

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



**FINAL REPORT**  
**A-523/CENIPA/2015**

<b>OCCURRENCE:</b>	<b>ACCIDENT</b>
<b>AIRCRAFT:</b>	<b>PT-HZE</b>
<b>MODEL:</b>	<b>HB-350E</b>
<b>DATE:</b>	<b>20AUG2012</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 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.**

## SYNOPSIS

This is the Final Report of the 20 AUG 2012 accident with the HB-350B aircraft, registration PT-HZE. The accident was classified as “undershoot landing”.

During a session of auto-rotation training on the final approach procedure, the aircraft was not able to reach the desired altitude, and ended up colliding with a slope located just a few meters short of the runway.

Both crewmembers were seriously injured.

The aircraft sustained substantial damage.

An accredited representative of the French *Bureau d'Enquetes et d'Analyses pour la Sécurité de l'Aviation* (BEA) - France, state of design, was designated for participation in the investigation.



## CONTENTS

<b>GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS .....</b>	<b>5</b>
<b>1. FACTUAL INFORMATION.....</b>	<b>6</b>
1.1 History of the flight.....	6
1.2 Injuries to persons.....	6
1.3 Damage to the aircraft.....	6
1.4 Other damage.....	6
1.5 Personnel information.....	6
1.5.1 Crew's flight experience.....	6
1.5.2 Personnel training.....	6
1.5.3 Category of licenses and validity of certificates.....	7
1.5.4 Qualification and flight experience.....	7
1.5.5 Validity of medical certificate.....	7
1.6 Aircraft information.....	7
1.7 Meteorological information.....	7
1.8 Aids to navigation.....	7
1.9 Communications.....	7
1.10 Aerodrome information.....	7
1.11 Flight recorders.....	7
1.12 Wreckage and impact information.....	7
1.13 Medical and pathological information.....	8
1.13.1 Medical aspects.....	8
1.13.2 Ergonomic information.....	8
1.13.3 Psychological aspects.....	8
1.14 Fire.....	8
1.15 Survival aspects.....	8
1.16 Tests and research.....	8
1.17 Organizational and management information.....	8
1.18 Operational information.....	8
1.19 Additional information.....	11
1.20 Useful or effective investigation techniques.....	11
<b>2. ANALYSIS.....</b>	<b>11</b>
<b>3. CONCLUSIONS.....</b>	<b>12</b>
3.1 Facts.....	12
3.2 Contributing factors.....	13
<b>4. SAFETY RECOMMENDATION.....</b>	<b>14</b>
<b>5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN.....</b>	<b>14</b>

## GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS

ANAC	Brazil's National Civil Aviation Agency
BEA	Bureau d'Enquêtes et d'Analyses pour la securité de l'aviation civile
CENIPA	Aeronautical Accidents Investigation and Prevention Center
CIV	Pilot's Flight Logbook
DCTA	Department of Science and Airspace Technology
HELIBRAS	Helicopters of Brazil, Inc.
INFRAERO	Brazilian Airports Infrastructure Enterprise
IVV	Vertical Speed Indicator
Lat	Latitude
Long	Longitude
PCH	Commercial Pilot License - helicopter category
PPH	Private Pilot License (helicopter category)
RPM	Revolutions per Minute
RS	Safety Recommendation
SBPR	ICAO location designator - <i>Carlos Prates Aerodrome</i>
SNXC	ICAO location designator - <i>Viganó 2 Helipad</i>
SERIPA	Aeronautical Accidents Investigation and Prevention Service
SIPAER	Aeronautical Accidents Investigation and Prevention System
UTC	Universal Time Coordinated
VFR	Visual Flight Rules

