LIMITED ACCIDENT INVESTIGATION REPORT - FINAL

Reference Number	CA18/2/3/10184					
Classification	Accident	**Date**	3 July 2022	**Time**	0926Z	
Type of Operation	Private (Part 94)					
Location						
Place of Departure	Private Airstrip in Molteno, Eastern Cape Province		Place of Intended Landing	Eagle's Creek Airfield, Gauteng Province		
Place of Accident	Open field next to Molteno Private Airstrip					
GPS Co-ordinates	Latitude	31° 25´08. 3" S	Longitude	26° 32´.44.8" E	Elevation	5 254ft
Aircraft Information						
Registration	ZU-IPN					
Make/Model	Van's RV-10 (Serial Number. 41813)					
Damage to Aircraft	Substantial		Total Aircraft Hours	15		
Pilot-in-command						
Licence Type	Private Pilot Licence (PPL)		Gender	Male	Age: 48	
Licence Valid	Yes					
Total Hours on Type	204.5		Total Flying Hours	1 892.3		
People On-board	1 + 3	Injuries 0	Fatalities	0	Other (On ground)	0
What Happened						

On Thursday morning, 30 June 2022, a pilot and three passengers on-board a Van's RV-10 aircraft with registration ZU-IPN took off on a private flight from Eagle's Creek Airfield in Centurion, Gauteng province, to Bram Fischer International Airport (FABL) in the Free State province. The duration of the flight to FABL was approximately 1 hour 20 minutes. In preparation for another flight to a private airstrip in Molteno, Eastern Cape province, 108 litres (l) of Avgas 100LL fuel was uplifted at FABL fuel bay; this is according to the invoice with serial number 19737, dated 30 June 2022. The pilot reported that the tanks were at full capacity with 230 litres (l) on-board. The pilot stated that the flight to the private airstrip was normal. Upon landing, the aircraft had approximately 174 litres of fuel remaining in the tanks. On Sunday morning, 3 July 2022, the pilot prepared the aircraft for the return flight to Eagle's Creek Aerodrome. No additional fuel was uplifted. Visual meteorological conditions (VMC) by day prevailed at the time of the flight, and no flight plan was filed. The flight was conducted under the provisions of Part 94 of the Civil Aviation Regulations (CAR) 2011 as amended.

The pilot reported that after the passengers had boarded the aircraft, he started the engine and allowed it to run for a few minutes until all the indications were within limits. He later taxied the aircraft to the threshold of the gravel runway where pre-departure checks were carried out. At approximately 0915Z, he opened the throttle to 2 550 engine revolutions per minute (RPM) and took off into the wind in a northerly direction towards higher grounds/mountainous area. During the climb at approximately 75 feet above ground level (AGL), the pilot felt a severe vibration that was caused by a strong turbulent wind and, as a result, the aircraft entered an uncontrolled descent. The pilot's attempts to recover the aircraft were in vain and, thus, opted to perform a forced landing on an open field that was adjacent to the runway. During the landing roll, the aircraft collided with the perimeter fence which severed the aircraft's fuel tanks, causing all the remaining fuel to leak out. The aircraft sustained substantial damages; however, the occupants were not injured.

Figure 1: The private airstrip runway and take-off direction. (Source: Google Earth)

Figure 2: The aircraft post-accident.

The Aircraft

The Van's RV-10 series aircraft are an all-aluminium four-seat low-wing monoplane of riveted monocoque construction with tricycle fixed landing gears. The aircraft are deemed experimental amateur built – under authority by the Federal Aviation Administration (FAA) in the United States of America (USA) and are accepted under the corresponding category by several other aviation authorities around the world. In South Africa, the aircraft type is registered under the Non-Type Certified Aircraft (NTCA) category Part 24.01.01. The aircraft was powered by a Lycoming IO-540 (serial number HC-C3YR-IRF) six-cylinder, direct drive, horizontally opposed, fuel-injected air-cooled engine driving a three-bladed Hartzell constant speed propeller with serial number 190131. The engine had a rated maximum continuous power output of 360-horsepower (hp) at 2 700 RPM.

