



Australian Government

Australian Transport Safety Bureau

Hard landing involving Robinson R44, VH-HYR

15 km N of Broome Airport Western Australia, 7 September 2012

ATSB Transport Safety Report

Aviation Investigation

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Hard landing involving Robinson R44 VH-HYR

What happened

On 7 September 2012 at 0930 Western Standard Time¹, a Robinson R44 Raven II helicopter registered VH-HYR departed Broome airport, Western Australia on a charter flight to a pearl farm, located north of Broome. On board the helicopter were the pilot and three passengers.

Shortly after departing Broome Airport, the pilot reported that the engine and rotor tachometer were indicating that the engine and rotor revolutions per minute (RPM) were at the upper limit of the operating range.² The pilot also advised that the engine and rotor sounded like it was overspeeding.

The pilot stated that he attempted to override the governor³ by manually rolling off the throttle, however he was unable to reduce the engine and rotor RPM. The pilot reported that he switched the governor off and was able to reduce the engine and rotor RPM, however the low RPM light and horn activated. The pilot flared⁴ the helicopter slightly to increase the rotor RPM and lowered the collective⁵. The pilot attempted to re-join the engine and rotor RPM by manipulating the throttle, however this was unsuccessful.

At about 200 feet above ground level and a speed of 60-70 knots, the pilot was unable to re-establish control of the engine RPM and he elected to perform a precautionary landing on a road and entered an autorotation⁶ by lowering the collective completely.

The pilot planned on performing a power recovery⁷ and terminated the autorotation at about 10 feet above the ground with 0 knots groundspeed,⁸ at the same time winding on throttle to increase the engine RPM, however the engine did not respond. The low rotor RPM light and horn activated and the pilot increased the collective lever in attempt to utilise the remaining rotor RPM to cushion the landing. However, the helicopter landed heavily and the main rotor severed the tail boom. All occupants exited the helicopter without injury.

VH-HYR



Source: Operator

¹ Western Standard Time was Coordinated Universal Time (UTC) + 8 Hours.

² Low rotor RPM does not produce sufficient lift, and high rotor RPM may cause structural damage, therefore rotor RPM limitations have minimum and maximum values. A green arc depicts the normal operating range with red lines showing the minimum and maximum values.

³ The governor is designed to assist in keeping the rotor RPM constant. 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. The governor is only active at about 80% engine RPM and can be switched on or off using a toggle switch on the end of the right seat collective.

⁴ The flare is used to reduce airspeed and rate of descent prior to landing. During autorotation the flare also increases rotor RPM.

⁵ 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.

⁶ Descent with power off, air flowing in reverse direction upwards through lifting rotor(s) causing it to continue to rotate at approximately cruise RPM. Pilot preserves usual control functions through pedals, cyclic and collective. The rate of descent is reduced just before ground impact by an increase in collective pitch; this increases lift, trading stored kinetic energy for increased aerodynamic reaction of the blades, and should result in a gentle touchdown.

⁷ Usually used during training to terminate an autorotation at a height above ground level, by restoring full engine power, resulting in the helicopter coming to a hover above the ground.

⁸ Aircraft's speed relative to the ground

Pilot Information and Comments

The pilot held a Commercial Pilots Licence (Helicopter) with a total time of 191 hours with 84 hours on the Robinson R44.

The pilot reported that when the RPM was first increased prior to take-off, he noticed that the rotor and engine tachometer were both indicating erratically for a few seconds, before stabilising.

Helicopter Information

The helicopter had a total of 880 hours at the time of the accident. The left magneto had been replaced on 5 September 2012. The helicopter's maintenance release noted that the right magneto was to be retained in service until 881.3 hours due to "inability to fit serviceable item".

Governor

The governor is designed to assist in controlling RPM under normal conditions. The governor maintains engine RPM by sensing changes and applies corrective throttle inputs through a friction clutch that can be overridden by the pilot.

The governor controller senses RPM via tachometer points in the engine's right magneto and provides a corrective signal to the governor assembly. The governor assembly is attached to the collective stick assembly. When activated by the governor controller, the governor gear-motor and attached worm gear drive a friction clutch connected to the throttle.

The Pilots Operating Handbook provides that in the event of a governor malfunction;

If the engine RPM governor malfunctions, grip throttle firmly to override governor, then switch governor off. Complete flight using manual throttle control.

The Robinson R44 Maintenance Manual provides in relation to the Governor:

Governor Troubleshooting

Erratic operation is usually indicative of wiring damage or tachometer point problems. Wiring damage may be evidenced by crushing, pinching, or abrasion, all of which can result in grounding of one or both centre wire conductor(s) to the shielding or to structure. Tachometer point problems may be caused by contamination (due to over-lubrication of magneto cam follower felt), oxidation (such as from an obstructed vent plug or leaking magneto drive seal), or loose contact(s), in addition to installation or assembly errors.

Figure 1: VH-HYR



Source: Operator

ATSB comment

The ATSB did not attend the accident site or examine the aircraft and the reason for the accident could not be conclusively established. A malfunction within the governor assembly was not able to be ruled out. However, it is considered likely that the engine's right magneto may have malfunctioned by providing an incorrect signal to the governor assembly which manifested as a governor failure.

Safety message

For further reading of a similar accident involving a governor malfunction in an R44 refer to:

South African Civil Aviation Authority Investigation - CA18/2/3/8694

- www.caa.co.za/resource%20center/accidents%20&%20incidents/reports/2009/8694.pdf

General details

Manufacturer and model:	Robinson R44 Raven II	
Registration:	VH-HYR	
Type of operation:	Charter (passenger)	
Occurrence type:	Accident	
Primary occurrence type:	Hard landing	
Location:	15 km north Broome Airport, Western Australia	
	Latitude: 122°16'45 E	Longitude: 17°43'57 S
Persons on board:	Crew – 1	Passengers – 3
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Substantial	

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.