

COMANDO DA AERONÁUTICA
CENTRO DE INVESTIGAÇÃO E PREVENÇÃO DE
ACIDENTES AERONÁUTICOS



FINAL REPORT
IG - 076/CENIPA/2015

OCCURRENCE:	SERIOUS INCIDENT
AIRCRAFT:	PR-POL
MODEL:	AS-350 B2
DATE:	20MAY2015



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 20MAY2015 serious incident with the AS-350 B2 aircraft, registration PR-POL. The serious incident was classified as "Collision In-Flight with Obstacle".

During a flight to support police operations, after a go-around procedure, the helicopter collided with a low-voltage rural electrification network.

The aircraft had minor damages.

All occupants were unharmed.

An Accredited Representative of the BEA - Bureau d'Enquêtes et d'Analyses pour la Sécurité de l'Aviation Civile, 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	State Direct 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
CENIPA	Aeronautical Accident Investigation and Prevention Center
CG	Center of Gravity
CHT	Technical Qualification Certificate
CMA	Aeronautical Medical Certificate
CRM	Corporate Resource Management
GOA	Air Operations Group
GSO	Safety Manager
IAC	Civil Aviation Instruction
LAT	Latitude
LONG	Longitude
MGSO	Safety Management Manual
OEE	Special Equipment Operators
PCH	Commercial Pilot License - Helicopter Category
PPH	Private Pilot License - Helicopter Category
PPSAC	Small Civil Aviation Service Providers
RBAC	Brazilian Civil Aviation Regulation
RBHA	Brazilian Aeronautical Homologation Regulation
RS	Safety Recommendation
SBMO	ICAO location designator - Maceió Aerodrome
SGSO	Safety Management System
SIPAER	Aeronautical Accident Investigation and Prevention System
UTC	Universal Coordinated Time
VHS	Very High Frequency

1. FACTUAL INFORMATION.

Aircraft	Model: AS-350B2 Registration: PR-POL Manufacturer: HELIBRAS	Operator: Secretary of State for Social Defense of Alagoas
Occurrence	Date/time: 20MAY2015/1510 UTC Location: Rural area of Ibataguara Lat. 08°56'58"S Long. 035°53'13"W Municipality – State: Ibataguara - AL	Type(s): "Collision In-Flight with Obstacle" Subtype(s): Nil.

1.1 History of the flight.

The aircraft took off from the Zumbi dos Palmares International Airport, located in the municipality of Maceió, AL (SBMO), at about 1435 (UTC), in order to participate in a police operation in the municipality of Ibataguara, AL, approximately 70 km from Maceió, with one pilot and three crew members on board.

After a hovering flight, during a go-around procedure, the helicopter collided with a low voltage rural electrification network cable.

The pilot landed with the engine shutdown a few meters ahead of the crash site. After visually checking the aircraft and removing a piece of electric cable that was wrapped around the base of the main rotor, there was the return to the airport of Maceió. The SBMO landing occurred successfully.

The aircraft had minor damages.

The pilot and three crewmembers were unharmed.

1.2 Injuries to persons.

Injuries	Crew	Passengers	Others
Fatal	-	-	-
Serious	-	-	-
Minor	-	-	-
None	4	-	-

1.3 Damage to the aircraft.

The aircraft had damages in the main rotor pitch changing links, in one of the tail rotor blades (Figure 2), in the engine exhaust (Figure 3), in the horizontal stabilizer (Figure 4), in the pilot instrument panel, on the right upper "plexiglass" and the VHF radio antenna.



Figure 1- Damage in the main rotor assembly.

As a consequence of the impact, the power cable ruptured and collided with the aircraft structure, wrapping into the space between the fixed and rotating plateaus and the main rotor pitch changing links (Figure 1).



Figure 2 - Damage to one of the tail rotor blades.



Figure 3 - Damage to engine exhaust.



Figure 4 - Damage to the horizontal stabilizer.

