COMANDO DA AERONÁUTICA

CENTRO DE INVESTIGAÇÃO E PREVENÇÃO DE ACIDENTES AERONÁUTICOS

FINAL REPORT
A - 036/CENIPA/2019

OCCURRENCE:	**ACCIDENT**
AIRCRAFT:	**PR-OCW**
MODEL:	**A320-214**
DATE:	**03MAR2019**

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 03MAR2019 accident with the A320-214 aircraft model, registration PR-OCW. The accident was classified as “[USOS] Undershoot/Overshoot”.

During the approach under Instrument Flight Conditions (IMC) to runway 15, at Antônio Carlos Jobim Aerodrome (SBGL), Rio de Janeiro - RJ, the pilots obtained visual contact with the runway when crossing, approximately, 800ft of altitude, proceeding to the landing with visual references.

The touch occurred to the right of the runway's central axis, about 900 meters from threshold 15. The right main landing gear touched outside the right side of the runway. The aircraft traveled for approximately 660 meters outside the runway, in a grassy area within the limits of the runway strip.

The aircraft had substantial damage. The crewmembers 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) was designated for participation in the investigation.

CONTENTS

GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS

ANAC	Brazil's National Civil Aviation Agency
AOA	Angle of Attack
AP	Auto Pilot
APP	Approach Control
AQD	Aviation Quality Database
ATC	Air Traffic Control
ATIS	Automatic Terminal Information Service
ATS	Air Traffic Services
A/THR	Auto Thrust
BEA	Bureau d'Enquêtes et d'Analyses pour la Sécurité de l'Aviation Civile
BIMTRA	Air Traffic Movement Information Bank
CA	Airworthiness Certificate
CCO	Operational Control Center
CENIPA	Aeronautical Accident Investigation and Prevention Center
CES	Emergency and Safety Center
CHETA	Air Transport Company Approval Certificate
CINDACTA II	Second Air Defense and Air Traffic Control Integrated Center
CMA	Aeronautical Medical Certificate
CRM	Crew Resource Management
CVR	Cockpit Voice Recorder
DA	Decision Altitude
FCU	Flight Control Unit
FD	Flight Director
FDR	Flight Data Recorder
FMS	Flight Management System
GNDC	Ground Control
GNSS	Global Navigation Satellite System
GRAER	Air Radio patrol Unit of the Goiás State Military Police
IFR	Instrument Flight Rules
IFRA	Instrument Flight Rating - Airplane
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
LABDATA	Flight Data Recorders Read-Out and Analysis Laboratory
METAR	Aviation Routine Weather Report
MGO	General Operations Manual
MLG	Main Landing Gear
NLG	Nose Landing Gear

NOTAM	Notice to Airmen
NPA	Standard Rule of Action
NSCA	Aeronautics Command System Standard
PAPI	Precision Approach Path Indicator
PCM	Commercial Pilot License – Airplane
PF	Pilot Flying
PIC	Pilot in Command
PLA	Airline Pilot License - Airplane
PPR	Private Pilot License – Airplane
PN	Part Number
RBAC	Brazilian Civil Aviation Regulation
REDEMET	Aeronautics Command Meteorology Network
RESA	Runway End Safety Area
RNAV	Area Navigation
ROTAER	Auxiliary Air Route Manual
SBGL	ICAO Location Designator - Antônio Carlos Jobim International Airport, Rio de Janeiro - RJ
SBGR	ICAO Location Designator - Governador André Franco Montoro International Airport, Guarulhos - SP
SBSV	ICAO Location Designator - Deputado Luís Eduardo Magalhães Aerodrome, Salvador - BA
SIGMET	Significant Meteorological Information
SIGWX	Significant Weather Chart
SIPAER	Aeronautical Accident Investigation and Prevention System
S/N	Serial Number
SOP	Standard Operational Procedures
SPECI	Selected Special Aeronautical Weather Report
STAR	Standard Instrument Arrival
TCAS	Traffic Collision Avoidance System
TLA	Thrust Lever Angle
TPR	Aircraft Registration Category of Regular Public Transport
TWR-GL	Air Traffic Control Tower - Galeão Aerodrome
UTC	Universal Time Coordinated
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions

1. FACTUAL INFORMATION.

Aircraft	**Model:** A320-214 **Registration:** PR-OCW **Manufacturer:** *Airbus Industrie*	**Operator:** Oceanair Airlines S.A. (Avianca)
Occurrence	**Date/time:** 03MAR2019 – 2035 (UTC) **Location:** Antônio Carlos Jobim International Airport (SBGL) **Lat.** 22°48'36"S **Long.** 043°15'02"W **Municipality – State:** Rio de Janeiro – RJ	**Type(s):** "[USOS] Undershoot/Overshoot" **Subtype(s):** NIL

1.1 History of the flight.

The aircraft took off from the Deputado Luís Eduardo Magalhães International Aerodrome (SBSV), Salvador - BA, to the Antônio Carlos Jobim International Aerodrome (SBGL), Rio de Janeiro - RJ, at about 1845 (UTC), in order to transport personnel, with 6 crewmembers and 162 passengers on board.

The flight en-route from Salvador to Rio de Janeiro was uneventful, being carried out according to the planning provided by the Operational Flight Dispatch for the crew.

Upon arrival for landing in SBGL, the standard arrival procedure (STAR) UTBOM 1A and the procedure for approaching by RNAV Z RWY 15 instrument were performed.

When carrying out the descent procedures, the crewmembers encountered an adverse weather situation, with the presence of a cloud layer with its top at 2,500ft, as well as rain in the vicinity of the Aerodrome.

During the approach under IMC to runway 15, the pilots obtained visual contact with the runway when crossing, approximately, 800ft of altitude. Thus, they proceeded to the landing with visual references.

Near the threshold of runway 15, when crossing 100ft of altitude, there was a degradation of weather conditions caused by heavy rain on the Aerodrome, coupled with a gradual increase in the left wind component.

The landing took place at 2035 (UTC), to the right of the runway's central axis, about 900 meters from threshold 15. The left main landing gear touched the runway within the established lateral limits, however, the right landing gear touched outside the right lateral limit of runway 15.

The aircraft traveled approximately 660 meters outside the runway, in a grassy area within the limits of the runway strip.

The crewmembers resumed directional control of the aircraft, leading it back to the center of the runway.

The return taxi took place on its own, requiring guidance via the FOLLOW-ME vehicle, due to the deterioration of visibility conditions in SBGL. All passengers disembarked at position 20 of the apron.

The aircraft had substantial damage.

All crewmembers and passengers left unharmed.

1.2 Injuries to persons.

Injuries	Crew	Passengers	Others
Fatal	-	-	-
Serious	-	-	-
Minor	-	-	-
None	6	162	-

1.3 Damage to the aircraft.

The aircraft had substantial damage. Most of the damage, at the aircraft's dorsal region, was caused by the impact of large amounts of mud and debris during the temporary exit of the runway.

The assessment was carried out by the airline according to the Technical Engineering Report (ENGSYS-001-2019). The damages were specified as follows:

1. Nose Landing Gear (NLG) # 1 with cuts (some with exposed canvas);

2. Damaged belly fairing panels: 191 BB / 191 AB / 192 AB;

3. Dent in the front fuselage, left side, next to the AOA sensor;

4. Sets of right and left land lights very dirty and out of position.

5. Lower part of the left and right Main Landing Gear (MLG) brackets broken;

6. Damaged brake temperature sensor # 1;

7. MLG wheels # 1 / # 3 / # 4, with several cuts and damages;

8. Dirty areas, with mud and grass (NLG leg + bay, MLG legs + bay, left flap, right slat, afterward cargo door, left pylon and belly fairing in general);

9. Signs of entry of mud and grass in packs # 1 and # 2 (abrasion damage to the leading edge of the inlet vane);

10. Bottom fuselage, before and after belly fairing with several damage to the paint and scratches;

11. VHF antenna # 2 with damage on its right side;

12. Afterward cargo door and bulk cargo door with various paint damage and scratches;

13. Hydraulic hose of Brake # 2 of the green system (front) of the left MLG showing leakage;

14. Left MLG scissors with several scratches and paint damage;

15. Inboard and outboard of the left and right flaps with various dents and scratches;

16. Engine # 2 blades with four cuts;

17. Dent on Eng # 2's right Fan Cowl.

18. Engine # 1:

- Scratches on the spinner (front + rear);
- Scratches, paint damage and dents in the inlet cowl;
- Fan cowl with three perforations, paint damage and scratch;
- C-duct with various paint damage and scratches;
- Front impact panel with scratches in the position between 4 and 5 o'clock;

- Abradable shroud with hole;
- Indications of grass entry in the Booster; and
- Blades # 5, # 16, # 17, # 22, # 23, # 24, # 25, # 27 and # 33 damaged.

1.4 Other damage.

None.

1.5 Personnel information.

1.5.1 Crew's flight experience.

Flight Hours		
	Pilot	Copilot
Total	5.200:00	2.400:00
Total in the last 30 days	65:00	65:00
Total in the last 24 hours	02:00	05:00
In this type of aircraft	2.700:00	640:00
In this type in the last 30 days	65:00	65:00
In this type in the last 24 hours	02:00	05:00

N.B.: The data related to the flown hours were obtained through the records provided by the Airline that hired the pilots.

1.5.2 Personnel training.

The pilot took the PPR course at the Sorocaba Aeroclub – SP, in 1991.

The copilot took the PPR course at the São Paulo Aeroclub – SP, in 2008.

1.5.3 Category of licenses and validity of certificates.

The pilot had the PLA License and had valid A320 aircraft type Rating (which included the A320-214 model) and IFRA Rating.

The copilot had the PCM License and had valid A320 aircraft type Rating and IFRA Rating.

1.5.4 Qualification and flight experience.

The pilots were qualified and had experience in the type of flight.

1.5.5 Validity of medical certificate.

The pilots had valid CMAs.

1.6 Aircraft information.

The aircraft, serial number 6813, was manufactured by Airbus, in 2015, and it was registered in the TPR category.

The aircraft had valid Airworthiness Certificate (CA).

The technical maintenance records were updated.

The last major inspection of the aircraft, the "12000FH / 36MO" type was carried out on 10OCT2018 by the maintenance organization Oceanair Airlines, in São Paulo - SP, with the aircraft having flown 1,495 hours after the overhaul.

