



# ROBINSON HELICOPTER OCCURRENCE ANALYSIS

January 2017 – December 2022

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<b>Version</b>	5.1
<b>Date</b>	30 May 2023

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## 2 EXECUTIVE SUMMARY

Robinson piston engine helicopters (R22/R44) account for approximately half of the total rotorcraft registrations and over 80% of rotorcraft piston engine registrations in Australia. They represent the bulk of the rotary wing aircraft fleet, and this would be a factor in these aircraft experiencing a higher number of reported accidents compared to other similar aircraft.

There were 167 reported occurrences for Robinson R22 helicopters over the six-year period 2017 – 2022, an average of 7 per quarter. By comparison the Robinson R44 helicopter had 245 occurrences at an average of 10 per quarter. No evidence of an increasing trend was identified for either R22 or R44.

Over the period analysed, 42% (70 of 167) of occurrences resulted in accidents for the R22, compared to 18% (44 of 245) for the R44. Of the 70 R22 accidents, 6 were fatal accidents (7 fatalities). The R44 had 44 accidents with 4 fatal accidents (6 fatalities).

For the R22, the rate of reported occurrences (per 100,000 hours flown) averaged 18.2 over the five-year period 2017 to 2021. This rate is above the Bell 47G (11.5) and below each of R44 (45.7), Bell 206 (40.4) rotary aircraft. When comparing to fixed wing aircraft, the Cessna 172 (107.4) and Cessna 182 (95.4) recorded higher occurrence rates.

The analysis identified that 49% of the R22 occurrences (Jan-2017 – Dec-2022) occurred in Queensland. By comparison, 34% of occurrences for R44 occurred in Queensland (and 29% in NSW).

For R22 aircraft, 60% (101 of 167) of occurrences occurred during either aerial work or instructional flying activity. For R44, 26% (64 of 245) of occurrences occurred during the activity type of Commercial Air Transport and 18% (43) for aerial work.

Collision with terrain was the primary occurrence type categorised for both the Robinson R22 (56) and R44 (40) helicopters. This was followed by loss of control (32) for the R22 model but not the R44 airframe. All other categories were relatively consistent for both aircraft.

### 3 BACKGROUND

Due to a suspected increase in Robinson Helicopter accidents, the Executive Manager Guidance, Transformation and Safety Systems (GTSS), requested an analysis of helicopter models produced by this manufacturer. The scope of the analysis was to concentrate on accidents/incidents in the last five years, the nature of operations, and any concerning trends or relevant factors related to potential causes.

### 4 DATA SOURCES

The Australian Transport Safety Bureau (ATSB) maintains its own database, the ATSB Investigation Management System (AIMS), in which all reported occurrences are logged, assessed, classified, and recorded. The information contained within AIMS is dynamic and subject to change based on additional and/or updated data.

The data in this report is based on the ATSB's quality assured Air Safety Incident Reports (ASIR) dataset which is loaded into CASA's data warehouse on a weekly basis.

The following parameters were used in this analysis.

Data field name	Extracted value/s
Airframe Manufacturer	Robinson Helicopter
Model Name	R22 and R44

The CASA Aircraft Register was used to determine the number of active aircraft registrations for the Robinson Helicopter models.

The Bureau of Infrastructure and Transport Research (BITRE) conducts the General Aviation Activity Survey of operators to obtain estimates of flight activity. Occurrence and accident rates were calculated using BITRE's annual flight activity survey data. The latest survey results available is 2021.

### 5 AIRCRAFT REGISTRATIONS

The Robinson R22 helicopter is the most common rotary-wing type on the VH aircraft register, with 26% of rotary-wing registrations. This is followed by the Robinson R44, with 24%, and the Bell 206 with 10% of helicopters. Piston-engined Robinson helicopters constitute around 50% of rotary wing aircraft in Australia, a proportion that has remained consistent over the six-year period analysed. Over this time, the R22 fleet has increased by 10% from 620 to 684, and the R44 fleet has increased by 21% from 511 to 621 registered aircraft.

