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Australian aviation wildlife strike statistics

2004 to 2013





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Addendum

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Safety summary

Why we have done this report

Occurrences involving aircraft striking wildlife, particularly birds, are the most common aviation occurrence reported to the Australian Transport Safety Bureau (ATSB). Strikes with birds continue to be a significant economic risk for aerodrome and airline operators and a potential safety risk for pilots. The aim of the ATSB's statistical report series is to give information back to pilots, aerodrome and airline operators, regulators, and other aviation industry participants to assist them with managing the risks associated with bird and animal strikes. This report updates the last edition published in 2012 with data from 2012-2013.

What the ATSB found

Between 2004 and 2013, there were 14,571 birdstrikes reported to the ATSB, most of which involved high capacity air transport aircraft. Although the number of birdstrikes has continued to increase for all operation types, due to increasing aircraft movements, the rate per aircraft movement has actually decreased slightly in recent years. In the 2 years since 2011, the rates for seven of the ten major airports have reduced. Indeed, Adelaide, Melbourne, Perth and Sydney had lower rates in 2013 than in 2004. The largest increase in birdstrike rate was observed in Darwin, where the rate has more than doubled in the two years since 2011 and maintains the highest average birdstrike rate of all the major airports. Alice Springs Airport has shown the most significant reduction in rate.

Domestic high capacity aircraft were those most often involved in birdstrikes, and the strike rate per aircraft movement for these aircraft was significantly higher than all other categories. The number of engine ingestions for high capacity air transport operations had been increasing until 2011, but has since decreased to the lowest level in 10 years. Still, one in nine birdstrikes for turbofan aircraft involved an engine ingestion.

The four most commonly struck types of birds have not changed in the 2012 to 2013 period, those being kites, bats/flying foxes, lapwings/plovers and galahs. Kites had the most significant increase in the number of reported strikes per year in the last 2 years, with these species being involved in an average of 129 strikes per year for 2012 and 2013 compared with 84 per year on average across the entire 10-year reporting period. Galahs were more commonly involved in strikes of multiple birds, with more than 38 per cent of galah strikes involving more than one galah. However, larger birds were more likely to result in aircraft damage.

Historically, birdstrikes have not been a significant safety risk to civilian air travel in Australia. ATSB data dating back to 1969 show no civilian aviation fatalities attributed to birdstrikes. Additionally, the vast majority (98.7%) of birdstrikes over the 10 year study period were assessed using the ATSB event risk classification (ERC) framework as being low risk occurrences.

Compared to birdstrikes, animal strikes are relatively rare. The most common animals involved were hares and rabbits, kangaroos, dogs / foxes and wallabies. Damaging strikes mostly involved kangaroos, wallabies and livestock.

Safety message

Australian aviation wildlife strike statistics provide a reminder to everyone involved in the operation of aircraft and aerodromes to be aware of the hazards posed to aircraft by birds and non-flying animals. Timely and thorough reporting of birdstrikes is paramount. The growth of reporting to the ATSB that has been seen over the last 10 years has helped to better understand the nature of birdstrikes, and what and where the major safety risks lie. This helps everyone in the aviation industry to better manage their safety risk.

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1. Context

Each year, the Australian Transport Safety Bureau (ATSB) receives accident and incident notifications from pilots, airlines, aerodrome personnel, air traffic control and others involved in the aviation industry. The reporting of these aviation accidents and incidents, collectively termed occurrences, assists the ATSB in monitoring safety through its core function of independent investigation and the analysis of data to identify emerging trends.

The Transport Safety Investigation Regulations 2003 provide a list of matters reportable to the ATSB[1]. One routine reportable matter has been a collision with an animal, including a bird, for:

- all air transport operations (all bird and animal strikes), and
- aircraft operations other than air transport operations when the strike occurs on a licensed aerodrome.

In addition to the above, all accidents[2] are immediately reportable to the ATSB, and all occurrences involving injury or difficulty controlling the aircraft (including from a bird or animal strike) are reportable matters for all operation types.

A significant proportion of all occurrences reported to the ATSB involve aircraft striking wildlife, especially birds. Wildlife strikes represent an ongoing challenge to the aviation industry. Birds and other animals are hazards to aviation that will always be present and so need to be managed, both in terms of reducing the likelihood of a wildlife strike and reducing the consequences of strikes that occur.

For the purposes of this report, birdstrikes refer to strikes from all flying animals, including bats and flying foxes, while animal strikes refer to strikes from all flightless animals, including flightless birds such as emus and cassowaries.

This report provides aviation birdstrike and animal strike occurrence data for the period 1 January 2004 to 31 December 2013. It should be noted that some data may vary when compared with the previous *Australian aviation wildlife strike statistics* report from 2002 to 2011 due to ongoing quality improvements in ATSB data.

The *Australian aviation wildlife strike statistics* report aims to give industry an insight into the number, locations, and types of strikes in Australia, and describe characteristics of the common birds and animals involved, and the consequences of these strikes. This is the third edition of this report. Chapters 3 to 7 detail birdstrike occurrences, while chapter 8 summarises animal strikes. In response to increasing industry interest, a new chapter has been added to the report (chapter 9) which summarises occurrences involving insects.

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1 Available from the ATSB internet site: http://www.atsb.gov.au.

2 Accident refers to aviation occurrences where (a) a person dies or suffers serious injury, (b) the aircraft is destroyed or seriously damaged; or (c) other property is destroyed or seriously damaged.

2. Data sources

2.1 ATSB Occurrence data

Birdstrike and animal strike occurrence data used in this report have been reported to the Australia Transport Safety Bureau (ATSB) under the provisions of the Transport Safety Investigation (TSI) Regulations 2003. Only actual strikes are included in the report as these are reportable occurrences under the TSI Regulations. This includes strikes reported by pilots that have not been independently verified by aerodrome staff or an engineering inspection. Near strikes with birds or other animals are not reportable matters under the TSI Regulations and are not included in this report.

Wildlife descriptors and grouping

Bird and animal types have been grouped by similar species rather than reporting data on specific species. Type groupings were defined by grouping birds and animals of similar species, size, and/or appearance. These groupings were done because similar birds are often reported to the ATSB as an incorrect species. A complete list of bird and animal types is included in Appendix A on page 70.

For the purpose of this report, the birdstrike data included all flying animals - including bats and flying foxes. Animal strikes were considered to involve all non-flying animals, so included emus.

Bird and animal size were coded as small, medium or large based on common understandings of these categories. For birds, bird types that were typical for these size categories included:

- small birds - wrens, sparrows, and swifts
- medium birds - magpies, silver gulls, flying foxes and galahs
- large birds - pelicans, wedge-tailed eagles and brush turkeys.

For animals, typical sizes were:

- small animals - rabbit/hare, lizards
- medium animals - wallabies, foxes/dogs
- large animals - cattle, kangaroos.

Location data

Birdstrikes are often identified during a pre, or post-flight inspection, where the previous flight crew had no knowledge of striking a bird. In these cases the location of the birdstrike has been set to unknown, rather than at the aerodrome where the inspection was carried out. In this report, 738 records were identified as having an unknown strike location and as such have been excluded from location reporting.

The proximity of the aerodrome to a birdstrike has been coded as either:

- within the aerodrome confines
- 5 to 15 km from the aerodrome
- more than 15 km from the aerodrome.

Operation types

Some of the data presented below have been arranged into operation types. This applies only to data where the aircraft involved in the strike was known. The operation types used were:

- *high capacity air transport* – includes regular public transport (RPT) and charter operations on aircraft certified as having a maximum capacity exceeding 38 seats or a maximum payload exceeding 4,200 kg

- *low capacity air transport* – includes all RPT and charter operations on aircraft other than high capacity
- *general aviation* – all aerial work, flying training, and private, business, and sport (including gliding and ballooning) aviation, and recreational (non-VH registered) aviation (including ultralights and trikes).
- *military* – all military operations

2.2 Aircraft movements

Aircraft movements were defined as a take-off, a landing, or a circuit. Therefore, an aircraft completing a single sector will have two movements recorded, one for take-off and one for landing. Aircraft movements are used in this report as the normalising variable for all birdstrike rate calculations.

Bureau of Infrastructure, Transport and Regional Economics (BITRE) data

Aircraft movement information by operation type, weight category, and engine type was provided to the ATSB by the Bureau of Infrastructure, Transport and Regional Economics.

Movements were calculated by doubling the number of recorded departures, except in the case of international movements, where arrival and departure information was used.

There are slight differences between the total number of movements when split by each of these categories due to departures being used to calculate movements by operation type, and the combination of arrivals and departures being used to calculate movements by weight category and by engine type.

Airservices Australia data

Movement data by aircraft weight category for specific aerodromes was obtained from movement data published by Airservices Australia.[3]

[3] Located at website: http://www.airservicesaustralia.com/publications/reports-and-statistics/ (Airservices Australia data used in this report was current at the time of writing (August 2014)).

3. Birdstrikes across Australia

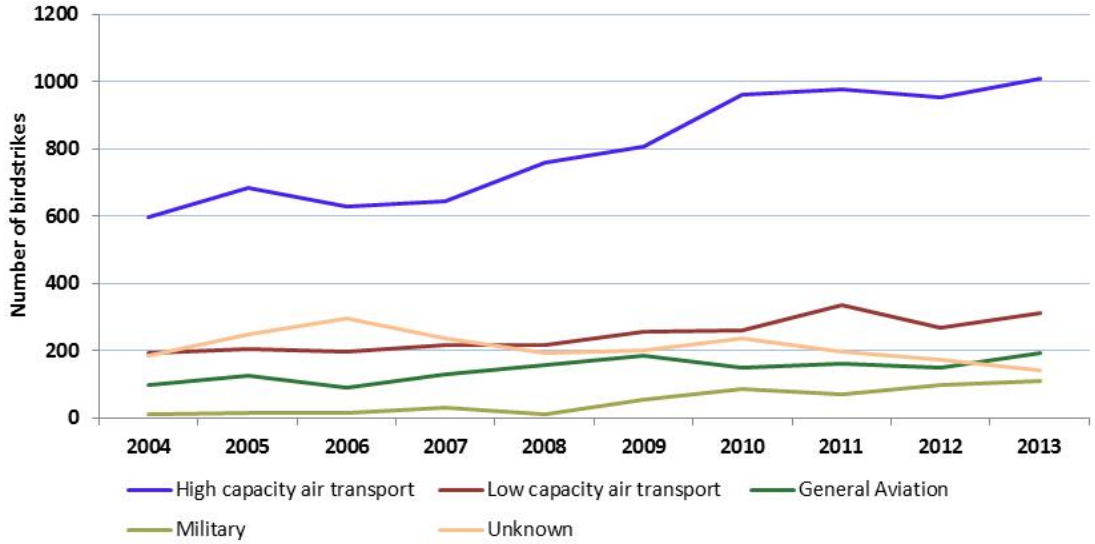
3.1 Birdstrikes by operation type

The number of birdstrikes reported to the ATSB by year and operation type is shown in Table 1 and Figure 1 below. On average the total number of reported birdstrikes has continued to increase between 2004 and 2013, although the total increase in the 2012 – 2013 period was far less than the 2 years prior. Between 2004 and 2013 the number of reported birdstrikes has also increased for each individual operation type, with the exception of the unknown group (generally from aerodrome operator reports of finding bird remains), which could be indicative of an increase in the quality of data reported to the ATSB. Interestingly, with the exception of military operations, all operation types experienced a reduction in reported birdstrikes in 2012 relative to 2011, before all increasing again in 2013.

Table 1: Number of birdstrikes per year by operation type

Operation Type	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
High capacity air transport	596	684	631	645	762	809	964	980	954	1,010
Low capacity air transport	194	204	199	216	218	256	262	337	268	313
General Aviation	99	125	91	130	158	185	151	163	151	192
Military	10	14	15	30	10	57	86	73	98	111
Unknown	186	251	298	237	192	203	239	198	173	143
Total	**1,085**	**1,278**	**1,234**	**1,258**	**1,340**	**1,510**	**1,702**	**1,751**	**1,644**	**1,769**

Figure 1: Number of birdstrikes per year by operation type, 2004 to 2013



Boeing C17A Globemaster engine ingestion on take-off - Military

During the take-off roll from Amberley Aerodrome, Qld, at approximately 90 knots the Captain observed a magpie appear to strike engine number one. A rejected take-off was conducted and the aircraft was taxied back to the lines and shutdown for inspection. Evidence of a bird strike was observed on the number one engine nacelle and further inspection found damage to some of the fan blades. The damaged blades were required to be replaced (4 March 2013).

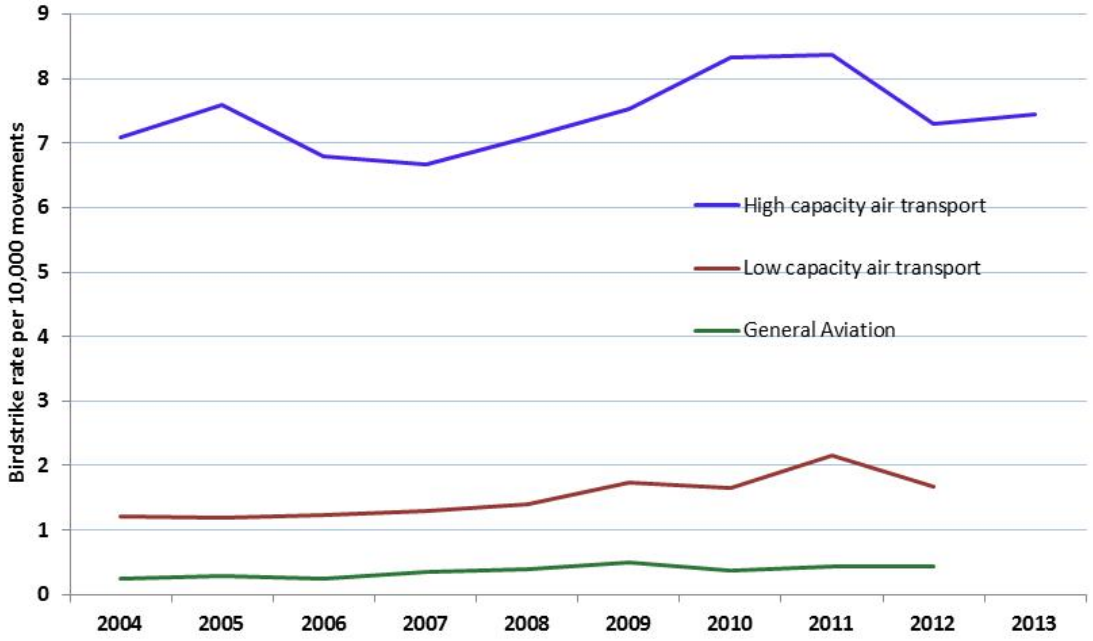
The rate of birdstrikes per 10,000 aircraft movements is shown in Table 2 and Figure 2 below. High capacity air transport aircraft continue to have a significantly higher birdstrike rate than all other operation types. It is likely that the speed and size of these aircraft, longer take-off and landing rolls, and large turbofan engines are factors contributing to the higher rate. The rate for high capacity operations has, however, decreased markedly in the 2 years after a maximum in 2011 of 8.38 birdstrikes per 10,000 movements to 7.3 in 2012, then 7.45 in 2013. After slightly but steadily increasing from 2004 to 2010, the low capacity aircraft birdstrike rate jumped to a 10 year maximum in 2011 before decreasing again in 2013 to a rate similar to 2010. General aviation birdstrike rates have not significantly changed.

Table 2: Birdstrike rate per 10,000 movements per year by operation type[4]

Operation Type	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
High capacity air transport	7.08	7.6	6.79	6.67	7.09	7.54	8.33	8.38	7.3	7.45
Low capacity air transport	1.21	1.19	1.24	1.3	1.41	1.74	1.65	2.15	1.67	0
General Aviation	0.25	0.28	0.25	0.36	0.4	0.5	0.38	0.44	0.43	0

[4] 2013 BITRE movement data for General Aviation and Charter (which forms part of the low capacity) operations was not available at the time of writing this report.

Figure 2: Birdstrike rate for fixed-wing aircraft (per 10,000 movements) per year by operation type, 2004 to 2013



3.2 Birdstrikes by aircraft weight

Aeroplanes (fixed-wing aircraft)

The number of birdstrikes reported to the ATSB for aeroplanes by the maximum take-off weight (MTOW) of the aircraft is shown below in Table 3 and Figure 3. Of particular note is the number of strikes encountered by aircraft with a MTOW between 27,000 and 272,000 kilograms. Typical aircraft models in this category flying in Australia range from the Bombardier Dash 8 Q400 to the Boeing 737 and Airbus A320, and include larger wide-body aircraft such as the Airbus A330. Aircraft in this weight category make up the bulk of those conducting high capacity air transport operations. This is reflected by the similarity between the 27,001 – 272,200 kg line in the graph below and the trend for high capacity air transport birdstrikes shown previously in Figure 1.

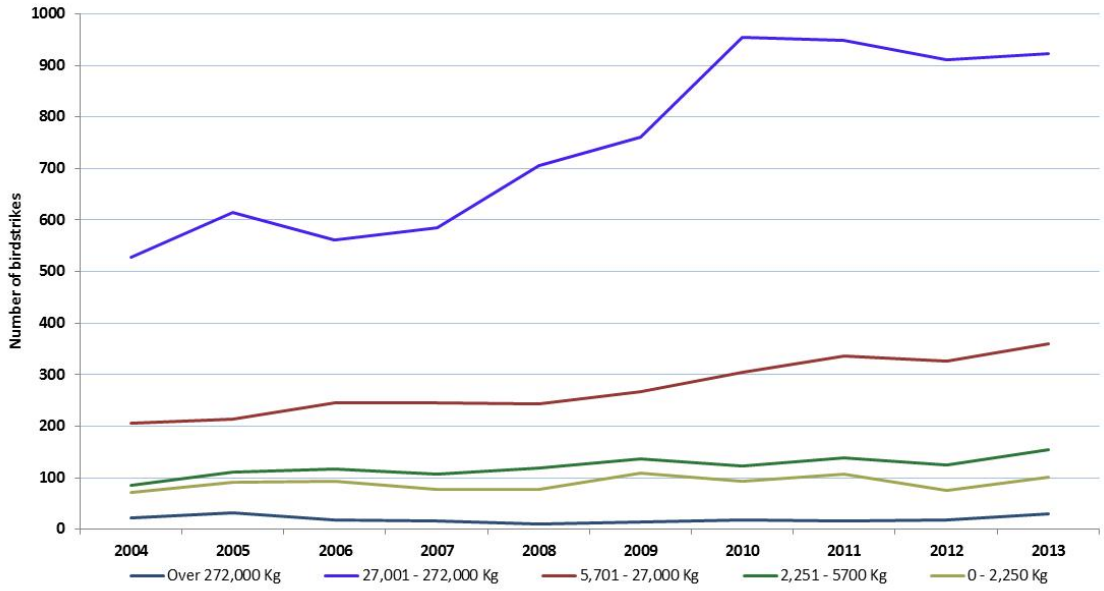
Aircraft with MTOWs between 5,701 and 27,000 kg were the second most commonly involved aircraft in reported birdstrikes, and were mostly used in low capacity air transport operations (but included some high capacity air transport). Models ranged from Fairchild Metro III aircraft through to larger aircraft such as the de Havilland Canada Dash 8 -100 /-300 series aircraft, the ATR-72 and British Aerospace Jetstream 41 aircraft, which are commonly used by regional scheduled and charter airlines in Australia.

The number of birdstrikes involving very large (generally international) aircraft (those with an MTOW above 272,000 kg) were the lowest of all the weight categories, averaging 20 per year over the 10 years. Aircraft in this weight category are generally four-engine aircraft, and include Boeing 747, the Airbus A340, and the Airbus A380 as well as the larger of the Boeing 777 series.

Table 3: Number of birdstrikes for aeroplanes per year by weight category, 2004 to 2013

Weight category	2004	2005	2006	2007	2008	2009	2010	2010	2012	2013
Over 272,000 Kg	23	31	19	17	10	15	19	17	19	29
27,001 - 272,000 Kg	527	615	561	586	705	761	955	949	912	922
5,701 - 27,000 Kg	206	213	245	245	243	267	304	337	327	360
2,251 - 5700 Kg	86	111	116	108	118	136	123	139	125	154
0 - 2,250 Kg	72	91	93	78	78	109	93	107	76	102
Total	**914**	**1,061**	**1,034**	**1,034**	**1,154**	**1,288**	**1,494**	**1,549**	**1,459**	**1,567**

Figure 3: Number of birdstrikes for aeroplanes per year by weight category, 2004 to 2013



Helicopters

The number of helicopter birdstrikes by MTOW category is shown in Table 4 and Figure 4 below. The number of birdstrikes is significantly lower for most helicopter weight categories when compared with most aeroplane groups which is a direct consequence of the difference in the number of movements between fixed-wing aircraft and helicopters. The lower number of birdstrikes generally seen for helicopters may also be due to helicopters flying at lower speeds and being easier for birds and pilots to see and avoid.

Helicopters with a MTOW between 5,701 and 27,000 kg have been involved in the most number of reported birdstrikes in both 2012 and 2013, and have continued increasing since 2010. Helicopters in this weight range would typically include Aérospatiale AS332 Super puma, Eurocopter EC225, Westland Aviation Wessex, Sikorsky S-61 and Agusta AW139.

There has been a marked increase in the number of reported birdstrikes for helicopters in both the 2,251 – 5,700 kg and less than 2,250 kg categories, doubling from 2012 to 2013 after both had been steadily decreasing since 2010. Helicopters in the 2,251 – 5,700 kg category could include

the Sikorsky S-76, Bell 412 / 212 / 205 / 407, Eurocopter AS365 and EC135. While helicopters like the Bell 206 Robinson R22 / R44, Bel 47, Aérospatiale AS350 and Hughes 269 / 369 would be found in the less than 2,250 kg category.

Although the number of helicopter birdstrikes is low, the consequences of helicopter birdstrikes are generally more severe (depending on the component struck). Therefore, the risk to the safety of flight is expected to be much higher than the number of occurrences presented would suggest (see Table 17 on page 49).

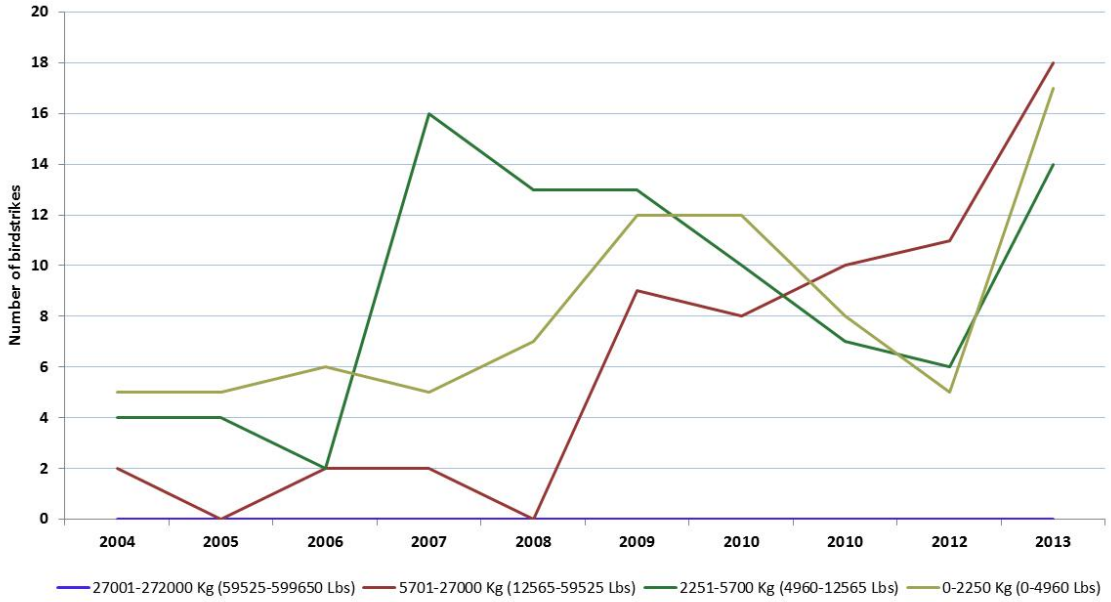
Robinson Helicopter R44 main rotor strike and precautionary landing

As the helicopter was lifted into a hover for a local joy flight from the Geelong waterfront ,Vic., a seagull struck the main rotor blades and a precautionary landing was performed. A subsequent inspection revealed minor damage on the main rotor blades (16 June 2012).

Table 4: Number of birdstrikes for helicopters per year by weight category, 2004 to 2013

Maximum weight category	2004	2005	2006	2007	2008	2009	2010	2010	2012	2013
27,001 – 272,000 kg	0	0	0	0	0	0	0	0	0	0
5,701 – 27,000 kg	2	0	2	2	0	9	8	10	11	18
2,251 – 5,700 kg	4	4	2	16	13	13	10	7	6	14
Less than 2,250 kg	5	5	6	5	7	12	12	8	5	17
Total	**11**	**9**	**10**	**23**	**20**	**34**	**30**	**25**	**22**	**49**

Figure 4: Number of birdstrikes for helicopters per year by weight category, 2004 to 2013



3.3 Birdstrikes by aircraft engine type

Aeroplanes

As the different engine types fitted to aeroplanes is highly correlated to the particular types of operations they conduct and the maximum weight of those aircraft, the relative number and rate of

birdstrikes by engine type is similar in distribution to the birdstrikes by weight category and operation type. For example, turbofan engine aircraft make up the vast majority of civil aircraft above 27,000 kg conducting high capacity air transport operations. As such, the birdstrike rate for high capacity air transport aircraft is similar to that for aircraft with a maximum weight between 27,000 kg and 272,000 kg, which is similar to the rate for turbofan engine aircraft. Other corresponding categories are:

- aeroplanes with turboprop engines, a maximum weight between 5,700 kg and 27,000 kg, and conducting low capacity air transport operations
- piston-engine aeroplanes aircraft, a maximum weight below 5,700 kg, and operating in general aviation.

A summary table showing the number of birdstrikes by engine type is presented below for aeroplanes (Table 5). The data are also shown in Figure 5

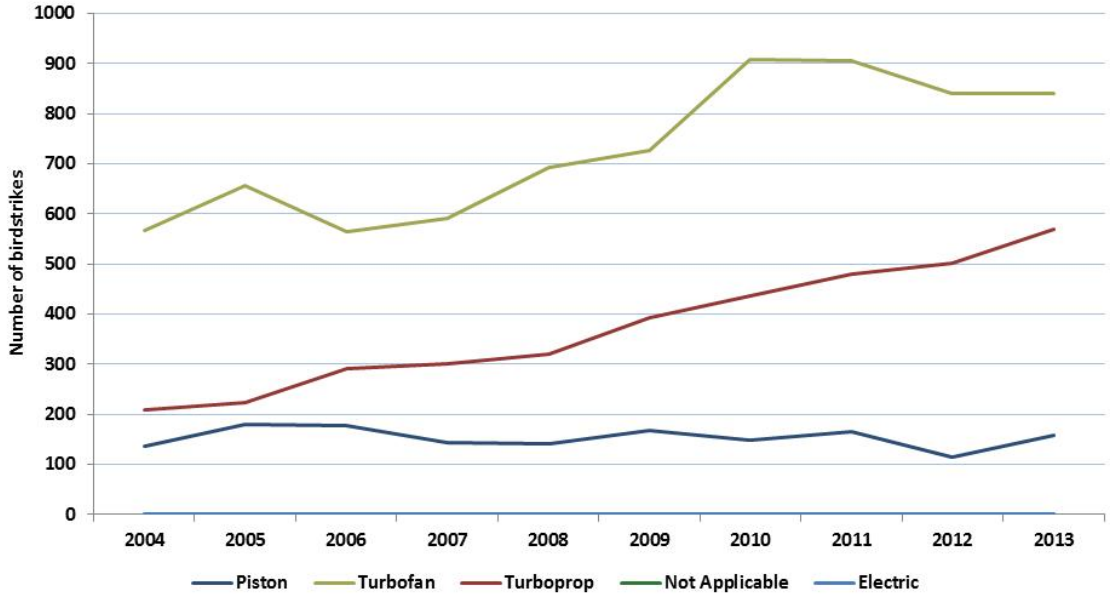
Embraer ERJ 190 engine ingestion and air return

On take-off from Karratha Aerodrome, WA a Brahminy Kite was ingested into the right turbofan engine causing engine vibrations and problems with the flaps. The aircraft was returned to Karratha. An engineering inspection revealed five stage one fan blades found with damage outside of limits and two outer guide vanes found with damage outside of limits. (6 February 2012)

Table 5: Number of fixed-wing aircraft birdstrikes per year by engine type, 2004 to 2013

Engine Type	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Turbofan	568	657	564	590	693	727	908	905	841	840
Turboprop	209	224	292	300	321	392	437	480	502	569
Piston	136	179	178	144	140	168	148	165	114	157
Not Applicable	1	0	0	0	0	0	0	0	0	1
Electric	0	0	0	0	0	0	0	0	0	1
Total	**914**	**1,060**	**1,034**	**1,034**	**1,154**	**1,287**	**1,493**	**1,550**	**1,457**	**1,568**

Figure 5: Number of birdstrikes per year by aircraft ATSB engine type (where known) for fixed wing aircraft, 2004 - 2013



Helicopters

Helicopters with turboshaft engines had a larger number of birdstrikes compared with helicopters fitted with piston engines (0.07 strikes per 10,000 movements).

In comparison with piston engine aeroplanes, turboshaft engine helicopters had a similar average strike rate in 2009 and 2010 (0.46 strikes per 10,000 helicopter movements, compared with 0.51 strikes per 10,000 movements for fixed-wing aircraft). This may be due to these more powerful (and generally larger) helicopters flying at similar speeds to general aviation aircraft, whereas piston engine helicopters are generally smaller and fly at slower speeds.

Sikorsky S-76A birdstrike at night and air return

During night vision google training near Rockhampton, Qld, the helicopter was reported to have struck a bat (likely to have been a flying fox). The helicopter was returned to Rockhampton were a post-flight inspection exposed impact damage to the underbelly and a broken search light lens (7 December 2012).

Table 6: Number of birdstrikes per year by aircraft engine type (where known) for fixed wing aircraft, 2004 - 2013

Engine Type	2004	2005	2006	2007	2008	2009	2010	2010	2012	2013
Turboshaft	10	4	8	19	17	29	27	20	18	43
Piston	1	5	2	3	3	5	3	5	4	6
Total	**11**	**9**	**10**	**22**	**20**	**34**	**30**	**25**	**22**	**49**

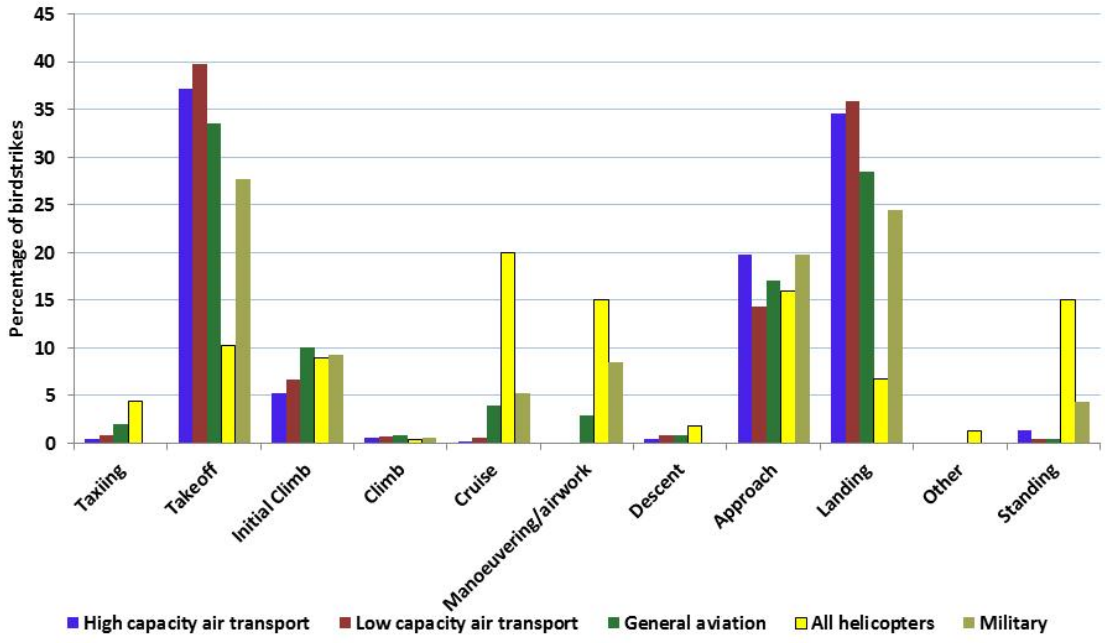
3.4 Birdstrikes by phase of flight

Figure 6 below shows the proportion of birdstrikes in each phase of flight by operation type for both aeroplanes and helicopters. Birdstrikes reported during take-off were most common for all fixed-wing aircraft (38%), followed by landing (36%), approach (18%) and initial climb (6%). This was similar for high capacity, low capacity, and general aviation aeroplanes.

Helicopters had a different distribution for phase of flight when compared with aeroplanes, with cruise, standing and approach and manoeuvring / airwork all being common times in an average flight when a birdstrike occurs. The elevated proportion of birdstrikes occurring these four phases of flight may be a result of the lower altitudes at which helicopters generally operate. While the high proportion of helicopter birdstrikes on the ground (standing) is likely to be due to birds colliding with the moving rotor blades of a stationary helicopter. The lower proportion of strikes during landing and take-off may be due to the louder and varying noise caused by helicopter rotor speed and pitch changes during these flight phases.

About 15 per cent of birdstrikes have an unknown phase of flight as the notification was based on where a carcass has been found on the runway and the aircraft that struck the bird could not be identified, or where evidence of a birdstrike is detected after the flight and was not reported after the flight (usually because the pilots were unaware of the strike occurring).

Figure 6: Proportion of birdstrikes by phase of flight (where known) and operation type, aggregated for the 2004-2013 period



Airbus A330 engine ingestion on approach

On an early morning approach into Cairns Aerodrome, Qld an Airbus A330 ingested an animal into the number one engine. The approach and subsequent landing continued unaffected. A borascope inspection of the engine recovered pieces of a flying fox.
(17 June 2013)

3.5 Birdstrikes by time of day

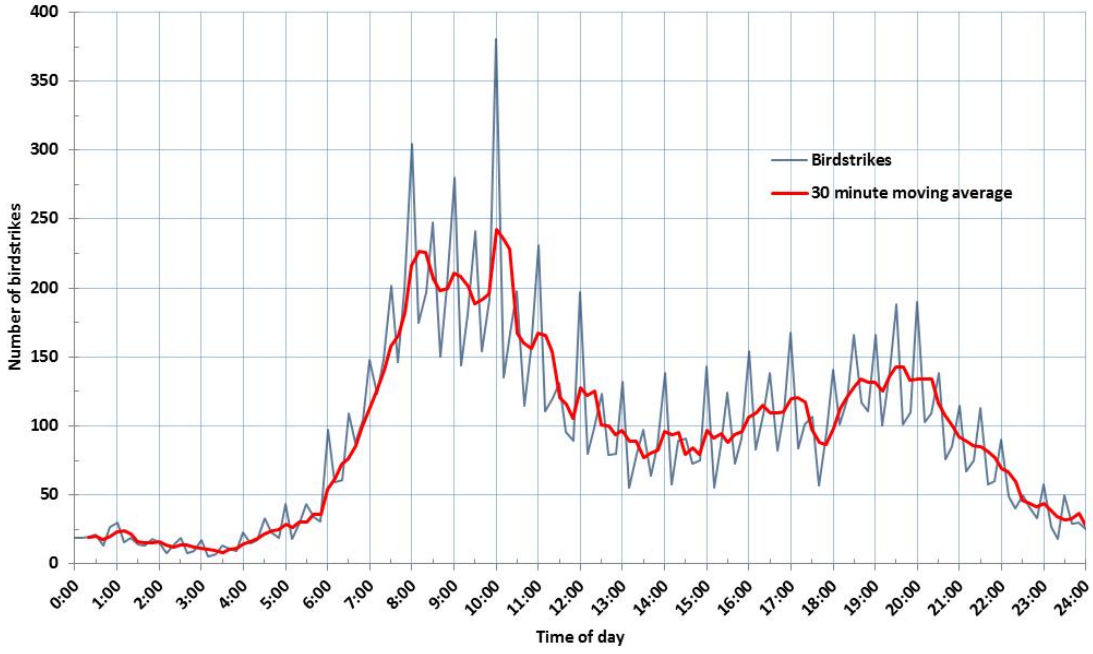
Figure 7 shows the number of birdstrikes by time of day as reported between 2004 and 2013 across Australia. The horizontal axis is set out in 24 hour time format (data shown for each 10 minute interval), with 1 hour repeating at the beginning and end of the day for the purpose of generating a 3 point (30 minute) moving average line (shown in red). This helps to remove some variation from the data.

Birdstrikes are most common across most locations between 0730 and 1030 each morning, reducing to a low strike period in the early afternoon between about 1330 to 1430. An increase in birdstrikes is seen again in the dusk and evening twilight periods between 1800 and 2000 at night, steadily reducing after this time to the lowest period in the early hours of the morning (between 0130 and 0400).

In general, the likelihood for a birdstrike is determined by the bird activity and aircraft activity in and around airports. Major airports in particular have week-day peak movement times in the mornings and evenings, which heavily influence the twin peaks seen in Figure 7.

The peak times for birdstrikes are also shown by bird species in Table 40 on page 123. Additionally, Appendix B – *Hourly birdstrikes counts and rates, 2010 - 2013* on page 77 shows the both the hourly birdstrike counts as well as the rate of birdstrikes per 10,000 movements for the ten major aerodromes. Also shown are the rates and counts for each of the top three species struck (where species is known) for these ten aerodromes. Due to a number of data anomalies and the high sensitivity of the rate at low count values, data between midnight and 2 am have been excluded.

Figure 7: Number of birdstrikes by time of day, aggregated for the 2004-2013 period



4. Birdstrikes in Australian states and territories

Across the last 10 years, the number of birdstrikes continued to rise in all states with an average 31 per cent increase in 2012 - 2013 compared with 2004 - 2011 figures. The number of birdstrikes occurring in South Australia has risen more slowly in recent years, with an increase of about 22 per cent in 2012 and 2013. Australian territorial islands (denoted in Table 7 as 'Other') have shown the most significant increase in the number of birdstrikes, with a 49 per cent increase in the last 2 years.

The 'Unknown' field in Table 7 indicates birdstrikes where it could not be determined where the strike occurred.

The number of birdstrikes in each state over the reporting period is directly related to:

- the number of aerodromes in that state
- the particular bird species and environments available, and the bird population
- the number of air traffic movements into each airport.

These factors are considered and reviewed further in later chapters

Table 7: Number of birdstrikes per year by state, 2004 to 2013

State	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
ACT	19	33	48	37	30	24	34	46	21	33	**325**
NSW	207	215	222	256	260	297	292	332	298	356	**2,735**
NT	119	156	112	115	112	162	183	166	145	212	**1,482**
QLD	368	446	396	412	454	471	590	561	516	613	**4,827**
SA	107	119	98	92	94	136	124	162	110	90	**1,132**
TAS	27	54	41	62	56	51	55	36	43	49	**474**
VIC	98	127	126	81	117	134	157	108	119	110	**1,177**
WA	114	107	159	138	124	156	152	210	256	201	**1,617**
Other	0	2	3	4	9	9	9	7	12	9	**64**
Unknown	26	19	29	61	84	70	106	123	124	96	**738**
Total	**1,085**	**1,278**	**1,234**	**1,258**	**1,340**	**1,510**	**1,702**	**1,751**	**1,644**	**1,769**	**14,571**

Figure 8 below shows the average number of birdstrikes per year from 2004 to 2013, compared with that for the last 2 years of the reporting period (2012 and 2013). Relative to the 10-year average, in the past 2 years (2012 – 2013), Tasmania had the smallest increase in birdstrikes per year, with an average increase of only 2.3 per cent in 2010 -2011.

In descending order, Australian Territorial Islands (denoted as 'Other'), Western Australia, Queensland and the Australian Capital Territory had the highest percentage increase in the last 2 years when compared with the 10-year average. It is important to note that very few birdstrikes occurred in the ACT or in the Australian Territorial Islands over the last 10 years.

Figure 8: Average birdstrikes per year by state, 2004 to 2013

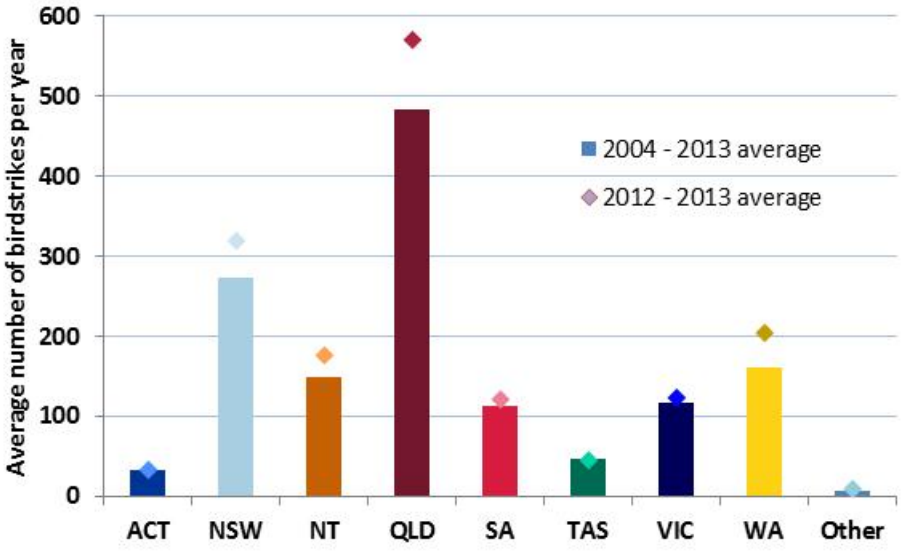
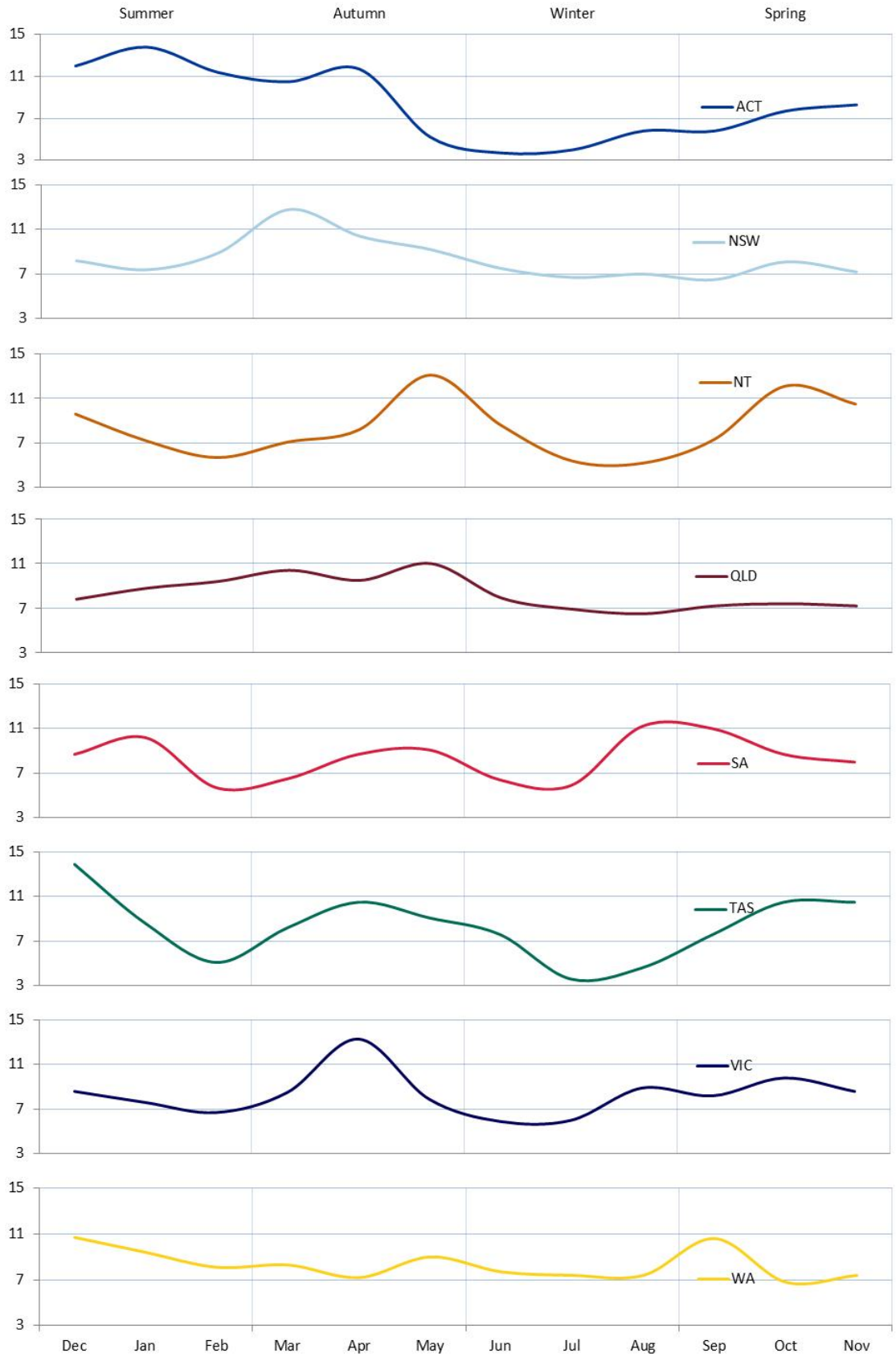


Figure 9 (below) shows birdstrikes by season and by state. Considering all states, July has the lowest number of birdstrikes on average, with only 5.5 per cent of the yearly average for the 10-year period. In comparison, almost 10 per cent occurred in both October and December. There was some variability observed across all states; however, most have one or two distinct peaks.

