

**COMANDO DA AERONÁUTICA**  
**CENTRO DE INVESTIGAÇÃO E PREVENÇÃO DE**  
**ACIDENTES AERONÁUTICOS**



**FINAL REPORT**  
**A - 009/CENIPA/2020**

<b>OCCURRENCE:</b>	<b>ACCIDENT</b>
<b>AIRCRAFT:</b>	<b>PR-CJD</b>
<b>MODEL:</b>	<b>AS 350 B2</b>
<b>DATE:</b>	<b>18JAN2020</b>



## NOTICE

*According to the Law n° 7565, dated 19 December 1986, the Aeronautical Accident Investigation and Prevention System – SIPAER – is responsible for the planning, guidance, coordination and execution of the activities of investigation and prevention of aeronautical accidents.*

*The elaboration of this Final Report was conducted 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 n° 21713, dated 27 August 1946.*

*Thus, it is worth highlighting the importance of protecting the persons who provide information regarding an aeronautical accident. The utilization of this report for punitive purposes maculates the principle of “non-self-incrimination” derived from the “right to remain silent” sheltered by the Federal Constitution.*

*Consequently, the use of this report for any purpose other than that of preventing future accidents, may induce to erroneous interpretations and conclusions.*

**N.B.: This English version of the report has been written and published by the CENIPA with the intention of making it easier to be read by English speaking people. 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

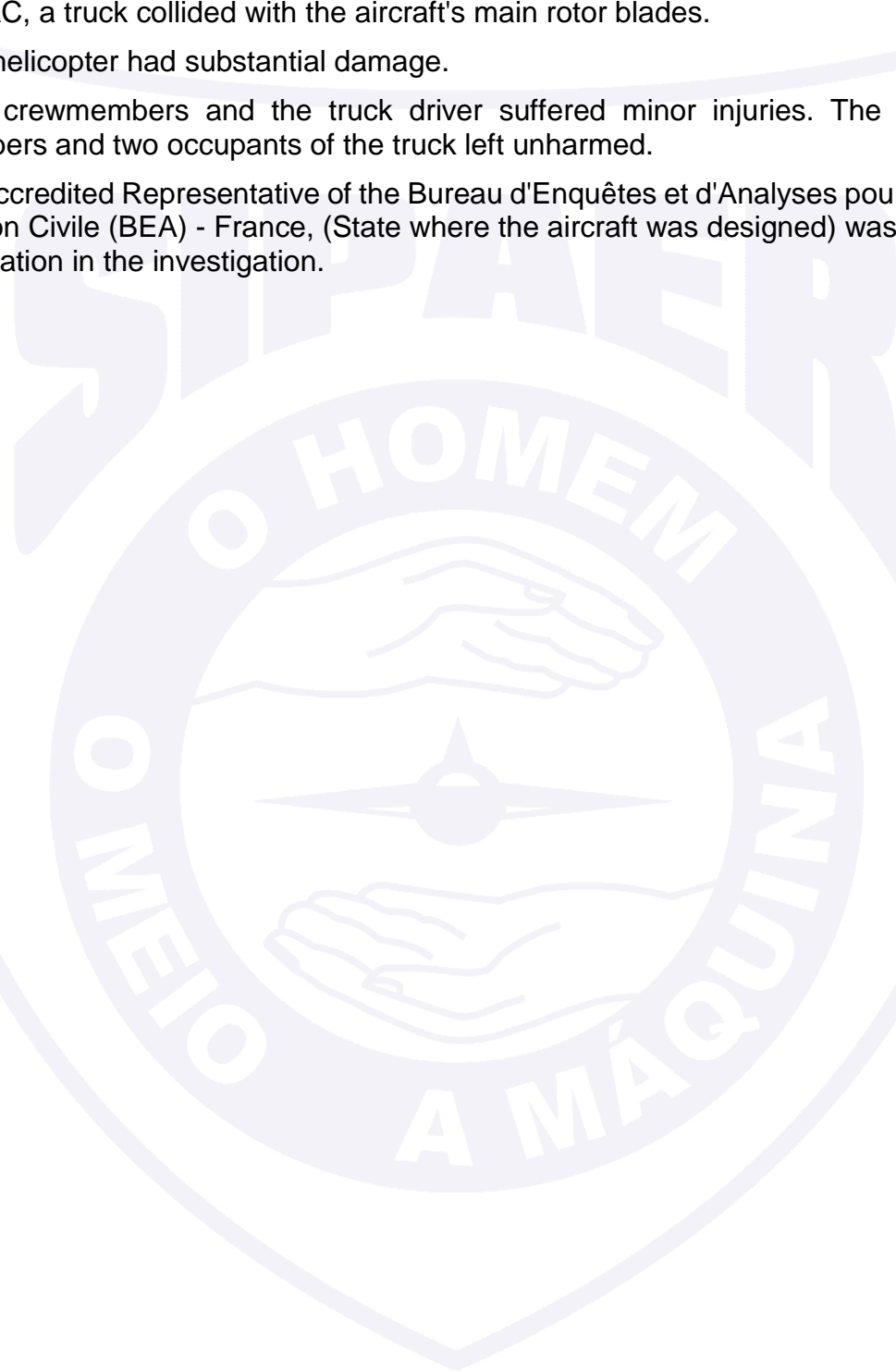
This is the Final Report of the 18JAN2020 accident with the AS 350 B2 aircraft model, registration PR-CJD. The accident was classified as “[OTHR] Other/ Vehicle and Aircraft Collision”.

After starting the engine to return to the Plácido de Castro Aerodrome (SBRB), Rio Branco - AC, a truck collided with the aircraft's main rotor blades.

The helicopter had substantial damage.

Two crewmembers and the truck driver suffered minor injuries. The other three crewmembers and two occupants of the truck 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 designed) was designated for participation in the investigation.



