

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



**FINAL REPORT**  
**A - 070/CENIPA/2014**

<b>OCCURRENCE:</b>	<b>ACCIDENT</b>
<b>AIRCRAFT:</b>	<b>PT-ROS</b>
<b>MODEL:</b>	<b>EMB720D</b>
<b>DATE:</b>	<b>06APR2014</b>



## NOTICE

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

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

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

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

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

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

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

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

## SYNOPSIS

This is the Final Report of the 06APR2014 accident with the EMB-720D aircraft, registration PT-ROS. The accident was classified as "Collision with Obstacle in-Flight".

The aircraft took off from the Aripuanã Aerodrome - MT, and did not arrive at the intended landing site. The wreckage was found the next day in an elevation at Triângulo Farm, a rural area of the same municipality.

The aircraft was destroyed.

The four occupants perished at the accident site.

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



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**GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS**

ANAC	(Brazil's) National Civil Aviation Agency
AIP	Aeronautical Information Publication
AVGAS	Aviation Gasoline
CA	Airworthiness Certificate
CENIPA	Aeronautical Accident Investigation and Prevention Center
CG	Center of Gravity
CHE	Certificate of Company Approval
CIOPAER	Integrated Center of Air Operations
CMA	Aeronautical Medical Certificate
GPS	Global Positioning System
HFAB	Brasília Air Force Hospital
IFR	Instrument Flight Rules
IFRA	Rating to perform flights under IFR rules - Airplane
IMC	Instrument Meteorological Conditions
LAT	Latitude
LONG	Longitude
MNTE	Qualification Type – Airplane Single-Engine Land
NOTAM	Notice to Airmen
PPR	Private Pilot License – Airplane category
RBHA	Brazilian Aeronautical Certification Regulation
SEMA	State Department for the Environment
SIPAER	Aeronautical Accident Investigation and Prevention System
TPP	Private Aircraft Service Registration Category
UTC	Coordinated Universal Time
VEM	Maximum Elevation Values
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
WAC	World Aeronautical Chart

## 1. FACTUAL INFORMATION.

<b>Aircraft</b>	<b>Model:</b> EMB720D <b>Registration:</b> PT-ROS <b>Manufacturer:</b> Neiva	<b>Operator:</b> Private
<b>Occurrence</b>	<b>Date/time:</b> 06APR2014/1130 UTC <b>Location:</b> Triângulo Farm <b>Lat.</b> 10°00'22"S <b>Long.</b> 059°34'40"W <b>Municipality – State:</b> Aripuanã - MT	<b>Type(s):</b> Collision with Obstacle In-Flight <b>Subtype(s):</b> Nil.

### 1.1 History of the flight.

The aircraft took off from the Aripuanã Aerodrome, MT, to Vespôr Farm, MT, at 1113 UTC on 06APR2014, with one pilot and three passengers on board, without a flight plan and under visual conditions.

The aircraft did not reach its destination. The searches began on the same day and the single-engine wreckage was found the following day at an elevation located at Triângulo Farm, a rural area in the municipality of Aripuanã, MT.

### 1.2 Injuries to persons.

Injuries	Crew	Passengers	Others
Fatal	1	3	-
Serious	-	-	-
Minor	-	-	-
None	-	-	-

### 1.3 Damage to the aircraft.

The aircraft was completely destroyed.



Figure 1 - View of the fuselage, empennage and engine's resting location.



Figure 2 - View of the right wing.

#### 1.4 Other damage.

Nil.

#### 1.5 Personnel information.

##### 1.5.1 Crew's flight experience.

Hours Flown	
	Pilot
Total	10.000:00
Total in the last 30 days	10:00
Total in the last 24 hours	00:10
In this type of aircraft	1.000:00
In this type in the last 30 days	10:00
In this type in the last 24 hours	00:10

**N.B.:** The Data on flown hours were obtained through family members.

##### 1.5.2 Personnel training.

The pilot took the Private Pilot - Airplane (PPR) course at the Aeroclub de Bragança, in the city of Bragança Paulista - SP, in 1992.

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

The pilot had the Private Pilot License - Airplane (PPR) and had valid Airplane Single-Engine Land Rating (MNTE).

##### 1.5.4 Qualification and flight experience.

The pilot was qualified, experienced and knew the region well, but did not have the technical qualification to fly instruments (IFRA).

##### 1.5.5 Validity of medical certificate.

The pilot had valid Aeronautical Medical Certificate (CMA).

