

Interim Report AO-2016-007: Collision with terrain, Robinson R44, ZK-HTH
Glenbervie Forest, Northland, 31 October 2016

The Transport Accident Investigation Commission is an independent Crown entity established to determine the circumstances and causes of accidents and incidents with a view to avoiding similar occurrences in the future. Accordingly it is inappropriate that reports should be used to assign fault or blame or determine liability, since neither the investigation nor the reporting process has been undertaken for that purpose.

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Interim Report

Inquiry AO-2016-007
Collision with terrain
Robinson R44, ZK-HTH
Glenbervie Forest, Northland
31 October 2016

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.

It would not be appropriate then to use this interim factual report to pursue criminal, civil or regulatory action against any person or agency. The Transport Accident Investigation Commission Act 1990 makes this interim report inadmissible as evidence in any proceedings. A full report will be released on completion of the inquiry.

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Important notes

Nature of this report

This is an interim report. It is not a draft report prepared for comment but a completed report, that the Commission believes is necessary or appropriate in the interests of transport safety.

This interim report presents some of the facts and circumstances established up to this point in the Commission's inquiry, and contains no analysis or final conclusions. Any extrapolation of the information given in this report would be speculation.

Final report may include different information

The Commission will publish a final report on the accident after it completes its inquiry. That report will contain an analysis of the facts of the accident, 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 cited in this interim report. Documents that would normally be accessible to industry participants only and not discoverable under the Official Information Act 1982 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	



ZK-HTH R44 Raven II
(source: J Wegg)



Location of accident

Source: mapsof.net

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Abbreviations

Commission Transport Accident Investigation Commission

RCC Rescue Co-ordination Centre New Zealand

Robinson Robinson Helicopter Company

Glossary

mast the main rotor driveshaft of a helicopter

mast-bump contact between the inboard end of a main rotor blade (the spindle) and the main rotor driveshaft (or mast)

pitch link a link between the upper rotating half of the swashplate 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

Data summary

Aircraft particulars

Aircraft registration:	ZK-HTH
Type and serial number:	Robinson Helicopter Company R44 Raven II, 13529
Number and type of engines:	one IO-540-AE1A5 normally aspirated, reciprocating
Year of manufacture:	2013
Operator:	Helisika Agricultural Limited
Type of flight:	commercial
Persons on board:	two
Pilot's licence:	commercial pilot licence (helicopter)
Pilot's age:	42
Pilot's total flying experience:	2,090 hours (approximately)

Date and time 31 October 2016, 1258¹

Location Glenbervie Forest, near Whangarei
latitude: 35° 37' 23" S
longitude: 174° 21' 56" E

Injuries two fatal

Damage helicopter destroyed

¹ Times in this report are in New Zealand Daylight Time (co-ordinated universal time +13 hours) and are expressed in the 24-hour format.

1. Conduct of the inquiry

- 1.1. The Civil Aviation Authority of New Zealand notified the Commission of the accident at 1545 on 31 October 2016. The Commission sought more information about the accident before deciding whether to open an inquiry.
- 1.2. On 1 November 2016, the Commission opened an inquiry under section 13(1) of the Transport Accident Investigation Commission Act 1990 and appointed an investigator in charge. Two investigators travelled to Northland later that day to begin the site investigation. In accordance with a memorandum of understanding between the New Zealand Defence Force and the Commission they were assisted by an investigator from the Royal New Zealand Air Force.
- 1.3. Civil Aviation Authority investigators had attended the site together with the Police and taken photographs and gathered perishable paper documents. These were later provided to the Commission.
- 1.4. The helicopter and its engine had been manufactured in the United States. On 1 November 2016, in accordance with Annex 13 to the Convention on International Civil Aviation, the Commission notified the National Transportation Safety Board of the United States of the accident, and requested that the United States appoint an 'Accredited Representative' to participate in the investigation. The United States appointed a non-travelling accredited representative, and appointed the helicopter manufacturer Robinson Helicopter Company (Robinson) as its 'Adviser'.
- 1.5. Robinson, as provided for in Annex 13, requested participation in the initial site and wreckage investigation. The Commission accepted its request in accordance with section 14(2) of the Transport Accident Investigation Commission Act, and a Robinson investigator arrived in New Zealand on 2 November 2016.
- 1.6. The Commission's investigators conducted interviews with representatives of the operator and persons associated with the spraying operation.
- 1.7. The initial site investigation was conducted on 3 November 2016, with the assistance of the investigators from Robinson and the Royal New Zealand Air Force.
- 1.8. The helicopter wreckage was removed from the site on 3 November 2016 and taken to the Commission's workshop facility in Wellington, where the investigators conducted a more detailed examination.
- 1.9. On 8 November 2016, the Commission engaged Quest Integrity to conduct a metallurgical examination of some components of the main rotor control system.
- 1.10. The Commission approved this interim factual report for publication on 23 November 2016.

