CIVIL AVIATION AUTHORITY
OF NEW ZEALAND
Te Mana Rererangi Tūmatanui o Aotearoa

# AIRCRAFT ACCIDENT REPORT

# CAA OCCURRENCE NUMBER 15/1102

# ROBINSON R44 RAVEN II

# ZK-IWL

# COLLISION WITH POWER LINES

# FRENCH PASS, MARLBOROUGH SOUNDS

# 13 MARCH 2015


Sourced from: http://www.blogspot.com/

# Foreword

New Zealand's legislative mandate to investigate an accident or incident are prescribed in the Transport Accident Investigation Commission Act 1990 (the TAIC Act) and Civil Aviation Act 1990 (the CAA 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 CAA 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 investigation is to determine the circumstances and identify contributory factors of an accident or incident with the purpose 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 CAA with the information required to assess which, if any, risk-based regulatory intervention tools may be required to attain CAA safety objectives.

## Contents



### Figures

## Data summary

| | |
|---|---|
| **Aircraft type, serial number and registration:** | Robinson R44 Raven II, s/n 10202, ZK-IWL |
| **Number and type of engines:** | One, Lycoming IO-540-AE1A5 |
| **Year of manufacture:** | 2003 |
| **Date and time of accident:** | 13 March 2015, 1720 hours[1] (approximately) |
| **Location[2]:** | French Pass, Marlborough Sounds<br>Latitude: 40° 55' 5.70" S<br>Longitude: 173° 50' 6.30" E |
| **Type of flight:** | Private |
| **Persons on board:** | Crew: 1 |
| **Injuries:** | Crew: 1 (fatal) |
| **Nature of damage:** | Aircraft destroyed |
| **Pilot-in-command's licence** | Private Pilot Licence (Helicopter) |
| **Pilot-in-command's age** | 65 years |
| **Pilot-in-command's total flying experience:** | Approximately 810 hours |
| **Investigator in Charge:** | Mr P Breuilly |

[1] All times NZDT (UTC + 13 hours)

[2] World Geodetic System 1984 (WGS-84) co-ordinates

## Executive summary

The Civil Aviation Authority (CAA) was notified of the accident at 1750 hours on Friday, 13 March 2015. The Transport Accident Investigation Commission was notified shortly thereafter and elected not to investigate. The CAA did not undertake an on-site investigation at the time of the accident. CAA investigators undertook an overflight of the site in August 2016.

The pilot was on a private cross-country flight in the Marlborough Sounds under visual flight rules (VFR). Witnesses observed the helicopter flying contour to the terrain and coastline of D'Urville Island in an anti-clockwise direction. The witnesses observed the helicopter striking the transmission line spanning French Pass and subsequently impacting the water. A commercial diver accompanied by several water-borne vessels and a rescue helicopter located and marked the wreckage and confirmed the fatality. Police arrived on the scene the following morning to gather witness statements and recover the deceased and wreckage.

The investigation identified the following causal factors:

(i) The pilot entered into a flight mode requiring an increased level of situational awareness by flying below the minimum height for VFR flight and subsequently reduced regulated safety margins.

(ii) While approaching the wire hazard, the pilot did not maintain a flight path that provided adequate clearance above the obstacle.

The following safety recommendations are made:

(i) Continue to support CAA outreach programmes that focus on obstacle removal or marking, hazard communication, and promotion of safety awareness in the wire environment.

(ii) Consider an assessment of the adequacy of current markings on hazards to navigable airspace through the CAA policy issue assessment process to ensure that the shielding principles to not prevent hazards on low-level transit routes from being marked appropriately.

(iii) All pilots should remain mindful that the purpose of rule 91.311 *Minimum heights for VFR flights* is to provide a margin of safety above obstacles.

# 1. Factual Information

## 1.1 History of the flight

1.1.1 On 13 March 2015 at 1300 hours, the pilot of the Robinson R44 Raven II (Reg. No. ZK-IWL) departed Omaka Aerodrome on a private flight to a holiday home at Waimaru Bay via Havelock and Pelorus Sound. The expected time of arrival at the holiday home was approximately 1400 hours, and the pilot departed the holiday home sometime prior to 1700 hours.

