COMMAND OF AERONAUTICS

AERONAUTICAL ACCIDENT INVESTIGATION AND PREVENTION CENTER

FINAL REPORT
A - 050/CENIPA/2014

OCCURRENCE:	**ACCIDENT**
AIRCRAFT:	**PP-WCA**
MODEL:	**C-90 A**
DATE:	**20 April 2012**

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 item 3.1, 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.

CONTENTS

SYNOPSIS

This is the Final Report of the accident with the C-90A aircraft, registration PP-WCA, on 20 April 2012. The accident was classified as loss of control in flight.

The pilot declared emergency while the aircraft was on the approach for landing. It crashed into the ground at a distance of 180 meters from the runway threshold.

The pilot perished in the crash.

The aircraft was completely destroyed.

An accredited representative of the National Transportation Safety Board of the USA was designated for participation in the investigation.

GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS

AAIB	Air Accidents Investigation Branch
AIS	Aeronautical Information Service
ANAC	(Brazil's) National Civil Aviation Agency
ATS	Air Traffic Services
CA	Airworthiness Certificate
CENIPA	Aeronautical Accident Investigation and Prevention Center
CHT	Technical Qualification Certificate
CMA	Aeronautical Medical Certificate
DAESP	State of São Paulo Air Transport Department
DECEA	Airspace Control Department
DCERTA	Computerized System for the Monitoring and Verification of Regularity
EGPWS	Enhanced Ground Proximity Warning System
ICA	Instruction of the Command of Aeronautics
IFR	Instrument Flight Rules
INFRAERO	Brazilian Airports Infrastructure Enterprise
Lat	Latitude
Long	Longitude
MLTE	Airplane Multi-engine Land
MNTE	Airplane Single-engine Land
PLA	Airline Transport Pilot (Airplane category)
SBJD	ICAO Location Designator – Jundiaí Aerodrome, State of São Paulo
SERIPA	Regional Aeronautical Accident Investigation and Prevention Service
SIPAER	Aeronautical Accident Investigation and Prevention System
TWR-JD	Jundiaí Control Tower
UTC	Coordinated Universal Time

AIRCRAFT	**Model:** C-90A **Registration:** PP-WCA **Manufacturer:** *Beech Aircraft*	**Operator:** Private
OCCURRENCE	**Date/time:** 20 April 2012 / 20:20 UTC **Location:** Jundiaí Aerodrome (SBJD) **Lat.** 23°11'17"S – **Long.** 046º56'28"W **Municipality – State:** Jundiaí – São Paulo	**Type:** Loss of control in flight

1 FACTUAL INFORMATION

1.1 History of the occurrence

The aircraft took off from runway 36 (SBJD), for a local flight, with only the pilot on board.

Shortly after departure, the pilot declared emergency and asked for a landing on the opposite runway threshold. Then, he canceled emergency, stating that the problem had been solved.

Before long, the pilot declared emergency again, and joined the base leg of the traffic pattern by the right.

Upon joining the final approach for landing, while still turning, the aircraft crashed into the ground at approximately 180 meters from the runway threshold.

1.2 Injuries to persons

Injuries	Crew	Passengers	Third parties
Fatal	01	-	-
Serious	-	-	-
Minor	-	-	-
Uninjured	-	-	-

1.3 Damage to the aircraft

The aircraft was completely destroyed.

1.4 Other damage

None.

1.5 Personnel information

1.5.1 Information on the crew

HOURS FLOWN	
	PILOT
Total	-
Total in the last 30 days	-
Total in the last 24 hours	-
In this type of aircraft	-
In this type in the last 30 days	-
In this type in the last 24 hours	-

NB.: Information not available.

1.5.1.1 Professional formation

It was not possible to get information on the flying school attended by the pilot.

1.5.1.2 Validity and category of licenses and certificates

The pilot had an Airline Transport Pilot license (airplane category), as well as valid Airplane Multi-engine Land Certificate and IFR rating. He did not have a technical qualification certificate for the type of aircraft (BE90).

1.5.1.3 Qualification and flight experience

The pilot did not have qualification for flight in this type of aircraft.

It was not possible to get information on the pilot's experience.

1.5.1.4 Validity of the medical certificate

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

1.6 Aircraft information

The aircraft (Serial Number LJ-1676) was manufactured by Beech Aircraft in 2002.

The aircraft had a valid Airworthiness Certificate.

The airframe, engine, and propeller logbooks had up-to-date records.

