



CAA Safety Investigation Report

Collision with terrain

ZK-ING, Hughes Tool Company H269B

Haast Pass, Mount Aspiring National Park

11 April 2014

CAA Final Report 13/5710

15 August 2018

Executive summary

About 1730 hours on 11 April 2014 ZK-ING, a Hughes Tool Company 269B piston engine helicopter, departed from Wanaka Aerodrome. The pilot and passenger were destined for the Haast area via the Haast Pass. The pilot and passenger failed to advise a friend acting as a flight follower of their progress. They were reported overdue. Search and rescue was initiated that evening but ceased due to poor weather conditions.

About 0915 hours on the following day ZK-ING was found in the Fish River. Both occupants were deceased. The Civil Aviation Authority (CAA) commenced a field investigation.

The main contributing factor was determined to be the pilot's decision to depart on the flight toward deteriorating weather and lowering ambient light conditions.

Other contributing factors to the accident were:

- operating a helicopter into meteorological conditions below Visual Flight Rule (VFR) minima
- operating a helicopter not equipped to fly in instrument meteorological conditions
- the pilot was insufficiently qualified for the meteorological conditions
- currency of pilot's skills and experience

Safety Message

The accident highlights the dangers of pressing on into deteriorating weather conditions. Weather-related general aviation accidents remain one of the most significant causes for concern in aviation safety. The often fatal outcomes of these accidents are all the more tragic because they are usually avoidable.

Pilots operating helicopters have the added capabilities, assuming a site is acceptable, of being able to land just about anywhere. Taking advantage of this capability should be done well before continuation of the flight becomes too hazardous¹.

No new safety recommendations have resulted from this accident, however pilots operating under VFR need to ensure that weather conditions along the length of the chosen route are appropriate for the flight.

¹ President of the Helicopter Association International, Mr Matt Zuccaro advocates to '*Land the damn helicopter!*' <https://www.rotor.org/Publications/ROTORAILY/tabid/843/articleType/ArticleView/articleId/3230/HAI-Presidents-Message-Land-the-Damn-Helicopter.aspx> (July 2013)

Incident timeline

Thursday 10 April 2014

The Chief Engineer, pilot and passenger met at Bruce Bay to work on the passenger's own Hughes H269 and stayed overnight.

Friday 11 April 2014

1330 hours: All parties travel by car to Wanaka Aerodrome to collect ZK-ING following an annual and 100 hour maintenance inspections.

1708-1710 hours: The pilot and an engineer carry out a post maintenance flight in ZK-ING at Wanaka Aerodrome.

1729 hours: The pilot and passenger refuelled ZK-ING from two plastic 20 litre fuel cans. They were seen to refill the fuel cans and attach them to the cargo rack on ZK-ING.

1730 hours: The pilot and passenger depart for Haast area in ZK-ING.

1732:34 hours: Pilot reports ZK-ING '...2 miles south of Lake Hawea tracking to Hawea'.

1734:38 hours: Pilot reports ZK-ING '...overhead Lake Wanaka township heading north'. Pilot of ZK-ING, was advised by another pilot flying in the area that ZK-ING was actually overhead Hawea, not Wanaka.

1735:08 hours: Pilot reports ZK-ING '...at Hawea at 33 tracking North'.

1815 hours: At Makarora, a pilot on the ground saw ZK-ING fly overhead heading toward Haast Pass. Radio contact was attempted with ZK-ING but no response is received.

2100 hours: ZK-ING is reported missing by a friend providing flight following. A ground and air search is commenced, however the air search is suspended due to poor weather conditions.

Saturday 12 April 2013

0915 hours Police Search and Rescue officers identify damage to trees above the Fish River and locate ZK-ING submerged in the river. Both occupants are found on-board.

