LIMITED ACCIDENT INVESTIGATION REPORT

Reference Number	CA18/2/3/10146								
Classification	Accident	**Date**	21 April 2022	**Time**	0800Z				
Type of Operation	Private (Part 91)								
Location									
Place of Departure	Eike Farm in Standerton, Mpumalanga Province		Place of Intended Landing		Wonderboom Aerodrome (FAWB), Gauteng Province				
Place of Accident	Private Farm in Brakspruit, Mpumalanga Province								
GPS Co-ordinates	Latitude	S 26º 56' 24.4"	Longitude	E 029º 08' 51.5"	Elevation	5100 ft			
Aircraft Information									
Registration	ZS-TCG								
Model/Make	Cessna T210N (Serial Number: 210-63438)								
Damage to Aircraft	Substantial		Total Aircraft Hours	3342.5					
Pilot-in-command									
Licence Type	Private Pilot Licence		Gender	Male	Age	41			
Licence Valid	Yes								
Total Hours on Type	14.7		Total Flying Hours	212.15					
People On-board	1+0	Injuries	0	Fatalities	0	Other (on ground)	0		
What Happened									

On 21 April 2022 at approximately 0800Z, a pilot on-board a Cessna T210N Centurion aircraft with registration ZS-TCG took off on a private flight from Runway 09 at Die Eike Private Farm Airstrip, situated 7 kilometres (km) west of Standerton in Mpumalanga province. The pilot intended to land at Wonderboom Aerodrome (FAWB) in Gauteng province, where maintenance of the aircraft was scheduled to be carried out. The flight was conducted under the provisions of Part 91 of the Civil Aviation Regulations (CAR) 2011 as amended.

The pilot stated that during the climb phase at approximately 500 feet (ft) above ground level (AGL), he retracted the aircraft's landing gears. After the aircraft had levelled off at approximately 700ft, he retracted the flaps and continued with the flight. He then reduced the manifold pressure to 30 inches of Mercury (in.Hg) and the engine revolutions per minute (rpm) by retarding the throttle control lever, however, the engine power dropped drastically. The pilot attempted to correct the fault but was unsuccessful.

He then surveyed the surrounding area, but opted to turn left to return to the take-off airstrip, which was approximately 2.7 kilometres (km) away at that point. However, the aircraft lost significant height

and the pilot identified a gravel road (at another private farm) located between two cultivated lands that had just been irrigated on which to conduct a forced landing.

According to the pilot, after touchdown and during the landing roll, the aircraft's left main gear collided with a rock and broke off. As a result, the aircraft's left wing dropped, and the left aileron made contact with the ground and broke off. The aircraft veered off to the left-side of the gravel road and onto the cultivated area. During this process, the nose gear collapsed and the propeller contacted the ground with its blade tips. Thereafter, the aircraft slid on the ground until it came to a stop approximately 40 metres (m) from the initial touchdown point facing north-east.

The aircraft was substantially damaged during the accident sequence, and the pilot was not injured.

The accident occurred at Brakspruit private farm, situated 2.7km south-west of Die-Eike Private Farm Airstrip at Global Positioning System (GPS) co-ordinates determined to be South 26º 56' 24.4" East 029º 08' 51.5" at 5100 feet (ft) above mean sea level (AMSL).

Figure 1: The aircraft at the accident site. (Source: Pilot)

What was found

After the accident, the aircraft was recovered to an aircraft maintenance organisation (AMO) at FAWB for further investigation. Post-accident inspection was conducted on the engine, and nothing abnormal was detected. The engine was then subjected to a test run, and the engine started with no difficulties. All parameters prescribed in the Lycoming Engine Manual were met. Moreover, an engine power settings test was conducted in which the fuel mixture control was leaned excessively. The outcome of the test was engine power loss.

