

COMANDO DA AERONÁUTICA
CENTRO DE INVESTIGAÇÃO E PREVENÇÃO DE
ACIDENTES AERONÁUTICOS



FINAL REPORT
A-055/CENIPA/2020

| | |
|--------------------|------------------|
| OCCURRENCE: | ACCIDENT |
| AIRCRAFT: | PP-ZCA |
| MODEL: | RV-7A |
| DATE: | 21ABR2020 |



NOTICE

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

The elaboration of this Final Report was conducted considering the contributing factors and hypotheses raised. The report is, therefore, a technical document which reflects the result obtained by SIPAER regarding the circumstances that contributed or may have contributed to triggering this occurrence.

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

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

This Final Report has been made available to the ANAC and the DECEA so that the technical-scientific analyses of this investigation can be used as a source of data and information, aiming at identifying hazards and assessing risks, as set forth in the Brazilian Program for Civil Aviation Operational Safety (PSO-BR).

This Report does not resort to any proof production procedure for the determination of civil or criminal liability, and is in accordance with Appendix 2, Annex 13 to the 1944 Chicago Convention, which was incorporated in the Brazilian legal system by virtue of the Decree no 21713, dated 27 August 1946.

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

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

N.B.: This English version of the report has been written and published by the CENIPA with the intention of making it easier to be read by English speaking people. Considering the nuances of a foreign language, no matter how accurate this translation may be, readers are advised that the original Portuguese version is the work of reference.

SYNOPSIS

This is the Final Report of the accident involving the model RV-7A aircraft, registration PP-ZCA, on 21 April 2020. The accident received the typification of “[LALT] Operation at low altitude”.

During a private flight, the airplane collided with tree branches and then with the ground, skidding for about 45 meters before coming to a stop in an upside-down position.

The aircraft was destroyed.

Both occupants of the aircraft (the pilot and a passenger) suffered fatal injuries.

For being the USA the State of engine manufacture, the National Transportation Safety Board (NTSB) appointed an Accredited Representative for participation in the investigation of the accident.



TABLE OF CONTENTS

| | |
|--|-----------|
| GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS | 6 |
| 1. FACTUAL INFORMATION..... | 7 |
| 1.1. History of the flight..... | 7 |
| 1.2. Injuries to persons..... | 7 |
| 1.3. Damage to the aircraft..... | 7 |
| 1.4. Other damage..... | 7 |
| 1.5. Personnel information..... | 7 |
| 1.5.1. Crew's flight experience..... | 7 |
| 1.5.2. Personnel training..... | 7 |
| 1.5.3. Category of licenses and validity of certificates..... | 8 |
| 1.5.4. Qualification and flight experience..... | 8 |
| 1.5.5. Validity of medical certificate..... | 8 |
| 1.6. Aircraft information..... | 8 |
| 1.7. Meteorological information..... | 8 |
| 1.8. Aids to navigation..... | 9 |
| 1.9. Communications..... | 9 |
| 1.10. Aerodrome information..... | 9 |
| 1.11. Flight recorders..... | 9 |
| 1.12. Wreckage and impact information..... | 9 |
| 1.13. Medical and pathological information..... | 10 |
| 1.13.1. Medical aspects..... | 10 |
| 1.13.2. Ergonomic information..... | 10 |
| 1.13.3. Psychological aspects..... | 10 |
| 1.14. Fire..... | 11 |
| 1.15. Survival aspects..... | 11 |
| 1.16. Tests and research..... | 11 |
| 1.17. Organizational and management information..... | 12 |
| 1.18. Operational information..... | 12 |
| 1.19. Additional information..... | 13 |
| 1.20. Useful or effective investigation techniques..... | 14 |
| 2. ANALYSIS..... | 14 |
| 3. CONCLUSIONS..... | 14 |
| 3.1. Findings..... | 14 |
| 3.2. Contributing factors..... | 15 |
| 4. SAFETY RECOMMENDATIONS | 15 |
| 5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN..... | 16 |

GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS

| | |
|----------|---|
| ANAC | Brazil's National Civil Aviation Agency |
| CAV | Flight Authorization Certificate |
| CAVE | Experimental-Flight Authorization Certificate |
| CENIPA | Aeronautical Accidents Investigation and Prevention Center |
| CIV | Pilot Logbook |
| CMA | Aeronautical Medical Certificate |
| CPTEC | Weather Forecasting and Climate Studies Center |
| DCTA | Department of Science and Aerospace Technology |
| GPS | Global Positioning System |
| IFRA | IFR Flight rating (Airplane) |
| IML | Institute of Legal Medicine |
| INPE | National Institute for Space Research |
| MLTE | Multi-Engine Land-Airplane Class Rating |
| MNTE | Single-Engine Land-Airplane Class Rating |
| NTSB | National Transportation Safety Board (USA) |
| PCM | Commercial Pilot License (Airplane) |
| PET | Experimental Aircraft (Private Category) |
| PIC | Pilot in Command |
| PPR | Private Pilot License (Airplane) |
| RAB | Brazilian Aeronautical Registry |
| RBAC | Brazilian Civil Aviation Regulation |
| RBHA | Brazilian Aeronautical Certification Regulation |
| REDEMET | Command of Aeronautics' Meteorology Network |
| RETA | Civil Liability Insurance for Air Carriers and Explorers |
| RIAM | Annual Maintenance Inspection Report |
| SERIPA V | 5 th Regional Service for the Investigation and Prevention of Aeronautical Accidents |
| SIPAER | Aeronautical Accidents Investigation and Prevention System |
| SN | Serial Number |
| UTC | Universal Time Coordinated |
| VFR | Visual Flight Rules |

1. FACTUAL INFORMATION.

| | | |
|------------|---|---|
| Aircraft | Model: RV-7A | Operator: [Private] |
| | Registration: PP-ZCA | |
| | Manufacturer: [Amateur Aircraft-BUILDER] | |
| Occurrence | Date/time: 21ABR2020 – 20:21 (UTC) | Type(s): [[LALT] Low altitude operations]] |
| | Location: [Fazenda Montesion] | |
| | Lat. [24°52'58"S] Long. [053°45'26"W] | |
| | Municipality – State: [Toledo - Paraná] | |

1.1. History of the flight.

[The aircraft took off from SIYM (*Fazenda Montesion* Aerodrome, *Toledo, Paraná*) on a private local flight, with the pilot and a passenger onboard.]

At about 20:21 UTC, while flying over *Fazenda Montesion*, the aircraft collided with tree branches and subsequently with the ground, skidding for about 45 meters before coming to a stop in an upside-down position.

The aircraft was destroyed in the crash.

Both occupants of the aircraft suffered fatal injuries.]

1.2. Injuries to persons.

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

1.3. Damage to the aircraft.

[The aircraft was destroyed.]

1.4. Other damage.

[NIL.]

1.5. Personnel information.

1.5.1. Crew's flight experience.

| | PIC |
|-----------------------------------|----------|
| Total | 2,500:00 |
| Total in the last 30 days | 10:00 |
| Total in the last 24 hours | 00:30 |
| In this type of aircraft | 100:00 |
| In this type in the last 30 days | 10:00 |
| In this type in the last 24 hours | 00:30 |

Obs.: [Third-party reports were the source of data relating to the hours flown by the pilot. The physical pilot logbook (CIV) was not found. There was a total of 274 hours and 59 minutes logged in his digital CIV.]

1.5.2. Personnel training.

[The PIC (Pilot in Command) did his PPR (Private Pilot – Airplane) course in 1970, at *Aeroclub do Paraná, Curitiba, State of Paraná*.]

1.5.3. Category of licenses and validity of certificates.

The PIC held a PCM license (Commercial Pilot - Airplane), as well as valid ratings for MNTE (Single-Engine Land Airplane), MLTE (Multi-Engine Land Airplane), and IFRA (IFR Flight - Airplane).

1.5.4. Qualification and flight experience.

The PIC underwent his latest proficiency exam on 22 November 2019, at *West Wing Escola de Aviação Ltda.* On that occasion, his performance was satisfactory in all the items of the evaluation form.

