



Australian Government

Australian Transport Safety Bureau

Wake turbulence encounter and forced landing involving Robinson R44, VH-EWM

About 15 km north-east of Bankstown Airport, New South Wales on 7 April 2025



ATSB Transport Safety Report

Aviation Occurrence Investigation (Short)

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Cover photo: Bankstown Helicopters

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Investigation summary

What happened

At 1021 on 7 April 2025, a Bankstown Helicopters Robinson R44 helicopter, registered VH-EWM (EWM), with a pilot and 2 passengers on board, departed from Bankstown Airport, New South Wales, for a local scenic flight around Sydney Harbour. Shortly after 1028, as EWM was entering the Parramatta River helicopter lane behind an EC120 helicopter, the occupants of EWM experienced a sudden onset of turbulence followed by an uncontrolled descent.

In response, the pilot applied full collective, which resulted in a low rotor speed condition as the helicopter descended towards the water. The pilot was able to manoeuvre the helicopter and complete a forced landing on the river shoreline.

What the ATSB found

The ATSB found that it is likely that EWM entered the rotor wake from a preceding heavier EC120 helicopter, which resulted in the control difficulties, an uncontrolled descent, low rotor speed warning and the forced landing.

Safety message

Flight tests have demonstrated that helicopter wake turbulence is comparatively larger and less predictable in its behaviour than for aeroplanes of the same weight. Helicopter rotor vortices can descend, remain level or climb, and the duration of their persistence can increase significantly in conducive weather conditions. The United States Helicopter Safety Team website recommends remaining 3 rotor disks clear of a hovering or taxiing helicopter and allowing 3 NM and/or 2 minutes for the rotor wake from a preceding helicopter to dissipate.

The investigation

The ATSB scopes its investigations based on many factors, including the level of safety benefit likely to be obtained from an investigation and the associated resources required. For this occurrence, the ATSB conducted a limited-scope investigation in order to produce a short investigation report, and allow for greater industry awareness of findings that affect safety and potential learning opportunities.

The occurrence

At 1021 local time on 7 April 2025, a Bankstown Helicopters Robinson R44 Raven 1 helicopter, registered VH-EWM (EWM), with a pilot and 2 passengers on board, departed from Bankstown Airport, New South Wales for a local scenic flight around Sydney Harbour. Bankstown Tower air traffic control (TWR) cleared EWM to depart via 'Choppers West', which was a standard procedure for helicopters departing to the north when runway 29 was active at Bankstown.

The pilot reported that they climbed to about 1,000 ft above mean sea level.¹ The pilot's plan was to join the Parramatta River on the west side of the Ryde Bridge and descend to 500 ft to follow the helicopter lane² along the south side of the river to Sydney Harbour (Figure 1).

Figure 1: Key locations



Source: Google Earth, annotated by the ATSB

About 1 minute after EWM departed, an Airbus EC120B helicopter departed Bankstown, also following the Choppers West departure. Shortly after the EC120 departed, TWR advised the EC120 pilot that there was 'R44 traffic 1 NM ahead', to which the EC120 pilot reported that they had the traffic sighted. Bankstown TWR then advised the pilot of EWM that they were not receiving their transponder data, which the pilot acknowledged. The pilot of EWM then turned their transponder off and on in an attempt to transmit transponder information, but no data was received from it throughout the incident flight.

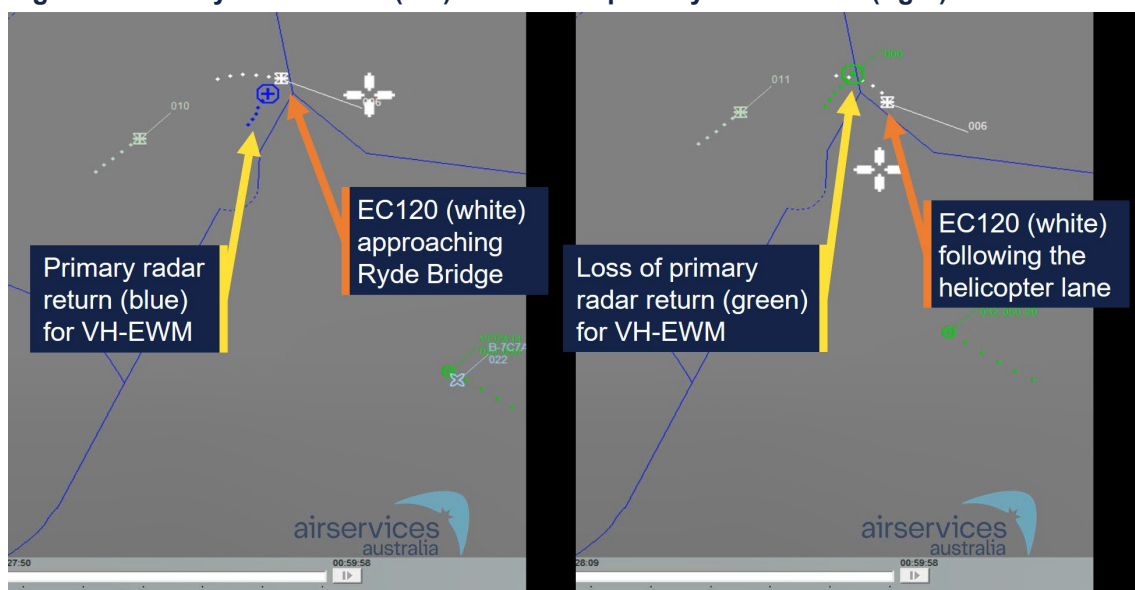
¹ All heights in the report are altitudes unless stated otherwise.

