Australian Government
Australian Transport Safety Bureau

Ditching involving Robinson R44, VH-CYH

83 km N of Horn Island airport, Queensland, 9 June 2012

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Ditching involving Robinson R44, VH-CYH

What happened

On 9 June 2012, a Robinson R44 helicopter, registered VH-CYH (CYH), departed Thursday Island to Dauan Island, Queensland (Figure 1), on a charter passenger flight with one passenger. The pilot had submitted a flight plan, with a nominated SARTIME[1] of 1800 Eastern Standard Time[2].

During the flight, the alternator light illuminated on two separate occasions. The pilot turned the alternator off and then back on and the light extinguished on both occasions.

When at Dauan Island, the pilot attempted to start the engine for the return flight, however, he reported that the engine rotated several times and then a clicking sound was heard 'like a battery without enough power'. After consultation with the operator, truck batteries were used to start the helicopter. The engine was run at idle power for about 10 minutes before the helicopter departed for Horn Island at about 1700, with only the pilot on board.

About 10 minutes after departing, the alternator light illuminated. The pilot turned the alternator off and back on again and the light went out. Shortly after, the alternator light illuminated again, the pilot turned the alternator off and back on again and the light went out. This happened twice again in quick succession before the pilot then isolated all non-essential electrical systems and, as he had passed the point of no return[3] to Dauan Island he elected to fly to Moa Island.

About 10 minutes later, the pilot heard a high 'revving' sound and the engine governor failed[4]; the pilot switched the governor off. The pilot also noted that the engine and main rotor tachometer indicators were reading higher than normal. In response, the pilot manually reduced the engine revolutions per minute (RPM). The pilot became concerned that the high engine and main rotor RPM may have resulted in a main rotor transmission overspeed. As a precaution, the pilot descended the helicopter to 500 ft above the water, so that he could better assess the helicopter's height above the water in the event of an emergency.

Over the next 10 minutes, the pilot adjusted the throttle manually to manage the engine and rotor RPM which would stabilize for a few minutes and then indicate a reduction. The engine manifold air pressure increased each time the throttle was adjusted and the pilot made adjustments to maintain the manifold air pressure within the normal range. This was coupled with a gradually increasing vibration and grinding noise. When at about 300 ft above the water, the pilot deployed the emergency 'pop-out' floats. The pilot was concerned about the increase in engine noise and vibration and elected to descend and commence a hover taxi. Soon after, the throttle was not able to be adjusted further and the manifold air pressure continued to rise, and he elected to ditch the helicopter.

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1 A SARTIME is nominated by a pilot for the initiation of Search and Rescue action if a report from the pilot has not been received by the nominated unit. SARTIMEs are managed on a national basis by the central SARTIME management database, CENSAR.

2 Eastern Standard Time (EST) was Coordinated Universal Time + 10 hours.

3 Point of no return is the geographic position on track or time at which fuel remaining becomes insufficient for aircraft to return to starting point.

4 The governor maintains engine RPM by sensing changes and applying corrective throttle inputs through a friction clutch, which can be overridden by the pilot. If the governor malfunctions, the pilot is required to grip the throttle firmly to override the governor, then switch the governor off. The flight is then completed using manual throttle control. The governor operates on 14 volts supplied via a voltage regulator and ceases operation when the battery voltage decreases below 10 volts.

