SOUTH AFRICAN CIVIL AVIATION AUTHORITY

Section/division **Accident and Incident Investigations Division** Form Number: CA 12-57

LIMITED OCCURRENCE INVESTIGATION REPORT – FINAL

Reference Number	CA18/2/3/10437						
Classification	Accident	**Date**	31 March 2024		**Time**	0922Z	
Type of Operation	Private (Part 91)						
Location							
Place of Departure	Goodside Private Airfield, Lydenburg, Mpumalanga Province	Place of Intended Landing	Hoedspruit Civil Airfield, Limpopo Province				
Place of Occurrence	30 metres from the end of Runway 30 at Goodside Private Airfield						
GPS Co-ordinates	Latitude	25°0'31.17" S	Longitude	30°27'51.14" E	Elevation	4 537ft	
Aircraft Information							
Registration	ZS-LLY						
Make; Model; S/N	Cessna; 172 RG (Serial Number: 172RG-0025)						
Damage to Aircraft	Substantial	Total Aircraft Hours	6 194.4 hours				
Pilot-in-command							
Licence Type	Private Pilot Licence (PPL)	Gender	Male	Age	63		
Licence Valid	Yes	Total Hours	372.5	Total Hours on Type	6.3		
Total Hours 30 Days	8.7	Total Flying on Type Past 90 Days	6.3				
People On-board	1+1	**Injuries**	0	**Fatalities**	0	**Other (on ground)**	0

What Happened

On Sunday, 31 March 2024 at 0922Z, a pilot and a passenger on-board a Cessna 172RG aircraft with registration ZS-LLY took off from Goodside Private Airfield in Lydenburg, Mpumalanga province, to Hoedspruit Civil Airfield in Limpopo province. Clear weather conditions prevailed at the time of the flight. The flight was conducted under visual meteorological conditions by day and under the provisions of Part 91 of the Civil Aviation Regulations (CAR) 2011 as amended.

The pilot stated that 38.5 gallons (145.7 litres) of fuel was uplifted prior to the flight. After conducting the pre-flight inspection, the pilot conducted the pre-start checks and, thereafter, started the engine. He then taxied the aircraft to the run-up bay where the run-up checks were performed. He stated that the engine revolutions per minute (RPM) reached approximately 1 800, which is a good performance. The maximum power for this aircraft is 2 700 RPM. After the run-up checks, the aircraft entered Runway 30 and the pilot applied full power to initiate the take-off roll. However, the aircraft was slow to accelerate; it only achieved 70% (50 knots) of the take-off speed at the halfway mark of the runway. The acceleration continued to be sluggish despite the pilot's efforts to raise the flaps to 10°. At this point, the airspeed was approximately 50 knots. He then pulled back the control column and the aircraft lifted off momentarily, but the left wing stalled. To avoid an accident, the pilot pushed the control column forward and the aircraft landed back on the runway towards the end of it. It overran the runway and impacted the perimeter fence, which entangled the right wing and the left strut and, thus, caused the aircraft to turn to the right. The aircraft skidded sideways in a left-wing down attitude before it came to a stop. The pilot completed the shutdown procedure, and both occupants vacated

the aircraft unassisted. During a walk around to inspect the aircraft, the pilot noticed that the flaps did not deploy.

According to the eyewitness report who was positioned at the 700-metre (m) mark of the runway, he noticed that ZS-LLY had not rotated yet at the 700m mark. The 700m mark is used as a reference or decision-making point during the take-off run to abort take-off. He stated that the engine spluttered which meant that it was not producing optimum power. He further stated that after the wheels lifted off the ground, the aircraft yawed to the left before it exited the runway. The aircraft impacted the fence and it turned 90° to the right before it stopped. He then rushed to the scene and found fuel leaking from the right wing; the occupants had disembarked from the aircraft when he arrived at the accident site.

The aircraft sustained substantial damage; the occupants were not injured.

