

COMMAND OF AERONAUTICS
AERONAUTICAL ACCIDENT INVESTIGATION AND
PREVENTION CENTER



FINAL REPORT
A - 108/CENIPA/2013

<u>OCCURRENCE:</u>	ACCIDENT
<u>AIRCRAFT:</u>	PT-SUL
<u>MODEL:</u>	AT-502B
<u>DATE:</u>	07 JUNE 2013



NOTICE

According to the Law n° 7565, dated 19 December 1986, the Aeronautical Accident Investigation and Prevention System – SIPAER – is responsible for the planning, guidance, coordination and execution of the activities of investigation and prevention of aeronautical accidents.

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

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

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

This Report does not resort to any proof production procedure for the determination of civil or criminal liability, and is in accordance with item 3.1, Annex 13 to the 1944 Chicago Convention, which was incorporated in the Brazilian legal system by virtue of the Decree n° 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.

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SYNOPSIS

This is the Final Report of the accident with the AT-502B aircraft (registration PT-SUL) on 7 June 2013. The accident was classified as loss of control on the ground.

During the takeoff roll, the aircraft ran over the departure end of the runway, entered a cotton plantation capsized and remained in an upside down position.

The pilot suffered minor injuries.

The aircraft sustained substantial damage.

There was no designation of an accredited representative, but the National Transportation Safety Board indicated a technical advisor from the Air Tractor to support the investigation.

GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS

AFM	Airplane Flight Manual
ANAC	(Brazil's) National Civil Aviation Agency
ATS	Air Traffic Services
CENIPA	Aeronautical Accident Investigation and Prevention Center
CHT	Technical Qualification Certificate
CMA	Aeronautical Medical Certificate
Lat	Latitude
Long	Longitude
MNTE	Airplane Single-Engine Land (ASEL) rating
NTSB	National Transportation Safety Board
PAGA	Agricultural Pilot (Airplane category)
PCM	Commercial Pilot (Airplane category)
PMD	Maximum Take-off Weight (MTOW)
PPR	Private Pilot (Airplane category)
RBAC	Brazilian Civil Aviation Regulation
RBHA	Brazilian Aeronautical Homologation Regulation
RS	Safety Recommendation
SERIPA	Serviço Regional de Investigação e Prevenção de Acidentes Aeronáuticos
HP	Horse Power
SINDAG	National Union of Agricultural Aviation Companies
SIPAER	Aeronautical Accident Investigation and Prevention System
UTC	Coordinated Universal Time
VFR	Visual Flight Rules

AIRCRAFT	Model: AT-502B Registration: PT-SUL Manufacturer: Air Tractor	Operator: Agrisul Aviação Agrícola Ltda. - ME
OCCURRENCE	Date/time: 07 JUNE 2013 / 10:15 (UTC) Location: Fazenda Caimbé Lat. 14°54'12"S – Long. 054°13'23"W Municipality – State: Primavera do Leste – Mato Grosso	Type: Loss of control on the ground

1 Factual information

1.1 History of the occurrence

The aircraft was engaged on an aerial application operation, whose contingent landing area was on the Caimbé Farm, located in the municipality of Primavera do Leste, State of Mato Grosso.

During the takeoff roll, at 06:15 local time, before the aircraft reached the departure end and was still on the ground, the pilot started jettisoning the hopper load.

Then, the aircraft ran over the departure end, entered a cotton plantation, capsized, and remained in an upside down position.

After the aircraft stopped, there was an onset of fire in the left wing. The pilot was removed from the aircraft by a person (agricultural assistant) that was monitoring the operation.

1.2 Injuries to persons

Injuries	Crew	Passengers	Third parties
Fatal	-	-	-
Serious	-	-	-
Minor	01	-	-
Unhurt	-	-	-

1.3 Damage to the aircraft

The aircraft sustained substantial damage.

1.4 Other damage

Nil.