### **1.6 Aircraft information.**

The single-engine, monoplane aircraft, with low wing, equipped with a fixed landing gear, EMB-720D model, serial number 720163, was manufactured by Neiva Aeronautics Industry in 1982 and was registered in the Private Air Service (TPP) category.

The aircraft had valid Airworthiness Certificate (CA).

The aircraft had 2.782 flight hours.

The last "100 hours type" inspection was completed on 05DEC2013 by the HAR3 approved shop (CHE nº 780901) in Santo Antônio do Leverger, MT, having flown 37 hours after the inspection.

In the aircraft documentation, there was no record of discrepancies that could affect its airworthiness

### **1.7 Meteorological information.**

There was no automatic or conventional station of the National Meteorological Institute within a 50 NM radius of the place of occurrence.

According to information from a pilot of the Integrated Center of Air Operations (CIOPAER) who planned to take off from the city of Aripuanã in the morning of the accident, the weather conditions were bad and with little visibility. The CIOPAER Commander took off after 1200 UTC, when the weather was more favorable for the visual flight.

Employees and neighbors of the Triângulo Farm reported that the visibility was very restricted by fog near the accident site. According to the reports, it was not possible to observe the distant trees at approximately 200 meters from the farmhouse.

### **1.8 Aids to navigation.**

Nil.

### **1.9 Communications.**

Nil.

### **1.10 Aerodrome information.**

The occurrence took place outside the Aerodrome.

### **1.11 Flight recorders.**

Neither required nor installed.

### **1.12 Wreckage and impact information.**

The accident happened in an area of high and dense forest, on an elevation of 299 meters of altitude at Triângulo Farm, municipality of Aripuanã, MT.



Figure 3 - View of the impact location of the aircraft.

The wreckage of the aircraft was spread for about 75 meters.

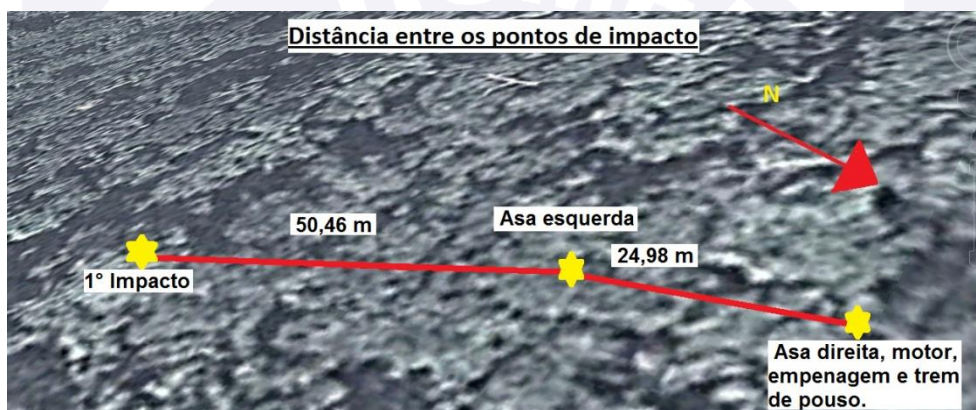


Figure 4 - Distances between the first impact, the left wing resting place and the last impact location.

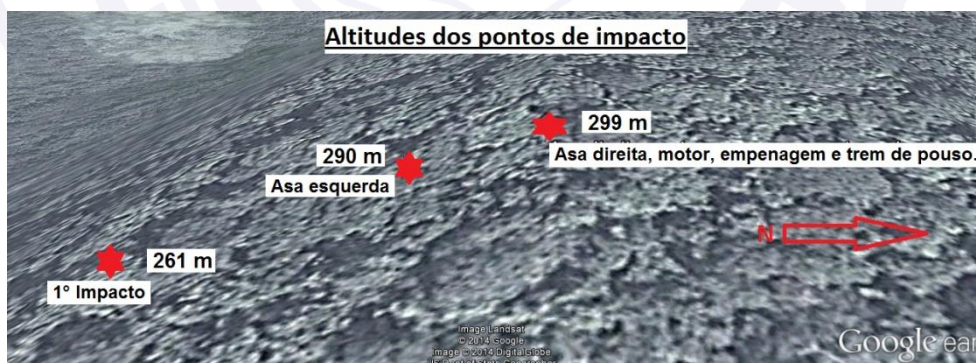


Figure 5 - Altitudes of the points of impact.

