



Australian Government
Australian Transport Safety Bureau

Collision with terrain involving Robinson R44 helicopter, VH-HWQ

Bulli Tops, New South Wales, | 21 March 2013



Investigation

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Safety summary

What happened

At about 1207 local time on 21 March 2013, a Robinson Helicopter Company R44 helicopter (R44), registered VH-HWQ, was manoeuvring at a grassed area at Bulli Tops, New South Wales. Shortly after landing, the helicopter lifted off and turned to the right. The main rotor struck branches of a nearby tree, and the helicopter descended and then rolled over onto its right side. A fire started on the grass under the rotor mast and the cabin. The pilot and the three passengers were fatally injured.

VH-HWQ



Source: Brenden Scott

What the ATSB found

The circumstances of this accident are consistent with two recent R44 accidents in Australia involving low-energy impacts that resulted in the all-aluminium fuel tanks being breached and a fuel-fed fire. R44 accidents result in a significantly higher proportion of post-impact fires than for other similar helicopter types. The accident helicopter was equipped with an all-aluminium tank.

On 20 December 2010 the Robinson Helicopter Company issued Service Bulletin SB-78 providing for the replacement of all-aluminium tanks in R44 helicopters with bladder-type tanks that substantially reduce the likelihood of post-crash fires. On 28 September 2012 the Robinson Helicopter Company revised and reissued the service bulletin as SB-78B. This revision brought forward the compliance date for the service bulletin to 30 April 2013. The ATSB has assessed that about 100 Australian R44 helicopters will not have met the service bulletin by the due date.

What's been done as a result

In response to this accident, the Civil Aviation Safety Authority (CASA) has confirmed its understanding that the great majority of Australian R44 helicopter owners are legally required to comply with Service Bulletin SB-78B. CASA has also undertaken to contact owners who may not be required to comply and then consider further action depending on the response to that contact.

The ATSB remains concerned at the significant risk that many R44 helicopters will not comply with the service bulletin and has recommended that CASA take further action to ensure compliance.

Safety message

The fitment of bladder-type fuel tanks to R44 helicopters is a very important safety enhancement that could save lives and is very strongly encouraged. In addition, regulators and investigation agencies in other countries should take note of this report and consider what steps they can take to increase compliance with the manufacturer's safety bulletin.

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The occurrence

The information contained in this preliminary report is derived from the initial investigation of the occurrence. Readers are cautioned that there is the possibility that new evidence may become available that alters the circumstances as depicted in the report.

On 21 March 2013, a Robinson Helicopter Company R44 helicopter (R44), registered VH-HWQ, departed Bankstown Airport on a private flight to a function centre at Bulli Tops, near Wollongong, New South Wales (NSW). On board were the pilot and three adult passengers.

At about 1207 Eastern Daylight-saving Time¹, the pilot was manoeuvring at a grassed area at Bulli Tops. Witnesses reported that the R44 had approached the grassed area from the south-east and touched down facing in a north-westerly direction. Shortly after landing, the witnesses observed the helicopter lifting off and then turning to the right through 180°. As the helicopter faced a north-easterly direction, the main rotor struck branches of a nearby tree on the northern edge of the grassed area (Figure 1).

The helicopter was then observed to descend onto the grass and roll over onto its right side. Soon after, a fire started on the grass under the rotor mast and the cabin. A number of witnesses attempted to extinguish the fire and remove the occupants, but were unsuccessful due to the intensity of the fire. The pilot and three passengers were fatally injured and the helicopter was destroyed.

Figure 1: Wreckage with the broken tree branches in the background



Source: ATSB

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

Context

Pilot information

The pilot held an Australian Private Pilot (Helicopter) Licence that was issued by the Civil Aviation Safety Authority (CASA) in September 2011. The pilot was appropriately endorsed to operate the R44.

The pilot's flying logbook indicated that, prior to the accident flight, he had accrued 174.7 hours flight time, of which 21.9 hours were in R44 helicopters. He had previously operated into the grassed area at Bulli Tops in an R44 on 27 August 2012.

