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2005 to 2014

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Addendum

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Safety summary

Why have we done this report

Thousands of safety occurrences involving Australian-registered and foreign aircraft are reported to the ATSB every year by individuals and organisations in Australia's aviation industry, and by the public. The aim of the ATSB's statistical report series is to give information back to pilots, operators, regulators, and other aviation industry participants on what accidents and incidents have happened, how often they are happening, and what we can learn from them.

What the ATSB found

In the 10-year period of 2005 to 2014, 254 aircraft have been involved in fatal accidents in Australia, leading to 374 fatalities. Most fatalities (240) were in CASA-registered (VH registrations) general aviation aircraft (including aerial agriculture, mustering, search and rescue, flying training, private and sport operations). Non-CASA registered recreational aircraft (aeroplanes, weight shift hang gliders, trikes, paragliders and powered parachutes, and gyrocopters) accounted for 98 fatalities. Commercial air transport (passenger regular public transport, charter and medical transport) accounted for 36 fatalities.

Across the 10-year period, the accident rate per hours flown was the highest for recreational aeroplanes, followed by aerial agriculture and private and sport aviation. However, all VH-registered private and sport operations (including gliding) had a similar accident rate as that for all non-VH recreational flying combined. Recreational aircraft, private/sport, and aerial agriculture operation types were among the most likely to result in a fatal accident when considering the amount of flying activity. Within recreational aviation, half of all gyrocopters accidents were fatal and almost a third of weight shift aircraft accidents were fatal.

In 2014 alone, there was a total of 278 aircraft involved in accidents, and 202 involved in serious incidents (indicating an accident nearly occurred). Twenty aircraft were involved in fatal accidents, and another 28 resulted in serious injury. In 2014, Australia saw 28 fatalities and 36 serious injuries as a result of aviation accidents.

Commercial air transport recorded no fatalities in 2014. However, there were 27 accidents, an increase compared to the 10-year average of 19. Five of the accidents resulted in seven serious injuries. Most accidents (23) involved charter aircraft, and were mostly collision with terrain or failure of the landing gear. The 37 serious incidents (mostly aircraft separation and pilot incapacitation events) was a significant drop compared to the previous 2 years.

General aviation experienced 149 accidents in 2014 (the highest in 10 years), 11 of which were fatal (the lowest in 10 years) and another 15 resulted in serious injuries. These accidents led to 17 fatalities and 20 serious injuries. General aviation aircraft were involved in 118 serious incidents in 2014. In 2013 – the last year with available activity data – the general aviation accident rate per departure was almost five times that of commercial air transport. The year 2013 saw a significant decrease in the accident rate compared with the previous 6 years. However, the fatal accident rate was consistent with the 10-year average. Aerial agriculture, followed by private and sport aviation had the highest general aviation accidents rates, while flying training had the lowest.

The reporting of safety incidents to the ATSB from recreational (non-VH) aviation has increased more than tenfold in the last 10 years. This is due to both the growth in recreational flying and improving awareness of reporting requirements. In 2014, 99 accidents were reported, nine of which were fatal and another eight leading to serious injuries. Most accidents involved aeroplanes, as these are the most common recreational aircraft.

Contents

Context

Each year, the Australian Transport Safety Bureau (ATSB) receives accident and incident notifications from pilots, airline operators, air traffic control, maintenance personnel, aerodrome operators, emergency services authorities, and from the general public. The reporting of these aviation accidents and incidents, collectively termed occurrences, assists the ATSB in monitoring safety through its core functions of independent investigation and the analysis of data to identify emerging trends.

The types of occurrences that are required to be reported to the ATSB are detailed in the Transport Safety Investigation Regulations 2003. Depending on the seriousness of the event (in terms of the potential to cause injury or damage) and the category of operation, these occurrences are categorised as either immediately reportable matters (IRMs) or routine reportable matters (RRMs). To see the full list of IRMs and RRMs, visit the ATSB's website.[1]

Aviation occurrence statistics are updated and published annually by the ATSB, and can be subject to change pending the provision of new information to the ATSB. When using these statistics, it is important to remember that occurrence data are provided to the ATSB by responsible persons as defined in Part 2.5 of the Regulations. The ATSB accepts no liability for any loss or damage suffered by any person or corporation resulting from the use of these statistics.

See *Appendix A – Explanatory notes* for definitions of aircraft operation types and a general explanation of the analysis approach. Definitions of occurrence categories appear in the *Glossary*.

NOTE 1: In this edition of *Aviation occurrence statistics*, *Medical transport* operations have been grouped with *Commercial air transport* operations. Previous editions grouped *emergency medical services* under *General Aviation – Aerial work*. This change is to be consistent with the Civil Aviation Safety Authority's Notice of Proposed Rule Making (NPRM) 1304OS, July 2013, which outlines policy that Medical transport flights will operate under the requirements of an Air transport Air Operator's Certificate (issued under CASR Part 119) and the applicable operational rule set (CASR Part 133 for helicopter operations and either Part 121 or 135 for aeroplane operations). This edition also combines occurrences involving mustering activities classified within *Private* operations with *Aerial work – Mustering*.

NOTE 2: Although comparable with the previous edition of *Aviation occurrence statistics*, there are generally less incidents shown in this edition than earlier (pre-2014) editions due to a change of ATSB policy. Events involving operational non-compliance with air traffic control verbal or published instruction, airspace infringement, and breakdown of co-ordination between air navigation service providers, when they occur without any other occurrence event, have not been included as incidents in this edition. See Appendix A – Explanatory notes for more detail.

[1] www.atsb.gov.au/about_atsb/legislation.aspx

Activity data

The overall number of safety occurrences alone does not represent a complete picture of aviation safety. For meaningful comparisons to be made between different types of aircraft and the operations they perform, aviation occurrence statistics are often presented as a rate per million hours flown or per million departures.

The Bureau of Infrastructure, Transport and Regional Economics (BITRE) collect and compile this activity data from reports submitted by airlines, and from other aircraft operators through the *General Aviation Activity Survey*.

Table 1 and Table 2 display activity data used to calculate rates in this report. This data is rounded to the nearest thousand hours (or thousand departures) to present the size or magnitude of the data in more general terms. Specific activity data for movements of non-Australian (foreign) registered aircraft is limited, but is tabulated where available.

Aviation activity presented below have been grouped into the following operational types:

- Commercial air transport - high capacity regular public transport (RPT) flights, low capacity RPT flights, charter flights and medical transport
- General aviation - aerial work operations (including aerial agriculture, aerial mustering, search and rescue, and aerial survey), flying training, and private, business and sports (including gliding) aviation (VH– or foreign-registered)
- Recreational aviation – aircraft being used for recreational flying that are registered by a recreational aviation administration organisation (RAAO).

Departures

Aircraft departures are widely used as a measure of exposure, that is, the opportunity for an event to occur within a certain amount of flying activity. This report uses departure data for calculating accident and fatal accident rates for all air transport operation types and general aviation (as a whole). Where figures are available, departures are considered to be a more appropriate measure than hours flown as most accidents occur either during the approach and landing or departure phases of flight.

Departures data is not available for individual operation types within general aviation (GA) and for any recreational aviation. The combined totals do not include medical transport (commercial air transport) or gliding (general aviation). At the time of publication, departures were only available to 2013 for most operation types, and to 2014 for some types of air transport.

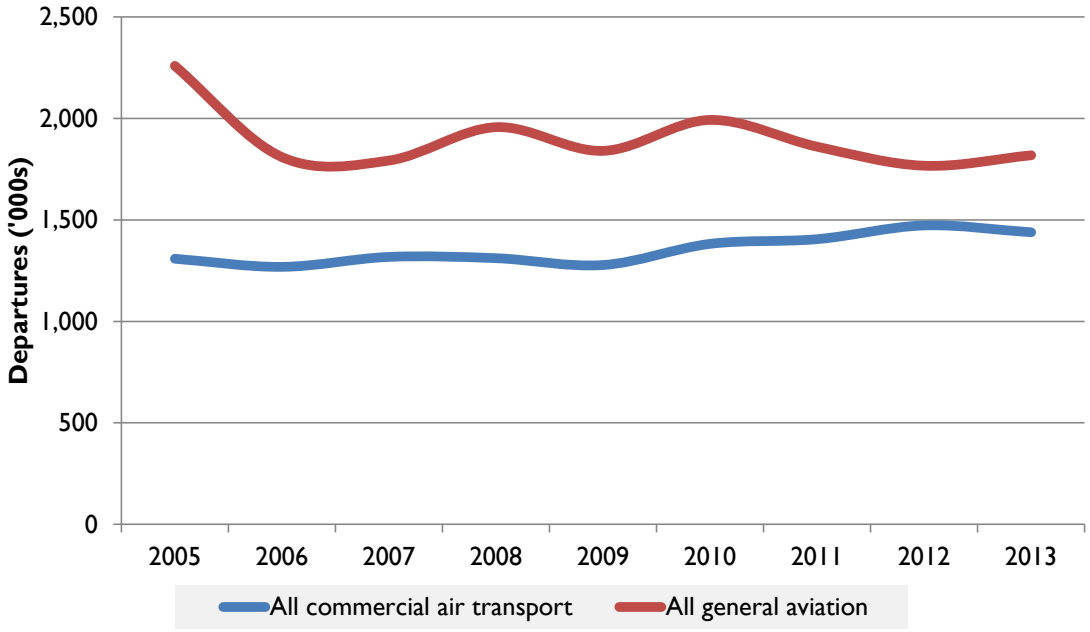
Table 1: Departures (thousands), 2005 to 2014[2]

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
All commercial air transport (excl. medical transport)	1,309	1,269	1,318	1,311	1,278	1,382	1,405	1,473	1,439	N/A
High capacity RPT & charter (VH- registered)	405	421	439	491	493	537	559	610	616	616
Low capacity RPT (VH- registered)	199	180	168	141	128	133	143	154	146	129
Low capacity charter (VH- registered, estimated)[3]	660	624	667	633	609	662	651	655	618	N/A
Foreign-registered	45	44	44	47	48	50	53	54	59	62
All VH- registered general aviation (excluding gliding)	2,259	1,810	1,793	1,957	1,840	1,993	1,861	1,767	1,819	N/A

Commercial air transport operations have shown a gradual increase over the last 10 years, whereas general aviation departures have significantly decreased (Figure 1).

Within air transport, high capacity regular public transport (RPT) departures have steadily increased since 2005. Low capacity RPT departures have decreased to around two-thirds their 2005 levels, while charter departures have remained relatively steady over the last decade (Figure 2). By 2013, there was a similar number of departures in charter and high capacity RPT.

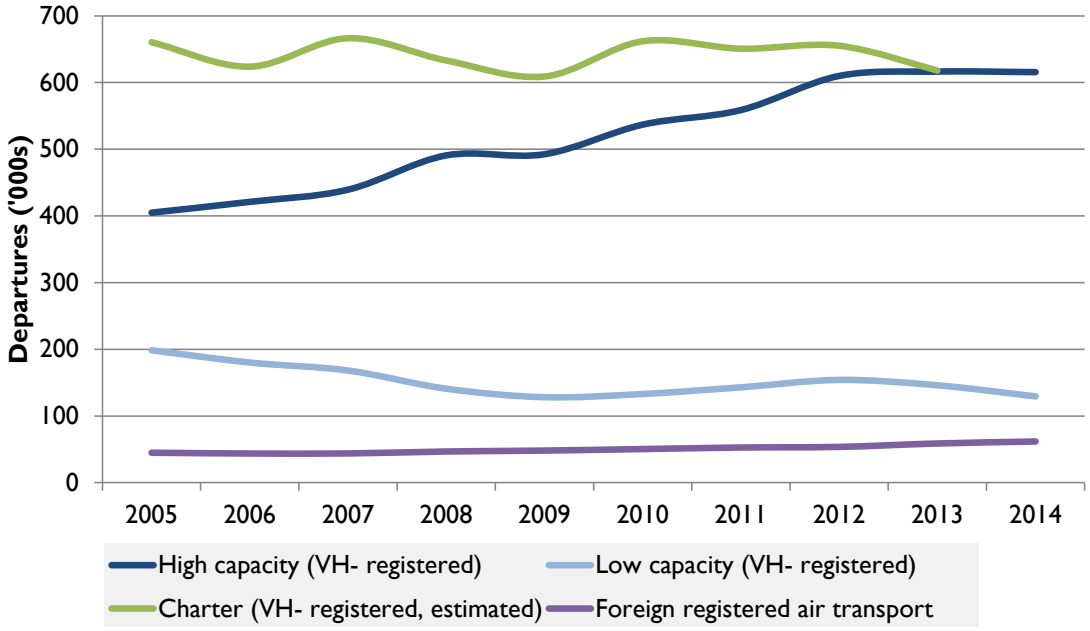
Figure 1: Departures by operation type, 2005 to 2013



[2] Departures are not available for medical transport, recreational aviation or gliding.

[3] Charter operations in high capacity aircraft are combined with regular public transport (RPT).
Charter operations on low capacity aircraft are reported to BITRE through the *General Aviation Activity Survey*. Low capacity charter departures are estimated because departures are not recorded separately for different types of operations in the BITRE *General Aviation Activity Survey.* The estimation model calculates the rate of departures per hour flown for aircraft that only perform charter operations. It then uses this ratio to estimate the number of charter-related departures for all aircraft based on the number of charter hours flown. Ratios are specific to aircraft type (aeroplane or helicopter) and number of engines (single or multi-engine).

Figure 2: Departures in commercial air transport, 2005 to 2014



Hours flown

While departures are generally used as a measure of exposure for commercial air transport operations, flying hours are a more useful measure of exposure for GA because of the higher risk of an accident outside of the approach/landing and take-off phases of flight (for example, agricultural and search and rescue aircraft performing low flying as part of normal operations).

Table 2 records thousands of hours flown by operation type[4] for Australian (VH-) registered aircraft, and for recreational aircraft registered by a recreational aviation administration organisation (RAAO). At the time of publication, reliable hours flown data was only available to the end of 2013 for most operation types.

[4] Hours flown are not recorded individually for all types of aerial work that are reported on in these statistics (such as fire control). Hours flown for several categories of aerial work are not collected by the BITRE, so hours flown for 'all aerial work' includes additional types of aerial work categories to those shown in Table 2. Similarly, for private/business/sport, only gliding flying activity is recorded separately.
The *General Aviation Activity Survey* collects test and ferry hours as a separate category. In Table 2, test and ferry hours are distributed across charter, aerial work, flying training and private/business/sport operations, based on the expected proportion of test and ferry flights in those categories. Private/business/sport is assigned 11 per cent, flying training 11 per cent, charter 21 per cent, and aerial work is assigned the remaining proportion.

Table 2: Hours flown (thousands), Australian-registered, 2005 to 2013

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
All commercial air transport (VH- registered)	1,699	1,720	1,816	1,858	1,798	1,947	2,011	2,141	2,090	N/A
High capacity RPT & charter	944	979	1,027	1,122	1,134	1,231	1,296	1,384	1,355	1,356
Low capacity RPT	202	181	167	133	111	117	139	156	147	127
Low capacity charter	485	481	547	521	471	509	487	504	488	N/A
Medical transport	69	79	75	82	81	90	88	97	100	N/A
All general aviation (VH- registered)	1,381	1,421	1,467	1,439	1,468	1,426	1,355	1,291	1,336	N/A
All aerial work	358	333	370	382	364	424	421	373	405	N/A
Aerial agriculture	95	62	62	78	73	104	100	89	80	N/A
Aerial mustering	113	102	113	113	106	118	126	113	125	N/A
Aerial search & rescue	7	7	9	9	7	6	7	6	6	N/A
Aerial survey	33	45	54	64	38	58	68	48	50	N/A
Flying training	420	429	461	490	501	440	391	365	384	N/A
Private/Business/Sport	603	660	636	567	603	562	544	553	547	N/A
Gliding	212	286	257	184	214	178	159	187	183	N/A
Recreational aviation (Non-VH/RAAO- registered)	242	247	258	279	307	285	298	353	343	N/A
Gyrocopters[5]	30	28	28	30	36	44	49	47	45	N/A
Recreational aeroplanes[6]	87	113	129	145	163	129	141	176	169	N/A
Weight Shift[7]	125	106	100	103	109	111	108	130	130	N/A

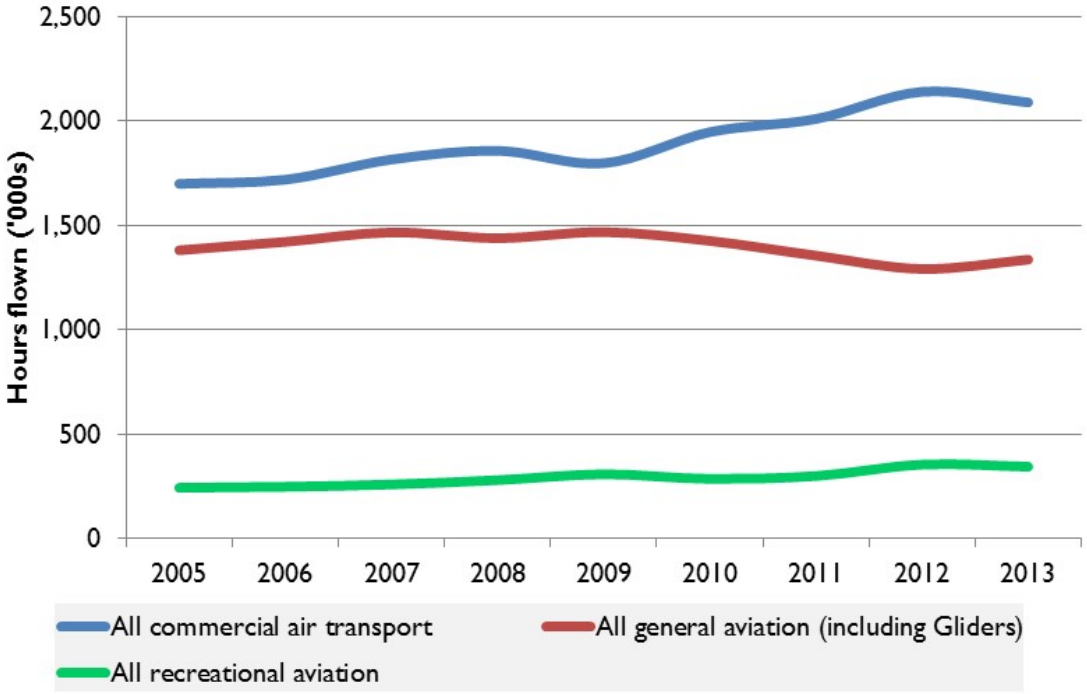
Air transport and recreational flying hours have significantly increased over the last 10 years. In contrast, general aviation has remained relatively steady (Figure 3). In 2013, commercial air transport had 1.5 times more hours flown than GA. In turn, GA had nearly 4 times more hours flown than recreational aviation.

[5] Australian Sport Rotorcraft Association (ASRA) registers and collects all activity data for gyrocopters. Data sourced from BITRE.

[6] Recreational Aviation Australia (RA-Aus) register and collect activity data for recreational (light sport) aeroplanes, including ultralights and some motorised gliders. Data sourced from BITRE.

[7] Both the Hang Gliding Federation of Australia (HGFA) and RA-Aus register and collect activity data for weight shift aircraft, including hang gliders (HGFA only), paragliders (HGFA only), powered parachutes, and weight-shift microlights/trikes. Data sourced from BITRE.

Figure 3: Hours flown by operation type, Australian-registered, 2005 to 2013



The majority of commercial air transport flying in Australia is high capacity RPT, and its proportion of total air transport hours flown increased in every year between 2005 and 2013. In contrast, the 2013 low capacity RPT hours flown were significantly less than 2005, and charter hours have remained relatively static. Further, medical transport hours flown increased by approximately 45 per cent from 2005 to 2013 (Figure 4).

Figure 4: Hours flown in VH-registered commercial air transport, 2005 to 2013

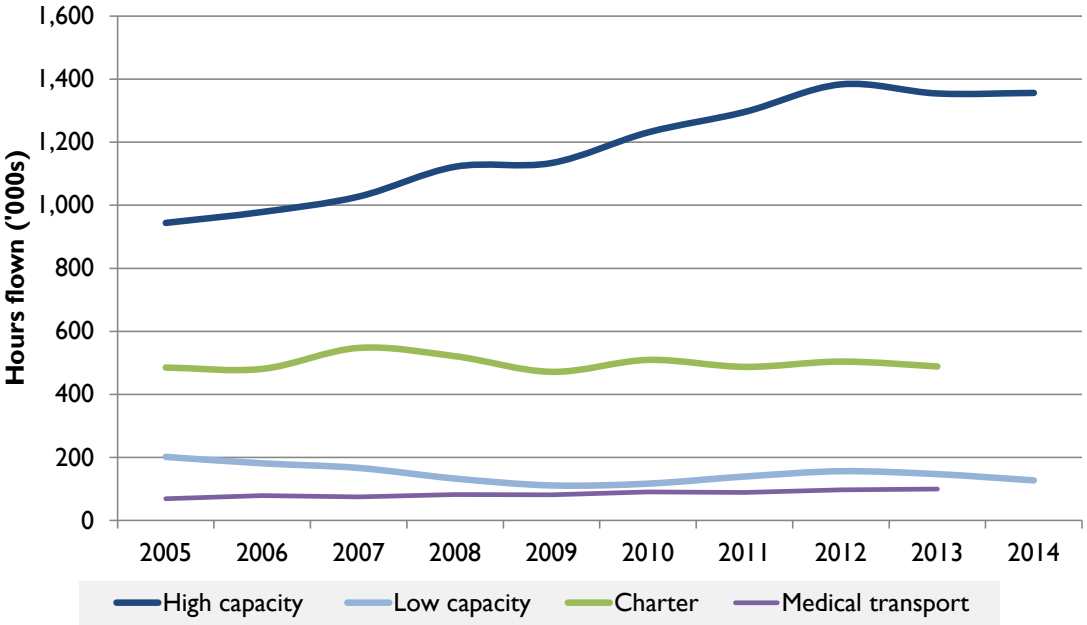
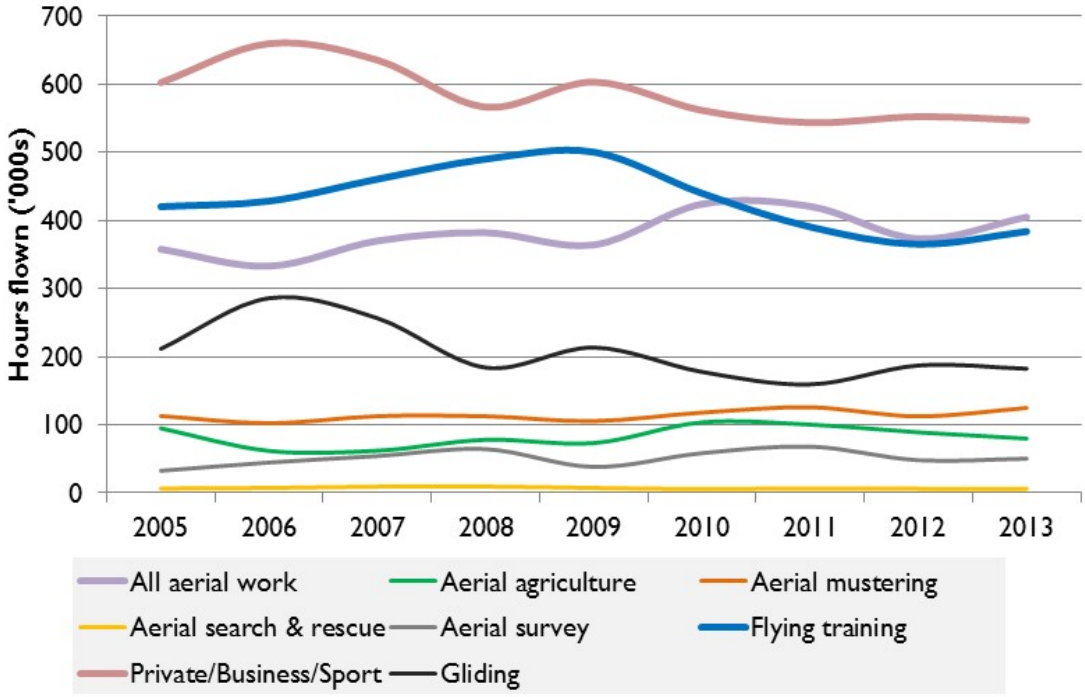


Figure 5 shows a comparison of flying activity across GA. Flying training has fallen by more than 20 per cent since its peak in 2009. Gliders' activity has also decreased during the study period – down around 36 per cent since 2006. Other types of GA had steady flying activity from 2005 to 2013.

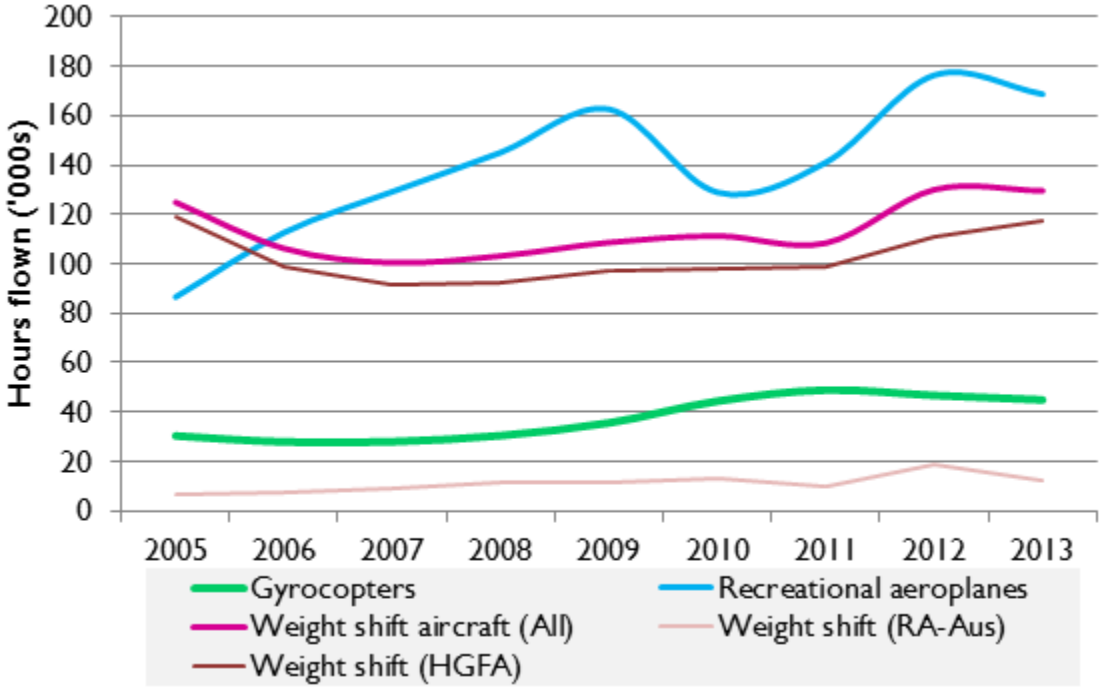
Aerial work makes up around one-third of all GA flying hours.

Figure 5: Hours flown in general aviation, 2005 to 2013



Activity data (hours flown) is now available for Australian (non-VH) recreational aviation. Figure 6 shows a comparison of flying activity across different types of RAAO, as reported by each RAAO to the BITRE. Flying hours of RA-Aus registered recreational aeroplanes have almost doubled over the last 10 years. This increase in activity is notably higher than other common flying operations, such as high capacity RPT (43 per cent increase over this period), aerial work (14 per cent increase), flying training (nine per cent decrease), charter (1 per cent increase), and private and business (decrease of around seven per cent over this period). Gyrocopters also had a significant increase over this period.

