



Australian Government  
Australian Transport Safety Bureau

# VFR into IMC – Bell 206L Helicopter, VH-CIV

South Turramurra, New South Wales | 22 July 2011



Source: Gary Brown G3 Photographics

Investigation

**ATSB Transport Safety Report**  
Aviation Occurrence Investigation  
AO-2011-085  
Final



**Australian Government**  
**Australian Transport Safety Bureau**

**ATSB TRANSPORT SAFETY REPORT**  
Aviation Occurrence Investigation  
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**VFR into IMC**  
**South Turrumurra, New South Wales**  
**22 July 2011**  
**VH-CIV**  
**Bell 206L Helicopter**

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## **SAFETY SUMMARY**

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### **What happened**

At 0900 Eastern Standard Time on 22 July 2011, a Bell 206L helicopter, registered VH-CIV, with a pilot and one passenger, departed from Rosehill, New South Wales on a private flight to the Sydney Adventist Hospital near South Turramurra. As the aircraft neared the destination, the pilot encountered low cloud and rain in the area. Shortly thereafter, witnesses observed the helicopter descending rapidly, with the tail section separated. The helicopter subsequently collided with terrain, fatally injuring both occupants.

### **What the ATSB found**

The ATSB found it was likely that during manoeuvring in the area of low cloud and rain, the pilot inadvertently flew into reduced visibility conditions, leading to the onset of disorientation and a loss of control of the helicopter.

### **What has been done as a result**

There were no systemic safety issues identified as a result of the ATSB investigation and no specific safety actions taken. An ATSB research report released in July 2011 addressing avoidable accidents is relevant to the circumstances found during the investigation of this accident. The report can be accessed at the following web address;

<http://www.atsb.gov.au/publications/2011/ar2011050.aspx>

### **Safety message**

The hazards associated with visual flight into conditions of limited visibility are significant. The ATSB has investigated a number of accidents associated with visual flight rules (VFR) flight into instrument meteorological conditions (IMC), and has published several research reports into the factors that can contribute to this type of accident. The Civil Aviation Safety Authority (CASA) also maintains a library of advisory materials aimed at assisting pilots in decision-making before and during visual flights in conditions where continued visibility cannot be assured.

Pilots and operators are encouraged to familiarise themselves with guidance material on safe visual flight operations, and use this to develop appropriate strategies for planning and in-flight decision making if reduced visibility conditions are encountered.

Although no definitive conclusion could be made with respect to the extent to which any external pressures may have affected the pilot's decision making, the accident does serve as a reminder to pilots of the need to manage pressures and external factors in the planning and conduct of any flight.

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# THE AUSTRALIAN TRANSPORT SAFETY BUREAU

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The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The Bureau 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 Commonwealth 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 fare-paying passenger operations.

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 safety factors related to the transport safety matter being investigated. The terms the ATSB uses to refer to key safety and risk concepts are set out in the next section: Terminology Used in this Report.

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.

## **Developing safety action**

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. The ATSB prefers to encourage the relevant organisation(s) to initiate proactive safety action that addresses safety issues. Nevertheless, the ATSB may use its power to make a formal safety recommendation either during or at the end of an investigation, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation.

When safety recommendations are issued, they focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on a preferred method of corrective action. As with equivalent overseas organisations, the ATSB has no power to enforce the implementation of its recommendations. It is a matter for the body to which an ATSB recommendation is directed to assess the costs and benefits of any particular means of addressing a safety issue.

When the ATSB issues a safety recommendation to a person, organisation or agency, they must provide a written response within 90 days. That response must indicate whether they accept the recommendation, any reasons for not accepting part or all of the recommendation, and details of any proposed safety action to give effect to the recommendation.

The ATSB can also issue safety advisory notices suggesting that an organisation or an industry sector consider a safety issue and take action where it believes appropriate, or to raise general awareness of important safety information in the industry. There is no requirement for a formal response to an advisory notice, although the ATSB will publish any response it receives.

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## TERMINOLOGY USED IN THIS REPORT

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**Occurrence:** accident or incident.

**Safety factor:** an event or condition that increases safety risk. In other words, it is something that, if it occurred in the future, would increase the likelihood of an occurrence, and/or the severity of the adverse consequences associated with an occurrence. Safety factors include the occurrence events (e.g. engine failure, signal passed at danger, grounding), individual actions (e.g. errors and violations), local conditions, current risk controls and organisational influences.

**Contributing safety factor:** a safety factor that, had it not occurred or existed at the time of an occurrence, then either: (a) the occurrence would probably not have occurred; or (b) the adverse consequences associated with the occurrence would probably not have occurred or have been as serious, or (c) another contributing safety factor would probably not have occurred or existed.

**Other safety factor:** a safety factor identified during an occurrence investigation which did not meet the definition of contributing safety factor but was still considered to be important to communicate in an investigation report in the interests of improved transport safety.

**Other key finding:** any finding, other than that associated with safety factors, considered important to include in an investigation report. Such findings may resolve ambiguity or controversy, describe possible scenarios or safety factors when firm safety factor findings were not able to be made, or note events or conditions which ‘saved the day’ or played an important role in reducing the risk associated with an occurrence.

