AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:	CA18/2/3/9860		
Aircraft Registration	**ZU-DJU**	**Date of Accident**	2 February 2020		**Time of Accident**	0615Z	
Type of Aircraft	Bantam B22J		**Type of Operation**		Private (Part 94)		
Pilot-in-command Licence Type	National Pilot Licence		**Age**	58	**Licence Valid**	Yes	
Pilot-in-command Flying Experience	Total Flying Hours		117		Hours on Type	79.3	
Last Point of Departure	Pietersburg Civil Aerodrome (FAPI), Limpopo Province						
Next Point of Intended Landing	Pietersburg Civil Aerodrome (FAPI), Limpopo Province						

Location of the accident site with reference to easily defined geographical points (GPS readings if possible)

Approximately 5 nautical miles (nm) south-east of Pietersburg Civil Aerodrome (FAPI) at GPS co-ordinates determined to be 23°56'40.38'' S 029°35'72'' E at an elevation of 4348ft

Meteorological Information	Wind: 130° at 5kt; Visibility: 9999m; Clouds: NIL; Temperature: 24°C; Dew point: 14°C and QNH: 1024				
Damage to Aircraft	Substantial				
Number of People On-board	1 + 1	**No. of People Injured**	0	**No. of People Killed**	0

Synopsis

On 2 February 2020 at 0600Z, a pilot and a passenger on-board a Bantam B22J aircraft with registration ZU-DJU took off on a private flight from Runway (RWY) 08 at Pietersburg Civil Aerodrome (FAPI) in Limpopo province with the intention to return to the same aerodrome. The flight was conducted under visual flight rules (VFR) by day in visual meteorological conditions (VMC).

The pilot reported that whilst flying the aircraft at a height of approximately 900 feet (ft) above ground level (AGL) south of FAPI, the aircraft engine started to lose power. The pilot attempted to restore power to 2800 revolutions per minute (rpm) without success. The aircraft lost altitude and he elected to execute a forced landing on a bushy terrain; however, the aircraft collided with trees during the landing sequence and sustained substantial damage. The pilot shut down the aircraft engine after the forced landing. The two occupants on-board the aircraft did not sustain any injuries.

Post-accident inspection of the aircraft revealed that it had enough fuel. There was no evidence of engine failure or damage prior to the accident; the damage on the airframe was due to the impact force.

Probable cause/s and/or contributory factors

The aircraft experienced engine power loss while climbing to 900ft AGL, resulting in the pilot being unable to maintain the aircraft's altitude. The pilot attempted to carry out a forced landing, however, the aircraft impacted the trees. The cause of engine power loss could not be determined.

SRP Date	16 February 2021	Publication Date	22 February 2021

ABBREVIATION	DESCRIPTION
AGL	Above Ground Level
AMO	Aircraft Maintenance Organisation
AP	Approved Person
AIID	Accident and Incident Investigations Division
ATF	Authority to Fly
CoR	Certificate of Registration
CVR	Cockpit Voice Recorder
°C	Degree Celsius
FAPI	Pietersburg Civil Aerodrome
ft	Feet
FDR	Flight Data Recorder
FL	Flight Level
GPS	Global Positioning System
IFR	Instrument Flight Rules
NPL	National Pilot Licence
NM	Nautical mile
Runway	RWY
SAWS	South African Weather Service
TBO	Time Between Overhaul
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions

Reference Number	**:** CA18/2/3/9860
Name of Owner/Operator	**:** Marius Potgieter
Manufacturer	**:** Micro Aviation New Zealand Ltd
Model	**:** Bantam B22J
Nationality	**:** South African
Registration Marks	**:** ZU-DJU
Place	**:** Polokwane Civil Aerodrome (FAPI), Limpopo province
Date	**:** 2 February 2020
Time	**:** 0615Z

All times given in this report are Co-ordinated Universal Time (UTC) and will be denoted by (Z). South African Standard Time is UTC plus 2 hours.

