SOUTH AFRICAN CIVIL AVIATION AUTHORITY

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

LIMITED OCCURRENCE INVESTIGATION REPORT – FINAL

Reference Number	CA18/2/3/10462										
Classification	Accident			**Date**	20 May 2024			**Time**	0803Z		
Type of Operation	Private (Part 91)										
Location											
Place of Departure	Alldays Game Pens, Limpopo Province			Place of Intended Landing				Game Farm near Alldays, Limpopo Province			
Place of Occurrence	Alldays Game Pens in Limpopo Province										
GPS Co-ordinates	Latitude	22°40'33.26" S		Longitude	029°05'39.13" E			Elevation	2 742 feet		
Aircraft Information											
Registration	ZS-HGS										
Make; Model; S/N	Robinson Helicopter Company, R22 Beta II (Serial Number: 4330)										
Damage to Aircraft	Substantial					Total Aircraft Hours		358.8			
Pilot-in-command											
Licence Type	Private Pilot Licence (PPL)			Gender	Male			Age	52		
Licence Valid	Yes	Total Hours		6 400.1		Total Hours on Type		6 361.6			
Total Hours 90 Days	113.6			Total Flying on Type Past 90 Days				113.6			
People On-board	1 + 0	**Injuries**	0	**Fatalities**	0		**Other (on ground)**		0		

What Happened

On Monday morning, 20 May 2024, a pilot on-board a Robinson R22 Beta II helicopter with registration ZS-HGS took off from Alldays Game Pens in Limpopo province to a game farm, 6 nautical miles (nm) from the point of departure, in the same province. The flight was conducted in visual meteorological conditions (VMC) by day and under the provisions of Part 91 of the Civil Aviation Regulations (CAR) 2011 as amended.

The pilot reported that he conducted a pre-flight inspection of the helicopter, and no anomalies were noted. The helicopter, which had the doors removed, was parked and secured on top of a trailer bed. The pilot had also topped up fuel to the main and auxiliary tanks which totalled three-quarters (¾) each. With the assistance of a friend, the pilot loosened the skid gear which was tied down to the trailer using brackets (see Figure 5) and, thereafter, removed the main rotor blade support frames. *The brackets and the supporting equipment were not secured in a designated container; they were left lying on the front section of the trailer platform*. The pilot then boarded the helicopter and started the engine, which he allowed to warm up until the temperature and pressures were in the green arch. He then raised the collective pitch lever to lift off. The pilot intended to fly to a game farm which was 6 nautical miles (nm) from the take-off location to assess the amount of game available to capture.

The pilot stated: *"As I was taking off there was a sudden pull and yaw to the left, I tried to rectify it, but it was all in a split second and the helicopter's main rotor blades struck the ground and it fell over onto its left side."*

The helicopter sustained substantial damage to the fuselage, the main rotor blades and the tail boom which was severed by the main rotor blades. The front section of the left skid gear also broke off. The pilot vacated the helicopter unharmed.

This accident was reported to the Accident and Incident Investigations Division (AIID) on 10 June 2024, 21 days after the occurrence. During this time, the wreckage had already been recovered from the accident site to Wonderboom Aerodrome (FAWB) where it was kept in a hangar. The delayed reporting of the occurrence contravened Part 12.02.1 of the CAR 2011.

12.02.1 Notification of accidents

(1) The PIC of an aircraft involved in an accident within the Republic, or if he or she is killed or incapacitated, a flight crew member, or if there are no surviving flight crew members or if they are incapacitated, the operator or owner, as the case may be, shall, as soon as possible but at least within 24 hours since the time of the accident, notify—

(a) the Director;

(b) an ATSU; or

(c) the nearest police station, of such accident.

12.04.1 Guarding of aircraft involved in accident

Where an accident occurs within the Republic, the PIC of the aircraft involved in the accident, or if he or she is killed or incapacitated, a flight crew member, or if there are no surviving flight crew members, or if they are incapacitated, the operator or owner of such aircraft or where the accident occurs on an aerodrome, the aerodrome manager, shall—

(a) pending the arrival of a police guard, take such steps which may be necessary to prevent any interference with the aircraft, the wreck or wreckage and anything transported therein and any marks resulting from the accident which may be of assistance in an investigation;

(b) forthwith arrange with a member of the South African Police Service to guard the aircraft, the wreck or wreckage and anything transported therein and any marks resulting from the accident which may be of assistance in an investigation.

