

COMANDO DA AERONÁUTICA
CENTRO DE INVESTIGAÇÃO E PREVENÇÃO DE
ACIDENTES AERONÁUTICOS



FINAL REPORT
A-087/CENIPA/2018

OCCURRENCE:	ACCIDENT
AIRCRAFT:	PT-HKY
MODEL:	206B
DATE:	09MAI2018



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 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 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. 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 09 May 2018 accident with the 206B aircraft, registration marks PT-HKY. The occurrence received the typification of “[FUEL] Fuel related”.

While on level flight, the aircraft had an emergency and lost height, crashing into the sea at a distance of approximately 200 m off the coast of Barra da Tijuca beach, in the municipality of *Rio de Janeiro*, State of *Rio de Janeiro*.

The aircraft sustained substantial damage.

The pilot was fatally injured, one of the passengers received serious injuries, and the other two passengers were slightly injured.

Being the USA the State of Manufacture of Engine Accessories and Canada the State of aircraft design, both the NTSB (National Transportation Safety Board - USA) and the TSB (Canada's Transportation Safety Board) respectively designated an Accredited Representative for participation in the investigation of the occurrence.

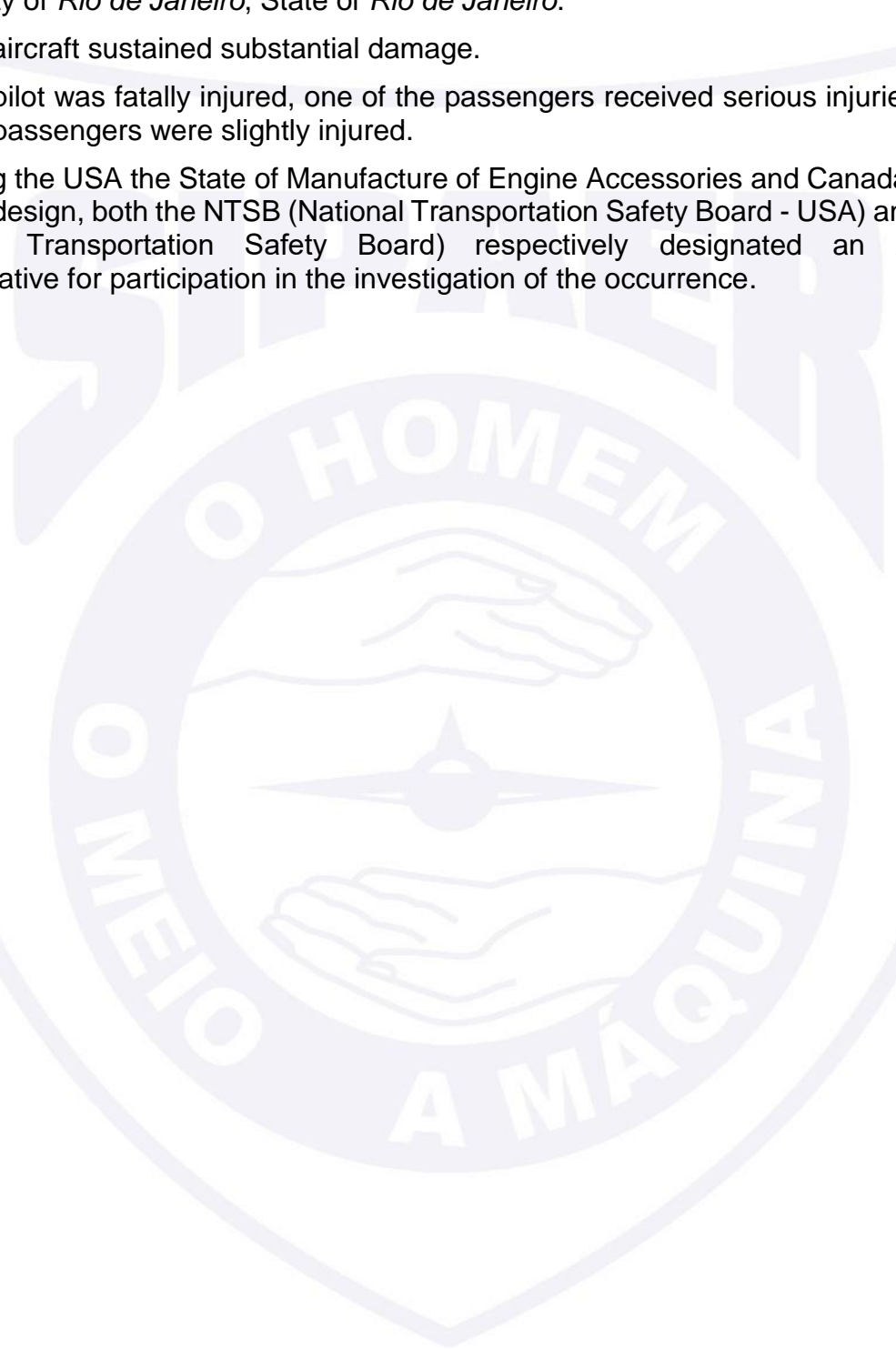


TABLE OF CONTENTS

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.....	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.....	9
1.17. Organizational and management information.....	10
1.18. Operational information.....	10
1.19. Additional information.....	12
1.20. Useful or effective investigation techniques.....	12
2. ANALYSIS.....	12
3. CONCLUSIONS.....	13
3.1. Findings.....	13
3.2. Contributing factors.....	13
4. SAFETY RECOMMENDATIONS	14
5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN.....	14

GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS

ANAC	Brazil's National Civil Aviation Agency
CA	Certificate of Airworthiness
CENIPA	Brazil's Aeronautical Accidents Investigation and Prevention Center
CMA	Aeronautical Medical Certificate
DCTA	Department of Science and Aerospace Technology
FCU	Fuel Control Unit
HMNT	Single-Engine Turbine Helicopter Class rating
METAR	Meteorological Aerodrome Report
NTSB	National Transportation Safety Board (USA)
OM	Maintenance Organization
PCH	Commercial Pilot License (Helicopter)
PIC	Pilot in Command
PPH	Private Pilot License (Helicopter)
PTG	Power Turbine Governor