TABLE 1: ROBINSON HELICOPTER REGISTRATIONS

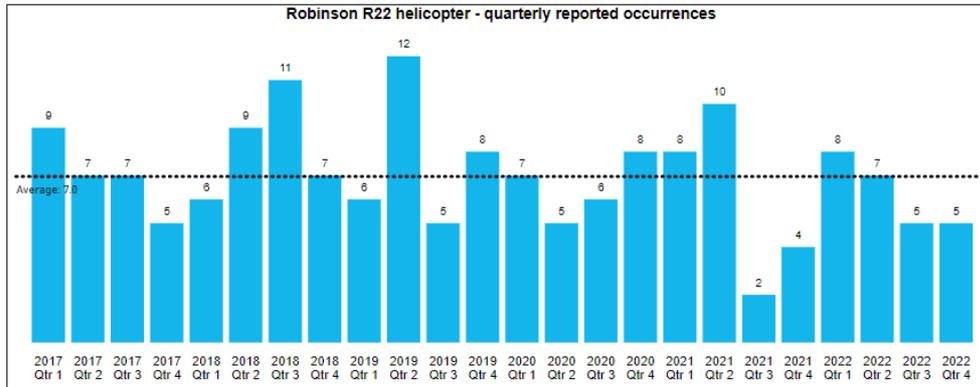
Year	Robinson R22			Robinson R44			Bell 47G		Bell 206	
	Number	% of piston rotorcraft	% of total rotorcraft	Number	% of piston rotorcraft	% of total rotorcraft	Number	% of total rotorcraft	Number	% of total rotorcraft
2017	620	45%	27%	511	37%	22%	81	4%	268	12%
2018	644	45%	27%	538	37%	23%	78	3%	277	12%
2019	638	44%	27%	558	39%	23%	76	3%	288	12%
2020	646	44%	27%	570	39%	24%	74	3%	289	12%
2021	668	44%	27%	596	39%	24%	74	3%	292	12%
2022	684	44%	26%	621	40%	24%	75	3%	298	11%

Source: CASA Aircraft Register

## 6 OCCURRENCE FREQUENCY

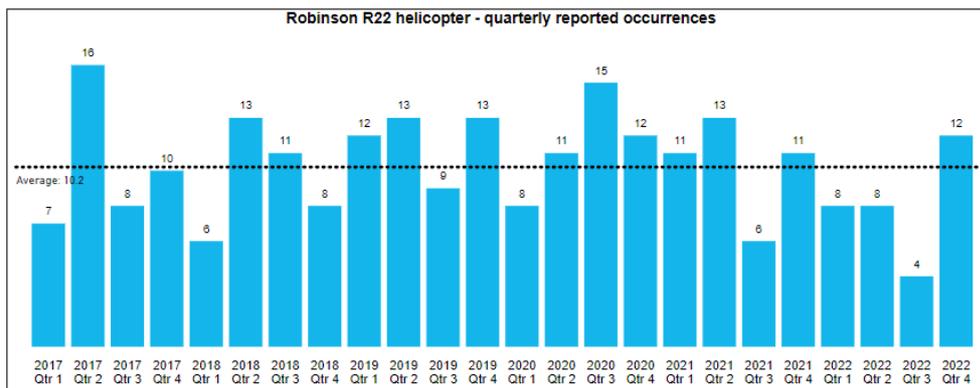
A total of 167 occurrences for Robinson R22 helicopter were reported in the six-year period January 2017 - December 2022, averaging 7.0 per quarter, with no evidence of an increasing trend. Of the 167 reported occurrences, 70 were accidents, at an average of 2.9 per quarter.

FIGURE 1: ROBINSON R22 REPORTED OCCURRENCES



A total of 245 occurrences for Robinson R44 helicopter were reported in the six-year period January 2017 - December 2022, averaging 10.2 per quarter, with no evidence of an increasing trend. Of the 245 occurrences, 44 accidents were reported, at an average of 1.8 per quarter.