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## GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS

ADE	Aircraft Registration Category – Direct State Administration
ANAC	Brazil's National Civil Aviation Agency
CA	Airworthiness Certificate
CENIPA	Aeronautical Accident Investigation and Prevention Center
CIOPAER	Integrated Air Operations Center
CMA	Aeronautical Medical Certificate
CRM	Crew Resource Management
CSO	Operational Safety Coordinator
EPI	Personal Protective Equipment
FCU	Fuel Control Unit
HMNT	Single Turbo Helicopter Rating
IAM	Annual Maintenance Inspection
IS	Supplementary Instruction
METAR	Meteorological Aerodrome Report
MGSO	Safety Management Manual
MOP	Operations Manual
MPPO	Operating Procedures Standardization Manual
NVIS	Night Vision Imaging System
OM	Maintenance Organization
PCH	Commercial Pilot License – Helicopter
PIC	Pilot in Command
POP	Standard Procedures
PPH	Private Pilot License – Helicopter
P-PSAC	Small Civil Aviation Service Provider
PTO	Operational Training Program
RBAC	Brazilian Civil Aviation Regulation
RBHA	Brazilian Aeronautical Certification Regulation
SBRB	ICAO Location Designator - Plácido de Castro Aerodrome, Rio Branco - AC
SEJUSP	Acre State Department of Justice and Public Security
SGSO	Safety Management System
SIC	Second in Command
SOP	Standard Operational Procedures
UAP	Public Air Unit
UTC	Universal Time Coordinated

## 1. FACTUAL INFORMATION.

Aircraft	<b>Model:</b> AS 350 B2	<b>Operator:</b> Public Security Department – SESP
	<b>Registration:</b> PR-CJD	
	<b>Manufacturer:</b> Helibras	
Occurrence	<b>Date/time:</b> 18JAN2020 - 1515 UTC	<b>Type(s):</b> [OTHR] Other
	<b>Location:</b> BR 314, KM 124	
	<b>Lat. 10°00'41"S Long. 067°47'24"W</b>	<b>Subtype(s):</b> Vehicle and Aircraft Collision
	<b>Municipality – State:</b> Rio Branco – AC	

### 1.1 History of the flight.

The aircraft took off from the Plácido de Castro Aerodrome (SBRB), Rio Branco - AC, in order to carry out a police operation, with five crewmembers on board.

During the operation, the helicopter landed on a public road, at kilometer 124 of the BR-314, in the municipality of Santa Inês, metropolitan region of Rio Branco.

After starting the engine to return to SBRB, while the pre-takeoff checks were being carried out, a truck collided with the helicopter's main rotor blades.

The aircraft had substantial damage.

Two crewmembers and the truck driver suffered minor injuries. Three other crewmembers and two occupants of the truck left unharmed.

### 1.2 Injuries to persons.

Injuries	Crew	Passengers	Others
Fatal	-	-	-
Serious	-	-	-
Minor	2	-	1
None	3	-	2

### 1.3 Damage to the aircraft.

The aircraft had substantial damage to the main rotor, transmission, tail cone and right-side door.



Figure 1 - View of the aircraft after the collision and total rotor stop.

### 1.4 Other damage.

The truck had damage to the right front and right side of the trunk (Figure 2).



Figure 2 - Condition of the truck after the impact against the main rotor of the aircraft.

## 1.5 Personnel information.

### 1.5.1 Crew's flight experience.

Flight Hours		
	PIC	SIC
Total	1.142:50	200:55
Total in the last 30 days	13:40	21:00
Total in the last 24 hours	02:40	02:40
In this type of aircraft	803:10	160:50
In this type in the last 30 days	13:40	21:00
In this type in the last 24 hours	02:40	02:40

**N.B.:** The data related to the flown hours were informed by the pilots.

### 1.5.2 Personnel training.

The PIC took the PPH course at EDRA *Escola de Aeronáutica*, in Ipeúna – SP, in 2005.

The SIC took the PPH course at EDRA *Escola de Aeronáutica*, in Ipeúna – SP, in 2013.

### 1.5.3 Category of licenses and validity of certificates.

The PIC had the PCH License and the SIC had the PPH License.

Both had valid HMNT Ratings.

### 1.5.4 Qualification and flight experience.

The pilots were qualified but did not have experience in landing and taking-off operations on traffic lanes.

Both reported having performed the same operation the day before, but there were no records of training for the type of operation.

Despite having landed on the same location the day before, it was found that landing on traffic lanes was not routine. During the interviews with the crew, none of them remembered another operation of that type.

### 1.5.5 Validity of medical certificate.

The pilots had valid CMAs.

## 1.6 Aircraft information.

The aircraft, serial number 4727, was manufactured by Helibras, in 2009, and it was registered in the ADE category.

The aircraft had valid Airworthiness Certificate (CA).

The airframe and engine logbook records were updated.

The last inspections of the aircraft, the "10H/7D/3M" type were carried out on 15JAN2020 by the maintenance organization AEROMOT, in Rio Branco - AC, with the aircraft having flown 3 hours and 30 minutes after the inspection.

The last inspection of the aircraft, the "IAM" type was carried out on 11SEPT2019 by the maintenance organization AEROMOT, in Rio Branco - AC, with the aircraft having flown 107 hours and 20 minutes after the inspection.

During the documentary verification of the maintenance records, it was found that the aircraft had flown, in the periods mentioned in Figure 3, with the 7D and 10H airframe inspection and 7D and 15H engine inspection expired.

Período	Quantidade dias	Total de horas voadas
11/09 a 03/10/2019	22	31:00
17/10 a 05/11/2019	19	18:35
19/11 a 09/12/2019	20	06:40
19/12/2019 a 08/01/2020	21	21:30

Figure 3 - Data related to periods flown with inspections expired.

According to reports, this happened because the mechanic responsible for the services, whose company was based in Porto Alegre - RS, worked fortnightly in Rio Branco, at the CIOPAER, and stayed the other fifteen days at the headquarters of the company.

As a result, maintenance actions were only performed during periods when this professional remained in Rio Branco.

The investigators also noted that, in Part I - Monthly Use Records - of the engine logbook, there were pencil notes, erasures and, in some cases, the ANAC code or the signature of the person who made the transcripts was missing.

Similarly, some records in Part I of the airframe logbook did not contain the ANAC code or the signature of the person responsible for it (Figures 4 and 5).