The last inspection of the aircraft ("Phase 1 and 2" type) was made by the WAS Work Aviation Service workshop in Sorocaba, State of São Paulo. The aircraft flew 30 hours 10 minutes after the inspection.

According to the continued maintenance program of the manufacturer, there was not an overhaul programmed for the aircraft model.

The maintenance program was divided into four phases, with a calendar/time control. Over a period of two years, compliance with at least the four phases was compulsory.

1.7 Meteorological information

The weather conditions were VMC.

1.8 Navigational aids

Nil.

1.9 Communications

The pilot stayed in contact with Jundiaí Tower Control (TWR-JD) from departure up to the moment of the accident.

1.10 Aerodrome information

The aerodrome was public (under the administration of the State of São Paulo Air Transport Department. It operated VFR during day- and night-time.

The 1,180m x 30m runway was paved with asphalt, having the thresholds 18/36, at an elevation of 2,484ft.

1.11 Flight recorders

The aircraft was fitted with a Cockpit Voice Recorder (CVR), which was sent to the CENIPA for voice data readout.

1.12 Wreckage and impact information

The aircraft, after joining the final approach for landing on runway 36 of SBJD, crashed into the ground in a pasture area, at a distance of 180 meters from the runway threshold.

The aircraft crashed in an inverted position (upside-down), with the landing gear extended. A post-impact fire occurred.

Figures 1 and 2 – Situation of the aircraft after impact with the ground.

1.13 Medical and pathological information

1.13.1 Medical aspects

Not investigated.

1.13.2 Ergonomic information

Nil.

1.13.3 Psychological aspects

Not investigated.

1.13.3.1 Individual information

Nil.

1.13.3.2 Psychosocial information

Nil.

1.13.3.3 Organizational information

Nil.

1.14 Fire

After colliding with the ground, the aircraft was consumed by fire.

1.15 Survival aspects

Nil.

1.16 Tests and research

The engine was analyzed at the premises of Pratt & Whitney Brazil in Sorocaba, State of São Paulo, on 19 June 2012.

In the analysis of the hot section of the right engine, evidence was found that the right engine was rotating when the aircraft collided with the ground.

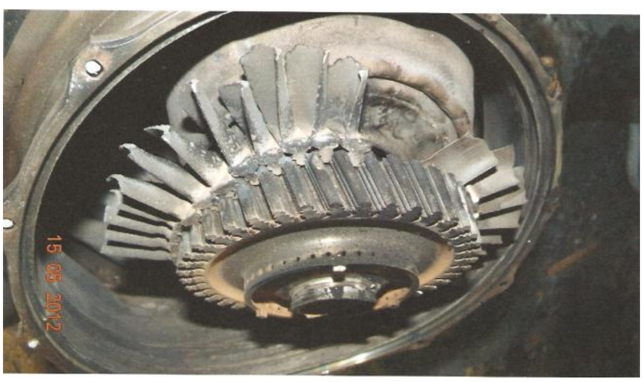
Marks of rubbing were identified in the root of the blades of the gas generator turbine rotor. In addition to the marks, small fractures could be observed in the tips of the blades.

Figure 3 – View of the right engine rotor.

Also in the engine diaphragm, marks of light rubbing were found.

The power turbine rotor of this engine was found with all blades fractured in a mid-position relative to their length. Such signature is compatible with an engine that was not developing a high level of power upon impact, with a resulting abrupt stop.

It is possible to affirm that the right engine power level at the moment of the accident was between medium and low.



Figures 4 and 5 – General view of the power turbine rotor, and the fractured blades of this assembly.

As for the propeller of the right engine, the investigation verified that its characteristics apparently indicated that the engine was developing low power.

All the blades presented a bending at the mid-position relative to their length. In addition, it was observed that one of the blades had transversal marks, indicating that they were turning at the moment of the impact of the aircraft with the ground.

It was also observed that the spinner had a helicoidally-shaped bending, indicative of a turning propeller at the moment of impact with the ground.

In the analysis of the left engine hot section, evidence was found that engine was developing high power at the moment of the collision with the ground.

There were marks of intense rubbing of the gas generator turbine rotor with the engine diaphragm. A blue coloration was observed both in the disks and diaphragm, indicating a high level of power developed by the engine at the moment of the accident.

Another evidence of the power being developed by the engine was observed in the engine exhaust region. Such region was rather hot, something that facilitated the plastic deformation verified in the external exhaust metal sheet.