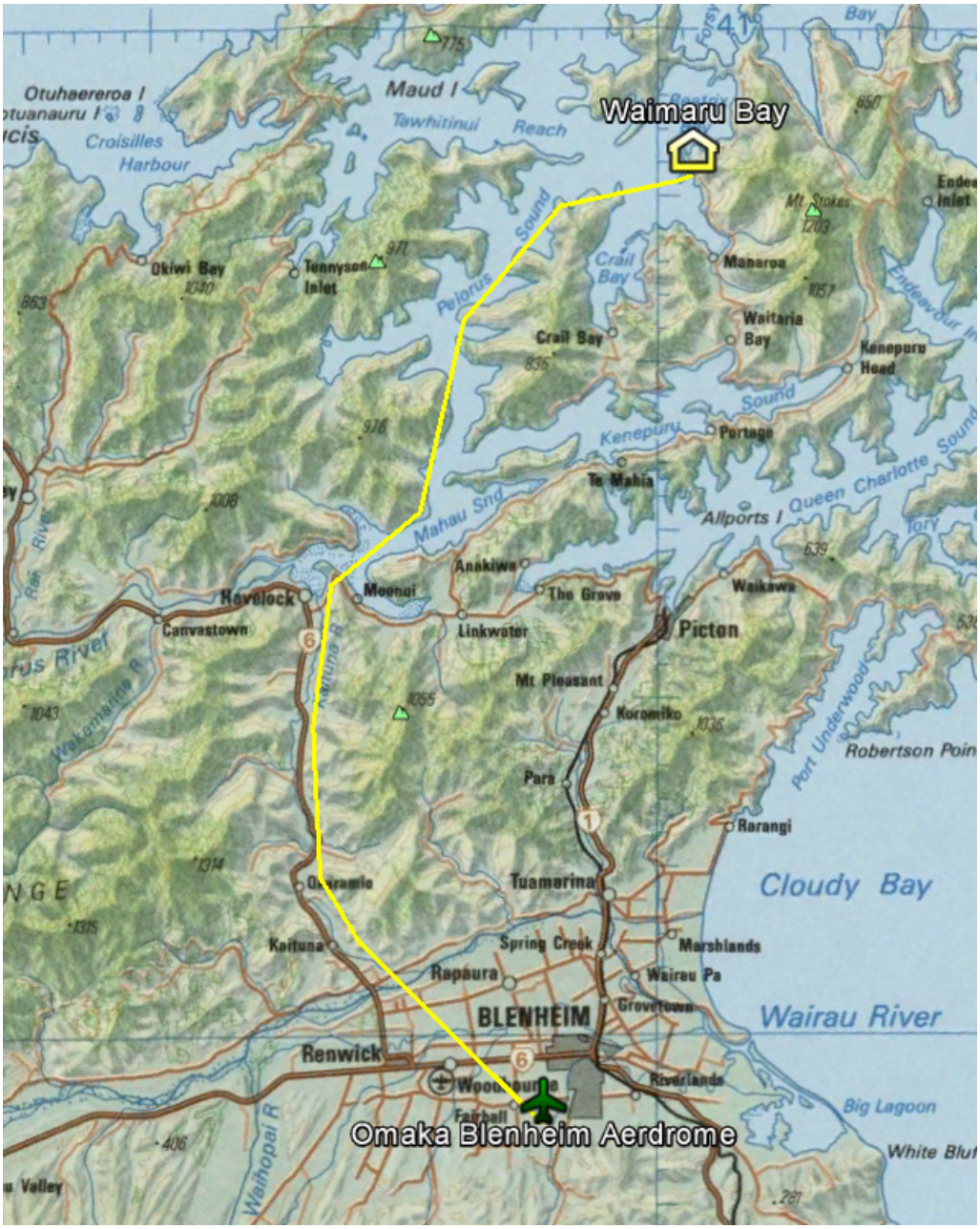


Figure 1: Pilot's route from Omaka Aerodrome to his holiday home at Waimaru Bay. Sourced from Topographic Map 242-3 North Meets South. Crown Copyright Reserved

1.1.2 Residents of Whareata Bay observed the helicopter flying along the northeast coast of D'Urville Island between Half Way Point and the Rangitoto Islands. The witnesses stated that helicopters transition through the area 'regularly', and the small white helicopter they observed that afternoon was 'flying very low… close to the land… inland of two boats moored at the northern end of Whareatea Bay'. They were 'worried that it would hit the mast of a yacht' moored in the bay, due to the altitude at which it was flying. Figure 2 depicts the helicopter's estimated flight path, based on witness accounts.