Purpose of the Investigation:

In terms of Regulation 12.03.1 of the Civil Aviation Regulations (CAR) 2011, this report was compiled in the interest of the promotion of aviation safety and the reduction of the risk of aviation accidents or incidents and ***not to apportion blame or liability****.*

Investigation Process:

The accident was notified to the Accident and Incident Investigations Division (AIID) on 2 February 2020 at about 1300Z. The AIID investigator did not go on site, instead, a desktop investigation was conducted. The AIID of the South African Civil Aviation Authority (SACAA) is leading the investigation as the Republic of South Africa is the State of Occurrence.

Notes:
1. Whenever the following words are mentioned in this report, they shall mean the following:

- *Accident – this investigated accident*
- *Aircraft – the Bantam B22J involved in this accident*
- *Investigation – the investigation into the circumstances of this accident*
- *Pilot – the pilot involved in this accident*
- *Report – this accident report*

2. Photos and figures used in this report were taken from different sources and may be adjusted from the original for the sole purpose of improving clarity of the report. Modifications to images used in this report are limited to cropping, magnification, file compression; or enhancement of colour, brightness, contrast; or addition of text boxes, arrows or lines.

Disclaimer:

1. FACTUAL INFORMATION

1.1. History of Flight

1.1.1 On 2 February 2020 at 0600Z, a pilot accompanied by a passenger on-board a Bantam B22J aircraft with registration ZU-DJU took off on a private flight from Runway (RWY) 08 at Pietersburg Civil Aerodrome (FAPI) with the intention to return to the same aerodrome.

1.1.2 The flight was conducted under visual flight rules (VFR) by day and in visual meteorological conditions (VMC).

1.1.3 During the pre-flight inspection, the pilot reported that he added 30 litres of fuel to the aircraft and, thus, had a total of 35 litres of fuel showing on the sight glass gauge. This was recorded in the flight folio prior to the flight. According to the Bantam Pilot Operating Handbook (POH), the take-off revolutions per minute (rpm) are 2800 and cruise is at 2600 rpm.

1.1.4 The aircraft took-off and climbed to 400 feet (ft) above ground level (AGL) before turning south and climbing to 600ft AGL. The aircraft climbed further to approximately 900ft AGL before the engine started losing power while heading in a south-westerly direction. The pilot attempted to restore power without success, and the aircraft started losing altitude. The pilot elected to execute a forced landing, turning the aircraft south-east into the prevailing wind. During the forced landing, the aircraft impacted trees, resulting in substantial damage to the aircraft. The pilot shut down the aircraft engine after the forced landing. The two occupants on-board did not report any injuries as a result of the accident.

1.1.5 The accident took place approximately 5 nautical miles (nm) south-east of FAPI at Global Positioning System (GPS) co-ordinates determined to be 23°56’40.38’’ S 029°35’72’’ E at an elevation of 4348ft.

Figure 1: The aircraft flight path from take-off to the point of accident. (Source: Google Earth)

1.2. Injuries to Persons

Injuries	Pilot	Crew	Pass.	Total On-board	Other on Ground
Fatal	-	-	-	-	-
Serious	-	-	-	-	-
Minor	-	-	-	-	-
None	1	-	1	2	-
Total	1	-	1	2	-

1.3. Damage to Aircraft

1.3.1 The aircraft was substantially damaged during the accident sequence. Moreover, the wreckage was subjected to the elements such as rain before it was recovered from the accident site.

Figure 2: The aircraft after it came to rest at the accident site. (Source: Pilot)

1.4. Other Damage

1.4.1 None.

1.5. Personnel Information

Nationality	South African	Gender	Male	Age	58
Licence Number	0279043467	Licence Type	National Pilot Licence		
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	None				
Medical Expiry Date	27 November 2020				
Restrictions	None				
Previous Accidents	None				

Flying Experience:

Total Hours	117
Total Past 90 Days	50
Total on Type Past 90 Days	50
Total on Type	79.3

1.6. Aircraft Information

1.6.1 The Bantam B22J is a two-seater high-wing ultralight aircraft. The aircraft is made from aluminium tubing, which is bolted together and covered in Dacron sailcloth. The single engine is mounted above the cockpit in a tractor configuration. The engine is an air-cooled flat four-cylinder reciprocating unit.