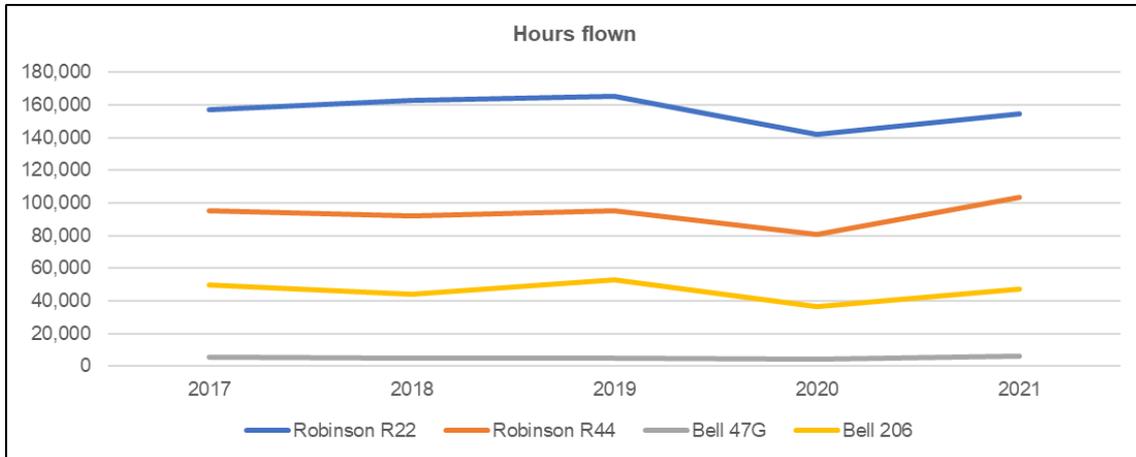
FIGURE 2: ROBINSON R44 REPORTED OCCURRENCES



## 7 AIRCRAFT ACTIVITY

Activity data for selected rotary aircraft models indicates that the Robinson R22 and R44 models have consistently flown the most hours in the period reviewed.

FIGURE 3: FLYING HOURS FOR RELEVANT HELICOPTER MODELS



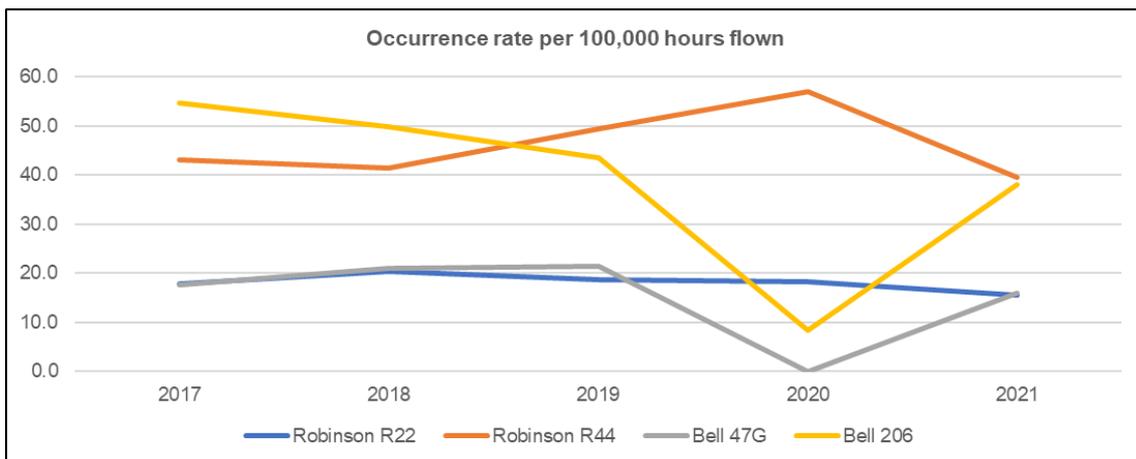
Source: BITRE flying activity survey

## 8 OCCURRENCE RATES

The occurrence rate is calculated by dividing the number of occurrences by a measure of activity; in this case, hours flown. Activity data is sourced from BITRE’s General Aviation Activity Survey. The most recent data available is for the year 2021.

For the five-year period 2017 - 2021, the occurrence rate for R22 helicopters has averaged 0.18 per 100,000 hours flown. There was no observable trend identified over this period. This compares to the following helicopter models: R44 (0.46), Bell 47G (0.17); Bell 206 (0.37).