It was not possible to determine which the first surface of the aircraft to hit the treetops was.

The aircraft was 50.46m away from the first impact point and 29m above, it collided against the treetops and the left wing was sectioned, causing bearing movement.

The last crash of the aircraft against the trees broke the right wing and caused the plane's fuselage to fall, impacting "from top to bottom" on the back, away 24.98m from the left wing resting place and 9m above.

The mechanical control lever of the flaps was found in the 10 ° extension position. It was not possible to observe the positioning of the surfaces due to the state of the wrecks.



Figure 6 - View of the flaps control lever.



Figure 7 - View of the engine and propeller damaged by fire.

All fuel leaked after impact.

### **1.13 Medical and pathological information.**

#### **1.13.1 Medical aspects.**

The last health inspection of the pilot was performed at the Brasília Air Force Hospital (HFAB) on 30NOV2012. He was considered "able" for air activity with recommendations for the use of corrective lenses, treatment of obesity and hearing loss on the right side, within the acceptable limits by the current legislation at the time of the accident.

There was sudden inability with the aircraft fire, leading to the carbonization of the pilot's body, which was identified by exclusion.

#### **1.13.2 Ergonomic information.**

Nil.

#### **1.13.3 Psychological aspects.**

The pilot was a mining operator in different locations of Brazil. It was in this type of operation that he acquired more experience in aviation.

Reports from people close to the pilot confirmed that, although he did not have qualification for instrument flight, for more than once he entered non-visual flight conditions. This was a normal practice for him.

For more than 10 years, on average, period that he lived in Aripuanã, the pilot was a reference in the city, since he provided air transportation for the population, considering the distance that the city was from the great urban centers.

He had a social role in the community through activities such as patient air transportation, tourist flights and transfer service for holidays.

#### **1.14 Fire.**

It was not possible to determine the source of ignition after the collision against the rock, since the fire consumed most of the aircraft.

Fire was extinguished without interference from firefighting service, after consuming all inflammable material present. The temperature reached by the flames in the wreck was enough to melt the engine carter and the governor of the propeller.

#### **1.15 Survival aspects.**

Nil.

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

After the first impact of the aircraft on the ground, the GPS in the cabin, Garmin 296 model, was thrown out of the aircraft and therefore was not burnt along with the wreckage.

The de-recording of the data in the equipment allowed the following data to be obtained: date/time information, flight altitude, displacement, velocities, heading, geographic coordinates, vertical and horizontal displacement profiles (Figure 8).

On 06APR2014, a displacement of 13.2 NM, with a duration of 6 minutes and 40 seconds was recorded; whose origin was the Aripuanã Aerodrome, MT.