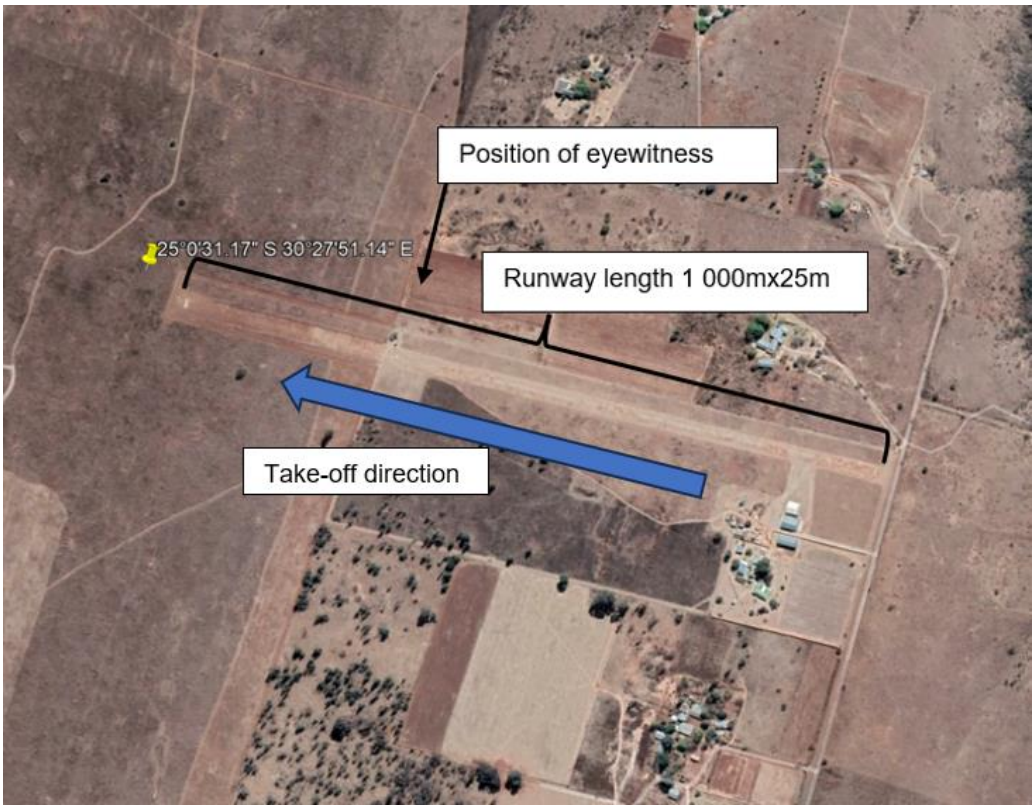

Figure 1: Overlay of the accident site. (Source: Google Earth)

Figure 2: Position of aircraft after the accident. (Operator)

Figure 3: The left main landing gear that broke off. (Source: Operator)

Figure 4: The damaged perimeter fence. (Source: Operator)

Take-off Procedure (Source: Pilot's Operating Handbook)
Normal take-off:

1. *Wing Flaps* *0°*
2. *Carburettor Heat* *COLD*
3. *Power* *FULL THROTTLE and 2700 RPM*
4. *Elevator Control* *LIFT NOSE WHEEL at 55 KIAS*
5. *Climb Speed* *70-80 KIAS*
6. *Brakes* *APPLY momentarily when airborne.*
7. *Landing Gear* *RETRACT in climb out.*

NOTE

When the nose wheel is lifted, the gear motor may run 1-2 seconds to restore hydraulic pressure.

Flap Limitation

Approved take-off range	
Above 2 550 POUNDS take-off weight	*0°*
2 550 POUNDS take-off weight or less	*0° to 10°*
Approved landing range	*0° to 30°*

Wing Flap Setting

Normal and short field take-offs are accomplished with wing flaps of 0°. ***To clear an obstacle, an obstacle clearance speed of 63 KIAS should be used.*** *Soft field takeoffs are performed by lifting the airplane off the ground as soon as practical in a slight tail-low attitude. If no obstacle is ahead, the airplane should be levelled off immediately to accelerate to a safer climb speed. At takeoff weights of 2550 pounds or less, 10° flaps may be used if desired for minimum ground runs or takeoffs from soft or rough fields.*

Density Altitude Calculation (Source: E6B flight computer)

