COMANDO DA AERONÁUTICA

CENTRO DE INVESTIGAÇÃO E PREVENÇÃO DE ACIDENTES AERONÁUTICOS

FINAL REPORT
A - 512/CENIPA/2021

OCCURRENCE:	**ACCIDENT**
AIRCRAFT:	**PP-LOS**
MODEL:	**AW109SP**
DATE:	**31AUG2012**

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 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. 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 31AUG2012 accident with the AW109SP aircraft model, registration PP-LOS. The accident was classified as “[RAMP] Ground Handling”.

During the procedure for disembarking passengers from the aircraft, a helipad employee, when approaching the aircraft to provide support to passengers, was hit on the head by the aircraft's main rotor blades.

The aircraft had no damage.

The crewmember and passengers left unharmed.

The employee suffered serious injuries.

An Accredited Representative of the *Agenzia Nazionale per la Sicurezza del Volo* (ANSV) - Italy, (State where the aircraft was 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
ANSV	*Agenzia Nazionale per la Sicurezza del Volo*
CA	Airworthiness Certificate
CAVOK	Ceiling and Visibility OK
CENIPA	Aeronautical Accident Investigation and Prevention Center
CMA	Aeronautical Medical Certificate
DECEA	Air Space Control Department
IAM	Annual Maintenance Inspection
METAR	Meteorological Aerodrome Report
MGSO	Safety Management Manual
NSCA	Aeronautics Command System Standard
PCH	Commercial Pilot License – Helicopter
PFD	Primary Flight Display
PIC	Pilot in Command
PPAA	Aeronautical Accident Prevention Program
PPH	Private Pilot License - Helicopter
PSO-BR	Operational Safety Plan for the Brazilian Civil Aviation
RBAC	Brazilian Civil Aviation Regulation
SBSC	ICAO Location Designator - Campo Nero Moura, Rio de Janeiro - RJ
SDLA	ICAO Location Designator - Condomínio Laranjeiras Helipad, Parati - RJ
SERIPA III	Third Regional Aeronautical Accident Investigation and Prevention Service
SGSO	Safety Management System
SIPAER	Aeronautical Accident Investigation and Prevention System
SJCG	ICAO Location Designator - Iate Clube de Santos Helipad, Angra dos Reis - RJ
TPX	Aircraft Registration Category of Non-Regular Public Air Transport
UTC	Universal Time Coordinated
VFR	Visual Flight Rules

1. FACTUAL INFORMATION.

Aircraft	**Model:** AW109SP **Registration:** PP-LOS **Manufacturer:** Agusta S.P.A	**Operator:** Aero Master Air Taxi Ltd.
Occurrence	**Date/time:** 31AUG2012 - 1850 UTC **Location:** Iate Clube de Santos Helipad - Angra dos Reis (SJCG) **Lat.** 22°58'41"S **Long.** 044°26'01"W **Municipality – State:** Angra dos Reis – RJ	**Type(s):** "[RAMP] Ground Handling" **Subtype(s):** Nil

1.1 History of the flight.

The aircraft took off from the Condomínio Laranjeiras Helipad (SDLA), Parati - RJ, to the Iate Clube de Santos Helipad - Angra dos Reis (SJCG), Angra dos Reis - RJ, at about 1840 (UTC), in order to transport personnel, with a pilot and three passengers on board.

After landing on SJCG, the pilot remained on board the aircraft, which had the engine at idle, directing the passengers to disembark. A helipad employee, when approaching the aircraft, in order to provide support to passengers, was hit on the head by the main rotor blades.

When the pilot observed the fallen employee, he shut down the engines and went to help.

The aircraft had no damage. The crewmember and the passengers left unharmed. The employee suffered serious injuries.

1.2 Injuries to persons.

Injuries	Crew	Passengers	Others
Fatal	-	-	-
Serious	-	-	-
Minor	-	-	-
None	1	3	-

1.3 Damage to the aircraft.

None.

1.4 Other damage.

None.

1.5 Personnel information.

1.5.1 Crew's flight experience.

Flight Hours	PIC
Total	8.500:00
Total in the last 30 days	20:00
Total in the last 24 hours	01:40
In this type of aircraft	300:00
In this type in the last 30 days	20:00
In this type in the last 24 hours	01:40

N.B.: The data related to the flown hours were obtained through the pilot's statement.

1.5.2 Personnel training.

The PIC took the PPH course at the *Escola Superior de Aviação* - Campo de Marte, in São Paulo - SP, in 1984.

1.5.3 Category of licenses and validity of certificates.

The PIC had a PCH License and had a valid A109 aircraft type Rating (which included the AW109SP model).

1.5.4 Qualification and flight experience.

The pilot was qualified and had experience in the type of flight.