FIGURE 4: OCCURRENCE RATE PER 100,000 HOURS FLOWN



## 9 AIRCRAFT TYPE COMPARISON

A comparison of several key metrics between Robinson and Bell helicopter aircraft models was conducted. The data indicates the R22 and R44 had a higher number of reported occurrences and accidents compared to other rotary-wing models.

A comparison was also made between the Robinson helicopters and fixed wing aircraft of similar size and utilised for similar purposes; the Cessna 172 and Cessna 182. The results indicate these aircraft had a higher occurrence rate than the Robinson R22 and R44 models, suggesting a better reporting culture in the operators of the fixed-wing aircraft, but a similar accident and fatal accident rate.

TABLE 2: AIRCRAFT TYPE COMPARISONS

Report period: 2017-2022	Rotary-wing				Fixed-wing	
	Robinson R22	Robinson R44	Bell 47G	Bell 206	Cessna 172	Cessna 182
Number of occurrences	167	245	4	113	932	214
Occurrence rate <sup>1</sup>	18.2	45.7	11.5	40.4	107.4	95.4
Number of accidents <sup>2</sup>	70	44	0	19	34	13
Accident rate <sup>1</sup>	7.3	8.2	0.0	5.7	3.4	6.2
% of occurrences classified as accidents	41.9%	18.0%	0.0%	16.8%	3.6%	6.1%
Fatal accidents	6	4	0	3	5	3
Fatal accident rate <sup>1</sup>	0.5	0.6	0.0	0.0	0.5	1.5
% of occurrences classified as fatal accidents	3.6%	1.6%	0.0%	2.7%	0.5%	1.4%

1. Rate per 100,000 flying hours

2. Includes fatal accidents

## 10 OCCURRENCE ACTIVITY TYPE

For R22 aircraft, 36% (60 of 167) of occurrences occurred during aerial work activity, 25% (41) for instructional flying and 24% (40) for unknown general aviation flying. Within aerial work, 65% (39 of the 60) occurred during agricultural mustering.

For R44 aircraft, 26% (64 of 245) of occurrences occurred during activity type Commercial Air Transport, 22% (53) for unknown general aviation flying, and 18% (43) for aerial work.