**Safety issue:** a safety factor that (a) can reasonably be regarded as having the potential to adversely affect the safety of future operations, and (b) is a characteristic of an organisation or a system, rather than a characteristic of a specific individual, or characteristic of an operational environment at a specific point in time.

**Risk level:** the ATSB’s assessment of the risk level associated with a safety issue is noted in the Findings section of the investigation report. It reflects the risk level as it existed at the time of the occurrence. That risk level may subsequently have been reduced as a result of safety actions taken by individuals or organisations during the course of an investigation.

Safety issues are broadly classified in terms of their level of risk as follows:

- **Critical** safety issue: associated with an intolerable level of risk and generally leading to the immediate issue of a safety recommendation unless corrective safety action has already been taken.
- **Significant** safety issue: associated with a risk level regarded as acceptable only if it is kept as low as reasonably practicable. The ATSB may issue a safety recommendation or a safety advisory notice if it assesses that further safety action may be practicable.
- **Minor** safety issue: associated with a broadly acceptable level of risk, although the ATSB may sometimes issue a safety advisory notice.

**Safety action:** the steps taken or proposed to be taken by a person, organisation or agency in response to a safety issue.

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## FACTUAL INFORMATION

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### History of the flight

At about 0815 Eastern Standard Time<sup>1</sup> on 22 July 2011, the pilot (sole occupant) of a Bell Helicopter Co. 206 *Longranger*, registered VH-CIV (CIV) departed from Wyee for Rosehill, New South Wales. The helicopter arrived at Rosehill at 0854, where the helicopter owner was to board for the next sector to the Sydney Adventist Hospital near South Turramurra, for a scheduled medical appointment. The flights were conducted in the private category under the Visual Flight Rules (VFR).

At Rosehill, the pilot contacted the Sydney Adventist Hospital by phone to inform security to expect their arrival in 10 to 15 minutes. During this discussion, the security officer advised the pilot to exercise caution, as the weather in the hospital area was poor.

At about 0900, the pilot departed from Rosehill, broadcasting his intentions to track via the helicopter transit lane<sup>2</sup>. That transmission was the last communication recorded from the pilot.

Air Traffic Control (ATC) radar surveillance data showed that the helicopter tracked above the Parramatta and Lane Cove Rivers to South Turramurra, via the helicopter transit lane and at a consistent altitude of about 700 ft above mean sea level (AMSL).

Data downloaded from a damaged Garmin map 495 GPS, operating on board at the time of the accident, indicated that at about 1.4 km from the destination, the helicopter track reversed for about 1 minute (Figure 1). The data showed the helicopter manoeuvring for about 20 seconds, followed by the commencement of a climb in the general direction of the hospital. Several eye witnesses in the local area observed that while it was manoeuvring, the helicopter was obscured at times by cloud and was observed climbing.

After about 25 seconds, at 0914:29, the helicopter reached an altitude of 1,300 ft, at which time the data recording ceased. The last radar surveillance altitude recorded was 1,500 feet (AMSL) at 0914:31.<sup>3</sup>

Two eye witnesses reported seeing the helicopter appear below the cloud and that parts had separated from around the tail area. The helicopter was observed rolling to the right before being lost from sight behind trees. The helicopter then collided with terrain, fatally injuring both the pilot and passenger.

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<sup>1</sup> Eastern Standard Time (EST) was Coordinated Universal Time (UTC) + 10 hours.

<sup>2</sup> Route established for helicopters transiting within a broader control zone.

<sup>3</sup> The difference in radar and GPS altitudes is due to the use of different datum and data sampling/processing rates.

