Australian Government
Australian Transport Safety Bureau

Australian aviation wildlife strike statistics

Bird and animal strikes 2002 to 2011

Research

ATSB Transport Safety Report
Aviation Research Report
AR-2012-031
Final

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ATSB TRANSPORT SAFETY INVESTIGATION REPORT

Aviation Research and Analysis Report
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Australian aviation wildlife strike statistics: Bird and animal strikes 2002 to 2011

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SAFETY SUMMARY

Why we have done this report

A significant proportion of all occurrences reported to the Australian Transport Safety Bureau (ATSB) involve aircraft striking wildlife, especially birds. 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 controlling the risks associated with bird and animal strikes. This report updates the first edition published in 2010 with data from 2010-2011.

What the ATSB found

In 2011, there were 1,751 birdstrikes reported to the ATSB. Most birdstrikes involved high capacity air transport aircraft. For high capacity aircraft operations, reported birdstrikes have increased from 400 to 980 over the last 10 years of study, and the rate per aircraft movement also increased. Domestic high capacity aircraft (such as Boeing 737 and Airbus A320) were those most often involved in birdstrikes, and the strike rate per aircraft movement for these aircraft was significantly higher than all other categories. Larger high capacity aircraft (such as Boeing 747 and Airbus A340 and A380) had a significantly lower strike rate. One in eight birdstrikes for turbofan aircraft involved an engine ingestion.

Takeoff and landing was the most common part of a flight for birdstrikes to occur in aeroplanes, while helicopters sustained strikes mostly while parked on the ground, or during cruise and approach to land. Birdstrikes were most common between 7:30 am and 10:30 am each morning, with a smaller peak in birdstrikes between 6pm and 8pm at night, especially for bats.

All major airports except Hobart and Darwin had high birdstrike rates per aircraft movement in the past 2 years compared with the average for the decade. Avalon Airport had a relatively small number of birdstrikes, but along with Alice Springs, had the largest strike rates per aircraft movement for all towered aerodromes in the past 2 years.

In 2010 and 2011, the most common types of birds struck by aircraft were bats/flying foxes, galahs, kites and lapwings/plovers. Galahs were more commonly involved in strikes of multiple birds. Not surprisingly, larger birds were more likely to result in aircraft damage.

Animal strikes were relatively rare. The most common animals involved were hares and rabbits, kangaroos and wallabies, and dogs and foxes. 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. While it is uncommon that a birdstrike causes any harm to aircraft crew and passengers, many result in damage to aircraft, and some have resulted in serious consequential events, such as forced landings and high speed rejected takeoffs.

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.

CONTENTS

THE AUSTRALIAN TRANSPORT SAFETY BUREAU

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The Bureau is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: independent investigation of transport accidents and other safety occurrences; safety data recording, analysis and research; fostering safety awareness, knowledge and action.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to fare-paying passenger operations.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

Purpose of safety investigations

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the safety factors related to the transport safety matter being investigated.

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.

1 INTRODUCTION

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, while animal strikes refer to strikes from all flightless animals, including flightless birds.

This report provides aviation birdstrike and animal strike occurrence data for the period 1 January 2002 to 31 December 2011. It should be noted that some data may vary when compared with the previous *Australian aviation wildlife strike statistics* report from 2002 to 2009 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 second edition of this report, which builds on the first edition (released June 2010) through the addition of comparisons of strikes by aircraft weight category, engine type, and analysis of rain fall, phase of flight and time of day. This report will be updated biennially.

Chapters 3 to 7 detail birdstrike occurrences, while Chapter 8 summarises animal strikes, for the period 2002 to 2011. Chapter 9 describes the results of a Civil Aviation Safety Authority survey of aerodrome operators concerning wildlife control measures.

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[1] Available from the ATSB internet site: http://www.atsb.gov.au. From late 2012, reportable wildlife strikes will be redefined as simply 'any collision between an aircraft and an animal or a bird' for all aircraft operation types.

[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 83.

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

Some birdstrikes were identified during pre-flight inspections, where the previous flight crew had no knowledge of striking a bird. In these cases, the location of the birdstrike has been recorded as unknown. As a result, there will be slightly fewer birdstrikes recorded at airports compared with the 2010 report *Australian aviation wildlife strike statistics: Bird and Animal strikes 2002 to 2011*, which did not clearly delineate between birdstrikes that had occurred on a known flight, and those discovered at a particular aerodrome, but had occurred at an earlier time. In this report, 582 records have been excluded from location reporting and a further 25 have been added due to a data cleaning process resulting in a positive location match.

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 takeoff, a landing, or a circuit. Therefore, an aircraft completing a single sector will have two movements recorded, one for takeoff 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 (March 2012)).

2.3 Rainfall data

Daily rainfall data published by the Bureau of Meteorology[4] was gathered for 58 selected airports. This was used to show whether changing seasonal and climatic conditions across the reporting period had any effect on the frequency of birdstrikes in specific locations. The criterion for the selection of airports for this type of analysis was where 15 or more birdstrikes had occurred since 2009.

Calculations of rainfall data

Daily rainfall measurements were nominally made at 9 am local clock time, and recorded the total precipitation for the preceding 24 hours. Rainfall prior to a birdstrike was calculated using this assumption, taking the proportion of rainfall on relevant days using the hour of the birdstrike relative to 9 am.

Some meteorological sites used in this analysis had aggregate measurements provided for rainfall over several days. Where this was the case, the average rainfall over the period of measurement was used to approximate the daily rainfall. For example, 15 millimetres of rainfall measured after a 3 day period would be approximated as 5 millimetres for each day during the period.

Limitations of rainfall data

Very few meteorological sites have a complete unbroken record of climate information. Missing values existing in the data used were treated as zero readings. As a result, rainfall quantities are slightly underestimated in this report.

In some locations, gathering of meteorological data commenced after 2002, therefore, some rainfall data was missing for birdstrikes at two of the 58 selected aerodromes. Where this was the case, these birdstrikes were excluded from the analysis.

2.4 Civil Aviation Safety Authority 2011 Aerodrome Survey

An information paper was prepared by the Civil Aviation Safety Authority (CASA) following a survey of certified and registered aerodromes[5] across Australia. The intention of this survey was to identify wildlife hazard management strategies conducted by these aerodrome owners and operators, and the bird and animal species that are perceived to present a larger than usual risk to safe flying operations. These results are presented in Chapter 9 of this report from page 73.

Survey methodology

The questionnaire was undertaken as a ‘point-in-time’ survey and questions related to the 2010-2011 financial year. All 315 certified and registered aerodromes across

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[4] Located at website: http://www.bom.gov.au/climate/data/ (Bureau of Meteorology data used in this report was current at the time of writing (March 2012))

[5] Certified aerodromes are aerodromes for which the operators have been granted a certificate by CASA under Civil Aviation Safety Regulation (CASR) 139.050.
Registered aerodromes are aerodromes that have been registered by CASA under CASR 139.265.

Australia, including islands and territories, were provided with a copy of the survey. All aerodrome operators received the same set of questions, using either an online CASA survey tool or by completing a paper survey.

The scope specifically excluded the following:

- unlicensed aerodromes
- any rating or investigation into security measures at airports
- airspace-related issues
- user perception and satisfaction with aerodromes.

Responses were received from 242 aerodromes, representing a response rate of 76 per cent. These aerodromes were located in a variety of urban, rural and remote areas and were of varying sizes and functions. Some responses were incomplete, but where data was suitable for reporting, these responses were included for analysis. Just over 60 per cent of responses were from certified aerodromes and almost 40 per cent were from registered aerodromes.

Responses were well distributed across the country, with the exception of the Northern Territory that had a cluster of aerodrome operators that did not return completed surveys to CASA (Figure 1).

The aerodrome size categories used in this report are based on self-reported numbers, and are defined as:

- very small - less than 1,000 annual aircraft movements
- small - between 1,000 and 5,000 annual aircraft movements
- medium - between 5,000 and 20,000 annual aircraft movements
- large - more than 20,000 annual aircraft movements.

For analysis, aerodromes were assigned to climate categories according to the Australian Building Codes Board climate zone regions. One-fifth of the responding aerodromes were located in equatorial, tropical and subtropical regions. Another 31 per cent of aerodromes were in temperate and alpine areas, and the remaining aerodromes were located in desert and grassland areas. A map showing climatic regions of Australia in more detail is included in Appendix D on page 120.

Survey questions

All aerodromes were asked the following three questions:

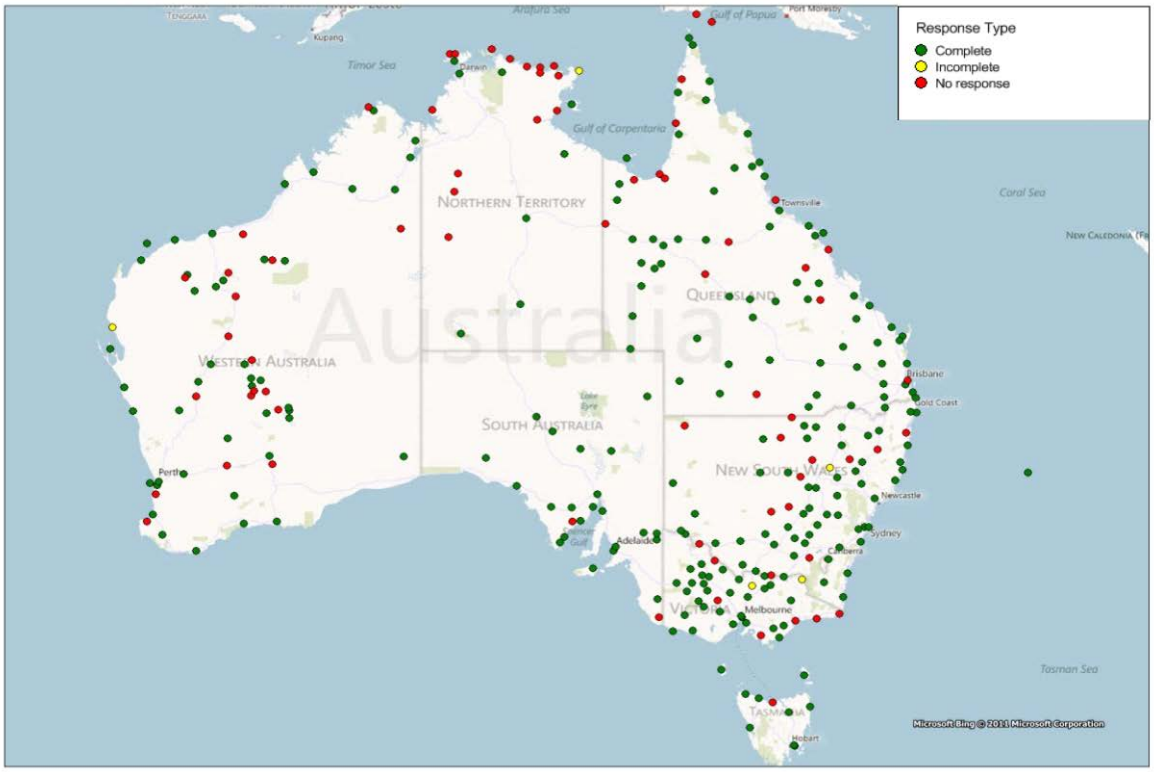
- Has a formal risk assessment for wildlife been carried out on this aerodrome?
- What level of risk does wildlife pose to this aerodrome?
- Is a Wildlife Hazard Management Plan in place for the aerodrome?

Two additional questions were conditional and were prompted only when the risk of wildlife hazard at the airport was rated as *medium* or *high*:

- Which species pose the biggest threat to aircraft safety on your aerodrome?
- Please indicate the wildlife strike mitigation strategies that are currently used at your aerodrome and any additional strategies planned for the next 12 months.

The responses to the first three questions are discussed in Chapter 9. All aircraft movements used in this analysis were reported by the aerodrome operators.

Figure 1: Respondents to the CASA 2011 Aerodrome Survey



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 2 below. Generally, birdstrike reports increased between 2002 and 2011 for all operation types, and in particular high capacity air transport birdstrikes, which have increased from 400 to 980 over the last 10 years. Between 2010 and 2011, birdstrikes were significantly higher than in previous years, although both years had similar numbers of birdstrikes. An increase was also observed in military birdstrikes reported to the ATSB since 2009.

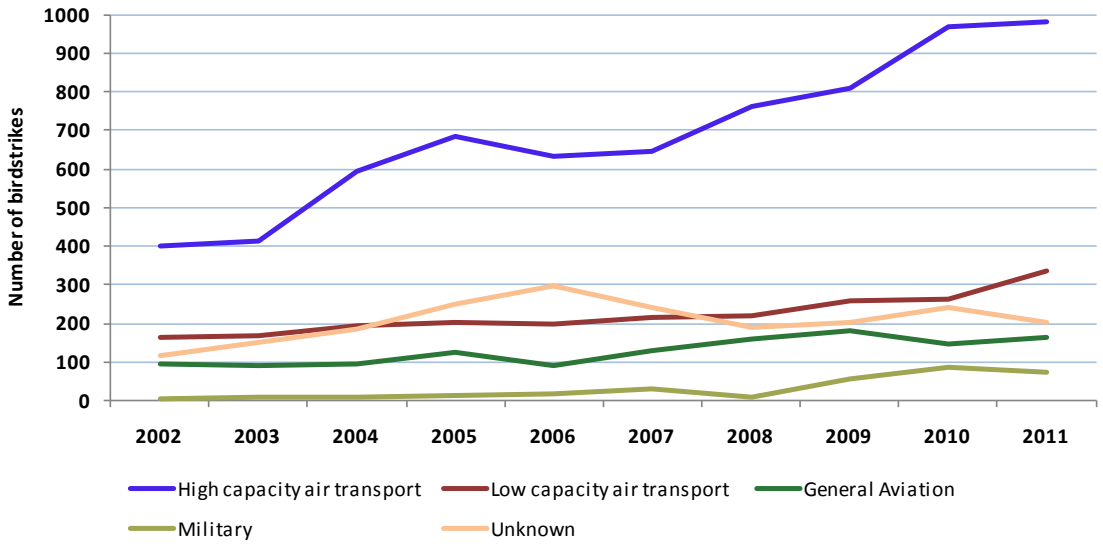
Boeing F/A-18F Super Hornet engine ingestion at night, followed by high speed rejected takeoff – Military

During the take-off roll from Amberley Aerodrome at 120 knots, the aircraft struck a bird in the intake area which was ingested into one of the aircraft engines. The pilot rejected the takeoff and decelerated the aircraft before the end of the runway. The engine required replacement and the brakes were also changed due to overheating from high speed emergency braking (31 August 2011).

Table 1: Number of birdstrikes per year by operation type

Operation type	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
High capacity air transport	400	413	596	684	631	646	762	809	969	980
Low capacity air transport	163	167	195	204	199	216	218	257	263	338
General Aviation	96	92	97	124	90	129	158	183	149	164
Military	6	9	11	15	16	31	10	58	88	73
Unknown	115	152	186	251	298	240	192	203	241	203
Total	**780**	**833**	**1,085**	**1,278**	**1,234**	**1,262**	**1,340**	**1,510**	**1,710**	**1,758**

Figure 2: Number of birdstrikes per year by operation type, 2002 to 2011



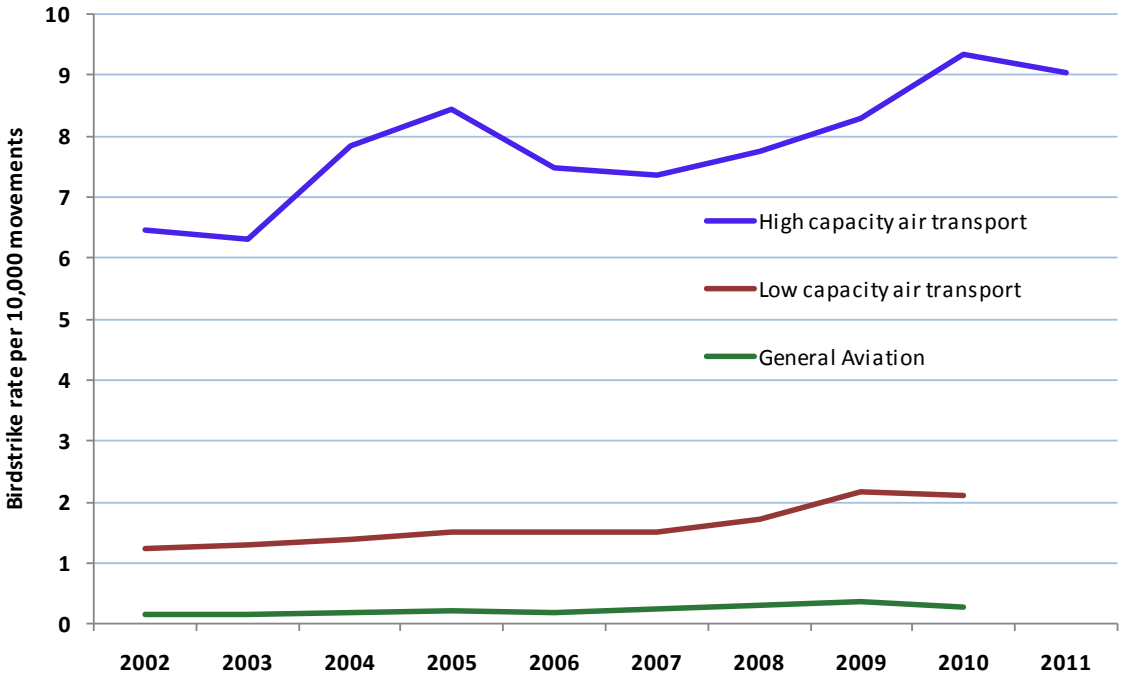
The rate of birdstrikes per 10,000 aircraft movements is shown in Table 2 and Figure 3 below. High capacity air transport aircraft have a significantly higher birdstrike rate than all other operation types. It is likely that the speed and size of these aircraft, longer take-off and landing rolls, and large turbofan engines are factors contributing to the higher rate.

High capacity aircraft birdstrike rate has increased since 2007 from 7.4 to over 9 strikes per 10,000 movements in 2011. The slight yearly increase in the annual low capacity air transport strike rates has accelerated since 2007, and appears to be becoming more significant. General aviation birdstrike rates have not significantly changed.

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

Operation type	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011[6]
High capacity air transport	6.45	6.32	7.85	8.45	7.49	7.35	7.76	8.28	9.34	9.03
Low capacity air transport	1.23	1.31	1.4	1.51	1.52	1.52	1.71	2.18	2.12	
General Aviation	0.17	0.17	0.19	0.21	0.18	0.26	0.3	0.37	0.28	

Figure 3: Birdstrike rate for fixed-wing aircraft (per 10,000 movements) per year by operation type, 2002 to 2011



[6] Where movement data is not available, this is shown in tables by blanked out cells.

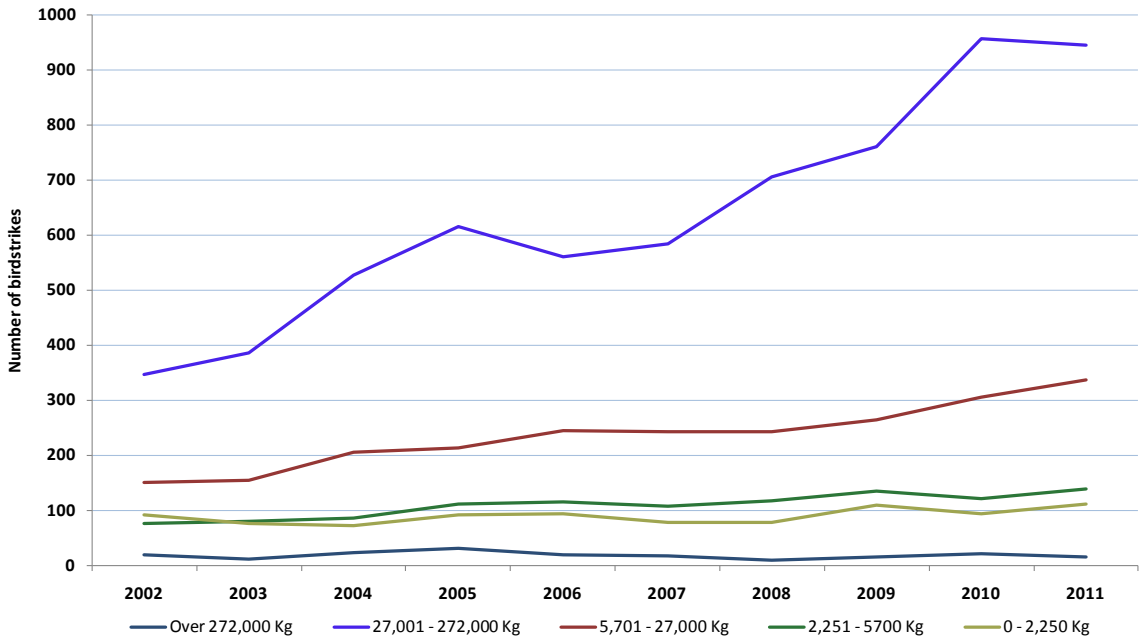
3.2 Birdstrikes by aircraft weight

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 in Figure 4 below. 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 widebody 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 in Figure 2 above.

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 and British Aerospace Jetstream 41 aircraft, which are commonly used by regional scheduled and charter airlines in Australia.

Figure 4: Number of birdstrikes for aeroplanes per year by weight category, 2002 to 2011



The aeroplane birdstrike rate per 10,000 aircraft movements (by aircraft weight category) is shown in Figure 5 and Table 3 below. The birdstrike rate for aircraft with MTOWs between 27,001 and 272,000 kg (Dash 8 Q400, Boeing 737, Airbus A320 and A330) is higher than for all other weight categories; however, it is increasing at a more gradual rate than the number of birdstrikes reported. This

reflects that flying activity involving larger aircraft has been increasing over the last 10 years.

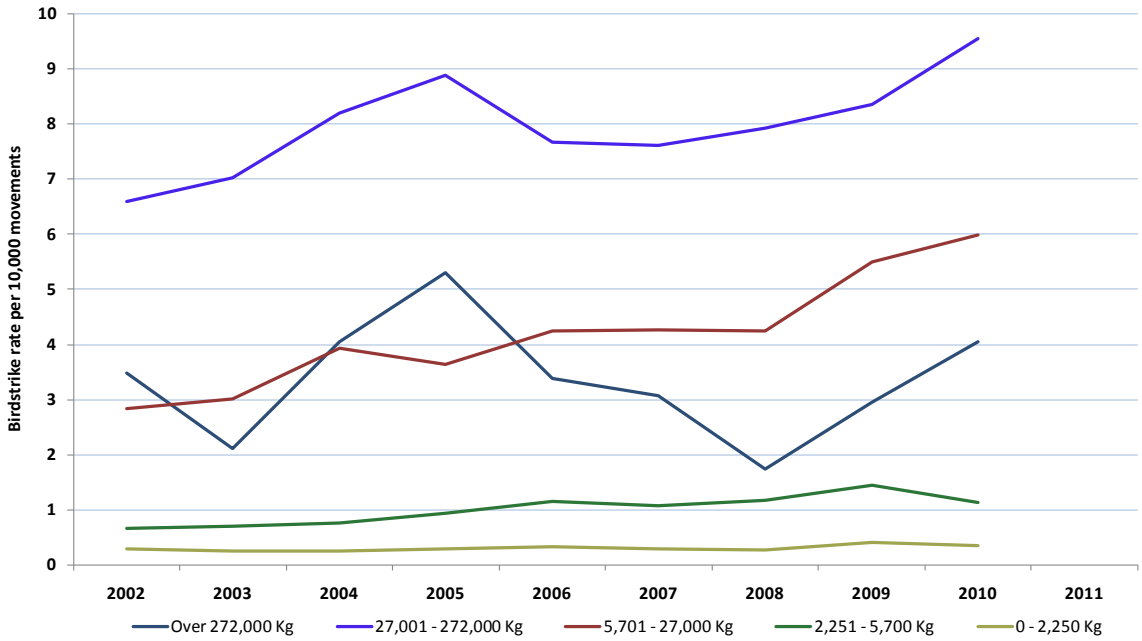
Very large (generally international) aircraft (those with an MTOW above 272,000 kg) had a strike rate of less than half that of smaller (typically domestic) jet aircraft. This may be due in part to the larger airports that these aircraft operate from. Aircraft in this weight category are generally four-engine aircraft, and include Boeing 747, the Airbus A340, and the Airbus A380.

The rate of reported birdstrikes for aircraft with MTOWs between 5,701 kg and 27,000 kg showed the most significant increase over the last 10 years, with the 2010 strike rate being more than twice the rate recorded in 2002.

Table 3: Fixed-wing aircraft birdstrike rate per year (per 10,000 movements) by weight category, 2002 to 2011

Maximum weight category	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011[7]
Over 272,000 kg	3.49	2.11	4.05	5.3	3.39	3.08	1.74	2.95	4.06	
27,001 – 272,000 kg	6.59	7.03	8.2	8.88	7.68	7.61	7.93	8.36	9.55	
5,701 – 27,000 kg	2.83	3.02	3.93	3.63	4.25	4.26	4.25	5.49	5.99	
2,251 – 5,700 kg	0.66	0.7	0.77	0.93	1.15	1.08	1.17	1.45	1.14	
Less than 2,250 kg	0.29	0.25	0.26	0.29	0.34	0.3	0.28	0.42	0.35	

Figure 5: Birdstrike rate for fixed-wing aircraft (per 10,000 movements) per year by weight category, 2002 to 2011



[7] Where data is not available, this is shown in tables by blanked out cells.

Helicopters

The number of helicopter birdstrikes and rate of birdstrikes per 10,000 movements by MTOW category is shown in Table 4 and Table 5 below. Both the number and rate of birdstrikes is significantly lower for most helicopter weight categories when compared with most aeroplane groups. For helicopters with a MTOW below 2,250 kg, the number and rate of reported birdstrikes is similar to that for fixed-wing aircraft. The lower number and rate of birdstrikes generally seen for helicopters may be due to helicopters flying at lower speeds, and being easier for birds and pilots to see and avoid.

There is a notable increase in the strike rate between 2007 and 2009 for helicopters with maximum weight categories below 27,000 kg, which has remained high in 2010. It is worth noting though that these figures are still slightly lower than those for the lightest aeroplane category.

Although the helicopter birdstrike rate 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 18 on page 52).

Robinson Helicopter R22 main rotor strike with a Wedge-tailed Eagle

During mustering operations, the helicopter struck a wedge-tailed eagle that impacted the main rotor blades. The pilot safely landed the helicopter on a grassy surface that was subsequently set alight by the helicopter exhaust. The helicopter was seriously damaged in the fire, however, the pilot was uninjured (7 August 2010).