To provide further detail into the monthly birdstrikes across the country, aircraft movement data has been obtained for thirty aerodromes for the 10-year period between 2004 and 2013. With these data the normalised averaged monthly rate of birdstrikes for all major, regional class D and metropolitan class D aerodromes is provided in Appendix C – Hourly birdstrikes counts and rates, 2010 - 2013 on page 77. Within each of the three aerodrome groups the vertical axis scale remains constant to facilitate a qualitative comparison between similar aerodromes.

Figure 9: Percentage of total yearly reported birdstrikes occurring each month by state, averaged for the 2004 - 2013 period



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5. Birdstrikes at Australian aerodromes

This chapter reviews birdstrikes at and around Australian aerodromes for all types of aircraft, and intends to characterise the risk for operators flying into specific aerodromes (rather than attribute blame to any party).

As shown in Figure 6 on page 11, the majority of birdstrikes occur within the confines of an aerodrome, that is, within 5 km from the aerodrome or on the aerodrome. This is because birds and aircraft more commonly share the same airspace while the aircraft is on the runway for take-off and landing, and during the climb and approach phases of flight. In addition, even when pilots are not aware of a birdstrike on the ground or in the aerodrome confines, remnants of the bird will often be found and reported by aerodrome staff.

An aerodrome-specific list of birdstrikes is provided in Appendix D – *Additional birdstrike data*, showing the number of birdstrikes within the confines of the aerodrome, within 5 to 15 km of the aerodrome, and those that occurred more than 15 km away. In Appendix D, Table 31 provides this information for major aerodromes, Table 33 for metropolitan class D aerodromes, Table 32 for towered regional aerodromes, and Table 34 for other regional aerodromes with a significant number of birdstrikes.

5.1 Birdstrike numbers by aerodrome

Figure 10 shows the number of birdstrikes for the past 2 years (2012-2013) at all major aerodromes, towered regional, and metro class D aerodromes, while Figure 11 shows the numbers for other regional aerodromes with a significant number of birdstrikes (10 or more birdstrikes in the 2012 – 2013 period). Only birdstrikes that occurred within the confines of aerodromes have been included. The horizontal scale of the two figures has been held constant to enable a comparison between the two figures.

With an average of nearly 130 birdstrikes each, the major airports (except Hobart) account for the bulk of the number of birdstrikes due to the large number of aircraft movements at these aerodromes. The only other airports with more than 50 birdstrikes over the 2-year period were Townsville and Rockhampton. Aerodromes with between 30 and 50 birdstrikes over the 2-year period were Albury, Launceston, Mackay, Tamworth, Parafield, Broome, Dubbo, Port Hedland and Williamtown.

Figure 10: Number of birdstrikes (inside aerodrome confines) at major aerodromes, towered regional and metro class D aerodromes, 2012 and 2013

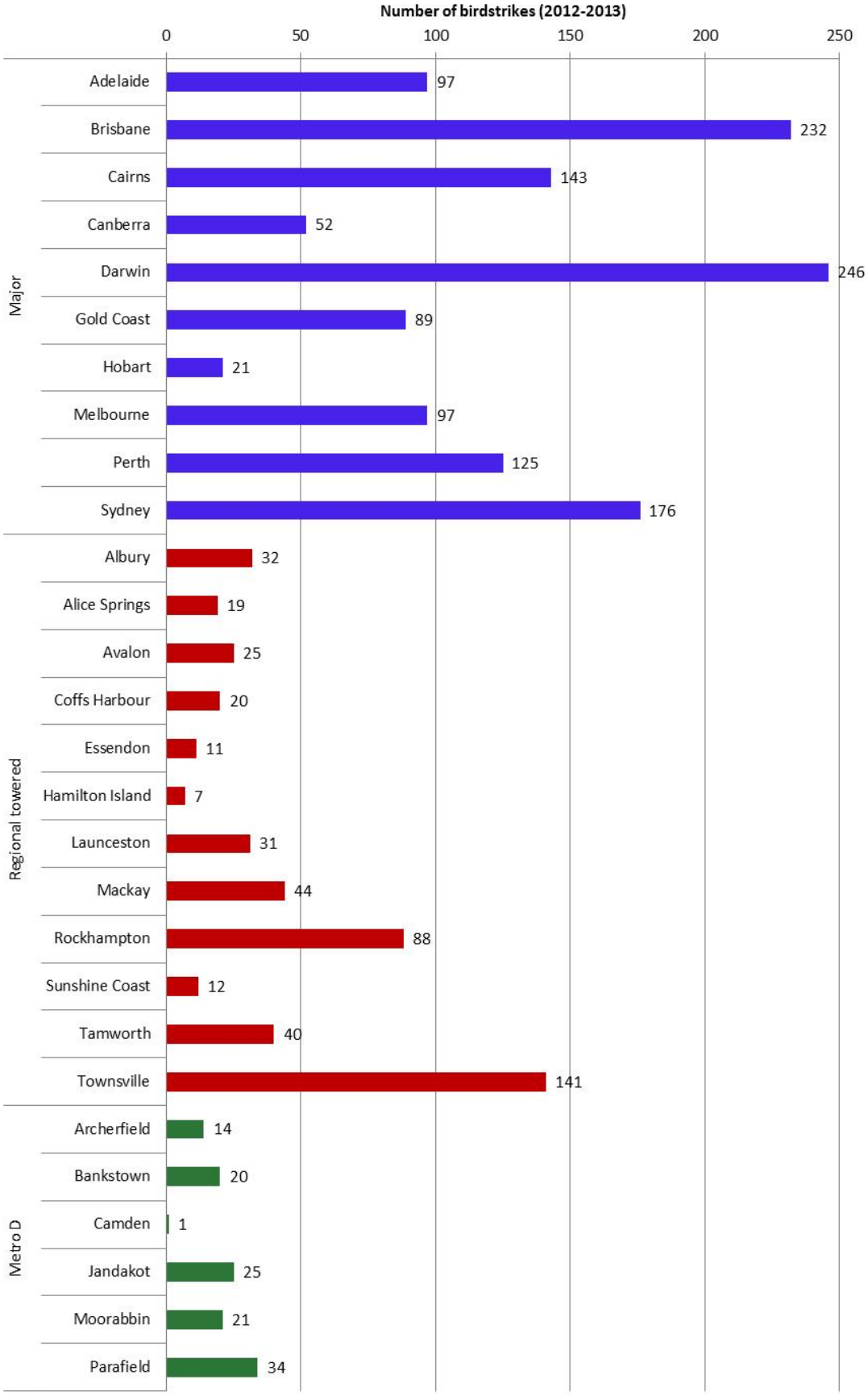
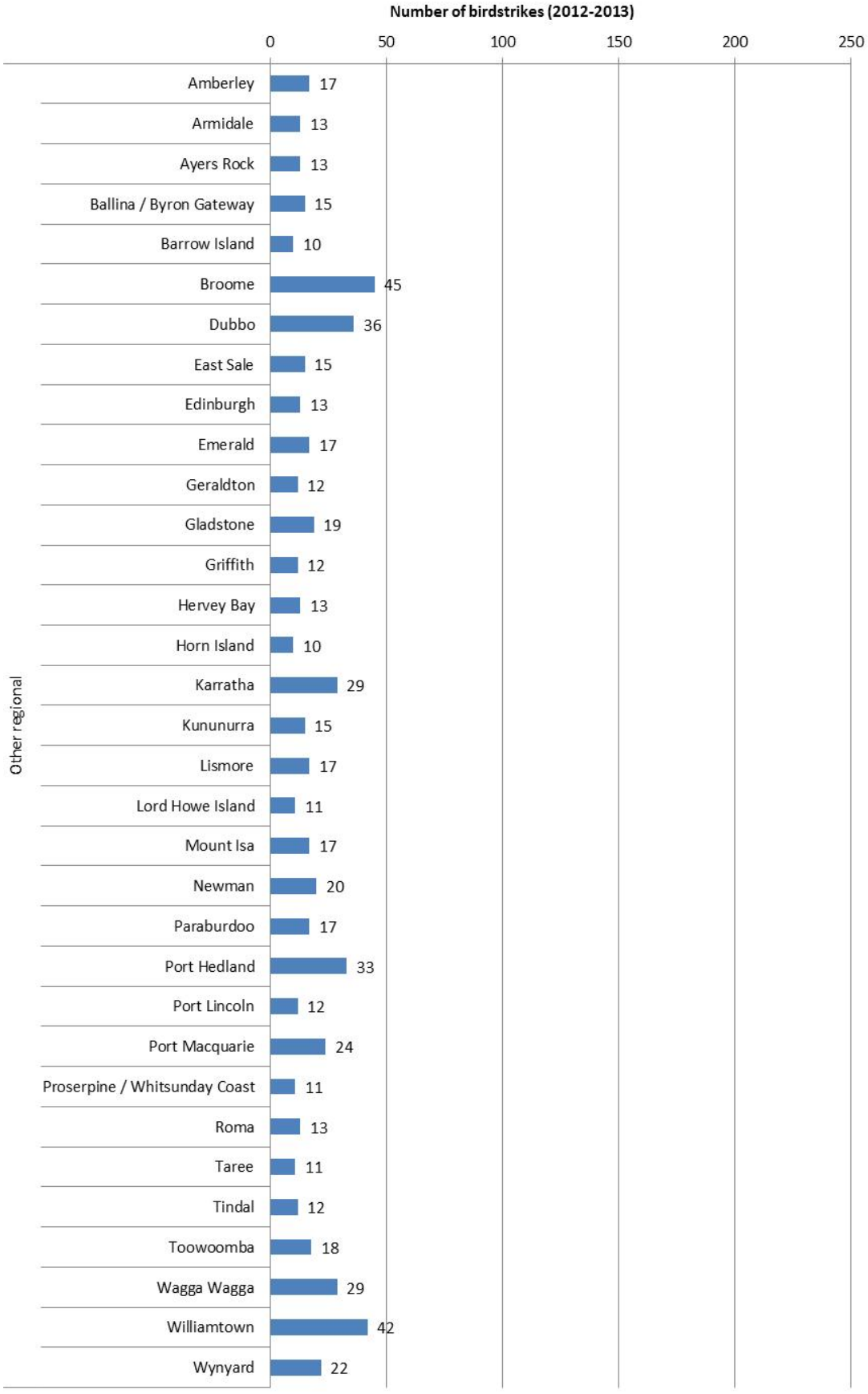


Figure 11: Number of birdstrikes (inside aerodrome confines) at other significant aerodromes, 2012 and 2013



5.2 Birdstrike rates by aerodrome

The count data from Figure 10 are normalised by movements and shown as the rate of birdstrikes per 10,000 movements for each aerodrome category in Figure 12. Major and towered regional aerodromes continue to have significantly higher rates of reported birdstrikes than metropolitan class D aerodromes. In 2012, the strike rate for towered regional aerodromes once again overtook that of the major airports, before returning to just under the major airport rate for 2013. After increasing slightly in the 2010 – 2011 period, the rates for metropolitan class D birdstrikes have decreased again, although overall they have been quite consistent over the entire 10 year period. More detail on the strike rates for individual aerodromes are shown in the following figures and tables. Only birdstrikes that occurred within the confines of aerodromes have been included.

Figure 12: Total rate of birdstrikes (inside aerodrome confines) for all aircraft per 10,000 movements, 2004 to 2013

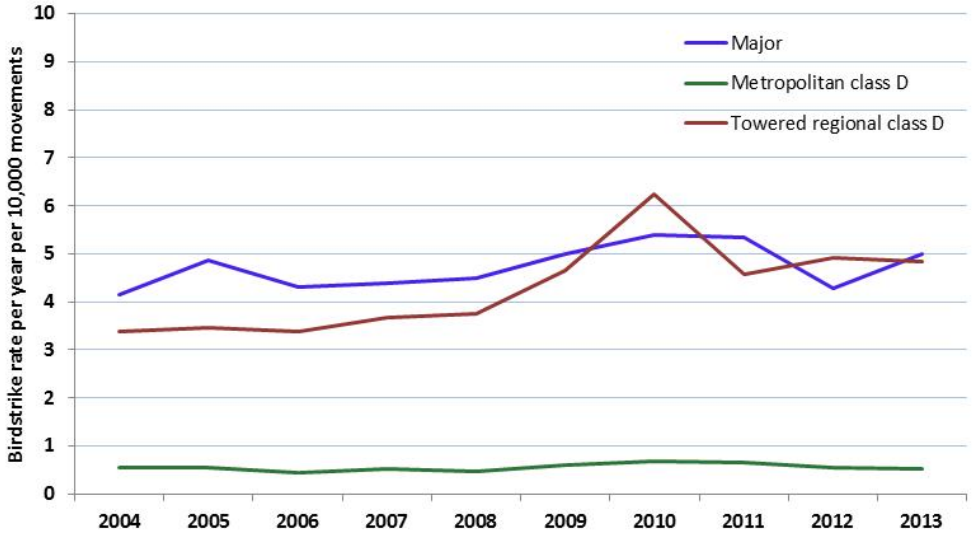


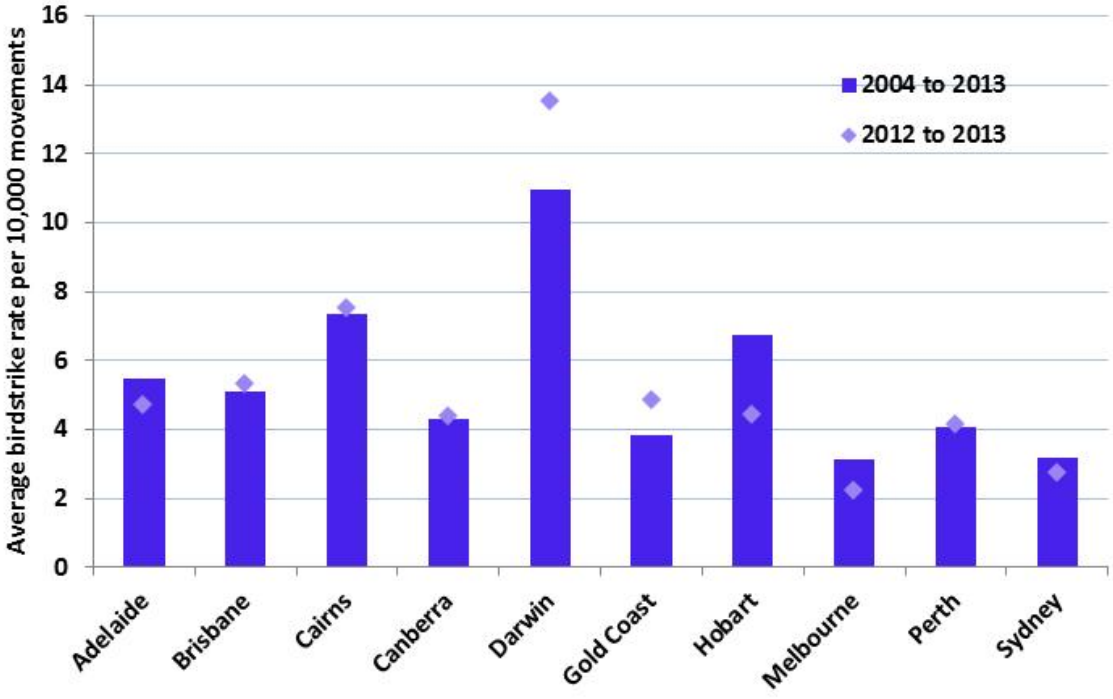
Table 8 shows the birdstrike rates for each of the ten major aerodromes between 2004 and 2013 while Figure 13 shows the ten year average (solid bars) compared with the 2012-2013 average (data points) for each major airport. The rates shown in Table 8 show considerable variation from year to year, particularly at Darwin and Hobart. Compared to the last reporting period, where it appeared there were increases across most major airports, in the most recent reporting period the reverse appears true. In the 2 years since 2011, the rates for seven (Adelaide, Brisbane, Canberra, Gold Coast, Melbourne, Perth and Sydney) of the ten major airport has actually reduced. Indeed, Adelaide, Melbourne, Perth and Sydney had lower rates in 2013 than in 2004. The largest increase in birdstrike rate was observed in Darwin, where the rate has more than doubled in the 2 years since 2011 and maintains the highest average birdstrike rate of all the major airports.

These changes are reflected in the average rates shown in Figure 13 where a reduction in recent (2012-2013) rates relative to the ten year average is observed at Adelaide, Hobart, Melbourne, Perth and Sydney. Little change is observed at Brisbane, Cairns, Canberra and Perth, while the Gold Coast and Darwin have increased.

Table 8: Rate of birdstrikes each year at major aerodromes (inside aerodrome confines) per 10,000 movements, 2004 to 2013

Aerodrome	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Average
Adelaide	5.82	5.8	5.42	4.62	4.29	7.31	5.04	7.12	5.41	4.04	**5.49**
Brisbane	3.98	4.13	4.02	4.22	6.14	5.75	5.82	6.34	5.02	5.61	**5.1**
Cairns	5.51	7.5	4.14	8.25	8.24	8.1	9.38	7.6	6.19	8.83	**7.37**
Canberra	2.32	3.88	5.45	4.59	3.34	2.56	5.01	7.09	3.47	5.25	**4.3**
Darwin	11.73	13.86	8.09	8.2	8.72	12.99	11.31	7.76	9.24	17.75	**10.96**
Gold Coast	1.71	3.73	3.86	4.55	2.25	2.4	4.69	5.27	4.76	4.94	**3.82**
Hobart	3.62	9.23	9.21	11.02	7.39	7.23	6.38	4.28	4.33	4.51	**6.72**
Melbourne	3.09	3.38	3.91	1.95	3.81	3.24	4.69	2.81	2.09	2.35	**3.13**
Perth	4.35	3.84	4.2	3.39	3.93	3.38	4.35	4.92	4.84	3.45	**4.07**
Sydney	3.11	2.95	2.59	3	2.82	3.9	3.69	4.32	2.57	2.85	**3.18**

Figure 13: Average rate of birdstrikes for major aerodromes (inside aerodrome confines) per 10,000 movements, 2004 to 2013



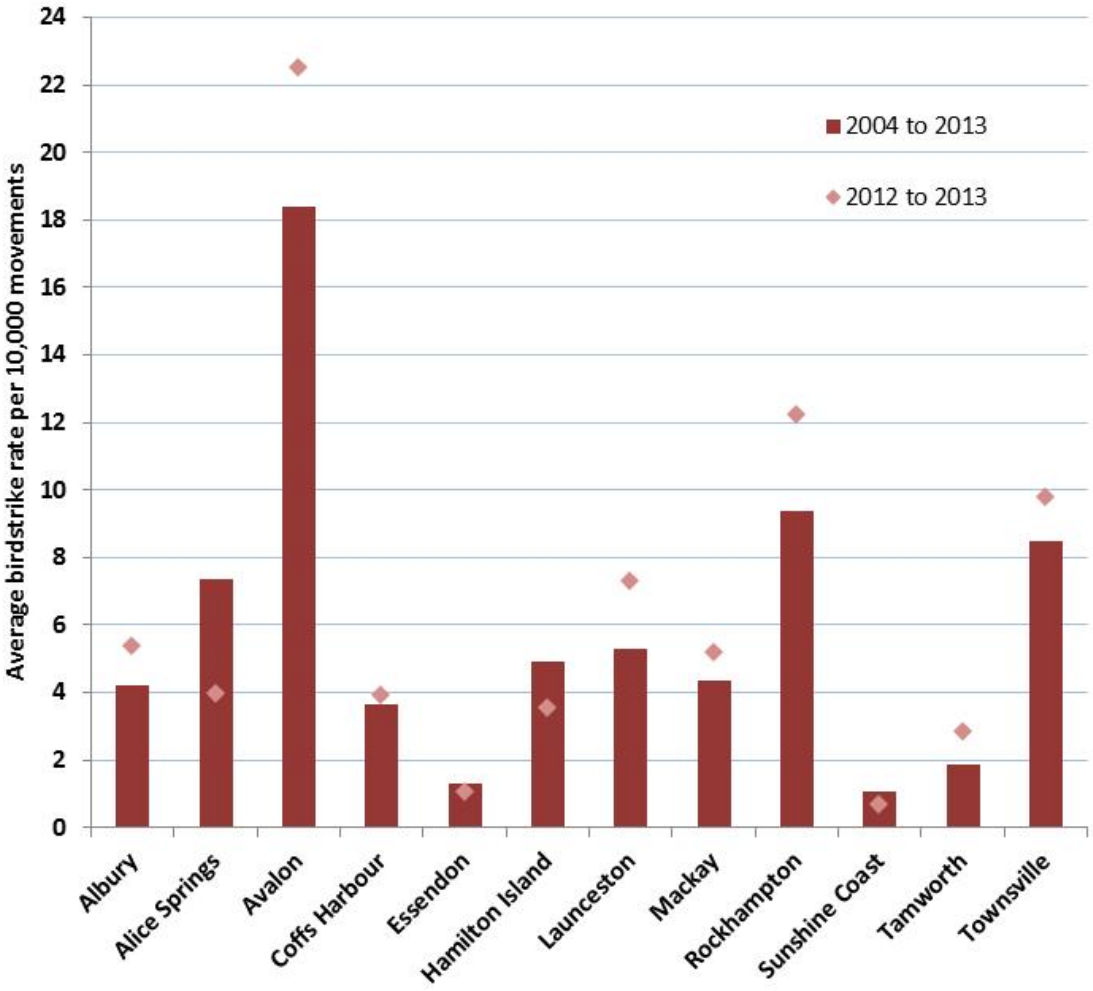
The birdstrike rate for towered regional aerodromes between 2004 and 2013 are shown in Table 9. Although the birdstrike rates have continued to increase for most aerodromes, the rate of increase has diminished, with an average increase of 0.66 birdstrikes per 10,000 movements at towered regional aerodromes for 2012 to 2013 compared with the 10-year average for all Australian aerodromes.

Table 9: Rate of birdstrikes each year at towered regional aerodromes (inside aerodrome confines) per 10,000 movements, 2004 to 2013

Aerodrome	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Average
Albury	2.83	3.32	3.07	4.83	2.88	5.95	4.37	4.06	5.02	5.65	**4.20**
Alice Springs	4.49	5.22	6.05	5.91	1.91	5.32	22.92	13.88	4.19	3.72	**7.36**
Avalon	---	---	---	7.66	8.71	25.79	24.96	16.75	36.13	8.85	**18.40**
Coffs Harbour	1.51	4.23	3.94	5.05	2.99	3.48	4.02	3.31	4.11	3.68	**3.63**
Essendon	0.84	1.36	2.03	1.12	1.52	2.03	0.94	0.94	0.95	1.14	**1.29**
Hamilton Island	3.7	6.02	6.29	6.66	4.95	4.62	4.87	5.01	1.72	5.34	**4.92**
Launceston	4.18	5.22	1.97	3.93	9.11	5.22	5.5	3.44	8.34	6.21	**5.31**
Mackay	7.3	4.32	3.15	1.96	2.41	4.43	5.03	4.4	5.55	4.81	**4.34**
Rockhampton	7.36	6.98	8.14	5.1	9.5	9.84	13.02	9.59	10.06	14.35	**9.39**
Sunshine Coast	1.19	0.85	1.18	1.97	0.78	1.14	1.58	0.69	0.52	0.85	**1.07**
Tamworth	1.08	0.88	1.69	2.06	2.67	1.51	1.61	1.5	2.89	2.75	**1.86**
Townsville	7.45	6.44	4.73	7.39	8.43	9.97	12.16	8.62	10.35	9.21	**8.47**

Figure 14 (below) shows both the 2004 – 2013 10-year average birdstrike rate (solid bars), and 2-year (2012 – 2013) average (data points) at towered regional aerodromes. All aerodromes apart from Alice Springs, Essendon, Hamilton Island and Sunshine Coast recorded increases in strike rates for 2012 to 2013 when compared with the 10-year average.

Figure 14: Average rate of birdstrikes for towered regional aerodromes (inside aerodrome confines) per 10,000 movements, 2004 to 2013



The strike rate per 10,000 movements at Avalon Airport was again the highest average of all towered regional airports with an average strike rate of 18.4 birdstrikes per 10,000 movements (since 2006 when movement data was first available). The rates have continued to increase in recent years at Avalon as shown by the increase in the two year average relative to the ten year (since 2006) set. This was driven largely by a doubling of the rate in 2012 from 16.75 strikes per 10,000 movements in 2011 to 36.13 in 2013, however, in 2013 the rate dropped by three quarters to 8.85 strikes per 10,000 movements. Other significant increases were observed at Rockhampton, Launceston and Townsville. At aerodromes with relatively low numbers of birdstrikes, the normalised rates become very sensitive to changes in counts. As shown in Figure 10 on page 17, there were only 25 birdstrikes at Avalon in the 2012 – 2013 period. Twenty of these were in 2012 while 2013 only accounted for five, and with approximately the same movements in each of these years the result is a dramatic change in the rate.

After the highest increase in rate in the previous reporting period, Alice Springs Airport has shown the most significant reduction in rate, nearly halving the ten year average of 7.36 strikes per 10,000 movements to 3.96 in the 2012 – 2013 2-year period. The rates were consistently low for both 2012 (4.14) and 2013 (3.72). Other reductions were observed at Essendon, Hamilton Island and the Sunshine Coast.

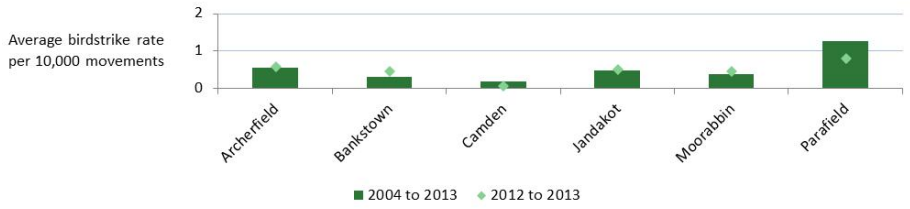
The reported birdstrike rate at metropolitan class D aerodromes remained low (Table 10), with most of these aerodromes having a 10-year average strike rate lower than that of all major and towered regional aerodromes.

Table 10: Rate of birdstrikes each year at metropolitan class D aerodromes (inside aerodrome confines) per 10,000 movements, 2004 to 2013

Aerodrome	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Average
Archerfield	0.16	0.28	0.31	0.51	0.51	1.36	0.76	0.59	0.23	0.89	**0.56**
Bankstown	0.26	0.25	0.16	0.23	0.36	0.37	0.25	0.21	0.3	0.6	**0.30**
Camden	0	0	0.44	0.8	0.36	0	0.12	0	0	0.11	**0.18**
Jandakot	0.67	0.4	0.69	0.55	0.11	0.22	0.63	0.53	0.66	0.33	**0.48**
Moorabbin	0.44	0.45	0.21	0.29	0.31	0.45	0.48	0.31	0.46	0.44	**0.38**
Parafield	1.38	1.58	0.72	1.16	1.35	1.31	1.66	1.84	0.91	0.66	**1.26**

Although Parafield Airport again had the highest strike rate of all metropolitan class D aerodromes, with an average strike rate of 1.26 strikes per 10,000 movements between 2004 and 2013, the 2-year average between 2012 and 2013 has decreased to 0.79 strikes per 10,000 movements (Figure 15). The rate of birdstrikes at Bankstown, Jandakot and Moorabbin Airports have all increased slightly in recent years, although they are relatively low when compared with other regional and metropolitan Australian locations.

Figure 15: Average rate of birdstrikes for metropolitan class D aerodromes (inside aerodrome confines) per 10,000 movements, 2004 to 2013

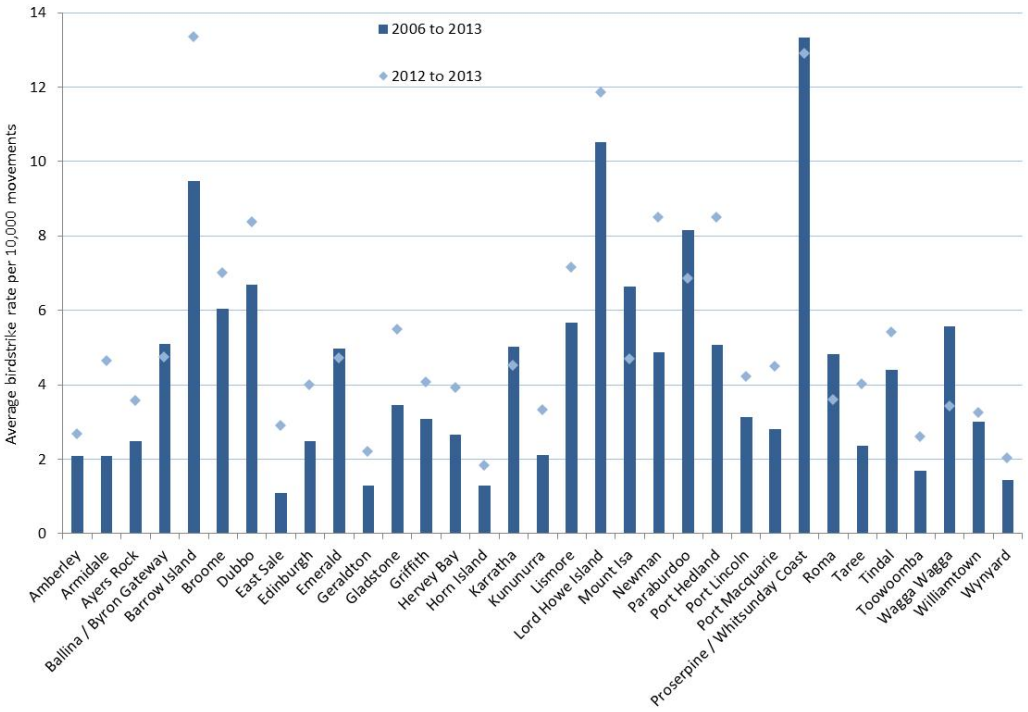


The yearly rates of birdstrikes for the other significant aerodromes are shown in Table 11, while the average rates are shown in Figure 18. The aircraft movements data for these aerodromes was only available from 2006, limiting the year range over which rates can be calculated. Thus, the averages shown in Figure 16 are a comparison between the most recent two years (2012 to 2013) and the entire eight years (2006 to 2013).Proserpine / Whitsunday Coast, Lord Howe Island and Barrow Island all had had the highest rates respectively. The numbers of birdstrikes at these locations were by no means the highest in this group, with 50, 38 and 22 birdstrikes respectively for the eight year period. However, these three aerodromes do have the lowest number of aircraft movements in the group, which has driven up the rates for these aerodromes.

Table 11: Rate of birdstrikes each year at the other significant aerodromes (inside aerodrome confines) per 10,000 movements, 2006 to 2013

Aerodrome	2006	2007	2008	2009	2010	2011	2012	2013	Average
Amberley	0.00	0.36	0.00	1.58	7.69	1.81	2.48	2.86	2.10
Armidale	0.36	0.00	0.75	3.39	1.46	1.40	4.34	4.95	2.08
Ayers Rock	1.59	2.11	1.06	0.55	1.09	6.42	5.41	1.72	2.49
Ballina / Byron Gateway	1.84	7.14	5.65	3.92	5.64	7.18	5.32	4.16	5.11
Barrow Island	11.11	0.00	0.00	9.09	7.69	21.21	22.22	4.44	9.47
Broome	2.99	7.09	5.65	2.96	10.83	4.87	5.23	8.79	6.05
Dubbo	2.65	6.46	12.12	3.77	6.39	5.32	7.06	9.68	6.68
East Sale	0.00	0.33	0.00	0.35	0.00	2.28	2.29	3.52	1.10
Edinburgh	0.00	2.39	1.29	0.00	3.80	4.36	2.46	5.51	2.48
Emerald	3.41	9.00	5.86	1.57	7.15	3.30	3.57	5.85	4.96
Geraldton	1.68	0.49	0.00	0.95	1.62	1.17	2.94	1.48	1.29
Gladstone	2.20	0.91	0.00	1.98	8.82	2.76	4.09	6.88	3.45
Griffith	1.45	2.67	0.90	2.48	2.05	6.97	3.72	4.41	3.08
Hervey Bay	1.23	1.45	1.96	2.61	5.59	0.64	5.42	2.40	2.66
Horn Island	0.44	0.81	1.23	1.27	2.22	0.69	1.39	2.25	1.29
Karratha	5.28	2.71	1.91	11.24	3.15	6.85	5.24	3.79	5.02
Kununurra	0.44	0.79	2.76	2.01	2.81	1.51	4.67	1.96	2.12
Lismore	3.19	10.61	2.30	5.19	3.11	6.60	5.55	8.76	5.66
Lord Howe Island	7.14	15.91	13.04	8.89	15.56	0.00	10.64	13.04	10.53
Mount Isa	3.18	4.27	6.31	9.76	7.65	12.57	6.56	2.79	6.64
Newman	1.42	1.52	1.95	6.93	1.22	8.90	7.57	9.44	4.87
Paraburdoo	0.00	3.96	21.62	6.03	11.90	8.00	7.57	6.12	8.15
Port Hedland	5.00	1.09	1.00	6.22	3.51	6.69	11.39	5.58	5.06
Port Lincoln	2.79	0.74	6.59	4.51	0.67	1.39	1.31	7.12	3.14
Port Macquarie	1.27	0.00	1.42	1.37	5.73	3.75	3.63	5.37	2.82
Proserpine / Whitsunday Coast	8.78	8.71	14.67	13.21	25.70	9.80	11.51	14.27	13.33
Roma	0.00	3.21	10.77	3.36	8.73	5.26	1.30	5.86	4.81
Taree	0.00	1.35	2.61	2.68	1.41	2.78	2.84	5.19	2.36
Tindal	1.98	2.09	0.00	6.85	8.43	4.94	6.93	3.89	4.39
Toowoomba	0.00	0.54	1.55	2.75	1.96	1.43	1.63	3.58	1.68
Wagga Wagga	3.32	6.23	7.18	8.18	5.42	7.30	2.12	4.70	5.56
Williamtown	2.58	3.21	2.81	4.17	2.50	2.36	3.35	3.15	3.01
Wynyard	1.07	1.24	1.42	0.96	2.15	0.75	1.43	2.60	1.45

Figure 16: Average rate of birdstrikes for the other significant aerodromes (inside aerodrome confines) per 10,000 movements, 2006 to 2013

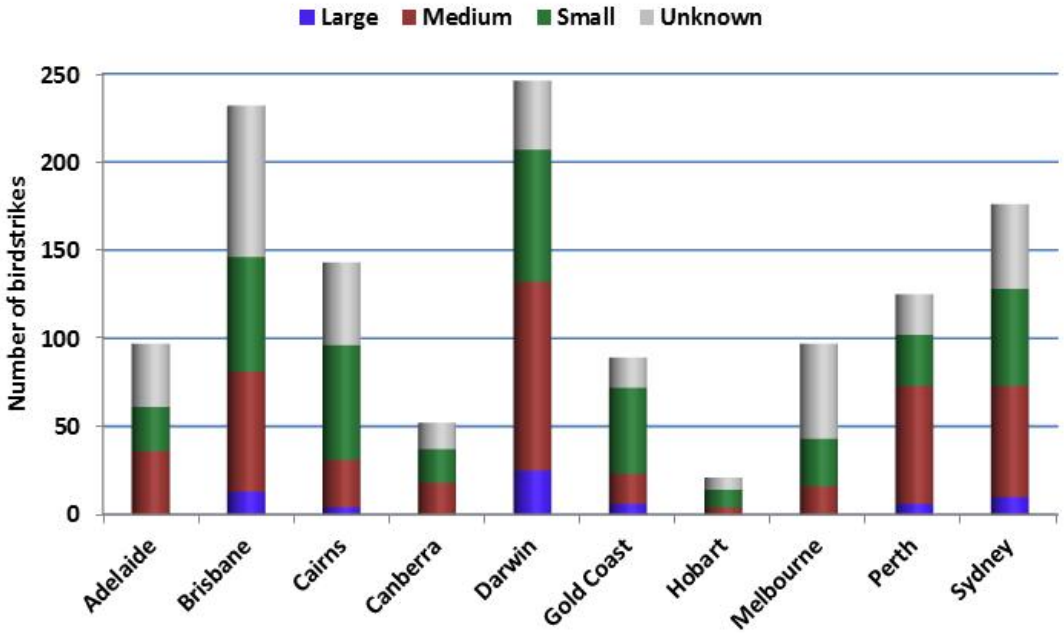


5.3 Birdstrikes at aerodromes by bird size

The figures below show the number of birdstrikes by the size of bird struck at major, regional towered, metropolitan class D, and other significant aerodromes during 2012 and 2013. As there are more birdstrikes reported at major airports than regional airports, the figures are not to the same scale. This has been done so that the bird size proportions are more visible.

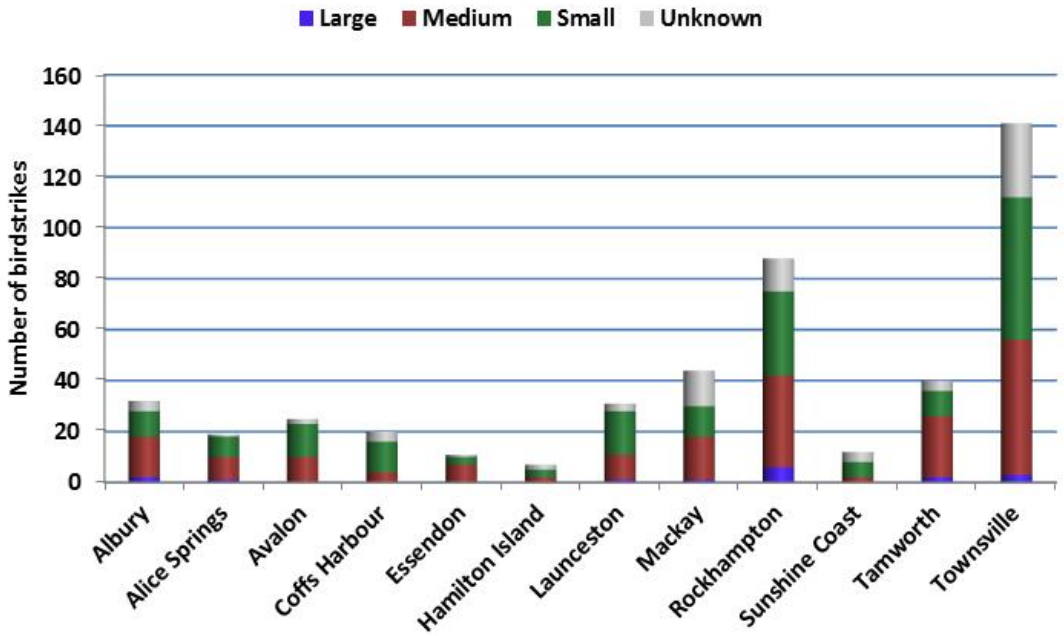
Figure 17 shows that large birds are mostly struck by aircraft operating in the vicinity of Brisbane, Sydney, and Darwin Airports, although medium and small birds were most commonly struck at all airports.

Figure 17: Birdstrikes at major airports (aerodrome confines only) by bird size for the 2012-2013 period



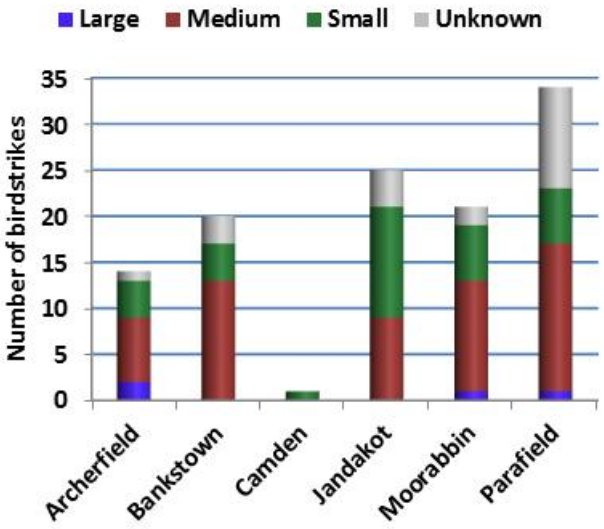
Of the towered regional airports (Figure 18), Rockhampton had the largest proportion of strikes involving large birds in 2012 and 2013, with Townsville, Albury and Tamworth the only other to have more than one case of aircraft striking large birds.

Figure 18: Birdstrikes at towered regional class D airports (aerodrome confines only) by bird size for the 2012-2013 period



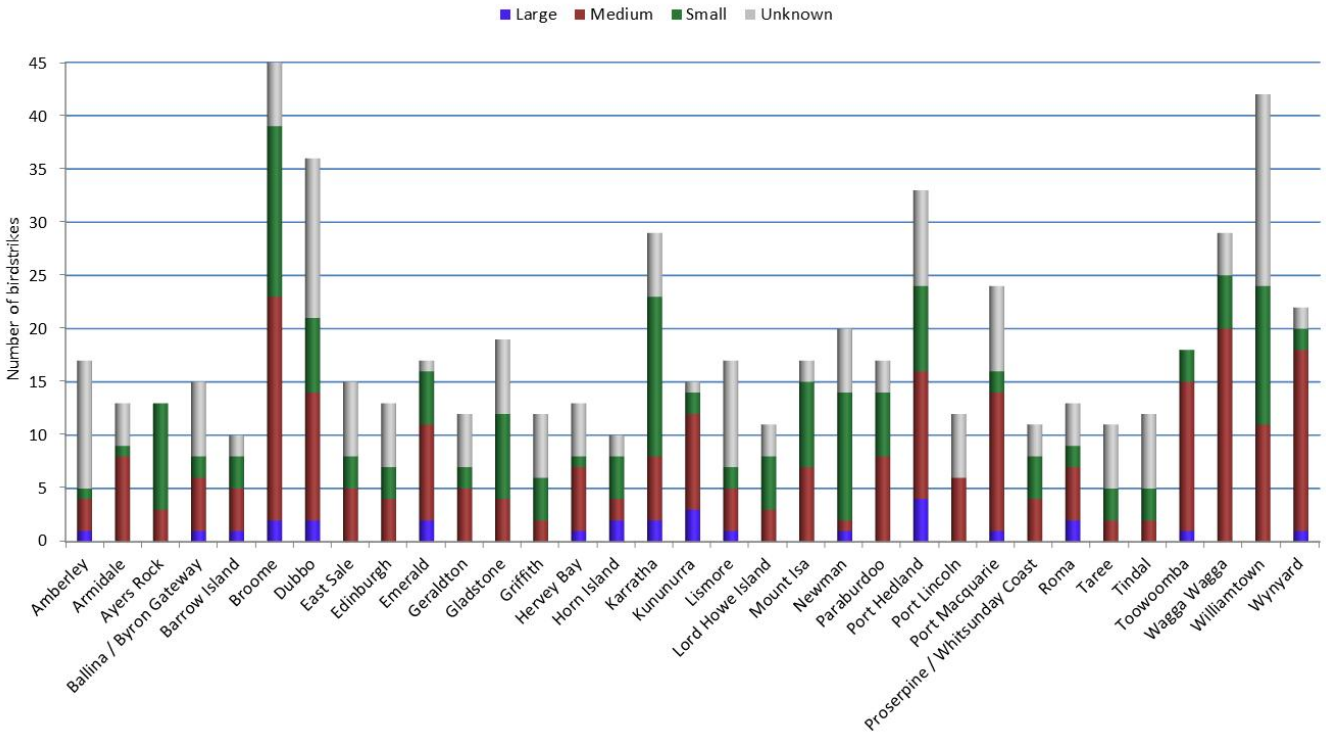
At metropolitan class D airports, Parafield Airport had the largest number (Figure 19) and rate (Figure 15) of birdstrikes with the majority of birdstrikes arising from medium sized birds, in particular galahs. There was one large birdstrike reported for Parafield Airport, involving a pelican, in this time period. Although Archerfield had the second lowest total number of reported birdstrikes in 2012 and 2013, it did have the highest proportion of large birdstrikes, with two strikes of Ibis.