1.5.5 Validity of medical certificate.

The pilot had a valid CMA.

1.6 Aircraft information.

The aircraft, serial number 22.224, was manufactured by Agusta S.P.A. in 2011 and was registered in the TPX category.

The aircraft had a valid CA.

The airframe and engine logbook records were updated.

The last inspection of the aircraft, the “IAM” type, was carried out on 21JUN2012 by the maintenance organization Agusta Westland, in Osasco - SP, with 30 hours flown after the inspection.

The aircraft had not yet been overhauled.

The model was a light twin-engine turbine helicopter, having a four-blade main rotor and a two-blade tail rotor. The main rotor had a diameter of 10.83m and a height of 2.446m from the tip of the blade to the ground, at the front of the aircraft (Figure 1).

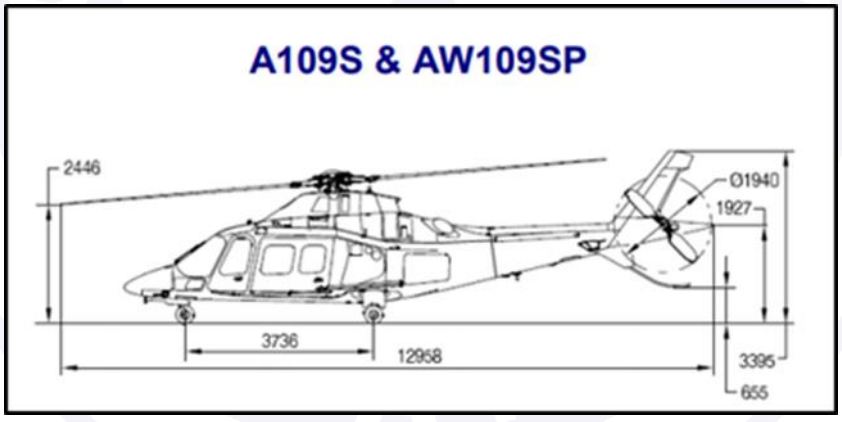

Figure 1 - Dimensions of the AW109SP, in millimeters.

The main rotor rotated in a counterclockwise direction.

1.7 Meteorological information.

The METAR from the Santa Cruz Aerodrome (SBSC), 40 nautical miles away from the accident site, provided the following information:

METAR SBSC 311800Z 15008KT 9999 FEW040 23/12 Q1020=

METAR SBSC 311900Z 15009KT CAVOK 23/12 Q1020=

Conditions were found to be favorable for the visual flight with visibility above 10 km and few clouds at 4,000 ft. The wind direction was from the Southeast, with intensity between 8 and 9 kt.

According to the pilot's report, at the time of the occurrence, the wind had a direction of 140° and an intensity of 17 kt, continuously, and the visibility was above 10 km.

1.8 Aids to navigation.

Nil.

1.9 Communications.

Nil.

1.10 Aerodrome information.

The SJCG Helipad was private, managed by the Iate Clube de Santos - Angra dos Reis, and operated under VFR, day, and night. The surface was grassy, with dimensions of 24 x 24 m, ramp 21, and an elevation of 213 ft.

No warning was identified on the helipad containing Safety Warnings, as provided for in item 12.7 of Ordinance No. 18/GM5 - Instructions for Helicopter Operation, for the Construction and Use of Helipads or Heliports, of 14FEB1974:

> Ordinance No. 18/GM5 of 02/14/1974
>
> Helicopter Operation Instructions for Construction and Use of Helipads or Heliports
>
> 12.7 – Safety Warning
>
> Posters containing Safety Warnings must be placed on all helipads, in order to avoid accidents with people passing through the landing area and its surroundings. Such notices shall contain express recommendations mainly in the event of people approaching, loading of cargo and/or personnel, with the rotors of the helicopter in motion. Special emphasis should be given to warnings aimed at preventing people from colliding with the helicopter's tail rotor.

The employee who helped with the boarding and disembarkation of passengers did not have the training to perform the activity. However, the regulations in force at the time did not deal with training for personnel working on the helipads.

1.11 Flight recorders.

Neither required nor installed.

1.12 Wreckage and impact information.

The helicopter was on the ground at the time of the occurrence, with an approximate heading of 085°.

The terrain was grassy and flat, with a gentle downward slope in the tail-nose direction of the aircraft.

According to observers, the passengers were disembarking from the side of the aircraft, when the helipad support employee approached from the front of the aircraft and was hit by the main rotor blades.

With the impact suffered by the main rotor blades, the employee was thrown to the ground and later taken to the hospital with serious injuries.

The pilot had his attention focused on the disembarkation of the passengers and did not observe the exact moment of the accident. He only noticed the employee lying on the ground when he shut down the engine and helped the employee.