1.5 Personnel information

1.5.1 Information on the crew

HOURS FLOWN	
	PILOT
Total	1,460:00
Total in the last 30 days	44:00
Total in the last 24 hours	00:00
In this type of aircraft	180:00
In this type in the last 30 days	44:00
In this type in the last 24 hours	00:00

NB.: Data provided by the pilot.

1.5.1.1 Professional formation

The pilot did his Private Pilot Course (airplane category) in the Flying School of Santiago, State of Rio Grande do Sul, in the year 2000. His Agricultural Pilot Course was done in the *EJ Escola de Aeronáutica Civil*, State of São Paulo, in 2008.

1.5.1.2 Validity and category of licenses and certificates

The pilot had a commercial pilot license (airplane category), and valid ASEL and agricultural pilot ratings.

1.5.1.3 Qualification and flight experience

The pilot had qualification and enough experience for the flight in question.

1.5.1.4 Validity of the medical certificate

The pilot had a valid Aeronautical Medical Certificate.

1.6 Aircraft information

The serial number 502B-2857 aircraft was manufactured by the Air Tractor Inc. in 2012.

The airworthiness certificate was valid.

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

The last inspection of the aircraft (type "50 hours") was done on 15 May 2013 by the *Marca Manutenção de Aeronaves Ltda. workshop* in Primavera do Leste, State of Mato Grosso. After the inspection, the aircraft flew 34 hours and 50 minutes.

On the date of the accident, the aircraft had a total of 181.5 hours since new, and had not reached the amount of hours required for the first overhaul.

1.7 Meteorological information

The prevailing weather conditions were VMC.

1.8 Navigational aids

Nil.

1.9 Communications

Nil.

1.10 Aerodrome information

The contingent landing area was located on the Caimbé Farm, municipality of Primavera do Leste, State of Mato Grosso.

It was a gravel runway, thresholds 15/33, measuring 910m x 13.4m, at an elevation of 751 meters (2,463ft).

The pilot began the takeoff roll from the threshold 33.



Figures 1 and 2 - Runway 33 threshold, and station for aircraft refueling/supply of agricultural products, located near the threshold.

1.11 Flight recorders

Neither required nor installed.

1.12 Wreckage and impact information

After moving along the entire runway without getting airborne, the aircraft entered a cotton plantation on an uneven terrain with declivity to the left.

In this area, the aircraft capsized and stopped at a distance of 157 meters from the runway 15 threshold.

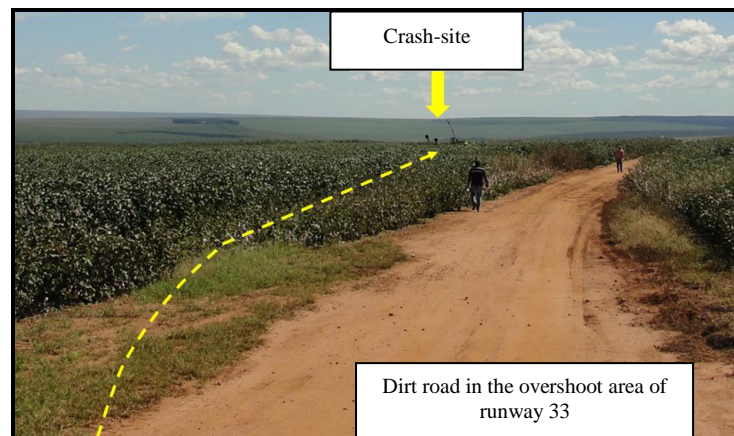


Figure 3 - Trajectory of the aircraft after exiting the contingent landing area (yellow dotted line).

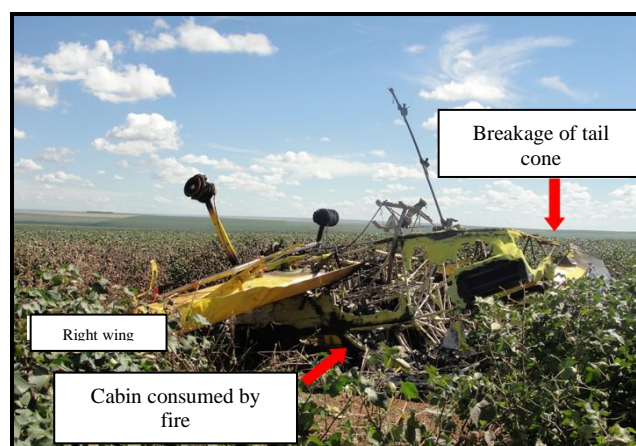


Figure 04: Situation of the aircraft after capsizing.