1.4 Other damage.

Damage to the low voltage rural electrification network.

1.5 Personnel information.

1.5.1 Crew's flight experience.

Hours Flown	
	Pilot
Total	1.200:00
Total in the last 30 days	10:00
Total in the last 24 hours	00:00
In this type of aircraft	600:00
In this type in the last 30 days	10:00
In this type in the last 24 hours	00:00

N.B.: The Data on flown hours were obtained from the pilot himself.

1.5.2 Personnel training.

The pilot took the Private Pilot course - Helicopter (PPH) at EDRA Aeronautics – Aviation School, Ipeúna - SP, in 2003.

1.5.3 Category of licenses and validity of certificates.

The pilot had the Commercial Pilot License - Helicopter (PCH) and had valid aircraft technical qualification in H350.

1.5.4 Qualification and flight experience.

The pilot was qualified to perform this kind of flight.

1.5.5 Validity of medical certificate.

The pilot had valid Aeronautical Medical Certificate (CMA).

The other crewmembers had expired Aeronautical Medical Certificates (CMA).

1.6 Aircraft information.

The aircraft, serial number 7475 was manufactured by HELIBRÁS in 2012, and was registered in the category of Direct State Administration (ADE).

The aircraft had valid Airworthiness Certificate (CA).

The airframe and engine logbooks records were up-to-date.

The last inspection of the aircraft, the "7 days type (weekly)" - Airframe / "7 days or 15 hours" - Engine, was performed on 19MAR2015 by the HELIBRÁS shop in Itajubá, MG, having flown 5 hours and 30 minutes after the inspection.

The last revision of the aircraft, the "general" type was held on 15MAY2014, by the HELIBRÁS shop in Itajubá, MG, having flown 296 hours and 5 minutes after the revision.

1.7 Meteorological information.

The 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 outside the Aerodrome.

1.11 Flight recorders.

Neither required nor installed.

1.12 Wreckage and impact information.

The region in which the accident occurred was situated in a valley between two elevations.

After a hovering flight, during a go-around procedure, the helicopter collided with a low-voltage rural electrification network cable. (Figure 5)

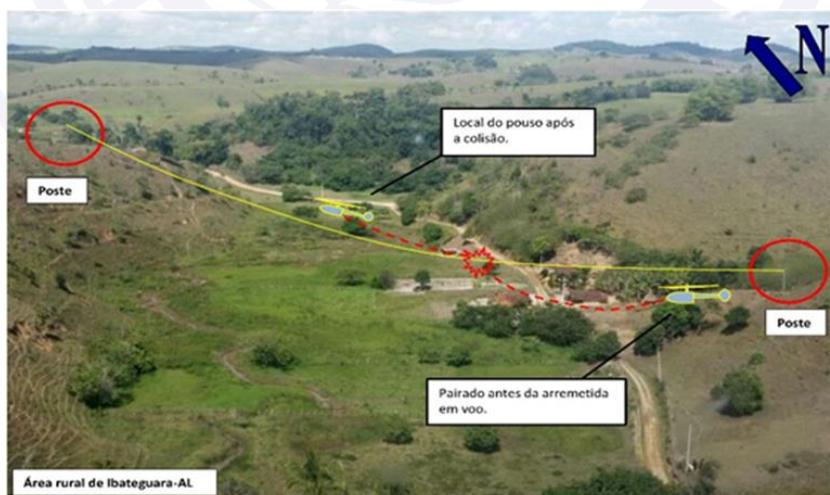


Figure 5 - Sketch of the accident site.

After removing the electric cable from the main rotor assembly (Figure 6), the crew evaluated the technical conditions of the aircraft and performed a new takeoff to Maceió.



Figure 6 - Electrical cable attached to the main rotor components.

1.13 Medical and pathological information.

1.13.1 Medical aspects.

Nil.

1.13.2 Ergonomic information.

Nil.

