COMANDO DA AERONÁUTICA <u>CENTRO DE INVESTIGAÇÃO E PREVENÇÃO DE</u> <u>ACIDENTES AERONÁUTICOS</u>



FINAL REPORT A-070/CENIPA/2022

OCCURRENCE: AIRCRAFT: MODEL: DATE: ACCIDENT PT-HMD HB-350B 09JUN2022



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 considering 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 distinct 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 Final Report has been made available to the ANAC and the DECEA so that the technical-scientific analyses of this investigation can be used as a source of data and information, aiming at identifying hazards and assessing risks, as set forth in the Brazilian Program for Civil Aviation Operational Safety (PSO-BR).

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. Considering 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 June 9, 2022, accident involving the model HB-350B helicopter of registration marks PT-HMD. The occurrence was classified as "[LOC-G] Loss of Control – Ground."

During a ferry flight, the aircraft emitted strange sounds shortly after takeoff, and the pilot performed a precautionary landing on the bulk carrier YM OPUS at the coordinates 02°23'16"S / 044°13'52"W. After landing, the aircraft rolled over on the helideck, colliding with the vessel's right-hand guardrail.

The aircraft sustained substantial damage.

The pilot suffered minor injuries.

Being France the State of Design of the aircraft, the French *BEA* (*Bureau d'Enquêtes* et d'Analyses pour la Sécurité de l'Aviation Civile) designated an Accredited Representative for participation in the investigation of the occurrence.

TABLE OF CONTENTS

GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS	5
1. FACTUAL INFORMATION	6
1.1. History of the flight	6
1.2. Injuries to persons.	6
1.3. Damage to the aircraft	6
1.4. Other damage	7
1.5. Personnel information	7
1.5.1.Crew's flight experience.	7
1.5.2. Personnel training.	7
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.	8
1.6. Aircraft information.	8
1.7. Meteorological information.	8
1.8. Aids to navigation.	9
1.9. Communications	9
1.10. Aerodrome information.	9
1.11. Flight recorders.	.10
1.12. Wreckage and impact information.	.10
1.13. Medical and pathological information.	.12
1.13.1.Medical aspects.	.12
1.13.2.Ergonomic information.	.12
1.13.3.Psychological aspects.	.12
1.14. Fire	.12
1.15. Survival aspects.	.12
1.16. Tests and research	.12
1.17. Organizational and management information.	.12
1.18. Operational information.	.13
1.19. Additional information.	.16
1.20. Useful or effective investigation techniques	.17
2. ANALYSIS	.17
3. CONCLUSIONS.	.19
3.1. Findings.	.19
3.2. Contributing factors.	20
4. SAFETY RECOMMENDATIONS	.21
	- ·
5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN.	21

GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS

AD	Airworthiness Directive
ANAC	Brazil's National Civil Aviation Agency
CENIPA	Brazil's Center for the Investigation and Prevention of Aeronautical Accidents
CIV	Digital Pilot-Logbook
CMA	Aeronautical Medical Certificate
CVA	Certificate of Airworthiness
DA	Airworthiness Directive
EO	Operations Specifications
EFAI	EFAI Escola de Aviação Civil Ltda. (EFAI Civil Aviation School Limited)
FAP	Pilot Evaluation Form
HMNT	Single-Turbine Engine Helicopter Class Rating
MCA	Command of Aeronautics' Manual
NORMAM	Maritime Authority Norms
METAR	Routine Meteorological Aerodrome Report
MGO	General Operating Manual
MGSO	Safety Management Manual
PIC	Pilot in Command
PPH	Private Pilot License – Helicopter
PCH	Commercial Pilot License - Helicopter
PTO	Operational Training Program
RBAC	Brazilian Civil Aviation Regulation
SSIV	ICAO location designator - Delta Helipad, São José de Ribamar, State of Maranhão
SIPAER	Aeronautical Accidents Investigation and Prevention System
SGSO	Safety Management System
SBSL	ICAO location designator - Marechal Cunha Machado Aerodrome, São
ТРХ	Private Registration Category – Non-Regular Public Air Transport
UTC	Coordinated Universal Time

PT-HMD 09JUN2022

1. FACTUAL INFORMATION.

	Model:	HB-350B	Operator:
Aircraft	Registration:	PT-HMD	Delta Aero Táxi Ltda.
	Manufacturer:	HELIBRAS	
	Date/time: 09Jl	JN2022 - 20:00 (UTC)	Type(s):
	Location: Bulk	Carrier YM OPUS	[LOC-G] Loss of control - ground
Occurrence	Lat. 02°23'16"S	Long. 044°13'52"W	
	Municipality -	State: São José de	
	Ribamar – Mara	anhão.	

