COMANDO DA AERONÁUTICA

CENTRO DE INVESTIGAÇÃO E PREVENÇÃO DE ACIDENTES AERONÁUTICOS

FINAL REPORT
A-008/CENIPA/2022

OCCURRENCE:	**ACCIDENT**
AIRCRAFT:	**PR-JGV**
MODEL:	**Baron 58**
DATE:	**19JAN2022**

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 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 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. 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 Final Report pertains to the 19 January 2022 accident involving the Beechcraft Baron 58 aircraft, registration marks PR-JGV. The occurrence was typified as “[SCF-PP] Engine failure or malfunction”.

During the approach for landing at SBBI (*Bacacheri* Aerodrome, *Curitiba*, *Paraná* State), the left engine of the aircraft experienced a loss of power. The pilot attempted a direct approach to runway 18, but ended up landing on a grassy area of the aerodrome, subsequently colliding with a containment embankment.

The aircraft sustained substantial damage.

All occupants emerged uninjured.

Being the United States of America, the State of Aircraft and Engine Manufacture, the USA’s NTSB (National Transportation Safety Board) appointed an Accredited Representative for participation in the investigation of this accident.

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GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS

ADC	Aerodrome Chart
AFM	Aircraft Flight Manual
ANAC	Brazil's National Civil Aviation Agency
APMS	*Antes do Ponto Morto Superior* (Before Top Dead Center)
APP-CT	*Curitiba* Approach Control
ASDA	Accelerate-Stop Distance Available
CIV	Digital Pilot-Logbook
CMA	Aeronautical Medical Certificate
CVA	Certificate of Airworthiness
DECEA	Department of Airspace Control
IAF	Initial Approach Fix
ICA	Command of Aeronautics' Instruction
IFR	Instrument Flight Rules
IFRA	Instrument Flight Rating - Airplane
IS	Supplementary Instruction
LDA	Landing Distance Available
MLTE	Multi-Engine Land Airplane Class Rating
OM	Maintenance Organization
PCM	Commercial Pilot License - Airplane
PIC	Pilot in Command
PMD	Maximum Takeoff Weight
PN	Part Number
PPR	Private Pilot License - Airplane
RBAC	Brazilian Civil Aviation Regulation
RNP	Required Navigation Performance
SBBI	ICAO location designator - *Bacacheri* Aerodrome, *Curitiba*, *Paraná* State
SSKG	ICAO location designator - *Estância Santa Maria* Aerodrome, *Campo Grande*, State of *Mato Grosso do Sul*
TCU	Towering-Cumulus cloud
TODA	Take-Off Distance Available
TORA	Takeoff Run Available
TPP	Private Air Services Aircraft Registration Category
TWR-BI	*Bacacheri* Aerodrome Control Tower
UTC	Universal Time Coordinated
VFR	Visual Flight Rules

1. FACTUAL INFORMATION.

Aircraft	**Model:** Baron 58 **Registration:** PR-JGV **Manufacturer:** Beech Aircraft.	**Operator:** *Pajoara Indústria e Comércio Ltda*.
Occurrence	**Date/time**: 19JAN2022 – 16:05 (UTC) **Location:** SBBI – *Bacacheri* Aerodrome **Lat.** 25°24'12"S **Long.** 049°14'01"W **Municipality – State:** *Curitiba - Paraná*	**Type(s):** [SCF-PP] Powerplant failure or malfunction

1.1. History of the flight.

At approximately 13:45 UTC, the aircraft departed from SSKG (*Estância Santa Maria* Aerodrome*, Campo Grande*, State of *Mato Grosso do Sul*), bound for SBBI (*Bacacheri* Aerodrome, *Curitiba*, *Paraná* State), on a private transport flight, with one pilot and five passengers on board.

During the approach to SBBI, the left engine failed to respond to the commands of the Pilot in Command (PIC) and remained at minimal power.

The PIC shut down the left engine and landed on a grassy area within the airport premises.

Figure 1 - Final position of the aircraft and displacement marks on the grassy area.

The aircraft sustained substantial damage and all occupants emerged unharmed.

1.2. Injuries to persons.

Injuries	Crew	Passengers	Others
Fatal	-	-	-
Serious	-	-	-
Minor	-	-	-
None	1	5	-

1.3. Damage to the aircraft.

The off-runway landing on a grassy area caused substantial damage to the landing gear, with the left main gear and the nose gear detaching from the aircraft (Figure 2).

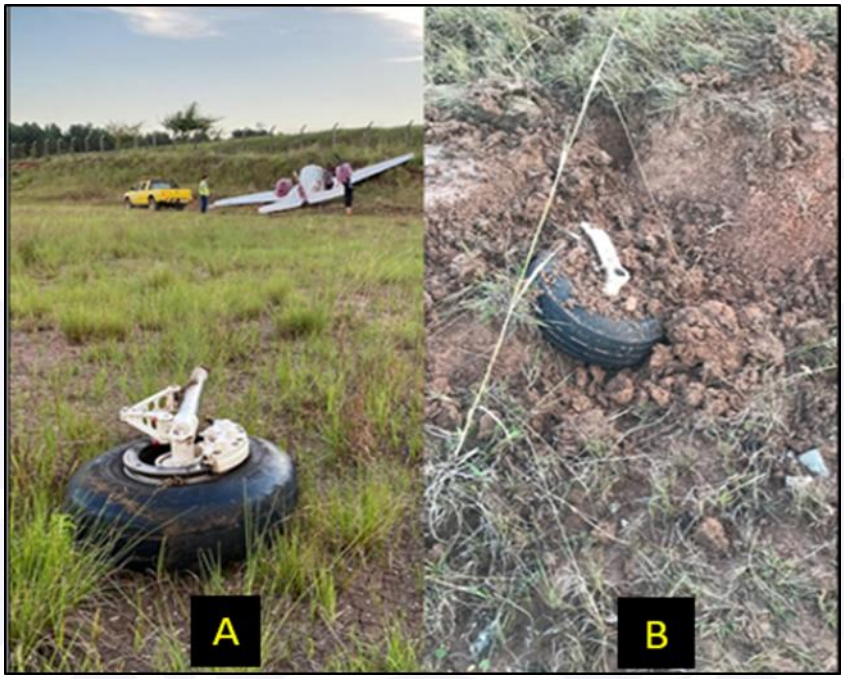

Figure 2 - Left main landing gear (A) and nose landing gear (B).

The blades of the left engine propeller were found in the feathered position, with only one blade showing longitudinal damage (Figure 3).

Figure 3 - Left engine's propeller blades in the feathered position showing longitudinal damage to one of the blades.

The blades of the right engine propeller were found in a position other than feathered, and all of them exhibited longitudinal damage, bending backward (Figure 4).

Figure 4 - Right engine propeller blades not feathered, exhibiting longitudinal damage.

The cowling of both engines and the forward section of the fuselage remained relatively preserved, with significant denting concentrated in the front part (Figure 5).

Figure 5 - View of the damage sustained by the propeller blades and fuselage.

1.4. Other damage.

NIL.