² The helicopter lane from Ryde Bridge to Sydney Harbour Bridge was contained within Restricted Area R405A.

As the 2 helicopters tracked north towards the Parramatta River, the EC120 flew to the west of EWM and passed it before reaching the river. The EC120 then turned right to join the Parramatta River helicopter lane, tracking towards the Ryde Bridge and Sydney Harbour, and passed over the Ryde Bridge at a recorded radar altitude of 600 ft.

The pilot of EWM reported that they descended the helicopter to 500 ft as they approached the river. Just before the pilot turned EWM right to join the helicopter lane, another larger helicopter (the EC120) suddenly appeared in front of them (Figure 2). The pilot of EWM estimated the EC120 was about 500–600 ft (150–180 m) in front of them and about 100 ft above them. While there was no recorded altitude for EWM, primary radar data indicated that EWM entered the lane about 9 seconds behind the EC120.³ Primary radar data for EWM was lost about 10 seconds later, just after 1028, indicating it had descended below radar coverage.

Figure 2: Primary radar return (left) and loss of primary radar return (right) for VH-EWM



Source: Airservices Australia, annotated by the ATSB

The pilot of EWM made a radio broadcast that they were entering the helicopter lane as they crossed the Ryde Bridge behind the EC120. They then experienced what they described as very strong turbulence from a vertical motion in the atmosphere. A passenger later described it as ‘like heavy turbulence ... rolling left and right’ followed by ‘diving towards the water’.

The pilot noted that the helicopter was descending through 400 ft and responded by raising the collective lever.⁴ However, the helicopter continued descending towards the water as it tracked behind and below the EC120. A passenger recalled the pilot announced ‘brace for impact’ as the helicopter approached the water. The pilot applied full collective to avoid the water, which caused the rotor speed to decay sufficiently for the low rotor speed warning horn to activate. They also reported feeling that they could not escape what they believed to be the rotor wake from the EC120. The pilot then sighted a suitable forced landing area at Cabarita Park and, using the helicopter’s

³ Radar data did not display speed for the helicopters, but this would correspond to a separation of 556 m at 120 kt.

⁴ Collective: a primary helicopter flight control that simultaneously affects the pitch of all blades of a lifting rotor and engine power. Collective input is the main control for vertical velocity.

remaining airspeed and rotor speed, manoeuvred the helicopter to the shoreline for a landing.

Following the landing, the pilot rolled the engine throttle back to idle and proceeded through their after-start checks and confirmed normal operations on the ground. The pilot then conducted a hover check and again confirmed normal operations. The pilot attempted radio contact with their operations base but received no reply. They then conducted a return flight to Bankstown without further incident.

Context

Pilot information

The pilot held a commercial helicopter pilot licence, issued on 26 November 2024, with a single-engine helicopter class rating and low-level rating. The pilot held a class 1 aviation medical certificate with no restrictions and expiration date of 30 May 2025. The pilot had accumulated about 112 hours flying experience and the incident flight was the pilot's first commercial flight.

Helicopter information

The incident helicopter, EWM, was a piston-engine 2-bladed Robinson Helicopter Company R44 Raven 1 with a maximum take-off weight of 1,089 kg. The weight and balance data provided by the operator indicated it was within limits for the flight.

The Airbus EC120B was a turbine-engine 3-bladed helicopter with a maximum take-off weight of 1,715 kg. Therefore, the EC120 was about 57% heavier than EWM at their respective maximum take-off weights.