Figure 19: Birdstrikes at metropolitan class D airports (aerodrome confines only) by bird size for the 2012-2013 period



At regional aerodromes (Figure 20), Port Hedland Airport had a larger proportion of birdstrikes involving large birds when compared with other significant regional airports. Wagga Wagga had a vast majority of bird strikes involving medium-sized birds, and Broome Airport had the most reported birdstrikes at regional airports involving small birds.

Figure 20: Birdstrikes at other significant regional aerodromes (aerodrome confines only) by bird size for the 2012-2013 period



5.4 Risk analysis – event risk classification

The ATSB assesses the probable level of safety risk associated with each reported safety occurrence, considering the circumstances of the occurrence at the time it happened.[5] The safety risk of occurrences is assessed using a modified version of the Aviation Risk Management Solutions (ARMS) ERC framework.[6] This framework bases the safety risk on the most credible potential accident outcome that could have eventuated, and the effectiveness of the remaining defences that stood between the occurrence and that outcome. The intention of this assessment is to determine if there was a credible risk of injury to passengers, crew, and the public or damage to the aircraft.

The ERC framework is used to determine whether an occurrence could pose a low, medium, high, or very high risk to the safety of people, property and aircraft. It is not necessarily based on the actual outcome of the reported incident, but rather, what could have happened. The risk that is credibly posed by an occurrence is determined by answering two questions:

- If this event had escalated into an accident, what would have been the most credible accident outcome?
- What was the effectiveness of the remaining barriers between this event and the most credible accident outcome?

Most birdstrike occurrences pose a low risk to the safety of aircraft and passengers, where there is no potential for an accident outcome. In fact, there are generally many good defences in place that keep the safety of flight risk associated with these occurrences low. However, some birdstrike occurrences have the potential of resulting in either personal injury, particularly when the occurrence involves larger birds and/or multiple birds, and in cases where a bird penetrates the windshield or damages the aircraft, particularly in cases of an engine ingestion.

Very few of the 14,571 birdstrike occurrences reported to the ATSB between 2004 and 2013 posed any likely injury risk. As shown in Figure 21, the vast majority (98.7%) of birdstrikes over the 10-year period were assessed using the ERC framework as being low risk occurrences, while 187 (1.28%) were assessed as being medium risk. Less visible in Figure 21 are the four (0.03%) high risk occurrence, two in 2005 and one each in 2007 and 2008. Summaries of these four high risk occurrences are provided below. There were no birdstrike occurrences reported to the ATSB between 2004 and 2013 that were assessed by the ATSBs ERC framework as being very high risk occurrences.

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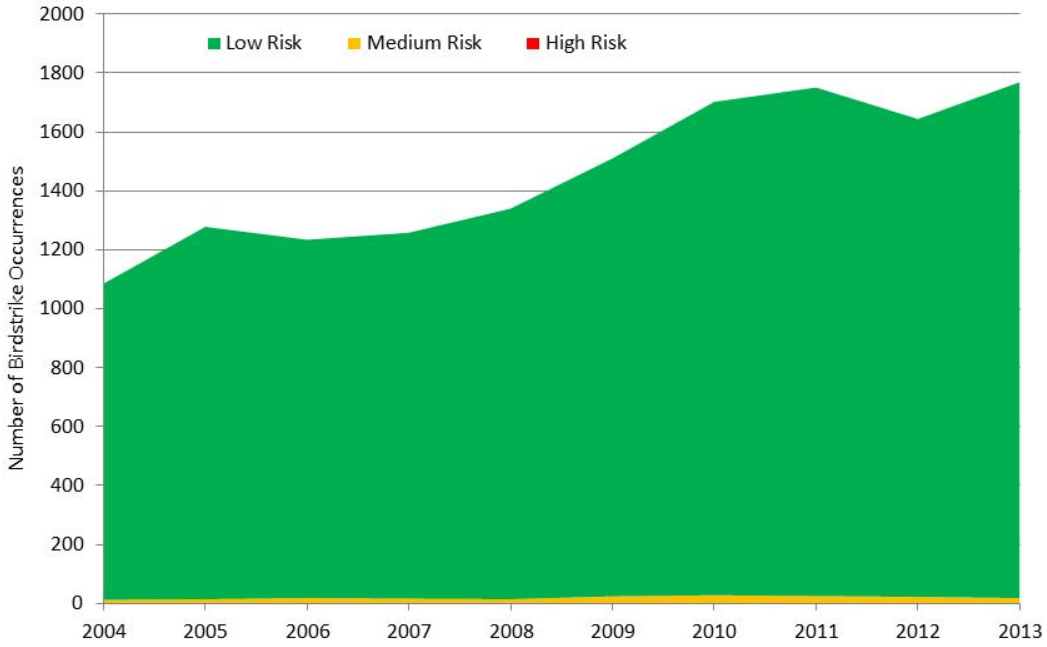
[5] The Event Risk Classification (ERC) methodology is used by the ATSB to make assessments of the safety risk associated with occurrences. For more information on how the ATSB uses occurrence and investigation data to drive proactive safety improvements, see Godley, 2012.

[6] The methodology is from the report *The ARMS Methodology for Operational Risk Assessment in Aviation Organisations* (version 4.1, March 2010). ARMS is an industry working group set up 2007 in order to develop a new and better methodology for Operational Risk Assessments. It is a non-political, non-profit working group, with a mission to produce a good risk assessment methodology for the industry. The results are freely available to the whole industry and to anyone else interested in the concept.

Figure 21: Number of birdstrikes per year by risk category, 2004-2013



Birdstrike occurrences assessed with medium ratings were generally a result of small aircraft hitting large birds (148 of 187), or less commonly, birds hitting the tail rotors of helicopters (16 of 187). Other factors that can elevate the risk rating of a birdstrike occurrence are: if the strike resulted in a partial, or total loss of power, if a forced or precautionary landing was required, if a take-off had to be rejected, if there was any collision with terrain or ground strike subsequent to the birdstrike, or whether the pilot was incapacitated by a strike through the windshield.

Only four occurrences associated with birdstrikes were reported between 2004 and 2013 where the ATSB assessed that there was a high risk to safety using the ERC framework. All involved helicopters and all were associated with a loss of control and subsequent collision with terrain.

Eagle strike with tail rotor leading to loss of control and collision with terrain

During cattle mustering operations in February 2005, the helicopter's (Schweizer 269) tail rotor struck an eagle. The pilot lost control and the helicopter crashed into a heavily timbered area. The pilot received minor injuries but the helicopter was destroyed.

Robinson R22 birdstrike with tail rotor

In August of 2005, a Robinson R22 helicopter was being operated on a private photographic survey flight when the pilot reported hearing a loud bang, followed by increasing vibration and a loss of main rotor power. The pilot immediately initiated autorotation and descended to a landing, during which, control of the helicopter was lost and it rolled onto its side. There were no reported injuries. Upon examination of the helicopter at the accident site, the owner's representative reported damage to the tail rotor and drive assembly, with evidence of the tail rotor having struck a large bird. Damage to the tail rotor gearbox mountings and dislodgement of the clutch wheel drive belts was noted.

Robinson R22 birdstrike with multiple Galahs

In June 2007, during mustering operations, a Robinson R22 helicopter struck a flock of galahs resulting in a severe tail rotor vibration. The pilot completed a forced landing into a swamp during which the helicopter rolled to the left causing the main rotor blades to strike the ground.

Robinson R22 birdstrike with tail rotor

During the approach at about 45 feet a loud bang was heard as a bird flew into the tail rotor. The pilot lost control of the Robinson R22 helicopter and crashed into a river. The helicopter was destroyed

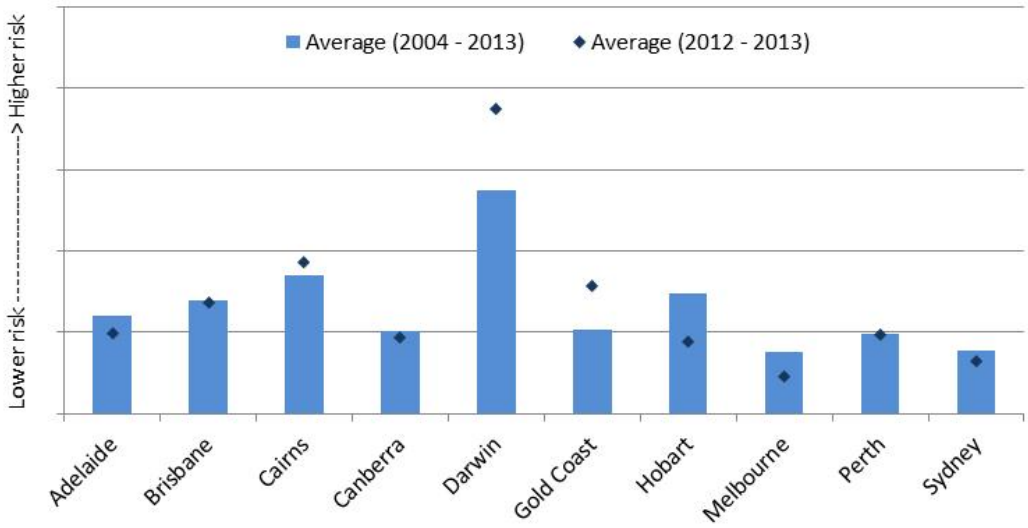
An example of a Robinson R22, a helicopter type commonly used for mustering operations in Australia. Source: www.abc.net.au

In addition to the risk level (low, medium, high, very high) the ERC also designates a risk rating score which gives greater fidelity within each risk level. For example, occurrences with a risk rating between 1 and 10 are assessed as minor risk, between 20 and 250 as medium risk, between 500 and 503 as high risk and between 2,500 and 12,500 as very high risk. Thus, rather than considering the risk levels of individual occurrences, another way of using the ERC is to consider the sum-of-risk, that is, the sum of each individual risk rating score. In this way we can compare the sum of risk for birdstrike occurrences either at one location for different time periods or between airports.

Figure 22 to Figure 24 show the average sum of risk for the 10 years between 2004 and 2013 (solid bars) and the last 2 years (2012 – 2013) (data points), for major airports (Figure 22), towered regional class D airports (Figure 23), and metropolitan class D airports (Figure 24). In all cases the sum of risk has been normalised by aircraft movements to show the average sum of risk per 10,000 movements. The absolute value of the sum of risk has no real world meaning; rather, it is intended to provide a qualitative (descriptive) comparison of the risk between two different locations. Hence the vertical axes of Figure 22 to Figure 24 have no units, they are, however, displayed on the same risk rating scale to enable a relative comparison of airports between all three graphs.

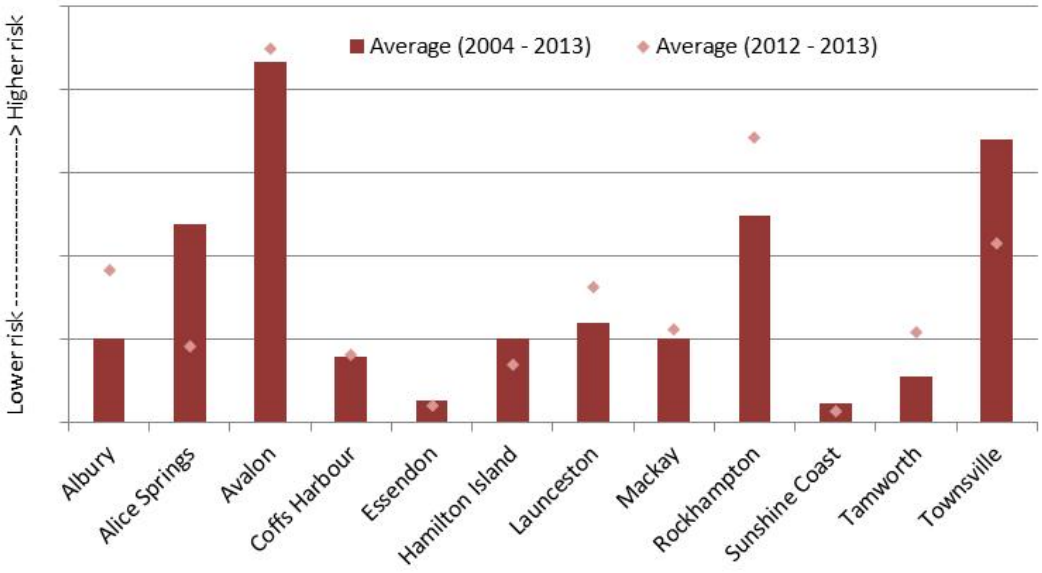
Figure 22 shows the sum of risk per 10,000 movements for the ten major airports. With most birdstrike occurrences assessed as low risk, that is, with risk rating scores below ten, the data in Figure 22 is driven largely by the rate of occurrences. There are therefore, strong similarities with this figure and Figure 13 which shows the normalised rate of occurrences. Indeed, if every occurrence had a risk rating of one, the two graphs would be identical. For example, Figure 22 shows that the relative risk at Darwin airport has increased in recent years, and Figure 13 shows that this increased risk is a result of the increased rate of occurrences, whereas if the rate was constant (or reduced) with the risk increasing, it would have implied that the types of birdstrike occurrences had changed in recent years, for example, with larger birds being struck. Conversely, it can be sees from Figure 13 that there is a higher rate of birdstrike occurrences at Adelaide than Brisbane, whereas Figure 22 shows that risk is actually higher in Brisbane. This is due to the types (size) of birds being struck; the 66 large birds struck at Brisbane poses a greater hazard than the 3 struck at Adelaide.

Figure 22: Average sum of risk per 10,000 movements for birdstrikes at major airports (inside aerodrome confines)



There are similar consistencies between Figure 14 and Figure 23 which show the normalised rate and sum of risk for towered regional class D airports respectively. The only notable difference between the two figures in shown by Townsville, which despite having an increased rate of birdstrikes in the most recent two years (2012 – 2013) (Figure 14), has actually had a decrease in the average sum of risk for the same time period (Figure 23). This recent reduction in average sum of risk may in part be due to a recent decline in the number of large birds being struck at Townsville; as shown in Figure 18, there were only three large birds reported as being struck between 2012 and 2013, compared with 12 in the previous two years (shown in the same figure from the previous report AR-2012-031).

Figure 23: Average sum of risk per 10,000 movements for birdstrikes at towered regional class D airports (inside aerodrome confines)



When comparing Figure 15 with Figure 13 and Figure 14 (which are on the same vertical scale) it is clear that the rates of birdstrikes at metropolitan class D airports are significantly lower than for either the major or towered regional class D airports. This low rate of birdstrikes is reflected in the low average sum of risk for metropolitan class D airports shown in Figure 24. Similarly, when comparing Figure 24 with Figure 22 and Figure 23, which are also presented with the same vertical scale, it is clear that there is a significantly lower relative risk of birdstrikes at these locations.

Figure 24: Average sum of risk per 10,000 movements for birdstrikes at metropolitan class D airports (inside aerodrome confines)

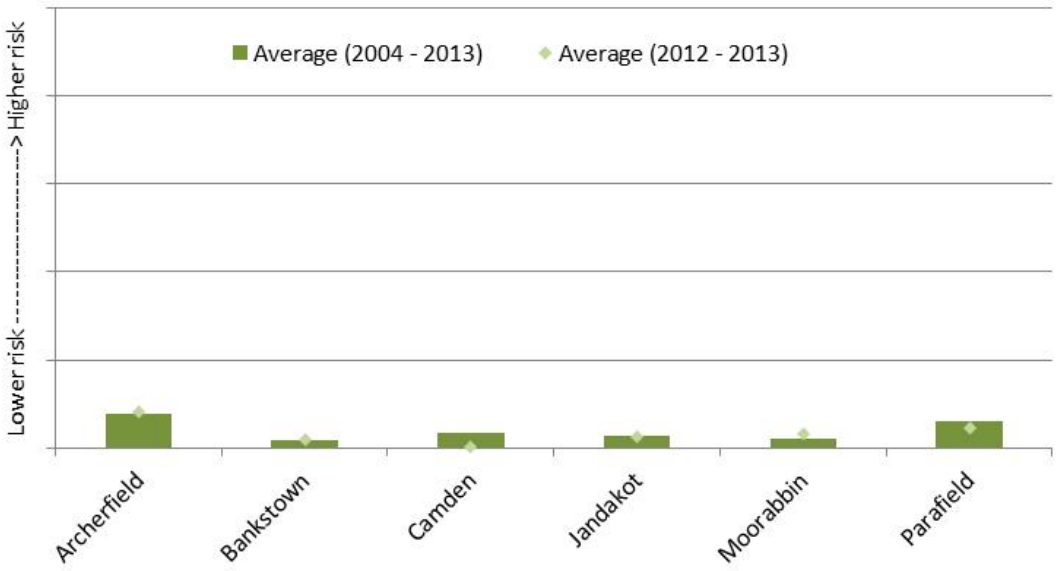
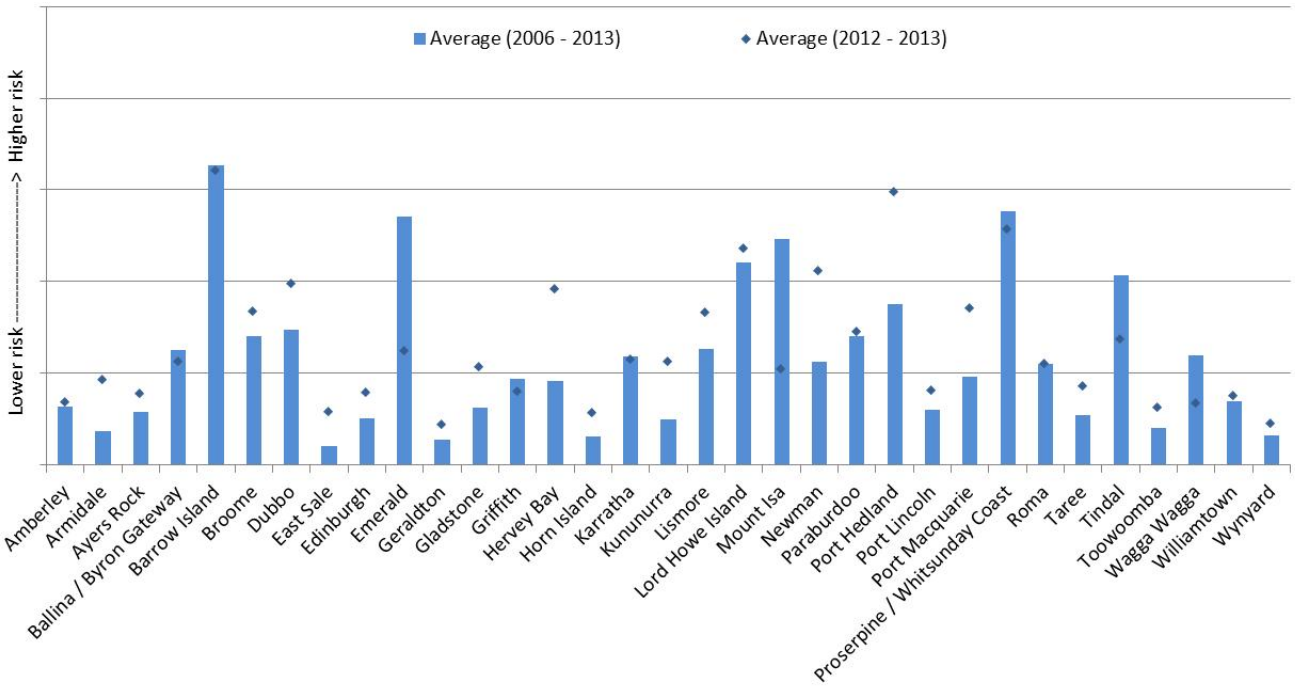


Figure 25 shows the average sum of risk per 10,000 movements for birdstrikes at other significant regional aerodromes. Comparing with the rates shown in Figure 16 one notable difference is observed at Emerald, which had a relatively average rate of birdstrikes but has the second highest sum of risk. The sum of risk at Emerald is dominated by a single occurrence (contributing to over half the total sum of risk) involving an agricultural aircraft that struck an Australian Bustard on take-off causing the aircraft to lose control and crash into a fence resulting in significant damage to the aircraft.

Figure 25: Average sum of risk per 10,000 movements for birdstrikes at other significant regional aerodromes (inside aerodrome confines)



6. Significant Australian birdstrikes

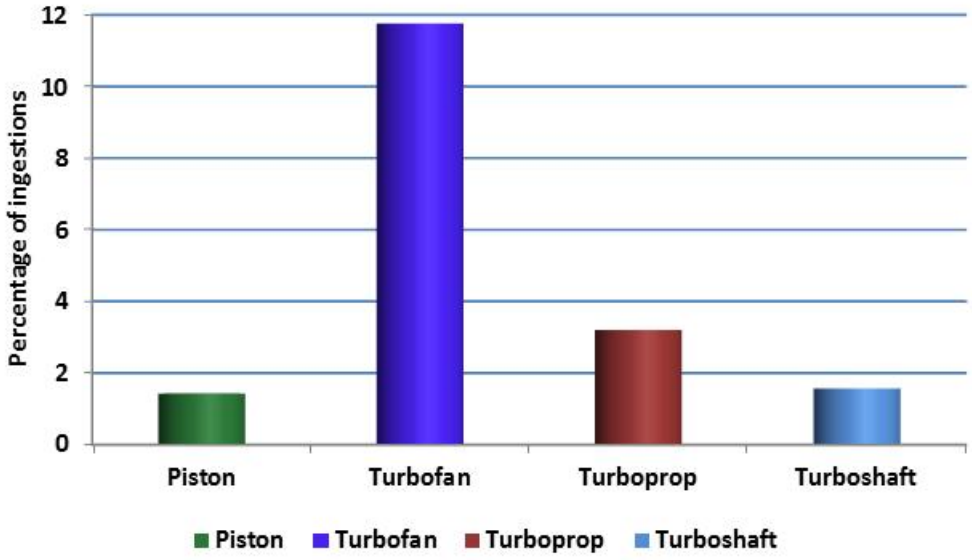
This chapter reviews birdstrikes that have been identified as posing a significant threat to the continued safety of flight of an aircraft. Birdstrikes involving ingestion of a bird, or birds, into a turbine engine, and occurrences involving aircraft damage and personal injuries as a result of birdstrikes are considered.

6.1 Bird engine ingestions

Most birdstrikes in which an engine ingestion occurred involved aircraft powered by turbofan engines. This is related to the relatively larger engine air intake and suction of these engines compared with other engine types, and because of the longer landing and take-off runs of most turbine aircraft (resulting in a higher exposure to altitudes where birds fly more frequently).

Figure 26 shows the percentage of birdstrikes where an engine ingestion occurred, compared with the type of engine involved. Turbofan engine aircraft had the highest proportion of ingestions per strike, with one in every nine strikes involving at least one bird being ingested into an engine.

Figure 26: Percentage of birdstrikes resulting in an engine ingestion by engine type (where known) over the 2004 - 2013 period



Most birdstrikes involving an engine ingestion involved aircraft being used for high capacity air transport (80 per cent). Aircraft operating these services (such as Boeing and Airbus aircraft) are primarily fitted with turbofan engines. Table 12 shows that the number of engine ingestions for high capacity air transport operations had been increasing until 2011 but has since decreased to the lowest level in 10 years. While the number of ingestions involving low capacity air transport aircraft has remained relatively steady after peaking in 2008.

Table 12: Number of engine ingestions by operation type, 2004 - 2013

Operation Type	Engine Ingestion	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
High capacity air transport	1 engine	66	62	63	74	76	71	82	82	79	55	**710**
	2 engines	1	1	3	0	1	2	0	0	0	0	**8**
Low capacity air transport	1 engine	7	4	8	14	20	6	6	10	8	11	**94**
	2 engines	1	0	0	0	1	0	0	1	0	0	**3**
General Aviation	1 engine	1	5	0	3	5	1	2	2	1	3	**23**
Military	1 engine	0	0	0	3	0	7	8	11	13	9	**51**
	2 engines	0	0	0	0	1	0	2	0	0	0	**3**
Unknown	1 engine	0	0	1	1	0	0	0	1	0	0	**3**
Total	**1 engine**	**74**	**71**	**72**	**95**	**101**	**85**	**98**	**106**	**101**	**78**	**881**
	2 engines	**2**	**1**	**3**	**0**	**3**	**2**	**2**	**1**	**0**	**0**	**14**

Cessna Model 650 (Citation VII) engine ingestion on take off

During take-off form Gold Coast Aerodrome, Qld, on rotation the pilot reported striking a bird which was ingested into the right engine. A loud noise was heard but the take-off was continued. After the landing gear was retracted erratic indications were observed for the right engine, accompanied by significant vibrations and noise. The engine was shut down, a Pan[7] declared, and the aircraft was returned to the Gold Coast. Upon landing an inspection showed damage caused by a flying fox included bent and broken fan blades in the right engine, severed fuel lines and a hole in engine cowl where liberated fan blades exited the engine
(21 June 2013).

Significant occurrences involving engine ingestions

There were 179 single engine ingestions in 2012 – 2013, slightly less than the preceding 2 years; most of these did not result in damage to the engine. There are case studies of some of the more significant single engine ingestions throughout the report.

Table 12 above shows that multiple engine ingestions account for less than two per cent of all bird engine ingestion occurrences. Multiple engine ingestions present a greater hazard to aviation safety, as the potential for loss of thrust to more than one engine exists, which may result in an aircraft being unable to maintain height.

There have been no multiple engine ingestions reported for any aircraft in the 2012 – 2013 period.

[7] Pan is a radio code indicating uncertainty or alert.

Airbus A320 Engine ingestion on take-off

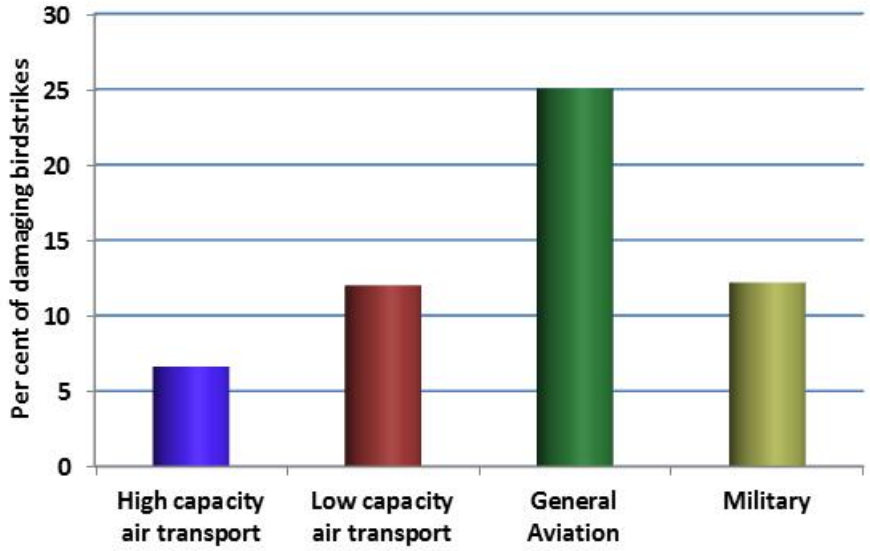
As the aircraft was rotating for take-off from Gold Coast Aerodrome, Qld both pilots noticed 2 birds flying across their path. A loud bang was heard followed by vibrations, and smoke and sparks were observed emanating from an engine. The engine instruments indicated an engine failure and a Mayday was declared. Subsequently the engine indications returned to normal and the Mayday was downgraded to a Pan and the aircraft returned to the Gold Coast. An inspection revealed fan blade damage that was found to be from a duck, see figure below (20 May 2013).

Fan blade damage caused by ingesting a duck. Source: Operator

6.2 Damage caused to aircraft by birdstrikes

Birdstrikes resulting in aircraft damage (including engine ingestions) present a significant hazard to aviation. In cases where a birdstrike results in aircraft airframe or engine damage, a considerable repair cost can also be involved. General aviation operations continue to have the highest proportion of damaging birdstrikes, with one quarter of all reported general aviation strikes between 2004 and 2013 resulting in damage (Figure 27).

Figure 27: Proportion of birdstrikes resulting in damage in each operation type over the 2004-2013 period



Aircraft parts damaged from birdstrikes

Aeroplane wings and helicopter rotor blades are the most commonly damaged aircraft components across all operational types, particularly in general aviation, which had the highest number of strikes in which these parts were damaged (Table 13). Wings may be the most common damaging strike location on fixed-wing aircraft as they present a large frontal surface area on an aircraft and aerodynamic effects may draw birds into a collision course, and in helicopters, because of the high rotational speed of the rotors. Engines were the most frequently damaged component in high capacity air transport aircraft (related to the large proportion of these strikes which result in a bird being ingested into the engine).

Table 13: Number of birdstrikes by part damaged and operation type over the 2004 - 2014 period

Part damaged	High capacity air transport	Low capacity air transport	General Aviation	Military	Unknown	Total
Wing/Rotor	110	105	171	14	4	**404**
Engine	158	44	11	18	1	**232**
Nose	41	20	17	5	1	**84**
Propeller	20	28	23	0	6	**77**
Other	17	19	23	8	1	**68**
Windscreen	9	11	27	2	1	**50**
Landing Gear	22	12	8	2	2	**46**
Tail	16	9	18	2	0	**45**
Lights	20	8	7	0	3	**38**
Fuselage	12	9	10	4	0	**35**

Birdstrike with Eagle

In December 2013, while cruising at 1,000 ft near Devonport, Tas., the Avid Mark IV aircraft struck an eagle which damaged the left flaperon. The pilot was able to turn the aircraft using the rudder and returned to Devonport for a successful landing.

Damage caused by strike with an eagle. Source ATSB

Birdstrikes resulting in serious damage

There were 12 birdstrike occurrences from 2004 to 2013 that resulted in serious damage[8] to the aircraft. Eleven of these occurred in general aviation flying, while one was in low capacity air transport operations. Six of the 12 occurrences involved helicopters.

There were two birdstrikes occurrences resulting in substantial aircraft damage between the two years 2012 - 2013. One of these involved a birdstrike (Australian Brush-turkey) followed by an animal strike (bull). As it was the latter that caused the substantial damage, this case will be discussed in chapter 8. *Non-flying animal strikes*. The second occurrence, in which the aircraft was destroyed is summarised below:

[8] Serious damage is defined in the Transport Safety Investigation Regulations 2003 as damage to an aircraft that: (i) significantly affects the structural integrity, performance or operational characteristics of the aircraft; and (ii) requires major repair or replacement of the affected component or components of the aircraft; or (b) destruction of the aircraft.

RPA Birdstrike with Eagle

In January 2013, a Gatewing X100 remotely piloted aircraft (RPA) was being used for aerial survey work south of Perth, WA. During the cruise, the aircraft struck an Eagle resulting in it losing stability and colliding with terrain. The aircraft was destroyed.

An example of the Gatewing RPA system on its launch rail. Source Wiki Commons

Recent international birdstrikes resulting in serious damage

Outside of Australia, there have been numerous examples of birdstrikes involving large birds, sometimes multiple large birds, resulting in serious damage to aircraft. The 2009 ditching into the Hudson River, US, of an Airbus A320 following a double engine failure after striking multiple Canadian geese has been documented in a previous ATSB *Australian aviation wildlife strike statistics report* (AR-2009-064).

More recently on 31 July 2012, a Boeing 737-900 on descent to Denver, US, struck a single bird at 5,500 above the airport. Feather and DNA analysis identified it as a white-faced ibis, a bird with an average weight of 0.6 kg. Following the impact, noise in the flight deck increased markedly, making communication with air traffic control (ATC) and between the pilots difficult. The autopilot and autothrottle both disengaged and the airspeed indicator and vertical speed indicator on the captain's side of the flight deck became inoperative, requiring the captain to use stand-by instruments. An emergency was declared. Due to confusing instrument readings, power settings relative to aircraft configuration along with ATC communications about the aircraft's observed ground speed were used to make the approach, resulting in an uneventful landing. Damage to the aircraft included a large hole in the radome, a bent left-side pitot head with a piece of broken radome lodged on it, and a dent to the leading edge of the vertical stabiliser.[9]

[9] National Transport Safety Board investigation CEN12IA502.

Damage to a Boeing 737-900 following a birdstrike on descent to Denver, US. Source: NTSB

6.3 Personal injuries resulting from birdstrikes

Injuries from birdstrikes have occurred mainly due to the bird penetrating the aircraft windscreen. However, some injuries have occurred due to some form of loss of control following the birdstrike. Sometimes, this is through emergency actions such as a forced landing that may have been required after a birdstrike to another part of the aircraft, such as the tail rotor (in helicopters) or the leading edge of the wing (in aeroplanes), where critical damage prevented safe and effective control of the aircraft.

Ten of the reported birdstrike occurrences between 2004 and 2013 resulted in injury, three of which were during 2012 and 2013. Eight occurred in general aviation, while two occurred during low capacity air transport operations. In all cases, the injuries received as a consequence of the birdstrike were minor.

One of the three occurrences in 2012-2013 resulting in injuries was the same wildlife strike occurrence mentioned previously involving a birdstrike followed by a collision with a bull, and is not included in this section. The remaining two occurrences are summarised below:

Cessna 210 Birdstrike with Kite penetrating windshield

During approach to land at Ramingining Aerodrome, NT, a bird (kite) was sighted approximately 200 m from the aircraft. The pilot attempted to manoeuvre but the bird struck the windshield of the Cessna 210, penetrating the windshield and hitting the pilot in the face. The pilot received minor abrasions but was able to continue the landing without further incident (8 June 2012).

Cessna 152 Strike with Flying fox during night circuits

While conducting night circuits at Port Macquarie Aerodrome, NSW, the aircraft struck a flying fox which penetrated the windscreen. The crew suffered minor injuries and the aircraft sustained minor damage (18 July 2012).

The result of an impact with a Flying fox, showing where the animal penetrated the windshield of the Cessna 152. Source: ATSB

7. Birdstrikes by bird type, number struck, and size

7.1 Types of birds struck

7.1.1 Total birdstrikes by bird type

Table 14 shows the total number of birdstrikes by bird type, distributed by state. The data is presented in order of the most commonly struck bird types nationwide, and includes all bird types that were involved in 70 or more birdstrike occurrences nationally between 2004 and 2013. A full listing of the bird species involved in birdstrikes in each Australian state over this period can be found in Appendix D (Table 37).

Flying foxes and bats continue to be the most commonly struck species in Australia for the 2004 to 2013 period, with the majority of strikes occurring at locations on the east coast of Australia. It is likely that the majority of these strikes are flying foxes, however, bats and flying foxes are reported as a combined group as flying foxes are often reported as bats (see Appendix A for bird groupings used in this report, Table 29).

Birds in the lapwing and plover families were the second most frequent bird type struck over the 10-year period; however, it is likely that this is influenced by the broad species range included in this bird type (banded plover, black-fronted plover, dotterel, lapwing, masked lapwing, masked plover, oriental plover, pacific golden plover, plover, spur-winged plover).

Since the last report kites have replaced galahs as the third most frequently struck bird type. In Appendix A it can be seen that the kite group is made up of birds that are reported as being either kites, black kites, kite-hawks, whistling kites, black-shouldered kites, and fork-tailed kites. Whereas galahs are a single group, and although fourth overall, they remain the most frequent single species struck across Australia in the 2004 to 2013 period. They also make up the highest number of overall strikes in South Australia and the Australian Capital Territory and the second highest in New South Wales.

Some larger, less commonly struck birds are not included in Table 14, such as the brush turkey (35 birdstrikes), wedge-tailed eagle (26 birdstrikes), magpie goose (18 birdstrikes), pelican (19 birdstrikes) and bustard (21 birdstrikes). These are, however, shown in the section on damaging birdstrikes. While the number of total strikes involving these larger birds is relatively low, the potential for aircraft damage or injury from such strikes represents a significant risk to continued safety of flight (see Section 7.1.2).

Table 14: Birdstrikes by bird type and state, 2004 to 2013

Bird Type	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Other	Total
Bat/Flying Fox	1	303	62	432	6	0	42	26	0	**872**
Lapwing/Plover	14	153	117	175	49	162	47	144	0	**861**
Kite	0	65	239	406	9	0	30	90	0	**839**
Galah	105	297	22	120	147	1	35	68	0	**795**
Nankeen Kestrel	11	95	30	192	58	1	11	122	15	**535**
Swallow/Martin	11	78	38	283	27	13	25	51	1	**527**
Magpie	33	118	3	83	118	7	129	29	0	**520**
Magpie-lark	1	49	24	137	126	5	10	20	0	**372**
Hawk	10	69	22	114	19	13	16	72	1	**336**
Silver Gull	1	84	2	14	59	33	57	41	2	**293**
Curlew/Sandpiper	0	3	103	132	2	0	0	9	3	**252**
Pipit	8	80	8	32	0	11	55	36	0	**230**
Dove	0	39	14	50	72	0	25	21	2	**223**
Duck	21	38	4	84	3	6	17	36	2	**211**
Pratincole	0	0	168	18	0	0	0	7	0	**193**
House Sparrow	1	30	5	63	10	12	39	16	0	**176**
Heron/Egret	0	21	5	101	2	0	6	9	9	**153**
Owl	0	26	11	45	6	0	18	42	0	**148**
Ibis	0	36	4	74	5	0	16	3	0	**138**
Eagle	0	15	7	34	1	2	6	29	0	**94**
Crow/Raven	6	11	6	31	9	8	13	10	0	**94**
Finch	0	3	18	17	1	23	3	17	2	**84**
Parrot	0	7	18	24	8	0	1	21	0	**79**
Falcon	1	9	15	12	3	1	17	15	0	**73**

Table 15 shows the common bird types struck in the last 2 years (2012 and 2013) with more than 30 reported birdstrikes across Australia. Of the 19 Bird types in Table 15, the pratincole and ibis are the only new additions when compared with the previous 2-year period. When compared with the 10-year average there is also very little difference regarding the top ten bird types, where only the tenth place bird is different. The biggest difference comparing Table 14 and Table 15 is that bird strikes involving kites have been the most frequent in 2012 and 2013, increasing from third most frequent in the previous 2-year period.

Table 15: Birdstrikes by bird type and state, 2012 to 2013

Bird Type	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Other	Total
Kite	0	25	97	96	2	0	1	36	0	**257**
Bat/Flying Fox	0	68	12	119	3	0	3	9	0	**214**
Lapwing/Plover	1	39	21	36	12	29	10	35	0	**183**
Galah	22	46	8	17	26	0	7	19	0	**145**
Nankeen Kestrel	2	27	10	55	5	0	2	30	5	**136**
Swallow/Martin	0	22	10	64	7	3	9	17	0	**132**
Magpie	4	24	0	17	14	3	20	5	0	**87**
Hawk	0	24	3	25	3	1	2	18	0	**76**
Magpie-lark	1	13	3	17	19	1	2	5	0	**61**
Duck	2	13	2	18	1	3	5	17	0	**61**
Silver Gull	0	12	0	2	8	8	14	13	1	**58**
Pipit	3	21	1	12	0	5	4	6	0	**52**
Dove	0	7	4	16	11	0	1	6	0	**45**
Owl	0	7	3	12	1	0	3	16	0	**42**
Curlew/Sandpiper	0	1	15	19	0	0	0	4	2	**41**
Heron/Egret	0	6	1	28	2	0	1	1	1	**40**
House Sparrow	0	8	1	17	0	3	7	1	0	**37**
Pratincole	0	0	25	6	0	0	0	6	0	**37**
Ibis	0	7	2	22	1	0	3	0	0	**35**

Figure 28: **The four bird types most commonly involved in birdstrikes between 2012 and 2013 remains the same as the 2010 to 2011 period. Clockwise from top left; bat/flying fox, kite, lapwing/plover and galah.**

Figure 29 shows the yearly average number of strikes by species group for the last 10 years (2004 - 2013), versus the average over just the last 2 years (2012 and 2013) for bird types with a 10-year average of over 20 strikes per year. Kites had the most significant increase in the number of reported strikes per year in the last 2 years, with these species being involved in an average of 129 strikes per year for 2012 and 2013 compared with 84 per year on average across the entire 10-year reporting period. The number of strikes involving bat/flying foxes has also increased in recent years, with an average 113 strikes per year for 2012 and 2013 compared with 90 per year on average across the 10-years. Galahs, magpies, magpie-larks and curlew/sandpipers were all involved in birdstrikes slightly less frequently than the 10-year average during 2012 and 2013.

Figure 29: **Average number of birdstrikes per year by bird type, 2004 to 2013**

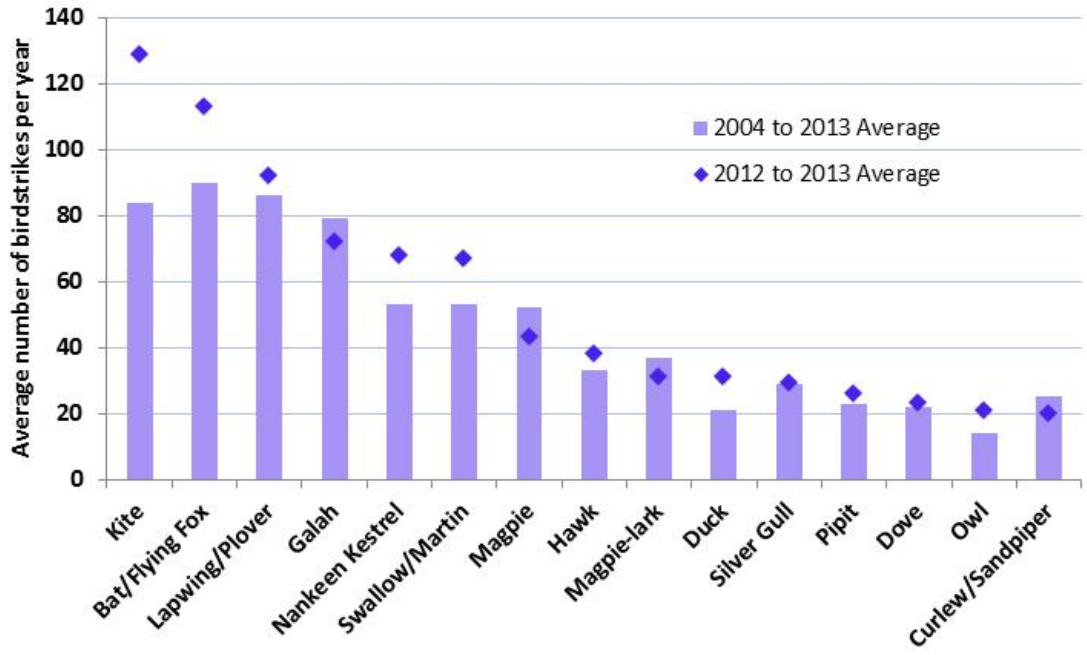
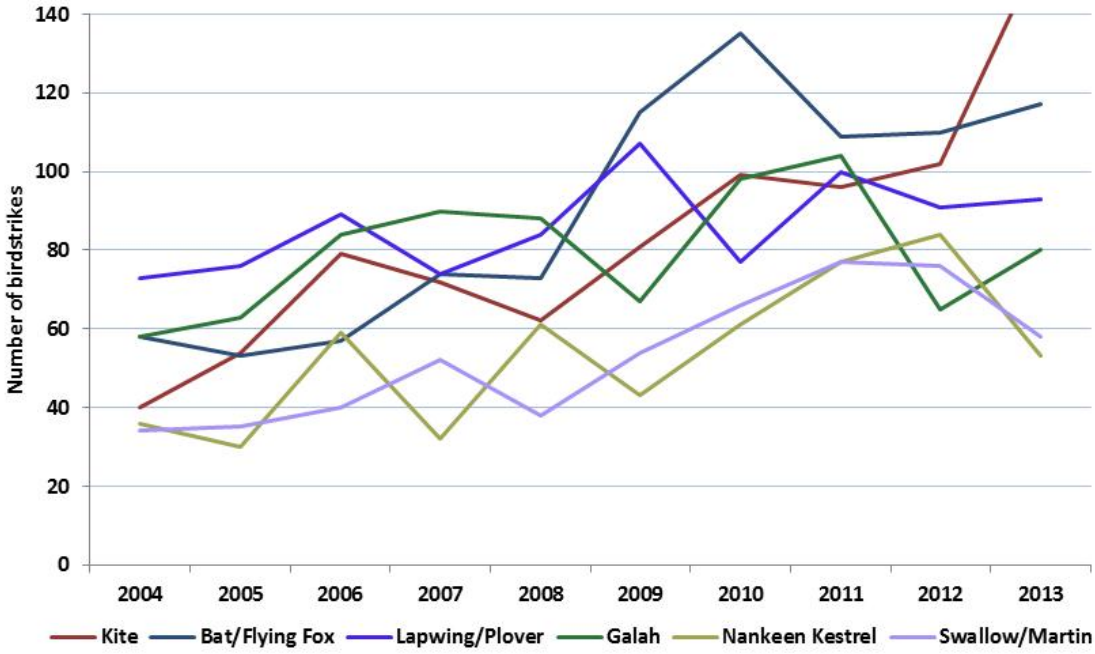


Figure 30 (below) shows the 10-year trend for the six bird types most commonly struck by aircraft from 2004 to 2013. The large increase in kite strikes in the 2012-2013 can be seen to be driven by a large increase in 2013. A full list of species by year is included in Appendix D (Table 38).

