SDW6 (*Ceolin Grãos e Fibra* Aerodrome, *São Desidério*, State of *Bahia*), engaged on a crop-dusting flight, with 01 POB (pilot).

Control of the aircraft was lost during the landing run, and it exceeded the left-hand side limits of the airstrip.

After colliding with a fence, the aircraft abruptly rotated to the left and came to a stop.

Figure 1 - View of the aircraft at the location of the serious incident.

1.2. Injuries to persons.

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

1.3. Damage to the aircraft.

The aircraft suffered minor damage, restricted to the fuselage, wings, and propeller blades.

Figure 2 - Damage to the fuselage.

Figure 3 - Damage to the right-hand wing.

Figure 4 - Damage to the propeller blades.

1.4. Other damage.

NIL.

1.5. Personnel information.

1.5.1. Crew's flight experience.

FLIGHT EXPERIENCE	
	PIC
Total	3.604:50
Total in the last 30 days	50:25
Total in the last 24 hours	01:30
In this type of aircraft	880:30
In this type in the last 30 days	50:25
In this type in the last 24 hours	01:30

RMK: flight-time data obtained through information provided by the pilot.

1.5.2. Personnel training.

The PIC (Pilot in Command) did the PPR course (Private Pilot – Airplane) in 1983, at the *Aeroclube de Penápolis*, State of *São Paulo*.

1.5.3. Category of licenses and validity of certificates.

The PIC held a PCM license (Commercial Pilot - Airplane) and valid ratings for MNTE (Single-Engine Land Airplane Class) and PAGA (Agricultural Pilot - Airplane).

1.5.4. Qualification and flight experience.

The pilot was qualified and had experience in the type of flight.

1.5.5. Validity of medical certificate.

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

1.6. Aircraft information.

The aircraft, serial number 502B-3317, was a product manufactured by Air Tractor, Inc., in 2021, and registered in the Private Air Services Registration Category (TPP).

The aircraft's CVA (Airworthiness-Verification Certificate) was valid.

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

The latest inspection of the aircraft (type “300 hours + special items of 200/400/800 hours”, was carried out on 26 March 2023 by the Maintenance Organization *Serrana Manutenção de Aeronaves Ltda*. in *São Desidério*, State of *Bahia*. The aircraft flew 98 hours and 30 minutes after the referred inspection.

The latest more comprehensive inspection of the aircraft (type “300 hours + 12-month inspection of items of the airframe/engine/propeller + CVA”), was carried out on 20 August 2022 at the premises of the same maintenance organization mentioned above. The aircraft flew 395 hours and 10 minutes after the said inspection.

Brake system

The brake system consisted of two independent and identical (right and left) *Cleveland* sets, Part Number 30-98C. The *Cleveland* brake cylinders had the Part Number 10-23F.

The brake fluid used had the MIL H 5606A specification. The *Volkswagen* brake fluid reservoir, PN 113611301 L, was mounted on top of the lower instrument panel, where the fluid level was always conspicuous.

The *Scott* parking-brake valve had the Part number PN 4500A-2. The master cylinder supplied pressure to the parking-brake valve via *Stratoflex* hoses, and stainless steel piping was routed from the valve to the connection installed in the bulkhead near the main landing gear. A high-pressure *Stratoflex* hose connected the bulkhead connection to the wheel cylinders.

The aircraft's braking system is schematically represented in Figure 5.

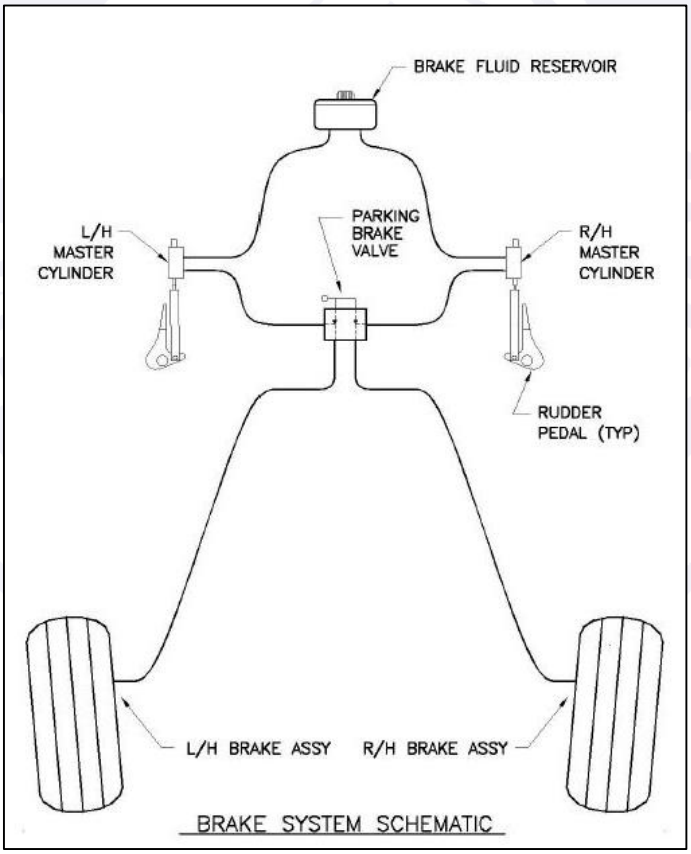

Figure 5 - Scheme of the AT-502B brake system.
Source: AFM AT-502B.