## 1. FACTUAL INFORMATION.

Aircraft	<b>Model:</b> HB-350B	<b>Operator:</b> EFAI <i>Escola de Pilotagem Ltda.</i>
	<b>Registration:</b> PT-HZE	
	<b>Manufacturer:</b> HELIBRÁS	
Occurrence	<b>Date/time:</b> 20AUG2012 / 17:50 UTC	<b>Type(s):</b> Undershoot landing.
	<b>Location:</b> Carlos Prates Aerodrome - SBPR	
	<b>Lat.</b> 19°54'32"S <b>Long.</b> 043°59'20"W	
	<b>Municipality – State:</b> <i>Belo Horizonte - State of Minas Gerais</i>	

### 1.1 History of the flight.

At 17:30 UTC, the aircraft took off from Viganó 2 Helipad (SNXC) destined for Carlos Prates aerodrome (SBPR), for an auto-rotation training flight, with a crew of two persons on board. SNXC and SBPR are located in the municipality of *Belo Horizonte*, State of *Minas Gerais*.

On the final leg of the procedure for approaching the area utilized for the training, the aircraft was not able to reach the desired touchdown point, and ended up colliding with a slope located just a few meters short of the runway 09 threshold.

### 1.2 Injuries to persons.

Injuries	Crew	Passengers	Others
Fatal	-	-	-
Serious	2	-	-
Minor	-	-	-
None	-	-	-

### 1.3 Damage to the aircraft.

The aircraft sustained substantial damage to its whole structure.

### 1.4 Other damage.

None.

### 1.5 Personnel information.

#### 1.5.1 Crew's flight experience.

	Hours Flown	
	Pilot	Copilot
Total	9,400:00	2,700:00
Total in the last 30 days	06:55	25:00
Total in the last 24 hours	02:00	02:00
In this type of aircraft	5,000:00	2,600:00
In this type in the last 30 days	02:00	25:00
In this type in the last 24 hours	02:00	02:00

**N.B.:** Data obtained from the pilots' flight logbooks.

#### 1.5.2 Personnel training.

The instructor pilot took the Aviator Officers Training Course at the Brazilian Air Force Academy in 1970.

The pilot under training took his private pilot course (helicopter category) in the Minas Gerais State Military Police in 1999.

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

The instructor pilot held a Commercial Pilot License and a valid H350 aircraft technical qualification certificate.

The pilot under training held a Commercial Pilot License and a valid H350 aircraft technical qualification certificate.

### **1.5.4 Qualification and flight experience.**

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

### **1.5.5 Validity of medical certificate.**

The pilots held valid aeronautical medical certificates.

### **1.6 Aircraft information.**

The aircraft (SN HB1009/1163), registered in the private category, was manufactured by HELIBRAS in 1980.

Its airworthiness certificate was valid.

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

The last inspection of the aircraft ("600 hours" type) was done by *HELIT MANUTENÇÃO DE HELICÓPTEROS* in *Belo Horizonte*, State of *Minas Gerais* on 25 May 2012. The helicopter flew 55 hours after that inspection.

The last overhaul of the aircraft (Annual Maintenance Inspection) was done by *HELIT MANUTENÇÃO DE HELICÓPTEROS* in *Belo Horizonte*, State of *Minas Gerais* on 16 March 2012. The helicopter flew 117 hours and 10 minutes after the overhaul.

### **1.7 Meteorological information.**

The prevailing wind at the site of the occurrence was 110° at 15 kt. There were downdrafts in the approach sector of runway 09, on account of a slope adjacent to the runway threshold.

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

Nil.

### **1.9 Communications.**

Nil.

### **1.10 Aerodrome information.**

The aerodrome was public, under the administration of INFRAERO, and operates day-time VFR.

The runway was paved with asphalt, with thresholds 09/27, measuring 928m x 18m, at an elevation of 3,044 ft.

### **1.11 Flight recorders.**

Neither required nor installed.

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

The aircraft collided with a slope adjacent to the threshold 09. The wreckage remained concentrated.





Figure 1 - Aspect of the wreckage.

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

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

Not investigated.

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

Nil.