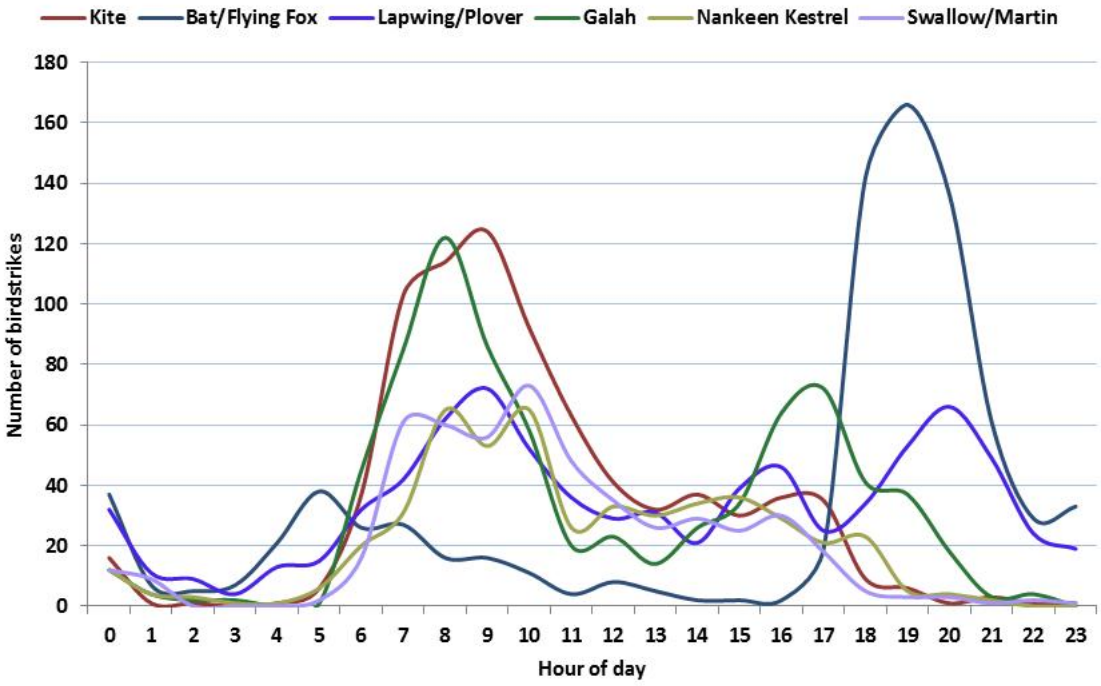
Figure 30: Number of birdstrikes for the Top 6 most frequent bird types struck by year, 2004 to 2013



7.1.2 Time of day and bird type

Figure 31 shows the times of the day when strikes occurred for the six most commonly struck bird types. As mentioned above, the overall frequency of birdstrikes across the day is influenced by the morning and evening peak aircraft movement times at major airports, but the hourly level of activity for different species clearly also has an influence on birdstrikes. Of note are strikes involving bats and flying foxes, which tend to occur around 1900 (likely just after last light), whereas most other birds are struck during daylight hours. The galah and lapwing/plover have peak strike times in the morning and later significant peaks in late afternoon for the galah and just after dark for the lapwing/plover. This is contrary to other types of birds, which generally exhibit only one period of the day where most strikes occur. A complete list of strike times (by hour of the day) by bird type is included in Appendix D (Table 40).

Figure 31: Birdstrikes by bird type by hour of day over the 2002-2011 period



7.1.3 Damaging birdstrikes by bird type

Aeroplane (fixed-wing aircraft) damage

Table 16 on page 48 shows the total number of birdstrikes (by bird type) which resulted in reported damage to fixed-wing aircraft. The level of damage to the aeroplanes (destroyed, substantial, minor and nil) is presented where both the damage and bird type was known, and the bird type was involved in at least one birdstrike in the last 10 years that resulted in damage. A 'damage ratio' is also presented, which shows, for each bird type, the proportion of all strikes that resulted in damage. This gives a relative indication of which bird types tend to be involved in damaging strikes.

The only birdstrike resulting in a destroyed aircraft (a RPA) was the result of an eagle strike. Australian brush-turkeys, magpie geese and bustards were all reported as causing substantial damage on aeroplanes in at least one reported birdstrike since 2004, with bats / flying foxes, galahs and kites most frequently causing minor damage over the same period.

Table 16: Damaging birdstrikes to aeroplanes by bird type, 2004 to 2013

Bird Type	Destroyed	Substantial damage	Minor damage	Nil damage	Damage ratio
Eagle	1	0	28	54	0.35
Australian Brush-turkey	0	1	9	20	0.33
Magpie Goose	0	1	5	10	0.38
Bustard	0	1	4	14	0.26
Bat/Flying Fox	0	0	76	512	0.13
Galah	0	0	72	520	0.12
Kite	0	0	70	556	0.11
Duck	0	0	38	122	0.24
Hawk	0	0	34	222	0.13
Lapwing/Plover	0	0	32	611	0.05
Ibis	0	0	27	80	0.25
Magpie	0	0	25	336	0.07
Silver Gull	0	0	24	173	0.12
Pelican	0	0	14	3	0.82
Curlew/Sandpiper	0	0	13	154	0.08
Crow/Raven	0	0	12	50	0.19
Magpie-lark	0	0	11	238	0.04
Dove	0	0	11	130	0.08
Cockatoo	0	0	11	36	0.23
Nankeen Kestrel	0	0	9	342	0.03
Owl	0	0	8	82	0.09
Parrot	0	0	8	56	0.13
Heron/Egret	0	0	7	110	0.06
Wedge-tailed Eagle	0	0	6	14	0.3
House Sparrow	0	0	5	145	0.03
Falcon	0	0	5	48	0.09
Pratincole	0	0	4	114	0.03
Swallow/Martin	0	0	3	414	0.01
Pipit	0	0	2	153	0.01
Tern	0	0	2	33	0.06
Pacific Gull	0	0	2	14	0.13
Swan	0	0	2	2	0.5
Thrush	0	0	2	1	0.67

Helicopter damage

Table 17 shows the number of helicopter birdstrikes by bird type where at least one report of damage was received for a particular bird type. Helicopters have a relatively smaller number of birdstrikes reported to the ATSB; however, these tend to result in aircraft damage more frequently than for aeroplanes. As with the fixed wing aircraft, the eagle (not wedge-tailed) was the only bird to have resulted in a destroyed helicopter. While wedge-tailed eagles, galahs and pelicans were all reported as causing substantial damage on helicopters in at least one reported birdstrike since 2004.

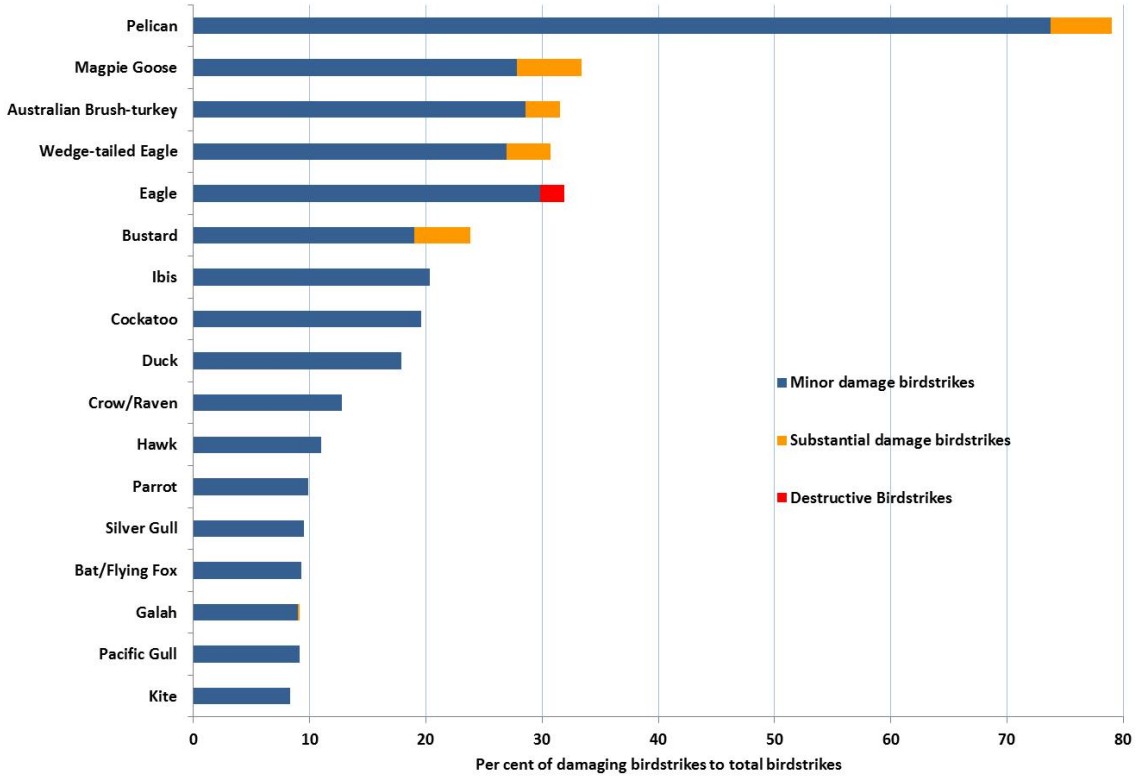
Table 17: Damaging birdstrikes to helicopters by bird type, 2004 to 2013

Bird Type	Destroyed	Substantial damage	Minor damage	Nil damage	Damage ratio
Eagle	1	0	0	1	0.5
Wedge-tailed Eagle	0	1	1	1	0.67
Galah	0	1	0	4	0.2
Pelican	0	1	0	0	1
Bat/Flying Fox	0	0	8	27	0.23
Silver Gull	0	0	4	20	0.17
Hawk	0	0	3	2	0.6
Dove	0	0	1	6	0.14
Swift	0	0	1	2	0.33
Australian Brush-turkey	0	0	1	0	1
Ibis	0	0	1	0	1
Tern	0	0	0	12	0
Swallow/Martin	0	0	0	2	0
Magpie-lark	0	0	0	2	0
Owl	0	0	0	2	0
Kite	0	0	0	2	0
Lapwing/Plover	0	0	0	1	0
Magpie	0	0	0	1	0
Falcon	0	0	0	1	0
Parrot	0	0	0	1	0
Kingfisher/Kookaburra	0	0	0	1	0
Duck	0	0	0	1	0
Crow/Raven	0	0	0	1	0

All aircraft types

Figure 32 shows the bird types that have the highest proportion of damaging strikes, compared with the total number of strikes reported involving that bird type. Nearly 80 per cent of pelican strikes resulted in aircraft damage (74% minor damage and 5% substantial damage). Magpie geese, Australian brush-turkeys, wedge-tailed eagles and other eagles all have a high rate of damaging strikes (at least one in every three reported strikes resulted in some level of damage). More than one in every five reported birdstrikes involving bustards and ibis also resulted in damage.

Figure 32: Percentage of reported birdstrikes where damage occurred by bird type (where known) over the 2004-2013 period



7.1.4 Damaging birdstrikes by bird type and operation type

Strikes causing serious damage

There were eight reported birdstrikes that caused either substantial or destructive aircraft damage between 2004 and 2013 where the bird type was known. One of these birdstrikes involved a pelican that hit a Robinson R44 helicopter conducting low capacity air transport operations resulting in substantial damage to the aircraft. All other substantial damage birdstrikes involved aircraft conducting general aviation operations.

Birds with the most reported damaging strikes for each operation type

The figures below show the bird types with the highest number of damaging birdstrikes reported for each operation type. There were common species across all of the operation types; however, each operation type shows a distinct distribution of the bird species that most frequently caused damage. This probably reflects varying bird threats at specific locations used by different types of operations – for example, major capital city airports are generally not used by general aviation aircraft. A complete list of bird types involved in damaging strikes (by aerodrome and operation type) is included in Appendix D (Table 36).

Figure 33: High capacity air transport damaging birdstrikes by bird type, 2004-2013

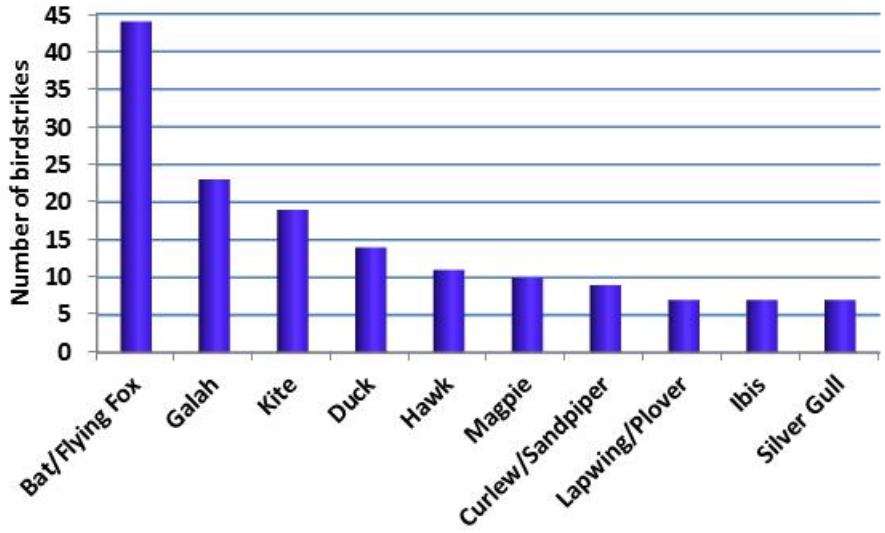


Figure 34: Low capacity air transport damaging birdstrikes by bird type, 2004-2013

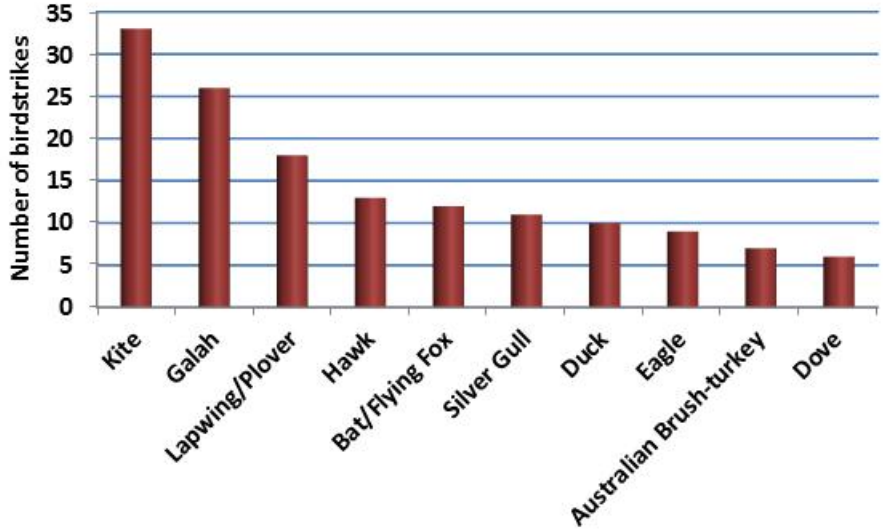
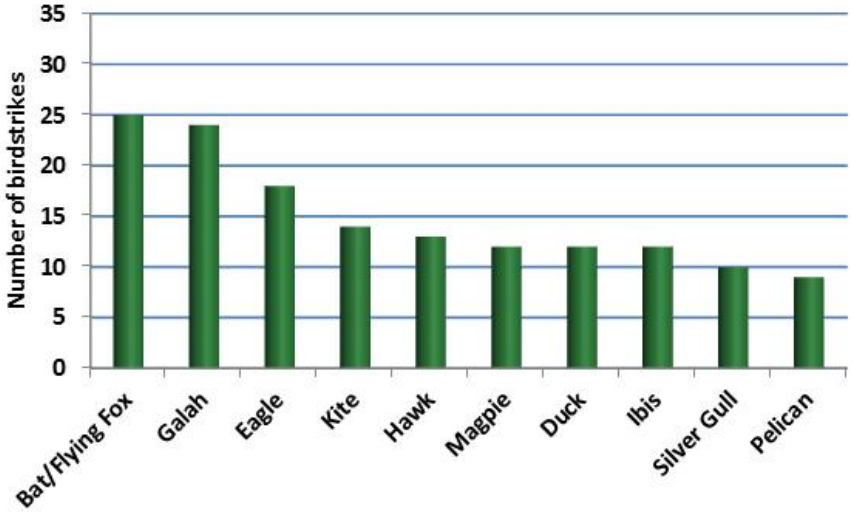


Figure 35: General aviation damaging birdstrikes by bird type, 2004-2013



In addition, there were 12 reported cases where birdstrikes resulted in damage to military aircraft where the species were known (shown in Table 18 below). Damaging military birdstrikes had no distinct distribution by bird type, although similar types of birds were struck when compared with other operation types.

Table 18: Damaging birdstrikes to military aircraft by bird type and damage severity, 2004-2013

Bird type	Birdstrikes
Duck	2
Bat/Flying Fox	2
Pelican	2
Pratincole	1
Crow/Raven	1
Eagle	1
Ibis	1
Kite	1
Nankeen Kestrel	1

7.2 Strikes involving multiple birds

A birdstrike occurrence in which multiple birds are struck generally presents a greater hazard to continued safe flight. For larger aircraft, one of the most hazardous scenarios is when multiple engine ingestions occur, especially involving large birds.

Table 19 shows those bird types with at least one birdstrike occurrence in the 2004 - 2013 period which involved multiple birds being struck. Multiple galah strikes were the most common over the study period, with more than one bird hit in over 38 per cent of galah strikes, related to the fact that galahs are known to have flocking tendencies. Silver gulls, parrots, finches, ducks, pacific gulls and magpie geese all involved a collisions with multiple birds in at least one in four occurrences (when considered collectively).

Cessna 152 Multiple strikes with pigeons

On approach into Bankstown Aerodrome, NSW, after a training flight, at 300 feet a flock of 20-25 white pigeons flew up from the ground directly in front of the aircraft. Five or six were hit by various parts of the aircraft including the windscreen, spinner and wings. One bird hit the port side leading edge near the wingtip causing minor damage. Upon touchdown the leading edge detached from the aircraft (1 June 2013).

Table 19: Birdstrikes involving multiple strikes by bird type, 2004-2013

Bird type	Greater than 10	Between 2 and 10	Single bird
Galah	17	284	491
Silver Gull	4	70	220
Dove	3	50	172
Parrot	3	23	55
Finch	3	19	63
Lapwing/Plover	1	131	732
Bat/Flying Fox	1	69	822
Swallow/Martin	1	55	472
Curlew/Sandpiper	1	27	224
Magpie	1	23	495
Pratincole	1	21	170
Swift	1	13	46
Cockatoo	1	13	42
Tern	1	4	48
Duck	0	62	150
Kite	0	56	785
Magpie-lark	0	24	349
Nankeen Kestrel	0	17	519
Ibis	0	17	121
Pipit	0	12	219
Hawk	0	11	325
Heron/Egret	0	10	143
House Sparrow	0	7	168
Starling	0	6	59
Pacific Gull	0	6	16
Crow/Raven	0	5	89
Magpie Goose	0	5	13
Owl	0	3	145
Australian Brush-turkey	0	2	33
Wader	0	2	11
Thrush	0	2	1
Eagle	0	1	93
Falcon	0	1	73
Skylark	0	1	44
Wedge-tailed Eagle	0	1	25
Kingfisher/Kookaburra	0	1	11
Robin	0	1	7
Wren	0	1	5

7.3 Size of birds struck

7.3.1 Total birdstrikes by bird size

Figure 36 shows that after peaking in 2011, the number of strikes involving medium sized birds has decreased markedly to levels not seen since 2008 despite increasing slightly from 2012 to 2013. The number of large bird strikes has also decreased since 2011, although the difference is quite subtle. Strikes with smaller birds have, on the other hand, continued to increase since 2009, and the overall trend for the 10-year period is increasing more for smaller birds than the large and medium birds. It is possible that these trends may suggest that recent mitigation strategies appear to be effective at reducing strikes involving the higher risk medium and larger sized birds. However, the number of reported birdstrikes with birds of unknown size (data not shown), make it difficult to drawn any definitive conclusions from Figure 36.

Figure 36: Number of birdstrikes by bird size, 2004 to 2013

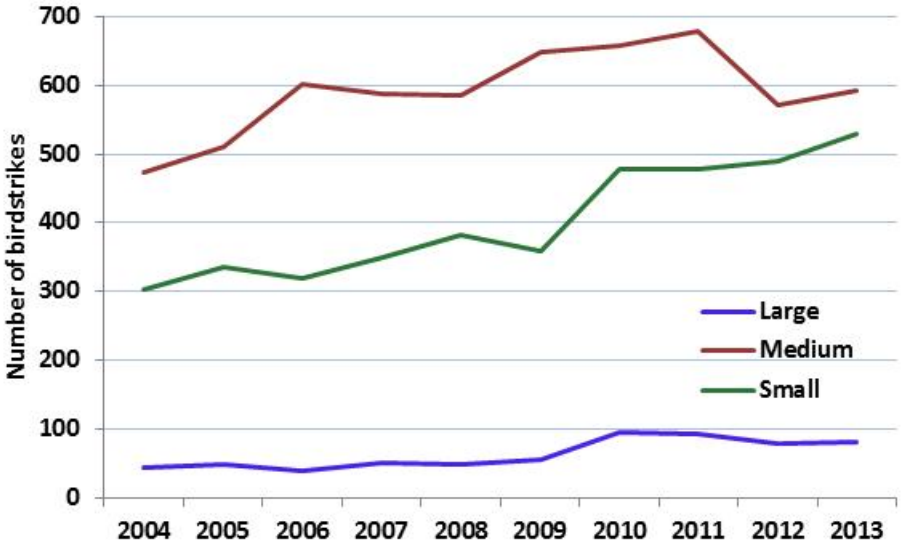


Table 20 shows that in high and low capacity air transport as well as general aviation, medium-sized birds were struck the most often, followed by small birds. In military operations the order was reversed, with slightly more smaller birds being struck, although numbers struck for both were quite similar. General aviation had proportionally more strikes involving large birds, with about 7 per cent of birds struck being large compared with 5.7 per cent for low capacity operations, 3.8 per cent for high capacity and 3.4 per cent for military operations.

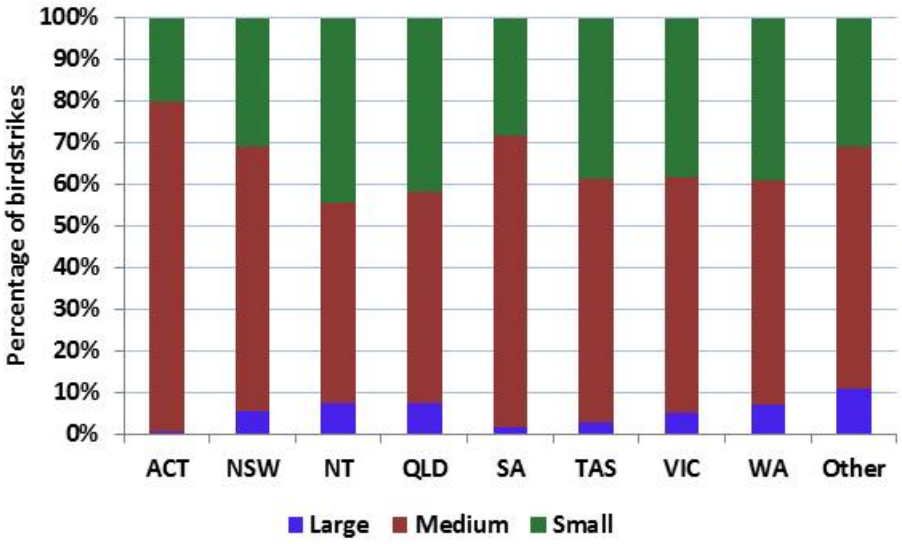
Table 20: Number of birdstrikes by bird size and operation type, 2004 to 2013

Operation Type	Bird size	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
High capacity air transport	Large	16	23	14	25	31	23	40	49	39	43	**303**
	Medium	217	232	247	239	240	265	301	284	288	253	**2,566**
	Small	179	189	196	204	255	211	295	282	305	337	**2,453**
	Unknown	184	240	174	177	236	310	328	365	322	377	**2,713**
Low capacity air transport	Large	12	12	10	13	9	8	20	19	21	16	**140**
	Medium	96	90	129	121	126	141	140	180	103	145	**1,271**
	Small	47	47	20	49	56	52	61	80	77	77	**566**
	Unknown	39	55	40	33	27	55	41	58	67	75	**490**
General Aviation	Large	8	9	7	6	5	19	11	14	8	15	**102**
	Medium	44	60	43	68	89	90	71	84	69	89	**707**
	Small	28	29	23	28	31	35	37	40	37	51	**339**
	Unknown	19	27	18	28	33	41	32	25	37	37	**297**
Military	Large	0	1	0	2	1	1	3	3	5	1	**17**
	Medium	4	2	6	14	4	19	17	10	9	25	**110**
	Small	2	3	3	4	2	20	24	17	18	27	**120**
	Unknown	4	8	6	10	3	17	42	43	66	58	**257**
Unknown	Large	7	3	7	5	3	5	21	8	5	7	**71**
	Medium	113	126	177	146	127	133	128	120	103	80	**1,253**
	Small	47	68	78	64	38	41	62	59	52	37	**546**
	Unknown	19	54	36	22	24	24	28	11	13	19	**250**

Figure 37 shows a breakdown by state and territory of the percentage of birds struck by bird size (where the bird size was known). This generally correlated with the particular bird types struck that are common to each state[10], as shown in Table 14 on page 43. A full list of the number of birds struck by size in each state and territory is provided in Appendix D (Table 39). From Figure 37 it can be seen that in an average year between 2004 and 2013, over 40 per cent of birdstrikes in Queensland and the Northern Territory involved small birds and in all states and territory's medium sized birds are by far the most frequently stuck. In general, these numbers have remained similar to the previous reporting period (2010 and 2011).

[10] Some bird types may include several species of significantly different sizes (for example, bats and flying foxes); however, for the majority of bird types, the bird species within that type are of similar mass and dimensions.

Figure 37: Percentage of birds struck by bird size for each state for the 2004-2013 period



7.3.2 Damaging birdstrikes by bird size

Damaging birdstrikes by bird size and operation type

Table 21 shows that the larger the bird size, the more likely a strike that will result in aircraft damage. This is irrespective of the type of operation the aircraft is conducting. However, as a proportion of total strikes, those aircraft involved in high capacity air transport operations are less likely to be involved in a damaging strike than those being used for low capacity air transport. These in turn are less likely to be involved in a damaging strike than general aviation aircraft. This is related to the size and construction of typical aircraft in these operation type categories, as shown in Figure 38 on page 58.

Table 21: Bird size by aircraft damage and operation type for the 2004-2013 period

Operation type	Aircraft damage	Large bird	Medium bird	Small bird
High capacity air transport	Destroyed	0	0	0
	Substantial	0	0	0
	Minor	38	163	47
	Nil	192	1,848	2,018
Low capacity air transport	Destroyed	0	0	0
	Substantial	1	0	0
	Minor	38	168	21
	Nil	95	992	505
General Aviation	Destroyed	1	1	0
	Substantial	5	2	0
	Minor	57	147	47
	Nil	36	480	271
Military	Destroyed	0	0	0
	Substantial	0	0	0
	Minor	6	7	7
	Nil	9	84	104

Damaging birdstrikes by bird size and aircraft maximum weight

Figure 38 shows that lighter aircraft are more susceptible to damage than heavier aircraft as the size of the bird involved in the strike increases. However, aircraft with a maximum take-off weight above 272,000 kg appear to be more susceptible to damage than aircraft in the 5,700-272,000 kg weight category (although the number of strikes is considerably lower in the very large weight category). In the very large weight category, the Boeing 747 and the Boeing 777 were mostly commonly damaged, with the majority of damage being incurred on the wings of the aircraft, followed by the engines. Table 22 shows the number of strikes reported by bird size and aircraft weight category where the report indicated that the aircraft incurred some damage.

Figure 38: Percentage of damaging birdstrikes for bird size by aircraft maximum weight, 2004-2013

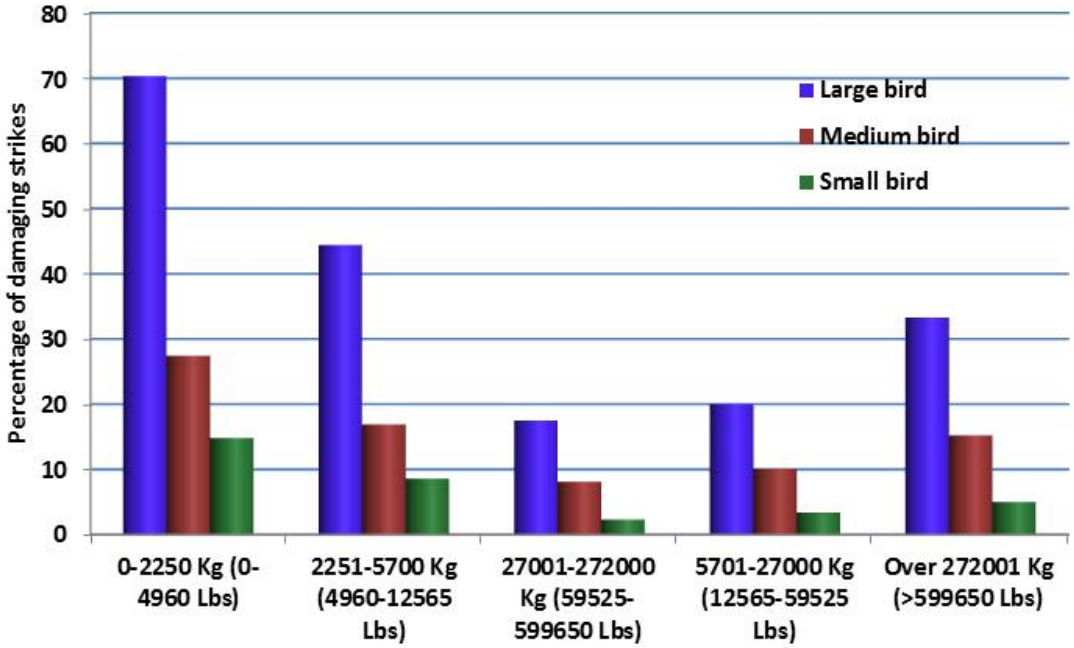


Table 22: Number of damaging birdstrikes by aircraft weight and bird size for the 2004-2013 period

Maximum takeoff weight	Was aircraft damage reported?	Large bird	Medium bird	Small bird
Less than 2,250 kg	Aircraft damaged	45	114	32
	No damage	19	302	184
2,251 - 5,700 kg	Aircraft damaged	40	107	23
	No damage	50	528	246
5,701 - 27,000 kg	Aircraft damaged	22	117	22
	No damage	88	1037	618
27,001 - 272,000 kg	Aircraft damaged	39	146	44
	No damage	184	1,667	1,898
Over 272,001 kg	Aircraft damaged	2	7	1
	No damage	4	39	19

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8. Non-flying animal strikes

When compared with birdstrikes (which are the most commonly reported type of air safety occurrence to the ATSB), cases of an aircraft striking a ground-based animal are not commonly reported. While infrequent, there is a relatively high possibility that animal strikes could more frequently result in significant aircraft damage when compared with birdstrikes.

8.1 Number of animals struck

From Table 23 it can be seen that the total number of animal strikes continues to fluctuate significantly from year to year. After increasing to a 10-year high in 2010, high capacity air transport animal strikes have reduced in the 2-year period of 2012 to 2013, while low capacity air transport and general have had slight increases in animal strikes in the past 2 years (2012 – 2013) relative to the 10-year average of 2004 – 2013, as shown in Figure 39.

Table 23: Number of animal strikes per year by operation type, 2004 to 2013

Operation Type	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Average
High capacity air transport	17	13	13	13	13	12	22	18	8	16	**14.5**
Low capacity air transport	5	4	10	10	6	9	5	3	6	11	**6.9**
General Aviation	6	11	5	12	6	13	9	8	12	7	**8.9**
Military	0	0	1	0	1	0	1	0	0	0	**0.3**
Unknown	5	3	5	6	8	6	11	3	7	8	**6.2**
Total	**33**	**31**	**34**	**41**	**34**	**40**	**48**	**32**	**33**	**42**	**36.8**

Figure 39: Average animals struck per year by operation type for the 2004-2013 period

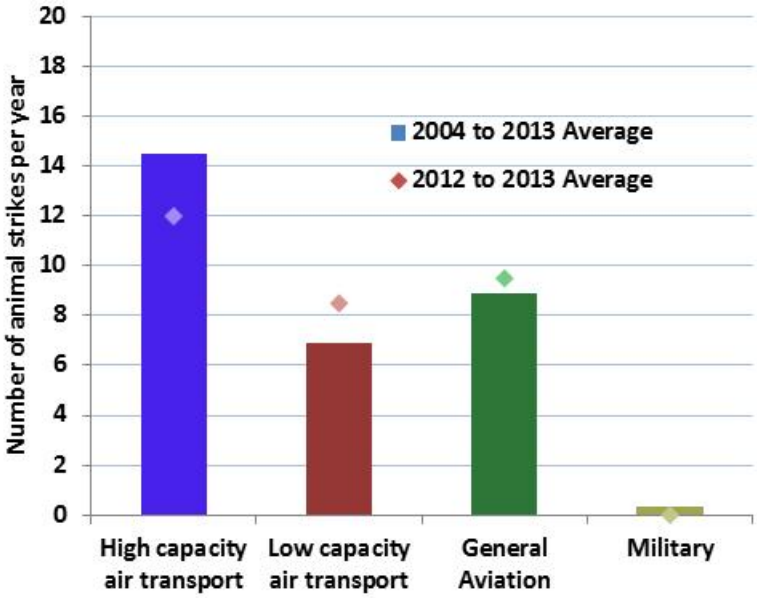


Table 24 shows that Queensland had the highest rate of animal strikes over the last 10 years, followed by New South Wales and Western Australia. Hares and rabbits were the most common animals struck, followed by kangaroos, dogs and foxes, and wallabies.

Table 24: Animal strikes by animal type and state, 2004-2013

Animal Type	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Total
Hare/Rabbit	3	32	0	39	21	12	23	8	**138**
Kangaroo	0	17	9	21	4	1	1	12	**65**
Dog/fox	3	10	3	7	9	0	7	5	**44**
Wallaby	0	6	6	18	2	2	0	4	**38**
Lizard/snake	0	3	5	10	1	0	0	5	**24**
Goanna/Monitor	0	0	3	2	0	0	0	7	**12**
Livestock	0	1	1	3	0	0	1	3	**9**
Echidna	0	0	0	4	0	3	0	0	**7**
Bandicoot	0	0	2	1	0	1	0	1	**5**
Turtle	0	2	0	2	0	0	0	1	**5**
Possum	0	0	1	2	0	0	0	0	**3**
Frog/Toad	0	0	1	2	0	0	0	0	**3**
Large Flightless bird	0	0	0	0	1	0	0	1	**2**
Mouse/Rat	0	0	0	0	0	1	1	0	**2**
Potoroo	0	0	0	0	0	1	0	0	**1**
Wombat	0	0	0	0	0	1	0	0	**1**
Cat	0	0	0	1	0	0	0	0	**1**
Total	**6**	**71**	**31**	**112**	**38**	**22**	**33**	**47**	**360**

Table 25 shows the number of animal strikes by state in the last 2 years only (2012 and 2013). There has been an increase in the relative number of hares/rabbits, dogs/foxes, and lizards/snakes struck in 2012-2013. The increase in hare and rabbit strikes occurred mostly in Queensland, as has the increase in lizard and snake strikes. The growth in dog and fox strikes is more evenly distributed across Australia, with New South Wales having a higher number of these strikes.

Table 25: Animal strikes by animal type and state, 2012-2013

Animal Type	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Total
Hare/Rabbit	1	7	0	14	2	2	5	3	**34**
Dog/fox	0	4	2	1	1	0	2	2	**12**
Lizard/snake	0	1	2	5	0	0	0	1	**9**
Kangaroo	0	2	1	2	1	0	1	1	**8**
Wallaby	0	1	1	5	0	0	0	1	**8**
Goanna/Monitor	0	0	0	0	0	0	0	3	**3**
Mouse/Rat	0	0	0	0	0	1	0	0	**1**
Possum	0	0	0	1	0	0	0	0	**1**
Turtle	0	0	0	0	0	0	0	1	**1**
Bandicoot	0	0	1	0	0	0	0	0	**1**
Total	**1**	**15**	**7**	**28**	**4**	**3**	**8**	**12**	**78**

8.2 Aircraft damage from animal strikes

8.2.1 Damage by animal type

Animal strikes can cause a relatively large amount of damage compared with birdstrikes. This is due to the larger size and mass of many of the animals involved.

The majority of animal strikes where damage was reported involved kangaroos, with 39 out of 61 strikes resulting in either serious or minor damage. All of the eight livestock strikes since 2004 have resulted in aircraft damage, often of a serious nature (Table 26, below), one of which resulted in an aircraft being destroyed. Livestock strikes that occur away from licensed aerodromes and involve general aviation aircraft are currently only reportable to the ATSB under the Transport Safety Investigation Regulations when they result in aircraft damage or injury, so it is probable that the actual number of animal strikes involving livestock is higher than the reported figure.

Table 26: Aircraft damage from animal strikes (where damage is known) by animal type, 2004 - 2013

Animal Type	Destroyed	Substantial	Minor	Nil	Total
Kangaroo	0	4	35	22	**61**
Wallaby	0	3	9	19	**31**
Livestock	1	4	3	0	**8**
Dog/fox	0	2	3	24	**29**
Hare/Rabbit	0	0	2	96	**98**
Echidna	0	0	1	2	**3**
Lizard/snake	0	0	0	19	**19**
Goanna/Monitor	0	0	0	7	**7**
Bandicoot	0	0	0	3	**3**
Large Flightless bird	0	0	0	2	**2**
Possum	0	0	0	2	**2**
Potoroo	0	0	0	1	**1**
Turtle	0	0	0	1	**1**
Frog/Toad	0	0	0	1	**1**

Serious aircraft damage and injury

Since 2004, there have been 15 animal strikes that caused serious damage to aircraft. Four of these occurred during 2012 – 2013. One of these four also resulted in injuries to a passenger. These are described below.

Magni Gryo M22 Voyager animal strike and collision on ground

During the rotation on take-off from Montpellier Airfield near Townsville, Qld, a wallaby was observed to the left of the aircraft. The wallaby just missed the left side wheel but collided with the propeller. Braking was attempted but the M-22 Voyager gyrocopter collided with a fence resulting in substantial damage (22 September 2013).

The Magni Gyro M22 Voyager, showing damage to the propeller caused by the wallaby strike. Source: ATSB

Piper PA-22 animal strike and ground strike

During the landing roll at Bairnsdale Aerodrome, Vic., the Piper PA-22 struck a fox with the left wheel. The aircraft lifted slightly and began to fishtailing and ground looped with the right wing striking the ground. The aircraft sustained substantial damage (8 January 2013).

Cessna 210 animal strike, go around and landing gear failure

During the landing flare at Thylungra, Qld, the Cessna 210 struck a kangaroo and the pilot conducted a go-around. During the subsequent landing, the nose landing gear collapsed. The aircraft was substantially damaged (16 October 2012).

Mooney M20J Birdstrike on approach followed by animal strike

The pilot commenced the landing flare at about 10 feet above the runway at Hedlow airfield, Qld, during which time a brush turkey struck the left wing. The aircraft yawed slightly left and the left wing dropped; the pilot applied opposite aileron to maintain wings level. The aircraft then drifted to the right of the runway into an adjacent paddock and the left wing struck a bull. The aircraft landed in the paddock. The aircraft sustained substantial damage from the bull strike and one passenger received minor injuries. The bull was put down as a result of the injuries sustained from the strike (24 March 2013).

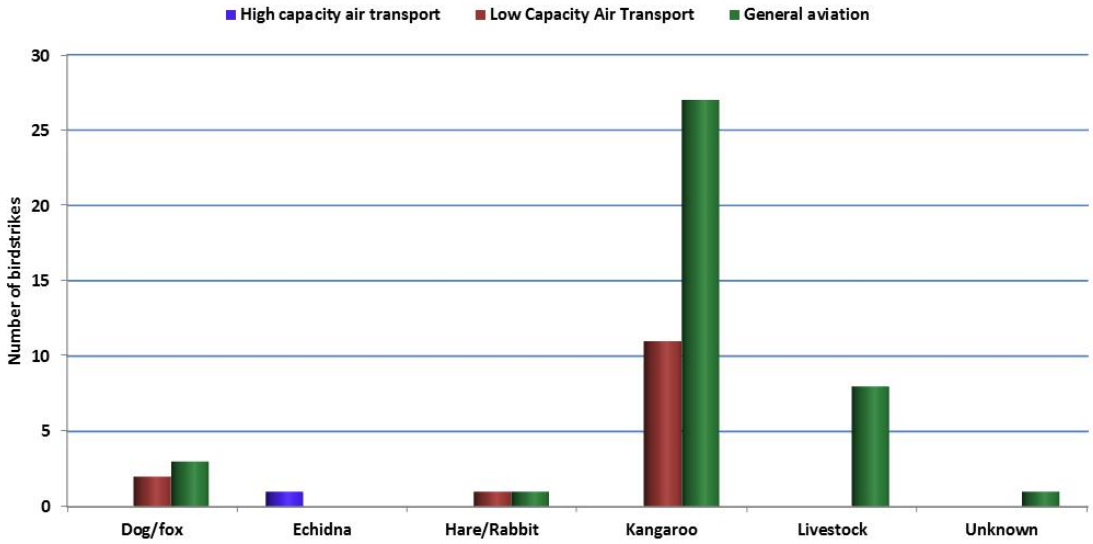
Damage to the Mooney M20J caused by striking a bull. Source: ATSB

All five of the livestock strikes where serious or destructive aircraft damage resulted occurred in general aviation and all occurred at remote landing sites (two aeroplane landing areas[11] and three private airfields) which may not have been distinctly separated from the surrounding environment. This might include landing in a paddock, or at landing areas adjacent to grazing paddocks where fences did not exist or were inadequate to separate livestock from aircraft operations.

Figure 40 shows animal-related aircraft damage mainly involved general aviation aircraft, and some low capacity air transport aircraft. There was only one high capacity air transport aircraft damaged in an animal strike, where a Boeing 717 ran over an Echidna on landing and punctured a tyre. The low number of damaging animal strikes in high capacity air transport may be due to the generally more secure airports that these aircraft fly into. Kangaroos and wallabies make up the majority of damaging animal strikes in low capacity air transport and general aviation operations.

[11] Aeroplane landing areas are unlicensed aerodromes that have been determined as suitable for landing, however, may not meet the full requirements for a licensed aerodrome.