Table 4: Number of birdstrikes for helicopters aircraft per year by weight category, 2002 to 2011

Maximum weight category	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
27,001 – 272,000 kg	0	0	0	0	0	0	0	1	0	0
5,701 – 27,000 kg	0	1	2	0	2	2	0	8	8	7
2,251 – 5,700 kg	5	5	4	4	2	16	13	13	9	6
Less than 2,250 kg	4	5	5	5	5	5	7	12	12	9
Total	**9**	**11**	**11**	**9**	**9**	**23**	**20**	**34**	**29**	**22**

Table 5: Helicopter birdstrike rate per 10,000 movements per year by weight category, 2002 to 2011

Maximum weight category	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
27,001-272,000 kg	0	0	0	0	0	0	0	0.01	0	
5,701-27,000 kg	0	0.02	0.04	0	0.03	0.04	0	0.17	0.16	
2,251-5,700 kg	0.04	0.04	0.04	0.03	0.02	0.16	0.13	0.14	0.08	
Less than 2,250 kg	0.01	0.02	0.02	0.02	0.02	0.02	0.03	0.05	0.04	

3.3 Birdstrikes by aircraft engine type

Aeroplanes

As different engine types are fitted to aeroplanes based on 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 27,000kg 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 6). Data is only shown from 2008 onwards, as engine type information was not recorded for a significant proportion of the birdstrike occurrences before 2008.

Table 6: Number of fixed-wing aircraft birdstrikes per year by engine type, 2008 to 2011

Engine type	2008	2009	2010	2011
Turbofan	687	719	907	902
Turbojet	6	6	7	1
Turboprop	321	393	438	479
Piston	140	167	148	170
Total	**1,154**	**1,285**	**1,500**	**1,552**

Boeing 737 Ibis ingestion into turbofan engine

During the initial climb after takeoff, the pilot observed a bird passing by the left side of the aircraft. Approximately 10 seconds later, a burning smell was detected in the cabin and on the flight deck, consistent with a bird ingestion into the engine core. A visible dent was observed on the leading edge of the engine cowl; however, all engine indications were normal. The aircraft made an uneventful landing with minimal reverse thrust at the intended destination (7 October 2011).

Helicopters

Turboshaft engine helicopters had a larger number of birdstrikes compared with helicopters fitted with piston engines, which had the lowest strike rate of all helicopter engine types (0.07 strikes per 10,000 movements).

Bell Jetranger collision with flying fox at night – Turboshaft engines

During final approach at night, at an altitude of about 100 feet above the ground and an airspeed of 75 knots, the helicopter struck a flying fox. The impact broke the right windshield, and the flying fox struck the pilot in the face with sufficient force for the pilot's headset to be thrown to the left side of the aircraft. The helicopter lost altitude and yawed when the pilot momentarily released the collective. The pilot received scratches to his arm and hand from the broken windscreen, and a swollen mouth and sore neck from the impact with the flying fox. Following the incident, the pilot visited a hospital to commence a series of injections relating to possible flying fox infections (16 October 2010).

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.

3.4 Birdstrikes by phase of flight

Aeroplanes

The number and proportion of birdstrikes for aeroplanes by phase of flight is shown in Table 7 and Figure 6 in chronological order of a typical flight sequence.

Phase of flight will be typically recorded as 'unknown' 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).

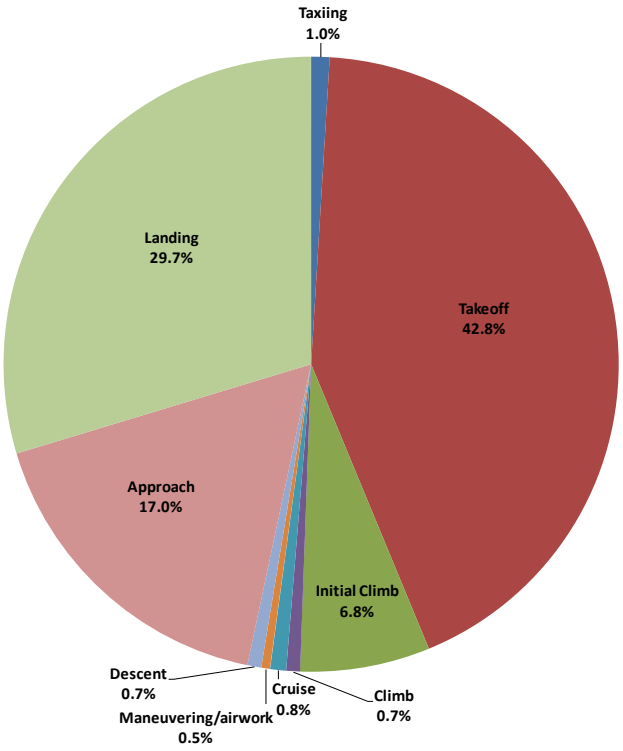
Table 7: Number of birdstrikes by phase of flight for aeroplanes, 2002 to 2011

Phase of flight	Number of birdstrikes
Taxiing	101
Takeoff	4,442
Initial climb	708
Climb	75
Cruise	88
Maneuvering/airwork	47
Descent	76
Approach	1,763
Landing	3,083
Unknown[8]	2,064
Total	**12,447**

The vast majority of birdstrikes occurred at airports. More than 40 per cent of birdstrikes with a known phase of flight involving aeroplanes occurred during takeoff, and almost 30 per cent occurred during landing. In total, 96 per cent of birdstrikes with a known phase of flight occurred while the aircraft was on the runway, on approach to land or just after takeoff. Very few occurred during cruise.

[8] A small proportion of 'Unknown' phases of flight may be 'Standing'. These have been excluded in this report due to most being the location where the strike was discovered.

Figure 6: Proportion of birdstrikes by phase of flight (where known) for aeroplanes only, 2002 to 2011

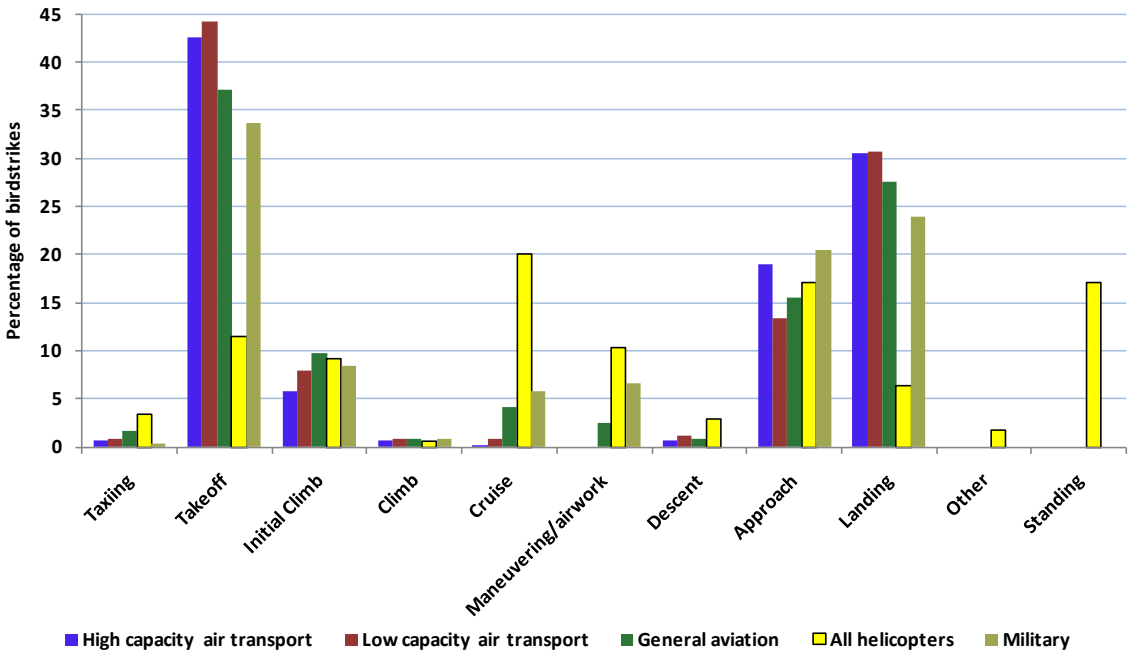


All aircraft types

Figure 7 below shows the proportion of birdstrikes in each phase of flight by operation type for aeroplanes and helicopters. Birdstrikes reported during takeoff were most common for fixed-wing aircraft, followed by landing, or during approach and initial climb. 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 being the most common times in an average flight when a birdstrike occurs. A high proportion of birdstrikes while 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 takeoff may be due to the louder and varying noise caused by helicopter rotor speed and pitch changes during these flight phases.

Figure 7: Proportion of birdstrikes by phase of flight (where known) and operation type, aggregated for the 2002-2011 period



Learjet LR35 Whistling Kite ingestion during takeoff followed by return to base

During the take-off roll, the aircraft struck three whistling kites. One bird was ingested into the right side engine, bending the compressor blades. The pilot reported that due to the runway slope, the birds were not visible until a collision was unavoidable, and t he pilot was committed to a takeoff. The aircraft dumped fuel and r eturned for landing approximately 10 minutes later (28 October 2011).

3.5 Birdstrikes by time of day

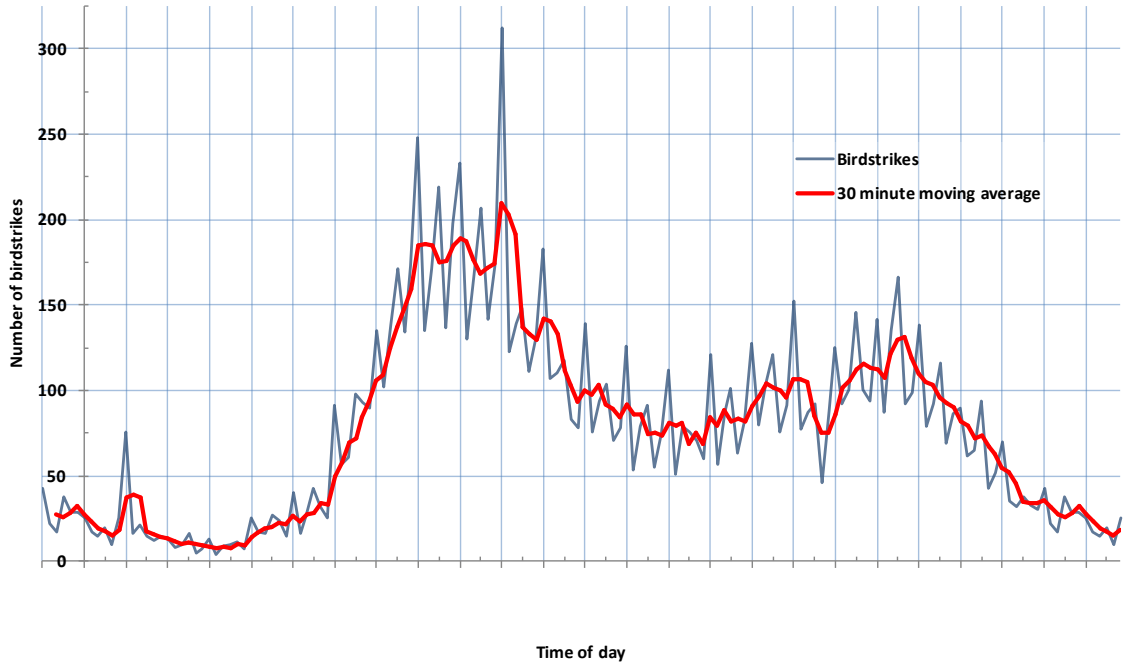
Figure 8 shows the number of birdstrikes by time of day as reported between 2002 and 2011. The horizontal axis is set out in 24 hour time format (data shown for each 10 minute interval), with 1 hour repeating at the beginning and end of the day for the purpose of generating a 3 point moving average line (shown in red). This helps to remove some variation from the data.

Birdstrikes are most common across most locations between 7:30 am and 10:30 am each morning, reducing to a low strike period in the early afternoon between about 1:30 pm to 2:30 pm. An increase in birdstrikes is seen again in the dusk and evening twilight periods between 6 pm and 8 pm at night, steadily reducing after this time to the lowest period in the early hours of the morning (between 1:30 am and 4:00 am).

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 8. Other factors expected to contribute are the bird species and the size, and the airspeed and engine type of the aircraft. Due to the large number of birdstrikes reported involving high capacity air transport aircraft, the time distribution is largely governed by these strikes.

The peak times for birdstrikes are also shown by bird species in Table 40 on page 113.

Figure 8: Number of birdstrikes by time of day, aggregated for the 2002-2011 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 37 per cent increase in 2011 compared with 2002 figures. The number of birdstrikes occurring in Tasmania has risen more slowly in recent years, with an increase of about 26 per cent in 2010 and 2011. Australian territorial islands (denoted in Table 8 as 'Other') have shown the most significant increase in the number of birdstrikes, with a 97 per cent increase in the last 2 years.

The 'Unknown' field in Table 8 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 8: Number of birdstrikes per year by state, 2002 to 2011

State	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
ACT	11	9	19	33	48	37	30	24	33	46	**290**
NSW	146	163	207	215	222	256	260	297	291	336	**2,393**
NT	120	94	119	156	112	115	113	163	183	166	**1,341**
QLD	231	305	368	446	396	414	455	471	592	561	**4,239**
SA	74	64	107	119	98	92	94	137	124	162	**1,071**
TAS	35	30	27	54	41	63	56	51	55	36	**448**
VIC	68	62	98	127	126	81	117	134	157	108	**1,078**
WA	80	93	114	107	159	138	124	156	153	211	**1,335**
Other	1	0	0	2	3	5	9	9	17	11	**57**
Unknown	14	13	26	19	29	61	82	68	105	121	**538**
Total	**780**	**833**	**1,085**	**1,278**	**1,234**	**1,262**	**1,340**	**1,510**	**1,710**	**1,758**	**12,790**

Figure 9 below shows the average number of birdstrikes per year from 2002 to 2011, compared with that for the last 2 years of the reporting period (2010 and 2011). 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 9: Average birdstrikes per year by state, 2002 to 2011

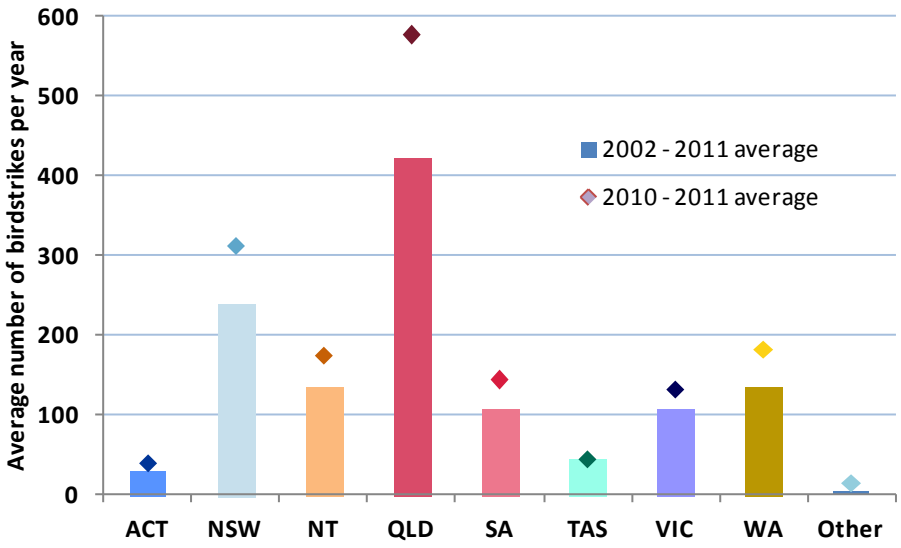
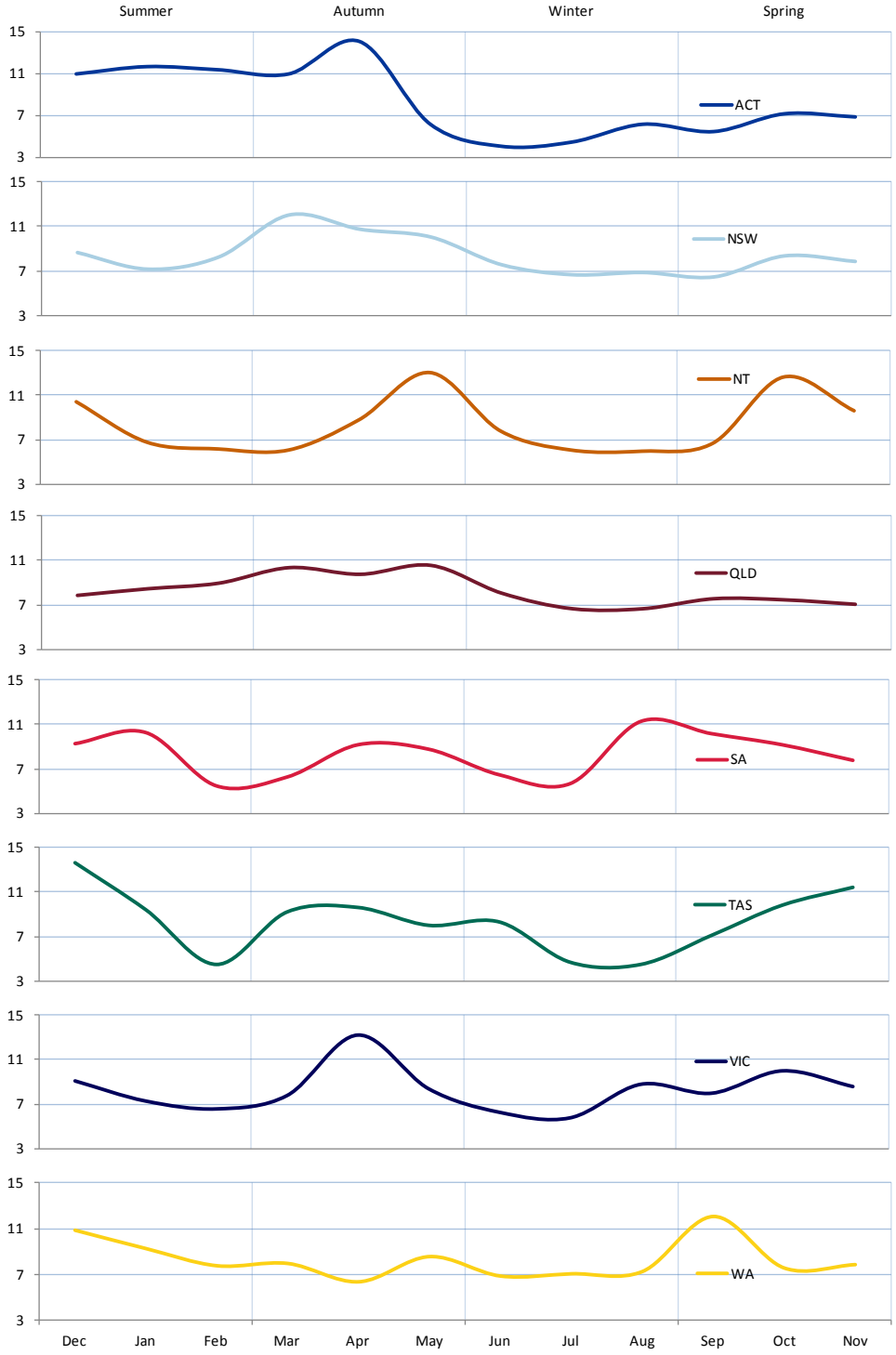


Figure 10 (below) shows birdstrikes by season and by state. Considering all states, July has the lowest number of birdstrikes on average, with only 5.5 per cent of the yearly average for the 10-year period. In comparison, almost 10 per cent occurred in both October and December. There was some variability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

Figure 10: Percentage of total yearly reported birdstrikes occurring each month by state, averaged for the 2002-2011 period



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 17, 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 takeoff 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 B, 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. 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 significant regional aerodromes.

Cessna 182 Birdstrike with Magpie Goose on approach to Ayr ALA

As the aircraft descended from 1,000 ft into Ayr Aeroplane Landing Area (ALA) following a practice skydiving flight with six people on board, the pilot noticed a bird to the left of the aircraft. This was followed almost immediately by an impact with the windscreen. The Magpie Goose penetrated the windscreen, causing it to shatter. The pilot selected full power, but the aircraft was unable to maintain altitude due to the increased drag on the aircraft.

Approaching 200 ft above ground level, the pilot selected a cane field in which to conduct a forced landing. Following the landing, the aircraft came to a stop and the pilot and passengers were able to exit the aircraft through the jump door and the windscreen. The pilot and passengers sustained minor injuries.

In this case, the pilot focused on maintaining control of the aircraft after the birdstrike had occurred. The decision to make a controlled landing into a cane field resulted in a safe outcome (15 October 2011).

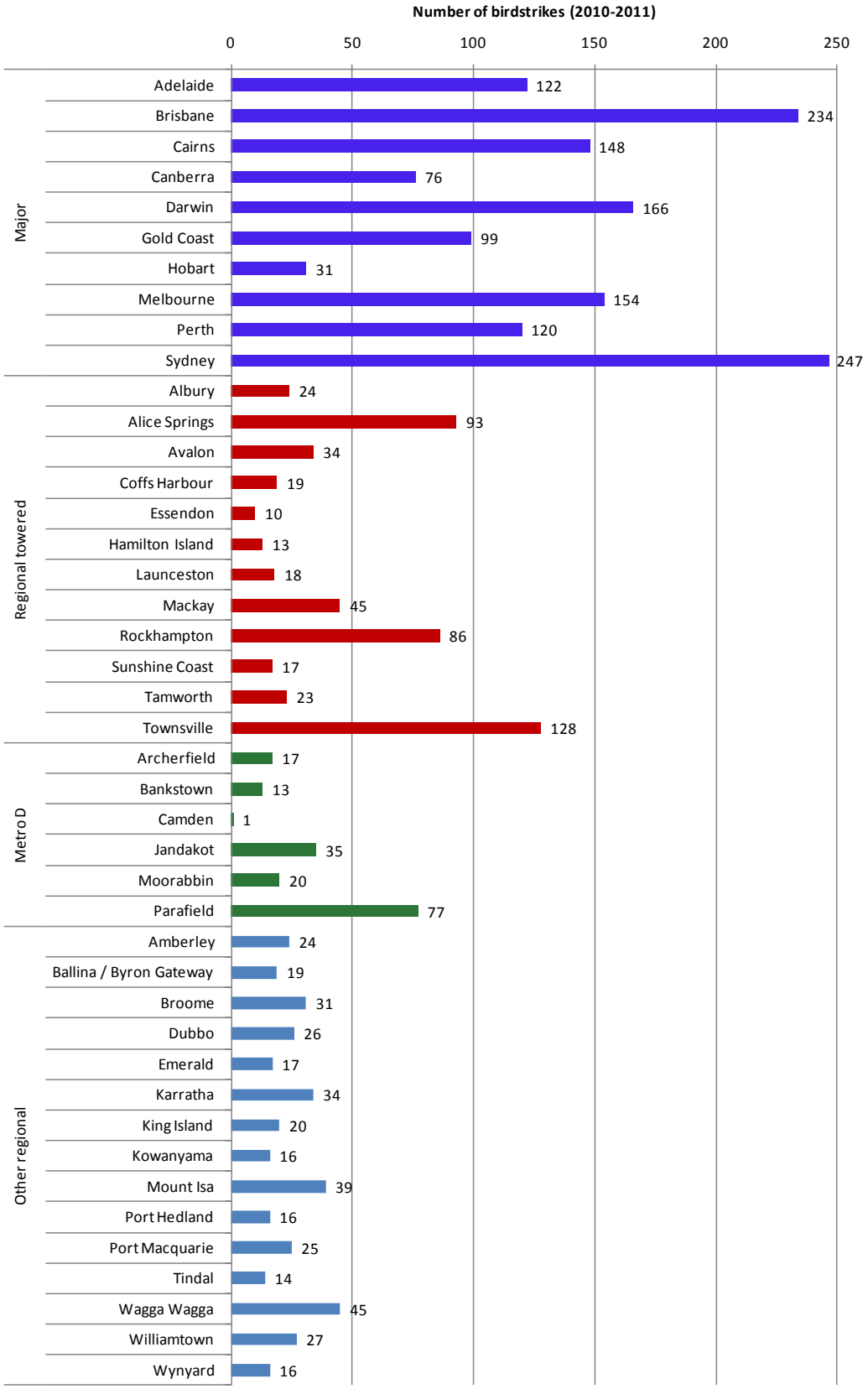
ATSB Investigation Number: AO-2011-133

5.1 Birdstrike numbers by aerodrome

Figure 11 shows the number of birdstrikes for the past 2 years (2010-2011) at all major aerodromes, towered regional, and metro class D, and at other regional aerodromes with a significant number of birdstrikes. Only birdstrikes that occurred within the confines of aerodromes have been included.

It can be seen that the major airports (except Hobart) dominate in terms of the number of birdstrikes, due to the large number of aircraft movements. Other airports with more than 50 birdstrikes over the 2-year period were Townsville, Alice Springs, Rockhampton, and Parafield. Aerodromes with between 30 and 50 birdstrikes over the 2-year period were Wagga Wagga, Mackay, Mount Isa, Jandakot, Avalon, Karratha, Broome and Hobart.

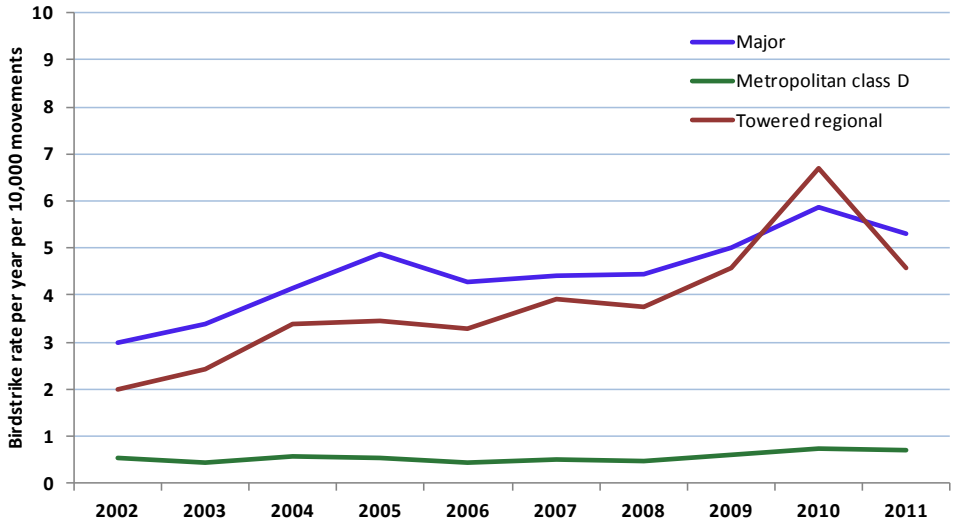
Figure 11: Number of birdstrikes (inside aerodrome confines) 2010 and 2011



5.2 Birdstrike rates by aerodrome

Major and towered regional aerodromes had significantly higher rates of reported birdstrikes than metropolitan class D aerodromes. In 2010 for the first time, towered regional aerodrome strike rates were greater than for major airports. This rate decreased in 2011 to be slightly lower than that of the majors. Metropolitan class D birdstrike rates increased slightly in 2010 and 2011. This can be seen in Figure 12 (below), which shows the rate of birdstrikes for every 10,000 movements in each aerodrome category. 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, 2002 to 2011



For major aerodromes, Table 9 shows that there has been an overall increase in the birdstrike rate at most aerodromes since 2002. There was some year-on-year variability, in particular for Hobart, Cairns and Darwin.