Figure 6: Hours flown in recreational aviation, 2005 to 2013



More aviation activity statistics are available from the BITRE website.[8]

[8] www.bitre.gov.au

Occurrences by operation type

Occurrence numbers and rates presented in the statistics in this section relate to the following operational types:

- Commercial air transport - high capacity regular public transport (RPT) flights, low capacity RPT flights, charter flights and medical transport
- General aviation - aerial work operations, flying training, and private, business and sports (including gliding) aviation (VH– or foreign-registered)
- Recreational aviation – aircraft being used for recreational flying that are registered by a recreational aviation administration organisation (RAAO)
- Remotely piloted aircraft operations – all operations using remotely piloted aircraft (RPA) approved by the Civil Aviation Safety Authority.

Aircraft involved in these occurrences included both Australian civil registered aircraft (both VH– aircraft, and aircraft registered by recreational aviation organisations) operating within or outside of Australian territory,[9] and foreign registered aircraft operating within Australian territory. For further information on how the statistics in this report were treated, and how these operational types are defined by the ATSB, see *Appendix A – Explanatory notes*.

Table 3 compares the number of fatal accidents and fatalities for commercial air transport, general aviation, and recreational aviation, and each of their subtypes. Fatal accidents in some aircraft operations are more likely to have a greater number of associated fatalities than in other operation types. For example, aircraft used for agricultural operations usually have only the pilot on board so the number of fatal accidents was the same as the number of fatalities over the last 10 years. In contrast, survey/photography aircraft generally have a pilot, as well as camera operators or navigators, on board, so there were twice as many fatalities as fatal accidents in the last 10 years.

[9] Australian territory refers to mainland Australia, the land areas of Tasmania and Australia's offshore territories. It also includes territorial waters, and coastal waters to the 12 NM limit.

Table 3: Fatal accidents and fatalities by operation type (Australian-registered unless specified), 2005 to 2014

Operation type	Number of aircraft associated with a fatality	Number of fatalities
Commercial air transport	**14**	**36**
High capacity RPT	0	0
Low capacity RPT	2	17
Charter	12	19
Medical transport	0	0
Foreign registered air transport	0	0
General aviation	**160**	**240**
Aerial work	48	60
Agriculture	16	16
Mustering[10]	12	13
Search & rescue	2	2
Fire control	3	3
Survey and photography	8	16
Other	7	10
Flying training	8	11
Private/Business/Sport	103	168
Private/Business	83	144
Sport aviation (excluding gliding)	5	6
Gliding	15	18
Foreign registered general aviation	1	1
Recreational aviation	**80**	**98**
Gyrocopters	16	18
Aeroplanes[11]	38	50
Weight Shift	21	25
Total	**254**	**374**

In 2014, (non-VH registered) recreational aviation had the most accidents and fatal accidents of all individual operation types. Private/business aviation (which traditionally has made up the greatest share of accidents and fatal accidents) recorded the most fatalities of all operation types in 2014, but there were less than in 2013. In aerial mustering and aerial agriculture (generally higher risk operations) there was an increase in the number of accidents in 2014 compared to 2013. In air transport, the number of reported accidents almost double and the number serious incidents significantly decrease compared to 2013, with no fatalities and seven serious injuries (mostly involving charter operations).

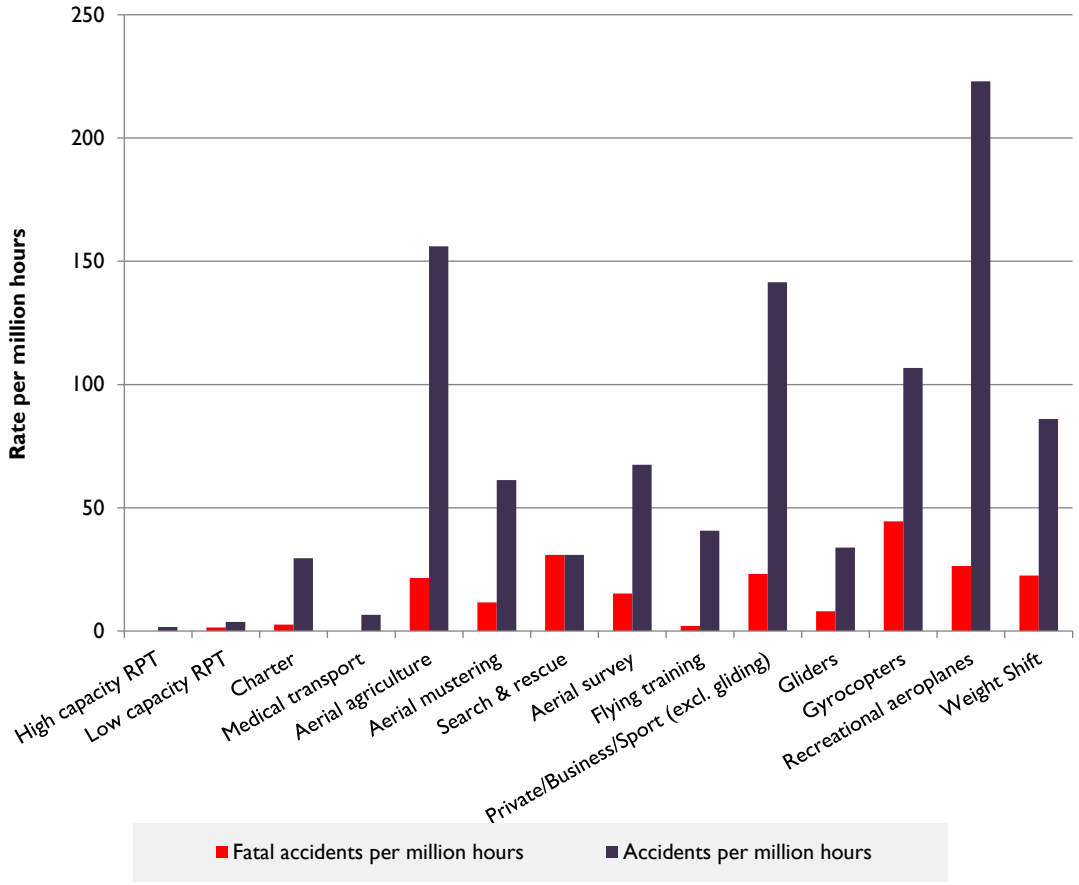
[10] Mustering shows commercial mustering only. In addition, the private/business category includes seven fatal accidents and eight fatalities from private mustering operations.

[11] Includes a single motorised glider.

Figure 7 below shows the rate of accidents and of fatal accidents for each of the specific operation types[12] over this period per million hours flown. Recreational aviation operation types had notably higher accident rates when compared to most general aviation (GA) or air transport operations, excluding aerial agriculture and private/business/sport flights, which had similar accident rates to recreational. When combining VH-registered gliding with private/business/sport operations, the accident rate is the same as that for all non-VH recreational flying combined.

Recreational, private/business/sport, and aerial agriculture operation types were among the most likely to result in a fatal accident when considering the amount of flying activity. However, half of all gyrocopters accidents were fatal (and gyrocopters also had the worst fatal accident rate per million hours flown), almost a third of weight shift aircraft accidents were fatal, and about a quarter of gliding and aerial survey and photography accidents were fatal. Both search and rescue accidents were fatal. Note that reporting of accidents to the ATSB from the recreational operations has markedly increased since 2006 due to a greater awareness of reporting responsibilities in that sector. As such, the accident rate in more recent years is higher – see the *Recreational aviation* section below (page 62) for more details. More detailed information on accident rates for each operation type is provided in the following sections of this report.

Figure 7: Rate of accidents and fatal accidents (Australian-registered aircraft only) by operation type, 2005 to 2013[12]



[12] Activity data for each operation type is provided by the Bureau of Infrastructure, Transport and Regional Economics (BITRE), except for the following where information on hours flown and number of departures was not collected between 2005 and 2013: Fire control, Other/unknown GA, Foreign-registered GA.
Accident and fatal accident rates are based on those accidents from 2005 to 2013 only, as activity data was not yet available for 2014 at the time of writing. Private/Business/Sport excludes gliding.

Commercial air transport

The number of reportable safety incidents in commercial air transport increased over the last 10 years (Table 4). This is an indication of the increase in flying activity in most types of air transport, and the operators' greater awareness of their reporting requirements to the ATSB. Around 30 per cent of all commercial air transport incidents reported to the ATSB involved birdstrikes.

Serious incidents are indicators of events that almost led to accidents. They represent occurrences which could have had more serious consequences. The number of serious incidents in 2014 in commercial air transport was consistent with the 10-yearly average. This was a significant decrease from the peak in 2013, ending a 2-year trend of increasing serious incident numbers.

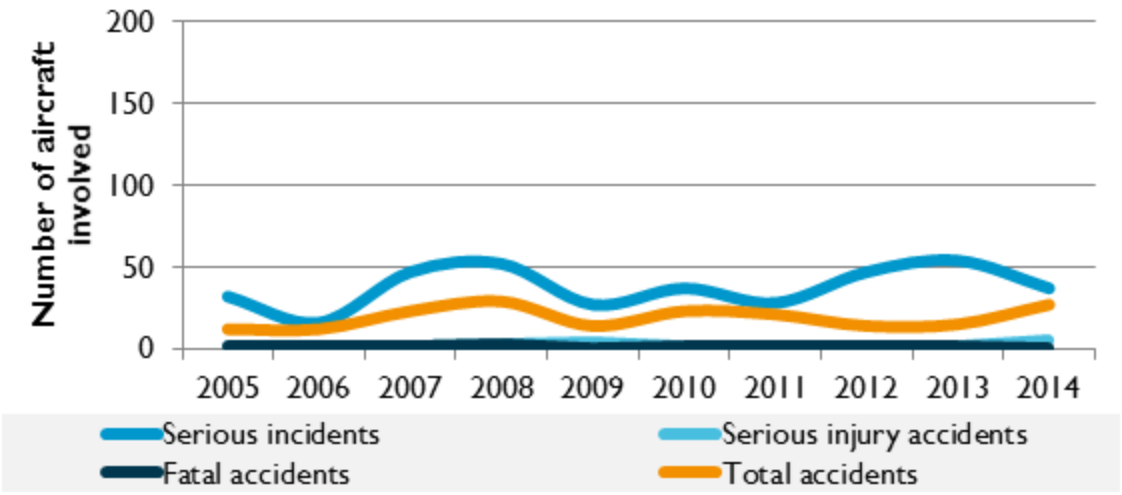
There were 27 accidents involving commercial air transport in 2014. The majority of these (23) involved charter aircraft. This is a significant increase compared to the 10-year average of around 19 accidents per year.

There were no fatal accidents in 2014 involving commercial air transport. The number of serious injury accidents (5) was about double the 10-year average. These numbers were low in comparison to other types of aviation.

Table 4: All commercial air transport occurrences (VH- and foreign registered aircraft), 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of aircraft involved										
Incidents	3,332	3,081	3,152	3,337	3,162	3,477	4,002	4,222	4,402	4,308
Serious incidents	32	16	47	52	27	37	28	47	54	37
Serious injury accidents	2	0	1	3	4	2	2	2	2	5
Fatal accidents	2	1	2	3	0	1	2	1	2	0
Total accidents	12	12	23	29	14	23	21	14	15	27
Number of people involved										
Serious injuries	2	0	1	15	6	2	2	2	4	7
Fatalities	18	2	2	6	0	2	2	1	3	0
Rate of aircraft involved										
Accidents per million departures	9.2	9.5	17.5	22.1	11	16.6	14.9	9.5	10.4	N/A
Fatal accidents per million departures	1.5	0.8	1.5	2.3	0	0.7	1.4	0.7	1.4	N/A

Figure 8: Commercial air transport occurrence and injuries, 2005 to 2014



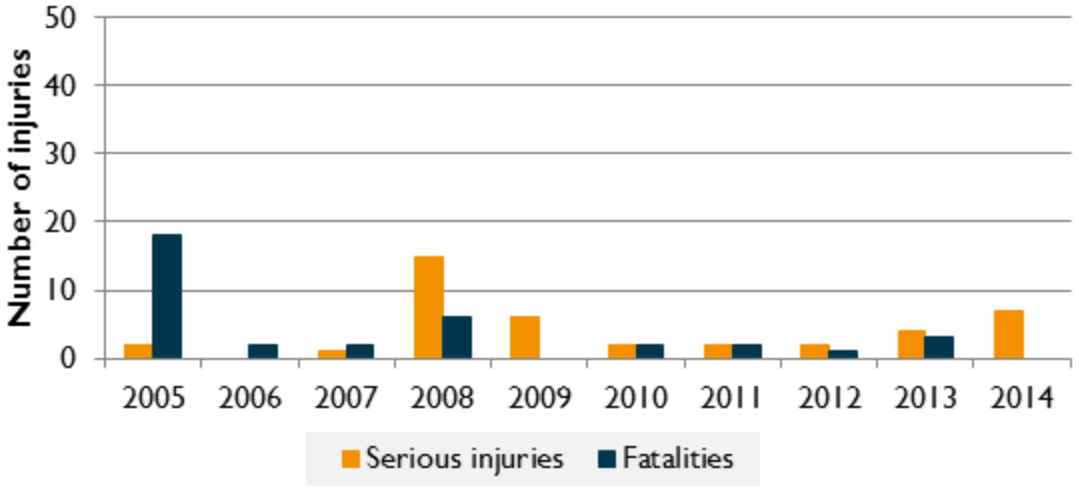
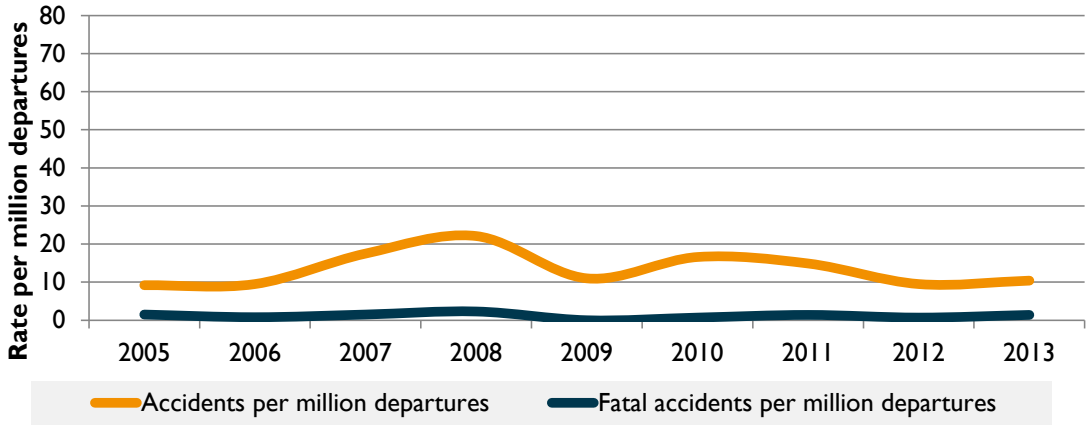


Figure 9: Commercial air transport accident and fatal accident rate (per million departures), 2005 to 2013



High capacity RPT and charter (VH- registered)

The number of incidents reported to the ATSB involving VH- registered high capacity RPT has risen by around 56 per cent in the last 10 years. This is consistent with the increase in the rate of departures (52 per cent) over this time. That is, the incident to departures ratio has remained relatively constant. Provided these trends remain constant, the number of reported incidents would double every 14 years, with departures doubling every 15 years.

The most commonly reported safety incident to the ATSB in 2014 concerning high capacity RPT involved birdstrikes.

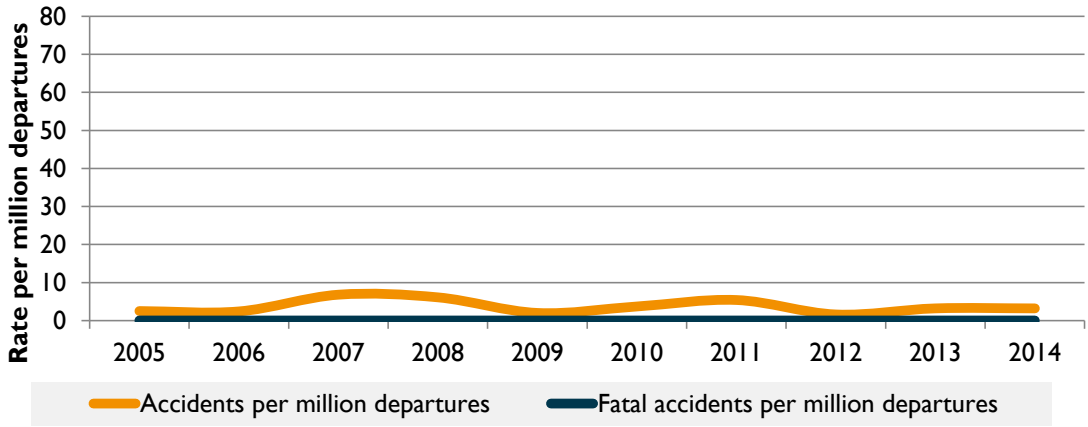
The number of serious incidents and accidents in 2014 was consistent with the 10-yearly average.

No fatalities involving VH- registered high capacity RPT aircraft have occurred since 1975.

Table 5: High capacity RPT (VH- registered aircraft) occurrences, 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of aircraft involved										
Incidents	2,053	1,900	1,916	2,130	2,016	2,428	2,853	3,106	3,291	3,214
Serious incidents	11	4	16	20	10	13	13	12	23	13
Serious injury accidents	1	0	1	1	1	2	1	0	1	1
Fatal accidents	0	0	0	0	0	0	0	0	0	0
Total accidents	1	1	3	3	1	2	3	1	2	2
Number of people involved										
Serious injuries	1	0	1	12	1	2	1	0	1	1
Fatalities	0	0	0	0	0	0	0	0	0	0
Rate of aircraft involved										
Accidents per million departures	2.5	2.4	6.8	6.1	2	3.7	5.4	1.6	3.2	3.2
Fatal accidents per million departures	0	0	0	0	0	0	0	0	0	0
Accidents per million hours	1.1	1	2.9	2.7	0.9	1.6	2.3	0.7	1.5	1.5
Fatal accidents per million hours	0	0	0	0	0	0	0	0	0	0

Figure 10: Accident rate for high capacity RPT aircraft (VH- registered) (per million departures), 2005 to 2014



There were two accidents and 13 serious incidents involving VH-registered aircraft, most involving flight crew incapacitation, across all high capacity RPT operations in 2014. These are described below:

- The two accidents involved the same aircraft five days apart. On 20 February 2014, a cabin crew member received a serious injury on a Virgin Regional Airlines ATR 72 en route from Canberra to Sydney. The injury resulted from a flight control event caused by a decoupling of the left and right elevator control systems. Maintenance engineers on a post-occurrence inspection detected no defects. The aircraft returned to service the following day. During descent into Albury NSW on 25 February, after operating for 13 sectors since 20 February, the aircraft passed in close proximity to birds alerting the captain to the possibility of birdstrike. On the ground, the aircraft's pitch trim system fluctuated abnormally despite any indications of a birdstrike. A deformity of the fairing at the top leading edge of the vertical stabiliser was the only abnormality found by the captain on a post-occurrence walk-around inspection. At the captain's request, an inspection of the tailplane by an engineer confirmed the fairing damage might have resulted from a birdstrike. Significant structural damage to the top of the tailplane

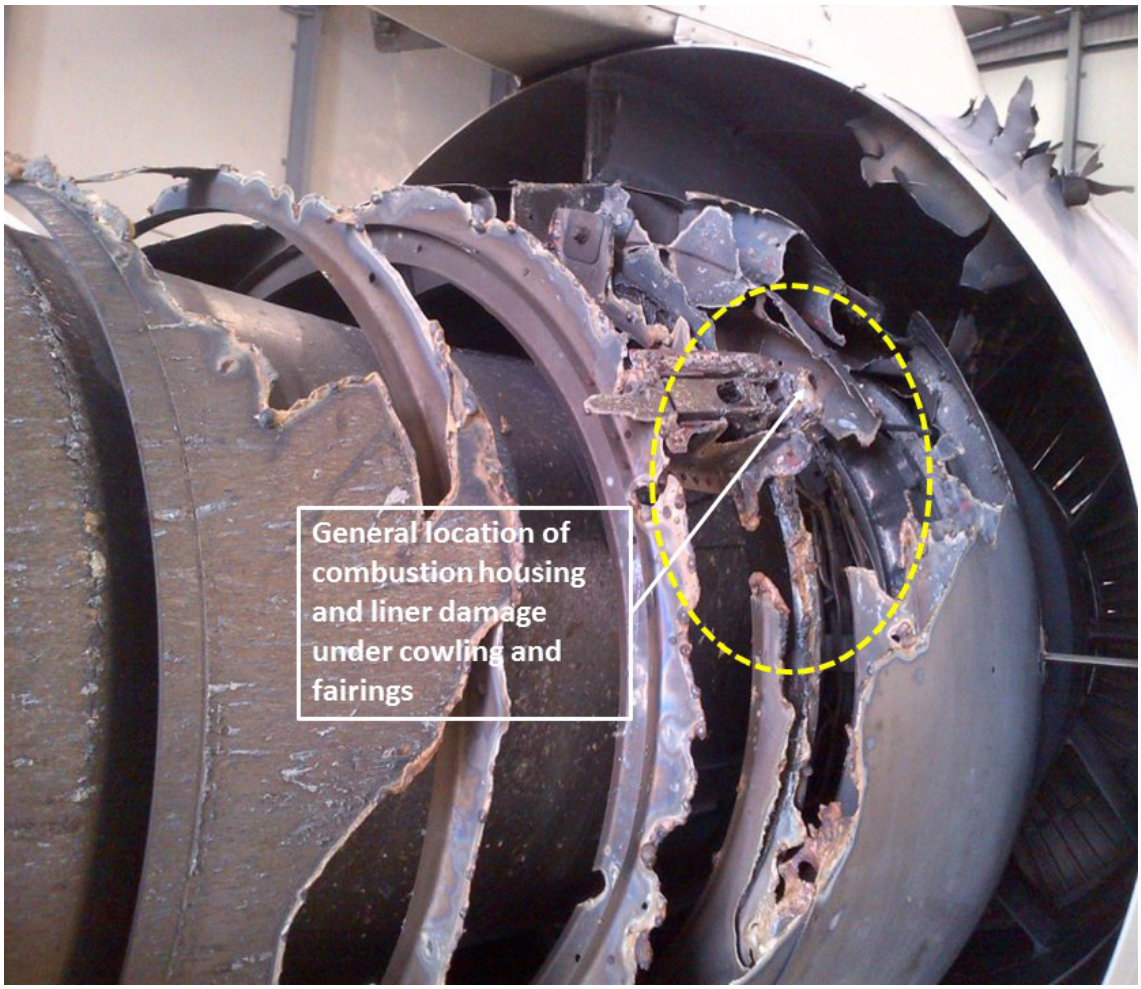
was also identified which may have been a result of the occurrence on 20 February. The ATSB investigation is ongoing (ATSB investigation AO-2014-032).

Flight control event involving an ATR72, 47 km WSW Sydney Airport, NSW on 20 February 2014 (ATSB investigation AO-2014032) - tailplane external damage (indicated by marks and stickers). Source ATSB.

- While pushing a Sunstate Airlines Bombardier DHC-8 from a bay at Sydney airport, the tug driver observed a vehicle approaching the back of the aircraft on the apron access road and applied emergency breaking to avoid a collision (ATSB occurrence 201400563).
- While on final approach to Moranbah airport, Qld, at around 20 ft AGL, the captain of a Virgin Regional Airlines ATR 72 sighted a safety vehicle near the far end of the runway. The captain immediately broadcast 'car vacate' on the common traffic advisory frequency (CTAF). The first officer sighted the car's orange beacon when at about 10 ft AGL, within about 1 second before touchdown. The safety vehicle immediately left the runway and once clear broadcast that it had vacated all runways. At the time of the occurrence, the airport reporting officer (ARO) was conducting a runway inspection following the report by a recently landed aircraft of a suspected birdstrike. The ARO conducted a thorough lookout for aircraft and broadcasted their intentions before entering the runway. At that time, the aircraft was in cloud conducting an NDB approach and the crew did not hear the broadcast (ATSB investigation AO-2014-041).
- While descending to Gold Coast airport, Qld from Auckland, New Zealand, a Jetstar Airways Airbus A320's enhanced ground proximity warning system (EGPWS) 'TERRAIN' waning sounded resulting in a missed approach. It was found that incorrect barometric data was entered into the altimeter causing the incident. On departure from Auckland, the local barometric pressure (QNH) was 1025 hPa, and the crew had selected 'STD' for the standard atmospheric pressure of 1013 hPa on the altimeters while climbing to flight levels. During cruise, about 15 minutes before commencing the descent, the crew obtained the automatic terminal information service (ATIS) for Gold Coast. The captain wrote the details onto the take-off and landing data (TOLD) card. The crew conducted the approach briefing, including a review of the ATIS information. The information was then entered into the flight management and guidance computer (FMGC) for the approach. Approaching transition altitude, the 'BARO

REF' warning flashed, however, the captain was communicating with air traffic control (ATC) and the page in the FMGC with the QNH displayed was not selected. The first officer glanced at the TOLD card, and entered 1025 into the altimeter, possibly inadvertently interpreting either the cloud (025) or the temperature (25) as the QNH, instead of 1018. The captain then completed the communication with ATC and commenced the transition check by stating 'transition'. At this time the captain omitted to select the FMGC onto the flight plan page to display the QNH that had been entered. The first officer stated 'set QNH 1025', the captain entered that into the second altimeter and the first officer entered the same value into the standby altimeter. A cross-check confirmed that all three altimeters matched. Passing about 1,000 ft AMSL, as the first officer completed the turn onto final, he observed the T-VASIS indicating a 'fly-up' profile. The radio altimeter callout of 500 ft sounded and the first officer realised the approach path was incorrect. Around 159 ft above ground level, the EGPWS 'TERRAIN' warning sounded, and the first officer commenced the missed approach. The first officer checked the QNH on the TOLD card and realised an incorrect QNH had been set (ATSB investigation AO-2014-065).

- During (or shortly after) take-off, a Cobham Aviation Services Australia ARVO 146 sustained an in-flight fuel-fed fire in the No. 2 engine. The flight crew shut down the engine and activated the first suppression system before returning to Perth. The aircraft was en route to Barrow Island, WA. The initial examination found that a portion of the Honeywell AFL-507-1F engine's combustor housing fractured and was ejected. The fracture occurred at a welded boss that facilitated one of four combustion liner locators per engine. A portion of the combustion liner adjacent to the damaged area of the combustor housing also failed. The breach of the combustion liner and engine combustor housing created a radial escape path for the fuel-fed, high-pressure combusting gases. These gases quickly burnt through the engine cowling in that location. The examination of the combustion turbine module found that the engine combustor housing was previously weld-repaired on three separate occasions. These repairs were in the area of the combustion lining locating pin boss that was located at the two o'clock position on the module's circumference (looking forward). The weld and a section of the combustor housing had undergone grinding as part of the repair process, which reduced the wall thickness of the combustor housing. A crack developed in this area of the combustor housing during subsequent operational service. The engine manufacturer's maintenance schedule specified that the combustor housing should be inspected for cracks at each scheduled heavy maintenance check. The crack and subsequent fracture of the combustor housing occurred prior to the next scheduled heavy maintenance check. The engine manufacturer advised that the reduction of the combustor housing wall thickness was not an approved process by the manufacturer. The investigation is continuing with cooperation from the engine manufacturer and the aircraft operator. The ATSB is also being assisted by the Schweizerische Unfalluntersuchungsstelle (the Swiss Accident Investigation Board) and Bundesstelle für Flugunfalluntersuchung (the German Federal Bureau of Aircraft Accidents Investigation) to obtain copies of documentation from European repair stations that performed work on the engine components, including the repairs in the area of the combustion lining locating pin boss. In response to this occurrence, the aircraft operator conducted a fleet-wide inspection of the weld around the combustor liner locating pin bosses on the combustor housings of its engines of this type. While no cracks were identified in this area in these other engines, the inspection identified an additional engine that had undergone grinding. The ATSB investigation is ongoing (ATSB investigation AO-2014-076).



