Australian Government
Australian Transport Safety Bureau

Collision with terrain- VH-HOU, Robinson R44

93 km south of Alice Springs Aerodrome, Northern Territory, 10 June 2012

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Published by: Australian Transport Safety Bureau
Postal address: PO Box 967, Civic Square ACT 2608
Office: 62 Northbourne Avenue Canberra, Australian Capital Territory 2601
Telephone: 1800 020 616, from overseas +61 2 6257 4150
Accident and incident notification: 1800 011 034 (24 hours)
Facsimile: 02 6247 3117, from overseas +61 2 6247 3117
Email: atsbinfo@atsb.gov.au
Internet: www.atsb.gov.au

Collision with terrain VH-HOU, Robinson R44 – Raven 1

AO-2012-078

VH-HOU

Source: Passenger

What happened

On 10 June 2012 at about 1245 Central Standard Time[1], a Robinson Helicopter Company R44 Raven 1, registered VH-HOU, was seriously damaged, following a reported loss of power and collision with terrain near Maryvale, Northern Territory. The helicopter was providing support and aerial filming of a competitor participating in the annual Finke Desert race.

The helicopter departed the Finke Desert race start line at 1130. On board the helicopter were the pilot and three passengers. At about 1240 and about 115 km into the race, the pilot described lowering the collective lever[2] and reducing the power to about 17 inches of manifold pressure[3] in order to perform a gentle flare, to slow the helicopter from 80 kts to 60 kts. At about 200 ft above ground level (AGL) and at 60 kts, the pilot described levelling the helicopter and applying power to increase the helicopter's airspeed in order to maintain the helicopter's position relative to the race competitor on a motorbike.

As the pilot increased the position of the collective lever, there was not a corresponding increase in manifold pressure. The helicopter began to sink and the pilot increased the collective position further. The low rotor revolutions per minute (RPM) light and horn activated[4] and the pilot lowered collective and applied full throttle. The pilot was unable to recover the rotor RPM and increased the collective lever to its upper limit, in an attempt to use the remaining rotor RPM to decrease the rate of descent immediately prior to impacting terrain.

The helicopter impacted the terrain in a level attitude collapsing the skids on impact. The helicopter came to rest on its belly in an upright position (Figure 1). The pilot and front seat passenger exited the helicopter without assistance. The front seat passenger and the pilot were able to assist the two rear seat passengers to exit the aircraft. The passenger seated behind the pilot sustained serious injuries. The other passengers and the pilot sustained minor injuries.

Weather

Weather observations were obtained for Alice Springs Airport from the Bureau of Meteorology. Alice Springs Airport is approximately 97 km north of the accident site.

At Alice Springs Airport the following conditions were observed:

- At 1230 – the wind was 120° at 5 kts, tempertaure 13° C with a dew point -4° C, barometric presure was 1022 hpa.
- At 1300– the wind was 050° at 6 kts, temperature 14° C with a dew point of - 3° C, barometric pressure was 1022 hpa.

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1 Central Standard Time (CST) was coordinated universal time (UTC) + 9.5 hours.

2 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.

3 Manifold Air Pressure (MAP) is the absolute pressure, in inches of mercury, of the air flowing through the engine intakemanifold. It indicates the amount of power being generated by an engine.

4 A horn and indicated caution light indicate that rotor RPM may be below safe limits.

Fuel on board

A review of the operator's fuel records revealed that at the time of departure from Alice Springs Airport the helicopter was fuelled with 150 litres of 100LL aviation fuel. At the time of the accident the fuel on board was calculated to be approximately 90 litres.

Weight and balance

A review of the helicopter's weight and balance data revealed that the helicopter would have been at maximum takeoff weight on departure from the start line with the passengers on board.

Pilot comments

The pilot stated that while on the ground and prior to departure he noticed that the carburettor heat temperature gauge was within the yellow caution range[5] for carburettor icing[6]. Prior to lift off to the hover the pilot applied enough carburettor heat to keep the gauge out of the yellow caution range. HOU was fitted with a carburettor heat assist system[7], no further adjustment was made to the carburettor heat by the pilot during the flight and the heat assist system was left in the unlocked position.

Figure 1: VH-HOU

Source: ***Passenger***

ATSB comment

A definitive reason for the reported loss of engine power could not be determined. However, a review of the carburettor icing probability chart reveals that the temperature/dew point spread, put the accident flight in the 'serious icing – descent power' operating realm (Figure 2).

