



**Australian Government**

**Australian Transport Safety Bureau**

# Hard landing involving Cabri G2, VH-CDU

Bankstown Airport, 25 October 2012

**ATSB Transport Safety Report**  
Aviation Occurrence Investigation  
AO-2012-140  
Final – 27 February 2013

Released in accordance with section 25 of the *Transport Safety Investigation Act 2003*

#### **Publishing information**

**Published by:** Australian Transport Safety Bureau  
**Postal address:** PO Box 967, Civic Square ACT 2608  
**Office:** 62 Northbourne Avenue Canberra, Australian Capital Territory 2601  
**Telephone:** 1800 020 616, from overseas +61 2 6257 4150  
Accident and incident notification: 1800 011 034 (24 hours)  
**Facsimile:** 02 6247 3117, from overseas +61 2 6247 3117  
**Email:** [atsbinfo@atsb.gov.au](mailto:atsbinfo@atsb.gov.au)  
**Internet:** [www.atsb.gov.au](http://www.atsb.gov.au)

© Commonwealth of Australia 2013



#### **Ownership of intellectual property rights in this publication**

Unless otherwise noted, copyright (and any other intellectual property rights, if any) in this publication is owned by the Commonwealth of Australia.

#### **Creative Commons licence**

With the exception of the Coat of Arms, ATSB logo, and photos and graphics in which a third party holds copyright, this publication is licensed under a Creative Commons Attribution 3.0 Australia licence.

Creative Commons Attribution 3.0 Australia Licence is a standard form license agreement that allows you to copy, distribute, transmit and adapt this publication provided that you attribute the work.

The ATSB's preference is that you attribute this publication (and any material sourced from it) using the following wording: *Source:* Australian Transport Safety Bureau

Copyright in material obtained from other agencies, private individuals or organisations, belongs to those agencies, individuals or organisations. Where you want to use their material you will need to contact them directly.

# Hard landing involving Cabri G2, VH-CDU

## What happened

On 25 October 2012, at about 1510 EDT<sup>1</sup> a Hélicoptères Guimbal Cabri G2 (Cabri G2) helicopter, registered VH-CDU (CDU), landed heavily at Bankstown Airport, New South Wales. On board the helicopter were an instructor and a student pilot.

The purpose of the flight was to demonstrate the recovery procedure from various emergencies in the hover, including engine failure, loss of yaw control and low main rotor revolutions per minute (RPM).

A short briefing was performed by the instructor and at 1445 CDU departed for the western grass helicopter training area at Bankstown Airport. The instructor commenced the lesson by demonstrating a number of jammed pedal exercises and the recovery procedure. The instructor then proceeded to demonstrate a low main rotor RPM<sup>2</sup> situation and the recovery procedure.

The instructor reported that it was his usual practice to initiate the low RPM situation by overriding the governor<sup>3</sup> and winding the throttle<sup>4</sup> closed slightly to reduce the main rotor RPM to about 95% RPM<sup>5</sup> (513 RPM). However, in this case he could not recall specifically what value the RPM was reduced to, but considered that it was less than 95%. As a result, the helicopter began to rotate to the left at a high rate. The instructor stated that he opposed the rotation with full right pedal<sup>6</sup> however this had no effect on the rate of rotation.

The instructor was unable to maintain the position of the helicopter with the cyclic control, due to the rate of rotation, and the helicopter drifted towards the airport boundary fence. The instructor stated that the speed of rotation started to decrease, however the boundary fence was approaching rapidly. He elected to put the helicopter on the ground rather than see if he could arrest the rotation.

The helicopter landed heavily and remained upright. A further three rotations occurred on the ground before the helicopter came to rest with the tail about 60 cm from the fence. The instructor and student were able to exit the helicopter without injury. There was minor damage to the helicopter as a result of the incident.

**Guimbal Cabri G2**



Source: Helicopter operator

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

<sup>2</sup> Low rotor RPM is a product of insufficient engine power relative to the engine power required. A lack of engine power can be due to a number of reasons including complete engine failure, a partial power loss, the ambient conditions or pilot technique.