CONTROLE MENSAL				CONTROLE TOTAL				CÓDIGO / RUBRICA
MÊS/ANO	HORAS	CSN	NTL	CSN	TSO	CSO	NTL	
12/2/14				1802.7	2885.91	2520		13049 4
03/01/15	12.2	12.54	14	1915.9	2886.03	2534		13049 4
04/01/15	28.2	40.05	5.5	1944.6	2891.06	2639		13049 4
05/01/15	16.3	21.72	9.2	1963.9	2911.29	2616		13049 4
06/01/15	10.3	18.02	1.6	1974.5	2926.01	2639		13049 4
07/01/15	16.8	22.07	2.2	1991.5	2958.01	2659		13049 4
08/01/15	25.9	27.28	3.4	2007.3	2986.35	2689		13049 4
09/01/15	43.3	50.16	6.2	2051.1	3038.11	2755		13049 4
10/01/15	39.5	50.85	6.3	2090.5	3089.96	2818		13049 4
11/01/15	14.6	22.04	3.5	2106.9	3122.0	2853		13049 4
12/01/15	0.3	0.22	1	2111.1				
01/01/16	0.3	0.25	1	2111.4				
02/01/16	0			2111.4				
03/01/16	0			2111.4				
04/01/16	0			2111.4				
05/01/16	0			2111.4				
06/01/16	0			2111.4				
07/01/16	0			2111.4				

Figure 4 - Image of Part I of the Engine Logbook, containing records filled in with pencil (green highlight) and erasures (orange highlight).



CONTROLE MENSAL						CONTROLE TOTAL					
MÊS/ANO	HORAS	TRANSPORTE	TSN	CSN	CÓD./RUB.	MÊS/ANO	HORAS	TRANSPORTE	TSN	CSN	CÓD./RUB.
JAN/16	0	0	2133,1	6716		01/16	16,8	30	2412,2	7223	
FEB/16	22,0	24	2461,1	6940		02/16	13,6	42	2437,1	7495	
MAR/16	9,5	20	2170,6	6760		03/16	10,4	40	2475,5	7235	
ABR/16	13,5	43	2184,1	7203		04/16	13,7	24	2402,2	7257	
MAY/16	41,1	73	2275,2	2076		05/16	1,2	3	2411,4	7280	
JUN/16	19,9	51	2245,1	2122		06/16	0	0	2461,4	7260	
JUL/16	11,7	44	2230,8	2121		07/16	0	0	2461,4	7260	
AUG/16	21,9	33	2239,2	2002		08/16	0	0	2461,4	7260	
SET/16	16,1	69	2289,8	2223		09/16	0	0	2461,4	7260	
OCT/16	13,5	37	2302,3	2312		10/16	0	0	2461,4	7260	
NOV/16	13,1	50	2315,4	2362		11/16	0	0	2461,4	7260	
DEZ/16	14,6	19	2320,0	2381		12/16	14,8	51	2473,2	7813	
JAN/17	12,9	72	2340,9	2433		01/17	6,6	19	2489,8	7832	
FEB/17	14,0	93	238,9	2366		02/17	4,4	7	2492,6	7833	
MAR/17	14,9	42	2376,8	2368		03/17	2,8	38	2495,4	7868	
ABR/17	10,6	26	2337,4	2574		04/17	1,6	4	2495,0	7908	
MAY/17	16,3	28	2401,2	2623							

Figure 5 - Image of Part I of the Airframe Logbook, containing records without the signature and the ANAC code of the person responsible for it (highlighted yellow).

### 1.7 Meteorological information.

The METAR of SBRB at 1500 (UTC), 10 NM away from the place of the occurrence, had the following information:

METAR SBRB 181500Z 17003KT 9999 SCT015 29/24 Q1015

Conditions were found to be favorable for the visual flight, with visibility above 10 km and sparse clouds at 1,500 ft. The wind had an intensity of 3 kt.

### 1.8 Aids to navigation.

Nil.

### 1.9 Communications.

The aircraft was equipped with a radio communicator, used for coordination with police teams on the ground, however, this equipment was inoperative at the time of the occurrence.

Due to this failure, the commander of the aircraft assigned a crewmember to carry out the necessary coordination with the police teams on the ground, through a portable radio. However, according to reports, this crewmember did not make the call to the teams of the police checkpoint that supported the operation.

### 1.10 Aerodrome information.

The occurrence took place out of the Aerodrome.

### 1.11 Flight recorders.

Neither required nor installed.

### 1.12 Wreckage and impact information.

The truck collided with the aircraft's main rotor while it was making the turn on the BR-364's return and stopped 28 meters ahead. According to reports, the driver intended to access the gas station on the other side of the highway.

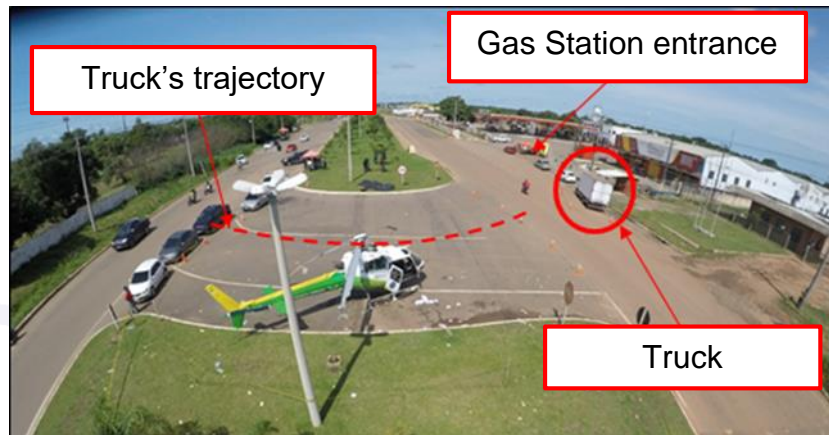


Figure 6 - Aerial view of the occurrence site.

