# AIRCRAFT ACCIDENT SHORT REPORT

**CA18/2/3/9758**, ZS-RLV, Unsuccessful forced landing following a decay in main rotor RPM while flying at low level

| | |
|---|---|
| **Date and time** | **:** 3 December 2018, 1530Z |
| **Location** | **:** Farm Potgietersleger, Ventersburg district, Free State Province |
| **Occurrence type** | **:** Accident |
| **Aircraft registration** | **:** ZS-RLV |
| **Aircraft manufacturer and model** | **:** Robinson Helicopter Company, R22 Beta |
| **Last point of departure** | **:** Farm Erfenis |
| **Next point of intended landing** | **:** Farm Erfenis |
| **Location of accident site with reference to easily defined geographical points (GPS readings if possible)** | **:** Farm Potgietersleger, 28°08'01.58" South 027°19'29.29" East |
| **Meteorological information** | **:** Surface wind: 240°/11 kt gusting 20 kt, temperature: 33°C, CAVOK |
| **Type of operation** | **:** Commercial (Part 127) |
| **Persons on board** | **:** 1 + 1 |
| **Injuries** | **:** None |
| **Damage to aircraft** | **:** Substantial |

*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 of the Investigation:**

*In terms of Regulation 12.03.1 of the Civil Aviation Regulations (2011) this report was compiled in the interests of the promotion of aviation safety and the reduction of the risk of aviation accidents and incidents and* ***not to apportion blame or liability****.*

**Disclaimer:**

*This report is produced without prejudice to the rights of the CAA, which are reserved.*

# 1 SYNOPSIS

1.1 On Monday 3 December 2018 at approximately 1510Z the pilot accompanied by a passenger took off from the farm Erfenis and flew to the farm Potgietersleger in the Ventersburg district.

1.2 The purpose of the flight was to search for jackals on the farm as the jackals were killing and injuring livestock. Both doors of the helicopter were removed for the flight to provide for better visibility. The flight was conducted along a densely vegetated area next to the Koolspruit River as that was the area the jackals would most likely hide. The pilot stated that while maneuvering over the vegetated area at a low level, at a speed of approximately 30 kt, they encountered a sudden gust of wind from behind. The low main rotor revolutions per minute (RPM) horn sounded and the low RPM warning light illuminated on the instrument panel. The pilot stated that he aimed to clear the eroded embankment, and commenced with a right turn with the intention to turn into wind. He managed to clear the eroded embankment and landed on a flat area but the helicopter touched down hard and the right skid dug into the soil and broke off and the helicopter rolled over to the right.

1.3 None of the occupants on-board the helicopter sustained any injuries. The helicopter sustained substantial damage during the accident sequence.

1.4 The investigation revealed that the main rotor RPM decayed due to a sudden gust of wind whilst maneuvering at low height resulting in an unsuccessful forced landing.

# 2 FACTUAL INFORMATION

## 2.1 History of flight

2.1.1 The pilot, accompanied by the farm owner, took off from the farm Erfenis and flew to the farm Potgietersleger in the Ventersburg district with the intention to look for jackal's as they had become a major problem, killing and or causing injury to livestock on the farm, including cattle. The farmer was convinced that the jackals were hiding in the densely vegetated area on the banks of the Koolspruit River that passes through the farm.

2.1.2 Both doors were removed to provide for better visibility during the flight. The pilot stated that they were airborne for approximately 20 minutes flying at low level along the river. According to the pilot, while they were flying at approximately 30 knots from west to east they encountered a sudden gust of wind from behind. He pulled the collective pitch lever up in order to try and maintain their height above the vegetation as the terrain had become very eroded/hazardous. He then attempted to turn the helicopters nose into the wind and he applied right yaw pedal. He stated that as he commenced with the turn the low main rotor RPM audio warning activated as well as the warning light illuminated. He managed to clear the eroded (hazardous) terrain. He then told his passenger to hold on as they were going to crash as the main rotor RPM was depleted. They touched down heavily on the skid gear, and the right front skid gear penetrating the soil, which caused the helicopter to roll over to the right.