The maintenance release for EWM indicated the helicopter was operated by Bankstown Helicopters in the operational category of Part 133 Air Transport. The maintenance release current at the time of the incident was issued on 3 April 2025 at 4,349 hours total time in service with an expiry date of 3 April 2026 or 4,400 hours. A maintenance test flight was certified on the maintenance release as conducted on 3 April with 'nil defects evident.'

After the incident, the operator's maintenance organisation inspected the helicopter and found no defects. As the flight hours remaining on the helicopter were close to the next overhaul, the operator elected to remove the helicopter from service and have the maintenance organisation complete the overhaul.

Meteorological information

The METAR⁵ recordings for Bankstown Airport at 1000 and 1030 indicated that the wind was westerly at a speed of 9 kt at 1000 and 7 kt at 1030. No cloud was detected. These conditions were consistent with the Bankstown Airport forecast for 8 kt westerly winds. The pilot reported their assessment of the weather was 5 kt of variable wind and CAVOK⁶ conditions, but when they encountered the turbulence over the Ryde Bridge it felt like 40 kt of wind.

⁵ METAR: a routine report of meteorological conditions at an aerodrome. METAR are normally issued on the hour and half hour.

⁶ Ceiling and visibility okay (CAVOK): Visibility 10 km or more, no significant cloud below 5,000 ft, no cumulonimbus cloud and no other significant weather.

Rotor wake turbulence

In 1996, the United States Federal Aviation Administration (FAA) produced a report on the subject of *Flight test investigation of rotorcraft wake vortices in forward flight*. They used a laser doppler velocimeter to measure the vortices and small probe aircraft to test the actual flying conditions. Smoke generation was used to visualise the wake vortices for the probe aircraft. Their investigation concluded that:

- The measured vortex circulation diminished with decreasing airspeed for helicopter airspeeds below 40 knots. At these lower speeds, the wake vortex structure begins to break down and changes to a distinct downwash.
- Vortex duration depends strongly on ambient weather conditions and a variance of 300% was observed on those days most conducive⁷ to vortex persistence and duration compared with those observed on typical days.
- Typically, helicopters with higher gross weight, larger rotor diameters, and larger numbers of rotor blades generated vortices of larger core diameters.
- Probe tests revealed that helicopter vortices did not descend in the same predictable manner as for fixed-wing aircraft. Some vortices descended; some remained level; and some initially descended, levelled off, and then ascended above the altitude of the generating helicopter.

Figure 3: Rotor wake vortices visualised with smoke generators



Visualisation of the wake vortices behind an S-76A helicopter in forward flight with smoke generators from the FAA (1996) flight tests.
Source: Reddit

Meiris (n.d.) provided an article for the United States Helicopter Safety Team website, on the subject of *Avoiding helicopter wake turbulence*. The article referenced the FAA 1996 flight test report and provided the following recommendations:

As a result of these findings and the studies conducted regarding helicopter downwash in a hover, a few guidelines have been developed to increase awareness around helicopter wake turbulence:

- For hovering flight or a hover taxi, stay three rotor diameters away.

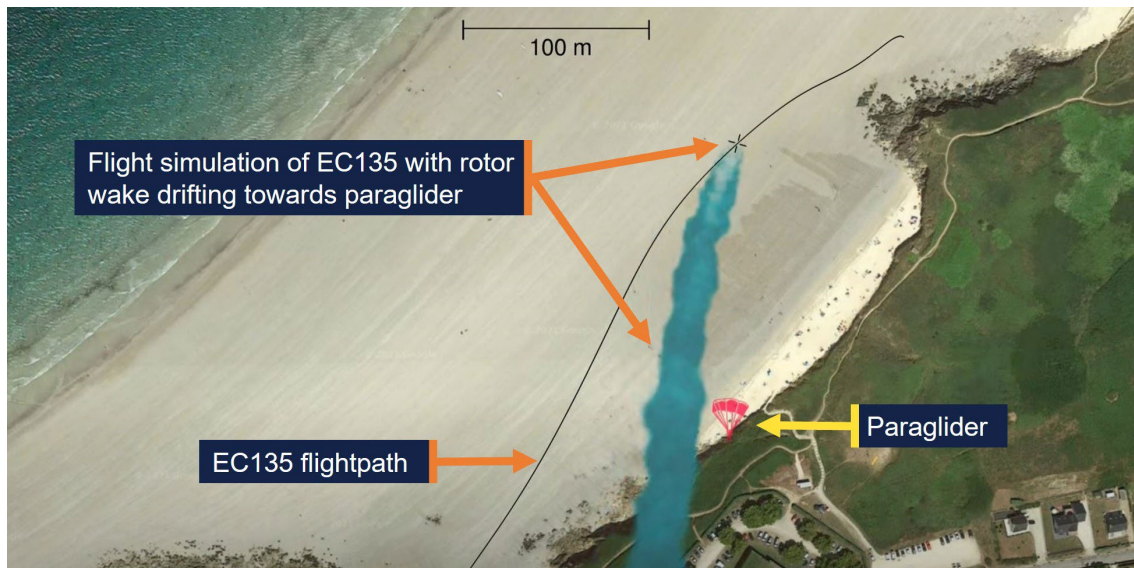
⁷ Studies have shown that atmospheric turbulence hastens wake breakup, while other atmospheric conditions can transport wake horizontally and vertically (FAA, 2023).