1.5. Personnel information.

1.5.1. Crew's flight experience.

FLIGHT EXPERIENCE	
	PIC
Total	1.650:00
Total in the last 30 days	06:42
Total in the last 24 hours	02:20
In this type of aircraft	183:00
In this type in the last 30 days	02:20
In this type in the last 24 hours	02:20

RMK: data on the hours flown obtained from the records of the pilot's CIV (Digital Logbook).

1.5.2. Personnel training.

The PIC did his PPR course (Private Pilot - Airplane) in 2012, at Cloud Dancer Aviation, DeLand, Florida, USA.

Subsequently, through an administrative process, the ANAC (Brazil's National Civil Aviation Agency) was requested to validate the license earned on 27 September 2012.

1.5.3. Category of licenses and validity of certificates.

The PIC held a PCM License (Commercial Pilot - Airplane) and valid ratings for MLTE (Multi-Engine Land Airplane) and IFRA (Instrument Flight - Airplane).

1.5.4. Qualification and flight experience.

The PIC had experience in other models classified as light twin-engine aircraft, such as the PA34T and 55. He had also operated the following aircraft models: CAP4; AB115; C150; C152; C172; C206; SR22; P28R; P28T; BE36; and PC6.

The PIC was qualified and experienced in the type of flight.

1.5.5. Validity of medical certificate.

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

1.6. Aircraft information.

The aircraft, serial number TH-1924, was manufactured by Beech Aircraft in 1999. It was registered under the Private Air Services (TPP) Registration Category and operated by *Pajoara Indústria e Comércio Ltda*.

The aircraft's Airworthiness Verification Certificate (CVA) was valid.

The monthly entries in the airframe, engine, and propeller logbooks were out of date in Part I (Monthly Utilization Records).

The latest inspection of the aircraft (a "50-hour" check which included issuance of the CVA, was performed on 20 August 2021, by the *ATM* Maintenance Organization, in *Campo Grande*, State of *Mato Grosso do Sul*. The aircraft flew 48 hours after the said inspection.

The latest more comprehensive maintenance intervention was performed on 16 April 2021, by *FENIX Aviação Ltda.* maintenance organization, in *Arapongas*, *Paraná* State. The airplane logged 66 hours and 35 minutes of flight after the overhaul.

The Beech Aircraft Baron 58 was equipped with two Teledyne Continental engines, model IO-550-C, featuring fuel injection, direct drive, air cooling, and six horizontally opposed cylinders.

The engine controls were operated via throttles located on top of the central pedestal, as shown in Figure 6.

Figure 6 - Image of the throttle, propeller, and fuel lever positions after the accident.

The levers operated through horizontal movement: forward, to increase the property associated with the lever and backward to decrease it.

The transmission of adjustments to the power, propeller, and fuel mixture control surfaces occurred via steel cables, connecting each lever to its respective adjustment system.

The throttle lever controlled the servo injector through a cable, opening and closing a butterfly valve to adjust the air/fuel mixture and define the power level for the specific phase of flight. This same assembly also operated a flow valve, adjusting the optimal fuel volume for the engine based on the air mass being admitted at the time.

1.7. Meteorological information.

The weather conditions were above the minimum requirements for conducting the operation under the rules of the proposed type of flight.

1.8. Aids to navigation.

The PIC reported that he would perform the *Required Navigation Performance* procedure, RNP B RWY 36 of SBBI, as shown in Figure 7.

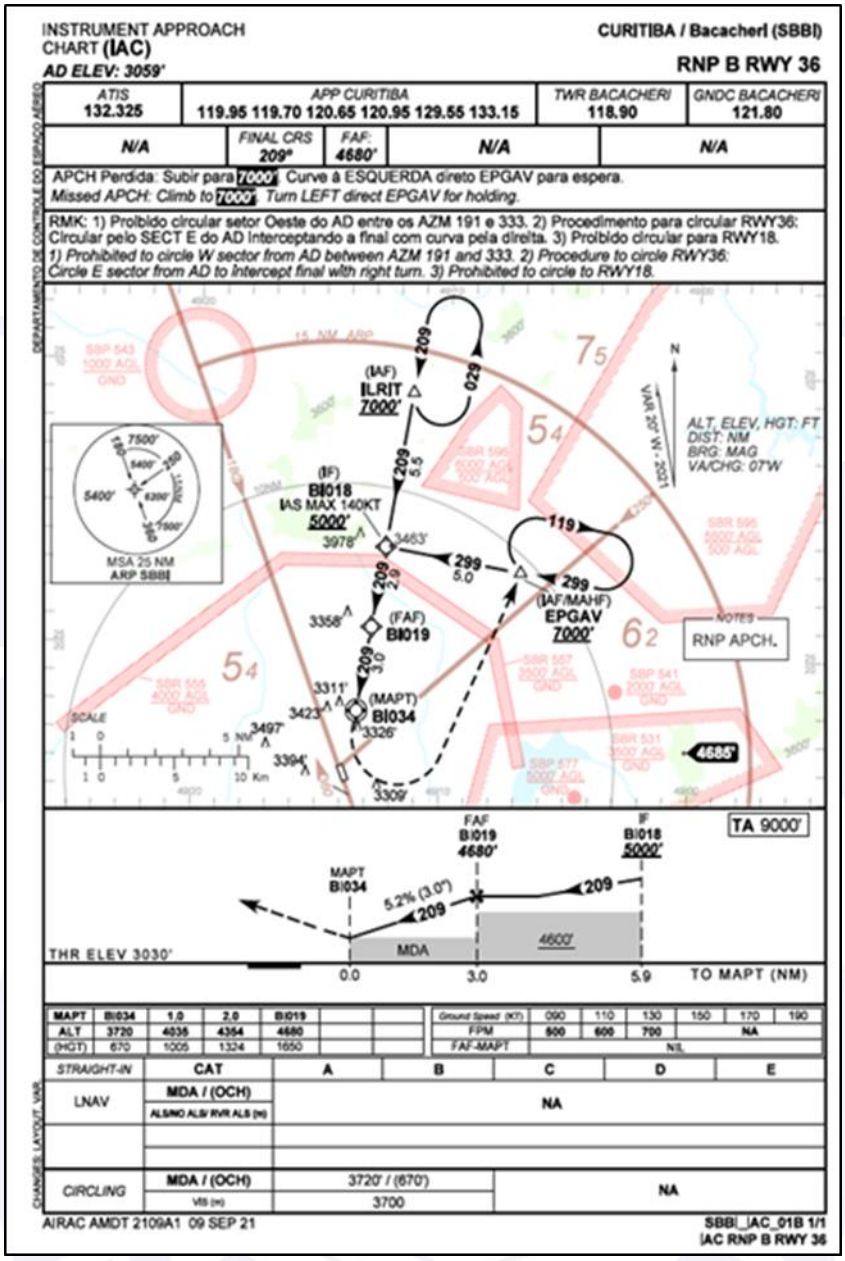

Figure 7 - SBBI RNP B RWY 36 procedure to be performed.

The planned altitude for the Initial Approach Fix (IAF) was 7,000 ft., approximately 3,940 ft. above the runway elevation at SBBI, located 13 NM away on the 030º radial.

Moments before initiating the RNP B RWY 36 procedure, the PIC flew a direct heading toward SBBI, aiming to land on runway 18. This resulted in the aircraft being to the right of the procedure profile, as shown in Figure 8.