FIGURE 5: ACTIVITY TYPES OF ROBINSON R22 OCCURRENCES

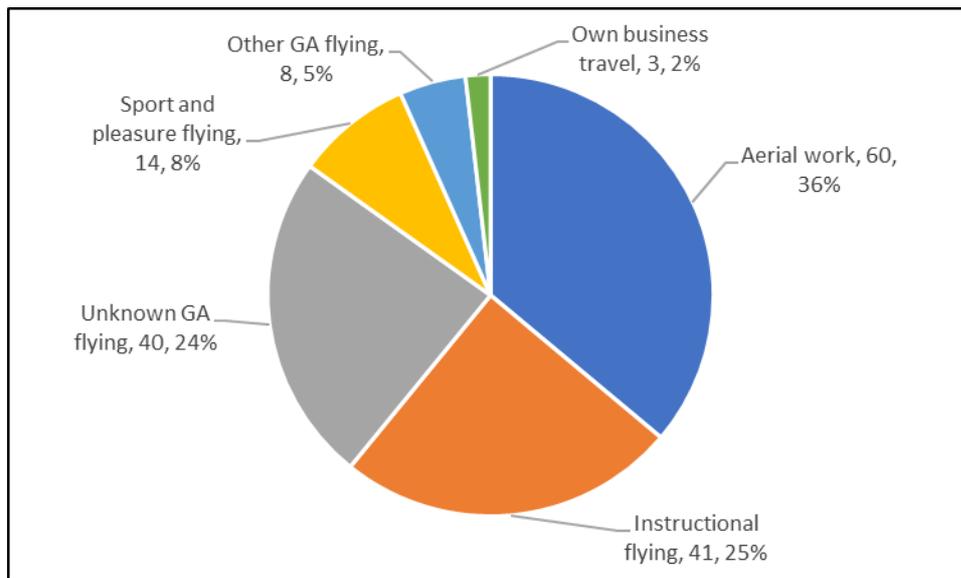
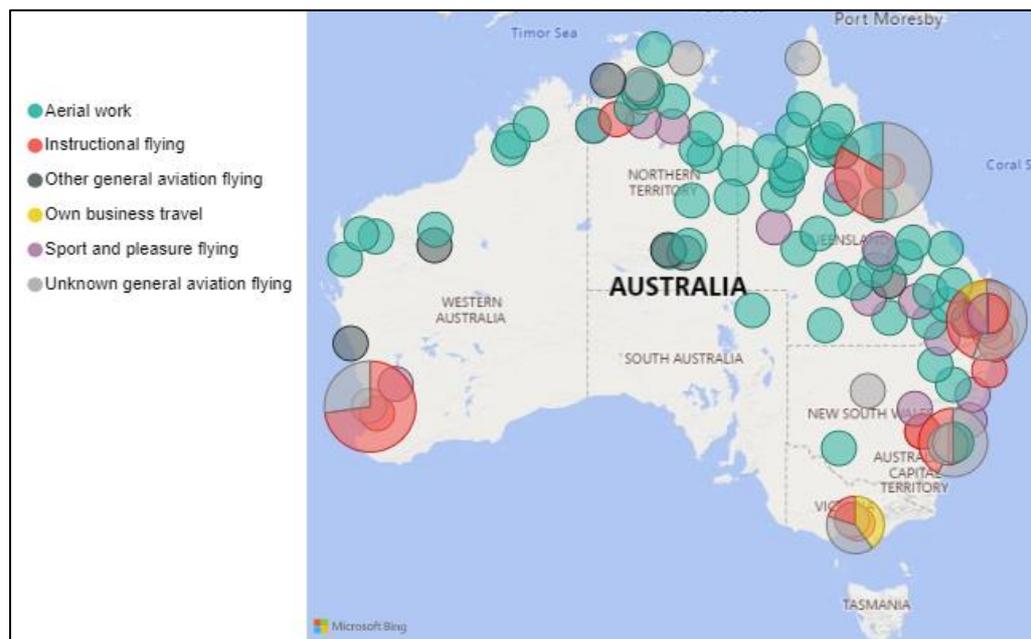