1.13 Medical and pathological information

1.13.1 Medical aspects

The pilot's health records relative to his latest medical checkup indicated that he was fit for the air activity.

1.13.2 Ergonomic information

Nil.

1.13.3 Psychological aspects

1.13.3.1 Individual information

The pilot was an agricultural technician before starting his training to become an agricultural pilot.

In 2004, in the municipality of Primavera do Leste, State of Mato Grosso, the pilot gathered a few flight hours in an agricultural aviation company owned by some friends of his.

In 2009, he joined the AGRISUL Company, where he worked for about four years, always flying the same model of agricultural airplane (Ipanema).

1.13.3.2 Psychosocial information

Nil.

1.13.3.3 Organizational information

In February 2013, the AGRISUL Company received the Air Tractor aircraft, model AT-502B.

Ever since, it was this aircraft that did the job of aerial application on Caimbé Farm.

The Company did not have a periodical training program for the pilots, since the training was done on a daily basis, during the crop dusting activities.

The owner of the AGRISUL company informed that the pilot would do training in the Air tractor simulator in the United States in August 2013.

According to reports made by members of the AGRISUL Company, they had structural and operation support for the safe operation of the aircraft fleet, and the owner had control over the maintenance procedures and documentation of the aircraft.

1.14 Fire

After the aircraft came to a stop, a post-impact fire spread. The material for combustion was the aircraft fuel, but it was not possible to identify the source of ignition.

The fire began in the left wing, and moved towards the pilot's cabin, consuming a large part of the instrument panel and pilot seat.

1.15 Survival aspects

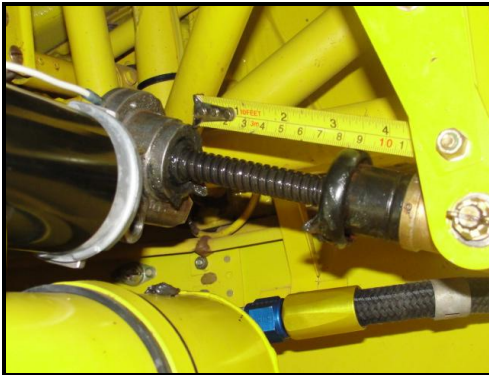
The aircraft stopped after capsizing, and the pilot remained stuck by the seat belt and harness, without showing any reaction as to evacuate from the aircraft.

The agricultural assistant, who was at the threshold of runway 33, witnessed the accident. He got into a pickup truck, drove to the accident scene, and removed the pilot from the aircraft.

Despite wearing a helmet, the pilot suffered a cut at the top of his head.

1.16 Tests and research

Comparison between the endless screw of the accident aircraft and the same component of another aircraft.



Figures 5 and 6 - Comparison between the endless screw of the flap in an aircraft with fully extended flaps and the endless screw of the accident aircraft.

At the initial action by the go-team, it was verified, by means of comparison between the endless screw of the accident aircraft and the one of another aircraft, that the flap of the former was completely extended (full).

1.17 Organizational and management information

The company of the operator had been established approximately twelve years before and had four aircraft in its aerial application fleet (two AT-502B's, one AT-402A, and one EMB-202).

The company informed that the operations were planned according to the length of the runways, as follows:

- a) Runways with length of 800 meters or more: without restrictions for the operation of the BEM-202; and
- b) Runways with length of 900 meters or more: without restrictions for the operation of the AT-402A and AT-502B.

1.18 Operational information

In aerial application of earlier crops, the pilot had operated the EMB-201 and EMB-202 aircraft, which had a MTOW of 1,800kg, were equipped with a reciprocating engine of 300HP and 320HP, respectively.