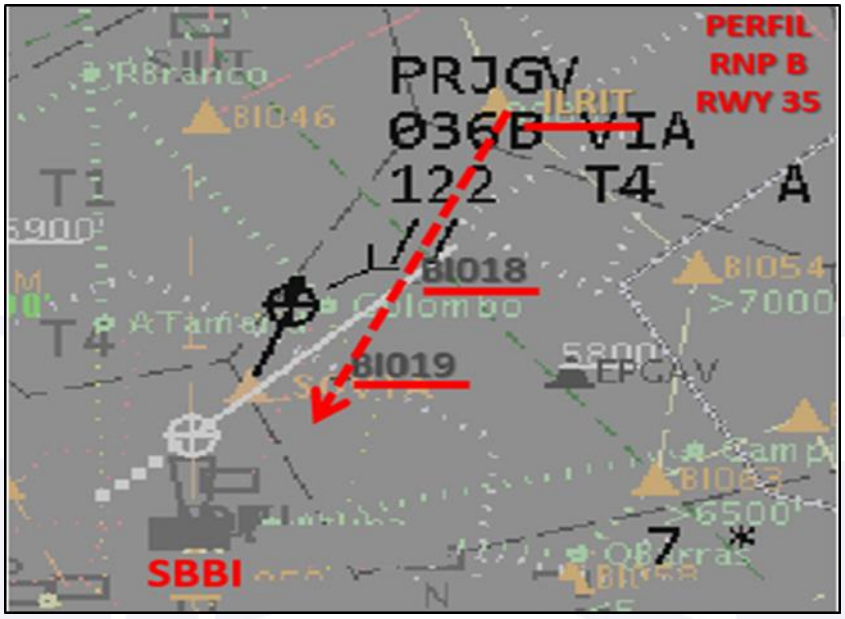

Figure 8 - PR-JGV following a profile to the right of the course prescribed
For the RNP B RWY 36 procedure.

1.9. Communications.

According to the audio transcripts of the communications between the PR-JGV pilot and air traffic control units, it was confirmed that the PIC maintained two-way radio contact with *Curitiba* Approach Control (APP-CT) and *Bacacheri* Control Tower (TWR-BI), moments before the accident.

After being instructed to establish contact with TWR-BI, the PR-JGV initiated the call at 16:05:49 UTC, reporting that he had the aerodrome in sight. On the occasion, the PIC requested to land on runway 18 and informed that maintaining altitude was challenging.

To support the analyses of the sequence of events preceding the approach for landing at SBBI, the Investigation Committee highlighted some of the radio communication exchanges that might help in understanding the dynamic of the occurrence. The time reference is UTC (Universal Time Coordinated):

- 16:05:49 - PRJGV - *Bacacheri Tower, this is Juliet Golf Victor attempting... we are visual with the aerodrome, struggling to maintain altitude.*
- 16:05:57 - TWR-BI - *Juliet Golf Victor, good afternoon, Bacacheri Tower. Runway in use 36, QNH 1021, proceed for landing at Bacacheri. Wind 340 degrees, 6 knots. Confirm intentions.*
- 16:06:08 - PRJGV - *Is it possible to use (runway) 18, Juliet Golf Victor?*
- 16:06:12 - TWR-BI - *At your discretion. Report on the final of (runway) 18, Juliet Golf Victor.*

The clearance to land on runway 18 was issued at 16:07:51, after TWR-BI confirmed having the aircraft in sight.

- 16:07:46 - TWR-BI - *Juliet Golf Victor in sight. Cleared to land, (wind) 030 degrees, 12 knots.*
- 16:07:51 - PRJGV – *Cleared to land, Juliet Golf Victor.*

At 16:08:23, the PP-GBK airplane, which was on Taxiway B of the aerodrome, informed TWR-BI about the accident, and stated having visual contact with the aircraft that had crossed the runway.

- 16:08:23 - PPGBK - *Golf Bravo Kilo, we are visual with the aircraft that crossed the runway.*
- 16:08:25 - TWR-BI - *Roger, thank you for the information*.

1.10. Aerodrome information.

The aerodrome was a public/military facility, managed by *CCR Aeroportos*, operating both VFR and IFR, during day- and night-time.

The runway was asphalt-sealed, with thresholds 18/36. It measured 1,390 x 31 m, at an elevation of 3,059 ft.

The declared distances regarding TORA (Take-Off Run Available), TODA (Take-Off Distance Available), ASDA (Accelerate-Stop Distance Available), and LDA (Landing Distance Available) corresponded to those specified in the ADC (Aerodrome Chart), as shown in Figure 9.

RWY	TORA(m)	TODA(m)	ASDA(m)	LDA(m)
18	1390	1390	1390	1090
36	1090	1090	1390	1390

Figure 9 - Declared distances from SBBI runway, according to ADC, 01MAR2018

The aerodrome featured a runway, four taxiways (A, B, C, and D), a parking apron for passenger boarding and disembarking next to the passenger terminal, and a hangar area (Figure 10).

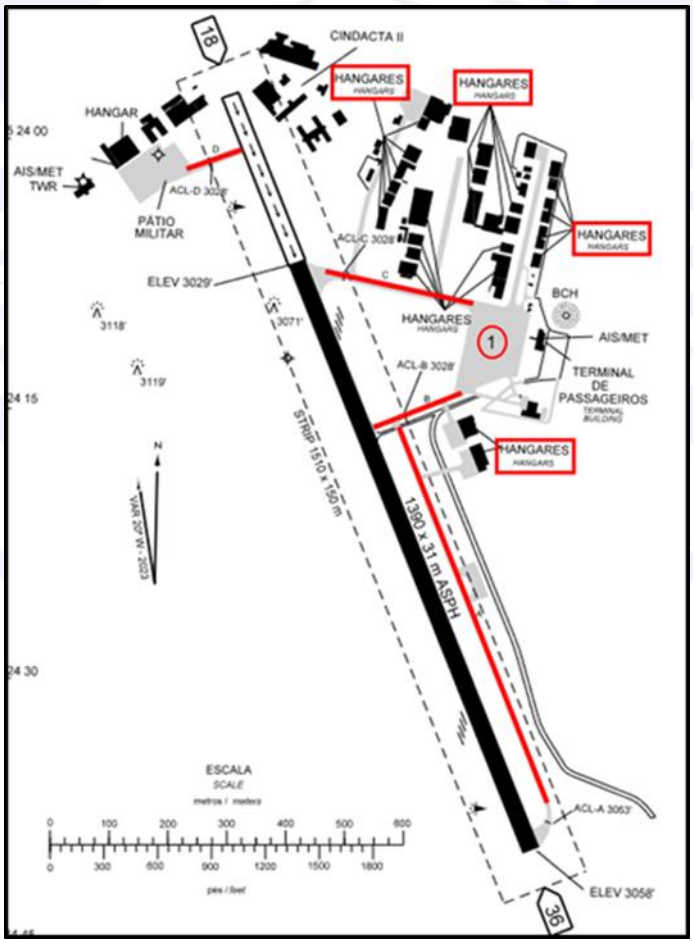

Figure 10 - SBBI ADC highlighting taxiways and buildings.