In-flight engine fire involving BAE146 near Perth Airport, WA on 29 April 2014 (ATSB investigation AO-2014-076) – number 2 engine showing fire damage (looking forward). Source: Cobham (edited by the ATSB)

- During cruise from Sydney to Darwin, the first officer of a Qantas Airways Boeing 737 became medically incapacitated and removed from duties for the remainder of the flight. The aircraft landed without further incident (ATSB occurrence 201405414).
- At Perth Airport, the captain of a QantasLink Boeing 717 conducted a go-around after the first officer observed a vehicle with flashing lights on the runway. Before the incident, an airport safety officer informed the aerodrome controller (ADC) that their vehicle was holding short of runway 24 for a runway inspection. The ADC cleared the vehicle to enter runway 24 and hold short of runway 21. The ADC then indicated the runway was occupied on the console runway strip. At this time, the aircraft was on final approach and the flight crew did not hear the vehicle being cleared onto the runway. The safety officer drove along the centreline of runway 24 towards the intersection with runway 21. Following this, the ADC cleared an aircraft for take-off from runway 21. After observing that aircraft pass through the intersection of runway 24, the ADC picked up the flight progress strip for the QantasLink aircraft. The ADC scanned the runway but did not see the vehicle on it, and moved the strip into the console runway bay. The ADC then cleared the aircraft to land on runway 24. The safety vehicle was on runway 24. The safety officer heard the aircraft being cleared to land but not the assigned runway. As the aircraft touched down, the first officer saw flashing lights of a vehicle on the runway and immediately stated ‘go-around, car on runway’. The pilot responded by commencing a go-around. The safety vehicle was stationary on the centreline of the runway around 1,180 m from the threshold. The safety officer did not see the aircraft until it passed about 150 ft over the safety vehicle and immediately vacated the runway (ATSB investigation AO-2014-133).

- During cruise from Mount Isa to Townsville, Qld, the first officer of a Sunstate Airlines Bombardier DHC-8 became medically incapacitated. The first officer was unable to complete flying duties for the remainder of the flight. Subsequently the first officer was transferred to hospital (ATSB occurrence 201405716).
- During climb from Adelaide, the captain of a Virgin Australia Airlines Boeing 737 to Melbourne, became medically incapacitated and was removed from duty. A company captain travelling on the aircraft assumed pilot-in-command duties for the remainder of the flight. The aircraft landed without further incident. Subsequently the captain was transferred to hospital (ATSB occurrence 201406684).
- During cruise from Kuala Lumpur, Malaysia to Dubai, UAE, the captain of a Virgin Australia Boeing 777 became temporarily medically incapacitated. The aircraft landed without further incident (ATSB occurrence 201408213).
- On pushback at Hong Kong, the first officer of a Qantas Airways Airbus A330 to Brisbane became medically incapacitated. The aircraft returned to the bay and the first officer was transferred to hospital. While disembarking a passenger broke their ankle (ATSB occurrence 201408340).
- During climb from Cairns, the captain of a Virgin Australia Boeing 737 to Sydney became temporarily medically incapacitated before returning to flying duties. The aircrafts landed without further incident (ATSB occurrence 201408741).
- During cruise from Melbourne to Brisbane, the first officer of a Qantas Airways Boeing 767 became medically incapacitated. The first officer was removed from flying duties to the remainder of the flight (ATSB occurrence 201408435).
- An electrical discharge resulting from a lighting strike incapacitated two ground crew members at Perth Airport. After a Virgin Airlines Airbus A330 landed and came to a stop, a ground handling crew member chocked the nose wheels and connected a headset to the intercom jack of the aircraft's nose landing gear. The ground crew member was communicating with the flight crew when an electrical discharge apparently passed through the headset. Subsequently, the ground crew member staggered from the aircraft before collapsing unconscious to the ground. Another ground crew member went to assist and an electrical discharge also forced them to the ground without losing consciousness. Another ground crew member in the process of parking another aircraft in the opposite bay reported seeing lighting strike the tail of the Virgin A330. The affected ground crew were transported to hospital for observation. The ground crew member that lost consciousness remained in hospital for several days. The operator's initial inspection found no evidence or defects that could account for the injuries sustained. Meteorological information for the day indicated that the last lightning strike occurred 16 minutes prior to the aircraft parking at bay 20A and that this activity was approximately 39 km (21 NM) south-south-west of the airport. The ATSB investigation is ongoing (ATSB investigation AO-2014-185).

Low capacity RPT (VH- registered)

In contrast to other types of commercial air transport, the number of incidents reported to the ATSB involving low capacity RPT aircraft has significantly declined over the last 10 years. This is primarily due to the decline in flying activity over this period (in both hours and departures). This decline is a combined result of Australia's mining boom (larger aircraft are needed to move more people to regional cities and mining communities), regional airlines using aircraft with larger seating capacities (moving many former low capacity flight into the high capacity type), and the additional regional travel options provided by high capacity RPT operators.

The majority of low capacity RPT incidents reported to the ATSB in 2014 involved birdstrikes.

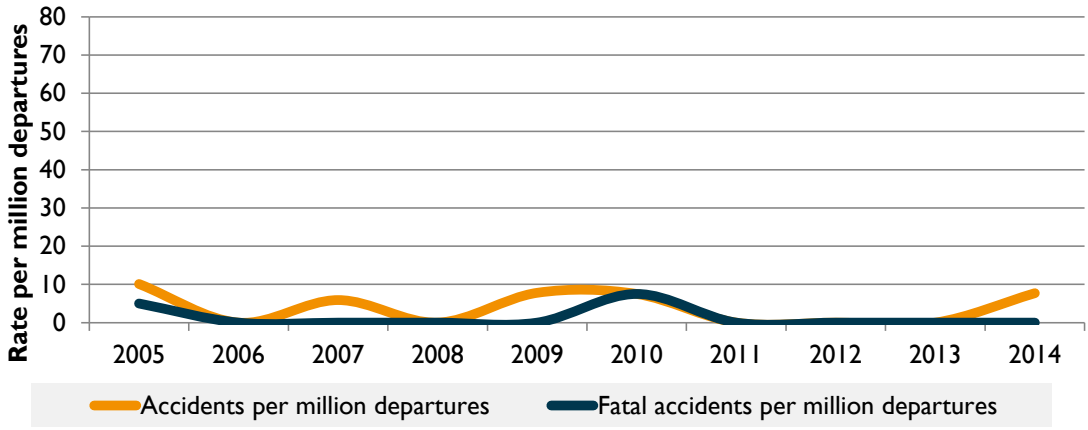
The number of serious incidents (1) in 2014 was significantly lower than the 10-year average of around 5 per year. The single accident in 2014 was consistent with the average.

No fatalities involving VH- registered low capacity RPT aircraft have occurred since 2010.

Table 6: Low capacity RPT (VH- registered aircraft) occurrences, 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of aircraft involved										
Incidents	567	468	481	393	405	432	453	392	368	374
Serious incidents	7	5	8	11	4	6	2	5	3	1
Serious injury accidents	0	0	0	0	0	0	0	0	0	0
Fatal accidents	1	0	0	0	0	1	0	0	0	0
Total accidents	2	0	1	0	1	1	0	0	0	1
Number of people involved										
Serious injuries	0	0	0	0	0	0	0	0	0	0
Fatalities	15	0	0	0	0	2	0	0	0	0
Rate of aircraft involved										
Accidents per million departures	10.1	0	5.9	0	7.8	7.5	0	0	0	7.7
Fatal accidents per million departures	5	0	0	0	0	7.5	0	0	0	0
Accidents per million hours	9.9	0	6	0	9	8.6	0	0	0	7.9
Fatal accidents per million hours	5	0	0	0	0	8.6	0	0	0	0

Figure 11: Accident rate for low capacity RPT aircraft (VH- registered) (per million departures), 2005 to 2014



There was one accident and one serious incident reported in 2014 that involved low capacity RPT operations. These are described below:

- During taxiing for departure from Murray Island, Qld, the propeller of a West Wing Aviation Cessna 208B struck a fence causing substantial damage (ATSB occurrence 201408089).
- During cruise from Richmond, Qld to Brisbane, a Toll Aviation Fairchild SA227's autopilot altitude hold mode constantly went into a runaway trim situation without disconnecting. The aircraft's attitude remained constant while the trim repeatedly fluctuated. After manually disconnecting the autopilot, the aircraft was in and out of the trim situation requiring significant force by the pilot to overcome. Both times this occurred, the aircraft's altitude varied by 300 to 400 ft before the pilot manually returned it to level flight. The pilot decided to leave the altitude hold disconnected for the remainder of the flight. It was noted that with the auto trim system in the off position and the altitude hold mode engaged, the trim indication on the autopilot annunciator panel was constantly working either up or down. An engineering inspection of the aircraft found incorrectly rigged trim sensor wires (ATSB occurrence 201408124).

Charter (VH- registered), low capacity

The number of incidents reported to the ATSB involving Australian-registered aircraft conducting charter work has been relatively stable for most of the last 10 years. Of all commercial air transport operations, charter has the highest total number and highest rates of accidents and fatal accidents over most years. The accident and fatal accident rate per million hours was higher than for departures, which reflects the short duration of most charter flights and hence a greater exposure to approach and landing accidents (due to more departures per each hour flown).

The most commonly reported safety incident to the ATSB in 2014 concerning charter aircraft involved birdstrikes.

There were no fatal accidents involving charter aircraft in 2014. However, there was a significant increase in the total number of accidents (23) compared to the 10-year average; this was around double the two previous years. The majority of these accidents involved collision with terrain or failure of the landing gear.

The number of serious incidents in 2014 was significantly higher than the 10-year average but was consistent with the recent average starting in 2012. The majority of serious incidents involved near collisions or air-ground-air communications failures. The four serious injury incidents was a significant increase in 2014 compared to the 10-year average.

Table 7: Charter (VH- registered aircraft) occurrences, 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of aircraft involved										
Incidents	419	465	521	553	492	357	401	398	398	394
Serious incidents	6	6	16	13	9	14	11	20	22	19
Serious injury accidents	1	0	0	2	1	0	1	2	1	4
Fatal accidents	1	1	2	3	0	0	2	1	2	0
Total accidents	9	10	18	26	8	20	18	12	12	23
Number of people involved										
Serious injuries	1	0	0	3	2	0	1	2	3	6
Fatalities	3	2	2	6	0	0	2	1	3	0
Rate of aircraft involved										
Accidents per million departures	13.6	16	27	41.1	13.1	30.2	27.7	18.3	19.4	N/A
Fatal accidents per million departures	1.5	1.6	3	4.7	0	0	3.1	1.5	3.2	N/A
Accidents per million hours	18.6	20.8	32.9	49.9	17	39.3	36.9	23.8	24.6	N/A
Fatal accidents per million hours	2.1	2.1	3.7	5.8	0	0	4.1	2	4.1	N/A

Figure 12: Accident rate for charter aircraft (VH- registered) (per million departures), 2005 to 2013

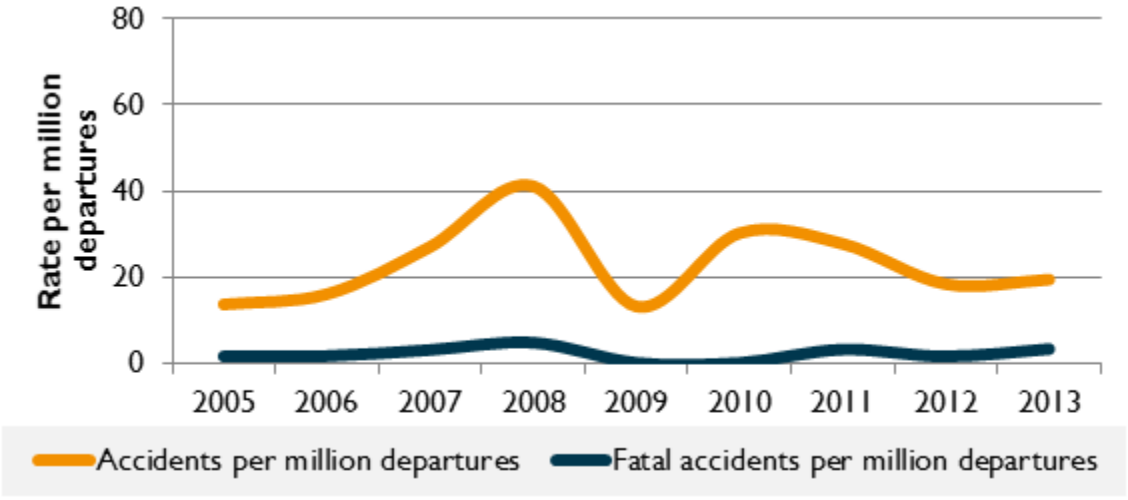
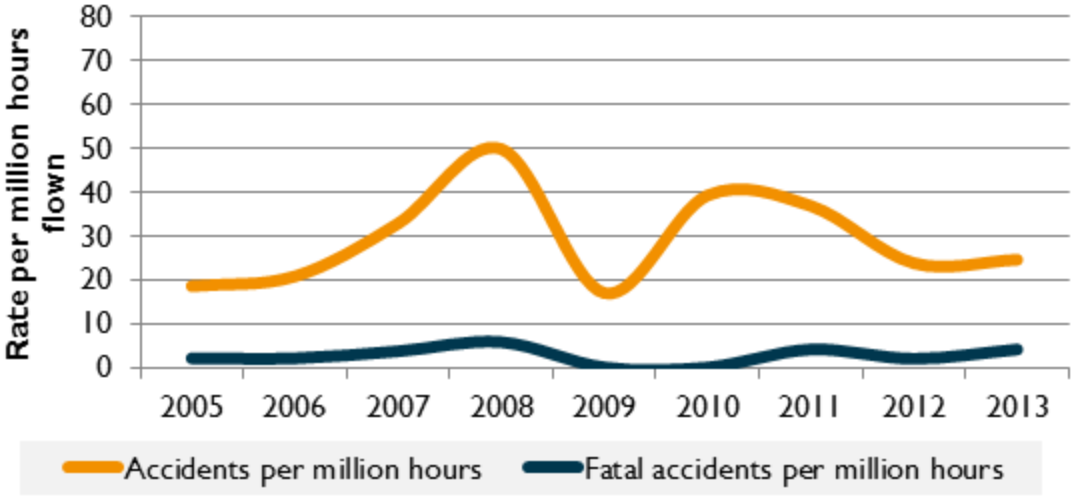


Figure 13: Accident rate for charter aircraft (VH- registered) (per million hours flown), 2005 to 2013



There were 42 VH- registered aircraft conducting charter work that were involved in accidents or serious incidents in 2014. The four accidents that resulted in serious injuries are described below:

- The passenger and pilot of a Katherine Aviation Cessna 210 received serious injuries from a collision with terrain near Numbulwar NT. At around 22 NM out from Numbulwar, en route to Tindal, the passenger felt a bump and detected smoke emanating from the floor area beside the pilot. The pilot broadcast a 'MAYDAY' on the CTAF advising of an engine failure and also that there were no roads in sight on which to conduct a forced landing, only trees. The pilot then asked the passenger to retrieve the fire extinguisher, which was passed to the pilot. The passenger reported that the smoke stopped very quickly. The aircraft descended and the pilot retrieved the portable emergency locator transmitter (ELT) from the front compartment, extended the antenna and activated it. The pilot advised the passenger to brace for landing. The passenger reported that the aircraft landed heavily, skidded, and collided with two trees prior to coming to rest at an angle, but upright. The passenger quickly undid the seatbelt and exited the aircraft through the open right door, assisting the pilot out of the aircraft. The passenger and the pilot moved about 10 m from the aircraft, prior to multiple explosions occurring. Both sustained serious injuries and the aircraft was destroyed. An initial engineering

inspection found that a broken connecting rod was the most likely cause of the engine failure (ATSB investigation AO-2014-059).

Collision with terrain involving a Cessna 210 50 km W of Numbulwar Aerodrome, NT on 28 March 2014 (ATSB investigation AO-2014-059) – accident site and aircraft wreckage. Source: Rescue crew.

- One passenger sustained serious injuries from a collision with terrain of a Cessna 206. On return to Rawnsley Park Authorised Landing Area (ALA), SA, after the first of three scheduled scenic flights for the day, the pilot conducted a straight-in-approach onto the runway. The pilot did not compensate for the 8 to10 knot crosswind during the flare and touchdown. After landing the pilot retracted all stages of flap, and applied light pressure to the brakes. The aircraft then began to veer to the left. The pilot applied right rudder, but was unable to correct the situation, so initiated a go-around. During the go-around the horizontal stabiliser struck a shrub, causing significant damage to the aircraft. The pilot lowered the aircraft nose. After clearing a small tree, the pilot raised the aircraft's nose in an attempt to clear the windsock. Moments later, the aircraft spun rapidly to the left and collided with the ground. The pilot shut down the aircraft and assisted the passengers to exit. One passenger sustained serious injuries and another sustained minor injuries. The pilot was not injured. The aircraft was substantially damaged (ATSB investigation AO-2014-135).

Collision with terrain involving a Cessna C206 at Rawnsley Park, SA on 2 August 2014 (ATSB investigation AO-2014-135) – rear fuselage and tail damage. Source: South Australian Police.

- Two passengers sustained serious injuries from the hard landing of a Kavanagh Balloon. Due to forecast winds, the pilot decided to depart from Beaudesert, Qld with a planned landing at Cedar Grove Qld. Before the flight, the pilot conducted a passenger safety briefing including demonstration of the landing position. The passengers then assumed their landing positions and the pilot was satisfied they understood the correct position to adopt. After about a 20-minute flight, the pilot commenced the descent to the landing site. During the approach, the pilot observed a light ground fog and was heading directly into the sun, making the landing site difficult to see. The pilot attempted to obtain an accurate rate of descent from the altimeter, but it was reading erratically. The pilot instructed the passengers to adopt the landing position, but not all of them complied. He repeated his instructions to the passengers. The altimeter continued to read erratically and facing directly into the sun made visual assessment of the approach difficult. The balloon landed hard and bounced once before landing about 3 m further along the ground. Two passengers sustained serious injuries, and seven had minor injuries. The balloon was undamaged. In this incident, the combination of moderate wind speed, the position of the sun, equipment issues and non-compliance to instructions by passengers, contributed to an increased pilot workload at a critical phase of flight (ATSB investigation AO-2014-157).
- A ground coordinator sustained serious injuries and a passenger received minor injuries when a Bell 206 helicopter collided with terrain at Mount Cook, Qld. The helicopter departed Cairns with one passenger to conduct a charter flight to Mount Cook. To assess the landing area at Mount Cook the pilot made three-to-four practice approaches and a practice landing prior to continuing to Cooktown to pick up the remaining passengers. The landing area was a rocky ledge jutting out from the south-eastern side near the top of Mount Cook. The pilot conducted two flights to drop off a total of five passengers. The pilot reported that the wind during these two flights was about 10 knots from the south-east. Upon returning to pick up the first load of passengers, the wind had increased to about 14-15 knots. During the approach to land, the pilot reported that the helicopter felt stable and appeared unaffected by the increased wind. As the helicopter prepared to touch down, both the ground coordinator and a passenger walked closer to it. Just prior to touching down on the right skid, the pilot felt the helicopter momentarily lift, most likely from a gust of wind, and drift to the right. The helicopter rolled rapidly onto its right side and slid a short distance forward, prior to coming to rest. The helicopter fell onto the ground coordinator and nearby passenger. The ground coordinator sustained serious injuries. The pilot and passenger received minor injuries and the helicopter was substantially damaged.

The roll onto the right side by the helicopter is consistent with the phenomenon known as dynamic rollover. When a helicopter rests on one skid, the aircraft may begin rolling, and under certain circumstances it cannot be controlled (ATSB investigation AO-2014-161).

Loss of control during landing, involving a Bell 206B3 9km south-east of Cooktown Airport (Mount Cook), Queensland, 7 October 2014 (ATSB investigation AO-2014-161) – dynamic rollover accident on Mount Cook. Source: Queensland Police.

Some other notable accidents and serious incidents in 2014 involving charter operations are described below:

- A de Havilland Canada DHC-8, on approach to Perth Airport, had a near collision with an unknown object. The crew of the DHC-8 sighted a bright strobe light directly in from of the aircraft about 23 km north-northwest of Perth at around 3,800 ft AMSL. The light appeared to track towards the aircraft and the crew realised that the light was on an unknown object, possibly remotely piloted aircraft (RPA). The pilot took evasive action turning towards the west to avoid a collision with the object. The object passed about 20 m horizontally and 100 ft vertically from the aircraft. The pilot reported that the object was cylindrical in shape and grey in colour. It was at about 3,700 ft AMSL and in controlled airspace. The crew did not receive a traffic collision avoidance system (TCAS) alert. The airspace below 3,500 ft AMSL was military restricted airspace and the Australian Defence Force was not operating RPAs and was not aware of any RPA operations in the area at the time of the incident. The ATSB was not able to confirm the details of the object or identify any RPA operator in the area at that time (ATSB investigation AO-2014-052).
- A Piper Saratoga and a Beech 200 Kingair had a near collision near Normanton airport, Qld. The Piper Saratoga departed Mareeba on a private flight to Normanton. The direct flight was planned under visual flight rules and the pilot was the sole person of board. The flight went normally until approaching Normanton. Approaching the 10 NM boundary, the pilot broadcast their intentions on the Normanton CTAF and realised the radio in use had failed. The pilot attempted but was unable to get the other radio in the aircraft operational. Due to being low on fuel, the pilot had little time to trouble shoot any further, so joined the circuit at Normanton for

runway 14. The pilot continued to make broadcasts on the radio in the hope that it may still be transmitting. At the same time, a Beech 200 Kingair aircraft was completing a short leg of a charter flight from nearby Karumba. After obtaining the weather from the AWIS at Normanton, and broadcasting their intentions on the Normanton CTAF, the pilot elected to conduct a straight-in approach to runway 14. As the Kingair descended through 800 ft, the pilot noticed movement to the left periphery and below. The Saratoga was partly obscured by aircraft's engine nacelles and the colour merged into the swollen river below. The two aircraft were on converging tracks and about 50 m apart. The pilot of the Kingair initiated a go-around and the pilot of the Saratoga, still unaware of the near collision, landed on runway 14 (ATSB investigation AO-2014-039).

- A pilot's miscalculation led to a potential fuel exhaust event of de Havilland DHC-2 aircraft on a charter flight route from Shute Harbour to Whitehaven Beach, Qld. The pilot planned to fly one group of passengers to Whitehaven Beach, return solo to Shute Harbour, and take a second group of passengers to Whitehaven Beach. The pilot would then wait at Whitehaven beach before returning to Shute Harbour with the first group of passengers. The pilot would then return solo to Whitehaven Beach, collect the second group of passengers and return to Shute Harbour. During the planning, the pilot had omitted to include the solo ferry flights in the fuel calculations. During the final flight to Whitehaven Beach, the pilot realised that they had planned for two return flights and omitted to allow additional fuel for the two empty sectors. The pilot expected to land back at Shute Harbour with about 7 minutes of fuel remaining and elected to collect the passengers from Whitehaven Beach and return to Shute Harbour as planned. The pilot landed the aircraft close to the passenger pick-up point to reduce taxi time, collected the passengers for the flight and conducted a short taxi and take-off for the estimated 12 minute flight. The aircraft landed at Shute Harbour and the pilot and passengers disembarked. About 6 L of fuel was in the tank when the aircraft landed, significantly less than the required 50 L reserve (ATSB investigation AO-2014-136).
- The pilot of a Cessna 310 conducted an unintentional wheels-up landing at Jabiru Aerodrome, NT. There were five passengers on board, including three children, on the flight from Oenpelli, NT. During the short flight, one of the passengers coughed incessantly through the headset, which distracted the pilot. Once the aircraft was stable, the pilot reached over and unplugged the headset. The pilot manoeuvred the aircraft to join a late downwind for runway 27 at Jabiru. The pilot reported that during the pre-landing checks, they verbalised 'undercarriage down' but made a decision to defer the associated procedure. The pilot elected to keep the aircraft speed slightly higher than normal and, as per the company procedures, kept a stable power setting and profile and only made adjustments when needed at around 300 ft. The pilot was also mindful of a Cessna 210 aircraft close behind. The pilot then focused on the passengers, and made sure that they had their seatbelts correctly fastened prior to landing. The pilot reported that they normally completed the remaining memory-recall PUFF (set Propeller pitch, Undercarriage down, and Flaps Full down) check on final approach, but on this occasion did not. As the aircraft was flared for landing the pilot became aware that the undercarriage was not down and the propellers contacted the ground (ATSB investigation AO-2014-188).

Wheels-up landing involving a Cessna 310 at Jabiru Airport on 12 December 2014 (ATSB investigation AO-2014-188). Source: Grant Hampton.

- An engine failure resulted in the pilot of a Cessna 210 aircraft conducting a forced landing. The charter flight departed from Broome WA with four passengers and landed at Fitzroy Crossing to refuel before continuing to Balgo Hill where three of the passengers disembarked. The aircraft then departed for Ringer Soak ALA, WA, where the remaining passenger was due to disembark. About 25 NM from Ringer Soak while cruising at 5,500 ft AMSL, the pilot noticed a low oil pressure indication. The pilot reported that all other engine instrument indications were within normal parameters, so they elected to continue and assess the situation at Ringer Soak. Shortly after, the pilot detected a burning smell in the cockpit followed by a loud bang from the engine. The pilot immediately commenced the memory items from the emergency checklist and configured the aircraft for an optimum glide. The pilot broadcast a MAYDAY on the area frequency and selected a suitable forced landing area from among the predominantly thick scrub. After touchdown with the gear retracted, the aircraft slid to a stop and the pilot and passenger exited the aircraft. The pilot retrieved first aid items, emergency rations and the GPS, and set up a temporary shelter under the wing until assistance arrived. This was the aircraft's first operational flight after maintenance for excessive oil consumption (ATSB investigation AO-2014-186).

Engine failure and forced landing involving Cessna 210, 111 km SE Halls Creek, WA on 28 November 2014 (ATSB investigation AO-2014-186) – showing aircraft after emergency equipment had been retrieved. Source: Pilot.

- Landing in wet conditions, a Fairchild SA226 aircraft veered off the side of the runway at Archerfield Airport, Qld. En route from Thangool, the pilot received the current Automatic Terminal Information Service (ATIS) for Archerfield, which indicated cloud at 800 ft and that the runway was 'wet'. At about 1615, the pilot commenced an instrument approach to Archerfield. On approach to the aerodrome, the pilot sighted the runway and circled at 900 ft AGL before approaching to land on runway 10 Left. When lined up on final, the aircraft was to the right of the extended runway centreline and the pilot elected to conduct a go-around. The second circuit was still tight, due to low cloud to the west of the runway, and the pilot reported that the aircraft was about 30 to 50 m right of the extended runway centreline when on final. It was raining heavily as the aircraft touched down close to the runway centreline and about 300 m beyond the runway threshold. The pilot reported that as the wheels touched down, the aircraft commenced sliding towards the right, possibly due to aquaplaning. The aircraft veered off the right side of the runway and onto the grass. The aircraft then returned to the runway, slid along and veered off to the left side. The left main landing gear entered the grass and the aircraft came to rest at an angle to the runway. A runway inspection revealed standing water on the right side of the runway near the threshold (ATSB investigation AO-2014-016).

Runway excursion involving a Fairchild SA226 at Archerfield Airport, Qld on 23 January 2014 (ATSB investigation AO-2014-016) – skid marks in the grass following a runway veer off in wet conditions.

Medical transport

In previous versions of this report, medical transport occurrences were reported as emergency medical services (EMS) under general aviation. In this report, medical transport has been grouped under commercial air transport to reflect current Civil Aviation Safety Regulation reforms.

The number of incidents involving medical transport aircraft reported to the ATSB in 2014 was the highest in the last 10 years (Table 8). However, assuming an increase in flying activity consistent with the previous 9 years,[13] the number of incidents per hours flown would be consistent with the 10-year average. Birdstrikes were the most common reported incident.