The crop that was being dusted when the accident occurred was the first in which the pilot was operating an AT-502B.

For starting operation of the AT-502B, there is no requirement concerning evaluation or demonstration of knowledge and ability in the equipment, since it is not considered a "type aircraft".

In order obtain basic knowledge for the initial flights on the AT-502B, the pilot consulted workmates that flew the aircraft already.

The operational publications of the AT-502B were not studied.

The pilot had never consulted the aircraft takeoff performance graph.

On the day of the occurrence, at about 04:15 local time, the pilot and the agricultural aviation assistant began a one-hour-twenty-minute trip from Primavera do Leste to Caimbé Farm.

Upon arrival on the farm, they started preparation of the aircraft.

The *hopper* received a supply of 1,590 liters of water, to which 10 liters of a chemical product were added, resulting in a weight of 1600kg (water density 1.0).

The aircraft was refueled with 850 liters of QAV-1 (density of .7850 at 20°C), corresponding to a weight of 667kg.

The basic weight of the empty aircraft was 2,104kg, according to the weight and balance sheet. The pilot's weight was 90kg.

The takeoff was made with the flaps at 26° (full).

Later, the pilot informed that he decided to utilize full flaps based on information received from pilots more experienced in the AT-502B.

According to them, with full flaps the aircraft would have better performance at takeoffs with a weight close to the MTOW.

Takeoff roll started at 06:15. Short of the runway departure end, the pilot realized that did not have adequate performance, and began jettisoning the hopper load.

The aircraft ran over the departure end of the contingent landing area without getting airborne.

According to the AT-502B Airplane Flight Manual, officially made available in English:

- In Section 1 – Limitations, the AT-502B maximum takeoff weight is 3,629kg;
- In Section 2 – Normal Procedures (*BEFORE TAKE-OFF*) - *Flaps should be retracted for normal take-off*;
- In Section 2 – Normal Procedures, there is an instruction for taking off with flaps at 10° when the hopper is fully loaded and the runway is short.

TAKE-OFF (FULL HOPPER LOAD AND SHORT FIELD):

Use the same procedure as for normal take-off except as follows:

1. Lower flaps to 10° position (First Mark).
2. With a full hopper load full power can be applied (Within torque and temperature limits) before brakes are released.
3. After breaking ground do not retract the flaps until at least 105 mph (91 kts) (169 km/h) (IAS) is reached for take-off weights of 8,000 lbs.

Figure 7 - AT-502B Airplane Flight Manual.

In Section 4 – Performance, there is a graph for the calculation of the takeoff roll distance necessary to clear an obstacle of 50ft.

1.19 Additional information

1.19.1 Consulting the aircraft manufacturer

After verification that there were operators performing takeoffs with the AT-502B with full flaps, the manufacturer was consulted on the issue. The Air Tractor Inc. gave the following answer:

1) *Air Tractor does not have takeoff performance for FULL FLAPS. Air Tractor does not recommend using FULL FLAPS for any takeoff.*

2) *Air Tractor recommends using the procedures described in the section titled Take-off (Full Hopper Load and Short Field) including the use of only 10 degrees of flaps.*

1.19.2 Brazilian Civil Aviation Regulation Civil 137 (RBAC-137)

The pilot involved in the occurrence was not proficient in English.

The Brazilian aeronautical regulation does not require a foreign manufacturer to provide publications in Portuguese for the aircraft sold to Brazilian customers.

