SOUTH AFRICAN CIVIL AVIATION AUTHORITY

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

LIMITED OCCURRENCE INVESTIGATION REPORT – FINAL

Reference Number	CA18/2/3/10237										
Classification	Accident		**Date**	2 December 2022			**Time**	0630Z			
Type of Operation	Training (Part 141)										
Location											
Place of Departure	Rand Airport (FAGM), Gauteng Province			Place of Intended Landing			Rand Airport (FAGM), Gauteng Province				
Place of Occurrence	Helipad in front of Hangar Number 6, Rand Airport (FAGM), Gauteng Province										
GPS Co-ordinates	Latitude	26° 14' 17.58" S		Longitude	28° 09' 1.71" E		Elevation	5 465 ft			
Helicopter Information											
Registration	ZS-RYX										
Make; Model; S/N	Robinson Helicopter Company; R44 Raven II (Serial Number: 12498)										
Damage to Helicopter	Substantial			Total Helicopter Hours	2 596.1						
Pilot-in-command											
Licence Type	Student Pilot Licence (SPL) Helicopter (H)					Gender	Male	Age	46		
Licence Valid	Yes	Total Hours on Type		66.1	Total Flying Hours	66.1					
Total Hours 30 Days	7.8	Total Flying Hours on Type Past 90 Days		11.6							
People On-board	1 + 0	**Injuries**	0	**Fatalities**	0	**Other (on ground)**	0				

What Happened

On 2 December 2022, a student pilot (SP) on-board a Robinson R44 Raven II helicopter with registration ZS-RYX was on a solo navigation training flight from Rand Airport (FAGM), Gauteng province, with pre-planned routes via the non-directional beacon (NDB) Romeo Delta (RD), Baragwanath Airfield (FASY) and Vereeniging Airfield (FAVV), before returning to FAGM. The flight was conducted under visual flight rules (VFR). The flight was operated under the provisions of Part 141 of the Civil Aviation Regulations (CAR) 2011 as amended.

The SP reported a safe touch-and-go landing at FASY and, thereafter, flew towards FAVV. The SP did not land at FAVV; he routed back to FAGM.

Upon reaching FAGM, the SP received updated weather information as well as landing clearance from the FAGM air traffic control (ATC) before he crossed the active Runway (RWY) 29 threshold.

The SP hover-taxied the helicopter in a northerly direction to the designated helipad in front of Hangar Number 6, which is almost parallel to RWY 35. As the SP settled the helicopter on the ground, the rear end of the right skid contacted the ground hard. This caused the helicopter to bounce. To correct this, the SP lowered the collective lever with the intention to touch down smoothly, but the helicopter abruptly yawed to the left, making a 90-degree (°) yaw.

Startled by the unanticipated left yaw, the SP raised the collective lever for lift off from the ground to avoid a possible dynamic rollover and made further abrupt collective control inputs which caused the helicopter's nose to pitch up. Soon after, the SP heard a loud bang when one of the main rotor blades severed the tail boom whilst the retreating blade struck the ground. The helicopter landed hard and came to rest on the rear portion of its skids on the helipad facing north-east (30 degrees direction).

The SP closed the fuel shut-off valve and attempted to switch off the engine by pulling the mixture control, however, the mixture control lever was reported (by the SP) to have been unresponsive (jammed), possibly due to impact forces. As an alternative, the SP turned off the magnetos switch which caused the engine to stop, and exited the helicopter through the right-side door.

Upon witnessing the accident, the operator's personnel as well as maintenance personnel from other operators who were near the crash site rushed to the accident scene to assist the SP. Small flames which emanated around the auxiliary fuel tank were put out using fire extinguishers before they could cause further damage to the helicopter.

The helicopter was substantially damaged; however, the pilot was uninjured during the accident.

Figure 1: The helicopter as it came to rest.

Findings

1. Personnel Information

1.1. The SP was reissued a Student Pilot Licence (SPL) Helicopter (H) on 26 January 2022 with an expiry date of 25 January 2023. The Robinson R44 Raven II helicopter type was endorsed on the SP's licence. A Class 2 medical certificate was issued to the SP on 3 August 2022 with an expiry date of 3 August 2024. The SP's medical certificate had a restriction to wear suitable corrective lenses. The SP was properly licensed and medically fit for the flight in accordance with the existing regulations.