According to information gathered from the Maintenance Organization *Serrana Manutenção de Aeronaves Ltda,* the latest maintenance intervention on the PS-CGF brake

system was performed at the “100-hour” inspection of 08 April 2022, with replacement of the twelve brake pads of the right-hand wheel.

The AT-502B Maintenance Manual (dated 14 March 2018) read:

> If air enters the brake system due to worn O-rings or due to replacement of brake-system components, the brake pedal will become “soft” and the brakes will lose some of their effectiveness. It will then be necessary to bleed the brakes to remove the air.

1.7. Meteorological information.

The meteorological conditions were above the minimums for conduction of the operation under the rules of the proposed type of flight.

The PIC stated that, at the time of the incident, the wind was calm.

1.8. Aids to navigation.

NIL.

1.9. Communications.

NIL.

1.10. Aerodrome information.

It was a private aerodrome under the administration of *Ceolin Grãos e Fibra* Company. It operated VFR during day- and night-time.

It had a dirt airstrip, with thresholds 08/26, measuring 1,400 m x 18 m, at an elevation of 2,779 ft.

At the initial field investigation action, the Investigation Committee found that the airstrip had a segment of 1,800 m available for landings and takeoffs.

At the time of the incident, the runway was dry and unobstructed. There were no windsocks.

1.11. Flight recorders.

Neither required nor fitted.

1.12. Wreckage and impact information.

The aircraft approached the threshold 26 for landing, and touched down approximately 200 m beyond the threshold. The aircraft traveled approximately 1,050 m during the landing run, and then began to lose the airstrip centerline, eventually exceeding the left-hand side limit of the runway.

The aircraft hit a barbed-wire fence that delimited the perimeter of the aerodrome, made an abrupt rotation to left, and came to a complete stop at a distance of 1,400 m from the threshold 26.

After the aircraft came to a stop, the PIC got out through its left main door.

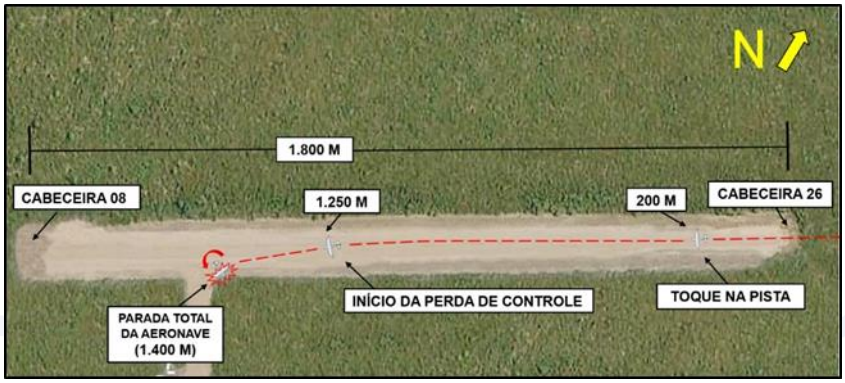

Figure 6 - Croquis of the occurrence.

1.13. Medical and pathological information.

1.13.1. Medical aspects.

NIL.

1.13.2. Ergonomic information.

NIL.

1.13.3. Psychological aspects.

NIL.

1.14. Fire.

There was no fire.

1.15. Survival aspects.

NIL.

1.16. Tests and research.

At the site of the incident, the SIPAER team carried out a check on the aircraft's braking system, which included inspecting the brakes for wear on the pads, condition of the discs, and fluid leakage both in the lines and in the master cylinders, in addition to checking the amount of brake fluid in the reservoir.

With such checking, one observed that the aforementioned reservoir had an adequate supply of fluid (Figure 7) and that the left- and right-hand brake sets were working without apparent alterations.

Figure 7 - Reservoir with a full supply of brake fluid.

At a second moment, one checked the operation of the tailwheel locking-pin and inspected the condition of the centering springs, finding no abnormalities, thus corroborating the PIC's report on the adequate functioning of the system during the landing run.

Finally, one checked the performance of the brake pedals from inside the cabin, and found that each pedal effectively braked its respective wheel, despite the fact that the travel distance of the right-hand brake pedal was rather long (deep) and offered little resistance to the first testing inputs. With repeated inputs, the travel distance of the right-hand brake pedal became shorter and featured a more rigid behavior, matching the operating pattern of the left-hand brake pedal.