All aircraft systems were operating regularly during the flight and there was no failure or alert record triggered until the time of landing off the runway.

1.7 Meteorological information.

The CINDACTA 2 conducted a study of the weather conditions present in SBGL at the time of the event.

According to Opinion n° 04 / CVM / 2019, the synoptic situation presented a frontal system moving across the Atlantic Ocean in the state of Rio de Janeiro, as shown in Figure 1.

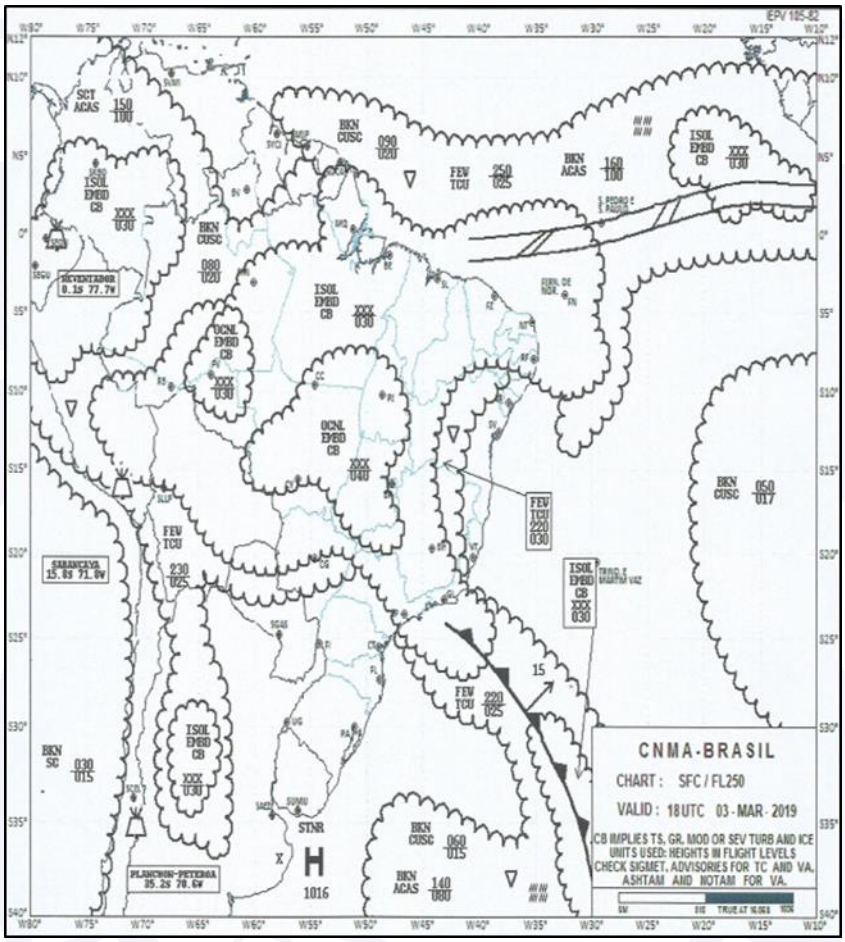


Figure 1 - SIGWX chart, from surface to FL250 - 03MAR2019 at 1800 (UTC).

The METAR and the SPECI of SBGL showed the following information:

METAR SBGL 031900Z 12008KT 9999 FEW010 SCT025 FEW030TCU BKN100 28/25 Q1012=

METAR SBGL 032000Z 15006KT 9999 4000NE -TSRA FEW012 BKN025 FEW027TCU FEW030CB OVC080 27/24 Q1013=

SPECI SBGL 032018Z 08004KT 3000 +TSRA FEW012 BKN025 FEW030CB OVC090 27/25 Q1014=

SPECI SBGL 032043Z 02008G22KT 0500 R15///// R33///// R10/1000 R28/1700 +TSRA FEW004 BKN009 BKN020 FEW030CB 23/22 Q1016=

METAR SBGL 032100Z 32006KT 0800 R15///// R33///// R10/1700 R28/P2000 +TSRA FEW004 SCT008 BKN015 FEW025CB 23/22 Q1015=

The Aerodrome warning in the Rio de Janeiro's area - RJ, showed the following information:

SBGL/SBRJ/SBJR AD WRNG 3 VALID 031800/032200 TS WSPD 15KT MAX 30 FCST INTSF

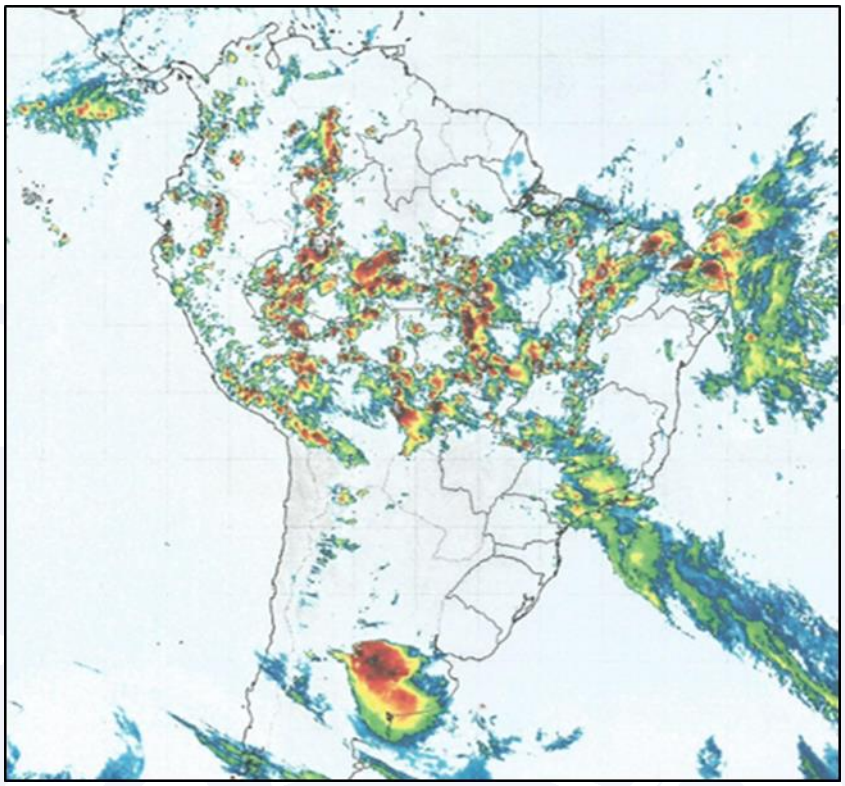


Figure 2 - Satellite image (Infrared) from 2030 (UTC) on 03MAR2019.

The opinion concluded that the weather was unstable with rain and thunderstorms forecast. The sky was covered with cloudiness in the form of CB and TCU. At 2000 (UTC), there was already an atmospheric discharge in SBGL.

At 2018 (UTC), there was a deterioration of the weather conditions, due to the presence of thunderstorms with heavy rain and the reduction of visibility to 3,000m.

The landing of the PR-OCW aircraft, recorded on the aircraft's navigation equipment, was at 2033 (UTC).

In interviews with the supervisors of the apron and runway inspection team of the concessionaire that manages the International Airport, it was estimated that the rains that fell most heavily on the Aerodrome started around 2030 (UTC).

Shortly after the PR-OCW aircraft landing, the SPECI was issued at 2043 (UTC) and operations at the Aerodrome were suspended, due to the deterioration of the weather conditions over the airfield.

In the 2043 (UTC) SPECI, another worsening in the weather conditions was detected, with the presence of gusts of 22kt and the reduction of horizontal visibility to about 500m, a condition observed until the issue of the 2100 (UTC) METAR.

It should be noted that there was a forecast of strong surface winds and thunderstorms for SBGL, according to Aerodrome warning number 3, valid between 1800 (UTC) and 2200 (UTC).

1.8 Aids to navigation.

On the date of the accident, the following aids were out of service:

- NOTAM SBGL D0072/2019 - PAPI RWY 15 U/S.

- NOTAM SBGL D2115/2018 NOTAMR SBGL D2114/2018 - ILS IGL RWY 15 U/S.

- NOTAM SBGL D0245/2019 NOTAMR SBGL D0232/2019 - VOR/DME CXI 112.3MHZ/CH70X U/S.

1.9 Communications.

All internal and control communications happened properly. The last contact before landing occurred with the TWR-GL. After the event, the coordination with the Galeão ground was established without any complications.

With the aircraft under control after landing, the crew requested the taxi to return to the apron without reporting to the TWR-GL or ground control the event involving landing off the runway and the consequent excursion beyond the right side limit.

Thus, the control agencies were not aware of the fact and therefore it was not possible to inform the teams of the COR, the AIRSIDE or, even, the CES.

The supervision of aprons and runways, when receiving flight O66227 in position 20 at the apron 1, was communicated by the mechanic of the airline about the presence of grass stuck in the lower fuselage and landing gear of the PR-OCW aircraft.

Figure 3 - Lower fuselage of the aircraft with grass stuck in it.

Figure 4 - Nose landing gear with grass stuck in it.

The supervision of aprons and runways requested the inspection of runways 10/28 and 15/33. The inspection located grass and pieces of asphalt on the right side of runway 15, between taxi lanes C and D, with the tire tracks of the aircraft.

Figure 5 - Runway 15 asphalt damaged by the passage of the aircraft's main landing gear.

After confirmation of the event by the supervision, the concessionaire proceeded to clean runway 15 according to the procedures prevised and normal operation was restored at 2100 (UTC) on 04MAR2019.

1.10 Aerodrome information.

The Aerodrome was public, managed by Concessionaire Rio de Janeiro S.A. (RIOgaleão) and operated under VFR and by IFR, during the day and night.

The runway was made of asphalt, with thresholds 15/33, dimensions of 2,930m x 47m, with elevation of 28 feet.

Of the operational conditions of the airport infrastructure, related to the event, the following stand out:

- the SBGL drainage system was monitored every four months by the Concessionaire's maintenance team. The last monitoring carried out before the accident was dated 16NOV2018. According to the opinion issued, there were no problems in the drainage system of runway 15/33;

- the monitoring of air navigation assist lights was performed weekly by the maintenance team hired by the Concessionaire, and was also checked daily by the apron and runway inspection team. The last weekly monitoring carried out before the accident was dated 28FEB2019;

- according to the issued opinion, the flashlights of the threshold 15 were out of operation and the PAPI of the thresholds 15 and 33 were inoperative, waiting for approval. PAPI was inoperative due to the displacement of visual aids from the RESA expansion service of SBGL runways; and

- the runway strips of RWY 15/33 were in accordance with the provisions of the RBAC 154. The strips were free of obstacles, in order to reduce the risk of damage to the aircraft, as well as being in a prepared condition, level and with adequate support capacity, in order to minimize risks in case an aircraft accidentally leaves the runway.