1.1. History of the flight.

At approximately 19:55 UTC, the aircraft took off from the bulk carrier SM GEMINI 2 (02°24'54"S / 044°16'39"W) bound for SSIV (Delta Helipad, São José de Ribamar, State of Maranhão, on a ferry-flight with 01 POB (crew).

Shortly after takeoff, the aircraft emitted atypical sounds, prompting the pilot to perform a precautionary landing on the bulk carrier YM OPUS (02°23'16"S/044°13'52"W).

After landing, control of the aircraft was lost, and it rolled over on the helideck, colliding with the vessel's right-hand guardrail.

The aircraft sustained substantial damage.

The pilot suffered minor injuries.



Figure 1 - PT-HMD helicopter after the accident.

1.2. Injuries to persons.

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

1.3. Damage to the aircraft.

The aircraft sustained substantial damage. The tail section separated, resulting in the destruction of the tail rotor blades, along with the partial severing of the left skid. Additionally, one observed twisting of the tail boom and deformation with exposure of the tail-rotor drive shaft.

There was also damage to the transmission, and the main rotor blades were destroyed. The right door's plexiglass was shattered, and there was damage to the front left section of the roof.

1.4. Other damage.

The right-hand guardrail of the bulk carrier YM OPUS sustained deformation.

1.5. Personnel information.

1.5.1. Crew's flight experience.

FLIGHT HOURS	
	PIC
Total	2,600:00
Total in the last 30 days	10:00
Total in the last 24 hours	00:30
In this type of aircraft	17:25
In this type in the last 30 days	08:25
In this type in the last 24 hours	00:25

Note: flight-hour data obtained from the CIV (Digital Pilot-Logbook), complemented by declarations issued by the companies for which the pilot had flown before, as well as by reports from the pilot himself.

1.5.2. Personnel training.

The PIC (Pilot in Command) did his PPH course (Private Pilot – Helicopter) in 2011, at *Escola de Aviação Civil Asas Rotativas (*Rotary-Wing Civil Aviation School) in *Piraquara*, State of *Paraná*.

1.5.3. Category of licenses and validity of certificates.

The PIC held a PCH license (Commercial Pilot - Helicopter) and a valid rating for HMNT (Single-Turbine Engine Helicopter Class).

1.5.4. Qualification and flight experience.

According to reports, the PIC had been working for the aircraft operator for just over a year before the accident. During this period, he had flown a total of 16 hours and 30 minutes in the HB-350B *Esquilo* helicopter (registration marks PT-HMD), according to the company's records.

The pilot's operational history was developed in air taxi companies, where he worked as a helicopter pilot for approximately 10 years, accumulating around 2,600 total flight hours.

He had flown the following rotary-wing aircraft models: Robinson 22, Robinson 44, Robinson 66, Bell 407, Bell 206, HB-350B, and EC 130.

The pilot also had experience with fixed-wing aircraft, having flown airplanes such as Cessna C152, Cessna C172, *Aero-Boero* 115, and Neiva P56-C *Paulistinha*.

The latest Pilot Evaluation Form (FAP) provided by the operator did not reveal deficiencies in the pilot's handling of the accident helicopter during proficiency check-flights.

Since the company was not authorized to conduct offshore operations, the Operational Training Program (PTO) approved by the ANAC (National Civil Aviation Agency), which outlined the crew's training and operational maintenance, did not include preparation or standardization for flights involving landings and takeoffs on offshore helipads and vessels.

According to the RBAC-135 (Brazilian Civil Aviation Regulation nº 135), Amendment nº 11 – "Public air transport operations with airplanes certified for a maximum passenger

seating configuration of up to 19 seats and a maximum payload capacity of up to 3,400 kg (7,500 lb.), or helicopters", the concept of "qualified" was defined as follows:

135.321 Applicability and terms used

[...]

(10) Qualified. It means that the pilot must have valid category and class ratings, type and operation ratings as appropriate; must have successfully completed the approved training program for the operations authorized for the certificate holder; and must meet the recent experience requirements for a specific aircraft and onboard function.

Therefore, the pilot did not have qualification for offshore helipad operations. However, he had experience in passenger transport flights.

1.5.5. Validity of medical certificate.

The PIC held a valid CMA (Aeronautical Medical Certificate).

1.6. Aircraft information.

The aircraft (serial number HB/1040-1582) was manufactured in 1982 by *Indústria Aeronáutica HELIBRAS*. It was registered under the Private Registration Category - Non-Regular Public Air Transport Service (TPX).