According to the RBAC 137:

I) 137.201 Requirements concerning Aircraft and Equipment

(a) *The operator of an agricultural aircraft will only be allowed to operate it in agricultural activities if:*

(3) *Operation manuals, technical publications, service bulletins, equipment manuals and other documents necessary for the adequate conduction of the operations are made available to the pilot and maintenance personnel;*

II) 137.301 Contingent landing area

(b) *Operational safety*

(2) *The agricultural aviation operator shall carry out a management of the risks to operational safety before starting operations in any locality;*

(d) *Restrictions*

(1) *No person is allowed to operate an aircraft in a contingent landing area, unless:*

(iv) *The area to be utilized meets the requirements of the safe operation of the agricultural aircraft at its maximum performance, in accordance with its respective flight manual;*

1.19.3 Brazilian Aeronautical Homologation Regulation 91 (RBHA 91):

I) *The RBHA 91.103 determines that the pilot, before starting the flight, must get familiarized with the takeoff distance data listed in the flight manual;*

II) *The RBHA 91.505 determines that any pilot in command of an airplane must, before starting the flight, get familiarized with the pertinent airplane flight manual.*

1.19.4 Records of AT-502B accidents associated with takeoff outside the operational envelope.

a) PR-FMM – 08 APRIL 2011: During the takeoff roll, the aircraft ran over the departure end, and collided with obstacles (stones and holes) located at 150 meters beyond the runway, sustaining substantial damage. The pilot got out uninjured.



Figure 8 - PR-FMM after the crash.

Calculations indicated that the operation took place outside of the operational limits.

The takeoff failure was a result that should have been expected. The estimated takeoff weight was 5,112kg, well above the MTOW of 3,629kg.

b) PR-TPL – 01 MARCH 2013: The aircraft got airborne only three meters short of the departure, lost altitude, and collided with two fences located at 86 meters and 98 meters from the runway.

Then, the aircraft crashed into the ground. The aircraft stopped at a distance of 140 meters from the departure end, and the engine continued functioning.

The aircraft sustained substantial damage, and the pilot got out uninjured.



Figure 9 - PR-TPL after the crash.

Calculations indicated that the operation took place with the aircraft outside of its operational limits. The pilot utilized 800 meters of the runway, instead of the 878 meters that were necessary. An unsuccessful takeoff should be considered as the expected result.

The pilot informed that he had started the takeoff with flaps at 10°. However, in the wreckage, the indication was of fully extended flaps.

1.20 Utilization of other investigation techniques

Nil.

2 ANALYSIS

For evaluation of the factors involved in this accident, the commission initially verified the aspects associated with the training of the pilot in the AT-502B aircraft.

The pilot was experienced in EMB-201 and EMB-202 aircraft, which have, respectively, a reciprocating engine of 300HP and 320HP, and a MTOW of 1,800kg.

Upon starting operations with the AT-502B, the pilot did not have to demonstrate theoretical proficiency of operational publications, as well as the limits and performance of the new aircraft because it was not considered a “type aircraft”.

The AT-502B is equipped with a turboprop engine of 750SHP, i.e., more than twice as much the power of the EMB-201 and EMB-202 aircraft.

This may generate in a little experienced pilot a wrong feeling of “surplus of power”.

Here, therefore, appears the first latent condition, if the pilot does not know the operational publications, the limits, and the performance of the AT-502B, as was the case in this accident.

Thus, the lack of a period of training of the pilot in the AT-502B configured a context of potential risk for the operation, since it contributed to his being unaware of the different operation parameters of that aircraft.

Such situation was not an isolated case, since there had been other accidents not long before (and presented in this report), involving lack of knowledge of operational publications, aircraft limits and performance.

In this case, there was not a time reserved for adaptation and practical learning of the specific operational standards of the AT-502B by the pilot, leading him to overestimate the operational limits of the Air Tractor in relation to the Ipanema model, based on a wrong perception of “*surplus of performance*”.

Despite a considerable increase in power, the MTOW of the AT-502B is 3,629kg, a little more than twice as much the weight of the EMB-201 and EMB-202 aircraft. Therefore, the increase of power is just one side of the question. The pilot has to consider the increase of the MTOW as well.

The appropriate way to do this evaluation is by means of the performance graphs contained in the aircraft flight manual.

However, the investigation revealed that the pilot would never make use of the flight manual in his operations of the aircraft, corroborating once more with the pilot’s belief of the supposedly higher operational limits of the Air Tractor.