Meteorological information

Witnesses at the site reported that, at the time of the accident, the weather was fine with good visibility and there was a light breeze from a north-westerly direction. These reports were consistent with indications of the wind in photographs taken of the accident site soon after the collision with terrain.

Helicopter information

The R44 is a four-seat, single main and tail rotor helicopter that is powered by a carburetted six-cylinder O-540-F1B5 piston-engine, and is equipped with skid-type landing gear. The helicopter, serial number 1445, was manufactured in the United States (US) in 2004 and first registered in Australia on 15 December 2004.

The pilot's weight and balance calculations indicated that the helicopter departed Bankstown at the maximum allowable gross weight of 1,089 kg, and within the centre of gravity limits.

The helicopter was not fitted with dual controls at the time of the accident.

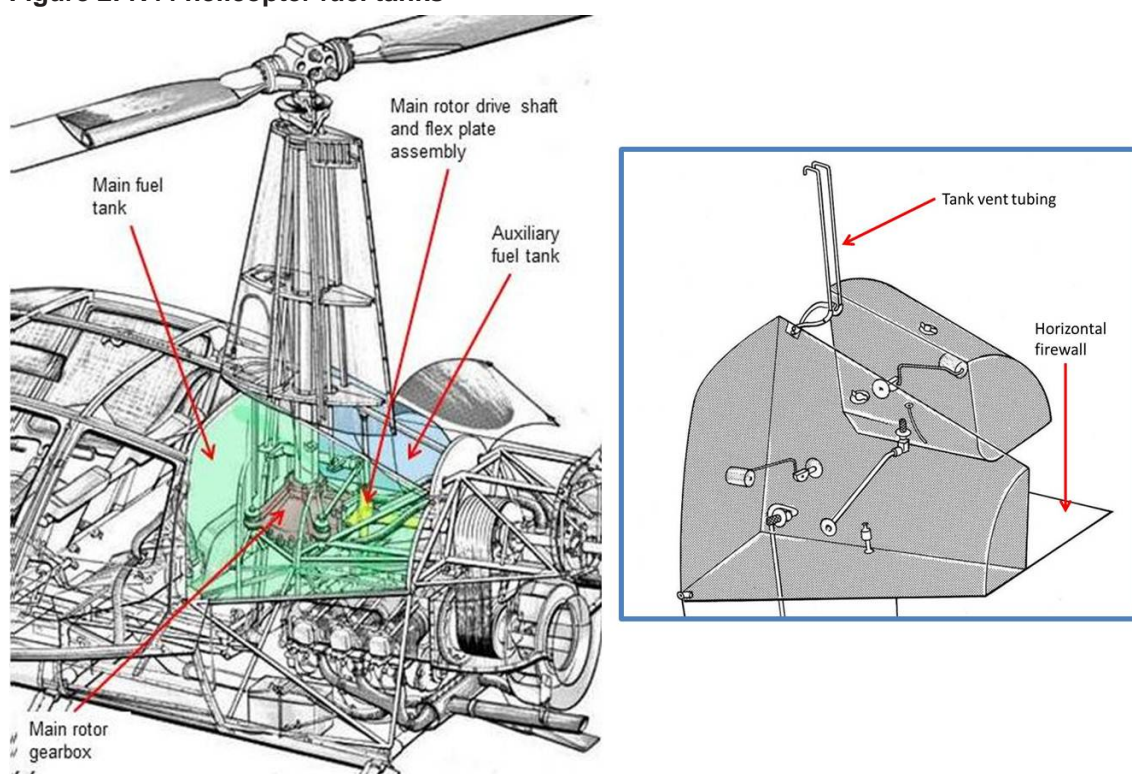
Fuel and fuel system

The engine fitted to VH-HWQ operated on aviation gasoline (Avgas). Avgas is a volatile fuel that can ignite easily if a fuel tank is ruptured in the presence of an ignition source, such as a spark during an impact sequence.