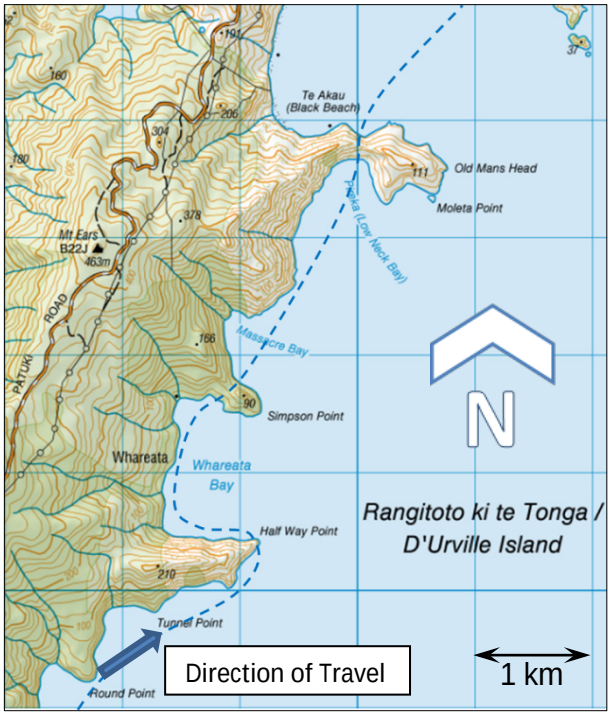


**Figure 2: Estimated flight path along northeast coast from witness statement. Sourced from NZTopo50-BP28 Te Aumiti/French Pass. Crown Copyright Reserved**

1.1.3 The helicopter passed witnesses on a yacht abeam Audibert Point at an estimated altitude of 100 feet above mean sea level (AMSL), heading northeast towards French Pass. The witnesses observed the helicopter climbing, beginning at Wainui Bay, and levelling off as it neared the ridgeline at French Pass. Additional witnesses include a couple that was at the French Pass lookout on the south side of the pass. All of the witnesses observed the helicopter approaching the power distribution lines, pitching abruptly to a nose-down attitude, and descending into Ngamuka Bay. The witness locations are depicted in Figure 3.

1.1.4 Based on statements obtained during the investigation, the witnesses on the yacht proceeded with their vessel to the green buoy southwest of French Pass. They observed that the distribution line was hanging low, indicating that the helicopter had struck it. The estimated time from the time of impact to the time of arrival at the scene was approximately seven minutes. The skipper contacted Maritime Radio at approximately 1730 hours to provide the initial notification of the accident. As the vessel continued towards the suspected crash site, the witnesses identified the odour of fuel and began gathering debris. Three additional vessels and a rescue helicopter arrived on the scene, including a commercial paua diver. The diver identified the helicopter, confirmed that the pilot was still strapped inside, and attached a marker buoy to the main mast.


**Figure 3: Estimated flight path leading to the accident and the known location of wires, witnesses, and the final position of the helicopter. The helicopter was observed in a climb beginning at Wainui Bay, levelling off prior to crossing the wires. Sourced from NZTopo50-BP28 Te Aumiti/French Pass. Crown Copyright Reserved**

1.1.5 The accident occurred in daylight at approximately 1715 hours at French Pass, Marlborough Sounds: Coordinates 40°55'5.70"S, 173°50'6.30"E.

## 1.2 Injuries to persons

| Injuries | Crew |
|---|---|
| Fatal | 1 |

## 1.3 Damage to aircraft

1.3.1 The aircraft was destroyed on impact with the sea.

## 1.4 Other damage

The middle power distribution wire spanning French Pass was severed. An impact mark was present near the point that the line overloaded and sheared.