The helicopter's CVA (Certificate of Airworthiness) was valid.

Its airframe had accumulated a total of 5,336 hours and 40 minutes TSN (time since new), according to the last entry recorded in the logbook on June 9, 2022.

However, the monthly control in Part 1 of the aircraft's logbooks did not contain records of flight hours in March, April, May, and June 2022. Consequently, both the airframe and engine logbooks were out of date.

Regarding this subject, the IS (Supplementary Instruction) n^o 43.9-003, Revision B, item 5.6.2, issued by the ANAC and valid at the time of the accident, read the following:

5.6.2 The updating of Part I of the airframe, engine, and propeller logbooks is mandatory and is to be completed by the fifth day of the following month, whenever there are changes in the operating times mentioned in paragraphs 4.4 and 4.5 of this IS. Thus, if an aircraft, engine, or propeller, remains inactive for more than one month, such inactivity shall be logged in a single line in the Monthly Control section of Part I of the respective logbooks. Example: "No flight hours recorded from 04/30/02 to 09/30/02 - reason: IAM.

The AD (Airworthiness Directive) maps and Component Maps were up to date.

The aircraft's latest inspection, required for the issuance of the CVA, was performed cumulatively with the following inspections: '10h', '20h', '30h', '50h/6 months', '100h', '150h/3 months', '150h/6 months', '150h/12 months', '500h/24 months', '600h/3 months', '600h/6 months', '1,000h/48 months', '1,200h/48 months', '2,500h/48 months', '5,000h/72 months', '7 days', '1 month', '3 months', '6 months', '12 months', and '24 months'. The inspection was completed on March 19, 2022, by the maintenance organization *EFAI Escola de Aviação Civil Ltda*.

According to the last entry in the logbook, on 09JUN2022, the aircraft had flown 13 hours and 40 minutes after the last inspection.

1.7. Meteorological information.

The METARs of SBSL (*Marechal Cunha Machado* Aerodrome, located approximately 5.45 NM from the accident site) contained the following pieces of information:

METAR SBSL 091900Z 07007KT 9999 SCT020 SCT100 30/24 Q1010.

METAR SBSL 092000Z 08004KT 9999 FEW020 SCT100 29/24 Q1011.

The visibility was greater than 10 km, with scattered clouds at 2,000 ft. and 10,000 ft. Wind speeds ranged from 4 to 7 knots.

Therefore, the meteorological conditions at SBSL and along the route were above the minimum requirements for conducting the operation under the proposed flight rules.

1.8. Aids to navigation.

NIL.

1.9. Communications.

NIL.

1.10. Aerodrome information.

The bulk carrier SM GEMINI 2, to which the passengers were transported, was positioned approximately 4.35 NM off the coast of *São Luís*.

As observed, the bulk carrier's helideck was neither certified nor registered as an "adapted helideck" with the Helideck Division of the Directorate of Ports and Coasts (DPC) for aircraft landing and takeoff operations. The Maritime Authority Norm (NORMAM)-27/DPC, which regulated the registration of helidecks on vessels and offshore platforms, established this requirement. By means of the Second Revision, 4th Modification, in effect at the time of the accident, it provided the following definition:

Adapted Helideck - An adapted landing area located midship, on the hatch cover of general cargo ships or bulk carriers, or on the side of the main deck of other types of ships. It differs from a helideck due to the absence of a purpose-built structure to enable routine helicopter landings and takeoffs. Its use is restricted to the boarding and disembarkation of public agents/pilots, and to the evacuation of injured or ill persons to locations where they can receive proper medical assistance.

Likewise, the helideck of the bulk carrier YM OPUS, chosen by the pilot for the precautionary landing, was neither registered nor certified as an "adapted helideck" with the DPC.

The Chapter 6 of NORMAM-27/DPC established the following responsibilities concerning helicopter commanders:

The Helicopter Commander must:

1) be familiar with the NORMAM-27.

2) be familiar with the current regulations issued by the Command of Aeronautics and the ANAC.

3) keep two-way communication with ATC units, platforms, or vessels.

4) communicate via radio with the destination vessel/platform at least 30 minutes before the estimated landing time. If the flight time is shorter than 30 minutes, communication must be made immediately after takeoff.

5) comply with safety regulations for the transport of external cargo and restricted items.

6) accept only properly tested fuel for the aircraft under their command.

7) report any irregularities encountered to their company.

8) before landing/takeoff, verify the presence of any vessel near the helideck that could interfere with operations in case of a single-engine performance situation.