2. Factual information

- 2.1.1. On Monday 31 October 2016, a Robinson R44 helicopter, registered ZK-HTH, (the helicopter) was being used to spray recently-planted seedling blocks in two exotic forests in Northland. Prior to commencing each spraying job, the pilot flew a short survey flight with a forestry contractor to ensure that the boundaries of the target blocks were correctly identified and to check for any hazards and obstacles.
- 2.1.2. At about 1000 that day, the pilot completed spraying eight sites in the Mokau Forest on the east coast, north of Whangarei. He then refuelled the helicopter and flew to a loading area in the Glenbervie Forest, shut down the helicopter, and waited for his ground crewman and the contractor to drive to the loading area. They commenced flying again after taking a lunchbreak.
- 2.1.3. The accident happened while the pilot and contractor were undertaking the survey flight prior to spraying the Glenbervie blocks. At 1309 the Rescue Coordination Centre New Zealand (RCC) received an alert that the emergency locator transmitter fitted to the helicopter had activated briefly at 1258. The RCC contacted the operator, who then phoned the ground crew. The ground crewman was already concerned that the helicopter had not returned from what he expected to be a 10-minute flight. The ground crewman and forestry staff then began a ground search for the helicopter.
- 2.1.4. The helicopter had caught fire when it crashed. Smoke from the fire led the ground-based searchers to the accident site, which was in a native forest block, one and a half kilometres to the north of the loading area. A search and rescue helicopter from Whangarei, which had been engaged by RCC to locate the helicopter, arrived at the scene shortly afterwards. Both occupants were found deceased in the wreckage.



Figure 1
Accident site

2.2. Site and wreckage examination

- 2.2.1. The wreckage was located in a compact area with most of the helicopter contained around the point of impact with the ground (see Figure 1). Parts of the landing skids and the carbon-fibre spray booms had broken off as the helicopter fell through the trees in a northerly direction. The damage to the helicopter indicated that it had struck the ground with a high rate of descent and a low forward speed.
- 2.2.2. An intense fire had destroyed most of the fuselage forward of the tail boom, including the main rotor transmission housing and most of the fairing around the main rotor drive-shaft. The fire had melted the aluminium components in the fuselage and destroyed the fibreglass cabin structure. The fire had not spread beyond the main wreckage.
- 2.2.3. The tail, including the horizontal and vertical stabilisers and the complete tail rotor assembly, had detached as a unit from the tail boom. Heavy crushing was found on the leading edge of the horizontal stabiliser, which was consistent with the stabiliser having hit a tree.
- 2.2.4. The main rotor blades were attached to the hub and were not damaged by the fire. Outboard sections of both blades had separated and were found close to a tree, which was identified as the first tree the helicopter had struck as it entered the forest. Two pitch links² were normally connected between the upper swashplate³ and the pitch horn on the main rotor blades (refer Figure 2).