**Figure 1: GPS track showing helicopter manoeuvring prior to the accident**

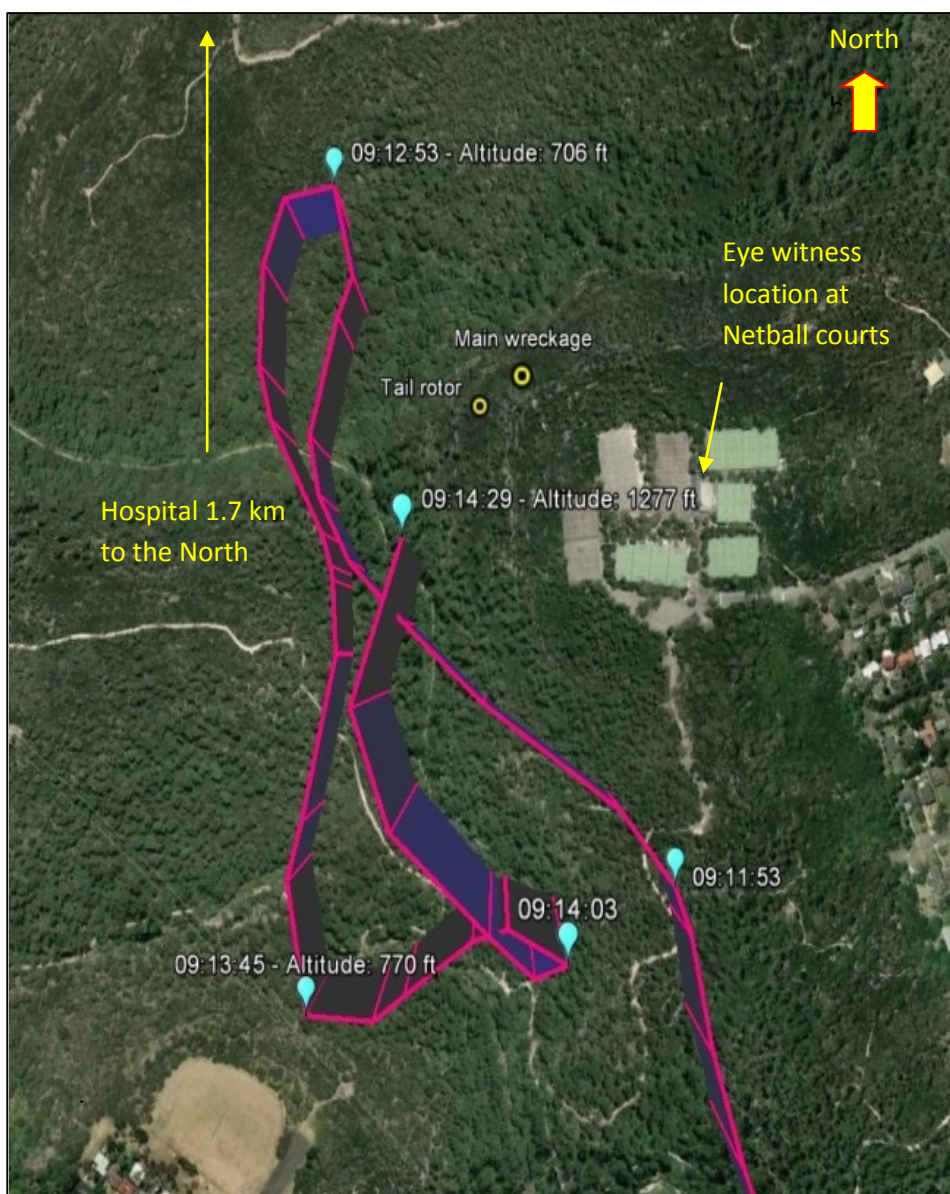


Photo courtesy of Google Earth

## **Pilot information**

The pilot held a Commercial Pilot (Helicopter) Licence issued in 2000, with a night VFR rating issued in 2006. He held a current Class-1 aviation medical certificate, without restrictions, which was valid until February 2012. The pilot did not hold an instrument rating.

The pilot's log books showed he was endorsed on a number of helicopter types, including the *Longranger*, and had flown CIV on numerous prior occasions. His total aeronautical experience was about 4,600 hours, including a significant amount of experience in Papua New Guinea.

It was reported to Australian Transport Safety Bureau (ATSB) investigators that the pilot was well rested and in good health before the flight. There was no medical

condition identified in the post mortem or toxicology reports that may have affected the pilot's performance during the accident flight.

## Helicopter information

The helicopter, serial number 45125, was manufactured in 1977. The helicopter had 17,292.1 total flight hours before the flights on the day of the accident.

The helicopter was maintained in accordance with the Bell Helicopter Co. 206L system of maintenance. The current maintenance release was found at the accident site and there were no outstanding maintenance requirements or defects listed. A review of the helicopter's maintenance documentation showed that the most recent maintenance was a periodic inspection conducted on 29 June 2011 at 17,287.3 flight hours, which was 4.8 flight hours before the accident flight. No anomalies were identified during the examination of the maintenance documentation.

The helicopter was not equipped or approved for flight at night or under the instrument flight rules. Significantly, the helicopter was not fitted with an attitude indicator instrument (Artificial Horizon)<sup>4</sup>, although a turn and slip indicator was fitted, providing rate-based turn information.

The aircraft fuel load at the commencement of the flight from Wyee was 480 lb (272 L) of Avtur<sup>5</sup>. At the specified average fuel consumption rate of 200 lb (113 L) per hour, the fuel remaining at the time of the accident was calculated to be around 330 lb (187 L).

## Accident site and wreckage information

The helicopter wreckage was located in steeply-sloping, heavily wooded terrain in the South Turramurra area. The main wreckage site was located at the base of a cliff which was approximately 10 metres in height. The wreckage was distributed over an area of approximately 60 metres, oriented on a magnetic bearing of approximately 065°.

The first item in the wreckage trail was the tail assembly including the tail rotor, vertical stabiliser and about one metre of tail boom (Figure 2). The tail section was located 50 metres away from the main wreckage. Numerous other parts of the tail boom, stabilisers and main rotor blades were distributed throughout the wreckage trail to the right of the tail assembly and main wreckage (Figure 3).

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<sup>4</sup> Artificial horizon – Primary cockpit flight instrument which, often in addition to other functions, indicates aircraft attitude with respect to the horizon ahead. This instrument is not mandatory for helicopters operating in VMC.