2.1.3 The pilot stated that his weight was 80 kg and that of the farmer 95 kg, and they had a ¼ tank of fuel in each the main and auxilliary tanks when they took off from the farm. Nobody was injured in the accident, but the helicopter sustained substantial damage.

2.1.4 The accident occurred during daylight conditions at a geographical position determined to be 28°08’01.58” South 027°19’29.29” East at an elevation of 4 658 ft above mean sea level (AMSL). This was a very remote area of the farm and there were no persons within several kilometres of the accident site. The farmer was able to phone his wife via his cellphone, and by making use of the application "Find my Phone", which uses GPS co-ordinates to locate the phone, his wife and the pilot's assistant then drove to the location on the farm where the aircraft had crashed. From Figure 1 it can be seen that the area consists of vast open areas, with dense vegetation visible along the Koolspruit River.


**Figure 1:** A Google Earth overlay of the area where the accident occurred

2.1.5 The pilot was requested to submit a detailed weight and balance (WB) calculation for the accident flight. The information that follows, namely the WB calculation and the two centre of gravity (CG) charts, were obtained from the pilot. The maximum take-off weight for this helicopter, according to the pilot's operating handbook (POH), section 2, is not allowed to exceed 1 370 lb (622 kg). According to the WB calculation, the helicopter was operated at 63.6 lb (29 kg) below its maximum gross weight limit.

| Item | Weight (lb) | Arm (inches) | Moment (lb x inches) |
|---|---|---|---|
| *Helicopter empty weight | 904.4 | 102.71 | 92 890.9 |
| Remove right door | –5.2 | 77.5 | –403 |
| Remove left door | –5.2 | 77.5 | –403 |
| Pilot (80 kg) | 176 | 78 | 13 728 |
| Passenger (95 kg) | 210 | 78 | 16 380 |
| **Total weight (zero usable fuel)** | **1 280** | **95.46** | **122 193.9** |
| Usable main tank (6 kg) | 13.2 | 108.6 | 1 433.5 |
| Usable aux tank (6 kg) | 13.2 | 103.8 | 1 370.2 |
| **Total weight at accident** | **1 306.4** | **95.68** | **124 996.7** |

*NOTE: The helicopter empty weight was obtained from the last mass and balance report (CA 43-17), which was certified on 2 October 2017.

2.1.6 Wreckage and impact information:

The helicopter came to rest on its right side on a heading of 300ºM. Several main rotor blade strike markings were evident in the hard dry soil next to the wreckage where it came to rest, despite the fact that the main rotor blades remained attached to the main rotor hub assembly (though severely deformed). The tail boom as well as the tail rotor control assembly remained attached to the fuselage. No damage was visible to the tail rotor assembly, as can be seen in Figure 4. Apart from the left windshield, which broke during impact, the cockpit/cabin area remained intact, including the instrument cluster (Figure 5). The skid gear broke off during the impact sequence and was lying in close proximity to the main wreckage, with the right skid trapped underneath the helicopter (on the pilot's side) (Figure 5). The pilot indicated that he had closed the fuel shut-off valve after they had evacuated the cabin area. Figure 6 shows the densely vegetated terrain they were flying over when they encountered the sudden gust of wind from behind. The pilot stated that he was afraid that they were going to collide with an embankment and was trying to clear it in order to mitigate the risk of injury, when they impacted with level ground.

**Figure 2:** The helicopter as it came to rest

**Figure 3:** A front view of the helicopter as it came to rest


**Figure 4:** A view of the tail rotor assembly, which did not sustain any damage

**Figure 5:** A view of the cockpit/cabin area, which remained intact apart from the left windshield that broke

**Figure 6:** A view of the eroded terrain/embankment the pilot had to clear

# 3 FINDINGS

3.1 The pilot was a holder of a valid commercial pilot's licence (helicopter). He had the helicopter type endorsed in his licence and held the required rating to conduct this flight.

