SOUTH AFRICAN CIVIL AVIATION AUTHORITY

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

LIMITED ACCIDENT INVESTIGATION REPORT

Reference Number	CA18/2/3/10038						
Classification	Accident	**Date**	15 September 2021	**Time**	0610Z		
Type of Operation	General Aviation and Operating Flight Rules (Part 91)						
Location							
Place of Departure	Tilodi Game Reserve Leeupoort, Limpopo Province	Place of Intended Landing	Tilodi Game Reserve, Leeupoort, Limpopo Province				
Place of Accident	Tilodi Game Reserve						
GPS Co-ordinates	Latitude	24˚56'44.9" S	Longitude	027˚42'03.9" E	Elevation	3 500 feet	
Aircraft Information							
Registration	ZS-HBH						
Model/Make	Robinson 44 Raven II (Serial Number: 12287)						
Damage to Aircraft	Substantial	Total Aircraft Hours	1 679.1 hours				
Pilot-in-command							
Licence Type	Commercial Pilot Licence (CPL) H	Gender	Male	Age	25		
Licence Valid	Yes						
Total Hours on Type	298.6 hours	Total Flying Hours	361.9 hours				
People On-board	1 + 2	Injuries	0	Fatalities	0	Other (on ground)	0
What Happened							

On Wednesday morning, 15 September 2021 at about 0510Z, a pilot and two passengers on-board a Robinson 44 Raven II with registration mark ZS-HBH were engaged in a game livestock counting exercise at Tilodi Game Reserve in Leeupoort, Limpopo Province. This was a private flight conducted under the provisions of Part 91 of the Civil Aviation Regulations (CAR) 2011 as amended. Clear weather conditions prevailed at the time leading to the accident.

According to the pilot's statement, whilst flying at low altitude at a speed of approximately 20 knots (kts) in a grid pattern, they spotted a herd of buffalos on the left-side of the helicopter. The passengers required to have a closer look. During repositioning to have a closer view, the helicopter turned to the right (which positioned the helicopter into downwind). The pilot stated that the airspeed was slow (±20 knot) and power setting was high (±21 inches manifold pressure). This resulted in the

helicopter running out of power. The height that the pilot was operating from was insufficient to allow for recovery. The pilot was unable to regain control and the helicopter impacted the ground. The helicopter was substantially damaged; however, no injuries were reported by the pilot. There were no reported defects or warning lights prior to impact.

Robinson 44 POH Safety tips

10. Never make takeoffs or landings downwind, especially at high altitude. The resulting loss of translational lift can cause the aircraft to settle into the ground or obstacles.

Turning Flight (Source: FAA-H-8083-21A Helicopter Handbook)

In forward flight, the rotor disc is tilted forward, which also tilts the total lift-thrust force of the rotor disc forward. When the helicopter is banked, the rotor disc is tilted sideward resulting in lift being separated into two components. Lift acting upward and opposing weight is called the vertical component of lift. Lift acting horizontally and opposing inertia (centrifugal force) is the horizontal component of lift (centripetal force). [Figure 31] As the angle of bank increases, the total lift force is tilted more toward the horizontal, thus causing the rate of turn to increase because more lift is acting horizontally. Since the resultant lifting force acts more horizontally, the effect of lift acting vertically is deceased. To compensate for this decreased vertical lift, the angle of attack of the rotor blades must be increased in order to maintain altitude. The steeper the angle of bank, the greater the angle of attack of the rotor blades required to maintain altitude. Thus, with an increase in bank and a greater angle of attack, the resultant lifting force increases and the rate of turn is faster.

