

Interim Report AO-2018-006: Robinson R44, ZK-HTB,
Stevensons Arm, Lake Wanaka, 21 July 2018

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The Commission may make recommendations to improve transport safety. The cost of implementing any recommendation must always be balanced against its benefits. Such analysis is a matter for the regulator and the industry.

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Interim Report

Aviation inquiry A02018-006
Robinson R44, ZK-HTB
Stevensons Arm, Lake Wanaka
21 July 2018

Approved for publication: December 2018

Transport Accident Investigation Commission

About the Transport Accident Investigation Commission

The Transport Accident Investigation Commission (Commission) is a standing commission of inquiry and an independent Crown entity responsible for inquiring into maritime, aviation and rail accidents and incidents for New Zealand, and co-ordinating and co-operating with other accident investigation organisations overseas. The principal purpose of its inquiries is to determine the circumstances and causes of occurrences with a view to avoiding similar occurrences in the future. Its purpose is not to ascribe blame to any person or agency or to pursue (or to assist an agency to pursue) criminal, civil or regulatory action against a person or agency. The Commission carries out its purpose by informing members of the transport sector and the public, both domestically and internationally, of the lessons that can be learnt from transport accidents and incidents.

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Important notes

Nature of this report

The Commission believes that this interim report is necessary or appropriate in the interests of transport safety. The interim report presents the facts and circumstances established up to this point in the Commission's inquiry, and contains no analysis or findings. Any extrapolation of the information given in this report would be speculation.

Final report may include different information

The Commission intends completing a final report on the occurrence after it completes its inquiry. That report will contain an analysis of the facts of the occurrence, findings and recommendations. The information contained in the Commission's final report may differ from the information contained in this interim report.

Citations and referencing

Information derived from interviews during the Commission's inquiry into the occurrence is not formally cited in this interim report. Documents that would normally be accessible to industry participants only and not discoverable under the Official Information Act 1980 have been referenced as footnotes only. Other documents referred to during the Commission's inquiry that are publicly available are cited.

Photographs, diagrams, pictures

Unless otherwise specified, photographs, diagrams and pictures included in this interim report are provided by, and owned by, the Commission.

