SOUTH AFRICAN CIVIL AVIATION AUTHORITY

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

LIMITED OCCURRENCE INVESTIGATION REPORT – FINAL

Reference Number	CA18/2/3/10329						
Classification	Accident	**Date**	13 June 2023		**Time**	0549Z	
Type of Operation	Training (Part 141)						
Location							
Place of Departure	Ultimate Heli, Waterfall City, Gauteng Province	Place of Intended Landing	Ultimate Heli, Waterfall City, Gauteng Province				
Place of Occurrence	On taxiway at Grand Central Airport, Gauteng Province						
GPS Co-ordinates	Latitude	25º59'16.23" S	Longitude	28º08'25.47" E	Elevation	5 312 ft	
Helicopter Information							
Registration	ZS-HXU						
Make; Model; S/N	Robinson; R22 BETA (Serial Number: 1562)						
Damage to Helicopter	Substantial	Total Helicopter Hours	5 582.5				
Pilot-in-command							
Licence Type	Commercial Pilot Licence (CPL) Helicopter	Gender	Male	Age	56		
Licence Valid	Yes	Total Hours	1 496.8	Total Hours on Type	261.6		
Total Hours 30 Days	20.1	Total Flying on Type Past 90 Days	13.4				
People On-board	2 + 0	**Injuries**	0	**Fatalities**	0	**Other (on ground)**	0

What Happened

On Tuesday morning, 13 June 2023, an instructor and a student pilot on-board a Robinson R22 Beta helicopter with registration ZS-HXU took off on a training flight from Ultimate Heli in Midrand to Grand Central Airport (FAGC), both in Gauteng province, with the intention to return to Ultimate Heli. The intention of the flight was to conduct circuits and emergency exercises on the taxiway at FAGC. The flight was conducted under visual meteorological conditions (VMC) by day and under the provisions of Part 141 of the Civil Aviation Regulations (CAR) 2011 as amended.

The instructor, who was the pilot monitoring, stated that they had completed four circuits which comprised a single circuit and three rudder pedal failure procedure circuits at approximately 0545Z. Thereafter, they requested to perform an autorotation from FAGC tower for their fifth circuit. FAGC tower granted them permission and they initiated the autorotation at 700 feet (ft) above ground level (AGL). The instructor stated that at approximately 150 ft AGL, the student pilot added power to recover from autorotation, but the engine did not respond. The instructor realised that the engine had stopped and, thus, took control of the helicopter and tried to restart the engine but he did not have sufficient time. Meanwhile, whilst FAGC tower cleared a fixed-wing traffic for final approach on Runway 17 for a touch-and-go landing, they (tower) observed ZS-HXU rapidly losing height before it yawed to the left and crashed on the taxiway next to Runway 17. The FAGC tower activated the crash alarm, and the Aircraft Rescue and Firefighting (ARFF) personnel and company (the operator)

responded to the scene. The instructor and the student pilot evacuated the helicopter unassisted and uninjured. The helicopter rotors had stopped operating during the accident sequence. The helicopter sustained substantial damage.

Figure 1: The aerial view of the accident site at FAGC. (Source: Google Earth)

Figure 2: Final position of the helicopter showing the right side.

Figure 3: Final position of the helicopter showing the left side.

The helicopter was recovered with the assistance of the aircraft maintenance organisation (AMO). The engine was tested, and it operated satisfactorily whilst still in the airframe with the main rotor blades removed and the clutch disengaged. In an interview with the crew, it was found that the engine stoppage was due to possible carburettor icing.

The instructor, through the pilot questionnaire, reported the weather conditions as follows – wind direction: 210º at 8-10 knots, temperature: 4ºC, and dew point: 2ºC.

According to the South African Weather Service (SAWS), the official weather was as follows: wind direction was 185º-194º, temperature was 6.8ºC and dew point was 1.5ºC. Therefore, dew point depression was calculated as 5.3ºC.

