



Australian Government

Australian Transport Safety Bureau

Collision with terrain involving a Schweizer 269C-1, VH-FTY

Parafield Airport, South Australia, 24 December 2014

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Addendum

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Collision with terrain involving a Schweizer 269C-1, VH-FTY

What happened

On the morning of 24 December 2014, an instructor and student were conducting circuits and emergency training in a Schweizer 269C-1 helicopter, on the grass area south of runway 08 at Parafield Airport, South Australia. The weather was clear at the time, with a temperature of 19⁰ C. The wind was initially light and variable, but as the flight progressed, the wind became a south-easterly at about 10 kt. After a number of exercises, including simulated engine failures, the instructor assumed control of the helicopter to demonstrate how to respond to a tail rotor failure while hovering.

To assist the student's understanding of what to expect, the instructor planned to slow the exercise down and highlight the component parts of the sequence. Accordingly, the instructor intended to initially demonstrate the yawing motion (main rotor torque effect) that could be expected in the event of a tail rotor failure. To add emphasis, the instructor intended to allow the yawing motion to continue through 360 degrees. As the helicopter neared 360 degrees of rotation, the instructor intended to reduce the throttle setting (reduce the main rotor torque effect) to eliminate the yawing motion. Then he planned to demonstrate how to control the ensuing descent using the remaining inertia of the main rotor.

While in the hover with the skids about 5 ft above ground level (AGL) and the helicopter facing into wind (toward the south-east), the instructor commenced the demonstration by adjusting pedal pressure to initiate a yaw to the right. As planned, the instructor allowed the yaw to continue through about 360 degrees, with the helicopter still about 5 ft AGL. As the helicopter neared 360 degrees of rotation, again facing into the wind, the instructor began reducing engine power by slowly closing the throttle. Contrary to the instructor's intent, as he closed the throttle, the helicopter began yawing rapidly in the opposite direction (to the left), and also drifting sideways to the left. The instructor believed that the drift was probably in part due to the influence of the wind which, because of the unintended yaw to the left, was now a crosswind from the right.

After about 90 degrees of rotation to the left, the instructor was able to arrest the unintended yaw, but despite the application of right cyclic,¹ he was unable to stop the left drift. With the helicopter now descending, the instructor applied full throttle and raised the collective² in an attempt to recover the situation. He heard the engine respond to the throttle application, but at that point main rotor RPM had probably decayed substantially, limiting the immediate effectiveness of throttle application. Even with full right cyclic, the left drift continued as the helicopter touched down on the left skid. The skid initially scuffed the ground and lifted off, then touched down again as the helicopter rolled over the skid onto its left side.

After the helicopter had rolled onto its side, the instructor switched the battery off and activated the Emergency Location Transmitter.³ The instructor directed the student to shut the fuel off, and then assisted the student to evacuate the helicopter through the right door. The instructor then evacuated the helicopter behind the student. Apart from some minor bruising, both the instructor and student were uninjured. The helicopter main rotor assembly and upper-left cabin area were damaged in the accident (Figure 1). The tail rotor also showed some evidence of having scuffed the ground during the accident sequence.

¹ Cyclic is 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.

² Collective is a primary helicopter flight control that simultaneously affects the pitch of all blades of the lifting rotor. Collective input is the main control for vertical velocity.

³ The instructor was unsure at the time if Air Traffic Control staff located in the tower had witnessed the accident.

Figure 1: Orientation of helicopter following accident, facing to the north-east



Source: Helicopter operator

Note: Absorbent material placed next to the fuel tank by emergency services personnel, and the panel on the ground visible in the photograph behind the helicopter, was removed by emergency services personnel following the accident.

Operator's report

The operator's report dealing with the accident found that the instructor introduced complications by endeavouring to slow down the sequence and break it into component parts. These complications placed the helicopter in a situation from which the instructor was unable to effectively recover.

The report noted that the demonstration on this occasion varied from the manner in which a tail rotor failure while hovering would normally be simulated. The exercise normally involved introducing a yaw to the right by varying pedal pressure, then arresting the yaw by smartly closing the throttle to eliminate main rotor torque. The yaw would normally be arrested after less than about 90 degrees of rotation, and the helicopter would then be allowed to sink onto the ground, with the landing cushioned by increasing collective (using existing main rotor inertia). During a normal simulation of tail rotor failure while hovering, the time taken from closing the throttle to touch down is relatively brief (around 2 seconds), allowing the main rotor RPM to be sufficiently preserved to ensure effective control.