The R44 was originally manufactured with two all-aluminium fuel tanks that were installed above the engine firewall, either side of the main transmission (Figure 2).

The maintenance provider for VH-HWQ advised that helicopter manufacturer's Service Bulletin SB-78B, to replace the all-aluminium fuel tanks with bladder tanks, had been planned to be conducted prior to the due date of 30 April 2013. The rotor brake switch had been replaced on 17 April 2012 in accordance with Service Bulletin SB-82 (see below), which reduced the risk of the switch as a possible ignition source in the event of a fuel leak. Further details of these bulletins are provided below.

Figure 2: R44 helicopter fuel tanks



Source: Flight International; David Hatchard, Torrance, California July 1992

Wreckage and impact information

All of the helicopter's major components were identified at the accident site, and the wreckage was located across a relatively small area (Figure 3).

The wreckage was resting on its right side and orientated facing to the east on a heading of 103° M. There was evidence of two main rotor strikes on the tail boom and the boom was severed during the accident sequence. A large section of tail rotor drive shaft was located approximately 15 m to the south-west of the main wreckage. Both main rotor blades were still attached to the main rotor head with both blades displaying rearward and upward bending.

Examination showed that the main rotor impact caused the main rotor mast and gearbox assembly to move, breaching one or both fuel tanks. That provided the fuel source for the post-impact, fuel-fed fire. Due to the extent of the post-impact fire, identification of the ignition source was not possible. The intense fire destroyed the cabin area.

Overall, the physical evidence was consistent with the witness evidence and indicated a very low-energy impact. Preliminary assessment of the wreckage identified no pre-existing defects associated with the helicopter.

Figure 3: Main wreckage



Source: ATSB

R44 fuel tank replacement history

Initial service bulletin to replace tanks

On 20 December 2010, the helicopter manufacturer issued R44 Service Bulletin SB-78² requiring that R44 helicopters with all-aluminium fuel tanks be retrofitted with bladder-type tanks as soon as practical, but no later than 31 December 2014. The SB was applicable to R44 aircraft with serial numbers 0001 to 2064 and R44 II aircraft with serial numbers 10000 to 12890. The background information to the SB stated:

To improve the R44 fuel system's resistance to a post accident fuel leak, this retrofit must be performed as soon as possible.

The manufacturer advised that the bladder-type tanks provided improved resistance to post-accident fuel leaks due to their improved cut and tear resistance. In addition, the bladders were able to sustain large deformations without rupture.

Previous accidents involving fuel tank ruptures and fires

Accident involving VH-HFH (ATSB investigation AO-2011-016)

On 4 February 2011, an R44 helicopter, registered VH-HFH, commenced circuit operations at Cessnock Aerodrome, NSW. On board the helicopter were a flight instructor, a pilot and a passenger. Following a landing as part of a simulated failure of the hydraulic boost system for helicopter's flight controls, the instructor elected to reposition the helicopter to the apron. As the helicopter became airborne, it became uncontrollable and collided with the runway and caught fire. The pilot exited the helicopter; however, the instructor and passenger were fatally injured.

² Prior to the issue of SB-78, the manufacturer had issued other service bulletins that were designed to reduce the likelihood of post-accident fuel leaks.

In addition to factors contributing to the collision with terrain, the ATSB identified that the fatal injuries sustained by the instructor and passenger were due to the post-impact fire. The ATSB's final report included the following safety issue:

*A significant number of R44 helicopters, including VH-HFH, were not fitted with bladder-type fuel tanks and other modifications detailed in the manufacturer's service bulletin 78 that were designed to provide improved resistance to post-impact fuel leaks.
[Significant safety issue]*

Accident involving VH-COK (ATSB investigation AO-2012-021)

On 4 February 2012, an R44 helicopter, registered VH COK, lifted off from Jaspers Brush Aerodrome, NSW to photograph the launch of a deep sea submarine in nearby Jervis Bay. On board the helicopter were the pilot and a camera operator. Soon after lifting off the helicopter abruptly pitched nose-up then steeply nose-down, rolling to the right before the right landing gear skid and main rotor blades struck the ground. A fuel-fed fire started in the vicinity of the fuel tanks and lower mast area prior to the helicopter coming to a stop. Both occupants were fatally injured and the helicopter was destroyed.

