

COMANDO DA AERONÁUTICA
CENTRO DE INVESTIGAÇÃO E PREVENÇÃO DE
ACIDENTES AERONÁUTICOS



FINAL REPORT
A - 202/CENIPA/2014

OCCURRENCE:	ACCIDENT
AIRCRAFT:	PR-BGR
MODEL:	EC 225 LP
DATE:	17DEC2014



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 by taking into account the contributing factors and hypotheses raised. The report is, therefore, a technical document that reflects the result obtained by SIPAER regarding the circumstances that contributed or may have contributed to triggering this occurrence.

The document does not focus on quantifying the degree of contribution of the different factors, including the individual, psychosocial or organizational variables that conditioned the human performance and interacted to create a scenario favorable to the accident.

The exclusive objective of this work is to recommend the study and the adoption of provisions of preventative nature, and the decision as to whether they should be applied belongs to the President, Director, Chief, or the one corresponding to the highest level in the hierarchy of the organization to which they are being forwarded.

This Report does not resort to any proof production procedure for the determination of civil or criminal liability, and is in accordance with Appendix 2, Annex 13 to the 1944 Chicago Convention, which was incorporated into the Brazilian legal system by 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 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 17DEC2014 accident with the EC 225 LP aircraft model, registration PR-BGR. The accident was classified as “[ARC] Abnormal Runway Contact – Hard Landing”.

The aircraft carried passengers between the P-35 and P-50 platforms in Rio de Janeiro.

After starting takeoff from the P-35 platform, the pilot noticed an abnormal noise followed by vibration and commanded the return to the helideck, causing a hard landing.

The aircraft had substantial damage.

The crew and passengers left unharmed.

An Accredited Representative of the *Bureau d'Enquêtes et d'Analyses pour la Sécurité de l'Aviation Civile (BEA)* - France, (State where the aircraft was manufactured/designed) was designated for participation in the investigation.



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GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS

ANAC	Brazil's National Civil Aviation Agency
BEA	<i>Bureau d'Enquêtes et d'Analyses pour la Sécurité de l'Aviation Civile</i>
CA	Airworthiness Certificate
CENIPA	Aeronautical Accident Investigation and Prevention Center
CIV	Pilot's Flight Logbook
CMA	Aeronautical Medical Certificate
CVR	Cockpit Voice Recorder
EECU	Engine Electronic Control Unit
FDR	Flight Data Recorder
FOD	Foreign Object Damage
HUMS	Health and Usage Monitoring System
IAM	Annual Maintenance Inspection
IFRH	Helicopter Flight Rating
P-35	ICAO Location Designator - Petrobras Platform 35
P-50	ICAO Location Designator - Petrobras Platform 50
PF	Pilot Flying
PIC	Pilot in Command
PLH	Airline Pilot License – Helicopter
PM	Pilot Monitoring
PPH	Private Pilot License – Helicopter
SB	Service Bulletin
SERIPA III	Third Regional Aeronautical Accident Investigation and Prevention Service
SIC	Second in Command
TPX	Non-Regular Public Air Transport Aircraft Registration Category
UTC	Universal Time Coordinated

1. FACTUAL INFORMATION.

Aircraft	Model: EC 225 LP	Operator: BHS Braz. Helicopter. Air Taxi S.A.
	Registration: PR-BGR	
	Manufacturer: Eurocopter France	
Occurrence	Date/time: 17DEC2014 - 1845 UTC	Type(s): "[ARC] Abnormal Runway Contact"
	Location: Platform P-35	
	Lat. 22°26'33" S Long. 040°04'19" W	Subtype(s): Hard Landing
	Municipality – State: Macaé – RJ	

1.1 History of the flight.

The aircraft would take off from platform P-35 - RJ to platform P-50 - RJ, around 18:45 (UTC), to transport personnel, with two pilots, a flight attendant, and fourteen passengers on board.

During the hovering flight before take-off from the platform, the crew noticed a noise followed by vibration and instability of the aircraft.

The Flying Pilot (PF) aborted the take-off and made an immediate landing on the helideck, which caused the helicopter to abruptly touch the surface.

The aircraft had substantial damage.

The three crewmembers and fourteen passengers left unharmed.