9) considering greater clearance from obstacles at the installation, it is recommended that the aircraft approach for landing using the SLO (Safe Landing Offset). Check sub-item "g" of item 0404.

10) <u>comply with current aviation regulations when operating on helidecks or adapted</u> <u>helidecks on vessels/platforms</u> (emphasis added).

11) ensure that after a Wrong Deck Landing (WDL), the aircraft will only take off from the incorrect helideck once it has been secured by the EMCIA team and upon authorization from ALPH.

The NORMAM-27/DPC established the following requirements for landing and takeoff operations on certified adapted helidecks:

LANDING AND TAKEOFF

Landing and takeoff operations on approved adapted helidecks are only authorized under the following conditions: the ship must be anchored or have its engines shut down; operations must take place during daylight hours; operations are restricted to the boarding and disembarkation of public agents/pilots and evacuation of injured or ill persons to be taken to a facility where they can receive proper medical assistance.

For situations in which a medical emergency is declared by a doctor, or in their absence, by a nurse, nursing technician, or the ship's commander, night operations are permitted for the evacuation of injured or ill individuals to be taken to a location where they can receive adequate medical assistance. In this case, adequate lighting must be provided for the adapted helideck. Spotlights must be properly installed to ensure the light source is not directly visible to the pilot. The lighting arrangement must be designed to minimize shadows as much as possible.

<u>Under no circumstances is one allowed to shut down the aircraft's engines on these helidecks</u> (emphasis added).

Regarding the use of unregistered helipads, which fall under the general aerodrome category, the RBAC-91, Amendment n^o 3 – General Operational Requirements for Civil Aircraft, Section 91.102(d), reads:

[...]

(d) the use of an aerodrome in Brazil is only allowed if it is registered, and the operator has determined that such aerodrome is suitable for the type of aircraft involved and for the proposed operation.

1.11. Flight recorders.

Not required and not installed.

1.12. Wreckage and impact information.

According to reports, the aircraft approached from the right side of the vessel, whose bow was facing toward the coast of *São Luís*, MA. The helicopter's fuselage had rolled over to the right, resting at a heading of 130°, at the edge of the right-hand guardrail of the bulk carrier YM OPUS.

These pieces of evidence suggest that, during the loss of control, the aircraft yawed to the right, rolled over in the same direction, and fell off the helideck (Figure 2).



Figure 2 - Direction of landing and possible direction of the rollover.

Small dents were noted on the fuselage, below the aircraft's left cabin door (Fig. 3).



Figure 3 - Dents concentrated on the fuselage below the left door.

The horizontal and vertical stabilizers had detached, and lying a few meters behind the helicopter.

The rear transmission box and the tail-rotor head attachment assembly were not found.

The collective pitch control was found unlocked and positioned fully upward, while the cyclic control was found fully tightened with friction applied (Figure 4).



Figure 4 - Collective pitch control positioned fully upward.

The switches of the battery, generator, fuel pump, pitot heat, artificial horizon, and low RPM warning horn were all found switched on.

The right skid was broken in half and had marks resulting from its contact with the deck.

There were scratches and marks on the helideck, caused by the dragging of the right skid in the direction where the fuselage had come to rest. Additionally, there was evidence of tail rotor strikes on the helideck surface (Figure 5).



Figure 5 – Tail-rotor contact marks on the helideck.

The main- and tail-rotor blades were broken and scattered, with impact marks observed on the helideck floor.

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 information gathered, the PIC did not report any concerns in terms of his personal, family, or professional life. He described himself as a meticulous professional with respect to flight procedures.

The PIC stated that, until the day of the occurrence, he had a good relationship with the owner of the company and was happy with his job. He also said that he held no other roles within the company, working exclusively as a pilot.

The PIC reported having had a satisfactory night's sleep before the day of the accident.

1.14. Fire.

There was no fire.

1.15. Survival aspects.

After the accident, the PIC got out of the aircraft through the left door.

1.16. Tests and research.

NIL.

1.17. Organizational and management information.

The company *Delta Aero Táxi Ltda.* operated in compliance with the requirements established under RBAC-135.

The operator did not present evidence of having a contract of service provision with the company responsible for the passengers transported to the bulk carrier SM GEMINI 2.

Regarding this subject, Section 135.64(d) of RBAC 135, Amendment No. 11 read:

A certificate holder conducting non-regular operations must retain a copy of each written contract under which it provides air transport services for at least one year after the contract execution date. In the case of a verbal contract, the certificate holder must maintain a memorandum documenting its terms, as well as any amendments to the contract, for at least one year after its execution or amendment.