FIGURE 6: LOCATION OF ACTIVITY TYPES OF ROBINSON R22 OCCURRENCES



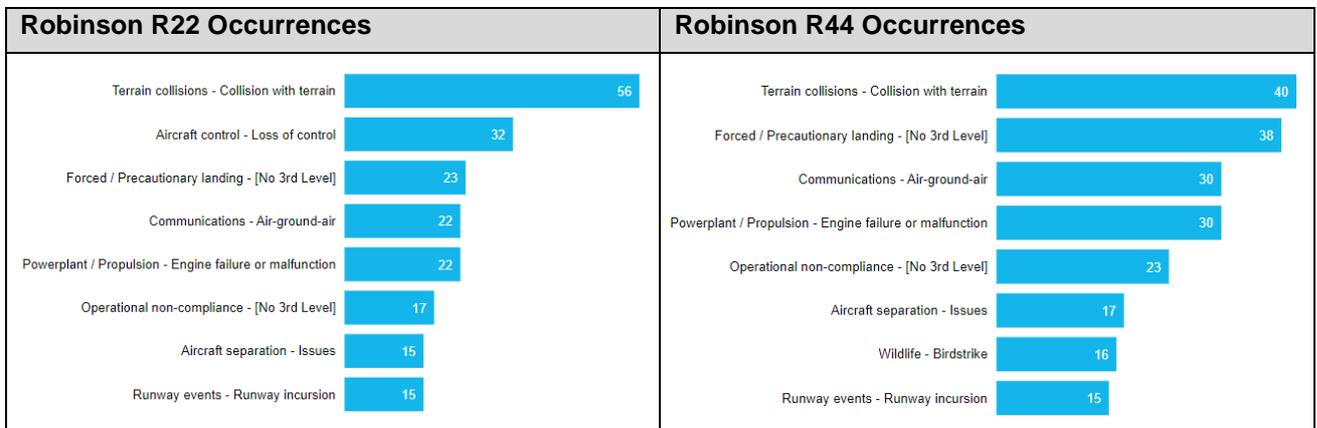
# 11 OCCURRENCE TYPES

The ATSB classify occurrences according to a three-level taxonomy hierarchy. This enables the grouping of occurrences across various category levels. Further information on the arrangement and definitions of the taxonomy can be found on the ATSB website under the Occurrence category taxonomy and terminology section [www.atsb.gov.au/avdata/terminology](http://www.atsb.gov.au/avdata/terminology)

The ATSB can classify occurrences against multiple categories, this means that some occurrences may be included in several of the listed classifications. An example would be a collision with terrain which may be due to a loss of control of the aircraft.

Over the six-year period analysed, collision with terrain was the primary occurrence type recorded for both Robinson R22 (34%) and R44 (16%) helicopters. loss of control was the second highest category for the R22 airframe but this was not recorded in the top eight classifications for the R44 helicopter. All other categories were relatively consistent for both aircraft.

FIGURE 7: OCCURRENCE TYPES FOR ROBINSON R22 AND R44 MODELS

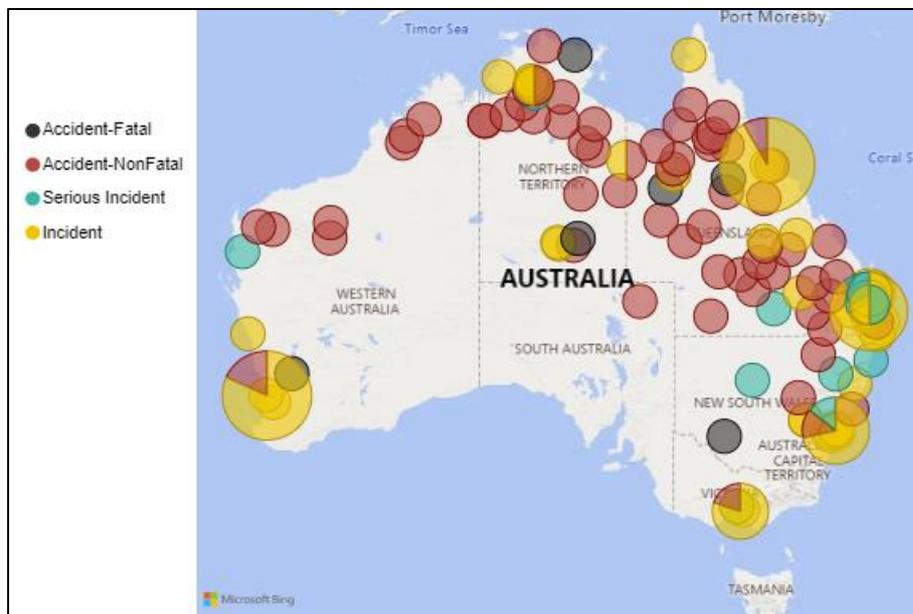


Note: Only categories with 15 or more occurrences in the period analysed were included.

# 12 OCCURRENCE LOCATION

Forty-nine per cent of the R22 occurrences (Jan-2017 – Dec-2022) were recorded in Queensland (16% NT, 15% NSW, 14% WA). By comparison, 34% of occurrences for R44 were reported in Queensland (and 29% in NSW).

FIGURE 8: LOCATION OF ROBINSON R22 REPORTED OCCURRENCES



## 13 FATAL ACCIDENTS

Six fatal accidents have occurred within the report period for R22 and four involving the R44 helicopters.

