

COMANDO DA AERONÁUTICA
CENTRO DE INVESTIGAÇÃO E PREVENÇÃO DE
ACIDENTES AERONÁUTICOS



FINAL REPORT
A - 140/CENIPA/2017

OCCURRENCE:	ACCIDENT
AIRCRAFT:	PP-ENM
MODEL:	AS-350 B2
DATE:	10NOV2017



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 Appendix 2, 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.

SYNOPSIS

This is the Final Report of the 10NOV2017 accident with the AS 350 B2 aircraft model, registration PP-ENM. The accident was classified as “[LALT] Low Altitude Operations”.

During the monitoring of a vehicle, in an aero police operation, the aircraft collided the blades of the main rotor against a low voltage power grid. Then, the pilot decided to make a precautionary landing, in order to assess the condition of the aircraft.

There was substantial damage to the aircraft.

The five occupants of the helicopter left unharmed.

An Accredited Representative of the *Bureau d'Enquêtes et d'Analyses pour la Sécurité de l'Aviation Civile* (BEA) - France, (State where the aircraft was designed) was designated for participation in the investigation.



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GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS

ADE	Aircraft Registration Category – Direct State Administration
ANAC	Brazil's National Civil Aviation Agency
BEA	Bureau d'Enquêtes et d'Analyses pour la Sécurité de l'Aviation Civile
CA	Airworthiness Certificate
CIOPAER	Integrated Air Operations Coordination
CIV	Pilot's Flight Logbook
CMA	Aeronautical Medical Certificate
CRM	Crew Resource Management
DAC	Civil Aviation Department
DECEA	Air Space Control Department
HMLT	Helicopter Multi-Engine Rating
HMNT	Single Turbo Helicopter Rating
IAC	Civil Aviation Instruction
IAM	Annual Maintenance Inspection
INVH	Flight Instructor Rating - Helicopter
METAR	Aviation Routine Weather Report
MGSO	Safety Management Manual
MOP	Operations Manual
NADSO	Acceptable Operational Safety Performance Level
OEE	Special Equipment Operator
PCH	Commercial Pilot License – Helicopter
PF	Pilot Flying
PNF	Pilot Not Flying
PPH	Private Pilot License – Helicopter
P-PSAC	Small Civil Aviation Service Providers
RBHA	Brazilian Aeronautical Certification Regulation
SERIPA II	Second Regional Aeronautical Accident Investigation and Prevention Service
S/N	Serial Number
SGSO	Safety Management System
SOP	Standard Operating Procedures
SSPDS	Public Security and Social Defense Department
UAP	Public Air Unit
UTC	Universal Time Coordinated

1. FACTUAL INFORMATION.

Aircraft	Model: AS-350 B2 Registration: PP-ENM Manufacturer: Eurocopter France	Operator: Ceará's Public Security and Social Defense Department
Occurrence	Date/time: 10NOV2017 - 1543 UTC Location: Guassussê District Lat. 06°19'57"S Long. 038°58'20"W Municipality – State: Orós – CE	Type(s): [LALT] Low Altitude Operations Subtype(s): NIL

1.1 History of the flight.

The aircraft took off from Nova Floresta - CE, at about 1535 (UTC), in order to participate in an aero police operation in the region, with two pilots and three Special Equipment Operators (OEE) on board.

With about ten minutes of flight, while accompanying a vehicle, the aircraft collided the blades of the main rotor against a low voltage power grid. The crew immediately decided to land to assess the helicopter. The maneuver took place successfully.

The aircraft had substantial damage.

The five crewmembers left unharmed.

1.2 Injuries to persons.

Injuries	Crew	Passengers	Others
Fatal	-	-	-
Serious	-	-	-
Minor	-	-	-
None	5	-	-

1.3 Damage to the aircraft.

The aircraft had substantial damage to the main rotor blades.

1.4 Other damage.

There was damage to the low voltage power grid.

1.5 Personnel information.

1.5.1 Crew's flight experience.

Flight Hours		
	Pilot	Copilot
Total	4.416:00	1.200:00
Total in the last 30 days	14:40	06:20
Total in the last 24 hours	01:50	01:05
In this type of aircraft	1.273:00	700:00
In this type in the last 30 days	13:40	05:20
In this type in the last 24 hours	01:50	01:05

N.B.: The data related to the flown hours were obtained through the Pilots' Flight Logbooks.