The examiner commented that the pilot had good knowledge of the aircraft and its systems, both under normal and emergency conditions. He also stated that the PIC showed to be adapted, demonstrating experience, good decision-making and skillfulness during the check flights.

According to reports, the pilot was qualified and experienced in the type of flight.

1.5.5. Validity of medical certificate.

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

1.6. Aircraft information.

The aircraft, Serial Number FVE-1816, of amateur construction, manufactured in 2010, was registered in the Private Category - Experimental (PET). It had room for a pilot and a passenger onboard.

The aircraft's Flight Authorization Certificate (CAV), number 101240, dated 07 October 2014, was valid for one year after issuance. After that period, the validity of the CAV would be the same as that of the RETA (Explorer or Air Carrier's Civil Liability Insurance Policy), valid up to 14 February 2020, or the Annual Maintenance Inspection Report (RIAM), valid until 19 October 2020, whichever expired first. Thus, one learned that the aircraft's CAV was not valid.

The airframe and engine logbooks were out of date, since their latest records dated from August 2011. The aircraft did not have a propeller logbook, and there was only one balance certificate, which had expired in September 2016.

1.7. Meteorological information.

The automatic station of the Center for Weather Forecasting and Climatic Studies (CPTEC) of the National Institute for Space Research (INPE) in *Toledo*, PR, registered (at 20:00 UTC) a temperature of 28.2°C, humidity of 38%, and wind with a direction of 135° at an intensity between 2 and 7 kt, without significant cloudiness or visibility restrictions (Figure 1).



Figure 1 - Aircraft crash-site, and the sky without restrictive/significant weather conditions.

According to the meteorological data gathered, the conditions were consistent with VFR flights.]

1.8. Aids to navigation.

[NIL.]

1.9. Communications.

[NIL.]

1.10. Aerodrome information.

[The accident occurred outside of aerodrome area.]

1.11. Flight recorders.

[Neither voice nor data recorders were required for the category of the aircraft in question.]

There was a Garmin MAP 695 Global Positioning System device equipping the aircraft. The NTSB analyzed the GPS, but found no relevant information related to the accident.

1.12. Wreckage and impact information.

[One verified that the crash-site was located between the airstrip of SIYM and the pilot's residence. Reports from witnesses informed that the airplane, after taking off with a passenger on board, remained flying at low altitude, performing a number of maneuvers both over the airstrip and the pilot's residence (Figure 2).