This last condition was proven by the fact that, despite having traveled about 660m outside the asphalt strip, the crew managed to return to the runway limits, complete the return taxi and safely disembark the passengers.

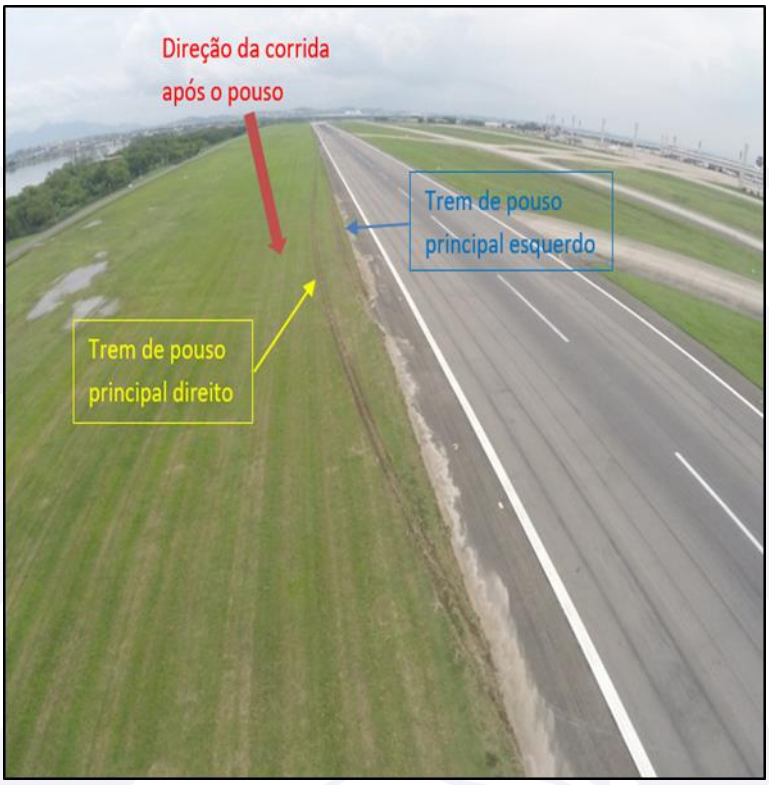


Figure 6 - Panoramic view of the aircraft's trajectory during the landing roll.

Figure 7 - Leveled concrete box in the strip area (lane 15/33).

1.11 Flight recorders.

The recorders were operating regularly. The data were extracted by the CENIPA's LABDATA and the analyzes were used during the investigation process.

The aircraft was equipped with a Flight Data Recorder (FDR) L-3, model FA2100 FDR (solid-state memory), Part Number (P / N) 2100-4045-00, Serial Number (S / N) 931524, with a capacity of 1024 words (each word has 12 bits), thus making a reading of 1024 x 12 every second (words per second).

In addition, it was also equipped with a Cockpit Voice Recorder (CVR) L-3 digital voice recorder, model FA2100 CVR (solid-state memory), P / N 2100-1226-02, S / N 954688, with capacity for two hours of recording, with four channels of two hours of High Quality audio.

Both flight data and cabin voice recorders recorded data related to the occurrence (Figure 8).

Figure 8 - Flight recorders intact and in good condition.

1.12 Wreckage and impact information.

The landing of the PR-OCW aircraft occurred under unfavorable weather conditions caused by heavy rain over the airfield and sudden variation in the direction and intensity of the surface wind. At the exact moment of the touch, the gust wind, calculated by the aircraft's navigation system, indicated a direction of 057º and an intensity of 19kt.

The contact of the aircraft with the ground occurred about 916m far from the threshold 15 with the right main landing gear completely outside the lateral limits of the runway, speed of 121kt, descent rate of 400ft / min, magnetic heading of 140º and flight path of 149º. After landing, the aircraft traveled 668m outside the runway. The pilot regained control of the aircraft and returned it to runway 15 (Figures 9 and 10).

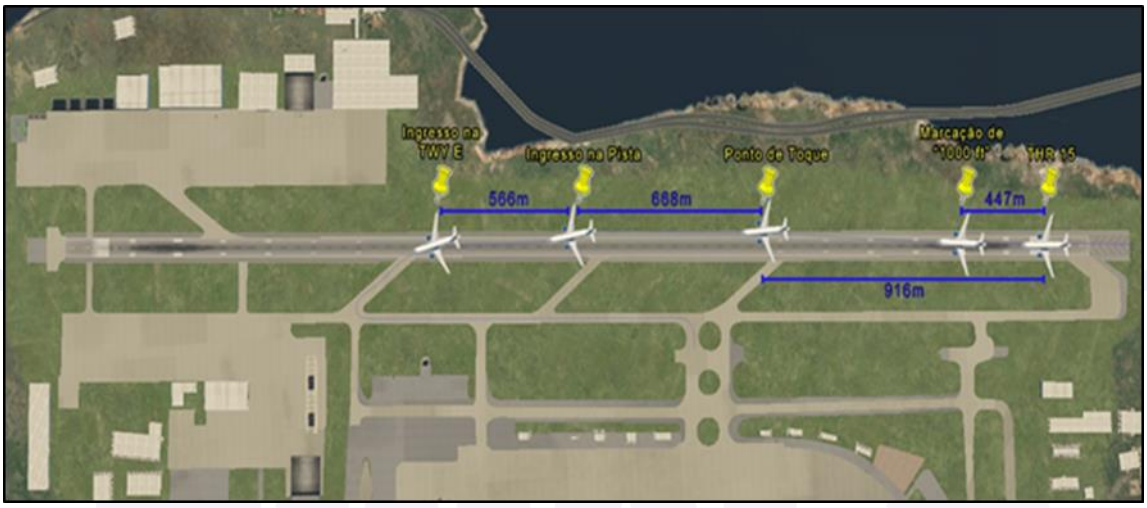


Figure 9 - Place of the aircraft's first contact with the ground and trajectory after contact.

Figure 10 - Place of the first contact of the right main landing gear with the ground.

Along the aircraft's running path over the grassy area, various debris impacted the aircraft's fuselage and entered the aircraft's turbines. However, the damage that occurred did not cause an immediate impact on its operation, making it possible to travel to the apron area and shutdown the engines.

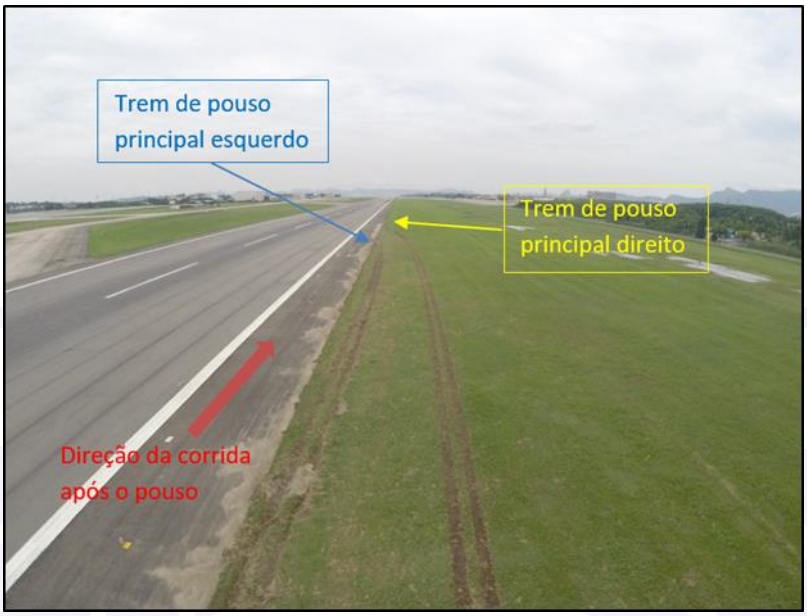


Figure 11 - Place where the aircraft returned to the runway.

Thus, after the complete stop on the runway, the crewmembers requested the return taxi and did not communicate the event to the ATC agencies.

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.

The commander had been serving the company for seven years.

For the flight of this occurrence, on the morning of the day of its realization, the commander was contacted by the company to inform him about the change in the roster, in which he started to assume the role of commander. In the original schedule, he was an extra crewmember, since he would go to Guarulhos, where he would stay to perform a flight simulator training.

The commander came from a resting period, whose last day of flight was 28FEB2019. He felt in full condition to fly. When he arrived at the airport, he became aware that the crew was not yet complete, as the copilot and the flight chief were in transfer. In order to avoid further delays, he chose to start preparing the aircraft and carry out all necessary checks and briefings.

When the copilot came in for the flight, the commander realized that he was uncomfortable with the delay.

They took off normally after a thirty-minute delay. In flight, they learned that there was a possibility of rain and meteorological degradation on the route.

In the speech to passengers, the commander said he would do his best to ease the delay. However, he reported that all in-flight procedures were performed calmly, so that they could focus on approaching the rain.

Throughout the flight, they made deviations from light turbulence. By the radar, they had the notion that, after the mountain, the weather was bad, which was considered normal by the commander, due to the local geography.

In the final for landing, they noticed that the weather conditions worsened, but they were still within the parameters allowed for the operation.

The pilots had the go-around procedure in readiness in case of need, but as they assessed there were conditions for landing, they proceeded to perform it. The commander considered that he had already operated in more degraded conditions than those found in this situation.

After the decoupling of the autopilot, the wind component on the left was identified. When in the final approach for landing, already below 200ft, the commander was warned by the copilot that they were off the axis, and then he replied that he was aware and would correct it.

In this circumstance, the weather conditions deteriorated furthermore, with the increase in the intensity of the rain on the airport, to the point of impairing the pilots' peripheral vision, compromising the exact notion of depth of the aircraft in relation to the runway.

Further on, as it was close to the ground, already flying over the runway, the possibility of discontinuing the landing and proceeding to the alternative was not considered a viable action. The commander reported being committed to landing and, to avoid a heavier landing, he was modulating the flare with the thrust of the engines.