Table 9: Rate of birdstrikes each year at major aerodromes (inside aerodrome confines) per 10,000 movements, 2002 to 2011

Aerodrome	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average
Adelaide	3.09	3.55	5.82	5.8	5.44	4.61	4.29	7.4	5.5	7	**5.25**
Brisbane	4.46	4.43	3.98	4.13	4.01	4.21	6.19	5.75	6.35	6.28	**4.98**
Cairns	2.85	4.58	5.51	7.5	4.14	8.23	8.2	8.09	10.37	7.47	**6.69**
Canberra	1.05	0.57	2.32	3.88	5.38	4.58	3.32	2.56	5.18	7.07	**3.59**
Darwin	8.67	8.2	11.73	13.86	7.93	8.11	8.7	13.08	12.26	7.68	**10.02**
Gold Coast	2.32	3.55	1.71	3.73	3.82	4.53	2.12	2.4	5.12	5.26	**3.46**
Hobart	7.99	5.62	3.62	9.23	9.16	11.33	7.39	7.24	6.63	4.27	**7.25**
Melbourne	2.38	1.89	3.09	3.38	3.89	1.95	3.81	3.23	5.14	2.81	**3.16**
Perth	1.63	3.51	4.35	3.84	4.22	3.38	3.91	3.37	4.78	4.84	**3.78**
Sydney	1.66	2.36	3.11	2.95	2.58	3	2.82	3.9	4.03	4.34	**3.07**

In 2010 and 2011, the birdstrike rate for most aerodromes increased, as shown in Figure 13 below. A decrease was observed at Hobart Airport for 2010-2011, and the 2010-2011 Darwin Airport strike rate was slightly lower than the 10 year average. Canberra, Cairns and Gold Coast had the largest 2010-2011 average and proportional increase relative to the 10 year average.

Figure 13: Average rate of birdstrikes for major aerodromes (inside aerodrome confines) per 10,000 movements, 2002 to 2011

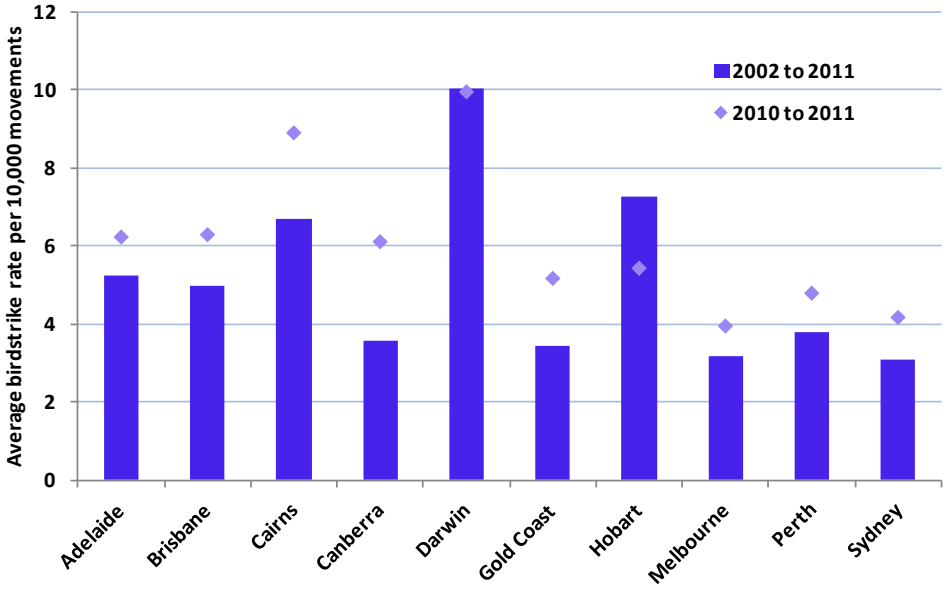


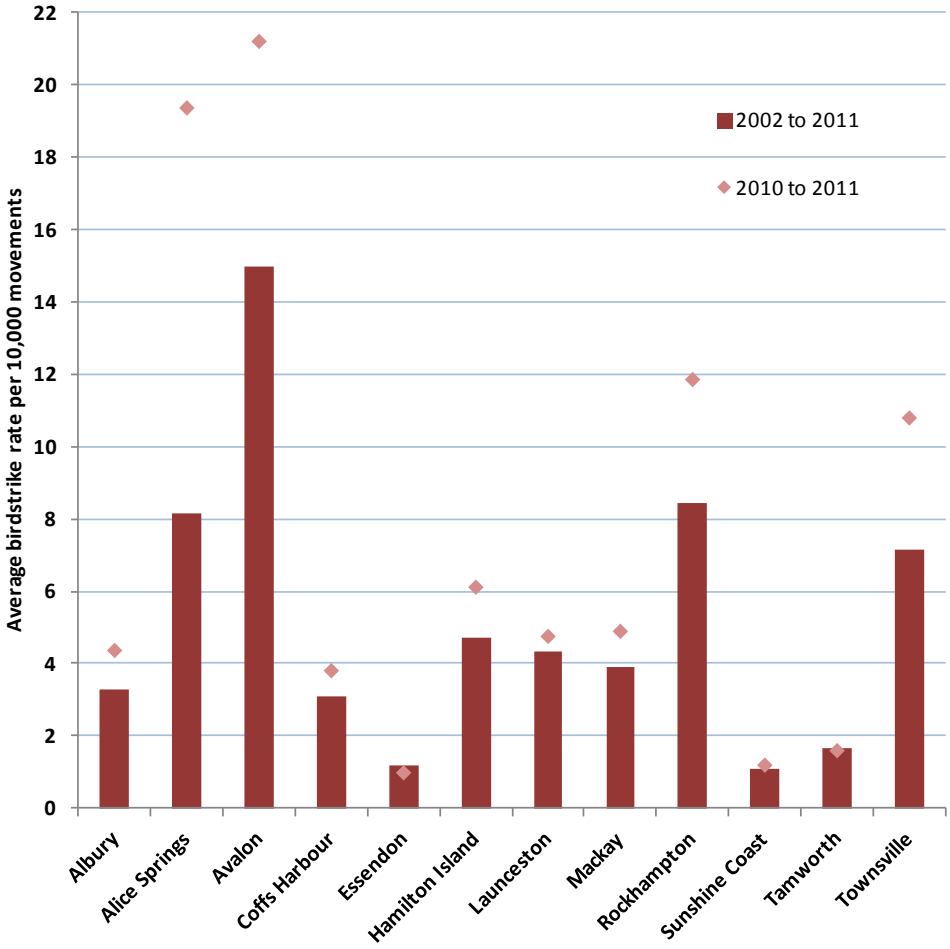
Table 10 shows the birdstrike rate for towered regional aerodromes between 2002 and 2011. Birdstrike rates have increased for most aerodromes, with an average increase of 2.41 birdstrikes per 10,000 movements at towered regional aerodromes for 2010 to 2011 compared with the 10-year average for all Australian aerodromes.

Table 10: Rate of birdstrikes each year at towered regional aerodromes (inside aerodrome confines) per 10,000 movements, 2002 to 2011

Aerodrome	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average
Albury	1.01	0.32	2.83	3.32	3.04	4.83	2.88	5.94	4.68	4.04	**3.29**
Alice Springs	9.74	3.84	4.49	5.22	5.98	5.9	2.29	5.32	24.85	13.86	**8.15**
Avalon	-	-	-	-	5.62	7.64	8.7	25.61	26.74	15.66	**14.99**
Coffs Harbour	0.27	2.29	1.51	4.23	3.87	4.89	2.97	3.47	4.3	3.3	**3.11**
Essendon	0.73	0.47	0.84	1.36	2.03	1.12	1.52	2.02	1.03	0.93	**1.2**
Hamilton Island	1.27	1.4	3.7	6.02	6.19	6.65	4.94	4.61	6.36	5.85	**4.7**
Launceston	3.65	0.55	4.18	5.22	1.95	3.93	9.08	5.22	6.05	3.44	**4.33**
Mackay	3.48	2.11	7.3	4.32	3.12	1.95	2.41	4.43	5.4	4.39	**3.89**
Rockhampton	3.43	10.74	7.36	6.98	8.01	5.09	9.46	9.84	14.14	9.56	**8.46**
Sunshine Coast	0.41	0.85	1.19	0.85	1.17	2.06	0.78	1.14	1.7	0.69	**1.08**
Tamworth	1.27	2.26	1.08	0.88	1.66	1.99	2.65	1.41	1.68	1.5	**1.64**
Townsville	2.58	3.04	7.45	6.44	4.63	7.5	8.34	9.96	13.04	8.53	**7.15**

Figure 14 (below) shows the average birdstrike rate for the last 10 years (2002 to 2011), and for the last 2 years (2010 to 2011) at towered regional aerodromes. All aerodromes apart from Essendon and Tamworth recorded increases in strike rates for 2010 to 2011 when compared with the 10-year average.

Figure 14: Average rate of birdstrikes for towered regional aerodromes (inside aerodrome confines) per 10,000 movements, 2002 to 2011



The strike rate per movement at Avalon Airport was the largest average for all Australian towered airports with an average strike rate of 14.99 birdstrikes per 10,000 movements (since 2006 when movement data was first available). However, the overall number of strikes at Avalon Airport is relatively low, as shown in Figure 11 on page 26.

The unusually high rate for Avalon results from the last 3 years of data, in particular in 2009 and 2010, where the average strike rate was more than three times the 2010 to 2011 towered regional aerodrome average strike rate of 7.57 strikes per 10,000 movements. The birdstrike rate at this aerodrome remained high in 2011; however, it had reduced somewhat to 15.66 strikes per 10,000 movements.

Alice Springs Airport had the largest increase in strike rate when comparing the 10 year average strike rate to the rate in 2010-2011. This was mainly due to a large spike in 2010, although the 2011 strike rate was significantly higher than the 10 year average for this aerodrome. Other significant increases were observed at Rockhampton and Townsville.

The reported birdstrike rate at metropolitan class D aerodromes remained low (Table 11), with most of these aerodromes having a 10-year average strike rate lower than that of all major and towered regional aerodromes.

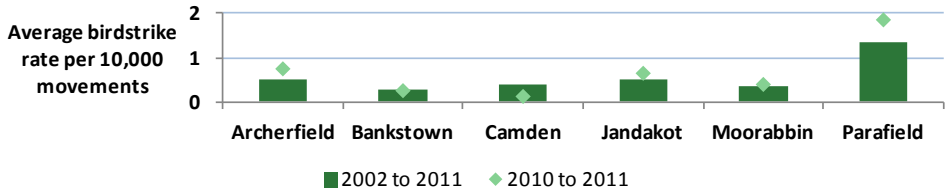
Table 11: Rate of birdstrikes each year at metropolitan class D aerodromes (inside aerodrome confines) per 10,000 movements, 2002 to 2011

Aerodrome	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average
Archerfield	-	0.08	0.16	0.28	0.3	0.51	0.51	1.36	0.82	0.67	**0.52**
Bankstown	0.26	0.44	0.26	0.25	0.15	0.23	0.36	0.37	0.27	0.25	**0.28**
Camden	0.32	-	-	-	0.44	0.8	0.36	-	0.13	-	**0.41**
Jandakot	0.83	0.46	0.67	0.4	0.69	0.55	0.11	0.22	0.73	0.56	**0.52**
Moorabbin	0.32	0.3	0.44	0.45	0.21	0.29	0.31	0.45	0.51	0.29	**0.36**
Parafield	1.19	1.09	1.38	1.58	0.71	1.16	1.35	1.31	1.81	1.88	**1.35**

Parafield Airport had the highest strike rate of all metropolitan class D aerodromes, with an average strike rate of 1.85 strikes per 10,000 movements between 2010 and 2011 (Figure 15).

The rate of birdstrikes at Archerfield and Jandakot Airports has also increased 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, 2002 to 2011



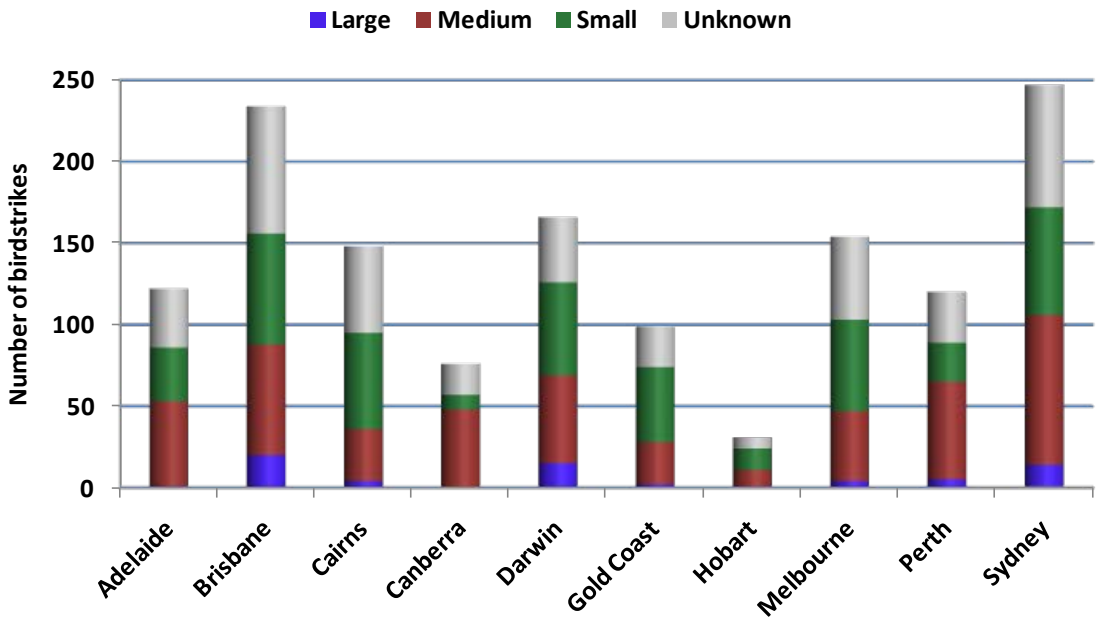
As the movement rate at non-towered regional aerodromes has not been published, the rate of birdstrikes at these aerodromes has not been reported.

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 2010 and 2011. 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.

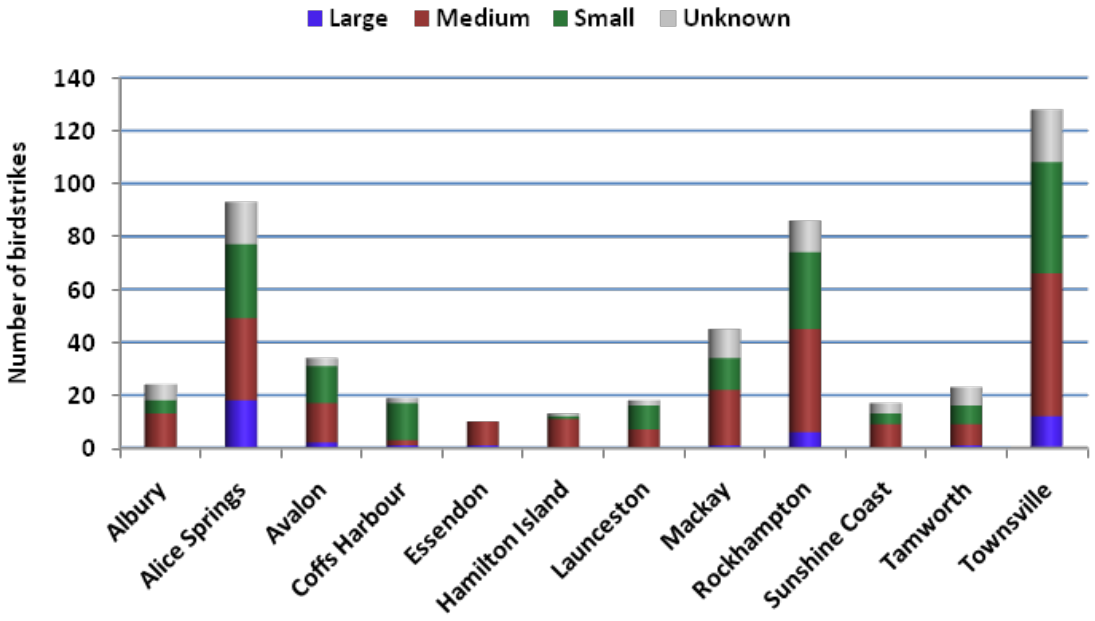
Figure 16 shows that large birds are mostly struck by aircraft operating in the vicinity of Brisbane, Sydney, and Darwin Airports, although medium and small birds were most commonly struck at all airports.

Figure 16: Birdstrikes at major airports (aerodrome confines only) by bird size for the 2010-2011 period



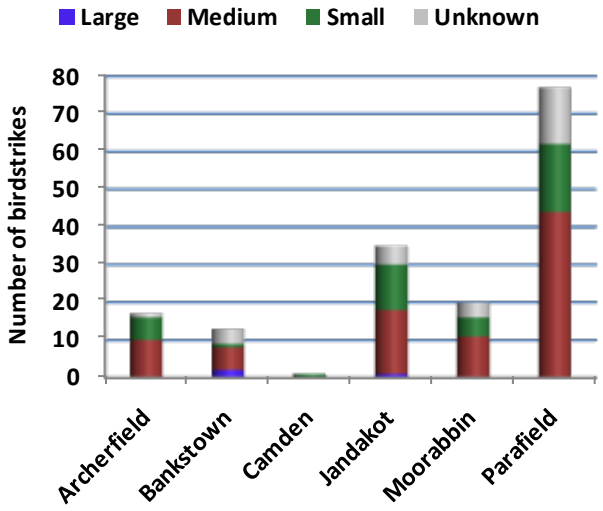
Of the towered regional airports, Alice Springs had the largest proportion of strikes involving large birds in 2010 and 2011, with Townsville and Rockhampton also having more than a few cases of aircraft striking large birds.

Figure 17: Birdstrikes at towered regional class D airports (aerodrome confines only) by bird size for the 2010-2011 period



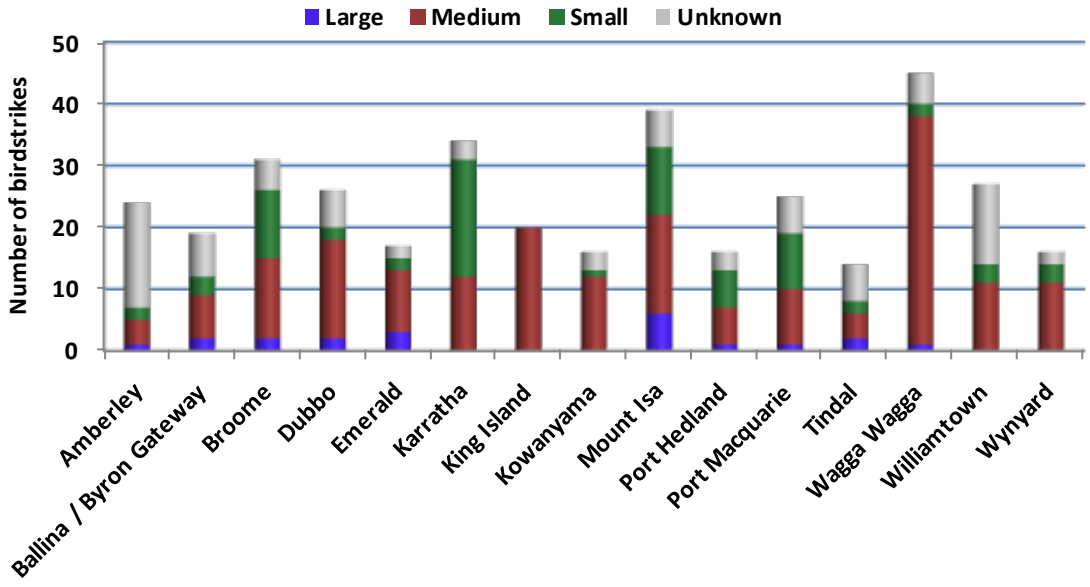
Considering the large number of movements, Bankstown Airport had one of the lowest number of birdstrikes in 2010 and 2011 for a metropolitan class D aerodrome. It is worth noting that this airport differed from other locations in that most birds struck were large or medium in size. Parafield Airport has the largest number and rate of birdstrikes with the majority of birdstrikes arising from medium sized birds, in particular galahs and magpies. There were no large bird strikes reported for Parafield Airport in this time.

Figure 18: Birdstrikes at metropolitan class D airports (aerodrome confines only) by bird size for the 2010-2011 period



In regional Australia, Mount Isa 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 Karratha Airport had the most reported birdstrikes at regional airports involving small birds.

Figure 19: Birdstrikes at other significant regional (aerodrome confines only) by bird size for the 2010-2011 period



5.4 Rainfall at aerodromes

The number of birdstrikes and the effect of daily rainfall was analysed for 2010 and 2011. Although there may be other aerodromes where rainfall has an effect on bird activity and birdstrikes, only seven of the 58 aerodromes in the study were found to have a statistically significant correlation between the number of birdstrikes and the amount of rainfall in the past day and night[9], and these all had very weak correlations. These were Proserpine / Whitsunday Coast, Karratha, Essendon, Launceston, Townsville, Lismore and Sydney airports. The analysis did not take into account long-term effects of rainfall and climatic patterns.

Table 12: Daily rainfall versus birdstrikes correlation for the 2010-2011 period

Location	Pearson Correlation (r)[10]	Significance (two-tailed)[11]
Essendon	0.159	0.01
Karratha	0.139	0.01
Launceston	0.129	0.01
Proserpine / Whitsunday Coast	0.114	0.01
Townsville	0.085	0.01
Sydney	0.074	0.05
Lismore	0.073	0.05

Essendon Airport had the largest correlation between the number of birdstrikes and the amount of daily rainfall, with rainfall accounting for only 2.5 per cent of the variation. This means that daily rainfall is related to the occurrence of that birdstrike in only 2.5 per cent of cases, when considered in isolation. Lismore had only 0.5 per cent of birdstrikes accounted for by daily rainfall.

It is likely that other factors, such as the temperature, time of day, time of movements, and the existence (and time of application) of bird hazard management strategies all have an interrelated effect on bird activity and birdstrikes. In addition, variation in rainfall throughout the day is not be captured by this analysis.

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9 Rainfall in the 24 hours up to 9 am for each day was compared to birdstrikes from midnight to 23:59 on the same days.

10 The Pearson Correlation is an indicator of the strength of the linear relationship between the two variables, daily rainfall and daily birdstrikes. Taking the square of this correlation gives the percentage value that variation in birdstrikes is affected by rainfall alone.

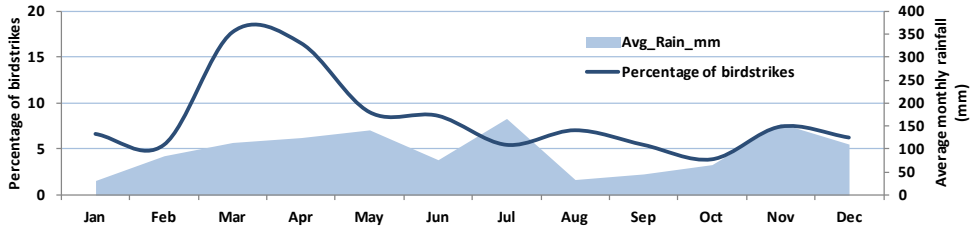
11 The level of significance indicates the likelihood that rainfall and birdstrikes could have occurred by chance alone. For example, a level of significance of 0.01 indicates that there is a 99 per cent chance that rainfall has had some effect on birdstrikes.

A weak linear relationship exists between the amount of rainfall at aerodromes and birdstrikes

Rainfall case study: Sydney Airport

Sydney Airport was chosen for this case study, due to the relatively large number of birdstrikes resulting from high aircraft movements. Figure 20 shows the distribution of birdstrikes across each month of the year as a percentage of the total number of birdstrikes reported in 2010 and 2011, compared with the average rainfall per month for Sydney Airport.

Figure 20: Percentage of birdstrikes at Sydney Airport versus average rainfall per month for the 2010-2011 period



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.

Air Tractor AT-802A loss of control following wing strike with Bustard

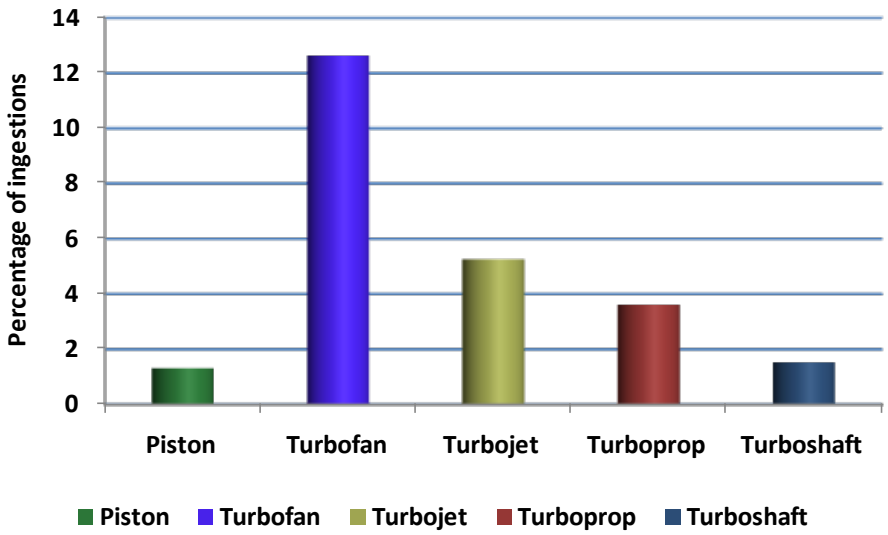
During the takeoff, the aircraft struck an Australian bustard. The impact damaged the leading edge of the wing forward of the left aileron and outer left flap. The impact was sufficient to break a wing rib and flatten a 1 m x 0.5 m section on the leading edge. This caused a significant degree of asymmetric lift and drag, and eventuated in a loss of control. The aircraft veered left, the left wing struck a fence, and the aircraft ground-looped through 180 degrees. In addition to the wing, the tail section and fuselage were also damaged (11 September 2011).

