Australian Government
Australian Transport Safety Bureau

# Wirestrike and collision with terrain involving Robinson R44, VH-KCH

near Mansfield, Victoria, on 6 July 2019

**ATSB Transport Safety Report**
Aviation Occurrence Investigation
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**Addendum**

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# Safety summary

## What happened

On 6 July 2019, the pilot of a Robinson Helicopter Company R44 helicopter, registered VH-KCH, was conducting a private flight from a property near Mansfield, Victoria, with one passenger on board. Shortly after take-off, the helicopter struck a powerline and subsequently collided with terrain resulting in serious injuries to the passenger and minor injuries to the pilot.

## What the ATSB found

The pilot obtained some information from the landowner about powerlines on the property from where the helicopter took off, and a neighbouring property. However, he did not identify the presence of powerlines during the flight planning process and he did not see the wires or the associated poles during the shallow departure. The wires were strung across a valley with a span of 560 m, which the helicopter struck 158 ft above the ground. The wire did not have aircraft warning markers and did not require marking in accordance with Australian Standard 3891.

The ATSB also identified that, unlike other states of Australia, electricity network information was not readily available in Victoria to aid pilots during the flight planning process.

## Safety message

The ability of pilots to detect powerlines depends on physical characteristics such as the spacing of power poles, the orientation of the wire, and the effect of weather conditions. Depending on the environmental conditions, powerlines may not be contrasted against the surrounding environment. In addition, the size of the wire and limitations of the eye can mean that it is actually impossible to see the wire.

Robinson Helicopter Company Safety Notice SN-16, *Power lines are deadly*, included advising helicopter pilots to:

- watch for power poles and fly directly over them when crossing powerlines
- constantly scan the terrain on either side of your flight path for poles/towers
- always maintain at least 500 feet above ground level except during take-off and landing.

The Aerial Application Association of Australia *Powerline Safety Program* aims to encourage and facilitate power companies to improve aviation safety. The program involves the provision of mapping information of powerline networks and the marking of powerlines by network operators wherever it is requested by a pilot, aviation company or landholder.

In summary, effective wire avoidance can be achieved using a combination of:

- available wire location information
- wire marking
- avoidance of unnecessary low flying, especially flight below the height of surrounding higher terrain where wire spans may be present.

# The occurrence

## What happened

At 1259 Eastern Standard Time[1] on 6 July 2019, a Robinson R44 Raven 1 helicopter departed Moorabbin Airport, Victoria, for a private flight to a rural property near Mansfield, Victoria. The 128 km flight was conducted under the visual flight rules[2] with the pilot and one passenger on board.

At about 1400, the helicopter landed at the property in a westerly direction.

After spending about 1 hour at the property, the pilot and passenger boarded the helicopter for the planned return flight to Moorabbin. The pilot assessed there was a light breeze and elected to depart in a north-westerly direction, over different ground to that overflown during the arrival.

Shortly after 1505, the helicopter lifted off and climbed gradually. The pilot reported that he focused on clearing two trees on the departure path, and that he did not notice a powerline pole on the nearby hilltop (Figure 1). The helicopter accelerated to an airspeed of at least 50 kt and travelled about 400 m from the take-off site.

**Figure 1: Helicopter shortly after take-off (hilltop pole visible from that location)**


Source: Provided to the ATSB

At 1506, the helicopter struck a two-wire powerline, 158 ft above ground level (Figure 2). The pilot reported that he did not see the wires, but felt a jolt and observed that the windscreen had cracked. He did not identify that the helicopter had struck a powerline, and focused on controlling the helicopter to a run-on landing. The helicopter descended rapidly, travelling about 400 m after the wirestrike, in which time the pilot felt another jolt. The aircraft collided with the ground in an upright position before it spun around and rolled over. The pilot sustained minor injuries and the passenger was seriously injured. The helicopter was substantially damaged (Figure 3).

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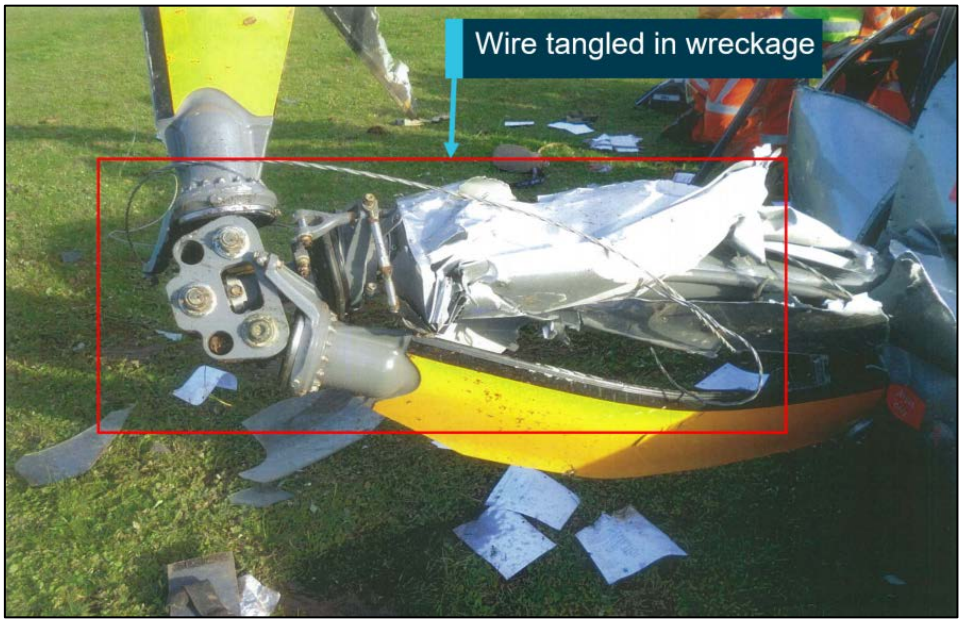
1 Eastern Standard Time (EST): Coordinated Universal Time (UTC) + 10 hours.