Therefore, the evidence that was found in both engines indicates that they were rotating and developing power. It is also possible to affirm that the level of power being developed by the left engine at the moment of the accident was higher than the one of the right engine.

1.17 Organizational and management information

Nil.

1.18 Operational aspects

From the readout of the Cockpit Voice Recorder data, it was possible to confirm that, after the aircraft rotation, there was variation in the RPM of the engines.

Due to the fact that the recording had only one channel (mono), it was not possible to determine the source of the aforementioned variation.

After departure, the pilot requested return to the airfield, declaring emergency on account of a possible failure of the landing gear. It was possible to verify, from the CVR recording, the activation of the EGPWS warning – *Don't Sink!*

This EGPWS system remains armed after departure up to an altitude of approximately 700ft above the elevation of the departure runway, and it is activated whenever the aircraft displays a negative rate of climb or loss of altitude.

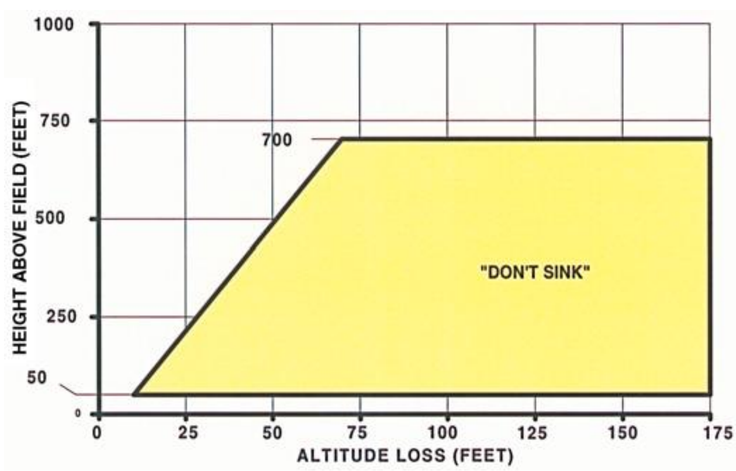


Figure 6 – Graph of the EGPWS operation – *Don´t Sink.*

After being authorized by YWR-JD to return to the runway, the pilot canceled emergency, saying that he had solved the problem.

It was verified that the aircraft landing gear was retracted at that moment.

In the sequence, a new variation of the engine RPM was identified, together with the activation of the landing gear warning horn (which remained active for approximately 12 seconds).

The aircraft was equipped with a landing gear warning horn system which was activated when one or both power levers were reduced, and the landing gear was in a position different from down and locked.

A second EGPWS call-out (“Caution Terrain”) occurred concomitantly with a new declaration of emergency by the pilot.

This call-out is activated whenever the aircraft flight path conflicts with obstacles or with the very terrain.

The pilot lowered the landing gear, and the Pull Up call-out became evident to him. This system is activated whenever an obstacle is detected at a distance corresponding to 30 seconds ahead of the aircraft.

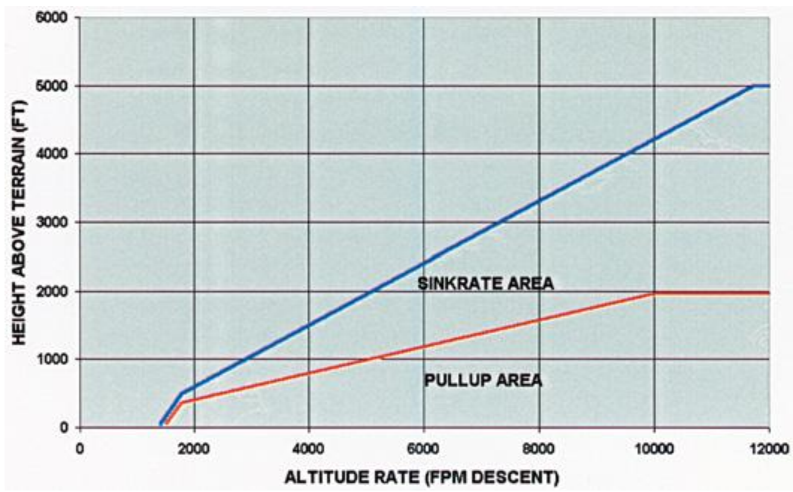


Figure 7- Graph of the EGPWS operation – *Pull Up*.