## 1.5 Personnel information

| | | | |
|---|---|---|---|
| Pilot-in-command: | age 65 years | | |
| License: | Private Pilot License (Helicopter) issued 16 February 2007 | | |
| Type Ratings: | Robinson R44 | | |
| Medical: | Class 2 Certificate dated 11 March 2013 endorsed “004 Half spectacles must be readily available”, “040 Not valid for IFR flights” | | |
| Flying experience: | Flying hours | All types | Robinson R44 |
| | Last 24 hours | - | - |
| | Last 7 days | 0.2 | 0.2 |
| | Last 30 days | 3.8 | 3.8 |
| | Last 90 days | 11.8 | 11.8 |
| | Total hours | 810 | Not specified |

1.5.1 On days that the pilot had flown in the previous 90 days, less than one hour of flight time on average were logged. The first leg of the pilot’s flight from Omaka Aerodrome to the holiday home in Waimaru Bay had taken 0.6-0.8 hours on previously logged flights.

1.5.2 The last entry made in the pilot's logbook was dated 9 March 2015.

## 1.6 Aircraft information

| | |
|---|---|
| Aircraft type and serial number: | Robinson R44 Raven II, s/n 10202 |
| Date of construction: | 11/2003 |
| Registration mark: | ZK-IWL |
| Registration Certificate: | 25 May 2006 |
| Airworthiness Certification: | Issued by CAA 17 December 2003 |
| Engine Type and model: | Piston, Lycoming IO-540-AE1A5 |

1.6.1 No defects are suspected to have been present or contributing at the time of the accident. Witnesses reported that the helicopter appeared to be operating normally as it approached the wires. The review of airworthiness was last completed 6 March 2014, with the next due on 6 March 2015. The most recent maintenance performed on the aircraft was a 50 hour inspection completed 30 October 2014 at 1135.3 aircraft hours. The aircraft was released to service with no faults. As of the last entry on 9 March 2015, the aircraft logbook indicates that the aircraft had flown 18.7 hours since the last inspection.

1.6.2 The aircraft weight and balance is not considered a contributing factor to this accident.

## 1.7 Meteorological information

Area forecasts and automated weather system reports from the area indicate that the meteorological conditions near French Pass were acceptable for operation under VFR at the time of the accident. Weather is not considered a contributing factor to this accident.

## 1.8 Aids to navigation

1.8.1 A Visual Navigation Chart C7 Marlborough, 1:250,000 scale, was on board at the time of the accident. The map was not current, with an effective date of 19 November 2009; however, the wire markings and elevations on the map in the vicinity of French Pass and D'Urville Island remain unchanged on current maps.

1.8.2 A Garmin GNC 250XL global positioning system (GPS) was installed in the aircraft. This unit provides a moving map display that shows locations from the Jeppesen®

database, and a built-in VHF transceiver[3]. The moving map shown includes airspace and navigation aids, and does not provide the pilot with a terrain map or obstacle information.

## 1.9 Communications

1.9.1 The aircraft was equipped with two VHF transceivers, a transponder, audio controller, and emergency locator transmitter.

1.9.2 No radio communications were recorded pertaining to this flight.

## 1.10 Wreckage and impact information

1.10.1 The helicopter contacted the middle power distribution line spanning French Pass[4]. The lack of longitudinal damage to the cockpit and main mast, and lack of impact damage or separation of the main rotor blades, indicate that this impact occurred to the lower left fuselage and skid. The disruption and abrupt deceleration caused by this impact destabilised the main rotor to the extent that one or both main rotor blades passed through the cockpit prior to or during the descent at a steep angle towards the sea. One main rotor blade buckled in several places due to the downward deflection.

1.10.2 The impact with the sea was at a high angle and high rate of descent. The force of the impact dislodged all forward and intermediate fuselage panels and all of the cockpit and cabin doors. The main rotor blades deflected upward upon impact with the water. The floor of the cockpit and cabin folded laterally, inverting the right side floor and seats in relation to the main mast and rotor system. The skid struts and skids separated from the fuselage. The left forward skid strut fairing was heavily damaged.