There was a decrease in the number of serious incidents compared to the previous 2 years and there were no accidents in 2014 involving aircraft on medical transport operations.

[13] Hours flown for medical transport in 2014 was not available at the time of publication.

Table 8: Medical transport aircraft occurrences, 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of aircraft involved										
Incidents	102	98	92	121	123	100	114	149	136	159
Serious incidents	1	0	2	5	3	3	1	7	5	2
Serious injury accidents	0	0	0	0	2	0	0	0	0	0
Fatal accidents	0	0	0	0	0	0	0	0	0	0
Total accidents	0	0	1	0	3	0	0	0	1	0
Number of people involved										
Serious injuries	0	0	0	0	3	0	0	0	0	0
Fatalities	0	0	0	0	0	0	0	0	0	0
Rate of aircraft involved										
Accidents per million hours	0	0	13.4	0	36.8	0	0	0	10	N/A
Fatal accidents per million hours	0	0	0	0	0	0	0	0	0	N/A

In 2014 there were two serious incidents, both involving near collisions, involving medical transport aircraft. These are described below:

- A Piper PA-31 on an aeromedical flight to Bankstown from Canberra had a near collision with a Piper PA-28 departing Bankstown for a training flight. The PA-28 departed Bankstown to Orange, with a pilot-under-instruction and a flight instructor, under the night visual flight rules (NVFR). When on descent to Bankstown, Sydney ATC advised the pilot of the PA-31 that a VFR aircraft had departed Bankstown and was about 5 NM away and at 1,600 ft AMSL. The pilot responded that they had the aircraft in sight. The pilot of the PA-31 then contacted the Bankstown Tower controller who instructed the pilot to join the final approach and advised that departing traffic was a Cherokee (PA-28) about 2 NM away, and at 2,300 ft AMSL. The PA-31 pilot replied that they had the traffic sighted. When at 2,300 ft AMSL and about 6 NM from Bankstown, the PA-28 instructor heard the controller give PA-31 the traffic and sighted the PA-31. The PA-28 instructor then observed the landing light of the PA-31 come on, immediately took control of the aircraft and conducted an evasive manoeuvre. The PA-31 passed about 200 ft below the PA-28 (ATSB investigation AO-2014-067).
- On approach to Toowoomba aerodrome, the pilot of a Careflight Bell 412 observed a Piper PA-38 cross in front in close proximity. The Bell 412 pilot contacted the PA-38 crew which subsequently conducted a missed approach (ATSB occurrence 201403594).

Foreign-registered air transport

Incidents reported to the ATSB involving foreign-registered air transport operations remained steady across the last 10 years. No foreign aircraft operating as air transport in Australia has been involved in fatal or serious injury accidents in the last 10 years (Table 9).

Table 9: Occurrences involving foreign-registered air transport aircraft in Australia, 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of aircraft involved										
Incidents	180	146	137	131	120	143	159	159	188	162
Serious incidents	7	1	5	3	1	1	1	3	1	2
Serious injury accidents	0	0	0	0	0	0	0	0	0	0
Fatal accidents	0	0	0	0	0	0	0	0	0	0
Total accidents	0	1	0	0	1	0	0	1	0	1
Number of people involved										
Serious injuries	0	0	0	0	0	0	0	0	0	0
Fatalities	0	0	0	0	0	0	0	0	0	0

There was one accident and two serious incidents involving a foreign-registered air transport aircraft reported to the ATSB in 2014:

- A Fiji Airways Airbus A330 flared late, resulting in a hard landing at Sydney airport. A cabin crew member received minor injuries in the accident. The aircraft subsequently departed for Nadi where an engineering inspection identified serious damage to the aircraft (ATSB occurrence 201402825).
- While still at the gate prior to departure at Melbourne Airport, the first officer of a Fiji Airways Boeing 737 declared a 'MAYDAY' due to smoke billowing from the aft cargo hold. Undeclared lithium-Ion batteries in a passenger's checked baggage were the cause of the fire and subsequent smoke. At the time of the fire, the passengers' bags were being loaded. The cabin crew members were on board preparing the aircraft prior to passengers boarding. The first officer was in the cockpit conducting pre-flight checks. The captain was on the tarmac conducting an external inspection of the aircraft. A ground engineer observed smoke emanating from the aft cargo hold, alerted the captain and notified the aerodrome rescue and firefighting (ARFF) service. The captain saw white heavy smoke billowing from the hold and immediately called the first officer to advise him. The first officer observed that the aft cargo fire warning light was illuminated. The captain directed the first officer to activate the aft cargo hold fire suppression system, shut down the auxiliary power unit and order an evacuation of the aircraft. The first officer advised air traffic control and declared a 'MAYDAY'. The ARFF arrived and a smouldering hard-plastic case was removed to a safe location and cooled with a fine water spray. The passenger who had checked in the case was located and asked whether any batteries were in it, to which the passenger responded there were none. The ARFF and Australian Federal Police inspected all four of the bags checked in by the passenger and found 19 batteries intact and an additional 6-8 batteries that had been destroyed by fire. An initial investigation revealed that several lithium-ion polymer batteries and an RPA controller were contained in the case. An electrical short circuit involving the batteries resulted in the initiation of a fire, destroying the contents and damaging the case. An RPA controller containing other, similar, lithium-ion polymer batteries was found in another of the passenger's checked-in bags. The fire-damaged case had been screened through the oversized luggage point at Melbourne Airport (ATSB investigation AO-2014-082).

Cargo hold smoke event involving a Boeing 737, Melbourne Airport, Vic, on 26 April 2014 (ATSB investigation AO-2014-082) – fire-damaged bag and contents. Source: CASA.

- During the landing at Perth, the co-pilot (and pilot flying) of an Air New Zealand Boeing 787 from Auckland became medically incapacitated. The captain assumed control of the aircraft. The aircraft landed without further incident. Subsequently the co-pilot was transferred to hospital and later passed away (ATSB occurrence 201408011).

General aviation

General aviation (GA) is considered to be all flying activities of VH- registered aircraft outside of commercial air transport (scheduled (RPT) and non-scheduled (charter and medical transport) passenger and freight operations). It excludes recreational aircraft that are administered by recreational aviation administration organisations (RAAOs) and do not have an Australian civil (VH-) registration, such as recreational aeroplanes up to 600 kg, weight shift hang gliders, paragliders, powered parachutes and trikes, and gyrocopters. Recreational aircraft statistics are reported separately below (page 62) in *Recreational aviation*. General aviation also excludes all remotely piloted aircraft operations, which are reported separately below (page 69) in *Remotely Piloted Aircraft*.

General aviation is further broken down into aerial work (agriculture, mustering, search and rescue, fire control, and survey and photography), flying training, and private/business and sports aviation (see *Appendix A – Explanatory notes*).

General aviation also accounts for over half of all aircraft movements across Australia (see Figure 1 on page 4). In comparison, large air transport aircraft operated by major airlines make up less than five per cent of Australian-registered aircraft[14]. General aviation aircraft also make up about

[14] This was calculated using SQL code PercentageATBig4.SQL. Where the number of VH-registered aircraft in the Air Transport group type were calculated and compared with the total number of VH- aircraft in the CASA registry

40 per cent of the total hours flown by Australian-registered aircraft (as shown in Figure 3 on page 7).

Despite the larger size of GA compared to air transport in both fleet size and number of departures, there are comparatively few occurrence reports sent to the ATSB. In 2014, there were 1,406 GA occurrences reported to the ATSB (Table 10). Although there is a less comprehensive reporting requirement for aircraft not engaged in commercial air transport, the reporting rate is small when compared to the 4,224 occurrences involving commercial air transport aircraft reported to the ATSB in 2014.

The most commonly reported safety incident to the ATSB concerning GA in 2014 was birdstrikes.

Table 10: All general aviation occurrences (VH- and foreign registered aircraft), 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of aircraft involved										
Incidents	1,546	1,654	1,597	1,608	1,795	1,552	1,503	1,407	1,399	1,256
Serious incidents	57	70	93	103	95	132	137	159	186	118
Serious injury accidents	4	8	7	16	8	15	14	17	6	15
Fatal accidents	16	19	12	22	16	13	16	20	15	11
Total accidents	118	91	117	126	117	127	116	112	90	149
Number of people involved										
Serious injuries	5	13	9	23	10	19	23	20	8	20
Fatalities	21	34	21	34	16	16	28	29	24	17
Rate of aircraft involved[15]										
Accidents per million departures	52.2	50.3	65.3	64.4	63.6	63.7	62.3	63.4	49.5	N/A
Fatal accidents per million departures	7.1	10.5	6.7	11.2	8.7	6.5	8.6	11.3	8.2	N/A
Accidents per million hours	100.9	80.2	96.7	100.4	93.3	101.8	97	101.5	78	N/A
Fatal accidents per million hours	13.7	16.7	9.9	17.5	12.8	10.4	13.4	18.1	13	N/A

A major challenge for the ATSB in its charter to improve transport safety is that there is a lower level of awareness in the GA community of the need to report safety matters, and what constitutes a reportable transport safety matter. Underreporting of safety matters has been identified as one of the ATSB's *SafetyWatch* priorities for improving transport safety in Australia. Future amendments to the Transport Safety Investigation Regulations intend to clarify what industry needs to report, in order to make reporting clearer and less onerous for pilots and operators alike.

As discussed above, previous editions of this report have grouped medical services with aerial work, while this edition has moved medical transport to commercial air transport. This has led to a decrease in the contribution aerial work makes to the overall general aviation statistics compared to previous editions.

Flying training had the highest number of general aviation occurrences reported to the ATSB over the 10-year period. The number of private/business/sports aviation operations occurrences was about 90 per cent of those reported involving flying training. While this could suggest that certain general aviation operations involve a greater level of risk, it is more likely that the reporting

[15] Foreign registered general aviation departures and hours are not known. VH- registered aircraft hours are used as a proxy denominator. The real rate per departure or hour will be slightly smaller than the figures presented in this table. This equates to 9 accidents over the period between 2005 and 2014 (including one fatal accidents) where aircraft hours are not known and are not included in the denominator figures.

cultures and safety management systems of the operators involved in these types of flying is stronger than in other areas of GA.

The type of flying the aircraft was conducting was not reported to the ATSB for about 50 per cent of GA reported occurrences. In these occurrences, someone other than the pilot(s) of the aircraft involved notified the ATSB (such as air traffic control, the public, pilots of nearby aircraft or aerodrome-base staff). A review of 'unknown' general aviation occurrences found that most were associated with either:

- aircraft separation;
- runway events, primarily runway incursions;
- bird and animal strikes;
- communications failure;
- diversion/return; or
- operation non-compliance.

The number of GA aircraft involved in incidents has decreased every year since 2009. Further, the number of serious incidents in 2014 involving GA aircraft (118) was the lowest reported to the ATSB since 2009. However, 2014 saw the greatest number of accidents (149) involving GA aircraft in the last 10 years. This number was significantly greater than the 10-yearly average of around 120 accidents per year. The number of fatal accidents (11) was the lowest over the reporting period. The number of fatalities in 2014 was significantly below the 10-yearly average and 2014 was only the second year where fatalities were less than serious injuries over the reporting period.

Figure 14: General aviation occurrences and injuries (VH- and foreign registered aircraft), 2005 to 2014

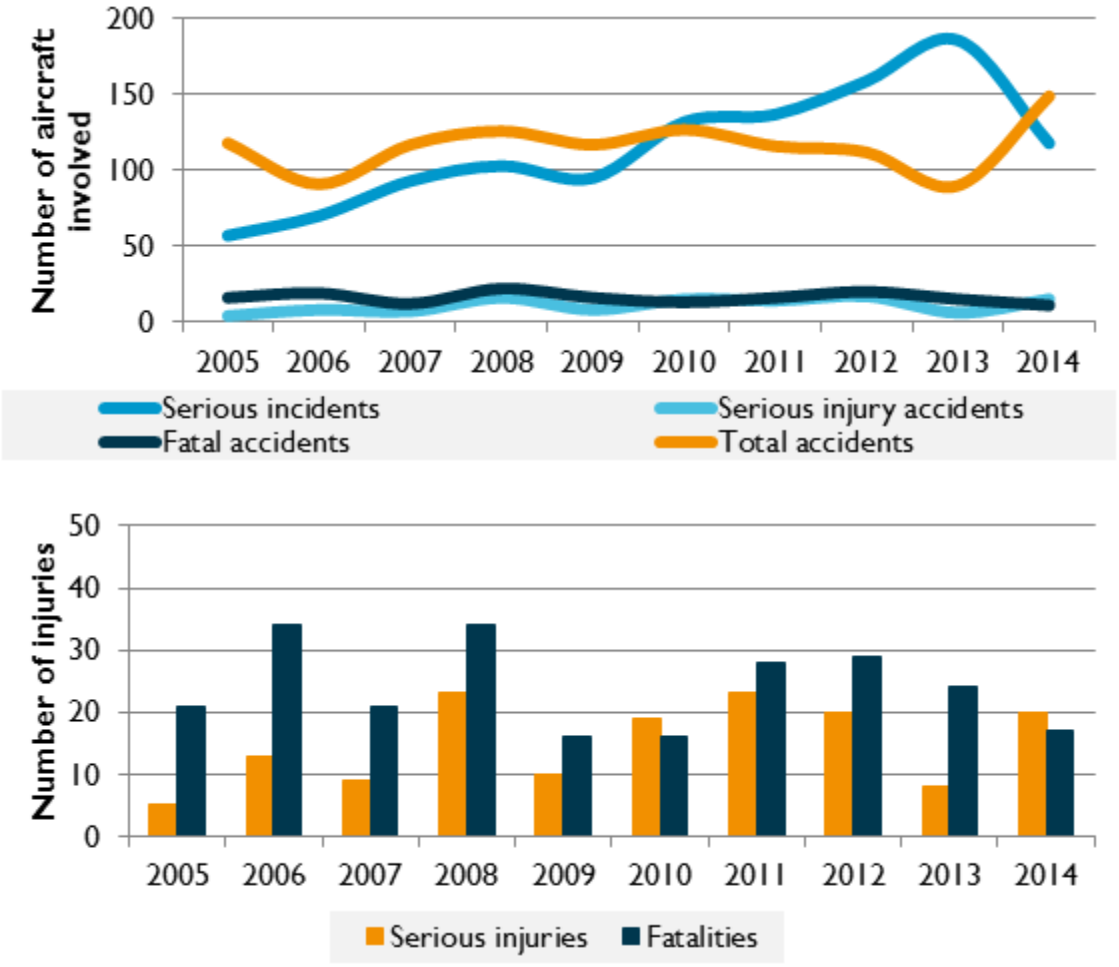
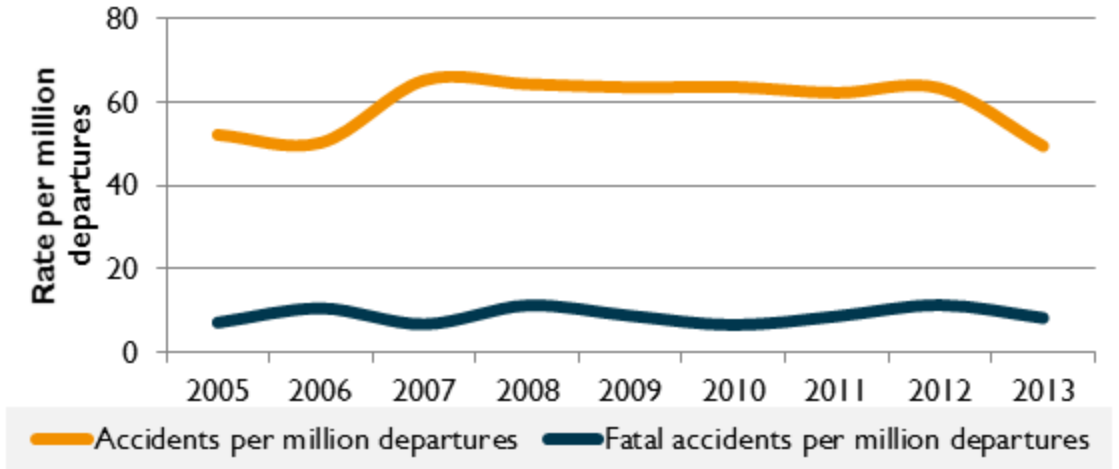


Figure 15: General aviation accident and fatal accident rate (per million departures, VH-registered aircraft only), 2005 to 2013



Of the 1,163 GA aircraft involved in accidents over the last 10 years, about 14 per cent (160) have been fatal, with 244 fatalities. In 2013 – the last year with available GA departure information – the GA accidents rate was almost five times that of commercial air transport. The year 2013 saw a significant decrease in the accident rate compared with the previous 6 years. However, the fatal accident rate was consistent with the 10-year average.

Accident types and severity varied across different types of general aviation flying, as some types of operations involve a greater level of accepted operational risk (like low flying in aerial agriculture and mustering). Over the 2005 to 2013 period, per million hours flown:

- aerial agriculture had the highest average rates of reported accidents (154.8 per million hours flown) and fatal accidents (21.1 per million hours flown).
- flying training had the lowest average rates of reported accidents (40.6 per million hours flown) and fatal accidents (2.0 per million hours flown).
- aerial mustering and survey and photography had similar average rates of accidents (61.3 and 66.2 per million hours flown) and fatal accidents (11.7 and 13.7 per million hours flown).
- private/business/sports flying had the second highest average rates of accidents (103.9 per million hour flown) and fatal accidents (17.8 per million hours flown).

Aerial work

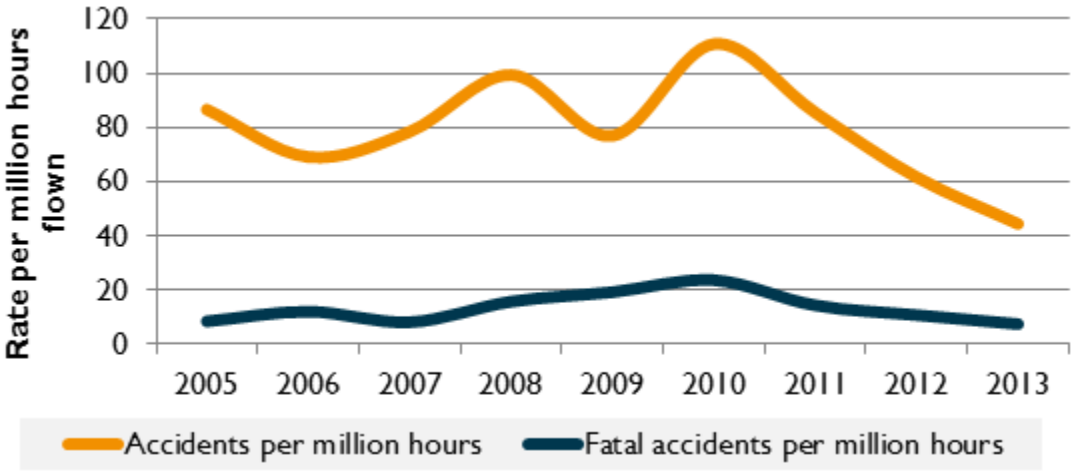
Aerial work is made up of a number of different commercial activities, including aerial agriculture, mustering, surveying and photography, search and rescue, check and training flights, and aerial fire control. Some of these activities require aircraft to regularly operate in conditions with inherent risks, such as manoeuvring at low level (crop spraying and aerial mustering), which should be considered when comparing aerial work occurrence data with that of other operation types.

In 2014, the number of incidents reported to the ATSB involving GA aircraft conducting aerial work was the greatest in the last 10 years. The number of aircraft involved in serious incidents (19) or accidents (27) was consistent with the 10-year average.

Table 11: Aerial work (VH- registered aircraft) occurrences, 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of aircraft involved										
Incidents	107	111	103	91	117	110	126	106	129	133
Serious incidents	14	9	12	13	13	28	23	31	44	19
Serious injury accidents	2	2	2	7	1	5	5	2	1	3
Fatal accidents	3	4	3	6	7	10	6	4	3	2
Total accidents	31	23	29	38	28	47	36	23	18	27
Number of people involved										
Serious injuries	2	2	2	9	2	6	8	2	1	3
Fatalities	3	9	3	7	7	12	9	4	3	3
Rate of aircraft involved										
Accidents per million hours	86.6	69.1	78.4	99.4	76.9	110.8	85.5	61.6	44.4	N/A
Fatal accidents per million hours	8.4	12	8.1	15.7	19.2	23.6	14.3	10.7	7.4	N/A

Figure 16: Accident rate for aircraft (VH- registered) involved in aerial work (per million hours flown), 2005 to 2013



The year 2013 had the lowest reported accident and fatality rates in the years from 2005 (

Figure 16).

The following sections explore the accidents, serious incidents and injuries that occurred in 2014 in the difference types of aerial work.

Aerial agriculture

The ratio of incidents to serious incidents or accidents reported to the ATSB involving aircraft conducting aerial agriculture operations is significantly lower compared to most other aviation types. This indicates there is likely a significant amount of underreporting occurring. Underreporting reduces the ATSB's ability to derive meaningful inferences from the reported statistical data.

For the first time since 2007, there were no fatal accidents involving aircraft conducting aerial agriculture operations in 2014. Further, 2014 also had the lowest number of serious incidents (7) since 2007. However, the number of accidents (12) in 2014 was consistent with the 10-year average.

The most commonly reported occurrence involving aircraft conducting aerial agriculture operations in 2014 was wirestrike (11) followed by collision with terrain (7) and forced or precautionary landing (6).

Table 12: Occurrences involving general aviation aircraft conducting aerial agriculture, 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of aircraft involved										
Incidents	4	1	4	5	5	2	7	6	9	7
Serious incidents	9	3	5	7	5	17	13	15	27	7
Serious injury accidents	1	1	1	4	0	0	3	0	0	1
Fatal accidents	1	1	0	3	3	4	1	2	1	0
Total accidents	18	8	10	18	10	16	18	10	8	12
Number of people involved										
Serious injuries	1	1	1	4	0	0	3	0	0	1
Fatalities	1	1	0	3	3	4	1	2	1	0
Rate of aircraft involved										
Accidents per million hours	189.5	129.6	161	230.2	136.5	154.2	179.3	112.3	100.2	N/A
Fatal accidents per million hours	10.5	16.2	0	38.4	40.9	38.5	10	22.5	12.5	N/A

There were 12 accidents in 2014 involving aerial agriculture. Some of the notable accidents are described below:

- The pilot of a Bell 206B helicopter sustained serious injuries from a collision with terrain near Mission Beach, Qld. The helicopter took off from a banana plantation to conduct aerial spraying. The pilot conducted pre-application checks including assessing the wind strength and direction, the position of the sun, identifying the area to be sprayed and any hazards. The block was to be sprayed as soon as possible after first light and the pilot planned to conduct the spraying in an east-west direction. After about 5 minutes of spraying, some overspray accumulated on the windscreen, resembling a white paint. The pilot then noted that the on-board smoke generator indicated the wind had changed direction, so flew the helicopter to the southern end of the block and resumed spraying into wind. After completing spraying, the pilot commenced a return to the staging area. To comply with local noise abatement procedures, the pilot climbed the helicopter to about 250-300 ft AGL and established a flight path to avoid overflying noise-sensitive areas. On descent to the staging area, at about 150-200 ft AGL, the helicopter's rotor blades collided with a tree, dislodged a branch, and the helicopter subsequently collided with terrain. The helicopter was substantially damaged (ATSB investigation AO-2014-027).

Controlled flight into terrain involving a Bell 206B, VH-BNG, near Mission Beach, Qld on 20 February 2014 (ATSB investigation AO-2014-027) - Damage to the aircraft. Source: Operator.

- The pilot of a Hughes 269C helicopter conducted a forced landing after fuel exhaustion at a property about 55 km north-east of Launceston, Tas. Subsequently, the aircraft received substantial damage. About a week before the accident, the pilot had parked the helicopter beside a dam, aware that it was low on fuel. On the day of the accident, the pilot prepared for a short 200 m flight to reposition the helicopter to the other side of the dam for refuelling. Fuel drains were conducted and no contaminants found. The helicopter took off and climbed to about 20 ft above ground level. About three quarters of the way across the dam, the engine stopped due to fuel exhaustion. The pilot conducted a forced landing onto the edge of the dam, with part of the helicopter sinking into the water and mud. The main rotor blades collided with the embankment resulting in substantial damage to the aircraft. The pilot was not injured (ATSB investigation AO-2014-030).

Collision with terrain involving a Hughes 269C, 55 km NE Launceston Airport, Tasmania on 23 February 2014 (ATSB investigation AO-2014-030) – damage of the aircraft. Source: Operator.

- A Robinson R44 helicopter collided with terrain while conducting aerial agricultural operations near Yass NSW. Prior to the accident, after successfully completing five loads of spraying, the helicopter was refuelled and reloaded with chemical for the next flight. The wind at the time was light and variable but favouring a southerly direction and the pilot manoeuvred the helicopter to take off towards the south. During the take-off, when at about 3 ft AGL, the pilot reported that the helicopter was not climbing as expected and thought that the wind had veered to a more westerly direction. The pilot commenced a right pedal turn towards the west, and down the slope, in an attempt to gain translational lift. The pilot reported that the wind had actually turned more easterly, and the helicopter therefore had a tailwind. The low rotor RPM warning sounded and the pilot jettisoned the chemical load. The helicopter was then about 5 ft AGL, the pilot was attempting to gain lift and concentrating on keeping the helicopter straight in order to keep the landing skids level. The pilot sighted a dry creek bed ahead and attempted to gain altitude prior to crossing it. The helicopter was about 40-50 m beyond where the load had been jettisoned, and the pilot was focused on gaining lift, when the left skid contacted the ground, and the helicopter rolled over. The pilot was not injured in the accident (ATSB investigation AO-2014-031).

Collision with terrain involving a Robinson R44, near Yass, NSW on 22 February 2014 (ATSB investigation AO-2014-031) – damage to the aircraft. Source: Operator.

- An in-flight engine failure during climb caused the pilot of an Air Tractor AT-502B to conduct a forced landing into a crop of cotton near Moree, NSW. The aircraft was substantially damaged (ATSB occurrence 201401907).
- The pilot of a Robinson R66 helicopter received minor injuries when the aircraft struck powerlines and subsequently collided with the ground near Giru, Qld. The pilot conducted a site inspection from a vehicle prior to commencing aerial spraying. The pilot identified powerlines running along the eastern, southern and northern boundaries of the paddock to be sprayed. The pilot then conducted a flight over the paddock and assessed the hazards in the area, and confirmed they were able to see all of the powerlines he had identified from the ground. The pilot commenced aerial spraying in an east-west direction. At the end of each run, the pilot climbed the helicopter up and over the powerlines, turned then descended once clear of the powerlines and sprayed the paddock in the opposite direction. The helicopter was operating along the southern boundary of the paddock, parallel to the powerlines running along the southern and northern borders. The pilot was aware of those powerlines, however, when about 5 m from the eastern boundary, they sighted the powerlines running perpendicular to the direction of flight. The pilot assessed that it was too late to climb over the powerlines and elected to fly underneath them. The crop was about 6 ft tall and the pilot wanted to ensure the helicopter remained above the crop. The main rotor blade hub struck the powerlines and the helicopter collided with the ground and was substantially damaged (ATSB investigation AO-2014-142).

Wirestrike involving Robinson R66, near Giru, Qld. on 20 August 2014 (ATSB investigation AO-2014-142) – aircraft damage. Source: Operator.

- An Air Tractor AT-502B conducting aerial agricultural spraying collided with terrain resulting in substantial damage to the aircraft near Moree, NSW. The job consisted of spraying four fields and the two western-most fields were sprayed in a north-south direction. To avoid an adjoining property, the two remaining fields were sprayed in an east-west direction. The pilot established a racetrack pattern at the southern end of the field and overflew a storage dam wall heading east. At that time, the pilot could observe the dam wall as the sun was rising but obscured by cloud. The pilot then turned the aircraft towards the west and commenced the first spray run, again overflying the dam wall. After completing that spray run, the pilot turned the aircraft to the east again for the second spray run. The sun was then above the cloud and directly in the pilot's eyes obscuring their visibility ahead of the aircraft. As the pilot was about to commence a climb and turn at the end of the spray run, they extended the run to spray some weeds. The pilot then turned the spray off and commenced a climb. As the aircraft climbed to about 30 ft, the landing gear collided with the dam wall, about 60 cm below the top of the wall. The pilot then dumped the chemical load and returned to the airstrip on the property about 4 km away. Both landing gear struts had been detached, which had then broken off the right flap, damaged the left flap and ruptured both fuel tanks. During the landing, the propeller was damaged. The pilot was not injured (ATSB investigation AO-2014-191).