SACI	Integrated Civil Aviation Information System
SBCB	ICAO location designator – Aerodrome of <i>Cabo Frio</i> , State of <i>Rio de Janeiro</i>
SBJR	ICAO location designator - <i>Roberto Marinho</i> Aerodrome, <i>Jacarepaguá</i> , <i>Rio de Janeiro</i> , State of <i>Rio de Janeiro</i>
SDRE	ICAO location designator - <i>Recreio</i> Helipad, <i>Rio de Janeiro</i> , State of <i>Rio de Janeiro</i>
SN	Serial Number
TPP	Private Air Services Aircraft Registration Category
TSB	Transportation Safety Board (Canada)
UTC	Universal Time Coordinated

1. FACTUAL INFORMATION.

Aircraft	Model: 206B Registration: PT-HKY Manufacturer: Bell Helicopter	Operator: <i>Mapa Empreendimentos e Participações Ltda.</i>
Occurrence	Date/time: 09MAI2018 – 14:05 UTC Location: <i>Barra da Tijuca</i> beach. Lat. 23°00'48"S. Long. 043°20'04"W. Municipality – State: <i>Rio de Janeiro – Rio de Janeiro.</i>	Type(s): [FUEL] Fuel related

1.1. History of the flight.

At around 14:00 UTC, the aircraft took off from SDRE (*Recreio* Helipad, municipality of *Rio de Janeiro*, RJ) bound for SBCB (Aerodrome of *Cabo Frio*, State of *Rio de Janeiro*), on a private flight for the transport of passengers, with a pilot and three passengers on board.

While flying en route, the aircraft entered an emergency and lost height, colliding with the sea approximately 200 m off the coast of *Barra da Tijuca* beach, in the municipality of *Rio de Janeiro*, RJ.

The aircraft sustained substantial damage.

The pilot received fatal injuries, one passenger had serious injuries, and the remainder two passengers had minor injuries.

1.2. Injuries to persons.

Injuries	Crew	Passengers	Others
Fatal	1	-	-
Serious	-	1	-
Minor	-	2	-
None	-	-	-

1.3. Damage to the aircraft.

The aircraft sustained substantial damage. It crashed into the sea and drifted ashore with the tide.

1.4. Other damage.

NIL.

1.5. Personnel information.

1.5.1. Crew's flight experience.

	PIC
Total	493:38
Total in the last 30 days	15:50
Total in the last 24 hours	00:15
In this type of aircraft	473:00
In this type in the last 30 days	15:50
In this type in the last 24 hours	00:15

N.B.: the data related to the hours flown by the pilot were obtained through the records of the aircraft logbook and through the records of the ANAC's Integrated Civil Aviation Information System (SACI).

1.5.2. Personnel training.

The Pilot in Command (PIC) did his PPH course (Private Pilot - Helicopter) at SKYLAB - Escola de Aviação, Rio de Janeiro, RJ, in 2008.