1.11. Flight recorders.

Not required and not installed.

1.12. Wreckage and impact information.

Based on the physical evidence at the site of the first impact, along with observations from the aerodrome's surveillance camera footage, the aircraft was flying on a heading of 218°, in an attempt to approach runway 18 for landing.

The aircraft overflew the hangar area, as shown in Figure 11.

Figure 11 - Surveillance camera image of the PR-JGV overflying the hangar area before the emergency landing.

The landing occurred on a grassy area between taxiways C and B. The aircraft traveled approximately 250 meters until crossing the runway and colliding with a containment embankment (Figure 12).

Figure 12 - PR-JGV trajectory over *Bacacheri* Aerodrome until coming to a stop.

The left main landing gear and the nose gear detached from the aircraft during the post-landing roll on uneven terrain.

As for the aircraft's engines, the left one exhibited evidence of being in a feathered position, while the right one displayed characteristics of being operating at the time of landing.

Most of the aircraft's damage was concentrated on the lower front section of the fuselage, the hydraulic system, the landing gear, and the powerplant assembly.

The throttle and fuel levers for both engines were found in the retarded position, consistent with the engines being shut down. The left propeller pitch-control lever was in the retarded position, consistent with the feathered state, while the right propeller was in the forward position.

The left fuel selector was in the OFF position, while the right fuel selector was in the CROSS FEED position. These positions were consistent with the cross-feed configuration, as shown in Figure 13.

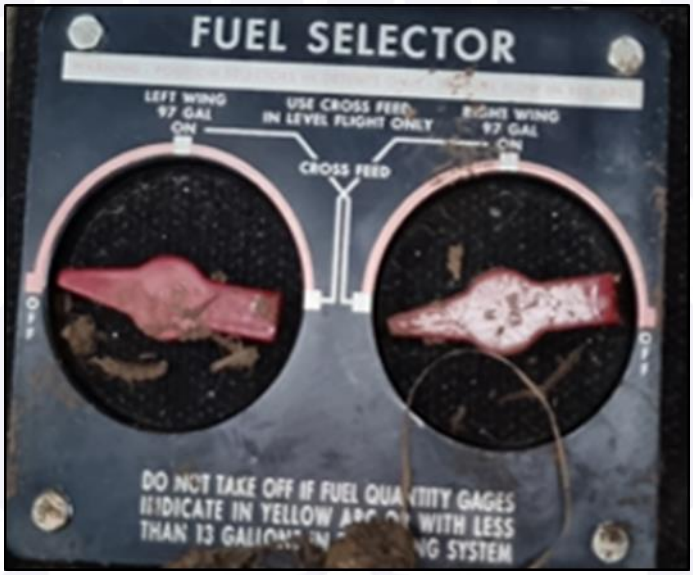

Figure 13 - Position of the left fuel selector in OFF and the right fuel selector in CROSS FEED.

The landing gear control lever was in the DOWN position, consistent with the landing gear being extended and locked (Figure 14).

Figure 14 - Landing gear lever in the DOWN position.

1.13. Medical and pathological information.

1.13.1 Medical aspects.

NIL.

1.13.2. Ergonomic information.

NIL.

1.13.3. Psychological aspects.

NIL.

1.14 Fire.

There was no fire.

1.15 Survival aspects.

NIL.

1.16 Tests and research.

The IO-550-C engines fitting the aircraft had accumulated a total of 1,965 operating hours and had flown approximately 379 hours since the last overhaul.

Examinations and tests were conducted on the left engine, which exhibited signs of propeller impact in the feathered position, to determine its operating condition during the approach to SBBI.

Externally, the engine displayed an intact appearance in its components and accessories, with no apparent damage resulting from the emergency landing (Figure 15).

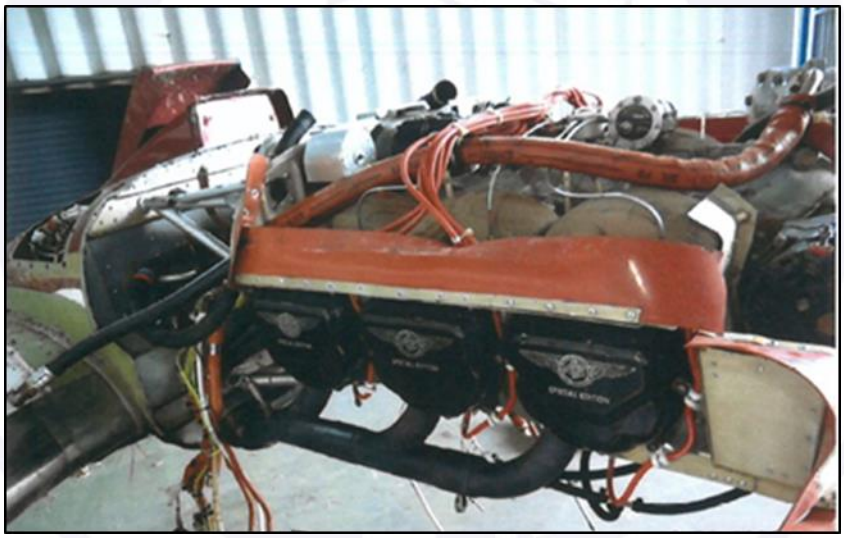

Figure 15 - Left engine showing external integrity.

It was not possible to start the engine on the aircraft itself due to the other structural damages present.

Examinations of the left engine's fuel injectors indicated that they were unobstructed (Figure 16).

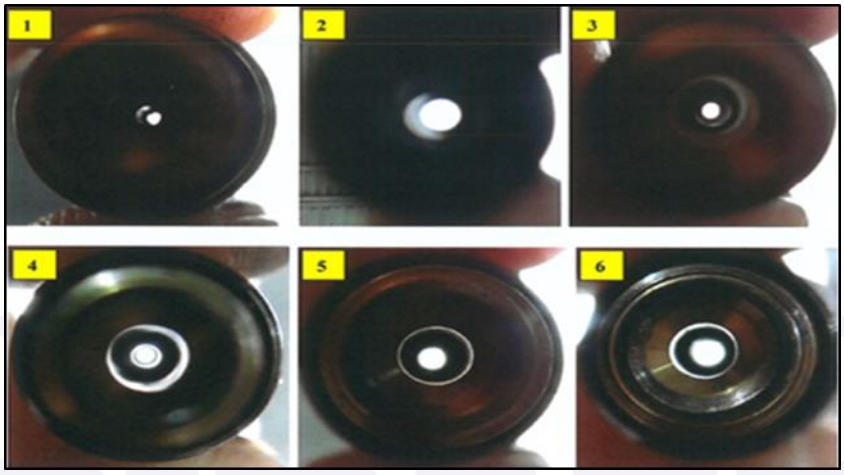

Figure 16 – Unobstructed fuel injectors of the left engine.

The fuel distributor was disassembled, and no contamination was found in its internal filter. The fuel pump was manually rotated, expelling the residual fuel within, indicating normal operation.

The fuel flow valve, installed on the throttle body, was inspected, and the fuel inlet filter showed no signs of contamination.

The lubrication system had a clean primary filter element, with no retained material present.