<sup>5</sup> Aviation turbine fuel, also referred to as Jet A-1

**Figure 2: Separated tail boom section and tail rotor**



**Figure 3: Wreckage plot**

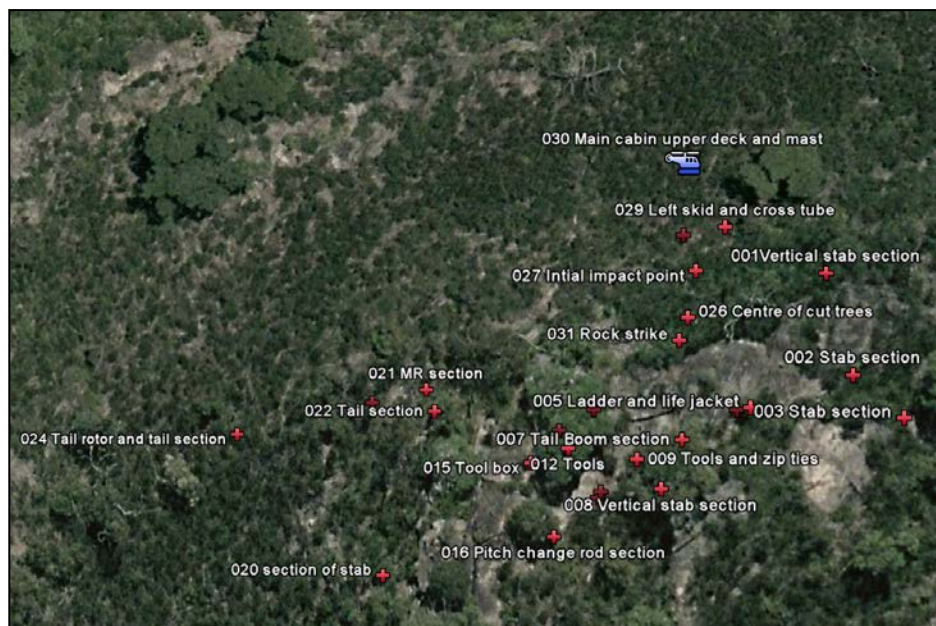


Photo courtesy of Google Earth

Fuselage impact marks were first observed several metres up-slope from where the main wreckage had come to rest (Figure 4). The wreckage had been significantly disrupted by impact forces. The cabin area was completely destroyed, the upper deck and transmission had separated from the cabin, the engine and a small section of tail boom had separated from the upper deck and the remaining parts of the main rotor blades had separated around one metre from their inboard ends (Figure 5).

Strike marks and damage found on surrounding trees, rocks and the ground indicated considerable force and unidirectional characteristics consistent with main rotor impacts.

**Figure 4: Wreckage component locations looking down hill**



Both main rotor blades were still securely attached to the rotor hub and displayed extensive fragmentation and chord wise bending in the opposite direction to rotation. All fractures were the result of impact-related overstress and were consistent with the effects of high rotational energy.

Both blades and the rotor head showed free movement in all principal axes. Examination of the main rotor system showed continuity from the input of the main rotor gearbox to the main rotors, with the assembly operating freely when turned by hand.

**Figure 5: Upper deck transmission and main rotor**



Examination of the engine on site found the first two stages of axial compressor blades sheared off at the blade root (Figure 6). The free-wheeling unit coupling bolts had sheared and bolt holes were elongated; consistent with power being delivered to the main rotor. The unit operated as expected when turned by hand.

**Figure 6: Sheared axial compressor blades**

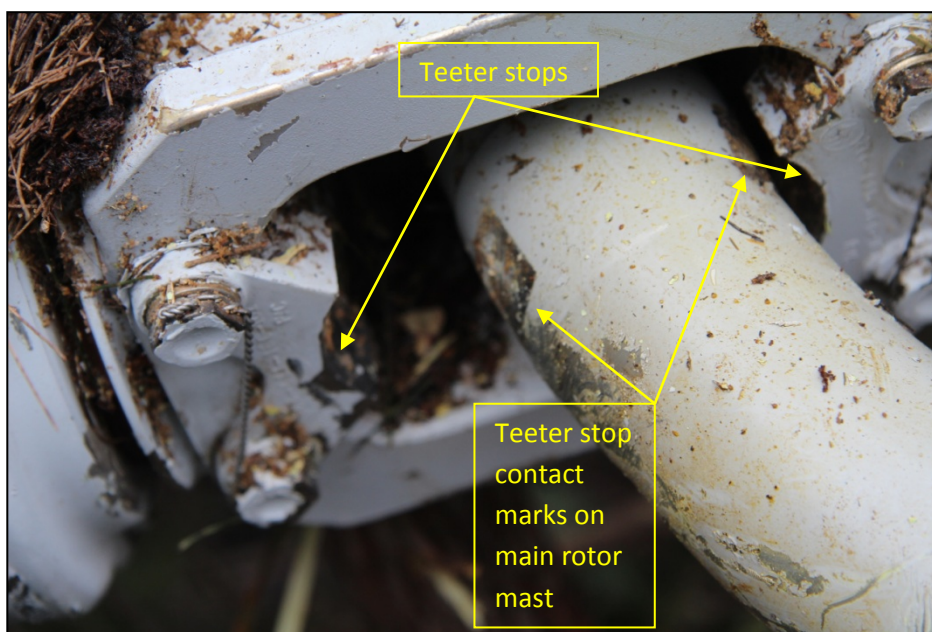


A post impact fire had initiated around the engine area, causing heat damage to several engine components and systems. There was heat damage to foliage and wreckage adjacent to the exhaust outlets. There was no evidence identified of a pre-impact fire.