Following this accident, on 21 February 2012, the manufacturer issued a revision to SB-78, numbered SB-78A. That revision reduced the time frame for compliance with the tank fitment from 31 December 2014 to 31 December 2013. The manufacturer also issued SB-82 relating to the fitment of a 'more rugged, environmentally sealed [sic] type rotor brake activation switch. The manufacturer indicated that the new switch was less likely to cause a spark in the event of an accident. SB-82 had a compliance date of 31 May 2012.³

In its Preliminary report into the VH-COK accident released on 9 March 2012, the ATSB released safety advisory notice AO-2012-021-SAN-001, which stated:

The Australian Transport Safety Bureau encourages all operators and owners of R44 helicopters that are fitted with all-aluminium fuel tanks to note the circumstances of this accident as detailed in this preliminary report. It is suggested that those operators and owners actively consider replacing these tanks with bladder-type fuel tanks as detailed in the manufacturer's Service Bulletin (SB) 78A as soon as possible.

Subsequent safety actions

On 15 June 2012, the manufacturer forwarded a letter of offer to all R44 Dealers, Service Centres and Owners, advising them of a financial incentive for them to install the SB-78A fuel tank kits 'on or before 31 December 2012'.

On 26 June 2012, CASA published Airworthiness Bulletin AWB 28-012 titled *Robinson R44 Fuel Tanks*. That AWB highlighted the improvement in the 'post-crash survivability' of R44 helicopters that had been fitted with bladder-type fuel tanks. It also 'strongly' recommended that operators of R44 aircraft incorporate SB-78A 'at their earliest convenience'.

On 28 September 2012, the manufacturer again revised the compliance date with the issue of SB-78B. That revision further reduced the date for compliance from 31 December to 30 April 2013.

On 22 November 2012, the ATSB listed R44 fuel tanks as one of its Safety Watch concerns on its web site⁴, and again encouraged all owners and operators of R44 helicopters fitted with

³ VH-HWQ had been fitted with the new switch as required by SB-82.

⁴ The ATSB Safety Watch highlights the broad safety concerns derived from its investigation findings and from the occurrence data reported by industry. The transport community is urged to give heightened attention to the identified risk areas in that watch list.

all-aluminium fuel tanks to 'consider replacing these tanks with bladder-type fuel tanks as detailed in the manufacturer's Service Bulletin 78B as soon as possible'.⁵

On 19 December 2012, in response to a question from the ATSB as to the possible mandating of the requirement for the fitment of the bladder tanks as indicated by the manufacturer in SB-78 and its associated SBs, CASA advised that:

CASA has drafted a Notice of Proposed Rule Making (NPRM) relating to a unique Australian Airworthiness Directive (AD) that will mandate the Robinson Helicopters R 44 SB 78B Bladder Fuel Tank Retrofit. Release of this NPRM, expected in early in 2013, is subject to confirmation from the FAA [US Federal Aviation Administration] as to their intended actions, which will follow their current investigation.

CASA advised that it had been liaising with the FAA's certification office regarding the subject of mandating SB-78B. In January 2013, the FAA advised CASA that, after analysis of accident data involving post-impact fires, the R44 fuel system crashworthiness did not appear inconsistent with that of other similar helicopters and that the FAA would be taking no corrective action.

On 6 February 2013, CASA issued a revised version of AWB 28-012. It included the same recommendation to R44 operators to incorporate SB-78 at their earliest convenience. On this date CASA also wrote to all R44 operators, with a note that:

Operators are reminded of their responsibility to ensure that aircraft are in a safe and airworthy state. This requires the operator to review manufacturer's recommendations and associated data and, where appropriate, to incorporate those recommendations.