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 21 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 eight strikes involving at least one bird being ingested into an engine.

Figure 21: Percentage of engine ingestions by engine type (where known) over the 2002-2011 period



Most birdstrikes involving an engine ingestion involved aircraft being used for high capacity air transport (82 per cent). Aircraft operating these services (such as Boeing and Airbus aircraft) are primarily fitted with turbofan engines. Table 13

shows that the number of engine ingestions has increased over the 10-year reporting period in high capacity air transport operations, while the number of ingestions involving low capacity air transport aircraft has decreased since a peak in 2008.

Table 13: Number of birdstrikes by engine ingestion by operation type

Operation type	Engine ingestion	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
High capacity air transport	1 engine	43	33	66	61	63	74	73	67	78	71	**629**
	2 engines	1	1	1	1	3	-	1	2	-	-	**10**
Low capacity air transport	1 engine	2	8	7	4	8	14	20	6	5	9	**83**
	2 engines	-	-	1	-	-	-	1	-	-	1	**3**
General Aviation	1 engine	-	2	1	4	-	3	5	-	2	2	**19**
Military	1 engine	-	-	-	1	-	3	-	7	8	10	**29**
	2 engines	-	-	-	-	-	-	1	-	2	-	**3**
Unknown	1 engine	-	-	-	-	1	-	-	-	-	1	**2**
Total	**1 engine**	**45**	**43**	**74**	**70**	**72**	**94**	**98**	**80**	**93**	**93**	**762**
	2 engines	**1**	**1**	**2**	**1**	**3**	**0**	**3**	**2**	**2**	**1**	**16**

Significant occurrences involving engine ingestions

There were 93 single engine ingestions in 2010 and 2011; however, 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 13 above shows that multiple engine ingestions account for approximately two per cent of all bird engine ingestions. 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.

Metroliner turboprop engine ingestion following birdstrike with multiple galahs

There were no multiple engine ingestions for aircraft operating in high capacity air transport during 2010 and 2011. Two dual engine ingestions occurred in military operations in 2010, and one dual engine ingestion occurred involving a low capacity air transport aircraft in 2011. Two of these occurrences are described below.

Boeing C17 Globemaster inboard engine ingestions at night

During rotation a significant humming noise was heard. A subsequent maintenance inspection revealed that birds had been ingested into the two inboard engines. Further inspection revealed six damaged fan blades on the left inner engine, and a nick out of one of one fan blade in the right inner engine (4 March 2010).

SAAB 340B ingestion of plovers into both engine intakes

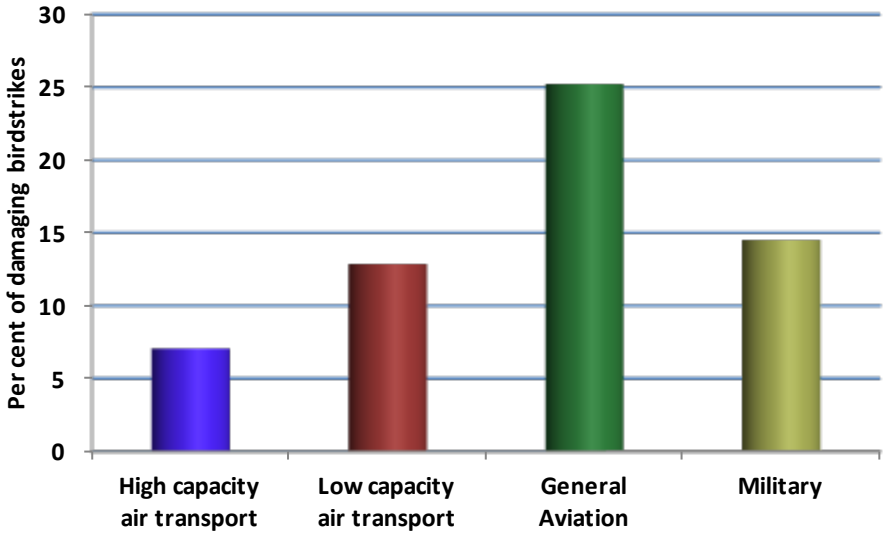
On touchdown, numerous birds were observed on and around the touchdown zone. Although no abnormal indications were present when the engines were shutdown, an almost complete plover was discovered in the left engine intake on a post-flight inspection. Bird remains were also detected in the right engine intake. The aircraft was grounded pending a detailed engineering inspection (25 November 2011).

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 had the highest proportion of damaging birdstrikes, with more than 25 per cent of general aviation strikes resulting in damage between 2002 and 2011 (Figure 22).

Figure 22: Proportion of damaging birdstrikes in each operation type over the 2002-2011 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 14). 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 (often related to the large proportion of these strikes which result in a bird being ingested into the engine).

Boeing 737 horizontal stabiliser damage from birdstrike (species unknown)

Table 14: Number of birdstrikes by part damaged and operation type over the 2002-2011 period

Part damaged	High capacity air transport	Low capacity air transport	General aviation	Military	Unknown	Total
Wing/Rotor	90	100	142	10	2	**344**
Engine	147	44	8	14	1	**214**
Nose	33	15	19	3	0	**70**
Propeller	14	24	21	0	4	**63**
Windscreen	8	12	29	1	1	**51**
Landing gear	26	13	9	0	2	**50**
Tail	15	9	14	1	0	**39**
Other	10	8	14	6	1	**39**
Fuselage	9	11	11	2	1	**34**
Lights	14	5	4	0	3	**26**

Birdstrikes resulting in serious damage

There were 12 birdstrike occurrences from 2002 to 2011 that resulted in serious damage[12] to the aircraft. Ten of these occurred in general aviation flying, and two were in low capacity air transport operations. Four of the 10 general aviation occurrences were during 2010 and 2011. Six of the 12 occurrences involved helicopters.

There were four birdstrikes resulting in aircraft serious damage between the two years 2010-2011. These were:

- During the cruise at 500 ft AGL near Williamtown, NSW, an amateur built 'Murphy Rebel' aircraft struck an unknown bird, causing the windscreen to cave in. The pilot conducted a forced landing on a nearby beach.
- During mustering, a Robinson R22 helicopter struck a wedge tail eagle that impacted the main rotor blades. The pilot landed the helicopter on a grassy surface that was subsequently set alight by the helicopter's exhaust. The helicopter was seriously damaged in the fire.
- During the takeoff, an Air Tractor AT802 aircraft struck an Australian bustard. The impact damaged the wing, causing a loss of control, and resulted in the left wing striking a fence.
- On descent into Ayr (ALA), a Cessna 182 aircraft struck a Magpie Goose. The bird penetrated the windscreen, causing it to shatter. The pilot conducted a forced landing in a cane field.

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.

Seven of the reported birdstrike occurrences between 2002 and 2011 resulted in injury, three of which were during 2010 and 2011. Six occurred in general aviation, and one occurred during low capacity air transport helicopter operations. In all cases, the injuries received as a consequence of the birdstrike were minor.

The three occurrences in 2010-2011 resulting in injuries were:

- During approach to Cairns Aiport, a Bell 206 helicopter struck a flying fox. The impact broke the right windshield and the fruit bat struck the pilot, resulting in minor injuries. The helicopter lost altitude and yawed when the pilot momentarily released the collective.

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[12] 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.

- During approach to Caloundra (ALA), a Piper PA-28 aircraft struck an eagle that shattered the pilot side windscreen and entered the cockpit. The pilot sustained minor injuries.
- On descent into Ayr ALA, a Cessna 182 aircraft struck a Magpie Goose. The bird penetrated the windscreen, causing it to shatter. The pilot and passengers sustained minor injuries.

7 BIRDSTRIKES BY BIRD TYPE, NUMBER STRUCK, AND SIZE

7.1 Types of birds struck

7.1.1 Total birdstrikes by bird type

Table 15 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, and includes all bird types that were involved in 70 or more birdstrike occurrences nationally between 2002 and 2011. A full listing of the bird species involved in birdstrikes in Australia over this period can be found in Appendix B (Table 37).

Flying foxes and bats were the most commonly struck species in Australia between 2002 and 2011, 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 (Appendix A, 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).

Galahs remained the most frequent single species struck across Australia in 2011, making up the highest number of overall strikes in many states (New South Wales, South Australia, and the Australian Capital Territory).

Kites were the most common bird struck in the Northern Territory, and the second most common in Queensland between 2002 and 2011.

Some larger, less commonly struck birds are not included on the list above, such as the brush turkey (34 birdstrikes), wedge-tailed eagle (24 birdstrikes), magpie goose (19 birdstrikes), pelican (15 birdstrikes) and bustard (14 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 below).

Table 15: Birdstrikes by bird type and state, 2002 to 2011

Bird type	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Other	Total
Bat/flying fox	1	257	66	370	4	0	42	26	1	**767**
Lapwing/plover	13	122	127	153	37	146	41	121	0	**760**
Galah	87	279	14	118	142	1	31	57	0	**729**
Kite	0	53	153	336	9	0	32	55	0	**638**
Magpie	31	105	3	78	112	4	120	29	0	**482**
Nankeen kestrel	9	79	22	156	73	1	10	105	10	**465**
Swallow/martin	11	66	29	240	22	12	18	38	0	**436**
Magpie-lark	0	39	23	125	112	6	7	16	0	**328**
Hawk	10	50	24	103	22	14	20	58	1	**302**
Silver gull	1	87	2	15	67	28	50	30	1	**281**
Curlew/sandpiper	0	2	102	125	2	0	0	5	1	**237**
Dove	0	35	9	36	64	0	26	15	2	**187**
Pipit	5	63	7	21	0	6	56	29	0	**187**
Pratincole	0	0	163	12	0	0	0	1	0	**176**
Duck	21	28	2	73	3	3	13	23	2	**168**
House sparrow	1	30	8	49	12	10	35	20	0	**165**
Heron/egret	0	15	4	76	0	0	6	9	8	**118**
Owl	0	22	13	33	6	0	14	29	0	**117**
Ibis	0	31	2	58	4	0	14	5	0	**114**
Eagle	0	15	9	31	1	3	5	25	1	**90**
Crow/raven	6	14	4	26	9	8	13	9	0	**89**

Table 16 shows the common bird types struck in the last 2 years (2010 and 2011), which were those with more than 30 reported birdstrikes across Australia over this period. The 10 most commonly struck bird types have not changed significantly in 2010 and 2011 compared with the 10-year period, with the exception of the pipit, which has risen to the 9th from the 13th most commonly struck bird type; and the silver gull, which decreased from 10th to 12th most commonly struck bird type.

When compared with the 10-year average (2002-2011), galah and kite strikes have been more frequent in 2010 and 2011 than those involving the lapwing/plover bird types. This is due to the combined effect of an increase of galah and kite strikes in some states, and a relative decrease in the number of lapwing/plover strikes (Figure 23, below).

Table 16: Birdstrikes by bird type and state, 2010 to 2011

Bird type	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Other	Total
Bat/flying fox	1	81	16	108	2	0	16	4	1	**229**
Galah	30	67	6	39	30	0	10	18	0	**200**
Kite	0	5	50	103	7	0	4	17	0	**186**
Lapwing/plover	1	31	18	30	13	36	11	26	0	**166**
Swallow/martin	4	31	7	72	5	4	8	9	0	**140**
Nankeen kestrel	1	24	8	58	7	1	4	32	4	**139**
Magpie	11	27	2	20	35	1	32	4	0	**132**
Magpie-lark	0	6	4	37	37	0	3	8	0	**95**
Pipit	1	22	3	11	0	2	15	11	0	**65**
Hawk	0	13	3	26	3	2	2	7	0	**56**
Curlew/sandpiper	0	0	23	24	1	0	0	2	0	**50**
Silver gull	0	15	1	3	8	6	8	7	1	**49**
Dove	0	5	5	8	17	0	4	4	1	**44**
Duck	3	8	0	20	0	1	0	9	1	**42**
Heron/egret	0	5	2	23	0	0	1	2	0	**33**
Owl	0	8	1	14	1	0	2	6	0	**32**
Falcon	0	4	12	5	0	0	4	6	0	**31**
House sparrow	0	5	1	12	0	3	3	6	0	**30**

Four most common bird types involved in birdstrikes are (clockwise from top left) bat/flying fox, kite, galah, and lapwing plover

Figure 23 shows the yearly average number of strikes by species group for the last 10 years (2002-2011), versus the average over just the last 2 years (2010 and 2011) for bird types with a 10-year average of over 20 strikes per year. Bats and flying foxes 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 119 strikes per year compared with 78 times per year on average across the entire 10-year reporting period. Hawks and silver gulls were involved in birdstrikes slightly less frequently than the 10-year average during 2010 and 2011.

Figure 23: Average number of birdstrikes per year by bird type, 2002 to 2011

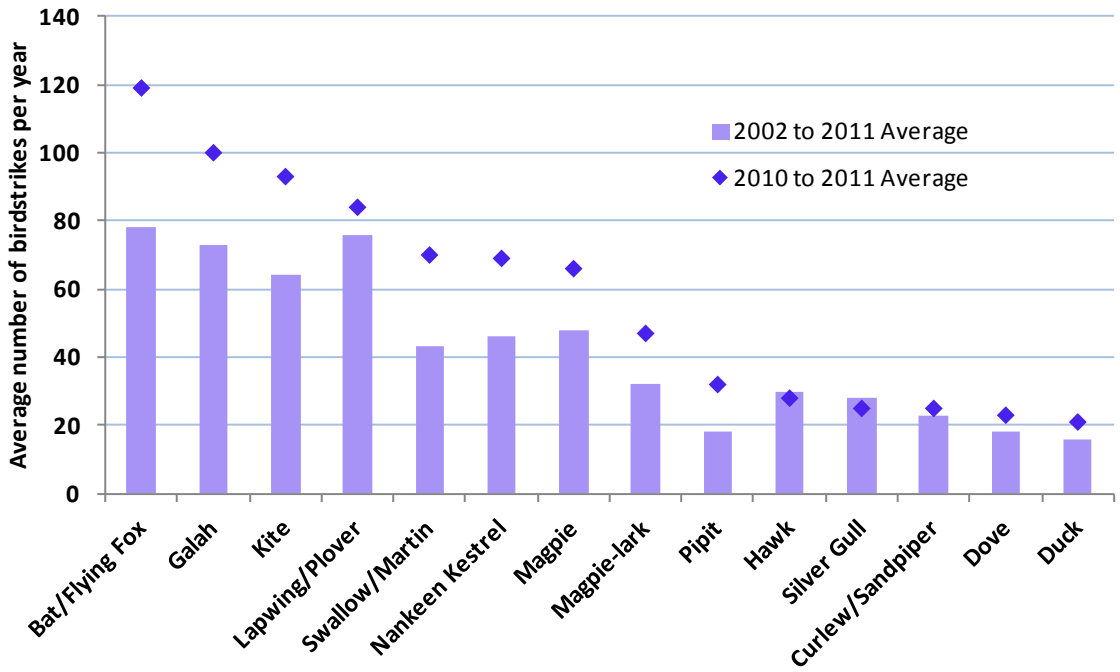
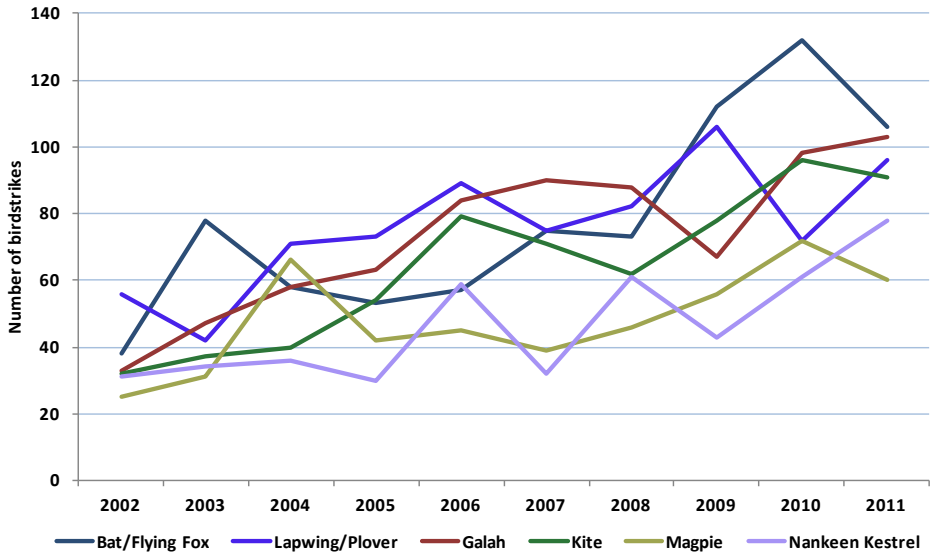


Figure 24 (below) shows the 10-year trend for the six bird types most commonly struck by aircraft from 2002 to 2011. A full list of species by year is included in Appendix B (Table 38).

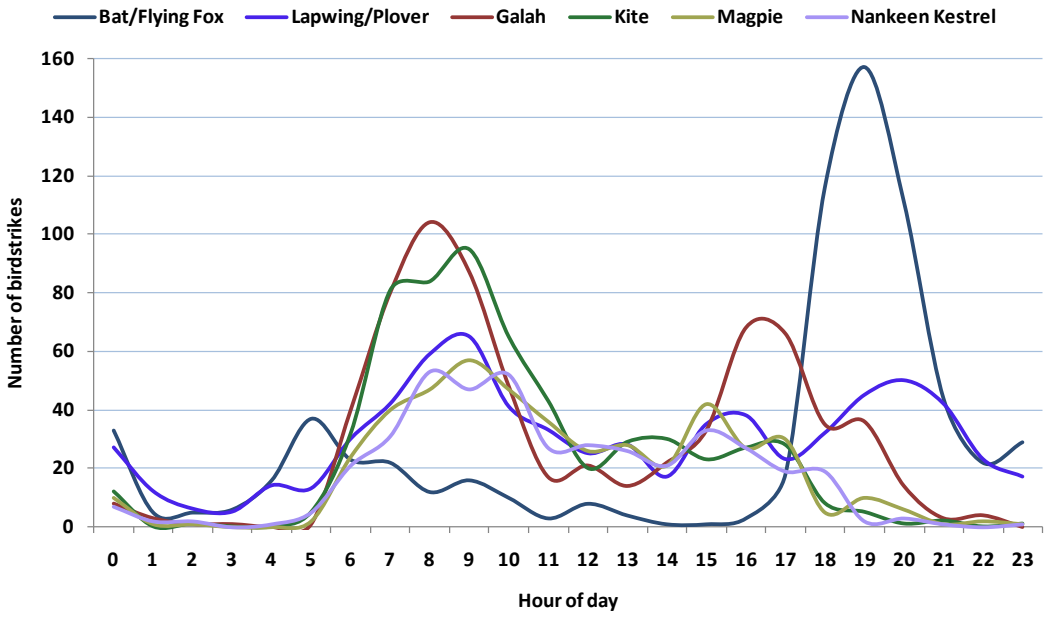
Figure 24: Number of birdstrikes for the Top 6 most frequent bird types struck by year, 2002 to 2011



Time of day and bird type

Figure 25 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 7 pm (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 B (Table 40).

Figure 25: Birdstrikes by bird type by hour of day over the 2002-2011 period



7.1.2 Damaging birdstrikes by bird type

Aeroplane (fixed-wing aircraft) damage

Table 17 on page 51 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 (serious, minor, 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.

Eagles, magpie geese and bustards were all reported as causing serious damage on aeroplanes in at least one reported birdstrike since 2002, with galahs, bats and flying foxes, and kites most frequently causing minor damage over the same period.

Piper PA-28 Cherokee windscreen strike with Eagle – General aviation

The pilot reported that after completing a local flight he joined the circuit pattern, and was on mid-base at an altitude of approximately 800 ft above ground level when an eagle struck his aircraft. The bird entered the cockpit via the pilot side front windscreen, and came to rest in the back seat of the aircraft. The pilot sustained impact injuries from both the bird and from shattered glass; however, the aircraft was under control at all times. A normal approach and landing was made without any further problems. The eagle did not survive, and most likely died upon initial impact with the windscreen (22 May 2011).

Table 17: Damaging birdstrikes to aeroplanes by bird type, 2002 to 2011

Bird type	Serious damage	Minor damage	Nil damage	Damage ratio
Pelican	0	9	3	0.75
Swan	0	2	2	0.5
Magpie goose	1	6	11	0.39
Australian brush-turkey	0	11	18	0.38
Eagle	1	26	51	0.35
Bustard	1	3	9	0.31
Ibis	0	24	59	0.29
Wedge-tailed eagle	0	5	14	0.26
Frigate	0	1	3	0.25
Duck	0	29	98	0.23
Crow/raven	0	12	47	0.2
Cockatoo	0	7	35	0.17
Parrot	0	6	29	0.17
Pacific gull	0	3	15	0.17
Tern	0	4	23	0.15
Hawk	0	31	192	0.14
Galah	0	70	464	0.13
Bat/flying fox	0	65	431	0.13
Silver gull	0	23	159	0.13
Myna	0	1	7	0.13
Kite	0	51	399	0.11
Falcon	0	5	39	0.11
Cormorant	0	1	9	0.1
Dove	0	9	103	0.08
Heron/egret	0	7	78	0.08
Magpie	0	23	310	0.07
Curlew/sandpiper	0	11	144	0.07
Owl	0	5	64	0.07
Lapwing/plover	0	27	524	0.05
Magpie-lark	0	10	199	0.05
Swift	0	1	20	0.05
Pratincole	0	3	102	0.03
Nankeen kestrel	0	5	287	0.02
Starling	0	1	42	0.02
Swallow/martin	0	3	328	0.01
House sparrow	0	2	134	0.01
Pipit	0	1	111	0.01

Helicopter damage

Table 18 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.

Table 18: Damaging birdstrikes to helicopters by bird type, 2002 to 2011

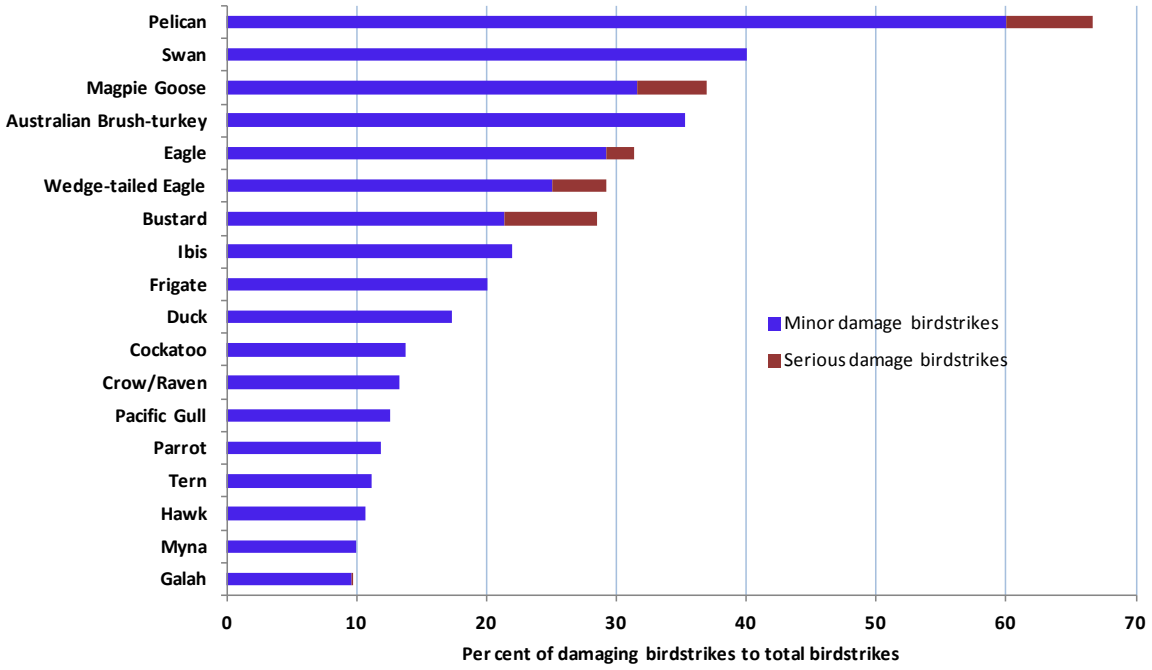
Bird type	Serious damage	Minor damage	Nil damage	Damage ratio
Ibis	0	1	0	1
Swallow/martin	0	1	0	1
Australian brush-turkey	0	1	0	1
Wedge-tailed eagle	1	1	1	0.67
Eagle	1	0	1	0.5
Pelican	1	0	1	0.5
Hawk	0	1	1	0.5
Swift	0	1	2	0.33
Galah	1	0	3	0.25
Bat/flying fox	0	6	18	0.25
Silver gull	0	4	19	0.17
Dove	0	1	5	0.17
Tern	0	1	10	0.09

All aircraft types

Figure 26 shows the bird types that have the highest proportion of damaging strikes, compared with the total number of strikes reported involving that bird type. With the exception of the galah, all bird types shown had at least one damaging strike reported in every 10 occurrences.

More than 65 per cent of pelican strikes resulted in aircraft damage, with the swan, magpie goose and Australian brush turkey having a high rate of damaging strikes (at least 1 in every 3 reported strikes resulted in some level of damage). More than 1 in every 5 reported birdstrikes involving eagles, bustards, ibis, and frigates resulted in damage.

Figure 26: Percentage of reported birdstrikes where damage occurred by bird type (where known) over the 2002-2011 period



7.1.3 Damaging birdstrikes by bird type and operation type

Strikes causing serious damage

There were seven reported birdstrikes that caused serious aircraft damage between 2002 and 2011 in which the bird type was known. One birdstrike involved a pelican that hit a Robinson R44 helicopter conducting low capacity air transport operations resulting in serious damage to the aircraft. All other serious-damage birdstrikes involved aircraft conducting general aviation operations.

Robinson R22 helicopter strike with flock of galahs

During mustering operations, the 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 (23 July 2007).

In 2010 to 2011, a wedge-tailed eagle, bustard and magpie goose were attributed to causing serious damage to a Robinson R22, Air Tractor AT-802 and Cessna 182 respectively. Some of these occurrences are described in more detail in section 6.2 on page 42.

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 B (Table 36).