1.6.2 The aircraft wreckage was recovered and stored for the duration of three months during the national lockdown. The engine was then sold to an approved person (AP) who performed a teardown inspection. The AP found no fault with the engine; it was turning freely.

Airframe:

Type	Bantam B22J	
Serial Number	04-0244	
Manufacturer	Micro Aviation New Zealand	
Date of Manufacture	2004	
Total Airframe Hours (At time of Accident)	679.4	
Last MPI (Date & Hours)	11 November 2019	636.4
Hours Since Last MPI	43	
ATF (Issue Date)	11 November 2019	
C of R (Issue Date) (Present Owner)	1 February 2019	
Operating Categories	94	
Recommended Fuel Used	AVGAS 100LL	

According to the pilot's statement, he took off with 35 litres of fuel and flew for approximately 15 minutes. According to the Bantam Pilot Operating Handbook (POH), fuel consumption is 15 litres per hour. This meant that the aircraft had a total of approximately 31 litres of fuel remaining (see Figure 4).

Engine:

Type	Jabiru 2200
Serial Number	22A1706
Hours Since New	679.4
Hours Since Overhaul	TBO not reached

NOTE: Jabiru Aircraft recommend a Time Between Overhaul (TBO) of 2000 hours, with a top-end overhaul done at 1000 hours, or when engine condition indicates the need to overhaul earlier.

Propeller:

Type	De Necker
Serial Number	N2465FE
Hours since New	679.4
Hours since Overhaul	TBO not reached

1.7. Meteorological Information

1.7.1 The weather information was sourced from the South African Weather Service (SAWS) for FAPI on 2 February 2020 at 0800Z.

Wind direction	130°	Wind speed	05 kts	Visibility	9999m
Temperature	24°C	Cloud cover	FEW	Cloud base	2500 feet
Dew point	14°C	QNH	1024		