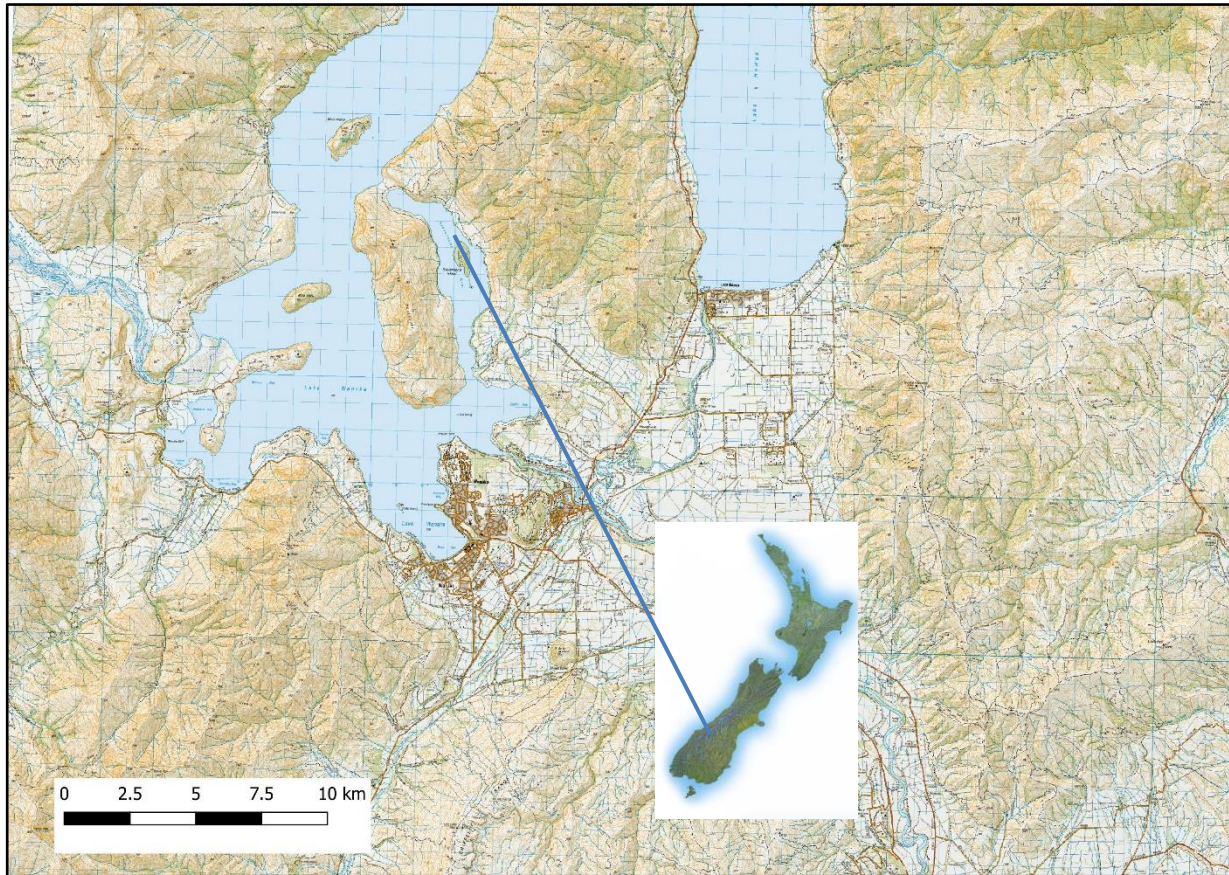
Verbal probability expressions

The expressions listed in the following table are used in this report to describe the degree of probability (or likelihood) that an event happened or a condition existed in support of a hypothesis.

Terminology (Adopted from the Intergovernmental Panel on Climate Change)	Likelihood of the occurrence/outcome	Equivalent terms
Virtually certain	> 99% probability of occurrence	Almost certain
Very likely	> 90% probability	Highly likely, very probable
Likely	> 66% probability	Probable
About as likely as not	33% to 66% probability	More or less likely
Unlikely	< 33% probability	Improbable
Very unlikely	< 10% probability	Highly unlikely
Exceptionally unlikely	< 1% probability	



R44 Raven II ZK-HTB
(Photograph courtesy of David Paull – NZCIVAIR)



Location of accident
Stevensons Arm, Lake Wanaka

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Abbreviations

Commission	Transport Accident Investigation Commission
m	metre(s)

Glossary

pitch link	a link between the upper rotating half of a helicopter's swashplate (see below) and a main rotor blade that enables the pilot to change the pitch angle of the blade
swashplate	a component that transfers the pilot's cyclic and collective control inputs to the main rotor through two pitch links
teeter stops	two elastomeric blocks that limit the amount of movement about the teeter bolt

Data summary

Aircraft particulars

Aircraft registration:	ZK-HTB
Type and serial number:	Robinson Helicopter Company R44 Raven II, 11259
Number and type of engines:	one IO-540-AE1A5 normally aspirated, reciprocating
Year of manufacture:	2006
Owner:	The Alpine Group Limited
Type of flight:	private
Persons on board:	one (pilot)

Crew particulars

Pilot's licence:	private pilot licence (helicopter and aeroplane)
Pilot's total flying experience:	1,270 hours total 390 helicopter hours (375 on type)

Date and time 21 July 2018, 1304¹

Location Stevensons Arm, Lake Wanaka
latitude: 44° 35.4' south
longitude: 169° 7.7' east

Injuries one fatal

Damage helicopter destroyed

¹ Times in this report are in New Zealand Standard Time, which is co-ordinated universal time plus 12 hours, and expressed in the 24-hour format.

