Australian Government
Australian Transport Safety Bureau

Collision with terrain involving Robinson R44, VH-HBV

Julatten, Queensland, 15 August 2017

ATSB Transport Safety Report
Aviation Occurrence Investigation
AO-2017-083
Final – 22 March 2018

Released in accordance with section 25 of the *Transport Safety Investigation Act 2003*

Publishing information

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Addendum

Page	Change	Date
3 and 4	Minor change to safety message	4 May 2018

Collision with terrain involving Robinson R44, VH-HBV

What happened

On 15 August 2017, the pilot of a Robinson R44 helicopter, registered VH-HBV (HBV), conducted a private ferry flight from Cooktown to Mossman, Queensland. After refuelling in Mossman, the helicopter departed for a short ferry flight to Julatten, Queensland. The pilot was the sole occupant of the helicopter.

At about 1520 Eastern Standard Time,[1] the helicopter approached the landing site in a northerly direction. The pilot conducted an orbit at about 300–500 ft above the site to assess the conditions and then commenced the approach.

Just prior to touchdown, the pilot pulled back on the cyclic.[2] As a result, the tail rotor struck the ground behind the helicopter. The pilot felt the tail contact the ground through the airframe and pedals. The helicopter shuddered violently and yawed[3] rapidly to the right.

As the helicopter completed a 360 degree turn with the skids about 3–5 ft above the ground, the pilot lowered the collective[4] in an attempt to land on the helipad. The helicopter was still yawing as the skids contacted the helipad. It rolled over, the main rotor blades struck the ground and the helicopter came to rest on its left side.

The pilot was uninjured and the helicopter sustained substantial damage (Figure 1).

Figure 1: Accident site showing damage to VH-HBV

Source: CASA

1 Eastern Standard Time (EST): Coordinated Universal Time (UTC) + 10 hours.

2 Cyclic: a primary helicopter flight control that is similar to an aircraft control column. Cyclic input tilts the main rotor disc, varying the attitude of the helicopter and hence the direction of movement.

3 Yawing: the motion of an aircraft about its vertical or normal axis.

4 Collective: 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 commented that there were trees along the approach to the landing site, but it did not require a steep approach path and consequently he conducted a shallow approach. The wind at the time was from the south-east at 10 to 15 kt, but, due to the sheltered location, there was no wind at the landing site.

A company helicopter had landed shortly before HBV, and was parked on the front of the pad. The pilot commented that he may have looked at that helicopter as he touched down, which led to pulling back on the cyclic. HBV was an older model R44 helicopter than the pilot had flown previously and he reported that when the cyclic was in the neutral position, it sat slightly further forward than he was accustomed to. The pilot also commented that had he rolled off the throttle immediately after the tail rotor struck the ground, it would have reduced the helicopter's rate of rotation and potentially prevented the rollover. He stated, however, that he did not recognise the developing situation, and roll off the throttle, before the helicopter began yawing. He also reported being unable to land the helicopter until it had rotated through 360° due to concern about terrain contact. Finally, the pilot recalled that he rolled off the throttle upon lowering the collective but the yaw did not stop completely prior to the skids contacting the ground.

The chief pilot, who witnessed the accident, indicated that the helicopter came in with the tail a bit lower than normal, the tail rotor struck a small mound of dirt, and the tail rotor and gear box detached. He commented that the pilot only weighed about 65 to 70 kg and, without any passengers or gear on board, the centre of gravity of the R44 is quite aft and the tail is therefore lower than when more heavily loaded. He further stated that the fuel tank was about three-quarters full, and the helicopter was within weight and balance limitations.

Safety analysis

The pilot applied aft cyclic just prior to touchdown, which resulted in a slightly tail-low attitude for landing. The tail stinger would normally contact the ground and prevent a tail rotor strike. However, because the ground sloped away behind the concrete landing pad, the stinger was over the slope, allowing the tail rotor to strike the ground and detach without prior warning (Figure 2).

