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Australian Transport Safety Bureau

Collision with terrain involving a Robinson R22, VH-HUA

93 km SE of Mount Isa, Queensland, 20 March 2015

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Addendum

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Collision with terrain involving a Robinson R22, VH-HUA

What happened

On 20 March 2015, at about 1140 Eastern Standard Time (EST), a Robinson R22 helicopter, registered VH-HUA, departed from Stanbroke Station for a private flight to Devoncourt Station, Queensland. On board were a pilot and one passenger. The main fuel tank was filled to capacity prior to departure, with 68 L of fuel. While en route between the two stations, the pilot was assessing the water available for stock by overflying water holdings.

At about midday, while about 500 ft above ground level, the helicopter approached a gorge. To assess the water quantity in the gorge, the pilot conducted a descent to about 100 ft and slowed the helicopter to a hover. As the pilot shifted his focus outside, the rotor revolutions per minute (RPM) decreased, the low rotor RPM warning horn sounded and the helicopter commenced descending. The pilot immediately lowered the collective[1] and turned the helicopter away from the higher gorge walls in an attempt to increase forward speed and rotor RPM. He was unable to regain sufficient rotor RPM and the helicopter continued to descend.

The right skid landed heavily on uneven ground, followed by the left skid. The main rotor then collided with a rock and the helicopter rolled onto its right side. The pilot and passengers exited the helicopter and were not injured. The helicopter sustained substantial damage (Figure 1).

Figure 1: Damage to VH-HUA

Source: Aircraft operator

Local conditions

The temperature at the time was about 42 °C and the elevation of the area was about 1,000 ft above mean sea level. The pilot reported the wind was southerly at about 10-15 kt, but the gorge was sheltered and the wind in the vicinity of the accident was calm.

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[1] A primary helicopter flight control that simultaneously affects the pitch of all blades of a lifting rotor. Collective input is the main control for vertical velocity.

Pilot comments

The pilot reported that his attention was momentarily diverted outside checking the water, when he would normally be watching the gauges and monitoring the rotor RPM. He usually operated without a passenger on board, so the extra weight of the passenger had reduced the helicopter's performance, particularly its ability to maintain a hover out of ground effect.

Power required and power available

A number of factors related to the power required and the power available may have contributed to the decaying main rotor RPM during a hover out of ground effect.[2] These factors include density altitude, take-off weight and the wind component.

- ***Density altitude***. Increasing density altitude adversely affects helicopter performance through the combined effects of reducing the power available and increasing the power required. Considering elevation and temperature, and barometric pressure in the area, the density altitude at the accident site would have been around 4,000 ft. High relative humidity would have had the effect of further increasing the density altitude.
- ***Operating weight***. Increasing the helicopter weight increases the power required. The greater lifting force demanded of the main rotor, and the requirement to counter the associated increased torque effect[3] with the tail rotor, both contribute to an increased power requirement. The weight of the helicopter at the time of the accident was less than the maximum permitted operating weight, but reduced the ability to hover out of ground effect.
- ***Wind component***. A nil wind component increases the power required because of the diminished or delayed influence of translational lift.[4]

The following references discuss factors affecting helicopter performance, and provide some guidance to pilots regarding the associated considerations:

- A 'Good Aviation Practice' booklet titled *Helicopter Performance,* produced by the Civil Aviation Authority (CAA) of New Zealand. The booklet is available via the CAA website: www.caa.govt.nz/safety_info/good_aviation_practice.htm
- The Federal Aviation Administration (FAA) *Helicopter Flying Handbook* (chapter 7 deals with helicopter performance). The handbook is available on the FAA website: www.faa.gov/regulations_policies/handbooks_manuals/aviation/helicopter_flying_handbook/

Safety message

The Robinson R22 Pilot's Operating Handbook includes a number of important safety tips and notices. Pilots (particularly those who fly Robinson helicopters) are encouraged to carefully reflect on these safety tips and notices – the tips are intended to improve safety, while the notices have been issued as a result of various accidents and incidents. The R22 Pilot's Operating Handbook – Section 10 Safety Tips and Notices is available at: www.robinsonheli.com/manuals/r22_poh/r22_poh_10.pdf.

The Robinson Helicopter Company Safety Notice SN-10: *Fatal accidents caused by low rpm rotor stall*, advised that a 'primary cause of fatal accidents in light helicopters is failure to maintain rotor RPM. To avoid this, every pilot must have his reflexes conditioned so he will instantly add throttle and lower collective to maintain RPM in any emergency'.

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2 Ground effect refers to the apparent improvement in helicopter performance near the ground which results from a modification of the airflow through the main rotor due to the interaction of that flow with the ground beneath.

3 In this context, torque effect is the reaction of the helicopter to the torque applied by the main rotor. This effect is countered by the tail rotor.

4 Translational lift is the additional lift resulting from induced airflow through the main rotor as a result of forward airspeed (oncoming flow of air through the main rotor).

Three other ATSB investigation reports that identified helicopter performance and low main rotor RPM as possible factors include AO-2013-203, 200600979 and 199900833. These investigation reports are available on the ATSB website:

- www.atsb.gov.au/publications/investigation_reports/2013/aair/ao-2013-203.aspx
- www.atsb.gov.au/publications/investigation_reports/2006/aair/aair200600979.aspx
- www.atsb.gov.au/publications/investigation_reports/1999/aair/aair199900833.aspx

This incident provides a reminder of the effect of density altitude, weight, and wind on helicopter performance. Pilots are encouraged to carefully and accurately assess these factors to ensure that an adequate performance margin is maintained. When performance is likely to be adversely affected by a combination of these factors, extreme caution is warranted.

General details

Occurrence details

Date and time:	24 March 2015 – 1100 EST	
Occurrence category:	Accident	
Primary occurrence type:	Collision with terrain	
Location:	93 km SE Mount Isa Aerodrome, Queensland	
	Latitude: 21° 18.83' S	Longitude: 140° 02.95' E

Helicopter details

Manufacturer and model:	Robinson Helicopter Company R22	
Registration:	VH-HUA	
Serial number:	3973	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – 1
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Substantial	

About the ATSB

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The ATSB is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: independent investigation of transport accidents and other safety occurrences; safety data recording, analysis and research; and fostering safety awareness, knowledge and action.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to fare-paying passenger operations.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the safety factors related to the transport safety matter being investigated.

It is not a function of the ATSB to apportion blame or determine liability. At the same time, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

About this report

Decisions regarding whether to conduct an investigation, 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, a limited-scope, fact-gathering investigation was conducted in order to produce a short summary report, and allow for greater industry awareness of potential safety issues and possible safety actions.