COMMAND OF AERONAUTICS

AERONAUTICAL ACCIDENT INVESTIGATION AND PREVENTION CENTER

FINAL REPORT
A - 042/CENIPA/2014

OCCURRENCE:	**ACCIDENT**
AIRCRAFT:	**PR-DMG**
MODEL:	**AS-350B2**
DATE:	**8 AUG 2012**

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 item 3.1, 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.

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SYNOPSIS

This is the Final Report of the 8 August 2012 accident with the AS-350B2 aircraft, registration PR-DMG. The accident was classified as inflight collision with obstacle.

During the final approach for landing in an unprepared area, the aircraft collided with the ground.

The aircraft occupants (a pilot and five passengers) got out uninjured.

The aircraft sustained substantial damage.

An Accredited representative of the French - *Bureau d'Enquêtes et d'Analyses pour la sécurité de l'aviation civil* - was designated for participation in the investigation.

GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS

ANAC	(Brazil's) National Civil Aviation Agency
ATS	Air Traffic Services
BEA	*Bureau d'Enquêtes et d'Analyses pour la sécurité de l'aviation civile* of France
CENIPA	Aeronautical Accident Investigation and Prevention Center
CHT	Technical Qualification Certificate
CMA	Aeronautical Medical Certificate
IFR	Instrument Flight Rules
INFRAERO	Brazilian Airports Infrastructure Enterprise
Lat	Latitude
Long	Longitude
PCH	Commercial Pilot (Helicopter category)
PPH	Private Pilot (Helicopter category)
RBHA	Brazilian Aeronautical Homologation Regulation
SBPS	ICAO Location designator – Porto Seguro Aerodrome
SERIPA	Regional Aeronautical Accidents Investigation and Prevention Service
SIPAER	Aeronautical Accidents Investigation and Prevention System
TPP	Private Air Services
UTC	Coordinated Universal Time
VFR	Visual Flight Rules

AIRCRAFT	**Model:** AS-350B2 **Registration:** PR-DMG **Manufacturer:** *Eurocopter France*	**Operator:** *Power Aviation Importação Ltda.*
OCCURRENCE	**Date/time:** 8 AUG 2012 / 18:50 UTC **Location:** Rua da Praça, B. Alto do Mundaí **Lat.** 16º24'12"S – **Long.** 039º03'04"W **Municipality – State:** Porto Seguro - Bahia	**Type:** Inflight collision with obstacle

1 FACTUAL INFORMATION

1.1 History of the occurrence

At 15:15 local time, with only a pilot on board, the aircraft departed from SBPS.

After 10 minutes of flight, the aircraft landed in the vicinity of *Praia do Trancoso* (*Trancoso* Beach), where it picked up five passengers for a scenic flight over the coast line.

During the flight, the passengers asked the pilot to land on a wooden deck of a residence.

On the approach to the requested landing spot, the aircraft collided with the ground.

1.2 Injuries to persons

Injuries	Crew	Passengers	Third parties
Fatal	-	-	-
Serious	-	-	-
Minor	-	-	-
Uninjured	01	05	-

1.3 Damage to the aircraft

The aircraft sustained substantial damage to the fuselage, main rotor assembly, tail boom, rear transmission shaft, right hand side landing ski, tail rotor blades, and engine.

1.4 Other damage

Nil.

1.5 Personnel information

1.5.1 Information on the crew

HOURS FLOWN	
	PILOT
Total	322:30
Total in the last 30 days	36:30
Total in the last 24 hours	01:55
In this type of aircraft	36:30
In this type in the last 30 days	29:35
In this type in the last 24 hours	01:55

NB: Information provided by the pilot.

1.5.1.1 Professional formation

The pilot did his Private Pilot course (Helicopter category) in the *Escola de Aviação Civil de Asas Rotativas* (Rotary-Wing Aviation School) of Piraquara, State of Paraná, in 2010.

1.5.1.2 Validity and category of licenses and certificates

The pilot had a Commercial Pilot (Helicopter category) license and a valid H350 Helicopter Technical Qualification Certificate.