<sup>3</sup> The governor is designed to assist in keeping the rotor RPM constant at flight RPM. The governor maintains the engine RPM by sensing changes and applying corrective throttle inputs through a friction clutch which can be overridden by the pilot.

<sup>4</sup> The throttle is situated on the end of the collective and is operated by a twist grip.

<sup>5</sup> Flight RPM of 100% is 530 RPM.

<sup>6</sup> The anti-torque pedals control yaw about the yaw axis by simultaneously varying pitch on the shrouded tail rotor blades.

## ***Weather***

The METAR<sup>7</sup> issued for Bankstown Airport around the time of the incident reported the weather to be fine and the wind as:

- 030° at 8 knots, at 1430
- 060° at 12 knots, at 1500
- 060° at 13 knots, at 1530

The pilot reported that the wind at the time of the accident was gusting to 20 knots<sup>8</sup>.

## ***Pilot information and comments***

At the time of the accident, the instructor held a Commercial Pilot (Helicopter) Licence and a Grade 1 Instructor Rating. The instructor had about 7,500 hours helicopter experience with about 300 hours on the Cabri G2.

The student had approximately 40 hours total time, all on the Cabri G2.

The instructor commented that it was his understanding that the Civil Aviation Safety Authority (CASA) had recommended and required low RPM awareness training be conducted in all helicopter types including the Cabri G2.

The instructor commented that he could not recall what initiated the rotation but considered it may have been as a result of;

- raising the collective or
- his hand may have slipped on the throttle allowing the governor to suddenly open the throttle.

## ***Aircraft information***

The Guimbal Cabri G2 is a two-seat helicopter manufactured in France. It features a 3-bladed main rotor which rotates clockwise when viewed from above. The torque produced by the main rotor causes the fuselage of the helicopter to rotate in the opposite direction (nose left in this case). The anti-torque system comprises a 7-bladed shrouded tail rotor<sup>9</sup> in place of a conventional tail rotor. The shrouded tail rotor provides thrust, which counteracts the main rotor torque and provides directional control while hovering.

## ***Manufacturer comments***

The main rotor of the Cabri has a high inertia, with a t/k criteria<sup>10</sup> of 1.6 seconds, compared to other helicopters in a similar category where a figure between 0.8 and 1.1 seconds is common. At 85 per cent RPM (450 RPM) the main rotor produces the maximum amount of lift. That is the main rotor initially produces more lift as the RPM is reduced below the normal flight RPM (at 100 % or 530 RPM).

Both the European Aviation Safety Agency (EASA) and the US Federal Aviation Administration (FAA) certification requirements are that the helicopter (in this category) can be controlled in yaw with a 17 knot wind from every direction at the maximum gross weight for the density altitude and at the minimum powered rotor speed (515 RPM or 95% in the Cabri G2). The Cabri G2 exceeds the certification requirements and has demonstrated that yaw can be controlled at a main rotor speed as low as 85 % RPM (450 RPM) in nil wind conditions (Figure 1). Following the incident, the

---

<sup>7</sup> Routine aerodrome weather report issued at fixed times, hourly or half hourly

<sup>8</sup> Maximum wind speed is only reported when the maximum wind speed is 10kts or more than the mean wind speed.

<sup>9</sup> Helicopter tail rotor with numerous blades rotating in a short duct inset into the fin.