Nome: ACTIVE LOG 048 Cor: Azul Cancelar

Índice	Horário	Elevação	Velocidade do trecho	Percurso do trecho	Posição	Duração do trecho	Comprimento do trecho	P.
1	06/04/2014 08:13:18	226 m	53 nó	350° verdadeiro	S10 11 30.5 W59 27 24.1	0:00:06	540 pés	
2	06/04/2014 08:13:24	227 m	71 nó	351° verdadeiro	S10 11 25.2 W59 27 25.1	0:00:06	0.1 mn (milha náutica)	
3	06/04/2014 08:13:30	224 m	88 nó	351° verdadeiro	S10 11 18.2 W59 27 26.2	0:00:08	0.2 mn (milha náutica)	
4	06/04/2014 08:13:38	230 m	93 nó	349° verdadeiro	S10 11 06.6 W59 27 28.1	0:00:10	0.3 mn (milha náutica)	
5	06/04/2014 08:13:48	246 m	92 nó	341° verdadeiro	S10 10 51.5 W59 27 31.1	0:00:03	466 pés	
6	06/04/2014 08:13:51	248 m	95 nó	324° verdadeiro	S10 10 47.1 W59 27 32.5	0:00:04	0.1 mn (milha náutica)	
7	06/04/2014 08:13:55	251 m	101 nó	312° verdadeiro	S10 10 42.0 W59 27 36.3	0:00:09	0.3 mn (milha náutica)	
8	06/04/2014 08:14:04	261 m	104 nó	317° verdadeiro	S10 10 31.8 W59 27 47.7	0:00:12	0.3 mn (milha náutica)	
9	06/04/2014 08:14:16	281 m	110 nó	319° verdadeiro	S10 10 16.7 W59 28 02.2	0:00:11	0.3 mn (milha náutica)	
10	06/04/2014 08:14:27	290 m	119 nó	318° verdadeiro	S10 10 01.5 W59 28 15.5	0:00:15	0.5 mn (milha náutica)	
11	06/04/2014 08:14:42	289 m	121 nó	314° verdadeiro	S10 09 39.4 W59 28 35.5	0:00:11	0.4 mn (milha náutica)	
12	06/04/2014 08:14:53	296 m	122 nó	316° verdadeiro	S10 09 24.1 W59 28 51.7	0:00:10	0.3 mn (milha náutica)	
13	06/04/2014 08:15:03	301 m	121 nó	318° verdadeiro	S10 09 09.5 W59 29 06.0	0:00:13	0.4 mn (milha náutica)	
14	06/04/2014 08:15:16	307 m	126 nó	322° verdadeiro	S10 08 49.9 W59 29 23.6	0:00:12	0.4 mn (milha náutica)	
15	06/04/2014 08:15:28	293 m	130 nó	327° verdadeiro	S10 08 30.1 W59 29 39.4	0:00:09	0.3 mn (milha náutica)	
16	06/04/2014 08:15:37	298 m	127 nó	327° verdadeiro	S10 08 13.9 W59 29 50.3	0:00:19	0.7 mn (milha náutica)	
17	06/04/2014 08:15:56	305 m	128 nó	330° verdadeiro	S10 07 40.1 W59 30 12.6	0:00:09	0.3 mn (milha náutica)	
18	06/04/2014 08:16:05	304 m	129 nó	334° verdadeiro	S10 07 23.5 W59 30 22.4	0:00:13	0.5 mn (milha náutica)	
19	06/04/2014 08:16:18	294 m	128 nó	335° verdadeiro	S10 06 58.3 W59 30 34.7	0:00:14	0.5 mn (milha náutica)	
20	06/04/2014 08:16:32	288 m	127 nó	333° verdadeiro	S10 06 31.3 W59 30 47.5	0:00:11	0.4 mn (milha náutica)	
21	06/04/2014 08:16:43	283 m	126 nó	337° verdadeiro	S10 06 10.5 W59 30 58.2	0:00:12	0.4 mn (milha náutica)	
22	06/04/2014 08:16:55	275 m	127 nó	335° verdadeiro	S10 05 47.4 W59 31 08.4	0:00:09	0.3 mn (milha náutica)	
23	06/04/2014 08:17:04	267 m	127 nó	328° verdadeiro	S10 05 30.3 W59 31 16.7	0:00:10	0.4 mn (milha náutica)	
24	06/04/2014 08:17:14	260 m	126 nó	327° verdadeiro	S10 05 12.3 W59 31 28.1	0:00:19	0.7 mn (milha náutica)	
25	06/04/2014 08:17:33	248 m	123 nó	327° verdadeiro	S10 04 38.9 W59 31 50.1	0:00:14	0.5 mn (milha náutica)	
26	06/04/2014 08:17:47	253 m	120 nó	326° verdadeiro	S10 04 14.9 W59 32 06.1	0:00:29	1.0 mn (milha náutica)	
27	06/04/2014 08:18:16	255 m	118 nó	323° verdadeiro	S10 03 26.9 W59 32 38.9	0:00:19	0.6 mn (milha náutica)	
28	06/04/2014 08:18:35	250 m	122 nó	322° verdadeiro	S10 02 57.0 W59 33 01.7	0:00:13	0.4 mn (milha náutica)	
29	06/04/2014 08:18:48	243 m	123 nó	320° verdadeiro	S10 02 36.1 W59 33 18.1	0:00:21	0.7 mn (milha náutica)	
30	06/04/2014 08:19:09	230 m	125 nó	326° verdadeiro	S10 02 03.1 W59 33 45.9	0:00:07	0.2 mn (milha náutica)	
31	06/04/2014 08:19:16	223 m	128 nó	334° verdadeiro	S10 01 51.0 W59 33 54.1	0:00:09	0.3 mn (milha náutica)	
32	06/04/2014 08:19:25	221 m	128 nó	334° verdadeiro	S10 01 33.8 W59 34 02.8	0:00:13	0.5 mn (milha náutica)	
33	06/04/2014 08:19:38	206 m	128 nó	332° verdadeiro	S10 01 09.0 W59 34 15.3	0:00:13	0.5 mn (milha náutica)	
34	06/04/2014 08:19:51	195 m	118 nó	332° verdadeiro	S10 00 44.4 W59 34 28.4	0:00:07	0.2 mn (milha náutica)	
35	06/04/2014 08:19:58	192 m			S10 00 32.3 W59 34 35.0			

<fim>

Figure 8 - Numerical data collected from the Garmin GPS 296.