1.5.2 Personnel training.

The pilot took the PPH course at the *Aeroclub do Brasil* - RJ, in 1997.

The copilot took the PPH course at the *Aeroclub do Ceará* – Brazil, in 2011.

1.5.3 Category of licenses and validity of certificates.

The pilot had the PCH License and valid HMNT, HMLT and INVH Ratings.

The copilot had the PCH License and valid HMNT, HMLT and INVH Ratings.

1.5.4 Qualification and flight experience.

The pilots were qualified and had experience in the kind of flight.

1.5.5 Validity of medical certificate.

The crewmembers had valid CMAs.

1.6 Aircraft information.

The aircraft, serial number 3333, AS-350B2 model, was manufactured by Eurocopter France, in 2001, and it was registered in the ADE category.

The aircraft had valid Airworthiness Certificate (CA).

The airframe and engine logbooks records were updated.

The last inspection of the aircraft, the "10 hours type", was carried out on 07NOV2017, by the CIOPAER, in Fortaleza - CE, with the aircraft having flown 03 hours and 05 minutes after the inspection.

The last inspection of the aircraft, the "IAM type", was carried out on 25OCT2017, by the maintenance organization Chopper Solution, in Eusébio - CE, with the aircraft having flown 22 hours after the inspection.

1.7 Meteorological information.

The weather conditions were favorable for the visual flight.

1.8 Aids to navigation.

Nil.

1.9 Communications.

Nil.

1.10 Aerodrome information.

The occurrence took place out of the Aerodrome.

1.11 Flight recorders.

Neither required nor installed.

1.12 Wreckage and impact information.

After the precautionary landing, substantial damage was observed to the main rotor blades (Figure 1).