Collision with terrain involving an Air Tractor AT-502B, 45 km west of Moree Airport, NSW on 18 December 2014 (ATSB investigation AO-2014-191) - Damage to aircraft. Source: Pilot.

Aerial mustering

Similar to aerial agriculture, the number of aerial mustering incidents reported to the ATSB each year, relative to the number of accidents and serious incidents, is low. This indicates a high level of underreporting is probably occurring. There were no safety incidents reported to the ATSB involving aerial mustering aircraft in 2014.

The most commonly reported occurrence involving aerial mustering aircraft in 2014 was collision with terrain.

Table 13: Occurrences involving general aviation aircraft conducting aerial mustering, 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of aircraft involved										
Incidents	1	0	1	0	2	0	1	0	0	0
Serious incidents	1	1	0	1	0	2	1	0	2	2
Serious injury accidents	0	0	1	1	0	4	1	1	0	2
Fatal accidents	1	0	1	0	3	4	1	2	0	0
Total accidents	6	4	9	3	6	19	6	9	1	4
Number of people involved										
Serious injuries	0	0	1	1	0	4	1	1	0	2
Fatalities	1	0	1	0	3	5	1	2	0	0
Rate of aircraft involved										
Accidents per million hours	53.1	39	79.8	26.6	56.8	160.9	47.7	80	8	
Fatal accidents per million hours	8.8	0	8.9	0	28.4	33.9	7.9	17.8	0	

In 2014, there were four aerial mustering aircraft accidents and a single serious incident (involving two aerial mustering aircraft) that were reported to the ATSB. Two of the accidents resulted in serious injuries. These accidents and the serious incident are described below:

- A Robinson R22 helicopter, conducting aerial mustering on a property near Fitzroy crossing, WA, collided with the ground causing substantial damage to the aircraft. The accident resulted from an insecurely stowed jerry can becoming dislodged and jamming between the cyclic control and the seat. The pilot had refuelled the helicopter from the jerry can and then secured the empty can in the passenger seat using the seatbelt. In the air, the pilot manoeuvred the helicopter to the rear of a mob of cattle. At about 300 ft AGL, the pilot conducted a balanced descending turn. At approximately 10 ft AGL, the pilot applied right pedal and as they raised collective to climb away, a gust of wind blew through the left door opening and dislodged the jerry can from the seatbelt. The can became wedged between the seat and the cyclic control. The pilot applied forward cyclic and the nose of the helicopter lowered. As the pilot then attempted to apply aft cyclic to raise the nose, they realised the cyclic was jammed. As a result of the low nose attitude and minimal height above the ground, the pilot used collective in an attempt to flare the helicopter. The front of the landing skids collided with the ground and the helicopter rotated forwards. The main rotor blades chopped through the tail boom and the helicopter continued rotating forwards and bounced back up to about 50 ft AGL before coming to rest inverted. The pilot reported that the impact dislodged the top of the front dashboard and struck his helmet. The pilot was uninjured but the helicopter sustained substantial damage (ATSB investigation AO-2014-055).
- The pilot of a Robinson R22 was seriously injured when the helicopter collided with terrain. The helicopter departed from Mullapunyah station, WA. About 10 minutes after departure the pilot radioed that the drive v-belts had failed and the station owner, in another R22, saw the helicopter enter a steep descent. Soon after, the station owner found the helicopter complete and upright in a relatively clear area. The pilot sustained a serious head injury and was transported to hospital. The ATSB investigation found that during the initial engine start/clutch engagement process following an extended period of static belt stretching, one or both rotor drive v-belts were displaced on the lower sheave with consequent increase in v-belt slack. Although the pilot, who was not qualified to conduct such maintenance, adjusted the clutch actuator to correct the excessive v-belt slack, the v-belt displacement went undetected. While being operated in that abnormal configuration, one of the belts weakened and failed with consequent failure of the remaining belt, loss of drive to the rotors, and a forced landing (ATSB investigation AO-2014-058).
- A Robinson R22 conducting aerial mustering was destroyed by fire following a collision with terrain about 40 km north-east of Hughenden, Qld. Prior to the accident, during mustering, the pilot noticed a number of cattle retreat to a protected area beneath trees. The pilot descended in what appeared to be a clear area adjacent to the trees in an attempt to keep the cattle moving, but as the aircraft descended, the main rotor blade struck a dead tree. Concerned about the extent of damage to the helicopter and possible loss of control, the pilot elected to make a controlled descent to the ground immediately beneath. A fire ignited in the grass beneath the engine behind the cockpit area after the helicopter settled on the ground. The pilot was able to retreat to a safe area and was uninjured, but the fire grew rapidly and destroyed the helicopter (ATSB investigation AO-2014-087).

Collision with terrain involving Robinson R22, 40 km NE of Hughenden, Qld on 13 May 2014 (ATSB investigation AO-2014-087) – accident site showing long, dry grass and 'gidgee' trees in the background. Source: Operator.

- The pilot of a Robinson R22 sustained serious injuries from a ground strike while mustering near Fitzroy Crossing, WA. As the pilot was manoeuvring the helicopter at low level, the tail rotor struck the ground. The helicopter commenced a severe right yaw. The pilot kept the helicopter in a clear area, while it rapidly completed about four full rotations to the right. To arrest the yaw, the pilot immediately closed the throttle. This resulted in a rapid rate of descent. In an attempt to lessen the rate of descent, the pilot raised the collective. The helicopter struck the ground heavily, and then rolled onto the right side. The pilot sustained serious injuries and the helicopter was substantially damaged (ATSB investigation AO-2014-091).

Groundstrike and loss of control involving Robinson R22 helicopter, near Fitzroy Crossing, WA on 18 May 2014 (ATSB investigation AO-2014-091) – accident site. Source: Operator.

- Two Robinson R22 helicopters mustering near Broome WA had a near collision with an unknown aircraft. The two R22 pilots were working together, and had planned mutual separation using relevant ground features. The pilots were in radio contact on a company radio and monitoring the Multicom frequency. One pilot observed a light aircraft in close proximity and advised the other R22 pilot. The light aircraft banked sharply possibly in response to sighting one of the R22's operating almost directly beneath its flight path. Following what appeared to be an evasive manoeuvre, the light aircraft resumed its easterly track, still at low level. One of the R22 pilots tried to contact the pilot of the light aircraft on the Multicom frequency, but without response. The light aircraft continued out of sight towards the east, and the two R22s resumed their aerial mustering operation (ATSB investigation AO-2014-152).

Search and rescue

The year 2014 had the highest number of reported incidents involving aircraft conducting search and rescue operations in the previous 10 years.

Generally, the ATSB is notified of very few occurrences involving search and rescue aircraft. This is likely due to the very small amount of search and rescue flying in Australia (relative to other type of general aviation.

Table 14: Occurrences involving general aviation aircraft conducting search and rescue operations, 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of aircraft involved										
Incidents	8	11	7	3	4	4	7	7	9	12
Serious incidents	0	0	0	1	0	3	0	3	2	1
Serious injury accidents	0	0	0	0	0	0	0	0	0	0
Fatal accidents	0	0	0	0	0	0	1	0	1	0
Total accidents	0	0	0	0	0	0	1	0	1	1
Number of people involved										
Serious injuries	0	0	0	0	0	0	0	0	0	0
Fatalities	0	0	0	0	0	0	1	0	1	0

In 2014, there was one accident and one serious incident involving search and rescue aircraft reported to the ATSB. These are described below:

- A Bell 412 conducting a winching operation collided with terrain causing damage to the tail rotor blades about 72 km west-north-west of Townsville. The helicopter's crew consisted of a pilot, an air crew officer (ACO), a rescue crew officer (RCO), a paramedic and a doctor. The pilot established the helicopter in a hover about 100 ft AGL facing down a slope. The ACO directed the pilot to manoeuvre the helicopter to perform the operation and remain clear of all obstacles. The doctor and RCO were winched down to the site together, and subsequently the paramedic was lowered. The pilot conducted an orbit before returning to winch the stretcher and rescue equipment down. The pilot and ACO then departed and after about 15 minutes, returned to commence the winch recovery. The ACO directed the pilot to manoeuvre the helicopter and winched up the doctor and the stretcher. The ACO handed the visual reference over to the pilot, while the ACO's attention was focused on securing the stretcher inside the cabin. About 1 minute later, the ACO returned to the door and observed that the helicopter had drifted back and left and immediately directed the pilot to manoeuvre up and to the right; however, the tail rotor collided with some foliage. The ACO advised the pilot. The pilot had not detected any strike, there were no abnormal indications or vibrations and the helicopter was operating normally. The RCO and paramedic were then winched into the helicopter and the ACO returned to the front seat. After landing, the pilot observed some ripples on the tail rotor blades (ATSB investigation AO-2014-095).
- A Kawasaki BK117 helicopter conducting search and rescue operations at 200 ft over water had a near collision with a Piper PA-28. The crew of the BK117 observed the PA-28 on approach at the same altitude and descended below 50 ft. The PA-28 passed overhead in close proximity. The pilot of the BK117 contacted the PA-28 pilot who then apologised (ATSB occurrence 201407843).

Fire control

Generally, few accidents and serious incidents involving fire control operations are reported to the ATSB each year, despite the potential hazards associated with reduced visibility, spatial disorientation, low-level manoeuvring, and high operating weight.

There were four incidents reported to the ATSB in 2014, the most common was air-ground-air communications difficulties.

Table 15: Occurrences involving general aviation aircraft conducting fire control operations, 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of aircraft involved										
Incidents	1	6	3	1	6	1	0	3	3	4
Serious incidents	2	1	1	1	3	0	0	1	1	1
Serious injury accidents	0	0	0	0	1	0	0	0	0	0
Fatal accidents	0	1	0	0	1	0	0	0	1	0
Total accidents	0	3	1	0	4	0	0	0	2	2
Number of people involved										
Serious injuries	0	0	0	0	2	0	0	0	0	0
Fatalities	0	1	0	0	1	0	0	0	1	0

In 2014, there were two accidents and one serious incident involving aerial fire control aircraft reported to the ATSB, these are described below:

- During engine start of an Aerospatiale AS350BA helicopter conducting aerial fire control operations at Essendon Aerodrome in strong winds, the main rotor struck the tail boom resulting in substantial damage to the helicopter (ATSB occurrence 201401454).
- A Cessna 337E on aerial fire control operations conducted a wheels up landing at Hells Gate Qld, resulting in substantial damage to the aircraft. The pilot became distracted on approach and forgot to lower the landing gear (ATSB occurrence 201407115).
- While conducting aerial fire control operations near Mangrove Mountain, NSW, the cargo hook of a Bell AMT UH-1H malfunctioned resulting in the line and bucket falling from the aircraft (ATSB occurrence 201409555).

Survey and photography

Survey and photography aerial work results in around the same number of fatalities per year as aerial agriculture and mustering. However, survey and photography has a much higher rate of reporting occurrences – the highest for any form of aerial work. This is probably an indication of a stronger reporting culture (relative to other types of aerial work).

The most common reported incidents for survey and photography operations in 2014 to the ATSB involved birdstrikes.

Table 16: Occurrences involving general aviation aircraft conducting survey and photography operations, 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of aircraft involved										
Incidents	10	11	15	17	24	29	27	17	26	27
Serious incidents	0	1	1	1	2	3	3	7	4	2
Serious injury accidents	1	1	0	1	0	1	0	0	0	0
Fatal accidents	0	2	1	2	0	0	2	0	0	1
Total accidents	2	3	2	7	3	5	4	0	5	2
Number of people involved										
Serious injuries	1	1	0	3	0	2	1	0	0	0
Fatalities	0	7	1	2	0	0	4	0	0	2
Rate of aircraft involved										
Accidents per million hours	61.2	67	36.9	108.6	78.2	85.5	58.7	0	99.3	N/A
Fatal accidents per million hours	0	44.7	18.4	31	0	0	29.4	0	0	N/A

In 2014, there were two accidents and two serious incidents involving survey and photography aircraft investigated by the ATSB. One of the accidents resulted in two fatal injuries. These are described below:

- A Cessna 404 aircraft conducting aerial survey operations near Mangalore Aerodrome Vic. had a near collision with a Piper PA-28 conducting a training flight. The survey pattern required the Cessna to fly across the extended centreline of runway 36. The Cessna's pilot made all required CTAF broadcasts while operating in the area. During the survey, three PA-28 aircraft departed Mangalore for a series of navigational exercises. The Cessna's pilot continually attempted to communicate with the departing aircraft to establish their position and intentions. However, as per their training, the PA-28 pilot did not respond until they were at 500 ft AGL. Due to misunderstanding the Cessna pilot's intentions, the PA-28 pilot did not respond to his radio calls, unless the request was directed at their aircraft. When the solo student pilot of the PA-28 departed runway 36, he focussed on flying the aircraft rather than communicating, until it reached 500 feet AGL. Then the student lowered the aircraft's nose to check for traffic and saw the Cessna in close proximity. The student pilot turned the PA-28 to the right at the same time that the pilot of the Cessna initiated a climbing turn to the right resulting in the near collision (ATSB investigation AO-2014-006).
- The pilot of a Reims Aviation F406 aircraft conducting an aerial survey near Emerald Qld was temporarily incapacitated from hypoxia. The aircraft departed Emerald with a pilot and navigator. The aircraft was fitted with an oxygen system to allow unpressurised operations above 10,000 ft. The pilot tested the oxygen system for normal operation prior to the flight. During the climb, the pilot turned on the aircraft's oxygen supply, and connected and donned the oxygen mask. The pilot then monitored their blood oxygen saturation level on an oxygen pulse meter as the aircraft continued to climb, and monitored the flow of oxygen by reference to a flow indication in the supply tube. All appeared normal until about flight level 180, when the pilot noticed that their blood oxygen saturation level had fallen significantly. The pilot attempted to increase the amount of oxygen they was receiving by making an adjustment to the oxygen system controller, but the accuracy with which the pilot was controlling the aircraft deteriorated, and their speech became slurred. The navigator encouraged the pilot to maintain control and descend, and air traffic control prompted the pilot to ensure that they were receiving an adequate supply of oxygen. The pilot was ultimately able to reconnect a fitting in their oxygen supply system that had become disconnected. When they reconnected to the fitting, the pilot sensed almost immediate relief and was able to make a controlled descent. The crew returned to Emerald for an uneventful landing (ATSB investigation AO-2014-134).
- A Robinson R44 helicopter conducting a gravity survey was substantially damaged in a collision with terrain about 126 km east-south-east of Tindal Aerodrome, NT. On the aircraft were a pilot and a geophysical technician. The operation involved flying to specified locations 2 km apart and selecting a suitable landing site within 400 m of the location. After completing landings at about 30 sites, the helicopter arrived overhead at the specified location. The pilot identified a potential landing site, overflew it to make a closer assessment and then entered an out-of-ground-effect hover just above the treetops to determine if the site was suitable for landing. The pilot decided the site was unsuitable as trees prevented sufficient clearance for the main and tail rotors. As the pilot attempted to depart the area, the helicopter started to sink and the pilot observed the rotor RPM decaying. The pilot lowered the collective and rolled on throttle in an attempt to increase the rotor rpm. The outside air temperature gauge indicated about 40 °C and the pilot reported that increasing the throttle did not provide any detectable increase in power. The pilot then eased forward on the cyclic. The helicopter continued to descend and the main rotor blade collided with multiple tree branches. When at about 6 ft AGL, the helicopter rotated about 180° and landed hard with the left skid touching the ground first. The helicopter sustained substantial damage but the pilot and passenger were uninjured (ATSB investigation AO-2014-154).

Collision with terrain involving a Robinson R44, 126 km ESE of Tindal Airport, NT on 23 September 2014 (ATSB investigation AO-2014-154) – accident site. Source: Operator.

- The pilot and photographer were fatally injured when their Cessna 172S collided with terrain at Storm Bay near Port Arthur, Tas. The purpose of the flight was to photograph yachts participating in the Sydney Hobart Yacht Race 2014 as they sailed around the Tasman Peninsula and into Storm Bay en route to Hobart. The pilot of the aircraft had completed a number of low-level passes on various yachts in the vicinity of Storm Bay before commencing a low-level pass from a southerly direction on the yacht Mistraal. After passing abeam of Mistraal, the aircraft continued on its northerly track for about 20 seconds and then commenced what witnesses described as a level, steep left turn. Witnesses stated that shortly after commencing the turn, the aircraft's nose dropped sharply and the aircraft descended rapidly, impacting the surface of the ocean. Mistraal and several other yachts diverted to assist. The aircraft was recovered from about 90 m of water by Tasmania Police and transported to Hobart. Initial inspection of the aircraft wreckage has not identified any mechanical failures that may have contributed to the accident. Damage to the aircraft structure confirmed that it impacted the water in a steep, nose-down attitude. The investigation is continuing (ATSB investigation AO-2014-192).

Collision with terrain involving Cessna 172, Storm Bay near Port Arthur, Tasmania on 29 December 2014 (ATSB investigation AO-2014-192) – aircraft wreckage. Source: ATSB.

Flying training

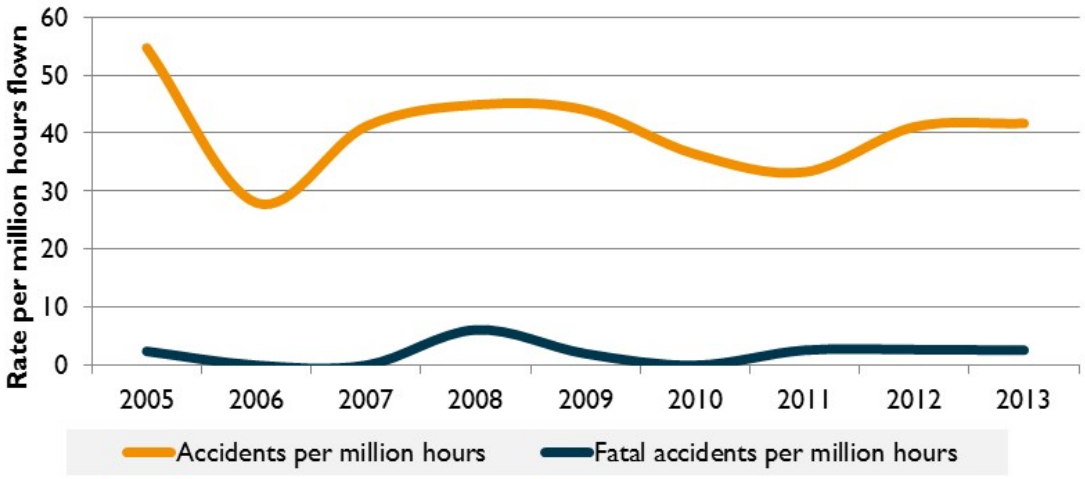
The year 2014 saw the highest number of accidents (31) involving flying training in the last 10 years. However, there were no fatal accidents. The number of serious incidents (42) was also high compared to the 10-year average but was comparable with the previous 2 years.

The most common reported occurrences involving flying training in 2014 involved birdstrikes and near collision. Terrain collisions made up the majority of accidents and near collisions were the most common serious incident.

Table 17: Flying training (VH- registered) aircraft occurrences, 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of aircraft involved										
Incidents	327	295	265	210	226	213	210	222	296	288
Serious incidents	12	22	18	18	24	30	22	45	48	42
Serious injury accidents	0	1	0	0	1	2	0	1	0	2
Fatal accidents	1	0	0	3	1	0	1	1	1	0
Total accidents	23	12	19	22	22	16	13	15	16	31
Number of people involved										
Serious injuries	0	1	0	0	1	3	1	1	0	2
Fatalities	1	0	0	4	1	0	2	2	1	0
Rate of aircraft involved										
Accidents per million hours	54.7	28	41.2	44.9	44	36.4	33.3	41.1	41.7	N/A
Fatal accidents per million hours	2.4	0	0	6.1	2	0	2.6	2.7	2.6	N/A

Figure 17: Accident rate for aircraft (VH- registered) involved in flying training (per million hours flown), 2005 to 2013



In 2014, there were 31 accidents involving flying training. Some of the notable accidents are described below:

- A Grob G-115 received substantial damage on a training flight at Merredin Aerodrome WA, following a loss of control of the aircraft. It was the pilot's first solo training flight to the area. During the landing, as the student commenced the round out, they realised the aircraft was about 15-20 ft above the ground and too high to continue with the landing, so commenced a go-around. The student applied full power and a small amount of rudder, but mindful of a previous instruction not to move the elevator forward while close to the ground, did not make any other changes to the aircraft configuration. The application of power caused the nose of the aircraft to rise. It then encountered a gust of wind, which pushed the nose even higher, with a resultant loss of airspeed. The stall warning started to sound and the aircraft began to sink. The student attempted to recover the aircraft from the stall, but shortly after, the left wing struck the ground. The aircraft bounced back into the air and struck the ground again. The aircraft received substantial damage (ATSB investigation AO-2014-020).
- The instructor conducting a training flight in a Kavanagh D-84 balloon was seriously injured after being thrown out of the basket during landing, 10 km south-south-west of Canowindra ALA, NSW. During the training flight, the student conducted a number of approaches to land, but levelled off with intentional overshoot just above ground level. About 50 minutes into the flight, a number of possible landing areas were selected. The balloon flew low and level and a landing area that favoured the surface wind conditions was selected. A normal approach was made in a 10 kt wind using windy landing procedures. The balloon flew over a line of trees on the eastern side of the landing area and then descended. At about 30 ft above the ground, the student indicated to the instructor that they would be landing and turned off the burner pilot lights. At about 6 ft above the ground, the student pulled the smart vent to land. The basket contacted the ground and the instructor was thrown forward and out of the basket while the student remained in the basket. The basket hit the instructor who was lying on the ground and the basket was dragged over him. The student continued to vent the balloon and it stopped a further 20 m downwind. The instructor was seriously injured and transported to hospital. The student pilot was uninjured and the balloon was not damaged (ATSB investigation AO-2014-092).
- A Cessna R182 on a training flight received substantial damage following a wheels up landing at Caloundra. The accident resulted from the flight crew failing to extend the landing gear during a practice glide approach (ATSB occurrence 201405342).
- The pilot under instruction (PUI) of a Robinson R22 sustained serious injuries and the supervising pilot (SP) received minor injuries following a collision with terrain 115 km west of

Rockhampton Airport, Qld. After completing about 7 hours of mustering, the helicopter was returning to a homestead near Dingo, Queensland. At about 1,000 ft AGL, the SP instructed the PUI to conduct a practice autorotation turning through 180°, which the PUI completed, increasing power when at about 5 ft AGL. During the subsequent climb, at about 450 ft AGL, the SP took control of the helicopter and initiated a second autorotation. The SP initially observed the airspeed at about 65 kt, the rotor rpm in the green arc and the autorotation 'looking good', and assumed at this stage that they had handed control of the helicopter to the PUI. At about 100 ft AGL, the PUI detected the rotor RPM decaying and a rapid rate of descent, but still assumed that the SP had control of the helicopter. When at about 20-40 ft AGL, the SP observed the vertical speed increasing and the rotor RPM decreasing, and rapidly lowered the collective and increased the throttle. Just prior to the helicopter contacting the ground, the SP flared, then levelled the helicopter and raised the collective. The helicopter landed hard, bounced once and rotated through about 180° before coming to rest. The helicopter was substantially damaged (ATSB investigation AO-2014-126).

Collision with terrain involving Robinson helicopter, 115 km W Rockhampton Airport Qld on 12 July 2014 (ATSB investigation AO-2014-126) – damage to aircraft. Source: Owner

- A Mooney M20J sustained substantial damage during a solo training flight in a collision with terrain at Northam ALA, WA. After a touch-and-go landing, the pilot conducted a second circuit with a missed approach from about 600 ft on final approach. The pilot then intended to conduct a third circuit with a touch-and-go landing. When on final approach, the pilot trimmed the aircraft in the approach configuration with full flaps and airspeed at about 70 kt. The pilot flared the aircraft for landing and touched down about one third of the way along the runway. As the aircraft slowed, the pilot selected the flaps to 15° and applied full throttle along with right rudder to counteract the aircraft's tendency to yaw left. As the airspeed increased to about 65 kt, the pilot rotated the aircraft for take-off and applied forward pressure against the control column as the aircraft nose tendency was to pitch up due to the combination of trim, flap and power settings. At about 50 ft AGL, the aircraft had drifted to the right of the runway centreline and the pilot reduced the right rudder input. Soon afterwards, the aircraft nose pitched up. The stall warning sounded and the pilot applied full right rudder and pushed forward on the control column in an attempt to level the aircraft's wings and recover from the stall. The left wing dropped as the aircraft stalled, and it collided with a hangar. The aircraft pivoted about the left

wing and came to rest wedged between two hangars, resulting in substantial damage (ATSB investigation AO-2014-148).

Collision with terrain involving a Mooney M20J, at Northam (ALA), Western Australia on 5 September 2014 (ATSB investigation AO-2014-148). - accident site and damage to the aircraft. Source: Operator.

- A Cessna 172P on a training flight at Jandakot Aerodrome WA was substantially damaged after the left wing collided with a tree, resulting in the aircraft becoming stuck in a ditch (ATSB occurrence 201402565).

Private/business/sports aviation

Private/business and sports aviation generally describes aircraft that are being operated for pleasure or recreation, or are being used for a business or professional need. It is often difficult to distinguish between business and private operations, so they are aggregated for the purposes of this report.

It is important to note that only aircraft conducting these operations that are registered on the Australian civil aircraft (VH-) register are included in this section. Sports and recreational aircraft that are registered under RAAO schemes are considered separately in the *Recreational* section of this report.

Private/business and sports aviation operations have the greatest number of reported accidents (69) of any GA operation type throughout the reporting period. However, 2014 saw the third lowest number of fatalities (14 from 9 accidents) in the last 10 years.

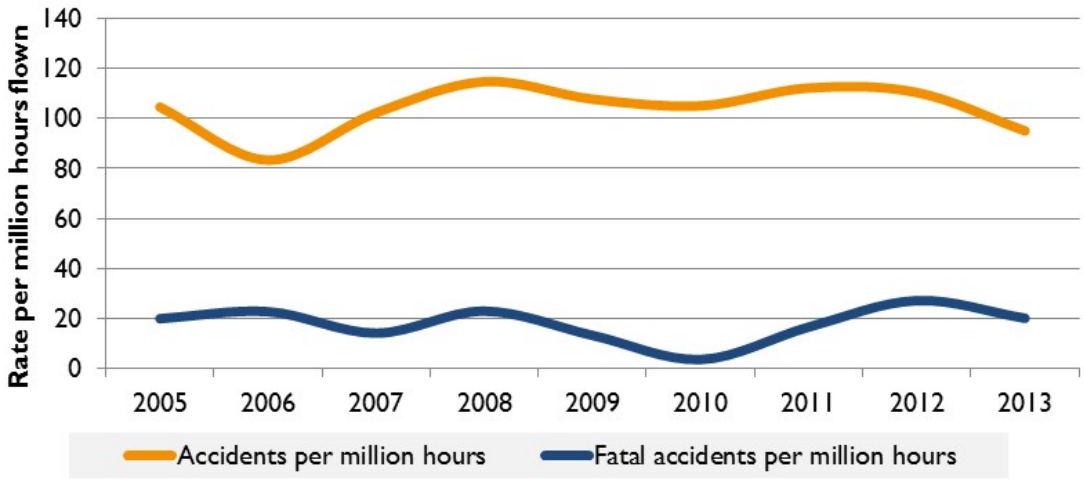
The most common occurrences reported to the ATSB in 2014 concerning private/business and sports aircraft were engine failure or malfunction, landing gear/indication and collision with terrain. The most common accidents were collision with terrain and the most common serious incidents were near collisions.

