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- independent investigation of transport accidents and other safety occurrences
- safety data recording, analysis and research
- fostering safety awareness, knowledge and action.

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Publication Date: November 2011

ISBN: 978-1-74251-225-9

Released in accordance with section 25 of the Transport Safety Investigation Act 2003

Collision with terrain, VH-ROU

67 km west of Sydney Airport, New South Wales

10 October 2010

Abstract

At about 0822 Eastern Daylight-saving Time on 10 October 2010, the pilot of a Eurocopter AS350B Squirrel helicopter, registered VH-ROU, inadvertently entered cloud while operating a visual flight rules charter flight from Parramatta heliport to Bathurst, New South Wales (NSW) with five passengers on board. The pilot became spatially disoriented and exited the base of the cloud just prior to colliding with terrain next to the Oaks Fire Trail, which was about 2 km south of Woodford, in the Blue Mountains region of NSW. Two of the passengers sustained minor injuries and were taken to hospital. The helicopter was seriously damaged.

The investigation found that, in the hours prior to, and during the flight, several operational and tactical decisions were made that did not adequately address the risk of visual flight into instrument meteorological conditions. In addition, a minor safety issue was identified in respect of the lack of a requirement for a charter-specific risk assessment for the flight. The result was that the risks associated with the charter were not adequately addressed. In response, the operator has advised that the operations manual will be amended to require risk assessments in support of all operational flights.

FACTUAL INFORMATION

History of the flight

At 0804 Eastern Daylight-saving Time¹ on 10 October 2010, the pilot of a Eurocopter AS350B Squirrel helicopter (AS350B), registered VH-ROU (ROU), took off from Parramatta heliport on a visual flight rules charter flight to Bathurst, New South Wales (NSW) with five passengers on board. The pilot was flying in company with three other helicopters: a Bell 407, another AS350B and a Robinson 44 (R44) with each helicopter carrying between three and six passengers.

A meeting was held on 6 October 2010 between the operator and two of the line pilots where aircraft and passenger allocations, task requirements and pilot briefings to be completed were discussed. The operator recalled directing that, if the charter was not possible to Bathurst, the flight was to proceed to the Hunter Valley instead. Whereas the operator reported that the risks associated with the charter were discussed at that meeting, the line pilots stated that no risk assessment was carried out in association with the operation. The pilots indicated that such risks were usually discussed at the pilot briefing.

On the morning of 10 October 2010, the pilot had repositioned ROU from Mascot heliport to Parramatta heliport, arriving at about 0700, and was prepared for the charter flight. The

1 Eastern Daylight-saving Time was Coordinated Universal Time (UTC) + 11 hours.

passengers of all four helicopters received a safety briefing from the chief pilot and were taken to their assigned helicopter.

Concerns were raised by two of the operator's line pilots in relation to that morning's weather information, especially as they regularly operated in the Blue Mountains region and had local knowledge of the weather conditions and terrain. The line pilots were expecting a pre-flight briefing from the chief pilot prior to departure, but this was reported not to have taken place.

Once underway, two of the line pilots continued to voice their concerns in relation to the weather over the company's radio frequency. However, the chief pilot requested that the flight continue in an attempt to find a way over the Blue Mountains to Bathurst. They needed to arrive prior to the closure of the airspace in the Bathurst area, which was to occur at 0900 due to the Bathurst 1000 car race.

At about 0818, the chief pilot, who was flying the Bell 407, stated to the other pilots that he thought he could get through the cloud and climbed to 7,000 ft above mean sea level (AMSL) toward a patch of blue sky. The R44 pilot stated that he felt his aircraft was unable to replicate the chief pilot's attempted climb to 7,000 ft. That assessment was later confirmed by the chief pilot.

The line pilots in the R44 and other AS350B decided that they were uncomfortable with the developing weather conditions and stated over the company's radio frequency that they were turning back. Shortly after, the chief pilot decided that they would not be able to find a way through the cloud and instructed all pilots to return.

The pilot of ROU complied and flew the same turning pattern as the chief pilot in the Bell 407 moments earlier. At about 0822, when about two-thirds of the way through the turn, ROU entered cloud. The pilot reported that he became spatially disoriented and attempted to level out and fly through the cloud with the aid of the helicopter's flight instruments.