12.04.3 Control of evidence

(1) An aircraft, a wreck, or wreckage, and anything transported in an aircraft and any marks resulting from an accident which may be of assistance in an investigation, shall remain under the control of an investigator-in-charge until released by such investigator-in-charge.

The accident occurred during daylight at Global Positioning System (GPS) co-ordinates determined to be 22º40’33.26” South 029º05’39.13” East, at an elevation of 2 742 feet (ft).

Figure 1: The helicopter as it came to rest next to the trailer bed. (Source: Pilot)

Figure 2: The tail boom was severed from the fuselage. (Source: Pilot)

Figure 3: The left front section of the skid gear that broke off. (Source: Pilot)

Figure 4: A view of the cabin area. (Source: Pilot)

Figure 5: Some of the brackets used to secure the helicopter to the trailer. (Source: Pilot)

Meteorological Information

The weather information entered in the table below was obtained from the pilot questionnaire (CA 12-03).

Wind Direction	090º	Wind Speed	Fair	Visibility	9999m
Temperature	18ºC	Cloud Cover	Nil	Cloud Base	Nil
Dew Point	Unknown	QNH	Unknown		

Trailers to transport small helicopters:

Trailers are being used to transport small helicopters over long distances in many countries, including South Africa. There is no regulation in the South African Civil Aviation Regulations (CARs) 2011 as amended that states that a pilot may not take off from a trailer. Although the risk associated with this type of take-off is high, it remains a pilot's discretion to do so.

Dynamic Rollover

Source: Helicopter Flying Handbook FAA-H-8083-21A

A helicopter is susceptible to a lateral rolling tendency, called dynamic rollover when the helicopter is in contact with the surface during take-offs or landings. For dynamic rollover to occur, some factor must first cause the helicopter to roll or pivot around a skid or landing gear wheel, until its critical rollover angle is reached. (5 - 8° depending on the helicopter, winds, and loading) Then, beyond this point, main rotor thrust continues the roll and recovery is impossible. After this angle is achieved, the cyclic does not have sufficient range of control to eliminate the thrust component and convert it to lift. If the critical rollover angle is exceeded, the helicopter rolls on its side regardless of the cyclic corrections made.

Dynamic rollover begins when the helicopter starts to pivot laterally around its skid or wheel. This can occur for a variety of reasons, including the failure to remove a tie-down or skid-securing device, or if the skid or wheel contacts a fixed object while hovering sideward, or if the gear is stuck in ice, soft asphalt, or mud. Dynamic rollover may also occur if you use an improper landing or take-off technique or while performing slope operations. Whatever the cause, if the gear or skid becomes a pivot point, dynamic rollover is possible if not using the proper corrective technique.

It is important to remember rotor blades have a limited range of movement. If the tilt or roll of the helicopter exceeds that range (5 - 8°), the controls (cyclic) can no longer command a vertical lift component and the thrust or lift becomes a lateral force that rolls the helicopter over. When limited rotor blade movement is coupled with the fact that most of a helicopter's weight is high in the airframe, another element of risk is added to an already slightly unstable centre of gravity. Pilots must remember that to remove thrust, the collective must be lowered as this is the only recovery technique available.

