

LIMITED OCCURRENCE INVESTIGATION REPORT – FINAL

Reference Number	CA18/2/3/10538						
Classification	Accident		Date	20 December 2024		Time	0405Z
Type of Operation	Private (Part 94)						
Location							
Place of Departure	Zuikerkop Lodge Airstrip near Clocolan, Free State Province			Place of Intended Landing	Zuikerkop Lodge Airstrip near Clocolan, Free State Province		
Place of Occurrence	Runway 09 at Zuikerkop Lodge Airstrip near Clocolan, Free State Province						
GPS Co-ordinates	Latitude	29°00'05.96" S	Longitude	027°35' 37.15" E	Elevation	5340ft	
Aircraft Information							
Registration	ZU-JBU						
Make; Model; S/N	Jabiru J430 (Serial Number: 1019)						
Damage to Aircraft	Substantial			Total Aircraft Hours	8.2		
Pilot-in-command							
Licence Type	Private Pilot Licence (PPL)		Gender	Male		Age	54
Licence Valid	Yes	Total Hours	94.1	Total Hours on Type	11.9		
Total Hours 30 Days	6.4		Total Flying on Type Past 90 Days			9.0	
People On-board	1+2	Injuries	0	Fatalities	0	Other (on ground)	0
What Happened							
On Friday morning, 20 December 2024, a pilot and two passengers on-board a Jabiru J430 aircraft with registration ZU-JBU were on a private flight from Zuikerkop Lodge Airstrip near Clocolan in Free State province with the intention to land back at the same airstrip when the accident occurred. The flight was conducted under visual meteorological conditions (VMC) by day and under the provisions of Part 94 of the Civil Aviation Regulations (CAR) 2011 as amended. The pilot stated that he conducted a pre-flight inspection of the aircraft and no anomalies were found. The aircraft had a total of 79 litres (L) of Avgas 100LL in the tanks. After the pilot had started the engine, he taxied the aircraft to the threshold of the gravel Runway 09 which is 900 metres (m) long and 15m wide. The prevailing wind was approximately 8 knots (kts) and blowing from the north at the time. A few minutes after reaching Runway 09, the pilot selected the first notch flaps (15°) and commenced with the take-off run at a ground speed of approximately 55 knots (kts). As the nose wheel started to lift off, the aircraft drifted to the left and impacted the rough ground approximately 250m from the start of the threshold (and left side of the runway). The nose wheel broke off, the propeller struck the ground and both main gear struts were damaged by horizontal forces. The pilot							

switched off the master switch and disembarked from the aircraft together with the passengers after bringing it to a stop. The aircraft sustained substantial damage; no person was injured.

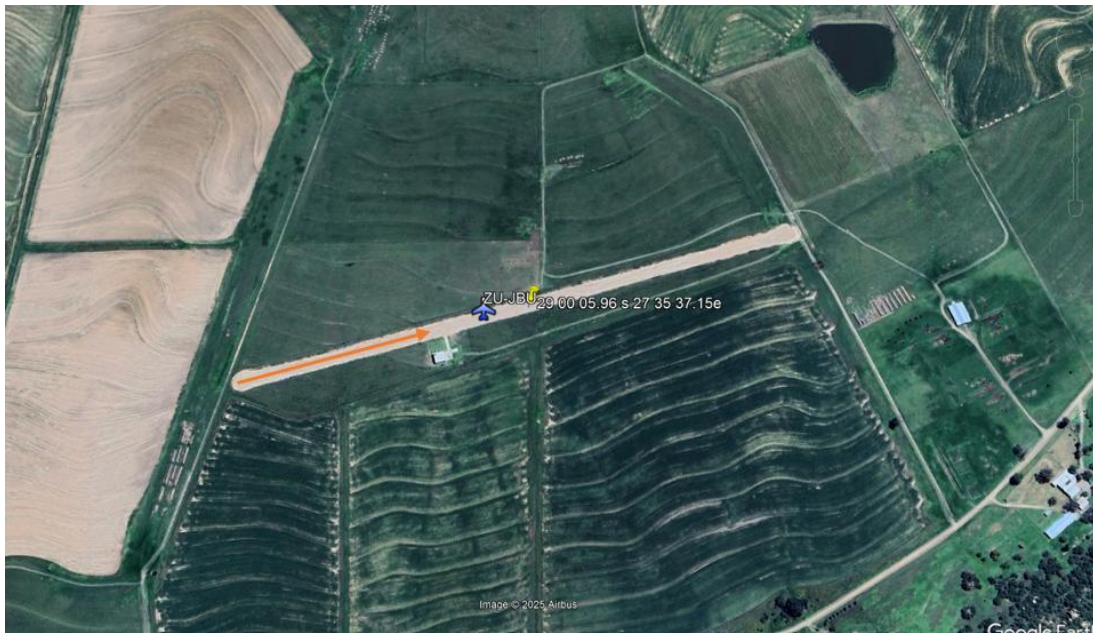


Figure 1: Aerial view of the runway, take-off direction and the accident site. (Source: Google Earth)



Figure 2: The aircraft at the accident site. (Source: Pilot)



Figure 3: The rear view of the aircraft showing the damaged right main gear. (Source: Pilot)



Figure 4: Right view of the aircraft showing the damaged right main gear strut. (Source: Pilot)

The aircraft was not yet airborne when the accident occurred; both main landing gear wheels were still on the ground when the aircraft drifted to the left during the take-off roll. The nosewheel broke off, the propeller struck the ground and both main gear struts were damaged by horizontal forces.