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

The instructor-pilot was the owner of the flying school, and was very knowledgeable and experienced in that type of flight, in the aircraft, and in the area where the accident happened. Among the helicopter pilots, he was known as a pilot of deep theoretical and practical knowledge of auto-rotation, being a reference in the aeronautical community as one of the most prepared pilots to successfully fly this type of maneuver.

#### **1.14 Fire.**

No signs of either inflight or post-impact fire.

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

Nil.

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

According to analyses conducted by the Department of Science and Aerospace Technology (DCTA), the tests of the Vertical Speed Indicator, RPM Indicator, and tachometer did not confirm malfunctioning of the items mentioned.

The analysis of the wreckage indicated that the engine was developing normal power at the moment of impact, and the power lever was in the *flight* position.

No evidence was found related to malfunctioning of the rotors or other systems of the aircraft.

#### **1.17 Organizational and management information.**

Nil.



### 1.18 Operational information.

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

The aircraft took off on a one-hour duration flight aimed at the pilot's annual re-evaluation and autorotation training, with two persons on board (the instructor pilot and the pilot under training). The training flight was being flown in an area located to the left of the threshold 09, which was usually utilized for that purpose.

When the aircraft was approximately 20 minutes into the flight, the instructor pilot, upon noticing that the wind had increased to a value close to the limit of 17 kt established by the flying school for that type of training, decided to discontinue the flight and perform a last autorotation as part of the final landing.

In order to start the autorotation training, the instructor commanded reduction of power on the downwind leg (the wind was strong, close to 17 kt, at an angle of 30° with the runway alignment) with the intention of increasing the distance between the aircraft and the runway.

According to the instructor, as soon as he commanded the emergency for the pilot under training, he felt that the pilot would not be able to conclude the maneuver with the aircraft reaching the touchdown point, but allowed him to proceed with the exercise even so.

During the straight-in descending approach in autorotation, the instructor estimated that the sink-rate had increased excessively, and that the pilot under training was below the ideal approach angle.

Thus, he gave verbal instructions for the go-around. After the command given by the instructor, the pilot under training still proceeded with the maneuver, following the autorotation descent profile.

The instructor, upon noticing that the pilot was unduly delaying the beginning of the go-around, took over the aircraft controls and started the procedure. At that moment, the helicopter was below the glide path and still distant from the threshold 09.

The instructor's view was that the pilot under training retarded the beginning of the turn onto the base leg and therefore the wind, which was moving the aircraft away, began to hinder its movement toward the threshold, shortening the aircraft reach. At that moment, the instructor accelerated the engine, placing the lever in the *flight* position but, according to him, it took long to respond accordingly.

The instructor took over the aircraft controls moments before the impact, in an attempt to go around and prevent the collision from happening, but ended up colliding with the ground short of the threshold on a service lane located below the level of the runway.

The instructor said that, in order to avoid a frontal collision with the slope, he made a *flare* and changed the approach axis in 90°, making it possible to position the aircraft on the small lane which gave access to the north apron of the aerodrome.



Figure 2 - View of the aircraft on the north apron access lane.

Just short of the threshold 09, there was a slope. Downward wind currents form in that threshold on account of the big and abrupt unevenness, generating eddies in the sector. Upon arriving at that sector, strong winds that pass over the obstacle-free area of the airport are directed downwards.



Figure 3 - Slope adjacent to the threshold 09.

The instructor also said that he was taken by surprise by the descending current of air, which threw the aircraft against the ground.



Figure 4 - Pronounced slope short of threshold 09.

In the instructor's view, the aircraft entered this descending current, which rendered the flight impossible to be recovered, and forced the aircraft downward against the ground.

The aircraft sustained substantial damage as a result of the violence of the impact with the ground and from the collision of the main rotor blades with the slope adjacent to the threshold 09.

#### **1.19 Additional information.**

Nil.

#### **1.20 Useful or effective investigation techniques.**

Nil.