TABLE 3: ROBINSON R22 FATAL ACCIDENTS

Details	Occurrence Description
<p>Occurrence date: 2/08/2017</p> <p>Occurrence Type Level3: Flight controls / In-flight break-up</p> <p>Activity type: Aerial work</p> <p>Activity SubType: Agricultural mustering</p>	<p>On the morning of 2 August 2017, the pilot of a Robinson R22 Beta II helicopter, registered VH HGU and operated by Cloncurry Mustering Company, departed Cloncurry Airport, Queensland, on a ferry flight in preparation for an aerial mustering operation. About 3 minutes after take-off, the pilot experienced a loss of control and the helicopter broke-up in-flight. The helicopter collided with terrain about 7 km north-north-west of Cloncurry. The pilot, who was the only occupant, was fatally injured and the helicopter was destroyed. The ATSB found that the helicopter had recently undergone a 2,200-hour overhaul and this was the first commercial flight since that time. The on-site examination established that the bell crank in the helicopter cyclic control assembly was missing a fastener, which allowed the assembly to disconnect in-flight. The ATSB concluded that it was likely that the fastener's self-locking nut was either not reinstalled or it was inadequately torqued during the overhaul. While it could not be determined what had occurred to result in this condition, it was noted that Cloncurry Air Maintenance (CAM) did not use the work-pack to record and track all maintenance activities during the overhaul, which extended over a period of almost 4 months. The ATSB noted that, in the years leading up to the accident, the CAM workforce structure had changed in a manner that reduced the levels of its qualifications and experience. In the month leading up to the accident, the CAM workforce was operating at a very high workload, which likely exceeded their workforce capability and reduced the chief engineer's capacity to oversight maintenance activities. Cloncurry Air Maintenance (CAM) had limited internal independent oversight of maintenance activities to evaluate its quality performance. The organisation was subject to both contracted and regulator audit activities in the years leading up to the accident. The ATSB reviewed two of the work-packs sampled during the audits and noted that discrepancies in their maintenance documentation practices were visible to the auditors. However, the auditors had not identified any issues associated with those practices, and therefore, the audits were of limited benefit to CAM. It was also established that CAM were re-using the MS21042L-series nuts on critical fasteners without replacing them with D210-series corrosion resistant nuts in accordance with the manufacturer's instructions. However, the ATSB also found that the re-use of self-locking nuts was a common and accepted industry practice.</p>
<p>Occurrence date: 24/11/2018</p> <p>Occurrence Type Level3: Collision with terrain</p> <p>Activity Type: Aerial work</p> <p>Activity SubType: Other agricultural</p>	<p>On the morning of 24 November 2018, the pilot and passenger of a Robinson R22 helicopter, registered VH-KZV, were tasked to assist with the recovery of a motor vehicle near Quartz Hill, located about 63 km east-north-east of Ambalindum Station (departure point), Northern Territory. They were also intending to visit some water bore sites. After departing, they landed at one bore site before continuing towards Quartz Hill. Shortly after entering the MacDonnell Ranges, the helicopter collided with terrain on a downslope (125 km east-north-east of Alice Springs Airport). The pilot was fatally injured and the passenger received serious injuries. The helicopter was destroyed.</p>

Details	Occurrence Description
<p>Occurrence date: 11/02/2021</p> <p>Occurrence Type Level3: Collision with terrain</p> <p>Activity Type: Sport and pleasure flying</p> <p>Activity SubType: Pleasure and personal transport</p>	<p>The helicopter collided with terrain and the pilot was fatally injured. The investigation is continuing.</p>
<p>Occurrence date: 26/05/2021</p> <p>Occurrence Type Level3: Wirestrike / Collision with terrain</p> <p>Activity Type: Aerial work</p> <p>Activity SubType: Agricultural mustering</p>	<p>On 26 May 2021, the pilot of a Robinson R22 Beta helicopter, registered VH-KLY and operated by Stock &amp; Station Aviation, was conducting mustering operations on a property 75 km west-north-west of Hay, New South Wales. The pilot was the only person on board. As the helicopter was flown towards cattle yards, it struck a powerline and collided with terrain. The pilot was fatally injured.</p>
<p>Occurrence date: 2/10/2022</p> <p>Occurrence Type Level3: Collision with terrain</p> <p>Activity Type: Sport and pleasure flying</p> <p>Activity SubType: Pleasure and personal transport</p>	<p>The helicopter collided with terrain. The pilot and passenger sustained fatal injuries and the helicopter was destroyed. The investigation is continuing.</p>