1.13.3 Psychological aspects.

Nil.

1.14 Fire.

There was no evidence of fire in flight or after impact.

1.15 Survival aspects.

Nil.

1.16 Tests and research.

The aircraft was taken to HELIBRAS, where a Failure Report was prepared.

The HELIBRAS Report concluded that the aircraft was in conditions to be repaired and that the cards related to the impact of the main rotor and tail rotor should be complied.

1.17 Organizational and management information.

At the time of this occurrence, the Air Operations Group (GOA) operated from an operational base based at Zumbi dos Palmares Aerodrome, Maceió (SBMO). The staff of the institution was composed of members of the Fire Department and Civil and Military Police of the State of Alagoas.

Created to provide administrative and operational support to preventive, ostensible and repressive air policing, GOA was also involved in rescue and aero-medical transportation, as well as in civil defense actions triggered by the organs of the Social Defense System of the State of Alagoas.

The GOA operated under the rules established in Subpart "K" of the Brazilian Regulation of Aeronautical Homologation nº 91 (RBHA 91), which deals with the air operations of public security and civil defense.

1.18 Operational information.

The aircraft was within the weight and balance parameters specified by the manufacturer.

The aircraft was engaged in a police operation in the municipality of Iateguara, AL. The collision against the cable of a low voltage rural electrification network occurred after a go-around procedure between two hills.

At the time of the occurrence, in addition to the commander, there were two Special Equipment Operators (OEE) and another helicopter pilot, which was not qualified on this model of aircraft.

The crew had never operated in that locality, and considered that the visualization of the power cable was difficult because of the lack of electrical signaling.

Although the commander of the aircraft made contact with the police officers involved in the ground-based police operation, there was no dialogue whatsoever that might alert the aircraft crew to the existence of obstacles in the vicinity and that represent risks to the air operations.

During investigations of the occurrence, it was found that in the context of GOA, for using helicopters to support police operations, there was no definition of a procedure that would establish the exchange of information between crewmembers and ground teams involved in these operations. These communications would seek to identify obstacles that could constitute risks to air activities.

At the time of the occurrence, the helicopter crew did not wear a helmet. Only the pilot used a headset.

Under the GOA, helmets were not available for all aeronauts. The use of helmets required personalized adjustments.

After the collision, the aircraft commander made the decision to take off with the helicopter after visually inspecting the aircraft and removing a piece of electrical cable that was attached to the main rotor assembly.

1.19 Additional information.

The resolution 106 from 30JUN2009 of the National Civil Aviation Agency (ANAC) approved the safety management system for small civil aviation service providers. For purposes of that Resolution, Article 2 considered, among others, small civil aviation service providers (PPSAC):

II - Public Security and / or Civil Defense air operators (ruled by Subpart K of the Brazilian Aeronautical Homologation Regulation - RBHA / Brazilian Civil Aviation Regulation - RBAC 91);

Since it is a Small Civil Aviation Service Provider (PPSAC), Public Safety and / or Civil Defense air operators should implement Safety Management System (SGSO) in the scope of airport operations.

According to the Guide for elaborating the Safety Management Manual (MGSO):

SGSO is a structured way of managing safety. It establishes the structure of the organization, identifies those responsible for safety in its activities, and documents clearly the policies and procedures that allow effective management of safety.

As part of the documentation for the implementation of the SGSO, Public Security and / or Civil Defense air operators should prepare their own Safety Management Manual (MGSO), which recommended the adoption of specific PPSAC programs, including the

Training in Management of Resources of Teams (Corporate Resource Management - CRM).

The Civil Aviation Instruction - IAC 060-1002 A, which dealt with training in CRM, among other aspects, established that:

3-4 - Training in CRM should include situations involving routine operations, seeking to have a positive effect on the crew, through exercises, in order to contribute to the reduction of stress in times of high workload. Continuous CRM practice also allows for satisfactory group performance during emergency situations when time pressure requires a rapid response.