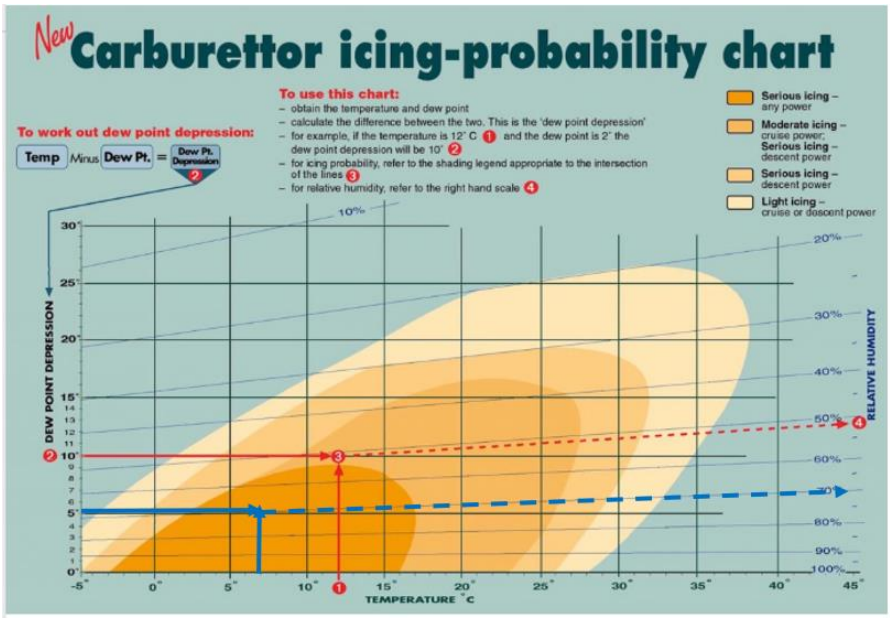

Figure 4: Carburettor Icing Probability Chart with blue arrows showing serious icing conditions at any power setting.

The dew point depression of 5.3ºC gives a 70% relative humidity, which results in serious icing probability in any power setting. The crew stated that the carburettor heat knob was in the "OFF" position during the autorotation practise.

According to the R22 Pilot's Operating Handbook (POH), Section 4, page 4-11, carburettor heat knob must always be in the "ON" position during autorotation and when power setting is below 18 inches of mercury. The instructor, who was the pilot monitoring the instruments during this flight, stated that the power setting was between 14-15 inches of mercury.

Safety Notice SN-25 Carburettor Icing (Source: Manufacturer)
Avoidable accidents have been attributed to engine stoppage due to carburettor ice. When used properly, the carburettor heat and carb heat assist systems on the R22 and R44 will prevent carburettor ice. Pressure drops and fuel evaporation inside the carburettor cause significant cooling. Therefore, carburettor ice can occur at Outside Air Temperature (OATs) as high as 30ºC (86ºF). Even in generally dry air, local conditions such as a nearby body of water can be conducive to carburettor ice. When in doubt, assume conditions are conducive to carburettor ice and apply carb heat as required.

Findings

1. The instructor was initially issued a Commercial Pilot Licence (CPL) Helicopter on 16 October 2017. The instructor conducted his last skills test on 21 January 2022 and his licence was reissued on 13 June 2022 with an expiry date of 30 June 2023. The instructor had flown a total of 1 496.8 hours of which 261.6 hours were on the helicopter type. The instructor was properly licensed and medically fit to conduct the flight.

2. The instructor had a Class 1 aviation medical certificate that was issued on 10 May 2023 with an expiry date of 20 May 2024, and had a restriction to wear suitable corrective lenses for defective near vision.

3. The student pilot applied for his Student Pilot Licence on 2 June 2023 and the licence was issued on 14 June 2023 with an expiry date of 13 June 2024. The student pilot had flown a total of approximately 10.2 hours at the time of the accident.

4. The last mandatory periodic inspection (MPI) was conducted on 10 June 2023 at 5 576.0 hours. The helicopter was issued a Certificate of Release to Service (CRS) on 10 June 2023 with an expiry date of 10 June 2024 or at 5 676.0 hours, whichever occurs first. The helicopter was flown a further 6.5 hours since the last MPI.

5. The helicopter had a valid Certificate of Airworthiness (C of A) that was initially issued on 23 September 2015. The C of A was last renewed on 22 May 2023 with an expiry date of 30 September 2024. The helicopter's Certificate of Registration (C of R) was issued to the current owner on 11 December 2012.

6. The helicopter lost engine power during autorotation practise due to carburettor icing. The crew omitted to select carburettor heat to "ON" position during the exercise as required by the helicopter POH.

7. The engine run was conducted after the accident and it operated without difficulty, an indication that there was no mechanical failure prior to loss of power.

Probable Cause(s)

Engine power loss during the autorotation practise due to carburettor icing.

Contributing Factor(s)

Carburettor heat was in the “OFF” position during the autorotation practise.

Safety Action(s)

None.

Safety Message

To avoid injury and damage to property, pilots are advised to always consider the effects of carburettor icing during flight planning and prior to any flight.

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 desk top enquiries 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 issued by:
Accident and Incident Investigations Division
South African Civil Aviation Authority
Republic of South Africa