1. Conduct of the inquiry

- 1.1. On the afternoon of Saturday 21 July 2018, the Civil Aviation Authority notified the Transport Accident Investigation Commission (Commission) of a missing helicopter. Advice was received soon afterwards of evidence that the helicopter had crashed. The Commission opened an inquiry under section 13(1)(b) of the Transport Accident Investigation Commission Act 1990 and appointed an investigator in charge.
- 1.2. Two investigators from the Commission arrived in Wanaka on the afternoon of 22 July 2018 and attended briefings by New Zealand Land Search and Rescue and New Zealand Police. The investigators obtained documents from the owner of the helicopter.
- 1.3. On 23 July 2018 the two investigators travelled to Stevensons Island and, with New Zealand Land Search and Rescue assistance, gathered items from the missing helicopter that had been washed ashore.
- 1.4. Later that day the investigators, along with New Zealand Police and Royal New Zealand Navy personnel, participated in the recovery of the helicopter. Over the next three days the Commission's investigators interviewed witnesses in Wanaka and collected aircraft documents and other material.
- 1.5. Investigators obtained a copy of closed-circuit television footage from cameras installed on the premises where the helicopter was stored.
- 1.6. The helicopter wreckage was initially kept in a secure hangar at Wanaka before being transported to the Commission's technical facility in Wellington.
- 1.7. On 23 July 2018, in accordance with Annex 13 to the Convention on International Civil Aviation, the Commission notified the accident to the United States National Transportation Safety Board (NTSB). The NTSB appointed a non-travelling Accredited Representative and a technical representative from the Robinson Helicopter Company (the helicopter manufacturer) as the NTSB's advisor.
- 1.8. On 26 July 2018 the Commission issued an Evidence Protection Order to ensure that any evidence relating to the accident found in the vicinity of Stevensons Island was forwarded to the Commission promptly. Several items subsequently found washed ashore on the island were passed to Commission investigators.
- 1.9. Between 13 and 15 August 2018 Commission investigators, assisted by the helicopter manufacturer's representative, examined the helicopter wreckage at the Commission's technical facility. On 21 August 2018 Civil Aviation Authority files relating to the pilot, the helicopter and the owner of the helicopter were reviewed. Further witnesses were interviewed around this time, and aircraft tracking and telecommunications information was gathered.
- 1.10. On 2 and 3 October 2018 the Royal New Zealand Navy completed a sonar survey of the lake bed, from where the helicopter had been recovered to the closest shore of Stevensons Island. Several items of interest were identified as a result. On 9 October 2018, with the assistance of the Royal New Zealand Navy, these items were photographed and then recovered.
- 1.11. On 21 November 2018 the Commission approved the interim factual report for consultation with interested persons.
- 1.12. Four submissions were received. The Commission considered the submissions, and changes as a result of those submissions have been included in the interim report.
- 1.13. On 12 December 2018 the Commission approved the interim report for publication.