3-5 - Training in CRM is defined by the following characteristics:

- It consists of the application of the concepts of Human Factors to improve team performance.
- It encompasses all the personnel involved with the aerial activity.
- It must be a part of every type of flight training.
- Focuses on team attitudes, behaviors, and their impact on Flight Safety.
- It requires the participation of all.
- Provides the opportunity for each individual and his / her group to analyze their own attitudes and promote appropriate changes, in order to optimize their capacity for teamwork and decision-making.

3.5.5.1 - The correct application of concepts in CRM practice sessions represents an extremely effective means to develop and strengthen the attitudes dictated by CRM Philosophy.

3.5.5.2 - The success in CRM Training depends on the commitment of the top management, facilitators and participants, in short, of the whole organization to be committed to the CRM philosophy.

The MGSO presented by GOA was not approved.

1.20 Useful or effective investigation techniques.

Nil.

2. ANALYSIS.

During a police operation in the municipality of Ibataguara, AL, in a go-around procedure, after a hovering flight, the helicopter collided with a low voltage rural electrification cable.

The pilot landed a few meters ahead of the collision site, to check the conditions of the aircraft. After inspecting the helicopter and removing the piece of electric cable that was wrapped around the base of the main rotor, the commander chose to return to the original airport.

In the aeronautical context, especially in the abnormal situations and emergencies, relevant aspects to be considered in the decision making refer to the time available and the risk associated with the problem. In that sense, the commander, when he decided to take off with the helicopter after visually inspecting the aircraft and removing a piece of electric cable that was wrapped in the main rotor assembly, did not correctly assess all the hazards involved in that context.

The failure report, prepared by HELIBRAS, concluded that the aircraft would only have flight conditions if it had previously fulfilled the inspection cards regarding the impact of the main rotor and tail rotor.

Bearing in mind that the region of the occurrence was not familiar to the helicopter crewmembers and the electric network had no signaling, it is inferred that the geographic

characteristics of the region, located in a valley, and the absence of signaling have, in some way, contributed to the event.

However, this lack of familiarity with the terrain would require the crew involved in the operation to adopt effective procedures to identify obstacles in the region before starting the go-around procedure. By not taking such measures, the commander did not properly evaluate the possible interference of the external physical environment in the performance of the mission.

Within GOA, there was no methodology that would define, in police operations, the type of coordination to be established between aircraft pilots and ground personnel. This coordination, if established, would allow an exchange of information about the existence of obstacles that pose risks to flight safety in the areas of police operations.

The lack of a GOA-approved MGSO contributed to the lack of implementation of specific programs that were in line with the organization's defined safety policy, such as the Corporate Resource Management (CRM).

The analysis of the circumstances surrounding the occurrence showed that, during that flight, there was no proper division of duties between the aircraft crew. This division of tasks would reduce the possibility of collision and would enable a more effective and secure result of teamwork.

The use of CRM concepts, in a situation of stress, typical of police operations, would give all crewmembers on board the elevation of situational awareness, thus increasing the perception of the presence of obstacles in the operation area, which came to collide with the aircraft.

The fact that only the pilot was wearing the headset at the time of the operation made it difficult to establish adequate communication between all the crewmembers. The absence of effective communication between the crew played a relevant role in the outcome.

The lack of availability of helmets to the number of GOA crewmembers and the impossibility of making "personalized" adjustments meant discomfort during flights and discouraged their use.

The marks left by the power cable on the panel and plexiglass in the right window of the helicopter indicated the high potential danger to which the crew was subjected at the time of the collision.

The Aeronautical Medical Certificates of the Special Equipment Operators that comprised the crew were expired, contrary to what was established in letter b, item 67.13, Subpart A, of the Brazilian Regulation of Civil Aviation (RBAC) nº 67.