The aircraft exited the base of the cloud at about 118 kts groundspeed, with about 41° left wing-low and 4,300 ft/min rate of descent (ROD). The pilot saw the Oaks Fire Trail below and had

time to flare² the helicopter and reduce airspeed before it collided with trees next to the trail.

The helicopter came to rest inverted, about 85 m from the first tree that was hit during the accident sequence. The helicopter was seriously damaged³ (Figure 1). Two passengers sustained minor injuries and were airlifted to Westmead Hospital from the accident site by emergency services as a precaution.

Figure 1: Wreckage of VH-ROU



Pilot information

The pilot completed a Private Pilot Licence (Helicopter) in the United Kingdom in 2002, and a Commercial Pilot (Helicopter) Licence in Australia in 2006. He had not conducted any instrument flight training in Australia, and was not required to do so by aviation regulation. He was not qualified for flight in instrument meteorological conditions (IMC).⁴

² A flare in a helicopter is defined as the tilting of the rotor disc upwards through movement of the cyclic aft. The result is a rapid deceleration of the helicopter.

³ The *Transport Safety Investigation Regulations* 2003 definition of 'serious damage' includes the 'destruction of the transport vehicle'.

⁴ IMC describes weather conditions that require pilots to fly primarily by reference to instruments, and therefore under instrument flight rules, rather than by outside visual

The pilot held a valid medical certificate and had completed 470 hours total time on turbine-powered helicopters, including 250 hours in the AS350.

Aircraft information

The helicopter, serial number 1119, was manufactured in France in 1979 and had accumulated about 5,713 hours total time in service at the time of the occurrence. The helicopter was powered by a Turbomeca Arriel 1B turboshaft engine. The aircraft was imported and placed on the Australian register on 12 August 2009.

The helicopter was not equipped for flight in IMC.

A review of the maintenance logs indicated that the helicopter had been maintained in accordance with the Eurocopter Master Servicing Recommendations latest revision. The helicopter had a current Certificate of Registration and Certificate of Airworthiness. The current maintenance release was found in the aircraft and showed that there were no outstanding maintenance items or defects.

A 100-hourly periodic inspection was carried out 6 months prior to the occurrence with no major defects identified. A weight and balance load data sheet was identified in the aircraft flight manual and the investigation estimated that the helicopter was within weight and balance limitations for the flight.

About 150 L of fuel was extracted from the helicopter by the NSW Fire Service after the occurrence. The fuel smell and texture was consistent with Jet A1 turbine fuel. No water or contaminants were visible in the tank prior to the fuel extraction process.

The aircraft was not fitted with a fixed emergency locator transmitter (ELT) and was not required to be by Civil Aviation Regulation (CAR) 252A. A personal ELT was carried in the helicopter for the flight and was activated by the pilot after the accident.

Meteorological information

The line pilots obtained a meteorological briefing that was valid for the route and duration of the flight via the Airservices Australia National Aeronautical Information Processing System (NAIPS). Those forecasts indicated broken⁵ cloud at 3,500 ft at Sydney and Bankstown Airports and at 2,500 ft at Richmond Airport.

The flight was planned to fly along the boundary between two forecast areas. The forecasts for those areas indicated that, at the time of the occurrence, broken cloud would be on the ranges in the area of the accident between 2,500 and 3,000 ft (the accident site elevation was 1,722 ft).

The flightpath would have taken the aircraft over Mount Victoria, and both area forecasts predicted broken cloud at ground level at that location, with associated showers of rain. Mount Victoria's elevation is 3,700 ft.

Global Positioning System information

The helicopter was fitted with a Garmin Global Positioning System (GPS) MAP 695. The GPS was recovered from the wreckage and the flight track information downloaded at the Australian Transport Safety Bureau's (ATSB) technical facilities in Canberra. The data obtained from the GPS provided information on the flight including flight track, heading and other data that allowed the calculation of the aircraft's speed, angle of bank and ROD.

Figure 2 shows a representation of the last few minutes of the flight, including the turnback following the decision to abort the flight and the descent out of the cloud. The yellow marker identifies the location of the accident site.

references. Typically, this means flying in cloud or in limited visibility.