An examination of the engine controls, fuel filter, starter generator, electrical system, wiring and engine accessories was conducted with no pre-existing abnormalities found.

An inspection of the main rotor mast showed heavy contact marks from the teeter stops (Figure 7). The mast itself was bent in two places; at the top, in line with the teeter stops and at the very bottom, where it entered the main rotor gearbox.

**Figure 7: Evidence of mast to hub contact**



Damage to the tail boom structure and tail rotor pitch control rod showed unidirectional characteristics, with deformation in the direction of main rotor blade rotation. Several other sections of tail boom were found towards the main wreckage area - each showing unidirectional impact deformation and paint transfer consistent with main rotor blade contact. Manual operation of the tail rotor pitch control and gearbox drive verified their functionality.

The unidirectional splintering of the wooded terrain at the initial main wreckage impact point was consistent with the helicopter impacting terrain while inverted and in an uncontrolled state.

The flight control system was inspected and all major flight control components were accounted for. Although the continuity of the system was disrupted by the accident, there was no evidence of pre-existing defects or abnormal operation.

No evidence of burning, arcing or abnormalities within the electrical wiring or electrical system was found during the onsite examination of the wreckage.

Selected aircraft instruments and the caution/warning annunciator panel were removed and retained for examination at the ATSB's facilities in Canberra.

The helicopter's electrically-operated turn and slip indicator was examined to determine its operational status at the point of impact. Signs of rotation were found on the gyro rotor and case, consistent with normal instrument operation.

Due to the damage sustained during the accident sequence, no relevant information was obtained from the examination of the caution/warning annunciator panel.

## Meteorological information

### Bureau of Meteorology analysis

A detailed analysis of the local weather around the time of the accident flight was provided by the Bureau of Meteorology (BoM). Relevant excerpts were as follows:

#### Forecasts and Warnings

....Area Forecasts, for both Area 20 and Area 21 [The accident site was located on the boundary of areas 20 and 21], valid for the time of the incident, indicated widespread showers with heavy falls, broken<sup>6</sup> low-level cloud with base 1000 feet (above MSL), low visibility in the area, including the incident location. The Area forecasts also indicated moderate turbulence below 7000 feet (AMSL) and severe icing above 7000 feet (AMSL), including the incident location.

#### Precipitation, cloud and visibility

.... Radar images (Figure 8) from Sydney (Terrey Hills) radar show that prior to and at around the time of the incident, scattered precipitation, including heavy falls, affected Sydney Metropolitan area, including the incident location. Surface weather observations and reports from the nearest available meteorological observation sites indicate that all the locations across the area of concern experienced heavy rainfall prior to and at around the time to the incident due to a persistent moist and deep south-easterly air stream across NSW coast.

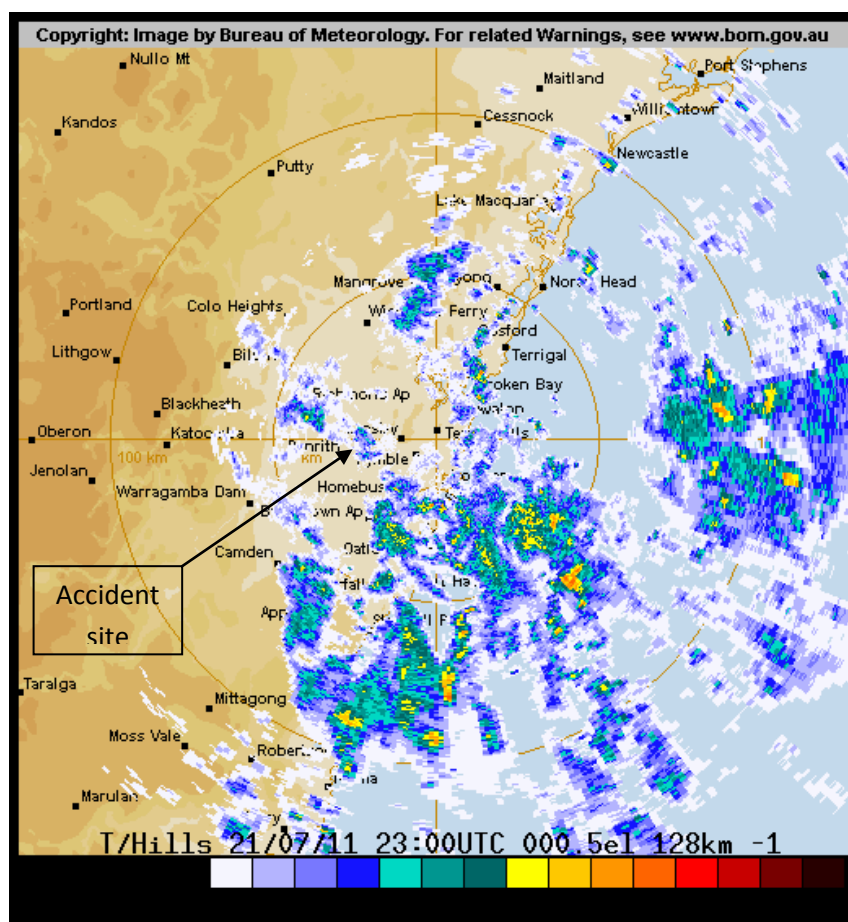
The manual observation at Parramatta North (Masons drive) is the closest observation site to the incident location. The observations recorded at Parramatta North at 2300 on 21 July and 0500 on 22 July show that there were 8 eighths of low-level cloud with base of less than 1000 feet. Scattered (3 to 4 eighths) to broken (5-7 eighths) layers of low-level cloud with base of approximately 2000 feet were also recorded at Bankstown and Sydney Airports.

