



Australian Government

Australian Transport Safety Bureau

Collision with terrain involving a Robinson R22, VH-SSD

23 km NE of Roma, Queensland, 16 January 2015

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Addendum

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Collision with terrain involving a Robinson R22, VH-SSD

What happened

On 16 January 2015, at about 0930 Eastern Standard Time (EST), the pilot of a Robinson R22 helicopter, registered VH-SSD, was conducting aerial mustering operations on a property 23 km north-east of Roma, Queensland.

The helicopter was about 100 ft above ground level (AGL), with a low forward airspeed of about 5-10 kt and the cattle moving slowly uphill, when the pilot observed the cattle start to move back down the side of the hill towards a creek. The wind was light and blowing across the path of the helicopter from the left. The pilot elected to descend along the side of the cattle and turned the helicopter towards the right.

As he did that, the helicopter turned downwind with a high power setting and low forward speed. The pilot realised he had turned downwind and started to raise the nose of the helicopter and raise collective.¹ He then detected a high rate of descent and an incipient vortex ring state, as the helicopter started to settle into its own downwash. He attempted to fly out of the situation, lowered the collective and wound the throttle on, but had insufficient forward speed and low rotor rpm. The low rotor rpm horn sounded at about 15-20 ft AGL. The pilot tried to regain rotor rpm but the helicopter sank quickly.

The pilot then ensured the skids were level and the helicopter collided with the ground. Due to the rough surface, the helicopter bounced into the air. The pilot pulled back on the cyclic² control, which resulted in the tail of the helicopter being chopped off by the main rotor. The helicopter then spun around and came to rest on its side (Figure 1). The helicopter was substantially damaged and the pilot was uninjured.

Figure 1: Damage to VH-SSD



Source: Operator

¹ A primary helicopter flight control that simultaneously affects the pitch of all blades of a lifting rotor. Collective input is the main control for vertical velocity.

² 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.

Vortex ring state

The United States Federal Aviation Administration (FAA) handbook www.faa.gov/regulations_policies/handbooks_manuals/ describes the vortex ring state or settling with power, as an aerodynamic condition in which a helicopter may be in a vertical descent with 20% to maximum power applied and little or no climb performance.

The following combination of conditions is likely to cause settling in a vortex ring state in any helicopter:

1. A vertical or nearly vertical descent of at least 300 feet per minute (fpm). The actual critical rate depends on the gross weight, rpm, density altitude, and other pertinent factors.
2. The rotor system must be using some of the available engine power, between 20-100%.
3. The horizontal velocity must be slower than effective translational lift.

A fully developed vortex ring state is characterized by an unstable condition in which the helicopter has uncommanded pitch and roll oscillations, little or no collective authority, and a descent rate that may approach 6,000 fpm, if allowed to develop (Figure 2).

Figure 2: Vortex ring state



Source: FAA

Safety message

The pilot involved in this incident was highly experienced, with over 10,000 hours total flying (helicopter) time and over 6,000 hours in Robinson R22 aircraft. He stated that the fundamental message was to always have forward airspeed before turning downwind.

This incident highlights the importance of continually assessing and reassessing the prevailing conditions and their effect on aircraft performance. The Airbus Helicopters (formerly Eurocopter) publication, Decision Making for Single-Pilot Helicopter Operations, www.airbushelicopters.com/site/docs_wsw/RUB_36/EHEST4_Single-Pilot-Decision-Making-v1.pdf, explains some of the factors that affect pilots' decision making.

In the ATSB investigation AO-2013-099, the pilot of the helicopter lost situational awareness during a night approach and the helicopter developed a high rate of descent with a low forward airspeed. This resulted in the onset of an incipient vortex ring state in the final stages of flight. The investigation report is available at:

www.atsb.gov.au/publications/investigation_reports/2013/aair/ao-2013-099.aspx

General details

Occurrence details

Date and time:	16 January 2015 – 0900 EST	
Occurrence category:	Accident	
Primary occurrence type:	Collision with terrain	
Location:	23 km NE Roma, Queensland	
	Latitude: 26° 23.02' S	Longitude: 148° 55.48' E

Helicopter details

Manufacturer and model:	Robinson Helicopter Company R22	
Registration:	VH-SSD	
Serial number:	4636	
Type of operation:	Aerial work – Aerial mustering	
Persons on board:	Crew – 1	Passengers – Nil
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.