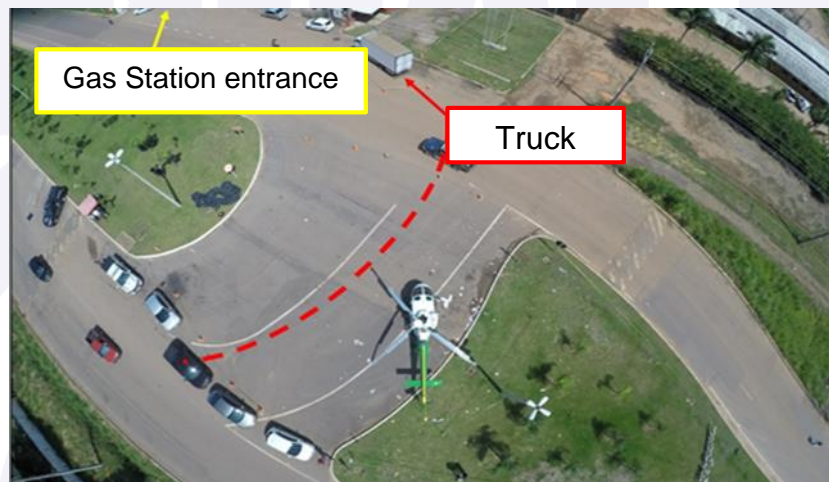


Figure 7 - Aerial view of the wreckage site. The red dotted line indicates the truck's trajectory. The yellow arrow indicates the entrance to the station.

### 1.13 Medical and pathological information.

#### 1.13.1 Medical aspects.

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

#### 1.13.2 Ergonomic information.

Nil.

#### 1.13.3 Psychological aspects.

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

### 1.14 Fire.

There was no fire.

### 1.15 Survival aspects.

During the departure procedure, the crewmember on the right had informed, through the internal phone, that he was ready. According to standard phraseology, this meant he would already be safe, with his lap belt fastened and his helicopter personal restraint cord "monkey harness" attached to the aircraft.

However, he was still without his lap belt fastened. At the moment of the impact of the truck against the helicopter, he was thrown out of the aircraft and held by the "monkey harness", having suffered minor injuries in the leg and in one of the hands.

The crewmember on the left, who accompanied the engine starting outside the helicopter, was the last to board and was not ready yet. With the collision, he fell from the aircraft.

At the time of the accident, none of the tactical air crewmembers was wearing the lap belt.

In the course of the investigation, it was found that the “monkey harness” type seat belts used by the tactical air operators were handcrafted and that each crewmember defined the length of the cable as deemed convenient.

The “monkey harness” used by the crewmember on the left, for example, allowed his body to exceed the limit of the aircraft's ski, at his option.

In addition, no one on board wore a helmet and only the SIC wore gloves.

#### **1.16 Tests and research.**

Nil.

#### **1.17 Organizational and management information.**

According to Article 1 of Decree No. 4,564, of 11SEPT2009, of the Acre's Government, the CIOPAER, part of the organizational structure of the Acre's SEJUSP, was created on 14SEPT2009 with the following purpose:

Art. 1 The CIOPAER is created in the organizational structure of the SESP, with the purpose of maximizing the control, integration and optimization of air resources available in the Public Security System and Civil Defense of the Acre State, whether in preventive, repressive or aiding police activities.

In this context, the CIOPAER performed police, rescue and citizenship operations, in response to the flight demands of the Military and Civil Police, as well as the Fire Department.

The CIOPAER had the following organizational structure, according to its Internal Regulation, 1st Edition, 2014:

- General coordinator;
- Administrative coordinator;
- Maintenance Coordinator;
- Operations and Instruction Coordinator; and
- Operational Security Coordinator.

There was also the position of deputy coordinator, which was designated through a state ordinance, but this function was not provided for in the Internal Regulation in force at the time of the accident.

On the date of the occurrence, the position of General Coordinator was vacant, as the last manager had been dismissed in the previous month.

The UAP fleet consisted of three aircraft: two helicopters and one plane.

The crew consisted of six pilots in command (one was away at the time of the accident), two second-in-command pilots and fifteen tactical air operators. Generally, flights were carried out with one pilot in command, one second in command and two tactical air operators.

The training of pilots and air tactical crew was done out of the state, in agreement with other operators and the UAP in Brazil.

In addition to the operational function, the crew also accumulated administrative functions.

The CSO had taken the SGSO course, given by the ANAC, in 2018, and had been appointed to the position shortly after completing this training.

On the date of the accident in question, the Resolution No. 512 of 11APR2019 was already in force, which approved the RBAC No. 90 - Requirements for Special Operations in Public Aviation, which established the following transition rules:

Art. 2 The following transitional provisions apply to the RBAC No. 90, Amendment No. 00:

I - the UAPs, as defined in the RBAC No. 90, of public agencies and entities will have until 12APR2022, to comply with the provisions of Subpart B of the RBAC No. 90;

II - for UAPs created after 12APR2019, the public agency or entity will have a period of up to 48 (forty-eight) months, from the date of formalization of the referred UAP, to comply with the provisions of Subpart B of the RBAC No. 90, provided that the risks to operational safety are mitigated;

III - the examiner already accredited on the date of publication of these Regulations must comply with the requirements of sections 90.47 and 90.49, as applicable, from 12APR2020 on, under penalty of disqualification;

IV - the UAP that does not have a properly qualified Tactical Air Operator and/or Medical Support Operator, in accordance with this Regulation, will have a deadline until 12APR2020 to comply with the requirement of composition of the operational crew, pursuant to section 90.21, since that the risks associated with this absence have been mitigated;

V - the stages of the MOP implementation plan must take place within the following deadlines:

- a) until 12APR2020, for the preparation of the MOP;
- b) until 12JUL2020, for approval of the MOP by the UAP manager;
- c) until 12OCT2020, for the dissemination of the MOP content to those involved in UAP air operations; and
- d) until 12APR2021, for the implementation of all procedures and policies defined in the MOP by the UAP;

VI - the stages of the SOP implementation plan must take place within the following deadlines:

- a) until 12APR2020, for the preparation of the SOP;
- b) until 12JUL2020, for approval of the SOP by the UAP manager;
- c) until 12OCT2020, for the dissemination of the SOP content to those involved in the UAP air operations; and
- d) until 12APR2021, for the implementation of all procedures and policies defined in the SOP by the UAP;

VII - public agencies and entities must comply with the provisions of Subpart K of RBAC No. 90 from 12APR2020;

VIII - public agencies and entities will have until 12JUL2020 to comply with the provisions of Subpart M of the RBAC No. 90, being allowed the use of training programs approved according to Subpart K of RBHA 91 during the term of this provision transient;

IX – the UAP pilots-in-command and second-in-command pilots who completed training by 12APR2019 and under subpart K of the RBHA 91, will have a maximum term of 24 (twenty-four) months, counted from the start date of the ground curriculum for initial, periodic, level-up or transition training to carry out the periodic training provided for in section 90.179 of the RBAC No. 90. Once this period has elapsed, the pilot must carry out the initial training, provided for in section 90.171 of the RBAC No. 90;

X – the UAP may use PCA/H or PLA/H as flight instructors until 12APR2020. After this period, the UAP must provide theoretical and practical instructions with qualified instructors under the RBAC No. 90;

XI - until 12APR2021, the UAP is entitled to perform instructor training for pilots holding a valid INVA/H license; however, these pilots must take the observation exam, in accordance with section 90,253 by 12APR2021 and have knowledge of the UAP training program; and

XII - the UAP may use pilot-in-command or instructors with notorious expertise to carry out the NVIS air operations, as defined in the RBAC No. 90, for a period determined by the agency or public entity.