### **2. ANALYSIS.**

The crew was doing a 180° approach training in autorotation. In one of the exercises, the instructor, after reducing the power and commanding the emergency for the pilot under training, perceived that the aircraft would not be able to conclude the exercise at the touchdown point. Nevertheless, he allowed the pilot to continue with the exercise, possibly on account of excessive self-confidence, since he momentarily underestimated the risk involved.

During the descent in autorotation, on account of considering that there was an excessive increase in the sink-rate and the instructor told pilot under training to go around. At that moment, the instructor accelerated the engine but did not apply power, allowing the pilot to keep the low approach trajectory for some more time.

From such instructor's attitude, one may infer that the pilot under training became doubtful of whether he had to start the go-around at the precise moment or could stay in the approach profile a little more time. He chose the second option. This fact configured a situation of lack of assertiveness in the cockpit communications. Lack of assertiveness in the transmission of messages between the crewmembers, mainly in critical moments of the flight, may contribute decisively to aggravating such conditions and degrading severely the desired level of safety.

Taking into consideration the situation reported, notwithstanding the fact that the pilot under training understood the moment of starting the go-around, it became clear that the instructor allowed the pilot to remain in that approach profile until the point which he (the instructor) deemed appropriate for starting the go-around. One may infer that the



instructor, despite all his previous experience in similar circumstances, was taken by surprise by the descending air current short of the threshold.

At a given moment, the instructor applied power and attempted to go around, but, then, the point of irreversibility of the occurrence had already been reached. The sum of the helicopter's rate of descent and the downward current encountered in that pronounced slope short of the runway exceeded the helicopter engine power capability. The situation was soon perceived by the instructor, which immediately commanded a *flare* with a 90° change of the axis, and managed to make a forced landing on the service lane located below the level of the runway. Such procedure is very likely to have prevented a more severe collision with the ground with worse consequences for the aircraft occupants.

Both pilots were very experienced in flight and in the equipment. Maybe this was the reason why there was an atmosphere of mutual confidence in the cockpit, favoring a tendency of flexibilization of recommendations, norms, and limits established by the flying school, since, even with the wind close to the established limit of 17 kt, the training was not discontinued.

In an analogous manner, on account of such context and (mainly) the experience of the instructor, it is possible to affirm that there were no supervision-tools capable of preventing that atmosphere of reciprocal confidence with possible degradation of the crew's perception of the risks involved from being established in the cockpit. The loss (or degradation) of the situational awareness in the cockpit may weaken the crew's capability to respond effectively to critical situations.

The investigation verified that descending currents of air are commonly observed at the threshold 09. They are formed by the wind, which blows over the obstacle-free area of the airport before encountering the terrain unevenness in that sector, taking some pilots by surprise. Previous knowledge of these recurrent situations, which present a certain level of danger to the air activity, is crucial for the safety operation of flights. In the case in question, it was possible to observe that there was poor perception on the part of the pilots as to the risks involved with the continuation of the flight under those conditions, together with inadequate flight planning.

The instructor was a highly experienced pilot, who knew the equipment very well, had been an instructor for many years, and was accustomed to do that type of training. By observing the sequence of the events, it is possible to see that the instructor allowed the pilot to continue with the autorotation training even after telling him that they would go around. He kept monitoring the procedure, and would intervene only when he deemed necessary to take the aircraft out of a possible situation of danger. The wind conditions and possible consequences ended up being underestimated, and the instructor only interfered when it was too late.

Such attitude on the part of the instructor presupposes either a feeling of invulnerability or excessive self-confidence, which may give rise to complacency, whose main characteristic is the degradation of the perception relative to the risks surrounding a certain situation. Precisely in a scenario of too many positive attributes, which would normally serve to raise the level of flight safety, complacency appears, working in the opposite direction.