Civil Aviation Regulation (CAR) 42A (4) 1988 states the following;

(4) If a person has elected to use a manufacturer's maintenance schedule for an aircraft's maintenance, all instructions issued by the manufacturer of components permanently, or from time to time, included in, or fitted to, the aircraft, being instructions for the continued airworthiness of the components, are to be taken to form part of the manufacturer's maintenance schedule and election has effect accordingly.

At this time, CASA strongly recommends that all operators of R44 helicopters, which are subject to the Robinson SB (78B), incorporate the manufacturer's modified bladder tanks at the earliest opportunity.

To enable CASA to determine the current and projected status of the R44 fleet, you are requested to advise CASA on the status of the fuel tank installation on your aircraft and whether the Service Bulletin modification has been installed. This can be achieved by completing the attached form and returning it by facsimile, mail or e-mail at the earliest opportunity.

Current situation

As of 21 March 2013, there were 484 R44 helicopters registered in Australia. Of these, 392 had serial numbers in the range referred to in SB-78.

On 25 March 2013, CASA advised that it had received 142 responses to its letter of 6 February 2013. These respondents indicated that 105 helicopters had been modified and 37 had not been modified. For those helicopters involved in charter operations, a total of 70 had been modified and 26 had not been modified. CASA also reported its assessment that approved maintenance organisations had the capacity to replace about 35 kits each month.

The ATSB contacted four major organisations in Australia that were obtaining and supplying the bladder-type retrofit kits for R44s in Australia. Overall, as of 25 March 2013, about 247 kits had been either fitted or supplied by those organisations, with another 23 kits on order.

⁵ See <http://www.atsb.gov.au/safetywatch/r44-fuel-tanks.aspx>.

Soon after the accident involving VH-HWQ on 21 March 2013, the helicopter manufacturer advised the ATSB that about 1,800 SB-78 retrofit kits had been factory installed or delivered worldwide to replace the all-aluminium tanks in the 4,000 affected R44 helicopters. The manufacturer advised that over 300 kits had been processed for Australia.

The helicopter manufacturer also advised that, in conjunction with the FAA, it was examining other methods to ensure greater compliance with the bladder-type fuel tank upgrade. However, the FAA was not currently in the process of developing an Airworthiness Directive (AD) that would mandate that all R44 owners had to comply with SB-78.

Under Part 39 of the Australian Civil Aviation Safety Regulations, airworthiness directives issued by a foreign State of Design are automatically applicable to Australian aircraft. This does not prevent CASA or regulatory authorities in other countries from placing their own regulatory requirements on aircraft types if they identify a need to do so.

On 27 March 2013, CASA advised the ATSB that, depending on the System of Maintenance affecting an individual helicopter, SB-78B required the fitment of bladder-type tank fitment to all R44 helicopters in lieu of the all-aluminium fuel tanks. More specifically, CASA stated that if a specific helicopter's Maintenance Schedule included a requirement to carry out scheduled maintenance, overhauls and inspections in accordance with Page 1.1 of the manufacturer's Maintenance Schedule, then compliance by the due date was mandatory. CASA also advised that it was of the opinion that the vast majority of operators would be using the manufacturer's maintenance program. However, CASA also advised it was possible that not all owners or maintainers were aware of this indirect requirement to comply with SB-78B.

Helicopter accidents involving post-impact fire

The ATSB reviewed statistics for helicopter accidents⁶ in Australia from 1 January 2003 until 21 March 2013 (Table 1). There were records of 22 accidents involving a post-impact fire. A higher proportion of accidents resulted in post-impact fire for R44 helicopters (12 per cent) compared with all other piston-engine helicopter types (6 per cent)⁷.

