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Australian Transport Safety Bureau

Loss of control involving a Robinson R44, VH-RYO

Moorabbin Airport, Victoria, 3 January 2013

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Loss of control involving a Robinson R44, VH-RYO

What happened

Helicopter damage

Source: Helicopter operator

On 3 January 2013, a student pilot of a Robinson R44 (R44) Raven 1 helicopter fitted with fixed floats, registered VH-RYO (RYO), was conducting flying training at Moorabbin, Victoria.

The student had conducted a flight earlier in the day in RYO with a flight instructor and was preparing for a second flight, consisting of solo circuits and a short navigation exercise.

The student conducted his pre-start up checks and attempted to start the engine, without success. After realising that the rotor brake was still engaged, which electrically prevents engine start, he disengaged the brake and started the engine. This was the first time the student had conducted the start-up procedure in the R44 on his own. He then commenced his pre-takeoff checks.

The student signalled to the pilot of another helicopter also preparing to take off, to depart first. The other helicopter departed and the student prepared RYO to become airborne by increasing the engine revolutions per minute (RPM) to 100%. The student slowly raised the collective[1] and applied some left cyclic[2] and left yaw control pedal,[3] the helicopter became light on the skids, and started to slide and yaw to the left. The left skid then caught on the ground twice. The student became tense and immediately raised the collective. He reported that his subsequent movements of the controls were erratic. The helicopter pitched upwards and the tail boom contacted the ground. The helicopter rolled and came to rest on its right side.

The student exited the helicopter. Fuel was observed spilling from the helicopter, but no fire resulted. The student received minor injuries and the helicopter sustained serious damage (Figure 1).

The student reported that he had applied an excessive amount of left cyclic and left yaw control pedal to compensate for the absence of the instructor in the left seat. This resulted in the helicopter sliding and yawing to the left, and the left skid contacting the ground. In an attempt to avoid a dynamic rollover[4], the student inadvertently raised the collective, rather than lowering it to reject the takeoff. The student advised that he was aware of the correct procedure for reacting to an impending dynamic rollover, but for unknown reasons, he responded to the contrary.

A witness reported hearing the rotor RPM behaving erratically and observing the helicopter pitching and rolling. The tail boom contacted the ground several times and the helicopter then rotated around the tail and came to rest on its right side.

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1 The collective pitch control, or collective, is a primary flight control used to make changes to the pitch angle of the main rotor blades. Collective input is the main control for vertical velocity.

2 The cyclic pitch control, or cyclic, is a primary flight control that allows the pilot to fly the helicopter in any direction of travel: forward, rearward, left, and right.

3 Yaw control or anti-torque pedals controls yaw about the yaw axis by controlling the pitch and therefore the thrust of the tail rotor blades or anti-torque system.

4 A dynamic rollover can occur whenever the landing gear (skid) contacts a fixed object, forcing the helicopter to pivot about the object instead of about its own centre of gravity. The fixed object can be any obstacle or surface that prevents the skid from moving sideways. Quickly reducing collective pitch is the most effective way to stop a dynamic rollover from developing.

Figure 1: Helicopter damage

Source: Helicopter operator

Pilot information

The pilot held a Student Pilots Licence, with about 64 hours total time, of which 5 hours were on the R44 and the remaining hours on the Hughes 300 helicopter. The pilot had a total of 1.2 hours solo time in the R44.

Helicopter information

The operator advised that RYO had not yet been retrofitted with bladder-type fuel tanks[5], but the rotor brake switch modification[6] had been completed, which reduced the chances of a possible ignition source in the event of a fuel leak.

Accident assistance

A bystander who attended the helicopter shortly after the accident elected not to assist the student with exiting due to the large fuel spillage and as the master electrical switch[7] was still turned on. The bystander commented that he did not want to expose more persons to a potentially dangerous situation. The aviation rescue and fire fighting personnel were called and no bystanders approached the helicopter until after the fuel spillage had been appropriately dealt with.

CASA independent investigation

The Civil Aviation Safety Authority (CASA) conducted an independent investigation, which found that the hydraulic switch was in the off position and the cyclic grip broken. It could not be conclusively determined if the hydraulics were turned off at the time of takeoff or if the switch was turned off as a result of the accident sequence.

Safety message

Aircraft fuels are a primary hazard that may contribute to a post-accident fire. If ignited they pose danger to survivors, rescue personnel, fire services personnel, etc[8]. This accident highlights the

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5 Bladder-type fuel tanks improve the fuel system resistance to a post-accident fuel leak.

6 Robinson Helicopter Company R44 Service Bulletin SB-82 'Rotor Brake Switch' www.robinsonheli.com/service_library/r44_service_bulletins/r44_sb82.pdf

7 The master switch provided electrical power to the helicopter's systems.

8 www.atsb.gov.au/media/1538966/civil_militaryaccidguide_v5.pdf

importance of considering all the potential hazards at an accident site before entering, and if there is any doubt, remain clear.

General details

Registration:	VH-RYO	
Manufacturer and model:	Robinson Helicopter Company R44 Raven 1	
Type of operation:	Flying training - solo	
Occurrence category:	Accident	
Primary occurrence type:	Collision with terrain	
Location:	Moorabbin Airport, Victoria	
	Latitude: 37° 58.55' S	Longitude: 145° 06.13' E
Persons on board:	Crew – 1	Passengers – Nil
Injuries:	Crew – 1 (Minor)	Passengers – Nil
Damage:	Nil	

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.