Details	Occurrence Description
<p>Occurrence date: 14/11/2022</p> <p>Occurrence Type Level3: Collision with terrain</p> <p>Activity Type: Unknown general aviation flying</p> <p>Activity SubType: &lt;blank&gt;</p>	<p>The Australian Transport Safety Bureau (ATSB) is investigating the collision with terrain involving Robinson Helicopter Company R22, registration VH-LOS, 40 km south of Ramingining, Northern Territory. After departing on Monday 14 November, the aircraft failed to return. The helicopter wreckage was located on Tuesday 15 November. The pilot, the sole occupant of the aircraft, was fatally injured. The evidence collection phase will include examination of the accident site and wreckage, and the collection of other relevant evidence including recorded data, weather information, witness reports, and pilot and maintenance records. A final report will be released at the conclusion of the investigation. Should a critical safety issue be identified during the course of the investigation, the ATSB will immediately notify relevant parties, so that appropriate safety action can be taken.</p>

TABLE 4: ROBINSON R44 FATAL ACCIDENTS

Details	Occurrence Description
<p>Occurrence date: 4/07/2020</p> <p>Occurrence Type Level3: In-flight break-up / Collision with terrain</p> <p>Activity Type: Sport and pleasure flying</p> <p>Activity SubType: Pleasure and personal transport</p>	<p>On 4 July 2020, a Robinson Helicopter Company R44 Raven I helicopter, registered VH-NBY and operated on a private flight, departed an industrial property 3 km north of Broome Airport, Western Australia on a local flight. On board were the pilot and 3 passengers. The pilot made a vertical departure to climb clear of obstacles before transitioning forwards. At that time witnesses heard a loud bang, and the empennage and tail rotor system of the helicopter broke away. The helicopter initially continued to climb and rotated to the right with increasing angular velocity. Control of the helicopter was then lost, and it collided with terrain on its right side in a nose low attitude. The pilot and a passenger seated on the right side of the helicopter were fatally injured and the 2 passengers on the left side were seriously injured. The helicopter was destroyed.</p>
<p>Occurrence date: 31/07/2020</p> <p>Occurrence Type Level3: Wirestrike / Collision with terrain</p> <p>Activity Type: Aerial work</p> <p>Activity SubType: Agricultural spreading / spraying</p>	<p>On 31 July 2020, the pilot of a Robinson R44 Raven I helicopter, registered VH-HNF and operated by Riverina Helicopters, was conducting aerial weed spraying at Steam Plains, 69 km south-east of Hay Airport, New South Wales. During the fifth spray load of the morning, the pilot turned the spray off and conducted a climb to clear a stand of trees. At 1057 Eastern Standard Time, as the helicopter descended to continue spraying, the top of the left skid struck a powerline that crossed the flight path. The helicopter entered uncontrolled flight and collided with terrain about 120 m beyond where it struck the wire, resulting in fatal injuries to the pilot. The helicopter was substantially damaged.</p>

Details	Occurrence Description
<p>Occurrence date: 2/12/2020</p> <p>Occurrence Type Level3: In-flight break-up</p> <p>Activity Type: Instructional flying</p> <p>Activity SubType: Instructional flying - dual</p>	<p>On the afternoon of 2 December 2020, a Robinson Helicopter Company (RHC) R44 Raven I, registered VH-HGU, departed Goulburn Airport, New South Wales with a student pilot and instructor on board. The helicopter flew east, and the last recorded automatic dependent surveillance broadcast (ADS-B) detected it descending into a valley in the Bungonia State Conservation Area. A search commenced when the helicopter did not return as expected, and the wreckage of VH-HGU was found in a valley, approximately 4 km north-west of its last ADS-B transmission. Both pilots were fatally injured, and the helicopter was destroyed.</p>
<p>Occurrence date: 28/02/2022</p> <p>Occurrence Type Level3: Exhaustion / Collision with terrain</p> <p>Activity Type: Aerial work</p> <p>Activity SubType: Other aerial work</p>	<p>During aerial operations, the helicopter collided with terrain and was destroyed. The pilot sustained serious injuries and the passenger was fatally injured. The investigation is continuing.</p>