



Australian Government

Australian Transport Safety Bureau

Loss of control involving a Robinson R44, VH-NUZ

170 km N of Derby (Montgomery Reef), Western Australia, 15 September 2013

ATSB Transport Safety Report

Aviation Short Investigations

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Addendum

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Loss of control involving a Robinson R44, VH-NUZ

What happened

On 15 September 2013, the pilot of a Robinson R44 helicopter, registered VH-NUZ, was flying passengers on a private scenic flight over the Montgomery Reef and Buccaneer Archipelago area of Western Australia. The pilot had completed several take-offs and landings at that site already on the day.

After a routine landing at the reef, the pilot shut down the engine. The passengers had disembarked and were standing about 20 to 30 m away.

At approximately 1530 Western Standard Time, the pilot, who was the sole occupant, then started the helicopter's engine and completed the pre-flight checks. When the pilot raised the collective¹ to bring the helicopter into a hover, it suddenly rotated three times while airborne. The pilot could not regain control and elected to land immediately, however the helicopter landed heavily. The pilot shutdown the engine and exited the helicopter.

Robinson R44, VH-NUZ



Source: Owner

The direction that the helicopter rotated could not be ascertained by the pilot or witnesses. The pilot and bystanders were not injured but the helicopter sustained substantial damage as a result of the hard landing. A subsequent inspection revealed that both tail rotor blades had broken off near the tail rotor hub, the vertical fin lower section and tail rotor guard were damaged, the tail rotor gearbox mounts had detached from the tail boom at two places and the landing gear skids were splayed (Figure 1).

Witnesses reported that the weather conditions on the day were clear skies, a light wind of about 5-8 kt, and a temperature of about 32 °C.

Based on the information provided, the Australian Transport Safety Bureau (ATSB) was unable to determine what led to the loss of control.

Montgomery Reef

The landing area was on an extensive sandbank at the centre of the Montgomery Reef formation, with no obstructions from trees or other large physical features. The sand was compacted and undulating.

Helicopter information

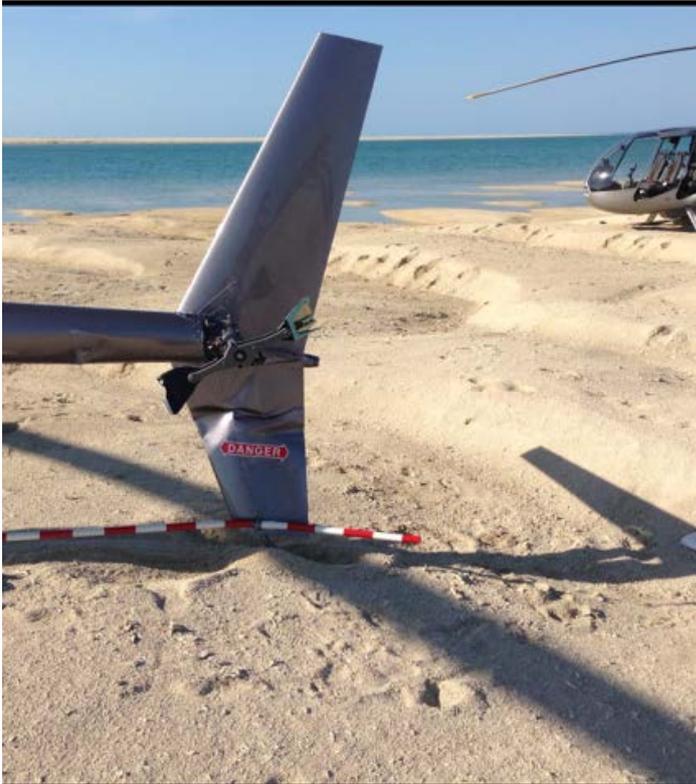
The helicopter, serial number 2272, was built in the United States in 2013 and first registered in Australia on 22 April 2013. At the time of the occurrence, the helicopter's total time in service was about 94 hours.

The ATSB was advised of a previous occurrence with the helicopter, which occurred at about 45 hours total time in service, where a sudden and violent yaw in both directions was experienced. A maintenance inspection of the engine cylinders found one stuck inlet valve, which was rectified.

Due to no further reports of this occurrence with the helicopter, it was deemed unlikely to be a contributing factor to this accident.

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.