The engine's initial ignition timing angle showed a 24º BTDC (Before Top Dead Center) setting, consistent with the engine's identification plate. The magnetos were deemed synchronized based on the lighting of the indicator lights verified using the "Timing Light".

All six cylinders exhibited compression within the limits set by the manufacturer, even under cold engine conditions.

Considering the good condition of the powerplant components, the accident characteristics, and the examinations performed, no discrepancies were found that could have caused engine malfunction, particularly in the fuel, ignition, or oil filter systems.

During the engine analysis conducted by members of the Investigation Committee, it was identified that the throttle body assembly (THROTTLE ASM-AIR) had one of its mounting brackets (BRACKET-THR BODY SUPPORT) broken (Figure 17).

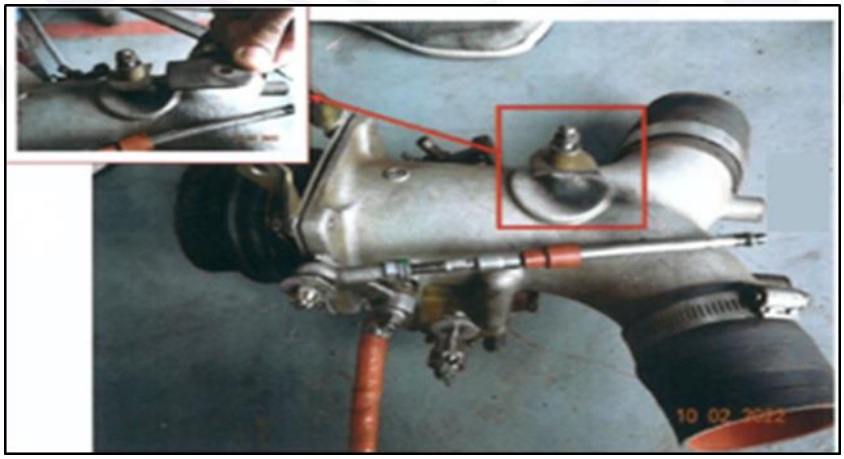

Figure 17 - General view of the throttle body assembly (THROTTLE ASM-AIR), highlighting the broken mounting bracket.

It was also noted that the throttle lever control cable was severed (Figure 18).

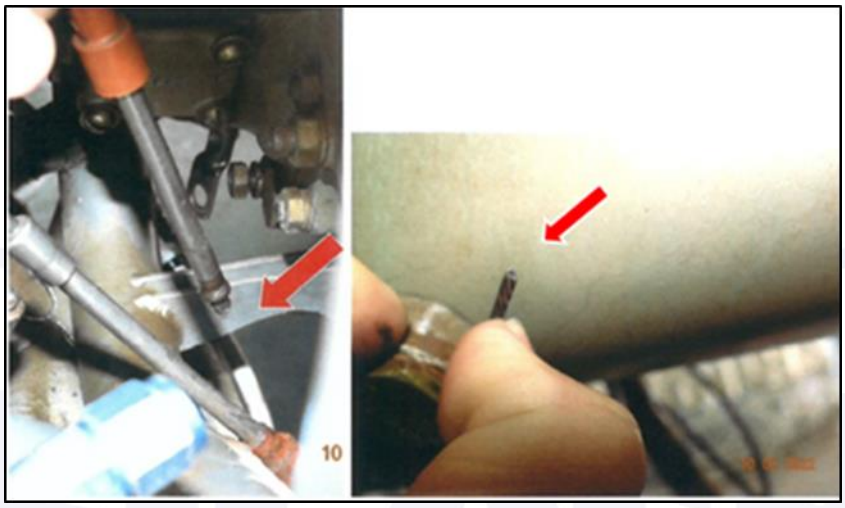

Figure 18 - Severed throttle lever control cable.

Through this control cable, the pilot operated the opening and closing of the butterfly valve, which was part of the throttle body assembly, to set the engine power level in accordance with the throttle lever selection. In addition, this cable operated on the flow valve, responsible for managing the appropriate fuel quantity relative to the admitted air mass, maintaining an air-fuel mixture consistent with the given inputs.

Laboratory examinations were conducted on the severed components to determine the failure mechanism.

Electrophotographs of the fractured wires showed denting on the fracture surface and striations indicative of fatigue failure (Figure 19).

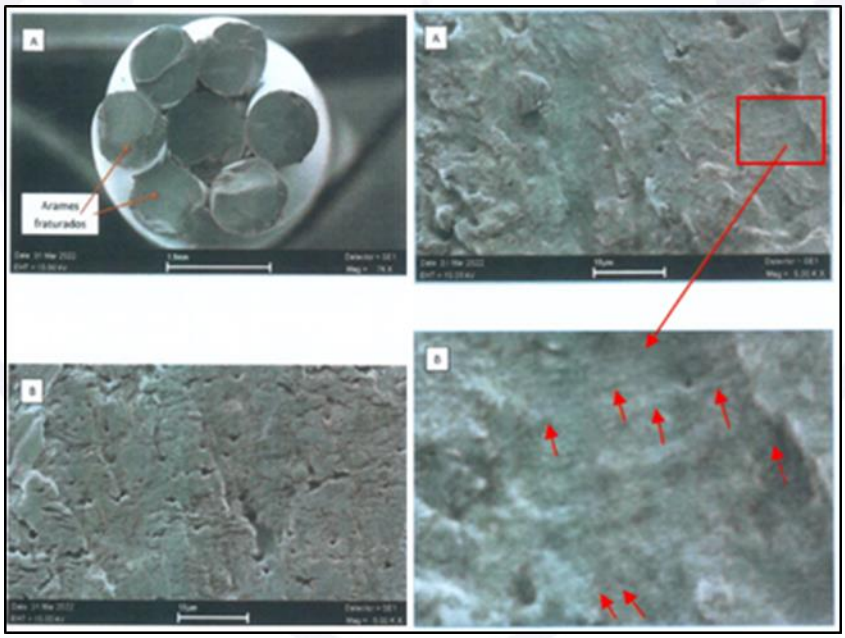

Figure 19 – Highlight of the fatigue mechanism
on the fractured wire (red arrows).

The throttle body bracket exhibited plastic deformation, warping, and a fracture at approximately 45º, indicating an overload on the throttle body assembly bracket (THROTTLE ASM-AIR).