Thus, at the time of this occurrence, some CIOPAER operations were still subject to the requirements established in Subpart K - Air Public Security and/or Civil Defense Operations, of the RBHA No. 91, Amendment 91-12, of 30DEC2005, which dealt with the General Operating Rules for Civil Aircraft.

Among the rules and procedures applicable to such activities, Subpart K of the RBHA 91 specified, in its section 91.963 - Responsibilities of Public Security and/or Civil Defense Authorities, letter (b), the following:

91.963 - RESPONSIBILITIES OF PUBLIC SECURITY AND/OR CIVIL DEFENSE AUTHORITIES

In addition to the responsibilities already mentioned in this subpart, the Agency involved in an air public security and/or civil defense operation is responsible for:

[...]

(b) Adopt precautionary measures aimed at the safety of the population and properties in the area of operation;

With regard to operational safety, the CIOPAER fell into the category of P-PSAC, as defined in item II, of Article 2, of Resolution No. 106, of 30JUN2009, which instituted the SGSO for small civil aviation service providers, as follows:

Art. 2 For the purposes of this Resolution, the following are considered to be small civil aviation service providers:

[...]

II - Public Security and/or Civil Defense air operators (ruled by Subpart K of the RBHA/RBAC 91);

In this context, paragraph 8 of the aforementioned Resolution established the following:

8. OPERATIONAL SAFETY MANAGEMENT MANUAL (MGSO) 8.1. PREPARATION AND UPDATE OF MGSO

8.1.1. A P-PSAC must develop and maintain documentation of data relating to its OSMS and the operational security status of its organization in paper or electronic media.

8.1.2. The P-PSAC must prepare a MGSO, consolidating its SGSO in order to meet the requirements established in this document.

Among other considerations about the MGSO, Resolution No. 106 provided the following:

8.5. MGSO DISCLOSURE

8.5.1. The P-PSAC must disclose its MGSO to all sectors and respective employees of the organization, in its entirety or only the relevant parts, since each has its share of cooperation in its operational results and, consequently, in the safety performance operational. Disclosure aims to ensure that its guidelines are assimilated and practiced in a comprehensive manner, contributing to the minimization of existing risks.

The CIOPAER's Internal Regulation also established, in its Article 9, items VIII to XIII, the following:

Art. 9 It is incumbent upon the Operational Safety Coordination:

[...]

VIII - promote training and dissemination of the MGSO to ensure that the necessary human resources are able to carry out their activities;

IX - maintain documentation and records of processes aimed at operational safety, including duly updated control mechanisms;

X - to implement and encourage an operational safety doctrine at the CIOPAER;

XI - maintain collections in aviation safety media or printed matter;

XII - create, maintain and update the MGSO;

XIII - participate or promote operational safety events.

According to reports, the Operational Safety Coordination was not effective in performing the functions assigned to it, since the crew involved in this accident reported not knowing the existence of the MGSO. In addition, during the investigation process, it was found that this manual had not been approved by the General Coordinator.

The UAP also had a MPPO, published in the Acre's Official Gazette n°10,450 of 30DEC2010, which presented a description of the activities performed by it.

About the landing in a restricted area, this manual established, among others, the following actions for the applicable POP:

[...]

3. Operational crew: ensure the placement of safety belts (abdominal and "monkey harness").

[...]

8. If the place is free of transit of people and vehicles, make contact with ground personnel (PM or others) via radio, so that the chosen place for landing can be previously isolated.

With regard to the safety of the aircraft on the ground in a restricted area, the MPPO required, among other actions, the following:

[...]

6. With the aircraft already on the ground, the aircraft's Commander must coordinate the safety actions, until the main rotor comes to a complete stop. If the place is free of transit of people and vehicles, as soon as possible, make contact with ground personnel (PM or others), via radio or in person, so that the chosen place for landing can be isolated, directly assisting in safety.

This manual also established, among others, the following action for the take-off POP in a restricted area:

[...]

8. If the place is free of transit of people and vehicles, when possible, make contact with ground personnel (PM, BM, PC or others), via radio or in person, so that the chosen place for take-off can be previously isolated.

The MPPO mentioned the use of EPI for some operations. However, a guide to standardize the models and/or characteristics suitable for these materials was not presented to the Investigation Team.

The use of an abdominal seat belt, for example, was included in the POP for landing in a restricted area, but it was not listed in the take-off procedure. The need to wear a helmet was not mentioned in any of the POPs.

During the interviews, it was informed that it was common for the landings and take-offs in a restricted area to be carried out by pilots in command. On these occasions, the function of the second-in-command was to perform the necessary coordination by radio. No record of this procedure was found in the operating manuals.

With regard to crew training, Subpart K of the RBHA 91 established the following:

91.959 - QUALIFICATION, TRAINING AND PROFICIENCY

[...]

(d) It is the responsibility of the Agency to establish minimum aircrew training standards with respect to air public safety and/or civil defense operations specified in paragraph 91.953(b) of this regulation.

Regarding the operation of Public Security and/or Civil Defense in non-approved or registered locations, in the case of restricted areas in urban perimeters, the RBHA 91 provided the following information:

91.961 - SPECIAL OPERATING CONDITIONS

(a) The DAC, a priori, authorizes the following special operating conditions, which exclude the general provisions of this regulation, in air operations of public safety and/or civil defense, provided that the objective is protection and public rescue. It is incumbent upon the Agency to establish training programs and standard operating and flight safety procedures in order to guide the conduct of crews under such special conditions. (Our Emphasis).