Figure 27: High capacity air transport damaging birdstrikes by bird type, 2002-2011

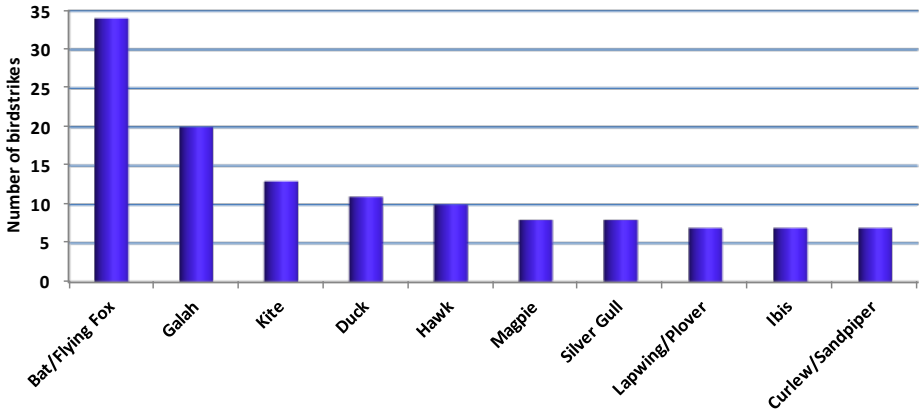


Figure 28: Low capacity air transport damaging birdstrikes by bird type, 2002-2011

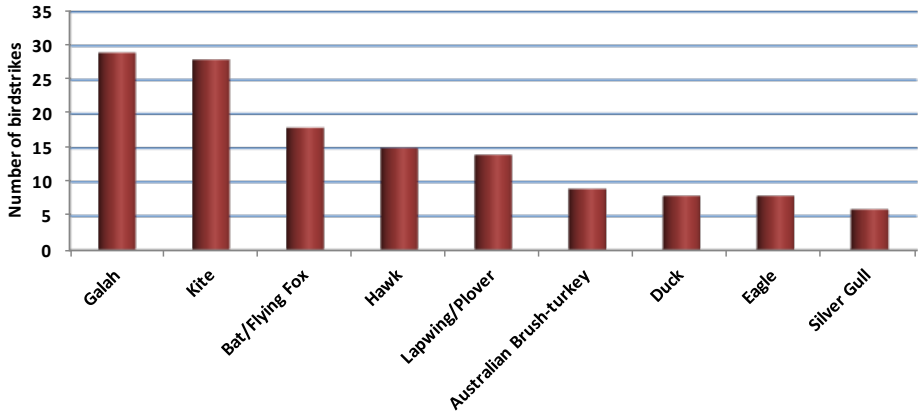
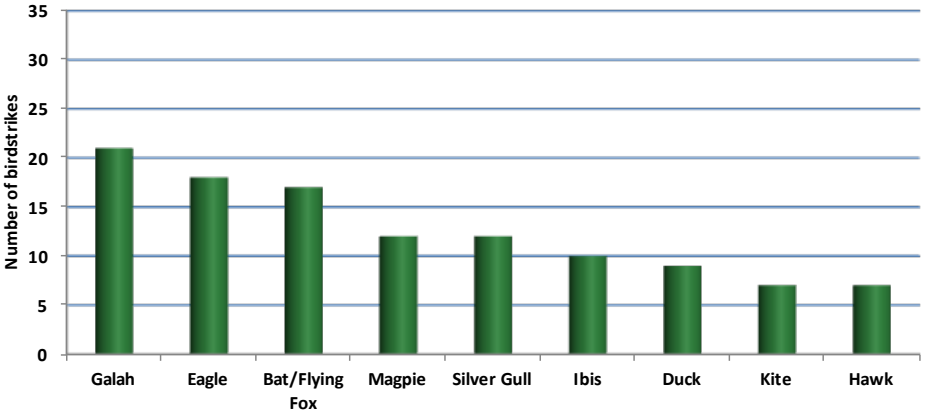


Figure 29: General aviation damaging birdstrikes by bird type, 2002-2011



In addition, there were 11 reported cases where birdstrikes resulted in damage to military aircraft where the species were known (as shown in Table 19 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 19: Damaging birdstrikes to military aircraft by bird type and damage severity, 2002-2011

Bird type	Birdstrikes
Pelican	2
Pratincole	1
Silver gull	1
Bat/flying fox	1
Duck	1
Eagle	1
Galah	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 20 presents those bird types where at least one birdstrike occurrence in the 2002-2011 period involved multiple birds being struck. Multiple galah strikes were the most common over the study period, with more than one bird hit in over 39 per cent of galah strikes, related to the fact that galahs are known to have flocking tendencies. Birdstrikes involving medium to large-sized flocking water bird types, such as the magpie-goose, duck, and silver gull, also involved a collision with multiple birds in at least one in four occurrences (when considered collectively).

Boeing 737 birdstrike with 41 small sea birds

During the takeoff from Avalon aerodrome and approximately midway along the runway, the aircraft struck a flock of small sea birds. The main areas of the aircraft struck were the wings and both engines. Thirty-nine dead birds and two injured birds were found on the runway by ground personnel following the strike. A later engineering inspection found that the fan blades in the right engine were damaged during the birdstrike. The species of bird was not identified (22 November 2009).

Table 20: Birdstrikes involving multiple strikes by bird type, 2002-2011

Bird type	Greater than 10	Between 2 and 10	Single bird
Galah	17	267	442
Silver gull	5	67	208
Parrot	3	10	38
Dove	2	40	147
Lapwing/plover	1	124	637
Bat/flying fox	1	60	717
Swallow/martin	1	48	387
Curlew/sandpiper	1	26	210
Magpie	1	21	459
Finch	1	16	45
Cockatoo	1	12	38
Magpie goose	1	3	15
Tern	1	1	43
Duck	0	48	120
Kite	0	37	603
Magpie-lark	0	22	306
Pratincole	0	19	157
Nankeen kestrel	0	17	448
Ibis	0	15	99
Hawk	0	12	290
Swift	0	11	24
Pipit	0	10	177
Heron/egret	0	10	108
House sparrow	0	9	156
Pacific gull	0	9	15
Owl	0	4	113
Starling	0	4	54
Crow/raven	0	3	87
Eagle	0	2	87
Australian brush-turkey	0	2	32
Falcon	0	1	63
Skylark	0	1	36
Wedge-tailed eagle	0	1	23
Robin	0	1	6
Wren	0	1	2

7.3 Size of birds struck

7.3.1 Total birdstrikes by bird size

An increase was observed in strikes of all bird sizes between 2002 and 2011, as shown in Figure 30. Proportionally, the number of larger birds struck has increased more so than other sizes of birds struck. This was especially the case in 2010 and 2011, where an 80 per cent increase above the 10-year average was observed for strikes involving large birds. This is compared with a 41 per cent increase for strikes involving small birds, and a 24 per cent increase for those involving medium-sized birds.

Figure 30: Number of birdstrikes by bird size, 2002 to 2011

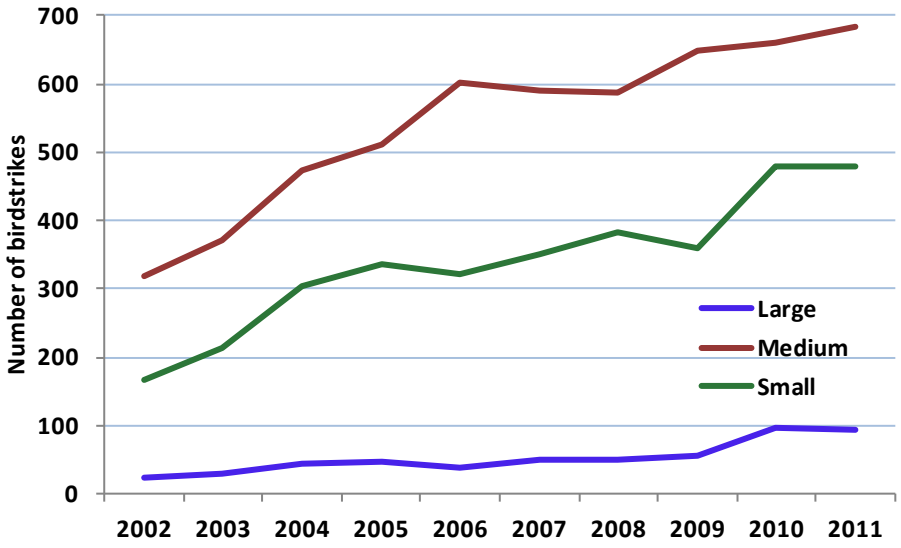


Table 21 shows that in every operation type, medium-sized birds were struck the most often, followed by small birds. General aviation had proportionally more strikes involving large birds, with about 7 per cent of birds struck being large compared with less than 3 per cent for other operation types.

Table 21: Number of birdstrikes by bird size and operation type, 2002 to 2011

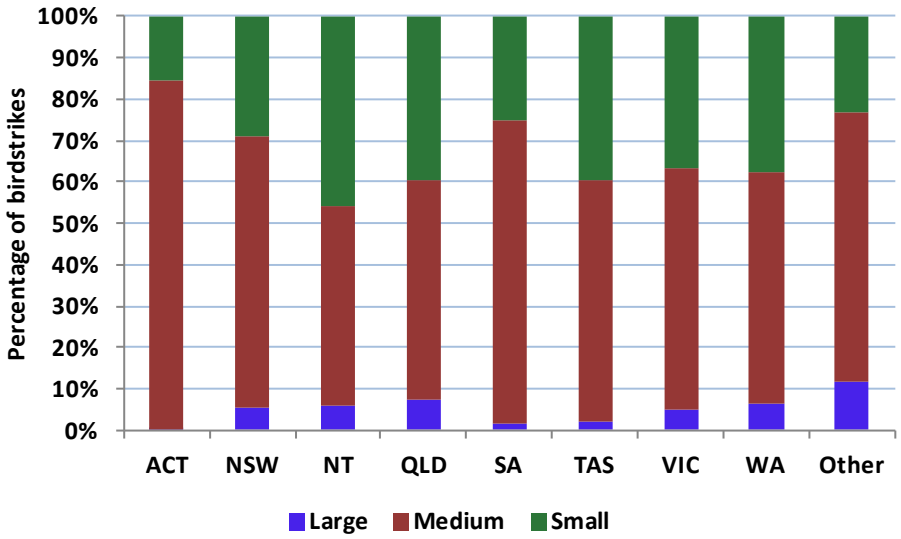
Operation type	Bird size	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
High capacity air transport	Large	11	12	16	23	14	25	31	23	41	49	**245**
	Medium	143	145	217	232	247	239	240	265	304	286	**2318**
	Small	98	114	179	189	196	205	255	211	294	282	**2023**
	Unknown	148	142	184	240	174	177	236	310	330	363	**2304**
Low capacity air transport	Large	7	6	12	12	10	13	9	8	20	19	**116**
	Medium	78	89	97	90	129	121	126	142	140	180	**1192**
	Small	31	39	47	47	20	49	56	52	61	81	**483**
	Unknown	47	33	39	55	40	33	27	55	42	58	**429**
General aviation	Large	5	5	8	9	7	6	5	19	11	14	**89**
	Medium	40	47	42	59	43	68	89	88	69	85	**630**
	Small	18	18	28	29	22	27	31	35	37	41	**286**
	Unknown	33	22	19	27	18	28	33	41	32	24	**277**
Military	Large	0	0	0	1	0	2	1	1	3	3	**11**
	Medium	1	3	5	3	6	14	4	20	19	10	**85**
	Small	4	2	2	3	4	5	2	20	24	16	**82**
	Unknown	1	4	4	8	6	10	3	17	42	44	**139**
Unknown	Large	1	6	7	3	7	5	3	5	21	9	**67**
	Medium	56	86	113	126	177	147	127	133	129	122	**1216**
	Small	17	40	47	68	78	66	38	41	63	60	**518**
	Unknown	41	20	19	54	36	22	24	24	28	12	**280**

Figure 31 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[13], as can be seen in Table 15 on page 46. The number of birdstrikes for all sizes of birds has increased over time in all Australian states and territories.

A full list of the number of birds struck by size in each state and territory is provided in Appendix B (Table 39).

Figure 31 shows that in an average year between 2002 and 2011, about 40 per cent of birdstrikes in Tasmania and Queensland (and about 46 per cent in the Northern Territory) involved small birds. These numbers have remained similar in both 2010 and 2011.

Figure 31: Percentage of birds struck by bird size for each state for the 2002-2011 period



7.3.2 Damaging birdstrikes by bird size

Damaging birdstrikes by bird size and operation type

Murphy Rebel windscreen strike with unknown bird (General Aviation)

During the cruise at an altitude of 500 feet above ground level, the aircraft struck a bird, causing complete destruction of the windscreen. The pilot transmitted a mayday call, and commenced a forced landing on a nearby beach. It was reported that the aircraft was a write off, however, the pilot was not injured and was able to exit the aircraft (28 April 2010).

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

Table 22 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 32 on page 62.

Table 22: Bird size by aircraft damage and operation type for the 2002-2011 period

Operation type	Aircraft damage	Large bird	Medium bird	Small bird
High capacity air transport	Serious	0	0	0
	Minor	36	144	39
	Nil	146	1636	1606
Low capacity air transport	Serious	2	0	0
	Minor	33	152	25
	Nil	74	932	419
General Aviation	Serious	6	2	0
	Minor	50	127	41
	Nil	28	429	224
Military	Serious	0	0	0
	Minor	5	6	6
	Nil	5	62	68

Damaging birdstrikes by bird size and aircraft maximum weight

Figure 32 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 23 shows the number of strikes reported by bird size and aircraft weight category where the report indicated that the aircraft incurred some damage.

Figure 32: Percentage of damaging birdstrikes for bird size by aircraft maximum weight, 2002-2011

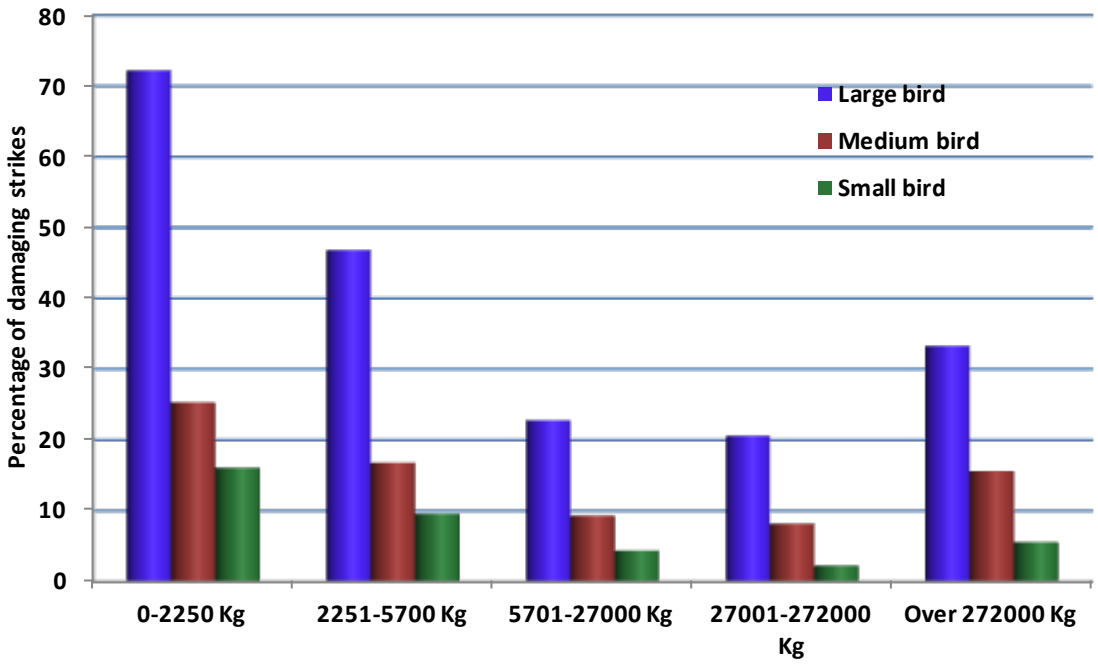


Table 23: Number of damaging birdstrikes by aircraft weight and bird size for the 2002-2011 period

Maximum takeoff weight	Was aircraft damage reported?	Large bird	Medium bird	Small bird
Less than 2,250 kg	Damaged	39	101	31
	Not damaged	15	299	162
2,251-5,700 kg	Damaged	37	99	22
	Not damaged	42	492	207
5,701-27,000 kg	Damaged	21	97	22
	Not damaged	71	950	482
27,001-272,000 kg	Damaged	35	130	35
	Not damaged	135	1,462	1,510
Over 272,000 kg	Damaged	2	7	1
	Not damaged	4	38	17

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.

Trike collision with multiple Wallaroos during flare – Serious Injuries

Following a short local flight in the Northern Territory, the pilot of a trike[14] flew overhead Emkaytee ALA to check the wind sock, and elected to land on a secondary cross strip into the wind. During the flare (at a height of about 6 feet above the ground and at a groundspeed of 60 knots), approximately five Antilopine Wallaroos jumped out from the right hand side of the airstrip into the path of the aircraft. The pilot reported that he did not see the animals on the approach, as they were in scrub just prior to landing.

Photo:
Australian Wildlife Conservancy

The aircraft collided with multiple Wallaroos. As a result of the impact, the pilot lost directional control of the trike, and it skidded along the gravel strip, sustaining serious damage.

The pilot broke his lower back and right ankle, fractured his right eye socket and broke his nose, and received severe lacerations to his right leg, arm and hand. The pilot was admitted to hospital for 6 weeks, and required lower back surgery as a result of his injuries.

After the accident, the pilot was unable to exit the aircraft or walk to safety due to injuries sustained. Due to filling out his planned flight on the search and rescue (SAR) board[15] at the local flying club, assistance arrived in less than 20 minutes after a brief search was conducted (15 September 2010).

[14] Trikes are also known as microlights or powered hang gliders.

[15] A notice board with details of a planned flight, including an expected time of arrival at a destination.

8.1 Number of animals struck

While the total number of animal strikes fluctuates each year, the total number of animal strikes increased slightly across the 10 years from 2002 to 2011. In particular, animal strikes to high capacity air transport aircraft have increased notably in 2010 and 2011. These 2 years recorded the highest number of animal strikes in the last 10 years for this operation type.

Low capacity air transport and general aviation aircraft were involved in less animal strikes in 2010 and 2011 when compared with the 10-year average, as shown in Figure 33.

Table 24: Number of animal strikes per year by operation type, 2002 to 2011

Operation type	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average
High capacity air transport	8	2	17	13	13	13	13	12	22	18	**13.1**
Low capacity air transport	3	12	5	4	10	10	6	9	5	3	**6.7**
General Aviation	7	14	6	11	5	12	6	13	9	8	**9.1**
Military	1	-	-	-	1	-	1	-	1	-	**0.4**
Unknown	-	-	5	3	5	6	8	6	11	3	**4.7**
Total	**19**	**28**	**33**	**31**	**34**	**41**	**34**	**40**	**48**	**32**	**34**

Figure 33: Average animals struck per year by operation type for the 2002-2011 period

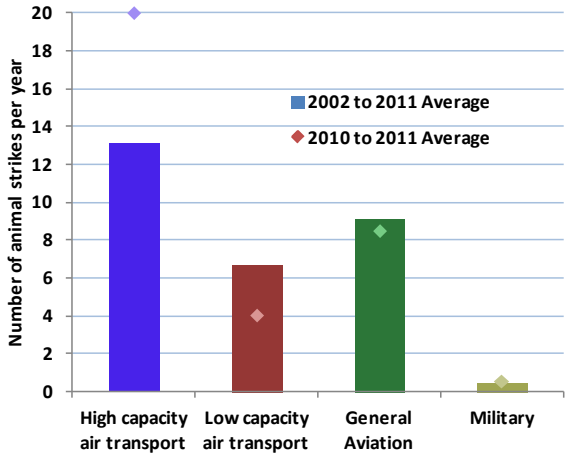


Table 25 shows that Queensland, followed by New South Wales, had the highest rate of animal strikes over the last 10 years. Hares and rabbits were the most common animals struck, followed by kangaroos, dogs and foxes, and wallabies.

Table 25: Animal strikes by animal type and state, 2002-2011

Animal type	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Total
Hare/rabbit	3	22	-	32	18	13	23	5	**116**
Kangaroo	-	19	9	19	4	1	2	12	**66**
Dog/fox	2	9	5	8	8	-	6	5	**43**
Wallaby	-	7	12	17	1	-	-	4	**41**
Lizard/snake	-	2	4	7	-	-	-	4	**17**
Goanna/monitor	-	-	4	2	-	-	-	5	**11**
Livestock	-	1	-	4	-	-	1	3	**9**
Echidna	-	-	-	3	-	3	-	-	**6**
Turtle	-	2	-	2	-	-	-	1	**5**
Emu	-	-	-	-	-	-	-	1	**1**
Other	-	1	5	9	-	4	1	-	**20**
Total	**5**	**63**	**39**	**103**	**31**	**21**	**33**	**40**	**335**

Table 26 shows the number of animal strikes by state in the last 2 years only (2010 and 2011). There has been an increase in the relative number of hares/rabbits, dogs/foxes, and lizards/snakes struck in 2010-2011. 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 26: Animal strikes by animal type and state, 2010-2011

Animal type	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Total
Hare/Rabbit	1	7	-	14	2	2	5	3	**34**
Dog/Fox	-	4	2	1	1	-	2	2	**12**
Kangaroo	-	2	1	2	1	-	1	1	**8**
Lizard/Snake	-	1	2	4	-	-	-	1	**8**
Wallaby	-	1	1	4	-	-	-	1	**7**
Goanna/Monitor	-	-	-	-	-	-	-	3	**3**
Turtle	-	-	-	-	-	-	-	1	**1**
Other	-	-	1	3	-	1	-	-	**5**
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 37 out of 60 strikes resulting in either serious or minor damage.

While no livestock strikes occurred during 2010 or 2011, all of the nine livestock strikes since 2002 have resulted in aircraft damage, often of a serious nature (Table 27, below). Livestock strikes that occur away from licensed aerodromes and involve general aviation aircraft are currently only reportable to the ATSB when they result in aircraft damage or injury, so it is possible that the actual number of animal strikes involving livestock is higher than the reported figure.

Table 27: Aircraft damage from animal strikes (where damage is known) by animal type, 2002-2011

Animal type	Serious	Minor	Nil	Total
Kangaroo	3	34	23	**60**
Wallaby	3	9	21	**33**
Livestock[16]	6	3	0	**9**
Dog/Fox	1	4	24	**29**
Hare/Rabbit	0	2	82	**84**
Echidna	0	1	1	**2**

Serious aircraft damage

Since 2002, there have been 13 animal strikes that caused serious damage to aircraft. Two of these occurred during 2010-2011:

- During the landing roll, the nose landing gear of a Piper PA-28 aircraft struck a wallaby. The nose landing gear collapsed causing serious damage to the aircraft.
- During the landing flare, a trike struck several wallaroos, and came to rest on its side. The pilot received serious injuries and the trike was seriously damaged.

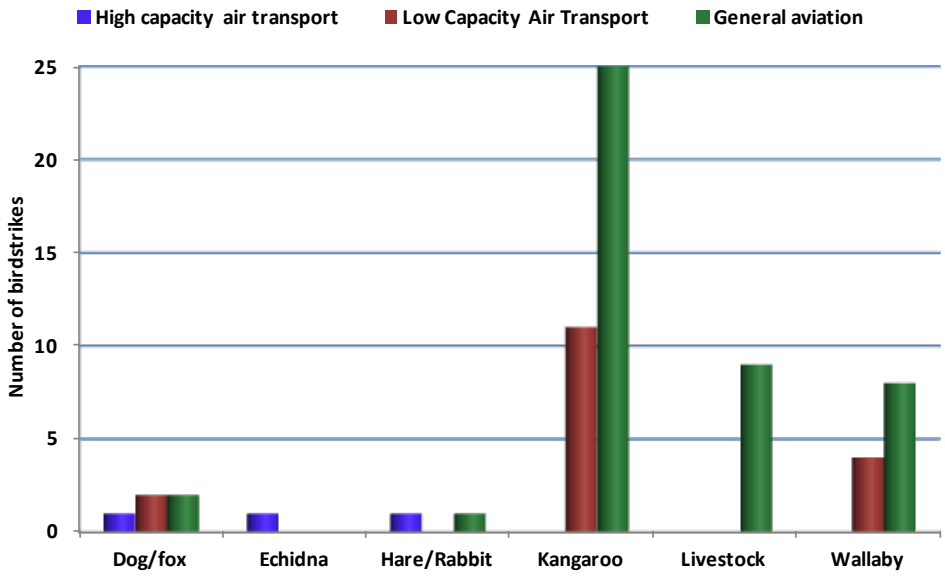
All of the six livestock strikes where serious aircraft damage resulted occurred in general aviation. Half of these involved mustering activities away from aerodromes and landing sites, while the remainder occurred when aircraft flew into locations that may not have been distinctly separated from the 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.

[16] One occurrence involving serious damage was caused by a collision with two horses.

General aviation aircraft landing at licensed aerodromes mostly struck kangaroos (including wallaroos), wallabies, and small animals (such as hares and rabbits) that are capable of penetrating aerodrome boundary fences. Kangaroos and wallabies were also commonly involved in animal strikes at aeroplane landing areas[17], as were larger animals such as cattle, horses and sheep.

Figure 34 shows animal-related aircraft damage mainly involved general aviation aircraft, and some low capacity air transport aircraft. There were very few high capacity air transport aircraft damaged in animal strikes, due to the relatively large size of these aircraft, and 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.

Figure 34: Aircraft damage by animal type and operation type for the 2002-2011 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, and engine of low capacity air transport aircraft are recorded as sustaining damage in animal strikes since 2002, as shown in Table 28 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 reported to the ATSB. In particular, damage to flaps, fuel drains and main rotor components were reported following animal strikes.

[17] 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.

Table 28: Number of animal strikes by part damaged (where known) and operation type for the 2002-2011 period

Operation type	Part Damaged	Animal Strikes
Low capacity air transport	Landing gear	5
	Propeller	4
	Engine	1
General Aviation	Landing gear	7
	Propeller	7
	Wing/Rotor	5
	Engine	3
	Fuselage	1

Piper PA-28 collision with wallaby on landing

The pilot reported making a normal approach and touchdown to the wet runway. During the landing rollout at approximately 50 metres after touchdown, a loud thump was heard towards the front of the aircraft as it struck a wallaby. As a result of the wallaby strike, the aircraft initially raised its nose as the wallaby impacted the nose, followed by the nose wheel collapsing. The aircraft then skidded a further 40 metres resting on the engine cowl. There was extensive damage to the nose wheel, engine cowl, propeller, engine mounts and firewall due to the impact with the wallaby and subsequent sliding on the runway surface. None of the four people on board were injured (6 July 2010).

8.2.3 Significant animal strikes

The following is a description of a recent animal strike occurrences where serious damage to the aircraft resulted.

Unknown animal strike in the dark

During a night training exercise that involved conducting circuits at an intermediate aerodrome[18], the student and instructor of a Piper PA-28 aircraft heard a loud thud from the left side of the aircraft during the take-off run at the point of rotation. After completing a safe takeoff, a low level circuit was flown to check the runway surface for an animal that may have been struck. No animal was identified due to the dark conditions, and there was no noticeable effect on aircraft control.