The information below is an extract from the Cessna T210N Pilot's Operating Handbook (POH):

The aircraft's engine is equipped with a turbocharging system and some of its characteristics are different from a normally aspirated engine. The following information describes the system and points out some of the items that are affected by the turbocharging system.

- *Engine induction air is taken in through an opening in the nose cap, ducted through a filter and into the compressor where it is compressed.*
- *The pressurised induction air then passes through the throttle body and induction manifold into the cylinders.*
- *The air and fuel are burned and exhausted to the supercharger turbine.*
- *The exhaust gases drive the turbine which, in turn, drives the compressor; thus, completing the cycle*

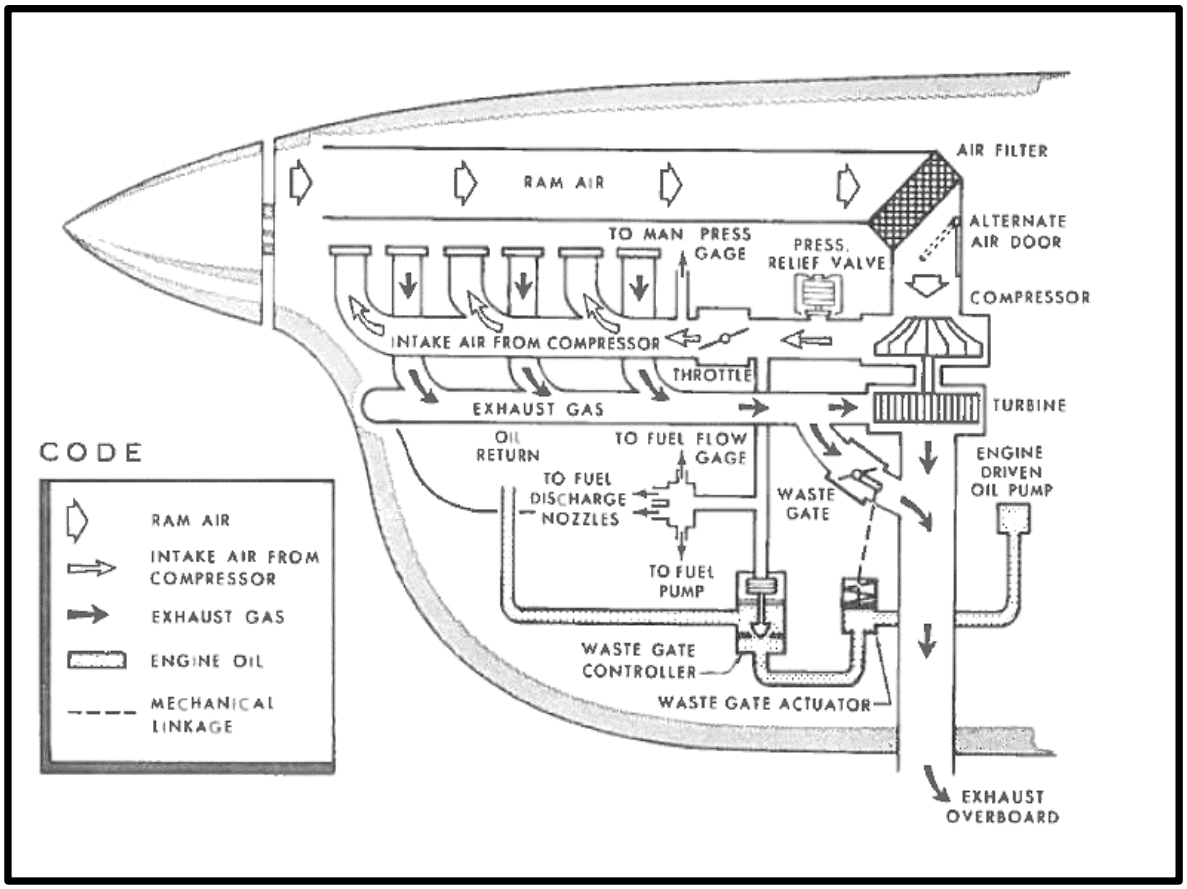

Diagram 1: The turbocharge system of the aircraft. (Source: Cessna T210N POH)