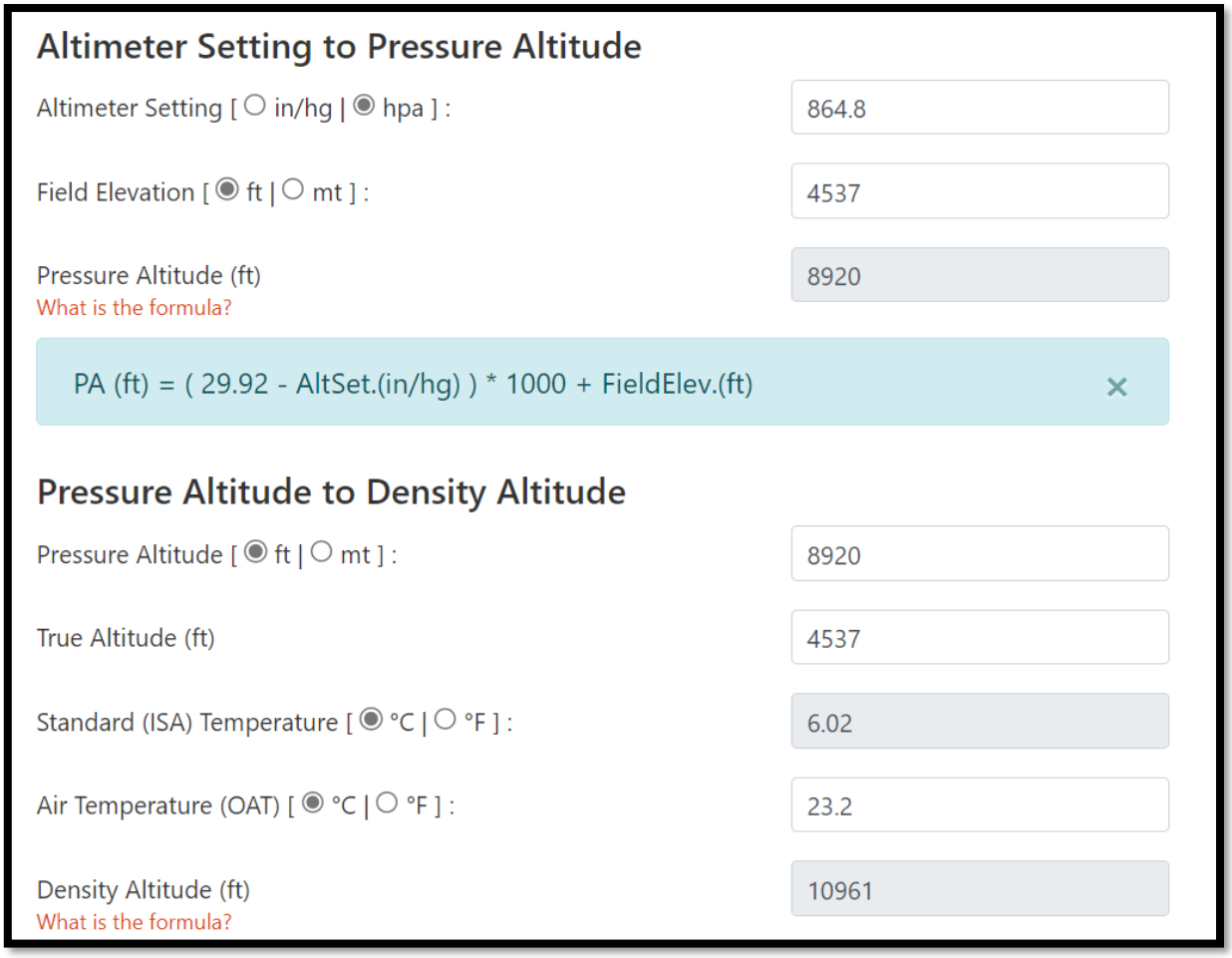

Table 1: Pressure and density altitude calculation. (Source: E6B flight computer)

According to the table above, the query nautical height (QNH) at station level was 864.8 Hectopascal (hPa) and the temperature was 23ºC. The field elevation is 4 537 feet (ft), therefore, the pressure altitude was calculated at 8 920 ft. The density altitude was at 10 961 ft. Based on the calculations; the power required for normal take-off was higher than the engine power output.

TAKEOFF DISTANCE

2500 LBS AND 2300 LBS

SHORT FIELD

REFER TO SHEET 1 FOR APPROPRIATE CONDITIONS AND NOTES.

WEIGHT LBS	TAKEOFF SPEED KIAS		PRESS ALT FT	0°C		10°C		20°C		30°C		40°C	
	LIFT OFF	AT 50 FT		GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS
2500	56	61	S.L.	835	1400	895	1495	960	1595	1025	1705	1100	1820
			1000	910	1525	975	1635	1045	1745	1120	1865	1200	1995
			2000	995	1670	1070	1790	1145	1915	1225	2050	1315	2195
			3000	1090	1835	1170	1965	1255	2105	1345	2260	1440	2420
			4000	1195	2015	1280	2165	1375	2325	1475	2500	1580	2685
			5000	1310	2230	1410	2400	1515	2580	1625	2780	1740	2990
			6000	1440	2470	1550	2665	1665	2875	1790	3105	1920	3355
			7000	1585	2760	1710	2980	1840	3230	1975	3500	2120	3800
			8000	1755	3095	1890	3360	2035	3655	2185	3980	2350	4350
2300	54	59	S.L.	690	1160	740	1240	790	1320	845	1405	905	1500
			1000	750	1265	805	1350	860	1440	920	1535	985	1635
			2000	820	1380	880	1475	940	1575	1010	1680	1080	1795
			3000	895	1505	960	1610	1030	1725	1105	1845	1180	1970
			4000	980	1650	1050	1770	1130	1895	1210	2025	1295	2170
			5000	1075	1815	1155	1950	1240	2090	1325	2240	1420	2400
			6000	1180	2005	1265	2150	1360	2310	1460	2485	1565	2670
			7000	1295	2220	1395	2385	1500	2570	1610	2765	1725	2980
			8000	1430	2465	1540	2660	1655	2875	1775	3105	1905	3355

Chart 1: Take-off distance (feet). (Source: Pilot's Operating Handbook)

The Goodside Private Airfield runway length is 3 280 ft (1 000m), and the runway is covered in grass. The take-off distance required on dry grass was calculated at 2452 feet (747m). According to the Pilot's Operating Handbook (POH), an additional 15% should be added to the take-off distance for dry grass take-off. Therefore, the total distance required to clear an obstacle was 2819 feet (859m). However, the aircraft was rotated before reaching the desired speed of 63 knots (the aircraft was rotated at 50 knots, which was 13 knots less than the required speed) towards the three-quarter mark of the runway with insufficient runway surface available to abort take-off. The flaps were selected late into the take-off run.