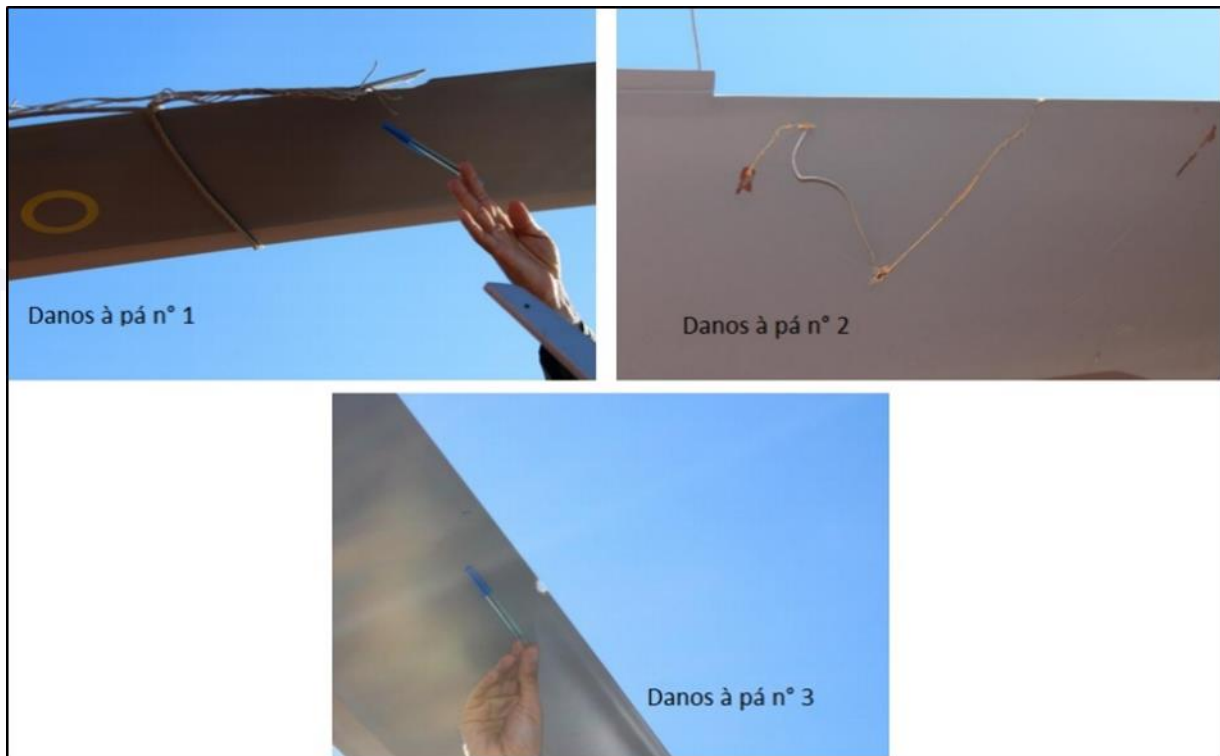


Figure 1 - Damage to the main rotor blades.

1.13 Medical and pathological information.

1.13.1 Medical aspects.

Nil.

1.13.2 Ergonomic information.

Nil.

1.13.3 Psychological aspects.

According to the information collected, the pilots involved in the occurrence were familiar with that type of operation and with the region in which the flight was being performed.

It was reported that, during the flight, the crewmembers were monitoring a vehicle traveling on a road. Although it was commented in a briefing about the possibility of obstacles at low altitude in that region, there was no coordination regarding the tasks assigned to each of the crew.

According to the reports obtained, it was common for the crew to adopt informal practices, due to the absence of criteria defined in rules that would guide aero police operations, such as the lack of a minimum height for certain operations.

1.14 Fire.

There was no fire.

1.15 Survival aspects.

Nil.

1.16 Tests and research.

Nil.

1.17 Organizational and management information.

The CIOPAER was a special enforcement body of the SSPDS, which provided air support to all units of the Civil Police, Fire Brigade and Military Police, as well as government and civil defense entities of the Ceará state.

The organization had a staff composed by officers and enlisted personnel from the Military Police and the Fire Brigade, as well as deputies, inspectors and clerks from the Civil Police, being directly subordinated to the SSPDS.

The CIOPAER operated with models AS-350 (*Esquilo*) and EC145 for the fulfillment of multiple missions of ostensive and repressive policing, firefighting and civil defense.

The CIOPAER was headquartered at Fortaleza International Airport, with operational bases in the countryside of Ceará. The crew involved in this accident operated with the aircraft AS 350 B2 and was based at Juazeiro do Norte.

Aero police operations that took place from the base located in Juazeiro do Norte - CE, were carried out under the technical and operational supervision of the CIOPAER's headquarters.

According to data obtained at the time of the accident, there were no standards and publications in the CIOPAER that formalized the procedures to be adopted in aero police operations.

Due to the absence of these normative criteria, some procedures were performed according to the crew's judgment, for example, the establishment of a minimum height for aero police operations, in order to avoid collision with obstacles.

1.18 Operational information.

It was a mission in support of the Ceará state's SSPDS.

The pilots had experience in the type of operation and were accustomed to the location (they knew the region of the flight). The crewmembers consisted of the pilot, in the function of Pilot Not Flying (PNF), copilot, in the function of Pilot Flying (PF) and three OEE.

According to the information obtained, the crewmembers had not received Team Resource Management training - crew (CRM) and did not know the IAC 060-1002A, from 14APR2005 - Training Corporate Resource Management - CRM.

The CIOPAER Training Program, in force at the time, did not establish a systematic procedure that would allow adequate training for crews on CRM. The concepts were explained superficially, when approaching other subjects.

There were also no standard height limits for the CIOPAER operations, notably for vehicle tracking missions.

The briefing for the mission was carried out by the aircraft commander, who was in the PNF function, who warned of possible obstacles at low altitude in the region. In the same briefing, a minimum height limit for that flight was not stipulated.

The aircraft was engaged to track a vehicle traveling on a road, in the rural area of the Guassussê district, in the municipality of Orós - CE.

During the maneuver, the helicopter collided the blades of the main rotor with a low voltage power grid, at a height of approximately 50 meters above the ground. The crewmembers immediately decided to land to assess the helicopter, next to the crash site. At the time of the collision, the aircraft was within the weight and balance limits specified by the manufacturer.