On this occasion, slow power reduction would have resulted in a gradual decrease in main rotor RPM and reduced the effectiveness of the instructor's attempts to subsequently control the helicopter. The report noted that, although the instructor applied power and collective in an attempt to recover the situation, main rotor RPM had probably decayed to the point that his control inputs were ineffective. As engine power was increasing, the final motion of the helicopter as it tipped onto its side may have been the result of dynamic rollover.⁴

Instructor's comments

The instructor was concerned that the student did not fully understand the theory behind the recovery technique associated with a tail rotor failure while hovering, even though they had covered the technique during the pre-flight brief. He therefore considered it important to slow the

⁴ In brief, dynamic rollover is the occurrence of a rolling motion while part of the landing gear is acting as a pivot. If the helicopter exceeds a critical angle it will roll onto its side.

exercise down and clearly demonstrate the various stages of the sequence, in order to eliminate any confusion or misunderstanding.

Although the instructor had considerable experience as a fixed wing instructor, he had relatively limited experience in rotary wing instruction, and this was the first time he had taught this particular sequence. He commented that even though he considered himself to be a cautious pilot, his decision to modify the training sequence may have been influenced by a level of confidence that stemmed from his considerable fixed wing experience. The instructor added that with the benefit of hindsight, he would not have broken the sequence down in the manner he attempted.

The instructor indicated that he generally preferred to hover slightly high during some training exercises, to provide a margin for error in the event of any handling difficulties. The instructor recalled that having commenced the demonstration at a height of about 5 ft AGL, and closing the throttle slowly at about that height, there was insufficient main rotor inertia to effectively control the helicopter during the ensuing descent. The instructor believed that the accident may have been avoided if he had commenced the demonstration at a lower height. Less main rotor inertia would have been required to control descent from a lower height, and the crosswind would probably have had less time to influence the motion of the helicopter.

Although the student did not believe that he was applying any force to the controls at the time of the accident, the instructor recalled that the controls felt relatively heavy during the demonstration. Heaviness of the controls may have adversely affected the instructor's ability to control the helicopter, particularly as the unintended yaw and lateral drift developed.

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.

Helicopter operator

In response to this occurrence, the helicopter operator planned a number of actions, including reinforcing appropriate conventions when instructors are demonstrating sequences that involve an increased level of risk. The operator also intended to highlight the importance of appropriate threat and error management to instructors and students engaged in training exercises of this nature.

Safety message

This incident serves to highlight the importance of standardised instructional sequences, and the provision of comprehensive guidance with respect to the associated demonstrations, and the potential safety risks involved. This is particularly important where a demonstration involves substantial manipulation of flight controls and engine power near the ground. Under those circumstances, any mishandling leaves little opportunity for an effective recovery.

Where there is any doubt about the best way to demonstrate a particular sequence to a student, instructors are encouraged to seek guidance from the Chief Flying Instructor. While the training effectiveness of a demonstration is undoubtedly important, of even greater importance is the need to ensure that any associated hazards are identified and effectively managed.

The instructor's comments regarding fixed wing and rotary wing experience are important and insightful. A Safety Information Notice published by Eurocopter (No 2418-S-00) titled Helicopter Airmanship includes the comment:

... A more cautious approach is necessary in the case of experienced fixed wing pilots, who have little helicopter experience. You may be confident and relaxed in the air but will not yet have developed the reflex responses, control feel, coordination and sensitivity necessary in a helicopter

This document is available on-line at www.airbushelicopters.com/website/docs_wsw/pdf/SIN2418-S-00-R0-EN.pdf

Rotary wing flying instructors may find the CASA *Flight Instructor Manual (Helicopter)* and the Federal Aviation Administration *Helicopter Flying Handbook* to be valuable references. These documents are available on-line at:

- www.casa.gov.au/scripts/nc.dll?WCMS:STANDARD::pc=PC_90306
- www.faa.gov/regulations_policies/handbooks_manuals/aviation/helicopter_flying_handbook/

General details

Occurrence details

Date and time:	24 December 2014 – 0858 CST	
Occurrence category:	Accident	
Primary occurrence type:	Collision with terrain	
Location:	Parafield Airport, South Australia	
	Latitude: 34° 47.8' S	Longitude: 138° 37.75' E

Aircraft details

Manufacturer and model:	Schweizer 269C-1	
Registration:	VH-FTY	
Serial number:	0368	
Type of operation:	Flying training	
Persons on board:	Crew – 2	Passengers – nil
Injuries:	Crew – 1 (minor)	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.