.... The available meteorological observation reports suggest that, along with [the] scattered to broken layer of low-level cloud and heavy precipitation, the horizontal visibility in the area would have been very low.

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<sup>6</sup> Cloud cover is normally reported using expressions that denote the extent of the cover. The expression Few indicates that up to a quarter of the sky was covered, Scattered indicates that cloud was covering between a quarter and a half of the sky (3 to 4 eighths). Broken indicates that more than half to almost all the sky was covered (5 to 7 eighths), while Overcast means all the sky was covered.

**Figure 8: Radar image of weather at the accident site (arrowed).**



## Witness reports

Eyewitnesses in the accident site area reported conditions of low cloud, with rain showers and a light wind at the time of the accident.

The hospital security officer, who received the phone call from the pilot, reported that he expected the helicopter to arrive between 0910 and 0915, and at that time, heavy rain was falling. He observed the hospital's wind sock, located on the roof, indicating the wind was blowing predominantly from a north-westerly direction and was variable in strength. The officer reported the visibility in the direction of the accident site was limited, and later estimated it to be around 300 metres.

In-car video recorded from a police vehicle responding to the accident (at a location 500 to 700 feet AMSL) showed low cloud and rain in the area 3 minutes after the accident (Figure 9).

Figure 9: Police in-car video still at 700 ft elevation



### Pilot weather briefing

Telephone records showed that the pilot accessed information from both Sydney and Bankstown Automatic Terminal Information Services (ATIS)<sup>7</sup>, before departure from Wyee. At the time of the calls, the Sydney ATIS was reporting significant cloud above 2,600 ft and reduced visibility in rain. Similarly, the Bankstown ATIS reported significant cloud above 2,500 ft and reduced visibility in passing rain showers.

There was no record that the pilot had accessed any weather forecasts via his National Aeronautical Information Processing System (NAIPS) account, or from ATC. The requirements of the *Aeronautical Information Publication (AIP)* ENR 1.10 *Flight Planning*, states that a pilot must obtain current weather reports and forecasts for the route to be flown, then plan the flight having regard to that information.

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<sup>7</sup> The ATIS is not a weather forecast and only contains meteorological and operational conditions relevant to the terminal area of the applicable airport.

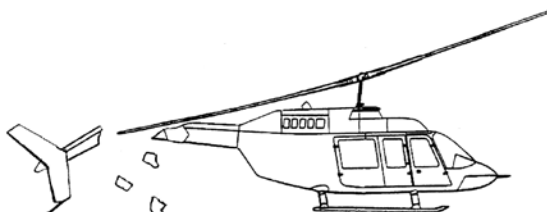
## Additional information

### Mast bumping and tail boom separation

The helicopter manufacturer provided the following description of a phenomenon known as ‘mast bumping’.

‘In-flight ‘mast bumping’ or hub to mast contact can occur when an under-slung teetering-rotor helicopter enters unapproved flight regimes. It may be possible for in-flight hub to mast contact to occur during low-g maneuvers or aerobatic flight (whether intentional or not). If a VFR helicopter pilot loses visual reference, then it is possible that pilot control inputs may cause the helicopter to depart from normal flight regimes. If the helicopter departs from normal flight regimes and hub to mast contact occurs, it may be possible for the main rotor to contact the tail boom in-flight.’(Figure 10)

**Figure 10: Typical main rotor contact to tail**



### Spatial disorientation

Spatial disorientation is a type of loss of situation awareness, and it is different to geographical disorientation (i.e. incorrectly perceiving the aircraft’s distance or bearing from a fixed location). Spatial disorientation occurs when pilots do not correctly sense their aircraft’s attitude, airspeed or altitude in relation to the Earth’s surface. In terms of attitude, it is often described simply as the inability to determine ‘which way is up’.