A decision was made to continue the flight and to land the aircraft at an airport where more facilities were present should assistance be required; however, the pilot continued as planned instead of tracking directly to the aerodrome. This involved flying almost twice the distance of a direct route via another intermediate aerodrome. Once overhead this aerodrome, the pilots noticed the left wing fuel tank quantity gauge to have reduced from 20 gallons to 8 gallons during that stage of flight, although this tank had not been used for this leg of the flight.

The instructor elected to land the aircraft at this aerodrome, and the aircraft made an uneventful landing. On inspection, it was discovered that the animal strike had resulted in substantial damage to the inboard section of the left wing. This included damage to the fuel drain, which had been bent and locked open, resulting in the aircraft leaking fuel for the flight following the animal strike (21 May 2008).

[18] A location that is not the intended final destination of the flight, however is used as a waypoint as part of the flight.

9 CASA WILDLIFE SURVEY

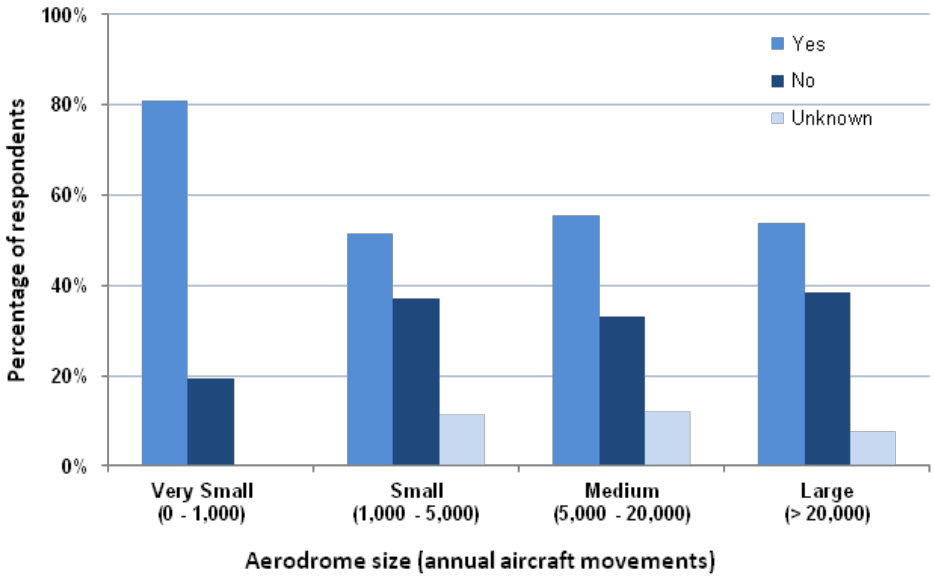
In October 2011, the Civil Aviation Safety Authority (CASA) conducted a survey of operators of certified and registered aerodromes across Australia. The purpose of the survey was to collect data relating to aerodrome operations and the strategies operators use to manage safety issues. This chapter tables the results of the part of the survey specific to wildlife hazard management issues, and the types of measures being used by aerodrome operators to control wildlife strikes. Further details regarding the survey methodology are outlined in section 2.4 on page 5.

9.1 Wildlife Hazard Management

Over 80 per cent of the very small aerodromes[19] surveyed stated they carried out a formal risk assessment for wildlife at the aerodrome (Figure 35). This is a remarkably high proportion when compared with large aerodromes, where only 53 per cent indicated that they had a similar risk assessment process in place. Furthermore, 40 per cent of large aerodrome operators indicated that they have not carried out any formal risk assessment of wildlife hazards. However, this data should be treated with caution, as it is likely that the various survey respondents interpreted the term *formal risk assessment* in different ways.

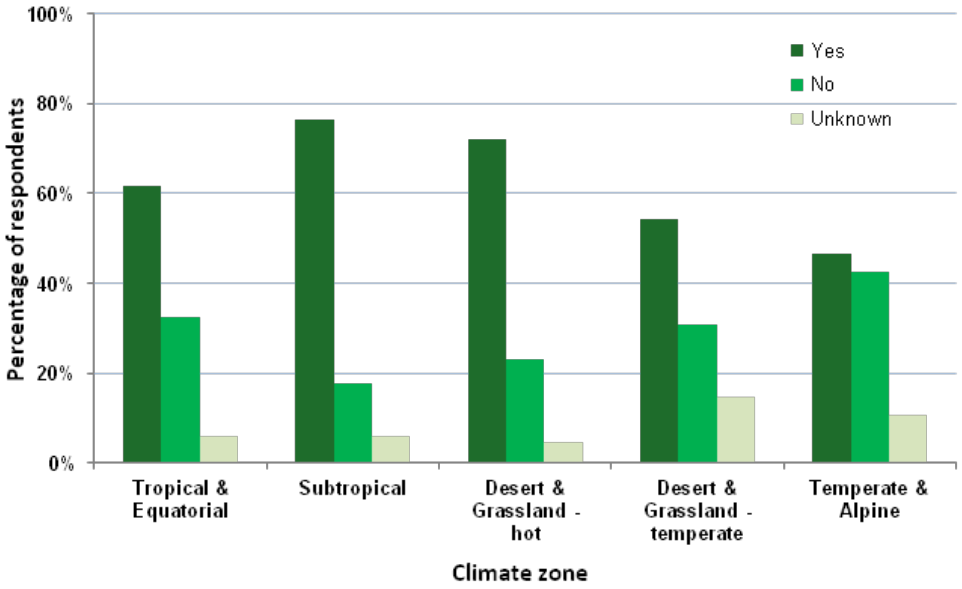
In relation to the climatic zones particular aerodromes are situated in (see map in Appendix D on page 120), higher proportions of aerodromes in hot, tropical or subtropical areas had conducted a wildlife risk assessment (Figure 36). Higher bird populations and therefore a greater strike risk in these climates may be a possible explanation.

Figure 35: Wildlife risk assessment carried out by number of annual aircraft movements



[19] Aerodromes were considered by CASA to be 'very small' if they reported less than 1,000 annual aircraft movements.

Figure 36: Wildlife risk assessment carried out by climate zone



Survey respondents were also asked to rate the risk level of wildlife at their airport. As can be seen in Figure 37 and Figure 38 below, very few operators rated the risk at their airport as *high* - most respondents rated the risk posed by wildlife as low. Larger aerodromes were more likely to report a *medium* risk (46 per cent).

In general, the aerodromes in tropical and subtropical areas rated the risk of wildlife on their aerodromes higher than operators of airports in more temperate regions.

Figure 37: Reported level of risk posed by wildlife by number of annual aircraft movements

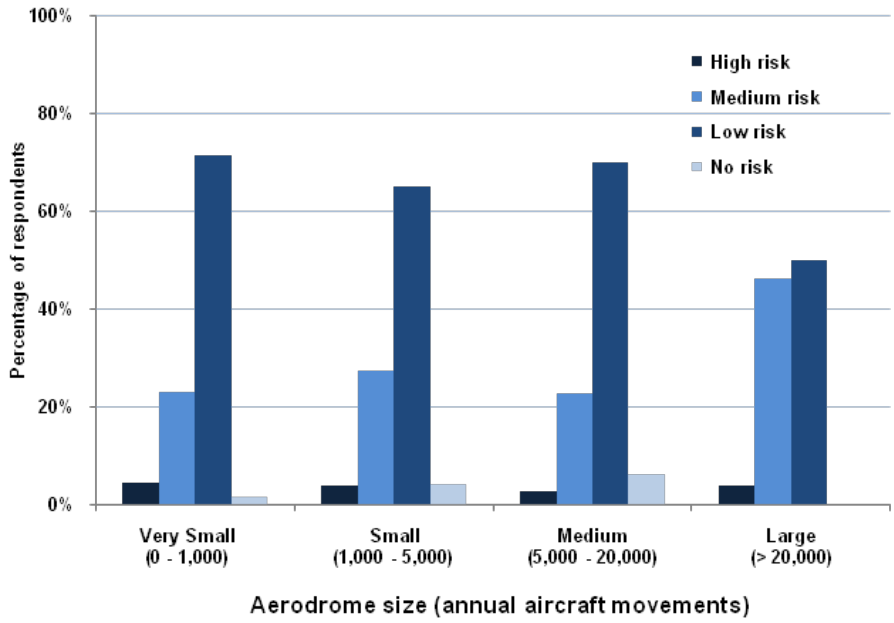
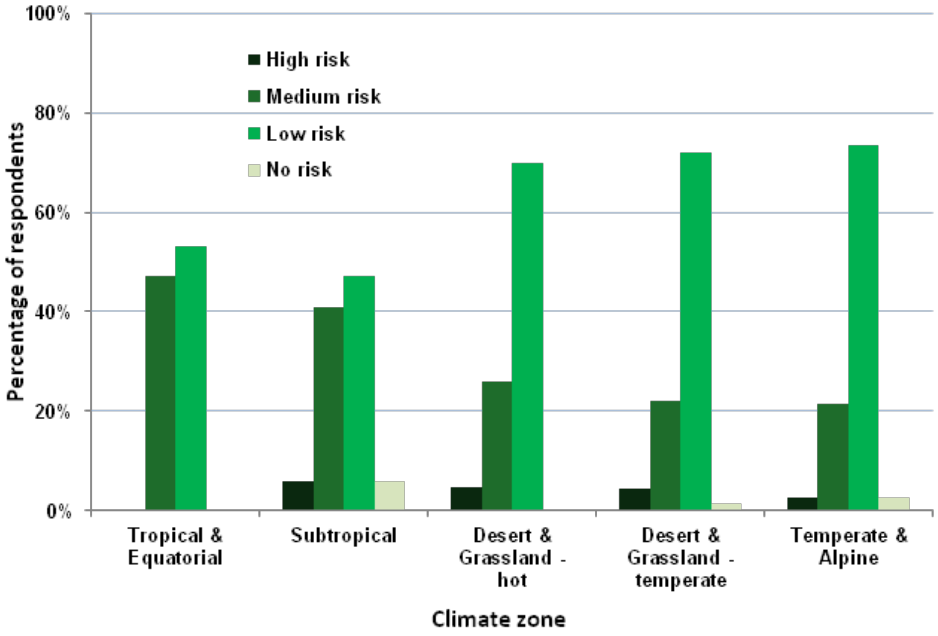


Figure 38: Reported level of risk posed by wildlife by climate zone

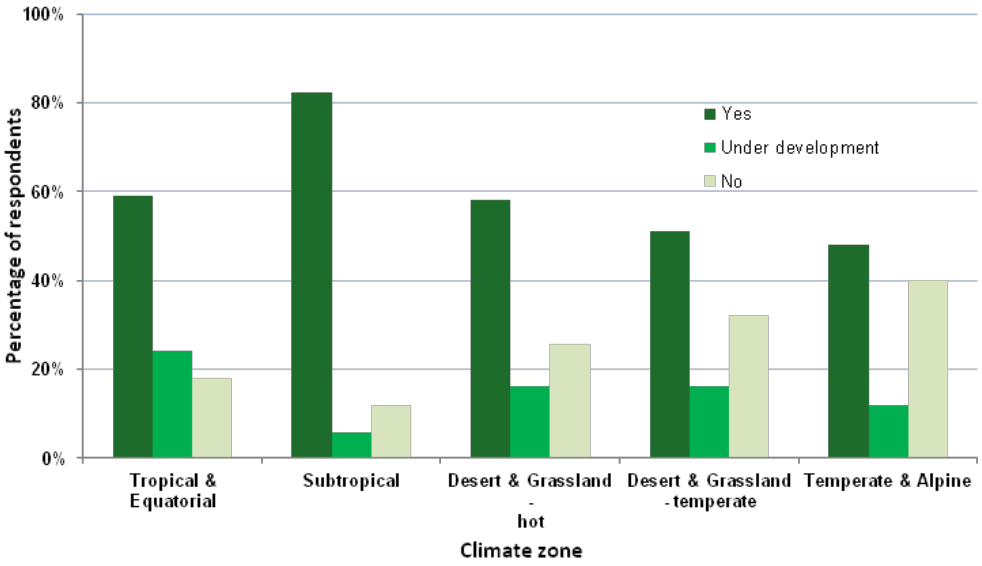


The majority of respondents indicated that they have a Wildlife Hazard Management Plan (WHMP) in place at their aerodrome, although around 30 per cent of the very small and small aerodromes (those with less than 5,000 movements annually) did not have such a plan. In terms of aerodrome type, only 20 per cent of registered aerodromes had a WHMP, as opposed to 80 per cent of the certified aerodromes. Almost 80 per cent of operators that carried out a risk assessment of wildlife at their airport stated that they had a WHMP.

A similar pattern of aerodrome operator approaches to wildlife hazard risk assessments can be seen when considering the location of aerodromes by climate zone. The majority of aerodromes in tropical latitudes have a WHMP, or are in the process of developing one, whereas 40 per cent of aerodromes in the temperate climatic zones do not have a WHMP in place.

Figure 39: Wildlife hazard management plan in place by aerodrome type

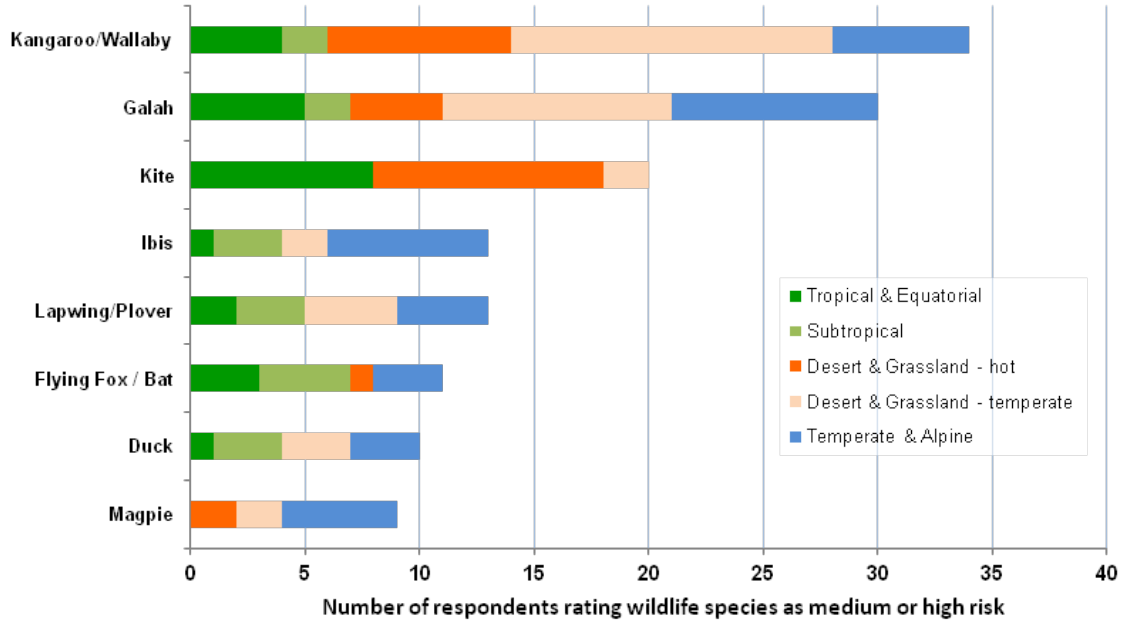
Figure 40: Wildlife hazard management plan in place by climate zone



9.2 Risk Species

Respondents who rated the risk of wildlife as *medium* or *high* were asked to indicate the specific species that posed the highest risk on their aerodrome. A maximum of three species could be chosen. The results are shown in Figure 41, and are broken down by climate zones.

Figure 41: Threat species by climate zone[20]



Kangaroos and wallabies were identified by most aerodrome operators as problematic species for their aerodrome, throughout all climate zones. Although the frequency of animal strikes is low (discussed in Chapter 8), there is a relatively high possibility of aircraft damage resulting from animal strikes when compared with bird strikes.

The highest rated risk bird species was the galah. Occurrence reports to the ATSB show that galahs were the second most common struck bird in the past 2 years across Australia and that galahs by far accounted for the most strikes involving multiple birds due to their flocking tendencies. Flocking behaviour, along with bird size, may also explain why ducks were rated as a hazard by 10 aerodromes. While bats/flying foxes were the most common bird/flying animal type struck in Australia in the past 2 years, they were only rated fifth-highest respectively in the ranking of risk species by aerodrome operators.

The survey results established that there are some significant differences in problem species for aerodrome operators across different climatic zones. In the hot desert and tropical areas, species of kite were rated as the most significant wildlife hazard. Temperate areas face most difficulties with galahs and ibises.

[20] Only species with eight or more respondents are displayed.

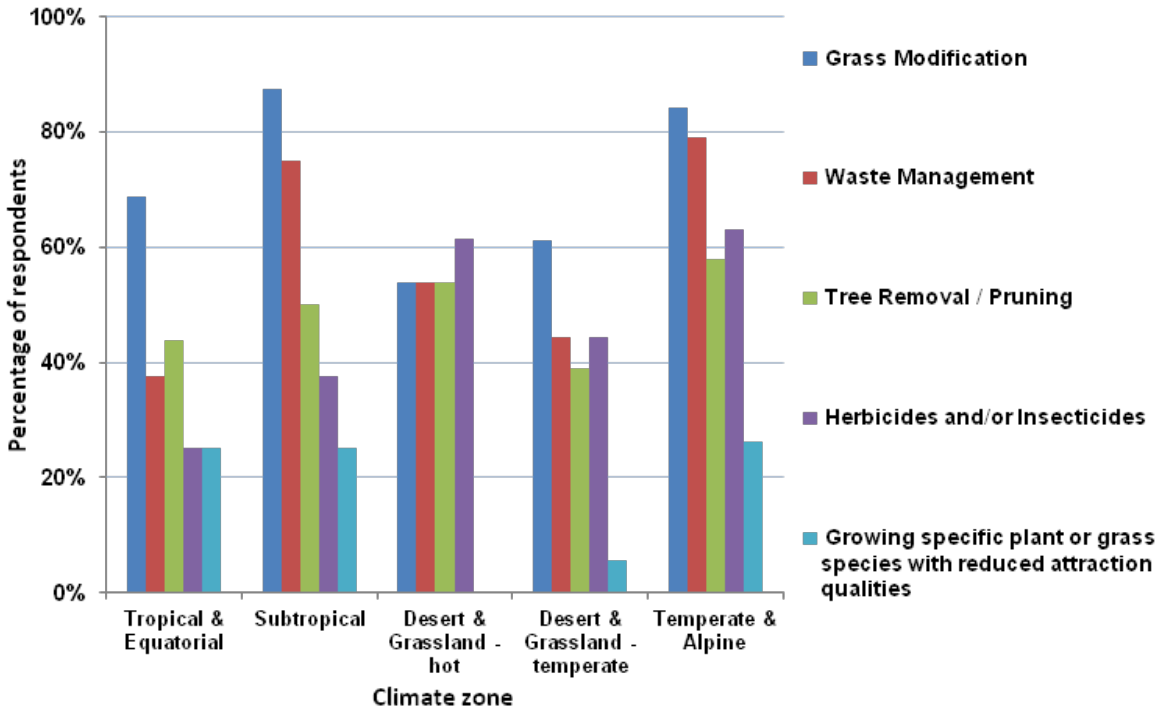
9.3 Wildlife mitigation strategies

This section describes the wildlife mitigation strategies currently used or planned to be implemented in the next 12 months by aerodrome operators who responded to the survey. The results only include aerodromes which had a wildlife risk rating of *medium* or *high*.

9.3.1 Habitat modification

There are a number of different methods used by operators to make the airport environment less appealing to birds as a habitat. Figure 9 shows that grass modification is used more regularly than other habitat modification strategies, closely followed by waste management. From the survey data, it was not possible to tell the difference between tall grass and short grass strategies. Tree removal and/or pruning were used by around half of the operators of aerodromes in all climate zones. Growing specific plant or grass species that were less attractive to birds took place less regularly, and primarily on the largest aerodromes.

Figure 42: Habitat modification strategies by climate zone

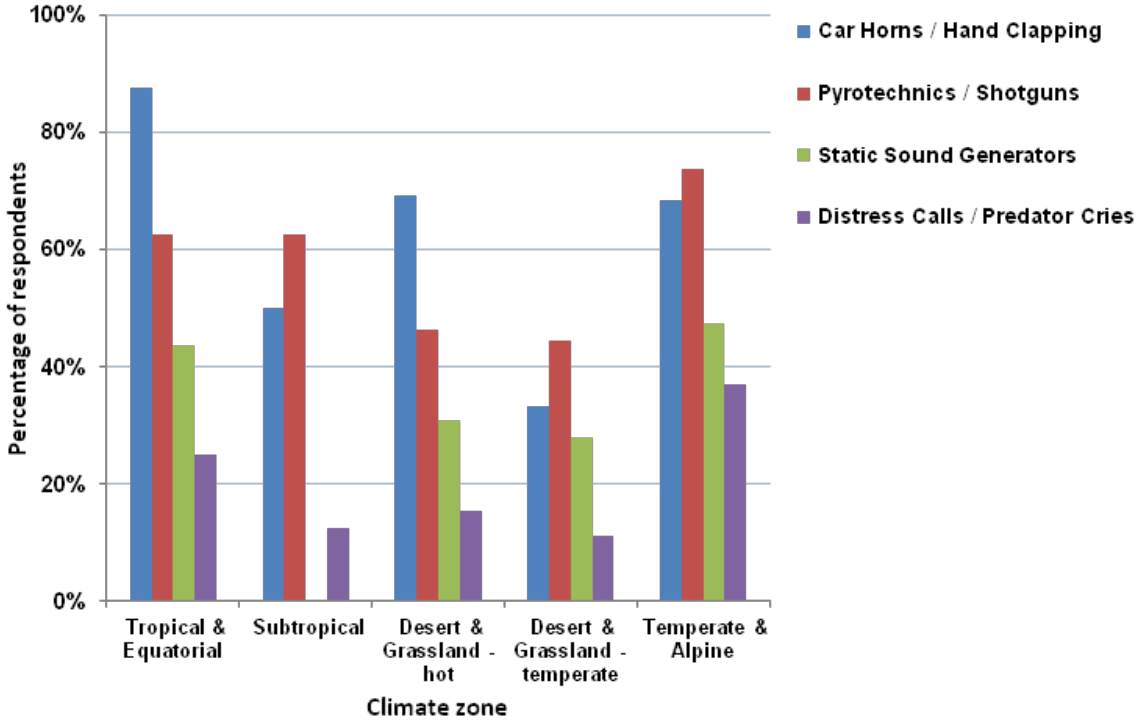


9.3.2 Auditory repellents

Where aerodrome operators used auditory repellents to scare off birds, or prevent flocks from developing, most respondents used a car horn or hand clapping (62 per cent) or pyrotechnics or shotguns (58 per cent) as auditory deterrents. A smaller (but substantial) number used static sound generators (34 per cent) to generate an unpleasant noise. These percentages are much lower than those reported in the 2009

ATSB wildlife survey[21]. An explanation for this difference may be that the sample used in both surveys varied; the ATSB survey only included medium-sized and large aerodromes. When considering the spread of aerodromes across different climatic regions, car horns and hand clapping are the most popular strategy at airports in tropical/equatorial and hot desert areas. The use of pyrotechnics and/or shotguns is the most widely used strategy at aerodromes in subtropical and the more temperate climates.

Figure 43: Auditory repellents by climate zone

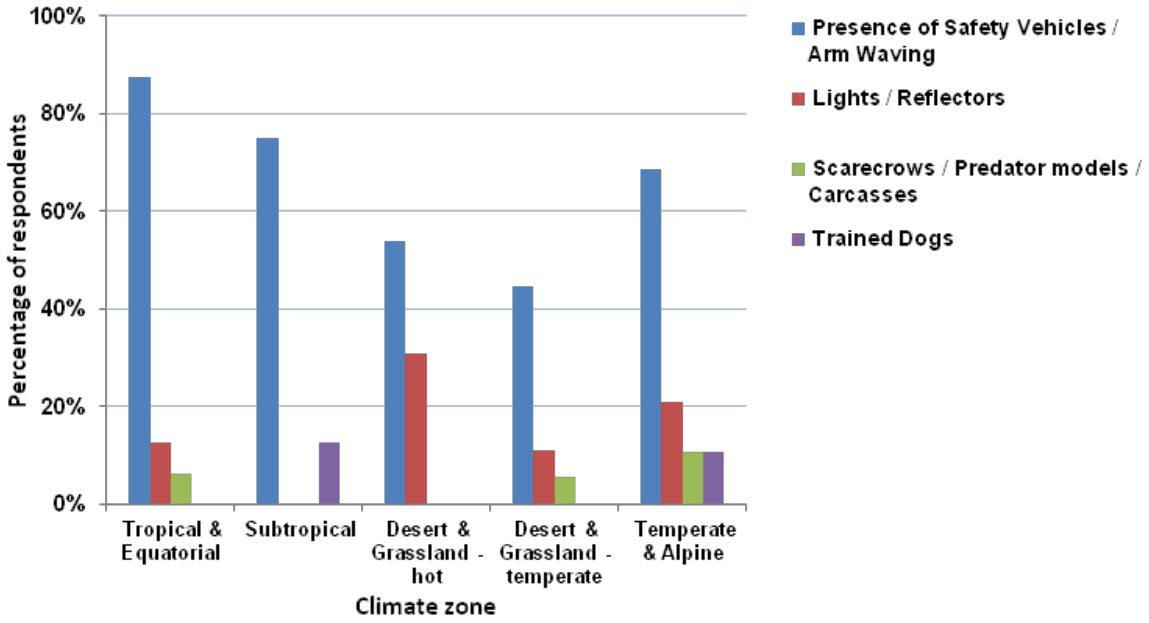


9.3.3 Visual deterrents

Visual deterrents are the least frequently used bird deterrent method used by aerodrome operators. The majority of operators who used this method had the presence of safety vehicles on airside areas and arm waving of aerodrome staff as the only visual deterrents. About 30 per cent of the aerodromes in hot desert and grassland climatic regions used lights and/or reflectors as a visual repellent. Trained dogs were used at a few larger aerodromes.