1.2 Injuries to persons.

Injuries	Crew	Passengers	Others
Fatal	-	-	-
Serious	-	-	-
Minor	-	-	-
None	3	14	-

1.3 Damage to the aircraft.

The aircraft had substantial damage to the tail cone and light damage to some points under the helicopter.

1.4 Other damage.

None.

1.5 Personnel information.

1.5.1 Crew's flight experience.

	Flight Hours	
	PIC	SIC
Total	4.747:30	7.959:00
Total in the last 30 days	62:20	96:55
Total in the last 24 hours	05:20	05:10
In this type of aircraft	759:30	882:50
In this type in the last 30 days	62:20	96:55
In this type in the last 24 hours	05:20	05:10

N.B.: The data relating to the flown hours were obtained through the pilots' CIV.

1.5.2 Personnel training.

The PIC took the PPH course at WMB Helicopters, in 1997.

The SIC took the pilot's course at the Air Force Academy, in 1987.

1.5.3 Category of licenses and validity of certificates.

The PIC, who acted as PF, had the PLH License and had valid EC25 type aircraft (which included the EC 225 LP model) and IFRH Ratings.

The SIC, which acted as PM had the PLH License and had a valid EC25 type aircraft Rating.

The flight attendant had a valid Technical License.

1.5.4 Qualification and flight experience.

The crewmembers were qualified and had experience in the kind of flight.

1.5.5 Validity of medical certificate.

The crewmembers had valid CMAs.

1.6 Aircraft information.

The aircraft, serial number 2899, was manufactured by Eurocopter France in 2013 and was registered in the TPX Category.

The aircraft CA was valid.

The airframe and engine logbook records were updated.

The last inspection of the aircraft, the "IAM" type, was carried out on 23JUN2014.

1.7 Meteorological information.

The weather conditions were favorable for the flight.

1.8 Aids to navigation.

Nil.

1.9 Communications.

Nil.

1.10 Aerodrome information.

The occurrence took place at the helideck of Platform 35.

1.11 Flight recorders.

The aircraft was equipped with a CVR and an FDR.

The pilots reported hearing a sound coming from the top of the aircraft, followed by a cyclic movement. Thus, the analysis of the audio captured by the CVR was performed with the BEA's specialists to try to identify and understand the sound reported by the pilots at the time of the accident.

The analysis identified a short duration popping noise, less than one second at 18:50:31.8s (UTC), when variations in the engine power regime of approximately 2% of Nr occurred.

1.12 Wreckage and impact information.

Nil.

1.13 Medical and pathological information.

1.13.1 Medical aspects.

No evidence was found that problems of physiological nature could have affected the flight crew performance.

1.13.2 Ergonomic information.

Nil.

1.13.3 Psychological aspects.

No evidence was found that problems of physiological nature or incapacitation could have affected the flight crew's performance.

1.14 Fire.

There was no fire.

1.15 Survival aspects.

Nil.

1.16 Tests and research.

The aircraft operated with two Makila 2A1 NS 13296 and 13297 engines for a total of 632 hours. The last power check was performed on 12DEC2014, four days before the accident, and it was observed that the parameters were within normal limits.

The manufacturer, accompanied by technicians from the investigation team of the SERIPA III, carried out boroscopic examinations and engine rotation. Light erosion was observed in the compressor, and the presence of salt and black dust on the blades and inside the compressor caused a reduced loss of power at low rpm.

However, the engines were within the manufacturer's acceptability standards, and no signs of failure were found. The EECU of the two engines corroborated the analysis, and there were no recordings of engine failures at the time of the accident.

Additionally, the aircraft was equipped with the HUMS, which was a system that performed, among other data, the recording of vibrations in the aircraft. However, due to the short time in which the accident was consolidated after the take-off (24 seconds), the acquisition system did not have enough time to consolidate these data. The last recordings were related to the normal landing on the platform's helideck, which did not show any abnormality.

1.17 Organizational and management information.

Nil.

1.18 Operational information.

The intended route foresaw the take-off from platform P-35 to transport passengers to platform P-50.

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

After starting the engines, the aircraft remained at 7 ft in hovering flight on the helideck between 18:50:09 (UTC) and 18:50:31 (UTC).

At 18:50:31.8s (UTC), a noise similar to pop was heard lasting approximately one second, which was reported by the pilots and confirmed in analysis by the CVR, followed by vibrations in the controls and a decrease of about 2% on power on both engines.