⁵ Cloud cover is normally reported using expressions that denote the extent of the cover. The expression 'broken' indicates that more than half to almost all the sky was covered.

Figure 2: Turnback and track during the descent out of cloud⁶



Operations manual and safety management system

A review was conducted of the organisation's operations manual and safety management system (SMS). Special emphasis was placed on reviewing the procedures used by the organisation in terms of the avoidance of approaching IMC and their safety management approach to charter operations.

Section A5.8 of the organisation's operations manual stated, in part, that:

...in deteriorating weather conditions...the pilot in command (PIC) is not advised to "push on".

The...policy is to play it safe, and either turn around to retreat or land until conditions improve.

Within the operator's SMS and Operational Risk Register (ORR), specific-to-task risk assessments were conducted in support of the operator's aerial work contracts (gas pipeline inspections and water board sample collections). They were not required for charter operations.

A review of the ORR showed risk assessments for general helicopter operations that appeared to be consistent with the majority of the operator's helicopter charter operations. However, a number of the operator's line pilots indicated that charter operations were considered to involve low to no risk, and that specific-to-operations risks were usually discussed in pilot briefings.

The operator stated that the 6 October meeting was intended to address the risks involved in the

operation. The line pilots stated that no risk assessment was conducted for the charter flight to Bathurst.

Operational and tactical decision making

The line pilots revealed feeling that several decisions in the hours prior to the flight and during the flight itself may have contributed to the pilot of ROU inadvertently entering cloud. Those decisions were seen to result in:

- an increased perception of time pressure
- the adoption of non-conservative attitudes and behaviours towards the developing weather conditions
- the absence of any overt form of threat and error management in relation to the charter flight.

The decisions made were as follows:

- ROU was re-positioned to the Parramatta heliport from the Mascot heliport on the morning of the accident flight and used in the charter operation. A serviceable AS350B helicopter was already at the Parramatta heliport but was not considered for the flight.
- The Bell 407 was not prepared to fly until the morning of the flight. Although the operator had undertaken a number of steps to ensure the security of the heliport, and reported directing that all of the helicopters were to be left outside overnight, the decision was made by those at the heliport that night to move the Bell 407 into the hangar. Reportedly, that was due to concerns for its security overnight. In contrast, as was the case with the other AS350B, the R44 was readied and positioned outside the hangar overnight.
- Prior to takeoff, the weather conditions on the day and the briefing obtained for the area were brought to the attention of the chief pilot by the line pilots. They recalled advising the chief pilot that they felt they would not be able to fly over the Blue Mountains due to the forecast for the area. The chief pilot related feeling that a patch of clear sky that was overhead at 0730 would drift west, allowing the helicopters to remain in visual meteorological conditions for the duration of the flight.

⁶ Satellite picture courtesy of Google Earth.

- No pre-flight pilot's briefing was carried out. The line pilots reported that they had expected a briefing. No threat and error management plan for the operation was considered, the weather briefing was not discussed and thus no specific criteria for aborting the charter were defined or discussed.
- The line pilots recalled again expressing their concerns regarding the cloud build-up ahead of them once underway but took no action in response.⁷
- It appears from the pilot's and passenger accounts that the charter continued to the edge of the cloud before any of the helicopters were turned back. The pilot reported that, shortly after observing the chief pilot commence a turnback around a column of cloud, he followed the chief pilot's route around the cloud. During that turn, the pilot inadvertently entered cloud.

VFR into IMC

Weather-related aviation accidents remain one of the most significant causes of concern in aviation safety. In the past 5 years, there have been 72 occurrences of VFR pilots flying into IMC reported to the ATSB. Seven of these resulted in fatal accidents, causing 14 fatalities. That is, about one in ten VFR into IMC events result in a fatal outcome.

Safety awareness information on VFR into IMC is available on the ATSB website www.atsb.gov.au in the safety publication titled *Avoidable Accidents No 4 - Accidents involving Visual Flight Rules pilots in Instrument Meteorological Conditions*.

ANALYSIS

This analysis discusses the pre-flight preparation and decisions taken prior to the charter flight and charter-specific risk assessments as they affected the development of the occurrence.