1.19 Additional information.

Regarding Public Security and / or Civil Defense Air Operations, Subpart K of the RBHA nº 91, General Operating Rules for Civil Aircraft, established that:

91.961 - SPECIAL OPERATING CONDITIONS:

(a) The DAC, "a priori", authorizes the following special operating conditions, which exception the general provisions of this regulation, in air operations of public security and / or civil defense, if the objective is public protection and assistance. The Agency is responsible for establishing training programs and standard operation and flight safety procedures, in order to guide the conduct of crews in such special conditions.

(...)

(c) To authorize or execute an air operation under paragraphs (a) and (b) of this section, the Agency and / or the commander of the aircraft involved must manage the risks considering, among others:

(1) whether the risks created by the operation will not aggravate an already serious situation;

(2) whether the risks created by the operation in relation to third parties are valid in terms of "cost-benefit";

(3) whether the risks assumed in the operation are acceptable in view of its objectives; and

(4) whether the crews involved are adequately trained and able to carry out the mission.

The resolution nº106 of the ANAC, from 30JUN2009, approved the Safety Management System for P-PSAC.

Art. 2 For the purposes of this Resolution, small civil aviation service providers are considered:

(...)

II - Public Security and / or Civil Defense air operators (governed by Subpart K of the RBHA / RBAC 91);

The Appendix to Resolution nº106, from 30JUN2009, as amended by Resolution nº234, from 30MAY2012 and Resolution nº240, from 26JUN2012, dealt with the Operational Safety Management System for Small Civil Aviation Service Providers, which among other aspects prescribed that:

(...)

5 - Risk Management Process

(...)

5.5.6. It is widely recommended to adopt those programs that, although not mandatory, have an intense relationship with the type of P-PSAC operation, such as:

(b) Corporate Resources Management - CRM;

According to Pinto (2011, p.178)¹:

The possibility of human errors in the fulfillment of public security aviation emergency missions in Brazil is described in the eight phases of an emergency or planned air mission, specifying each one, listing a high exposure to risk due to the complexity of acts and decisions made in each of the eight phases: (Figure 2)

¹ PINTO, Milton Kern. **A sobrevivência de helicópteros como um dos fatores preponderantes na aviação de segurança pública do Brasil.** Revista Conexão SIPAER, Brasília, v.2, n.3, p. 171-189, ago. 2011. Available at: <<http://conexaosipaer.cenipa.gov.br/index.php/sipaer/article/view/109/136>>. Access on: 21 nov. 2018.



Figure 2 - Complete cycle of a Public Security Aviation Mission / Air Operation.

Also according to Pinto (2011, p. 180), the fourth phase, which dealt with the visualization of the mission site and approach to landing, addressed, among others, aspects related to inattention to obstacles on the ground, to the distraction of the crew regarding coordination procedures (tunnel vision) and the lack of application of effective situational awareness in relation to obstacles:

According to Pinto (2011, p.180):

The fourth phase deals with the visualization of the mission site and approach, with possible inaccuracies, such as: hot entry into the emergency mission approach circuit with great speed, causing inattention to obstacles on the ground (power grid wires, trees, posts, etc.) and accentuated flare (rounding) for landing, providing, according to the direction and intensity of the wind, a possible pre-stall or power stall flare (rounding) with accentuated nose up, with tail wind; improper selection of the landing site (too restricted area or touching area with a lot of inaccuracy on the ground) creating danger for disembarking or boarding; incorrect judgment in approaching the glide ramp for landing or hovering with obstacles, associated direction and intensity of the wind; incorrect or disused standard operating phraseology by the crew in coordinating approaches and landings in restricted areas; distracting the crew from the coordination procedures when approaching, focusing more attention (tunnel vision) on the ground, such as: victims, people, vehicles, etc., forgetting to visualize the obstacles present in the approach ramp to a restricted area (wires, birds, wind, towers, trees, etc.); inattention of the crew regarding the presence of people moving in the landing and touching area of the helicopter; forget the advance planning for a probable go around procedure of the place that is approaching, assessing its availability of power reserve for a possible overcoming of obstacles to the detriment of the required power; lack of coordination or incorrect cabin phraseology in the acts and functions of each crewmember when approaching landing on stones, elevated helipads or terraces of burning buildings; lack of application of effective situational awareness with decision-making and anticipatory behavior in approaches and landings (restricted areas) in places where there are risky circumstances when landing the helicopter, such as wires, birds, towers, antennas, fire, smoke, heat, large number of people and moving vehicles nearby.