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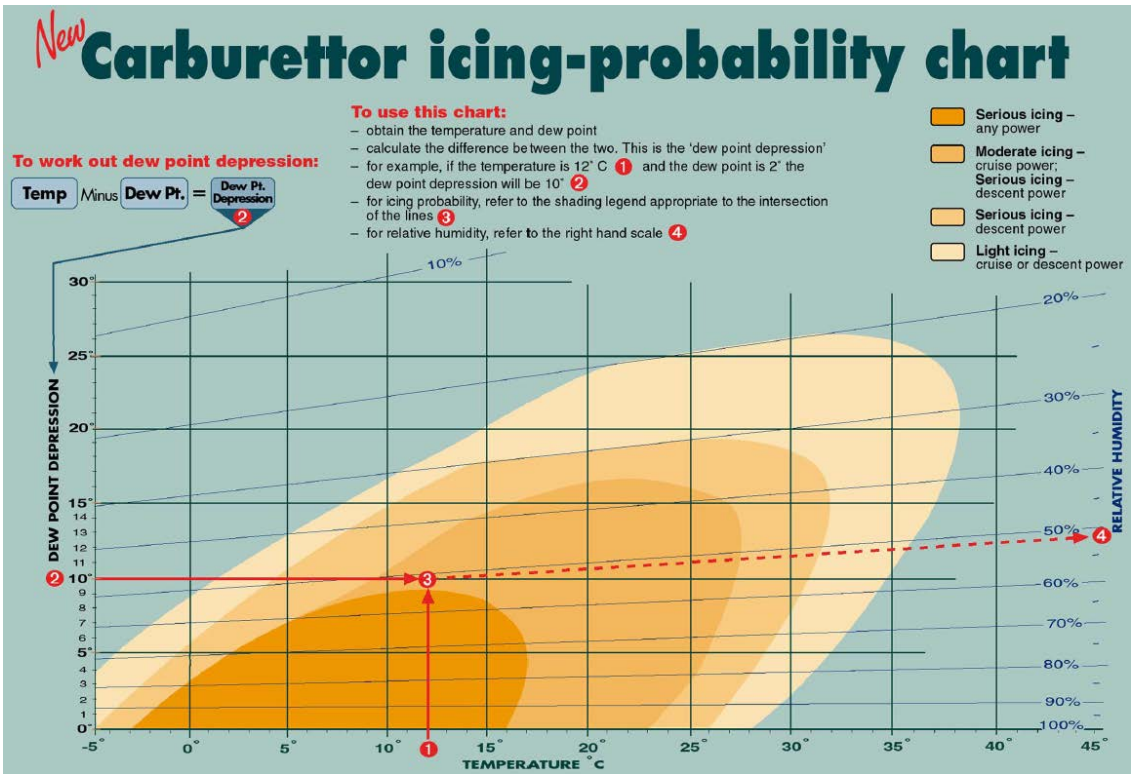
5 Caution range on a carburettor gauge is typically a yellow band between about -19 °C to +3 °C.

6 Carburettor ice is formed when the normal process of vaporising fuel in a carburettor cools the carburettor throat so much that ice forms from the moisture in the airflow and interferes with the operation of the engine.

7 The carburettor heat assist system fitted to the Robinson R44 Raven 1 is designed to apply a level of heat corresponding to the amount of power being applied via a mechanical correlation. The carburettor heat assist system does not sense carburettor temperature. This carburettor heat lever is able to be locked in the off position if carburettor heat is not required.

Figure 2: Carburettor icing probability chart



Source: *Civil Aviation Safety Authority*

Safety message

The Australian Transport Safety Bureau (ATSB) has investigated several occurrences of reported partial power loss situations where carburettor icing was suspected. The majority of those occurrences involved low power descents and a requirement for increased power at the bottom of the descent. Robinson Helicopter Company Safety Notices (SN) SN-25 and SN 31 warned pilots of the dangers and methods of preventing carburettor icing.

When an aircraft is fitted with a carburettor air temperature gauge, carburettor heat is applied to a level to maintain the temperature outside the caution range. The carburettor heat assist system fitted to the Robinson R44 Raven 1 is designed to automatically apply a level of heat corresponding to the amount of power being applied. It does not directly sense carburettor air temperature and further adjustments may be required to be made by the pilot to maintain the temperature outside the caution range.

Robinson Safety Notice SN-31 contains a reminder to pilots that if carburettor heat assist is used in conjunction with the throttle governor, it will reduce carburettor heat where the aircraft is lifting off to a hover and that the control may require adjustment in flight. This safety notice also contains a reminder to apply full carburettor heat when the manifold pressure is below 18 inches.

The following publications provide useful information on carburettor icing and avoidance:

- *Robinson Safety Notice SN-25*- Carburettor Ice
  www.robinsonheli.com/srvclib/rchsn25.pdf
- *Robinson Safety Notice SN-31*- Governor Can Mask Carb Ice
  www.robinsonheli.com/srvclib/rchsn31.pdf
- Melting Moments: Understanding Carburettor Icing
  www.atsb.gov.au/publications/2009/carburettor-icing.aspx
- Ice Blocked. Flight Safety Australia, November-December 2004, 31-33

www.casa.gov.au/fsa/2004/dec/32-33.pdf

- ATSB Report AO-2010-107
  www.atsb.gov.au/publications/investigation_reports/2010/aair/ao-2010-107.aspx
- ATSB Report AO-2009-031
  www.atsb.gov.au/publications/investigation_reports/2009/aair/ao-2009-031.aspx

Aircraft details

Manufacturer and model:	Robinson R44	
Registration:	VH-HOU	
Type of operation:	Aerial Work	
Location:	93km South of Alice Spring Airport	
Occurrence type:	Collision with Terrain	
Persons on board:	Crew – 1	Passengers – 3
Injuries:	Crew – 1	Passengers – 3
Damage:	Serious	

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.