Incident maps, plans, and photographs



Figure 1. Image of Makarora and Haast Pass indicating accident site. (adapted from Google Earth)

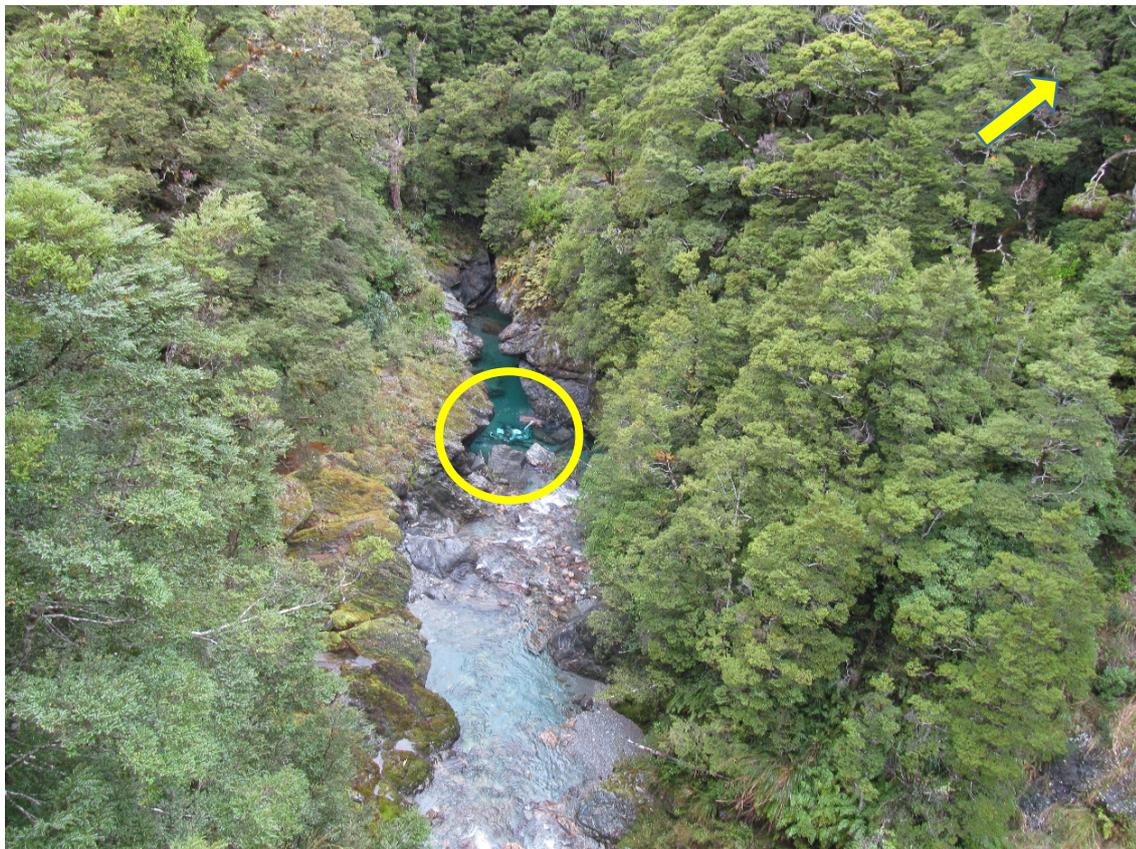


Figure 2. Wreckage of ZK-ING located in Fish River (arrow indicates North) (source New Zealand Police)



Figure 3. Picture of ZK-ING submerged in Fish River (source New Zealand Police)