In the same work, Pinto (2011, p. 182) talked about the seventh phase, addressing the transfer of a victim to a hospital or safe place, warning about the possible risks in this operation:

The seventh phase is the phase of transferring the victim to a hospital or safe place, which may occur: continuation of the flight with low fuel level; extrapolation of speed,

torque or gas generator (Ng) limits, in order to arrive at the hospital as quickly as possible; too much concern about the victim's condition, forgetting the constant evaluation of the parameters of the instruments on the panel; choosing an inappropriate route due to weather conditions; incorrect choice of altitude exposing to collision with obstacles on the ground; fly unnecessarily over places that do not have a minimum area for real auto-rotation, in case of engine failure; forget to do aeronautical and public security communications.

In addition, Pinto (2011, p. 183) highlighted that:

A public security aviation helicopter pilot will be able, during an emergency mission operation, on average, every four minutes of flight, to make, unexpectedly and simultaneously at least, forty decision-making actions with flight maneuvers and management of the aircraft systems, from the beginning to the end of the mission (considering turns, simultaneous application of pedals; application of collective and cyclic commands; uphill and downhill; radio communications; restricted landings and takeoffs, checklist; constant changes of heading and speed, scans (quick visualization) on panel instruments, among others) having the crew to ensure flight safety combined with achieving success in the mission.

On 12APR2019, the ANAC approved the RBAC n° 90, AMENDMENT n° 00, which dealt with the Requirements for Special Public Aviation Operations:

90.1 Applicability

(a) This Regulation is applicable to the special public aviation operations of the agencies and entities of the public administration, when exercising their duties established by law and in section 90.5 of these Regulations.

(...)

90.5 Assignments of air units of public agencies and entities

(a) Special public aviation operations carried out by public agencies and entities will be restricted to their attributions provided by law.

(b) The duties of the public agencies and entities reached by this Regulation are:

(1) aerial public security operations: aimed at preserving public order, the safety of people and property, protecting the environment and civil defense actions as established in art.144 of the Constitution of the Federative Republic of Brazil.

(...)

Among the aspects covered, Section 90.311 of Subpart V addressed the general requirements for Low Tactical Flight, below:

90,311 General requirements:

(a) The initial requirement for tactical operation at low altitude is that the control of the risk inherent in the operation, including the protection of aircraft, crew, persons on board, passengers and third parties, is within NADSO.

(b) The air operations prevised in this Regulation shall be carried out, as a priority, within the minimum height limits established by the RBHA 91, or RBAC that will replace it, and by the DECEA, except in landing, take-off, missed approach or to serve the aforementioned special public aviation operation.

(c) Tactical low flight under IFR or IMC is prohibited.

(d) Procedures for tactical flight at low altitude must be included in the MOP and SOP.

(e) The pilot-in-command of the aircraft may refuse any aerial operation below the minimum heights provided by the DECEA to preserve flight safety.

(f) Requirements for tactical operation at low height are:

(1) that is under VMC;

(2) that is essential to the fulfillment of the public mission;

(3) that the crewmembers and other people on board are properly trained for this type of operation, including the curriculum components to avoid collision with wires and obstacles close to the ground;

(4) that there is an evaluation of the operation site, observing that: (i) third parties on the ground are at a minimum height and safety distance; and (ii) the objects that are loose or that could be loosened on the ground of the operation are at a safe distance;

(5) that the level of tolerability of the risk of air operation is within the NADSO defined by the UAP;

(6) that only those involved in the operation are on board;

(7) that is in compliance with UAP's SOP and MOP;

(8) that the aircraft's performance parameters, including weight and balance, are kept within limits throughout the flight; and

(9) that other procedures defined by the UAP are observed.

(g) The pilot-in-command must avoid prolonged flights within the restricted area imposed by the height versus speed diagram (dead man's curve) established in the helicopter's AFM.