### 3. CONCLUSIONS.

#### 3.1 Facts.

- a) The pilots had valid aeronautical medical certificates;
- b) The pilots had valid type rated;
- c) The pilots had qualification and experience for the flight;
- d) The aircraft had a valid airworthiness certificate;
- e) The aircraft was within the prescribed weight and balance parameters;
- f) The airframe, engine, and rotor logbook records were up-to-date;
- g) The crew was doing an auto-rotation training;
- h) The prevailing wind at the site of the occurrence was 110° at 17 kt;
- i) There is a slope short of the threshold of runway 09 with a tendency to create currents of descending winds on account of the big and abrupt unevenness, favoring the appearance of vortices in that sector;
- j) The pilot stayed below the ideal glide slope at the last auto-rotation training;
- k) The instructor was slow in taking over the flight controls;
- l) The aircraft collided with the ground;
- m) No signs of malfunctioning in the aircraft systems were found;
- n) The aircraft sustained substantial damage; and
- o) The pilots suffered serious injuries.

#### 3.2 Contributing factors.

- **Attitude - undetermined.**

The fact that the instructor was knowledgeable of, and experienced in, that type of flight, paradoxically, contributed to the degradation of his perception of the risk involved. Such amount of experience may have created a feeling of invulnerability or excessive self-confidence, which, in turn, affected his perception of the real risk.

- **Cockpit coordination - undetermined.**

During the execution of the maneuver, there was failure or lack of assertiveness in the message transmitted by the instructor to the other pilot concerning the decision to go around, since the instructor did not determine the precise moment the go-around would have to begin. Such attitude may have either created doubt on who would be responsible for ordering the go-around, or contributed to the delay of the taking over of the controls by the instructor, leading the flight to an irreversible condition.

- **Handling of aircraft flight controls - a contributor**

The circumstances involving this occurrence indicate that a given moment during the execution of the autorotation maneuver, the pilot under training put the aircraft in an unsafe condition, forcing the instructor to take over the controls, but the handling of the controls by the instructor was neither effective nor timely enough for reversing the situation.

**- Piloting judgment - a contributor.**

The pilot overestimated his ability to revert the situation, and was not effective in using the aircraft flight controls.

**- Perception - undetermined.**

Due to the circumstances that involved this occurrence, one may presume that there was a decrease of the instructor's perception relative to the risk of the maneuver, mainly in relation to the severity of the possible consequences if the wind speed and direction in that sector presented variations, since he allowed the other pilot to keep the approach profile even after advising him that they would go around.

**- Flight planning - a contributor.**

The preparation for this training flight was poor, since there was not previous collection of information on the wind conditions for the flight time period, mainly in relation to the possibility of occurrence of gusts, downdrafts, or windshear, in the approach sector of runway 09.

#### **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 National Civil Aviation Agency (ANAC):**

###### **A - 523/CENIPA/2015 - 01**

**Issued on 02/05/2017**

Take the necessary measures before the *EFAI Escola de Pilotagem LTDA.*, in order to make sure that it institutes, in a permanent fashion, a conservative posture in the delivery of flight training, through the establishment of clear criteria for that purpose, with guidance to the instructors so that they can act more effectively during the training of emergencies at low altitude, in addition to guaranteeing a safety margin capable of preventing the flight from reaching the point of accident irreversibility.

###### **A - 523/CENIPA/2015 - 02**

**Issued on 02/05/2017**

Take the necessary measures before the *EFAI Escola de Pilotagem LTDA.*, in order to make sure that it includes, as a critical criterion of its training program, the analysis of the prevailing wind conditions, mainly in relation to the possibility of occurrence of downdraft and windshear in the training area.



**A - 523/CENIPA/2015 - 03****Issued on 02/05/2017**

Take the necessary measures before the *EFAI Escola de Pilotagem LTDA.*, with emphasis on the crew's actions, in order to make sure that it provides CRM training to its employees involved with the air activity, aiming at the mitigation of operational errors resulting from faulty communications, lack of assertiveness, or doubts in the definition of tasks in flight.

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

None.

On May 2<sup>nd</sup>, 2017.