1.5.3. Category of licenses and validity of certificates.

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

1.5.4. Qualification and flight experience.

The pilot had qualification and experience for the type of flight.

1.5.5. Validity of medical certificate.

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

1.6. Aircraft information.

The SN 3146 aircraft was a product manufactured by Bell Helicopters in 1980, and registered in the Private Air Services Registration Category (TPP).

The CA (Certificate of Airworthiness) was valid.

The airframe and engine logbooks were not up-to-date.

On 19 February 2018, *Helimar Helicópteros Ltda.* Maintenance Organization carried out the last inspection of the aircraft (type "1,500 hours/12M") in the municipality of Rio de Janeiro. The aircraft flew 17 hours after the referred inspection.

1.7. Meteorological information.

The METAR from SBJR (Jacarepaguá - Roberto Marinho Aerodrome), located at a distance of 4.28 NM away from the accident site, contained the following information:

METAR SBRJ 091300Z 0000KT 9999 SCT025 19/26 Q1022=

METAR SBRJ 091400Z 08006KT 9999 SCT025 18/25 Q1022=

METAR SBRJ 091500Z 12006KT 9999 SCT025 SCT080 26/19 Q1022=

One verified that the weather conditions were consistent with VFR flights, with visibility above 10 km and scattered clouds at 2,500 ft. The wind was 080° at 6 kt.

1.8. Aids to navigation.

NIL.

1.9. Communications.

NIL.

1.10. Aerodrome information.

The accident occurred outside of aerodrome area.

1.11. Flight recorders.

Neither required nor installed.

1.12. Wreckage and impact information.

The aircraft crashed into the sea, and its wreckage remained concentrated. On a visual analysis, the transmission system seemed to have preserved its integrity.



Figure 1 - Takeoff location and crash-site. Source: Adapted from Google Earth.

After the rescue work, the Second Maritime Group of the *Rio de Janeiro* State Military Fire Department marked the aircraft with rescue-tubes to make it easy to identify the location of the wreckage.

The aircraft drifted ashore with the tide and possibly sustained damage in the process.

According to the passengers, the first impact occurred in a nose-down attitude and with a banking of approximately 25° to the right, causing the position where the pilot was sitting (right-hand side) to be the first one to strike the water.

The degree of destruction caused by the collision of the aircraft with the sea, and its later displacement caused by the tide, made it difficult to confirm the position of equipment and instruments.

1.13. Medical and pathological information.

1.13.1. Medical aspects.

There was no evidence that issues of physiological nature or disability could have affected the performance of the pilot.

1.13.2. Ergonomic information.

NIL.

1.13.3. Psychological aspects.

There was no evidence that psychological issues might have affected the performance of the pilot.

1.14. Fire.

There was no fire.

1.15. Survival aspects.

All occupants of the aircraft were rescued by a team of lifeguards of the Second Maritime Group of the Fire Department.

The PIC did not survive the crash.

The passengers were taken to the *Lourenço Jorge* Municipal Hospital in the city of *Rio de Janeiro*.

1.16. Tests and research.

The SN CAE 833317 250-C20B Rolls Royce engine equipping the aircraft did not sustain severe damage from the accident. The Investigation Commission decided to send the engine to *Indústria de Aviação e Serviços*, an ANAC-certified maintenance organization located in *São José da Lapa*, State of *Minas Gerais*, capable of providing overhaul services on this model of engine.

Upon completion of the examination of the engine, the maintenance staff did not find anything that would preclude its normal operation.

According to the manufacturer's analysis, endorsed by the Department of Science and Aerospace Technology (DCTA), one found rubbing marks on the power turbine stages and deformations on the rotor of the first compression-stage, showing that the rotating parts of the engine were in motion in the moment of impact with the surface of the sea.

The Fuel Control Unit (FCU - fuel control unit) and the Power Turbine Governor (PTG - power turbine governor), engine accessories, were analyzed at the Honeywell's facilities in the United States.

The disassembling and analysis of these components did not identify any anomaly that would prevent the units from functioning normally.

The analysis of the fuel identified that all the samples collected from the wreckage of the aircraft were contaminated by the sea water, and that the ones collected from the storage tank and from the fuel-truck were intact, that is, they were not contaminated.

The fuel filler cap assembly was subject to a tightness test, which revealed leakage in both directions (from the outside to the inside and vice versa).