0500 UTC 11 Apr 2014

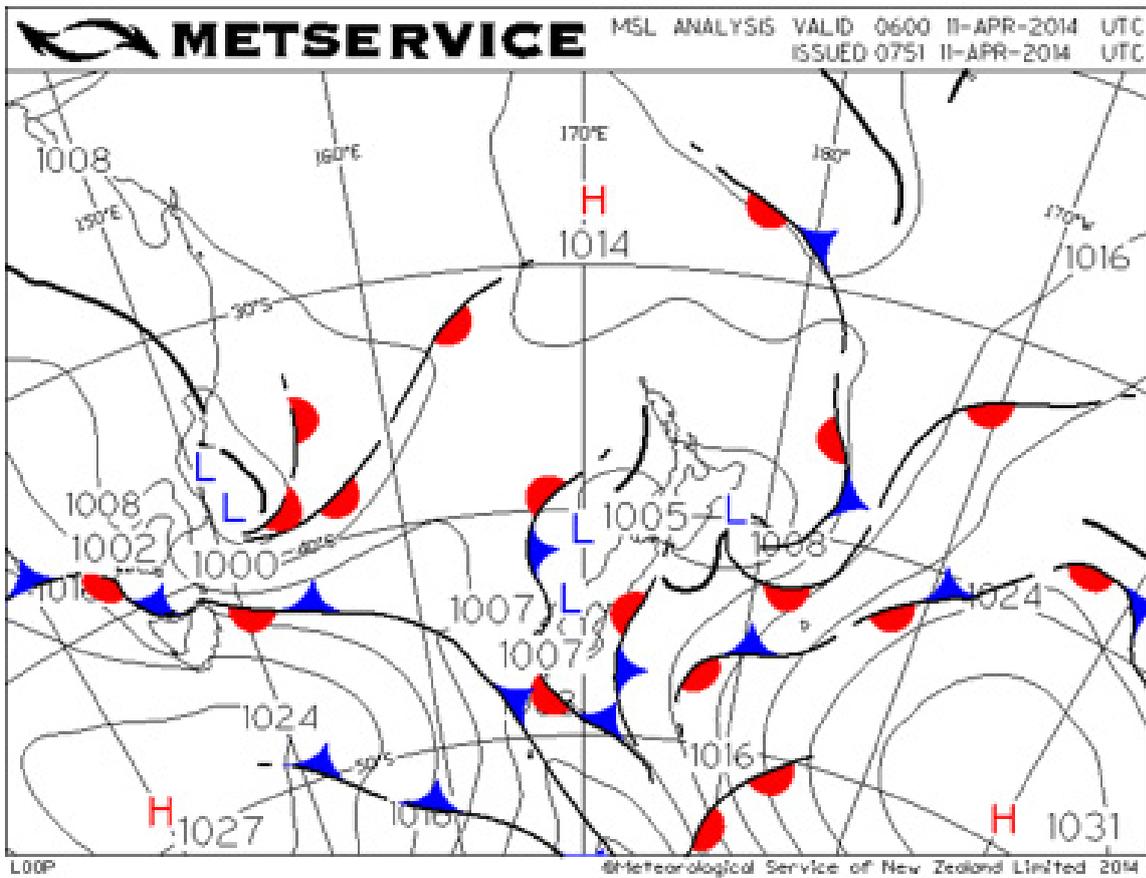
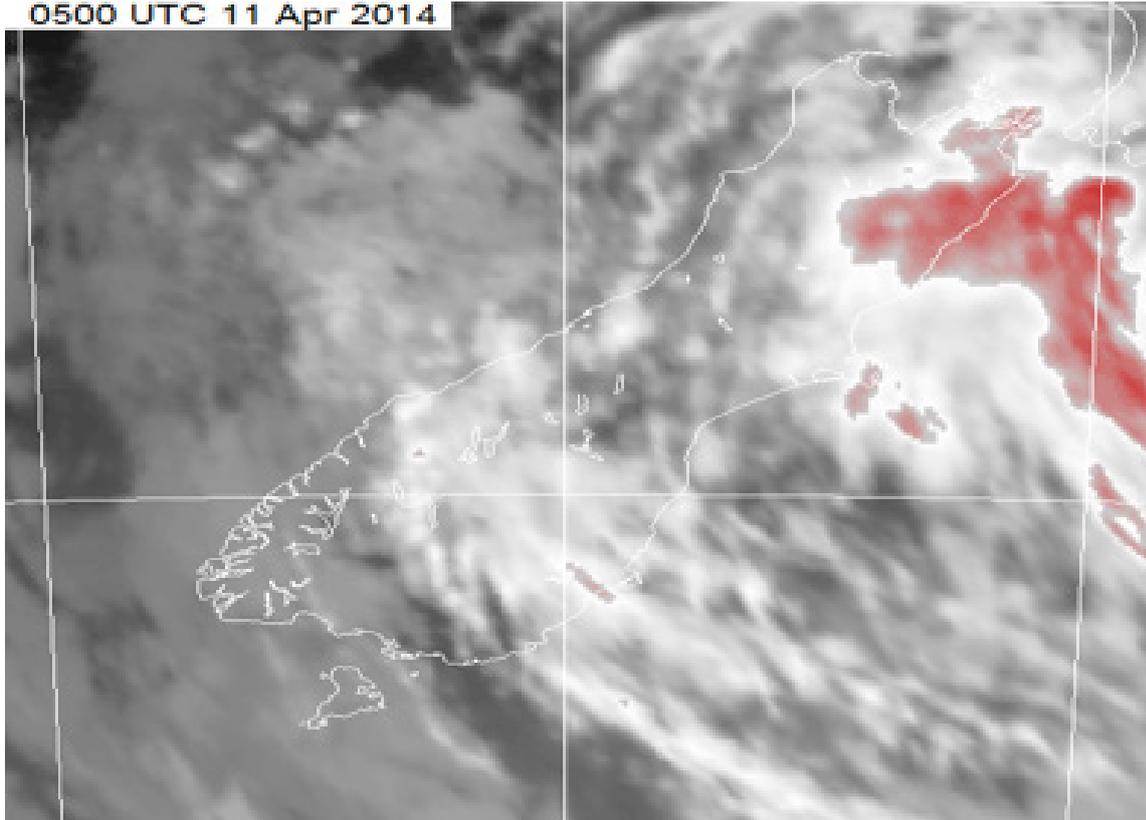