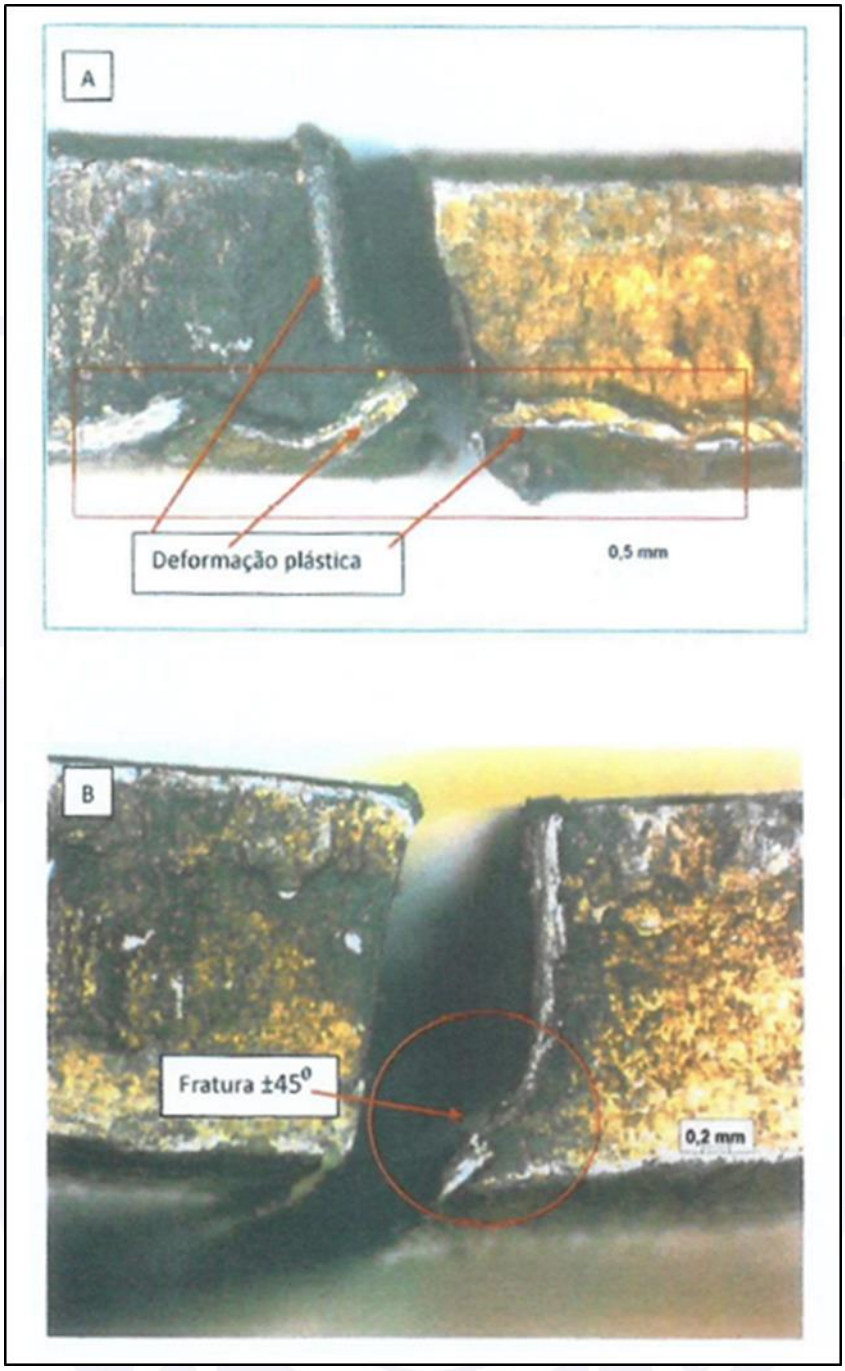

Figure 20 - View of the fracture of the throttle body assembly bracket.

It was noted that the fractured items had been inspected during the issuance of the CVA on 20 August 2021, as shown in Figure 21. The maintenance manual for the aircraft required the inspection of the engine controls every 100-hour / annual inspection, as well as the removal of the connections and wear check every 300 hours.

	MOTOR	
31	Área do(s) motor(es) quanto a vazamentos (óleo/combustível).	OK
32	Berço do(s) motor(es) quanto a trincas e folgas de fixação.	OK
33	Amortecedores flexíveis do(s) motor(es) – condições gerais.	OK
34	Controles do(s) motor(es) quanto a defeitos em geral.	OK
35	Tubulações/mangueiras do(s) motor(es) quanto a vazamentos.	OK
36	Conjuntos de escapamentos quanto a trincas e defeitos.	OK
37	Acessórios do(s) motor(es) quanto a defeitos aparentes.	OK
38	Capotas/Carenagens do(s) motor(es) – defeitos aparentes.	OK

Figure 21 - PR-JGV's CVA checklist from 20 August 2021.

It was not possible to determine the date of the last wear check or to verify whether any damage was identified during that inspection.

After the CVA was issued, the aircraft flew 48 hours, with no recorded incidents related to problems or failures involving the throttle body bracket.

Both items lacked serial numbers and were cataloged only by their Part Numbers (PN): 102-389010-47 (control cable) and PN 631840 (bracket).

1.17 Organizational and management information.

NIL.

1.18 Operational information.

The intended route involved a departure from SSKG at 13:00 UTC, climbing to FL075, and proceeding directly to SBBI. The flight was planned to be conducted under visual flight rules (VFR) from the departure aerodrome, changing to instrument flight rules (IFR) for the arrival at the destination aerodrome.

The aircraft's basic operating weight was 4,079.4 lb., and it was fueled with 825 lb. of aviation gasoline. Adding the weight of the crew and passengers, all without baggage, the takeoff weight was calculated to be 5,566 lb. The aircraft's Maximum Takeoff Weight (MTOW), as established by the manufacturer, was 5,500 lb.

During the flight, approximately 475 lb. of fuel was consumed. At the time of the occurrence, the aircraft's total weight was estimated to be 5,091 lb.

The pilot reported that, during the descent, he worked the items of the *Descent and Before Landing Checklist* to in preparation for landing at SBBI. To reduce speed and lower the landing gear, both throttles were set to idle. The PIC noted a tendency for the nose to yaw to the left, which was controlled using the right rudder pedal.

At this point, the PIC reported having observed the engine parameters and interpreted that the left engine had flamed out. Subsequently, the *Engine Failure in Flight Checklist* was executed in the minimum power configuration, propeller feathered, and mixture lever at cut-off.

The PIC then stated that the landing gear was retracted immediately, being extended again moments before touchdown. He reported keeping the slip indicator centered, adding a slight wing bank toward the operating engine, and attempting to restart the left engine twice while maintaining a minimum speed of approximately 81 kt. and heading toward SBBI.

The aircraft covered approximately 13 NM to the aerodrome on a steady descent. The approach was convergent with the runway on a heading toward threshold 18. The PIC overflew the hangar area and landed on a grassy surface between taxiways "C" and "B", traveling approximately 250 m, crossing runway 18/36, and colliding with an embankment.

In Figure 22, the table extracted from the Aircraft Flight Manual (AFM), Section V - *Performance* - shows that the service ceiling for a flight with one engine inoperative under the conditions estimated at the time of the accident (temperature of 29°C and weight of 5,100 lb.), was approximately 7,100 ft.