After the tests, one removed the fuel filler cap, in order to check the integrity of the fuel filler cap -sealing gasket. In this way, it was possible to perform a visual inspection of the sealing gasket (O-ring), in which damage was observed that could have contributed to the ineffectiveness of the seal against the leakage of fluids. An ineffective fuel filler cap could also provide a path for water to enter the fuel tank and contaminate the fuel.



Figure 2 - Condition of the cap sealing-gasket.

Upon consulting the aircraft manufacturer's Maintenance Manual, available at <http://bellhelicopter.net>, one found that, every 100 hours, the manual prescribed an inspection of the fuel filler cap, as shown in Figure 3.


 BHT-106A/B-SERIES-MM-1		
PROGRESSIVE INSPECTIONS		
5-19. 100-HOUR AIRFRAME PROGRESSIVE INSPECTION — EVENT NO. 4 (CONT)		
DATA REFERENCE	INSPECTION TASK DESCRIPTION	INITIAL MECH OTHER
ZONE 9 — AFT FUSELAGE		
PLACARDS AND MARKINGS		
Chapter 11	1. Examine the placards, decals, and markings. Make sure they are readable, correctly applied, and in agreement with the applicable configuration of your helicopter.	
FUSELAGE (EXTERIOR)		
Chapter 53	1. Examine aft fuselage for dents, cracks, corrosion, delamination, loose or missing rivets, and condition. 2. Examine aft fuselage for indications of fuel or oil leaks.	
Chapter 28	3. Examine the fuel cap for condition and security.	
Chapter 96	4. Examine the grounding plug for condition.	
Chapter 6 and Chapter 53	5. Examine all fuselage drains for condition and freedom from obstructions.	
Applicable Service Instruction	6. Examine heater and/or air conditioning inlets and outlets for cleanliness and absence of obstructions, if installed.	
Chapter 53	7. Examine baggage compartment door, seal, and latches for operation, condition, and security.	
Chapter 96	8. Examine aft cross-tube support tunnel structure for cracks, corrosion, distortion, and loose fasteners. 9. Verify operation of the baggage door ajar caution light, if installed.	
FUSELAGE (INTERIOR)		
Chapter 53	1. Examine baggage compartment for condition. 2. Gain access to inside of aft fuselage through access panels in baggage compartment and access panel located on the aft right side fuselage: a. Examine access panels and fasteners for condition.	

Figure 3 - Maintenance Manual showing the task of checking the filler cap.

Upon analyzing the technical documentation concerning the maintenance of the aircraft, one observed that the fulfillment of the task related to the examination of the fuel filler cap conditions and safety in the last inspection before the occurrence in question appeared in the 01/PT-HKY/02 airframe logbook.

1.17. Organizational and management information.

NIL.

1.18. Operational information.

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

The closed circuit surveillance system at the place of origin showed that local workers removed the aircraft from the hangar at 13:26 UTC.

At 13:29 UTC, the PIC went to the aircraft, put something away in the luggage compartment and, apparently, accessed the cabin from the outside of the aircraft. After that, he did not perform any type of inspection, check or pre-flight.

At 13:53 UTC, the PIC arrived at the aircraft with the passengers. He boarded the helicopter, started up the engine, and took off at 14:00 UTC.

The helicopter's Flight Manual provided for a pre-flight check and, according to information gathered from the employees who attended the aircraft, the PIC did not carry

out the said pre-flight check, a fact confirmed by the internal security surveillance system cameras.