(h) The flight crew shall establish, whenever possible, emergency landing areas or free flight trajectories to mitigate risks in the event of an emergency landing."

1.20 Useful or effective investigation techniques.

Nil.

2. ANALYSIS.

It was an aero police mission in the rural area of the Guassussê district, in the municipality of Orós - CE. The pilots were familiar with the region in which the operation was taking place.

The mission was carried out under favorable weather conditions for the visual flight.

During the monitoring of a vehicle traveling on a road, the helicopter crashed the blades of the main rotor against a low voltage power grid, at an approximate height of 50 meters above the ground.

When conducting a flight at low altitude, with attention focused on a particular vehicle, the crew did not adequately assess the risks involving obstacles in the region, notably those related to the low voltage power grid.

This sequence resulted in a low level of situational awareness of the crew as to the factors that could affect the execution of the task and compromise flight safety.

Thus, the focus on the vehicle that was being monitored contributed to the damage in the crew's attention, as well as to the reduction of a fast and precise response that would lead to the deviation of the power grid.

In this context, it is possible that the concomitance of tasks performed by the crew (conducting the flight and monitoring the vehicle) led the helicopter occupants to a condition of overload of stimuli, which favored the reduction of the capacity to recognize, organize and project the sensations from internal and external stimuli in the operation environment.

Within the scope of the CIOPAER, there was no procedure defining the minimum height for conducting aero police operations, in order to avoid collision with obstacles.

During the briefing for the mission, performed by the aircraft commander (PNF), there was an alert for possible obstacles at low altitude. However, a minimum flight height has not been established in order to provide a barrier to the risk of collision.

The analysis of the circumstances surrounding the occurrence confirms that, for the flight to happen there was not an adequate division of tasks between the crew of the aircraft,

seeking to assist pilots in visualizing the existing obstacles in the overflow area that represented risks to the operation.

At the time of the accident, the aircraft was engaged in an operation in which the crewmembers were exposed to the threats and risks characteristic of a hostile environment.

The RBHA 91.961 supported the realization of flights under special operating conditions, within the scope of the Public Security and Social Defense operations.

Pilots who worked in this aviation segment and who operated at low altitude assumed full responsibility for conducting the flight, having to manage the entire scenario to achieve a positive result.

The specificities of public security air operations demanded from the crew efficient management not only of the aspects related to the flight but also of those related to the police operations. Thus, operation at low height required adequate cabin coordination.

According to the information obtained, the crew had not received CRM training and did not know the IAC 060-1002A, of 14APR2005, which dealt with the CRM training.

It should be noted that the CRM training focuses on non-technical skills and is based on improving the use of the resources available to the crew. In this context, the lack of CRM training may have promoted gaps in knowledge, skills and attitudes necessary for proper team performance, contributing to the negative result of the air operation.

Although the phases cycle described by Pinto (2011) refers to a sick evacuation operation, it was sought to establish a relationship between the care to be adopted in the fourth and seventh phases and the type of operation performed by the CIOPAER aircraft involved in the accident.

Based on the information available and, according to the aspects of the fourth phase of the Complete Cycle of a Public Security Aviation Aerial Operation (PINTO, 2011), the following factors are inferred as the most likely hypotheses for the occurrence of the incidents:

- inattention to obstacles on the ground;
- distraction of the crew regarding the coordination procedures in the approach, focusing more attention (tunnel vision) on the ground, such as: victims, people, vehicles etc., forgetting to visualize the obstacles present in the approach ramp of restricted area (wires, birds, wind, towers, trees, etc.); and
- lack of application of effective situational awareness with decision-making and anticipated behavior in places where there are risky circumstances when landing the helicopter, such as wires, birds, towers, antennas, fire, smoke, heat, large numbers of people and moving vehicles nearby.

Regarding the seventh phase, Pinto (2011) describes as possible problems, among others, the incorrect choice of altitude, exposing the aircraft to collision with obstacles on the ground.

From the perspective of managerial supervision, the lack of rules to guide aero police operations, such as the standardization of the minimum height and the use of CRM techniques, in line with the ANAC Resolution n° 106, in force at the time of the occurrence, contributed to the emergence of informal rules of behavior of the crew during the flight.