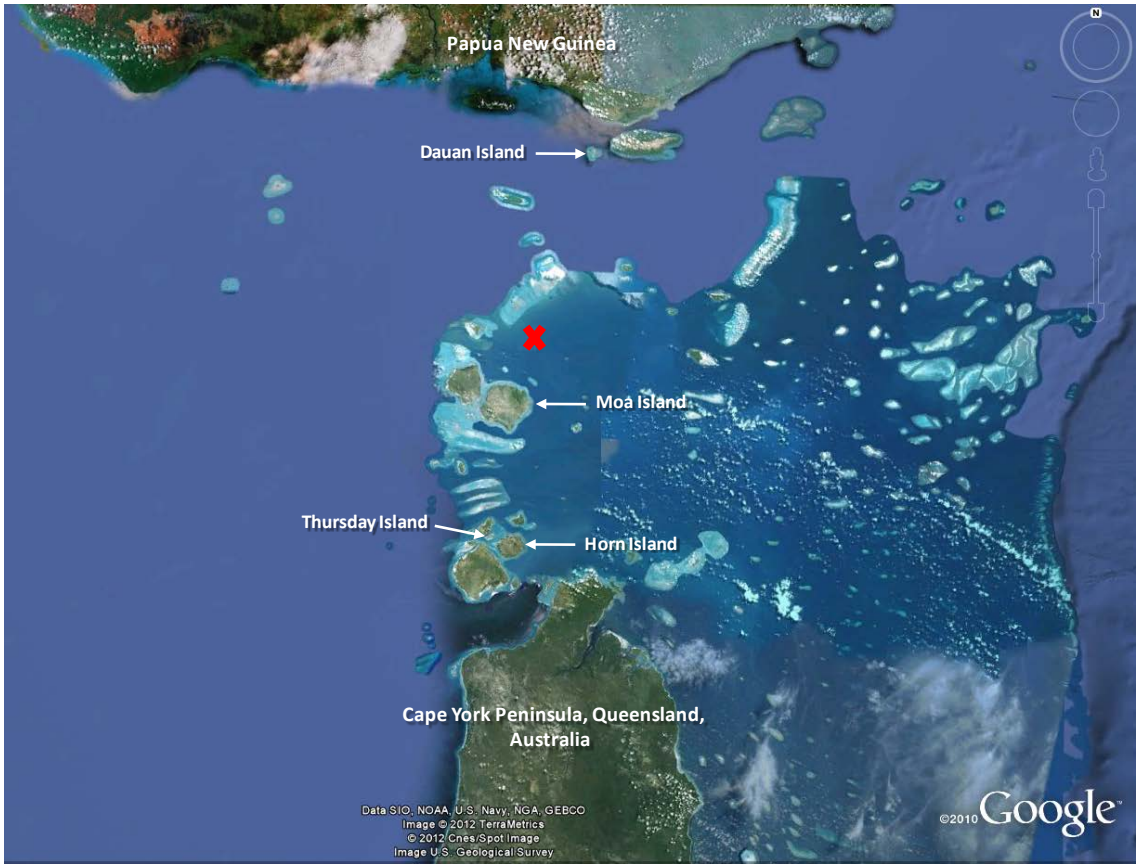
CHY was landed in 1 m of swell and remained upright. The pilot shut down the helicopter and remained in the cockpit, as conditions at that time were considered reasonably stable. The pilot, who was wearing a life jacket, activated his personal locator beacon (PLB).

The pilot attempted to contact the Horn Island police on his mobile phone, but the signal dropped out. The pilot then contacted the helicopter operator using his mobile phone, who initiated a search and rescue operation by contacting the Rescue Coordination Centre Australia (RCC)[5]. Shortly after, the signal from the PLB was detected by the Cospas-Sarsat system[6] and an automatic alert was generated and provided to the RCC.

At about 1800, CENSAR[7] contacted the pilot via mobile phone to advise that the SARTIME for CYH had expired.

At about 1845, a search and rescue helicopter arrived and transported the pilot to Horn Island. The pilot was uninjured, however the helicopter sustained substantial damage as a result of exposure to the salt water. The helicopter was recovered the next day.

Figure 1: Horn Island area showing the approximate location of ditching (red cross)



Source: ***Google Earth***

Pilot comments

The pilot reported that the crew of the search and rescue helicopter navigated to him using the flares that he had discharged until the helicopter was visible as they were not able to determine an accurate location from the PLB signal as it remained within the helicopter fuselage

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5 The search and rescue service is provided by the Rescue Coordination Centre Australia (RCC), the national search and rescue organisation, which is part of the Australian Maritime Safety Authority (AMSA).