1.5.1.3 Qualification and flight experience

The pilot had qualification, but only little experience for the flight in question.

1.5.1.4 Validity of the medical certificate

The pilot had a valid Aeronautical Medical Certificate (CMA).

1.6 Aircraft information

The aircraft (SN4737) was manufactured by Eurocopter France in 2009.

The airworthiness certificate was valid.

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

The last inspection of the aircraft (type 10h/7D/1M/3M) was performed on 18 May 2012 by Power Helicópteros workshop in Ribeirão Preto, State of São Paulo. The aircraft flew 17 hours and 45 minutes after this inspection.

1.7 Meteorological information

There was weather information available to the pilot at the moment of departure from SBPS.

Visibility was 8,000 meters, and meteorological conditions were VMC.

1.8 Navigational aids

Nil.

1.9 Communications

Nil.

1.10 Aerodrome information

Not applicable.

1.11 Flight recorders

Neither required nor installed.

1.12 Wreckage and impact information

After attempting to land on a wooden deck, the pilot did a maneuver in order to pass over a few obstacles (a house, trees and a brick wall).

During the maneuver, the main rotor blades hit the top of a tree and the straws of two palm trees located near the deck.

In the sequence, the aircraft collided with the ground, with the impact being softened by the vegetation.

Figures 1 and 2 – Internal and external views of the intended landing spot.

Figure 3 – Palm tree hit by the helicopter.

Figures 4 and 5 – Situation of the aircraft after the collision.

1.13 Medical and pathological information

1.13.1 Medical aspects

Not investigated.

1.13.2 Ergonomic information

Nil.

1.13.3 Psychological aspects

1.13.3.1 Individual information

Nil.

1.13.3.2 Psychosocial information

Nil.

1.13.3.3 Organizational information

Nil

1.14 Fire

There was no fire.

1.15 Survival aspects

Nil.

1.16 Tests and research

During the examination of the aircraft wreckage, it was verified that the coupling between the short shaft and long shaft of the tail rotor had broken.

The assembly did not show signs of wear on account of rotation friction, thus indicating that the breakage of the component resulted from the impact with the ground.

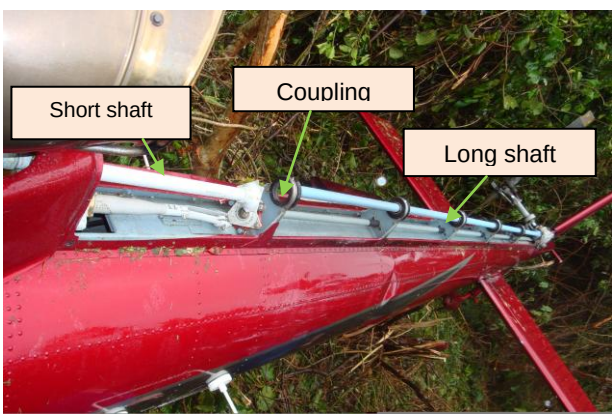
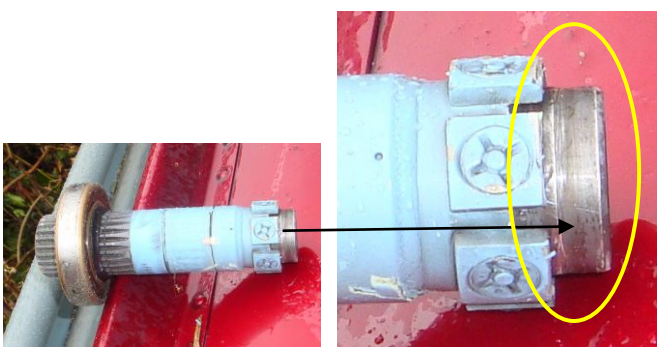


Figure 6 – Short shaft uncoupled from the long shaft.



Figures 7 and 8 – Coupling without signs of rotation-related friction.