According to the commander, for an instant, he assessed the implications of going for an alternative, given the situation the company was going through. However, he affirmed that this fact was not determined for the decision to proceed to the landing in SBGL. For him, despite the worsening weather conditions, it was possible to continue the landing procedure.

When the aircraft touched the ground, the commander felt the aircraft slide to the right, which was corroborated by the copilot. He tried to make the necessary corrections and managed to return the aircraft to the runway.

In the commander's assessment, the training received by the company facilitated the management of the situation. He reported that there was no report on what happened to air traffic control because he did not have this official forecast. He informed that the AQD only predicted that this type of occurrence would be reported immediately to the company, which he did promptly.

The copilot had been with the company for a year and three months. On the day of this occurrence, he was on the alert roster and was called for this flight on the morning of its realization. It was already the second change in his schedule on the same day.

He continued as an extra crewmember on a flight from Guarulhos to Salvador, whose estimated landing time would be fifteen minutes before the scheduled departure time for the flight, which he would be the copilot.

When presenting for the flight in Salvador, the aircraft was already prepared for takeoff. The flight went smoothly, with some slight turbulence. They had the information of light rain in the destination region.

During the approach procedure, the copilot reported that, upon seeing the runway, he noticed that the aircraft was getting more to the right and warned the commander, who said that was correcting it.

The copilot reported having realized that they would touch the grass, but he had no other choice of what to do, because the plane slipped too fast and yet, he still warned the commander.

The weather conditions at this point had deteriorated a lot, with heavy rain on the airfield.

In view of the situation, the copilot did not consider interfering in the aircraft's command because it was not a pilot incapacitation situation and relied on the commander's information that he was correcting the position.

It was the first flight the commander and copilot took together. Both reported that there was a good cabin environment, with an atmosphere of openness for interaction. They even talked in flight about the company's situation and the possibility of a new job.

The commander was described as a calm and professional person and the copilot as a very calm person.

All flight attendants were on alert when they were called in for that flight. According to their reports, the briefing was carried out quickly, with little detail and the weather was not addressed.

According to reports, cases of quick and superficial briefings were quite common on the company's general flights. Sometimes, they only called the flight chief to participate and at other times, there was no briefing.

About the flight, they reported that the aircraft shook a little on the route, which was considered normal, until, before landing, the vibration increased in intensity. The flight attendants at the rear felt the swing more than those at the front.

The flight attendants were unable to complete the cabin check for landing because the aircraft was shaking too much and the flight chief instructed them to sit down.

Very close to the touch, they felt that the aircraft was shaking more and, after the touch, the feeling was that they were on a dirt road.

The air steward who was in the right position - 4C, reported seeing transparent smoke coming from the cabin, accompanied by a plastic smell. He informed the flight chief about the fact, who passed it on to the cockpit. The pilots reported having no sign of smoke.

All crewmembers rated the work team as good and prepared for the role they performed, and also easy to relate to.

1.14 Fire.

No signs of either inflight or post-impact fire.

1.15 Survival aspects.

Passengers were disembarked regularly at position 20 of the SBGL's apron, terminal 1.

1.16 Tests and research.

Nil.

1.17 Organizational and management information.

The airline was created in 2002, under the name Oceanair *Linhas Aéreas* S.A and only in 2010 started to use the trading name Avianca Brasil. It was considered the fourth largest airline in Brazil and served both domestic and international flights.

In December 2018, the company filed for judicial reorganization, attributing as one of the causes the economic recession faced by the country since 2014.

By court decision, the company guaranteed the continuity of the airline tickets sale and scheduled flights at the airports where it operated.

As a result of this situation, the company was also in crisis with its internal employees. In January 2019, the process of dismissing employees began and those who remained in the company had delays in paying their salaries and benefits.

According to the reports, the working environment was not good, as there was a feeling of uncertainty and apprehension on the part of employees about whether or not to remain in the company, reinforced by the lack of clearer information about the situation faced and its possible causes developments.

Many events involving the management of the company were known by the employees, firstly, through exposure in the media and only later, they received e-mail from the company dealing with such content, as was the case with the change of presidency.

Ground coordinators, such as transportation and accommodation, also came under the responsibility of the crew, since there was no sector in the company dedicated to dealing with this matter effectively.

Commonly, the crews faced the situation of not having reservations at the hotels indicated by the company or they spent more than an hour waiting for the transfer to the hotel or airport.

According to information obtained, the training had not yet been affected by the crisis that the company was facing, that is, the schedule was being carried out normally. The training offered to technical and commercial crewmembers was considered very good for favoring an adequate preparation to act in flight.

The company's maintenance sector was considered as very good, organized and that aroused a feeling of safety in the crew.

1.18 Operational information.

The operation of the aircraft was in accordance with the operating specifications issued by the Brazilian civil aviation authority.

The aircraft was within the weight and balance limits established by the manufacturer. The flight planning was adequate, obeying all the operational rules standardized in the airplane manuals.

The crew had valid qualifications, as well as recurrent training conducted for the type of flight to be performed. The crew resting parameters, prevised in the Brazilian legislation, were obeyed.

However, for the fulfillment of the planned flight O66227, on 03MAR2019, the contingent activation of all six crewmembers was carried out by the company's CCO. The contingency actioning was caused by the shortage of crewmembers available to comply with flight O66227, which, in turn, was directly related to the financial problems faced by the company.

At the time of the accident, the company accumulated successive delays in the payment of salaries, as well as delays in the payment of extras related to travel outside the host city (daily rates).

In parallel, the company had started a judicial reorganization process, which led to a reduction in the number of employees. The reduction in the workforce was initiated in order to reduce the operational costs related to the payroll.

In this way, the constant delays in the payment of personnel and the reduction in the number of employees were causing constant problems of availability of crewmembers.

Based on the outlined schedule, it was observed that, due to issues of coordination and execution of the calling by the CCO, there was a need for the copilot and the flight chief to travel as “extra crewmembers on duty” in the Guarulhos / Salvador leg, which resulted in the delay of the aforementioned crewmembers in the presentation to the aircraft commander for the beginning of flight O66227 in SBSV.

The copilot and the flight chief took off, as extra crewmembers, from SBGR, on flight O66046 at 1555 (UTC), landing on Salvador at 1800 (UTC). Flight O66227 (Salvador / Galeão) was scheduled to depart at 1815 (UTC).

The crewmembers from Guarulhos arrived directly on the PR-OCW aircraft, at approximately 1820 (UTC), moments before the door procedures were performed, when the passengers had already boarded. Flight O66227 took off at 1845 (UTC).

According to the MGO, item 4.7.1 showed the following:

> 4.7.1 Presentation Time and Place
>
> As for the place of presentation:
>
> a) The presentation in the bases, where the company has D.O facilities, must be made in the D.Os, even when the crewmember is from another contractual basis. Any special situations / needs will be defined / communicated via bulletins specific to the location.
>
> b) For other locations, the presentation will happen at a place determined by the Flight Commander, boarding gate or directly on the aircraft.
>
> "In view of the needs regarding pre-flight procedures (our emphasis), the maintenance of punctuality and excellence of services provided to customers, the following procedures are defined in operations for national and international flights, when on and off base (our emphasis): ”

Voos em aeronaves versão passageiros	Nacional	A tripulação deverá se apresentar com **01 hora** antes do horário previsto para partida. (Eventuais situações/necessidades especiais serão definidas/comunicadas via boletins específicos para a localidade).
	Internacional	A tripulação deverá se apresentar com **01 hora e 30 minutos** antes do horário previsto para partida quando na base e **01 hora e 10 minutos** antes do horário previsto para partida, quando fora da base. (Eventuais situações/necessidades especiais serão definidas/comunicadas via boletins específicos para a localidade).

Figure 12 - MGO - Crew presentation table.

The same Manual also established that:

> “…the presentation time may be reduced to a minimum of 30 minutes before take-off, under the express evaluation/approval of the Pilot’s Head.”

Thus, it is worth noting that the presentation time of the copilot and flight chief in Salvador did not meet the criteria established above.

Despite the presentation for the flight being delayed by the copilot and the flight chief, all procedures for preparing the aircraft, boarding the passengers, starting the engines, the taxi and taking off from SBSV were performed correctly.

The normal and emergency briefings were carried out as planned.

The takeoff from SBSV happened in a standardized way and the cruise flight was uneventful. As planned, the pilots performed the preparation and the descent procedures correctly. The ATIS was properly consulted and confirmed that SBGL operated under IMC.

Upon arrival for landing on SBGL, the STAR, RNAV UTBOM 1A, from 08NOV2018, and the procedure for approaching by RNAV instruments (GNSS), Z RWY 15, from 11OCT2018, were performed.

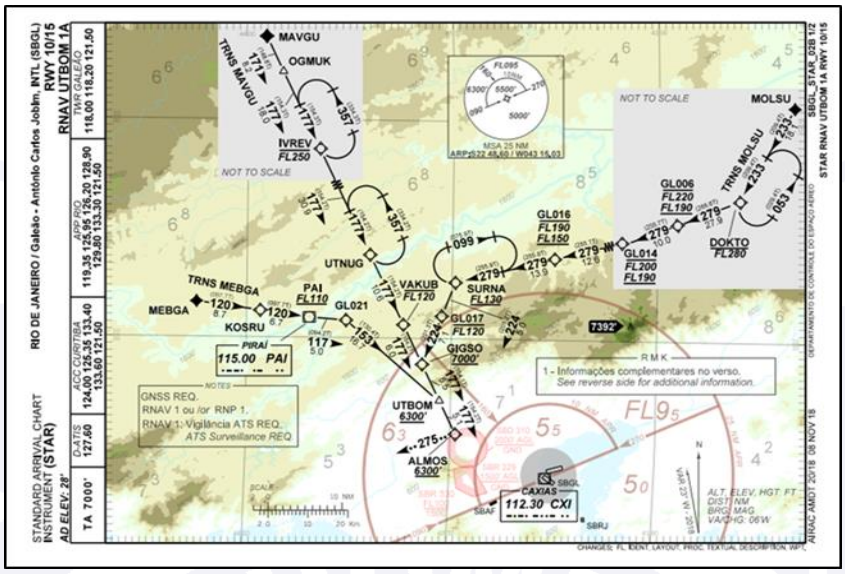


Figure 13 - Standard Arrival Chart - RNAV UTBOM 1A.