The number of occurrences in the private/business operation type is significantly greater than those of sports aviation.

Table 18: Private/business/sports aviation (VH-registered) aircraft occurrences (including gliding), 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of aircraft involved										
Incidents	193	206	213	185	201	160	191	168	136	187
Serious incidents	13	15	24	17	21	21	38	43	44	28
Serious injury accidents	2	5	5	9	6	8	7	3	4	9
Fatal accidents	12	15	9	13	8	2	9	15	11	9
Total accidents	63	55	65	65	65	59	61	61	52	82
Number of people involved										
Serious injuries	3	10	7	14	7	10	12	6	6	14
Fatalities	17	25	18	23	8	3	17	23	20	14
Rate of aircraft involved										
Accidents per million hours	104.6	83.4	102.3	114.7	107.7	105.0	112.2	110.4	95.0	N/A
Fatal accidents per million hours	19.9	22.7	14.2	22.9	13.3	3.6	16.6	27.1	20.1	N/A

Figure 18: Accident rate for aircraft (VH- registered) involved in private/business/sport (including gliding) (per million hours flown), 2005 to 2013



Private/business

There were over 2,300 aircraft being used for private or business flying in the last 10 years that were involved in incidents, serious incidents, and accidents that were reported to the ATSB. The number of occurrences reported to the ATSB in 2014 (163) was consistent with the 10-yearly average of around 163 per year, but was a significant increase from 2013 (117). The number of accidents was the highest in the 10-year period; however, fatalities were slightly less than average. Serious injury accidents in 2014 were around double the 10-year average.

Table 19: Occurrences involving general aviation aircraft conducting private and business operations, 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of aircraft involved										
Incidents	167	193	197	162	184	135	165	146	117	163
Serious incidents	12	14	19	14	17	14	27	34	28	22
Serious injury accidents	0	4	4	7	3	5	4	1	3	7
Fatal accidents	8	12	7	11	5	2	8	12	10	8
Total accidents	52	48	57	58	56	52	43	47	43	69
Number of people involved										
Serious injuries	1	9	6	12	3	6	9	3	4	12
Fatalities	13	21	15	20	5	3	16	19	19	13

There were 69 VH- registered aircraft involved in 67 accidents conducting private and/or business operations in 2014. There were 13 fatalities from eight fatal accidents and seven accidents resulted in serious injuries. The fatal accidents are described below:

- The pilot of an amateur-built Van's aircraft RV-6 was fatally injured from a collision with terrain at Gatton Airpark, Qld. The ATSB determined that it was very likely the pilot was performing a low-level aerobatic manoeuvre at a height from which recovery to normal flight was not completed before the aircraft collided with terrain. The pilot held a Civil Aviation Safety Authority student pilot licence and a Recreation Aviation Australia pilot certificate, but did not hold qualifications that entitled the pilot to fly the aircraft as pilot in command. (ATSB investigation AO-2014-035 was discontinued).

Collision with terrain involving Vans RV-6, near Gatton, Queensland on 2 March 2014 (ATSB investigation AO-2014-035) – accident site. Source: ATSB.

- The pilot and four passengers of a Cessna 206 were fatally injured when the aircraft collided with terrain at Caboolture airfield, Qld. The aircraft was conducting parachuting operations with the pilot and four parachutists on board. Soon after take-off the aircraft impacted terrain. The

aircraft was destroyed and there were no survivors. The investigation is continuing. (ATSB investigation AO-2014-053).

- A child passenger of a Maule M-5 was fatally injured after the aircraft struck a wire spanning the Clarence River and came to rest inverted with the cabin submerged, west-south-west of Casino, NSW. The wirestrike and resulting loss of aircraft control was an unintended consequence of the pilot's spur of the moment decision to fly at very low level along the river, in an unfamiliar environment and below the minimum stipulated height for flights over unpopulated areas. The pilot reported seeing the powerline cables just before the collision, but with insufficient time to avoid a wirestrike. The pilot repeatedly attempted to free the child, seated in the rear of the aircraft by the right-rear door, before recovering the child through the cockpit door. Sustained attempts to resuscitate the child were unsuccessful. An adult passenger seated in the front of the cabin survived the accident (ATSB investigation AO-2014-068).

Wirestrike involving Maule M-5, 50 km WSW of Casino, NSW on 12 April 2014 (ATSB investigation AO-2014-068) – accident site. Source: Northern Region Westpac Life Saver Rescue Helicopter Service.

- A passenger was fatally injured and the pilot sustained serious injuries when a Cessna T210N collided with terrain shortly after take-off at Inverell Airport, NSW. Another passenger sustained minor injuries in the accident. A witness reported that the take-off run appeared normal; however, the aircraft did not become airborne where normally expected. Instead, the aircraft continued further down the runway and became airborne about three-quarters of the way along, to a height of about 10 ft above ground level. Shortly after, the aircraft was observed to suddenly climb and then descend behind rising terrain beyond the upwind end of the runway. The aircraft subsequently collided with terrain about 600 m from the runway end. The ATSB investigation is ongoing (ATSB investigation AO-2014-119).
- The pilot of a Cessna 182L was fatally injured when the aircraft struck a powerline near Burrumbuttock, NSW. The ATSB investigation found there was no operational reason for the pilot to have been flying at such a low altitude on the day of the accident, and that the pilot had a history of unauthorised low flying. (ATSB investigation AO-2014-131).

- The pilot of a Robinson R22 sustained fatal injuries from a collision with terrain at night, 46 km west of Springvale. The ATSB found that the pilot, who did not hold a night visual flight rules (VFR) rating or instrument rating, continued flying towards the destination after last light (end of civil twilight), then in dark night conditions without local ground lighting, inadvertently allowed the helicopter to descend into terrain. (ATSB investigation AO-2014-144).

Collision with terrain involving Robinson R22 helicopter, 70 km north west of Halls Creek, WA on 25 August 2014 (ATSB investigation AO 2014 144) – wreckage trail with initial ground impact in the foreground. Source: Western Australia Police.

- The pilot and passenger of an amateur-built Vans aircraft RV-6 were fatally injured when the aircraft collided with terrain on approach at Mudgee Airport, NSW. Prior to turning onto the downwind leg of the circuit, the aircraft descended to about 600 ft above ground level. Witnesses stated that the pilot conducted a tight left turn onto final approach at a reported slow speed and low height. Witnesses also recalled hearing the aircraft's engine 'sputter' and 'stall'. The aircraft continued its high angle of bank left turn and collided with terrain about 300 m south-west of the threshold of the runway. The ATSB investigation is ongoing (ATSB investigation AO-2014-149).

Collision with terrain involving Vans RV-6, near Mudgee Airport NSW 14 September 2014 (ATSB investigation AO-2014-149) – accident site. Source: NSW Police.

- The pilot of an amateur-built Vans aircraft RV-6A was fatally injured when the aircraft collided with terrain in Chelsea, Vic. After taking off from Moorabbin Airport, the aircraft was observed on surveillance radar climbing to 2,900 ft AMSL. The aircraft was observed by witnesses descending rapidly before impacting the ground next to a house in the suburb of Chelsea, 8 km to the south of Moorabbin. The aircraft was destroyed by the impact and the pilot was fatally injured. The ATSB investigation is ongoing (ATSB investigation AO-2014-164).

Sports aviation

Sports aviation includes gliding, parachute operations, private balloon operations and aerobatics in VH-registered aircraft. In 2014, there were 24 aircraft involved in incidents, which was slightly higher than the 10-year average. The number of accidents was also higher than the 10-year average (13), however; the single fatal accident was significantly lower.

Table 20: Occurrences involving general aviation aircraft conducting sports aviation, 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of aircraft involved										
Incidents	26	13	16	23	17	25	26	22	19	24
Serious incidents	1	1	5	3	4	7	11	9	16	6
Serious injury accidents	2	1	1	2	3	3	3	2	1	2
Fatal accidents	4	3	2	2	3	0	1	3	1	1
Total accidents	11	7	8	7	9	7	18	14	9	13
Number of people involved										
Serious injuries	2	1	1	2	4	4	3	3	2	2
Fatalities	4	4	3	3	3	0	1	4	1	1

There were 13 accidents, one of which was fatal, 6 serious incidents and 2 serious injury incidents in 2014. Some of these are summarised below:

- The pilot of an amateur-built One Design DR-107 aeroplane sustained fatally injuries when the aircraft collided with terrain while conducting an aerobatic routine near Goolwa Airport, SA.

Witnesses described the aircraft performing a series of manoeuvres that involved a near vertical climb followed by a vertical dive, low-altitude recovery and repeat of the climbing manoeuvre. Witnesses also reported that during an apparent recovery from a dive, the aircraft collided with terrain. The pilot received fatal injuries and the aircraft was destroyed. The ATSB investigation is ongoing (ATSB investigation AO-2014-163).

- The pilot of an Alexander Schleicher Segelflugzeugbau AS-K13 glider sustained serious injuries following a hard landing at Woodbury ALA, Tas. The glider encountered a wind gust and ballooned before landing hard and ground looping. The glider sustained minor damage (ATSB occurrence 201400222)
- The pilot of an Alexander Schleicher Segelflugzeugbau ASW-20B glider received serious injuries Narromine Aerodrome, NSW. During the low and fast approach, the glider ballooned and landed hard. The glider was substantially damaged (ATSB occurrence 201401313).

Foreign general aviation

Generally, there are a small number of foreign GA accidents and serious incidents each year. In 2014 there were 27 foreign GA aircraft incidents reported to the ATSB. This is the most in any year over the reporting period.

Table 21: Foreign registered general aviation aircraft occurrences, 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of aircraft involved										
Incidents	17	14	18	26	14	12	14	18	16	25
Serious incidents	1	0	1	0	0	1	0	0	3	0
Serious injury accidents	0	0	0	0	0	0	0	2	0	0
Fatal accidents	0	0	0	0	0	1	0	0	0	0
Total accidents	0	1	1	1	0	2	0	2	0	2
Number of people involved										
Serious injuries	0	0	0	0	0	0	0	2	0	0
Fatalities	0	0	0	0	0	1	0	0	0	0

There were two accidents reported to the ATSB in 2014. These are described below:

- A DG Flugzeugbau LS10 glider was substantially damaged from a hard landing after stalling on short final approach at Stonfield Gliding ALA, SA (ATSB occurrence 201401664).
- A Cirrus SR22 aircraft was substantially damaged following a loss of control and subsequent forced landing near Katoomba, NSW. The flight was conducted as a sales demonstration, with the salesman acting as the pilot in command (PIC) and the prospective purchaser (who held a private pilot licence) conducting some of the pilot duties. During the flight, while conducting roll manoeuvres, the PIC lost control of the aircraft. At around 2,000 ft the PIC deployed the aircraft's parachute. On descent, the aircraft narrowly avoided powerlines and came to rest on a fence in the garden of a residential dwelling. No major injuries were sustained to the occupants of the aircraft (ATSB investigation AO-2014-083).

Loss of control involving a Cirrus SR22, near Katoomba, NSW on 10 May 2014 (ATSB investigation AO-2014-083) – accident site. Source: NSW Police.

Other general aviation

Between 2005 and 2014, over 7,400 aviation safety occurrences were reported to the ATSB that involved an Australian-registered GA aircraft, but no information was provided on the type of flying operation. In many occurrences involving a GA aircraft where the type of flying operation was not known, the ATSB was notified by someone other than the pilot of the aircraft involved (such as ATC, the public, pilots of nearby aircraft, or aerodrome-based staff). The number of occurrences involving 'unknown' GA aircraft has decreased by almost 50 per cent over the last 6 years, due to improvements in reporting detail and data collection methods. The year 2014 had the lowest number of 'unknown' GA occurrences in the last 10 years. The large number of unknown GA aircraft involved in reportable occurrences has been, in part, related to the abolition of mandatory flight plans for all aircraft since the mid 1990's, which is reflected in most of these occurrences being airspace-related (airspace infringements, aircraft proximity issues, non-compliance with published information, ATC instructions, or standard operating procedures). Other reasons that an operation type might not be recorded for an occurrence include no aircraft being affected (some ground operation-related occurrences), or where aerodrome officers have located dead wildlife on an aerodrome (suspected animal or bird strike).

Recreational aviation

Recreational aviation covers a very diverse range of aircraft types, including factory and amateur-built fixed-wing aeroplanes and motorised gliders, weight shift hang gliders, trikes, paragliders and powered parachutes, and gyrocopters. Aircraft involved in recreational aviation, as defined by the ATSB, are registered by an RAAO with an Australian non-VH- registration.

Over the last 10 years, reporting of safety incidents to the ATSB by recreational aviation pilots and organisations has increased more than tenfold due to both the growth in recreational flying, and improving awareness among RAAOs and pilots of the need to report safety matters to the ATSB. As a result, some of the relatively low numbers of occurrences towards the start of the 10-year period used in this report can be accounted for by under-reporting of accidents and incidents.

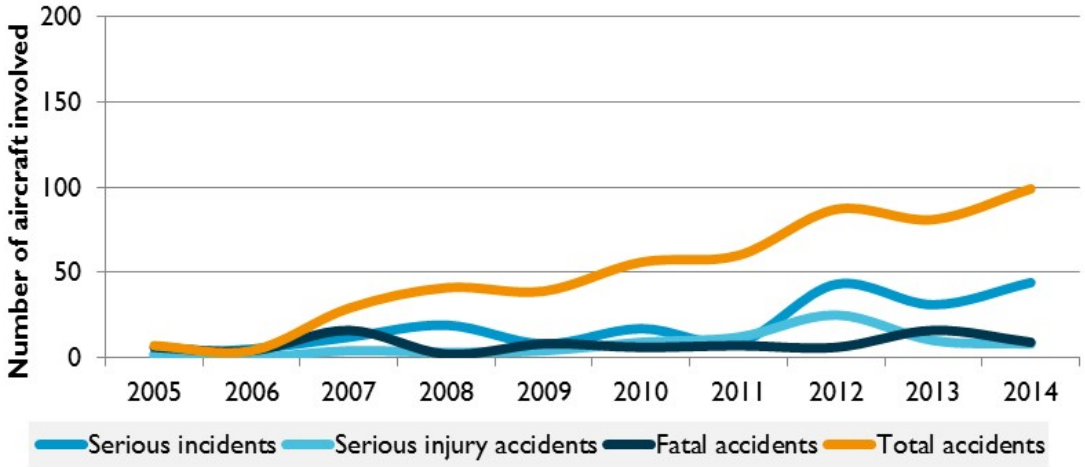
In 2014, the number of incidents, serious incidents and accidents involving recreational aircraft reported to the ATSB was significantly greater than the 10-year average. However, the number of fatalities was consistent with the average. Accidents involving recreational aircraft are not usually investigated by the ATSB, but the RAAO may conduct its own investigation.

Table 22: Recreational aviation (non-VH registered) aircraft occurrences, 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of aircraft involved										
Incidents	4	12	48	66	44	72	90	113	114	139
Serious incidents	2	5	12	19	8	17	9	43	31	44
Serious injury accidents	1	0	4	3	4	9	12	25	10	8
Fatal accidents	6	4	16	2	8	6	7	6	16	9
Total accidents	7	4	29	41	39	56	60	87	81	99
Number of people involved										
Serious injuries	1	2	8	4	4	12	15	26	11	9
Fatalities	6	4	21	3	9	7	9	9	19	11
Rate of aircraft involved[16]										
Accidents per million hours	28.9	16.2	112.5	147.1	127.1	196.7	201.1	246.3	236.0	N/A
Fatal accidents per million hours	24.8	16.2	62.1	7.2	26.1	21.1	23.5	17.0	46.6	N/A

There were nine fatal accidents involving recreational aircraft in 2014 resulting in 11 fatalities, and a further eight accidents where the occupants were seriously injured.

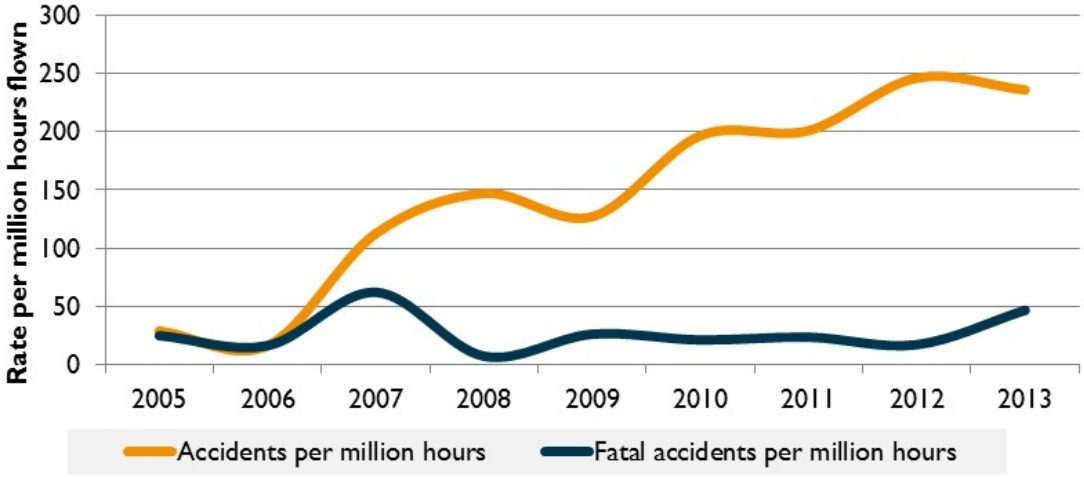
Figure 19: Recreational aviation occurrences and injuries, 2005 to 2014



[16] Data was only available from 2005 to 2013.

Figure 19 shows that the accident rate in recreational aviation has increased dramatically since 2006. While this increase is likely to be due to better reporting of accidents to the ATSB, the recreational aviation accidents in 2013 (215.6 accidents per million hours flown) was higher than any other type of flying in Australia. Recreational aeroplanes (those aircraft registered with Recreational Aviation Australia (RA-Aus)) made up the largest proportion of recreational flying hours, and were also involved in around 74 per cent of all recreational aviation accidents in the 2005 to 2014 period, and 48 per cent of the fatal accidents. Although the recreational aeroplane accident rate over this period was higher than all other types of flying, gyrocopters had a higher fatal accident rate.

Figure 20: Recreational aviation accident and fatal accident rate (per million hours flown), 2005 to 2013



The fatal and serious injury accidents involving recreational aircraft in 2014 are described in the sections below. For many of these occurrences, limited details were provided to the ATSB regarding the circumstances of the accident or serious incident. Increasing the level and quality of safety reporting in GA and recreational flying is a major challenge for the ATSB and is one of nine *SafetyWatch* priorities in improving Australian aviation safety.

There were 126 recreational aircraft involved in accidents or serious incidents reported to the ATSB in 2014 that did not result in fatal or serious injuries. Most of these occurrence involved fixed-wing recreational aeroplanes, with 11 involving weight shift aircraft and three gyrocopters. The common occurrence types were:

- collision with terrain
- engine failure or malfunction

- hard landing
- loss of control
- ground strike
- runway excursion.

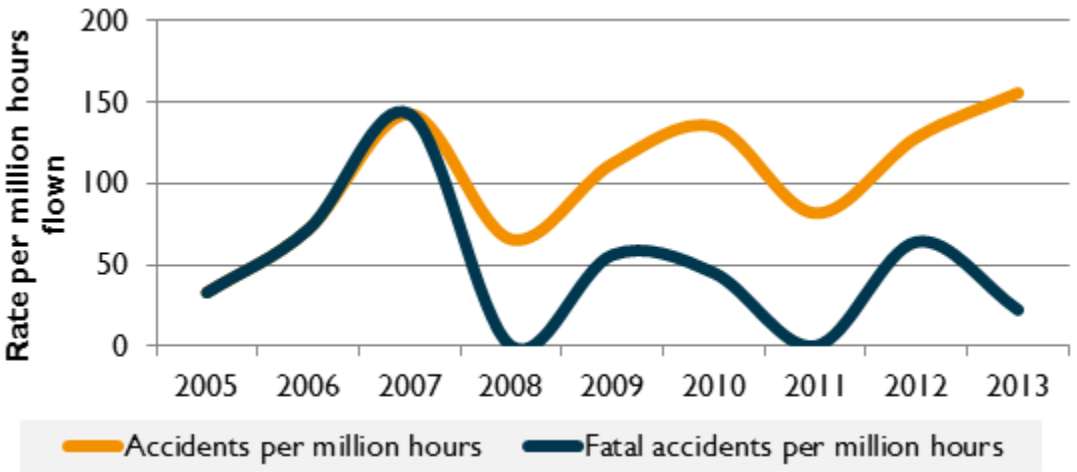
Gyrocopters

Over the last 10 years, seven incidents, five serious incidents and 41 accidents have been reported to the ATSB involving gyrocopters. While incident reporting rates have been very low over this period, there was a notable increase in reporting of gyrocopter accidents by the Australian Sport Rotorcraft Association (ASRA) from 2006. Figure 21 shows the rate of accidents and fatal accidents involving gyrocopters over the 2005 to 2013 period (for which flying hours were available).There was a 47 per cent increase in flying activity over this period. On average, gyrocopters had an accident rate (103 accidents per million hours flown) that was similar to private/business/sports (including gliding). (In 2013, the accident rate had risen to 156 accidents per million hours.) On the other hand, gyrocopter operations had the highest fatal accident rate of all types of flying in most years (45 per million hours flown, about double that of VH-registered private/business/sport operations and recreational weight shift and aeroplane operations).

Table 23: Occurrences involving recreational gyrocopter operations, 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of aircraft involved										
Incidents	0	0	1	1	0	1	0	0	3	1
Serious incidents	0	0	0	2	0	0	1	1	1	0
Serious injury accidents	0	0	0	0	0	2	3	1	2	1
Fatal accidents	1	2	4	0	2	2	0	3	1	1
Total accidents	1	2	4	2	4	6	4	6	7	5
Number of people involved										
Serious injuries	0	1	3	0	0	2	3	2	2	1
Fatalities	1	2	4	0	2	2	0	4	2	1
Rate of aircraft involved										
Accidents per million hours	32.9	71.7	142.8	65.6	112.3	135.1	81.8	128.3	155.8	N/A
Fatal accidents per million hours	32.9	71.7	142.8	0.0	56.1	45.0	0.0	64.2	22.3	N/A

Figure 21: Accident rate for recreational gyrocopter operations (per million hours flown), 2005 to 2013



There were five accidents (one fatal and one resulting in serious injuries) reported to the ATSB in 2014 involving gyrocopters. The fatal and serious injury accidents are described below:

- The pilot of an Advanced Kinetics Gyroz gyrocopter was fatally injured resulting from collision with terrain near Nowra, NSW (ATSB occurrence 201402770).
- The pilot of a Xenon gyrocopter was serious injured and the aircraft substantially damaged resulting from collision with terrain at Atherton ALA, Qld. A witness reported that the gyrocopter pitched-forward during take-off when it was about 3 ft AGL (ATSB occurrence 201404532).

More information on gyrocopter operations in Australia is available from ASRA at www.asra.org.au.

Recreational aeroplanes

Recreational aeroplanes include all non-weight shift controlled aircraft registered with RA-Aus. Reporting of safety occurrences involving recreational aeroplanes has increased significantly in recent years, as shown in Table 24. Between 2005 and 2013 (the period where flying hours were of available) flying hours increased by around 95 per cent.

Figure 22 shows the rate of accidents and fatal accidents involving recreational aeroplanes over the 2005 to 2013 period. Despite the increase in flying activity, the accident rate has increased for several consecutive years. In 2013, the recreational aeroplane accident rate in Australia (about 350 per million hours flown) was significantly higher than for any other type of flying, including higher risk GA operations such as aerial agriculture (100 accidents per million hours flown) and (VH-registered) private/business/sport (including gliding) (95 accidents per million hours flown).

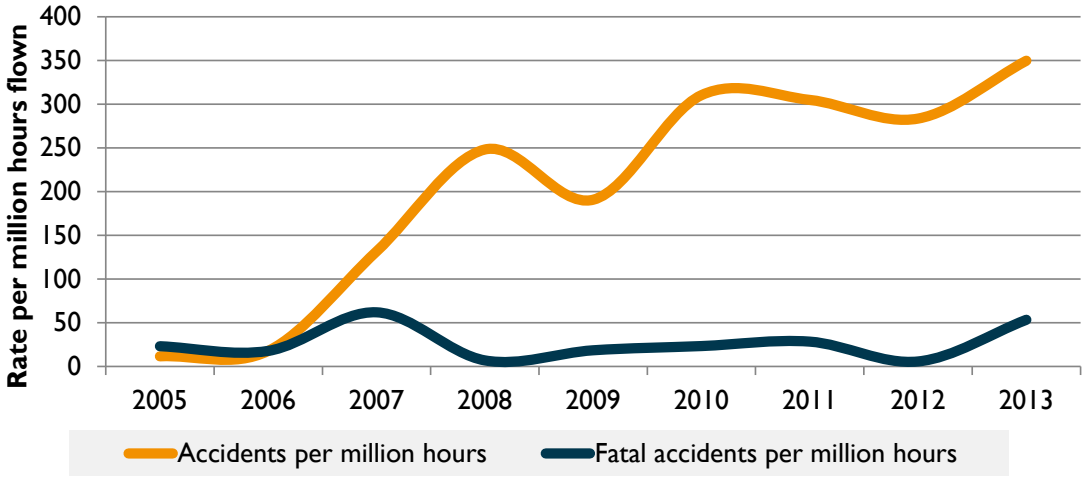
The fatal accident rate involving recreational aeroplanes in 2013 (53 fatal accidents per million hours flown) was significantly higher than for comparable private/business/sport (including gliding) operations (20 fatal accidents per million hours flown).

Table 24: Occurrences involving recreational aeroplane operations, 2005 to 2014[17]

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of aircraft involved										
Incidents	2	9	43	62	42	68	87	90	98	129
Serious incidents	1	4	11	16	8	17	7	35	27	41
Serious injury accidents	0	0	2	2	4	3	4	4	4	1
Fatal accidents	2	2	8	1	3	3	4	1	9	5
Total accidents	1	2	17	36	31	40	43	50	59	76
Number of people involved										
Serious injuries	0	1	3	2	4	6	5	4	5	1
Fatalities	2	2	12	2	3	4	6	2	10	7
Rate of aircraft involved										
Accidents per million hours	11.6	17.7	131.5	248.1	190.7	310.3	304.8	283.5	349.6	N/A
Fatal accidents per million hours	11.6	17.7	61.9	6.9	18.5	23.3	28.4	5.7	53.3	N/A

[17] Includes RA-Aus registered motorised gliders.

Figure 22: Accident rate for recreational aeroplane operations (per million hours flown), 2005 to 2013[17]



In 2014, there were 76 accidents and 41 serious incidents reported to the ATSB involving recreational aeroplanes. Five of these accidents were fatal, and one resulted in serious injuries. The fatal and serious injury accidents are described below:

- The pilot of an amateur-built Sonex aircraft was seriously injured following a collision with terrain at Ingham ALA, Qld. During the approach, the aircraft encountered a wind gust. The pilot conducted a missed approach during which, the aircraft stalled and subsequently collided with terrain (ATSB occurrence 201402053).
- The pilot of an Aeropro Eurofox 3K was fatally injured when the aircraft collided with terrain at Hay Aerodrome, NSW (ATSB occurrence 201403230).
- The pilot and passenger of a Tecnam 96 Golf were fatally injured when the aircraft collided with terrain near Krondorf, SA (ATSB occurrence 201404613).
- The pilot and passenger of a Morgan Aero Works Sierra 100 were fatally injured following a collision with water 10 km North-East of Moruya Aerodrome, NSW (ATSB occurrence 201404908).
- The pilot of a Spectrum Fisher Mk1 was fatally injured when the aircraft collided with terrain while conducting low level operations 7 km North of Ballina/Byron Gateway Aerodrome, NSW (ATSB occurrence 201407395).
- The pilot of a Savannah XL VG was fatally injured when the aircraft collided with terrain 20 km West of Calliope ALA, Qld (ATSB occurrence 201407428).