Table 1: Post-impact fire helicopter accidents in Australia from 2003 to 21 March 2013⁸

Type	No. of accidents	No. with post-impact fire	Per cent with post-impact fire
R44	59	7	12%
R22	141	7	5%
Other piston	57	4	7%
Turbine	78	4	5%

Preliminary analysis by the ATSB of the US National Transportation Safety Board accident database for helicopter accidents in the US during the period 2003 to 2012 gives similar results, with 15 per cent of R44 accidents, 5 per cent of R22 accidents and 4 per cent of other piston-engine helicopter accidents involving a post-impact fire.

For the 22 Australian post-impact fire accidents, six were non-fatal accidents, including one of the R44 accidents. Three of the R44 accidents that resulted in fatalities involved relatively low-energy impacts and rapid onset of fire (VH-HFH, VH-COK and VH-HWQ). All of the other 13 post-impact

⁶ An accident is an event that results in serious or fatal injuries, and/or the helicopter being substantially damaged or destroyed.

⁷ The R22 and R44 do not have a higher rate of accidents per flying hour than other piston-engine helicopter types.

⁸ These statistics do not include amateur-built helicopters. Accidents which did not involve an impact prior to the fire are not considered post-impact fires. One accident involving a mid-air collision between two R22s, resulting in post-impact fire to both, is counted here as two accidents.

fire accidents in Australia appeared to involve relatively high-energy impacts or circumstances likely to result in fatal injuries due to the impact alone.

The helicopter manufacturer advised being aware of four accidents involving R44 helicopters fitted with bladder-type tanks, none of which occurred in Australia. Each accident was of sufficient severity to result in fatal or serious injury to the occupants. Whereas the manufacturer advised that three of these accidents did not result in a post-accident fire, at the time of writing, the manufacturer was unable to confirm whether a post-accident fire occurred in the fourth instance.

Safety analysis

At this stage, the circumstances leading to the collision of the main rotor with the trees are still being examined.

The available evidence from witnesses and the assessment of the wreckage indicates that the accident involved a relatively low-energy impact, such that the impact forces would have been unlikely to lead to fatalities. This is the third R44 accident in 2 years with similar characteristics and tragic outcome. In addition, R44 accidents result in a significantly higher proportion of post-impact fires than for other similar helicopter types.

The helicopter manufacturer, Australian Transport Safety Bureau (ATSB) and the Civil Aviation Safety Authority have been actively encouraging all R44 owners and operators to replace the all-aluminium fuel tanks with bladder tanks as specified in the manufacturer's Service Bulletin SB-78. Although there has been a relatively high rate of compliance with this bulletin in Australia compared to other countries, there are still in the order of 100 R44 aircraft for which there appears to be no indication of a replacement kit having been ordered.

The ATSB considers this situation represents an unnecessary and significant risk to the occupants of unmodified R44 aircraft.

Preliminary finding

From the evidence available at the time of writing, the following preliminary finding is made with respect to the accident involving Robinson Helicopter Company R44, registered VH-HWQ, at Bulli Tops, New South Wales on 21 March 2013. They should not be read as apportioning blame or liability to any particular organisation or individual:

Other safety factor

- Robinson R44 helicopter accidents result in a significantly higher proportion of post-impact fires than for other similar helicopter types. In addition, a significant number of R44 helicopters have not been fitted with bladder-type fuel tanks as specified in the manufacturer's Service Bulletin SB-78 to improve resistance to post-impact fuel leaks and the existing regulatory arrangements are not sufficient to ensure all operators and owners of R44 aircraft will comply with the service bulletin. *[Significant safety issue]*

Safety issues and actions

A safety issue has been identified during the initial investigation of this accident as detailed in the Preliminary finding and Safety issues and actions sections of this report. The Australian Transport Safety Bureau (ATSB) expects that all safety issues identified by an 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.

During the preparation of this preliminary report, the ATSB provided the Civil Aviation Safety Authority (CASA) with information relating to the safety issue. CASA was invited to communicate what safety actions, if any, they had carried out or were planning to carry out in relation to the issue.