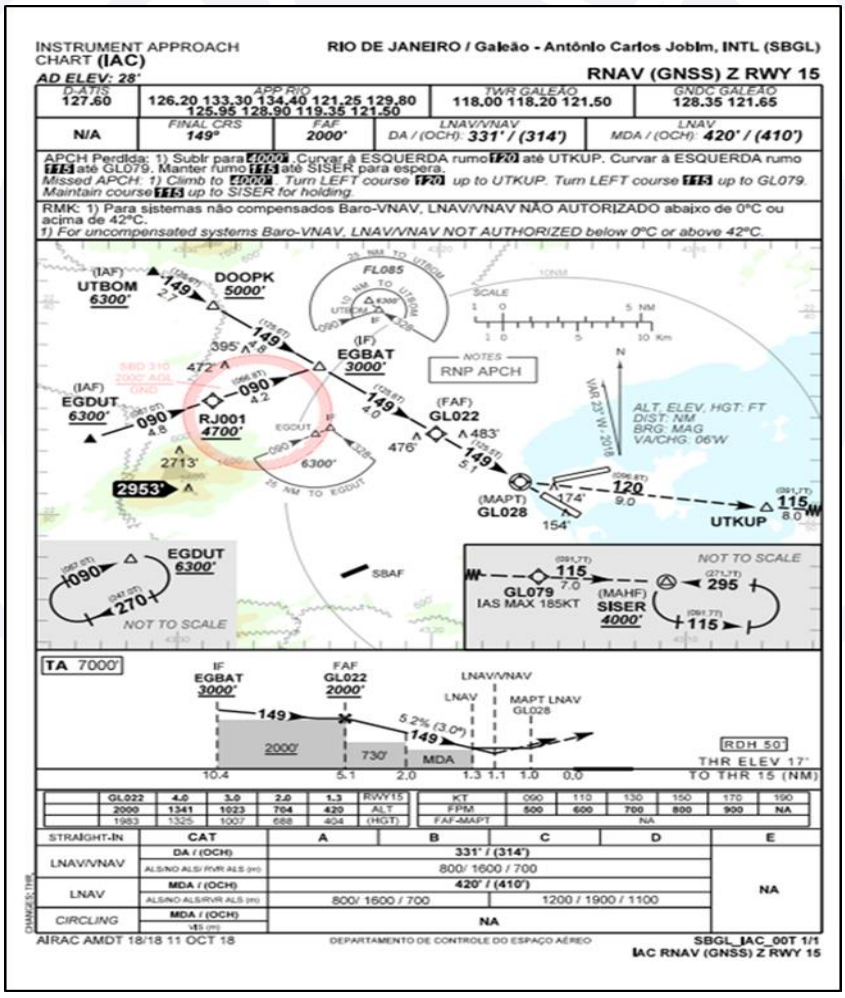


Figure 14 - Instrument Approach Chart- RNAV (GNSS) Z RWY 15.

Next, the sequencing of the procedures performed by the crew based on the data obtained from the aircraft's FDR will be presented. The hours are marked exactly as they were when reading the data:

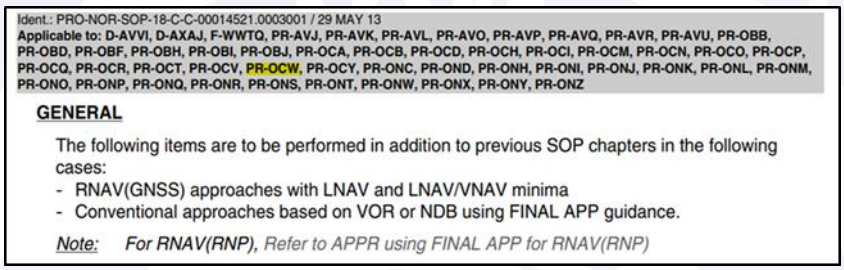
- At 20h22min50sec (UTC), the aircraft was flying in NAV flight mode to UTBOM position, AP1 coupled, A/THR ON, Flap configuration in the Up position, maintaining 230kt, 7,660ft of altitude, when it was authorized by the APP RIO to descend to 6,300ft and perform the procedure RNAV (GNSS) Z RWY 15;

- At 20h23min04sec (UTC), the pilot selected the 6,300ft altitude in the FCU to continue the descent;

- At 20h23min22s (UTC), the crewmembers started the reduction for the approach, according to the company's SOP, requesting Flap position 1;

- At 20h23min30s (UTC), the pilot set the APP flight mode at the FCU to perform the RNAV (GNSS) Z RWY 15, using the 331ft DA as a reference;

The DA was previously selected during the preparation of the cabin to perform the RNAV - GNSS - approach with minimal LNAV / VNAV procedure, as described in the company's SOP.



Ident.: PRO-NOR-SOP-18-C-C-00014521.0003001 / 29 MAY 13

Applicable to: D-AVVI, D-AXAJ, F-WWTQ, PR-AVJ, PR-AVK, PR-AVL, PR-AVO, PR-AVP, PR-AVQ, PR-AVR, PR-AVU, PR-OBB, PR-OBD, PR-OBF, PR-OBH, PR-OBI, PR-OBJ, PR-OCA, PR-OCB, PR-OCD, PR-OCH, PR-OCI, PR-OCM, PR-OCN, PR-OCO, PR-OCP, PR-OCQ, PR-OCR, PR-OCT, PR-OCV, PR-OCW, PR-OCY, PR-ONC, PR-OND, PR-ONH, PR-ONI, PR-ONJ, PR-ONK, PR-ONL, PR-ONM, PR-ONO, PR-ONP, PR-ONQ, PR-ONR, PR-ONS, PR-ONT, PR-ONW, PR-ONX, PR-ONY, PR-ONZ

GENERAL

The following items are to be performed in addition to previous SOP chapters in the following cases:

- RNAV(GNSS) approaches with LNAV and LNAV/VNAV minima
- Conventional approaches based on VOR or NDB using FINAL APP guidance.

Note: For RNAV(RNP), Refer to APPR using FINAL APP for RNAV(RNP)

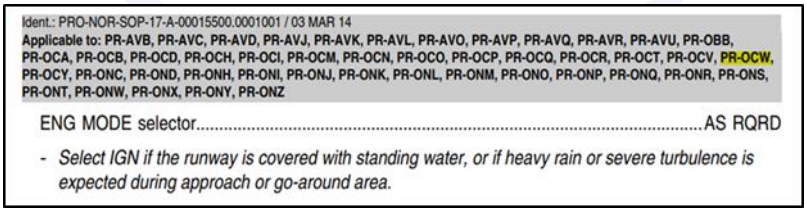
Figure 15 - FCOM - Approach Using Final APP Guidance - PRO-NOR-SOP-18-C P 6/30.

- At 20h23min45s (UTC), the crewmembers was informed that the SBGL airport had 3,000 meters of visibility, heavy rain and thunderstorm. At that moment, the copilot evaluated the conditions and informed the pilot that, according to the company's rules, it was possible to continue the approach;

The crew assessment followed the recommendations in the MGO, items 6.4 Meteorological minima for landings and takeoffs, 6.4.2 IFR - RBAC 121.651, as well as item 6.4.4 Meteorological Minima Information - RBAC 121.655;

- At 20h24min05s (UTC), passing 6,920ft, the crew adjusted the altimeter to 1012HPg and, subsequently, performed the Approach Checklist, in full compliance with the company's SOP;

- At 20h24min50s, the commander selected the ENG MODE selector in Ignition mode, as previsted in the SOP;



Ident.: PRO-NOR-SOP-17-A-00015500.0001001 / 03 MAR 14

Applicable to: PR-AVB, PR-AVC, PR-AVD, PR-AVJ, PR-AVK, PR-AVL, PR-AVO, PR-AVP, PR-AVQ, PR-AVR, PR-AVU, PR-OBB, PR-OCA, PR-OCB, PR-OCD, PR-OCH, PR-OCI, PR-OCM, PR-OCN, PR-OCO, PR-OCP, PR-OCQ, PR-OCR, PR-OCT, PR-OCV, PR-OCW, PR-OCY, PR-ONC, PR-OND, PR-ONH, PR-ONI, PR-ONJ, PR-ONK, PR-ONL, PR-ONM, PR-ONO, PR-ONP, PR-ONQ, PR-ONR, PR-ONS, PR-ONT, PR-ONW, PR-ONX, PR-ONY, PR-ONZ

ENG MODE selector.....AS RQRD

- *Select IGN if the runway is covered with standing water, or if heavy rain or severe turbulence is expected during approach or go-around area.*

Figure 16 - FCOM - ENG MODE - PRO-NOR-SOP-17 P 4/6.

- At 20h27min29s (UTC), passing 3,200ft, the Landing Gear was requested by the commander, in order to increase the rate of descent and adapt to the approach ramp;

- At 20h28min06s (UTC), passing 2.400ft, the copilot informed APP RIO that they were stabilized on the ramp (vertical profile) of the RNAV (GNSS) Z RWY 15 procedure. The recorded wind was 310º and 8kt of intensity;

- At 20h29min27s (UTC), passing 1.380ft, the aircraft was stabilized, maintaining Approach Speed (VAPP) of 140kts and descent rate of 800ft / min, obeying the company's operational policy regarding the stabilization criteria. The recorded wind was 276º and 5kt;

STABILIZATION CRITERIA

Ident.: PRO-NOR-SOP-18-A-00014487.0002001 / 06 DEC 16
Applicable to: ALL

The stabilization height is defined as one of the following:
- 1 000 ft above airfield elevation (AAL)in Instrument Meteorological Conditions (IMC), or
- 500 ft above airfield elevation (AAL) in Visual Meteorological Conditions (VMC), or
- Any other height defined in Operator policies or regulations.

In order for the approach to be stabilized, all of the following conditions must be satisfied before, or at the stabilization height:
- The aircraft is on the correct lateral and vertical flight path
- The aircraft is in the desired landing configuration

- The thrust is stabilized, usually above idle, and the aircraft is at target speed for approach

Note: *In IMC, if the ATC requests a speed constraint that is not compatible with the speed and thrust stabilization at 1 000 ft AAL, a later speed and thrust stabilization can be acceptable provided that:*
- *The aircraft is in deceleration toward the target approach speed*
- *The flight crew stabilizes speed and thrust as soon as possible and not later than 500 ft AAL.*

- The flight crew does not detect any excessive flight parameter deviation.