Figure 4. Infrared cloud imagery and synoptic chart (source New Zealand Met Service)

Findings and conclusions from the investigation

Conclusions

As a result of the CAA safety investigation the following conclusions were determined relevant to the pilot and the operational environment:

1. Weather conditions on the chosen route were not sufficient to maintain VFR flight.
2. The pilot and passenger had been offered accommodation for the night because of the weather forecast.
3. The pilot's low number of flight hours were accumulated over a 10 year period.
4. Examination of the wreckage revealed no mechanical anomalies which may have contributed to the accident.
5. Due to the impact forces encountered during the collision with terrain, the accident was not survivable.

Human factors

The pilot and passenger were collecting the helicopter after maintenance

On the 11 April 2014, the pilot, passenger and chief engineer drove from the Haast area to Wanaka to collect ZK-ING following an annual/100 hour inspection. On their arrival, the inspection was nearing completion but still required a maintenance flight before being released to service.

The pilot and passenger were intending to return to the Haast area due to personal commitments the following day. Due to delays in the completion of the inspection, lateness of the day and inclement weather expected en route, the chief engineer made several offers to accommodate both parties in Wanaka for the evening. A pilot friend located between Haast and Fox Glacier was also spoken to prior to their departure. Weather conditions had been described as poor at best with the cloud base approximately 200 feet above ground level with light precipitation. The pilot and passenger still chose to leave Wanaka.

Preparations were made to leave including loading and refuelling

At 1708:39² hours the pilot and a maintenance engineer took the helicopter for a circuit of the aerodrome as part of the post inspection maintenance check. The flight lasted approximately 3-4 minutes, and was considered to be satisfactory to release the helicopter to service. Whilst maintenance documentation was completed, the pilot and passenger were observed refuelling ZK-ING from two plastic 20 litre fuel cans, and then refilling them. These cans were then placed on an external rack.

Aircraft handling issues were noted causing concern to observers

At 1729 hours, with the pilot and passenger on board, ZK-ING began to depart from the fuel pump area. The chief engineer and an experienced helicopter pilot were watching the departure. They observed the helicopter lift into a hover and quickly descend. This occurred a couple of times, raising sufficient concerns for the Chief Engineer, to drive over to ZK-ING. However whilst approaching, the helicopter lifted into a hover again, manoeuvred away and departed the aerodrome. During the time

² Information obtained from radio recording system at Wanaka Aerodrome.

the handling issues were being experienced, the pilot had inadvertently transmitted on the Wanaka Aerodrome frequency which had recorded his exasperations and expletives.

The experienced helicopter pilot commented on the lack of performance of this particular helicopter type when 'heavy' [weight]. As a result of: damage to the helicopter, loss of the on-board fuel and fuel as cargo (in plastic cans), it was only possible to estimate the helicopter's weight. The weight estimation was 1595.8 lbs. The manufacturer's maximum allowable weight is 1650 lbs. ZK-ING's estimated weight was considered to be within the manufacturer's limits.