[...]

(3) exemption from the requirements established in paragraph 91.102(d) of this RBHA for landings and take-offs in non-approved or registered locations, as well as in eventual landing areas.

(4) exemption from the requirements established in paragraph 91.102(e) of this RBHA for the embarkation or disembarkation of persons from the aircraft with the engines running.

The PTO made available by the organization dated from 01JUN2015. This document was neither signed nor published. No formal records were presented proving the performance of the planned training.

This program did not mention the operation in a restricted area located in an urban perimeter.

The CIOPAER did not have a CRM training program.

It should also be noted that, during the interviews, it was found that, when the aircraft was unavailable for the flight, the crew returned to their organizations of origin to carry out activities not related to the air operation.

### **1.18 Operational information.**

The PIC had remained away from the air activity for a long period. According to what was informed, in mid-July 2019, he had performed his rehabilitation on the aircraft. However, no record of this training was presented. There was no record of his last CRM training.

The SIC reported having carried out the CRM in 2011, before joining the UAP. Likewise, no record of this training was presented to investigators.

According to information collected in interviews performed with the crew, in general, the roster was published weekly, in a group of messages. However, the crew was informed of this mission, by the Sub-coordinator of the CIOPAER, the day before.

This operation had been planned to take place only the day before the accident. However, it repeated itself the next day.

The crew consisted of 2 pilots and 3 air tactical crew.

In the 24 hours preceding this accident, the PIC and the SIC carried out a total of eight take-offs, in seven hours of uninterrupted work.

According to the reports collected, before the flight, the PIC carried out the mission's briefing and the pre-flight inspection, accompanied by the crew and mechanic.

After taking off from its base, the helicopter flew over some neighborhoods in the city of Rio Branco and made a passage over the highway, in order to check if there were adequate conditions for landing in the same place where they had landed the day before.

There was a police checkpoint 300 meters from the chosen landing site.

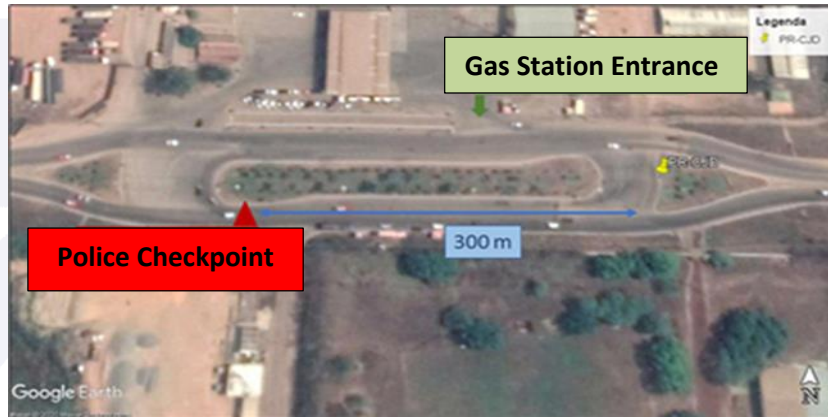


Figure 8 - Image illustrating the locations of the police checkpoint (red) and the landing of the helicopter (yellow). The blue arrow indicates the road and approximate distance.

The PIC chose to visually signalize, during the flyover, its intention to proceed to the landing, so that the ground personnel could stop the flow of vehicles, and entrusted the tactical aircrew on the left with this task. There was no bilateral radio contact between the aircraft and the barrier.

As the grassy area of the central roadbed had many light posts and trees, the aircraft captain chose to land on the paved area of a U-shaped return, which had two lanes, 23 m in total width.

For landing on the day of the occurrence, the PIC instructed the aircraft to be closer to the return curb in relation to the position in which it had been placed the day before. The intention was to position the helicopter as shown in Figure 9.

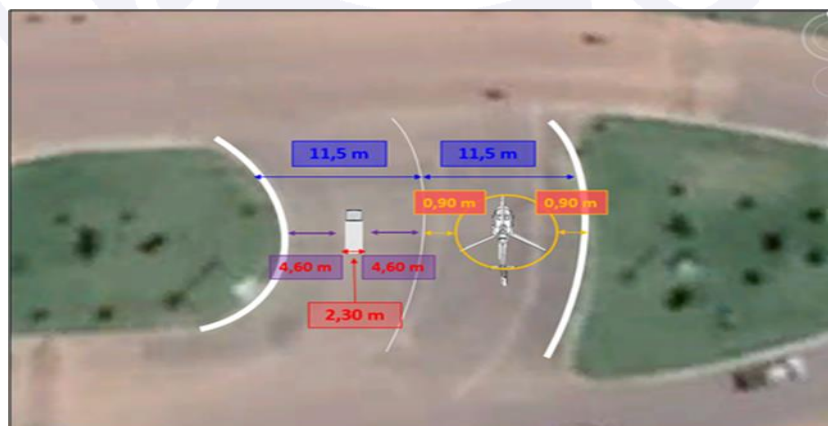


Figure 9 - Sketch with the approximate dimensions of the helicopter landing site and free spaces for the passage of vehicles.



After the engine was shutdown, the rear sector of the aircraft was marked out with a cone. Ground personnel were not called for this purpose, as prevised in the POP for aircraft safety on the ground in a restricted area.

The helicopter remained on the ground for approximately 30 minutes, with all crewmembers in close proximity to the aircraft. During this period, the flow of vehicles through the "U" return was released by the free lane.

This free flow of vehicles was prevised in the POP of Aircraft's Ground Safety in a Restricted Area as "Critical Activities". The "possibility of errors" included the crew's lack of judgment in relation to the risks at the landing site, as well as the approach of people or animals to the aircraft's rotors that were still in motion.

During the preparations for starting the engine and taking off, the left tactical aircrew went to the barrier and returned the cone that had been placed at the rear of the PR-CJD after landing. According to the reports collected, he informed that the helicopter would be activated, but he did not request the interruption of the flow of vehicles on the road or the previous isolation of the location.

As reported by the crew, the flow of vehicles was slow, the aircraft was visible and "noisy", and it was considered that it would not be necessary to ask the personnel of the police checkpoint to stop traffic.

Regarding the use of EPI, it was found that only the SIC wore gloves and none of the crew wore a helmet.