Figure 1: Damage to the tail assembly



Source: Owner

ATSB comment

During the investigation, the ATSB was advised that instances of sudden and violent yawing in forward flight of up to 30° to the left and right may have occurred on other, low-time, R44 helicopters. These occurrences were attributed to a 'sticky [engine] inlet valve', with no recurrence after maintenance rectification. One similar occurrence was identified in the ATSB notification database, however, a review of Service Difficulty Reports (SDR) provided to the Civil Aviation Safety Authority (CASA) did not identify any specific occurrences involving sticking inlet valves.

Information sought by the ATSB from 12 Australian helicopter and engine maintenance organisations identified three additional events attributed to sticking inlet valves.² These occurrences involved R44 Raven I and Raven II helicopters with less than 300 hours total time in service, and occurred between 2009 and April 2013.

A representative from the R44 engine manufacturer, Lycoming Engines, advised that they were aware of instances of sticking inlet valves, however the number of worldwide occurrences were very low and considered to be a problem that was unlikely to occur if the correct engine 'break-in' and operating procedures were followed.

The engine manufacturer advised the ATSB that possible warning signs can include high oil consumption with elevated cylinder head temperature, high magneto drop after engine start and engine hesitation. Cylinder compression checks can also assist with troubleshooting and identifying engine valve anomalies. If an intake valve is suspected or found to be stuck, borescope inspection by removing the induction pipes is an easy way to gain inspection access. The valve sealing face should also be inspected during the rectification process for burning or any other damage.

² A fourth event may also have been attributable to sticking engine inlet valves but that could not be confirmed.

The engine manufacturer has several publications available that provide guidance to prevent, identify and rectify sticking valves. These publications, which are available from the Lycoming Engines website³, include:

- Service bulletin SB 388C – Procedures to determine exhaust valve and guide condition*
- Service Instruction SI 1080C – Maintenance items for special attention*
- SI 1425A – Suggested maintenance procedures to reduce the possibility of valve sticking*
- SI 1427 – Lycoming reciprocating engine break-in and oil consumption*
- Service Letter SL L197 – Recommendations to avoid valve sticking*

The helicopter manufacturer advised that, while they were aware of instances of sticking exhaust valves, they were not aware of any reports of inlet valves being similarly affected. In order to prevent instances of sticking exhaust valves, Robinson Helicopters has implemented the requirement to conduct Lycoming Engines Service Bulletin SB 388C at the first 100 hour inspection, and every 300 hours thereafter. Additionally, participants in the manufacturer’s pilot safety course are advised that, where possible and subject to other operating limitations, engines should be operated at their Maximum Continuous Power (MCP –about 77% of rated power), for the first 50 hours of engine ‘break-in’ time.

Based on the information provided to the ATSB, engine valve sticking appears to be a known, but rare, phenomena that can be largely prevented by compliance with the engine and aircraft manufacturer’s recommendations. The ATSB also encourages the reporting of occurrences, and defects via the CASA SDR process, as this helps to identify emerging trends in aviation safety.

Safety message

The ATSB SafetyWatch highlights the broad safety concerns that come out of our investigation findings and from the occurrence data reported to us by industry. One of the safety concerns is under-reporting of occurrences. More information can be found on the ATSB website here:



www.atsb.gov.au/safetywatch/under-reporting-of-occurrences.aspx

The Civil Aviation Safety Authority (CASA) has Service Difficulty Reports to detect trends and permit timely safety oversight of the Australian aircraft fleet, CAAP 51-1 and Part 4B of CAR 1988 refers. More information can be found on the CASA and ComLaw websites here:

CAAP 51-1 http://www.casa.gov.au/wcmswr/_assets/main/download/caaps/airworth/51_1.pdf

CAR 1988 http://www.comlaw.gov.au/Details/F2013C00371/Html/Volume_1#_Toc360093931

General details

Occurrence details

Date and time:	15 September 2013 – 1530 WST	
Occurrence category:	Accident	
Primary occurrence type:	Loss of control	
Location:	170 km N of Derby (Montgomery Reef), Western Australia	
	Latitude: 15° 56.87' S	Longitude: 124° 16.32' E

³ Lycoming website www.lycoming.com/Lycoming/SUPPORT/TechnicalPublications.aspx

Helicopter details

Manufacturer and model:	Robinson Helicopter Company R44	
Registration:	VH-NUZ	
Serial number:	2272	
Type of operation:	Private	
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.