1.17 Organizational and management information

The aircraft was registered in the Private Air Services category, operating under the RBHA 91. Its base of operations was Porto Seguro Airport, in the State of Bahia.

1.18 Operational aspects

The aircraft departed from SBPS at about 18:20 UTC, with approximately 70% (378 liters) of its fuel capacity in the tanks, after filing notification for a local flight at 500ft.

Ten minutes later, it landed near Trancoso Beach, where five passengers boarded the helicopter.

After completing a scenic flight with approximate 15-min duration, the pilot flew the aircraft to an open area located close to a villa in the neighborhood of Alto do Mundaí, at a distance of three nautical miles from Porto Seguro aerodrome.

The pilot flew over the area for purposes of familiarization, and thought that it would be possible to land the aircraft in an open field.

While he was making a second pass over the area, one of the passengers asked him to land on a deck located near the residence.

It was a wooden deck in the shape of a square, with sides measuring 8 meters, located on the edge a hillside at a height of approximately 150 meters.

Figure 9 – View of the deck on top of the hillside.

The pilot agreed to land on the deck, and made a normal approach, maintaining a descent ramp with an indicated airspeed between 40kt and 60kt, in visual contact with the landing spot.

He made the approach at a heading of 320º, with the aircraft tail boom pointing to the hillside.

The landing spot did not have any device to indicate the wind direction/strength. According to the pilot, the wind direction was approximately 130º, with a tail component of moderate strength.

After completing the final approach for landing, and while doing the flare in order to reduce speed, the pilot heard a noise characteristic of the contact of tail rotor blades with the vegetation, and then the helicopter yawed to the left.

In an attempt to maintain control of the aircraft and avoid hitting obstacles (villa and trees) located ahead, the pilot applied the right pedal, simultaneously applying the collective upwards and moving the cyclic forward and to the right.

The helicopter continued turning to the left until forming an angle of 60º with the final approach direction.

Responding to the pilot's control inputs, the aircraft climbed about 5 meters, moving forward and to the right, and then the main rotor collided with the top of two palm trees and another type of tree.

After passing over the brick wall of the land surrounding the villa, the aircraft moved approximately 28 meters to the right and away from the deck, with its nose turning to the right.

During this segment of the flight, the pilot lowered the collective lever. As a result, the aircraft lost altitude until colliding with the terrain.

Figure 10 – Trajectory of the helicopter from the approach for landing up to the collision with the ground.

The pilot had an experience of 36 hours and 30 minutes in the operation of Esquilo B aircraft.

The flight of the accident was the second one flown by the pilot in Esquilo B2 aircraft. His first flight in that type of aircraft had been done on the same day of the accident, in the morning.

Some of the differences between Esquilo B and Esquilo B2 aircraft are shown below:

Esquilo	***AS350B***	***AS350B2***
Maximum takeoff weight	1,950 kg	2,250 Kg
Maximum takeoff power	650 SHP	732 SHP
Main rotor diameter	10.69m	10.69m
Length of aircraft with turning rotor	12.99m	12.94m

The experience of the pilot was characterized by the fact that he had been working predominantly as second pilot, with only a few flights in the capacity of aircraft captain.

He had been to Porto Seguro only a few times, and was neither familiar with the topography of the region nor with the landing spot.

At the moment of the accident, the aircraft was within the weight and balance limits established by the manufacturer.

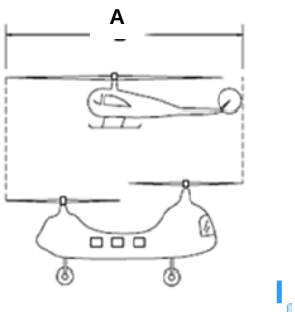
1.19 Additional information

The pilot was in Salvador (capital city of Bahia) the day before, when he was consulted on his availability for a flight to Porto Seguro.

After accepting the proposal, he traveled the following morning to Porto Seguro, where he was informed on the details of the flight.