Figure 40: Aircraft damage by animal type and operation type for the 2004-2013 period



8.2.2 Damage by aircraft component damaged

A review of the aircraft components damaged in animal strikes shows that the lower areas of an aircraft are more susceptible to damage in a strike due to their proximity to the ground. The landing gear, propeller, tail, and engine of low capacity air transport aircraft are recorded as sustaining damage in animal strikes since 2004, as shown in Table 27 below. Aircraft conducting general aviation operations were also likely to show a similar damage pattern, but there were also a number of wing damage and rotor strikes as well as fuselage and nose damage reported to the ATSB.

Table 27: Number of animal strikes by part damaged (where known) and operation type for the 2004-2013 period

Operation type	Part Damaged	Animal Strikes
Low capacity air transport	Landing gear	6
	Propeller	4
	Tail	1
	Engine	1
General Aviation	Propeller	12
	Landing gear	9
	Wing/Rotor	6
	Engine	3
	Fuselage	1
	Nose	1

9. Insect Occurrences

Recently there has been a growing industry interest in occurrences involving insects, particularly those occurrences where insects have found their way into pitot tubes[12] and affected flight instruments. In response to these inquiries, a search of the ATSB aviation occurrence database was conducted and revealed 53 occurrences between 2004 and 2013 where insects were reported to have been struck or otherwise adversely affected normal flight operations. One of the difficulties in conducting this search is that an insect strike in itself is not a reportable matter to the ATSB and so it is only when the insects are combined with some other type of occurrence, or when the insect has contributed to other consequences, that they would be reported. It is therefore likely the there are many more insect occurrences that have not been reported to the ATSB.

Not surprisingly, occurrences involving aircraft striking insects usually are not damaging to aircraft or do not affect the outcome of the flight. Indeed, of the ten occurrences that were reported simply as insect strikes, nine had no effect on the flight. One did involve an air-return when the pilot mistakenly interpreted the insect smears as a hydraulic leak and declared a Pan. More serious, however, are occurrences where insects have blocked some part of either the pitot-static system of the fuel lines.

The pitot-static system provides the static and dynamic pressures that are vital for several key flight instruments (the air speed indicator, the altimeter and the vertical speed indicator). In larger aircraft, these instruments are in turn vital for the correct functioning of the autopilot. Thus, any blockage of either the pitot tube or the static ports could result in potentially significant consequences. Worldwide over the past few decades there have been a number of accidents resulting from a blockage in the pitot static system, either by atmospheric icing (Northwest Airlines Flight 6231, USA, 1974 and Air France Flight 447, Atlantic Ocean, 2009) or by a maintenance related issue (AeroPeru Flight 603, Pacific Ocean, 1996). There has been one significant accident in recent history where the blockage was thought to have been attributed to a wasp nest, although, as the pitot tubes were unrecoverable, it could not be proven (Birgenair Flight 301, Dominican Republic, 1996).

Of the 53 occurrences in Australia between 2004 and 2013:

- 28 were identified as involving a blockage of the pitot-static system (27 blocked pitot tubes and one block static port)
- 10 were reported simply as an insect strike
- 8 involved a blockage in the fuel system
- 3 involved blocked air intakes
- 3 involved fumes or smoke in the cabin or cockpit, and
- 1 involved a number of insects on the windshield that impaired the pilot's visibility.

Table 28 shows the insect type involved by each type of occurrence above.

[12] Open-ended tube facing forwards into fluid flow, thus generating internal pressure equal to stagnation pressure (in case of supersonic flow, that downstream of normal shock).

Table 28: Types of occurrences involving insects by insect type, reported to the ATSB between 2004 and 2013.

Occurrence type	Wasp	Moth	Locust	Caterpillar	Grasshopper	Bee	Unknown	Total
Blocked pitot tube	12	6	0	1	0	1	7	27
Insect strike	0	0	2	0	0	0	8	10
Fuel blockage	4	0	0	0	0	0	4	8
Blocked air intake	0	0	1	0	0	0	2	3
Fumes | Smoke	0	2	0	0	0	0	1	3
Reduced visibility	0	0	0	0	1	0	0	1
Blocked static system	0	0	0	0	0	0	1	1
Total	**16**	**8**	**3**	**1**	**1**	**1**	**23**	**53**

In 32 of the 53 insect occurrences there were some consequential events or adverse effects on the flight:

- 12 cases (all blocked pitot tubes) resulted in rejected take-offs
- 8 resulted in air returns
- 5 resulted in engine failures (three due to blocked fuel lines and one due to a blocked air intake)
- 2 resulted in fuel starvations (also blocked fuel lines)
- 1 involved a stick shaker (stall warning) on take-off followed by an air-return
- 4 involved an engine failure (one followed by a forced landing, one causing the take-off to be rejected, one resulting in a ground return, and one resulting in a partial power loss).

The majority of these occurrences were located on the east coast of Australia, with 11 reported at Sydney and 10 at Brisbane. Three occurrences were reported from both Darwin and Alice Springs, and two each from Melbourne and Rockhampton. The remaining 22 occurrences were each reported from different locations across the country. Two of these occurrences that were investigated by the ATSB are detailed below.

Rejected takeoff Brisbane Airport, Airbus A330 19 March 2006

ATSB Investigation 200601453

On 19 March 2006, an Airbus A330 aircraft commenced a take-off at Brisbane Airport, Qld, on a scheduled passenger service to Singapore.
During the take-off roll, the flight crew noticed a significant discrepancy between the first officer's and captain's airspeed indications and rejected the take-off. The captain elected to not use reverse thrust and attempted to manually disconnect the auto-brakes via brake pedal deflection during the rejected take-off.
Shortly after vacating the runway, the flight crew noted increased brake temperatures and selected the brake cooling fans ON. During the taxi, the brake temperatures continued to rise and became excessive. The fusible plugs on six of the eight main landing gear wheels melted and the respective tyres deflated. There were no injuries to the crew or passengers.

A post-flight engineering inspection of the aircraft found what appeared to be wasp-related debris in the one of the aircraft's pitot probe and the operator determined that the contamination was a probable contributory factor in the incident.

The operator and airport owner undertook a number of safety actions to minimise the risk of future wasp activity at Brisbane Airport.

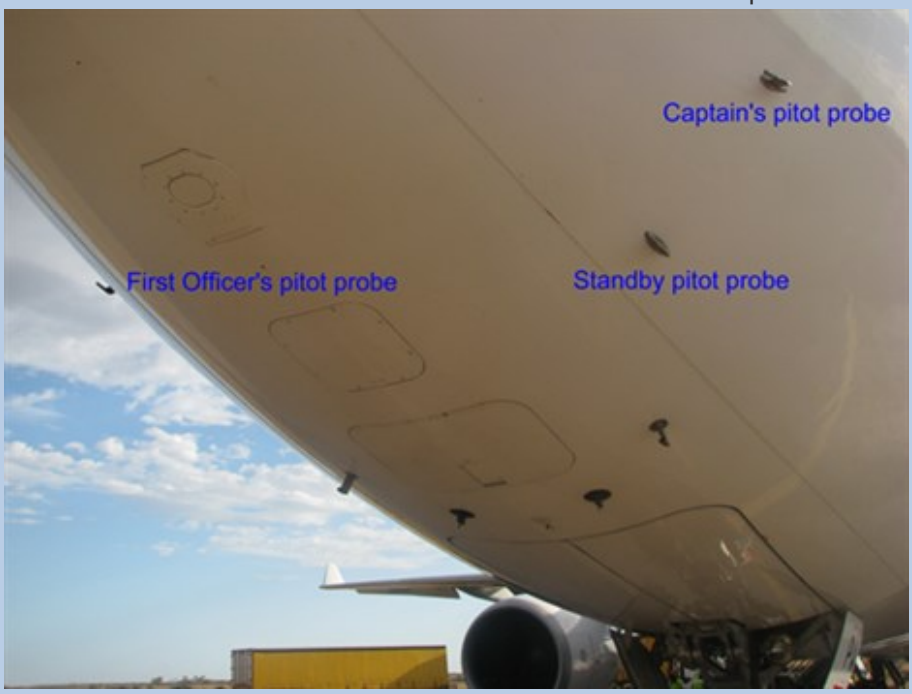
Air data system failure involving Airbus A330-243, A6-EYJ, near Brisbane Airport, Qld on 21 November 2013
ATSB Investigation AO-2013-212

On 21 November 2013, after a flight from Singapore, an Airbus A330 landed at Brisbane Airport and was taxied to the terminal. It came to a stop at 0949 Eastern Standard Time (EST). At 1152, the aircraft was pushed-back for the return flight to Singapore. At 1204, the captain discontinued (rejected) the take-off after observing an airspeed indication failure on his display. The maximum airspeed recorded by the flight data recorder during the rejected takeoff was 88 kt.

The aircraft taxied back to the terminal where trouble-shooting was carried out. As part of this work, ADIRU[1] 1 and ADIRU 2 were transposed and the aircraft was dispatched with the air data reference part of ADIRU 2 inoperative in accordance with the MEL[2]. The first officer's air data source was switched from ADIRU 2 to ADIRU 3. The captain's air data source remained switched to the normal (ADIRU 1) position.

At 1345, during the second take-off, the crew became aware of an airspeed discrepancy after the V1 rejected take-off decision speed and the take-off was continued. Once airborne, the crew declared a MAYDAY and decided to return to Brisbane where an overweight landing[3] was carried out.

Subsequently, the pitot probes (which measure airspeed information that is sent to the ADIRUs) were visually inspected. The inspection found that there was an internal obstruction of the captain's probe, while the first officer's and standby probes were clear. The captain's probe was removed from the aircraft and sent to the probe manufacturer in the USA. Examination showed that it had been almost completely blocked by an insect nest, composed of sand and mud that was consistent with the nest of a 'mud-dauber' wasp.



Locations of pitot probes. Source ATSB

[1] Air data and inertial reference unit, which supplies air data and inertial reference information to the pilots' flight instrument displays and other aircraft systems.

[2] A minimum equipment list (MEL) is a list of aircraft equipment and systems that may be inoperative for flight, subject to specified conditions.

[3] The actual landing weight was 199.7 tonnes while the maximum landing weight was 182 tonnes. After an overweight landing, depending on the vertical speed and acceleration at touchdown, an aircraft inspection may be required.

Appendices

Appendix A – Species in types

Table 29: Bird types by common name and species name (as reported), 2004 to 2013

Bird type	Name	Count
Australian Brush-turkey	Bush Turkey	28
	Brush Turkey	6
	Scrub Turkey	1
Bat/Flying Fox	bat	443
	Fruit bat	238
	flying fox	203
	micro bat	12
	Eastern Freetail Bat	2
	Mouse-eared bat	2
	Freetail bat	1
Bee-eater	Rainbow Bee-eater	3
Bustard	Australian Bustard	11
	Bustard	10
Cockatoo	Cockatoo	39
	Black Cockatoo	10
	Sulphur crested cockatoo	4
	white Cockatoo	2
	Pink Cockatoo	1
Cormorant	cormorant	18
	Pied Cormorant	5
Crow/Raven	Crow	73
	Raven	10
	Butcherbird	8
	Currawong	3
Cuckoo	Cuckoo-shrike	2
	Cuckoo	2

Continued

Bird type	Name	Count
Curlew/Sandpiper	Bush Stone-curlew	109
	Curlew	105
	Sandpiper	19
	Little curlew	13
	Whimbrel	2
	Bush Curlew	1
	Bush Thick-knee	1
	Eastern Curlew	1
	Stone-curlew Plover	1
Darter	Darter	4
Dove	Pigeon	174
	Dove	31
	Rock Dove	14
	Turtle Dove	3
	Crested pigeon	2
	Diamond dove	1
	Peaceful Dove	1
Duck	Duck	146
	Wood Duck	30
	Pacific Black Duck	28
	Black Duck	8
Eagle	Eagle (not wedgetail)	71
	Brahminy Kite	12
	Sea eagle	9
	Little Eagle	2
Falcon	Falcon	35
	Brown falcon	22
	Australian Hobby	8
	Peregrine Falcon	8
	Hobby	1
Finch	Finch	64
	Zebra Finch	16
	Goldfinch	5
Frigate	Frigate	8
Galah	Galah	797

Continued

Bird type	Name	Count
Hawk	Hawk	285
	Chicken hawk	12
	Goshawk	11
	Sparrowhawk	10
	Swamp Harrier	7
	Osprey	5
	Collared Sparrowhawk	4
	Spotted Harrier	2
Hen	Native Hen	9
	Swamphen	7
	Tasmanian Native-hen	1
Heron/Egret	Egret	34
	Cattle egret	31
	White-faced Heron	27
	Nankeen Night Heron	24
	Heron	21
	Crane	11
	Brolga	3
	Jabiru	2
Honeyeater/Chat	Black honeyeater	1
	Honeyeater	1
	Orange chat	1
	Red Wattlebird	1
House Sparrow	Sparrow	173
	House Sparrow	3
Ibis	Ibis	120
	Straw-necked Ibis	13
	White Ibis	5
Kingfisher/Kookaburra	Kookaburra	10
	Kingfisher	2

Continued

Bird type	Name	Count
Kite	Black Kite	289
	Kite	265
	Kite-Hawk	175
	Whistling Kite	91
	Black-shouldered Kite	16
	Fork-tailed Kite	2
	Brown kite	1
	Speckled Kite	1
	Square-tailed kite	1
Lapwing/Plover	Plover	665
	Masked Lapwing	103
	Lapwing	22
	Spur-winged Plover	22
	Dotterel	19
	Oriental Plover	19
	Banded Plover	8
	Masked Plover	5
	Banded lapwing	1
Magpie	Magpie	474
	Australian Magpie	46
Magpie Goose	Magpie Goose	16
	Goose	2
Magpie-lark	Magpie-lark	232
	Peewee	78
	Mudlark	34
	Lark	20
	Murray Magpie	6
	Brown Songlark	2
	Flycatcher	1
Myna	Myna	10
Nankeen Kestrel	Kestrel	325
	Nankeen Kestrel	192
	Australian Kestrel	19
Owl	Owl	96
	Barn Owl	50
	Frogmouth owl	1
	Masked owl	1

Continued

Bird type	Name	Count
Oystercatcher	Pied Oystercatcher	2
Pacific Gull	Pacific Gull	21
	Petrel	1
Parrot	Corella	34
	Parrot	17
	Rainbow Lorikeet	13
	Little Corella	9
	Budgerigar	5
	Crimson Rosella	2
	Lorikeet	1
Pelican	Pelican	19
Pheasant	Partridge	1
Pipit	Richard`s Pipit	142
	Pipit	69
	Australasian Pipit	16
	Australian Pipit	2
	Ground Lark	2
Pratincole	Pratincole	104
	Australian Pratincole	74
	Australian Courser	12
	Swallow-plover	3
Rail	Buff Banded Rail	1
	Dusky Moorhen	1
Robin	Robin	8
Silver Gull	Seagull	205
	Silver Gull	73
	Gull	16
Skylark	Skylark	44
	Common Skylark	1
Starling	Starling	61
	Common Starling	4

Continued

Bird type	Name	Count
Swallow/Martin	Swallow	276
	Fairy Martin	90
	Welcome Swallow	64
	Martin	49
	Wood swallow	31
	Black-faced Wood Swallow	15
	Barn Swallow	5
Swan	Swan	7
Swift	Swift	45
	Needle-tail swift	6
	Fork-tailed Swift	4
	Spine tailed swift	3
	Australian Swiftlet	2
Tern	Tern	44
	Crested Tern	6
	Little Tern	3
Thrush	Blackbird	3
Wader	Wader	3
	Courser	2
	Grey tailed tattler	2
	Red-necked Stint	2
	Banded Stilt	1
	Common greenshank	1
	Godwit	1
	Snipe	1
Wagtail	Willie Wagtail	9
	Wagtail	4
Wedge-tailed Eagle	Wedge-tailed Eagle	22
	Eagle-hawk	4
Wren	Wren	6
Other	Chicken	2
	Australasian Grebe	1
	Bittern, brown	1
	Eurasian Coot	1
	Grey bunting	1
	Leaf warbler	1

Table 30: Animal types by common and species names (as reported), 2004 to 2013

Animal type	Name	Count
Bandicoot	Bandicoot	5
Cat	Cat	1
Dog/fox	fox	37
	dog	5
	Dingo	2
Echidna	Echidna	7
Frog/Toad	Cane Toad	2
	Toad	1
Goanna/Monitor	Goanna	10
	Monitor	2
Hare/Rabbit	Hare	74
	Rabbit	65
Kangaroo	Kangaroo	64
	Wallaroo	1
Large Flightless bird	Emu	2
Livestock	Cattle	3
	Cow	2
	Sheep	2
	horse	1
	Pig	1
Lizard/snake	Lizard	15
	snake	8
	Bearded dragon	1
Mouse/Rat	Mouse	1
	Rat	1
Possum	Possum	3
Potoroo	Potoroo	1
Quokka	Quokka	2
Robber Crab	Robber Crab	1
Turtle	Turtle	5
Wallaby	Wallaby	38
Wombat	Wombat	1

Appendix B – Hourly birdstrikes counts and rates, 2010 - 2013

Adelaide

Figure 41: Total hourly birdstrike counts and rates per 10,000 movements for Adelaide aerodrome, 2010 – 2013. The strike rate is displayed in blue (left side axis); the strike count is displayed in red (right side axis).

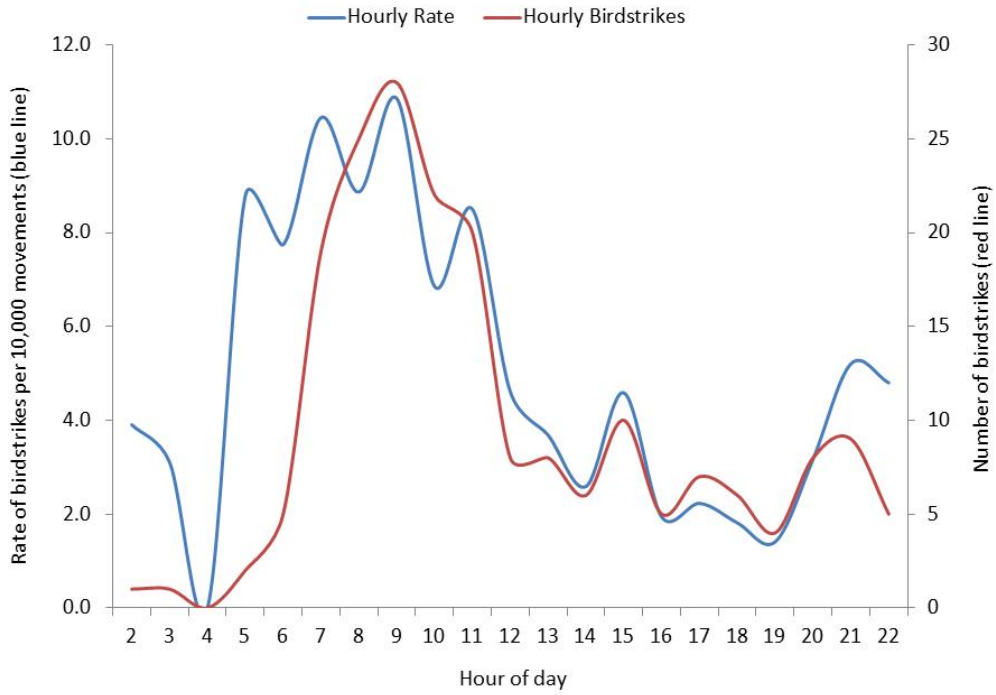
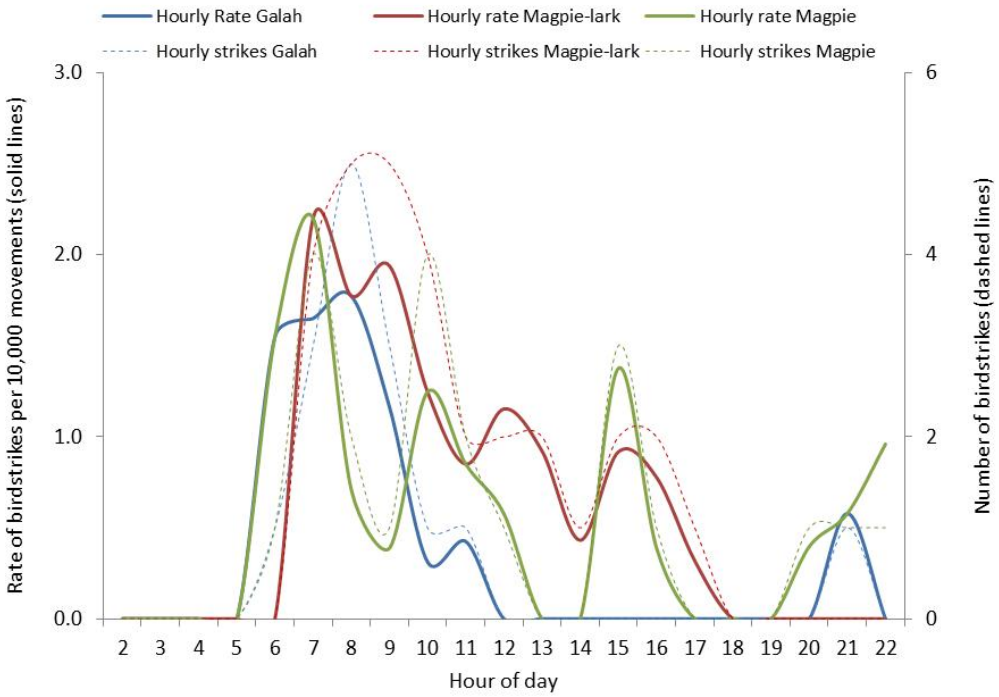


Figure 42: Hourly strike counts and strike rates per 10,000 movements for the top three species (where known) struck at Adelaide aerodrome, 2004 – 2013. The strike rates are displayed by solid lines (left side axis), the strike counts are displayed by dotted lines (right side axis).



Brisbane

Figure 43: Total hourly birdstrike counts and rates per 10,000 movements for Brisbane aerodrome, 2010 – 2013. The strike rate is displayed in blue (left side axis); the strike count is displayed in red (right side axis).

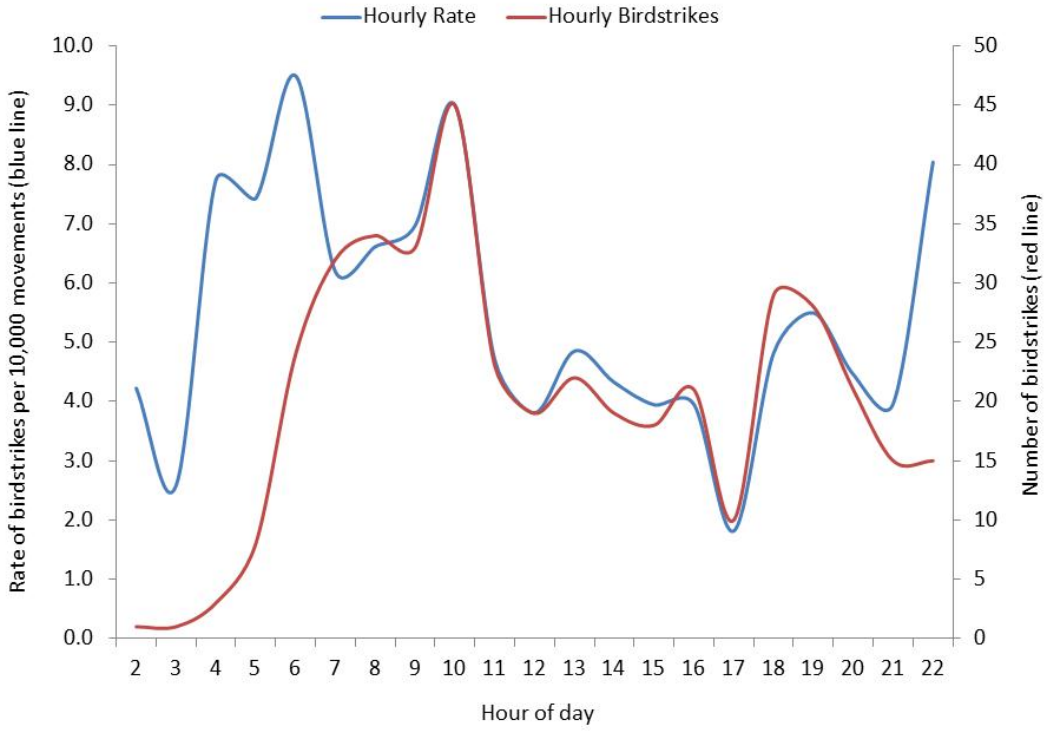
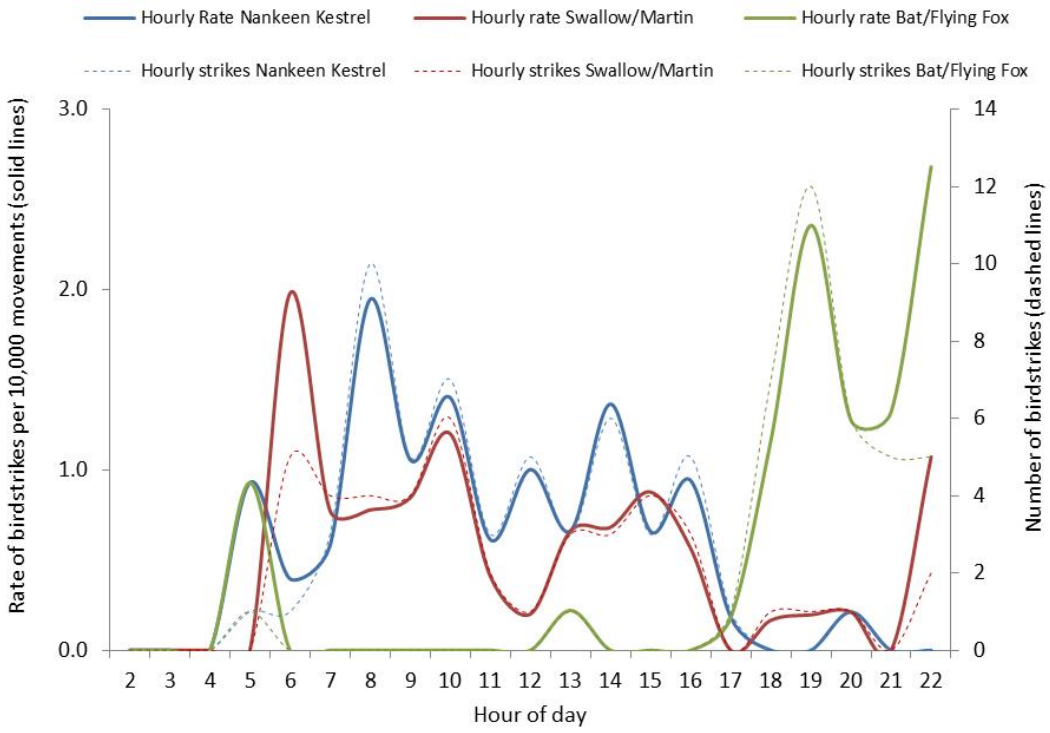


Figure 44: Hourly strike counts and strike rates per 10,000 movements for the top three species (where known) struck at Brisbane aerodrome, 2004 – 2013. The strike rates are displayed by solid lines (left side axis), the strike counts are displayed by dotted lines (right side axis).



Cairns

Figure 45: Total hourly birdstrike counts and rates per 10,000 movements for Cairns aerodrome, 2010 – 2013. The strike rate is displayed in blue (left side axis); the strike count is displayed in red (right side axis).

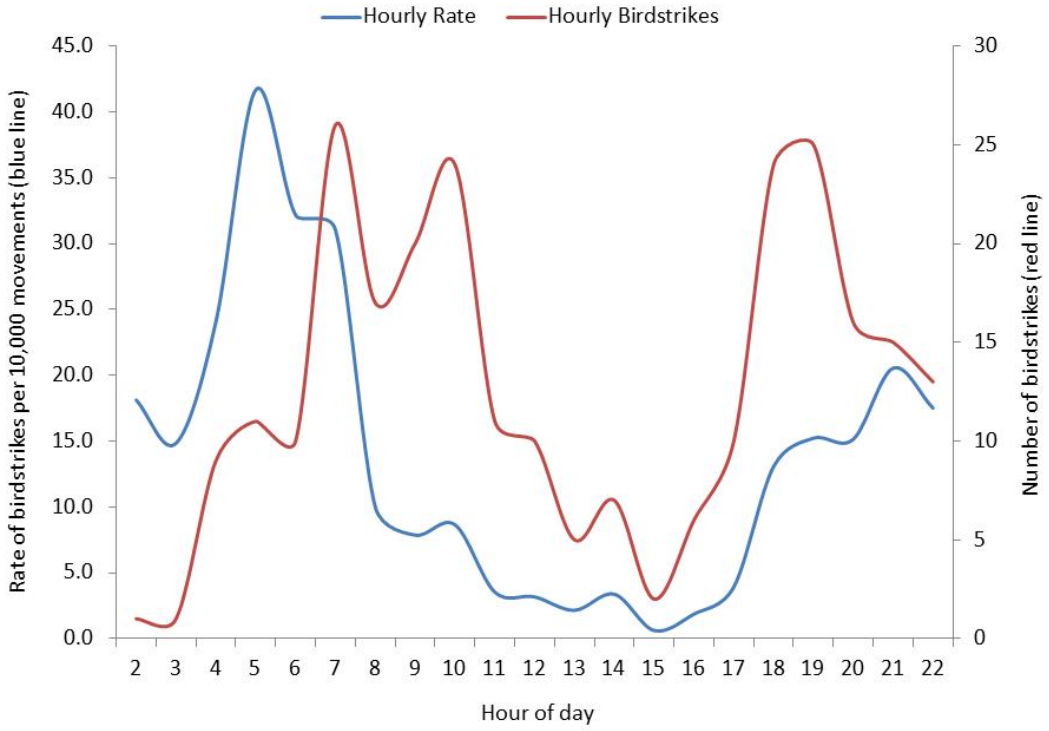
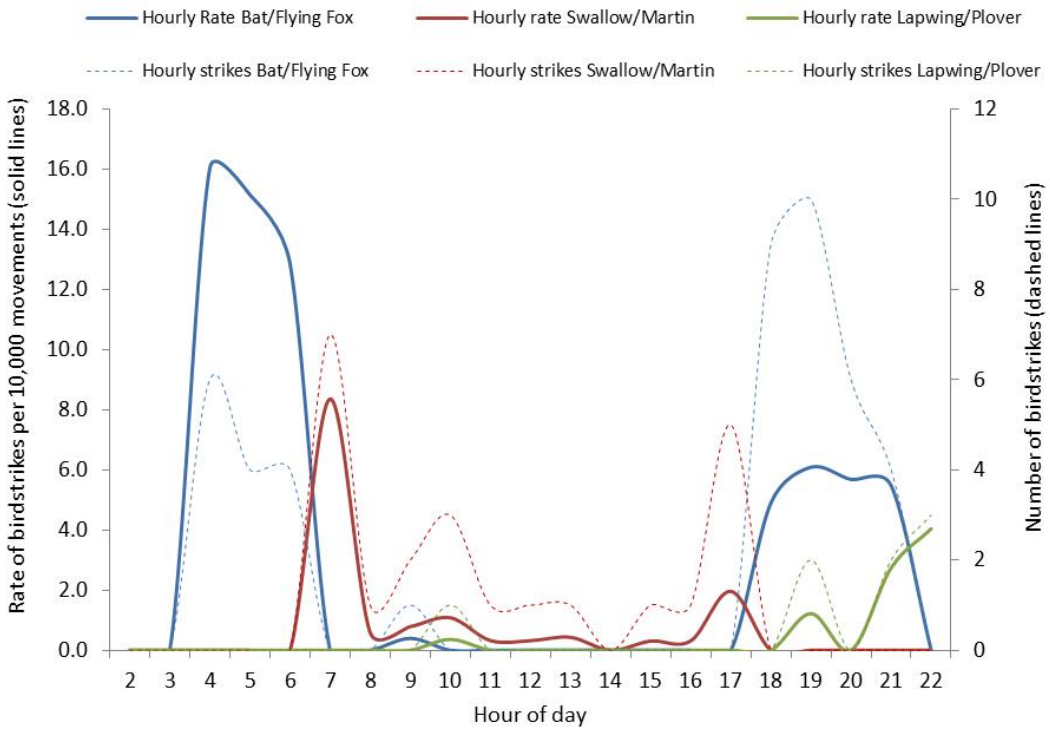


Figure 46: Hourly strike counts and strike rates per 10,000 movements for the top three species (where known) struck at Cairns aerodrome, 2004 – 2013. The strike rates are displayed by solid lines (left side axis), the strike counts are displayed by dotted lines (right side axis).



Canberra

Figure 47: Total hourly birdstrike counts and rates per 10,000 movements for Canberra aerodrome, 2010 – 2013. The strike rate is displayed in blue (left side axis); the strike count is displayed in red (right side axis).

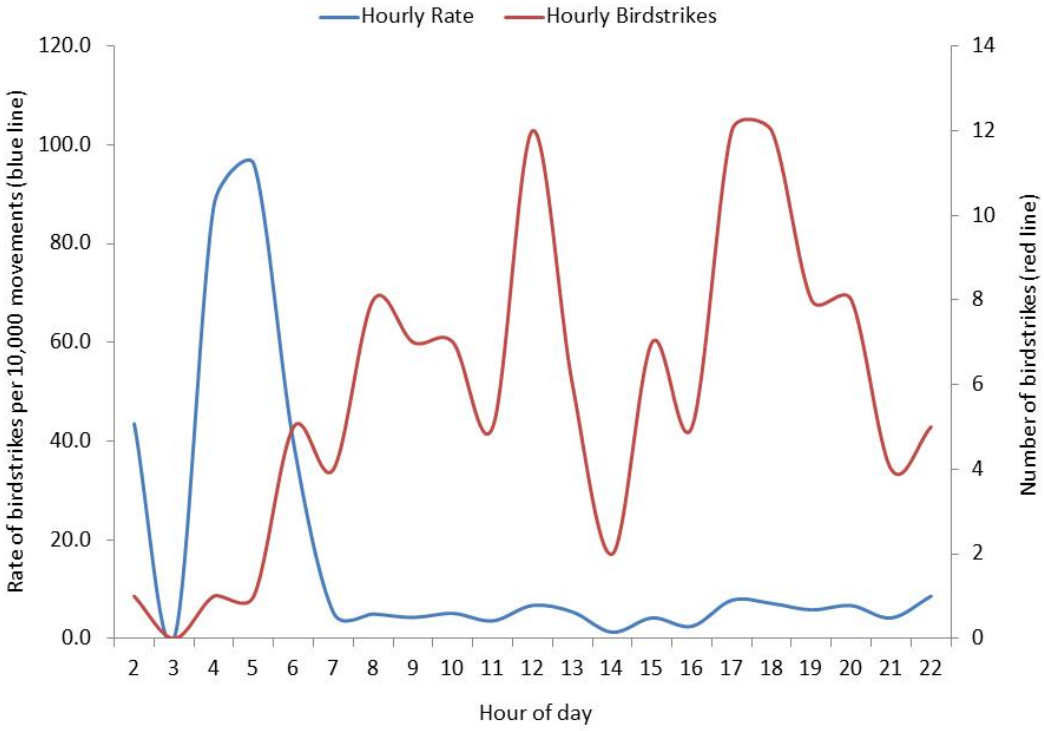
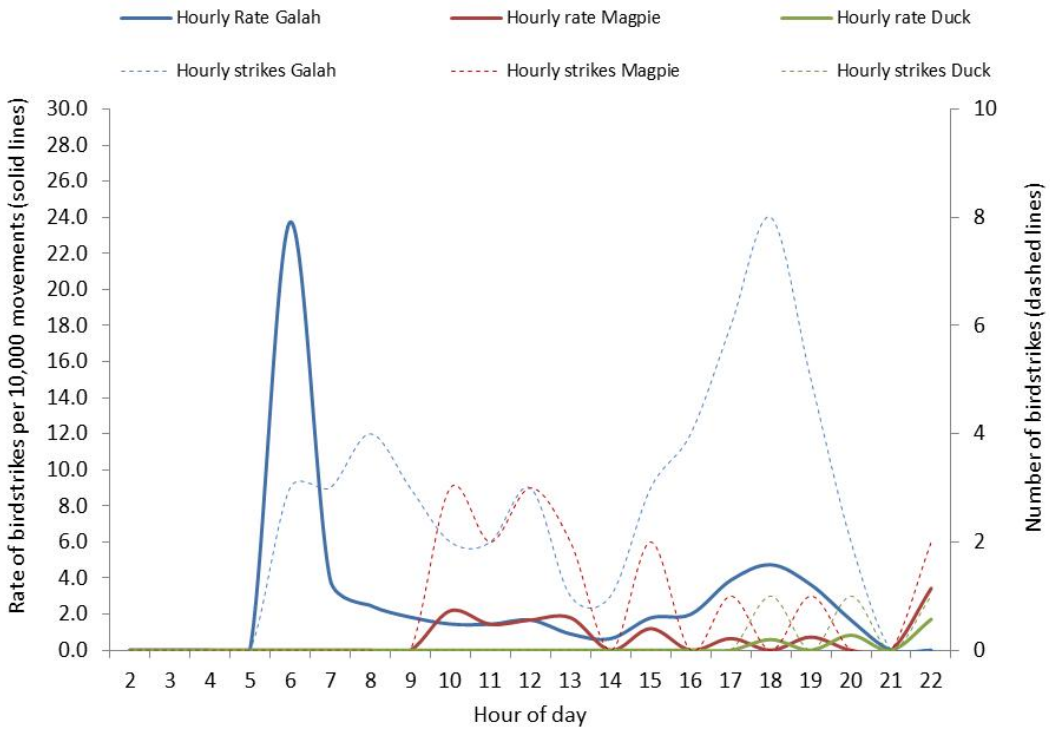


Figure 48: Hourly strike counts and strike rates per 10,000 movements for the top three species (where known) struck at Canberra aerodrome, 2004 – 2013. The strike rates are displayed by solid lines (left side axis), the strike counts are displayed by dotted lines (right side axis).



Darwin

Figure 49: Total hourly birdstrike counts and rates per 10,000 movements for Darwin aerodrome, 2010 – 2013. The strike rate is displayed in blue (left side axis); the strike count is displayed in red (right side axis).

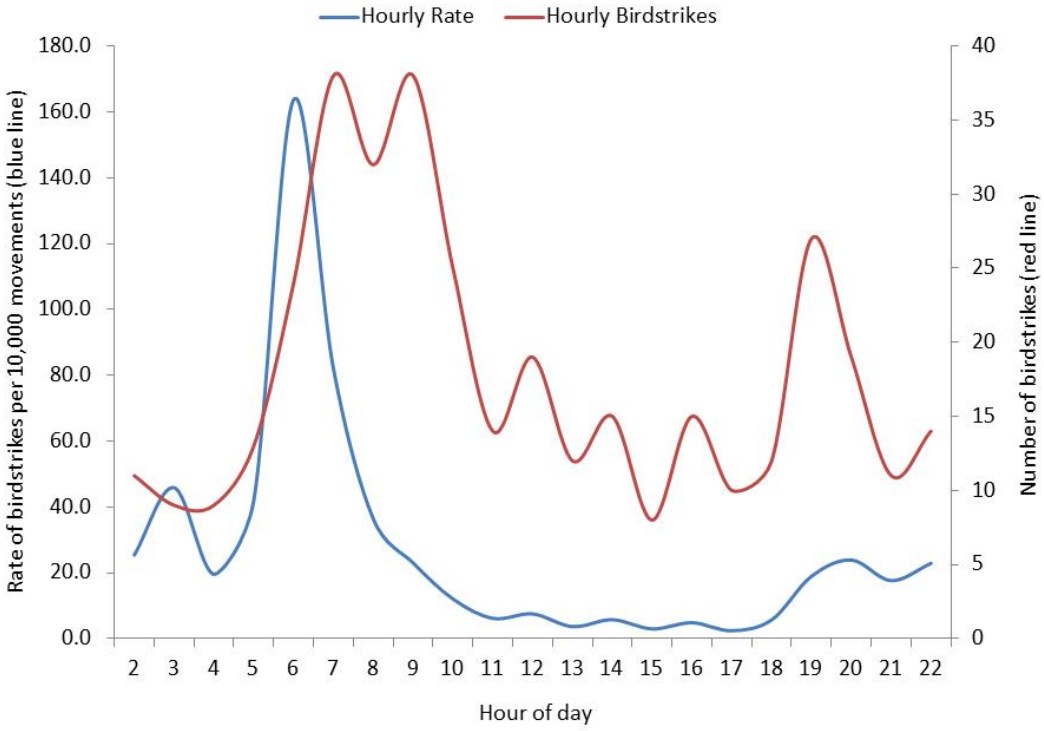
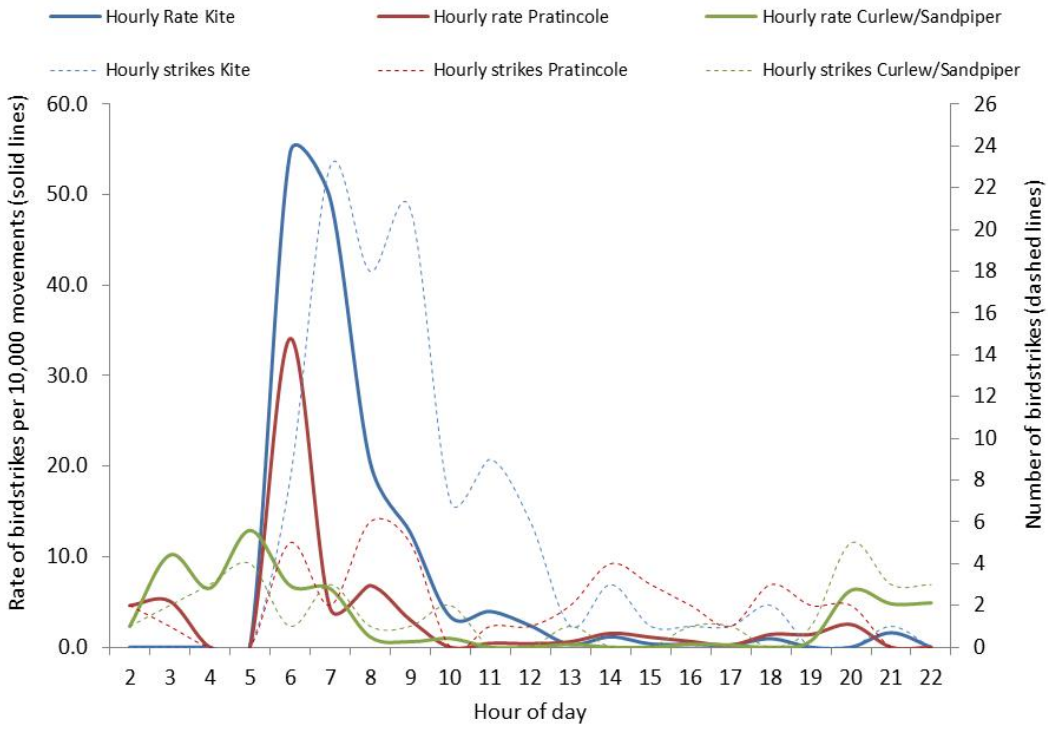


Figure 50: Hourly strike counts and strike rates per 10,000 movements for the top three species (where known) struck at Darwin aerodrome, 2004 – 2013. The strike rates are displayed by solid lines (left side axis), the strike counts are displayed by dotted lines (right side axis).



Gold Coast

Figure 51: Total hourly birdstrike counts and rates per 10,000 movements for Gold Coast aerodrome, 2010 – 2013. The strike rate is displayed in blue (left side axis); the strike count is displayed in red (right side axis).