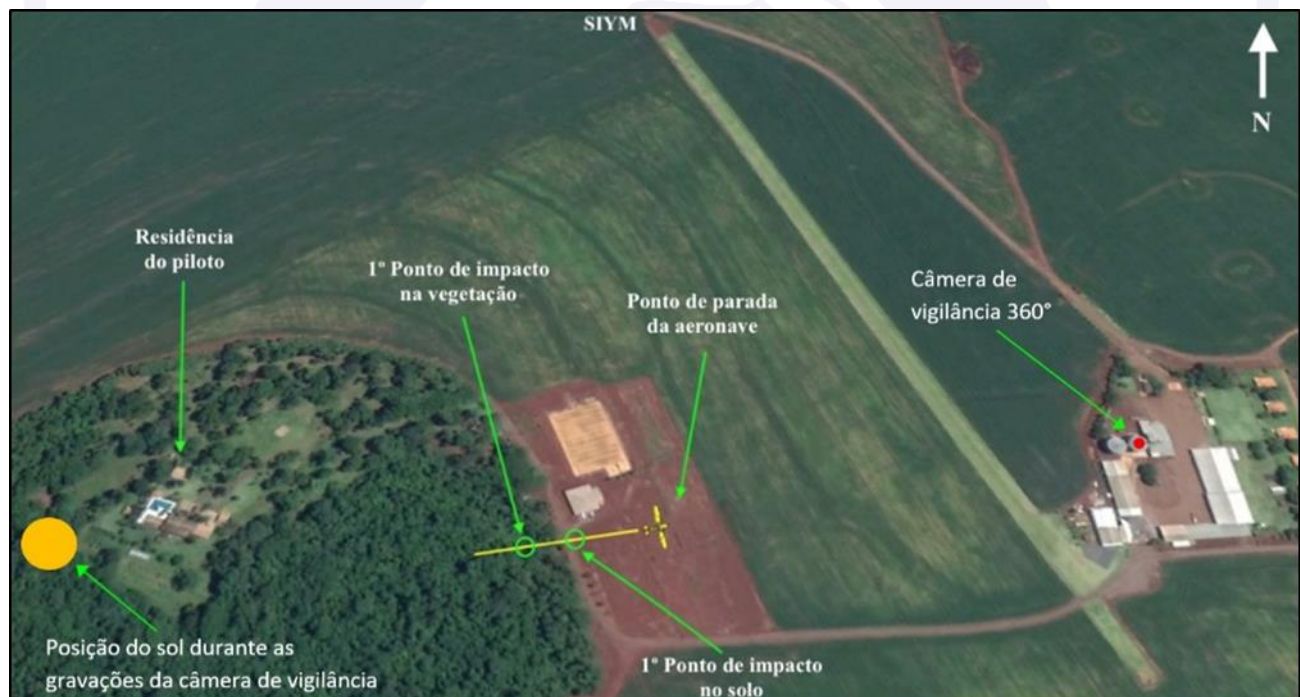


Figure 2 – A sketch of the occurrence, highlighting the points of impact on the trees and on the ground, as well as the final stop of the aircraft.

The aircraft first collided with tree branches and then with the ground, skidding for about 45 meters before coming to a complete stop (Figure 3).



Figure 3 - View of the impact points on the vegetation and on the ground. |

1.13. Medical and pathological information.

1.13.1. Medical aspects.

The Legal Medical Institute (IML) expert concluded that the cause of death of both occupants of the aircraft were the injuries sustained at the time of the aircraft's impact with the ground. Their blood samples were analyzed for the presence of alcohol, and the results were negative. The toxicological analysis also had a negative result.

The pilot had done his latest health checkup in Londrina, and it was valid until November 2020. His CMA (Aeronautical Medical Certificate) was valid at the time of the accident.

During the aforementioned checkup, the pilot said that he was making use of antidepressant medication, but a psychiatrist and a psychologist considered him fit for flights. On that occasion, the PIC was instructed to wear corrective lenses because of astigmatism.

1.13.2. Ergonomic information.

[NIL.]

1.13.3. Psychological aspects.

The pilot was a businessperson in the rural sector, owner of the farm and other aircraft. He was the administrator of his agricultural activities, and had joined a career in politics, as a substitute federal representative.

As for his personal characteristics, acquaintances described him as a friendly, generous, cheerful and active person. He had good interpersonal relationship with many people, and enjoyed entertaining his friends and relatives at home, often holding get-togethers.

Concerning his qualities as a pilot, they described him as a careful and experienced professional, who had a strong personality, with a bold and fearless profile. They also said that he had a great relationship with his family, and an intense social life.

People close to the PIC stated that he liked to perform local and acrobatic flights in the area of his property.

On the day of the occurrence, the pilot was at home with friends, and decided to make a local flight, inviting one of them to go with him.

According to accounts, the passenger was afraid of flying, but had been convinced to fly.

Some people near the place of occurrence on that day stated that the aircraft was making a low pass at the time of the accident.

1.14. Fire.

[There was no evidence of fire either in flight or after the aircraft stopped.]

1.15. Survival aspects.

[Nil.]

1.16. Tests and research.

[Because of the collision with trees and the ground, the aircraft sustained severe damage, such as dents, ruptures and deformations.

The aircraft's engine (Lycoming Engines, model Y10-360-M1B, SN L-35205-51E) was disassembled and inspected by engineers of the DCTA (Department of Science and Aerospace Technology). All the items tested and/or analyzed indicated normal engine operation.

There were no discrepancies observed in the lubrication system that might have caused malfunctions and/or jamming of the moving components.

In the ignition system, the spark plugs had a normal working appearance and coloring. Both magnetos, when turned by hand, were sparking.