1.2. According to the SP's training file report entry dated 8 July 2022, the following notes were made:

- The SP sometimes bleeds off too much forward speed at the end and that results in a non-effective flare.
- The SP was advised to remember to level the aircraft before cushioning with collective lever.

2. Helicopter Information

2.1. According to the helicopter's latest Certificate of Release to Service (CRS) and logbooks, the last mandatory periodic inspection (MPI) was certified on 6 October 2022 at 2 508.6 total airframe hours. At the time of the accident, the helicopter had accumulated 2 596.1 airframe hours and had flown a further 87.5 hours since the last MPI.

2.2. The last MPI was carried out by the helicopter maintenance organisation with a valid approval certificate. The AME who certified the last MPI was appropriately licensed to carry out maintenance on the helicopter type.

2.3. The helicopter logbooks and maintenance history documents were reviewed. All documents were found to be in order; and all applicable Service Instructions (SIs), Service Bulletins (SBs) and Airworthiness Directives (ADs) were complied with.

2.4. The helicopter had a valid Certificate of Airworthiness (C of A) and was maintained in compliance with the regulations. The helicopter was airworthy when it dispatched for the flight.

2.5. The wreckage was thoroughly examined, and the flight controls were inspected; no pre-impact anomaly was found.

2.6. The aircraft was structurally intact prior to impact; there was no evidence of airframe failure, and all damage to the aircraft was attributed to impact forces.

2.7. There was a post-impact fire that started after the crash landing. Small amounts of fuel leaked to the ground from the auxiliary fuel tank that had caught fire. The response from the operator and the aircraft maintenance organisation's (AMO's) maintenance personnel was quick; they extinguished the fire before it could intensify.

2.8. The helicopter was substantially damaged, and the SP did not sustain any injuries during the accident.

3. Meteorological Information

3.1. The ATC recordings were requested from Air Traffic and Navigation Services (ATNS) to clarify the wind conditions that were given to the SP when he was cleared to land. The following information was given to the SP on approach:

Wind Direction	320 °	Wind Speed	10 kt	Visibility	9999 m
Temperature	22 °C	Cloud Cover	Nil	Cloud Base	CAVOK
Dew Point	12 °C	QNH	1021 hPa		

3.2. Based on the wind conditions that were prevalent at the time of the accident, the aircraft landed in a headwind component of 7.66 knots (kt) and a crosswind component of 6.43 kt from the left. The weather was not considered to be a contributory factor to this accident.

4. Robinson Model R44 Safety Tips Information

4.1. According to *Section 10 – SAFETY TIPS* from the *Robinson Model R44 Pilot Operating Handbook (POH):*

GENERAL
This section provides suggestions for the pilot to operate the helicopter more safely.

SAFETY TIPS

12. The helicopter is stable on its landing gear if ground contact is made vertically or with the aircraft moving forward. Should ground contract be made with the helicopter moving rearward, damage and possibly a rollover could occur. Low-time pilots and students should practice landings and hovering with the aircraft slowly moving forward.

14. Do not use collective pitch to slow the rotor during shutdown. Collective pitch procedures lift on the blades which can disengage the droop stop friction and allow the blades to strike the tail cone.

PILOT KNOWLEDGE AND PROFICIENCY

Pilot knowledge and proficiency is essential to safe helicopter operation. In addition to being appropriately licenced and complying with regulatory recurrency requirements, all pilots should seek to keep their knowledge base current and proficiency at a high level.

4.2. Based on the information given above, the cause of the accident could be attributed to the SP's inadequate levelling of the helicopter's landing skids to ensure the helicopter was level before touchdown.

Probable Cause

The helicopter landed hard on the right skid rear portion, which resulted in loss of control. The helicopter then yawed to the left; to correct this, the SP made abrupt control inputs which caused one of the main rotor blades to strike the tail boom before the helicopter came to rest.

Contributing Factor

Incorrect landing technique.

Safety Actions

None.

Safety Recommendation/Message

None.

About this Report

Decisions regarding whether to investigate, and the scope of the investigation are based on many factors, including the level of safety benefit likely to be obtained from an investigation. For this occurrence, a limited scope, fact gathering investigation was conducted to compile this limited report and allow for greater industry awareness of potential safety issues as well as possible safety action/s that the industry might want to consider in preventing a reoccurrence.

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****.*

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 issued by:

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