The distance and duration recorded on the equipment were not equivalent to the totality of the performed flight, since the last position indicated on the device corresponded to a point distant 0.2 NM from the position where the wreckage was found.



Figure 9 - Trajectory recorded by the GPS and trajectory till the point of impact.

This gap can be explained by the recording method of flight data in the GPS. For memory savings, the data is recorded in certain time intervals.

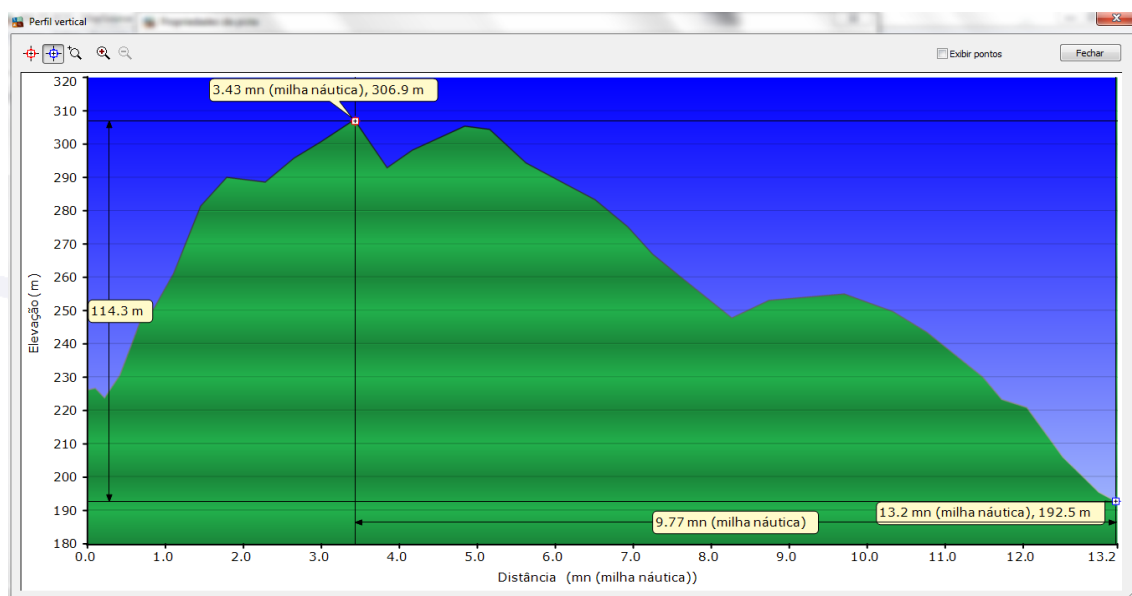


Figure 10 - Vertical profile recorded by the GPS of the PT-ROS (Garmin 296).

The location of Vespôr Farm, latitude 09°20'23 "S and longitude 059°59'55" W, was obtained in the aircraft's GPS database. The ideal heading of the runway from Aripuanã Aerodrome to Vespôr Farm was 328°.

### 1.17 Organizational and management information.

The pilot, along with his brother, developed his own business in the city, operating in a similar way to the air taxi service, although he did not have authorization for this type of service.

The flight that originated the accident was hired the day before the occurrence, 05ABR2014, by a wood sector executive of the region, of great economic power in the city. He aimed to transport two technicians from the State Environmental Department (SEMA) to Vespôr Farm, with the purpose of performing a scheduled survey, in which he had interest.

This survey was scheduled since 04/05/2014, but due to the heavy rains in the region, it was not possible to take the technicians to Vespôr Farm by land. The flight was then justified as a more viable way of transport.

According to information obtained by the Investigation Commission, the pilot had not performed any type of training for an instrument flight. It was also not possible to determine if he had some level of technical knowledge, acquired informally.

### 1.18 Operational information.

According to his relatives, the pilot had chartered flights, was used to fly in the region of the accident for more than 10 years, had operated in places that explored mining and had already performed flights under IMC conditions, although he did not have the qualification to operate by instruments.

The aircraft was fueled with 150 liters of AVGAS on the day of the accident. However, it was reported that there was remaining fuel in the tanks.