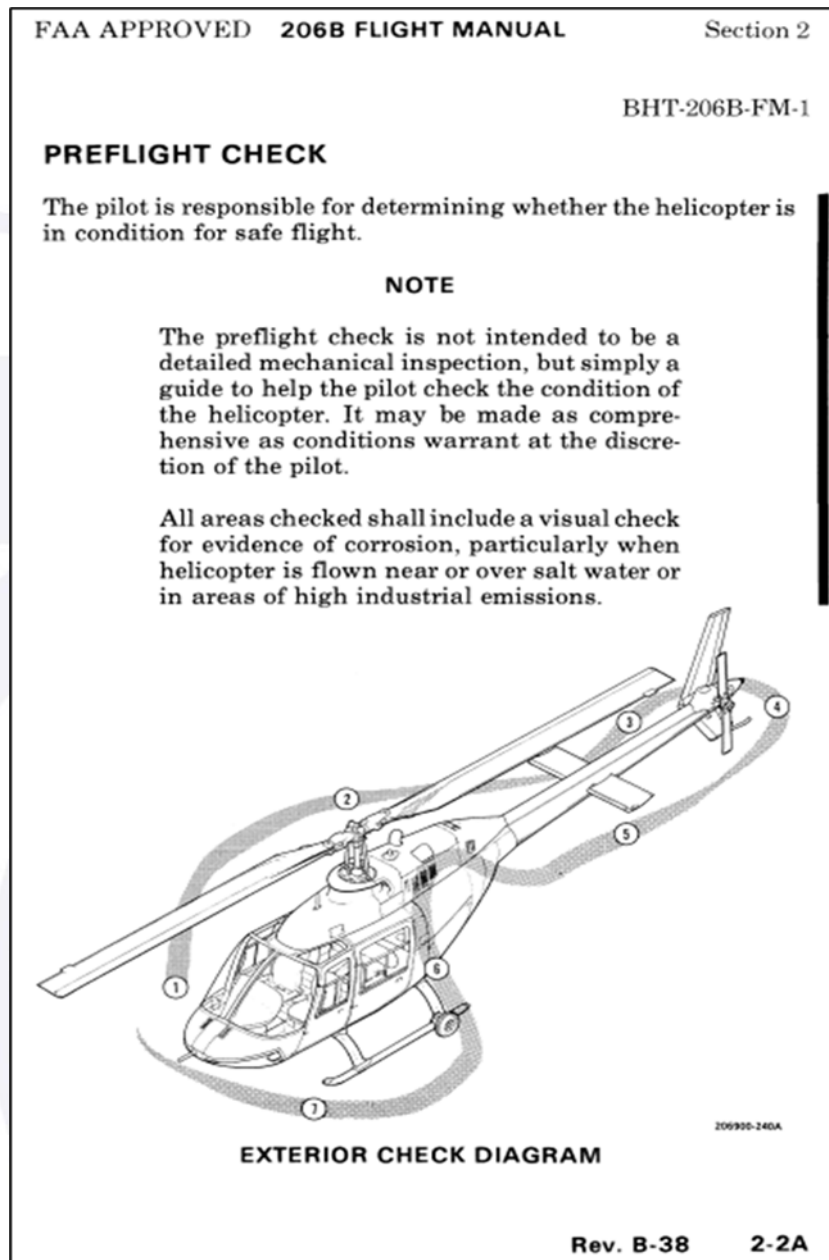


Figure 4 - Pre-flight of the aircraft as provided for in the Flight Manual.

The Preflight Check had prescriptions for several other procedures, including fuel draining before the first flight of the day. One did not find any evidence regarding the conduction of that procedure.

According to the passengers, a red light illuminated during the flight in the upper right-hand corner of the pilot's panel. They reported that the noise of the helicopter's engine diminished significantly, but the rotor blades remained rotating until the collision with the water. In addition, the passengers reported that the PIC told them that he had a failure.

The illuminated light in question may have been the ENG OUT light on the alarm panel. Such light would come on whenever the engine power (N1) dropped below 55%.

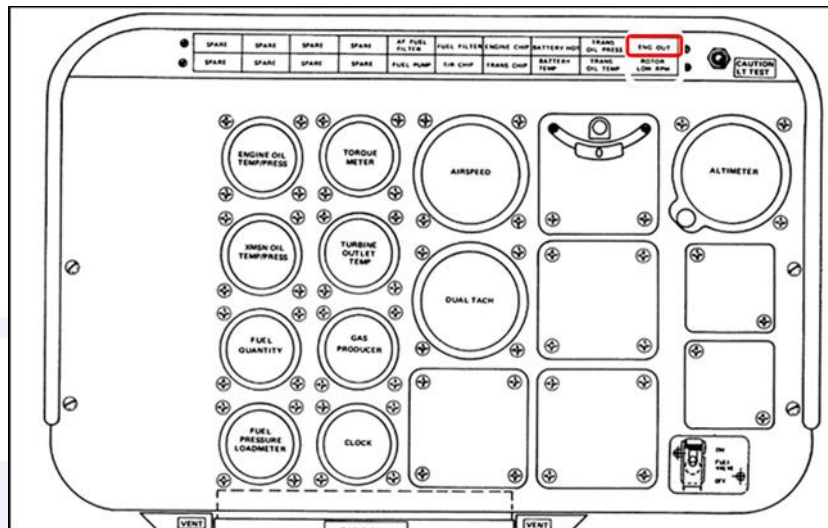


Figure 5 - Location of the ENG OUT alarm on the aircraft panel.