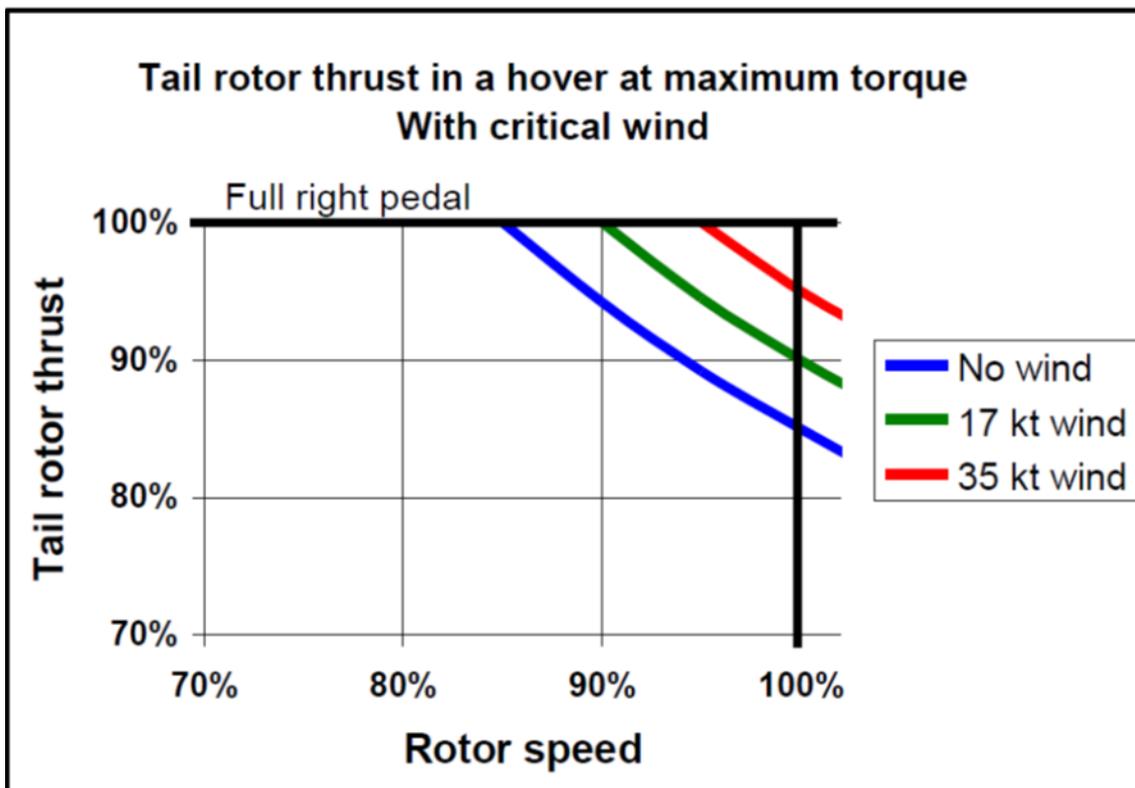
<sup>10</sup> t/k criteria is the standard by which the auto rotational ability is measured. It is calculated by dividing the useable rotor inertia (to rotor stall) by the power required to hover. t/k provides an indication of the time to land (in a hover) or time to enter autorotation (in cruise) after an engine failure at full power.

helicopter manufacturer examined CDU and considered that the main rotor RPM was likely between 70 and 75 % when CDU contacted the ground.

The electronic RPM governor in the Cabri controls the rotor speed within a maximum variation of +/- 3 %. It is possible to override the governor and lower the main rotor speed below the minimum controllable value of 85 % (Figure 1) while demonstrating low rotor speed in a hover. Increasing the torque in order to recover the rotor RPM in this situation may exceed the anti-torque capability of the shrouded tail rotor.

The Cabri G2's high main rotor inertia will make the yaw departure to the left comparatively quick. Moreover, if the governor is not turned off for the manoeuvre, the governor will react quickly in the event the pilot stops overriding it, contributing to the speed of departure in yaw to the left. The manufacturer commented that practising low main rotor RPM recovery in ground effect or at low altitudes poses an unnecessary risk and is not warranted in the Cabri G2 when a similar manoeuvre could be practised safely above 1000 ft above ground level. Such a manoeuvre at low altitude is not described or recommended in the aircraft flight manual.