According to the PIC, its intention was to takeoff with the doors open and locked, but the impact happened before the completion of the "before take-off" checks.

Right after the impact, there was a strong vibration. Initially, the pilot did not understand what caused such vibration, so, when he saw the rotor blade passing broken in front of the aircraft, he performed the engine shutdown and waited for the rotor to stop.

The SIC mentioned having heard a noise, but also did not understand what had happened. His initial reaction was to protect himself. Then, when he realized that the PIC had forgotten to turn off the EMERG Switch, a key that cut off all electrical energy to the instruments on the panel, he turned it off.

After performing the aircraft abandonment, he instructed that the injured tactical air operators be taken to the hospital.

The analysis of the various available videos of the accident revealed that, during the performance of the procedures that would precede the take-off, none of the crew monitored the passage of vehicles on the road. In one of the videos, it was noticed that the truck entered the return, traveling through the middle of the lane, approximately over the white strip that divided it into two parts (Figure 10).



Figure 10 - Video image when the truck enters the return through the middle of the lane.  
Note the inexistence of beacons on the road.

According to the occupants of the truck, they neither saw nor heard the helicopter activated on the road.

The crew also informed, during the interviews, that they did not observe the approach of the truck. According to the PIC, the impact happened before the “before take-off” verification.

In this way, the truck's trunk entered the radius of the main rotor and was hit by it. The vehicle stopped 28 meters in front of the helicopter. The PR-CJD turned about 40° to the left before the rotors came to a complete stop.

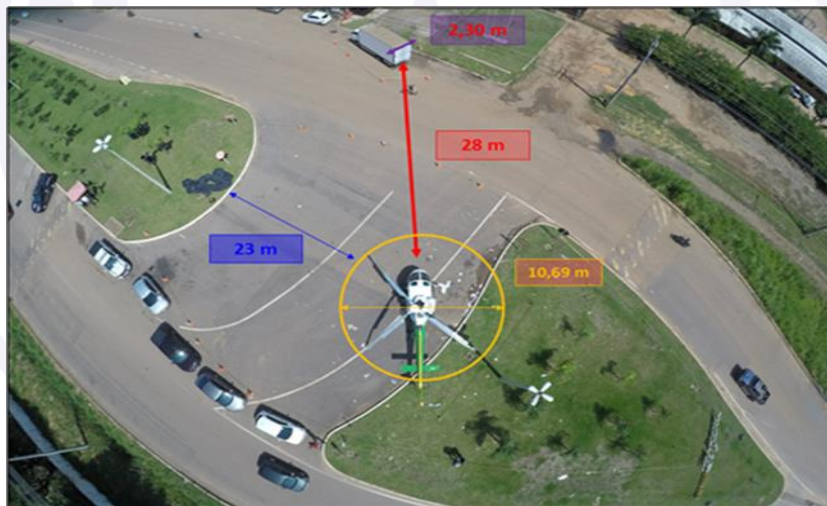


Figure 11 - Aerial image taken after the accident, showing the final positions of the truck and the aircraft after the impact.

### 1.19 Additional information.

Supplemental Instruction (IS) No. 43.9-003 Revision A, in force on the date of the occurrence, which dealt with the Airframe, Engine and Propeller Logbooks, provided, in its subitem 5.2.4 Part I - Monthly Use Control, letter E, the following:

5.2.4 Part I - Monthly Use Control: All airframe, engine and propeller logbooks must contain, right after the Opening Term, Part I, which constitutes the place for the Monthly Use Control. The content of Part I must contain at least what is established

on pages 26, 34 and 42 of this IS, and other information deemed pertinent may be added and aims to record the following:

[...]

e) For Airframe: Time Since New (TSN), Cycles Since New (CSN), Code and Initials of the person who transcribed the data in the "Full Control" field. For engine: Time Since New (TSN), Cycles Since New (CSN), Time Since Overhaul (TSO), Cycles Since Overhaul (CSO), Code and Initials of the person who transcribed the data in the "Full Control" field. For Propeller: Time Since New (TSN), Time Since Overhaul (TSO), Code and Rubric of the person who transcribed the data in the "Full Control" field, as applicable.

The same IS also established, in its item 5.7 - Form of Registration in Airframe, Engine and Propeller Logbooks, subitem 5.7.1, as follows:

5.7 Form of Registration in Airframe, Engine and Propeller Logbooks

5.7.1 The records in the airframe, engine and propeller logbooks must be made with ballpoint pens in blue or black, and legibly.

## 1.20 Useful or effective investigation techniques.

Nil.

## 2. ANALYSIS.

It was a flight to support crime combat operations carried out by the Military Police of Acre, within the scope of the CIOPAER's activities defined in its Decree.

Despite the fact that inaccuracies were identified in the airframe and engine logbook records, it was concluded that the airworthiness of the aircraft did not play a role in this accident.

The only abnormality identified in the aircraft was a malfunction in the radio communicator, used for the coordination with police teams on the ground. This condition was solved through the availability of a portable radio.

According to reports collected, the portable radio was not used to contact the police checkpoint teams that supported the air operation. Thus, the option of visually signaling the intention to land did not correspond to what was recommended in the UAP procedures manual, which prevised coordination via radio in item 8 of actions for landing in a restricted area.

Likewise, the fact that no support was requested for the isolation of the aircraft after landing characterized an inadequate assessment of the risks associated with the circulation of people and vehicles around the helicopter. The report of the truck's occupants, that they did not see or hear the helicopter activated, reaffirmed the need for isolation, as provided for in the manuals.

Based on the statements of those involved, it was found that the crew did not notice the approach of the truck, a fact that indicated a low level of attention to operational risks in that context.

It is noted, therefore, that there was an inefficiency in the use of human resources available for the operation and safety of the aircraft, due to inadequate management of the tasks assigned to each crewmember and failures in the communication process, which resulted in non-compliance with operational procedures.

The inadequacy of the interaction and mutual collaboration of team members may have been the result of deficiencies in the training process and in the systematic dissemination of manuals applicable to the operation conducted.

Thus, it was inferred that the training process previously received by those involved in the occurrence did not give them the fullness of knowledge and technical conditions necessary for the performance of that activity.