The pilot was to transport three passengers from Aripuanã, MT to Vespôr Farm, in Colniza, MT. The distance between the runways was 59.6NM and the ideal heading 328°.



After takeoff, the velocity was kept within the "normal operation" range and above the stall speed without power for 30° of inclination without flaps (Figure 12) up to 0.2 NM from the accident site, the last position recorded on the GPS database.

### 1.19 Additional information.

According to ICA 100-12, Rules of the Air:

#### 3.4.2 FLIGHT PLANNING

3.4.2.1 Before beginning a flight, the pilot-in-command of an aircraft shall be aware of all information necessary for the planning of the flight.

3.4.2.2 The information required for the flight referred to in 3.4.2.1 shall include at least the detailed study:

(A) of meteorological conditions (updated weather reports and forecasts) of the aerodromes involved and the route to be flown;

(B) of the estimated fuel calculated for the flight;

(C) of the alternative planning in case the flight cannot be completed; and

(D) of the flight pertinent conditions provided for in AIP-BRASIL and ROTAER, as well as those disclosed through NOTAM.

#### 4.9 Minimum of Cloud Visibility and Clearance in VMC.

Distance from clouds:

Airspace Class B - Cloud-free;

Classes of Airspaces C, D and E - 1500 m horizontally and 300 m (1000 ft) vertically.

5.1.3 Except as authorized by the ATC body to serve a special VFR flight, VFR flights may not land, take off, enter ATZ or the traffic circuit of such aerodrome if:

(A) the ceiling is less than 450 m (1500 ft); or

(B) the ground visibility is less than 5 km.

5.1.4 Except in landing and take-off operations, VFR flight will not be carried out:

(A) on cities, towns, inhabited places or groups of persons outdoors, less than 300 m (1000 ft) above the highest obstacle within a radius of 600 m around the aircraft; and

(B) in places not mentioned in the previous paragraph, at a height of less than 150 m (500 ft) above ground or water.

According to RBHA 91, Brazilian Regulation of Aeronautical Homologation:

#### 91.5 - Requirements for crews

(A) No person may operate a civil aircraft registered in Brazil, unless:

1) the minimum crew of the aircraft is that established by its certificate of airworthiness;

(2) when the certificate of airworthiness requires two pilots, one of them has been designated as pilot-in-command of the aircraft; and

(3) the operation is conducted by suitably qualified crew members, not only for the aircraft but also for the position they hold on board and valid certificate holders of physical capacity.

(4) for big airplanes and multi-engines aircraft, with turbine engines, the crew members must follow what is established on paragraphs (A) (1), (2) and (3) of this section, and in addition to the applicable requirements of sections 91.529, 91.531 and 91,533 of that regulation.

(B) No person may operate IFR with a civil aircraft registered in Brazil unless the crew meets the applicable requirements of paragraph (a) of this section and additionally:

(1) the aircraft must be homologated for IFR flight and the crew must conduct the operation according to the IFR flight procedures established by the approved Flight Manual of the aircraft;

2) For aircraft configured for passengers with 9 or fewer seats:

(ii) Without autopilot, the crew shall be composed by two pilots, both with IFR qualification, one of them qualified as pilot-in-command of the aircraft and the other one qualified at least as second-in-command.

## 1.20 Useful or effective investigation techniques.

Nil.

## 2. ANALYSIS.

The pilot was not qualified to operate by instruments and made charter flights in the region, which was his main occupation. He routinely operated from Aripuanã Aerodrome - MT, although the runway had been canceled since 15NOV2012.

Information from another pilot indicated that the Commander had already operated in unfavorable conditions for the visual flight, although he was not able to do so.

On 05/05/2014, the pilot was hired by a wood sector executive from the region to fly on 06ABR2014, with the intention of transporting two technicians from the State Department of Environment (SEMA) to Vespôr Farm.

The purpose of the technicians' trip to the farm was to perform a scheduled survey of the contractor's interest. Such an inspection was scheduled since 04/05/2014. However, due to the heavy rains in the region, it was not possible to take the technicians to Vespôr Farm by land.

On 06APR2014, the aircraft took off at 1113 UTC from the city of Aripuanã, MT, with one pilot and three passengers on board, in meteorological conditions unfavorable for the visual flight, according to reports.

After the takeoff, the pilot kept flying at low altitude, never exceeding the altitude of 1.000ft, as recorded in the GPS data.

It was also observed that in the WAC chart the values of maximum elevations (VEM) in the squares of the intended route were 1.700ft. Therefore, the minimum altitude that the pilot should maintain was 2.200ft.