3. CONCLUSIONS.

3.1 Facts.

- a) The pilot had valid Aeronautical Medical Certificate (CMA).
- b) The Special Equipment Operators' CMA were expired.
- c) the pilot had valid Technical Qualification Certificate (CHT).
- d) the pilot was qualified to perform the flight;
- e) the aircraft had valid Airworthiness Certificate (CA).
- f) the aircraft was within the weight and balance parameters;
- g) the airframe and engine logbooks records were up-to-date.

- h) the aircraft had been engaged in a police operation in the municipality of Ibataguara - AL;
- i) during a go-around procedure, after a hovering flight, the helicopter collided with a low-voltage rural electrification network cable;
- j) After the collision, the pilot landed a few meters ahead, where the electric cable that was wrapped in the base of the main rotor was removed;
- k) the aircraft crew members were not familiar with the region where the serious incident occurred;
- l) there was no coordination between the aircraft crew and the ground crew involved in the police operation, in order to obtain information on the presence of obstacles in that area;
- m) the crew did not wear helmets at the time of the occurrence;
- n) the aircraft returned to Maceió after a visual check performed by the crew;
- o) the failure report, prepared by HELIBRÁS, concluded that the aircraft would only have flight conditions if it had previously fulfilled the inspection cards regarding the impact of the main rotor and tail rotor;
- p) the aircraft had damages in the main rotor pitch changing links, in one of the tail rotor blades, in the engine exhaust, in the horizontal stabilizer, in the pilot instrument panel, on the upper right plexiglass and in the VHF radio antenna;
- q) the MGSO presented by GOA was not approved;
- r) the aircraft suffered minor damages; and
- s) the occupants were unharmed.

3.2 Contributing factors.

- Cockpit coordination – a contributor.

In the absence of an adequate division of duties on board, the commander did not count on the assistance of the other crewmembers of the aircraft, in order to alert him about the existence of an obstacle ahead during the go-around procedure.

- Influence from the environment – a contributor.

There was interference from the external environment, considering the geographical characteristics of the region where the occurrence happened. The collision occurred in a valley between two hills, where there was not an adequate signaling, which made it difficult for the pilot to visualize the wiring of the electric network.

- Piloting judgment – a contributor.

The pilot underestimated the degree of risk that the obstacles in the region where the police operation occurred represent to air operations.

- Flight planning – a contributor.

The pilot failed to adequately consider the need to establish coordination with the ground crew in order to obtain information on the presence of obstacles in the area where the police operations would take place.

- Management planning – undetermined.

It is possible that the lack of CRM techniques utilization, observed during the go-around procedure, was a consequence of inadequate GOA planning in the managerial context, characterized by the absence of an adequately implemented SGSO.

- **Support systems – a contributor.**

The contribution of this factor is directly related to the absence of available and approved standards, procedures and manuals, specifically the MGSO, that could establish compatible parameters with the safe operational performance of the equipment.

- **Managerial oversight – a contributor.**

The accomplishment of the flight without the use of an appropriate means of communication, compromising the CRM and exposing the crew to high potential of risk revealed that there was not the adequate management accompaniment during the phase of flight planning, in the administrative and operational scope.

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 at the publication of this report:

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

IG-076/CENIPA/2015 - 01

Issued on: 05/04/2018

Ensure the implementation of the SGSO within the scope of the GOA, in accordance with ANAC Resolution No. 106, 30JUN2009.

IG-076/CENIPA/2015 - 02

Issued on: 05/04/2018

Ensure that CRM training, to be implemented within GOA, is focused on its routine operations, in line with IAC 060-1002 A.

IG-076/CENIPA/2015 - 03

Issued on: 05/04/2018

To act with the GOA, in the sense that procedures are adopted for the adequate coordination of cabin among its crew, so that it is possible to have an effective communication in flight, fact that will allow a greater interaction and increase of situational awareness.

5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN.

None.

On April 5th, 2018.