Aircraft weight calculation

The investigation calculated the aircraft's weight at the time of the flight and the subsequent accident. The aircraft had a total of 174 litres (125 kilograms [kg]) of fuel at take-off from the private airstrip in Molteno. Taking the total flight time into account (0.1 hours [6 minutes]) from the time the aircraft took off to the time of the accident, it was determined that approximately 4 litres (2.88kg) of fuel was used, meaning that a total of 170 litres (122kg) remained in the tanks. Fuel consumption was based on a usage rate of approximately 51 litres per hour as per the Lycoming Operator's Manual. According to the Aircraft Flight Manual (AFM), the aircraft's empty weight is 739kg and the maximum take-off weight (MTOW) is 1227kg. All four occupants and the luggage weighed 216kg. The calculated total take-off weight of the accident flight was 1077kg. The aircraft was 150kg below the maximum certified weight.

Meteorological information from the South African Weather Service (SAWS)

The vertical profile of the atmosphere over the accident area showed some moisture close to the surface which warranted for scattered clouds. In addition, strong north-westerly winds (approximately 30 knots) were noted at the altitude at which the aircraft began losing height. The drastic change in surface winds compared to winds at altitude indicated sheering (turbulence). The vertical analysis of wind changes also indicated some mountain waves from the mountain side which had an elevation of 7 000ft. This coincided with the wave-like pattern, indicating severe mountain wave turbulence.