If one of the above-mentioned conditions is not satisfied, the flight crew must initiate a go-around, unless they estimate that only small corrections are required to recover stabilized approach conditions.

Note: *If the predicted tailwind at landing is greater than 10 kt, decelerated approach is not permitted, and the aircraft speed should be stabilized at around VREF + 5 kt in final.*

Figure 17 - FCOM - Stabilization Criteria - PRO-NOR-SOP-18-A- P3/6, P4/6.

The landing configuration was performed, according to BPO-FLT 004/18 (fuel savings procedures presentation), item 10, note 1:

> "Under wet runway conditions, use CONFIGURATION FULL, MAXIMUM REVERSE and AUTOBRAKE MEDIUM. If there are performance restrictions for using CONFIGURATION FULL, CONFIGURATION 3 should be used, according to landing analysis."

- At 20h30min25s (UTC), passing 600ft, the crewmembers reported visual reference with the ALS, a sufficient element to continue the approach, as provided for in the MGO. The VAPP was 136kts and the descent rate was 800ft / min;

a) A aeronave estiver perfeitamente controlada, em atitude estável e adequada para que um pouso na pista pretendida possa ser realizado com uma razão de descida normal, usando manobras normais e tocando na pista dentro da zona normal de toque;
b) A visibilidade em voo não for menor que a visibilidade estabelecida no procedimento de aproximação sendo realizado;
c) Exceto para pousos especialmente regulamentados, como ILS categoria II ou categoria III, onde os requisitos de referências visuais são especificamente fixados pela ANAC, pelo menos uma das seguintes referências visuais para a pista sendo usada seja distintamente visível e identificável pelo piloto:

i) O sistema de luzes de aproximação. Entretanto, a menos que as luzes das barras vermelhas do sistema sejam claramente visíveis, o piloto não pode descer abaixo da altitude de 100 pés acima da altitude da zona de toque usando apenas o sistema de luzes de aproximação;
ii) Na cabeceira da pista;
iii) As marcas da cabeceira da pista;
iv) As luzes de cabeceira da pista;
v) As luzes de identificação de início da pista;
vi) O indicador visual de trajetória de aproximação;
vii) Na zona de toque ou as marcas da mesma;
viii) As luzes de zona de toque;
ix) A pista ou as marcas da pista;
x) As luzes de pista;
xi) Quando executando um procedimento de descida com aproximação direta, de não-precisão, incorporando um ponto de controle visual e houver passado esse ponto, a menos que o ponto não tenha sido identificado pelo piloto ou, por atraso na execução da descida, não mais seja possível pousar usando razões de descida e procedimentos normais ao passar pelo ponto.

Figure 18 - MGO - Meteorological Minima - MN-POR-10-28, Section 6, pg. 20 and 21.

- At 20h30min34s (UTC), passing 490ft, Pilot Flying (PF) informed that he would proceed with the approach with visual reference and turned off the AP1, he requested Flight Director (FD) - OFF and BIRD - ON;

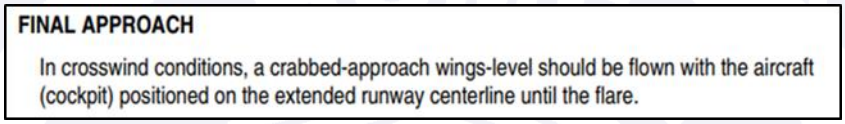
- At 20h30min58s (UTC), there was a significant change in the wind, starting to blow with 139° of direction and intensity of 9kts;

- At 20h31min07s (UTC), at 100ft height, the PF announced that the aircraft was off the runway axis and, immediately, the copilot confirmed the information. The aircraft was to the right of the runway's central axis. The VAPP was of 142kts and the descent rate was 600ft / min;

At that moment, it was observed that the commander exerted pressure on the left pedal, which allowed to deduce that he was trying to make the correction to resume the axis of the runway. The wind at that moment was in a direction of 137° and 10kts of intensity.

The FCTM established that corrections, lateral and directional control of the aircraft during the final, in crosswind conditions, should be through the “crabbed approach wing-level” technique.

In this way, the commander's initial actions corresponded to that recommended. However, the aircraft was no longer flying towards the central axis of the runway.


FINAL APPROACH

In crosswind conditions, a crabbed-approach wings-level should be flown with the aircraft (cockpit) positioned on the extended runway centerline until the flare.

Figura 19 - FCTM - Lateral and Directional Control/Final Approach - PR-NP-SOP P 3/10.

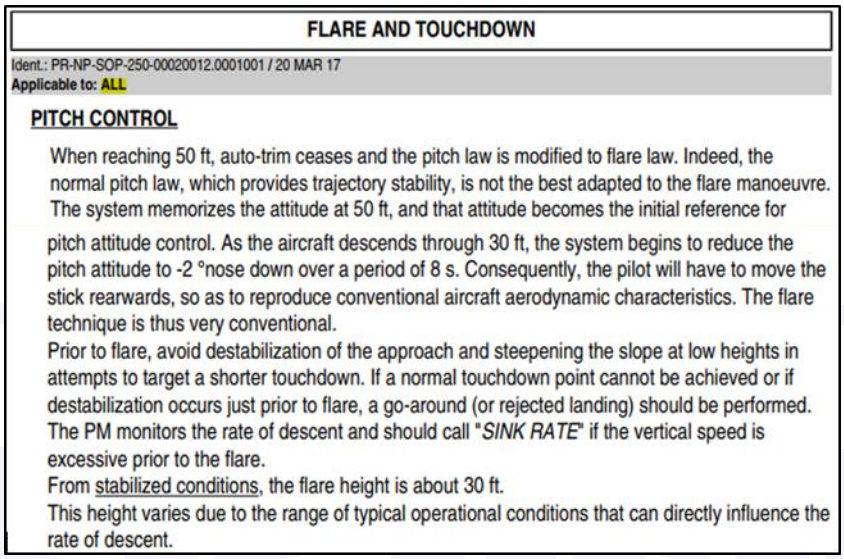
- At 20h31min10s, the aircraft crossed the runway threshold 15 to 80ft in height, with VREF 141kts and descent rate 650ft/min. At this point, the copilot made a new callout, informing that they were still off-axis. The commander responded to the copilot's callout, reporting, “correcting it”.

It was observed that the commander maintained the same pressure intensity on the left pedal, pointing to the fact that he was still trying to correct the axis through the pedals (Rudder). The recorded wind was 130º and 11kt of intensity.

- This action, added to the fact that the aircraft crossed the threshold at 80ft height, resulted that, at 20h31min14s (UTC), the aircraft crossed the 1,000ft mark still flying, with 46ft height, 138kt speed and descent rate of 480ft / min. The wind marked 120º direction and intensity of 12kt.

According to the FCTM, in stabilized conditions, the altitude of the flare was approximately 30ft, at which point the aircraft system started to reduce the pitch by -2º nose down for a period of approximately eight seconds.

At this point, the commander should move the side stick backwards, in order to reproduce the conventional aerodynamic characteristics of the aircraft. Thus, the flare technique on this aircraft was absolutely conventional.



FLARE AND TOUCHDOWN

Ident.: PR-NP-SOP-250-00020012.0001001 / 20 MAR 17
Applicable to: ALL

PITCH CONTROL

When reaching 50 ft, auto-trim ceases and the pitch law is modified to flare law. Indeed, the normal pitch law, which provides trajectory stability, is not the best adapted to the flare manoeuvre. The system memorizes the attitude at 50 ft, and that attitude becomes the initial reference for pitch attitude control. As the aircraft descends through 30 ft, the system begins to reduce the pitch attitude to -2 °nose down over a period of 8 s. Consequently, the pilot will have to move the stick rearwards, so as to reproduce conventional aircraft aerodynamic characteristics. The flare technique is thus very conventional.

Prior to flare, avoid destabilization of the approach and steepening the slope at low heights in attempts to target a shorter touchdown. If a normal touchdown point cannot be achieved or if destabilization occurs just prior to flare, a go-around (or rejected landing) should be performed.

The PM monitors the rate of descent and should call "*SINK RATE*" if the vertical speed is excessive prior to the flare.

From stabilized conditions, the flare height is about 30 ft.

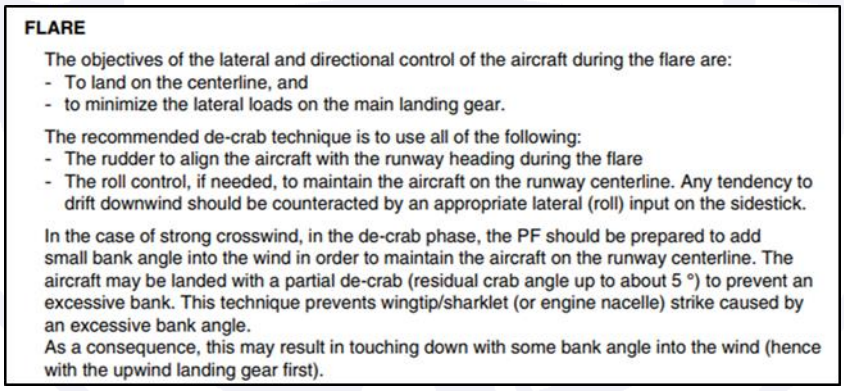
This height varies due to the range of typical operational conditions that can directly influence the rate of descent.

Figure 20 - FCTM - PR-NP-SOP-250 P 1/10, 2/10.

- At 20h31min15s (UTC), at 30ft height, the copilot made a new callout regarding the aircraft alignment, however, there was no response from the commander. The pressure on the pedals remained the same; however, it was not possible to correct the alignment. Throughout the flare, there was no command for correction with the wings, and the bank angle remaining fully leveled. The wind was 117º and 14kt of intensity;

The FCTM reported that, if the aircraft had a tendency to drift from the centerline of the runway, caused by crosswinds, the de-crab technique was also recommended, applying the appropriate roll command.

Additionally, in case of strong crosswinds, during the application of the de-crab technique, the commander should prepare to apply a small bank angle towards the wind, in order to assist in maintaining the center of the runway.



FLARE

The objectives of the lateral and directional control of the aircraft during the flare are:
- To land on the centerline, and
- to minimize the lateral loads on the main landing gear.

The recommended de-crab technique is to use all of the following:
- The rudder to align the aircraft with the runway heading during the flare
- The roll control, if needed, to maintain the aircraft on the runway centerline. Any tendency to drift downwind should be counteracted by an appropriate lateral (roll) input on the sidestick.

