Australian Government

Australian Transport Safety Bureau

Collision with water involving Robinson R44, VH-SCM

Talbot Bay, Western Australia, 23 April 2017

ATSB Transport Safety Report
Aviation Occurrence Investigation
AO-2017-047
Final – 27 July 2017

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

Publishing information

Published by: Australian Transport Safety Bureau
Postal address: PO Box 967, Civic Square ACT 2608
Office: 62 Northbourne Avenue Canberra, Australian Capital Territory 2601
Telephone: 1800 020 616, from overseas +61 2 6257 4150 (24 hours)
Accident and incident notification: 1800 011 034 (24 hours)
Facsimile: 02 6247 3117, from overseas +61 2 6247 3117
Email: atsbinfo@atsb.gov.au
Internet: www.atsb.gov.au

Addendum

Page	Change	Date

Collision with water involving Robinson R44, VH-SCM

What happened

On 23 April 2017, the pilot of a Robinson R44 Raven II helicopter, registered VH-SCM, conducted a short local charter flight from a helicopter landing site (HLS) on top of a boat at Talbot Bay, Western Australia (Figure 1). The pilot dropped off three passengers and then returned the helicopter alone to the boat. The pilot then remained seated in the helicopter, with the engine running, while two new passengers embarked. The helicopter's doors had been removed previously.

At about 0940 Western Standard Time (WST), the helicopter lifted off from the boat rooftop HLS. The pilot conducted a descent from the HLS, which was about 20 ft above the water, to about 5 ft above the water and applied forward cyclic[1] so the helicopter would accelerate.

As the helicopter's airspeed approached about 50 to 60 kt, the low rotor RPM warning horn sounded. The helicopter started to yaw[2] to the left and the pilot applied right pedal to correct the yaw. About 1 second later, the front of the helicopter skids collided with the water and the helicopter rolled over into the water.

The pilot and two passengers released their seatbelts and exited the helicopter underwater, but sustained minor injuries. After they exited the helicopter they inflated their lifejackets and swam about 50 m to shore.

Figure 1: Location of accident site

Source: Google earth – annotated by ATSB

1 The cyclic pitch control, or cyclic, is a primary flight control that allows the pilot to fly the helicopter in any direction of travel: forward, rearward, left, and right.

2 Term used to describe motion of an aircraft about its vertical or normal axis.

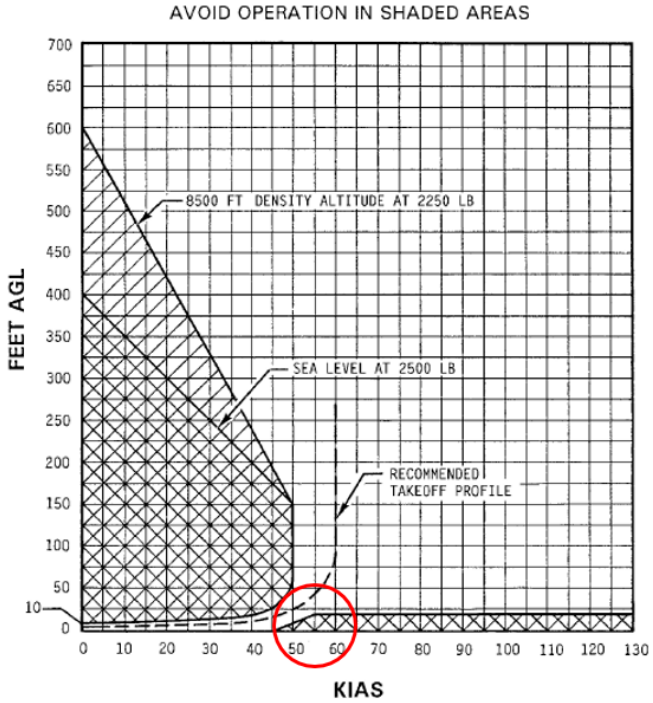
Departure profile

The pilot commented that their intention, in accordance with the height-velocity curve (Figure 2) published in the aircraft's pilot operating handbook, was to descend and remain in ground effect[3] until the helicopter had sufficient forward speed to achieve translational lift.[4]

The pilot reported rolling the cyclic and collective frictions off, ensuring the governor was on, rolling the throttle on until 102 per cent RPM was achieved, then lifting off into the hover, which was their normal lift-off procedure. The pilot then applied forward cyclic to accelerate the helicopter and descend from 20 ft to about 5–10 ft above the water level. The pilot was about to commence a climb (but had not yet raised collective[5] or applied aft cyclic) when the low rotor RPM warning horn sounded, indicating that the rotor RPM had reduced below 97 per cent. The helicopter struck the water about 300 m from the take-off site, at an airspeed the pilot estimated to be about 50 to 60 kt.