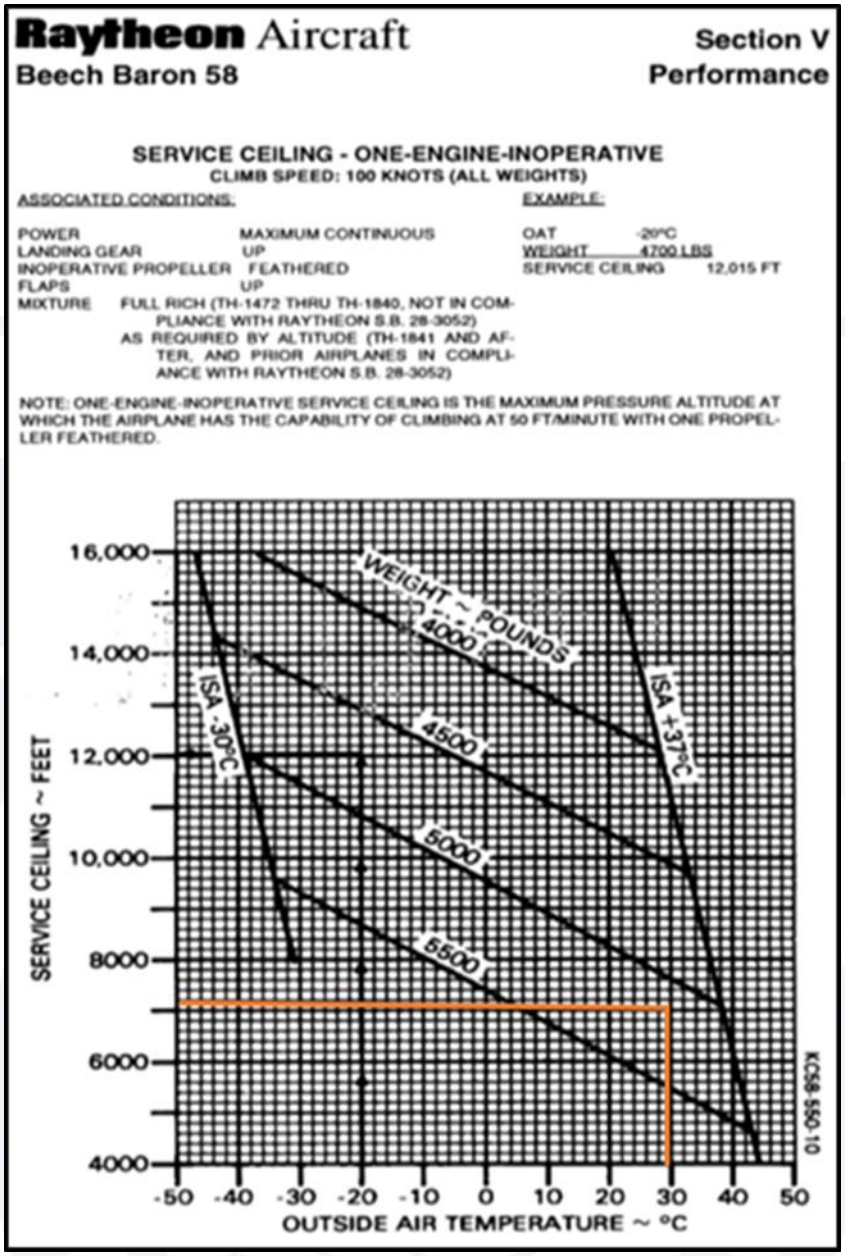

Figure 22 - Service ceiling with one engine inoperative.
Source: Beech Baron 58 AFM, Section V,
Performance Service Ceiling, ONE-ENGINE-INOPERATIVE.

The graph in Figure 23 provides the parameters for calculating the climb performance of the Beech Baron 58 aircraft with one engine inoperative, with the failed engine's propeller in the feathered position, and a forward speed of 100 kt.

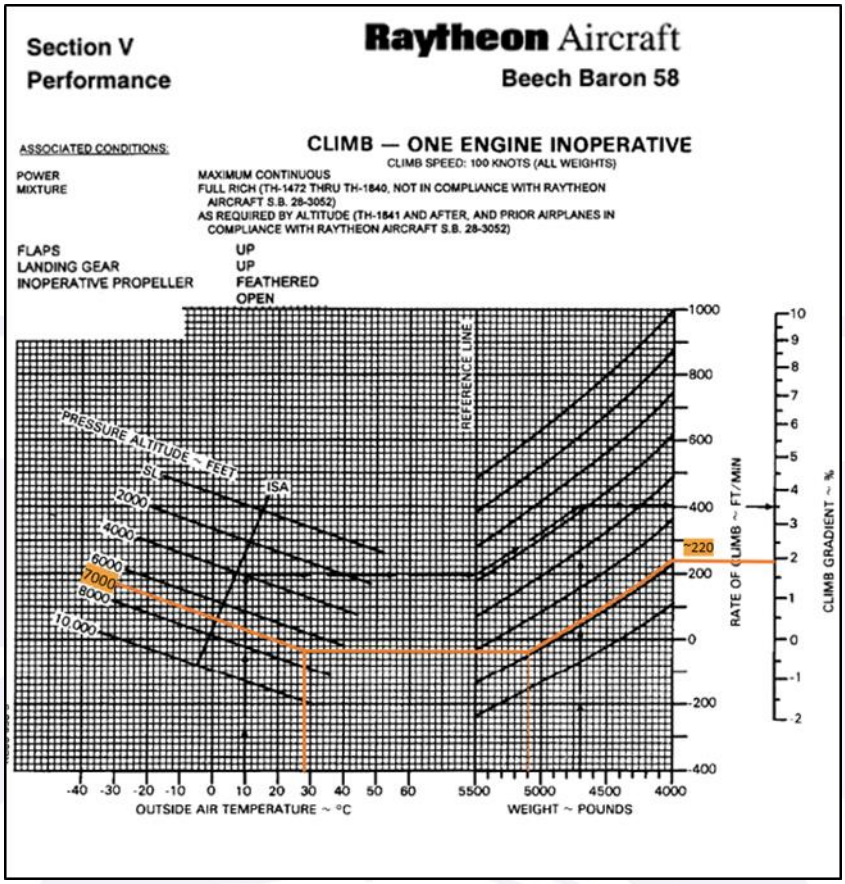

Figure 23 - Climb performance with one engine inoperative.
Source: Beech Baron 58 AFM, Section V, Climb, ONE ENGINE INOPERATIVE.

For the estimated conditions at the time of the accident (temperature of 29°C, initial altitude of 7,000 ft., and weight of 5,100 lb.), the aircraft would have been capable of maintaining a climb rate of approximately 220 ft./min with a gradient of 1.9%.

Regarding training for single-engine flight, the PIC stated that he had shut down one of the engines in flight during the course to obtain the MLTE qualification, experiencing the real single-engine situation, in 2012. During the MLTE and IFR qualification revalidation flights, instrument approaches were performed with simulated engine failure as a mandatory maneuver for multiengine aircraft, as established in Supplementary Instruction (IS) No. 00-002G, which established the "*Standards for Delivering Pilot Proficiency Exams*".

An analysis of the Pilot Evaluation Sheets completed during previous MLTE rating renewals revealed no comments indicating any difficulties during training.

1.19 Additional information.

Following the reconstruction of the events leading to the occurrence, as well as a review of the RADAR visualization and communications between the PR-JGV aircraft and the air traffic control units, it was confirmed that the PIC did not declare urgency or emergency during the engine failure event.

The Command of Aeronautics' Instruction 100-12, "*Rules of the Air*", issued by the Department of Airspace Control (DECEA), provides the following in its item 3*, Applicability of the Rules of the Air*, subitem 3.6, *Aircraft in Emergency*:

> 3 APPLICABILITY OF THE RULES OF THE AIR
>
> 3.6 AIRCRAFT IN EMERGENCY
>
> An aircraft in an emergency situation, either distress or urgency, must use the corresponding message (signal) via radiotelephony as prescribed in Annex A and MCA 100-16 (Air Traffic Phraseology).