There was a flat open area measuring approximately 15m x 20m, contiguous to the brick wall of the residence with the wooden deck where the landing would be attempted.

The dimension corresponding to the letter “A” in the figure below shows the larger helicopter dimension, which is obtained when the rotors are rotating.



As for the operation of helicopters in locations not homologated or registered, the RBHA 91.327 establishes that:

(a) notwithstanding the prescription contained in 91.102(d) of this regulation, helicopter landings on and takeoff from non-homologated or non-registered locations may be made, as an occasional operation, under full responsibility of the operator (regulated by the RBHA 135) and/or the pilot in command, as applicable, provided that:

(...)

***(7)** The selected location necessarily meets the following physical characteristics:*

***(i)** Landing area: the landing area shall be large enough to contain, at least, a circle with a diameter that is equal to the largest dimension of the helicopter to be utilized;*

***(ii)** Safety area: the landing area shall be surrounded by a safety area free from obstacles with a surface at a level not higher than the one of the landing area, projecting beyond the limits of that area with half of the total length of the helicopter to be utilized. ...*

For purposes of clarification, *flare* is defined as the rapid deceleration made when one needs to lose speed and/or descent rate quickly, consisting of an effective pitch-up movement followed by a level off movement, by and large, with the objective of making the helicopter hover over the location selected for landing.

1.20 Utilization of other investigation techniques

Nil.

2 ANALYSIS

The aircraft departed from the aerodrome of Porto Seguro on a local scenic flight.

After landing in the surroundings of Trancoso Beach and picking up five passengers, the aircraft made a scenic flight with approximate duration of fifteen minutes.

Then the pilot flew the aircraft to a villa located in the Bairro Alto do Mundaí, at a distance of three nautical miles from the aerodrome of Porto Seguro. A nearby open area had been chosen for landing.

As they were approaching the destination, one of the passengers asked the pilot to land the aircraft within the limits of referred villa, more exactly, on a wooden deck that had been built there.

The pilot, who was not familiar with the area, made a low pass over the deck in order to choose the best way to make the approach for landing.

Having decided to land, the pilot made a normal approach, maintaining a descent ramp at an indicated airspeed between 40kt and 60kt.

The approach for landing had a direction of 320º, with the aircraft tail pointing in the direction of the hillside. According to the pilot, the wind had a tail component, blowing from 130º with moderate strength.

The tail component of the wind may have had a share in the pilot's decision to fly an approach ramp at a ground speed higher than the one recommended in those circumstances.

On a downwind approach, when the aerodynamic speed is zero, the aircraft may be moving at some speed relatively to the ground, thus affecting the pilot's judgment.

When landing was imminent, it is possible that the pilot, noticing that the aircraft was sped-up, may have performed a flare with a pitch-up higher than the ideal, causing the tail rotor blades to hit the vegetation that had grown near the edge of the deck.

The yaw of the aircraft to the left shortly after the flare may be an indication of a momentary loss of tail rotor effectiveness. Since the space ahead was not sufficient for a go-around, the pilot flew the helicopter toward a contiguous open area, avoiding a possible collision with a nearby construction.

This maneuver showed that the pilot's controls were effective up to that moment. As a matter of fact, the lack of wear on account of rotation friction on the coupling of the short and long shafts of the tail rotor was evidence that the referred component broke only after the impact of the aircraft with the ground.

It was not possible to determine whether the damage sustained by one of the tail rotor blades resulted from the contact with the vegetation or from the impact of the aircraft with the ground.

Figure 11 – Vegetation on the edge of the deck.


Figure 12 – Damage to the tail rotor blades.

It was not possible to confirm whether the aircraft suffered influence from wind direction and/or strength variation during the approach for landing on the deck, on account of the hillside proximity.

Considering the dimensions both of the helicopter and the wooden deck, as well as the distances between the deck and obstacles (brick wall and trees) in the surrounding area, it may be said that the area chosen for the occasional landing did not meet the parameters established in the items (i) and (ii) of number 7, letter “a” of the RBHA 91.327.