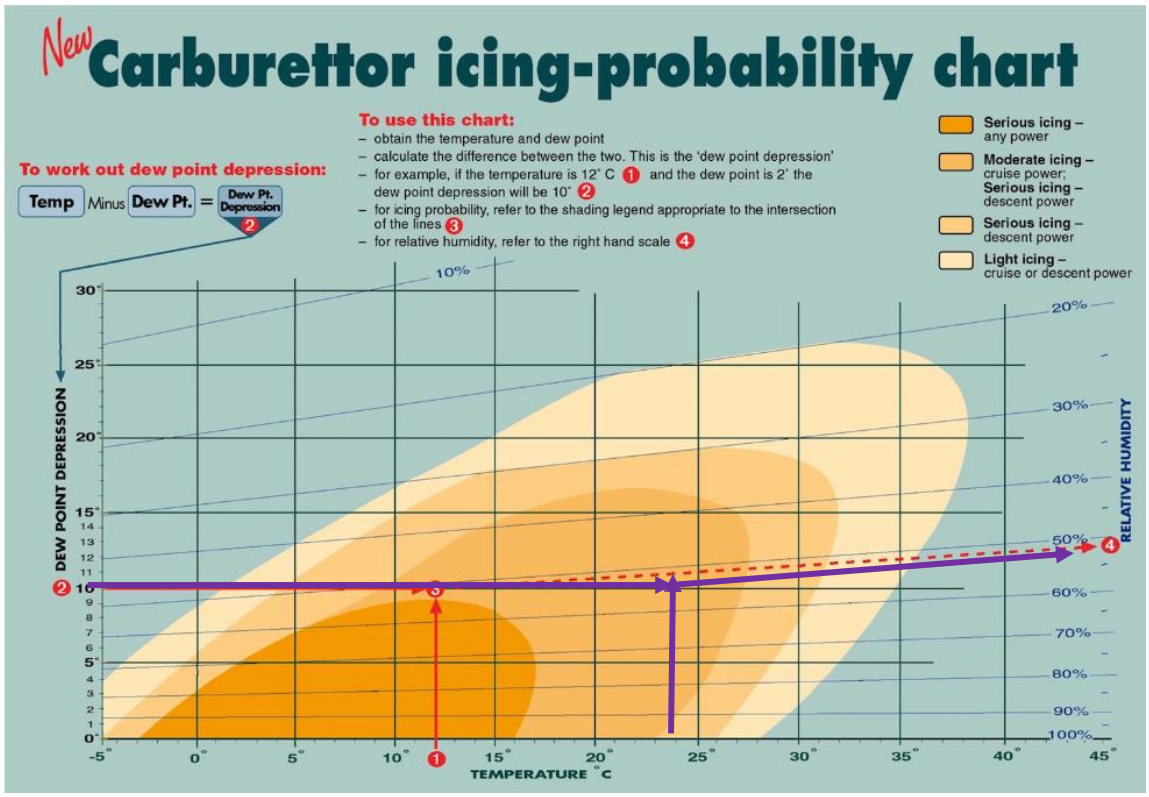

Figure 3: The carburetor icing chart showing a calculated icing probability in the FAPI area. (Source: https://foxbatpilot.files.wordpress.com/2017/01/carburettor-icing-chart.jpg)

1.7.2 According to the chart (Figure 3), the relative humidity in the area around FAPI was at approximately 52% with the temperature of 24°C, and dew point depreciation of 10°C; the result will be a moderate icing condition at cruise power with serious icing on descent. The relative humidity was less than 52%, therefore, carburettor icing was not a factor.

1.8. Aids to Navigation

1.8.1 The aircraft was equipped with standard navigational equipment as approved by the Regulator (SACAA) for the aircraft type. There was no record indicating that the navigation system was unserviceable prior to the accident.

1.9. Communication

1.9.1 The aircraft was equipped with standard communication equipment as approved by the Regulator for the aircraft type.

1.10. Aerodrome Information

1.10.1 The aircraft accident took place approximately 5 nautical miles (nm) south-east of FAPI.

Aerodrome Location	Pietersburg Civil Aerodrome (Limpopo Province)
Aerodrome Co-ordinates	24°06'16.73" S; 028°06'59.95" E
Aerodrome Elevation	4228 ft. (AMSL)
Runway Designations	08/26
Runway Dimensions	2200x 25m
Runway Used	08
Runway Surface	Asphalt
Approach Facilities	None

1.11. Flight Recorders

1.11.1 The aircraft was not equipped with a flight data recorder (FDR) nor a cockpit voice recorder (CVR), and neither recorder was required to be fitted on this aircraft type.

1.12 Wreckage and Impact Information

1.12.1 The aircraft lost engine power at approximately 900ft AGL. When the pilot could not restore engine power, he elected to execute a forced landing as the aircraft was also losing height.

1.12.2 The aircraft was forced landed on a bushy terrain after impacting trees during the landing sequence.

1.12.3 The wreckage was contained in one place (area) with the nose slightly raised. The windshield appeared shattered, wings damaged, the nose and main gears damaged. The damage on the airframe was due to the impact force (see Figure 2).

1.12.4 On-site observation found that there was 31 litres of fuel in the fuel tank as reflected on the sight glass gauge and there was no visual contamination of fuel (see Figure 4).

Figure 4: Fuel gauge showing the amount of fuel remaining in the tank. (Source: Insurance assessor)

Figure 5: Post-accident image. (Source: Pilot)

1.13 Medical and Pathological Information

1.13.1 None.

1.14 Fire

1.14.1 There was no evidence of a pre- or post-impact fire.

1.15 Survival Aspects

1.15.1 The aircraft accident was considered survivable as the cockpit area (where the two occupants were seated and strapped) did not sustain damage that could have injured them.

Figure 6: The cockpit cage and safety harnesses after the accident. (Source: Insurance assessor)

1.16 Tests and Research

1.16.1 The AP reported that he visually inspected the aircraft's engine and no abnormalities were found; the engine was turning freely before it was disassembled. Following the assembly of the engine, a shock loading was performed on the engine as the propeller had struck trees.

1.16.2 The aircraft still contained fuel in its tanks, according to the first respondents at the accident scene. The AP reported that the engine did not have serious mechanical failure prior to impact; and that it was turning freely. The damage to the engine was due to impact with terrain.

1.17 Organisational and Management Information

1.17.1 The aircraft was operated on a private capacity by the pilot and under the provisions of Part 94 of the CAR 2011 as amended.