1.10.3 To facilitate recovery, the divers cut the main rotor blades and separated the tail boom from the fuselage.

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[3] Sourced from Garmin.com product page: https://buy.garmin.com/en-US/US/p/68

[4] The span consists of three conductors. On the southern end, the conductors are supported at approximately the same height AMSL. At the northern end, the middle wire is supported approximately 2 metres higher than the other two.

## 1.11 Medical and pathological information

1.11.1 The pilot's medical certificate showed that "half spectacles must be readily available"[5]. The pilot's ability to see obstacles outside of the aircraft was acceptable for flight.

1.11.2 Post-mortem examination showed that the pilot died of multiple severe injuries caused by blunt force trauma.

1.11.3 The medical examiner was unable to recover suitable samples of blood, urine, vitreous, or other tissue to conduct a toxicology assessment.

## 1.12 Survival aspects

1.12.1 At least one main rotor blade entered the cockpit and caused blunt force trauma that was not survivable.

1.12.2 The seat belt in use was a four-point design that effectively restrained the pilot throughout the accident sequence. The internal injuries caused by the rapid deceleration upon impact with the sea were not survivable.

## 1.13 Additional information

1.13.1 Map Markings

The wires that span French Pass are marked on the AIP New Zealand Visual Navigation Chart 1:250 000 scale: Chart C7. The highest point of the span is indicated as 545 feet AMSL (see Figure 4 and Figure 5).

[5] This is typically a result of presbyopia, where the elasticity of the lens of the eye deteriorates due to aging.

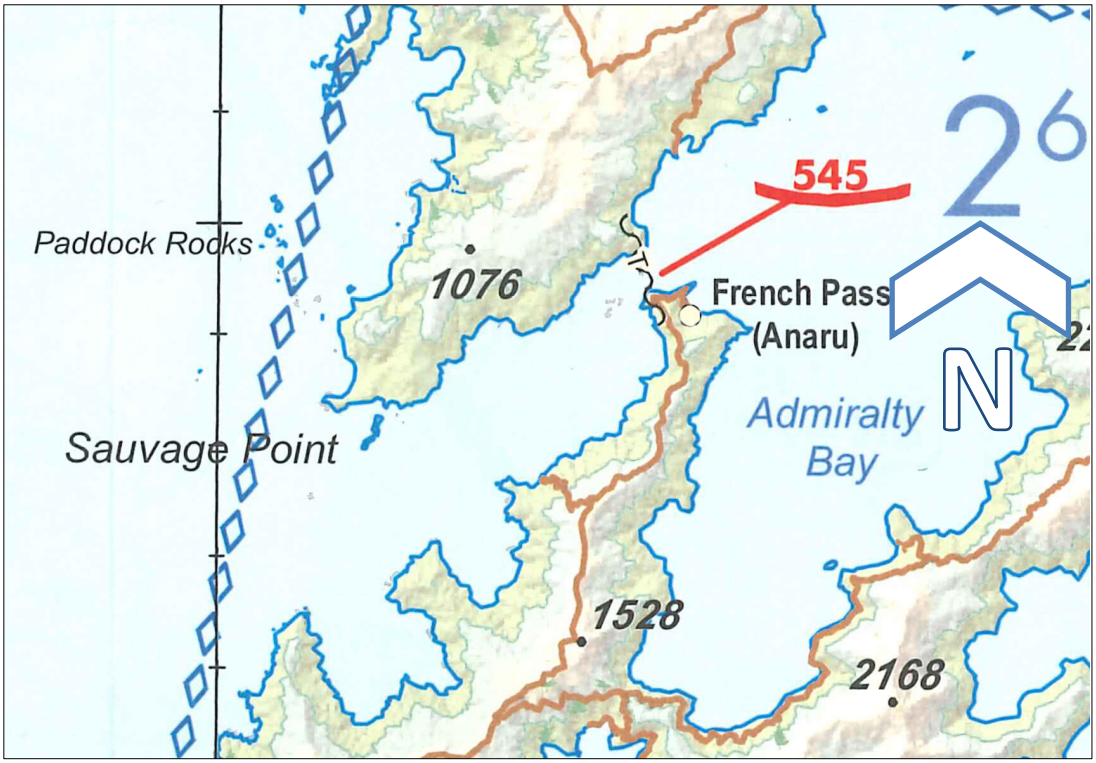


**Figure 4: French Pass Wire Hazard marking on AIP New Zealand Visual Navigation Chart 1 :250 000 scale: Chart number C7.**