- For forward flight, a minimum of 3 nm [NM] separation is recommended, especially from larger helicopters. The investigation we discussed previously discovered that even at 3nm [NM], the planes encountered uncommanded pitch and roll oscillations.
- Leave 2 minutes for the rotor vortices to dissipate behind a helicopter in forward flight.

Related occurrences

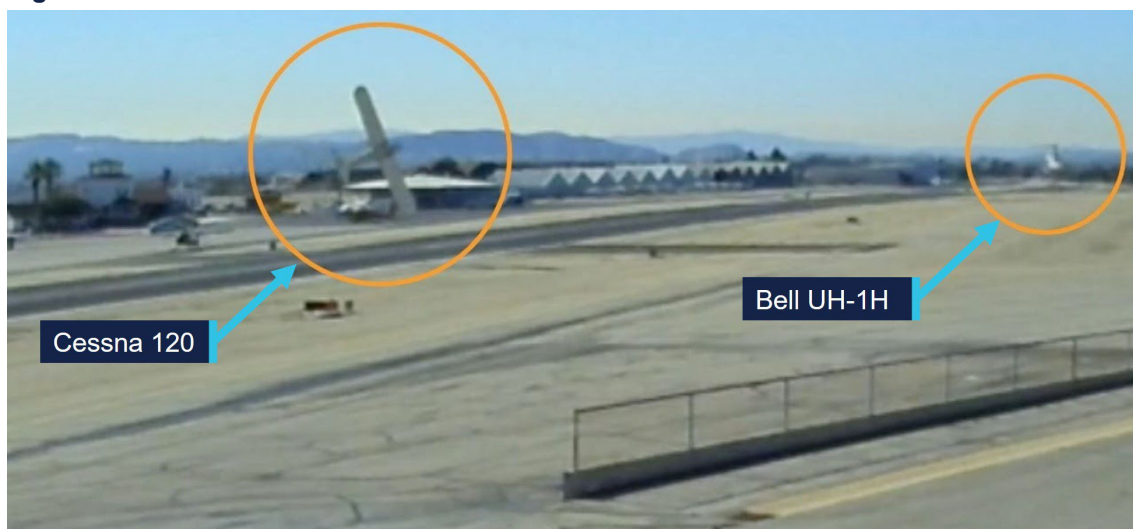
The French Bureau of Enquiry and Analysis for Civil Aviation Safety investigation [BEA2019-0234](#), *Accident to a paraglider involving the Airbus - EC135 - T2 PLUS registered F-HTIN*, examined a fatal paraglider accident in 2019. The paraglider's wing collapsed after encountering the rotor wake from an Airbus EC135 helicopter, which drifted with the wind from the helicopter's flightpath onto the paraglider (Figure 4).

Figure 4: Simulation of rotor wake drifting onto the paraglider



Source: YouTube – Bureau of Enquiry and Analysis for Civil Aviation Safety, annotated by ATSB

The 2022 United States National Transportation Safety Board investigation [WPR22LA072](#) found that the pilot of a Cessna 120 attempted a go-around about 20 seconds behind the passage of a Bell UH-1H helicopter. During the go-around the Cessna encountered wake turbulence, resulting in a loss of control and collision with terrain (Figure 5). The report indicated light wind conditions of 4 kt at the airport.

Figure 5: Loss of control accident from rotor wake

Source: YouTube – Aviation Safety Network, annotated by ATSB

Safety analysis

Primary radar data and the pilot's report indicated that EWM entered the Parramatta River helicopter lane and passed over the Ryde Bridge about 9 seconds behind and slightly below the EC120 helicopter. At this point, EWM encountered heavy turbulence, an uncontrolled descent and a low rotor speed when the pilot applied full collective to avoid a collision with the water.

The uncontrolled descent and low rotor speed condition resulted in the pilot conducting a forced landing on the shoreline of the Parramatta River.