The safety investigation could not establish the cause of the issues observed whilst ZK-ING was preparing to depart Wanaka Aerodrome.

A lack of currency and instrument flying qualifications were contributing factors

The CAA safety investigation assessment of the VFR-qualified pilot's logbook revealed an accumulated total of approximately 213 hours, on three helicopter types over 10 years. The pilot had completed the Civil Aviation Rule minimum requirements for 90 days³. Research has shown that pilots can experience a level of cognitive skill degradation, if skills are not routinely practised. While this could be interpreted as being only applicable to the 'hands-on controls' aspect, it is equally applicable to considerations around the aspects of pre-flight planning. The skills required for effective route planning and flight risk assessment, including the gathering and interpreting of relevant meteorological conditions, can degrade if not used regularly.

The pilot and passenger departed Wanaka Aerodrome with less than the prescribed visual meteorological⁴ conditions forecast along the planned route. They probably encountered these conditions shortly after passing Makarora and on entering the Mount Aspiring National Park. From the evidence available, it was likely that the pilot experienced reduced visibility to the extent that terrain avoidance could not be assured, resulting in the aircraft colliding with terrain in controlled flight.

Pre-flight planning and continual monitoring of flight conditions

Thorough pre-flight planning is essential for avoiding restrictive weather conditions. It is not only important to obtain the relevant weather⁵ forecasts to develop a mental picture of the conditions that may be encountered, but also to assess this information and understand how it relates to the planned flight. In forecast marginal weather, this involves consideration of alternative options such as diverting or turning back and pilots assessing their skills and the aircraft's suitability for the task in the conditions.

During flight, pilots must continuously assess the weather for conditions that may adversely affect the safety of the flight and be prepared to use an alternative course of action if conditions deteriorate. In some circumstances, consideration could be given to seeking assistance from air

³ Civil Aviation Rule Part 61.37(b) *Recent Flight Experience* prescribes that a private pilot must have carried out no less than 3 take-offs and 3 landings within the 90 days preceding the flight.
https://www.caa.govt.nz/assets/legacy/rules/Rule_Consolidations/Part_061_Consolidation.pdf (CAA website 2018)

⁴ Civil Aviation Rule Part 91.301 *VFR meteorological minima* prescribes the weather requirements for VFR flights including: distance from cloud and visibility. Table 4. Provides detail applicable in the airspace Class G, below 3000ft amsl.
https://www.caa.govt.nz/assets/legacy/rules/Rule_Consolidations/Part_091_Consolidation.pdf (CAA website 2018)

⁵ Civil Aviation Rule Part 91.217 (1) and (3) *Pre-flight Action*, '...current meteorological information' and '...alternatives available if the planned flight cannot be completed' (CAA website 2018)

traffic control services such as Christchurch Information or other air traffic in the vicinity. No assistance was sought en route by the pilot of ZK-ING.

Using ground visual references in low visibility conditions

A methodology often used by pilots flying up a valley under cloud is to fly level with sufficient height margins to remain clear of the cloud base and retain visibility. To assist with positioning and reference, a pilot may opt to track along the side of the valley providing sustainable visual reference or suitable position indicators. In this instance State Highway 6 was the most remarkable visual feature.

While the cause of the accident could not be fully determined, but excluded catastrophic failures of the helicopter systems, several hypotheses exist as to possible accident scenarios:

- an unexpected entry into cloud or unanticipated lower cloud levels
- disorientation and loss of control of the helicopter involving a spiral descent in an undesired direction
- loss of visual reference followed by the pilot manoeuvring the helicopter in an attempt to clear cloud without realising the close proximity of the terrain and vegetation.

The above could offer some explanation, but could not be fully determined during the investigation process.

This accident highlights the risks associated with operating under VFR in adverse weather, particularly when flying in a challenging environment such as in mountainous terrain.

Entering into a degraded visual environment can lead to spatial disorientation

A degraded visual environment⁶ (DVE) is an environmental condition that can impair the visual orientation of a helicopter pilot during flight or landing and includes fog and mist. The result of a pilot encountering DVE can lead to loss of situational awareness, an increase in workload and spatial disorientation⁷.