While the aircraft was aligning with the final approach for landing, the EGPWS “Don’t Sink” call-out was activated anew and, by means of the CVR readout it was possible to verify changes in the RPM of the engines.

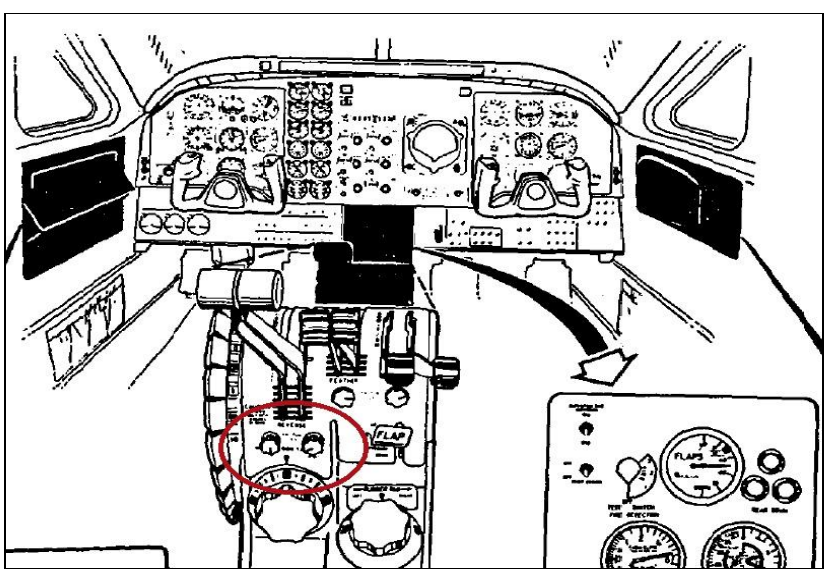


Figure 8 – View of the frictions of the power levers.

The power levers assembly of the aircraft had a double friction mechanism, allowing for an individual setting of the levers.

The power levers' pedestal was found consumed by the fire but, on account of the friction system characteristics it was possible to determine the setting utilized for each lever.

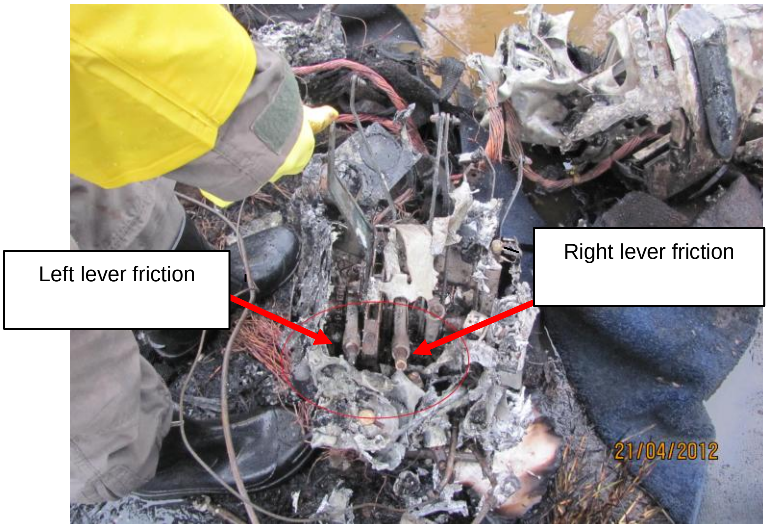


Figure 9 – In-detail view of the power lever frictions after the occurrence.

The power lever of the left engine was found with a maximum friction setting, where the power lever of the right engine was found with a minimum friction setting.

At the time of the accident, the aircraft "Before-takeoff" checklist had the following item: *Engine Frictions: Set.*

From an analysis of a video recording of the accident, it was possible to verify that, during the final segment of the visual approach, the aircraft was below the normal glide path while aligning with the runway 36 of SBJD.

The pilot crossed the prolonged axis of the runway. In an attempt to correct the final approach, he tightened the turn and may have applied the pedal.

It was possible to observe an increase of the aircraft angle of attack, something that may configure the onset of a Cross Control Stall.

A *Cross Control Stall* occurs when, due to crossing the approach axis, the pilot, with the intention of maintaining a constant angle of bank, applies the pedal in order to direct the nose of the aircraft towards the runway, destabilizing the aircraft.

With the aircraft turning, the application of pedal lowers the aircraft nose and tends to increase the angle of bank, forcing the pilot to move the stick towards the opposite side of the turn and to pull it in order to prevent the aircraft nose from descending.