The fuel system components were operational, and the ones tested were in good working order.

The propeller blades showed evidence of engine power development at the time of the accident. There were transverse scratches on both blades, which presented forward bends (Figure 4).



Figure 4 - (LE) View of the transverse scratches on the blade.

(DIR) Transversal scratches and forward bending at the end of the blade.

A rupture occurred at an angle of 45° on the crankshaft, next to the coupling flange with the propeller. That was another evidence of the normal operation of the engine, with development of power at the time of the accident.

The investigators sent some of the aircraft's instruments for analysis by the Materials Division, and for inspection by DCTA engineers.

The stereoscopic examinations of the instruments revealed no marks of impact of the internal movable surfaces against the respective protective glass. Thus, it was not possible to identify any flight parameters by means of that analysis.

There were fractures on the back of the Indicator Altitude Gyro and the Fuel Computer, due to overload in both of them.

The fact that the Fuel Computer instrument was digital, and without non-volatile memory information, made it impossible to read out the data (Figure 6).



Figure 6 - View of the Manifold Indicator, Indicator Altitude Gyro, Altimeter and Fuel Computer instruments. |

1.17. Organizational and management information.

[NIL.]

1.18. Operational information.

[The PIC had some experience as a pilot, but one could not estimate his degree of experience in aerobatic flights.

Regarding the minimum safety heights and altitudes, the Brazilian Civil Aviation Regulation nº 91 (RBAC-91), in its section 91.119, established that “the minimum heights and altitudes allowed for any flight are those established in the air traffic rules published by the DECEA”.

The ICA 100-12 “Rules of the Air”, published by the Department of Airspace Control (DECEA), prescribed the following requirements with regard to minimum safety heights and altitudes:

5 Visual Flight Rules

[...]

5.1.4 Except in landing and take-off operations, the VFR flight will not be conducted:

- a) over cities, towns, inhabited places or over groups of people outdoors, at a height of less than 300 m (1000 ft) above the highest existing obstacle within a radius of 600 m around the aircraft; and
- b) in places not mentioned in the previous paragraph, at a height of less than 150 m (500 feet) above the ground or water.

There were reports that, two days before the accident, the aircraft had presented a technical problem (possibly, an engine failure in flight). However, there were no corresponding records in the aircraft's logbooks.

A fuel purchase voucher issued on 13 April 2020 at *Toledo* airport, indicated that the pilot acquired approximately 700 liters of aviation gas.

In view of the rupture of the PP-ZCA tanks resulting from the accident, it was not possible to confirm the quantity of fuel present in the aircraft at the time of the occurrence.

One did not find the aircraft's weight-and-balance sheet, and it was not possible to verify whether the aircraft was within the design limits.

A 360-degree security-camera on the farm recorded moments of the aircraft during its preparation for takeoff (Figure 7).



Figure 7 - (Images 1, 2 and 3) Aircraft starting preparations for takeoff.

(Image 4) Moment right after takeoff showing smoke still present on the runway.

When the pilot accelerated the aircraft's engine to start the takeoff run, the security camera revealed dense smoke coming out of the aircraft's exhaust. Such smoke was produced by a special piece of equipment that threw oil into the hot exhaust, aiming to make the aircraft leave a white trail of smoke along the flight path. This is a commonly desirable effect in aerobatic aircraft.

Due to the position of the sun in relation to that camera, it was not possible to visualize the aircraft in flight, nor the moment when it collided with the ground.

1.19. Additional information.

The pilot, with support from the *Flyer Indústria Aeronáutica Ltda* company, built the aircraft in 2010. He was the first owner and operator of the PP-ZCA.

However, on 23 June 2014, he signed a contract for the sale of the aircraft, registered with the Third Notary Office of *Cascavel*.

Family members reported that the pilot had contacted the second owner of the PP-ZCA, and signed an agreement for the reacquisition of the aircraft. However, until the date of the accident, formalization was still pending in relation to the change of ownership and change of operator before the Brazilian Aeronautical Registry (RAB).

Thus, the RV-7A involved in the accident was still in the name of the second owner, who, on 10 April 2020, logged the last records of hours flown in the aircraft logbook.