3.2 The pilot was the holder of a valid aviation medical certificate, due to expire on 30 November 2019.

3.3 This was the fourth helicopter accident in which the pilot had been involved in since 2008. The table below summarises his previous accidents:

| |
|---|
| 1. On 17 December 2008, the pilot was involved in an accident in a Robinson R22, ZS-RNU, near Winburg in the Free State. |
| 2. On 30 September 2010, the pilot was involved in an accident in a Robinson R22, ZS-RIA, near Excelsior in the Free State. |
| 3. On 25 November 2014, the pilot was involved in an accident in a Robinson R44, ZS-RLJ, near Tierpoort Dam in the Free State. |

3.4 The pilot gave his passenger a safety briefing before they commenced with the flight and they were properly restrained during the flight.

3.5 The helicopter was in possession of a valid Certificate of Airworthiness, due to expire on 31 December 2018.

3.6 The Certificate of Release to service for this helicopter was issued on 14 May 2018 and would have lapsed on 13 May 2019 or 4 971.2 airframe hours, or whichever would have come first.

3.7 The last maintenance inspection that was carried out on the helicopter prior to the accident flight was certified on 14 May 2018 at 4 871.2 airframe hours by an approved aircraft maintenance organisation (AMO). A further 80.5 hours were flown with the helicopter since the inspection.

3.8 The pilot stated that there was no mechanical defect with the helicopter at any stage during the flight.

3.9 The helicopter was operated within the weight and balance limitations as contained in section 2 of the POH.

3.10 This was a commercial flight, conducted under the provisions of Part 127 of the Civil Aviation Regulations (CARs) of 2011 as amended. The operator was in possession of a valid air-operating certificate (AOC), no. CAA/N1050D, due to expire on 31 October 2019.

3.11 Nobody was injured in the accident.

3.12 An official weather report was obtained from the South African Weather Service (SAWS). The prevailing wind at the time of the flight was from the west-south-west direction and the temperature was 33°C, with clear sky conditions.

3.13 The density altitude was calculated to be 7 653 ft.

## 4 PROBABLE CAUSE

4.1 The main rotor RPM decayed due to a sudden gust of wind whilst maneuvering at low height resulting on an unsuccessful forced landing.

## 5 CONTRIBUTING FACTORS

5.1 The high density altitude conditions had a significant influence on the engine power, as the helicopter was equipped with a normal aspirated engine.

5.2 The power available from the engine is directly proportional to the RPM. In this accident, the engine power required to fly out of the situation exceeded the engine power available even after the pilot rolled on the throttle and lowered the collective pitch lever.

5.3 The pilot was afraid to collide with an embankment caused by soil erosion (Figure 6). In an attempt to clear it, the main rotor RPM was substantially depleted.

5.4 According to the pilot, the prevailing wind was from the same direction as on the day of the accident during the on-site investigation the following day. The wind

speed was observed to be inconsistent, and gusting from time to time. A substantial number of whirlwinds (dust devils) were also present.

## 6 REFERENCES USED IN THE REPORT

6.1 POH, section 2, pg. 2-3 (weight limits)

6.2 http://www.pilotfriend.com/pilot_resources/density.htm

| | |
|---|---|
| Elevation | 4 685 ft |
| Temperature | 33°C |
| *Dew point | –3°C |
| *Altimeter setting | 1 018 mb |
| **Density altitude** | **7 653 ft** |

*Note: The barometric pressure (altimeter setting) entered in the table above was obtained from the respective instrument during the on-site investigation. The dew point was obtained from the pilot questionnaire.

## 7 SAFETY RECOMMENDATION

7.1 None.

## 8 ORGANISATION

8.1 This was a commercial flight, which was conducted under the provisions of Part 127 of the CARs of 2011 as amended. The operator was in possession of a valid AOC, which was issued by the Civil Aviation Authority (CAA) on 13 November 2018 which and was valid until 31 October 2019.

# 9 SAFETY MESSAGES

9.1 None.

**This report is issued by:**

**Accident and Incident Investigation Division (AIID)**
**South African Civil Aviation Authority**
**Republic of South Africa**