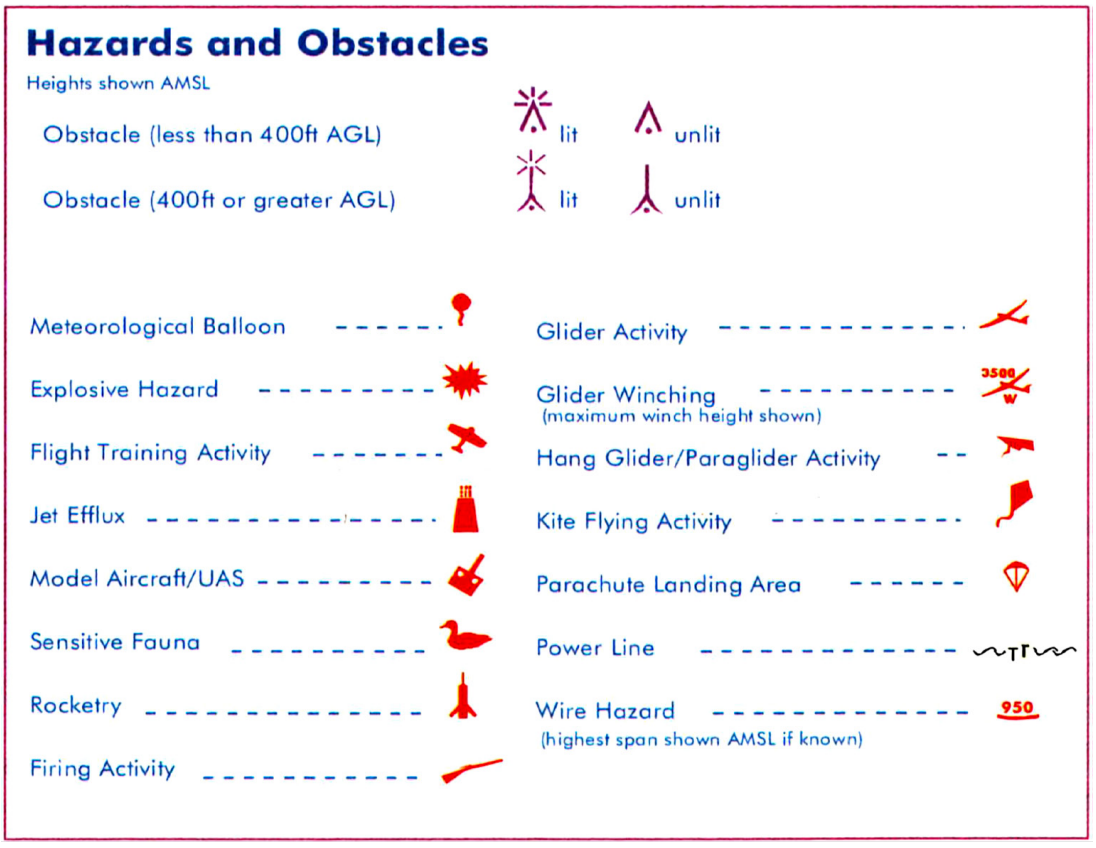


**Figure 5: Information on the AIP NZ Visual Navigation Chart 1:250 000 scale. Wire Hazards are marked with the "highest span shown AMSL if known".**

### 1.13.2 Wire Markings

The wires that span French Pass have been in place since 1974[6]. Ball markings were installed, but were removed in April 1988. An engineering evaluation, completed July 2002, identified this span as one of the '20 worst spans' affecting navigable airspace in New Zealand. The working group responsible for the study recommended marking of the span at the conclusion of the assessment.[7]

No marking devices were installed on the wires that span French Pass at the time of the accident. The supporting structures on each end of the span are painted white and red for contrast against foliage and sky.