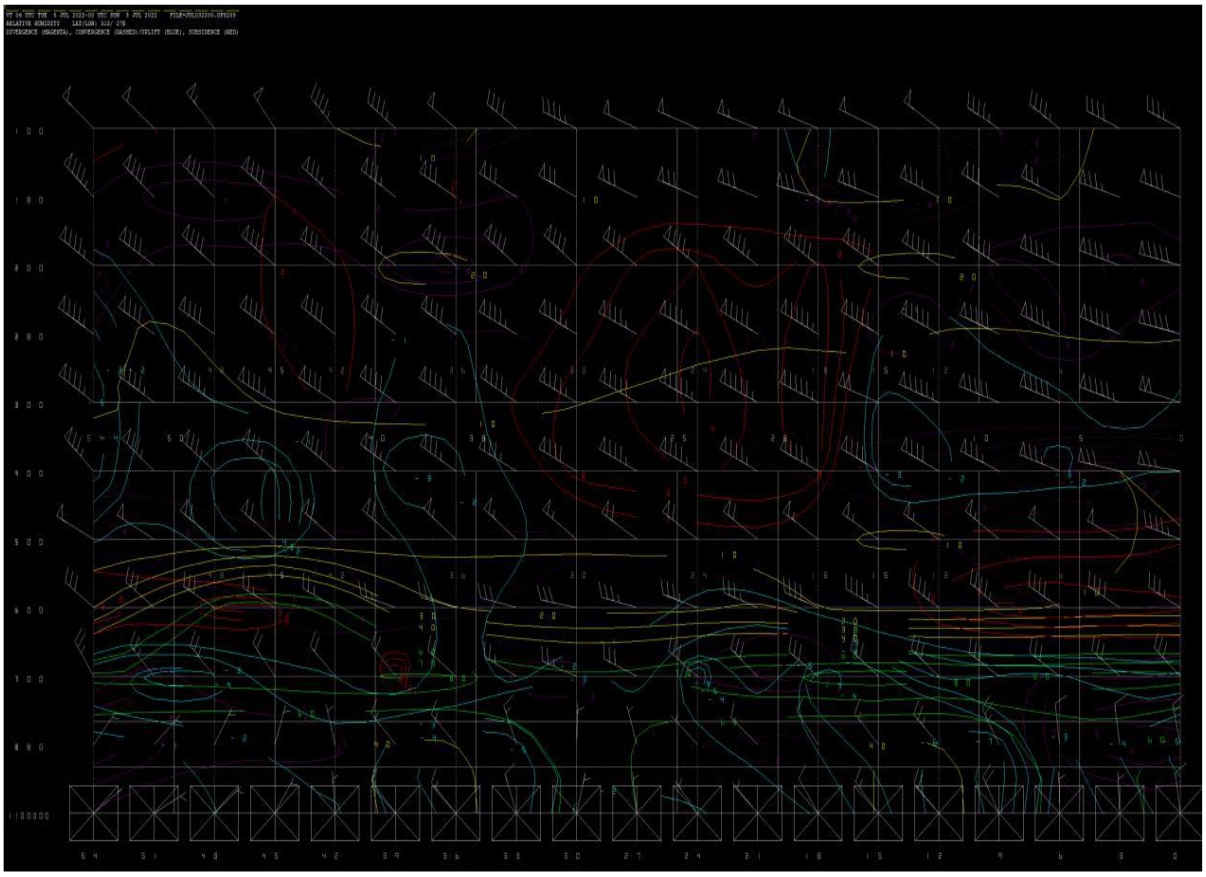

Figure 3: The satellite image indicating upper air analysis over the accident area.