Thus, the absence of rules and publications that formalized the procedures to be adopted in aero police operations denoted a failure in the support systems offered to subsidize the performance of the crewmembers.

3. CONCLUSIONS.

3.1 Facts.

- a) the crewmembers had valid CMAs;
- b) the pilots had valid HMNT Ratings;
- c) the pilots were qualified and had experience in the kind of flight;
- d) the aircraft had valid CA;
- e) the aircraft was within the weight and balance limits;
- f) the airframe and engine logbooks records were updated;
- g) the weather conditions were favorable for the flight;
- h) within the CIOPAER, there was no minimum altitude limit for police operations, notably for vehicle monitoring missions;
- i) the CIOPAER Training Program does not guarantee an adequate CRM training for the crews;
- j) during the briefing, carried out by the aircraft commander (PNF), a minimum altitude limit for the flight was not established;
- k) during the monitoring of a vehicle traveling on a road, the helicopter collided the blades of the main rotor against a low voltage power grid;
- l) after the collision, the crew decided to land to evaluate the helicopter;
- m) the aircraft had substantial damage to the main rotor blades;
- n) there was damage to the low voltage power grid; and
- o) the crewmembers left unharmed.

3.2 Contributing factors.

- **Attention – a contributor.**

Maintaining the focus of attention on the vehicle that was being monitored during the flight, contributed to the obstacles in the region were not properly observed by the crew, notably those related to the low voltage power grid.

- **Training – undetermined.**

The lack of training in CRM may have generated gaps in knowledge, skills and attitudes necessary for the performance of the team, leading to inadequate management of activities related to the crew involved in the accident.

- **Crew Resource Management – a contributor.**

There was no adequate use of the human resources available in the mission, which resulted in an ineffective management of the tasks assigned to the flight crew, culminating in the failure to visualize the obstacle reached by the blades of the main rotor.

- **Piloting judgment – a contributor.**

The risks arising from a low altitude operation were not adequately evaluated by the crew, which provided conditions for the collision of the main rotor blades against the low voltage power grid.

- **Perception – a contributor.**

The operation was characterized by a complex environment, composed by internal and external stimuli that were not properly recognized, leading to a decrease in the crew's

situational awareness, directly impacting in the ability to understand and project the risks involved in this mission.

- **Flight planning – a contributor.**

The preparation work for the flight was inadequate, especially in aspects related to the operating conditions of the environment in which the flight would be conducted.

- **Support systems – undetermined.**

Within the scope of the CIOPAER, there was no procedure, in the standards and publications available, defining the minimum altitude for conducting aero police operations. The absence of criteria to guide airport operations may have contributed to the adoption of inappropriate operating parameters during the flight, favoring the collision with obstacles.

- **Managerial oversight – undetermined.**

The lack of an effective monitoring of the planning and execution of operational activities may have allowed the adoption of the informal rules of behavior of the crew identified in this occurrence.

4. SAFETY RECOMMENDATION.

A proposal of an accident investigation authority based on information derived from an investigation, made with the intention of preventing accidents or incidents and which in no case has the purpose of creating a presumption of blame or liability for an accident or incident. In addition to safety recommendations arising from accident and incident investigations, safety recommendations may result from diverse sources, including safety studies.

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 at the publication of this report:

To the Brazil’s National Civil Aviation Agency (ANAC):

A-140/CENIPA/2017 - 01

Issued on 02/12/2021

Ensure that the CIOPAER Public Air Unit (UAP), implements the SGSO, as prevised in Subpart K of RBAC 90, Requirements for Special Public Aviation Operations, from 11JUN2019 and in ANAC’s Resolution n° 106, which approved the SGSO for Small Civil Aviation Service Providers, from 30JUN2009.

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Issued on 02/12/2021

Ensure that the CIOPAER complies with the CRM training by the crew, in accordance with the recommendations of IAC 060-1002A, from 14APR2005.

5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN.

The SERIPA II was informed, by the CIOPAER Coordinator, about the standardization of the minimum operating height at low altitude of its helicopters with the adoption of criteria for carrying out aero police activities.

On February 12th, 2021.