Following separation of the tail rotor and gearbox, the helicopter yawed rapidly to the right through 360° in response to the torque associated with the still-powered main rotor. As the pilot did not roll the throttle off quickly enough to reduce the rate of yaw of the helicopter prior to lowering the collective, the helicopter was still yawing when the skids contacted the ground. Consequently, it rolled over and the main rotor blades struck the ground.

Figure 2: Sloping ground away from helipad and tail rotor strike marks

Source: Queensland Police

Findings

These findings should not be read as apportioning blame or liability to any particular organisation or individual.

- The pilot applied aft cyclic just prior to touchdown, resulting in a tail-low attitude.
- The ground sloped downwards away from the landing pad and as a result, the tail stinger did not protect the tail rotor from ground contact.
- The tail rotor struck the ground and detached, resulting in the helicopter yawing rapidly to the right. The pilot did not roll off throttle to reduce the yaw rate prior to lowering the collective, which probably led to the helicopter rolling over as the skids contacted the ground.

Safety action

Whether or not the ATSB identifies safety issues in the course of an investigation, relevant organisations may proactively initiate safety action in order to reduce their safety risk. The ATSB has been advised of the following safety action in response to this occurrence.

Helicopter operator

As a result of this occurrence, the helicopter operator has taken the following safety actions:

- Company pilots were briefed immediately following the accident, and subsequently trained, with regard to flying alone or with very little cargo. R44s are inclined to have a nose-high attitude when light, which often results in tail and stinger encroaching too close to terrain.
- The company hazard register was updated to highlight the issue and company pilots were required to read the updated register. Pilots were advised that higher flare and slower approaches can mitigate the hazard.
- Company pilots were briefed regarding hazards associated with helicopter landing sites and bush landing sites with sloping terrain and any obstacle that may come into contact with tail rotor or helicopter.
- Retraining of company pilots in special procedures, including the conduct of hovering autorotations was conducted between October and November 2017. The operator assessed that use of this technique would have reduced the damage to the helicopter.

Safety message

This occurrence highlights that a loss of tail rotor thrust at low speed and low height above the ground requires an immediate and correct response to maintain control of the helicopter. It is therefore important that pilots are primed for this emergency, particularly during the approach and departure phases of flight.

The United States National Transportation Safety Board Safety Alert *Loss of tail rotor effectiveness in helicopters* states that due to safety concerns, training for loss of tail rotor effectiveness (LTE) is rarely conducted in an actual helicopter. While this incident involved the detachment of the tail rotor rather than aerodynamic LTE, the stated pilot responses to LTE are applicable here and consistent with the manufacturer's emergency procedures.

The US Federal Aviation Authority Advisory Circular 90-95 stated under effective recovery techniques (for LTE), that collective pitch reduction will aid in arresting yaw rate but may cause an increase in the rate of descent. If the rotation cannot be stopped and ground contact is imminent, an autorotation (i.e. rolling off throttle) may be the best course of action. While the pilot's action in lowering the collective during this occurrence may have reduced the yaw rate, following the manufacturer's emergency procedure for a loss of tail rotor thrust during hover will provide the best outcome when close to the ground. That is, if uncommanded yaw is experienced that cannot

be stopped by application of opposing tail rotor pedal:

- fully roll off the throttle and allow the helicopter to settle while controlling any drift
- raise the collective just before touchdown to cushion the landing.

General details

Occurrence details

Date and time:	15 August 2017 – 1505 EST	
Occurrence category:	Accident	
Primary occurrence type:	Collision with terrain	
Location:	Julatten, Queensland	
	Latitude: 16° 35.80' S	Longitude: 145° 20.02' E

Helicopter details

Manufacturer and model:	Robinson Helicopter Company R44	
Registration:	VH-HBV	
Serial number:	0052	
Type of operation:	Private – Test & Ferry	
Persons on board:	Crew – 1	Passengers – 0
Injuries:	Crew – 0	Passengers – 0
Aircraft damage:	Substantial	

About the ATSB

The 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 operations involving the travelling public.

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.