Spatial disorientation directly affects the stability mechanisms of the human body and the stimuli received from the eyes, ears and skin. The result of mixed messages between these senses can cause the pilot to believe the aircraft is orientated in one particular directional plane, contrary to the actual aircraft orientation. Subsequent incorrect inputs to the flight controls can result in partial or total loss of control.

The accident impact forces were not survivable

The pilot and passenger suffered severe blunt force trauma injuries as a result of ZK-ING impacting the ground. Results of toxicological testing showed no alcohol or drugs present in either party.

Reported locations and communications en route

ZK-ING was fitted with a Bendix King KY 97 radio capable of communicating with both airborne and ground Very High Frequency (VHF) stations.

⁶ <https://www.easa.europa.eu/sites/default/files/dfu/Final%20Report%20EASA.2011.02.pdf> (EASA, May 2013)

⁷ 'Spatial disorientation' the inability of a pilot to correctly interpret an aircraft attitude, altitude or airspeed in relation to the Earth or other points of reference. https://www.skybrary.aero/index.php/Spatial_Disorientation (sourced 2018)

Radio transmissions recorded at Wanaka Aerodrome from ZK-ING included the post maintenance flight (1708 hours) and the comments made by the pilot when departing the airport (1729 hours). Further review of the recordings provided the safety investigation with some position reports as advised by the pilot of ZK-ING. The pilot stated that ZK-ING was 'overhead Lake Wanaka' at 1734 hours, however another aircraft advised ZK-ING that it was overhead 'Hawea', which was acknowledged by ZK-ING at 1735 hours.

The pilot who witnessed ZK-ING fly overhead Makarora at 1815 hours attempted to make contact on the approved airspace frequency of 119.1 MHz, but received no response. It is possible that ZK-ING may have still been tuned to Wanaka Aerodrome on 120.1 MHz⁸. (Figure 1.)

Environment factors

Local pilot had to divert due to prevailing weather conditions

A Makarora based pilot recalled operating around Cascade Point on the West Coast, on the day of the accident. About 1600 hours that afternoon, the pilot commenced a direct return flight which would have been approximately 58 km. However, on encountering low cloud in the valleys, the pilot was required to divert some distance, resulting in a journey of 98 km.

The pilot further recalled that when flying south through the Haast Pass, the same valley which ZK-ING would subsequently travel up, due to cloud it was necessary to climb to approximately 4000 feet above mean sea level (amsl). It was then possible to descend clear of cloud around Cameron Flats (10 km North East of Makarora) (Figure 1.). The pilot also recalled communicating with a fixed wing pilot in the area, who had flown overhead the Pass at approximately 6000 feet amsl due to the cloud.

Meteorological information supported the eyewitness accounts

Meteorological information provided by the New Zealand Meteorological Service supported the recollections of the Makarora pilot. A moist south-westerly airflow was conducive to the formation of cloud in valley systems. (Figure 4.)

The accident occurred in a temperate rain forest area

The accident occurred within the Haast Pass where open plain river flats change to more dense native forestry. The accident site was 2.4 km from Davis Flats (Figure 1.), a significant open landing area. State Highway 6 would be positioned to the left of the aircraft as it travelled north toward Haast. The presence of cloud near the site at the time of the accident was likely due to the narrowing of the Pass. The development and sustaining of cloud would have been aided by vegetation coverage in the forest. A helicopter operating in a high level of relative humidity could quickly create localised cloud which could envelope it.

Aircraft information

ZK-ING was manufactured by the Hughes Tool Company in the USA in 1963. It was imported into New Zealand from the USA in 2011, formerly as N93909F, with a total airframe hours of 4966.8. At time of importation, the Lycoming HIO-360-AIA engine manufactured and installed in 1973, had accumulated a total of 4033.2 hours total time and 1457.2 hours since overhaul. ZK-ING had been operated in New Zealand for approximately 62.8 hours.

⁸ MHz- MegaHertz

No anomalies were found in the wreckage

The helicopter initially struck the tree tops, approximately 10 meters above the Fish River, adjacent to an old bridge foundation. The helicopter then hit the ground heavily splaying the skid undercarriage to the point of structural failure, allowing the engine to impact the ground sufficiently to break open the oil sump. The helicopter then fell approximately 10 feet into the river, coming to rest fully submerged on the river bed. (Figure 2 and 3.)