**Figure 1:** Tail rotor thrust margin versus rotor speed at maximum torque



Source: *Hélicoptères Guimbal*

### ATSB comment

In 1995, the US FAA responded to the issue of a failure to recognise the onset of settling with power, low rotor RPM and over-pitching in low speed operations in the Robinson R22 and R44 helicopter types by issuing Special Federal Aviation Regulation (SFAR) No.73. This regulation mandated annual awareness training, minimum aeronautical experience and flight review for pilots of the R22 and R44 helicopters.

ATSB report AO-2008-062, *Collision with terrain, 6 km NE of Purnululu ALA, Western Australia, 14 September 2008*, identified a safety issue with the Australian helicopter training syllabus. The issue identified was that there was no Australian requirement for endorsement and recurrent

training conducted on Robinson R22/R44 helicopters to specifically address the preconditions for low rotor RPM or the recovery procedure. The report is available at:

- [www.atsb.gov.au/publications/investigation\\_reports/2008/aair/ao-2008-062.aspx](http://www.atsb.gov.au/publications/investigation_reports/2008/aair/ao-2008-062.aspx)

CASA responded to the safety issue raised by the ATSB and recommendations of the WA Coroner and conducted a flight training meeting with industry helicopter Chief Flying Instructors (CFI) and Authorised Testing Officers (ATOs) in May 2011. This meeting specifically discussed the R22 and R44 and SFAR No.73. However it was recommended that a project to amend Civil Aviation Order (CAO) 40.3.0 be initiated to incorporate awareness training for any light single engine helicopter identified as an at risk type for the relevant key hazards contained in SFAR No.73.

On 19 December 2011, CASA approved project; OS 11/52 to include the requirement for Awareness Training to be conducted as part of endorsement for initial pilot training and endorsement and recurrent training on all helicopters identified as an at risk type. This would include a review of the Helicopter Flight Instructors Manual.

- Project OS 11/52 is available at:  
[www.casa.gov.au/scripts/nc.dll?WCMS:PWA::pc=PC\\_100815](http://www.casa.gov.au/scripts/nc.dll?WCMS:PWA::pc=PC_100815)

## Safety action

Whether or not the ATSB identifies safety issues in the course of an investigation, relevant organisations may proactively initiate safety action in order to reduce their safety risk. The ATSB has been advised of the following proactive safety action in response to this occurrence.

### **Manufacturer**

As a result of this occurrence, the manufacture has advised the ATSB that they are taking the following safety actions:

- A service letter (SL) is being prepared intended to help prevent inappropriate training procedures for the helicopter type.

## Safety message

This accident highlights that different helicopter types have their own specific handling characteristics and that pilots should be familiar with the emergency procedures prescribed by the helicopter manufacturer's flight manual and the immediate actions to be performed to ensure a successful outcome.

The following publications provide useful information;

- ATSB investigation: Guimbal Cabri G2, VH-ZZT  
[www.atsb.gov.au/publications/investigation\\_reports/2012/aair/ao-2012-055.aspx](http://www.atsb.gov.au/publications/investigation_reports/2012/aair/ao-2012-055.aspx)
- BFU Investigation: BFU 3X036-10: Guimbal Cabri G2  
[www.bfu-web.de/nn\\_223970/DE/Publikationen/Untersuchungsberichte/2010](http://www.bfu-web.de/nn_223970/DE/Publikationen/Untersuchungsberichte/2010)
- AAIB Investigation: Guimbal Cabri G2, G-UIMB  
[www.aaib.gov.uk/publications/bulletins/march\\_2012/guimbal\\_cabri\\_g2\\_g\\_uimb.cfm](http://www.aaib.gov.uk/publications/bulletins/march_2012/guimbal_cabri_g2_g_uimb.cfm)

## General details

Manufacturer and model:	Hélicoptères Guimbal Cabri-G2	
Registration:	VH-CDU	
Type of operation:	Flying training	
Primary occurrence type:	Hard landing	
Location:	Bankstown airport, New South Wales	
	Latitude: S 33° 55.47'	Longitude: E 150° 59.30'
Persons on board:	Crew – 2	Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Minor	

## About the ATSB

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; 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.