Spatial disorientation occurs when the brain receives conflicting or ambiguous information from the sensory systems, and is likely in conditions in which visual cues are poor or absent, such as in adverse weather or at night. Spatial disorientation presents a danger to pilots, as the resulting confusion can often lead to incorrect control inputs and resultant loss of aircraft control.

More information about spatial disorientation can be found in the ATSB aviation research and analysis report B2007/0063 - *An overview of spatial disorientation as a factor in aviation accidents and incidents*.

## VFR into IMC

In July 2011, the ATSB published a research report titled *Accidents involving Visual Flight Rules pilots in Instrument Meteorological Conditions*<sup>8</sup> as part of the ongoing *Avoidable Accidents* series. The report identified 72 instances of VFR pilots flying into instrument meteorological conditions (IMC) in a 5 year period, resulting in seven fatal accidents and 14 fatalities. The report listed three key messages:

- Avoiding deteriorating weather or IMC requires thorough pre-flight planning, having alternate plans in case of an unexpected deterioration in the weather, and making timely decisions to turn back or divert.
- Pressing on into IMC conditions with no instrument rating carries a significant risk of severe spatial disorientation due to powerful and misleading orientation sensations in the absence of visual cues. Disorientation can affect any pilot, no matter what their level of experience.
- VFR pilots are encouraged to use a 'personal minimums' checklist to help control and manage flight risks through identifying risk factors that include marginal weather conditions.

## Pilot decision making

Other pilots who had flown for the helicopter owner indicated that the owner had a strong expectation that flight would be continued in meteorological conditions that the pilots' considered as marginal. In those cases, the pilots might sometimes manage the owner's expectations by delaying a diversion until the weather was clearly impassable.

During an interview with ATSB investigators, the usual pilot of the helicopter indicated that on the afternoon prior to the accident flight, the poor weather outlook was discussed with the helicopter owner. The usual pilot of the helicopter also reported to the ATSB that the owner was advised to drive to the hospital the following morning, but that the owner was insistent that the helicopter flight go ahead as planned.

To accommodate the owner's desire that the flight proceed, arrangements were made that if the weather was unsuitable for the flight, the pilot was to call the owner before 0800, with the understanding that the owner would make alternative arrangements to get to the hospital. There was no record of such a phone call being made on the day of the accident.

## Similar accidents

In 1991, a Bureau of Air Safety Investigation (now ATSB) investigation (199102520) was conducted into a similar occurrence. This accident involved over-control input by the pilot, leading to hub to mast contact, main rotor contact and separation of the tail boom. The Bell 206L helicopter impacted terrain after loss of control. All seven occupants were fatally injured.

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<sup>8</sup> The report is available for download from the ATSB website <http://www.atsb.gov.au>

A similar accident involving spatial disorientation was examined in ATSB Investigation AO-2009-077 and involved a Bell 206L-1 *LongRanger*. As the helicopter became airborne, the pilot encountered reduced visibility conditions due to low cloud and lost all visual reference with the horizon and the ground. The pilot attempted to land, but the helicopter impacted the ground in an uncontrolled state and with significant vertical force. The passenger was fatally injured and the pilot was seriously injured. The helicopter was seriously damaged.

### **Survival aspects**

Due to the forces involved during the accident sequence and the severity of damage to the cabin, the accident was not considered survivable.

The helicopter was fitted with an appropriate Emergency Locator Transmitter (ELT) with a single axis 'G' switch which would be activated in the 'armed' mode with the appropriate g-loads in the specified direction printed on the label affixed to the ELT. The unit's switch was found in the 'armed' position; however, the unit had not activated, probably due to the inverted attitude of the helicopter as it impacted terrain. Subsequent technical examination of the unit showed that it remained functional and activated normally when exposed to g-loads along the marked axis required to trigger the 'G' switch.

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# ANALYSIS

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## Introduction

Witnesses reported the helicopter appearing beneath the cloud with the tail section separated before colliding with terrain. The ATSB found that the circumstances of this occurrence were consistent with a loss of control resulting from visual flight into non-visual conditions (instrument meteorological conditions -IMC). The following analysis examines the development of the accident sequence.

## Loss of control

Evidence found at the accident site confirmed that the main rotor blade/s had struck and severed the helicopter's tail boom. When that occurred, the helicopter lost the tail rotor thrust that normally opposes main rotor torque effect, seriously compromising directional control. In addition, loss of the tail boom removed the stability provided by the vertical and horizontal stabilisers. From that point, control of the helicopter was no longer possible and collision with terrain unavoidable.

For an under-slung teetering-rotor helicopter such as CIV, main rotor contact with the tail boom is a symptom of either a main rotor system defect or flight outside normal operating parameters. In this case, no abnormalities were found in the main rotor blades or control system.

Flight outside normal operating parameters usually occurs as a result of an encounter with extreme environmental conditions and/or inappropriate control inputs. The ATSB did not find any evidence that such extreme environmental conditions (such as severe turbulence) existed at the time of the accident.