2. Factual information

2.1. Narrative

- 2.1.1. On 21 July 2018 a Robinson R44 helicopter registered ZK-HTB (the helicopter) was made available by its owner to a pilot for a private flight. The pilot intended to fly from the owner's base at Wanaka Aerodrome to an alpine lodge on the northern side of Lake Wanaka (see Figure 1). The flight would normally take between 15 and 20 minutes. The pilot was to meet two friends who were to arrive at the lodge in another helicopter a short time later.
- 2.1.2. Closed-circuit television cameras recorded the pilot conducting a pre-flight inspection of the helicopter in a hangar, then loading items into the helicopter. The helicopter was then taken outside and refuelled. At 1245 the pilot started the helicopter and, while the engine was warming up, loaded further items on board. Some items were placed in the rear of the cabin while others were placed in a cargo pod mounted on the left side of the helicopter.
- 2.1.3. At 1257 the pilot made a radio call on the aerodrome frequency that the helicopter was taking off from Wanaka Aerodrome towards Dublin Bay, a prominent feature and reporting point about 10 kilometres to the northwest of the aerodrome.
- 2.1.4. The owner had a flight tracking system installed in the helicopter that was programmed to transmit position reports every three minutes. The first in-flight report was transmitted at 1300:25. The report recorded the helicopter passing to the east of Albert Town, about halfway to Dublin Bay. The helicopter was flying at an altitude² of 1,772 feet (540 metres [m]), approximately 600 feet (182 m) above the ground, at a groundspeed of 86 knots³.
- 2.1.5. The next, and last, report was made at 1303:25 when the helicopter was 500 m to the south of Stevensons Island, which is in the Stevensons Arm of Lake Wanaka. The helicopter was at an altitude of 1,454 feet (443 m) or about 500 feet (152 m) above the lake, at a groundspeed of 96 knots.
- 2.1.6. At about 1308 the duty person responsible for maintaining flight following⁴ for the owner's helicopters noted that it was nearly five minutes since the last position report from the helicopter. The duty person refreshed the display and, with no position update shown, initiated the owner's 'aircraft overdue' actions. These included trying to call the pilot on the radio and contacting the destination lodge.
- 2.1.7. At about 1325, after receiving advice from the duty person, the helicopter that was taking the friends to the lodge diverted to Stevensons Arm. The two pilots on board saw nothing of relevance. At 1336 another helicopter arrived on the scene and started to search around Stevensons Island. An oil slick was observed about 500 m north-west of the island. A weighted buoy was later dropped at this location.
- 2.1.8. Additional helicopters soon arrived and an aerial search of the lake arm and Stevensons Island was undertaken. Some items, thought to be from the helicopter, were found spread along about 95 m of the island's northern shore.
- 2.1.9. Over the next two days, searches by Police equipped with a sonar and a Royal New Zealand Navy remotely operated underwater vehicle located the helicopter on the lake bed close to where the oil slick had been first observed. The pilot and helicopter wreckage were recovered during the night of 23-24 July.

² Above mean sea level.

³ New Zealand is one of many countries that use feet rather than metres for the measurement of heights and altitudes in aviation. This is permitted by Annex 5 to the Convention on International Civil Aviation.

⁴ Monitoring the progress of helicopters and ensuring they reached their destinations.