1.17.2 The aircraft was maintained by an AP, licensed by Aeroclub of South Africa, with an aircraft maintenance AP number 343. The AP's licence/certificate number was issued on 1 March 2019 with an expiry date of 31 March 2021.

1.18 Additional Information

1.18.1 An article by Colin Cutler (09/10/2015) (*www.boldmethod.com/learn-to-fly/aircraft.../dont-let-carb-ice-happen-to-you/*) stated: "Most aircraft POH recommend that the carburettor heat levers be tested before take-off to make sure they are operational. Most aircraft manufacturers suggest take-off with carburettor heat in the 'off' position as carburettor heat reduces engine power."

1.18.2 An extract from the *B22J Flight Manual (Source):*

Engine Failure After Take-off

1. *Immediately lower the nose (to about a 30° nose-down attitude) and accelerate to or maintain 45kts.*
2. *Select a suitable landing spot.*
3. *Commence the flare at about 5 feet altitude and touch down in the normal attitude.*

CAUTION
Avoid commencing the flare at any higher altitudes as the airspeed will drop rapidly once the nose is raised, which could lead to a stall at a height where recovery may not be possible.

4. Engine Failure in Flight

1. *Immediately lower the nose to maintain 45kts.*
2. *Select a suitable landing place within glide range of the aircraft. Plan the approach. Remember, the aircraft has a very steep glide slope without applied power. As a guide, any landing place which is visible just above the nose of the aircraft when in level flight is within gliding distance in still air conditions.*
3. *If time permits, conduct a trouble check:*
   - *Check ignition on (cycle ignition switches)*
   - *Check fuel pump on and fuel contents*
   - *Check choke off (cycle choke control)*
   - *Check fuel cock on*

1.19 Useful or Effective Investigation Techniques

1.19.1 None.

2. ANALYSIS

2.1. General

From the evidence available, the following analysis was made with respect to this accident. These shall not be read as apportioning blame or liability to any particular organisation or individual.

2.2.

2.2.1 The pilot was issued a National Pilot Licence (NPL) on 26 July 2019 with an expiry date of 25 July 2020. His medical certificate was issued on 26 November 2018 with an expiry date of 27 November 2020. The pilot was in possession of required qualifications at the time of the accident.

2.2.2 The aircraft was registered for private operation as per Part 94 of the CAR 2011 as amended. The ZU-DJU aircraft's latest Authority to Fly (ATF) indicated that it was originally issued on 12 November 2019, with an expiry date of 30 November 2020. Records indicated that the aircraft was being maintained in line with the approved procedures and regulations. There were no reported or recorded defects prior to the flight.

2.2.3 The aircraft's Certificate of Release to Service (CRS) was issued on 14 October 2019 at 636.4 (airframe total hours) with an expiry date of 14 October 2020 or at 683.8 hours, whichever comes first. At the time of the accident, the aircraft had accumulated 43 hours since its last inspection. There were no pre-existing mechanical faults with the engine recorded in the flight folio and defect logs prior to the accident. The aircraft was airworthy prior to the flight.

2.2.4 There was enough fuel in the aircraft and no visual contamination. The relative humidity was at approximately 52% with the temperature of 24°C and dew point depreciation of 10°C, therefore, the result will be a moderate icing condition at cruise power with serious icing on descent; thus, it was unlikely that the carburettor icing was a factor.

2.2.5 During the pre-flight phase, the pilot reported that he added 30 litres of fuel and that the sight glass gauge showed 35 litres in the tanks; the pilot had registered the fuel uplifts in the flight folio. According to the pilot's statement, he took off with 35 litres of fuel and flew for about 15 minutes. This meant that the aircraft had a total of 31 litres of fuel remaining at the time of the accident; therefore, the aircraft had enough fuel at the time of crash.

2.2.6 The pilot reported that whilst flying the aircraft at a height of approximately 900ft AGL south of FAPI, the aircraft experienced engine power loss, resulting in the pilot being unable to maintain height of the aircraft. In an attempt to carry out a forced landing, the aircraft impacted trees, which resulted in an unsuccessful forced landing.