In the case of strong crosswind, in the de-crab phase, the PF should be prepared to add small bank angle into the wind in order to maintain the aircraft on the runway centerline. The aircraft may be landed with a partial de-crab (residual crab angle up to about 5 °) to prevent an excessive bank. This technique prevents wingtip/sharklet (or engine nacelle) strike caused by an excessive bank angle.

As a consequence, this may result in touching down with some bank angle into the wind (hence with the upwind landing gear first).

Figure 21 - FCTM - Lateral and Directional Control/Flare - PR-NP-SOP P 3/10.

-At 20h31min18s (UTC), the copilot informed, once again, that the aircraft was off the axis and, without any response to the callout, the commander completed the landing. The wind was 102º and 14kt of intensity;

- At 20h31min19s (UTC), when crossing 20ft in height, the commander reduced the throttles to idle, kept the pitch up varying between 4th and 5th and leveled wings. The wind was 100º and 15kt of intensity;

- At 20h31min24s (UTC), the aircraft touched the runway outside the central axis, 916m from threshold 15, with the right main landing gear touching the ground outside the runway's lateral limits. The wind was in the direction of 057º and 18kt of intensity. The touch occurred with 121kt speed, leveled wings and 140º magnetic heading.

Figure 22 - FDR - Exact moment when the aircraft touches the ground.

After the touch, the aircraft traveled 668m outside the runway. The commander regained control of the aircraft and returned it to the inner limits of runway 15.

- At 20h31min38s (UTC), the aircraft was completely inside the runway;

- At 20h32min01s (UTC), the aircraft cleared the runway via taxiway E;

The crewmembers did not inform the ATC of the event involving landing off the runway, nor the race after landing that took place on the right side of runway 15.

- At 20h41min00s (UTC), the aircraft parked in box 20 of SBGL terminal 1;

- At 20h41min03s (UTC), the engines were cut off.

The FCTM predicted that the stabilized approach condition should be obtained up to the limit height of 1,000ft IFR or 500ft VFR, and should be maintained until landing; otherwise, a go-around procedure should be performed.

The document also established that a go-around procedure close to the ground could be considered at any time; however, it warned that the maneuver should not be performed after the pilot in command selected the use of the reversers.

CONSIDERATIONS ABOUT GO-AROUND

Applicable to: ALL

Ident.: PR-NP-SOP-260-A-00019214.0001001 / 28 NOV 17

DECISION MAKING

The flight crew must consider to perform a go-around if:

- There is a loss or a doubt about situation awareness, or
- There is a malfunction which jeopardizes the safe completion of the approach e.g. major navigation problem, or
- ATC changes the final approach clearance resulting in rushed action from the crew or potentially unstable approach, or
- The approach is unstable in speed, altitude, or flight path in such a way that stability is not obtained by 1 000 ft AAL in IMC or (500 ft AAL in VMC), or is not maintained until landing, or
- Any of the following alerts occur:
  - GPWS, or
  - TCAS, or
  - Windshear, or
  - ROW alerts for the relevant runway condition. Refer to AS-ROWROP Operating Techniques.
- Adequate visual references are not obtained at minima or lost below minima.

Ident.: PR-NP-SOP-260-A-00019215.0001001 / 20 MAR 17

GO-AROUND NEAR THE GROUND

The PF must not initiate a go-around after the selection of the thrust reversers. If the PF initiates a go-around, the flight crew must complete the go-around maneuver.

If the flight crew performs a go-around near the ground, they should take into account the following:

- The PF should avoid excessive rotation rate, in order to prevent a tailstrike. For more information *Refer to PR-NP-SOP-250 Tail Strike Avoidance*
- A temporary landing gear contact with the runway is acceptable.

Only when the aircraft is safely established in the go-around, the flight crew retracts flaps one step and the landing gear.

Note: *If the aircraft is on the runway and in FULL configuration when the PF applies TOGA thrust, a CONFIG FLAPS NOT IN T.O CONFIG ECAM alert is triggered. The flight crew should disregard this alert.*

Figure 23 - FCTM - Considerations about Go-Around - PR-NP-SOP-260 P 1/6, 2/6.

According to the FCOM, the limit for crosswinds with a wet runway was of 38kt.

1.19 Additional information.

Due to the conditions observed in the initial stages of the investigation, on 16MAY2019, the CENIPA issued two RSVs. The RSVs are described in item 4 of this report.

1.20 Useful or effective investigation techniques.

Nil.

2. ANALYSIS.

It was a flight for regular passenger transport, operated by Oceanair Airlines, from SBSV to SBGL.

The airline was operating in accordance with the operating specifications issued by the Brazilian civil aviation authority. For the flight, all operational dispatch procedures were performed properly, with the aircraft within the weight and balance limits.

The crewmembers was qualified and with valid qualifications. The crew resting parameters, prevised in the Brazilian legislation, were obeyed.

The company was undergoing a judicial reorganization and, according to employee reports, the working environment was being affected by a feeling of uncertainty and apprehension about whether or not to remain in the company, reinforced by the lack of clearer information about the financial situation faced and its possible consequences.

Faced with a framework of spending containment, the ground coordination, such as transportation and accommodation, came under the responsibility of the crewmembers, since there was no sector in the company effectively dedicated to this subject.

Commonly, the crewmembers faced the situation of not having reservations at the hotels indicated by the company or they spent more than an hour waiting for the transfer to the hotel or airport. As a result of these facts, the company was also facing a crisis with its internal employees.

Other problems, such as reduced staff and late payment of wages, were causing constant crew availability problems.

In this context, in order to comply with the schedule, the company's CCO contingently activated all six crewmembers of this flight, including the need for the copilot and flight chief to have to perform the Guarulhos / Salvador section as extra crewmembers, which caused the delay in the presentation in SBSV.

Therefore, the copilot and the flight chief presented themselves, directly on the PR-OCW aircraft, with an hour and five minutes of delay in relation to the time established in the company's MGO (crew members should report for national flights. one hour before the scheduled departure time).

The takeoff took place at 18h45min (UTC).

Despite the delay, all operational procedures for the flight were performed correctly and the cruise flight went smoothly.

Although the weather conditions were much degraded in the region of Rio de Janeiro upon arrival, at no time were they below the minimums recommended by the company's MGO, as well as in all relevant legislation on the subject.

At 20h23min45s (UTC), the crew was informed by the APP RJ that SBGL had 3,000m of visibility, heavy rain and thunder, and the crewmembers estimated that, according to the company's rules, it was possible to continue the approach.

According to the commander, for a moment, he even considered the implications of going for an alternative in view of the situation that the company was going through. However, he affirmed that this fact was not determined for the decision to proceed to the landing in SBGL. For him, despite the worsening weather conditions, it was possible to continue the landing procedure.

According to reports and analysis of the descent data, the aircraft performed a stabilized approach up to approximately 490ft, when there was a significant change in the wind, which started blowing at 139° of direction with 9kt of intensity.

The commander even identified and announced, crossing approximately 100ft in height that the aircraft was off the runway axis. The copilot confirmed this information, showing that he was aware of the operational situation.

The FCTM established that the corrections, lateral and directional control of the aircraft during the final, in crosswind conditions, should be through the “crabbed approach wing-level” technique.

Thus, it was found that the commander's initial actions corresponded to that recommended in the FCTM. However, the aircraft was no longer flying towards the central strip of the runway and the corrections were not sufficient to redirect the aircraft to the center of the axis.

Given the situation, the copilot did not consider interfering in the command of the aircraft because, according to his report, he considered that it was not a situation of incapacitation of the pilot in command and relied on the commander's information that he was correcting the position.

The uncertainty regarding the effectiveness of the correction of the approach axis with the center of the runway, coupled with the sudden worsening of the visibility conditions, caused by the increase in the intensity of the rain, as well as by the change in the wind direction for the left abeam and the increase of its intensity, led the commander to act with greater amplitude in the commands, in order to try to correct the drift tendency to the right that was more and more accentuated.

Added to this action is the fact that the aircraft flew over the threshold at 80ft of altitude, resulting in the crossing of the 1,000ft mark of the runway, still flying, at 46ft of altitude, 138kt speed and 480ft / min descent rate. At that moment, the wind marked the direction of 120º with an intensity of 12kt.

At 30ft height, the copilot made a new callout regarding the aircraft's alignment; however, there was no further response from the commander.

From that moment on, the weather conditions deteriorated even more, with the increase in the intensity of the rain on the Aerodrome, to the point of impairing the pilots' peripheral vision, compromising the exact notion of depth of the aircraft in relation to the runway.

From the data studied, it could be said that, during the final approach phase, from 20h31min07s (UTC), already flying below 100ft height, it was observed that the crew had an exact notion that the aircraft was outside the central axis of the runway.

However, there was no perception that this situation would lead to an approach to a destabilized condition.

According to the FCTM, the go-around procedure should be made if the stabilized approach parameters were not maintained until landing. That document established that a go-around procedure close to the ground could be considered at any time. However, it warned that the maneuver should not be performed after the pilot in command selected the use of the reversers.

The copilot reported several times that the aircraft was off the runway axis. The commander checked the correction a few times; however, there was no effective action on the flight controls to correct this situation. At no time was there a callout to start the missed approach procedure.

For being close to the ground, already flying over the runway, the commander did not consider the possibility of discontinuing the landing and proceeding to the alternative as a viable action. He reported being committed to landing and that, to avoid a heavier landing, he was modulating the flare with the thrust of the engines.

Given the facts described above, two points must be considered. The first refers to the non-application of the procedure suggested in the FCTM for the situation of aircraft destabilized for landing.

Although the crewmembers were with their training updated and considered it adequate, it is possible to assume that the non-application of the procedures recommended in the operator's and aircraft manufacturer's manuals resulted from the lack of understanding of the destabilization condition, since they identified the lateral deviation of the aircraft and remained focused until the landing.

Another point to consider is related to the internal environment that existed in the organization, due to the financial crisis faced. The climate, as mentioned, was one of apprehension and uncertainty as to what could happen to the company and its employees.

Thus, the company's scenario coexisted with the adverse scenario of the occurrence and the implications of opting for a go-around procedure. It is a fact that, if they chose to proceed to the planned alternative, this decision would result in an increase in expenses by the company to cover mandatory assistance to passengers.