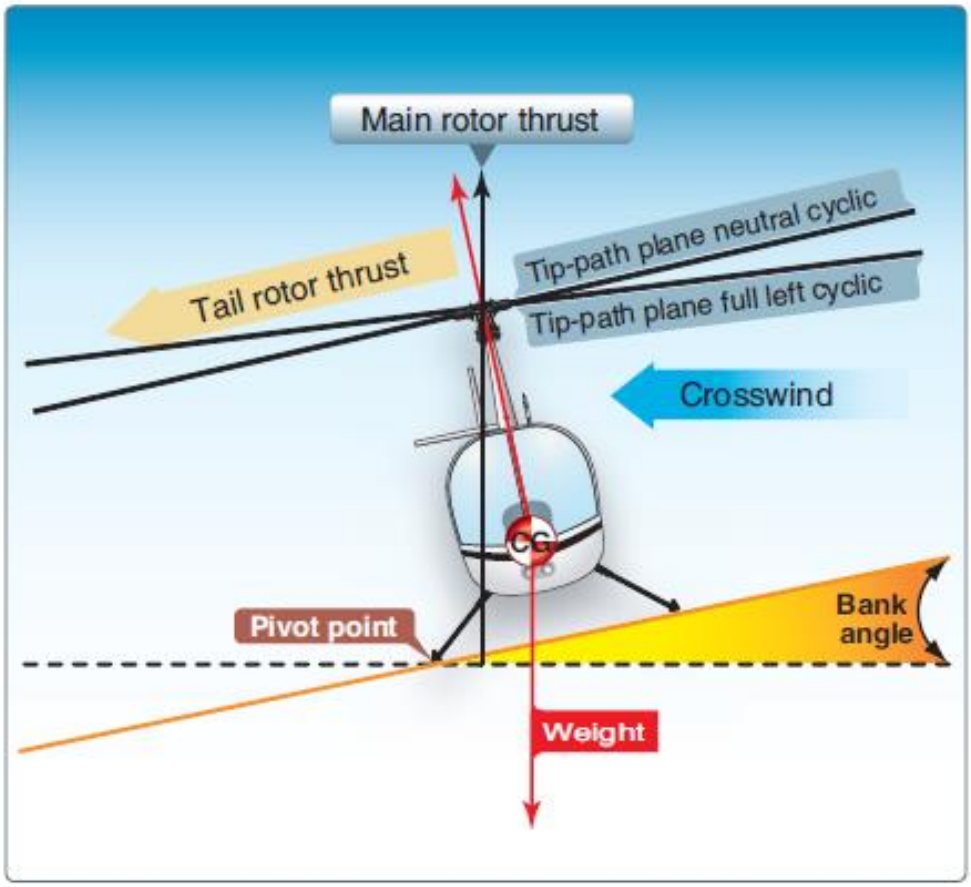

Illustration 1: Forces acting on a helicopter with right skid on the ground.

Findings

1. Personnel Information

1.1 The pilot had a Private Pilot Licence (PPL) that was initially issued by the Regulator (SACAA) on 14 April 1998; the latest renewed licence had an expiry date of 31 August 2024. The pilot had flown a total of 6 400.1 hours of which 6 361.6 hours were on the helicopter type.

1.2 The pilot was issued a Class 2 aviation medical certificate on 13 May 2024 with an expiry date of 31 May 2025.

1.3 The pilot had a medical restriction, according to his aviation medical certificate, which required that he wear corrective lenses for defective near vision.

1.4 The pilot was involved in a helicopter accident in the past:

(i) On 13 May 2021, a Robinson R22 helicopter with registration ZS-RGJ was involved in an accident in which the pilot lost control of the helicopter whilst lifting off from a trailer and crashed. The AIID report reference number for this accident is CA18/2/3/10002.

2. Aircraft Information

2.1 The last maintenance inspection conducted on the helicopter before the accident flight was certified on 13 May 2024 at 351.3 airframe hours. The helicopter had accrued 7.6 hours (four flights) since the last maintenance.

2.2 The helicopter had a valid Certificate of Airworthiness (C of A) that was initially issued on 31 January 2022. The latest C of A had an expiry date of 30 January 2025.

2.3 The helicopter's Certificate of Registration (C of R) was issued to the present owner on 20 May 2024.

2.4 The helicopter was issued a Certificate of Release to Service (CRS) on 13 May 2024 with an expiry date of 12 May 2025 or at 451.3 airframe hours, whichever occurs first.

3. The Trailer

3.1 The trailer on which the helicopter was parked at the time of the accident is used to transport the helicopter by road. During an interview with the pilot, he stated that he built the trailer as it is not a production-built unit and because it is task-specific. As there are no design criteria, the layout of the trailer varies, depending on the person(s) who are designing it. On this specific trailer, there is no secure container to house the tie-down brackets and tools. The trailer featured a side wall frame which had the potential to act as a pivot point.

3.2 The two main rotor blades of the helicopter were damaged on 31 March 2024 when it was transported on the trailer from a farm in the Free State to Musina in Limpopo province. The incident occurred when the trailer drove through a toll gate; one of the main rotor blades was bent at a 90° angle when it impacted an overhead noticeboard which subsequently impacted the top surface of the second main rotor blade.

4. Notification of an Accident

4.1 The pilot contravened Part 12.02.1 of the Civil Aviation Regulations 2011 by not reporting the accident within 24 hours of occurrence as prescribed in the regulations, and permission was not granted by the Regulator to recover the wreckage.

Probable Cause(s)

The helicopter exceeded the critical roll angle on take-off and the main rotor blades struck the ground whereupon the helicopter rolled over to the left and crashed next to the trailer.

Contributing Factor(s)
None.
Safety Action
It is recommended that all potential hazards (such as tie-down brackets and associated equipment) are properly secured in a container and away from the trailer to reduce the risks associated with taking off from these types of platforms.
Safety Message and/or Safety Recommendation/s
None.
About this Report
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 inquiries 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 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