One found no other mechanical problems on the aircraft that might have contributed to the serious incident in question.

1.17. Organizational and management information.

NIL.

1.18. Operational information.

The aircraft operated under the rules of the Brazilian Civil Aviation Regulation nº 137 – “Certification and Operational Requirements: Aeroagricultural Operations”.

At the time of landing after a local crop-dusting flight, the aircraft had 330 liters of fuel in the tanks and an empty hopper, being within the weight and balance limits specified by the manufacturer.

As reported by the PIC, the flight was uneventful, including the approach for landing and the touchdown on the runway.

During the landing run, with the power lever at IDLE, the PIC noticed that the aircraft suddenly veered to the left.

The PIC stated having unsuccessfully tried to control the aircraft by means of the pedals, after which he depressed the right-hand brake pedal in an attempt to regain directional control of the airplane.

According to the pilot, the attempt did not work as desired, so he used the reverse of the aircraft in order to reduce speed, but that was not enough to prevent the aircraft from exceeding the left-hand side limits of the runway.

The pilot added that, when he depressed the right-hand brake pedal, it just sank and did not result in effective braking of the aircraft.

Asked about what could have caused the aircraft to veer all of a sudden to the left during the landing run, the PIC attributed it to the excessive torque of the AT-502B aircraft.

1.19. Additional information.

NIL.

1.20. Useful or effective investigation techniques.

NIL.

2. ANALYSIS.

It was a local crop-dusting flight, conducted under the rules of the RBAC-137.

From an operational standpoint, the PIC met all the conditions that enabled him to carry out that operation. With regard to the location of the occurrence, one verified that the aerodrome in SDW6 was compatible with the operation of the aircraft, with a runway whose measures exceeded the ones declared.

Therefore, one concludes that the aforementioned aspects did not contribute to the occurrence.

As for the condition of the aircraft, the PIC reported that, when he applied the brakes, the right pedal sank, and his action did not result in effective braking of the aircraft.

One observed the same condition during the functional tests at the site of the incident, in the initial field-investigation action.

The Investigation Committee observed that all components of the braking system were in good condition, including the level of hydraulic fluid, which led to the conclusion that the runway excursion was related to the loss of effectiveness of the right-hand brake assembly, possibly due to air entering the system.

The investigation could not determine when air possibly entered the braking system, an event that would have caused its low efficiency. The maintenance intervention in this system, with records in the airframe logbook, had taken place approximately one year before the occurrence, and led one to raise two hypotheses: the first one referred to a possible inadequacy in the service performed during the replacement of the brake pads, with the airplane being operated in such condition since then. The second hypothesis referred to some other intervention in the brake system after the “100-hour” inspection and not logged in the technical logbooks, an intervention that would have caused air to enter the brake system.

Therefore, there may have been some maintenance intervention carried out on the brake assembly that allowed air to enter the system, contributing to the loss of control of the aircraft.

However, it was not possible to correlate the last logged intervention with the air entering the system because almost a year had passed between the provision of that service and the occurrence of the serious incident, without any reports of complications with the brake-system during the said period.

3. CONCLUSIONS.

3.1. Findings.

a) the pilot had a valid CMA (Aeronautical 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 had experience in the type of flight;

d) the aircraft had a valid CVA (Airworthiness-Verification Certificate);

e) the aircraft was within the prescribed 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 minimums for the flight;

h) the aircraft was operating a local crop-dusting flight, with 01 POB (pilot);

i) on the return landing, the aircraft touched down approximately 200 m past the threshold 26;

j) during the landing run, the aircraft lost directional control;

k) the aircraft exceeded the left-hand limit of the runway;

l) upon colliding with a fence, the aircraft made an abrupt rotation to the left and came to a complete stop when colliding against a fence, the aircraft yawed to the left and came to a complete stop, 1,400 m from threshold 26 of SDW6;

m) it was reported that the brake on the right-hand side lost its action;

n) tests performed on the ground after the occurrence of the incident revealed problems with the performance of the right-hand side brake;

o) the aircraft sustained slight damage; and

p) the PIC received no injuries.

3.2. Contributing factors.

- **Aircraft maintenance – undetermined.**

The runway excursion in question may be related to the loss of effectiveness of the right-hand brake set, possibly due to air entering the system during provision of some maintenance action.

4. SAFETY RECOMMENDATIONS

None.

5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN.

The Investigation Committee advised the aircraft operator to be especially aware of any signs of loss of effectiveness of the brake system, and to inspect the referred system in order to identify a contingent presence of air.

The Investigation Committee instructed the aerodrome administrator, who was also the operator of the aircraft, to install a windsock in SDW6, despite the fact that the lack of referred device was not relevant for the occurrence in question.

On June 20th, 2024.