Such behavior was observed in the improvised attitude of the pilot for determining the takeoff weight. Instead of consulting the graph contained in the manual, he would determine the weight based on the informal perception that it was possible to increase the takeoff weight since the airplane reacted well to the load previously received.

Thus, since consulting the manual was not his routine behavior, a complacent attitude on the part of the pilot became evident when he reported never having consulted the AT-502B takeoff graph, admitting tacitly his consent to operate the aircraft without previous knowledge of its operational limits.

Besides the fact that the pilots do not have to demonstrate knowledge of the AT-502B operation before the civil Aviation authority, the official manuals of the aircraft were written in English.

This turned out to be one more latent condition, as the pilot did not have even a basic knowledge of English.

Manuals and all the set of publications regarding the operation of the aircraft are tools that make up a system of support for the crew, and are fundamental for them to perform their functions.

The lack of adequacy in any of these tools in terms of content, language, composition or printing, may directly affect the operator's performance, and may lead to errors of planning, operation, and reaction to emergencies.

Therefore, the availability of an operation manual of the AT-502B only in English may have represented a factor of potential contribution to the unawareness of the pilot in relation to the standards and limits of the aircraft operation, since he did not understand the language.

The civil aviation authority, by means of the RBAC 137.201(a)3, prescribes that an agricultural aviation operator is allowed to utilize an aircraft only if there are adequate manuals at the disposal of the pilot.

However, one should not consider a manual written in a language not mastered by the pilot as adequate reference material.

On account of the language barrier in relation to the operational publications on the aircraft, the pilot sought to solve this problem by talking with workmates supposedly more experienced in the AT-502B, thus giving rise to an informal culture for the operation of the Air Tractor.

Among the informal practices adopted, one may highlight the use of full flaps for takeoffs of the AT-502B in those situations in which the takeoff weight was close/equal to the MTOW.

This goes against the aircraft flight manual, which instructs the takeoff to be made with flaps at 10° for departure from a short field with a hopper fully loaded (Section 2 – Normal Procedures).

This incompliance, besides showing inobservance of a procedure prescribed in the manual, made it evident that there was a culture in the group of agricultural pilots, who had already informally established in their operational practices the use of full flaps to guarantee a better performance at takeoff.

With the purpose of finding out whether there was any basis in habit of taking off with full flaps by some of the AT-502B pilots, the commission consulted the aircraft manufacturer. In its answer, the Air Tractor Company informed that:

- Under no circumstance, is it recommended to take off with the AT-502B using full flaps; and
- For a takeoff from a short field with a fully loaded hopper, one has to utilize flaps at 10°, as prescribed in the aircraft flight manual.

From the episodes of operational incoherence described, it was possible to observe a continuous and latent delivery of inadequate judgments on the part of the pilot in relation to the planning of his flights.

Parallely, based on an informal operational culture, the operating company, in very much the same way of the pilot, considered that there were no restrictions of performance affecting the AT-502B for runway lengths of more than 900 meters.

However, by means of looking at the aircraft flight manual, it is possible to conclude that this is a false premise.

The contingent landing area of the operation had the following characteristics: gravel surface, length of 910 meters, at an elevation of 751 meters (2,463ft).

Based on these pieces of information, and taking the MTOW and a temperature of 20°C, it is possible to calculate the length of the takeoff run necessary to clear an obstacle of 50ft by means of the graph contained in the airplane flight manual.

Thus, the takeoff from a gravel runway with a length of 910 meters was not viable, since 990 meters were necessary for clearing an obstacle of 50ft during the takeoff roll, with a dry, paved runway, with the aircraft at the MTOW (3,629kg.)