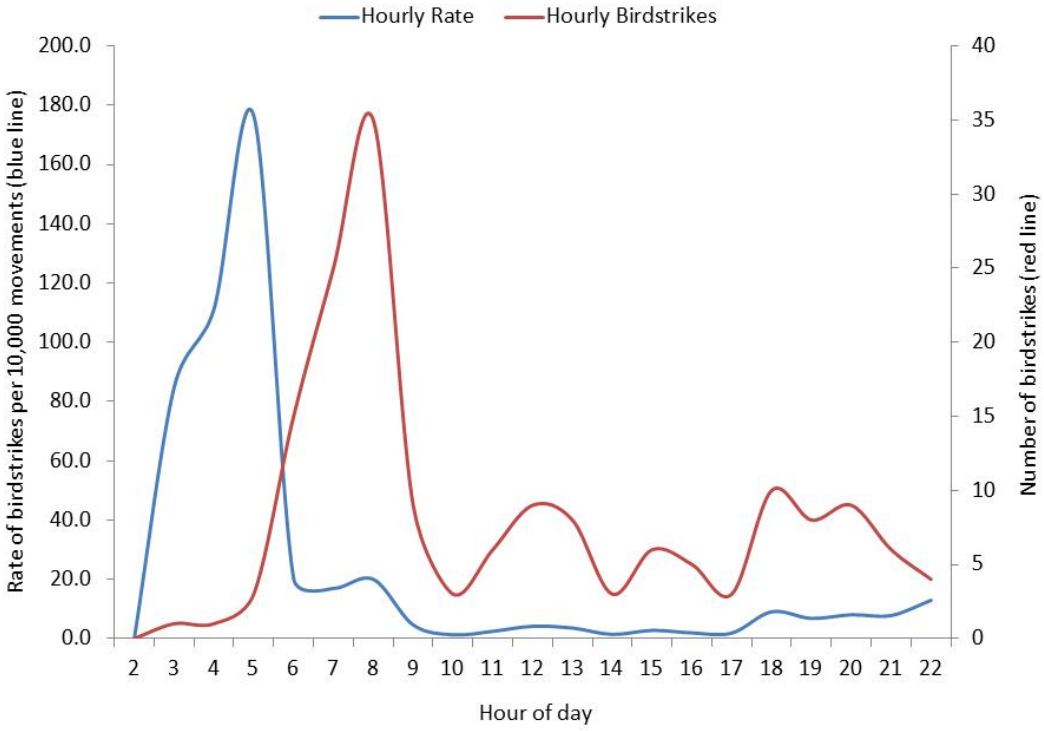
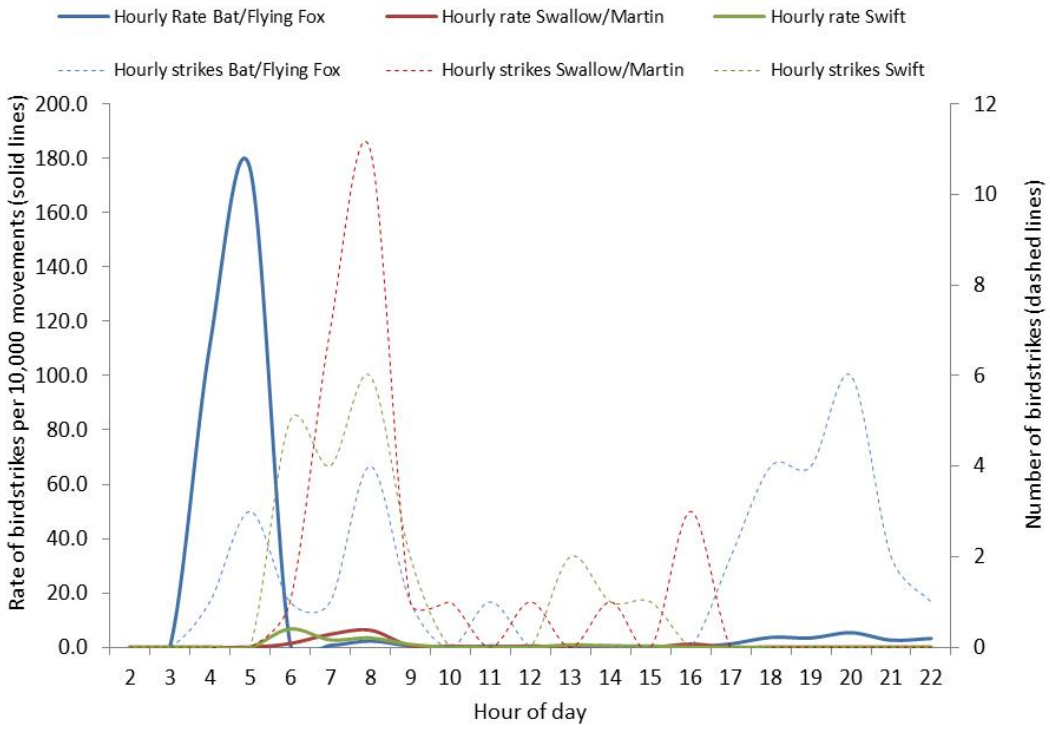


Figure 52: Hourly strike counts and strike rates per 10,000 movements for the top three species (where known) struck at Gold Coast aerodrome, 2004 – 2013. The strike rates are displayed by solid lines (left side axis), the strike counts are displayed by dotted lines (right side axis).



Hobart

Figure 53: Total hourly birdstrike counts and rates per 10,000 movements for Hobart aerodrome, 2010 – 2013. The strike rate is displayed in blue (left side axis); the strike count is displayed in red (right side axis).

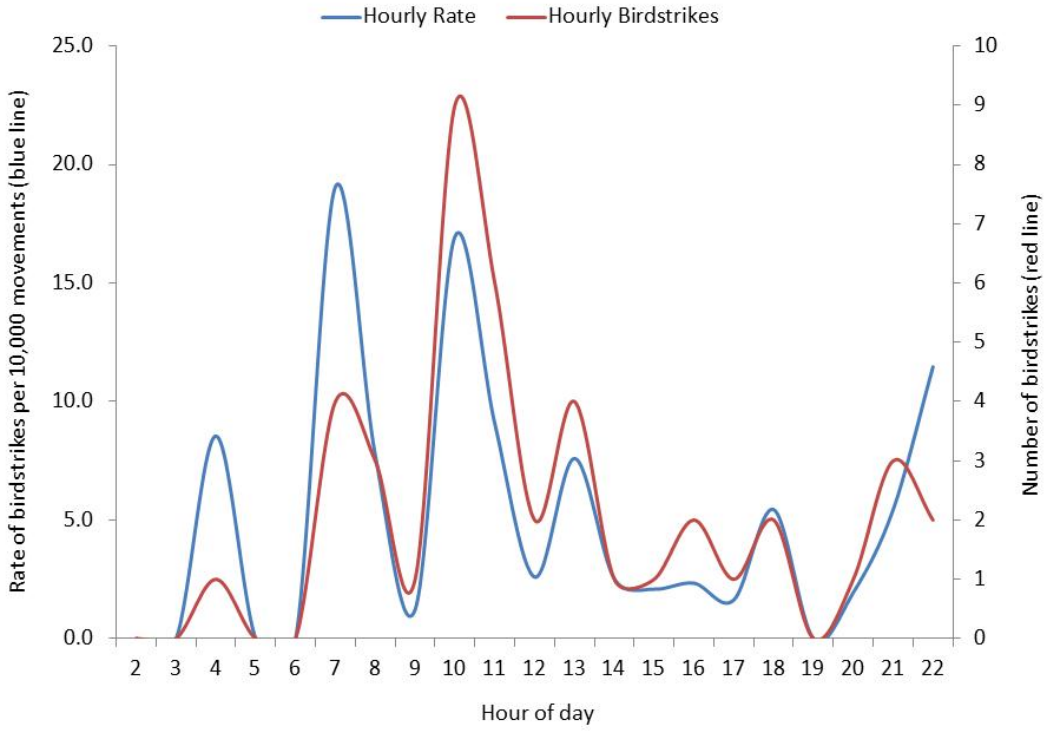
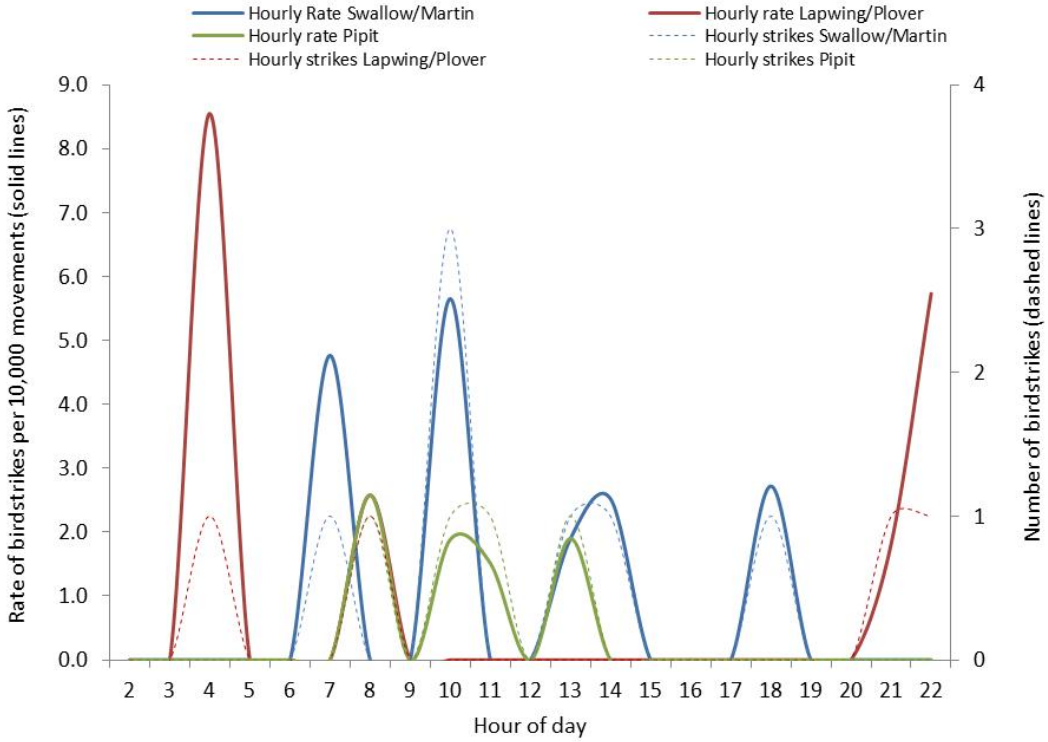


Figure 54: Hourly strike counts and strike rates per 10,000 movements for the top three species (where known) struck at Hobart aerodrome, 2004 – 2013. The strike rates are displayed by solid lines (left side axis), the strike counts are displayed by dotted lines (right side axis).



Melbourne

Figure 55: Total hourly birdstrike counts and rates per 10,000 movements for Melbourne aerodrome, 2010 – 2013. The strike rate is displayed in blue (left side axis); the strike count is displayed in red (right side axis).

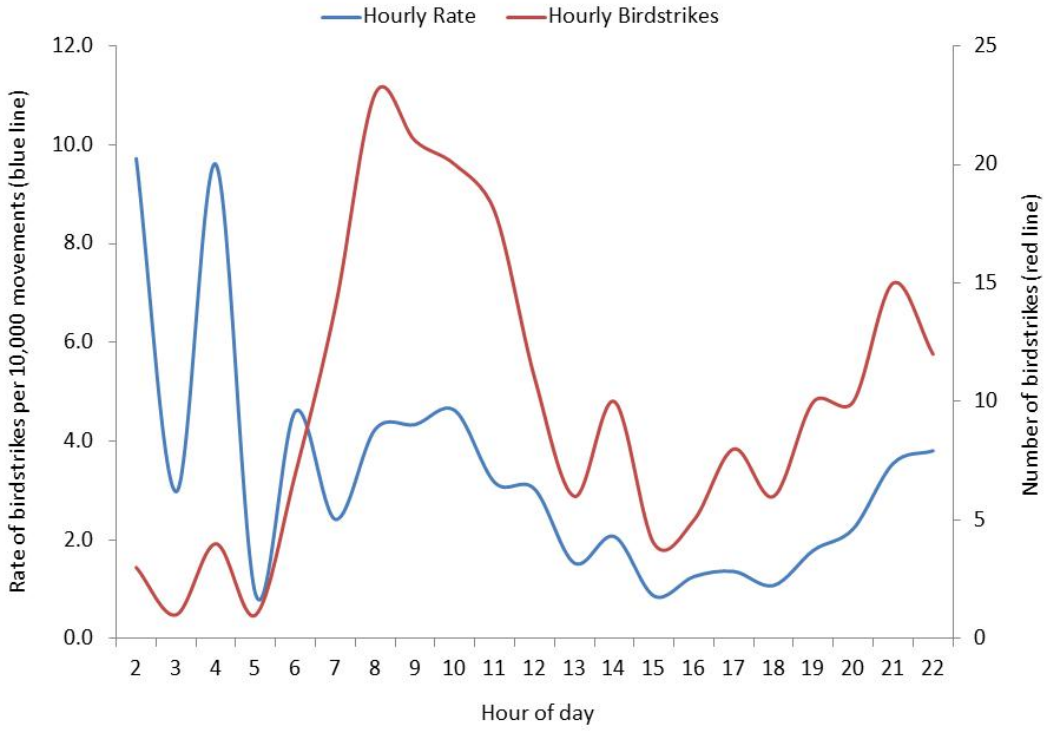
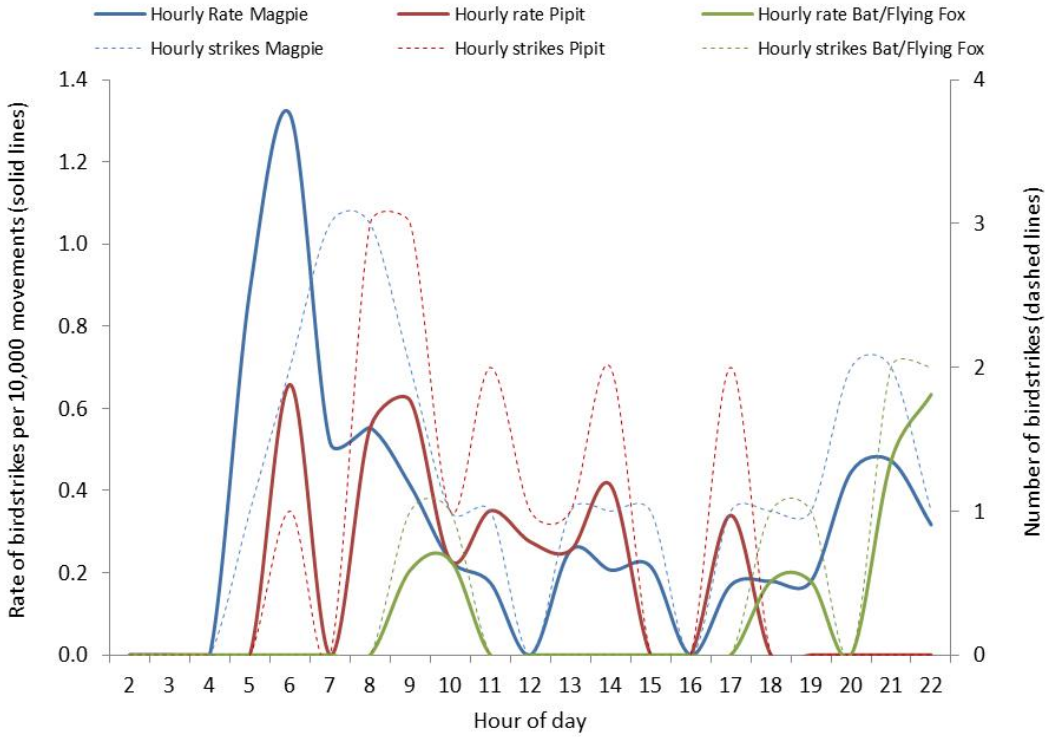


Figure 56: Hourly strike counts and strike rates per 10,000 movements for the top three species (where known) struck at Melbourne aerodrome, 2004 – 2013. The strike rates are displayed by solid lines (left side axis), the strike counts are displayed by dotted lines (right side axis).



Perth

Figure 57: Total hourly birdstrike counts and rates per 10,000 movements for Perth aerodrome, 2010 – 2013. The strike rate is displayed in blue (left side axis); the strike count is displayed in red (right side axis).

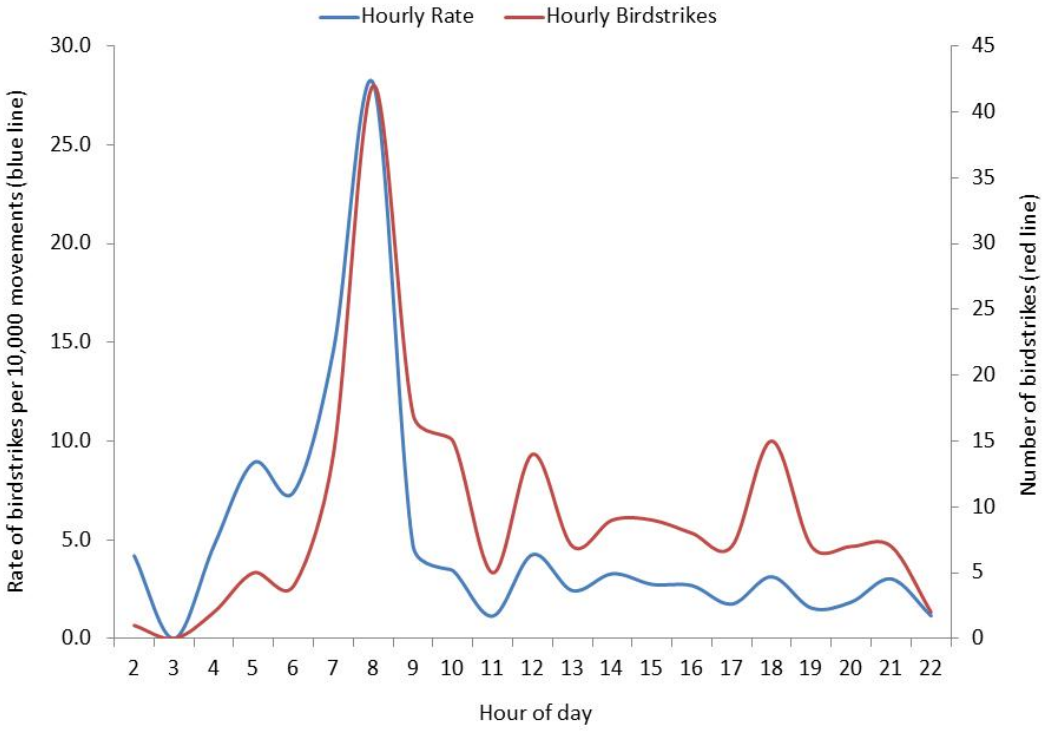
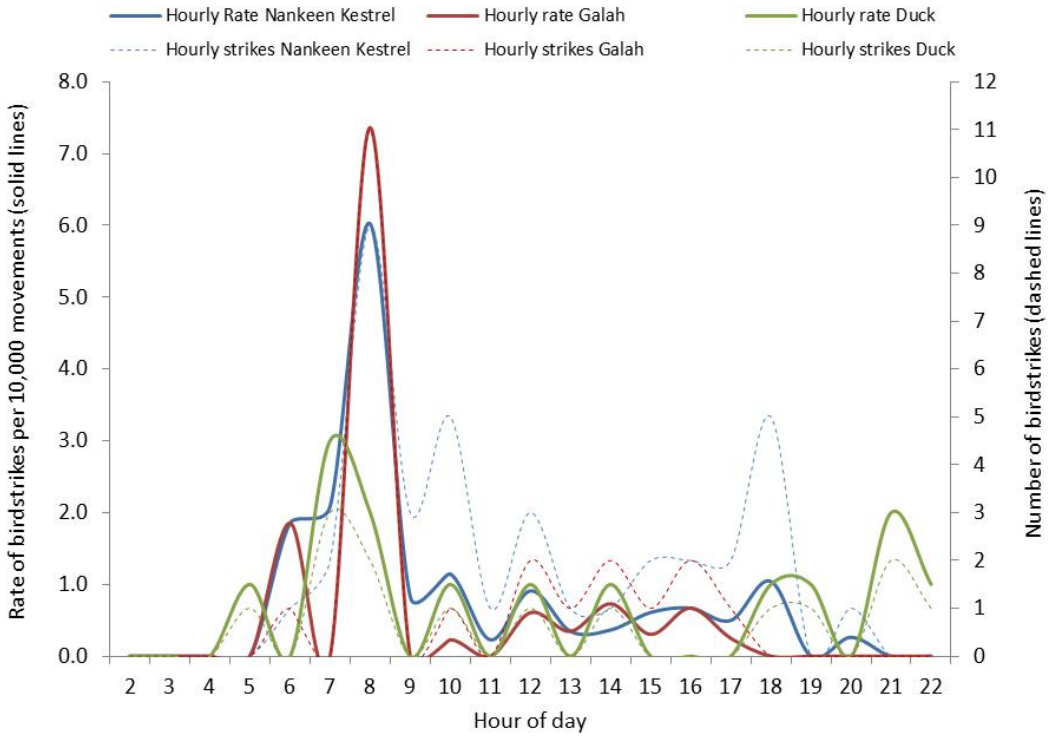


Figure 58: Hourly strike counts and strike rates per 10,000 movements for the top three species (where known) struck at Perth aerodrome, 2004 – 2013. The strike rates are displayed by solid lines (left side axis), the strike counts are displayed by dotted lines (right side axis).



Sydney

Figure 59: Total hourly birdstrike counts and rates per 10,000 movements for Sydney aerodrome, 2010 – 2013. The strike rate is displayed in blue (left side axis); the strike count is displayed in red (right side axis).

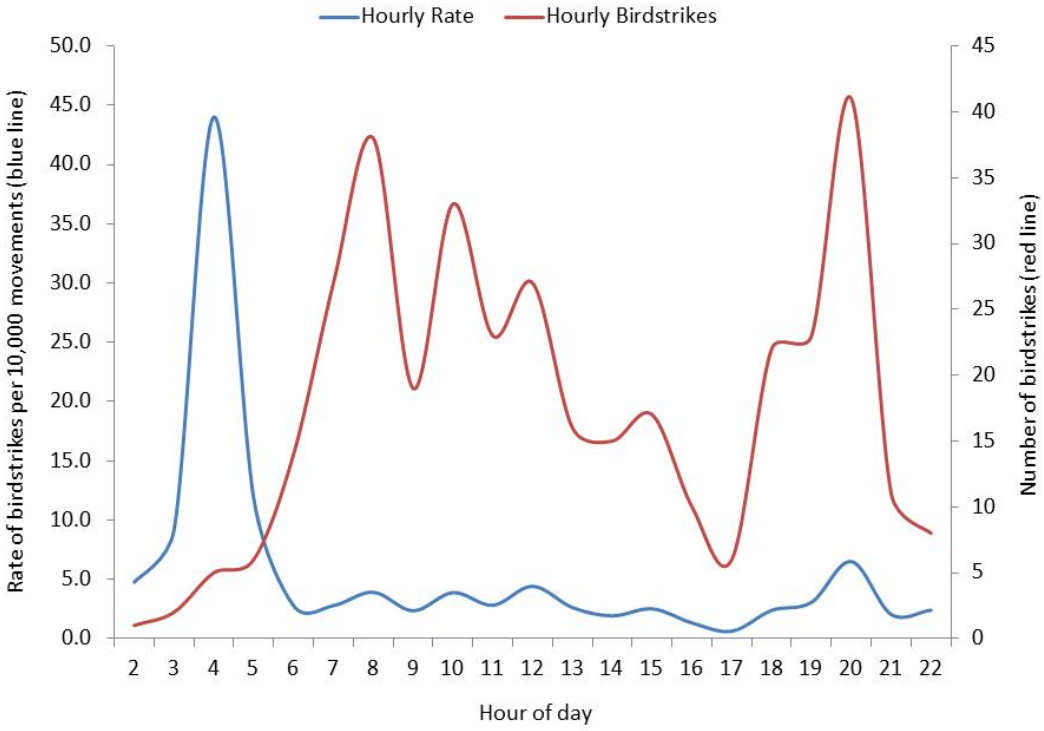
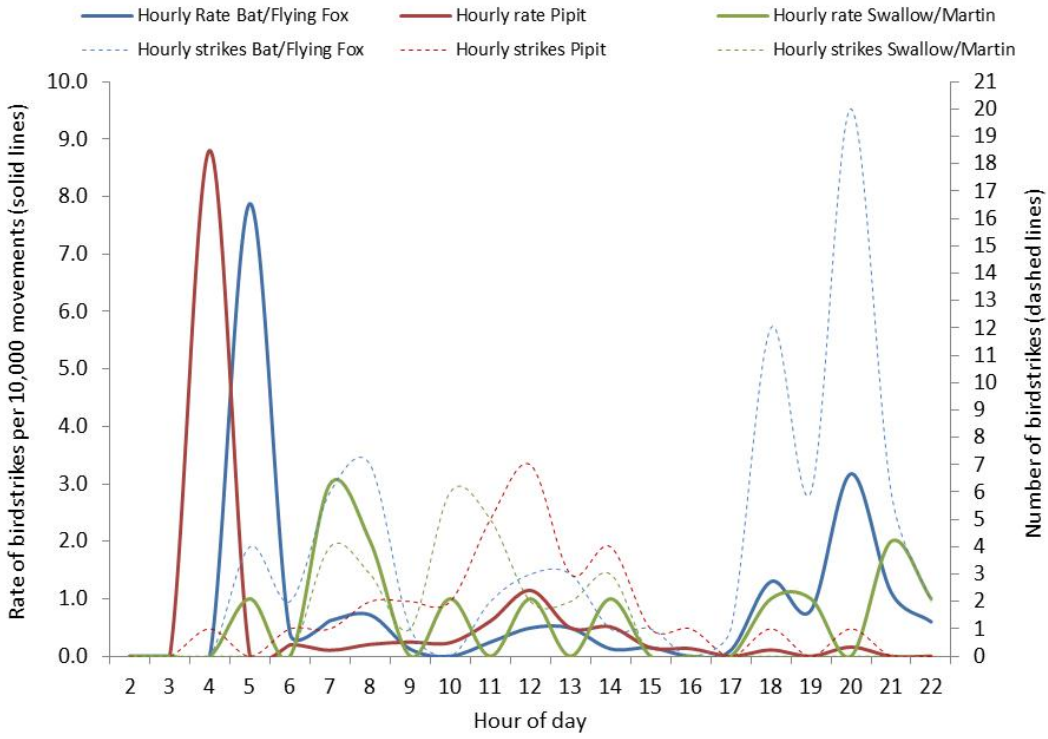


Figure 60: Hourly strike counts and strike rates per 10,000 movements for the top three species (where known) struck at Sydney aerodrome, 2004 – 2013. The strike rates are displayed by solid lines (left side axis), the strike counts are displayed by dotted lines (right side axis).



Appendix C – Monthly birdstrike rates by aerodrome

Major aerodromes

Figure 61: Monthly birdstrike rates for Adelaide aerodrome, 2004 - 2013

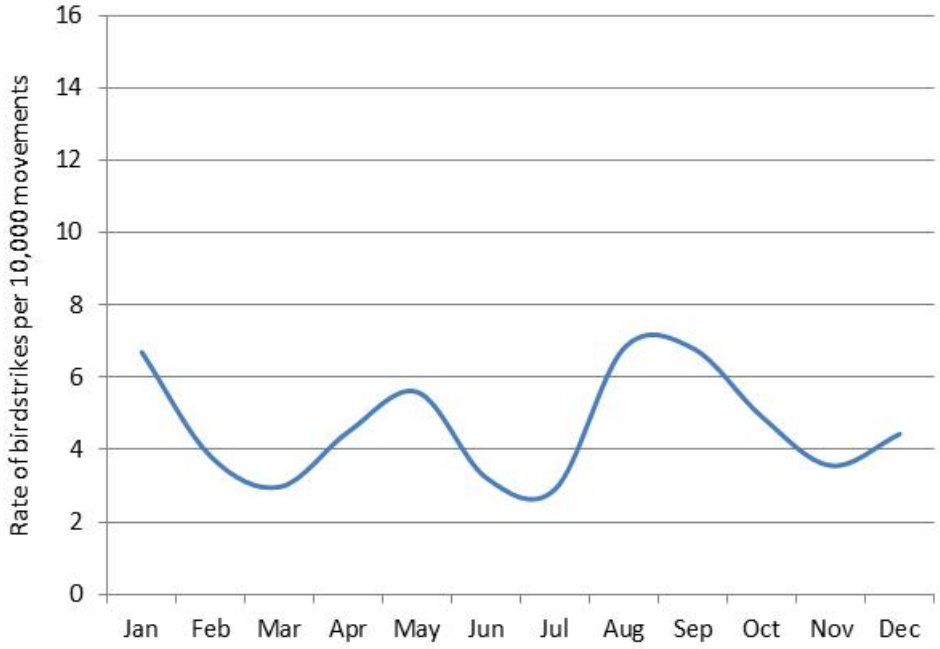


Figure 62: Monthly birdstrike rates for Brisbane aerodrome, 2004 - 2013

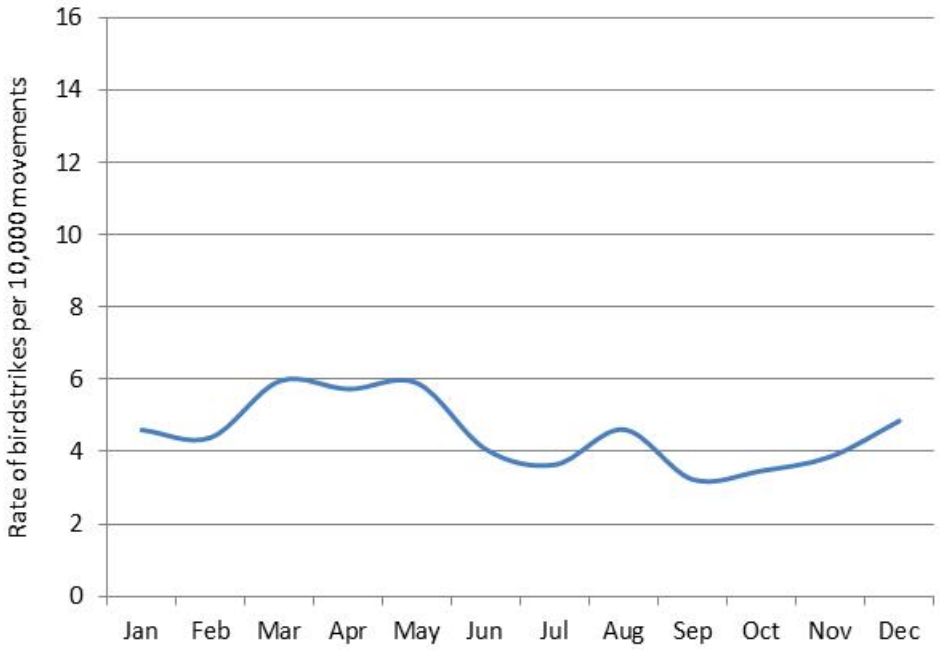


Figure 63: Monthly birdstrike rates for Cairns aerodrome, 2004 - 2013

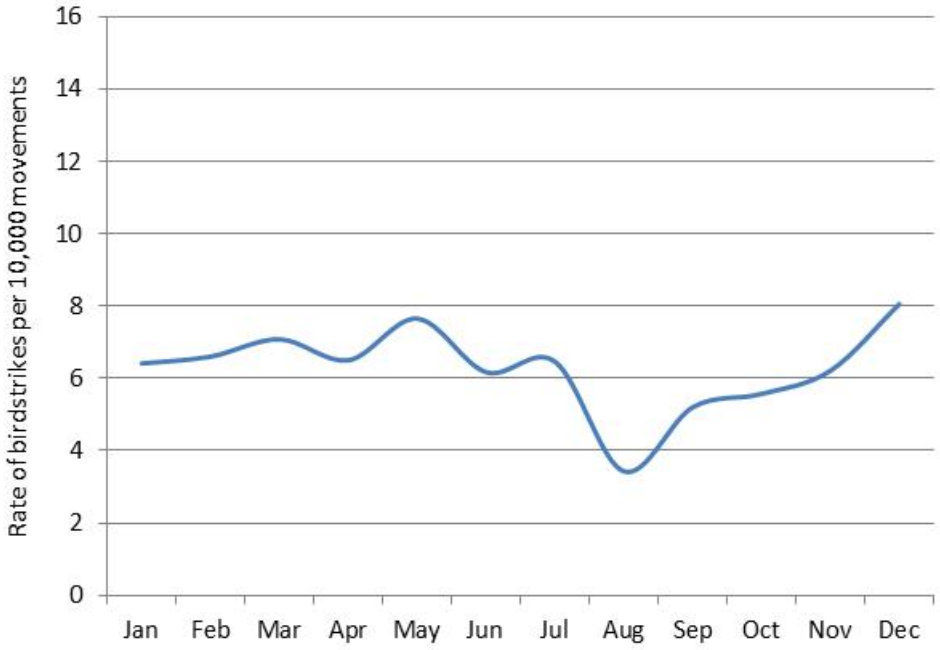


Figure 64: Monthly birdstrike rates for Canberra aerodrome, 2004 - 2013

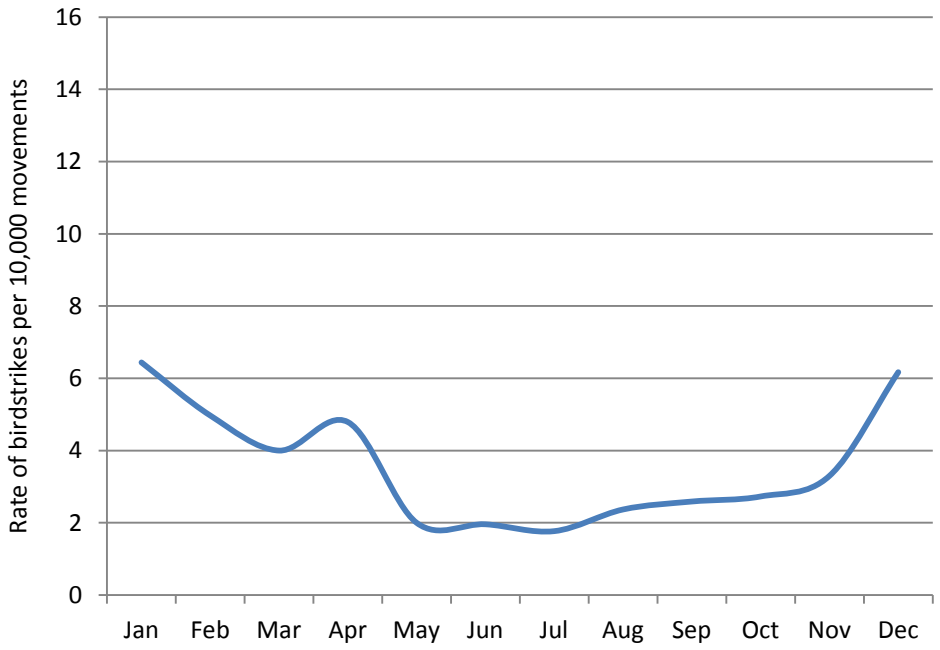


Figure 65: Monthly birdstrike rates for Darwin aerodrome, 2004 - 2013

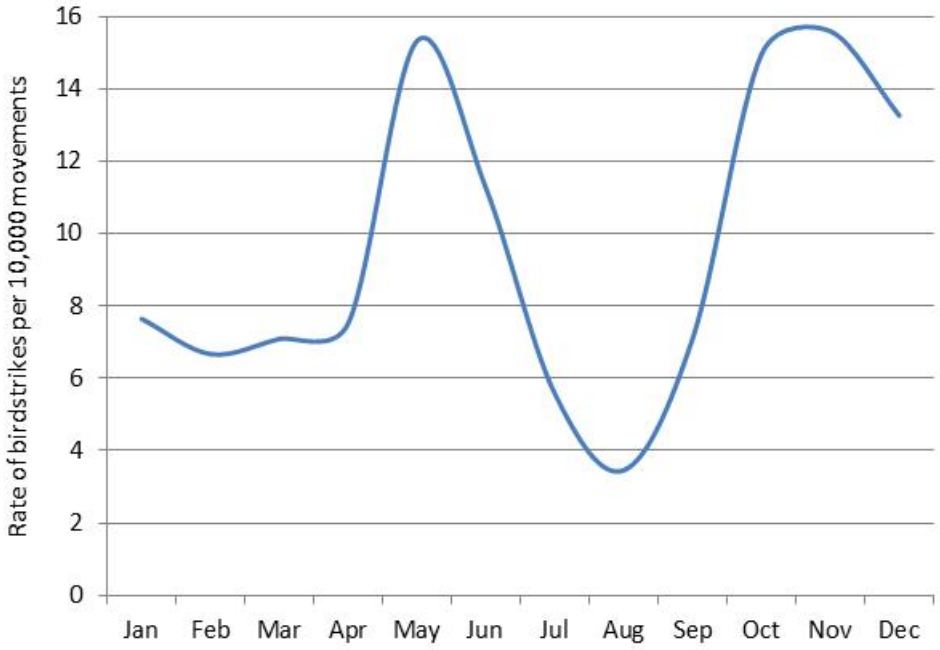


Figure 66: Monthly birdstrike rates for Gold Coast aerodrome, 2004 - 2013

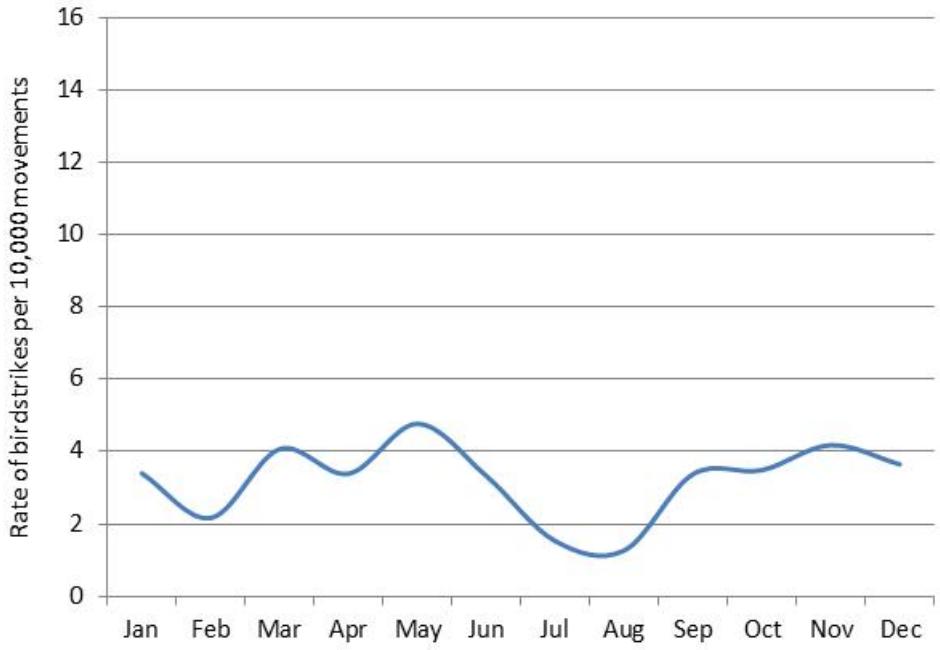


Figure 67: Monthly birdstrike rates for Hobart aerodrome, 2004 - 2013

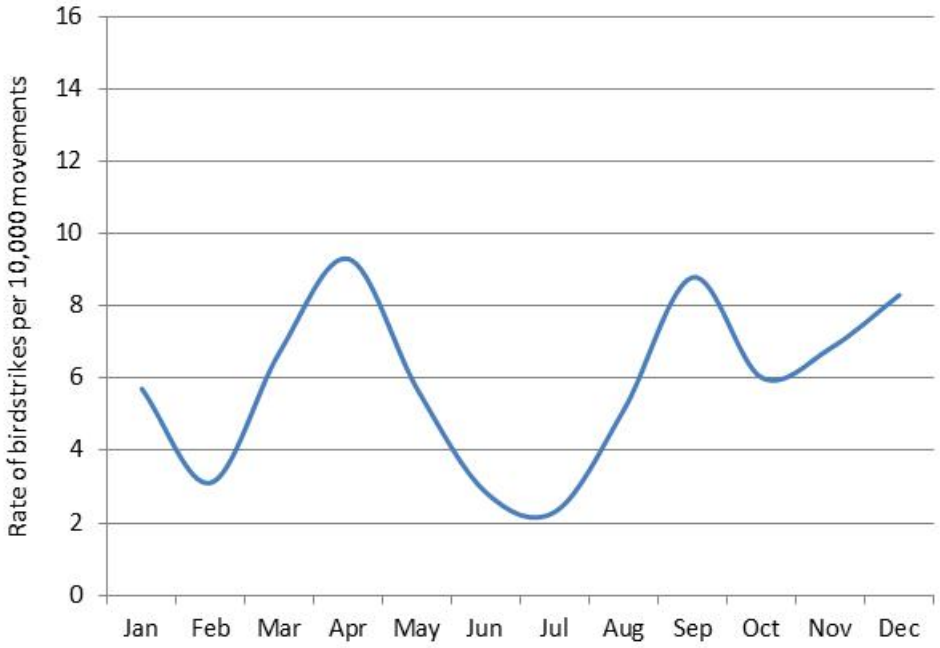


Figure 68: Monthly birdstrike rates for Melbourne aerodrome, 2004 - 2013

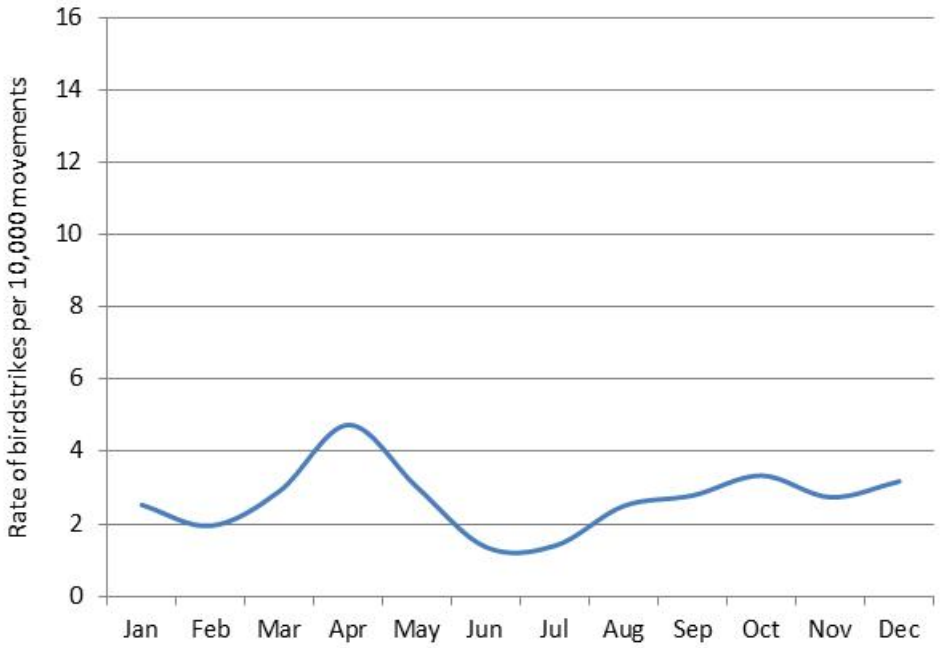


Figure 69: Monthly birdstrike rates for Perth aerodrome, 2004 - 2013

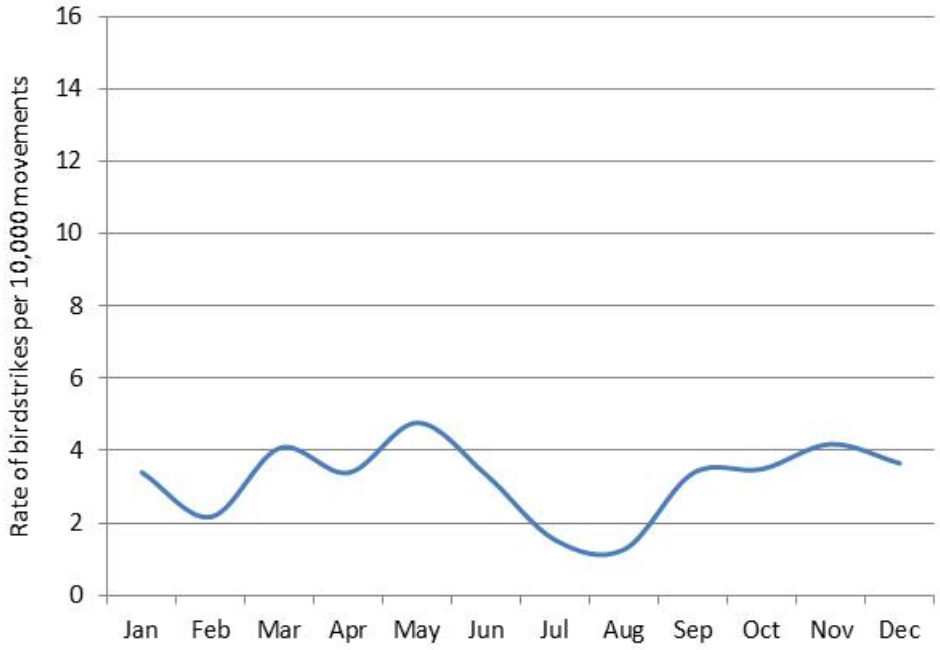
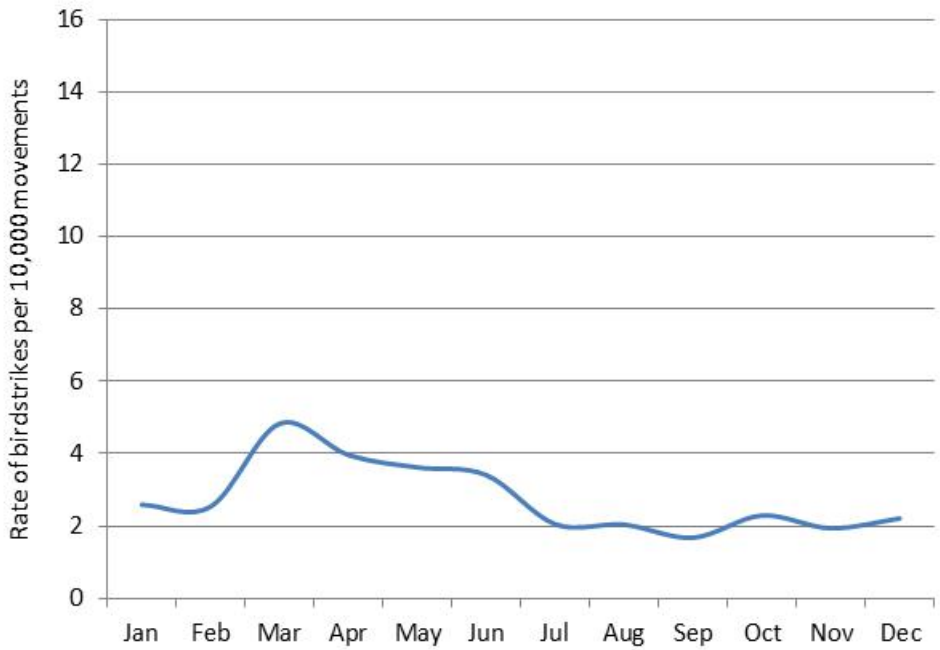