[21] ATSB (2010). *Australian aviation wildlife strike statistics: Bird and animal strikes 2002 to 2009* (AR-2009-064). ATSB: Canberra

Figure 44: Visual deterrents by climate zone

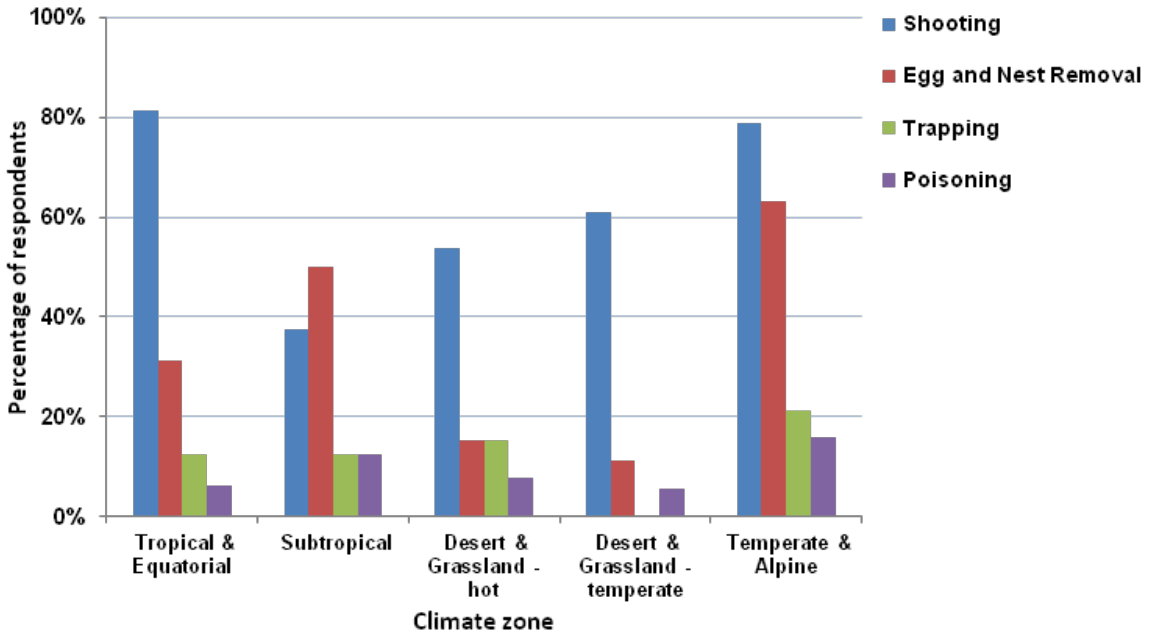


9.3.4 Removal methods

At two-thirds of the responding aerodromes, some form of bird removal by shooting was used. From the survey data, it was not possible to determine the frequency of this mitigation strategy. Egg and nest removal was preferred at one third of the responding aerodromes, mainly those in coastal areas.

Other methods for removal included trapping and poisoning, both of which were performed at around 10 per cent of the aerodromes surveyed.

Figure 45: Wildlife removal methods by climate zone

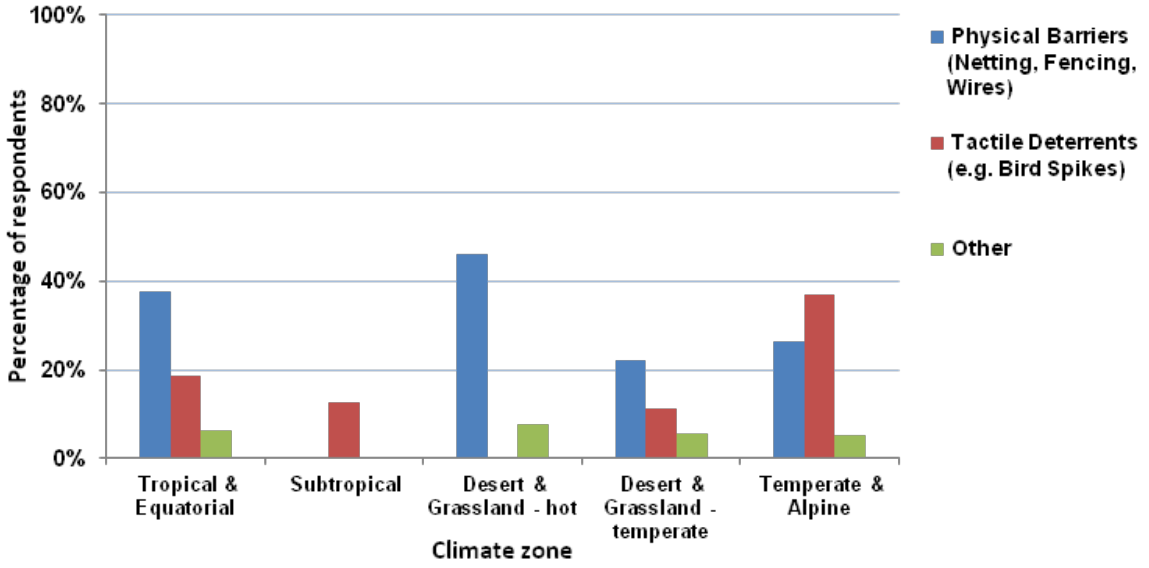


9.3.5 Other wildlife mitigation strategies

About 30 per cent of survey respondents used some form of physical barrier, such as netting or fencing to separate birds and other wildlife from aerodrome areas. The majority of aerodromes where this approach was used were in tropical and desert areas.

One-fifth of survey respondents reported using tactile deterrents such as bird spikes. Tactile deterrents were more common on large aerodromes than on smaller aerodromes. No significant differences were observed between the types of tactile deterrents used at aerodromes in tropical areas and those in more temperate climate zones.

Figure 46: Other wildlife mitigation strategies by climate zone



APPENDIX A: SPECIES IN TYPES

Table 29: Bird types by common name and species name (as reported), 2002 to 2011

Bird type	Name	Count
Australian Brush-turkey	Bush Turkey	27
	Brush Turkey	6
	Scrub Turkey	1
Bat/Flying Fox	Bat	370
	Fruit bat	253
	Flying fox	150
	Micro bat	11
	Mouse-eared bat	2
Bustard	Bustard	8
	Australian Bustard	6
Cockatoo	Cockatoo	37
	Black Cockatoo	8
	Sulphur crested cockatoo	3
	White Cockatoo	2
	Pink Cockatoo	1
Cormorant	Cormorant	14
	Pied Cormorant	1
Crow/Raven	Crow	70
	Raven	12
	Butcherbird	4
	Apostlebird	2
	Currawong	2
Cuckoo	Cuckoo-shrike	4
	Cuckoo	1
Curlew/Sandpiper	Curlew	104
	Bush Stone-curlew	96
	Sandpiper	18
	Little Curlew	16
	Bush Thick-knee	1
	Eastern Curlew	1
	Whimbrel	1

Continued

Bird type	Name	Count
Dove	Pigeon	159
	Dove	26
	Rock Dove	10
	Turtle Dove	3
	Peaceful Dove	1
Duck	Duck	118
	Wood Duck	26
	Pacific Black Duck	21
	Black Duck	6
Eagle	Eagle (not Wedgetail)	70
	Sea Eagle	10
	Brahminy Kite	8
	Little Eagle	2
Falcon	Falcon	32
	Brown Falcon	19
	Peregrine Falcon	8
	Australian Hobby	5
	Hobby	1
Finch	Finch	44
	Zebra Finch	13
	Goldfinch	5
Frigate	Frigate	6
Galah	Galah	731
Hawk	Hawk	263
	Chicken hawk	10
	Goshawk	8
	Sparrowhawk	8
	Swamp Harrier	5
	Collared Sparrowhawk	4
	Osprey	3
	Spotted Harrier	1
Hen	Native Hen	9
	Swamphen	7
	Tasmanian Native-hen	4

Continued

Bird type	Name	Count
Heron/Egret	Egret	25
	Cattle Egret	23
	Nankeen Night Heron	21
	White-faced Heron	20
	Heron	16
	Crane	11
	Brolga	2
	Jabiru	2
House Sparrow	Sparrow	164
	House Sparrow	2
Ibis	Ibis	101
	Straw-necked Ibis	9
	White Ibis	5
Kingfisher/Kookaburra	Kookaburra	10
	Kingfisher	2
Kite	Kite	207
	Black Kite	193
	Kite-Hawk	169
	Whistling Kite	59
	Black-shouldered Kite	13
	Fork-tailed Kite	3
Lapwing/Plover	Plover	609
	Masked Lapwing	80
	Spur-winged Plover	21
	Dotterel	16
	Oriental Plover	16
	Lapwing	14
	Masked Plover	10
	Banded Plover	2
	Pacific Golden Plover	1
Magpie	Magpie	444
	Australian Magpie	39
Magpie Goose	Magpie Goose	17
	Goose	2

Continued

Bird type	Name	Count
Magpie-lark	Magpie-lark	202
	Peewee	73
	Mudlark	32
	Lark	21
	Murray Magpie	5
Myna	Myna	11
Nankeen Kestrel	Kestrel	320
	Nankeen Kestrel	124
	Australian Kestrel	21
Owl	Owl	85
	Barn owl	31
	Masked Owl	2
Oystercatcher	Pied Oystercatcher	2
	Oystercatcher	1
Pacific Gull	Pacific Gull	24
Parrot	Corella	23
	Parrot	14
	Rainbow Lorikeet	10
	Little Corella	7
	Crimson Rosella	1
Pelican	Pelican	15
Pipit	Richard`s Pipit	114
	Pipit	63
	Australasian Pipit	8
	Australian Pipit	1
	Ground Lark	1
Pratincole	Pratincole	100
	Australian Pratincole	62
	Australian Courser	11
	Swallow-plover	3
Robin	Robin	7
Silver Gull	Seagull	205
	Silver Gull	66
	Gull	11
Skylark	Skylark	36
	Common Skylark	1

Continued

Bird type	Name	Count
Starling	Starling	53
	Common Starling	5
Swallow/Martin	Swallow	242
	Fairy Martin	72
	Welcome Swallow	46
	Martin	39
	Wood Swallow	22
	Black-faced Wood Swallow	12
	Barn Swallow	5
Swan	Swan	5
Swift	Swift	32
	Spine-tailed Swift	3
	Fork-tailed Swift	2
Tern	Tern	39
	Crested Tern	4
	Little Tern	2
	Black Tern	1
	Whiskered Tern	1
Thrush	Thrush	1
Wagtail	Willie Wagtail	8
	Wagtail	3
Wedge-tailed Eagle	Wedge-tailed Eagle	21
	Eagle-hawk	3
Wren	Wren	5

Continued

Bird type	Name	Count
Other	Blackbird	4
	Darter	4
	Wader	3
	Courser	2
	Flycatcher	2
	Grey tailed tattler	2
	Australasian Grebe	1
	Banded stilt	1
	Bittern, brown	1
	Black honeyeater	1
	Budgerigar	1
	Buff Banded Rail	1
	Common greenshank	1
	Dusky Moorhen	1
	Godwit	1
	Honeyeater	1
	Orange chat	1
	Partridge	1
	Petrel	1
	Rainbow bee-eater	1
	Red Wattlebird	1
	Red-necked Stint	1
	Snipe	1
	Spinifexbird	1
	Unknown - sea bird	1

Table 30: Animal types by common and species names (as reported), 2002 to 2011

Animal type	Name	Count
Dog/fox	Fox	34
	Dog	5
	Dingo	4
Echidna	Echidna	6
Goanna/Monitor	Goanna	9
	Monitor	2
Hare/Rabbit	Hare	60
	Rabbit	56
Kangaroo	Kangaroo	65
	Wallaroo	1
Large Flightless bird	Emu	1
Livestock	Cattle	4
	Cow	2
	Sheep	2
	Horse	1
Lizard/snake	Lizard	11
	Snake	7
Turtle	Turtle	5
Wallaby	Wallaby	42
Other	Bandicoot	4
	Possum	3
	Cat	2
	Rat	2
	Cane Toad	1
	Frog/Toad	1
	Mouse	1
	Pig	1
	Potoroo	1
	Toad	1
	Wombat	1

APPENDIX B: ADDITIONAL BIRDSTRIKE DATA

Table 31: Number of birdstrikes at major aerodromes by location, aggregated for all operation types, 2002 to 2011

Airport	Aerodrome proximity	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
Adelaide	Aerodrome confines	32	36	60	62	54	49	45	74	51	71	**534**
	5 to 15 km	3	3	6	8	7	1	-	3	-	2	**33**
	>15 km	1	-	2	2	1	-	-	-	-	-	**6**
Brisbane	Aerodrome confines	65	62	62	68	67	73	113	103	109	125	**847**
	5 to 15 km	11	15	23	15	14	4	2	1	2	1	**88**
	>15 km	2	2	4	1	1	-	-	-	-	1	**11**
Cairns	Aerodrome confines	29	47	50	78	46	87	80	69	80	68	**634**
	5 to 15 km	12	16	11	26	11	5	3	2	3	1	**90**
	>15 km	1	1	-	3	3	-	2	-	2	-	**12**
	Unknown	-	-	-	-	1	-	-	-	-	-	**1**
Canberra	Aerodrome confines	9	5	18	30	44	37	30	21	33	43	**270**
	5 to 15 km	2	4	2	5	3	1	-	2	-	2	**21**
	>15 km	-	-	-	2	1	-	1	-	-	1	**5**
Darwin	Aerodrome confines	68	61	89	108	66	73	77	113	93	73	**821**
	5 to 15 km	4	2	2	8	2	1	-	1	-	3	**23**
	>15 km	2	4	4	3	1	-	1	4	-	1	**20**
Gold Coast	Aerodrome confines	19	31	15	35	27	31	30	32	51	48	**319**
	5 to 15 km	4	4	8	7	9	-	-	-	1	2	**35**
	>15 km	-	1	1	-	-	-	-	-	-	-	**2**
	Unknown	-	-	-	-	-	-	-	-	-	1	**1**
Hobart	Aerodrome confines	17	17	10	28	28	35	22	21	18	13	**209**
	5 to 15 km	3	2	1	1	2	1	1	-	-	-	**11**

Continued

Airport	Aerodrome proximity	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
Melbourne	Aerodrome confines	37	30	54	61	70	36	76	62	96	58	**580**
	5 to 15 km	7	6	14	11	11	6	3	2	1	2	**63**
	>15 km	-	3	1	3	-	-	1	-	-	-	**8**
	Unknown	-	-	-	-	-	-	-	1	1	1	**3**
Perth	Aerodrome confines	15	33	42	39	42	37	46	40	54	66	**414**
	5 to 15 km	1	5	3	1	9	1	2	2	2	-	**26**
	>15 km	1	-	1	-	1	-	1	-	-	1	**5**
	Unknown	-	-	-	-	-	-	1	-	-	1	**2**
Sydney	Aerodrome confines	42	61	86	83	73	87	85	112	112	135	**876**
	5 to 15 km	10	9	19	17	9	5	-	1	1	-	**71**
	>15 km	2	3	1	1	3	-	-	-	-	-	**10**
	Unknown	-	-	-	-	-	-	-	-	-	6	**6**

Table 32: Number of birdstrikes at towered regional class D aerodromes by location, aggregated for all operation types, 2002 to 2011

Airport	Aerodrome proximity	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
Albury	Aerodrome confines	3	1	9	10	9	15	9	17	12	12	**97**
	5 to 15 km	3	1	1	-	1	-	-	-	1	1	**8**
Alice Springs	Aerodrome confines	25	10	10	11	14	14	6	12	55	38	**195**
	5 to 15 km	1	-	-	-	-	1	-	-	-	-	**2**
	>15 km	1	-	-	1	-	-	-	-	-	-	**2**
Avalon	Aerodrome confines	1	2	1	12	5	7	8	19	20	14	**89**
	5 to 15 km	2	-	-	3	-	1	-	-	-	1	**7**
Coffs Harbour	Aerodrome confines	1	7	4	12	10	14	9	10	10	9	**86**
	5 to 15 km	3	-	1	2	-	-	-	-	-	1	**7**
	>15 km	-	-	1	-	-	-	-	-	1	-	**2**
Essendon	Aerodrome confines	5	3	5	8	12	6	8	11	5	5	**68**
	5 to 15 km	-	-	1	-	1	-	1	-	-	-	**3**
Hamilton Island	Aerodrome confines	2	2	5	9	10	11	6	5	6	7	**63**
Launceston	Aerodrome confines	7	1	8	10	4	8	19	10	11	7	**85**
	5 to 15 km	1	-	1	1	1	-	-	-	-	-	**4**
Mackay	Aerodrome confines	13	8	33	22	16	10	12	23	25	20	**182**
	5 to 15 km	3	-	-	1	1	-	-	-	-	-	**5**
	>15 km	-	1	-	-	-	-	-	-	-	-	**1**
Rockhampton	Aerodrome confines	12	36	30	32	37	21	37	41	51	35	**332**
	5 to 15 km	2	4	3	1	1	-	1	-	1	4	**17**
	>15 km	-	2	1	-	1	-	-	1	-	-	**5**
	Unknown	-	-	-	-	-	-	-	-	-	1	**1**
Sunshine Coast	Aerodrome confines	3	5	7	7	9	18	7	9	11	6	**82**
	5 to 15 km	4	-	1	-	1	1	-	-	1	-	**8**
	>15 km	-	-	-	1	-	-	-	-	-	-	**1**
Tamworth	Aerodrome confines	12	21	11	9	17	17	23	12	12	11	**145**
	5 to 15 km	1	1	2	1	2	1	-	-	-	-	**8**
	>15 km	2	2	2	-	-	-	-	-	-	-	**6**

Continued

Airport	Aerodrome Proximity	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
Townsville	Aerodrome confines	14	16	35	31	26	45	44	52	66	62	**391**
	5 to 15 km	4	7	6	5	6	2	-	2	2	-	**34**
	>15 km	-	-	-	1	1	1	-	1	2	-	**6**
	Unknown	-	-	-	-	-	1	-	-	-	-	**1**

Table 33: Number of birdstrikes at metropolitan class D aerodromes by location, aggregated for all operation types, 2002 to 2011

Airport	Aerodrome proximity	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
Archerfield	Aerodrome confines	-	1	2	4	4	6	7	18	9	8	**59**
	5 to 15 kms	1	-	-	1	3	1	-	-	-	-	**6**
	>15 kms	-	-	1	1	1	-	-	-	-	-	**3**
Bankstown	Aerodrome confines	9	13	6	7	5	8	13	13	7	6	**87**
	5 to 15 kms	8	1	5	4	2	1	1	1	1	1	**25**
	>15 kms	-	-	-	-	1	-	-	-	-	-	**1**
Camden	Aerodrome confines	2	-	-	-	1	1	1	-	1	-	**6**
	5 to 15 kms	1	-	1	-	-	-	-	-	-	-	**2**
	>15 kms	-	-	-	1	-	-	-	-	-	-	**1**
Jandakot	Aerodrome confines	26	15	21	15	28	21	4	8	20	15	**173**
	5 to 15 kms	1	2	2	1	1	-	1	-	-	-	**8**
	>15 kms	-	1	2	-	-	-	1	1	-	-	**5**
Moorabbin	Aerodrome confines	8	7	10	12	5	9	11	14	12	8	**96**
	5 to 15 kms	1	-	1	-	2	1	-	2	-	-	**7**
	>15 kms	-	-	-	-	-	-	-	1	-	-	**1**
Parafield	Aerodrome confines	17	14	20	28	15	27	32	32	38	39	**262**
	5 to 15 kms	4	2	-	5	1	-	-	-	-	-	**12**
	>15 kms	-	-	-	-	1	-	-	-	-	-	**1**

Table 34: Number of birdstrikes at other significant regional aerodromes by location, aggregated for all operation types, 2002 to 2011

Airport	Aerodrome proximity	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
Amberley	Aerodrome confines	-	-	-	-	-	1	-	4	19	5	**29**
	5 to 15 kms	1	1	-	-	-	-	-	-	-	-	**2**
	>15 kms	-	-	-	-	1	-	-	-	-	-	**1**
	Unknown	-	-	-	-	-	-	-	-	-	1	**1**
Ballina / Byron Gateway	Aerodrome confines	12	5	6	6	3	10	8	6	8	11	**75**
	5 to 15 kms	3	-	1	2	3	1	-	-	-	-	**10**
Broome	Aerodrome confines	9	11	7	21	10	26	20	11	15	16	**146**
	5 to 15 kms	1	-	1	1	-	-	-	-	-	1	**4**
	>15 kms	-	-	-	-	1	-	-	-	-	-	**1**
Ceduna	Aerodrome confines	2	-	-	-	2	4	1	9	8	2	**28**
	5 to 15 kms	-	-	-	-	-	-	-	1	-	-	**1**
Dubbo	Aerodrome confines	6	7	9	7	10	17	26	7	14	12	**115**
	5 to 15 kms	-	1	-	-	1	-	-	-	1	-	**3**
Emerald	Aerodrome confines	-	5	4	7	6	12	8	2	11	6	**61**
	5 to 15 kms	-	-	1	-	-	1	-	-	-	-	**2**
	>15 kms	-	-	-	1	-	-	-	1	-	-	**2**
Karratha	Aerodrome confines	-	1	5	3	11	6	5	22	11	23	**87**
	5 to 15 kms	-	-	1	1	1	-	-	-	-	-	**3**
	Unknown	-	-	-	-	-	-	-	-	-	3	**3**
King Island	Aerodrome confines	1	-	-	1	1	7	4	9	11	9	**43**
	5 to 15 kms	1	-	-	-	-	-	-	-	-	-	**1**
Kowanyama	Aerodrome confines	-	10	3	9	12	8	8	5	7	9	**71**
	5 to 15 kms	-	-	-	1	3	-	-	-	-	-	**4**
	>15 kms	-	-	-	-	-	-	-	1	-	-	**1**
Kununurra	Aerodrome confines	3	2	2	2	3	3	7	5	7	4	**38**
	5 to 15 kms	1	2	2	1	-	-	-	-	-	-	**6**
	>15 kms	2	1	-	1	-	-	-	-	-	-	**4**

Continued

Airport	Aerodrome proximity	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
Lismore	Aerodrome confines	-	-	3	-	5	9	3	7	4	9	**40**
	5 to 15 kms	-	-	-	-	-	1	-	-	1	-	**2**
	>15 kms	-	1	-	-	-	-	-	-	-	-	**1**
Mildura	Aerodrome confines	1	1	4	5	17	4	4	2	3	3	**44**
	5 to 15 kms	-	-	-	1	-	-	-	-	-	-	**1**
Mount Isa	Aerodrome confines	-	-	10	7	11	15	9	18	15	24	**109**
	5 to 15 kms	-	-	-	-	1	-	-	-	-	-	**1**
	>15 kms	-	-	-	-	-	-	-	-	-	1	**1**
Port Hedland	Aerodrome confines	1	1	-	1	9	2	2	13	4	12	**45**
	5 to 15 kms	-	-	-	1	-	-	-	-	-	-	**1**
	>15 kms	-	-	-	1	-	-	-	-	-	-	**1**
Port Macquarie	Aerodrome confines	2	2	3	1	5	-	4	3	14	11	**45**
	5 to 15 kms	-	2	1	1	1	-	-	-	-	-	**5**
	>15 kms	-	1	-	-	-	-	-	-	-	-	**1**
Proserpine / Whitsunday Coast	Aerodrome confines	-	1	3	3	6	6	9	7	7	4	**46**
	5 to 15 kms	-	-	-	2	1	1	-	-	-	-	**4**
	>15 kms	-	-	-	-	-	1	-	-	-	-	**1**
Tindal	Aerodrome confines	-	4	1	2	2	2	-	7	9	5	**32**
	5 to 15 kms	1	1	-	-	-	1	-	-	1	-	**4**
	>15 kms	-	1	-	-	-	-	-	-	-	-	**1**
Wagga Wagga	Aerodrome confines	4	5	9	7	11	14	13	20	16	29	**128**
	5 to 15 kms	-	-	-	-	-	-	-	-	1	1	**2**
	>15 kms	-	-	-	-	-	-	-	1	-	-	**1**
Williamtown	Aerodrome confines	2	2	1	3	15	20	17	24	13	14	**111**
	5 to 15 kms	1	-	-	1	5	-	1	1	1	1	**11**
	>15 kms	-	-	1	1	-	1	-	-	-	-	**3**
	Unknown	-	-	-	-	-	-	-	-	1	-	**1**
Wynyard	Aerodrome confines	3	4	5	4	4	6	7	5	12	4	**54**
	5 to 15 kms	1	1	-	1	-	-	-	-	-	-	**3**

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, 2002 to 2011

Airport	Operation type	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Adelaide	High capacity air transport	-	-	2	-	1	1	1	4	1	1
	Low capacity air transport	-	-	1	-	1	-	-	2	-	1
	General Aviation	-	-	-	1	-	-	-	-	-	-
	Military	-	-	-	1	-	-	-	-	-	-
Albury	High capacity air transport	-	-	1	-	-	-	-	-	-	-
	Low capacity air transport	-	-	-	-	1	2	1	1	-	-
	General Aviation	1	-	-	-	-	-	-	-	-	-
Alice Springs	High capacity air transport	1	-	1	-	-	-	-	-	-	-
	Low capacity air transport	1	1	-	-	1	-	-	-	1	-
	General Aviation	-	-	-	-	-	1	-	-	-	1
Amberley	Military	-	-	-	-	-	-	-	1	2	4
Archerfield	Low capacity air transport	-	-	-	-	1	-	-	-	-	-
	General Aviation	1	-	2	3	2	1	1	5	-	3
Avalon	High capacity air transport	1	-	-	-	-	-	-	3	-	1
	General Aviation	-	-	-	-	1	-	-	-	-	-
Ballina / Byron Gateway	High capacity air transport	-	-	-	-	-	-	1	-	-	-
	Low capacity air transport	-	1	-	1	-	-	1	-	1	-
Bankstown	Low capacity air transport	1	-	-	-	1	-	-	-	-	1
	General Aviation	2	2	3	-	-	-	1	2	1	3
	Military	-	-	-	-	-	-	1	-	-	-
Brisbane	High capacity air transport	-	5	5	3	2	4	3	4	4	8
	Low capacity air transport	-	-	-	-	-	-	1	-	-	-
	General Aviation	1	-	1	-	-	-	-	-	-	1
	Military	-	-	-	-	-	1	-	-	-	-
Broome	High capacity air transport	-	-	1	-	-	-	1	-	-	-
	Low capacity air transport	-	1	-	-	1	-	-	1	-	1
Cairns	High capacity air transport	3	4	1	4	1	6	2	3	1	1
	Low capacity air transport	1	1	1	-	-	-	-	1	2	-
	General Aviation	1	-	-	-	-	-	1	-	-	2
	Military	-	-	-	-	1	-	-	-	-	-
	Unknown	1	-	-	-	-	-	-	-	-	-
Camden	General Aviation	-	-	-	-	-	-	1	-	-	-