According to the Operations Specification (EO), Revision 7, dated January 13, 2022, the PT-HMD helicopter had authorization for transporting passengers and medical patients; however, the authorization did not include the conduction of offshore operations.

The RBAC-01, Amendment n^o 09 – "Definitions, Drafting Rules, and Measurement Units for Use in ANAC Regulations", contained the following concept of Offshore Helipad:

Helideck is a helipad located on a structure over water, either fixed or floating. It is also known as Offshore Helipad (emphasis added).

The company had an Operations Manual (MOP) and an Operations Training Program (PTO) that outlined crew training and operational maintenance. However, neither document included provisions for training or standardization related to flights involving landings on, and takeoffs from, vessels.

According to reports, training for vessel operations was conducted exclusively in a practical manner, during actual passenger transport missions, with a more experienced pilot instructing a less experienced one.

At the time of the accident, the company had a Safety Management Manual (MGSO), duly approved by the ANAC. While the manual outlined provisions for managing operational safety risks, there was no evidence that these measures were effectively implemented. As for the accident flight, risk management was not carried out.

1.18. Operational information.

On the day of the occurrence, the aircraft had already completed a flight with another pilot, and no abnormalities or system failures had been reported.

The flight plan entailed departing from the helipad of *Delta Táxi Aéreo Ltda. at* SSIV to transport passengers to the bulk carrier SM GEMINI 2. After disembarking the passengers, the aircraft would return to its origin helipad.

The aircraft's weight was approximately 1,345 kg., within the weight and balance limits specified by the manufacturer.

The PIC stated that he had planned the mission considering the meteorological conditions and the geographical location of the helideck. He performed reconnaissance of the site through photos and information of the vessel's dimensions and position.

The PIC also reported having held a briefing with the passengers, who were not familiar with the aircraft. This briefing included instructions on how to close the helicopter doors after disembarkation, with hands-on training and multiple repetitions of the procedure.

According to accounts, the first leg of the flight, including the landing on the bulk carrier SM GEMINI 2, was uneventful. The passengers disembarked with the rotors turning. One of the passengers closed the helicopter door.

After the takeoff from the bulk carrier SM GEMINI 2, the PIC reported hearing an abnormal noise and experiencing unusual aircraft vibration. He said that the speed was reduced to approximately 60 knots, but the phenomena persisted.

He verified that the engine parameters and rotor RPM were normal, with no audible alarms indicating a drop in RPM or any other anomaly.

Upon inspecting the aircraft interior during flight, he noticed that the left door was not closed appropriately. This led him to suspect that the noise originated from a seat belt buckle striking the fuselage.

Nonetheless, he did not rule out the possibility of a mechanical failure, and decided to perform a precautionary landing on the bulk carrier YM OPUS (Figure 6).



Figure 6 - Sketch of the bulk carriers SM GEMINI 2 and YM OPUS's positions. Source: adapted from Google Earth.

The PIC reported that, after landing, while the rotor blades were still rotating, he locked the controls with the intention of stepping out to check the doors and overall condition of the aircraft. At that moment, the helicopter tipped over while he was still inside the cabin.

It is important to note that the PIC claimed not to recall the factors that contributed to the loss of control.

According to the aircraft's operational manual, the collective pitch control is supposed to be locked after landing (Figure 7).

1 APÓS O POUSO
Parada do motor e do rotor
 Desligar todos os sistemas desnecessários. Utilizando a manete de vazão de combustível, reduzir a Ng para um valor entre 67% e 70% e aguardar 30 segundos para a estabilização das temperaturas. Travar o passo coletivo. Cortar o motor, recuando a manete de vazão para a posição "corte". Desligar o gerador, a bomba de combustível e todas as outras chaves. Aplicar totalmente o freio rotor quando a NR for: 140 rpm ou menor - NR normal;
 170 rpm ou menor - NR máxima (em condições de vento forte). Desligar a bateria.
 Capas do tubo Pitot, das tomadas estáticas, da entrada de ar, do escapamento e peias das pás, se necessário.

Source: HB-350B flight manual.

Additionally, the Airbus Helicopters' Safety Information Notice (SIN) n^o 3268-S-00 warned about incidents in which helicopters inadvertently lifted off due to collective pitch movement without pilot input. The notice concluded that failure to lock the collective after landing was a contributing factor in such events (Figure 8).



Figure 8 - Excerpt from Safety Information Notice nº 3268-S-00 by Airbus Helicopters.

Regarding the PIC's intent to disembark while the blades were rotating, without another qualified pilot at the controls, it is worth mentioning a report from a company employee that such practice was habitual within the organization.