Civil Aviation Rules, Part 77 Objects *and Activities Affecting Navigable Airspace* do not require this span to be marked due to the height of the structures supporting the wires on each side of the span, and the fact that the wires across the span are considered shielded.[8]

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[6] "Wires below legal flying level – lines company", Radio New Zealand News, 15 March 2015.

[7] Performed by Power Line Solutions NZ Limited (report No. 166/1) as cited in the Civil Aviation Authority (CAA), *Wire marking review*, 22 June 2005

[8] A hazard may be considered shielded if it is lower than another obstacle that is already considered to be a hazard and that hazard is marked by standard obstacle marking or lighting. The object may be considered shielded if it is located within 600 metres of the shielding object. Reference: Civil Aviation Authority (CAA) Rule Part 77 *Objects and Activities Affecting Navigable Airspace*, Appendix C – Shielding, 1 April 2014

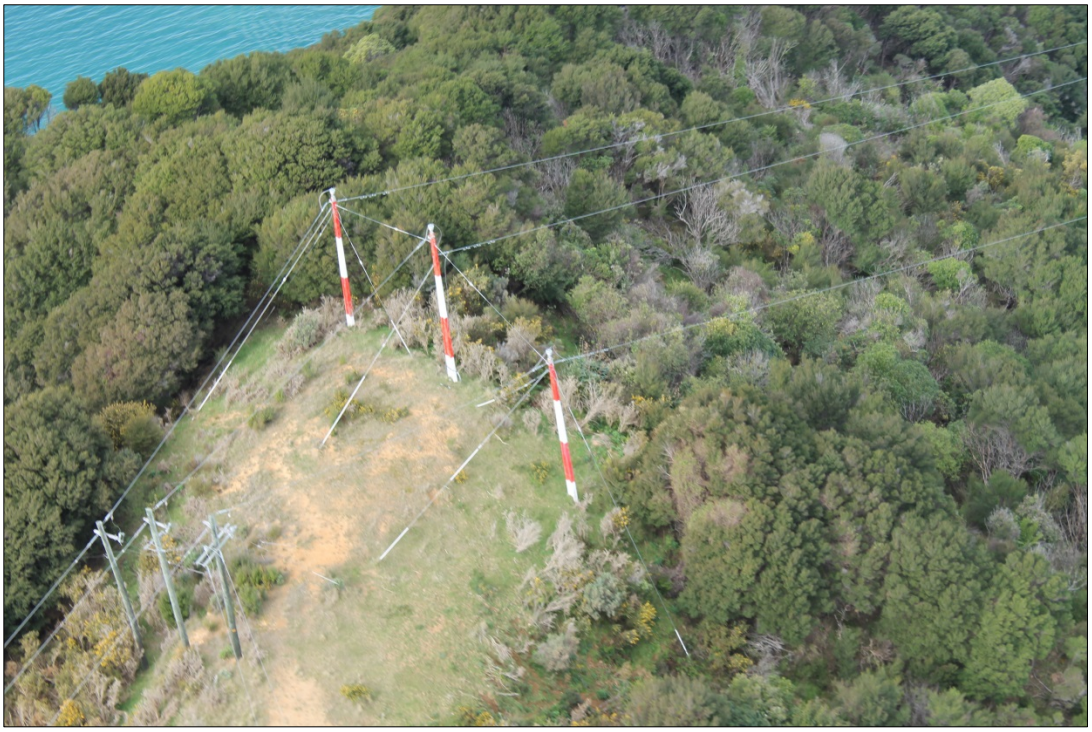

**Figure 6: The structures supporting the wires on each end of the span are painted white and red for contrast against the foliage and sky. These are the structures on the north end of the French Pass span.**

## 2. Analysis

**2.1** Based on witness statements received by the CAA and Police, the pilot was likely flying below the minimum height for VFR flights of 500 feet above the surface and obstacles within 150 meters of the point directly below the aircraft[9] for a period of time prior to the accident.

**2.2** The helicopter climbed as it approached the wires, indicating that the pilot was aware of the obstacle. The helicopter struck the wires at approximately 450 feet AMSL. There was sloping terrain directly below the wires, rising to the left, which indicates that the helicopter's position was below the 500 foot minimum altitude at the time of impact.