The pilot reported that the aircraft was airworthy at time it was dispatched for the flight. There were no anomalies that could have affected the steering mechanism of the aircraft. The pilot lost directional control due to the engine torque effect for which he did not adequately compensate.

According to the pilot questionnaire, the pilot obtained the weather forecast from the Bloemfontein weather office.

Wind Direction	20°	Wind Speed	8kts	Visibility	>10km
Temperature	26°C	Cloud Cover	None	Cloud Base	Clear
Dew Point	Unknown	QNH	Unknown		

Torque Reaction (Source: https://www.faa.gov/sites/faa.gov/files/07_phak_ch5_0.pdf)

Torque reaction involves Newton's Third Law of Physics— for every action, there is an equal and opposite reaction. As applied to the aircraft, this means that as the internal engine parts and propeller are revolving in one direction, an equal force is trying to rotate the aircraft in the opposite direction. [Figure 5-47]

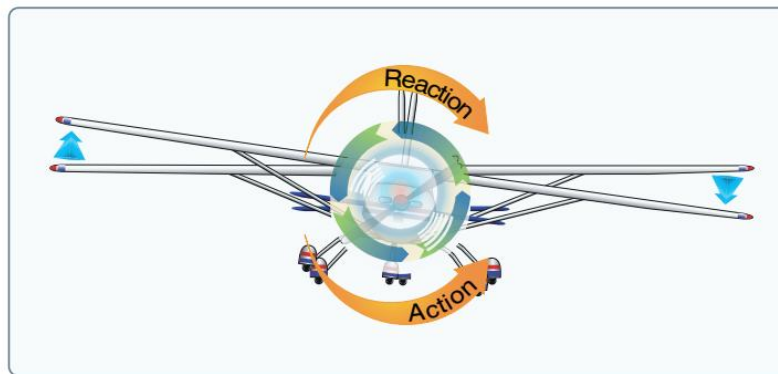


Figure 5-47. *Torque reaction.*

When the aircraft's wheels are on the ground during the take-off roll, an additional turning moment around the vertical axis is induced by torque reaction. As the left side of side of the aircraft is being forced down by torque reaction, more weight is being placed on the left main landing gear. This results in more ground friction, or drag, on the left tire than on the right, causing a further turning moment to the left. The magnitude of this moment is dependent on many variables. Some of these variables are:

- 1. Size and horsepower of engine*
- 2. Size of propeller and the rpm*
- 3. Size of the aircraft*
- 4. Condition of the ground surface*

This yawing moment on the take-off roll is corrected by the pilot's proper use of the rudder or rudder trim.

Weight and Balance:

	Weight
Empty weight	430kg
Pilot	84kg
Passenger 1	80kg
Passenger 2	63kg
Fuel	58kg(79L)
Total	715kg

Fuel Weight Calculation:

$$\begin{aligned}\text{Weight of fuel} &= \text{volume of fuel} \times \text{density of fuel} \\ &= 79\text{L} \times 0.735\text{kg/L} \\ &= 58\text{kg}\end{aligned}$$

According to the Pilot's Operating Handbook (POH), the maximum take-off weight (MTOW) is recorded as 760 kilograms (kg). Presented on the table above, the aircraft was 45kg below the MTOW of 715kg, which meant that the aircraft was within the allowable weight limit at take-off.

Findings

1. The pilot had a Private Pilot Licence (PPL) that was issued on 24 June 2024 with an expiry date of 31 May 2025. The pilot was appropriately rated to undertake the flight, and the aircraft type was endorsed on his licence. He had 94.1 total flying hours of which 11.9 hours were on the aircraft type. The pilot had last flown the aircraft type on 18 December 2024.
2. The pilot had a Class 2 aviation medical certificate that was issued on 8 August 2024 with an expiry date of 31 August 2025 with a restriction to wear corrective lenses.
3. The last annual inspection of the aircraft was conducted and certified on 4 December 2024 at zero (0) airframe hours after which a Certificate of Release to Service (CRS) was issued with an expiry date of 4 December 2025 or at 50 hours, whichever comes first. At the time of the flight, the aircraft had accrued 8.2 hours since new.
4. The aircraft Authority-to-fly (ATF) was issued on 12 December 2024 with an expiry date of 12 December 2025.
5. The Certificate of Registration (C of R) was issued to the present owner on 29 November 2024.

6. The pilot lost directional control of the aircraft during take-off on the gravel runway because of failure to compensate for engine torque effect. This resulted in the aircraft drifting to the left of the runway; subsequently, the nose gear broke off, the propeller struck the ground and both main gear struts were damaged. The aircraft came to rest next to the runway.
Probable Cause(s)
Loss of directional control of the aircraft during take-off on the gravel runway because of failure to compensate for the engine torque effect which resulted in the aircraft drifting to the left and damaging the landing gear.
Contributing Factor(s)
None.
Safety Action(s)
None.
Safety Message
None.
About this Report
<i>The decision to conduct a limited investigation is based on factors including whether the cause is known and the evidence supporting the cause is clear, the level of safety benefit likely to be obtained from an investigation and that will determine the scope of an investigation. For this occurrence, a limited 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 limited report. The report has been compiled using information supplied in the initial notification, as well as from follow-up desktop enquiries 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 occurrence.</i> <i>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.</i>
Purpose
<i>In terms of Regulation 12.03.1 of the Civil Aviation Regulations (CAR) 2011 and ICAO Annex 13, 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.</i>
Disclaimer
<i>This report is produced without prejudice to the rights of the AIID, which are reserved.</i>

This report is issued by:

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