The company's General Operations Manual (MGO) did not include provisions allowing the PIC to adopt that type of procedure.

In this respect, it is worth to note that the Law n^o 7565 of December 19, 1986 (Brazilian Code of Aeronautics - CBA), Chapter III (Infractions), Article 302, item II, sub-item (s), established that the following action constitutes an infraction attributable to aviators, aviation personnel, or aircraft operators:

[...]

s) to leave the aircraft with the engine running and without a crewmember on board.

[...]

Although the CBA explicitly imposed such restriction, no corresponding requirement was found in the regulations.

Research indicated that there were previous occurrences in which pilots disembarked from helicopters while the rotors were still turning, without another qualified pilot at the controls, leading to accidents such as those involving the PT-YGB on January 15, 2008, and the PR-DJC on May 30, 2013.

It is worth noting that, during the revision process of the RBAC-91, one deemed it necessary to include the Section 91.102(e) to address the Safety Recommendation RSV A-103/CENIPA/2013-01 arising from the PR-DJC accident on May 30, 2013.

Still in this context, the DIVOP (Operational Bulletin) n^o 004/2013 warned operators, pilots, and helicopter mechanics about the risks associated with ground operations with rotors turning and without a properly qualified pilot occupying the cockpit.

In this sense, this history of accidents demonstrated that the unsafe practice remained embedded within the culture of the rotary-wing aviation sector.

Relatively to this hazardous conduct, the Airbus Helicopters' Safety Information Notice nº 2727-S-00 warned about the dangers of leaving a helicopter on the ground with the blades rotating, without a qualified pilot at the controls, stating the following:

[...]

Airbus Helicopters continues to believe that leaving a helicopter operating on the ground without a qualified pilot at the controls can be dangerous. This situation can result in damage to the helicopter and/or to other property, serious bodily injury, or death.

[...])

1.19. Additional information.

For a better understanding of this accident, it is important to highlight some specific aspects of the collective and cyclic controls and their correlation with the flight of a helicopter. In his master's dissertation, L*írio* (2012)¹ made the following comments:

[...]

the helicopter has four independent controls, namely, longitudinal, lateral, vertical, and directional controls. The pilot operates these controls with their hands and feet using specific control levers located in the cockpit. The conventional control system consists of the Cyclic control, Collective control, Pedals, and Throttle lever, as described below:

- Cyclic Control: Located in front of the pilot, it is used for the longitudinal and lateral control of the helicopter. The pilot moves the cyclic control stick in the desired flight direction (forward, sideways, or backward), cyclically changing the pitch angle of the main rotor blades. It is the primary speed control for helicopters.

- Collective Control: Located to the left of the pilot, it is used for the vertical control of the aircraft. The pilot moves the collective control up or down, collectively adjusting the pitch angle of all main rotor blades. It is the primary altitude control for helicopters.

[...]

It is important to emphasize that both controls had specific locking mechanisms. The HB-350B flight manual, in Section 4.1 - "Operational Procedures", provided cockpit schematics illustrating the locations of the cyclic and collective controls, along with their respective locking mechanisms, as indicated by items 7, 8, 10, and 16 in Figure 9.

¹ LIRIO, T.A., **Guia Técnico de Investigação de Acidentes Aeronáuticos com Helicópteros para Investigadores do SIPAER**. Dissertação de Mestrado em Segurança de Aviação e Aeronavegabilidade Continuada - Instituto Tecnológico de Aeronáutica, São José dos Campos -SP, P.31, 2012.



Figure 9 - Schematic drawing of the cockpit. Source: HB-350B flight manual.

1.20. Useful or effective investigation techniques.

NIL.

2. ANALYSIS.

It was a passenger transport flight from the SSIV helipad to the bulk carrier SM GEMINI 2, followed by a ferry flight returning to the origin helipad.

The first leg of the flight, including landing on bulk carrier SM GEMINI 2, was uneventful, and the passengers disembarked on the vessel. It is worth highlighting that the deboarding was performed with the rotors turning and that the passengers were unfamiliar with the aircraft, despite the PIC having briefed them on pre-boarding instructions, which included training on how to close the helicopter doors after disembarking.

After taking off from the SM GEMINI 2 to return to SSIV, with no passengers on board, the PIC heard a strange noise along with vibration. However, he reported that the aircraft's parameters remained normal.

Taking that into account, the PIC inferred that the noise might have been caused by a seat belt buckle left outside the helicopter, possibly by one of the passengers during disembarkation. The pilot's report supported this hypothesis, as he observed that the left cabin door was not properly closed during an in-flight check.