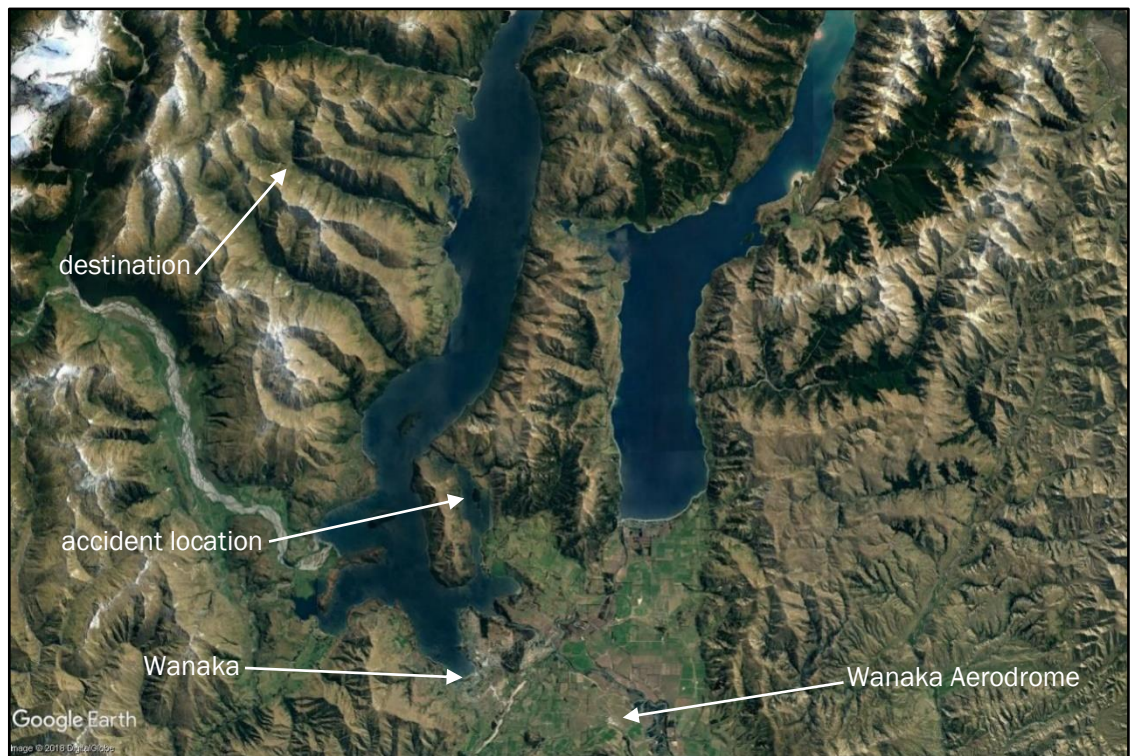


Figure 1
Location map

2.2. Aircraft information

- 2.2.1. ZK-HTB was a Robinson Helicopter Company R44 Raven II helicopter, manufactured in May 2006 and imported into New Zealand later that year. The helicopter had been sold to the owner in March 2012.
- 2.2.2. The most recent maintenance check had been a scheduled 100-hour check that was completed on 23 June 2018. Since then the helicopter had flown a further 21 hours, accruing a total of 2,860 hours at the time of the accident.

2.3. Site and wreckage information

- 2.3.1. The wreckage was found on the lake bed approximately 500 m north-west of Stevensons Island at a depth of 47 m. Between 95% and 98% of the helicopter by weight was recovered.
- 2.3.2. As the helicopter was lifted to the surface, the tail section, including the horizontal and vertical stabilisers and complete tail rotor assembly, was observed to be attached to the main wreckage by electrical cabling only (see Figure 2). Residual fuel was drained from the helicopter after it was lifted onto a barge and in preparation for transportation⁵.
- 2.3.3. Smaller items recovered from the shore of Stevensons Island included two sections of main rotor blade, some pieces of aircraft equipment and several items that had been loaded into the helicopter at Wanaka. The cargo pod and a section of landing skid were recovered several weeks later. They were located near where the main wreckage had been found.
- 2.3.4. The fuselage of the helicopter was severely damaged, with the left-front corner of the cabin extensively deformed. By comparison, the tail section was largely undamaged, apart from the damage caused when it had broken from the tail boom. The direction of break was to the left when viewed from the rear.

⁵ To assist in the recovery of the pilot and wreckage, a barge fitted with lifting gear and support equipment was used.

- 2.3.5. Both main rotor blades were attached to the main rotor hub, but a section behind the leading-edge spar of one of the blades was missing. Two pieces of main rotor blade that were recovered from the shore of Stevensons Island matched the missing section. The pitch links⁶, which connected the main rotor blade pitch horns to the swashplate⁷, and the flight control push rods were all broken. The teeter stops⁸ for both blades were crushed, which is an indication of the helicopter having experienced mast bumping at some point in the accident sequence. The evidence of mast bumping and the role it may have played in the accident sequence is subject to further investigation.
- 2.3.6. There were evenly spaced score marks on the underside of the main rotor blade that had the missing section. These marks matched the distance between the screws on the canopy bow⁹. The canopy bow was found with the main wreckage. The paint coating on some of the screw heads on the canopy bow had been scoured.
- 2.3.7. The flight instruments panel was normally mounted above the centrally mounted engine instruments panel (see Figure 3). It had been dislodged, but remained attached by electrical cabling. The vertical speed indicator, normally mounted above the altimeter, and the rear instruments panel cover were missing. The casing behind the face of the altimeter was damaged. An independent examination of the altimeter by instrument technicians found that the gearing, linkages and shafts for two of the indicator needles were broken or jammed. The jammed needles captured a reading on the altimeter face of 1,510 feet (460 m). This closely matched the altitude obtained from the last flight tracking report.
- 2.3.8. The signature marks on the underside of the main rotor blade that matched the spacing of the screws on the canopy bow, and the damage sustained by the altimeter and the 'captured' altimeter reading, indicated that the main rotor blade had struck and entered the cabin in flight.