**2.3** Based on the impact witness marks found on the helicopter, it is possible that the pilot saw and identified the wires. The pilot was seated on the right, and the impact occurred on the lower-left side. It is possible that the pilot believed he had sufficient clearance to avoid impact with the obstacle. Due to the release of tension and twisting of the wire that resulted, the angle of the initial impact on the wire cannot

[9] Civil Aviation Rule 91.311 *Minimum height for VFR flight*, 10 March 2017.

be determined.

The altitudes and manoeuvres described by witnesses indicate the pilot was in a contour flight profile after departure from the holiday home[10]. Based on the distance of approximately 45 NM, from the holiday home and anti-clockwise around D'Urville Island to the accident site, the accident would have occurred approximately 35 minutes into the flight[11]. The effects of the high and sustained mental and physical activity involved in the pilot's selected flight mode and the environmental factors of heat, vibration, and temperature are potential contributing factors.

## 3. Conclusions

**3.1** While operating at low level, the helicopter struck the upper transmission line spanning French Pass and subsequently impacted the water.

**3.2** The pilot was conducting flights below the minimum height for VFR flights[12] for a period before colliding with the wires.

**3.3** By conducting flight in close proximity to terrain and obstacles, the pilot reduced the safety margin provided by the minimum height requirement and increased the overall risk for the flight.

**3.4** The pilot entered into a flight mode requiring an increased level of situational awareness by flying below the minimum height for VFR flight and subsequently reduced regulated safety margins.

**3.5** The pilot either did not positively identify the upper transmission line to properly judge clearance or identified the obstacle and did not correctly judge the clearance.

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[10] Contour flight is defined as flying at low altitude, conforming with and in proximity to terrain at varying speeds and altitudes (Hart, 1988).

[11] The exact flight path is not known. A path was drawn in Google Earth with the approximate flight path that would have been taken anti-clockwise around D'Urville Island from the holiday home. A ground speed of 80 Kts was used for the estimated time of flight: 45 NM / (80NM/hr) = 0.6 hr.

[12] The minimum height for VFR flights is 500 feet above the surface and obstacles within 150 meters of the point directly below the aircraft Civil Aviation Rule 91.311 *Minimum height for VFR flight*, 10 March 2017.

**3.6** The accident was not survivable.

## 4. Safety Recommendations

**4.1** Pilots should be particularly aware of wires below 500 feet above ground level over flat terrain and water – especially spanning rivers, and any time they are operating below the ridge tops. Pilots should also be aware that tall structures often have guy wires for support and remain well clear[13]. This should continue to be emphasised in initial and recurring flight training and evaluations.

It is recommended that pilots conduct a review of the operational area for known wire hazards prior to flight and update their maps after flight if any new wire or other obstacles are identified. Swath cut vegetation and supporting poles and structures are primary indicators of the presence of wires. The safest way to cross wires is to overfly them at or near a supporting structure, as the structures are more easily identifiable than the wires. If overflying a structure is not practicable, the pilot should maintain an altitude at least as high as the structure[14] [15].

The CAA should continue to support outreach programmes, such as the New Zealand Helicopter Association and New Zealand Agricultural Aviation Association 'Down to the Wire' programme, that focus on obstacle removal or marking, hazard communication, and wire strike prevention training.

**4.2 Hazards to navigable airspace**

The CAA should consider an assessment of the adequacy of current markings on hazards to navigable airspace through the policy issue assessment process. The assessment should ensure that the shielding principles do not prevent hazardous wires and other hazards on low-level transit routes, like those in the Marlborough Sounds, from being marked to provide pilots with a visual warning that they are approaching a hazard.

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[13] From 'Avoiding Wirestrikes', Vector, January/February 2009

[14] From 'FM 3-04.203 Fundamentals of Flight', Headquarters, Department of the Army, 2007

[15] The altitude selected by the pilot was approximately 100 feet below the top of the highest pole on the northern end of the span.

## 5. Safety message

All pilots should remain mindful that the safety principle of rule 91.311 *Minimum heights for VFR flights* is to provide a margin of safety above obstacles. Obstacles below the minimum altitudes prescribed by the rule may not be marked and may be difficult to detect and identify in flight.

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