The PF decided to abort the take-off and command the landing immediately on the helideck. Thus, at 18:50:34 (UTC), the Radio Altimeter identified the height of the aircraft in relation to the 0 ft of the helideck.

The landing was consolidated with a quick touchdown command, occurring abruptly with consequent wrinkling of the tail cone and damage to the fuselage below the aircraft.

1.19 Additional information.

After the accident, the manufacturer issued the information letter n° 2819-I-71 that dealt with a series of events reported by various operators in different countries, which the manufacturer classified as popping.

Popping is a phenomenon that can occur with any helicopter. Manufacturers design their aircraft to mitigate the possibility or even the consequences of this phenomenon. It consists of the reabsorption of gases from the engine exhaust.

The helicopter is most susceptible to this phenomenon during hovering, when the aircraft is on the ground, or when it receives strong side or tailwinds. When reingesting the heated gas by the engine occurs, a short decrease in power is expected, accompanied by audible popping sounds and small vibrations in the aircraft controls.

It is important to note that these events occur very quickly. According to Airbus Helicopters, this phenomenon has been reported most of the time during takeoffs and landings with outside air temperatures above 25°C. Other factors that can contribute to this occurrence are flight conditions, erosion in the engine, ingestion of FOD, and the presence of internal debris.

The manufacturer recommended that during the flight, pilots be aware of the factors that contributed to this event and that they operate the aircraft within the envelope prevised in the manual, stating that pilots did not need to perform specific procedures during the event called popping and should continue the flight, as shown in Figure 1.

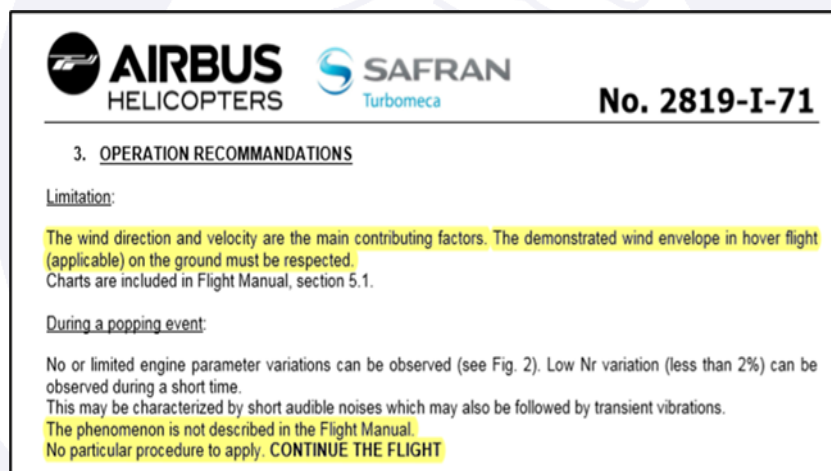


Figure 1 - Extract from information letter No. 2819-I-71.

As the phenomenon was not foreseen in the manual and the events were being frequently reported, the manufacturer issued SB No. EC225-71-015, specific for popping mitigation, is inserted in the flight manual procedures regarding the manual use of the bleed in temperatures above 25°C for landings and takeoffs, as shown in Figures 2 and 3.

3 CLIMBING	
After:	
- Landing gearRetract.	See Note.
NOTE	
1. If landing gear is retracted below 60 kt, then LAG will flash.	
2. If wheel brakes were used heavily on the ground before takeoff, leave the landing gear extended for at least 5 minutes.	
Add:	
If manual BLEED OFFSET was selected before Takeoff:	
- BLEED OFFSET pushbutton Press.	
- Check DFS (engines 1 and 2).	On VMS.

Figure 2 - New take-off procedure.

1 CHECKS PRIOR TO LANDING	
After:	
- Landing gearDown.	
Add:	
If OAT at landing point \geq approx. +25°C, apply the following:	
- BLEED OFFSET pushbutton Press.	
- Check DFS (engines 1 and 2).	On VMS.

Figure 3 - New landing procedure.

It is important to emphasize that even with these new procedures the phenomenon can occur. Crews should keep in mind that vibration and noise are transient events of short duration, usually less than one second, and a variation of less than 2% of Nr is expected, which must be automatically compensated by the other engine as per the N chart. 2819-I-71 of Airbus Helicopters, not being necessary to carry out specific procedures by the crews, and, as recommended by the manufacturer, continue the flight.