The conditions of distress and urgency are defined as:

a) Distress: a condition in which the aircraft is threatened by a grave and/or imminent danger and requires immediate assistance;

NOTE: The distress condition also applies to emergency situations in where an aviation accident is unavoidable or has already occurred.

b) Urgency: a condition involving the safety of the aircraft or a person on board, but which does not require immediate assistance.

1.20 Useful or effective investigation techniques.

NIL.

2. ANALYSIS.

The Beech Baron 58 aircraft, registration marks PR-JGV, was registered in the TPP category and operated by *Pajoara Indústria e Comércio Ltda*.

It was a private transport flight, with one pilot and five passengers on board, on the route from SSKG to SBBI, departing under visual flight rules and arriving under instrument flight rules.

The analysis concluded that neither the meteorological conditions nor the characteristics of the destination aerodrome contributed to the accident.

The monthly entries in the airframe, engine, and propeller logbooks were out of date in Part I (Monthly Utilization Records); however, this did not affect the scheduling of maintenance actions.

Moments before intercepting the IAF for the RNP B RWY 36 procedure, the PIC began reducing speed and lowering the landing gear. During these procedures, the pilot noticed a yaw to the left and, based on instrument indications, interpreted it as a left engine flameout.

From the position where the failure occurred, the PIC set a direct course to SBBI, maintaining a straight and descending trajectory.

The aircraft approached the runway heading toward threshold 18. With insufficient altitude to land, the aircraft overflew the hangar area and landed on a grassy surface between taxiways “C” and “B”, traveling approximately 250 meters, crossing runway 18/36, and colliding with an embankment.

The damage included the landing gear, hydraulic system, and engines. Analyzing the propeller blades and cockpit controls revealed that the left engine was shut down and feathered at the time of impact, while the right engine was at low power and not feathered.

Additionally, the fuel selector on the left side was found in the OFF position, while the right selector was in the CROSS FEED position, indicating cross-feed fuel supply to the left engine.

The left engine underwent laboratory testing to determine its operational state at the time of the accident. Externally, it showed integrity, with no apparent damage.

The tests concluded that the fuel, lubrication, and ignition systems exhibited characteristics consistent with normal operation at the time of the accident.

However, two broken components were identified during the examinations: one of the throttle body assembly’s mounting brackets (BRACKET-THR BODY SUPPORT) and the throttle lever control cable.

The throttle body bracket exhibited plastic deformation, warping, and fracture at approximately 45º, indicating overload stress. It was inferred that the bracket’s fracture likely occurred during the aircraft’s impact with the terrain.

The control cable rupture showed characteristics of a fatigue failure mechanism. It was hypothesized that prolonged use may have subjected the cable to conditions that accelerated its structural degradation, or that it was manufactured with deviations from its design specifications.

Maintenance records indicated that both components were inspected during the CVA issuance, and no events were reported that would justify the observed fracture mechanisms. There were also no records of these items being replaced.

Following the throttle lever control cable's rupture, control of the butterfly valve was lost, preventing the engine from responding to the pilot's commands. This situation was interpreted by the PIC as a left engine flameout, leading to the execution of the *Engine Failure in Flight* procedures, including shutting down the engine.

Subsequently, the PIC attempted an inflight restart, however, the inability to operate the butterfly valve by means of the throttle rendered the attempt unsuccessful, forcing the pilot to operate the aircraft with only one of the engines functioning.

According to the AFM charts, the aircraft was within the service ceiling limits for single-engine operation at a weight of 5,100 lb., an external temperature of up to 29º C and a pressure altitude of 7,100 ft.

Under these conditions, at the initial altitude of 7,000 ft., the aircraft would be able to sustain a climb rate of approximately 220 ft. /min, at 100 kt. with a climb gradient of 1.9%.

No evidence was found to suggest any conditions that would prevent single-engine flight. The most likely hypothesis is that when faced with the abnormal condition, the pilot initiated engine failure procedures and allowed the aircraft to establish a descent trajectory unsuitable for landing on runway 18 at SBBI.

Additionally, while attempting to restart the left engine in flight twice, the pilot's attention may have been diverted from flying, impairing their assessment of certain flight control parameters, such as speed and descent rate.

Although it did not contribute to the accident's consequences, it was noted that the PIC did not properly communicate the conditions encountered in flight to air traffic control units.

ICA 100-12 established conditions in which air traffic control agencies must be notified of either a Distress or Urgent situation when the aircraft is threatened by a grave and/or imminent danger, or in an emergency situation where an aviation accident is unavoidable or has already occurred.

3. CONCLUSIONS.

3.1. Findings.

a) the PIC held a valid CMA (Aeronautical Medical Certificate);

b) the PIC held valid ratings for MLTE (Multi-Engine Land Aeroplane) and IFRA (Instrument Flight - Aeroplane);

c) the PIC was qualified and experienced for the type of flight;

d) the aircraft had a valid CVA (Certificate of Airworthiness);

e) the aircraft was within weight and balance limits;

f) the entries in the airframe, engine, and propeller logbooks were out of date;

g) the meteorological conditions were above the minimum required for the flight;

h) at the time of the engine failure, the PIC abandoned the RNP B RWY 36 procedure and proceeded with a direct visual approach to land on runway 18 at SBBI;

i) the PIC did not report the emergency condition to the traffic control units;

j) examinations of the left engine did not identify discrepancies that could have caused its malfunction, specifically in the fuel, ignition, or oil filter systems;

k) examinations of the left engine indicated that the throttle body bracket, PN 631840, fractured due to overload;

l) examinations of the left engine revealed that the throttle control cable, PN 102-389010-47, showed signs of fracture due to fatigue;

m) the aircraft sustained substantial damage; and

n) all occupants of the aircraft emerged uninjured.

3.2. Contributing factors.

Attention – undetermined.

The PIC's divided attention, resulting from focusing on attempts to restart the left engine, may have hindered the proper maintenance of flight parameters during the single-engine condition, preventing the aircraft from reaching runway 18 at SBBI.

Manufacturing – undetermined.

A deficiency in the manufacturing process or assembly of the PN 102-389010-47 throttle control cable may have contributed to the premature degradation of its structure through the development of material fatigue. This ultimately led to its unexpected total failure during operation, resulting in the inability to control the left engine.

Handling of aircraft flight controls – undetermined.

Inadequate operation of the controls during the single-engine flight condition may have contributed to the aircraft's inability to maintain the landing profile on a direct approach to runway 18 at SBBI.

4. SAFETY RECOMMENDATIONS

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 consonance with the Law n°7565/1986, recommendations are made solely for the benefit of 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".

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

A-008/CENIPA/2022 - 01 **Issued on 05/14/2025**

Evaluate, together with the type certificate holder of the Beech Baron 58 aircraft model, whether the current maintenance requirements are sufficient to ensure that the throttle control cables, PN - 102-389010-47, do not fail under conditions different from those specified in their design parameters.

5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN.

None.

On May 14th, 2025.