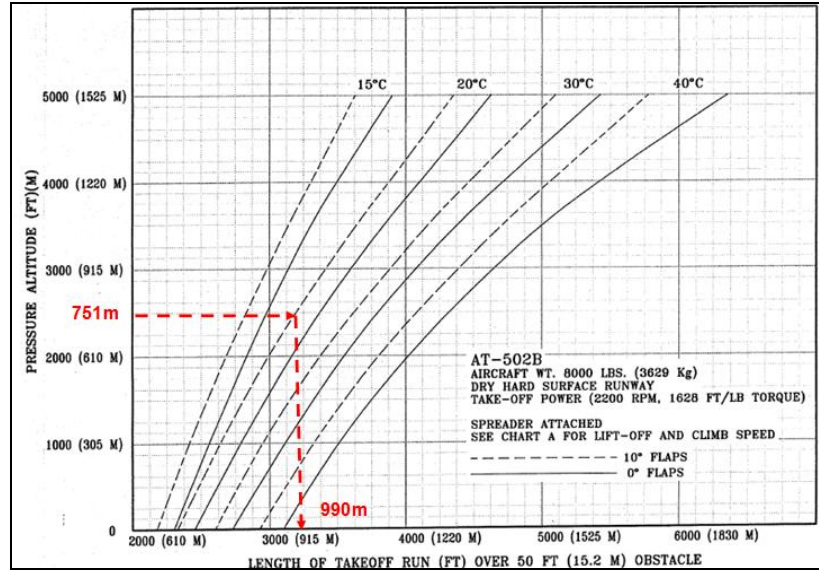


Figure 10 - Analysis of the takeoff roll distance to clear an obstacle of 50ft.

Additionally, the calculation of the takeoff weight indicated that the aircraft had a weight of 823kg above the MTOW, that is, even the 990 meters of runway would not be enough for such condition.

Basic aircraft weight (empty)	2,104Kg
Hopper load (1,600 litros – density 1,0)	1,600Kg
Fuel 850 liters of QAV-1 (density 0.7850 at 20°C)	667kg
Pilot's weight	90kg
Takeoff weight	4,461Kg

Figure 11 - Calculation of the takeoff weight.

Due to the excess weight and to the irregular position of the flap (full) at the takeoff roll, the operation took place outside the operational limits prescribed in the aircraft flight manual, resulting in the accident.

According to the RBHA 91.103 and 91.505, it is the pilot's responsibility to get familiarized with the takeoff distance data, as well as with the airplane flight manual and operational limits.

However, that was not the case, on account of the informal culture of the operation, the fact that there was no obligation to demonstrate proficiency before the civil Aviation authority, in addition to the language barrier represented by the operational publications.

In relation to the conduct of the operating company, there was no monitoring and close control of the pilot in the exercise of his activities.

This fact made hindered the verification and correction of contingent weak points of the pilot concerning his knowledge and operation of the AT-502B, especially the operation outside of safe limits.

The conduct of the operating company should follow what had been previously established in the RBAC 137.301 Contingent Landing Area, item (b)(2), which determines that the operator of agricultural aviation has to do a management of the risks to the operational safety before starting operation in any locality; also, in item (d)(1)(iv), which establishes that nobody is allowed to operate an aircraft in a contingent landing area, unless the area to be utilized meets the requirements of a safe operation of the agricultural aircraft at its maximum performance, in accordance with its respective flight manual.

3 CONCLUSIONS

3.1 Facts

- a) The pilot had valid Aeronautical Medical and Technical Qualification certificates;
- b) The pilot had qualification for the flight in question;
- c) The airframe, propeller, and engine logbook records were up to date;
- d) The aircraft airworthiness certificate was valid;
- e) Prevailing weather conditions were VMC;
- f) The pilot made use of *flap full* for takeoff;
- g) The aircraft had a weight of 832Kg above the MTOW;
- h) The pilot jettisoned the hopper load short of the end of the contingent landing area;
- i) The aircraft ran over the departure end into a plantation area, and capsized;
- j) Fire began after the aircraft came to a stop;
- k) The aircraft sustained substantial damage; and
- l) The pilot suffered minor injuries.

3.2 Contributing factors

3.2.1 Human Factor

3.2.1.1 Medical aspect

Not a contributor.

3.2.1.2 Psychological aspect

3.2.1.2.1 Individual information

a) Attitude – a contributor

The lack of utilization of the aircraft operation manual was a routine on the part of the pilot, a sign of his complacent attitude towards operating the aircraft without previous knowledge of its operational limits.