In such situation, the wing on the outer side of the turn has a higher speed when compared with the wing of the inner side, requiring more strength and amplitude in the application of the controls.

The application of the controls adds to the aircraft drag, obliging the pilot to increase the angle of attack for keeping the indicated airspeed and rate of descent.

The aircraft angle of attack increases up to reaching a critical value, generating a stall on the wing that is in the inner side of the turn. This wing has a lower speed and, thus, less lift.

In interviews conducted by the go-team investigators, they learned that the accident pilot had already flown in the right hand side seat of the aircraft in question on several occasions. However, they were not able to determine how many times he had flown.

The aircraft was within the weight and center of gravity limits prescribed by the manufacturer.

1.19 Additional information

The pilot went to the AIS office of SBJD in order to file a local flight notification. The notification contained the name of another pilot as the aircraft captain.

The Instruction of the Command of Aeronautics ICAO 100 -11 (Flight Plan), reads in its article 2.6.1: "*only pilots and operational flight-dispatchers are allowed to fill out and sign a flight plan*; […]

The ANAC Resolution Nº. 151 of 7 May 2010, in force at the time of the accident, created ta computerized system for the monitoring and verification of the regularity of aerodromes, aircraft / technical crew licenses and certificates (DCERTA), based on the data informed by means of the flight plan.

The RBHA 91 (article 91.5, paragraph (A) (3) reads: *"no person is allowed to operate an aircraft registered in Brazil, unless the operation is conducted by crewmembers who are adequately qualified in the aircraft and for the function performed on board and holders of valid aeronautical medical certificates".*

The RBAC 61 (article 61.3, paragraph (A) reads: "*in order to work as a pilot in command, or second in command, aboard a civil aircraft registered in Brazil, a person must be entitled to have and be carrying a pilot license/certificate with valid qualifications, issued in accordance with this Regulation and appropriate to the aircraft being flown, to the operation being executed, and to the function being performed onboard the aircraft"*.

During a research of similar occurrences, the investigation commission learned that, on 23 December 2000, a Beech 200 aircraft, registration VP-BBK, upon taking off from runway 08 of Blackbushe Aerodrome, UK (EGLK), sustained a loss of control and crashed into a manufacturing plant. The aircraft was consumed by the post-impact fire.

The investigation conducted by the *Air Accidents Investigation Branch* (AAIB) (Report AAIB EW/C2000/12/7) verified, by means of a CVR spectral analysis, that an RPM reduction had occurred in one of the aircraft engines, with a subsequent power asymmetry, which led to the aircraft loss of control.

The CVR readout by the AAIB revealed no comments on the part of the aircraft captain relative to any problems that might be affecting the aircraft during takeoff.

The spectral analysis performed by the AAIB on the CVR readout indicated that a significant difference of power occurred during takeoff, at a moment win which the pilot would normally take his hands off the aircraft power levers.

No abnormalities were verified in either of the aircraft engines, and the probable cause of the asymmetry of the engines was thought to be an inadvertent reduction of one of the power levers, on account of an insufficient friction setting of the referred power lever.

1.20 Utilization of other investigation techniques

Nil.

2 ANALYSIS

The pilot did not possess technical qualification to operate the aircraft. In the attempt to hide the irregular situation of his license from the DCERTA, he made use of the ANAC code of another pilot, who was qualified for the operation of the aircraft.

The regulations and the supervising procedures in force at the time of the accident, did not refrain the violation from being committed, since the filing of the flight notification was done by an unqualified pilot, revealing the vulnerability of the DCERTA.

From the analysis of the hot section of both engines, evidence was found that both engines were rotating and developing power.

It is possible to affirm that the left engine was developing more power than the right engine at the moment of the accident.

The right engine had characteristics compatible with the development of a power regime between medium and low. This could be observed by means of the light marks of rubbing that were found during the analysis and disassembling of this engine.

The aircraft power levers assembly, which had a double friction mechanism, was found consumed by the fire, but it was possible to determine the setting utilized in each of them.

The left engine power lever was found with a maximum friction setting.

The friction of the left engine power lever was found with a minimum setting. The friction setting of the levers is part of the Before-Takeoff Checklist. This check may not have been done by the pilot, since he lacked adequate training for the operation of this type of aircraft and was, therefore, not qualified.