Recognition, validation and conversion of foreign pilot licences and ratings Part 61.01.13

Validation of a foreign pilot licence and ratings

(13) The application for a certificate of validation of a pilot licence or rating issued by the appropriate authority of a Contracting State should be made to the Director on the appropriate prescribed form.

(14) The Director may validate a pilot licence and ratings issued by an appropriate authority of a Contracting State—

(a) subject to the same restrictions which apply to such foreign pilot licence and ratings;

(b) subject to such conditions and limitations as the Director may deem necessary in the interest of aviation safety;

(c) in accordance with, and subject to, the requirements and conditions as prescribed in these regulations;

on condition that the privileges may not exceed that of the South African pilot licence or rating.

Findings

Personnel Information

1. The pilot was issued a foreign Flight Crew Licence by the United Kingdom Civil Aviation Authority (CAA) on 2 November 2022. The licence was validated by the South African CAA and the pilot was issued a Private Pilot Licence (PPL) on 26 March 2024 with an expiry date of 25 March 2029. The pilot had flown a total of 372.5 hours of which 6.3 hours were on the aircraft type. The aircraft type was endorsed on his licence and on his logbook. The expiry date of validated PPL was not same as the expiry date of the foreign Flight Crew Licence, and this was not in line with the provisions of Part 61.01.13 14(a).

2. The pilot was issued a Class 2 aviation medical certificate on 23 June 2023 with an expiry date of 21 September 2024 with a medical waiver. The pilot was properly licensed to conduct the flight and was medically fit as per Part 67 of the CAR 2011.

3. The foreign Flight Crew Licence was verified by the SACAA Licencing Division on 5 February 2024.

Aircraft Information

4. The last mandatory periodic inspection (MPI) that was conducted on the aircraft was on 3 August 2023 at 6 164.5 airframe hours. The aircraft accrued 29.9 hours since the last MPI. The aircraft had a total of 6 194.4 hours since new.

5. The aircraft had a valid Certificate of Airworthiness (C of A) that was initially issued on 8 December 2017. The C of A was reissued with an expiry date of 31 May 2024.

6. The Certificate of Release to Service (CRS) was issued on 11 August 2023 with an expiry date of 10 August 2024 or at 6 264.1 hours, whichever comes first.

7. The Certificate of Registration (C of R) was issued to the current owner on 11 February 2022.

8. This was a hire-and-fly flight, and the owner had a hire-and-fly agreement which was duly signed by both parties on 25 March 2024.

9. There were no defects reported prior to the accident flight, therefore, the aircraft was airworthy at the time it was dispatched for the flight.

10. According to available information, the aircraft was involved in an accident (landed with the landing gear retracted) on 26 August 2001. The accident was investigated by the Accident and Incident Investigations Division (AIID) and was allocated reference number 7395.

11. According to the density altitude calculations, the density altitude for the day was high at 10 961 ft which would have required maximum throttle or full power for take-off. After reaching the 700m mark down the runway, the pilot should have rejected the take-off as he did not have the power required for a safe take-off due to high density altitude. All take-offs in piston engine are full power.

12. The pilot conducted a normal take-off which did not require the use of flaps; however, the pilot selected the flaps to 10° late into the take-off run which is not in line with the take-off procedures as stipulated in the POH. The airspeed at the time of selecting the flaps was 50kts, this introduced more drag to the aircraft and, thus, the reduction of airspeed. At that time, the aircraft had used more than 700m of the 1000m runway.

Probable Cause(s)

The aircraft had difficulty accelerating to the required speed during take-off due to high density altitude and the pilot aborted take-off after the 700m mark of the 1000m runway. This resulted in the aircraft overshooting the runway and impacted the fence.

Contributing Factor(s)

- In adequate or no pre-flight planning as the pilot failed to consider the effects of density altitude.
- The use of flaps (10° selection) during a normal take-off which was an incorrect configuration (for a normal take-off).

Safety Action(s)

None.

Safety Message and/or Safety Recommendation/s

It is recommended that pilots who operate aircraft at high altitudes consider the effects of density altitude during their flight planning phase.

About this Report

The decisions 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 desk top 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.

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

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.

Disclaimer

This report is issued by:

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