The accounts from the accident pilot and passengers indicated that the pilot inadvertently entered cloud before becoming spatially

disoriented. The pilot's lack of instrument training, and the absence of relevant instruments in the helicopter for flight in instrument meteorological conditions (IMC), increased the disorientation risk. The pilot emerged from the base of the cloud with insufficient height to recover from the descent before impacting the trees and terrain.

More inclusive pre-flight preparation could have reduced the safety risk associated with the flight. In terms of their local knowledge, had the line pilots been more assertive in advising of their weather concerns, and the chief pilot taken account of those concerns, the accident might not have occurred. As it was, a number of operational and tactical decisions in the hours prior to the occurrence, and during the flight, did not adequately address the risk of visual flight into IMC. The at times short notice aircraft movement and readiness decisions appear to have increased operational time pressure and may have impacted on the consideration of the visual flight into IMC risk.

The generalised risk assessments in support of the operator's helicopter charter operations were consistent with the reports by line pilots that the operator assessed those risks as low. However, risk is contextual, and the risk associated with the movement of twenty passengers in four helicopters across a mountain range in marginal weather is demonstrably different to that associated with a local, single aircraft passenger charter in good weather conditions.

The lack of a requirement for a charter-specific risk assessment in this case meant that the risks associated with the charter, in particular as a result of the carriage of passengers, were not adequately addressed. That included at an operational or organisational level, or by the individual pilots. Had such an assessment been carried out, the line pilots' concerns may have been more appropriately addressed, and the flight not been attempted in the conditions.

FINDINGS

From the evidence available, the following findings are made with respect to the collision with terrain that occurred 67 km west of Sydney Airport, New South Wales on 10 October 2010 and involving Eurocopter AS350B Squirrel helicopter, registered VH-ROU, and should not be

⁷ A pilot in command has specific responsibilities with regards the safety of the aircraft and passengers (Civil Aviation Regulation 224(2) and (2A) – Pilot in Command).

read as apportioning blame or liability to any particular organisation or individual.

Contributing safety factors

- The pilot inadvertently flew into cloud and became spatially disoriented such that, on emerging from the base of the cloud, there was insufficient time to recover from the descent before impacting the trees and terrain.
- A number of operational and tactical decisions in the hours prior to the occurrence, and during the flight, did not adequately address the risk of visual flight into instrument meteorological conditions.

Other safety factors

- The lack of a requirement for a charter-specific risk assessment in this case meant that the risks associated with the charter were not adequately addressed. *[Minor safety issue]*

SAFETY ACTION

The safety issues identified during this investigation are listed in the Findings and Safety Actions sections of this report. The Australian Transport Safety Bureau (ATSB) expects that all safety issues identified by the investigation should be addressed by the relevant organisation(s). In addressing those issues, the ATSB prefers to encourage relevant organisation(s) to proactively initiate safety action, rather than to issue formal safety recommendations or safety advisory notices.

All of the responsible organisations for the safety issues identified during this investigation were given a draft report and invited to provide submissions. As part of that process, each organisation was asked to communicate what safety actions, if any, they had carried out or were planning to carry out in relation to each safety issue relevant to their organisation.

Helicopter operator

Charter-specific risk assessments

Minor Safety Issue

The lack of a requirement for a charter-specific risk assessment in this case meant that the risks

associated with the charter were not adequately addressed.

Action taken by the operator

The operator has advised that, as a result of this accident, the operations manual will be amended to require risk assessments in support of all operational flights.

SOURCES AND SUBMISSIONS

Sources of Information

The sources of information during the investigation included the:

- passengers
- operator of the helicopter
- pilot of the helicopter
- chief pilot
- operator's line pilots.

Submissions

Under Part 4, Division 2 (Investigation Reports), Section 26 of the *Transport Safety Investigation Act 2003* (the Act), the Australian Transport Safety Bureau (ATSB) may provide a draft report, on a confidential basis, to any person whom the ATSB considers appropriate. Section 26 (1) (a) of the Act allows a person receiving a draft report to make submissions to the ATSB about the draft report.

A draft of this report was provided to the operator and chief pilot, the pilot and the Civil Aviation Safety Authority (CASA).

Submissions were received from CASA, the operator and the chief pilot. The submissions were reviewed and where considered appropriate, the text of the report was amended accordingly.