From the readout of the Cockpit Voice Recorder (CVR), it was possible to observe that, after the landing gear retraction, there was a variation of RPM in one of the engines.

According to the tests and research which were carried out, and according to the characteristics of the wreckage, a hypothesis was raised that, probably, on account of a mistaken pilot's interpretation of an inadvertent backing of the right engine power lever, associated with an inadequate application of the controls which culminated in a cross control stall, due to his lack of training and qualification in the aircraft model.

3 CONCLUSIONS

3.1 Facts

a) the pilot had a valid Aeronautical Medical Certificate;

b) the pilot did not have a valid technical qualification certificate for the type of aircraft;

c) the pilot was not qualified for the type of aircraft;

d) the aircraft had a valid airworthiness certificate;

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

f) the pilot made use of another pilot's ANAC code for the notification of a flight;

g) the aircraft took off from the runway 36 of SBJD for a local flight, with only the pilot on board;

h) shortly after departure, the pilot declared emergency, and asked to return for a landing on the opposite runway.

i) in the sequence, the pilot canceled the emergency and said that the problem had been solved;

j) A few moments later, the pilot declared emergency again and stated a return for landing on runway 36, joining a right base leg;

k) upon intercepting the final approach for landing, the aircraft collided with the ground at a distance of 180 meters from the runway threshold;

l) the aircraft was completely destroyed; and

m) the pilot perished in the crash.

3.2 Contributing factors

3.2.1 Human Factor

3.2.1.1 Medical Aspect

Nil.

3.2.1.2 Psychological Aspect

3.2.1.2.1 Individual information

Nil.

3.2.1.2.2 Psychosocial information

Nil.

3.2.1.2.3 Organizational information

Nil.

3.2.2 Operational Factor

3.2.2.1 Concerning the operation of the aircraft

a) Application of the controls – undetermined

Upon intercepting the final leg for landing, the aircraft crossed the approach axis, and the pilot, in an attempt to make the aircraft join the approach axis again, may have depressed the rudder pedal in an inadequate manner, inadvertently making the aircraft enter a Cross Control Stall.

b) Flight indiscipline – a contributor

The pilot, intentionally, violated a number of aeronautical regulations in force in order to fly an aircraft for which he had no training and was not qualified.

c) Pilot's short experience – a contributor

The short experience of the pilot in the aircraft model hindered the correct identification of the situation and the adoption of the necessary corrective measures.

d) Other – a contributor

The DCERTA's vulnerability allowed a non-qualified pilot to file a flight notification by making use of the code of a qualified pilot. Thus, the last barrier capable of preventing the accident flight to be initiated was easily thrown down, by making it difficult to implement a more effective supervisory action.

3.2.2.2 Concerning ATS units

Not a contributor.

3.2.3 Material Factor

3.2.3.1 Concerning the aircraft

Not a contributor.

3.2.3.2 Concerning ATS technology systems and equipment

Not a contributor.

4 SAFETY RECOMMENDATION

A measure of preventative/corrective nature issued by a SIPAER Investigation Authority or by a SIPAER-Link within respective area of jurisdiction, aimed at eliminating or mitigating the risk brought about by either a latent condition or an active failure. It results from the investigation of an aeronautical occurrence or from a preventative action, and shall never be used for purposes of blame presumption or apportion of civil liability.

In accordance with the Law n°12970/2014, recommendations are made solely for the benefit of the air activity operational safety.

Compliance with a Safety Recommendation is the responsibility of the holder of the highest executive position in the organization to which the recommendation is being made. An addressee who judges to be unable to comply with a Safety Recommendation must inform the CENIPA on the reason(s) for the non-compliance.

Safety Recommendations made by the CENIPA:

To the National Civil Aviation Agency (ANAC):

A-050/CENIPA/2014 – 001 **Issued on 15/08/2014**

Publicize the contents of this report at seminars, lectures and similar activities aimed at owners, operators and explorers of aircraft.

A-050/CENIPA/2014 – 002 **Issued on 15/08/2014**

Re-evaluate the quality of the supervision made by means of the DCERTA system, in order to prevent the violations verified by the investigation and presented in this report.

5 CORRECTIVE/PREVENTATIVE ACTION ALREADY TAKEN

Nil.

6 DISSEMINATION

–*National Transportation Safety Board* (NTSB)

–(Brazil's) National Civil Aviation Agency (ANAC)

–SERIPA IV

7 APPENDICES

Nil.

On 15 Aug 2014.