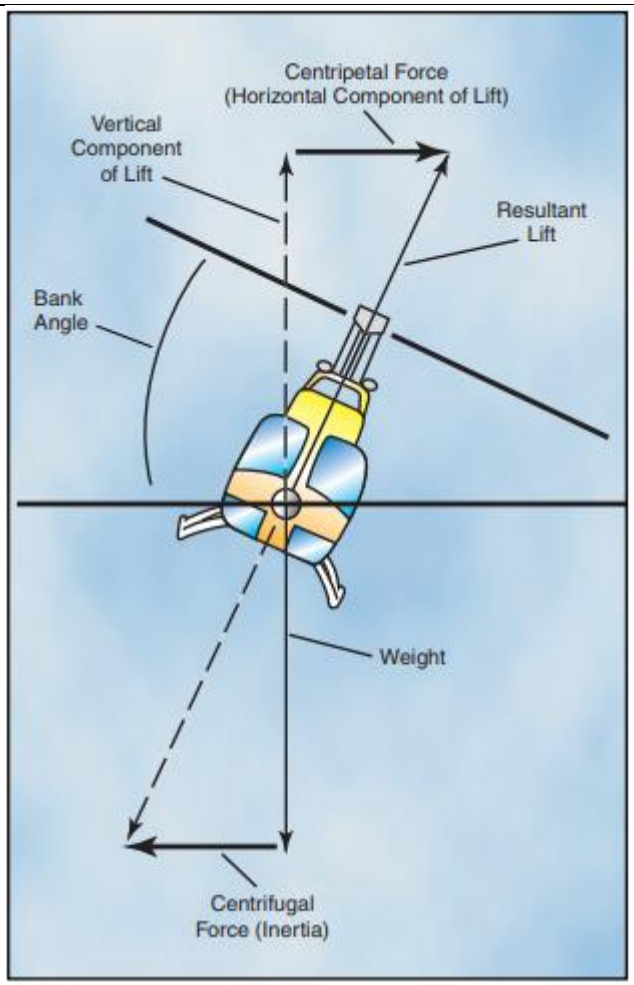

Illustration 1: The horizontal component of lift accelerates the helicopter toward the centre of the turn. (Source: FAA-H-8083-21A)

LIMIT MANIFOLD PRESSURE - IN. HG

MAXIMUM CONTINUOUS POWER								
PRESS	OAT - °C							
ALT-FT	-30	-20	-10	0	10	20	30	40
SL	21.5	21.8	22.1	22.4	22.6	22.9	23.1	23.3
2000	20.9	21.2	21.5	21.8	22.1	22.3	22.5	22.8
4000	20.4	20.7	21.0	21.3	21.5	21.8	22.0	22.2
6000	19.9	20.2	20.5	20.8	21.0	21.3	21.5	21.7
8000	19.5	19.8	20.1	20.3	20.6	20.8	21.0	21.3
10000	19.1	19.4	19.6	19.9	FULL THROTTLE			
12000								
FOR MAX TAKEOFF POWER (5 MIN), ADD 2.8 IN.								

Chart 1: Limit manifold pressure chart. (Source: POH)

Safety Notice SN-34

ROBINSON
HELICOPTER COMPANY

Safety Notice SN-34

Issued: Mar 99 Rev: Apr 2009

AERIAL SURVEY AND PHOTO FLIGHTS – VERY HIGH RISK

There is a misconception that aerial survey and photo flights can be flown safely by low time pilots. Not true. There have been numerous fatal accidents during aerial survey and photo flights, including several involving Robinson helicopters.

Often, to please the observer or photographer, an inexperienced pilot will slow the helicopter to less than 30 KIAS and then attempt to maneuver for the best viewing angle. While maneuvering, the pilot may lose track of airspeed and wind conditions. The helicopter can rapidly lose translational lift and begin to settle. An inexperienced pilot may raise the collective to stop the descent. This can reduce RPM thereby reducing power available and causing an even greater descent rate and further loss of RPM. Rolling on throttle will increase rotor torque but not power available due to the low RPM. Because tail rotor thrust is proportional to the square of RPM, if the RPM drops below 80% nearly one-half of the tail rotor thrust is lost and the helicopter will rotate nose right. Suddenly the decreasing RPM also causes the main rotor to stall and the helicopter falls rapidly while continuing to rotate. The resulting impact is usually fatal.

Aerial survey and photo flights should only be conducted by well trained, experienced pilots who:

1) Have at least 500 hours pilot-in-command in helicopters and over 100 hours in the model flown;

2) Have extensive training in both low RPM and settling-with-power recovery techniques;

3) Are willing to say no to the observer or photographer and only fly the aircraft at speeds, altitudes, and wind angles that are safe and allow good escape routes.

Also see Safety Notice SN-24.

What was found:

- The pilot had a valid Commercial Pilot Licence (CPL) issued on 13 November 2020 with an expiry date of 30 November 2021.
- The helicopter had a valid Certificate of Airworthiness issued on 26 June 2008 with an expiry date of 30 June 2022.
- The pilot allowed the helicopter to lose translational lift due to manoeuvring at low airspeed and in downwind direction, which led the helicopter to settle.

- According to the South African Weather Service report, the temperature for the day was 25˚C and the QNH was 1017hPa. The pressure altitude was calculated to be 3 388 feet. The density altitude was calculated to be 4 500 feet. The manifold pressure required to sustain flight was calculated to be 21.9" which was above the power setting that the pilot had selected.

Probable Cause

Loss of control because of an uncoordinated turn at low level, which resulted in loss of translational lift and high-power demand; hence, the subsequent impact with the ground.

Contributary Factor

Inadequate power setting selected during a turn.
Incorrect technique used.

Safety Action/s

None.

Safety Message

Pilots should avoid flying helicopters at low level and at less than 30 knots so as to prevent losing transitional lift and settling with power.

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.*
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