The compressor has the capability of producing manifold pressures in excess of 5 minutes take-off maximum of 36.6 inches Hg. In order not to exceed 36.5 inches of manifold pressure, a waste gate is used so that some of the exhaust will bypass the turbine and be vented into the tailpipe. Anything that affect the flow of induction air into the compressor or the flow of exhaust gases into the turbine will increase or decrease the speed of the turbocharger. This resultant change in flow will have no effect on the engine if the waste gate is still open because the waste gate position is changed to hold compressor discharge pressure constant. A waste gate controller automatically maintains maximum allowable compressor are capable of producing that pressure.

At high altitude, pat throttle or low RPM, the exhaust flow is not capable of turning the turbine and compressor fast enough to maintain maximum compressor discharge pressure, and the waste gate will close to force all of the exhaust flow through the turbine.

When the waste gate is fully closed, any change in turbocharger speed will mean a change in engine operation. Thus, any increase or decrease in turbine speed will cause an increase or decrease in manifold pressure and fuel flow. If turbine speed increases, the manifold pressure increases, if the

compression ratio approaches 3 to 1 at high altitude, any change in exhaust flow to the turbine or ram induction air pressure will be magnified proportionally by the compression ratio and the change in flow through the exhaust system.

The pilot stated that after the aircraft had levelled off (cruise phase), he reduced the manifold pressure as well as the engine rpm, and the engine power dropped.

Cruise checks (POH):

- *Power: 15-30 in.Hg manifold pressure and 2200-2500rpm*
- *Elevator and rudder trim adjust*
- *Mixture: lean for cruise fuel flow using the EGT gauge, a Cessna Power Computer (CPC)*

Note: Do not reduce power until wing flaps and landing gears have been retracted

- The pilot was initially issued a Private Pilot Licence (PPL) on 12 March 2018. His licence renewal was issued on 20 February 2022 with an expiry date of 28 February 2023.

- The pilot had a Class 2 medical certificate issued on 23 August 2021 with an expiry date of 23 August 2023.

- The pilot began his aircraft conversion on 21 May 2021 and completed it on 11 February 2022, which was endorsed by the Regulator (SACAA) on his logbook and licence.

- The pilot had a total of 212.15 flying hours, of which 14.7 hours were on the aircraft type. The pilot initially attained a Cessna C182 licence on which he accumulated approximately 198 hours. The C182 is a normal aspirated engine with different characteristics from those of the turbocharged engine type.

- The aircraft was issued a valid Certificate of Airworthiness by the Regulator on 1 March 2022 with an expiry date of 31 March 2023.

- The aircraft was maintained by an approved AMO. The AMO had issued the aircraft's Certificate of Release to Service on 17 May 2021 with an expiry date of 16 May 2022 or at 3399.3 airframe hours of flight time, unless the aircraft is involved in an accident or becomes unserviceable, thus, the certificate would be rendered invalid.

Probable Cause

The aircraft lost engine power due to an undetermined cause, resulting in an unsuccessful forced landing.

Safety Action/s

None.

Safety Message

None.

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****.*

About this Report
Decisions regarding whether to investigate, and the scope of an investigation are based on many factors, including the level of safety benefit likely to be obtained from an investigation. For this occurrence, no investigation has been conducted, and the Accident and Incident Investigations Division (AIID) has relied on the information submitted by the affected person/s and organisation/s to compile this brief report. The report has been compiled using information supplied in the initial notification, as well as follow-up information to bring awareness of potential safety issues to the industry in respect of this occurrence, as well as possible safety action/s that the industry might want to consider in preventing a recurrence of a similar accident. *This report provides an opportunity to share safety message/s in the absence of an investigation.* *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.*
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This report is issued by:

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