Fitment of rubber, bladder-type fuel tanks to R44 helicopters

Number:	AO-2013-055-SI-001
Issue owner:	Civil Aviation Safety Authority (CASA)
Type of Operation:	General aviation—all R44 helicopter operations
Who it affects:	All owners and operators of R44 helicopters
Risk at the time of the occurrence:	Significant

Safety issue description:

Robinson R44 helicopter accidents result in a significantly higher proportion of post-impact fires than for other similar helicopter types. In addition, a significant number of R44 helicopters have not been fitted with bladder-type fuel tanks as specified in the manufacturer's Service Bulletin SB-78 to improve resistance to post-impact fuel leaks and the existing regulatory arrangements are not sufficient to ensure all operators and owners of R44 aircraft will comply with the service bulletin.

Proactive safety action taken by the Civil Aviation Safety Authority

On 27 March 2013, CASA stated:

CASA has highlighted to registered operators the operation of CAR 42A. At page 1.1 of the Robinson Maintenance Schedule it states Service Bulletin compliance is mandatory. Registered operators of R44 helicopters who have elected, or are otherwise required, to use the manufacturer's maintenance schedule must comply with the abovementioned SB's by 30 April 2013. If they do not, the aircraft cannot be flown.

and that:

CASA will also, as soon as possible, write to all operators of Robinson R44 helicopters to identify if any of them are subject to an approved system of maintenance that does not include a requirement to comply with service bulletins. If any such systems do not contain such a requirement, CASA will consider directing that the system be changed under CAR 42Q to require compliance with service bulletins.

Action number: AO-2013-055-NSA-001

ATSB response: The ATSB notes that Australian owners and operators of Robinson R44 aircraft have shown a greater rate of compliance with the manufacturer's Service Bulletin SB-78B than has occurred on a worldwide basis. The ATSB also notes CASA's understanding that existing regulatory requirements are such that compliance with SB-78B is already mandatory for the vast majority of R44 helicopters in Australia. However, the ATSB remains concerned that a significant

number of Australian owners and operators have not yet taken steps to comply with the service bulletin and are therefore very unlikely to be able to comply by the required date of 30 April 2013.

ATSB safety recommendation to the Civil Aviation Safety Authority

Action number: AO-2013-055-SR-001

Action status: Released

The ATSB recommends that CASA take further action to ensure that owners and operators of Robinson R44 helicopters are aware of the relevant regulatory requirements and comply with the manufacturer's service bulletin SB-78B to replace all-aluminium fuel tanks with bladder-type tanks on Robinson R44 helicopters.

Ongoing investigation activities

The ATSB's investigation is ongoing and will include:

- review of the pilot's experience and training
- collection and further analysis of witness statements
- collection and analysis of meteorological information
- examination of damaged computers, mobile phones and cameras that were recovered from the accident site
- examination of a number of flight control components that were recovered from the wreckage
- further analysis of post-impact fire accidents
- further analysis of the Australian and international regulatory arrangements for the airworthiness of R44 helicopters.

General details

Occurrence details

Date and time:	21 March 2013 – 1207 EDT	
Occurrence category:	Accident	
Primary occurrence type:	Collision with terrain	
Type of operation:	Private	
Location:	Bulli Tops, New South Wales	
	Latitude: 34°18.2' S	Longitude: 150°54.6' E

Pilot details

Licence details:	Private Pilot (Helicopter) Licence, issued September 2011
Endorsements:	R22, R44
Medical certificate:	Class 2, renewed November 2012 (reading correction to be available)
Aeronautical experience:	175 hours total, 21.9 hours on R44
Last flight review:	29 August 2011

Aircraft details

Manufacturer and model:	Robinson Helicopter Company R44	
Registration:	VH-HWQ	
Operator:	Private	
Serial number:	1445	
Manufacture date:	2004	
Total time:	2,178 hours	
Persons on board:	Crew – 1	Passengers – 3
Injuries:	Crew – 1 fatal	Passengers – 3 fatal
Damage:	Destroyed	

Sources and submissions

Sources of information

The sources of information during the investigation to date have included the:

- New South Wales Police
- witnesses at Bulli Tops
- helicopter manufacturer
- Civil Aviation Safety Authority (CASA)
- helicopter maintenance organisation.