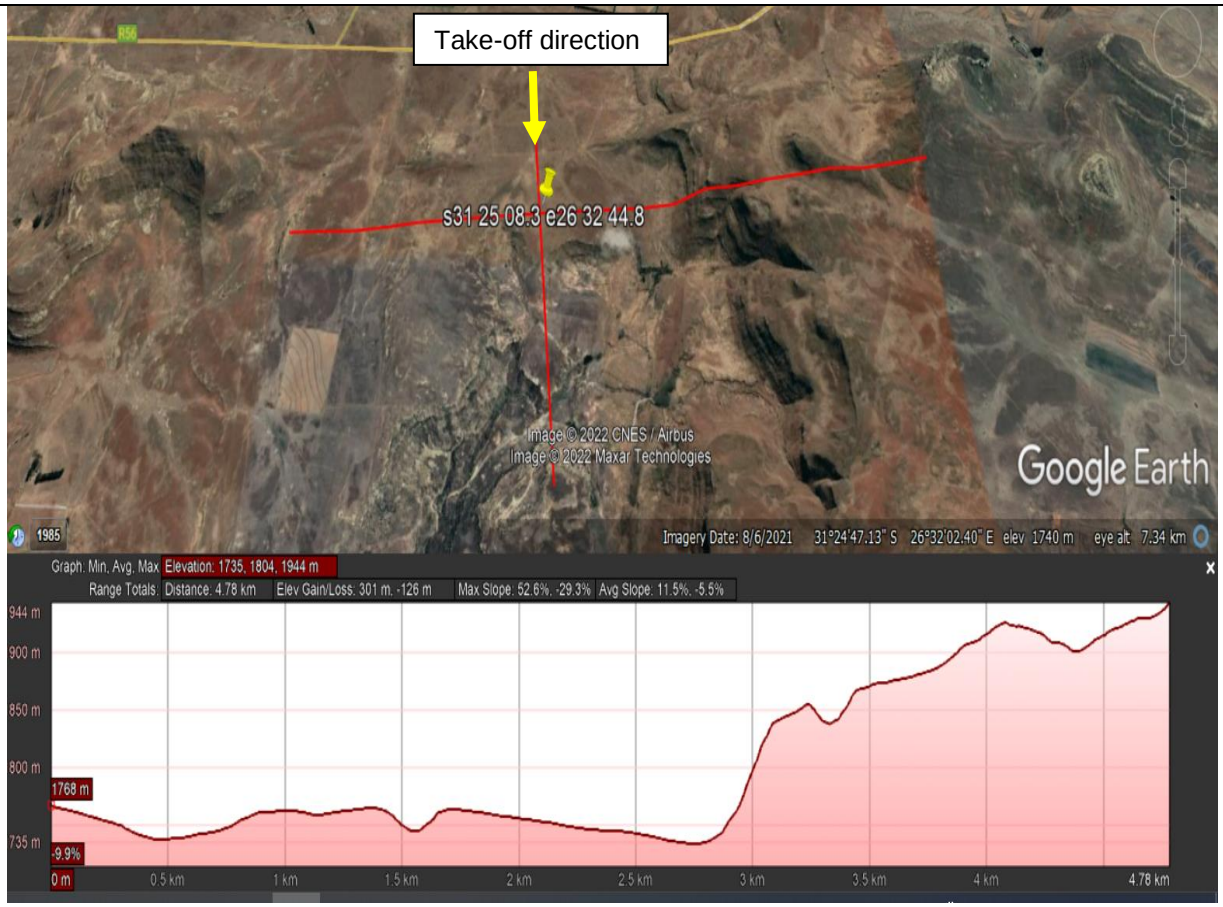

Figure 4: The topography of the area where the aircraft was operated. (Source: Google Earth)

Mountain wave turbulence (Source: Australian Transport Safety Bureau [ATSB])

Mountain wave and associated turbulence are commonly experienced over and to the lee side of mountain ranges in the south-east of the continent. They often appear in strong westerly wind flows on the east coast in late winter and early spring. Mountain waves are a different phenomena to the mechanical turbulence found in the lee side of mountain ranges and can exist as a smooth undulating airflow or may contain clear air turbulence in the form of breaking wave and 'rotors'. Mountain waves are defined as 'severe' when the associated downdrafts exceed 600 ft/min and/or severe turbulence is observed or forecast. Breaking wave and rotors associated with mountain wave are among the more hazardous phenomenon that pilots can experience.

