Australian Government
Australian Transport Safety Bureau

Loss of control involving a Eurocopter EC-120B, VH-VMT

16 km N of Ballina/Byron Gateway Airport, New South Wales, 8 December 2013

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Aviation Occurrence Investigation
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Addendum

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Loss of control involving a Eurocopter EC-120B, VH-VMT

What happened

On 8 December 2013, at about 1430 Eastern Daylight-savings Time,[1] a Eurocopter EC-120B helicopter, registered VH-VMT, departed from a property 16 km north of the Ballina/Byron Gateway Airport, New South Wales for a local flight. On board the helicopter were the pilot and two passengers.

At about 1555, the helicopter returned to the property from the north, overflew and approached to land on a heading of about 340º. The pilot reported that the wind was from the north, at about 20 kt.

When about 3 ft above ground level, the pilot reported that he entered the hover[2] with an airspeed of less than 10 kt and with full engine power selected. Immediately after, the helicopter began to yaw to the left. The pilot applied right anti-torque pedal to counteract the yaw and reduced the engine power to idle. The helicopter continued to yaw left and the pilot applied full right anti-torque pedal, but was unable to arrest the rotation. The helicopter rotated left about 90° before the left skid lowered and contacted the ground. It continued to rotate and rolled onto its right side. The helicopter was substantially damaged (Figure 1) and the pilot and passengers were able to evacuate uninjured.

The pilot believed that a combination of main rotor downwash and a wind gust contributed to a loss of tail rotor effectiveness (LTE).

Figure 1: VH-VMT

Source: NSW Police Force

Tail rotor (anti-torque) system

On European designed single rotor helicopters, such as the Eurocopter EC-120B, the main rotor blade rotates in a clockwise direction when viewed from above. The torque required to drive the main rotor causes the fuselage of the helicopter to rotate in the opposite direction, nose left. The tail rotor (anti-torque) system provides thrust, which counteracts this torque and provides directional control during hover.

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1 Eastern Daylight-savings Time (EDT) was Coordinated Universal Time (UTC) + 11 hours.

2 Most take-offs and landings are carried out in a helicopter via the hover as the aircraft is in equilibrium, with the heading, position and height over the surface constant.

Loss of tail rotor effectiveness

Loss of tail rotor effectiveness (LTE) is a critical, low-speed aerodynamic flight characteristic that can result in uncommanded rapid yaw rate, which does not subside of its own accord and, if uncorrected, may result in loss of control. In helicopters with a clockwise-rotating main rotor blade, the resulting yaw is to the left.

LTE may occur in all single main rotor helicopters at airspeeds less than 30 kt. Any manoeuvre that requires the pilot of a clockwise rotating main rotor blade to operate in a high-power, low-airspeed environment with a left crosswind or tailwind creates an environment where unanticipated left yaw may occur. Furthermore, the European Helicopter Safety Team (EHEST) leaflet, *Safety considerations: Methods to improve helicopter pilots' capabilities*,[3] states that LTE is more likely to occur when the critical yaw pedal (the right pedal for the EC-120) is close to the full travel position.

The Eurocopter EC-120 is also fitted with a shrouded tail rotor or Fenestron, which can be similarly affected by LTE as a conventional tail rotor. However, according to Eurocopter Service Letter 1673-67-04[4]:

> With a Fenestron, when transitioning from cruise flight to hover flight, be prepared for a significant movement of the foot to the right. Insufficient application of the rudder pedal will result in a leftward rotation of the helicopter during the transition.
>
> For the same thrust value needed for hover flight, the Fenestron requires a little more action to be applied to the right rudder pedal.

Pilot comment

The pilot reported that he had recently been operating a Eurocopter EC-350 (Squirrel), which required less anti-torque input than the EC-120.

Safety message

In helicopters, wind will cause anti-torque system thrust variations to occur. Certain relative wind directions are more likely to cause tail rotor thrust variations than others. Knowing which direction the wind is coming from is critical. By maintaining an awareness of the wind and its effect on the helicopter, pilots can significantly reduce the exposure to LTE. The EHEST leaflet highlights the importance of pilots recognising the onset of a potential LTE situation and commencing positive recovery actions without delay. The leaflet also details the varying conditions where LTE may occur, how LTE can be avoided, and the how to recover from a LTE.

The following ATSB reports provide additional information regarding LTE accidents:

- www.atsb.gov.au/publications/investigation_reports/2013/aair/ao-2013-016.aspx
- www.atsb.gov.au/publications/investigation_reports/2013/aair/ao-2013-021.aspx
- www.atsb.gov.au/publications/investigation_reports/2008/aair/ao-2008-043.aspx

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[3] www.eurocopter.com/site/docs_wsw/RUB_36/EHEST1_Training_Leaflet_Safety_Considerations.pdf

[4] www.eurocopter.com/site/docs_wsw/RUB_36/1673-67-04en.pdf

General details

Occurrence details

Date and time:	8 December 2013 – 1618 EDT	
Occurrence category:	Accident	
Primary occurrence type:	Loss of control	
Location:	16km N Ballina/Byron Gateway Airport, New South Wales	
	Latitude: 28° 41.68' S	Longitude: 153° 36.40' E

Helicopter details

Manufacturer and model:	Eurocopter EC-120B	
Registration:	VH-VMT	
Serial number:	1619	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – 2
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Substantial	

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.