2 Visual flight rules (VFR): a set of regulations that permit a pilot to operate an aircraft only in weather conditions generally clear enough to allow the pilot to see where the aircraft is going.

**Figure 2: Overview of the accident location**


Source: Victoria Police, annotated by ATSB

**Figure 3: Accident site showing wire tangled in the wreckage**




Source: Victoria Police, annotated by ATSB

A witness standing under the powerline heard and saw the helicopter take-off. He reported that the powerline was ‘very hard to see’ and that he saw a flash (arcing) when it was struck by the helicopter.

## *Pre-flight planning*

The pilot contacted the property owner prior to the flight and was advised that the property had solar power and no powerlines. The property owner did not know the contacted powerline ran across the valley and he could not see the wires from his property.

The pilot had visited the property and the neighbouring one many times by car and knew of powerlines and poles at the neighbouring property, which were about 26 ft (8 m) high. However, he was not aware of the distribution powerline that the helicopter struck and stated that he had not expected to encounter powerlines more than 150 ft above the ground.

## *Powerline*

The single phase, two wire (conductor) 22 kV powerline was strung across the spur line. It traversed a valley from a pole on the top of a hill to a pole located near the main road. The span ran perpendicular to a line of poles leading to a neighbour's house. The span length was 559 m between poles and the maximum clearance above the valley was 48.1 m (158 ft).

Following the wirestrike, the helicopter pulled the two wires off the pole, which then parted and fell to the ground. Some of the wire remained attached to the helicopter (Figure 3) with the rest of the span on the ground and resting in trees.

### *Mapping*

Energy companies in New South Wales and Queensland provide general aviation pilots (including those conducting authorised low-level operations) with access to network maps of high voltage electricity transmission lines and lower voltage distribution lines. The information is provided with a caveat that it may not be current and accurate.

Similar access to network maps is not provided by Victorian energy companies although the Victorian Department of Environment, Land, Water and Planning has a Spatial Datamart, which includes high-voltage transmission network information. The data does not contain information on the lower voltage distribution network. Additionally, use of the data for flight planning purposes requires extraction of the powerline information from a large dataset and processing to present it in a readily usable format such a map overlay.

In addition to network maps, Queensland's Ergon Energy Network brochure *Working safety around electricity when low-level flying* reminds pilots to practice safe work habits including:

- conducting a pre-flight briefing and reconnaissance
- applying appropriate flying techniques
- reading the physical structure indicators, e.g. poles and insulators
- knowing the location of powerlines on and around the property or the area you are flying in.

### *Marking*

Wire markings enhance the visibility of wires. The requirements for marking powerlines and their supporting structures were published in *Australian Standard AS 3891 Part 1, Permanent marking of overhead cables and their supporting structures for other than planned low-level flying* and *Part 2, Low level aviation operations*.

The powerline associated with this accident was not considered to be in an area involved in planned low-flying operations as described in AS 3891.2, although it was reported that aerial agricultural operations had previously occurred in the vicinity of the powerline. Additionally, the helicopter landing site was not an authorised landing area as defined in Part 1, nor did the cable height exceed 90 m or span exceed 1.5 km. The powerline therefore did not require marking in accordance with either Australian Standard.

The ATSB publication *Avoidable Accidents No. 2 - Wirestrikes involving known wires: A manageable aerial agriculture hazard* states that 'even in cases where the criteria of AS 3891.1 do not apply, there may be an obligation on the owner of the wire to mark the wire. This could be the case if there is a high level of risk in the particular circumstances associated with the visibility of the wire. If you consider that a wire creates an unacceptable level of risk you should tell the owner of the wire (and the property owner if they are not the same person).'

After this accident, local landowners advised the ATSB that the powerline was erected in the 1970s, and that an aircraft conducting aerial agriculture had struck it in the 1980s. They reported

that following that past incident, orange plastic marker balls had been fitted to the wires, however, they had perished over time and not been replaced.

No other wirestrikes involving this powerline were known to have occurred, and the energy transmission company had no record of any wirestrikes.