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 US National Transportation Safety Board, the manufacturer of the helicopter and CASA.

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

Australian Transport Safety Bureau

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; 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.

Purpose of safety investigations

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. The terms the ATSB uses to refer to key safety and risk concepts are set out in the next section: Terminology Used in this Report.

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.

Developing safety action

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. The ATSB prefers to encourage the relevant organisation(s) to initiate proactive safety action that addresses safety issues. Nevertheless, the ATSB may use its power to make a formal safety recommendation either during or at the end of an investigation, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation.

When safety recommendations are issued, they focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on a preferred method of corrective action. As with equivalent overseas organisations, the ATSB has no power to enforce the implementation of its recommendations. It is a matter for the body to which an ATSB recommendation is directed to assess the costs and benefits of any particular means of addressing a safety issue.

When the ATSB issues a safety recommendation to a person, organisation or agency, they must provide a written response within 90 days. That response must indicate whether they accept the recommendation, any reasons for not accepting part or all of the recommendation, and details of any proposed safety action to give effect to the recommendation.

The ATSB can also issue safety advisory notices suggesting that an organisation or an industry sector consider a safety issue and take action where it believes it appropriate. There is no requirement for a formal response to an advisory notice, although the ATSB will publish any response it receives.

Terminology used in this report

Occurrence: accident or incident.

Safety factor: an event or condition that increases safety risk. In other words, it is something that, if it occurred in the future, would increase the likelihood of an occurrence, and/or the severity of the adverse consequences associated with an occurrence. Safety factors include the occurrence events (e.g. engine failure, signal passed at danger, grounding), individual actions (e.g. errors and violations), local conditions, current risk controls and organisational influences.

Contributing safety factor: a safety factor that, had it not occurred or existed at the time of an occurrence, then either: (a) the occurrence would probably not have occurred; or (b) the adverse consequences associated with the occurrence would probably not have occurred or have been as serious, or (c) another contributing safety factor would probably not have occurred or existed.

Other safety factor: a safety factor identified during an occurrence investigation which did not meet the definition of contributing safety factor but was still considered to be important to communicate in an investigation report in the interests of improved transport safety.

Other key finding: any finding, other than that associated with safety factors, considered important to include in an investigation report. Such findings may resolve ambiguity or controversy, describe possible scenarios or safety factors when firm safety factor findings were not able to be made, or note events or conditions which 'saved the day' or played an important role in reducing the risk associated with an occurrence.

Safety issue: a safety factor that (a) can reasonably be regarded as having the potential to adversely affect the safety of future operations, and (b) is a characteristic of an organisation or a system, rather than a characteristic of a specific individual, or characteristic of an operational environment at a specific point in time.

Risk level: The ATSB's assessment of the risk level associated with a safety issue is noted in the Findings section of the investigation report. It reflects the risk level as it existed at the time of the occurrence. That risk level may subsequently have been reduced as a result of z taken by individuals or organisations during the course of an investigation.

Safety issues are broadly classified in terms of their level of risk as follows:

Critical safety issue: associated with an intolerable level of risk and generally leading to the immediate issue of a safety recommendation unless corrective safety action has already been taken.

Significant safety issue: associated with a risk level regarded as acceptable only if it is kept as low as reasonably practicable. The ATSB may issue a safety recommendation or a safety advisory notice if it assesses that further safety action may be practicable.

Minor safety issue: associated with a broadly acceptable level of risk, although the ATSB may sometimes issue a safety advisory notice.

Safety action: the steps taken or proposed to be taken by a person, organisation or agency in response to a safety issue.

Australian Transport Safety Bureau

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Investigation

ATSB Transport Safety Report

Aviation Occurrence Investigation

Collision with terrain involving Robinson R44 helicopter, VH-HWQ
Bulli Tops, New South Wales, 21 March 2013

AO-2013-055

Preliminary - 5 April 2013