Subsequent examination of the airframe and engine noted no anomalies which may have contributed to the accident. All damage was considered consistent with extreme impact forces and components being overstressed during the collision with the terrain. It was noticeable that the tail-rotor drive shaft displayed a characteristic torsional twist indicating that it was being driven by the engine. It was also found that the collective control on the pilot side was deformed upward, probably as a result of forces applied by the pilot.

Accident Data Summary

Aircraft make and model, registration and serial number:	Hughes Tool Company, H269B, ZK-ING ser.no 123-0011. Total time 5029 (approx.)
Year of manufacture:	December 1963
Engine (s) make and model, type of engine(s) and serial number(s):	1 Textron Lycoming HIO-360-A1A, four cylinder piston engine. Time since overhaul 1520 hours (approx.)
Year of manufacture:	August 1973
Accident Date and time:	11 April 2014, 18:15 hours NZDT (approximate)
Location:	Near Fish Bridge, Route 6 Latitude: S 44° 6' 58.19" Longitude: E 169° 20' 42.08"
Altitude:	1590 feet amsl
Type of flight:	Private VFR operation A-B
Persons on board:	Crew: 1 Passenger: 1
Injuries:	Crew: Fatal Passenger: Fatal
Nature of damage:	Helicopter substantially damaged
Pilot's licence:	Private Pilot
Pilot's age:	54 years
Pilot's total flying experience:	213.0 total hours, helicopter 63.9 total hours on type
Information sources:	Civil Aviation Authority field investigation.
Investigator in Charge:	Mr P B Breuilly

Appendix : Pilot Information

The pilot, aged 54 years, had undertaken aeroplane flying between 1979 and 1981 accumulating 13.2 hours. In Nov 2003 the pilot commenced helicopter flight training and was issued a Private Pilot Licence (Helicopter) in November 2005. The pilot held a current medical certificate with endorsement stipulating 'Half spectacles must be readily available' and 'Not valid for IFR flights'. The pilot had averaged approximately 21.3 hours per year. (Refer Table 1.)

Table 1. Pilot Flight Records

Description	Logbook record in decimal hours
Total flight hours helicopter	213.0 ⁹
Flight hours in last 7 days	1.0 (accident and maintenance flight)
Flight hours last 30 days	4.1
Flight hours last 90 days (ZK-ING)	15.1
Total flight hours on type H269B ¹⁰	63.9
Flight hours on other piston helicopter types R22	106.7
Flight hours on turbine type helicopter H500	43.25

⁹ Total time as Pilot in Command 137.8 hours

¹⁰ Type rating attained 19 Aug 2007

About the CAA

New Zealand's legislative mandates to investigate an accident or incident are prescribed in the Transport Accident Investigation Commission (TAIC) Act 1990 and Civil Aviation Act 1990 (the CA Act). Following notification of an accident or incident, TAIC may conduct an investigation. CAA may also investigate subject to Section 72B(2)(d) of the CA Act which prescribes the following:

72B Functions of Authority

(2) The Authority has the following functions:

- (d) To investigate and review civil aviation accidents and incidents in its capacity as the responsible safety and security authority, subject to the limitations set out in section [14\(3\)](#) of the [Transport Accident Investigation Commission Act 1990](#)

The purpose of a CAA safety investigation is to determine the circumstances and identify contributory factors of an accident or incident, with the aim of minimising or reducing the risk to an acceptable level, of a similar occurrence arising in the future. The investigation does not seek to ascribe responsibility to any person but to establish the contributory factors of the accident or incident based on the balance of probability.

A CAA safety investigation seeks to provide the Director of Civil Aviation with the information required to assess which, if any, risk-based regulatory intervention tools may be required to attain CAA safety objectives.

Civil Aviation Authority of New Zealand
Level 15, Asteron Centre
55 Featherston Street
Wellington 6011

OR

PO Box 3555, Wellington 6140
NEW ZEALAND

Tel: +64-4-560 9400 Fax: +64-4-569 2024
www.caa.govt.nz