More information on recreational aeroplane operations in Australia is available from RA-Aus at www.raa.asn.au.

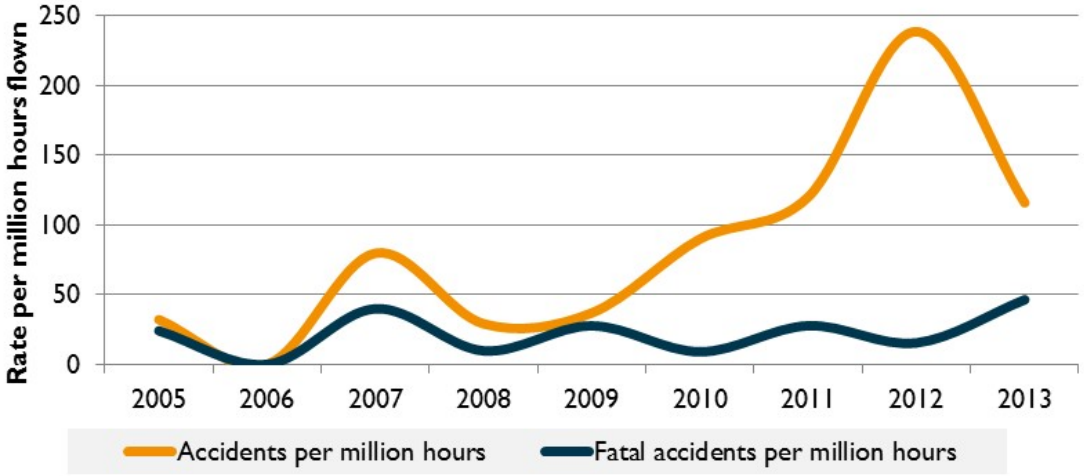
Weight shift

Weight shift aircraft refer to hang gliders, paragliders, powered parachutes, and weight-shift trikes and microlights. Over the last 10 years, 61 incidents, 18 serious incidents and 105 accidents have been reported to the ATSB involving weight shift aircraft (Table 25). Most of these aircraft were registered with the Hang Gliding Federation of Australia (HGFA), with some registered with RA-Aus. Figure 23 shows the rate of accidents and fatal accidents involving weight shift aircraft over the 2005 to 2013 period (for which flying hours were available). Weight shift activity (as reported by the HGFA and RA-Aus) remained relatively constant over this period. On average, weight shift aircraft had the lowest accident rates of all types of recreational flying, and private/business/sport operations.

Table 25: Occurrences involving recreational weight shift operations, 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of aircraft involved										
Incidents	2	1	4	3	2	3	3	23	13	7
Serious incidents	1	1	1	1	0	0	1	7	3	3
Serious injury accidents	1	0	2	1	0	4	5	20	4	6
Fatal accidents	3	0	4	1	3	1	3	2	6	3
Total accidents	4	0	8	3	4	10	13	31	15	17
Number of people involved										
Serious injuries	1	0	2	2	0	4	7	20	4	7
Fatalities	3	0	5	1	4	1	3	3	7	3
Rate of aircraft involved										
Accidents per million hours	32.0	0.0	79.7	29.1	36.8	89.8	119.9	238.4	115.7	N/A
Fatal accidents per million hours	24.0	0.0	39.8	9.7	27.6	9.0	27.7	15.4	46.3	N/A

Figure 23: Accident rate for recreational weight shift operations (per million hours flown), 2005 to 2013



There were 17 accidents and three serious incidents reported in 2014 involving weight shift aircraft. Three of these accidents resulted in fatalities, and six resulted in a serious injury. The fatal accidents are described below:

- The pilot was fatally injured and passenger sustained serious injuries when their AirBorne ST 912 collided with a house on approach to Tyabb ALA, Vic. (ATSB occurrence 201402665).
- The pilot of an Advance AG Alpha 4 was fatally injured at Mount Borah, NSW, when the paraglider stalled on a landing attempt and impacted the ground (ATSB occurrence 201407375).
- The pilot of a Moyes Delta Gliders Litespeed RS sustained fatal injuries when the hang glider collided with a house at Bar Beach, NSW (ATSB occurrence 201406450).

More information on weight shift aircraft in Australia is available from the HGFA at www.hgfa.asn.au , and RA-Aus at www.raa.asn.au.

Remotely Piloted Aircraft

Occurrence statistics regarding remotely piloted aircraft (RPA) have been added to this report for the first time. This is due to the increase of RPA in occurrences reported to the ATSB.

RPA refers to unmanned fixed-wing, rotary-wing, and lighter-than-air craft that are controlled by a ground-based operator. These aircraft may be VH- registered or not registered by CASA. RPA's are also known as unmanned aerial vehicles (UAVs) or drones. The term RPA emphasises that there is a human 'in the loop' controlling and overseeing the aircraft. From CASA's perspective, RPAs are used for commercial, government or research purposes in contrast to model aircraft, which are flown for sport and recreation.

In 2014 there were 17 occurrence involving RPAs (Table 26). This is a significant increase compared to any other year in the previous 10 years and reflects the increasing prevalence of these aircraft.

Table 26: Occurrences involving remotely piloted aircraft, 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of aircraft involved										
Incidents	0	0	0	0	0	0	3	1	2	11
Serious incidents	0	0	0	0	0	0	0	1	4	3
Serious injury accidents	0	0	0	0	0	0	0	0	0	0
Fatal accidents	0	0	0	0	0	0	0	0	0	0
Total accidents	0	0	0	0	0	0	0	0	2	3
Number of people involved										
Serious injuries	0	0	0	0	0	0	0	0	0	0
Fatalities	0	0	0	0	0	0	0	0	0	0

There were three accidents and three serious incidents reported to the ATSB involving RPAs in 2014. The three serious incidents related to near-collisions with manned aircraft. The three accidents are described below:

- A race participant received minor injuries, while competing in a triathlon in Geraldton, WA, from collision with an RPA that was filming the race, after the operator lost control of the aircraft (ATSB occurrence 201402113).
- A UAVER Avlan-S RPA collided with terrain soon after take-off and was substantially damaged, at St Lucia Golf Club, QLD (ATSB occurrence 201401906).
- A Trimble UX5 Aerial Imaging Rover conducting aerial survey operations was substantially damaged resulting from a collision with terrain after the operator lost control of the RPA near Fortescue Dave Forrest Aerodrome, WA (ATSB occurrence 201407488).

Occurrences by aircraft type

This section explores trends in occurrences by the type of aircraft involved, and the type of operation being conducted. It looks primarily at the rate of accidents within each type of operation, in relation to the number of hours flown by the type of aircraft within that category.

Of the 15,304 aircraft on the Australian civil aircraft (VH-) register at the time of writing, fixed-wing aircraft accounted for 83 per cent of all aircraft (11,509 powered fixed-wing aeroplanes, 256 motorised gliders and 1,001 unpowered gliders). Rotary-wing aircraft accounted for 14 per cent (2,139 aircraft). The remaining three per cent (398 aircraft) were balloons. Australian-registered recreational aircraft are additional to these figures. There were 5,302 aircraft registered with Recreational Aviation Australia (RA-Aus) in late-2014 (4,364 aeroplanes and motorised gliders and 938 weight shift aircraft). Gyrocopters are registered with the Australian Sport Rotorcraft Association (ASRA) and weight-shift aircraft are registered by both the Hang Gliding Federation of Australia (HGFA) and RA-Aus.

In this section:

- aeroplanes refer to all manned, VH- registered powered fixed-wing aircraft, and to recreational powered aeroplanes registered by RA-Aus
- balloons refer to all manned, VH- registered hot air balloons and lighter-than-air craft, including dirigibles
- helicopters refer to all manned, VH- registered rotary-wing aircraft
- gliders refer to all manned, VH- registered non-powered fixed-wing aircraft, and manned, VH-registered and non-VH- registered powered gliders
- gyrocopters refer to rotary-wing aircraft registered with ASRA, marked with a G- registration
- remotely piloted aircraft refers to unmanned fixed-wing, rotary-wing, and lighter-than-air craft that are controlled by a ground-based operator. These aircraft may be VH- registered or not registered by CASA.
- weight shift refers to manned aircraft which are controlled by human movement. They include hang gliders, paragliders, powered parachutes, weight-shift trikes and microlights. These aircraft may be registered with HGFA, marked with a T1- or T2- registration, or with RA-Aus marked with a 32- registration.

As flying activity data is only available for some of these types of aircraft, accident rates are only provided for aeroplanes, helicopters, and recreational aircraft types (recreational aeroplanes, gyrocopters, and weight-shift aircraft).

Differences in accidents between operation groups and aircraft type

There are considerably more accidents in Australia involving aeroplanes than other aircraft types – around 70 per cent of all accidents. The reporting of recreational aircraft accidents to the ATSB has improved significantly in the last 10 years. Recreational aeroplanes are involved in a similar number of the reported accidents as general aviation aeroplanes. In 2014, all fatal accidents involved general aviation or recreational aeroplanes (Table 28).

Table 27: Number of accidents involving Australian-registered aircraft, by aircraft type, 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Aeroplanes										
Air transport	12	10	17	23	11	20	16	9	9	22
General aviation	78	58	83	84	78	84	73	60	58	107
Recreational	1	2	17	36	31	40	43	50	59	76
Balloons										
Air transport	0	0	0	0	0	0	0	0	1	1
General aviation	0	1	2	3	3	2	3	1	0	2
Helicopters										
Air transport	0	1	6	6	2	3	5	4	5	3
General aviation	31	25	24	34	33	36	25	27	24	28
Gliders										
General aviation	9	6	5	4	3	3	12	12	8	9
Recreational	1	0	0	0	0	0	0	0	0	0
Gyrocopters										
Recreational	1	2	4	2	4	6	4	6	7	5
Remotely Piloted Aircraft										
General aviation	0	0	0	0	0	0	0	0	2	3
Weight Shift										
Recreational aircraft	4	0	8	3	4	10	13	31	15	17

Helicopters were involved in about 25 per cent of all general aviation (GA) accidents and fatal accidents in the last 10 years, even though they accounted for 14 per cent of the Australian VH-registered fleet and flew far less hours than aeroplanes. Recreational aircraft contributed an even larger proportion of the total number of fatal accidents. Between 2005 and 2014, 27 per cent of all accidents and 31 per cent of all fatal accidents in Australian aviation involved recreational aircraft, even though they contributed just nine per cent of the recorded hours flown by aircraft in Australia over this period (Table 28).

Table 28: Number of fatal accidents involving Australian-registered aircraft, by aircraft type, 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Aeroplanes										
Air transport	2	1	1	2	0	1	2	1	1	0
General aviation	10	12	9	18	7	8	6	14	12	9
Recreational	1	2	8	1	3	3	3	1	9	5
Balloons										
Air transport	0	0	0	0	0	0	0	0	1	0
General aviation	0	0	0	0	0	0	0	0	0	0
Helicopters										
Air transport	0	0	1	1	0	0	0	0	0	0
General aviation	3	4	2	2	8	4	9	4	2	2
Gliders										
General aviation	3	3	1	2	1	0	1	2	1	0
Recreational	1	0	0	0	0	0	0	0	0	0
Gyrocopters										
Recreational	1	2	4	0	2	2	0	3	1	1
Remotely Piloted Aircraft										
General aviation	0	0	0	0	0	0	0	0	0	0
Weight Shift										
Recreational aircraft	3	0	4	1	3	1	3	2	6	3

Differences in accidents between specific operation types and aircraft types

Considering flying activity, the accident rate involving helicopters in almost all types of operations is higher than for aeroplanes conducting the same type of operation (Table 29). In recreational aviation, the accident rate for gyrocopters was lower than the helicopter accident rate for private/business operations, and was comparable to that for flying training. The accident rate for recreational aeroplanes was higher than for aeroplanes in all operation types, while the accident rate for weight shift aircraft was relatively low.

The fatal accident rate over the 2005 to 2013 period was highest for gyrocopters, followed by helicopters used for private/business flying. It was lowest for fixed-wing flying training, and for all types of charter operations.

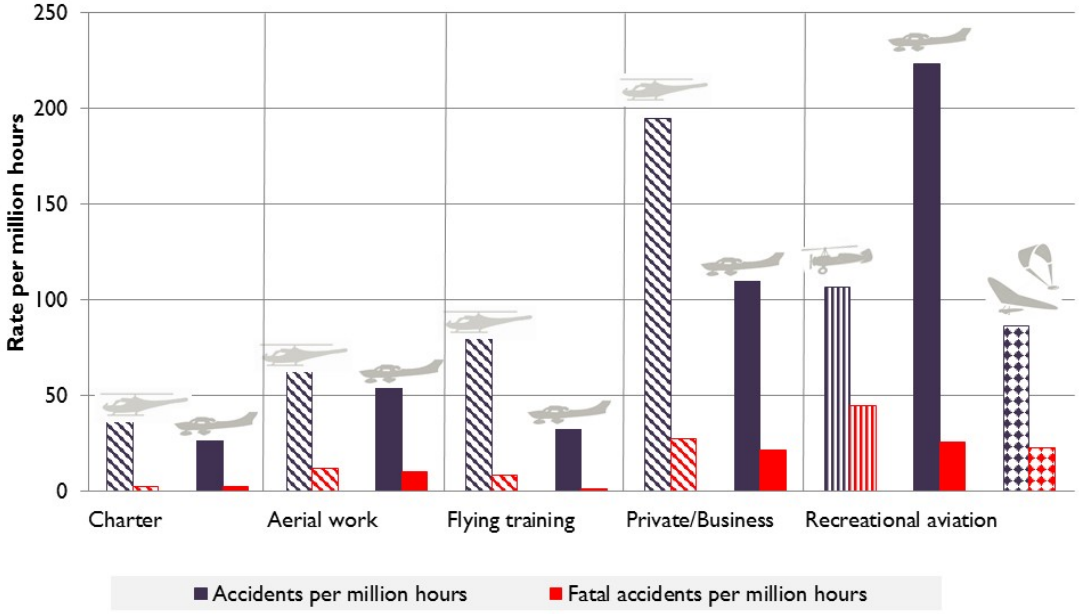
When comparing the accident rate of aircraft types[18] by operation type, there is significant difference between air transport (charter), GA, and recreational aviation (Table 29 and Figure 24). These differences are discussed below.

[18] Activity data was only available for aeroplanes, helicopters, balloons, gyrocopters, recreational aeroplanes, and weight-shift aircraft.

Table 29: Accidents, fatal accidents, and number of fatalities by operation type and aircraft type, 2005-2013

Operation	Aircraft type	Accidents per million hours	Fatal accidents per million hours
Charter	Helicopters	37.5	2.5
	Aeroplanes	28.1	2.5
	Balloons	-	-
Aerial work	Helicopters	70.1	11.7
	Aeroplanes	61.1	10.4
Flying training	Helicopters	88.7	8.3
	Aeroplanes	35.8	1.4
Private/business	Helicopters	194.3	27.2
	Aeroplanes	123.9	21.2
	Balloons	1,040.7	-
Recreational aviation	Gyrocopters	106.7	44.5
	Aeroplanes	223.0	25.6
	Weight Shift	86.0	22.5

Figure 24: Rate of accidents and fatal accidents by operation and aircraft type



Over the 2005 to 2013 period, all air transport using helicopters were charter operations, so the only air transport comparison for aircraft types provided here is for charter.

Charter

Helicopters involved in charter air transport operations had higher accident rates (about 28 versus 38 accidents per million hours flown over the 2005 to 2013 period) than charter aeroplanes.

The rate of fatal accidents over this period involving helicopters was the same for aeroplanes (2.5 per million hours flown).There were fewer fatalities in charter helicopter accidents (five) than in charter aeroplane accidents (13). There were no charter balloon accidents over this period, although there was a fatal charter balloon accident in 2014.

In 2013, charter hours flown by aeroplanes (about 387,000) were about four times higher than helicopter charter hours (about 92,700). There were about 6,200 charter hours flown by balloons.

Aerial work

Aeroplanes involved in all types of aerial work had a lower accident rate than for helicopters conducting aerial work (about 61 versus 70 per million hours flown over the 2005 to 2013 period). There are, however, significant differences in the types of aerial work that are performed by aeroplanes as opposed to helicopters.

The fatal accident rate in aerial work for helicopters over this period (about 12 per million hours flown) was slightly higher than the aeroplane fatal accident rate (about 10 per million hours flown). The number of fatalities involving helicopters and aeroplanes were similar (31 versus 29).

The amount of aerial work conducted by helicopters and aeroplanes was about equal. In 2013, about 218,200 hours were flown by helicopters conducting aerial work, compared to 193,200 for aeroplanes. In aerial agriculture, about four times as many hours were flown by aeroplanes in 2013 (68,600) than by helicopters (18,600).

Flying training

Helicopters used for flying training were involved in a lot more accidents than aeroplanes. The helicopter accident rate from 2005 to 2013 was about 89 per million hours flown, which was more than double that for aeroplanes conducting flying training (about 36 accidents per million hours flown). Most flying training was done in aeroplanes. In 2013, about 339,000 hours of aeroplane flying training were recorded by the BITRE (compared to about 44,800 for helicopters). A large fall in aeroplane flying training in Australia has occurred in recent years, with 30 per cent fewer hours flown in 2013 compared to a peak of 457,000 hours flown in 2009 (the highest of any year since 1990).

The fatal accident rate over the 2005 to 2013 period for helicopter flying training (about eight per million hours flown) was notably higher than that for aeroplanes (about one fatal accident per million hours flown), although there were fewer fatalities in total involving helicopters.

Private/business

Helicopters performing private or business flying had an accident rate over the 2005 to 2013 period that was about 60 per cent higher than that for aeroplanes (about 194 accidents per million hours for helicopters, compared to 124 per million hours flown for aeroplanes). Balloons being used for private/business flying had the highest accident rate over this period (1,041 per million hours flown), due to 15 accidents and a relatively small amount of flying activity. There were 1,482 hours flown in balloons used for other than charter in 2013, compared to 59,200 for helicopters and 304,000 for aeroplanes.

Helicopters also had a higher fatal accident rate, the accident rate was about 28 per cent higher involving helicopters than aeroplanes when corrected for flying activity (27 versus 21 fatal accidents per million hours flown). Due to the higher use of aeroplanes for private/business flying over this compared to helicopters, there were significantly more fatalities in those fatal accidents involving aeroplanes than in helicopter accidents. There were no fatal balloon accidents over this period.

Recreational aviation

Data on recreational flying activity is collected by the BITRE from individual RAAOs and was available for the 2005 to 2013 period. Weight shift aircraft had a lower accident rate than other types of recreational aircraft over this period. The overall accident rate for gyrocopters was comparable with the accident rate for helicopters used for flying training.

The fatal accident rate for gyrocopters over this period (47 per million hours flown) was almost double that of other recreational aircraft (30 per million hours flown for recreational aeroplanes, and 25 per million hours flown for weight shift aircraft). The fatal accident rate for gyrocopters was significantly higher than for all other aircraft and operation type combinations in air transport and general aviation.

The fatal accident rate for recreational aeroplanes was higher than for private/business aeroplanes (26 versus 21 fatal accidents per million hours flown), as was the overall accident rate (about 223 versus 134 accidents per million hours flown).

Weight shift aircraft had a low accident rate compared to most other recreational aircraft/operation types (86 per million hours flown). The weight shift fatal accident rate (23 per million hours flown) was higher than average when compared to all other aircraft/operation types.

Occurrence types: what happened

Accidents and incidents are often the result of a complex set of circumstances, involving a chain (or sequence) of events. The ATSB categorises each reported accident, serious incident and incident into one or more occurrence types to identify what happened, and how the sequence of events played out to lead to an accident or incident. Classifying occurrences in this way helps to understand what types of occurrences have taken place, and identify potential areas for safety improvement and communication.

Occurrence types do not explain why an accident or incident happened, but generally are a description of what occurred. This report does not delve into the safety factors (individual actions, local conditions, risk controls, or organisational influences) that explain what led to an occurrence. An analysis of safety factors is more valuable when considering a cluster of occurrences that have a similar occurrence type (such as in the ATSB's *Avoidable Accidents* series), or through detailed ATSB investigations of particular accidents or serious incidents.

There are broad occurrence type categories used by the ATSB to classify occurrences. These changed in late-2013, and are currently:

- airspace-related
- infrastructure -related
- environment-related
- operational-related
- technical-related.

Consequential events that happen as the result of an occurrence (for example, forced and precautionary landings, emergency descents, rejected take-offs, evacuations and fuel dumps to reduce landing weight) are also recorded.

The five categories of occurrences are further broken down into different occurrence types, which are detailed in Appendix B. The ATSB records one or more occurrence types for all aircraft involved in each occurrence. Accidents and serious incidents generally have more occurrence types coded than incidents, as they are more likely to be investigated, and their severity usually means that there is a greater amount of information to draw upon for analysis and coding. In occurrences involving multiple aircraft, aircraft with the same operation type are recorded twice, whereas aircraft with different operation types are recorded against the corresponding operation type.

The frequency of a particular occurrence type does not necessarily reflect its importance or safety risk. For example, fuel-related events may be relatively rare (when compared with fumes events), but fuel starvation is always a very serious incident. Many fuel starvation events result in an attempt at an emergency landing, and potential aircraft damage and injury to people on board or outside the aircraft. In comparison, most fumes-related events are minor in nature, do not affect the safety of flight, and do not result in any injury.

Commercial air transport

Accidents and serious incidents

In 2014, the most common accidents and serious incidents in air transport operations (Table 30) were related to:

- aircraft control
- runway events
- crew and cabin safety
- aircraft airframe problems

- terrain collisions
- aircraft separation
- powerplant and propulsion.

Table 30: Accidents and serious incidents in air transport operations, by occurrence type, 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Airspace											
Aircraft separation	6	4	17	10	7	14	7	18	16	8	107
Operational Non-compliance	3	0	5	6	3	2	2	1	3	0	25
ANSP Operational error	2	1	2	1	0	0	2	1	2	1	12
Airspace infringement	0	0	1	1	1	0	0	0	0	0	3
Breakdown of co-ordination	0	0	0	0	0	1	0	0	0	0	1
Other	0	0	1	0	0	0	0	0	0	0	1
Environment											
Weather	1	0	4	5	4	6	0	6	6	5	37
Wildlife	0	0	2	0	0	1	0	1	1	0	5
Interference with aircraft from ground	0	0	0	1	0	0	0	0	1	1	3
Infrastructure											
Other	1	0	0	0	0	0	0	0	0	0	1
Operational											
Aircraft control	6	6	16	20	11	14	6	13	10	18	120
Crew and cabin safety	9	4	11	18	9	5	6	6	4	10	82
Terrain Collisions	7	5	10	13	6	8	11	7	6	9	82
Runway events	2	5	9	8	1	5	7	6	10	12	65
Communications	1	2	2	4	2	3	3	5	2	5	29
Fuel related	2	0	4	6	3	1	2	2	7	2	29
Fumes, Smoke, Fire	4	1	1	7	3	2	1	1	2	3	25
Flight preparation / Navigation	5	0	4	0	2	4	0	2	4	1	22
Ground operations	0	1	1	1	1	1	4	3	4	6	22
Miscellaneous	0	2	0	6	3	5	0	1	1	1	19
Ground proximity alerts / warnings	1	0	2	0	1	0	0	2	1	1	8
Aircraft loading	0	0	0	0	0	1	0	0	0	1	2
Technical											
Powerplant / propulsion	5	5	10	18	6	11	12	8	10	8	93
Systems	5	2	6	10	6	3	4	2	3	5	46
Airframe	4	1	4	3	4	5	5	5	4	10	45
Consequential events	16	12	19	30	18	24	16	12	22	15	184

Aircraft separation

There were eight serious incidents in 2014 involving air transport aircraft with separation or aircraft proximity issues. Aircraft separation issues were the second most common type of serious incident in commercial air transport over the last 10 years.

By their nature, these types of serious incidents indicate a reduced safety margin between two aircraft, and an increased risk of a mid-air collision.

In October 2013, the ATSB published a research investigation that reviewed all loss of separation occurrences since 2008 (ATSB investigation AR-2012-034).

Runway events

There were 12 runway events involving air transport aircraft in 2014 – six accidents and six serious incidents. This was the highest number in the last 10 years. However, this number is consistent with the trend of increasing runway events beginning in 2009.

There were four runway events where the aircraft veered-off the runway, due to a landing gear mechanical failure and one event where the aircraft conducted an unintentional wheels up landing.

Powerplant / propulsion

Four accidents and four serious incidents relating to engine malfunctions on air transport aircraft were reported to the ATSB in 2014. In most cases, a power loss occurred during take-off / initial climb or cruise, and the pilot had time to make a diversion or a successful forced landing.

Aircraft control

There were 12 accidents and six serious incidents relating to aircraft control issues in air transport aircraft reported to the ATSB in 2014. Five of these were serious injury accidents. The majority of the aircraft control events occurred during the approach or landing phase of flight and with aircraft conducting charter operations.

Crew and cabin safety

One accident and nine serious incidents relating to cabin and crew safety were reported in 2014 involving an air transport aircraft. Eight of these events involved a member of the flight crew becoming medically incapacitated, usually during cruise.

The single accident involved a cabin crew member sustaining a serious injury during turbulence. The ATSB investigation is ongoing (ATSB investigation number AO-2014-032).

Airframe

There were eight accidents and two serious incidents reported to the ATSB in 2014 involving airframe problems. The majority of airframe related events involved landing gear mechanical failure. The highest number of airframe events over the 10-year period was reported in 2014 – significantly above the 10-year average.

Terrain collisions

There were nine terrain collision accidents involving air transport aircraft – eight charter and one low capacity aircraft – reported to the ATSB in 2014, three of which resulted in serious injuries. This number of terrain collision accidents in 2014 was consistent with the 10-year average for air transport.

Incidents

The most common incident types in 2014 involving air transport operations (Table 31) were:

- wildlife strikes
- weather-related issues
- aircraft system problems

Table 31: Incidents in air transport operations, by occurrence type, 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Airspace											
Aircraft separation	240	149	127	187	164	161	191	222	245	263	1,949
ANSP Operational error	243	253	190	173	129	75	50	59	99	119	1,390
Operational Non-compliance	81	62	104	115	78	100	95	114	119	126	994
Airspace infringement	13	16	26	25	16	10	13	20	16	18	173
Breakdown of co-ordination	21	10	26	26	20	16	4	13	16	20	172
Other	17	16	3	6	4	1	1	5	7	2	62
Environment											
Wildlife	991	952	986	1,093	1,207	1,372	1,453	1,370	1,438	1,425	12,287
Weather	157	126	147	177	141	209	254	302	464	550	2,527
Interference with aircraft from ground	1	4	6	1	3	5	6	8	9	6	49
Infrastructure											
Runway lighting	14	19	16	18	26	22	13	22	14	14	178
Other	14	15	17	11	8	6	4	7	11	5	98
ATM	29	7	4	5	1	5	0	1	1	4	57
Navaids	10	8	2	3	4	7	5	2	2	8	51
Radar / Surveillance	0	0	0	2	2	6	3	8	2	0	23
Operational											
Miscellaneous	145	223	242	331	302	273	282	395	273	278	2,744
Fumes, Smoke, Fire	105	102	125	146	139	266	292	305	288	294	2,062
Aircraft loading	43	78	115	91	65	124	221	222	202	191	1,352
Aircraft control	72	92	82	98	83	96	136	211	220	221	1,311
Ground proximity alerts / warnings	242	149	83	37	22	20	38	69	172	220	1,052
Communications	126	116	91	141	97	72	75	86	97	90	991
Crew and cabin safety	71	52	96	73	69	86	121	92	151	140	951
Ground operations	45	58	67	68	50	49	78	72	59	58	604
Flight preparation / Navigation	81	70	84	59	31	41	54	54	50	42	566
Runway events	40	43	41	56	47	52	66	69	63	68	545
Fuel related	24	33	55	52	35	30	36	32	35	30	362
Terrain Collisions	13	13	14	15	10	9	8	5	13	5	105
Technical											
Systems	308	287	328	369	311	430	487	515	494	500	4,029
Airframe	210	161	188	246	219	251	309	271	268	229	2,352
Powerplant / propulsion	169	170	209	215	212	176	218	244	199	180	1,992
Consequential events	454	622	620	716	701	652	744	865	827	810	7,011

Wildlife strikes

The majority of wildlife strikes involving air transport aircraft were birdstrikes, with a small number of animal strikes reported. The number of birdstrikes has increased by around 43 per cent over the last decade, driven by the large increase in aircraft movements (departures and landings) in high capacity RPT operations over the same period. In recent years, the ATSB, airport and airline operators have worked together to improve reporting processes for confirmed and suspected birdstrikes. This has resulted in a modest increase in the rate of birdstrikes per aircraft movement.