The ROTOR LOW RPM warning light was yellow in color, and would be accompanied with a horn-type sound signal. There was no evidence of the activation of this alarm, since the passengers did not report having heard any sounds of that type.

1.19. Additional information.

Nil.

1.20. Useful or effective investigation techniques.

Nil.

2. ANALYSIS.

Due to seawater having entered the fuel tank, it was not possible to determine whether the fuel was contaminated prior to takeoff. However, one identified that the fuel filler cap allowed water to enter the tank.

A visual inspection of the sealing gasket (O-ring) of the fuel filler cap was carried out and damage was observed that may have contributed to the ineffectiveness of the seal against the passage of fluids.

The analysis of the images of the security cameras revealed that the PIC did not perform the pre-flight inspection prescribed in the aircraft's manual. The inspection included drainage of the fuel. Had such action been taken, any contingent water allowed to enter the tank through the fuel neck would have been removed.

The Airframe logbook (no. 01/PT-HKY/020), relatively to the last inspection performed before the accident, contained the records pertinent to the fulfillment of the task related to the examination of the conditions and safety of the fuel filler cap, as provided for in the aircraft manufacturer's Maintenance Manual.

Thus, one inferred that, despite being reported as completed, the task may have been performed inappropriately, in view of the conditions of the sealing gasket. Additionally, it is possible that there was a lack of effective monitoring of the maintenance service delivered.

The pieces of evidence found in the examination carried out on the engine and its components, such as deformation of the compressor blades, the rubbing on the stators of the power turbine stages, and the undamaged bearings, indicated that the engine was working at the moment of the collision against the water, although one was not able to identify the engine's power regime.

According to the passengers, a red light came on in the upper right corner of the pilot's panel, and the noise of the helicopter's engine diminished significantly. The referred warning light may have been the ENG OUT light, indicating engine power (N1) below 55%.

Taking into account the deficiency in the sealing of the fuel filler cap and the reports from passengers, it is possible that the aircraft endured a reduction in power, probably due to contamination of the fuel by water, associated with the failure to drain the tank during the pre-flight check of the helicopter. Such reduction of power made it impossible to maintain the height, and forced the pilot to perform an autorotation, which would justify the absence of the ROTOR LOW RP light and sound alarm, when one considers that the main rotor RPM remained above 90% during the emergency condition.

During the analysis of the wreckage, one found no evidence of main rotor transmission jamming. In addition, passengers reported that the rotor blades were turning until they collided with the water, something which allowed to rule out a possible failure of that component.

3. CONCLUSIONS.

3.1. Findings.

- a) the PIC held a valid CMA (Aeronautical Medical Certificate);
- b) the PIC had a valid HMNT rating (Single-Engine Land Helicopter);
- c) the PIC had qualification and experience for the type of flight;
- d) the aircraft had a valid CA (Certificate of Airworthiness);
- e) the aircraft was within the prescribed weight and balance limits;
- f) the records of the airframe and engine logbooks were not up to date;
- g) the meteorological conditions were consistent with the type of flight;
- h) the aircraft took off from SDRE bound for SBCB;
- i) while on level flight, the aircraft entered an emergency and lost height, colliding with the surface of the sea;
- j) the aircraft sustained substantial damage; and
- k) the PIC suffered fatal injuries, one passenger received serious injuries, and the two remainder passengers received slight injuries.

3.2. Contributing factors.

- **Attitude – undetermined.**

The PIC did not perform the prescribed pre-flight inspection, in which the fuel had to be drained, thus revealing a complacent attitude characterized by non-compliance with procedures established in the aircraft's manual, which may have resulted in his taking off with fuel in the tank contaminated with water.

- **Aircraft maintenance – undetermined.**

The task of checking the condition and safety of the fuel filler cap by the maintenance staff may have been performed inappropriately, something which would have allowed water to enter the fuel tank and cause contamination.

- **Managerial oversight – undetermined.**

The task of verifying the conditions and safety of the fuel filler cap performed by the maintenance staff was apparently done inadequately since water would have been allowed to enter the tank of the helicopter afterwards, indicating a possible deficiency in the supervision of the services provided by the maintenance organization in question.

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 Brazil’s National Civil Aviation Agency (ANAC):

A-087/CENIPA/2018 - 01

Issued on 29/12/2023

Work with *Helimar Helicopters Ltda.* (COM No. 8003-02/ANAC), so that the referred maintenance organization demonstrates that its managerial oversight mechanisms guarantee the quality of the services performed on the aircraft the OM maintains, particularly in the case of 206B aircraft.

5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN.

None.

On December 29th, 2023.