1.20. Useful or effective investigation techniques.

[NIL.]

2. ANALYSIS.

[It was a private flight with an aircraft registered in the PET category.

All items that were tested and/or analyzed indicated normal operation of the engine.

It is possible that, during the flight, the pilot performed some maneuver or aerobatics at low altitude, and was not able to recover the aircraft in time to avoid colliding with trees and subsequently with the ground.

Furthermore, one cannot rule out the possibility of the pilot not having noticed how close the aircraft was to the tree branches and, consequently, the imminent collision that destabilized the aircraft, and led to the collision with the ground.

The fact that the aircraft was flying at low altitude, in discordance with the legislation in force, and the fact that aircraft was flying with an expired CAV, showed low adherence to the principles of Flight Safety, and non-compliance with the regulations established by the Brazilian State.

The operation in disagreement with the aeronautical regulations in force may imply safety levels below the acceptable minimums established by the Brazilian State.

The failure to meet the Brazilian State-defined minimum levels of safety, which are guaranteed through compliance with the RBHAs (Brazilian Aeronautical Certification Regulations) or RBACs (Brazilian Civil Aviation Regulations), may create latent unsafe conditions, which are to be eliminated or mitigated by means of the compliance with the very regulations.]

3. CONCLUSIONS.

3.1. Findings.

- a) [the pilot held a valid Aeronautical Medical Certificate (CMA);
- b) the pilot had valid MNTE, MLTE and IFRA ratings;
- c) according to third parties, the PIC was qualified and experienced for the type of flight;
- d) the aircraft had its Flight Authorization Certificate (CAV) expired since 14 February 2020, the same expiration date of the RETA insurance;
- e) the records of the airframe and engine logbooks were not up to date;
- f) the aircraft did not have a propeller logbook, and there was only one propeller balance certificate (expired in September 2016);
- g) no weight and balance sheets were found, and it was not possible to verify whether the aircraft was within the prescribed weight and balance limits;
- h) the last record in the aircraft logbook was logged by the second owner of the aircraft on 10 April 2020;
- i) a refueling voucher (dated 13 April 2020) from *Toledo* airport, showed that the pilot purchased approximately 700 liters of aviation gasoline;
- j) due to the rupture of the aircraft structure resulting from the impact with the ground, it was not possible to determine the amount of gasoline in the fuel tanks;

- k) the weather conditions were consistent with the type of flight;
- l) a 360-degree security camera recorded some moments of the aircraft during its preparation for takeoff;
- m) the aircraft collided with trees and the ground, skidding for about 45 meters before coming to a complete stop;
- n) the pilot did his last proficiency exam on 22 November 2019;
- o) the aircraft was of amateur construction, manufactured in 2010 by the pilot, together with the company *Flyer Indústria Aeronáutica Ltda.*;
- p) the analyses indicated normal operation of the aircraft's engine;
- q) the aircraft impacted the ground while flying at low altitude;
- r) the aircraft was destroyed; and
- s) the pilot and the female passenger suffered fatal injuries.

3.2. Contributing factors.

- **Attitude – undetermined.**

The fact that it was a flight at low altitude, with the aircraft flying with an expired CAV showed non-compliance with the regulations established by the Brazilian State, indicating a likely reduction in the safety of the operation.

- **Handling of aircraft flight controls – undetermined.**

Based on accounts and information collected throughout the investigation process, it is possible that the aircraft sustained loss of control due to inadequacy in the use of flight controls by the crewmember during maneuvers at low altitude.

- **Piloting judgment – undetermined.**

It is possible that inappropriate assessment existed concerning the parameters related to the operation of the aircraft when the pilot decided to perform maneuvers or aerobatics at low altitude, a fact that may have caused the loss of control in flight during the evolutions.

- **Perception – undetermined.**

It is possible that the pilot did not notice the approach with the tree branches due to the degree of luminosity or even the angle of action of the aircraft in the moments before the collision.

4. SAFETY RECOMMENDATIONS

[None.]

5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN.

[None.]

On September 22th, de 2023.