The pilot commented that although the helicopter was fitted with floats, they had no time to deploy them. The pilot and passengers were wearing life jackets, which they inflated after the helicopter collided with the water.

Figure 2: Robinson R44 II height-velocity curve



Source: Robinson R44 II Pilot's operating handbook

Helicopter performance

The helicopter all up weight was 1,044 kg, which was 90 kg below the maximum take-off weight of 1,134 kg. At that weight, with the air temperature 33 °C, high relative humidity, nil wind and at sea level, the helicopter was within the performance limitations to hover both in and out of ground effect. The pilot had conducted the previous flight in the same way only minutes earlier with an additional passenger and the extra ten minutes of flight fuel on board, taking off in the same direction with nil wind, and had not had any issues with the helicopter's performance.

---

[3] When hovering within about one rotor diameter of the ground, the performance of the main rotor is affected by ground effect. A helicopter hovering in-ground-effect (IGE) requires less engine power to hover than a helicopter hovering out-of-ground-effect (OGE).

[4] Translational lift occurs when clear, undisturbed air, flows through the rotor system from wind or forward speed.

[5] 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.

The maximum manifold pressure (or engine power) available for the flight based on the conditions was 25.9 inches. The pilot reported setting about 23 to 24 inches.

Helicopter maintenance

The Civil Aviation Safety Authority reviewed the helicopter log books and did not identify any anomalies. The helicopter engine had five cylinders removed, repaired or replaced in the preceding 50.8 hours due to low compression and high oil consumption. The engine had a total time of 1,778.2 hours since new, with a time between overhaul of 2,000 hours for that model engine.

Safety analysis

The helicopter was below the published maximum take-off weight and within the published weight limits for hovering in and out of ground effect. In addition, the speed at which minimum power is required is about 55 kt for the R44 II, therefore the power required at the accident speed was less than the power required to hover. In the reported calm conditions, the helicopter should have had sufficient power available to maintain rotor RPM. The ATSB was unable to determine the cause of the RPM decay.

The take-off profile recommended by the manufacturer was for the helicopter to achieve a height of 25 ft at an airspeed of 50 kt. However, the helicopter was still at 5–10 ft at 50–60 kt, which provided the pilot with very little reaction time to the low rotor RPM warning.

The pilot reported that there was no outstanding maintenance on the maintenance release (which was not retrieved from the helicopter) and that the helicopter had been running normally on the previous flight only minutes before the accident flight. As the helicopter had not been recovered from the water at the time of the ATSB investigation, no inspection of the engine had occurred.

The helicopter had recently undergone significant engine maintenance, mostly working on the cylinders, and was using more oil than normal, but not an abnormal amount for a running-in period. The pilot had topped up the oil prior to the first flight of the day. The pilot did not observe any warnings after the low rotor RPM horn sounded, but there was very little time before the helicopter collided with the water. The pilot commented that even a small drop in engine performance, such as from a magneto failure, would have been difficult to recover from at 5–10 ft above the water.

The pilot commented that as there was no wind, the water surface was glassy and they may not have been able to assess the height of the helicopter above the surface accurately. Operating at an estimated 5 ft above the water did not allow time to react in case of an engine failure or temporary reduction in performance.

Findings

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

- The rotor RPM decayed below 97 per cent at 5–10 ft above the water and the pilot was unable to recover control of the helicopter, resulting in a collision with the water.
- The helicopter was below maximum take-off weight and had sufficient power to hover in and out of ground effect with the engine operating normally.

Safety message

According to the FAA rotorcraft handbook, pilots should avoid the low altitude, high airspeed portion of the height-velocity diagram, because their ‘recognition of an engine failure will most likely coincide with, or shortly occur after, ground contact. Even if you detect an engine failure, there may not be sufficient time to rotate the helicopter from a nose low, high airspeed attitude to one suitable for slowing, then landing.’

Robinson Helicopter Company Safety Notice SN-19, Flying low over water is very hazardous, stated that 'Many pilots do not realize their loss of depth perception when flying over water.'

General details

Occurrence details

Date and time:	23 April 2017 – 0940 WST	
Occurrence category:	Accident	
Primary occurrence type:	Collision with terrain	
Location:	Talbot Bay, Western Australia	
	Latitude: 16° 21.00' S	Longitude: 123° 55.00' E

Helicopter details

Manufacturer and model:	Robinson Helicopter Company R44 II	
Registration:	VH-SCM	
Serial number:	11157	
Type of operation:	Charter – passenger	
Persons on board:	Crew – 1	Passengers – 2
Injuries:	Crew – 1 Minor	Passengers – 2 Minor
Aircraft 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 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.