Figure 2 - Position of the aircraft and the employee in relation to the helipad.

1.13 Medical and pathological information.

1.13.1 Medical aspects.

Nil.

1.13.2 Ergonomic information.

Nil.

1.13.3 Psychological aspects.

Nil.

1.14 Fire.

There was no fire.

1.15 Survival aspects.

Nil.

1.16 Tests and research.

Nil.

1.17 Organizational and management information.

Until 2009, air taxi companies used the PPAA, published in the CENIPA rules, as a tool to carry out their accident prevention activities. In October of the same year, through Resolution nº 117, the ANAC approved the RBAC nº 119 with new requirements for the certification of regular and non-regular operators, establishing the need to implement an SGSO to the process certification, in addition to defining the requirements and phases for this implementation.

The RBAC 119 defined that holders and/or applicants for a certificate regulated by the RBAC No. 135 should deliver, by 31AUG2011, an MGS containing their proposal to implement the SGSO for the company.

Thus, in the year of this occurrence (2012), the risk management culture, within the scope of companies that operated according to the RBAC 135, was in the implementation phase.

1.18 Operational information.

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

The pilot reported that he was in his seat, with the aircraft stabilized, the engines idling and the cyclic centered with the cyclic centering indication being displayed on the PFD - Main Flight Screen, while assisting in the disembarkation of the passengers.

During this disembarkation, one of the passengers opened the left front door to inform the pilot about the next day's flight schedule. The pilot observed the helipad employee who was heading for the helicopter and looked sideways in order to receive the passenger's instructions.

Then, according to the PIC, he felt a jolt in the cyclic and, looking forward, saw the employee lying near the nose of the aircraft. Given this, he shut down the engines, shut off the fuel, and applied the rotor brake, to then help the employee.

1.19 Additional information.

Blade sailing is a transient aeroelastic phenomenon characterized by the occurrence of a wide movement of the rotor blades. This episode is mainly observed when the helicopter rotor is at low rotational speed, under the influence of intense wind, especially gusts, occurring mainly during rotor engagement and disengagement.

The aforementioned wide movement occurs in the vertical plane, causing the main rotor blade, at the bottom of this movement, to reach a height where it is possible to injure a person or even strike the aircraft itself.

1.20 Useful or effective investigation techniques.

Nil.

2. ANALYSIS.

It was a personal transport flight. However, the occurrence took place after landing, during passenger disembarkation procedures.

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

The weather conditions were favorable for the flight to take place.

In this event, the tip of the aircraft's main rotor blades hit the head of a helipad employee. During the incident, the pilot was seated in the aircraft cabin and assisted in disembarking the passengers, while the aircraft engine was running at idle, with the rotors working.

At the time of the occurrence, one of the passengers opened the left front door to inform the pilot about the next day's flight schedule. The pilot observed the helipad employee heading for the helicopter and looked sideways in order to receive the passenger's instructions.

No helicopter failure was reported and, according to the crewmember, during the disembarkation of the passengers, the aircraft was with the cyclic centered, with an indication in the PFD regarding this position.

The height of the static main rotor blade tip to the ground was 2,446 m and the terrain was flat, with a gentle downward slope in the tail-to-nose direction of the aircraft.

Thus, it was possible to formulate two hypotheses for the occurrence:

- a momentary variation of the main rotor plane caused by a gust of wind; or

- an unconscious decentralization of the cyclic and, consequently, of the main rotor disk.

Considering the first hypothesis, it is necessary to check the meteorological conditions in the place. As there was no meteorological information in the locality, the meteorological messages from SBSC were considered, 40 NM away from the place of occurrence, which registered Southeast wind, with an intensity of 8 kt at 1800 (UTC) and 9 kt at 1900 (UTC). Also, the pilot's report was considered, which reported a continuous wind of 17 kt and a direction of 140°.

Analyzing the information reported by the pilot, it is observed that the indicated wind direction was similar to the information from the METAR of SBSC, with a lag in intensity, which would be acceptable given the distance of 40 NM between SBSC and SJCG.

Thus, considering the position of the aircraft at the time of the occurrence, whose heading was approximately 085°, the wind would have hit the aircraft from the heading, on the right side, forming an angle of approximately 55° with the nose of the helicopter.

The influence of the wind on the rotation of the rotor blades, in the conditions in which the aircraft was, that is, landed with the rotors at low rotation, momentarily altering its stability, stems from an event known as blade sailing.

During the event, the forces that in normal rotation act on the blades and keep them rigid during the rotation would not have been sufficient to compensate for the effect of the wind on them, due to the low rotation speed of the rotor. Thus, the blade advancing against the wind would tend to rise, reaching heights above the stabilized spin. On the other hand, the blade that was retreating in relation to the wind would tend to beat down, reaching heights below the stabilized turn.