3.2.1.2.2 Psychosocial information

a) Work group culture – a contributor

The existing culture of the agricultural pilots group, which established informally the use of flap full as a guaranty of better takeoff performance, contributed to accident pilot's adoption of this flap position for takeoff.

3.2.1.2.3 Organizational information

a) Support systems – undetermined

The fact that the AT-502B operation manual was made available only in English may have represented a factor of potential contribution to the pilot's lack of knowledge on the standards and limits of the aircraft operation, since he did not know even the basics of the referred language.

3.2.2 Operational factor

3.2.2.1 Concerning the operation of the aircraft

a) Training – a contributor

The lack of a formal process of training, with a requirement for the pilot to demonstrate theoretical proficiency in operational publications, aircraft limits, and aircraft performance contributed to the fact that the operation occurred outside of the limits and standards listed in the Aircraft Flight Manual.

b) Piloting judgment – a contributor

Due to his lack of knowledge of the aircraft performance, the pilot judged, without consulting the performance graph of the AT-502B flight manual, that there would be no restrictions for operation on runways with a length of 900 meters or more.

c) Flight planning – a contributor

The planning of the flight did not contemplate de takeoff calculations based on the flight manual, resulting in an attempt to take off outside of the operational limits.

d) Managerial oversight – a contributor

The aerial application operator did not exercise an adequate management of the risks to the operational safety, before starting operations in the contingent landing area of Caimbé Farm, failing to identify the aircraft limits for that locality.

3.2.2.2 Concerning ATS units

Not a contributor.

3.2.3 Material Factor

3.2.2.1 Concerning the aircraft

Not a contributor.

3.2.2.2 Concerning ATS equipment and technology systems

Not a contributor.

4 SAFETY RECOMMENDATION

A measure of preventative/corrective nature issued by a SIPAER Investigation Authority or by a SIPAER-Link within respective area of jurisdiction, aimed at eliminating or mitigating the risk brought about by either a latent condition or an active failure. It results from the investigation of an aeronautical occurrence or from a preventative action, and shall never be used for purposes of blame presumption or apportion of civil liability.

In accordance with the Law n°12970/2014, recommendations are made solely for the benefit of the air activity operational safety.

Compliance with a Safety Recommendation is the responsibility of the holder of the highest executive position in the organization to which the recommendation is being made. An addressee who judges to be unable to comply with a Safety Recommendation must inform the CENIPA on the reason(s) for the non-compliance.

Safety Recommendations made by the CENIPA:

To the National Civil Aviation Agency (ANAC):

A-108/CENIPA/2013 – 001

Issued on 07/07/2015

Establish a requirement for the manufacturer to offer operational publications in Portuguese, when the equipment is to be used in agricultural aerial applications.

A-108/CENIPA/2013 – 002

Issued on 07/07/2015

Establish a requirement for the pilot to demonstrate theoretical proficiency in operational publications, as well as in the limits and performance of turboprop aircraft destined for use in agricultural aerial applications.

5 CORRECTIVE/PREVENTATIVE ACTION ALREADY TAKEN

The Sixth Regional Aircraft Accident Investigation and Prevention Service forwarded, in June 2013, the Operational Bulletin n° 006/CENIPA/2013 to all AT-502B operators in its area of jurisdiction (States of Goiás, Tocantins, and Mato Grosso), as well as to the other SERIPA's, alerting for:

- I) Inadequate use of fully extended flaps for takeoff;
- II) Non-compliance with the Aircraft Flight Manual for the analysis of the takeoff performance;
- III) Utilization of the switch in the yoke to extend and retract the flaps; and
- IV) Inadequate calculation of the maximum takeoff weight.

6 DISSEMINATION

- (Brazil's) National Civil Aviation Agency - ANAC
- National Union of Agricultural Aviation Companies (SINDAG)
- Agrisul Aviação Agrícola Ltda. - ME
- SERIPA VI

7 APPENDICES

Nil.

On 07 July 2014.