The ATSB biennially publishes a report detailing wildlife strike statistics, the most recent report *Australian aviation wildlife strike statistics* was published in December 2014 (ATSB report AR-2014-075).

Aircraft system issues

Around 40 per cent of aircraft system issues were avionics or flight instrument problems. The majority of these incidents were minor in nature, and affected a wide range of aircraft systems and aircraft types.

About 10 per cent were air and pressurisation system issues, mostly relating to abnormal temperature or pressurisation indications. Similar proportions were electrical issues – particularly generator failures, flight control problems, or hydraulic issues.

Very few incidents (around five per cent of all systems issues) related to anti-ice protection or fuel system problems.

Weather

The ATSB received 550 reports of weather-related incidents that affected safe air transport operations in 2014. Around 80 per cent of all weather-related incidents reported to the ATSB in 2014 involved windshear or turbulence. This figure has increased exponentially since 2009 from around 83 reported events per year to 452 in 2014. The increase in windshear or turbulence events has significantly outpaced the increase in air transport activity over the decade. An increase of this magnitude has not been observed in other aviation operation types.

The next most commonly reported weather-related event was lightning strikes, which has remained relatively constant over the last 10 years.

General aviation

Accidents and serious incidents

In 2014, the most common accidents and serious incidents involving GA aircraft (Table 32) were:

- terrain collisions
- aircraft control
- aircraft separation
- powerplant / propulsion issues.

Table 32: Accidents and serious incidents in GA operations, by occurrence type, 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Airspace											
Aircraft separation	15	21	22	36	28	34	42	58	65	44	365
Operational Non-compliance	5	6	5	12	8	3	7	10	7	5	68
ANSP Operational error	1	2	0	4	3	1	2	1	1	0	15
Airspace infringement	1	1	1	2	3	1	1	0	2	1	13
Other	0	0	0	0	0	0	0	0	1	0	1
Environment											
Weather	2	4	13	2	10	8	3	7	5	8	62
Wildlife	5	0	2	2	3	3	4	1	3	3	26
Infrastructure											
Other	0	1	0	0	1	0	0	0	0	1	3
Runway lighting	0	0	0	0	0	0	0	1	0	0	1
Operational											
Terrain Collisions	92	75	97	116	82	138	104	96	89	100	989
Aircraft control	44	35	43	50	43	38	48	44	58	64	467
Runway events	9	10	21	20	22	21	18	19	21	27	188
Fuel related	7	4	6	9	8	14	16	16	7	9	96
Communications	2	2	1	10	4	6	11	14	17	12	79
Ground operations	2	0	5	1	5	2	4	3	3	12	37
Fumes, Smoke, Fire	3	4	4	5	6	4	2	3	2	3	36
Flight preparation / Navigation	1	2	4	4	5	0	4	6	5	3	34
Crew and cabin safety	3	3	3	4	3	2	5	1	2	4	30
Miscellaneous	2	1	0	2	1	4	2	3	4	3	22
Aircraft loading	0	0	1	1	1	0	0	0	0	1	4
Technical											
Powerplant / propulsion	27	37	63	39	50	41	36	40	32	32	397
Airframe	6	4	3	4	8	10	7	6	16	16	80
Systems	4	2	3	4	5	9	9	2	3	6	47
Consequential events	46	42	61	49	59	68	55	66	58	60	564

Terrain collisions

About 56 per cent of the terrain collisions in 2014 that involved a GA aircraft were collisions with terrain (60 accidents). Most collision with terrain accidents and serious incidents were investigated by the ATSB, and these investigations are discussed earlier in this report in *General aviation*.

Most other terrain collisions reported to the ATSB were ground strikes during take-off or landing or wirestrikes. The number of ground strikes in 2014, with 24 accidents (one resulting in serious injury) and one serious incident, was the greatest in the last 10 years. The number of wirestrikes in 2014 (10 accidents and eight serious incidents) was the lowest over the decade, however, two of the accidents were fatal.

Aircraft separation

In 2014, 78 GA aircraft were involved in 44 aircraft separation serious incidents. None of these occurrence resulted in injury. Thirty-seven of these serious incidents were near collisions and 12 were investigated by the ATSB in 2014.

Aircraft control

In 2014, the number of aircraft control problems reported to the ATSB involving GA aircraft was the highest in the last 10 years. This was significantly greater than the 10-years average; however, it was consistent with the general trend (since 2010) of increasing aircraft control occurrences in GA. Around 70 percent of these occurrences involved aeroplanes and greater than 50 per cent involved aircraft conducting private/business/sports operations.

There were 60 accidents – two fatal and six serious injury accidents – and four serious incidents. 22 of these occurrences were investigated by the ATSB. The most common control issues were loss of control, hard landings and wheels up landings.

Powerplant and propulsion

In 2014, there were 20 accidents – two fatal and six serious injury – and 12 serious incidents relating to engine-related issues reported to the ATSB involving GA aircraft. This was consistent with the 10-year average this report covers and made up around eight per cent of all GA accidents or serious incidents.

The majority of these engine-related accidents and serious incidents were due to an engine failure or malfunction and almost two-thirds involved aircraft conducting private/business/sports operations. Over 40 per cent of the engine failures occurred shortly after take-off and during climb. In many of these cases, the pilot conducted a forced landing on the remaining runway or in a paddock. In most of these occurrences, the aircraft was damaged but the occupants were not injured.

Incidents

The most common types of incidents involving GA aircraft in 2014 (Table 33) were:

- wildlife strikes
- aircraft separation
- aircraft system problems
- runway events.

Table 33: Incidents in GA operations, by occurrence type, 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Airspace											
Aircraft separation	121	128	133	177	178	146	192	177	186	174	1,612
Operational Non-compliance	62	95	123	264	213	193	183	161	125	91	1,510
Airspace infringement	26	71	69	58	49	39	40	41	37	24	454
ANSP Operational error	50	66	58	59	44	27	19	30	52	37	442
Breakdown of co-ordination	1	2	9	7	4	7	2	11	14	6	63
Other	8	0	1	1	1	1	1	2	5	1	21
Environment											
Wildlife	352	359	353	323	361	376	322	286	288	269	3,289
Weather	10	11	26	15	8	18	17	17	15	15	152
Interference with aircraft from ground	1	3	1	3	0	2	1	5	2	1	19
Infrastructure											
Other	5	2	3	2	2	2	4	5	2	1	28
ATM	3	7	0	2	1	0	0	0	2	0	15
Runway lighting	4	2	0	2	0	2	0	2	2	1	15
Radar / Surveillance	0	0	0	1	0	2	1	0	0	1	5
Navaids	0	0	0	0	1	0	1	0	0	0	2
Operational											
Runway events	227	260	229	295	450	300	260	239	243	142	2,645
Communications	75	174	122	200	147	135	119	119	127	111	1,329
Flight preparation / Navigation	106	118	118	73	74	65	51	46	61	40	752
Aircraft control	65	50	67	52	54	40	51	57	51	41	528
Terrain Collisions	45	28	43	43	51	31	34	35	41	11	362
Fumes, Smoke, Fire	28	37	38	33	28	36	35	31	29	30	325
Ground operations	37	26	28	24	30	32	20	26	27	35	285
Miscellaneous	19	19	18	31	27	32	37	31	26	33	273
Fuel related	20	13	17	19	13	21	19	14	12	25	173
Crew and cabin safety	8	7	8	2	4	5	5	3	4	4	50
Aircraft loading	1	1	4	4	1	3	1	2	1	2	20
Ground proximity alerts / warnings	4	0	0	0	1	0	1	0	0	0	6
Technical											
Systems	166	141	127	111	122	158	155	148	126	161	1,415
Powerplant / propulsion	144	121	159	148	136	111	133	142	114	121	1,329
Airframe	85	127	113	115	130	124	141	139	121	127	1,222
Consequential events	**237**	**317**	**279**	**294**	**311**	**276**	**293**	**310**	**275**	**277**	**2,869**

Wildlife

Reporting of wildlife strikes involving GA aircraft has reduced by around 30 per cent since its peak in 2010. In contrast, reporting of wildlife strikes in air transport has steadily increased over the study period, suggesting a significant amount of under reporting in GA. However, wildlife strikes were still the most commonly reported GA safety incident.

Runway events

The number of runway events reported to the ATSB in 2014 involving GA aircraft was the lowest over the 10-year period and was significantly below the 10-year average. Runway incursion was the most commonly reported incident, almost all involving an incursion by an aircraft due to the pilot's actions.

Aircraft using an incorrect runway accounted for the second largest share of runway events reported to the ATSB in 2014. Aircraft approaching or landing on the wrong runway were the most common.

Aircraft separation

Aircraft separation incident made up around 10 per cent of all GA incident reported to the ATSB in 2014. More than 50 per cent of these occurrences involved one aircraft where the operation type was unknown and around 17 per cent involved flying training.

Separation issue was the most commonly reported aircraft separation incident. Two-thirds of these were outside of controlled airspace (mostly at non-towered aerodromes using the common traffic advisory frequency (CTAF)).

Loss of separation or loss of separation assurance were the second most commonly reported incidents. About half of these were induced by pilots' non-compliance with ATC instructions (such as maintaining an altitude requirement) or with a published procedure, or by an airspace infringement. The other half were induced by air traffic control actions.

Recreational aviation

Accidents and serious incidents

Accident and serious incident reporting in the recreational aviation community has increased in recent years, as shown by the difference in the number of occurrences reported to the ATSB in 2005 compared to 2014 (Table 34). Significant growth in recreational flying has driven this increase, as has greater awareness among pilots and recreational aviation administration organisations (RAAOs) of the need to report accidents and serious incidents to the ATSB.

The most common types of accidents and serious incidents in recreational aviation are similar to those in general aviation. The most common in 2014 were:

- terrain collisions
- aircraft control
- powerplant / propulsion
- runway events.

Table 34: Accidents and serious incidents in recreational aviation, by occurrence type, 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Airspace											
Aircraft separation	1	2	3	6	2	3	1	5	5	9	37
Airspace infringement	0	1	0	0	0	0	0	0	0	1	2
Operational Non-compliance	0	0	0	0	1	0	0	1	0	0	2
Other	0	0	0	0	0	0	0	0	1	0	1
Environment											
Weather	0	0	0	1	1	3	0	6	5	4	20
Wildlife	0	0	0	1	0	1	0	0	3	1	6
Infrastructure	0	0	0	0	0	0	0	0	0	1	1
Operational											
Terrain Collisions	8	7	25	28	33	34	46	60	64	65	370
Aircraft control	2	0	10	12	8	20	17	44	38	49	200
Runway events	0	0	2	6	6	4	10	11	15	15	69
Fuel related	0	0	1	4	1	0	3	6	8	13	36
Ground operations	0	0	2	0	1	1	0	2	0	7	13
Communications	1	0	1	3	2	0	1	1	1	1	11
Fumes, Smoke, Fire	0	0	1	1	1	3	0	0	1	1	8
Flight preparation / Navigation	0	0	0	0	1	0	0	1	1	2	5
Aircraft loading	0	0	0	0	0	0	1	0	0	1	2
Crew and cabin safety	0	0	0	0	0	0	0	1	0	1	2
Miscellaneous	0	0	0	1	0	0	0	0	0	0	1
Technical											
Powerplant / propulsion	1	0	14	17	10	22	17	40	35	34	190
Airframe	0	0	0	3	2	3	1	10	4	7	30
Systems	0	0	0	2	2	0	0	4	4	3	15
Consequential events	0	0	11	24	9	25	18	38	35	57	217

Terrain collisions

There were 65 terrain collisions involving recreational aircraft that were reported to the ATSB in 2014 that were classified as an accident or serious incident. Nine involved fatal injuries (14 per cent) and seven involved serious injuries to the aircraft occupants. These are discussed in detail in the *Recreational* section of this report.

Very few recreational aviation accidents were investigated by the ATSB. In 2014, there were two accidents investigated by the ATSB and another where the ATSB provided technical assistance to an RAAO accident investigation.

Most (52) terrain collision accidents were collisions with terrain, with 12 ground strikes and one wirestrike also reported. Aeroplanes were the most common aircraft involved in terrain collisions, making up around 75 per cent of reported incidents.

Powerplant / propulsion

There were 25 powerplant-related accidents and nine serious incidents involving recreational aircraft reported to the ATSB in 2014. There were no fatal or serious injury accidents. Most involved recreational aeroplanes though there were four weight shift aircraft also included in the statistics.

All of the reported accidents and serious incidents involved engine failure or malfunctions, most requiring a forced landing. As almost all powered recreational aircraft are single-engine, a forced landing is generally the only remaining option for the pilot.

Aircraft control

There were 49 aircraft control issues reported in recreational aviation in 2014 – around 18 per cent of all recreational reported accidents/serious incidents. This was the highest number of reported occurrence of this type in the 10-year period and was significantly greater than the 10-year average. Most involved aeroplanes.

The 49 occurrence, including 44 accidents, were mostly hard landings or losses of control. Of these, there were three fatal and four serious injury accidents.

Runway events

There were 13 accidents and two serious incident runway events reported to the ATSB in 2014 involving recreational aircraft. There were no fatal or serious injury accidents. One of these involved a weight shift aircraft. The most common runway event reported was runway excursion.

Incidents

The most commonly reported types of incidents to the ATSB in 2014 (Table 35) that involved recreational aviation operations were:

- powerplant / propulsion
- runway events
- airframe.

Table 35: Incidents in recreational aviation, by occurrence type, 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Airspace											
Aircraft separation	3	3	3	3	9	4	5	6	5	17	58
Operational Non-compliance	0	2	2	1	2	2	4	3	4	3	23
Airspace infringement	1	0	2	1	4	2	1	1	2	5	19
ANSP Operational error	0	2	0	0	0	0	0	0	0	1	3
Environment											
Wildlife	0	0	2	2	2	3	5	0	4	3	21
Weather	0	0	0	2	0	2	4	4	2	2	16
Infrastructure											
Other	0	0	1	2	0	0	0	0	0	0	3
Operational											
Aircraft control	0	0	11	12	9	10	20	31	30	9	132
Terrain Collisions	0	0	14	16	6	15	20	19	25	5	120
Runway events	0	2	7	10	8	11	12	20	23	21	114
Communications	1	6	0	6	5	5	4	3	8	9	47
Ground operations	0	0	3	3	1	0	2	5	2	5	21
Flight preparation / Navigation	0	1	1	2	1	1	3	4	3	4	20
Fumes, Smoke, Fire	0	0	1	3	1	2	2	3	4	4	20
Fuel related	0	0	2	3	0	1	2	4	2	5	19
Miscellaneous	0	0	1	2	0	0	0	1	0	1	5
Crew and cabin safety	0	0	0	1	0	0	0	1	0	0	2
Aircraft loading	0	0	0	0	0	0	0	1	0	0	1
Technical											
Powerplant / propulsion	0	0	11	14	4	24	19	18	24	51	165
Airframe	0	0	6	10	8	12	18	16	19	20	109
Systems	0	0	2	1	1	4	5	9	5	13	40
Consequential events	1	1	8	16	8	29	20	28	19	43	173

Powerplant / propulsion

There were 51 powerplant-related incidents reported to the ATSB in 2014 involving recreational aircraft. This was more than double the number of any other year in the study period. This probably reflects an increase in awareness of reporting responsibilities in the recreational aviation community. Around two-thirds of these incidents involved engine failure or malfunction.

Runway events

There were 21 runway events involving a recreational aircraft reported to the ATSB in 2014, making up around 10 per cent of all recreational reported incidents. The number of events is consistent with the 10-year average and are consistent with the previous 2 years. Half of runway incidents were runway incursions (15) and around one-third were runway excursions.

Airframe

The highest number of incidents in the last 10 years relating to airframe problems, involving recreational aircraft was reported to the ATSB in 2014. However, this number was consistent with the increasing trend of these events. The majority involved landing gear mechanical failures.

Data sources and submissions

Sources of information

The sources of information during the investigation included:

- the ATSB occurrence database
- ATSB investigation reports
- aircraft and operator activity data from the Bureau of Infrastructure, Transport and Regional Economics (BITRE).

Appendices

Appendix A – Explanatory notes

Occurrence data represent a picture of aviation derived from information available at the time these statistics were prepared.

This appendix explains what data was included or excluded to produce these statistics, how operation types are defined, and other important points to consider when interpreting these statistics.

Analysis methodology

Inclusions

Specifically, occurrence data includes:

- the number of aircraft involved in incidents, serious incidents, serious injury accidents, fatal accidents and total accidents
- the number of serious injuries and fatalities
- accident and fatal accident rates per million departures and million hours flown.

Exclusions

Fatalities do not include those resulting from:

- parachuting operations where aircraft safety was not a factor
- suicides
- criminal acts.

Important points to consider

A number of procedures are used in different sections of this report to distinguish occurrences from aircraft and injuries.

- An occurrence may involve one or more aircraft.
- Where occurrence data is presented by operation type or occurrence type (as in the Occurrences by operation type and Occurrence by aircraft type
- Occurrence types: what happened sections of this report), tabulated figures refer to the number of aircraft involved in occurrences. Occurrences involving more than one aircraft are recorded once for each aircraft involved.
- Aircraft involved in fatal accidents are counted based on what happens to the aircraft occupants. This means that each aircraft with an on-board fatality is counted separately as being involved in a fatal accident within the operation type of the aircraft. If two aircraft collide in mid-air and fatalities occur on-board both aircraft, two aircraft involved in fatal accidents are counted. Using the same example, if two aircraft collide in mid-air and a fatality occurs on one aircraft only, one aircraft is recorded as being involved in a fatal accident, but in total, two aircraft are recorded as being involved in accidents.
- Injuries and fatalities are recorded against only the operation type of the aircraft in which the injury or fatality occurred.
- Tables in this report record aircraft where the registration or flight number is known and/or where the operation type can be reasonably ascertained. For example, aircraft operating in Class G airspace without a transponder or flight plan can be reasonably expected to belong to general aviation, even though the operation subtype is not known.
- Where an occurrence has more than one level of injury, the highest injury level is recorded. For example, an accident involving an aircraft with four occupants may have one person with no

injury, one person with minor injury, one person with serious injury, and one person with fatal injuries; this aircraft will be recorded as being involved in a fatal accident only.

- The number of serious injuries are derived from both fatal accidents that involve some serious injuries, and from serious injury accidents (serious injury accidents represent occurrences where serious injury is the highest injury recorded.)
- It is important not confuse serious injury accidents and serious incidents. A serious incident is an incident where an accident nearly occurred. In contrast, a serious injury accident involves an occurrence resulting in the highest injury that requires, or would usually require, admission to hospital within 7 days after the day when the injury is suffered.
- The high-level categories of all air transport, all general aviation and all recreational aviation include occurrence data where the country of registration is not known, but the general type of operation is known. This means that the addition of sub-categories will be less than the total number at the higher level.

Operation types

This report provides data pertaining to a number of operational types, which are utilised across a wide range of ATSB statistical and research reports.

Commercial air transport refers to scheduled and non-scheduled commercial operations used for the purposes of transporting passengers and/or cargo for hire or reward. Specifically, this includes:

- *High capacity regular public transport (RPT) and charter* - regular public transport operations[19] and charter operations conducted in high capacity aircraft. A high capacity aircraft refers to an aircraft that is certified as having a maximum capacity exceeding 38 seats, or having a maximum payload capability that exceeds 4,200 kg.
- *Low capacity RPT* - regular public transport operations conducted in aircraft other than high capacity aircraft. That is, aircraft with a maximum capacity of 38 seats or less, or having a maximum payload capability of 4,200 kg or below.
- *Charter* - operations involving the carriage of passengers and/or cargo on non-scheduled flights by the aircraft operator, or by the operator's employees, for trade or commerce (excluding RPT operations). In this report, charter operations (for both occurrences and departures/hours flown) mostly refer to charter operations in low capacity aircraft.[20]
- *Medical transport* - operations involving flights facilitating emergency medical assistance in and/or transport by carrying ill or injured persons as medical passengers, other persons directly involved with the medical passenger, and/or medical personnel.

General aviation (GA) is considered to be all flying activities that do not involve scheduled (RPT) and non-scheduled (charter) passenger and freight operations. It may involve Australian civil (VH–) registered aircraft, or aircraft registered outside of Australia. General aviation includes:

- Aerial work. This includes flying for the purposes of agriculture, mustering, search and rescue, fire control, or survey and photography.
- Flying training.
- Private, business and sports aviation. Sports aviation includes gliding, parachute operations, ballooning, warbird operations, and acrobatics.

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[19] RPT operations are conducted in accordance with fixed schedules to and from fixed terminals over specific routes.

[20] In the ATSB online aviation occurrence database, closed charter operations are generally coded as 'low capacity' operation type with 'charter' as an operation sub-type. Other charter occurrences in low capacity aircraft is coded as an operation type of 'charter'.

In these statistics, GA does not include operations involving Australian non-VH registered aircraft (such as military aircraft, or aircraft registered by recreational aviation administration organisations (RAAOs).

Recreational aviation refers to all flying conducted for pleasure involving aircraft registered in Australia by RAAOs. These organisations have been authorised by the Civil Aviation Safety Authority (CASA) to maintain registers of aircraft and conduct administration of recreational flying. Recreational aviation aircraft include those registered with:

- Australian Sports Rotorcraft Association (ASRA) (gyrocopters with a G– registration)
- Hang Gliding Federation of Australia (HGFA) (weight shift aircraft, such as hang gliders, paragliders, powered parachutes, weight shift trikes and microlights with a T1– or T2– registration)
- Recreational Aviation Australia (RA-Aus) (registrations in the 10-, 19-, 24-, 25-, 28-, 32-, and 55- series). These encompass a wide range of aircraft types, sizes, and performance levels, and may include fixed-wing aeroplanes or sport aircraft, amateur-built or experimental aircraft, weight-shift microlights, powered gliders and powered parachutes.

Remotely piloted aircraft (RPAs) refer to occurrences involving unmanned fixed-wing, rotary-wing or lighter-than-air craft that are controlled by a ground-based operator conducting commercial, government or research activities and not flown for sport or recreation.

Reports of safety incidents involving military aircraft that have been reported to the ATSB are excluded from these statistics, unless the military aircraft has affected the safety of a civil aircraft.

Occurrence types and events

Not all notifications reported to the ATSB are classified as incidents, serious incidents or accidents. Those that are deemed to not be a transport safety matter are classified as ‘events’. Events are not included in this report.

Notifications of the following occurrence type events *when they occur without any other occurrence type event* are coded as events:

- consequential events (diversion / return, fuel dump / burn off, missed approach / go-around)
- operational non-compliance with air traffic control verbal or published instruction
- airspace infringement
- breakdown of co-ordination between air navigation service providers.

Note that previous (pre-2014) editions of *Aviation occurrence statistics* did include operational non-compliance, airspace infringement and breakdown of co-ordination as incidents.

In addition, Infrastructure related events (air traffic management, Navigation aids, Radar / surveillance, Runway lighting) are coded as events when no aircraft was affected.

Appendix B – ATSB occurrence type taxonomy

Occurrence Type Level 1	Occurrence Type Level 2	Occurrence Type Level 3
Airspace	**Aircraft separation**	Airborne collision alert system warning
		Collision
		Loss of separation
		Loss of separation assurance
		Near collision
		Issues
	Airspace infringement	
	ANSP operational error	Information / procedural error
		Failure to pass traffic
		Other
	Breakdown of co-ordination	
	Operational non-compliance	
	Other	
Consequential events	**Ditching**	
	Diversion / return	
	Emergency evacuation	
	Emergency / precautionary descent	
	Forced / precautionary landing	
	Fuel dump / burn off	
	Missed approach / go-around	
	Rejected take-off	
	Other	
Environment	**Interference with aircraft from ground**	
	Weather	Icing
		Lightning strike
		Turbulence / windshear / microburst
		Unforecast weather
		Other
	Wildlife	Animal strike
		Birdstrike
		Other
	Other	
Infrastructure	**ATM**	
	Navaids	
	Radar / surveillance	
	Runway lighting	
	Other	
Operational	**Aircraft control**	Airframe overspeed
		Control issues
		Hard landing
		Incorrect configuration
		In-flight break-up
		Loss of control

Occurrence Type Level 1	Occurrence Type Level 2	Occurrence Type Level 3
		Stall warnings
		Unstable approach
		Wheels up landing
		Other
	Aircraft loading	Dangerous goods
		Loading related
		Other
	Communications	Air-ground-air
		Call sign confusion
		Transponder related
		Other
	Crew and cabin safety	Inter-crew communications
		Cabin injuries
		Cabin preparations
		Depressurisation
		Flight crew incapacitation
		Passenger related
		Unrestrained occupants / objects
		Other
	Fire, fumes and smoke	Fire
		Fumes
		Smoke
	Flight preparation / navigation	Aircraft preparation
		Flight below minimum altitude
		Lost / unsure of position
		VFR into IMC
		Other
	Fuel related	Contamination
		Exhaustion
		Leaking or venting
		Low fuel
		Starvation
		Other
	Ground operations	Foreign object damage / debris
		Ground handling
		Jet blast / prop / rotor wash
		Taxiing collision / near collision
		Other
	Ground proximity alerts / warnings	
	Miscellaneous	Missing aircraft
		Security related
		Warning devices
		Other
	Runway events	Depart / approach / land wrong runway
		Runway excursion

Occurrence Type Level 1	Occurrence Type Level 2	Occurrence Type Level 3
		Runway incursion
		Runway undershoot
		Other
	Terrain collisions	Collision with terrain
		Controlled flight into terrain
		Ground strike
		Wirestrike
Technical	**Airframe**	Doors / exits
		Furnishings and fittings
		Fuselage / wings / empennage
		Landing gear / indication
		Objects falling from aircraft
		Windows
		Other
	Powerplant / propulsion	Abnormal engine indications
		Auxiliary power unit
		Engine failure or malfunction
		Propeller / rotor malfunction
		Transmission and gearboxes
		Other
	Systems	Air / pressurisation
		Anti-ice protection
		Avionics / flight instruments
		Datalink (RPA)
		Electrical
		Fire protection
		Flight controls
		Fuel
		Hydraulic
		Other

Australian Transport Safety Bureau

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The ATSB 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 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.

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.

Glossary

Occurrence - an accident or incident.

Accident - an occurrence involving an aircraft where:

- a person dies or suffers serious injury
- the aircraft is destroyed, or is seriously damaged
- any property is destroyed or seriously damaged (Transport Safety Investigation Act 2003).

Incident - an occurrence, other than an accident, associated with the operation of an aircraft which affects or could affect the safety of operation (ICAO Annex 13).

Serious incident - an incident involving circumstances indicating that an accident nearly occurred (ICAO Annex 13).

Serious injury - an injury that requires, or would usually require, admission to hospital within seven days after the day when the injury was suffered (Transport Safety Investigation Regulations 2003).

Australian Transport Safety Bureau

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Investigation

ATSB Transport Safety Report
Aviation Research Statistics
Aviation Occurrence Statistics 2005 to 2014
AR-2015-082
Final – 23 December 2015