The air traffic regulations were clear as to the criteria for the VFR flight, stating that the aircraft should have been away from the clouds 1.500m horizontally and 1.000ft vertically.

Employees and neighbors of the Triângulo Farm reported that the visibility was very restricted at the time of the accident. According to them, it was not possible to observe the trees that were approximately 200m away from the farmhouse. This visibility was much lower than the one required for the visual flight. Some witnesses even reported that they saw the aircraft passing very close to the top of some trees.

Due to the evidence found, it is not possible to rule out the hypothesis that the pilot considered it possible to perform the flight, even in adverse weather conditions, motivated by the professional commitment to transfer the survey team to Vespôr Farm. It is known that much of the pilot's professional experience was based on the aviation in mining areas, which is supposed to have offered him a more daring profile and corroborated for him to develop an excessive confidence in his ability to pilot under high operational risk conditions.

However, regardless of the factor that motivated the execution of the flight, the pilot-in-command would be responsible for analyzing the meteorological conditions of the route

to be flown and for the alternative planning, in case it is not possible to complete the flight, as determined in item 3.4 .2.2 of ICA 100-12 (item 1.19 of this Report).

Nevertheless, as the pilot had previously performed visual flights under IFR flight conditions, according to reports, when encountering reduced visibility on the route to *Vespor Farm*, he may have been induced to attempt to fly in visual conditions when, in theory, the en route weather required the IFR flight.

The attempt to fly in visual conditions with the ground forced the pilot to remain at low altitude in an attempt to fix the visual contact with the land references and thus be possible landing at the intended location. It should be noted that the planned landing field was not registered and had no aid to the flight under IMC conditions.

The way in which the pilot conducted the flight, even in the face of bad weather conditions on the route, indicated that, at no time did he attempt to return to the *Aripuanã Aerodrome - MT*, since the heading variation did not exceed  $10^{\circ}$  in relation to the ideal one for the destination. It should be noted that the aircraft had enough fuel to perform such changes on the route.

Therefore, in face of heavy fog condition, in which external visual references were limited, with low altitude flight and without training for instrument flight, it is possible that the pilot could not maintain a safe and up-to-date visual image in relation with the obstacles ahead.

During the climb, it is likely that the ceiling conditions, along with the need to keep the flight with references on the ground, have led the Commander to level at an altitude of less than 1,000ft. When approaching to *Triângulo Farm*, it is assumed that the conditions have worsened, leading to the performance of a flight closer to the ground obstacles, that is, 192 meters.

Due to the visibility restriction, the pilot would only be able to observe the elevation at a distance of less than 0.2 NM from the point of impact. In this way, he is likely to have tried to ascend to overcome the obstacles. However, he did not succeed and collided with the vegetation.

Despite the impaired visual perception of the pilot, the analysis of the data on this occurrence showed that the accident could have been avoided if there had been adequate evaluation of the risks involved in an operation context, for which the pilot was not trained yet.

The pilot demonstrated an inadequate judgment regarding the risks involved in the operation, by agreeing to take off in visual condition when the en route characteristics would oblige him to operate by instrument, for which he was not qualified, and still flying below the minimum safety altitude.

Making an improper judgment increases the likelihood that new judgments and misjudgments will occur in sequence, leading to the adoption of unsafe attitudes, like the pilot's, who flew in a scenario for which he had never been trained.

It is a scenario that can significantly affect the situational awareness that the pilot must keep to manage a risk context, which, in this case, was illustrated by an erroneous perception and evaluation about the risks that environmental variable offered to the operation.

It was not possible to determine whether the reasons that would have led the pilot to assume such a risky flight condition were the commitment he made with the executive, the self-confidence to fly in conditions of greater risk or his familiarity with the region, as well as the combination of the three factors.

However, it became clear that the simple observation of the regulations provided by ICA 100-12 (Air Rules) as well as RBHA 91 would have acted as an important defense to prevent the accident.

It was not possible to test propellers and power plant system due to fire. Therefore, it is not possible to rule out completely a possible failure in these components.

However, taking into account the last speed recorded by the GPS-118kt, 48kt above the stall speed with 30° of lateral slope and without flaps, at 0.2 NM of the point of impact, besides the dispersion of the wreck of 75.44m in ascending positions, in the elevation of the accident site, it is possible to infer that the motor did not present functional problems.

