



**Australian Government**

**Australian Transport Safety Bureau**

# Loss of control involving a Bell 206L3, VH-BLV

Falls Creek, Victoria, on 20 July 2015

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

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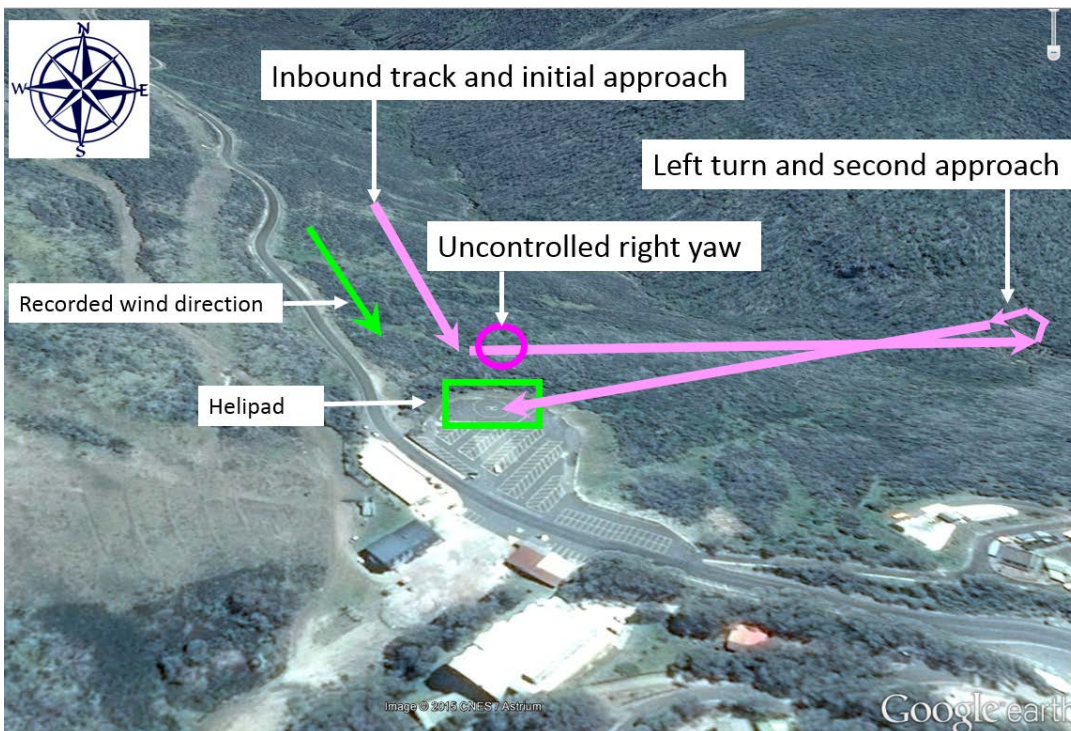
# Loss of control involving a Bell 206L3, VH-BLV

## What happened

On 20 July 2015, the pilot of a Bell 206L3 (Longranger) helicopter, registered VH-BLV (BLV), conducted a charter flight from Essendon Airport to Falls Creek, Victoria, with five passengers on board. The aircraft took off from Essendon close to its maximum take-off weight. Due to the weight, and therefore fuel limitations, the pilot landed and refuelled at a property near Lake Eildon. At about 1000 Eastern Standard Time (EST), the helicopter departed from the property for the 60 NM flight to Falls Creek, again close to its maximum take-off weight.

At about 1030, while 700 ft above ground level and tracking from the north-west, the pilot conducted a shallow approach towards the helipad at Falls Creek (Figure 1). As the helicopter descended to about 50 ft above ground level, the pilot found that significantly more power was required to conduct the approach than anticipated. The pilot assessed that there was insufficient power available to continue to land, and elected to abort the approach. The pilot pushed forwards on the cyclic<sup>1</sup> to increase the helicopter's airspeed and conducted a left turn towards the valley.

**Figure 1: Falls Creek helipad, approximate helicopter track and wind direction**



Source: Google earth and pilot recollection – annotated by the ATSB

As the helicopter turned left, it started to yaw<sup>2</sup> rapidly towards the right. The pilot applied full left pedal to counteract the yaw, but the helicopter continued to yaw. The helicopter turned through one and a half revolutions, as the pilot lowered the collective.<sup>3</sup> Lowering the collective reduced the

<sup>1</sup> A primary helicopter flight control that is similar to an aircraft control column. Cyclic input tilts the main rotor disc varying the attitude of the helicopter and hence the lateral direction.  
<sup>2</sup> Term used to describe motion of an aircraft about its vertical or normal axis.  
<sup>3</sup> A primary helicopter flight control that simultaneously affects the pitch of all blades of a lifting rotor. Collective input is the main control for vertical velocity.

power demand of the power rotor system, thereby increasing the ability of the anti-torque pedals to stop the right yaw. The combination of lowering collective and applying forward cyclic to gain forward airspeed, allowed the pilot to regain control of the helicopter. The pilot then conducted a left turn towards the helipad and made an approach to the helipad from an easterly direction. The helicopter landed following the second approach without further incident.

The pilot and passengers did not sustain any injuries and the helicopter was undamaged.

### ***Weather***

The pilot expected that the wind at Falls Creek would be variable at 2 kt, as it had been on departure from Essendon. The pilot did not see the windssock at the helipad prior to conducting the approach.

The Bureau of Meteorology provided the ATSB with a report of weather observations for Falls Creek. The automatic weather station is located south of the helipad at about 5,790 ft above mean sea level, above the village. Between 1020 and 1040, the recorded wind speed was from 17 to 20 kt, gusting to 24 kt, and wind direction was from 327° to 344° (degrees true), or 314° to 331° (degrees magnetic). The temperature was -1 °C.