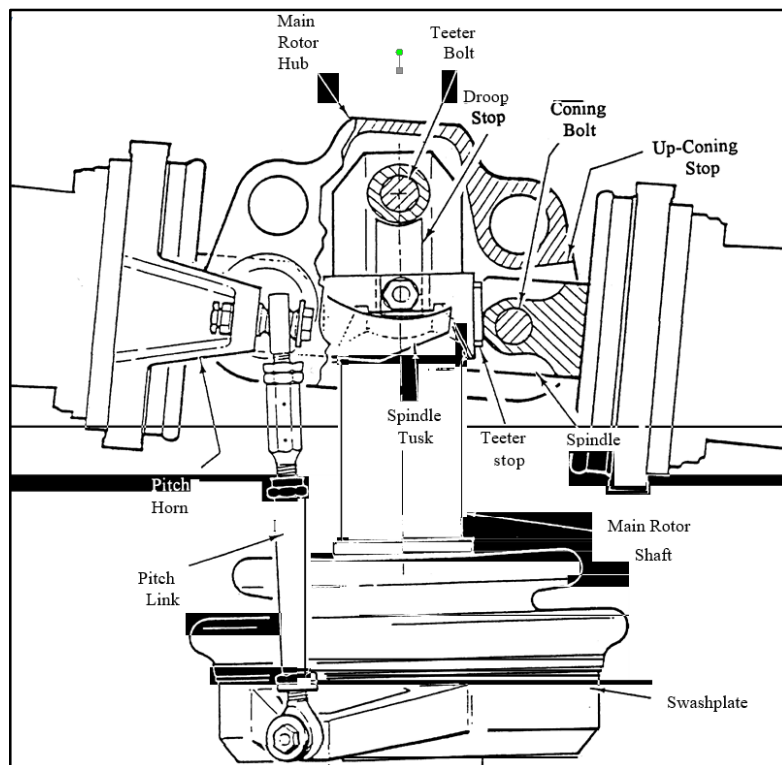


Figure 2
Robinson main rotor head
(source: Robinson)

- 2.2.5. Both pitch links were found attached to the upper swashplate. However, both had disconnected from their respective main rotor blades. One had broken at the upper rod-end thread, and the other was missing its upper attachment bolt that connected it to the pitch horn on the blade.

² A link between the upper rotating half of the swashplate and a main rotor blade that enables a pilot to change the pitch angle of the blade

³ A component that transfers the pilot's cyclic and collective control inputs to the main rotor through two pitch links

Mast bumping

- 2.2.6. The Commission is concerned about the number of accidents in New Zealand in which Robinson helicopters have experienced 'mast bumping'. On 27 October 2016 the Commission added this type of occurrence to its 'watchlist' of pressing transport safety concerns⁴.
- 2.2.7. Mast bumping is when the inboard end of a main rotor blade (the spindle) contacts the main rotor driveshaft (or mast). If severe enough, it can result in the main rotor blades striking the helicopter's cabin and skids, or sometimes the tail boom instead. When this occurs the main rotor driveshaft normally bends and fails, and the helicopter breaks up in flight and leaves a wreckage trail over a large area.
- 2.2.8. The leading edges and surfaces of the main rotor blades showed no signs of having struck the helicopter's cabin or skids.
- 2.2.9. There was no sign of the tail boom having been struck by a main rotor blade.
- 2.2.10. The main rotor driveshaft was not bent and had not failed through torsional overload⁵.
- 2.2.11. The confined nature of the wreckage field and the type of damage found on the main rotor blades and the tail boom, suggested that it was very unlikely that the helicopter had broken up in-flight or that the accident had been caused by mast bumping.

2.3. Further lines of inquiry

- 2.3.1. Current lines of inquiry include, but are not limited to, the following:
- the procedures for the conduct of forestry aerial spraying operations
 - the condition of the engine before the accident
 - the pre-impact integrity of the main rotor control system
 - weather conditions at the time of the accident
 - the maintenance history of the helicopter and its engine

⁴ Refer to www.taic.org.nz

⁵ When a main rotor blade strikes a solid, immovable object, a sudden stoppage will occur, and the main rotor driveshaft can fail due to torsional overload if the engine is still producing normal operating power and is driving the main rotor system.



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