The PTO provided by the organization was neither signed nor published, and no record of the instruction applied in the UAP was presented to the investigators. In addition, the manual did not mention the operation of landing and taking off in a restricted area located in an urban perimeter.

The reports that indicated flaws in the Operational Safety Coordination, the crew's lack of knowledge of the MGSO, as well as the fact that it was not approved by the General Coordinator, were indicative of a weak flight safety culture within the scope of the UAP.

Such conditions affected the collective perception of its members regarding the risks inherent to police operations in urban areas, which resulted in the circumstances that led to this accident.

The fact that both crewmembers positioned on the sides of the aircraft were thrown out of the helicopter, due to the non-use of EPI, revealed the inadequacy in the planning carried out by the organization, at its management level, with regard to the provision and control of the use of equipment.

In this context, the non-conformities pointed out concerning the manuals and procedures that should guide air operations, the finding that the helicopter had flown with overdue inspections, as well as the lack of records on the completion of the planned training, affected the performance of the crew and compromised the safety of operations.

### **3. CONCLUSIONS.**

#### **3.1 Facts.**

- a) the pilots had valid CMAs;
- b) the pilots had valid HMNT Ratings;
- c) the pilots were qualified and did not have experience in operating on public roads;
- d) there were no records of operation/training for landing and taking-off on public roads;
- e) the aircraft had valid CA;
- f) the airframe and engine logbook records were outdated;
- g) Part I of the logbooks was completed in disagreement with the IS 43.9-003A;
- h) the planning carried out by the organization, at its managerial level, was inadequate;
- i) the MGSO had not been formally implemented;
- j) the radio communicator used between the aircraft and the vehicles on the ground was inoperative;
- k) there was no radio contact between the crew and the ground crew;
- l) the procedures prevised in the MPPO were not followed;
- m) there was free traffic of vehicles when the engine was started;
- n) a truck entered the return traveling along the middle of the lane;
- o) the occupants of the truck did not notice the aircraft;
- p) the crewmembers did not notice the approach of the truck;
- q) the truck's trunk was hit by the main rotor of the helicopter;

- r) the aircraft had substantial damage;
- s) two crewmembers and the truck driver suffered minor injuries; and
- t) three other crewmembers and the other two occupants of the truck left unharmed.

### 3.2 Contributing factors.

#### - **Attitude – a contributor.**

There was an inadequate assessment of the risks associated with the activation of the engine while vehicles and people could move freely around the helicopter, contrary to what was established in item 8 of the POP for take-off in a restricted area, which revealed a complacent attitude towards important procedures for the safety.

#### - **Training – a contributor.**

The lack of a formally implemented training program resulted in organizational failures that led to the non-performance of actions that could prevent the operation on a public road, without the proper isolation of the area.

#### - **Communication – a contributor.**

During take-off procedures on public roads, communication between the crewmembers and the crew on the ground (police checkpoint) did not involve the dissemination of relevant information about the operation.

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

There was inefficiency in the use of human resources available for the operation of the aircraft, due to inadequate management of the tasks assigned to each crewmember, which resulted in non-compliance with operational standards.

#### - **Organizational culture – a contributor.**

The weakness of the organization's safety culture was found, which affected the collective perception of its members in relation to the risks inherent to police operations in urban areas.

#### - **Team dynamics – a contributor.**

The inadequate evaluation of all parameters related to that operation, possibly resulting from deficiencies in the training process and in the systematic disclosure of applicable manuals, contributed to an inefficient performance by the team.

#### - **Instruction – undetermined.**

It was inferred that the training process previously received by those involved in the occurrence did not give them the fullness of knowledge and technical conditions necessary for the performance of that specific activity, a condition that affected their performance in that complex scenario.

#### - **Flight planning – a contributor.**

The need to interrupt the traffic of vehicles, of people, and the convenience of carrying out a detailed briefing involving the crew and ground crew (police checkpoint) were not adequately considered.

#### - **Management planning – a contributor.**

The fact that both crewmembers positioned on the sides of the aircraft were thrown out of the helicopter, due to the non-use of EPI, revealed the inadequacy in the planning carried out by the organization, at its management level, with regard to the provision and control of the use of equipment.

- **Organizational processes – a contributor.**

The inefficiency in the management of people and processes, including managerial planning, documentation of standards and procedures, risk management and operational safety management led to failures in supervision, in monitoring the performance of crewmembers and in the design of important organizational procedures for the maintenance of safety.

- **Support systems – undetermined.**

The inadequacies of the rules and manuals may have contributed to the procedures not having been effectively implemented in the UAP.

- **Managerial oversight – a contributor.**

The non-conformities pointed out in relation to the manuals and procedures that should guide air operations, the finding that the helicopter had flown with overdue inspections, as well as the lack of records on the completion of the planned training, affected the performance of the crew and compromised the operations safety.

#### **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 at the publication of this report:**

##### **To the Brazil’s National Civil Aviation Agency (ANAC):**

##### **A-009/CENIPA/2020 - 01**

**Issued on 02/09/2022**

Work with the CIOPAER, in order to that Center demonstrates that it has approved, implemented and keeps continuously adequate to its operational reality, a SGSO, a MGSO, a MOP, a PTO and a SOP, in accordance with the provisions of Appendix A of the RBAC No. 90.

##### **A-009/CENIPA/2020 - 02**

**Issued on 02/09/2022**

Act with the CIOPAER, in order to that Center demonstrates that the procedures, established requirements, and responsibilities related to the management supervision of activities are implemented, properly defined, and being fulfilled, notably concerning the control of the organization's documentation, to the completion and control of aircraft maintenance and activities planning, completion and monitoring of administrative, technical and operational performance levels.

##### **A-009/CENIPA/2020 - 03**

**Issued on 02/09/2022**

Work with the CIOPAER, in order to that Center structures a Training Program in CRM for the organization, under the provisions of Subpart M of the RBAC No. 90 and IS 00-010A.

**A-009/CENIPA/2020 - 04****Issued on 02/09/2022**

Disseminate the lessons learned in this investigation, with the operators ruled by the RBAC No. 90, in order to emphasize the need for faithful compliance with the established requirements, as well as the importance of implementing and maintaining the devices established by this regulation functioning properly as a prevention tool of aeronautical occurrences.

**5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN.**

None.

On February 09<sup>th</sup>, 2022.