Besides, dents and marks were observed on the left fuselage below the door, which may have resulted from repeated impacts of the buckle against the fuselage, driven by relative wind forces following the takeoff from the bulk carrier SM GEMINI 2.

The PIC informed not having ruled out the possibility of a mechanical failure, and decided to perform a precautionary landing on the bulk carrier YM OPUS to ascertain the source of the noise.

The entries of the airframe and engine logbooks in Part I were out of date. This condition was noncompliant with the ANAC's Supplementary Instruction (IS) n° 43.9-003, Revision B, item 5.6.2, although the aircraft had undergone recent maintenance, being considered, at that time, fit to return to service.

No abnormalities were reported by the crew of the previous flight, nor were any issues observed during the flight for passenger transport from SSIV to the bulk carrier SM GEMINI 2. Thus, a technical malfunction of the aircraft was ruled out as a contributing factor to the accident.

It is worth noting that when the PIC heard the noise made by the aircraft, he was at a distance of 4.35 NM off the coast of *São Luís*. Besides, no signs of system failure or loss of controllability were identified that would have prevented him from continuing to the coastline or returning to the origin helipad.

The decision to land on the bulk carrier YM OPUS denoted a difficulty in assessing and analyzing the situation, characterizing an inadequate decision-making process.

The PIC reported that, after landing on the bulk carrier YM OPUS, he locked the controls, intending to step out of the aircraft while the blades were still running to inspect the doors and determine the source of the noise. At that moment, the pilot reported detecting an unexpected movement of the aircraft, which led to the loss of control on the ground.

However, photographic evidence from the accident site showed that the position of the collective pitch control was fully up, indicating that it had not been locked. The cyclic control, on the other hand, had its friction fully tightened.

There is the hypothesis that the collective control was inadvertently moved, resulting in unexpected helicopter movement.

Such hypothesis is reinforced by the Airbus Helicopters' Safety Information Notice n^o 3268-S-00, which reported the recurrence of similar events.

It is inferred that, upon noticing the unexpected aircraft movement, the PIC possibly acted inappropriately on the controls, pulling the collective pitch control in an attempt to regain stability. This action may have exacerbated the situation, given that the cyclic control had been locked after landing.

The PIC's intention to get out of the aircraft while the rotor was still running, without another qualified pilot to stay on board, reflected practices informally institutionalized and deficiencies in the company's risk management process. As the Airbus Helicopters' Safety Information Notice n^o 2727-S-00 warned, leaving a helicopter on the ground with the blades rotating without a qualified pilot at the controls could be dangerous and result in damage to the helicopter and/or other property, serious bodily injury, or fatalities.

Research indicated recurrent events in which pilots got out of their helicopters while the rotors were still running without another qualified pilot at the controls, such as, for example, the PT-YGB accident on January 15, 2008 and the PR-DJC accident on May 30, 2013.

Such unsafe practice may have persisted due to unclear regulatory requirements from the ANAC regarding the prohibition of leaving the cockpit of a running helicopter without another qualified pilot on board, despite explicit mention of this infraction in the Brazilian Aeronautical Code (CBA).

The absence of a clearly defined regulatory requirement in ANAC's regulations, combined with the inherent flexibility of rotary-wing aviation—which allows operations in

locations without ground support—facilitated the adoption of this unsafe practice by helicopter pilots. As a result, aviation accidents with similar characteristics became recurrent.

This practice weakened safety culture—or highlighted a lack of adherence to it compromising operational safety. This issue was likely exacerbated by the absence of stricter regulatory requirements.

It is worth highlighting that during the process of revision of the RBAC-91, the inclusion of Section 91.102(e) was necessary in the wake of the PR-DJC accident on May 30, 2013.

The fact that the company did not have specific training for landings and takeoffs on offshore helidecks meant that the PIC was not qualified for such operations, something that may have resulted in inadequate piloting performance.

Moreover, one found no records concerning the management of risks to the company's air operations, whose processes were outlined in the company's Safety Management Manual (MGSO).

The landing and takeoff operations on the helideck of the bulk carrier SM GEMINI 2, in which the passengers disembarked, was not in accordance with the maritime authority regulations, since the helideck was neither certified nor registered with the Directorate of Ports and Coasts (DPC) Helideck Division.

Since offshore operations were not included in the operator's Operations Specifications (EO), the pertinent Operational Training Program (PTO) did not prescribe training for landings and takeoffs at offshore helidecks.