6 The Cospas-Sarsat System comprises distress beacon receivers on orbiting satellites. A network of ground receiving stations receives the satellite transmissions and sends the information to the RCC.

7 CENSAR is an automated centralised SARTIME database software package used by Airservices to manage SARTIMEs (AIP Australia GEN 2.2 – 5).

The pilot reported that he had been using a noise-cancelling headset on the flight, which may have dampened the abnormal engine sounds. Consequently, he only became aware of the engine problems when the governor failed.

The pilot reported that ditching training undertaken in 2008 had prepared him for the water landing. The pilot also stated that the mobile phone signal in that area was intermittent and he had to turn his phone off at times to conserve battery power.

Helicopter inspection

A detailed examination of the helicopter following the accident determined that the engine number 4 cylinder exhaust valve stem cap had dislodged from its normal location and the engine cooling fan wheel had rotated 180^0 on the fan shaft assembly. This was reported to be consistent with an engine overspeed. The battery voltage, which was normally 24 volts, was measured as 10.5 volts.

R44 electrical systems

The R44 helicopter has a 28 volt electrical system. The dual engine/main rotor tachometer indicator operates electrically on 14 volts supplied via a voltage regulator. The helicopter manufacturer indicated that the dual-tachometer would under-read as the supplied voltage decreases. That is consistent with what the pilot observed. The engine oil temperature, oil pressure and cylinder head temperature gauges are also controlled electrically and will also under-read as the supplied voltage decreases below 21 volts. However, the manifold absolute pressure (MAP) gauge operates on pressure and will remain accurate irrespective of the electrical system status. The helicopter manufacturer indicated that a higher than normal MAP indication along with excessive engine noise and vibration are very reliable indications of an engine overspeed condition.

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.

Aircraft operator

As a result of this occurrence, the aircraft operator has advised the ATSB that they have, or intend to take the following safety actions:

- The lanyard on the PLB has been extended from 0.5 m to 3 m allowing the PLB to be thrown clear of the helicopter.
- Company policy has been amended in relation to a flat battery and faulty alternator, requiring immediate replacement.
- Pilots have been briefed in the use of noise cancelling headsets.
- A safety management program is being developed to monitor the reliability of helicopter components, to determine an appropriate time in service.

Safety message

This accident demonstrates the safety benefit of having a life jacket that was worn and equipped with flares and a PLB among other safety items.

A nominated realistic SARTIME provided another layer of safety, particularly if the pilot's mobile telephone was not available.

This accident also demonstrates the benefit of a thorough knowledge of an aircraft's systems. Low voltage from a failing battery led to the gauges for the engine/main rotor tachometer indicator

under-reading. The noise cancelling headset worn by the pilot may also have masked changes in the 'normal' sounds of the helicopter[8].

The pilot had undergone helicopter underwater escape training[9] and stated it gave him the knowledge and confidence to prepare for a water landing and a possible submersion.

General Details

Manufacturer and model:	Robinson Helicopter Co R44 II	
Registration:	VH-CYH	
Type of operation:	Charter – test and ferry	
Occurrence category	Accident	
Primary occurrence type:	Abnormal engine indications	
Location:	83 km N of Horn Island airport, Queensland	
	Latitude: S 09° 58.57'	Longitude: E 142° 21.23'
Persons on board:	Crew – 1	Passengers – 0
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Substantial	

[8] CASA Airworthiness Advisory Circular (AAC) 1-43 Noise Isolating Headsets www.casa.gov.au/scripts/nc.dll?WCMS:STANDARD::pc=PC_90691 .

[9] Flight Safety Australia magazine September-October 1999, Sink or Swim, p 38, 39 www.casa.gov.au/wcmswr/_assets/main/fsa/1999/sep/huet.pdf .

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.