In addition, it is assumed that the company could also encounter difficulties in allocating these passengers because it was a period of a lot of touristic activity at the alternative location, which would represent another addition of problems to a scenario that was already a crisis.

Although the commander did not recognize this situation as a decisive factor to proceed towards approach and landing, these factors may have had an influence on the decision-making process, even if not voluntarily, leading him to try until the last moment to correct the aircraft, although not responding and with very degraded weather conditions.

This scenario, in which the pilots did not identify a condition of destabilized approach, coupled with the organizational factors described above, resulted in the non-execution of a go-around procedure in flight. When crossing 20ft height, the commander reduced the throttles to idle, keeping the pitch up, varying between 4th and 5th and leveled wings, with the intention of landing the aircraft.

The landing took place under unfavorable weather conditions, caused by heavy rain over the airfield, sudden variation in the direction and intensity of the surface wind. At the exact moment of the touch, the wind calculated by the aircraft's navigation system indicated a 057º direction with an intensity of 19kt.

The contact of the aircraft with the ground occurred about 916m far from the threshold 15, with the right main landing gear outside the lateral limits of the runway, speed of 121kt, descent rate of 400ft / min, magnetic heading of 140º and flight path of 149º. After the touch, the aircraft traveled 668m outside the runway. The commander regained control of the aircraft and returned it to the inner limits of runway 15.

Analyzing the runway conditions, the investigation team concluded that it offered all the necessary conditions for the aircraft to make the landing, therefore, its contribution to this occurrence was discarded.

The aircraft cleared the runway via taxiway “E” and parked at position 20 of apron 1. The crewmembers did not report the event involving landing off the runway to the ATC, nor the landing roll on the right side of runway 15.

According to the crew, there was no standardized procedure by the company for this type of reporting. The AQD only prevised that this type of occurrence would be reported immediately to the company.

As a result, the control agencies were not immediately aware of the fact and, therefore, it was not possible to inform the teams of the RIOgaleão Operations Center, the supervision of aprons and runways or, even, the Emergency and Safety Center.

The supervision of aprons and runways, when receiving flight O66227 in position 20 of apron 1, was communicated by the mechanic of the airline about the presence of grass stuck in the lower fuselage and in the landing gear of the aircraft. Thus, the supervision requested the inspection of runways 10/28 and 15/33. The inspection located grass and pieces of asphalt on the right side of runway 15, between taxi lanes C and D, with the tire tracks of the aircraft.

After the confirmation of the event by the supervision, the concessionaire cleaned runway 15/33 according to the procedures prevised and, normal operation was restored at 2100 (UTC) on 04MAR2019.

3. CONCLUSIONS.

3.1 Facts.

a) the pilots had valid CMAs;

b) the pilots had valid A320 aircraft type Rating (which included the A320-214 model) and IFRA Ratings;

c) the pilots were qualified and had experience in the kind of flight;

d) the aircraft had valid CA;

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

f) the technical maintenance records were updated and all aircraft’s systems were operating properly;

g) SBGL was under IMC, however, the operation met all the operational requirements of the company and the relevant legislation;

h) the company filed for bankruptcy in December 2018;

i) there was a feeling of uncertainty and apprehension on the part of employees about whether or not to remain on the company's staff;

j) the ground coordination, such as transportation and accommodation, were in charge of the crewmembers themselves;

k) there were delays in the payment of salaries and benefits for the company's employees;

l) the delay in salaries and the reduction in the number of employees were causing constant problems of availability of crewmembers;

m) the six crewmembers of flight O66227 were called on alert;

n) the copilot and the flight chief had to travel on the SBGR - SBSV leg as extra crewmembers to compose the flight crew of the incident;

o) the copilot and the flight chief were late for the beginning of flight O66227, however, the procedures for boarding the passengers, starting the engines, taxi and taking off from SBSV were performed correctly;

p) SBGL operated with PAPI, ILS IGL and VOR / DME CXI of runway 15 inoperative;

q) the standard arrival procedure (STAR), RNAV UTBOM 1A and the procedure for approaching by RNAV instrument (GNSS), Z RWY 15 were performed;

r) the descent and the approach procedure were correctly performed until the moment when the pilot uncoupled the autopilot;

s) the direction and intensity of the wind changed, changing from tail to head;

t) at 100ft height the aircraft was flying to the right of the runway's central axis;

u) the pilots correctly identified the lateral deviation of the aircraft, however, there was no effectiveness in correcting it;

v) the pilots did not identify that the lateral deviation led to the approach to a destabilized condition;

w) the aircraft crossed the runway threshold 15 at 80ft height, with 141kt VREF and descent rate of 650ft / min;

x) there was an increase in the intensity of the rain on the vertical of the runway;

y) the landing took place about 916m away from the threshold 15, with the right main landing gear outside the lateral limits of the runway;

z) the aircraft traveled 668m outside the runway;

aa) the commander regained control of the aircraft and returned it to runway 15;

bb) the runway had all inspections scheduled and in full working condition;

cc) the aircraft cleared the runway by taxiway “E” and parked at position 20 of apron 1;

dd) the crewmembers did not inform the ATC of the event involving an off-runway landing;

ee) the airline's runway mechanic reported the presence of grass stuck in the aircraft's lower fuselage to the SBGL apron and runway supervision team;

ff) runway 15/33 was cleaned;

gg) normal operation of runway 15/33 was resumed at 2100 (UTC) on 04MAR2019;

hh) the aircraft had substantial damage; and

ii) the crewmembers and passengers left unharmed.

3.2 Contributing factors.

- **Control skills – a contributor.**

The corrections applied to the flight commands, in order to control the tendency of the aircraft to laterally deviate to the right in relation to the center of SBGL runway 15, were not sufficient to stop this movement, nor to redirect the aircraft to the central axis of flight. Consequently, the aircraft touched the ground with the right main landing gear outside the runway's lateral limits.

- **Organizational climate – undetermined.**

When considering the organizational climate present in the company at the time of the occurrence, it is possible that this scenario has influenced the assessments and,

consequently, the crew's decision to proceed with the landing, despite the adverse conditions encountered.

- **Adverse meteorological conditions – a contributor.**

The significant change in the direction and intensity of the wind in the final approach, which started to blow from the left abeam, and the increase in the intensity of the rain on the Aerodrome, which impaired the pilots' peripheral vision and compromised the exact notion of depth of the aircraft in relation to the runway, contributed to the drifting movement of the aircraft to the right side of the SBGL runway 15.

- **Crew Resource Management – a contributor.**

When the aircraft was flying below 100ft height, the copilot conducted several callouts stating that the aircraft was off the runway axis. The commander collated the first ones, however, after a certain moment; he no longer properly responded to the copilot's callouts and proceeded to land, despite the repeated alerts received.

The copilot, even realizing that the commander's corrections were not enough to control the aircraft and return it to the central axis of the runway, did not ask the commander, more assertively, to execute a go-around procedure in flight.

This showed that the crewmembers had enough information to discontinue the landing, but they chose not to use this feature, which contributed to the occurrence.

- **Piloting judgment – a contributor.**

There was an incomplete assessment of the aircraft's flight conditions. Once the tendency of lateral deviation to the right of the central axis of the runway was detected, the pilots thought it possible to correct this tendency in time to make the landing safely, which contributed to the outcome of the occurrence.

- **Perception – a contributor.**

The maintenance of the focus on the lateral deviation of the aircraft interfered in the identification of other variables present, such as the condition of destabilization and low visibility, which could affect the landing in a safe way. Thus, this selective perception, reinforced by the expectation of completing the landing at the destination, contributed to the outcome of this occurrence.

- **Management planning – undetermined.**

All crewmembers on flight O66227 were called for the mission in accordance with the on notice roster. The calling of the copilot and the flight chief did not adhere to the established in the company's MGO; consequently, both were late to present themselves for the aircraft commander. Flight O66227 took off 30 minutes after the scheduled time.

It is possible to consider that the delayed takeoff from Salvador to Rio de Janeiro had a negative influence on the assessments and the decision of the crewmembers to proceed with the execution of the landing.

- **Decision-making process – a contributor.**

There was a compromised analysis of the information available to the crew, so that the aircraft's destabilization condition was not considered, as well as the meteorological degradation in the final approach, culminating in the decision to try to correct the aircraft until the last moment, even if unanswered, and proceed with the landing on SBGL.

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".

Recommendations issued prior to the publication of this report:

To the Brazil's National Civil Aviation Agency (ANAC):

IG-036/CENIPA/2019 - 01 Issued on 16/05/2019

Work together with Oceanair Airlines S.A (Avianca), so that the operator ensures and provides the presentation of the crewmembers for the beginning of the trip in adequate time on the ground, aiming at the appropriate service to the plane, to the crewmembers and passengers, in accordance with the company's MGO, approved by the Civil Aviation Authority.

IG-036/CENIPA/2019 - 02 Issued on 16/05/2019

Work together with Oceanair Airlines S.A (Avianca), so that the operator ensures the disclosure of relevant information about the situation of judicial recovery experienced, through the company's internal communication channels, seeking to stabilize the organizational climate and consequently, maintaining acceptable levels of operational safety.

Recommendations issued at the publication of this report:

To the Brazil's National Civil Aviation Agency (ANAC):

IG-036/CENIPA/2019 - 03 Issued on 02/12/2021

Develop and implement specific monitoring and control processes and protocols in regular and non-regular public air transport companies, which are in the process of judicial reorganization, in order to prevent their crewmembers, maintainers and other employees from carrying out their daily work activities with their respective salaries and bonuses in arrears, in order to ensure that air operations take place as established in their MGO, as well as that these companies operate with the appropriate number of crewmembers to the size of their air network.

5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN.

Using the recommendations issued by the CENIPA, on 16MAY2019, as another tool in the internal decision-making process, the Oceanair Airlines Operational Safety Department (DSO) (Avianca) recommended, for the company's Operations Directorate, the suspension of its regular operations, recording the advice in the minutes of the meeting of the Operational Safety Commission, held on 24MAY2019.

The Operations Directorate informed the ANAC about the recommendation to suspend operations issued by the DSO of the Oceanair Airlines (Avianca).

In the possession of the advisory issued by the company's DSO, the ANAC carried out, on a precautionary basis, the suspension of its CHETA n° 2003-09-0ONE-03-02, on 24MAY2019, according to section 119.41 (b) RBAC 119.

On February 12th, 2021.