2.2.7 The aircraft's engine was visually inspected, and no abnormalities were found. Moreover, the engine was turning freely before it was disassembled. Following the assembly of the engine, shock loading was performed on the engine as the propeller had struck trees. There was no evidence that the engine suffered mechanical failure prior to impact with the ground. The cause of the engine power loss could not be determined.

3. CONCLUSION

3.1. General

From the evidence available, the following findings, causes and contributing factors were made with respect to this accident. These shall not be read as apportioning blame or liability to any particular organisation or individual.

To serve the objective of this investigation, the following sections are included in the conclusions heading:

- **Findings —** are statements of all significant conditions, events or circumstances in this accident. The findings are significant steps in this accident sequence, but they are not always causal or indicate deficiencies.
- **Causes —** are actions, omissions, events, conditions, or a combination thereof, which led to this accident.
- **Contributing factors —** are actions, omissions, events, conditions, or a combination thereof, which, if eliminated, avoided or absent, would have reduced the probability of the accident or incident occurring, or mitigated the severity of the consequences of the accident or incident. The identification of contributing factors does not imply the assignment of fault or the determination of administrative, civil or criminal liability.

3.2. Findings

3.2.1 The pilot was issued a National Pilot Licence (NPL) on 26 July 2019 with an expiry date of 25 July 2020. His medical certificate was issued on 26 November 2018 with an expiry date of 27 November 2020.

3.2.2 The last annual inspection on the aircraft was conducted on 12 November 2019 at 636.4 hours and the aircraft had flown a further 43 hours since its last annual inspection.

3.2.3 The aircraft was maintained by an AP licensed by Aeroclub of South Africa with an AP number 343. The AP's licence/certificate number was issued on 1 March 2019 with an expiry date of 31 March 2021.

3.2.4 The aircraft was issued an Authority to Fly (ATF) on 12 November 2019 with an expiry date of 30 November 2020.

3.2.5 The aircraft was issued a Certificate of Registration on 1 February 2019.

3.2.6 The flight was conducted during daylight in VFR in fine weather conditions. The aircraft was operated on a private capacity by the pilot and under the provisions of Part 94 of the CAR 2011 as amended.

3.2.7 There was enough fuel available in the aircraft and there was no visual contamination. The relative humidity was at approximately 52% with the temperature of 24°C and dew point depreciation of 10°C; therefore, the result will be a moderate icing condition at cruise power with serious icing on descent as per the carburettor icing chart in Figure 3.

3.2.8 During the pre-flight phase, the pilot reported that he added 30 litres of fuel and the sight glass gauge showed 35 litres in the tanks; the pilot had registered fuel uplifts in the flight folio. According to the pilot's statement, he took off with 35 litres of fuel and flew for approximately 15 minutes. This meant that the aircraft had a total of approximately 31 litres of fuel remaining at the time of the accident; therefore, the aircraft had enough fuel.

3.2.9 The aircraft had an in-flight engine power loss whilst flying at 900ft AGL where after, it started to lose altitude before colliding with trees during a forced landing. The aircraft was substantially damaged. The pilot and the passenger reported no injuries.

3.2.10 The aircraft experienced engine power loss while climbing to 900ft AGL, resulting in the pilot being unable to maintain the aircraft's altitude. The pilot attempted to carry out a forced landing, however, the aircraft impacted trees. The cause of engine power loss could not be determined.

3.3. Probable Cause/s

3.3.1 The aircraft experienced engine power loss while climbing to 900ft AGL, resulting in the pilot being unable to maintain the aircraft's altitude. The pilot attempted to carry out a forced landing, however, the aircraft impacted trees. The cause of engine power loss could not be determined.

3.4. Contributory Factors:

3.4.1 None.

4. SAFETY RECOMMENDATIONS

4.1. General

The safety recommendations listed in this report are proposed according to paragraph 6.8 of Annex 13 to the Convention on International Civil Aviation and are based on the conclusions listed in heading 3 of this report; the AIID expects that all safety issues identified by the investigation are addressed by the receiving states and organisations.

4.2. Safety Recommendation/s

4.2.1 None.

5. APPENDICES

5.1 None.

This Report is issued by:

Accident and Incident Investigations Division
South African Civil Aviation Authority
Republic of South Africa