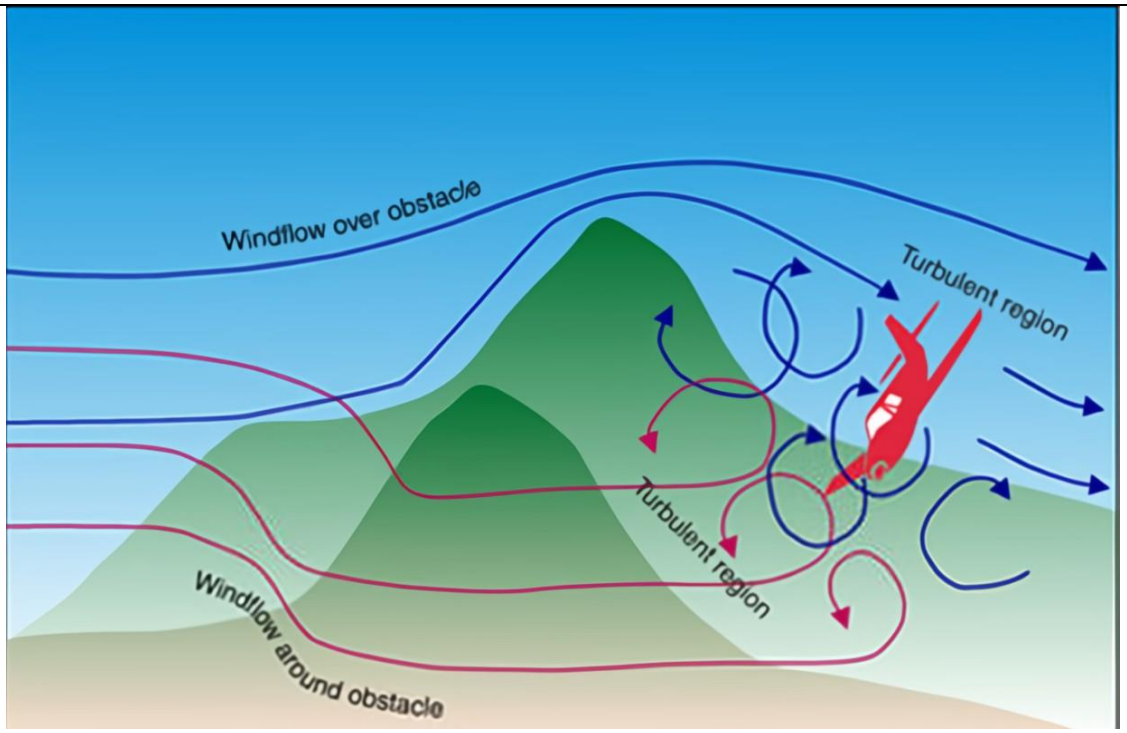

Illustration 1: The hypothetical air flow pattern associated with a mountain wave.

Post-accident examination of the aircraft and maintenance records

The wings were removed from the fuselage and the aircraft was recovered by road to the Rand Aerodrome (FAGM) in Germiston, Gauteng province. Examination of the airframe and engine did not disclose any signs of structural or mechanical anomalies that would have prevented normal operation. The elevator and rudder control continuity were established from the cockpit. The ailerons and flaps operations were also established. The right-side main landing gear had broken, and all three-wheel fairings had detached during the accident sequence. The two main wheel assemblies were intact, and the tyres were satisfactorily inflated.

According to the flight folio, the aircraft had flown a total of 15 hours since it was manufactured in 2019. The information in the aircraft file kept at the South African Civil Aviation Authority (SACAA) facility showed that the aircraft was issued a proving flight Authority to Fly (ATF) certificate on 20 January 2022 with an expiry date of 19 January 2023. This is in accordance with (IAW) the South African Civil Aviation Technical Standard (SA-CATS) 24.02.3 of the Civil Aviation Regulations (CAR) 2011.

It was stipulated in the proving flight ATF certificate that at least a minimum of 40 hours had to be flown IAW the requirements of Part 24 and Part 94 of the CAR. The owner of the aircraft had to make sure that the aircraft was serviceable before each flight and was correctly certified in the applicable airframe logbook. The aircraft was restricted to proving flights within a 100-kilometre radius from Eagle's Creek Airfield only, and no passengers were to be carried on-board. The investigation uncovered that the aircraft was operated outside the 100km radius and had passengers on-board; which meant that SA-CATS 24.02.3 was not adhered to.

Findings

i. The pilot was initially issued a PPL on 23 October 2008 with an expiry date of 31 May 2023. The aircraft type was endorsed on his licence IAW the provisions of Part 61.09.1(2)(a) of the CAR 2011 as amended.
ii. The pilot was issued a Class 2 aviation medical certificate on 31 March 2022 with an expiry date of 31 March 2024.
iii. The pilot had flown 28 hours during the past 90 days, including the accident flight duration of 0.1 hours.
iv. The aircraft had four occupants on-board at the time of the accident. Weight and balance was not compromised.
v. The aircraft was operated outside the provisions of SA-CATS 24.02.3.
vi. The flight was conducted under the provisions of Part 94 of the CAR 2011 as amended.
vii. The aircraft was issued a proving flight ATF certificate on 20 January 2022 with an expiry date of 19 January 2023, however, there was no record of an annual maintenance being conducted as required by Part 44.01.6.
viii. Mountain wave activity was forecasted in the area at the time of the accident; it played a role in this accident.
ix. No injuries were reported, and all four occupants had made use of the aircraft-equipped safety harnesses, which performed optimally.
x. Post-accident examination of the airframe and engine did not disclose any signs of structural or mechanical anomalies that would have prevented normal operation.

Probable cause

The aircraft took off in the direction of the mountain and, whilst on the climb, it lost lift because of the mountain wave; this was followed by an unsuccessful forced landing on a field next to the runway.

Contributing factor

- Poor flight planning.
- Non-adherence to the regulations.

Safety Action

None.

Safety Recommendation/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
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.*
Disclaimer
This report is produced without prejudice to the rights of the AIID, which are reserved.

This report is issued by:

Accident and Incident Investigations Division

South African Civil Aviation Authority

Republic of South Africa