It was not possible to determine whether the differences between the AS350B and AS350B2 models of the Esquilo helicopter contributed to the occurrence of the accident.

For making his decision to land on the deck, the pilot did not take into account: that it was an occasional operation, and that the landing area did not meet the physical characteristics established in the RBHA 91.327; that he lacked experience in dealing with similar situations while performing the duties of a captain; that the wind characteristics were not ideal; and that the contiguous terrain was best suited for a safe landing.

3 CONCLUSIONS

3.1 Facts

a) the pilot had a valid aeronautical medical certificate;

b) the pilot had a valid technical qualification certificate;

c) the pilot had qualification, but little experience for the flight in question;

d) the aircraft had a valid airworthiness certificate;

e) the aircraft was within the weight and balance limits;

f) the pilot was not accustomed to operating that aircraft model;

g) the pilot had little experience as an aircraft captain;

h) the pilot had little knowledge of the local topography;

i) initially, the aircraft was to land in an open area near a villa located in the neighborhood of *Alto do Mundaí*, at a distance of about 3 nautical miles from the aerodrome of *Porto Seguro*;

j) accommodating a request from a passenger, the pilot decided to land on a wooden deck located in the real state;

k) while the pilot was performing the flare prior to landing on the deck, the tail rotor of the helicopter hit the nearby vegetation;

l) the pilot performed a maneuver in order to avoid colliding with obstacles, and ended up making a forced landing in a nearby piece of land;

m) the physical features of the spot chosen for landing the aircraft were not in accordance with the prescriptions of the RBHA 91.327;

n) The aircraft sustained substantial damage; and

o) The pilot and passengers got out uninjured.

3.2 Contributing factors

3.2.1 Human Factor

3.2.1.1 Medical Aspect

Nil.

3.2.1.2 Psychological Aspect

3.2.1.2.1 Individual information

Nil.

3.2.1.2.2 Psychosocial information

Nil.

3.2.1.2.3 Organizational information

Nil.

3.2.2 Operational Factor

3.2.2.1 Concerning the operation of the aircraft

a) Piloting judgment – a contributor

The pilot did not evaluate the risks resulting from an occasional operation in an unknown area, which was not in accordance with the prescriptions established by the pertinent legislation, and without having enough experience for such.

b) Flight planning – a contributor

There was not adequate preparation for the flight, something that got evident when the pilot tried to land on the deck, without previously evaluating the physical features of the landing spot.

c) Flight indiscipline – undetermined

It was not possible to determine whether the pilot, upon deciding to land on the wooden deck, intentionally disobeyed the prescriptions established in the RBHA 91.327.

d) Pilot's short experience – undetermined

It is likely that the pilot's operational performance failures have connection with his little experience with the air activity, with the operation of the aircraft in the capacity of captain, and with the circumstances of the operation.

3.2.2.2 Concerning ATS units

Not a contributor.

3.2.3 Material Factor

3.2.3.1 Concerning the aircraft

Not a contributor

3.2.3.2 Concerning ATS technology systems and equipment

Not a contributor.

4 SAFETY RECOMMENDATION

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

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

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

Safety Recommendations made by the CENIPA:

To the National Civil Aviation Agency (ANAC):

A-042/CENIPA/2014 – 001 Issued on 09/06/2014

Publicize the contents of this report at seminars, lectures and similar activities held for the benefit of owners, operators and explorers of helicopters.

5 CORRECTIVE/PREVENTATIVE ACTION ALREADY TAKEN

In the interview with the investigator in charge, the aircraft pilot received guidance relative to the care that must be taken during occasional operations. Aspects were discussed, such as ramp, wind component, approach/go-around axes, and dimensions of the areas utilized for landing.

6 DISSEMINATION

–(Brazil’s) National Civil Aviation Agency - ANAC

–Bureau d'Enquêtes et d'Analyses pour la sécurité de l'aviation civile (BEA - France)

–SERIPA II

7 APPENDICES

Nil.

On 09 Jun 2014