⁶ A link between the upper rotating half of a helicopter's swashplate and a main rotor blade that enables the pilot to change the pitch angle of the blade.

⁷ A component that transfers the pilot's cyclic and collective control inputs to the main rotor through two pitch links.

⁸ Two elastomeric blocks that limit the amount of movement about the teeter bolt.

⁹ A thin strip that separated the two front Perspex windows (see Figure 2).



Figure 2
 Robinson R44 ZK-HTB
 (Photograph courtesy of David Paull – NZCIVAIR)



Figure 3
 Typical R44 flight instrument panel

2.4. Communications

- 2.4.1. The helicopter was fitted with a mobile phone mounting and connection to the pilot's headset that allowed the phone to be used hands-free. Records provided by the mobile network provider showed that the pilot had initiated a mobile phone call at 1258:49, approximately one minute after departing from Wanaka Aerodrome. The connection ended at 1304:16. The person who received the call was not aware that the pilot was flying at the time, and nothing in the call or the manner of the call termination caused them any concern. Telecommunications records show that the call was not deliberately terminated by either party.

2.5. The pilot

- 2.5.1. The pilot held private pilot licences for both aeroplane and helicopter. The pilot had flown a total of 1,270 hours, including 390 hours on helicopters, of which 375 were on the R44. The pilot's most recent two-yearly Robinson safety awareness training¹⁰ had been conducted as part of a biennial flight review on 5 October 2016.
- 2.5.2. The pilot held a current 'class 2' medical certificate valid until 8 July 2019. The certificate contained no restrictions.
- 2.5.3. The post-mortem examination opined that the pilot died as a result of high-energy impact injuries. Toxicology results were negative for any performance-impairing substances.

2.6. Meteorological information

- 2.6.1. A cold front was passing over the region at about the time of the accident, with associated moderate turbulence forecast for most of the South Island. An automatic weather station at Wanaka Aerodrome recorded the following information at 1300:
- surface wind 300° true at eight knots, varying between 260° and 330° true
 - visibility 20 kilometres with rain present
 - cloud scattered at 3,300 feet, broken¹¹ at 4,100 and broken at 5,000 feet
 - temperature 9° Celsius, dew point 5° Celsius
 - pressure 997 hectopascals.

¹⁰ Pilots were required to complete approved Robinson safety awareness courses before becoming qualified on the R44. At the time of this occurrence pilots were also required to complete two-yearly refresher courses.

¹¹ Cloud is measured in eighths or 'oktas', with 'scattered' being 3-4 oktas and 'broken' 5-7 oktas.

3. Safety issues

- 3.1. The principal purpose of the Commission's inquiries is "to determine the circumstances and causes of accidents and incidents with a view to avoiding similar occurrences in the future... [and]... not to ascribe blame to any person".
- 3.2. No new safety issue or recommendation has been identified at this stage of the inquiry.

4. Further lines of inquiry

4.1. The investigation is continuing. Further lines of inquiry include, but are not limited to, the following:

- a more detailed examination of the altimeter, telecommunications and flight tracking data
- the weather conditions at the time and location of the accident
- the pre-flight condition of the helicopter
- the weight and balance of the helicopter
- the engine performance
- an analysis of the events leading up to the accident.



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