Therefore, the lack of adherence to the regulatory requirements of the RBAC-135, as well as the non-compliance with maritime authority regulations, resulted in an operation for which the PIC was not qualified, and which was conducted on an offshore helideck that did not meet applicable standards. Such circumstance contributed to the occurrence of the accident.

3. CONCLUSIONS.

3.1. Findings.

- a) the PIC held a valid CMA (Aeronautical Medical Certificate);
- b) the PIC held a valid HMNT* rating *(Single-Turbine Engine Helicopter Class);
- c) the PIC was not qualified for offshore helipad operations;
- d) the aircraft had a valid CVA (Certificate of Airworthiness);
- e) the aircraft was within the specified weight and balance limits;
- f) the records of the airframe and engine logbooks were out of date;
- g) the meteorological conditions were above the minimum requirements for the flight;
- h) the operator's current Operations Specifications (EO) did not include authorization from the ANAC for offshore operations;
- i) the operator's PTO did not include operational training for crewmembers on procedures involving landings and takeoffs at offshore helidecks;
- j) there was no evidence of implementation of an operational risk management process by the company;
- k) the flight between the SSIV helipad and the bulk carrier SM GEMINI 2 proceeded as planned;

- passenger disembarkation on the bulk carrier SM GEMINI 2 took place with the rotors turning;
- m) the door of the helicopter was closed by one of the passengers;
- n) the PIC reported hearing a strange noise after the takeoff from the bulk carrier SM GEMINI 2;
- o) the PIC decided to perform a precautionary landing on the bulk carrier YM OPUS;
- p) the PIC reported that, after landing on the bulk carrier YM OPUS, an unexpected aircraft movement led him to lose control of the helicopter on the ground;
- q) after the accident, the aircraft remained resting on its right side;
- r) there were small dents located on the fuselage below the left cabin door;
- s) after the accident, the cyclic control was found with full friction applied;
- t) after the accident, the collective pitch control was found unlocked and fully raised;
- u) the aircraft sustained substantial damage; and
- v) the PIC suffered minor injuries.

3.2. Contributing factors.

- Training – undetermined.

The lack of specific training for landings and takeoffs on offshore helidecks meant that the PIC was not qualified for this type of operation, which may have resulted in inadequate performance.

- Organizational culture – a contributor.

The PIC's intention to get out of the helicopter while it was still running, without another qualified pilot on board, reflected informally institutionalized practices that weakened safety culture and exposed failures in the company's operational risk management.

- Handling of aircraft flight controls – undetermined.

It is possible that the pilot, upon noticing the unexpected movement of the aircraft, may have acted inappropriately on the controls, pulling the collective pitch control in an attempt to regain stability. This action may have worsened the situation, given that the cyclic control had been locked after landing.

- Decision-making process – a contributor.

At the time the PIC detected the abnormal noise, he was 4.35 NM from the coastline of *São Luís*. Additionally, there were no indications of system failure or loss of controllability that would have prevented him from continuing to the coastline or returning to the origin helipad.

The decision to perform a precautionary landing on the vessel in question demonstrated difficulty in assessing and analyzing the situation, characterizing an inadequate decision-making process.

- Support systems – a contributor.

Since offshore operations were not included in the operator's Operations Specifications (EO), the PTO did not prescribe any training for landings and takeoffs at offshore helidecks. Additionally, the helideck of the vessel where the passengers disembarked was neither certified nor registered with the Directorate of Ports and Coasts (DPC) Helideck Division.

Thus, the lack of adherence to the regulatory requirements of RBAC-135, along with non-compliance with maritime authority regulations, resulted in an operation for which the

PIC was not qualified, conducted on an offshore helideck that did not meet applicable standards. These circumstances contributed to the occurrence of the accident.

4. SAFETY RECOMMENDATIONS

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 consonance with the Law n°7565/1986, recommendations are made solely for the benefit of 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".

To the National Civil Aviation Agency (ANAC), it is recommended:

A-070/CENIPA/2022 - 01

Issued on 06/02/2025

Issued on 06/02/2025

Work with *Delta Táxi Aéreo* to ensure that the operator complies with the requirements established in the RBAC-135, particularly in relation to its Training Program, as well as to verify whether its Safety Management System (SMS) is effective to mitigate the risks identified.

A-070/CENIPA/2022 - 02

To conduct studies with the purpose of amending the RBAC-91, Section 91.102, to require that a qualified pilot always remain in the cockpit whenever the aircraft engine(s) are running, in accordance with Article 302, Item II, Letter S, of Law n^o 7565, dated December 19, 1986, Brazilian Code of Aeronautics (CBA).

5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN.

None.

On June 2nd, 2025.