The incident occurred under relatively calm wind conditions and EWM operated in a serviceable condition for the return flight. Subsequent maintenance inspections of the helicopter found no fault. Furthermore, EWM passed overhead the Ryde Bridge in sufficient proximity to a preceding heavier 3-bladed helicopter to be subject to a rotor wake induced upset. Therefore, the ATSB concluded that the sudden onset of turbulence and uncontrolled descent were likely the result of EWM encountering rotor wake turbulence from a preceding EC120 helicopter.

Findings

ATSB investigation report findings focus on safety factors (that is, events and conditions that increase risk). Safety factors include ‘contributing factors’ and ‘other factors that increased risk’ (that is, factors that did not meet the definition of a contributing factor for this occurrence but were still considered important to include in the report for the purpose of increasing awareness and enhancing safety). In addition, ‘other findings’ may be included to provide important information about topics other than safety factors.

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

From the evidence available, the following findings are made with respect to the wake turbulence encounter and forced landing involving Robinson R44, VH-EWM, about 15 km north-east of Bankstown Airport, New South Wales, on 7 April 2025.

Contributing factors

- It is likely that the incident helicopter entered the rotor wake from a preceding heavier helicopter, which resulted in control difficulties, an uncontrolled descent, low rotor speed warning and a forced landing.

General details

Occurrence details

Date and time:	7 April 2025 – 1028 Eastern Standard Time	
Occurrence class:	Serious incident	
Occurrence categories:	Turbulence, Control issues, Forced / Precautionary landing, Warning devices	
Location:	About 15 km north-east of Bankstown Airport	
	Latitude: 33.8243° S	Longitude: 151.0956° E

Aircraft details

Manufacturer and model:	Robinson Helicopter Company R44	
Registration:	VH-EWM	
Operator:	Bankstown Helicopters Pty Limited	
Serial number:	1394	
Type of operation:	Part 133 Air transport operations - Rotorcraft	
Activity:	Commercial air transport-Non-scheduled-Joyflights / sightseeing charters	
Departure:	Bankstown Aerodrome, New South Wales	
Destination:	Bankstown Aerodrome, New South Wales	
Persons on board:	Crew – 1	Passengers – 2
Injuries:	Crew – 0	Passengers – 0
Aircraft damage:	None	

Sources and submissions

Sources of information

The sources of information during the investigation included:

- Airservices Australia
- Civil Aviation Safety Authority
- the operator and maintenance organisation for VH-EWM
- the pilot and passengers of the incident flight

References

Bureau of Enquiry and Analysis for Civil Aviation Safety. (2021). *Accident to a paraglider involving the Airbus - EC135 - T2 PLUS registered F-HTIN on 11 May 2019 at Le Conquet (Finistère)*. https://bea.aero/fileadmin/user_upload/BEA2019-0234.en.pdf

Federal Aviation Administration. (2023). *Aeronautical information manual*. http://www.faa.gov/air_traffic/publications

Federal Aviation Administration. (1996). *Flight test investigation of wake vortices generated by rotorcraft in forward flight* (DOT/FAA/CT-94/117). <https://apps.dtic.mil/sti/tr/pdf/ADA318103.pdf>

Meiris, J. (n.d.). *Avoiding helicopter wake turbulence*. <https://ushst.org/avoiding-helicopter-wake-turbulence/>

National Transportation Safety Board. (2022). *Aviation investigation final report* (WPR22LA072). Investigation docket <https://data.nts.gov/Docket?ProjectID=104480>

Submissions

Under 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. That section 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 following directly involved parties:

- Civil Aviation Safety Authority
- the maintenance organisation for VH-EWM
- the operator and pilot of the incident flight.

No submissions were received.

About the ATSB

The **Australian Transport Safety Bureau** is the national transport safety investigator. Established by the *Transport Safety Investigation Act 2003* (TSI Act), the ATSB is an independent statutory agency of the Australian Government and is governed by a Commission. The ATSB is entirely separate from transport regulators, policy makers and service providers.

The ATSB's function is to improve transport safety in aviation, rail and shipping through:

- the independent investigation of transport accidents and other safety occurrences
- safety data recording, analysis, and research
- influencing safety action.

The ATSB prioritises investigations that have the potential to deliver the greatest public benefit through improvements to transport safety.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, international agreements.

Purpose of safety investigations

The objective of a safety investigation is to enhance transport safety. This is done through:

- identifying safety issues and facilitating safety action to address those issues
- providing information about occurrences and their associated safety factors to facilitate learning within the transport industry.

It is not a function of the ATSB to apportion blame or provide a means for determining 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.

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