Figure 70: Monthly birdstrike rates for Sydney aerodrome, 2004 - 2013



Towered regional class D aerodromes

Figure 71: Monthly birdstrike rates for Albury aerodrome, 2004 - 2013

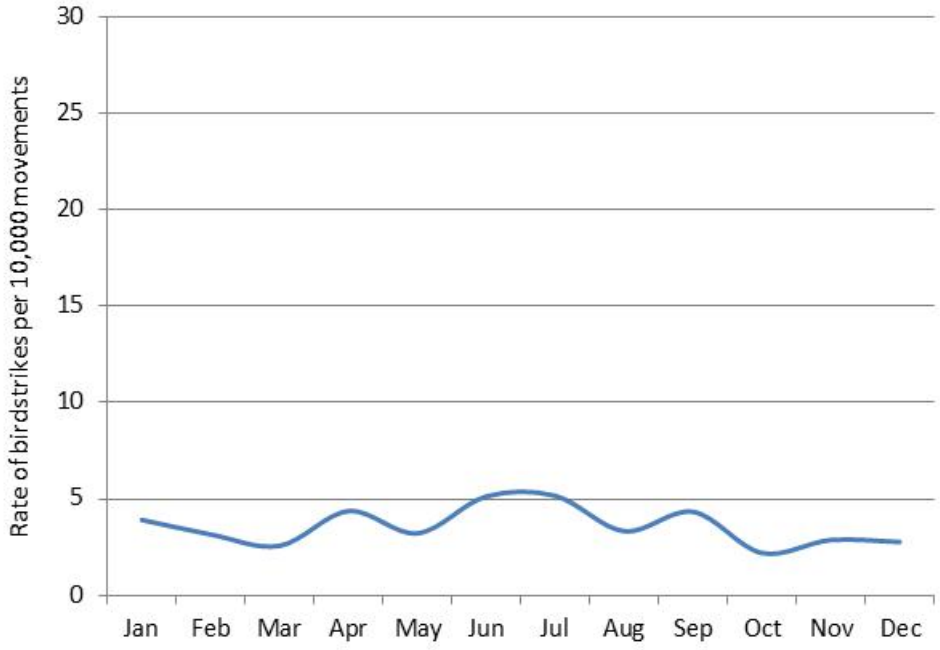


Figure 72: Monthly birdstrike rates for Alice Springs aerodrome, 2004 - 2013

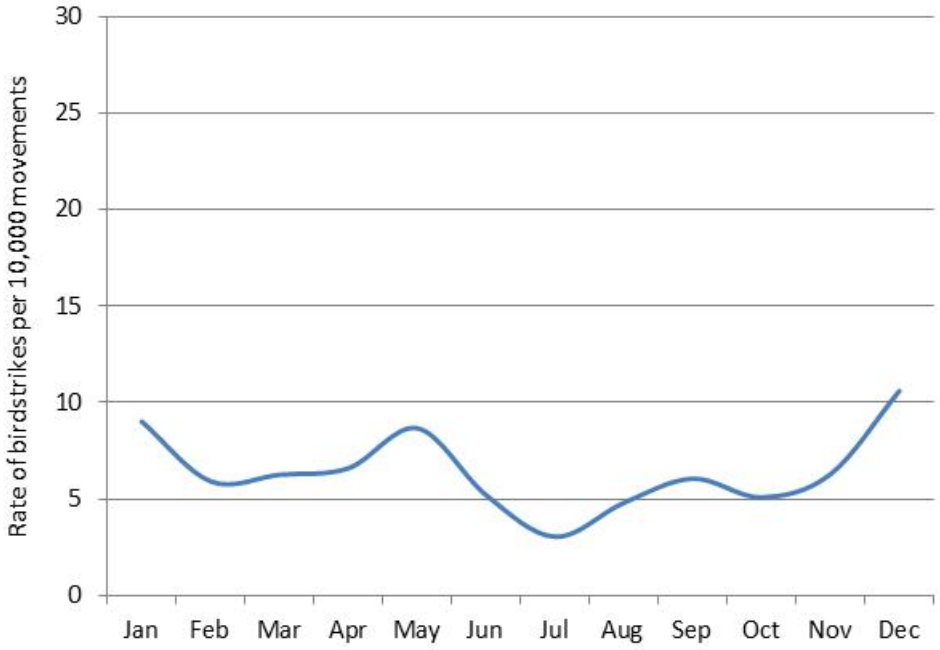


Figure 73: Monthly birdstrike rates for Avalon aerodrome, 2004 - 2013

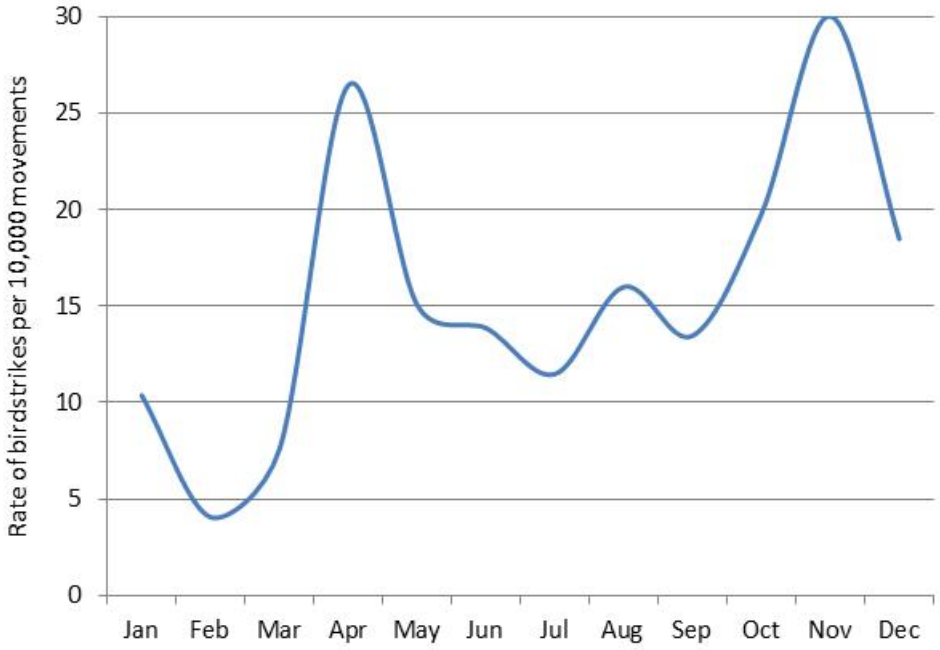


Figure 74: Monthly birdstrike rates for Coffs Harbour aerodrome, 2004 - 2013

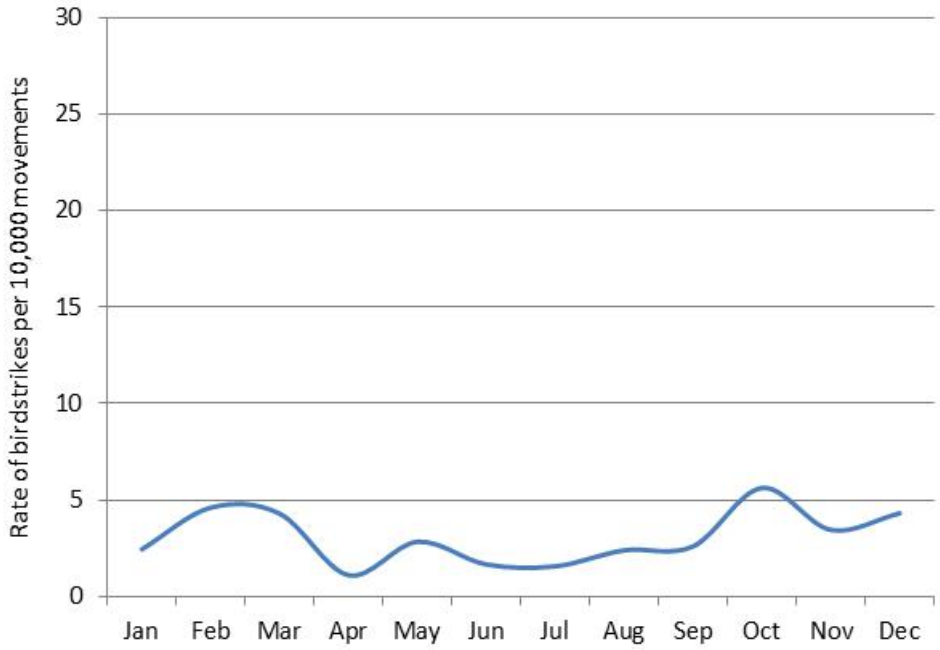


Figure 75: Monthly birdstrike rates for Essendon aerodrome, 2004 - 2013

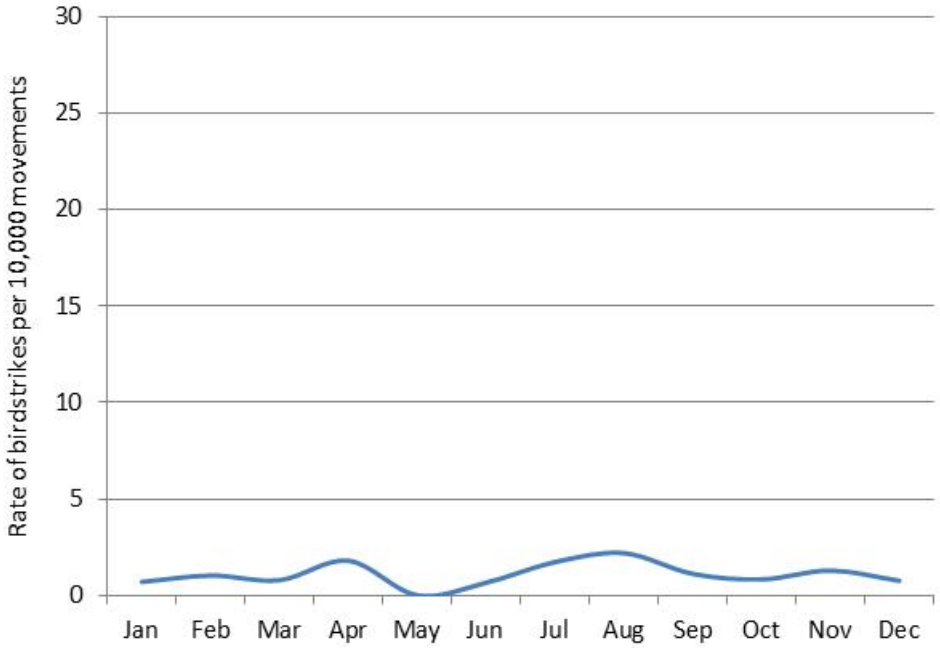


Figure 76: Monthly birdstrike rates for Hamilton Island aerodrome, 2004 - 2013

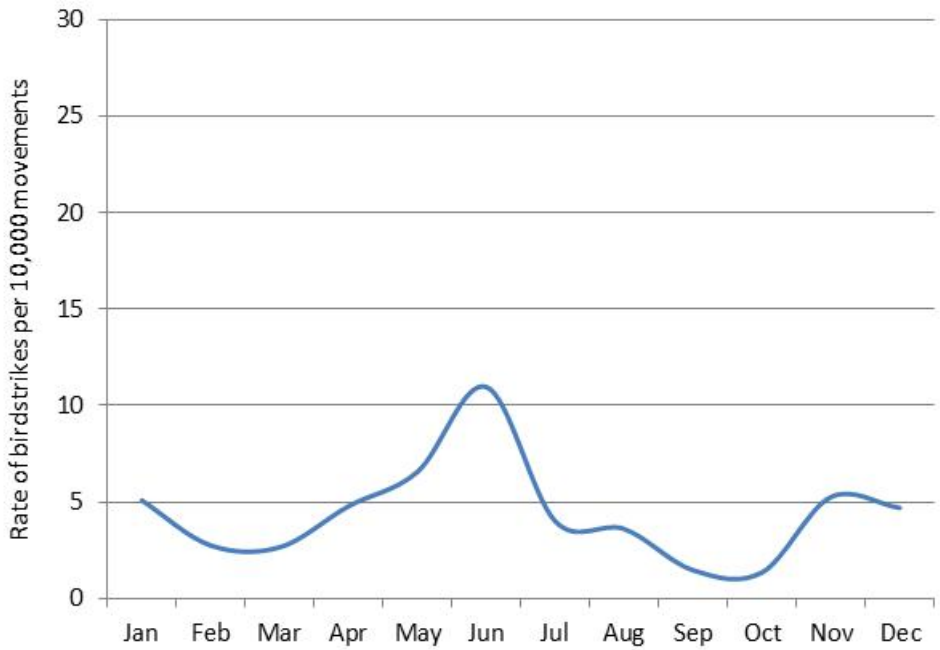


Figure 77: Monthly birdstrike rates for Launceston aerodrome, 2004 - 2013

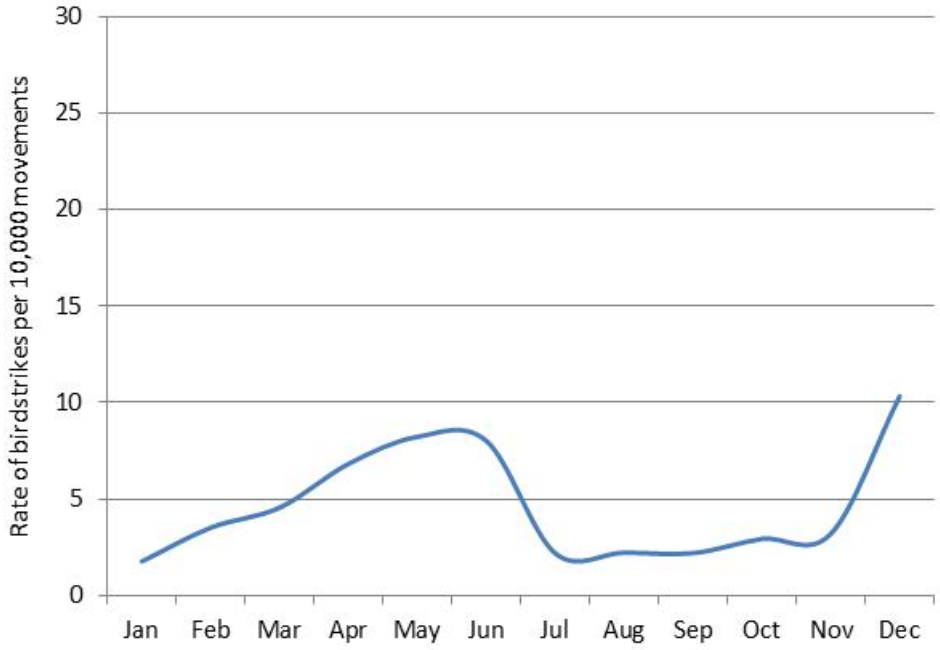


Figure 78: Monthly birdstrike rates for Mackay aerodrome, 2004 - 2013

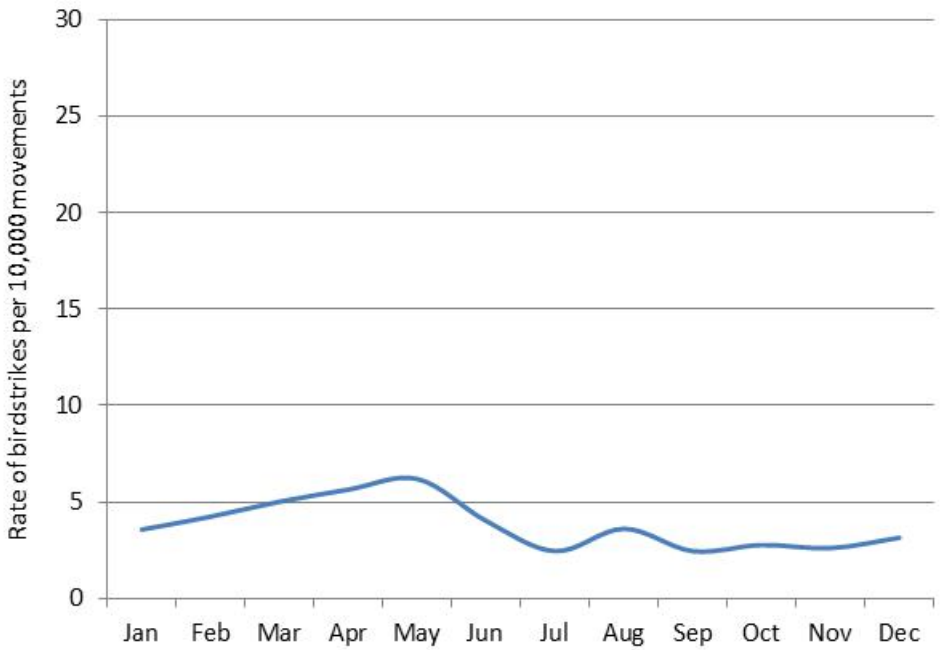


Figure 79: Monthly birdstrike rates for Rockhampton aerodrome, 2004 - 2013

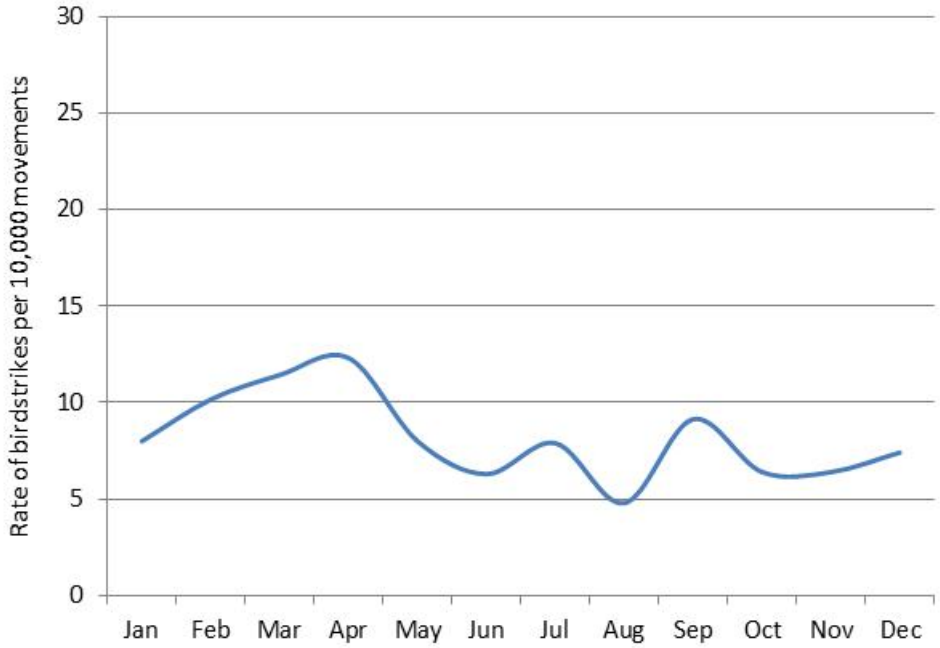


Figure 80: Monthly birdstrike rates for Sunshine Coast aerodrome, 2004 - 2013

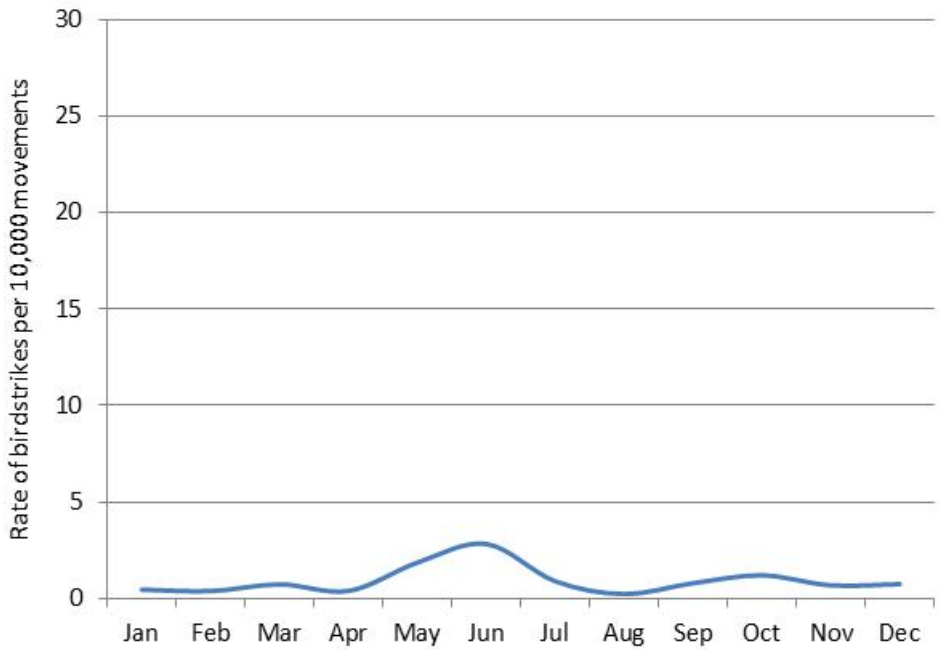


Figure 81: Monthly birdstrike rates for Tamworth aerodrome, 2004 - 2013

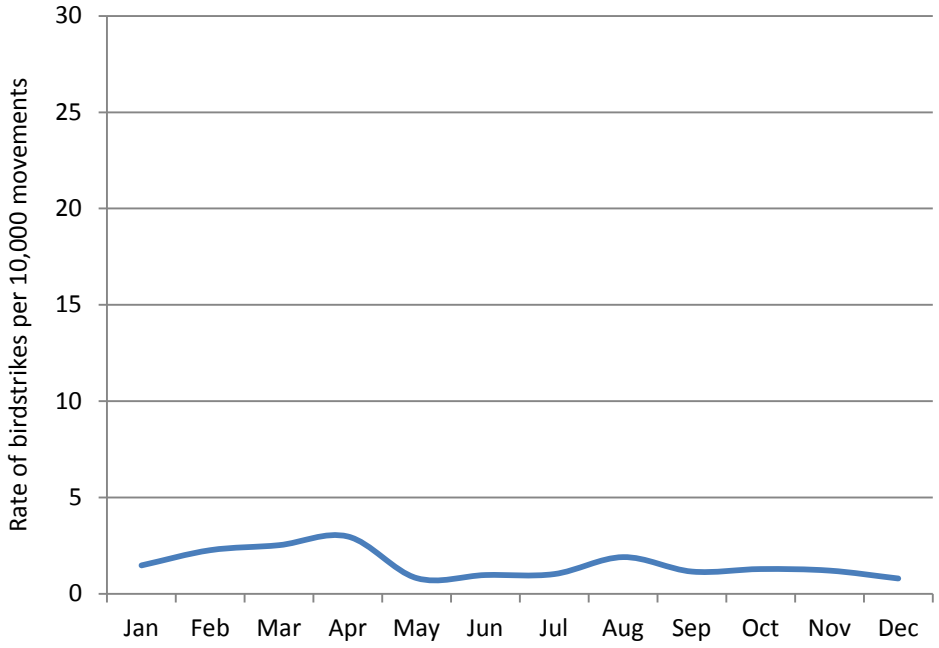
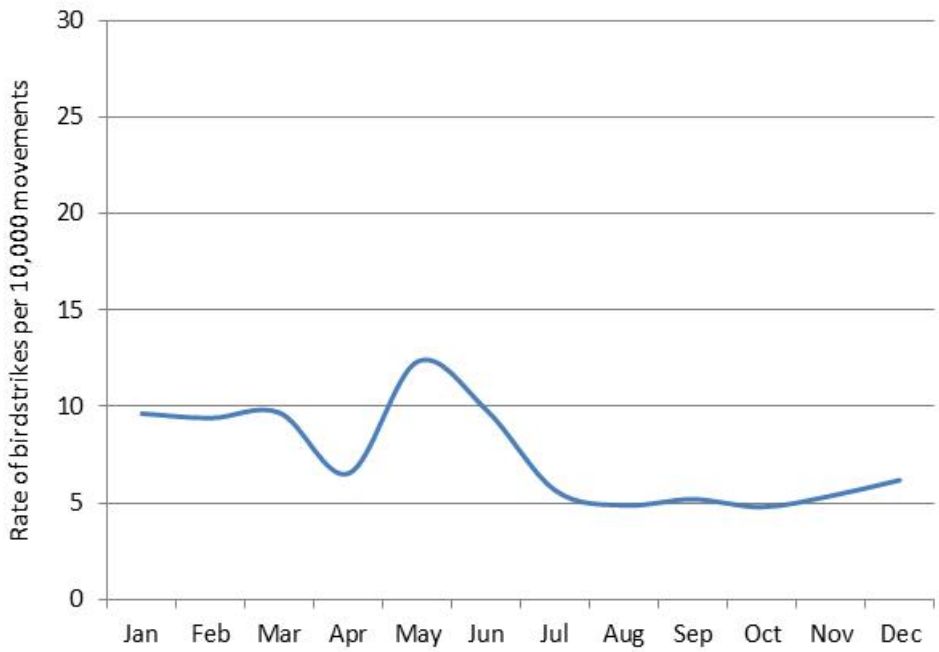


Figure 82: Monthly birdstrike rates for Townsville aerodrome, 2004 - 2013



Towered regional class D aerodromes

Figure 83: Monthly birdstrike rates for Archerfield aerodrome, 2004 - 2013

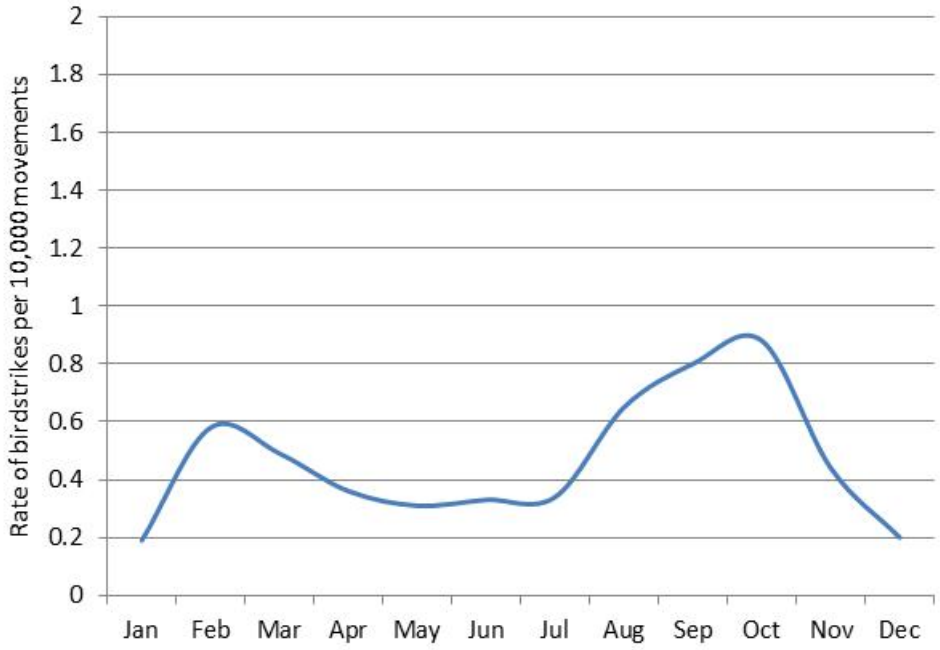


Figure 84: Monthly birdstrike rates for Bankstown aerodrome, 2004 – 2013

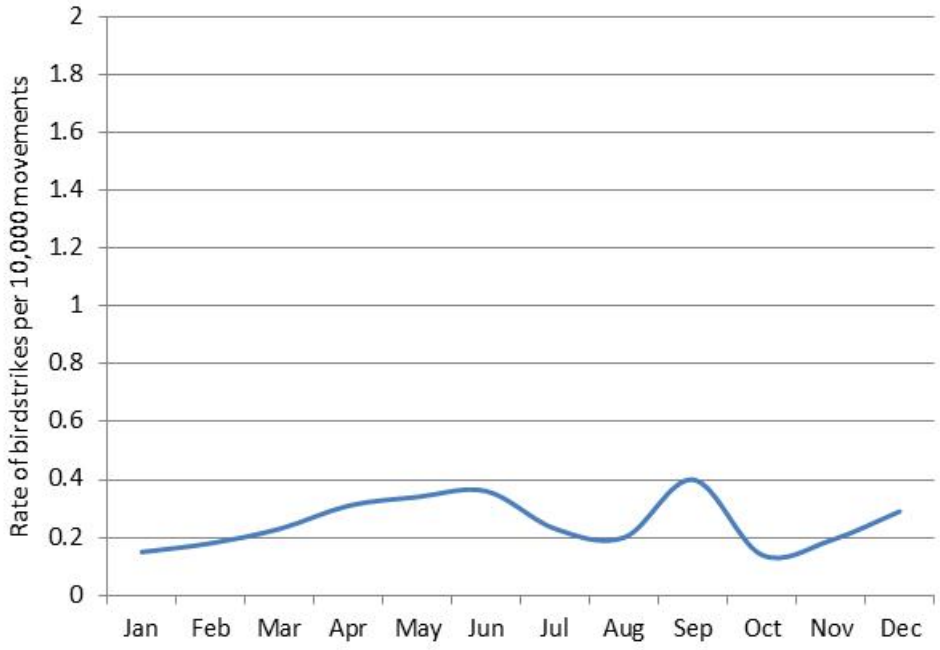


Figure 85: Monthly birdstrike rates for Camden aerodrome, 2004 – 2013

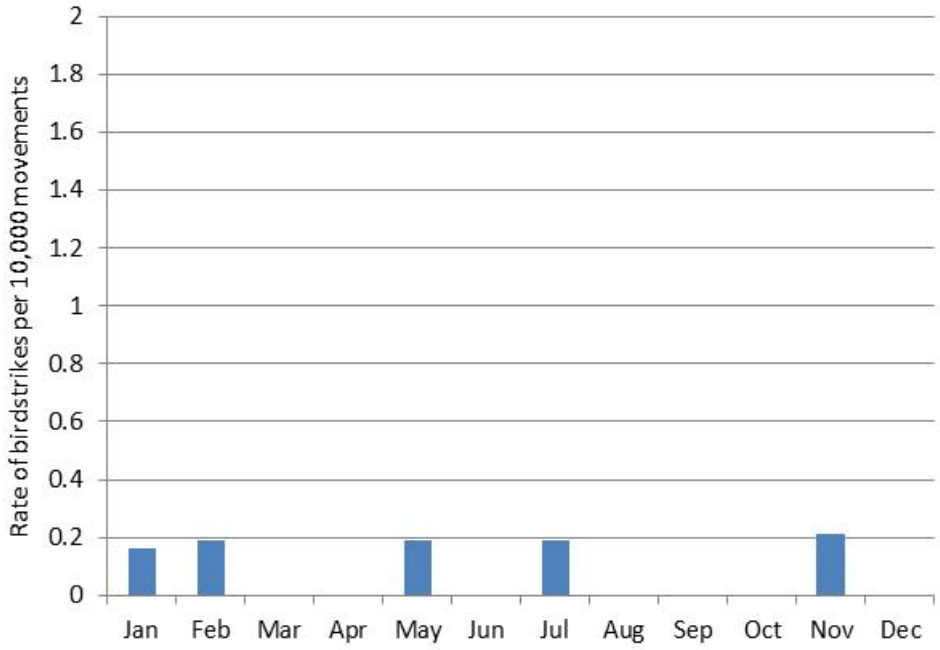


Figure 86: Monthly birdstrike rates for Jandakot aerodrome, 2004 – 2013

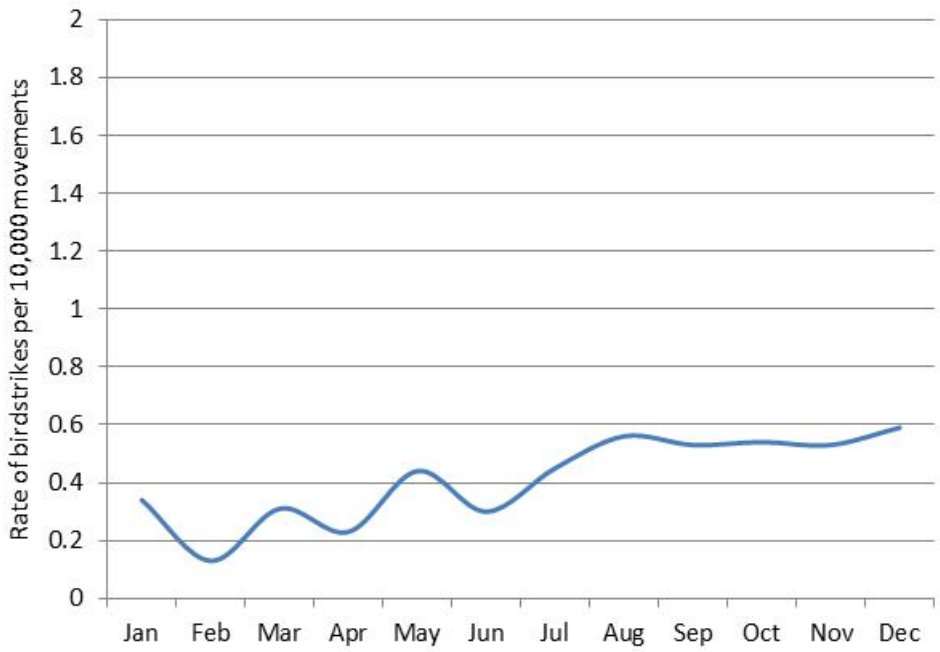


Figure 87: Monthly birdstrike rates for Moorabbin aerodrome, 2004 – 2013

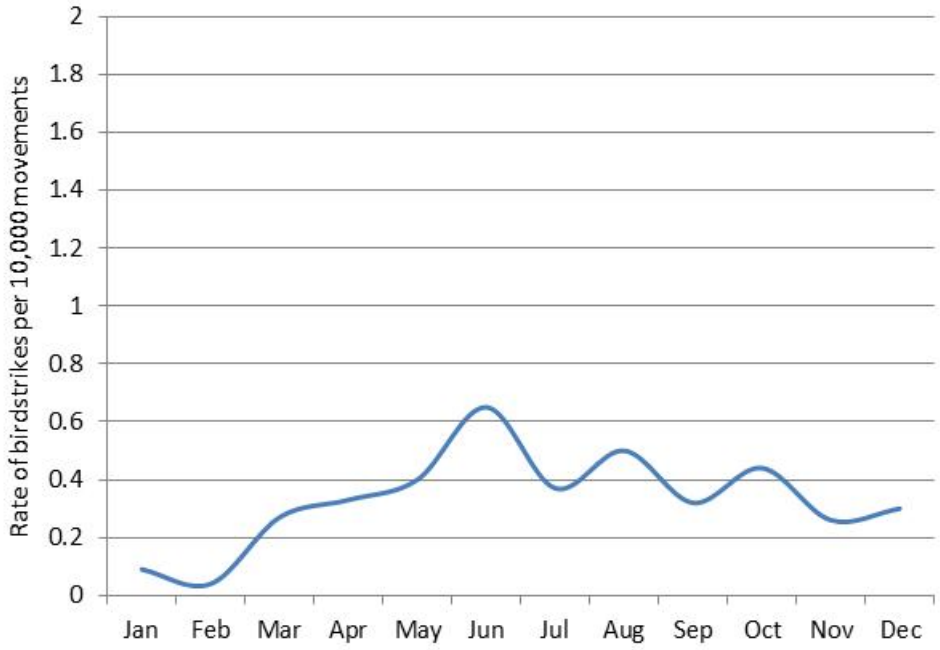
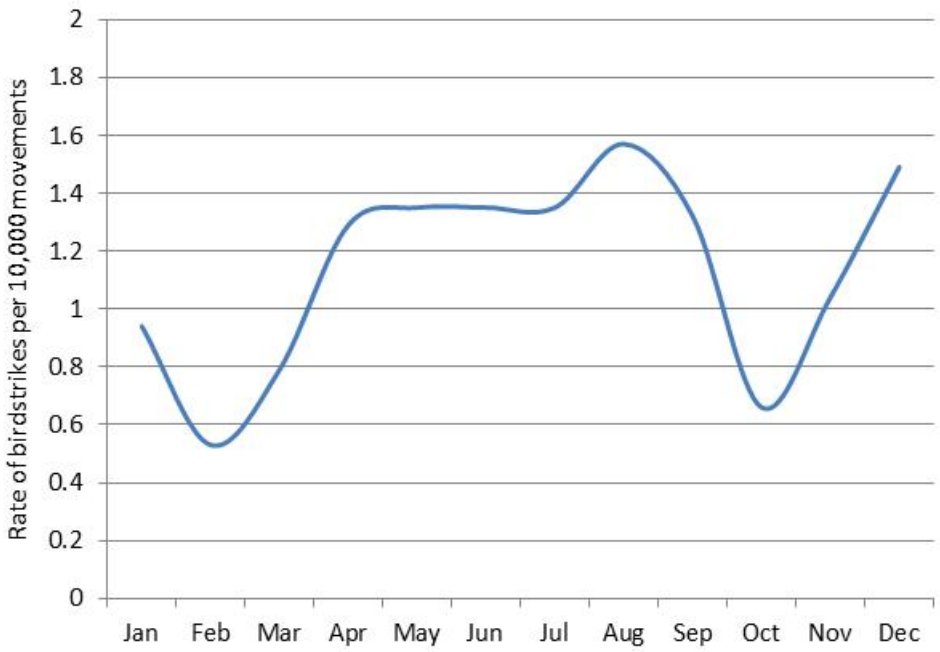


Figure 88: Monthly birdstrike rates for Parafield aerodrome, 2004 - 2013



Appendix D – Additional birdstrike data

Table 31: Number of birdstrikes at major aerodromes by location, aggregated for all operation types, 2004 to 2013

Airport	Aerodrome proximity	2004	2005	2064	2007	2008	2009	2010	2011	2012	2013	Total
Adelaide	Aerodrome confines	60	62	54	49	45	73	51	72	55	42	**563**
	5 to 15 km	6	8	7	1	0	3	0	2	2	0	**29**
	>15 km	2	2	1	0	0	0	0	0	0	0	**5**
Brisbane	Aerodrome confines	62	68	67	73	112	103	109	126	107	125	**952**
	5 to 15 km	23	15	14	4	2	1	2	1	3	3	**68**
	>15 km	4	1	1	0	0	0	0	1	0	1	**8**
	Unknown	0	0	0	0	0	0	0	0	0	1	**1**
Cairns	Aerodrome confines	50	78	46	87	80	69	79	69	61	82	**701**
	5 to 15 km	11	26	11	5	3	2	3	1	5	5	**72**
	>15 km	0	3	3	0	2	0	2	0	1	0	**11**
	Unknown	0	0	1	0	0	0	0	0	0	1	**2**
Canberra	Aerodrome confines	18	30	44	37	30	21	34	43	21	31	**309**
	5 to 15 km	2	5	3	1	0	2	0	2	0	1	**16**
	>15 km	0	2	1	0	1	0	0	1	0	0	**5**
	Unknown	0	0	0	0	0	0	0	0	0	1	**1**
Darwin	Aerodrome confines	89	108	66	73	77	112	93	73	89	157	**937**
	5 to 15 km	2	8	2	1	0	1	0	3	3	1	**21**
	>15 km	4	3	1	0	1	4	0	1	1	0	**15**
	Unknown	0	0	0	0	0	0	0	0	2	1	**3**
Gold Coast	Aerodrome confines	15	35	27	31	30	32	50	48	42	47	**357**
	5 to 15 km	8	7	9	0	0	0	1	2	1	2	**30**
	>15 km	1	0	0	0	0	0	0	0	0	0	**1**
	Unknown	0	0	0	0	0	0	0	1	0	0	**1**
Hobart	Aerodrome confines	10	28	28	34	22	21	19	13	10	11	**196**
	5 to 15 km	1	1	2	1	1	0	0	0	0	0	**6**
Melbourne	Aerodrome confines	54	61	70	36	76	62	96	58	45	52	**610**
	5 to 15 km	14	11	11	6	3	2	1	2	9	4	**63**
	>15 km	1	3	0	0	1	0	0	0	0	0	**5**
	Unknown	0	0	0	0	0	1	1	1	0	1	**4**

Continued

Airport	Aerodrome proximity	2004	2005	2064	2007	2008	2009	2010	2011	2012	2013	Total
Perth	Aerodrome confines	42	39	42	37	46	40	54	67	73	52	**492**
	5 to 15 km	3	1	9	1	2	2	2	0	3	0	**23**
	>15 km	1	0	1	0	1	0	0	1	0	1	**5**
	Unknown	0	0	0	0	1	0	0	1	0	0	**2**
Sydney	Aerodrome confines	86	83	73	87	85	112	112	134	83	93	**948**
	5 to 15 km	19	17	9	5	0	1	1	0	8	5	**65**
	>15 km	1	1	3	0	0	0	0	0	1	1	**7**
	Unknown	0	0	0	0	0	0	0	6	0	6	**12**

Table 32: Number of birdstrikes at towered regional class D aerodromes by location, aggregated for all operation types, 2004 to 2013