In this way, it is possible to verify that, since the rotation of the main rotor occurred in a counterclockwise direction, the blades, due to the wind direction, would tend to be above the height of the stabilized rotation, in the region around the helicopter where the employee was (Figure 2).

Thus, although the occurrence of this event was possible, it is unlikely.

After landing, the pilot remained at the controls of the aircraft, carrying out the safety orientation for the disembarkation of the passengers.

At that moment, while a support employee from the late Clube de Santos was approaching from the front of the helicopter, one of the passengers re-entered the aircraft through the left front door to give instructions to the pilot.

It is possible that the cyclic control was unintentionally moved, tilting the plane of the main rotor forward, to the point of being at a height low enough for the impact of the main rotor blades to occur on the employee, who was approaching from the heading of the helicopter.

Regarding the approximation of the employee to the helipad operator, it is noteworthy that the regulation applicable at the time, Ordinance nº 18/GM5, of 14FEB1974, did not provide for any training for this personnel, referring only to the prevention and extinguishing of fire carried out by personnel trained.

Thus, the helipad was devoid of personnel prepared to support the boarding and disembarkation of aircraft passengers or operations of ground support equipment.

This type of support to the aircraft, most of the time, was carried out with the engine stopped, and the employees did not have adequate safety guidelines to approach the aircraft with the engine running.

The employee approached from the front of the helicopter at the moment when the pilot had his attention focused on directing the disembarkation of passengers, through the rear side door of the aircraft and the passenger who was approaching him through the left front door.

Based on the evidence collected and the analysis performed, it was found that the employee, who did not have adequate training to perform the activity for which he was assigned, voluntarily approached the front of the helicopter.

In turn, it is likely that, while the pilot was guiding the passengers to disembark and was assisting one of them who opened the left front door, the forward cyclic command occurred, unintentionally, causing the rotation plane of the main rotor also leaned forward, hitting the employee who was moving in front of the helicopter. In this way, the pilot's attention deviation may have contributed to the occurrence.

3. CONCLUSIONS.

3.1 Facts.

a) the pilot had a valid CMA;

b) the pilot had a valid A109 aircraft type Rating;

c) the pilot was qualified and had experience in the type of flight;

d) the aircraft had a valid CA;

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

f) the airframe and engine logbook records were updated;

g) the weather conditions were favorable for the flight;

h) the helipad was devoid of personnel prepared to support the boarding and disembarkation of aircraft passengers or operations of ground support equipment;

i) the regulations applicable at the time did not provide for any training for this personnel;

j) the pilot was seated in the aircraft cabin, helping the passengers to disembark;

k) the employee providing support on the helipad approached from the front of the helicopter and had his head hit by the main rotor blades;

l) at the moment of impact, the aircraft was stabilized, and the engine was idling;

m) the aircraft was not damaged;

n) the pilot and the passengers left unharmed; and

o) the employee was seriously injured.

3.2 Contributing factors.

- **Control skills – undetermined.**

It is possible that the pilot, when directing his attention to the passenger who opened the aircraft door to give him directions, unintentionally commanded the aircraft to cycle forward, causing the plane of the main rotor disk to tilt, hitting the employee who was in front of the aircraft.

- **Attention – undetermined.**

The fact that the passenger had opened the aircraft door diverted the attention of the pilot, who, involuntarily, may have activated the forward cyclic command, causing the

rotation plane of the main rotor to also lean forward, reaching the employee who was moving in front of the helicopter.

- **Support personnel – a contributor.**

The employee who went to the aircraft to assist the disembarkation of passengers did not have the training to perform this activity. So, he approached the helicopter from its frontal area voluntarily.

- **Support systems – a contributor.**

The regulations in force at the time did not provide for training for personnel working on the helipads.

4. SAFETY RECOMMENDATION.

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 addition to safety recommendations arising from accident and incident investigations, safety recommendations may result from diverse sources, including safety studies.

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".

Nil.

5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN.

At the time of the occurrence, a prevention activity was carried out with the support staff of the Santos Iate Clube Helipad (SJCG) advising them on safety aspects when approaching and leaving the parking area, with the aircraft's engines running.

The absence of regulation on the training of support personnel in helipads was overcome by the edition of the RBAC No. 155 - Helipads, Amendment No. 00, of 16MAY2018, in which it was established, in sub-item 5 of the letter "a" of item 155.51, that:

> (a) The helipad operator is responsible for:
>
> [...]
>
> (5) provide training to all personnel whose activity influences operational safety, in order to adapt their activities to the specific characteristics of the helipad.

On july 8th, 2022.