As indicated by the helicopter manufacturer, inappropriate control inputs can occur during low-g or aerobatic manoeuvres. Given the pilot's experience (both generally and on this helicopter type), it is unlikely that the pilot attempted such manoeuvres or mismanaged control of the helicopter while in visual meteorological conditions.

From witness information and Bureau of Meteorology reports, it was evident that the pilot approached and entered an area of low cloud and rain that significantly reduced visibility. In those conditions, the pilot climbed from 700 ft to 1,300 ft. By climbing, the pilot reduced his ability to maintain reference with the ground and consequently, his ability to maintain spatial orientation. The pilot also was at an increased risk of entering cloud that extended down to 700 ft in areas around and at the time of the accident

As a result, the pilot probably entered IMC and was limited in his capacity to safely continue the flight. The pilot was not trained or qualified for instrument flight, nor was the helicopter equipped with the required instruments, such as an artificial horizon. In those circumstances the pilot probably became spatially disoriented, leading to inappropriate control inputs, the main rotor blades striking the tail boom and loss of control.

## **Operational safety considerations**

The Automatic Terminal Information Service (ATIS) weather information accessed by the pilot before the commencement of the flight indicated that the conditions were suitable for visual flight in the Bankstown and Sydney airport terminal areas. However, it is likely that the pilot did not obtain the required forecasts for the intended flight areas; forecasts that indicated deteriorating weather along the planned route. While these forecasts may not have changed the pilot's decision to proceed with the flight, a broader study of the available weather reports and forecasts would have given the pilot an improved awareness of the conditions and the opportunity to develop an appropriate plan for the intended flight.

Once the pilot departed from Rosehill, he was reliant on in-flight observations of the weather conditions. Based on his recent Papua New Guinea experience, the pilot was probably competent in assessing variable weather conditions in areas of elevated terrain. It is therefore not clear why he persisted in continuing towards the destination in deteriorating weather. However, in not having cancelled the flight at the agreed cut-off time of 0800, the pilot's decision making might have been adversely influenced by a desire to complete the task and meet the helicopter owner's expectation of reaching the hospital by air in a timely manner.

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## FINDINGS

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From the evidence available, the following findings are made with respect to the collision with terrain at South Turramurra, New South Wales on 22 July 2011, of a Bell 206L helicopter (registered VH-CIV), and should not be read as apportioning blame or liability to any particular organisation or individual.

### **Contributing safety factors**

- The pilot was not qualified for instrument flight nor was the helicopter equipped with the required instruments, such as an artificial horizon.
- In low cloud and rain, the pilot climbed from 700 ft to 1300 ft, reducing his ability to maintain visual reference with the ground.
- The pilot probably became spatially disoriented, leading to inappropriate control inputs, the main rotor blades severing the tail boom and loss of control.

### **Other safety factors**

- The pilot probably did not obtain the weather forecasts required for the intended flight.

### **Other key findings**

- There was no evidence that any helicopter airworthiness or serviceability issues had contributed to the accident.
- There was no evidence the pilot was affected by a medical condition that could have affected his ability to control the helicopter.

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## APPENDIX: SOURCES AND SUBMISSIONS

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### Sources of Information

- Eye witnesses and general witnesses
- Other pilot of VH-CIV
- Bureau of Meteorology
- Mobile phone service provider
- Maintenance documentation
- Aircraft daily operations records
- Pilot log books
- NSW Police & Coroner
- Bell Textron
- Airservices Australia
- Civil Aviation Safety Authority
- ATSB reports
- Google Earth

### References

ATSB Aviation Occurrence Investigation Report, AO-2009-070  
*Visual flight into instrument meteorological conditions – Dorrigo, NSW, 9 December 2009, VH-MJO, Bell Helicopter 206L-1 LongRanger*  
[http://www.atsb.gov.au/publications/investigation\\_reports/2009/aa/ao-2009-077.aspx](http://www.atsb.gov.au/publications/investigation_reports/2009/aa/ao-2009-077.aspx)

ATSB Aviation Research Report, AR-2011-050  
*Avoidable Accidents No.4 - Accidents involving Visual Flight Rules pilots in Instrument Meteorological Conditions*  
<http://www.atsb.gov.au/publications/2011/ar2011050.aspx>

### Submissions

Under Part 4, Division 2 (Investigation Reports), Section 26 of the Transport Safety Investigation Act 2003, the ATSB may provide a draft report, on a confidential basis, to any person whom the ATSB considers appropriate. Section 26 (1) (a) of the Act allows a person receiving a draft report to make submissions to the ATSB about the draft report.

A draft of this report was provided to the next of kin of the pilot and the passenger, the helicopter maintainer, the helicopter manufacturer (via the Accredited Representative to the State of Manufacture), the Civil Aviation Safety Authority (CASA), the Bureau of Meteorology and the NSW State Coroner.

Responses received from those parties have been reviewed and where relevant, the text of the final report was amended to clarify the information presented.

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**Investigation**

**ATSB Transport Safety Report**

Aviation Occurrence Investigation

VFR into IMC – Bell 206L Helicopter, VH-CIV, South Turramurra,  
New South Wales, 22 July 2011

AO-2011-085

Final