Airport	Aerodrome proximity	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
Albury	Aerodrome confines	9	10	9	15	9	17	12	12	15	17	**125**
	5 to 15 km	1	0	1	0	0	0	1	1	0	0	**4**
	Unknown	0	0	0	0	0	0	0	0	0	1	**1**
Alice Springs	Aerodrome confines	10	11	14	14	5	12	55	38	10	9	**178**
	5 to 15 km	0	0	0	1	0	0	0	0	1	0	**2**
	> 15 km	0	1	0	0	0	0	0	0	0	0	**1**
Avalon	Aerodrome confines	1	12	5	7	8	19	20	14	20	5	**111**
	5 to 15 km	0	3	0	1	0	0	0	1	0	0	**5**
Coffs Harbour	Aerodrome confines	4	12	10	14	9	10	10	9	10	10	**98**
	5 to 15 km	1	2	0	0	0	0	0	1	1	0	**5**
	> 15 km	1	0	0	0	0	0	1	0	0	0	**2**
Essendon	Aerodrome confines	5	8	12	6	8	11	5	5	5	6	**71**
	5 to 15 km	1	0	1	0	1	0	0	0	0	2	**5**
Hamilton Island	Aerodrome confines	5	9	10	11	6	5	5	6	2	5	**64**
Launceston	Aerodrome confines	8	10	4	8	19	10	11	7	17	14	**108**
	5 to 15 km	1	1	1	0	0	0	0	0	0	0	**3**
Mackay	Aerodrome confines	33	22	16	10	12	23	25	20	24	20	**205**
	5 to 15 km	0	1	1	0	0	0	0	0	1	0	**3**
	Unknown	0	0	0	0	0	0	0	0	1	0	**1**
Rockhampton	Aerodrome confines	30	32	37	21	37	41	51	35	38	50	**372**
	5 to 15 km	3	1	1	0	1	0	1	4	2	2	**15**
	> 15 km	1	0	1	0	0	1	0	0	0	1	**4**
	Unknown	0	0	0	0	0	0	0	1	1	0	**2**
Sunshine Coast	Aerodrome confines	7	7	9	17	7	9	11	6	5	7	**85**
	5 to 15 km	1	0	1	1	0	0	1	0	1	1	**6**
	> 15 km	0	1	0	0	0	0	0	0	0	0	**1**
Tamworth	Aerodrome confines	11	9	17	17	23	12	12	11	20	20	**152**
	5 to 15 km	2	1	2	1	0	0	0	0	0	0	**6**
	> 15 km	2	0	0	0	0	0	0	0	0	0	**2**

Continued

Airport	Aerodrome Proximity	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
Townsville	Aerodrome confines	35	31	26	44	44	52	67	62	73	68	**502**
	5 to 15 km	6	5	6	2	0	2	2	0	4	6	**33**
	> 15 km	0	1	1	1	0	1	2	0	0	0	**6**
	Unknown	0	0	0	1	0	0	0	0	1	2	**4**

Table 33: Number of birdstrikes at metropolitan class D aerodromes by location, aggregated for all operation types, 2004 to 2013

Airport	Aerodrome Proximity	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
Archerfield	Aerodrome confines	2	4	4	6	7	18	9	7	3	11	**71**
	5 to 15 km	0	1	3	1	0	0	0	0	0	0	**5**
	> 15 km	1	1	1	0	0	0	0	0	0	0	**3**
Bankstown	Aerodrome confines	6	7	5	8	13	13	7	5	7	13	**84**
	5 to 15 km	5	4	2	1	1	1	1	1	1	1	**18**
	> 15 km	0	0	1	0	0	0	0	0	0	1	**2**
Camden	Aerodrome confines	0	0	1	1	1	0	1	0	0	1	**5**
	5 to 15 km	1	0	0	0	0	0	0	0	0	0	**1**
	> 15 km	0	1	0	0	0	0	0	0	0	0	**1**
Jandakot	Aerodrome confines	21	15	28	21	4	8	19	14	17	8	**155**
	5 to 15 km	2	1	1	0	1	0	0	0	0	0	**5**
	> 15 km	2	0	0	0	1	1	0	0	0	0	**4**
Moorabbin	Aerodrome confines	10	12	5	9	11	14	12	8	11	10	**102**
	5 to 15 km	1	0	2	1	0	2	0	0	0	1	**7**
	> 15 km	0	0	0	0	0	1	0	0	0	0	**1**
	Unknown	0	0	0	0	0	0	0	0	0	1	**1**
Parafield	Aerodrome confines	20	28	15	27	32	32	38	38	22	12	**264**
	5 to 15 km	0	5	1	0	0	0	0	0	0	0	**6**
	> 15 km	0	0	1	0	0	0	0	0	0	0	**1**

Table 34: Number of birdstrikes at other significant regional aerodromes by location, aggregated for all operation types, 2004 to 2013

Airport	Aerodrome proximity	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
Amberley	Aerodrome confines	0	0	0	1	0	4	19	5	8	9	**46**
	5 to 15 km	0	0	0	0	0	0	0	0	1	2	**3**
	> 15 km	0	0	1	0	0	0	0	0	1	1	**3**
	Unknown	0	0	0	0	0	0	0	1	1	1	**3**
Ballina / Byron Gateway	Aerodrome confines	6	6	3	10	8	6	8	11	8	7	**73**
	5 to 15 km	1	2	3	1	0	0	0	0	0	0	**7**
Broome	Aerodrome confines	7	21	10	26	20	11	15	16	17	28	**171**
	5 to 15 km	1	1	0	0	0	0	0	1	1	0	**4**
	> 15 km	0	0	1	0	0	0	0	0	0	0	**1**
Ceduna	Aerodrome confines	0	0	2	4	1	9	8	2	3	2	**31**
	5 to 15 kms	0	0	0	0	0	1	0	0	0	0	**1**
Dubbo	Aerodrome confines	9	7	10	17	26	7	14	12	16	20	**138**
	5 to 15 kms	0	0	1	0	0	0	1	0	0	0	**2**
	Unknown	0	0	0	0	0	0	0	0	1	0	**1**
Emerald	Aerodrome confines	4	7	6	12	8	2	11	6	7	10	**73**
	5 to 15 km	1	0	0	1	0	0	0	0	0	0	**2**
	> 15 km	0	1	0	0	0	1	0	0	0	0	**2**
Karratha	Aerodrome confines	5	3	11	6	5	22	11	23	17	12	**115**
	5 to 15 km	1	1	1	0	0	0	0	0	0	1	**4**
	Unknown	0	0	0	0	0	0	0	2	0	0	**2**
King Island	Aerodrome confines	0	1	1	7	4	9	11	9	3	1	**46**
Kowanyama	Aerodrome confines	3	9	12	8	8	5	7	9	3	3	**67**
	5 to 15 km	0	1	3	0	0	0	0	0	0	0	**4**
	> 15 km	0	0	0	0	0	1	0	0	0	0	**1**
Kununurra	Aerodrome confines	2	2	3	3	7	5	7	4	11	4	**48**
	5 to 15 km	2	1	0	0	0	0	0	0	0	0	**3**
	> 15 km	0	1	0	0	0	0	0	0	0	0	**1**

Continued

Airport	Aerodrome proximity	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
Lismore	Aerodrome confines	3	0	5	9	3	7	4	9	7	10	**57**
	5 to 15 km	0	0	0	1	0	0	1	0	0	0	**2**
Mildura	Aerodrome confines	4	5	17	4	4	2	3	3	2	0	**44**
	5 to 15 km	0	1	0	0	0	0	0	0	0	0	**1**
Mount Isa	Aerodrome confines	10	7	11	15	9	18	15	24	12	5	**126**
	5 to 15 km	0	0	1	0	0	0	0	0	1	0	**2**
	> 15 km	0	0	0	0	0	0	0	1	0	0	**1**
Port Hedland	Aerodrome confines	0	1	9	2	2	13	4	12	20	13	**76**
	5 to 15 km	0	1	0	0	0	0	0	0	0	1	**2**
	> 15 km	0	1	0	0	0	0	0	0	0	0	**1**
Port Macquarie	Aerodrome confines	3	1	5	0	4	3	14	10	10	14	**64**
	5 to 15 km	1	1	1	0	0	0	0	0	0	0	**3**
Proserpine / Whitsunday Coast	Aerodrome confines	3	3	6	6	9	7	7	4	5	6	**56**
	5 to 15 km	0	2	1	1	0	0	0	0	0	0	**4**
	> 15 km	0	0	0	1	0	0	0	0	0	0	**1**
Tindal	Aerodrome confines	1	2	2	2	0	7	9	5	8	4	**40**
	5 to 15 km	0	0	0	1	0	0	1	0	0	0	**2**
	Unknown	0	0	0	0	0	0	0	0	0	1	**1**
Wagga Wagga	Aerodrome confines	9	7	11	14	13	20	16	28	9	20	**147**
	5 to 15 km	0	0	0	0	0	0	1	1	0	0	**2**
	> 15 km	0	0	0	0	0	1	0	0	0	1	**2**
Williamtown	Aerodrome confines	1	3	15	20	17	24	14	14	22	20	**150**
	5 to 15 km	0	1	5	0	1	1	1	1	1	2	**13**
	> 15 km	1	1	0	1	0	0	0	0	3	1	**7**
	Unknown	0	0	0	0	0	0	1	0	0	1	**2**
Wynyard	Aerodrome confines	5	4	4	6	7	5	11	4	8	14	**68**
	5 to 15 km	0	1	0	0	0	0	0	0	0	0	**1**

Table 35: Number of damaging (serious and minor) strikes at aerodromes, departing and on approach (including those further than 15 kilometres from an aerodrome) by operation type, 2004 to 2013

Airport	Operation type	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Adelaide	High capacity air transport	2	0	1	1	1	4	1	1	2	0
	Low capacity air transport	1	0	1	0	0	2	0	1	0	0
	General Aviation	0	2	0	0	0	0	0	0	0	0
Albury	High capacity air transport	1	0	0	0	0	0	0	0	0	0
	Low capacity air transport	0	0	1	2	1	1	0	0	0	0
Alice Springs	High capacity air transport	1	0	0	0	0	0	0	0	1	0
	Low capacity air transport	0	0	1	0	0	0	1	0	0	0
	General Aviation	0	0	0	1	0	0	0	1	0	0
Amberley	High capacity air transport	0	0	0	0	0	0	0	0	0	1
	Military	0	0	0	0	0	1	2	4	1	0
Archerfield	Low capacity air transport	0	0	1	0	0	0	0	0	0	0
	General Aviation	2	3	2	1	1	5	0	3	0	1
Avalon	High capacity air transport	0	0	0	0	0	2	0	1	0	0
	General Aviation	0	0	1	0	0	0	0	0	0	0
Ballina / Byron Gateway	High capacity air transport	0	0	0	0	1	0	0	0	0	0
	Low capacity air transport	0	1	0	0	1	0	1	0	0	0
Bankstown	Low capacity air transport	0	0	1	0	0	0	0	1	1	1
	General Aviation	3	0	0	0	1	2	1	3	1	1
	Military	0	0	0	0	1	0	0	0	0	0
Brisbane	High capacity air transport	5	3	2	4	3	4	4	8	4	7
	Low capacity air transport	0	0	0	0	1	0	0	0	0	0
	General Aviation	1	0	0	0	0	0	0	1	0	1
	Military	0	0	0	1	0	0	0	0	0	0
Broome	High capacity air transport	1	0	0	0	1	0	0	0	3	2
	Low capacity air transport	0	0	1	0	0	1	0	1	0	1
Cairns	High capacity air transport	1	4	1	6	2	3	1	1	1	4
	Low capacity air transport	1	0	0	0	0	1	2	0	1	0
	General Aviation	0	0	1	0	1	0	0	2	0	1
Camden	General Aviation	0	0	0	0	1	0	0	0	0	0
Canberra	High capacity air transport	1	0	4	2	3	3	0	2	2	0
	Low capacity air transport	0	0	1	0	0	0	0	0	0	0
	General Aviation	0	0	2	0	0	0	0	0	0	0
	Unknown	0	0	0	0	0	0	1	0	0	0

Continued

Airport	Operation type	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Ceduna	Low capacity air transport	0	0	0	0	0	1	0	0	0	0
Coffs Harbour	High capacity air transport	0	0	0	0	0	0	0	0	1	0
	Low capacity air transport	0	0	0	0	0	0	1	0	0	0
Darwin	High capacity air transport	2	5	1	0	3	4	1	0	2	4
	Low capacity air transport	1	1	1	1	2	2	1	1	4	5
	General Aviation	0	1	0	0	0	1	0	1	0	1
	Military	1	0	1	1	0	0	0	1	0	0
	Unknown	0	0	0	0	0	0	2	0	0	0
Dubbo	High capacity air transport	0	0	0	0	1	0	0	0	0	0
	Low capacity air transport	0	0	3	1	2	0	0	1	0	1
	General Aviation	0	1	0	0	1	0	1	0	0	0
Emerald	High capacity air transport	0	0	1	1	0	0	1	1	1	0
	General Aviation	0	0	0	0	0	0	0	1	0	0
Essendon	Low capacity air transport	0	0	3	0	0	1	0	0	0	0
	General Aviation	0	0	0	0	2	0	0	0	0	1
Gold Coast	High capacity air transport	0	1	0	2	2	0	2	1	1	3
	General Aviation	0	0	1	0	0	0	0	0	0	1
Hamilton Island	High capacity air transport	0	0	0	0	0	1	0	1	0	0
Hobart	High capacity air transport	0	0	0	2	0	1	0	0	0	0
	Low capacity air transport	1	0	0	0	0	0	0	0	0	0
Jandakot	General Aviation	4	0	0	0	2	1	0	1	0	0
Karratha	High capacity air transport	0	0	0	0	0	0	0	0	1	0
King Island	Low capacity air transport	0	0	0	0	0	1	0	1	1	0
Kowanyama	Low capacity air transport	0	0	2	1	2	2	0	1	0	1
Kununurra	High capacity air transport	0	0	0	0	1	0	1	0	1	0
	Low capacity air transport	0	0	0	1	1	0	0	0	1	0
	Unknown	0	0	0	0	0	0	1	0	0	0
Launceston	High capacity air transport	0	0	0	1	2	0	0	1	0	0
	General Aviation	0	0	0	0	1	0	0	0	0	0
Lismore	High capacity air transport	0	0	0	1	0	0	0	0	0	0
	Low capacity air transport	0	0	0	2	1	1	0	0	0	0
	General Aviation	0	0	0	0	1	0	0	0	0	1
Mackay	High capacity air transport	0	0	1	0	1	1	1	0	0	1
	Low capacity air transport	1	0	0	0	0	0	0	0	0	1
	General Aviation	0	0	0	0	1	0	0	0	0	0

Continued

Airport	Operation type	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Melbourne	High capacity air transport	11	4	4	1	3	2	6	3	1	2
	Low capacity air transport	0	0	0	0	0	1	1	0	0	0
Mildura	High capacity air transport	1	0	0	0	0	0	0	0	0	0
	General Aviation	0	0	0	0	0	0	0	0	1	0
Moorabbin	Low capacity air transport	0	0	2	0	0	0	1	0	0	1
	General Aviation	2	1	0	2	0	4	1	0	1	1
Mount Isa	High capacity air transport	0	1	0	0	0	0	0	0	0	0
	Low capacity air transport	0	0	2	0	0	0	0	0	0	0
	General Aviation	0	0	1	0	0	0	0	1	1	1
Other aerodromes	High capacity air transport	6	4	2	9	11	7	15	11	16	10
	Low capacity air transport	12	5	16	12	18	13	11	26	15	12
	General Aviation	8	8	9	15	13	23	21	24	21	28
	Military	0	0	0	1	1	4	5	3	4	7
	Unknown	0	0	0	0	0	0	2	2	2	1
Parafield	General Aviation	0	1	2	2	4	1	4	4	2	0
	Unknown	0	1	0	0	0	0	0	0	0	0
Perth	High capacity air transport	2	0	3	2	0	1	3	4	2	1
	Low capacity air transport	0	0	0	0	0	0	0	0	1	0
	Unknown	0	0	0	0	0	0	0	1	0	0
Port Hedland	High capacity air transport	0	0	0	0	0	0	0	0	1	0
	Low capacity air transport	0	0	0	0	0	0	0	1	0	0
	General Aviation	0	0	0	0	0	1	0	0	0	0
Port Macquarie	High capacity air transport	0	0	0	0	0	0	1	0	0	0
	Low capacity air transport	0	0	1	0	0	0	0	0	0	0
	General Aviation	0	0	3	0	0	0	0	1	3	1
	Unknown	0	1	0	0	0	0	0	0	0	1
Proserpine / Whitsunday Coast	High capacity air transport	0	0	0	0	0	0	1	0	0	0
	General Aviation	0	0	0	0	0	1	0	0	0	0
Rockhampton	High capacity air transport	0	0	2	1	0	2	1	3	1	0
	Low capacity air transport	0	0	0	0	0	1	0	0	1	0
	General Aviation	1	0	0	0	0	2	1	0	1	2
	Military	0	0	0	0	0	0	0	0	1	1
	Unknown	0	0	0	0	0	0	2	0	0	0
Sunshine Coast	High capacity air transport	0	0	0	0	0	1	1	0	0	0
	Low capacity air transport	1	0	0	0	0	0	0	0	0	0
	General Aviation	0	0	2	0	0	0	0	0	0	0

Continued

Airport	Operation type	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Sydney	High capacity air transport	10	7	6	5	2	3	3	6	6	3
	Low capacity air transport	2	0	0	1	0	1	0	2	1	1
	General Aviation	0	0	0	0	0	0	0	0	1	0
Tamworth	High capacity air transport	0	0	1	0	0	0	0	1	0	0
	Low capacity air transport	0	1	0	0	0	0	0	0	0	0
	General Aviation	2	1	0	0	1	1	0	0	0	1
Tindal	Low capacity air transport	0	0	0	0	0	1	0	0	0	0
	Military	0	0	0	1	0	1	1	0	1	0
	Unknown	0	0	0	0	0	0	0	0	1	0
Townsville	High capacity air transport	0	3	4	2	2	0	4	3	3	4
	Low capacity air transport	1	0	0	0	0	1	0	2	0	0
	General Aviation	0	0	0	1	0	1	1	1	1	2
	Military	0	1	0	0	0	0	0	1	1	0
Wagga Wagga	High capacity air transport	0	0	0	0	0	0	0	0	1	0
	Low capacity air transport	0	2	0	0	0	0	1	0	0	1
	General Aviation	0	0	0	0	0	0	1	0	0	0
Williamtown	High capacity air transport	0	0	1	1	1	1	2	0	0	0
	Low capacity air transport	0	0	0	1	1	0	1	1	1	1
	General Aviation	1	0	0	1	1	0	1	0	0	0
	Military	0	0	0	1	0	1	1	1	2	0
Wynyard	Low capacity air transport	0	0	0	1	0	1	1	0	1	3
	General Aviation	0	0	2	0	0	0	0	0	0	1

Table 36: Number of damaging (serious and minor damage) birdstrikes by bird type, operation type, and location (including those greater than 15 kilometres from an aerodrome), 2004 to 2013

Airport	Bird type	High capacity air transport	Low capacity air transport	General Aviation	Military	Unknown
Adelaide	Duck	0	1	0	0	0
	Galah	5	1	0	0	0
	Magpie	1	1	0	0	0
	Magpie-lark	1	0	0	0	0
	Silver Gull	0	1	1	0	0
Albury	Dove	0	1	0	0	0
	Duck	1	0	0	0	0
	Galah	0	1	0	0	0
	Hawk	0	1	0	0	0
	Lapwing/Plover	0	1	0	0	0
	Magpie-lark	0	1	0	0	0
Alice Springs	Falcon	0	1	0	0	0
	Kite	1	1	0	0	0
	Nankeen Kestrel	1	0	0	0	0
Archerfield	Bat/Flying Fox	0	1	3	0	0
	Crow/Raven	0	0	1	0	0
	Duck	0	0	1	0	0
	Ibis	0	0	1	0	0
	Magpie	0	0	1	0	0
	Magpie-lark	0	0	1	0	0
	Thrush	0	0	1	0	0
Avalon	Lapwing/Plover	1	0	0	0	0
	Magpie	1	0	0	0	0
Ballina / Byron Gateway	Bat/Flying Fox	1	0	0	0	0
	Duck	0	1	0	0	0
	Ibis	0	1	0	0	0
Bankstown	Bat/Flying Fox	0	1	3	0	0
	Dove	0	0	1	0	0
	Duck	0	0	0	1	0
	Ibis	0	0	1	0	0
	Magpie	0	0	2	0	0
	Owl	0	1	0	0	0
	Pelican	0	0	1	0	0

Continued

Airport	Bird type	High capacity air transport	Low capacity air transport	General Aviation	Military	Unknown
Brisbane	Bat/Flying Fox	5	0	0	0	0
	Hawk	1	0	0	0	0
	Heron/Egret	2	1	0	0	0
	House Sparrow	1	0	0	0	0
	Ibis	6	0	0	0	0
	Kite	0	0	1	0	0
	Lapwing/Plover	1	0	0	0	0
	Pelican	0	0	0	1	0
Broome	Eagle	0	1	0	0	0
	Kite	1	1	0	0	0
	Lapwing/Plover	1	0	0	0	0
	Pipit	2	0	0	0	0
	Silver Gull	0	1	0	0	0
Cairns	Bat/Flying Fox	5	3	2	0	0
	Duck	0	0	1	0	0
	Eagle	0	1	0	0	0
	Kite	3	0	0	0	0
	Nankeen Kestrel	1	0	0	0	0
	Parrot	1	0	0	0	0
	Swallow/Martin	1	0	0	0	0
Canberra	Bat/Flying Fox	1	0	0	0	0
	Crow/Raven	1	0	0	0	0
	Duck	4	0	0	0	0
	Galah	4	0	0	0	0
	Magpie	1	0	0	0	0
	Nankeen Kestrel	1	0	0	0	0
Ceduna	Cockatoo	0	1	0	0	0
Coffs Harbour	Bat/Flying Fox	1	0	0	0	0
	Duck	0	1	0	0	0

Continued

Airport	Bird type	High capacity air transport	Low capacity air transport	General Aviation	Military	Unknown
Darwin	Bat/Flying Fox	1	0	0	0	0
	Curlew/Sandpiper	3	2	0	0	0
	Duck	1	1	0	0	0
	Eagle	0	0	0	0	1
	Hawk	1	0	0	0	0
	Kite	6	8	1	1	0
	Owl	0	1	0	0	0
	Parrot	0	1	0	0	0
	Pratincole	1	0	1	1	0
Dubbo	Cockatoo	1	0	0	0	0
	Galah	0	2	2	0	0
	Kite	0	3	0	0	0
	Lapwing/Plover	0	1	0	0	0
	Magpie	0	1	0	0	0
Emerald	Bustard	0	0	1	0	0
	Hawk	1	0	0	0	0
	House Sparrow	1	0	0	0	0
	Kite	2	0	0	0	0
Essendon	Dove	0	1	0	0	0
	Duck	0	2	0	0	0
	Silver Gull	0	1	1	0	0
Gold Coast	Bat/Flying Fox	3	0	1	0	0
	Duck	3	0	0	0	0
	Eagle	0	0	1	0	0
Hamilton Island	Crow/Raven	1	0	0	0	0
	Curlew/Sandpiper	1	0	0	0	0
Hobart	Lapwing/Plover	1	0	0	0	0
	Pacific Gull	0	1	0	0	0
Jandakot	Eagle	0	0	4	0	0
	Pelican	0	0	1	0	0
Karratha	Eagle	1	0	0	0	0
King Island	Lapwing/Plover	0	3	0	0	0

Continued

Airport	Bird type	High capacity air transport	Low capacity air transport	General Aviation	Military	Unknown
Kowanyama	Galah	0	3	0	0	0
	Heron/Egret	0	1	0	0	0
	Kite	0	3	0	0	0
Kununurra	Eagle	0	1	0	0	0
	Hawk	1	0	0	0	0
	Kite	0	1	0	0	1
	Pratincole	1	0	0	0	0
Launceston	Duck	0	0	1	0	0
	Lapwing/Plover	1	0	0	0	0
	Nankeen Kestrel	1	0	0	0	0
	Swan	1	0	0	0	0
Lismore	Bat/Flying Fox	0	2	1	0	0
	Crow/Raven	0	1	0	0	0
	Duck	1	0	0	0	0
	Kite	0	0	1	0	0
	Lapwing/Plover	0	1	0	0	0
Mackay	Bat/Flying Fox	1	0	0	0	0
	Curlew/Sandpiper	1	0	0	0	0
	Hawk	1	0	0	0	0
	House Sparrow	1	0	0	0	0
	Parrot	0	1	0	0	0
Melbourne	Bat/Flying Fox	4	0	0	0	0
	Crow/Raven	1	0	0	0	0
	Falcon	1	0	0	0	0
	Ibis	0	1	0	0	0
	Magpie	4	1	0	0	0
	Owl	3	0	0	0	0
	Parrot	1	0	0	0	0
	Thrush	1	0	0	0	0
Mildura	Hawk	1	0	0	0	0
	House Sparrow	0	0	1	0	0
Moorabbin	Crow/Raven	0	0	1	0	0
	Duck	0	0	1	0	0
	Ibis	0	1	1	0	0
	Silver Gull	0	2	5	0	0

Continued

Airport	Bird type	High capacity air transport	Low capacity air transport	General Aviation	Military	Unknown
Mount Isa	Bat/Flying Fox	0	0	1	0	0
	Dove	0	1	0	0	0
	Hawk	0	0	1	0	0
	Kite	0	1	1	0	0
Parafield	Dove	0	0	2	0	0
	Galah	0	0	4	0	0
	Magpie	0	0	5	0	0
	Magpie-lark	0	0	2	0	0
	Pelican	0	0	3	0	0
Perth	Duck	1	0	0	0	0
	Falcon	0	0	0	0	1
	Galah	6	0	0	0	0
	Nankeen Kestrel	1	1	0	0	0
Port Hedland	Bat/Flying Fox	0	0	1	0	0
	Kite	1	1	0	0	0
Port Macquarie	Bat/Flying Fox	1	0	3	0	0
	Hawk	0	0	1	0	0
	Ibis	0	0	1	0	0
	Lapwing/Plover	0	0	1	0	0
	Swift	0	0	1	0	0
Proserpine / Whitsunday Coast	Curlew/Sandpiper	1	0	0	0	0
	Lapwing/Plover	0	0	1	0	0
Rockhampton	Bat/Flying Fox	1	1	1	0	0
	Hawk	1	0	0	0	0
	Kite	0	0	1	0	1
	Lapwing/Plover	1	0	0	0	0
	Magpie	0	0	1	0	0
	Owl	1	0	0	0	0
	Parrot	1	0	0	0	0
	Pelican	0	1	0	0	0
	Wedge-tailed Eagle	0	0	1	0	0
Sunshine Coast	Bat/Flying Fox	1	0	0	0	0
	Duck	0	0	1	0	0

Continued

Airport	Bird type	High capacity air transport	Low capacity air transport	General Aviation	Military	Unknown
Sydney	Bat/Flying Fox	8	1	0	0	0
	Cockatoo	1	0	0	0	0
	Cormorant	0	1	0	0	0
	Eagle	0	1	0	0	0
	Hawk	1	0	0	0	0
	Ibis	1	0	0	0	0
	Pelican	1	1	1	0	0
	Silver Gull	7	0	0	0	0
Tamworth	Galah	0	0	1	0	0
	House Sparrow	1	0	0	0	0
	Ibis	0	1	1	0	0
	Kite	0	0	1	0	0
	Magpie	0	0	1	0	0
	Magpie-lark	1	0	1	0	0
Tindal	Bat/Flying Fox	0	1	0	0	0
	Eagle	0	0	0	1	0
Townsville	Bat/Flying Fox	4	0	0	1	0
	Bustard	1	0	1	0	0
	Curlew/Sandpiper	3	1	0	0	0
	Dove	1	0	0	0	0
	Duck	2	0	1	0	0
	Heron/Egret	3	0	0	0	0
	Ibis	0	0	0	1	0
	Kite	2	0	1	0	0
	Lapwing/Plover	1	0	0	0	0
	Magpie	1	0	0	0	0
	Magpie Goose	1	1	1	0	0
Wagga Wagga	Galah	1	3	1	0	0
Williamtown	Bat/Flying Fox	2	0	1	0	0
	Duck	0	1	0	0	0
Wynyard	Duck	0	0	1	0	0
	Lapwing/Plover	0	5	1	0	0
	Silver Gull	0	2	0	0	0

Table 37: Number of reported birdstrikes by bird type by state, 2004 to 2013

Bird type	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Other	Total
Bat/Flying Fox	1	303	62	432	6	0	42	26	0	**872**
Lapwing/Plover	14	153	117	175	49	162	47	144	0	**861**
Kite	0	65	239	406	9	0	30	90	0	**839**
Galah	105	297	22	120	147	1	35	68	0	**795**
Nankeen Kestrel	11	95	30	192	58	1	11	122	15	**535**
Swallow/Martin	11	78	38	283	27	13	25	51	1	**527**
Magpie	33	118	3	83	118	7	129	29	0	**520**
Magpie-lark	1	49	24	137	126	5	10	20	0	**372**
Hawk	10	69	22	114	19	13	16	72	1	**336**
Silver Gull	1	84	2	14	59	33	57	41	2	**293**
Curlew/Sandpiper	0	3	103	132	2	0	0	9	3	**252**
Pipit	8	80	8	32	0	11	55	36	0	**230**
Dove	0	39	14	50	72	0	25	21	2	**223**
Duck	21	38	4	84	3	6	17	36	2	**211**
Pratincole	0	0	168	18	0	0	0	7	0	**193**
House Sparrow	1	30	5	63	10	12	39	16	0	**176**
Heron/Egret	0	21	5	101	2	0	6	9	9	**153**
Owl	0	26	11	45	6	0	18	42	0	**148**
Ibis	0	36	4	74	5	0	16	3	0	**138**
Eagle	0	15	7	34	1	2	6	29	0	**94**
Crow/Raven	6	11	6	31	9	8	13	10	0	**94**
Finch	0	3	18	17	1	23	3	17	2	**84**
Parrot	0	7	18	24	8	0	1	21	0	**79**
Falcon	1	9	15	12	3	1	17	15	0	**73**
Starling	0	16	1	9	13	14	10	2	0	**65**
Swift	0	14	0	40	0	0	1	3	0	**58**
Cockatoo	2	19	8	10	3	0	1	13	0	**56**
Tern	0	11	2	14	0	0	2	24	0	**53**
Skylark	0	0	0	1	8	23	13	0	0	**45**
Australian Brush-turkey	0	0	5	14	0	0	0	16	0	**35**

Continued

Bird type	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Other	Total
Wedge-tailed Eagle	0	9	1	7	2	0	0	7	0	**26**
Cormorant	0	10	0	7	3	1	2	0	0	**23**
Pacific Gull	0	3	0	0	0	9	10	0	0	**22**
Bustard	0	0	4	14	0	0	0	3	0	**21**
Pelican	0	7	1	4	3	0	2	2	0	**19**
Magpie Goose	0	0	3	13	2	0	0	0	0	**18**
Hen	0	2	0	5	1	9	0	0	0	**17**
Wader	0	1	2	5	0	0	0	5	0	**13**
Wagtail	0	1	4	3	1	0	0	4	0	**13**
Kingfisher/Kookaburra	0	5	2	3	0	0	0	1	0	**11**
Myna	0	2	0	3	0	0	2	3	0	**10**
Robin	1	0	0	0	0	1	0	6	0	**8**
Frigate	0	0	1	3	0	0	0	0	4	**8**
Swan	2	2	0	0	0	1	2	0	0	**7**
Wren	0	0	0	3	0	1	2	0	0	**6**
Honeyeater/Chat	0	1	0	0	1	0	0	2	0	**4**
Cuckoo	0	0	0	2	1	1	0	0	0	**4**
Darter	0	4	0	0	0	0	0	0	0	**4**
Bee-eater	0	1	0	1	0	0	0	1	0	**3**
Thrush	0	0	1	1	0	0	1	0	0	**3**
Rail	0	0	0	1	0	0	0	1	0	**2**
Oystercatcher	0	0	0	0	0	2	0	0	0	**2**
Chicken	0	0	0	0	0	0	0	0	2	**2**
Bittern, brown	0	0	0	1	0	0	0	0	0	**1**
Australasian Grebe	0	0	0	1	0	0	0	0	0	**1**
Eurasian Coot	0	1	0	0	0	0	0	0	0	**1**
Leaf warbler	0	0	0	1	0	0	0	0	0	**1**
Pheasant	0	0	0	0	0	0	0	1	0	**1**
Nil	0	0	0	0	0	0	0	1	0	**1**
Spangled drongo	0	0	0	1	0	0	0	0	0	**1**

Continued

Bird type	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Other	Total
Spinifexbird	0	0	0	0	0	0	0	1	0	**1**
Grey bunting	0	0	0	0	0	0	0	0	0	**0**

Table 38: Number of birdstrikes by bird type, ordered by average difference between 2004 to 2008 and 2009 to 2013

Bird type	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
Bat/Flying Fox	58	53	57	74	73	115	135	109	110	117	**901**
Kite	40	54	79	72	62	81	99	96	102	156	**841**
Swallow/Martin	34	35	40	52	38	54	66	77	76	58	**530**
Nankeen Kestrel	36	30	59	32	61	43	61	77	84	53	**536**
Lapwing/Plover	73	76	89	74	84	107	77	100	91	93	**864**
Parrot	1	5	4	5	3	10	19	6	13	15	**81**
Magpie	66	42	45	40	46	57	75	62	46	41	**520**
Pipit	7	11	19	23	36	17	34	31	18	35	**231**
Heron/Egret	6	9	9	17	17	20	12	23	22	18	**153**
Falcon	6	4	2	2	5	2	17	16	8	12	**74**
Duck	16	18	15	17	24	16	24	20	13	49	**212**
Galah	58	63	84	90	88	67	98	104	65	80	**797**
Owl	10	11	13	11	15	13	17	16	25	17	**148**
Dove	16	16	21	24	24	23	26	30	21	25	**226**
Finch	2	8	10	8	4	11	6	10	17	9	**85**
Ibis	15	13	11	11	9	13	13	18	18	17	**138**
Tern	0	1	1	10	5	7	7	5	11	6	**53**
Swift	4	4	6	6	1	0	8	6	9	16	**60**
Skylark	1	1	4	3	6	4	10	8	3	5	**45**
Bustard	0	0	2	1	1	1	2	7	4	3	**21**
Magpie Goose	0	0	0	3	0	5	5	5	0	0	**18**
Other	0	0	0	0	0	1	1	1	4	3	**10**
Magpie-lark	27	60	22	32	41	30	43	56	38	24	**373**
Cormorant	3	1	2	0	2	2	3	2	3	5	**23**
Wedge-tailed Eagle	2	2	2	1	3	2	5	4	2	3	**26**
Eagle	11	10	5	8	10	7	12	8	10	13	**94**
Honeyeater/Chat	0	0	0	0	0	0	1	3	0	0	**4**
Kingfisher/Kookaburra	2	0	2	0	0	0	0	7	1	0	**12**

Continued

Bird type	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
Pacific Gull	2	2	1	0	4	5	2	1	5	0	**22**
Frigate	0	0	1	0	1	1	1	2	1	1	**8**
Pelican	2	1	1	3	1	1	2	2	4	2	**19**
Wader	1	0	0	3	1	1	3	3	0	1	**13**
Wren	1	0	0	1	0	0	1	2	1	0	**6**
Cockatoo	4	4	6	8	5	6	4	8	7	4	**56**
Swan	0	0	1	2	0	1	0	1	1	1	**7**
Bee-eater	0	0	1	0	0	0	0	0	0	2	**3**
Hen	0	0	2	6	0	2	3	2	0	2	**17**
Wagtail	1	2	1	1	1	1	1	3	2	0	**13**
Myna	1	0	1	1	2	0	1	1	0	3	**10**
Crow/Raven	4	12	13	11	7	18	6	5	9	9	**94**
Hawk	29	42	39	35	23	32	37	23	42	34	**336**
Darter	0	0	0	0	2	1	0	1	0	0	**4**
Starling	3	5	10	6	9	6	8	4	8	6	**65**
Thrush	0	0	2	0	0	0	0	1	0	0	**3**
Pheasant	0	1	0	0	0	0	0	0	0	0	**1**
Cuckoo	0	1	1	1	0	0	0	0	0	1	**4**
Oystercatcher	0	1	0	1	0	0	0	0	0	0	**2**
Rail	0	0	0	1	1	0	0	0	0	0	**2**
Australian Brush-turkey	3	1	6	8	2	3	3	5	2	2	**35**
Robin	2	0	2	3	0	0	0	0	0	1	**8**
House Sparrow	17	24	12	10	29	13	17	17	19	18	**176**
Silver Gull	33	46	28	31	17	31	20	30	20	38	**294**
Curlew/Sandpiper	24	40	29	29	18	21	29	21	19	22	**252**
Pratincole	27	33	16	21	15	15	14	15	17	20	**193**

Table 39: Number of birdstrikes by bird size and state, 2004 to 2013

State	Bird size	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ACT	Large	0	0	1	0	0	0	0	0	0	0
	Medium	10	24	32	30	19	18	17	31	9	9
	Small	4	3	6	3	5	1	6	3	4	16
	Unknown	5	6	9	4	6	5	11	12	8	8
NSW	Large	11	8	2	10	11	7	15	17	10	20
	Medium	95	87	115	140	153	146	118	161	118	128
	Small	43	46	44	60	49	56	68	71	77	99
	Unknown	58	74	61	46	47	88	91	83	93	109
NT	Large	1	5	2	4	1	6	26	15	19	10
	Medium	41	51	60	44	44	70	65	64	38	108
	Small	55	69	38	58	49	53	54	55	50	61
	Unknown	22	31	12	9	18	33	38	32	38	33
QLD	Large	17	21	21	24	22	27	30	47	26	31
	Medium	137	159	175	179	181	172	236	204	180	180
	Small	117	121	113	122	146	123	180	176	176	214
	Unknown	97	145	87	87	105	149	144	134	134	188
SA	Large	1	2	2	1	0	1	3	2	2	1
	Medium	71	66	61	59	59	74	61	66	49	34
	Small	21	13	16	15	20	22	34	51	30	20
	Unknown	14	38	19	17	15	39	26	43	29	35
TAS	Large	1	1	0	1	2	1	2	0	0	3
	Medium	13	29	12	31	26	30	28	21	21	22
	Small	9	12	18	22	17	16	17	10	16	16
	Unknown	4	12	11	8	11	4	8	5	6	8
VIC	Large	0	5	5	5	6	5	6	3	4	2
	Medium	53	52	70	33	39	58	60	38	41	30
	Small	20	37	31	21	36	31	56	26	35	29
	Unknown	25	33	20	22	36	40	35	41	39	49
WA	Large	12	6	5	5	7	9	10	7	16	13
	Medium	51	39	75	68	58	72	61	86	109	76
	Small	33	30	50	41	43	44	46	72	89	57
	Unknown	18	32	29	24	16	31	35	45	42	55
Other	Large	0	0	0	1	0	0	1	2	1	1
	Medium	0	2	1	2	6	7	4	3	5	2
	Small	0	0	2	1	1	1	2	1	5	4
	Unknown	0	0	0	0	2	1	2	1	1	2

Table 40: Number of birdstrikes by bird type and hour of day (where time is known), 2004 to 2013

Hour of day	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Bat/Flying Fox	37	7	5	7	21	38	26	27	16	16	11	4	8	5	2	2	2	19	142	166	136	61	29	33
Lapwing/Plover	32	11	9	4	13	15	32	42	62	72	52	36	29	31	21	39	46	25	34	53	66	49	24	19
Kite	16	1	1	0	1	6	37	103	114	124	92	63	41	32	37	30	36	35	9	6	1	3	1	1
Galah	12	4	2	2	0	1	45	85	122	86	58	20	23	14	26	34	64	72	41	37	18	3	4	0
Nankeen Kestrel	12	4	3	1	1	6	20	31	65	53	65	26	33	30	34	36	29	21	23	5	4	2	0	0
Swallow/Martin	12	9	0	0	0	2	16	61	60	56	73	48	35	26	29	25	30	18	5	3	3	1	2	1
Magpie	11	2	1	0	0	2	26	41	53	56	49	40	28	28	24	41	26	36	8	12	9	4	3	1
Magpie-lark	7	3	1	0	1	1	13	32	60	43	31	16	28	17	11	15	27	28	8	1	4	4	3	0
Hawk	1	0	0	0	0	4	16	34	41	39	27	29	19	11	17	17	15	20	15	7	1	1	3	1
Silver Gull	4	4	2	0	3	1	11	35	36	20	27	15	16	12	13	21	17	14	6	12	6	2	4	1
Curlew/Sandpiper	16	7	4	5	6	19	5	8	5	7	5	3	4	1	2	4	5	3	10	34	37	24	10	10
Pipit	8	2	0	0	2	3	10	11	23	23	18	24	21	16	12	8	13	3	5	3	2	1	2	1
Dove	9	0	0	2	2	0	2	11	32	25	16	10	11	14	12	15	12	16	7	3	0	2	0	2
Duck	12	5	1	0	3	2	11	21	7	6	2	5	6	2	5	9	4	5	24	13	34	14	10	4
Pratincole	13	3	2	3	5	1	10	15	15	15	15	7	7	7	7	8	7	6	7	13	9	1	2	1
House Sparrow	2	0	0	0	0	2	7	15	24	26	14	13	8	11	11	9	13	7	2	2	0	1	1	0
Heron/Egret	3	0	1	2	0	1	10	4	10	16	19	9	9	9	9	5	11	6	4	6	12	3	2	0
Owl	13	9	0	1	1	4	2	2	4	1	0	1	0	0	1	0	0	3	5	37	22	13	9	7
Ibis	1	1	1	0	0	1	5	9	16	10	19	13	15	8	5	3	5	8	8	1	2	2	1	0
Eagle	2	0	0	0	1	0	2	5	9	6	14	7	6	7	7	6	8	4	3	2	0	0	0	0
Crow/Raven	0	0	0	0	0	0	9	8	11	10	11	5	5	2	9	7	8	3	2	1	1	0	0	0
Finch	2	1	1	0	0	0	3	8	10	13	6	6	6	3	3	4	2	2	3	0	0	3	3	2
Parrot	5	1	0	0	0	0	6	3	7	9	6	2	2	0	3	3	9	10	11	0	0	0	0	0
Falcon	2	0	1	0	0	1	3	4	11	11	2	3	8	2	1	6	9	5	0	2	1	1	0	1
Starling	1	0	1	0	1	4	3	5	9	4	11	5	6	1	2	0	2	3	2	0	1	0	0	0
Swift	1	0	0	0	0	1	7	13	19	4	3	0	0	2	2	3	1	1	1	0	0	0	0	0
Cockatoo	1	0	0	0	0	0	1	7	6	6	0	1	1	2	2	4	9	3	3	3	1	3	0	0
Tern	3	0	0	0	0	0	2	5	2	3	4	4	1	6	5	5	3	5	2	0	1	1	0	1
Skylark	1	0	0	1	0	0	1	3	4	8	6	5	5	1	2	0	2	0	2	1	0	0	0	0
Australian Brush-turkey	1	1	0	0	0	0	1	4	6	4	1	3	0	0	2	0	3	4	1	0	1	0	2	0
Wedge-tailed Eagle	0	0	0	0	0	0	0	1	2	5	3	2	3	2	1	2	4	0	0	1	0	0	0	0
Cormorant	0	0	0	0	0	1	4	1	3	2	0	2	1	2	0	1	1	0	1	0	1	0	1	0
Pacific Gull	1	0	0	0	0	0	1	3	5	0	2	1	0	0	1	2	1	2	1	0	0	0	0	1
Bustard	0	0	0	0	0	0	3	5	2	2	0	0	0	0	1	2	1	1	2	1	1	0	0	0
Pelican	0	0	0	0	0	0	0	1	0	2	2	3	3	2	1	1	0	0	3	0	0	1	0	0
Magpie Goose	1	0	1	0	1	0	1	0	3	1	2	0	0	0	1	0	1	2	2	0	1	0	0	0

Continued

Hour of day	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Hen	0	0	0	0	0	0	3	0	1	2	1	0	0	0	1	0	0	1	2	1	0	1	0	0
Wader	1	0	0	0	0	1	2	1	0	0	1	1	0	0	0	1	0	0	3	0	1	0	1	0
Wagtail	1	0	0	0	0	0	0	1	1	3	0	0	1	1	1	0	1	0	0	0	0	0	0	0
Kingfisher/Kookaburra	0	1	0	0	0	0	1	0	1	0	0	1	2	0	1	0	1	2	1	1	0	0	0	0
Myna	1	0	0	0	0	0	0	0	2	1	0	1	1	2	0	1	1	0	0	0	0	0	0	0
Other	0	0	1	0	0	1	0	1	2	0	1	0	1	0	1	0	0	0	0	0	1	1	0	0
Frigate	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	0	1	1	0	1	0	0	0	1
Robin	1	0	0	0	0	0	2	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Swan	0	0	1	0	0	0	1	1	0	0	0	0	1	1	0	0	0	1	0	0	1	0	0	0
Wren	0	0	0	0	0	0	2	0	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0
Darter	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	1	0	0	0	0
Cuckoo	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0
Honeyeater/Chat	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Bee-eater	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
Thrush	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Rail	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Oystercatcher	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0
Pheasant	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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.

Australian Transport Safety Bureau

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Investigation

ATSB Transport Safety Report
Aviation Research Statistics

Australian aviation wildlife strike statistics 2004 - 2013

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