### *Weather*

Footage of the take-off showed a sunny day with clear sky with some scattered high-level clouds, no wind and visibility greater than 10 km.

The United States Federal Aviation Administration (FAA) *Safety Study of Wire Strike Devices Installed on Civil and Military Helicopters* found from 1970-1979 and 1986-1996 clear skies and unlimited visibility conditions during most reported wire strikes and from 1994-2004, 86 per cent of the fatal wirestrike accidents occurred in day visual meteorological conditions.[3]

### *Pilot experience*

The pilot had 73.8 hours total aeronautical experience and attained his Private Pilot (Helicopter) Licence in April 2019. The pilot had completed 5.2 hours in an R44 helicopter in the 90 days prior to the accident flight.

The FAA study referenced above found that most of the helicopter wirestrikes occurred with experienced pilots. The study found that in the United States, between 1994 and 2004, there were 124 wirestrike accidents involving civil helicopters, of which 41 were fatal. About 60 per cent were general aviation operations, while agricultural operations accounted for about 27 per cent of the accidents. The average rotorcraft flying experience of the pilots was about 4,000 hours.

### *Previous occurrences*

Between July 2003 and June 2011, a total of 166 aircraft wirestrikes were reported to the ATSB. Electricity distribution and transmission companies identified an additional 101 wirestrikes that occurred during the same period that were not reported to the ATSB. Further information is in ATSB report from 2011, *Under reporting of aviation wirestrikes*.

According to ATSB publication *Wire-strike Accidents in General Aviation: Data Analysis 1994 to 2004*, 15 per cent of wirestrike accidents occurred in aircraft conducting private operations. Of those accidents, 61 per cent occurred in the vicinity of the landing area. These included take-off, approach, landing and conducting an aerial inspection of the landing area.

## Safety analysis

As part of his pre-flight planning, the pilot sought and obtained some information about hazards, including powerlines, from the property owner. However, the owner was not aware of the distribution powerline strung across the valley. Additionally, and unlike other states, readily usable electricity network maps were not available to assist the pilot's planning. Such maps provide valuable safety information to aid pilots in planning flights, and assist the visual identification of hazards, such as wires and poles. From past visits to the property by road, he knew of some low powerlines at a neighbouring property however that knowledge did not assist identification of the airborne wire hazard.

The pilot elected to depart in the same direction as the helicopter landed. Therefore, he had not overflown the powerline when arriving, depriving him of an opportunity to visually identify it. Additionally, he did not conduct aerial reconnaissance of the take-off and departure track that might have helped identify the powerline's poles and wires. Consequently, when the pilot departed

[3] Visual Meteorological Conditions (VMC): an aviation flight category in which visual flight rules (VFR) flight is permitted – that is, conditions in which pilots have sufficient visibility to fly the aircraft while maintaining visual separation from terrain and other aircraft.

from the property he was unaware of the presence of the distribution powerline across his intended flight path.

Powerlines at significant heights above the ground can be expected in valleys as they are often strung across them to use the terrain to reduce the number of poles and the need to clear vegetation below the wires. However, the pilot reported that he did not expect any powerline at a height of more than 150 ft above the ground. The pole on the hill was visible from the take-off site, but the pilot did not see it. Nor did he see (or expect) the powerline wires, which are inherently difficult to sight and had no markers to increase their visibility. Consequently, as the pilot conducted a shallow departure climb down the valley the helicopter struck the powerline about 400 m from the take-off site.

The circumstances of this accident highlight that the most effective means of preventing wirestrike can be achieved using a combination of:

- available wire location information
- wire marking
- avoidance of unnecessary low flying, especially flight below the height of surrounding higher terrain where wire spans may be present.

## Findings

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

- The helicopter's track down the valley and a shallow climb gradient resulted in controlled flight into the unseen powerline that was not fitted with visual markers.
- The pilot's pre-flight planning had not identified the powerline that was unknown to the property owner of the take-off site, and detail of the powerline network was not available to the pilot.

## Acknowledgements

The ATSB acknowledges the assistance provided by Victoria Police during this investigation.

# General details

## Occurrence details

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|---|---|---|
| Date and time: | 6 July 2019 – 1506 EST | |
| Occurrence category: | Accident | |
| Primary occurrence type: | Wirestrike | |
| Location: | near Mansfield, Vic. | |
| | Latitude: 37° 10.396' S | Longitude: 146° 08.340' E |

### *Helicopter details*

| | | |
|---|---|---|
| Manufacturer and model: | Robinson Helicopter Company R44 | |
| Registration: | VH-KCH | |
| Serial number: | 1548 | |
| Type of operation: | Private – Pleasure/Travel | |
| Departure: | near Mansfield, Victoria | |
| Destination: | Moorabbin Airport, Victoria | |
| Persons on board: | Crew – 1 | Passengers – 1 |
| Injuries: | Crew – 1 Minor | Passengers – 1 Serious |
| 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; 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 the ATSB's 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.

## Purpose of safety investigations

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the 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.