Letter N° 2819-I-71 also recommended maintenance procedures aimed at mitigating the incidence of this phenomenon which were cleaning the engine, checking the bleed valve, and checking the first axial stage of the compressor for erosion, as described in Figure 4.

<p><u>Preventive maintenance:</u></p> <p>TURBOMECA recommends a specific preventive plan that will help to reduce the number of occurrences.</p> <ul style="list-style-type: none"> • Engine cleaning as defined in the maintenance manual for "contaminated atmosphere". • Check the bleed valve for rubbing and butterfly play – every 400 hrs <ul style="list-style-type: none"> - Task: 75-31-00-200-801-A01 or B01 depending on bleed valve standard (TU69) - Report the case of rubbing and butterfly play to Turbomeca Technical Support contact. • Erosion check of the 1st axial wheel – every 400 hrs <ul style="list-style-type: none"> - Record the erosion value for trend monitoring <p>Any issue found during this preventive maintenance program or any event occurring shall be reported to Turbomeca and Airbus Helicopters.</p>
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Figure 4 - Preventive maintenance recommendations when popping.

1.20 Useful or effective investigation techniques.

Nil.

2. ANALYSIS.

It was a flight for the transport of passengers to take off from the P-35 platform to the P-50 platform, both in Rio de Janeiro, with the EC 225 LP model aircraft.

During the hovering flight, before the take-off from the platform, the crew noticed a noise followed by vibration and instability of the aircraft.

The PF aborted the take-off and immediately landed on the helideck. Inadequate use of the controls caused the P-35 to crash.

After the examinations performed on the sequence of events of this occurrence, it was concluded that the characteristics presented were related to the popping phenomenon.

However, the lack of specific procedures in the flight manual at that time contributed to the accident, as the lack of information about the phenomenon did not allow the pilot to recognize and act correctly, as well as not providing operational procedures to mitigate the possibility of popping occurring.

3. CONCLUSIONS.

3.1 Facts.

- a) the crewmembers had valid CMAs;
- b) the PIC had valid EC25 and IFRH Ratings;
- c) the SIC had a valid EC25 type Rating;
- d) the crewmembers were qualified and had experience in the type of flight;
- e) the aircraft had a valid CA;
- f) the aircraft was within the weight and balance limits;
- g) the airframe and engine logbook records were updated;
- h) the weather conditions were favorable for the flight;
- i) after analysis at the manufacturer, no damage was found to the engines;
- j) the two EECUs did not have recorded data on any breakdown at the time of the accident;
- k) the CVR recorded, at 18:50:31.8s (UTC), a noise that lasted approximately one second;
- l) there were no procedures or alerts specific to the popping phenomenon in the EC 225 LP aircraft manual at the time of the accident;
- m) the aircraft had substantial damage; and
- n) the crew and passengers left unharmed.

3.2 Contributing factors.

- **Control skills – a contributor.**

There was an immediate command for the helicopter to land shortly after hearing the noise characteristic of the popping phenomenon. The inappropriate use of the commands caused a sudden touch on the helideck of the P-35 platform.

- Instruction – a contributor.

The pilots did not receive the proper training process regarding the popping phenomenon, as there were no specific procedures described in the manual or the possibility of the phenomenon occurring. In this way, the pilots did not have the means to have the appropriate technical training to recognize the phenomenon.

- Support systems – a contributor.

The lack of information about the popping phenomenon, as well as the absence of operational procedures in the manual, prevented pilots from being able to identify the event, as well as preventing pilots from performing the procedures that could mitigate the possibility of occurrence or consequences of the accident.

4. SAFETY RECOMMENDATION.

A proposal of an accident investigation authority based on information derived from an investigation made intending to prevent 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 addition to safety recommendations arising from accident and incident investigations, safety recommendations may result from diverse sources, including safety studies.

In consonance with 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”.

None.

5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN.

Six days after the accident, the manufacturer issued a warning letter to operators, no. 2819-I-71 with information about the popping phenomenon, which described it technically and provided information so that this knowledge would enable pilots to identify and act in the case these events happen, besides recommending preventive procedures for maintainers.

On 23MAR2015, the manufacturer issued a technical service bulletin No. EC225-71-015 which included actions related to the operation of the bleed offset in the takeoff and landing procedures as a way of mitigating the possibility of the popping phenomenon occurring.

On December 5th, 2022.