### ***Pilot comments***

The pilot reported that the following combination of factors contributed to the incident:

- Unfamiliarity with the landing site and area.
- Inexperience operating at altitude, and unfamiliarity with the associated power requirements. The helipad at Falls Creek is at an elevation of about 5,000 ft above mean sea level.
- Lack of experience in the aircraft type – although the pilot had about 60 hours experience in the Bell Jetranger, this was only the pilot's second flight in the Longranger.
- High all up weight.
- Incorrect assessment of the wind direction – the pilot assumed that the wind would be light and variable at Falls Creek as it was had been on departure from Essendon. During the approach, the pilot assessed that the wind was from the right or a tailwind gusting to about 15 kt.

### ***Operator comment***

The operator of VH-BLV assessed that the unanticipated yaw was a result of too little pedal input, applied too late. This was most likely due to a combination of the pilot's inexperience on the 206L3, and being surprised by the downwind approach.

### ***Hover ceiling***

Hovering requires more power than any other flight regime. Additionally, hovering at higher altitudes requires more power than to hover at lower altitudes. The 'hover ceiling' is the height at which the power available equals the power required to hover. An increase in power increases the main rotor torque. This additional torque needs increased tail rotor thrust, to prevent the helicopter from yawing.

The Bell 206 L3 flight manual provides a *Hover ceiling – out of ground effect*<sup>4</sup> chart. At 5,000 ft, a temperature of 0 °C, and a gross weight of about 1,814 kg (4,000 lb), the helicopter was just within the chart's hover ceiling envelope. This indicates that adequate power should have been available to hover with those parameters. However, the wind direction and velocity also affect hovering performance.

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<sup>4</sup> Helicopters require more power to hover out of ground effect due to the absence of a cushioning effect created by the main rotor downwash striking the ground. The distance is usually defined as more than one main rotor diameter above the surface.

A stronger head wind reduces the power required to hover, while a tailwind increases the power required to hover. On the initial approach to the helipad, a tailwind meant that an increase in power and tail rotor thrust was required. The increased tail rotor thrust absorbs power from the engine, which means less power is available for the main rotor to produce lift. This led to the pilot's assessment of insufficient power available, and decision to discontinue the approach.

### ***Unanticipated right yaw***

The US Federal Aviation Administration (FAA) [Helicopter flying handbook](#) describes loss of tail rotor effectiveness (LTE) or an unanticipated yaw, as 'an uncommanded, rapid yaw towards the advancing blade which does not subside of its own accord'. It is caused by an interaction between the main rotor and tail rotor.

At high altitudes, the lower air density reduces tail rotor thrust and efficiency. Therefore, when operating at high altitudes and high gross weights, particularly while hovering or at low airspeeds, the tail rotor thrust may not be sufficient to maintain directional control. This can result in unanticipated yaw or LTE. In these circumstances, the hover ceiling is effectively limited by the tail rotor thrust, rather than the power available.

In this incident, other factors may also have contributed to the unanticipated yaw: low and slow flight outside of ground effect, a low speed downwind turn and a large change of power at low airspeed as the pilot aborted the approach.

The US Federal Aviation Administration Advisory Circular, [Unanticipated right yaw in helicopters](#), stated that unanticipated right yaw, or loss of tail rotor effectiveness (LTE) has been determined to be a contributing factor in a number of accidents. These mishaps have occurred at low altitude and in low-speed flight, often on final approach to landing. Unanticipated right yaw may occur during any manoeuvre in which the pilot is operating in a high-power, low-airspeed environment with a left crosswind (in aircraft with counter-clockwise blade rotation) or tailwind.

Three additional factors can significantly influence the severity of LTE:

- gross weight and density altitude
- low indicated airspeed
- a rapid application of power, causing power droop.

In order to reduce the onset of LTE, when manoeuvring between hover and 30 kt, the pilot should:

- Avoid tailwinds.
- Avoid out of ground effect hover and high power demand situations, such as low-speed downwind turns.
- Be aware of wind direction and velocity. A loss of translational lift results in an unexpected high power demand and an increased anti-torque requirement.
- Be aware that if a considerable amount of left pedal is being maintained, a sufficient amount of left pedal may not be available to counteract an unanticipated right yaw.
- Stay vigilant to power and wind conditions.

If a sudden unanticipated right yaw occurs, the pilot should:

- apply full left pedal
- simultaneously move cyclic forward to increase speed
- if altitude permits, reduce power.

### **Safety message**

Pilots should understand and avoid conditions that are conducive to uncontrolled yaw or loss of tail rotor effectiveness. Pilots can reduce their exposure to LTE by maintaining awareness of the wind and its effect on the helicopter. If a pilot encounters unanticipated yaw, quick application of

the correct response is essential to recover control of the helicopter. The ATSB reported on an incident involving LTE in [AO-2013-121](#).

This incident also highlights the effect of gross weight and airfield elevation on aircraft performance. Understanding controllability issues at the limits of the normal operating envelope can assist pilots in recognising the symptoms of reduced aircraft performance. Further information is available in ATSB report [AO-2013-203](#).

## General details

### Occurrence details

Date and time:	20 July 2015 – 1030 EST	
Occurrence category:	Serious Incident	
Primary occurrence type:	Loss of control	
Location:	Falls Creek, Victoria	
	Latitude: 36° 52.00' S	Longitude: 147° 17.00' E

### Helicopter details

Manufacturer and model:	Bell Helicopter Company 206L3	
Registration:	VH-BLV	
Serial number:	51582	
Type of operation:	Charter – passenger	
Persons on board:	Crew – 1	Passengers – 5
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Nil	

## About the ATSB

The Australian Transport Safety Bureau (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; and 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.

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.

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.