It was not possible to determine if the deflection of 10° in the flap control occurred intentionally, in an attempt to increase the lift to clear the obstacles or if it occurred due to forgetfulness after takeoff. Also, if it was the result of a large number of people who accessed the place of the accident before the arrival of the investigation group. The lack of training to operate under IMC conditions also contributed to the commander's inadequate piloting judgment, as he believed it was possible to keep the flight, even in unfavorable conditions to the VMC flight.

This may still have led the pilot to try to maintain the ground's view, even at an altitude that did not guarantee his safety, nor of his passengers.

### **3. CONCLUSIONS.**

#### **3.1 Facts.**

- a) the pilot had valid Aeronautical Medical Certificate (CMA);
- b) the pilot had the Private Pilot License - Airplane (PPR);
- c) the pilot had valid Airplane Single-Engine Land Rating (MNTE);
- d) the pilot did not have an instrument flight qualification (IFRA);
- e) the aircraft had valid Airworthiness Certificate (CA);
- f) weather conditions were not favorable for the visual flight.
- g) the Aripuanã Aerodrome MT was cancelled since 15NOV2012.
- h) the Vespur Farm runway was not on the list of private Aerodromes, available on the ANAC website.
- i) the pilot took off for a passenger transport flight.
- j) GPS recorded a displacement of 13.2NM with duration of 6min40sec.
- k) the aircraft collided against vegetation in a straight and ascending trajectory.
- l) The aircraft was destroyed.
- m) The pilot and all the occupants of the aircraft perished at the accident site.

#### **3.2 Contributing factors.**

##### **- Attitude – a contributor**

Despite the existence of regulations that determined the conditions for VFR and IFR flights, the pilot overestimated his ability to operate under visual flight rules in the midst of bad weather conditions. In addition, as he proceeded for this type of flight, he performed the operation in an improvised manner, compromising his safety.

##### **- Adverse meteorological conditions – a contributor**

The weather conditions allowed the formation of clouds at low altitude, making it difficult to see the elevation in the Triângulo Farm.

- **Training – a contributor.**

The lack of flight training per instrument contributed to the pilot to keep the flight below the minimum safety altitude and visibility limited, favoring the collision of the aircraft against obstacles ahead.

- **Flight indiscipline – a contributor.**

The pilot was not qualified for the IFR flight and took off from a canceled Aerodrome under adverse conditions to the VMC flight. After takeoff, the Commander kept the aircraft flying below 300 meters of height from the highest elevation of the ground.

The non-observation of these rules allowed the aircraft to approach the elevation of Triângulo Farm, where the collision occurred against vegetation, at an altitude in which the pilot could not overcome the obstacles.

- **Piloting judgment – a contributor.**

There was an inadequate evaluation of the route and of the meteorological conditions, leading the pilot to take off and to continue in VFR flight, without visibility and ceiling conditions.

- **Motivation – undetermined.**

It is possible that the pilot was motivated to perform the visual flight, even in adverse weather conditions, based both on his experience of having already operated visually in these conditions, and on the need to fulfill the commitment made with the timber executive, since the flight was the only way to access the Vespôr Farm at that time.

- **Perception – a contributor.**

The low altitude flight, without help of instruments, under heavy fog, demonstrated low situational awareness of the pilot to the risks that these conditions offered to the operation.

In addition, the limited visibility of the pilot from the obstacles ahead would have prevented him from identifying the specific distance of the aircraft from the trees in an adequate time to perform a deviation, favoring the collision of the aircraft against those obstacles.

- **Flight Planning – a contributor**

Since the pilot was not qualified for the IFR flight, he should have planned the use of an altitude compatible with the ground elevations and with the Air Rules (ICA 100-12), as well as performing alternative procedures to ensure the flight safety, in case the weather conditions prevented the visual flight.

- **Decision Making – a contributor.**

The decision to proceed to a flight under visual rules, when conditions were not favorable, reflected the lack of an adequate assessment of the risks that could affect the safety of the operation.

#### **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, criminal, or administrative liability.*

*In consonance with the Law n°7565/1986, recommendations are made solely for the benefit of the air activity operational safety, and shall be treated as established in the NSCA 3-13 “Protocols for the Investigation of Civil Aviation Aeronautical Occurrences conducted by the Brazilian State”.*

**Recommendations issued prior to the publication of this report:**

Nil.

**Recommendations issued at the publication of this report:**

Nil.

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

None.

On April 5<sup>th</sup>, 2018.