Continued

Airport	Operation type	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Canberra	High capacity air transport	1	1	1	-	4	2	3	3	-	2
	Low capacity air transport	-	-	-	-	1	-	-	-	-	-
	General Aviation	-	-	-	-	2	-	-	-	-	-
	Unknown	-	-	-	-	-	-	-	-	1	-
Ceduna	Low capacity air transport	-	-	-	-	-	-	-	1	-	-
Coffs Harbour	Low capacity air transport	1	-	-	-	-	-	-	-	1	-
	General Aviation	1	-	-	-	-	-	-	-	-	-
Darwin	High capacity air transport	3	3	2	5	1	-	3	4	1	-
	Low capacity air transport	2	1	1	1	1	1	2	2	1	1
	General Aviation	1	1	-	1	-	-	-	1	-	1
	Military	-	-	1	-	1	1	-	-	-	1
	Unknown	-	-	-	-	-	-	-	-	2	-
Dubbo	High capacity air transport	-	-	-	-	-	-	1	-	-	-
	Low capacity air transport	-	1	-	-	3	1	2	-	-	1
	General Aviation	-	-	-	1	-	-	1	-	1	-
Emerald	High capacity air transport	-	-	-	-	1	1	-	-	1	1
	General Aviation	-	1	-	-	-	-	-	-	-	1
Essendon	Low capacity air transport	-	-	-	-	3	-	-	1	-	-
	General Aviation	-	-	-	-	-	-	2	-	-	-
Gold Coast	High capacity air transport	-	-	-	1	-	2	2	-	2	1
	General Aviation	-	-	-	-	1	-	-	-	-	-
Hamilton Island	High capacity air transport	-	-	-	-	-	-	-	1	-	1
Hobart	High capacity air transport	1	4	-	-	-	2	-	1	-	-
	Low capacity air transport	-	-	1	-	-	-	-	-	-	-
Jandakot	General Aviation	1	5	4	-	-	-	2	1	-	1
King Island	Low capacity air transport	2	-	-	-	-	-	-	1	-	1
Kowanyama	Low capacity air transport	-	3	-	-	2	1	2	2	-	1
Kununurra	High capacity air transport	-	-	-	-	-	-	1	-	1	-
	Low capacity air transport	2	-	-	-	-	1	1	-	-	-
	Unknown	-	-	-	-	-	-	-	-	1	-
Launceston	High capacity air transport	2	-	-	-	-	1	2	-	-	1
	General Aviation	-	-	-	-	-	-	1	-	-	-
Lismore	High capacity air transport	-	-	-	-	-	1	-	-	-	-
	Low capacity air transport	-	-	-	-	-	2	1	1	-	-
	General Aviation	-	-	-	-	-	-	1	-	-	-

Continued

Airport	Operation type	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Mackay	High capacity air transport	-	-	-	-	1	-	1	1	1	-
	Low capacity air transport	1	-	1	-	-	-	-	-	-	-
	General Aviation	-	-	-	-	-	-	1	-	-	-
Melbourne	High capacity air transport	3	-	11	4	4	1	3	2	6	3
	Low capacity air transport	1	1	-	-	-	-	-	1	1	-
Mildura	High capacity air transport	-	-	1	-	-	-	-	-	-	-
Moorabbin	Low capacity air transport	-	-	-	-	2	-	-	-	1	-
	General Aviation	2	-	2	1	-	2	-	4	1	-
Mount Isa	High capacity air transport	-	-	-	1	-	-	-	-	-	-
	Low capacity air transport	-	-	-	-	2	-	-	-	-	-
	General Aviation	-	-	-	-	1	-	-	-	-	1
Other aerodromes	High capacity air transport	2	1	6	4	2	9	11	7	15	11
	Low capacity air transport	10	6	12	5	16	12	18	13	11	26
	General Aviation	7	7	8	9	9	15	14	22	21	24
	Military	-	-	-	-	-	1	1	5	5	3
	Unknown	-	-	-	-	-	-	-	-	2	2
Parafield	General Aviation	1	-	-	1	2	2	4	1	4	5
	Unknown	-	-	-	1	-	-	-	-	-	-
Perth	High capacity air transport	1	1	2	-	3	2	-	1	3	4
	General Aviation	1	-	-	-	-	-	-	-	-	-
	Unknown	-	-	-	-	-	-	-	-	-	1
Port Hedland	Low capacity air transport	-	-	-	-	-	-	-	-	-	1
	General Aviation	-	-	-	-	-	-	-	1	-	-
Port Macquarie	High capacity air transport	-	-	-	-	-	-	-	-	1	-
	Low capacity air transport	-	-	-	-	1	-	-	-	-	-
	General Aviation	-	-	-	-	3	-	-	-	-	1
	Unknown	-	-	-	1	-	-	-	-	-	-
Proserpine / Whitsunday Coast	High capacity air transport	-	-	-	-	-	-	-	-	1	-
	General Aviation	-	-	-	-	-	-	-	1	-	-
Rockhampton	High capacity air transport	-	1	-	-	2	1	-	2	1	3
	Low capacity air transport	1	-	-	-	-	-	-	1	-	-
	General Aviation	-	1	1	-	-	-	-	2	1	-
	Unknown	-	-	-	-	-	-	-	-	2	-
Sunshine Coast	High capacity air transport	-	-	-	-	-	-	-	1	1	-
	Low capacity air transport	-	-	1	-	-	-	-	-	-	-
	General Aviation	1	-	-	-	2	-	-	-	-	-

Continued

Airport	Operation type	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Sydney	High capacity air transport	5	2	10	7	6	5	2	3	3	5
	Low capacity air transport	-	-	2	-	-	1	-	1	-	2
Tamworth	High capacity air transport	-	-	-	-	1	-	-	-	-	1
	Low capacity air transport	-	2	-	1	-	-	-	-	-	-
	General Aviation	1	3	2	1	-	-	1	1	-	-
Tindal	Low capacity air transport	-	3	-	-	-	-	-	1	-	-
	Military	-	-	-	-	-	1	-	1	1	-
Townsville	High capacity air transport	1	1	-	3	4	2	2	-	4	3
	Low capacity air transport	-	-	1	-	-	-	-	1	-	2
	General Aviation	-	1	-	-	-	1	-	1	1	1
	Military	-	-	-	1	-	-	-	-	-	1
Wagga Wagga	Low capacity air transport	-	-	-	2	-	-	-	-	1	-
	General Aviation	-	-	-	-	-	-	-	-	1	-
Williamtown	High capacity air transport	-	-	-	-	1	1	1	1	2	-
	Low capacity air transport	1	-	-	-	-	1	1	-	1	1
	General Aviation	-	-	1	-	-	1	1	-	1	-
	Military	-	-	-	-	-	1	-	1	1	1
Wynyard	Low capacity air transport	-	1	-	-	-	1	-	1	1	-
	General Aviation	-	-	-	-	2	-	-	-	-	-

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), 2002 to 2011

Airport	Bird type	High capacity air transport	Low capacity air transport	General Aviation	Military	Unknown
Adelaide	Duck	0	1	0	0	0
	Galah	4	1	0	0	0
	Magpie	1	1	0	0	0
	Magpie-lark	1	0	0	0	0
	Silver Gull	0	1	0	1	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
	Lapwing/Plover	1	1	0	0	0
Archerfield	Bat/Flying Fox	0	1	3	0	0
	Blackbird	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
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	2	0	0	0
Bankstown	Bat/Flying Fox	0	2	2	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

Continued

Airport	Bird type	High capacity air transport	Low capacity air transport	General Aviation	Military	Unknown
Brisbane	Bat/Flying Fox	1	0	0	0	0
	Falcon	1	0	0	0	0
	Hawk	1	0	0	0	0
	Heron/Egret	2	1	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
	Tern	1	0	0	0	0
Broome	Eagle	0	1	0	0	0
	Kite	1	2	0	0	0
	Pipit	1	0	0	0	0
Cairns	Bat/Flying Fox	5	3	2	0	0
	Duck	0	1	1	0	0
	Eagle	1	0	0	0	0
	Heron/Egret	0	1	0	0	0
	Kite	2	0	0	0	0
	Myna	1	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	3	0	0	0	0
	Nankeen Kestrel	1	0	0	0	0
Ceduna	Cockatoo	0	1	0	0	0
Coffs Harbour	Crow/Raven	0	0	1	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	2	1	0	0	0
	Curlew/Sandpiper	2	2	0	0	0
	Duck	1	0	0	0	0
	Eagle	0	0	1	0	1
	Hawk	1	0	1	0	0
	Kite	3	5	0	1	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
	Hawk	0	1	0	0	0
	Kite	0	2	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	1	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	2	0	0	0	0
	Duck	2	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	2	0	0	0	0
	Pacific Gull	1	1	0	0	0
	Starling	1	0	0	0	0
Jandakot	Crow/Raven	0	0	1	0	0
	Eagle	0	0	6	0	0
	Hawk	0	0	1	0	0
	Ibis	0	0	1	0	0
	Pelican	0	0	1	0	0
King Island	Lapwing/Plover	0	2	0	0	0

Continued

Airport	Bird type	High capacity air transport	Low capacity air transport	General Aviation	Military	Unknown
Kowanyama	Galah	0	6	0	0	0
	Heron/Egret	0	1	0	0	0
	Kite	0	2	0	0	0
Kununurra	Bat/Flying Fox	0	2	0	0	0
	Eagle	0	1	0	0	0
	Hawk	1	0	0	0	0
	Kite	0	1	0	0	1
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
	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
Melbourne	Bat/Flying Fox	4	0	0	0	0
	Blackbird	1	0	0	0	0
	Crow/Raven	1	0	0	0	0
	Falcon	1	0	0	0	0
	Ibis	0	1	0	0	0
	Kite	1	0	0	0	0
	Magpie	4	1	0	0	0
	Owl	3	0	0	0	0
Mildura	Hawk	1	0	0	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	1	5	0	0
Mount Isa	Bat/Flying Fox	0	0	1	0	0
	Dove	0	1	0	0	0
	Kite	0	1	0	0	0

Continued

Airport	Bird type	High capacity air transport	Low capacity air transport	General Aviation	Military	Unknown
Parafield	Dove	0	0	2	0	0
	Galah	0	0	4	0	0
	Magpie	0	0	6	0	0
	Magpie-lark	0	0	2	0	0
	Pelican	0	0	1	0	0
Perth	Duck	1	0	0	0	0
	Falcon	0	0	0	0	1
	Galah	7	0	0	0	0
	Nankeen Kestrel	1	0	0	0	0
Port Hedland	Bat/Flying Fox	0	0	1	0	0
	Kite	0	1	0	0	0
Port Macquarie	Bat/Flying Fox	1	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	0	0	0
	Hawk	2	1	0	0	0
	Kite	0	0	2	0	1
	Owl	1	0	0	0	0
	Parrot	1	0	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
Sydney	Bat/Flying Fox	6	1	0	0	0
	Cockatoo	1	0	0	0	0
	Cormorant	0	1	0	0	0
	Eagle	0	1	0	0	0
	Ibis	1	0	0	0	0
	Pelican	1	1	0	0	0
	Silver Gull	8	0	0	0	0

Continued

Airport	Bird type	High capacity air transport	Low capacity air transport	General Aviation	Military	Unknown
Tamworth	Eagle	0	0	1	0	0
	Galah	0	0	1	0	0
	House Sparrow	1	0	0	0	0
	Ibis	0	1	1	0	0
	Kite	0	1	0	0	0
	Magpie	0	0	1	0	0
	Magpie-lark	1	0	1	0	0
Tindal	Australian Brush-turkey	0	1	0	0	0
	Bat/Flying Fox	0	1	0	0	0
	Eagle	0	0	0	1	0
Townsville	Bat/Flying Fox	3	0	0	1	0
	Bustard	1	0	1	0	0
	Curlew/Sandpiper	2	1	0	0	0
	Duck	1	0	0	0	0
	Heron/Egret	2	0	0	0	0
	Ibis	0	0	0	1	0
	Kite	2	0	0	0	0
	Lapwing/Plover	1	0	0	0	0
	Magpie	1	0	0	0	0
	Magpie Goose	1	1	2	0	0
Wagga Wagga	Galah	0	3	1	0	0
Williamtown	Bat/Flying Fox	2	0	1	0	0
Wynyard	Lapwing/Plover	0	3	1	0	0
	Silver Gull	0	1	0	0	0

Table 37: Number of reported birdstrikes by bird type by state, 2002 to 2011

Bird type	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Other	Total
Bat/Flying Fox	1	257	67	373	4	-	42	26	1	**771**
Lapwing/Plover	13	128	127	153	37	146	41	122	-	**767**
Galah	87	279	14	118	142	1	31	57	-	**729**
Kite	-	53	153	338	9	-	32	57	-	**642**
Magpie	31	105	3	78	113	4	120	29	-	**483**
Nankeen Kestrel	9	79	22	156	73	1	10	105	10	**465**
Swallow/Martin	11	67	29	240	22	12	18	38	-	**437**
Magpie-lark	-	39	25	126	113	6	8	16	-	**333**
Hawk	10	50	24	103	22	14	20	58	1	**302**
Silver Gull	1	87	2	15	67	28	50	30	1	**281**
Curlew/Sandpiper	-	2	102	125	2	-	-	5	1	**237**
Dove	-	35	12	37	68	-	26	17	2	**197**
Pipit	5	63	7	21	-	6	56	29	-	**187**
Pratincole	-	-	163	12	-	-	-	1	-	**176**
Duck	21	28	2	76	3	3	13	23	2	**171**
House Sparrow	1	30	8	49	12	11	35	20	-	**166**
Heron/Egret	-	15	4	78	-	-	6	9	8	**120**
Owl	-	22	13	34	6	-	14	29	-	**118**
Ibis	-	32	2	58	4	-	14	5	-	**115**
Eagle	-	15	9	31	1	3	5	25	1	**90**
Crow/Raven	6	14	4	26	9	8	13	9	-	**89**
Falcon	1	9	16	7	3	1	19	8	-	**64**
Finch	-	3	15	13	-	22	1	7	1	**62**
Starling	-	17	2	7	11	13	7	1	-	**58**
Parrot	-	5	15	16	7	-	1	9	-	**53**
Cockatoo	2	18	6	10	2	-	1	12	-	**51**
Tern	-	9	2	13	2	-	3	18	-	**47**
Swift	-	13	-	20	-	-	1	3	-	**37**
Skylark	-	-	-	-	4	21	12	-	-	**37**
Australian Brush-turkey	-	-	7	14	-	-	-	13	-	**34**

Continued

Bird type	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Other	Total
Wedge-tailed Eagle	-	6	1	7	2	-	-	8	-	**24**
Pacific Gull	-	2	-	-	-	12	10	-	-	**24**
Hen	-	2	-	6	-	12	-	-	-	**20**
Magpie Goose	-	1	3	13	2	-	-	-	-	**19**
Pelican	-	6	1	4	1	-	1	2	-	**15**
Cormorant	-	5	-	7	2	-	1	-	-	**15**
Bustard	-	-	2	11	-	-	-	1	-	**14**
Kingfisher/Kookaburra	-	4	3	3	-	-	-	1	-	**11**
Wagtail	-	1	4	2	1	-	-	3	-	**11**
Myna	-	1	-	5	-	-	1	3	-	**10**
Robin	1	-	-	-	-	1	-	5	-	**7**
Frigate	-	-	1	2	-	-	-	-	3	**6**
Cuckoo	-	-	-	3	2	-	-	-	-	**5**
Wren	-	-	-	3	-	1	1	-	-	**5**
Swan	1	1	-	-	-	1	2	-	-	**5**
Darter	-	4	-	-	-	-	-	-	-	**4**
Blackbird	-	-	1	1	1	-	1	-	-	**4**
Wader	-	-	-	-	-	-	-	3	-	**3**
Oystercatcher	-	-	-	-	-	3	-	-	-	**3**
Courser	-	-	-	2	-	-	-	-	-	**2**
Grey Tailed Tattler	-	-	-	-	-	-	-	2	-	**2**
Flycatcher	-	1	-	1	-	-	-	-	-	**2**
Dusky Moorhen	-	-	-	1	-	-	-	-	-	**1**
Godwit	-	1	-	-	-	-	-	-	-	**1**
Honeyeater	-	-	-	-	-	-	-	1	-	**1**
Common greenshank	-	-	1	-	-	-	-	-	-	**1**
Budgerigar	-	-	-	-	-	-	-	1	-	**1**
Buff Banded Rail	-	-	-	-	-	-	-	1	-	**1**
Australasian Grebe	-	-	-	1	-	-	-	-	-	**1**
Banded stilt	-	-	1	-	-	-	-	-	-	**1**

Continued

Bird type	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Other	Total
Bittern, brown	-	-	-	1	-	-	-	-	-	**1**
Black honeyeater	-	-	-	-	-	-	-	1	-	**1**
Orange chat	-	-	-	-	1	-	-	-	-	**1**
Partridge	-	-	-	-	-	-	-	1	-	**1**
Rainbow bee-eater	-	-	-	-	-	-	-	1	-	**1**
Red Wattlebird	-	1	-	-	-	-	-	-	-	**1**
Red-necked Stint	-	-	-	1	-	-	-	-	-	**1**
Thrush	-	-	-	-	-	-	1	-	-	**1**
Unknown - sea bird	-	-	-	1	-	-	-	-	-	**1**
Petrel	-	1	-	-	-	-	-	-	-	**1**
Snipe	-	-	-	1	-	-	-	-	-	**1**
Spinifexbird	-	-	-	-	-	-	-	1	-	**1**

Table 38: Number of birdstrikes by bird type, ordered by average difference between 2002 to 2006 and 2007 to 2011

Bird type	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
Bat/Flying Fox	38	78	58	53	57	75	73	112	135	107	**786**
Galah	33	47	58	63	84	90	88	67	98	103	**731**
Kite	32	37	40	54	79	71	62	78	98	93	**644**
Swallow/Martin	13	32	34	35	40	52	37	54	65	76	**438**
Lapwing/Plover	56	42	71	73	89	75	82	106	74	101	**769**
Pipit	2	8	7	11	19	23	35	17	34	31	**187**
Nankeen Kestrel	31	34	36	30	59	32	61	43	61	78	**465**
Magpie-lark	8	14	27	60	21	32	41	30	43	57	**333**
Magpie	25	31	66	42	45	39	46	56	73	60	**483**
Heron/Egret	5	2	6	9	9	17	17	20	12	23	**120**
Dove	11	9	16	16	21	23	24	23	26	30	**199**
Duck	10	11	16	17	15	17	24	16	24	21	**171**
Parrot	3	1	1	5	2	5	3	10	19	6	**55**
Skylark	-	1	1	1	4	3	6	4	10	7	**37**
Tern	4	7	-	1	1	10	5	7	7	5	**47**
Owl	7	8	10	11	13	11	14	11	17	16	**118**
Falcon	2	9	6	4	2	2	5	2	17	16	**65**
Other	-	2	1	1	5	4	4	5	5	9	**36**
Finch	1	2	2	8	10	8	4	11	6	10	**62**
Magpie Goose	1	2	-	-	-	2	-	5	4	5	**19**
Bustard	-	-	-	-	2	1	1	1	2	7	**14**
Ibis	4	10	15	13	11	11	9	12	13	17	**115**
Cockatoo	4	3	4	4	6	8	4	6	4	8	**51**
Australian Brush-turkey	2	1	3	1	6	8	2	3	3	5	**34**
Hen	1	4	-	-	2	6	-	2	3	2	**20**
Wedge-tailed Eagle	2	1	2	2	2	1	3	2	5	4	**24**
Crow/Raven	5	10	4	11	13	11	7	18	6	5	**90**
Eagle	5	12	11	10	5	8	10	6	14	9	**90**

Continued

Bird type	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
Frigate	-	-	-	-	1	-	1	1	1	2	**6**
Starling	4	6	3	5	9	6	7	6	8	4	**58**
Swan	-	-	-	-	1	2	-	1	-	1	**5**
Swift	2	1	4	4	6	6	1	-	7	6	**37**
Wren	-	-	1	-	-	1	-	-	1	2	**5**
Wagtail	-	-	1	2	1	1	1	1	1	3	**11**
Kingfisher/Kookaburra	-	1	2	-	2	-	-	-	-	7	**12**
Cormorant	1	-	3	1	2	-	1	2	3	2	**15**
Curlew/Sandpiper	10	16	24	40	29	29	18	21	29	21	**237**
Cuckoo	1	-	-	1	1	2	-	-	-	-	**5**
Myna	1	3	1	-	1	1	2	-	1	1	**11**
Oystercatcher	-	1	-	1	-	1	-	-	-	-	**3**
Thrush	1	-	-	-	-	-	-	-	-	-	**1**
Robin	-	-	2	-	2	3	-	-	-	-	**7**
Pelican	2	2	2	1	1	3	1	1	1	1	**15**
Pacific Gull	3	5	2	2	1	-	4	4	2	1	**24**
House Sparrow	19	13	17	24	12	10	28	12	17	14	**166**
Hawk	26	20	29	42	39	35	23	32	34	22	**302**
Pratincole	10	10	27	33	16	21	15	15	14	15	**176**
Silver Gull	18	31	32	46	28	30	17	30	20	30	**282**

Table 39: Number of birdstrikes by bird size and state, 2002 to 2011

State	Bird size	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
ACT	Large	-	-	-	-	1	-	-	-	-	-
	Medium	6	3	10	24	32	30	19	18	17	31
	Small	1	3	4	3	6	3	5	1	6	3
	Unknown	4	3	5	6	9	4	6	5	10	12
NSW	Large	6	5	11	8	2	10	11	7	15	18
	Medium	55	82	95	87	115	140	153	146	118	162
	Small	27	39	43	46	44	60	49	56	67	73
	Unknown	58	37	58	74	61	46	47	88	91	83
NT	Large	3	4	1	5	2	4	1	6	26	15
	Medium	42	41	41	51	60	44	44	70	65	64
	Small	35	32	55	69	38	58	49	53	54	55
	Unknown	40	17	22	31	12	9	19	34	38	32
QLD	Large	10	14	17	21	21	24	22	27	30	47
	Medium	89	119	137	159	175	180	181	172	238	205
	Small	52	82	117	121	113	123	146	123	179	177
	Unknown	80	90	97	145	87	87	106	149	145	132
SA	Large	-	1	1	2	2	1	-	1	3	2
	Medium	48	47	71	66	61	59	59	74	61	67
	Small	10	9	21	13	16	15	20	22	34	51
	Unknown	16	7	14	38	19	17	15	40	26	42
TAS	Large	-	-	1	1	-	1	2	1	2	-
	Medium	13	11	13	29	12	31	26	30	28	21
	Small	11	12	9	12	18	23	17	16	17	10
	Unknown	11	7	4	12	11	8	11	4	8	5
VIC	Large	2	2	-	5	5	5	6	5	6	3
	Medium	30	21	53	52	70	33	39	58	60	38
	Small	10	17	20	37	31	21	36	31	56	26
	Unknown	26	22	25	33	20	22	36	40	35	41
WA	Large	3	3	12	6	5	5	7	9	10	7
	Medium	35	43	51	39	75	68	58	72	61	87
	Small	18	17	33	30	50	41	43	44	47	72
	Unknown	24	30	18	32	29	24	16	31	35	45
Other	Large	-	-	-	-	-	1	-	-	2	2
	Medium	-	-	-	2	1	2	6	7	6	4
	Small	-	-	-	-	2	2	1	1	3	1
	Unknown	1	-	-	-	-	-	2	1	6	4

Table 40: Number of birdstrikes by bird type and hour of day (where time is known), 2002 to 2011

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	33	5	5	6	16	37	23	22	12	16	10	3	8	4	1	1	3	18	116	157	111	44	22	29
Lapwing/Plover	27	12	6	5	14	13	30	42	59	65	41	33	25	28	17	35	38	23	32	45	50	42	23	17
Galah	8	3	1	1	0	1	40	80	104	87	48	17	21	14	22	33	68	66	35	36	14	3	4	0
Kite	12	0	1	0	0	5	32	81	84	95	65	43	20	29	30	23	27	28	8	5	1	2	0	1
Magpie	10	1	1	0	0	2	24	40	47	57	47	36	26	28	21	42	27	30	5	10	6	1	2	1
Nankeen Kestrel	7	2	2	0	1	5	21	31	53	47	52	27	28	26	21	33	27	19	19	2	3	1	0	1
Swallow/Martin	10	6	0	0	0	0	19	48	52	45	56	41	26	27	22	18	23	15	3	5	2	1	3	1
Magpie-lark	6	3	0	0	1	1	12	27	53	38	30	15	27	15	11	13	21	25	8	1	3	3	2	0
Hawk	1	0	0	0	0	4	15	34	31	36	21	22	15	10	14	17	17	18	14	7	2	1	3	0
Silver Gull	4	5	2	0	1	1	10	36	38	18	25	12	17	11	13	17	16	15	7	10	8	2	2	0
Curlew/Sandpiper	14	6	4	4	4	17	7	7	5	2	4	3	3	1	4	4	5	4	11	33	36	24	8	9
Dove	6	0	0	2	1	0	1	12	26	23	10	9	11	15	12	13	12	12	6	2	0	2	0	1
Pipit	6	1	0	0	0	3	8	11	16	17	18	19	17	14	9	6	8	3	4	2	1	0	2	0
Pratincole	9	4	1	2	6	1	6	16	11	13	12	7	7	6	4	8	6	5	8	15	8	2	2	1
Duck	5	5	2	0	3	1	12	14	2	4	2	6	4	2	7	7	6	2	24	12	27	9	6	2
House Sparrow	1	0	0	0	0	1	5	11	24	25	13	14	10	13	12	10	7	6	3	2	2	0	0	0
Heron/Egret	3	0	1	2	1	2	7	3	8	13	15	4	6	7	9	4	8	4	4	5	9	1	2	0
Owl	9	7	0	0	1	3	2	2	2	1	0	1	0	0	0	0	0	3	3	35	16	10	6	5
Ibis	1	1	1	0	0	1	5	8	13	7	12	10	14	7	5	4	2	7	7	2	1	2	1	0
Crow/Raven	0	0	0	0	0	0	8	7	12	6	12	4	3	2	9	8	6	4	3	1	2	0	0	0
Eagle	2	0	0	0	1	1	2	3	7	8	9	7	5	7	8	6	11	3	3	3	0	0	0	0
Falcon	2	0	1	0	0	1	4	4	6	7	2	4	7	2	1	6	8	4	0	2	1	2	0	1
Finch	1	1	1	0	0	0	1	6	9	7	4	4	5	2	3	2	2	0	2	0	0	4	3	1
Starling	1	0	0	0	0	2	3	5	9	3	9	6	5	2	2	0	1	2	2	1	1	0	0	0
Parrot	4	1	0	0	0	0	2	3	6	8	5	1	1	0	1	1	5	8	5	0	0	0	0	0
Cockatoo	1	0	0	0	0	1	1	5	5	5	0	1	1	0	1	6	10	3	2	2	2	3	0	0
Tern	2	0	0	0	0	0	1	3	1	3	3	4	2	4	6	5	4	4	1	0	1	2	0	1
Swift	1	0	0	0	0	0	4	5	14	2	3	1	0	0	1	2	1	1	0	0	0	0	0	0
Skylark	1	0	0	1	0	0	2	3	4	5	4	4	5	1	2	0	1	0	1	0	0	0	0	0
Other	1	0	0	0	0	2	3	3	4	1	3	1	2	1	1	2	3	2	3	1	1	1	0	0
Australian Brush-turkey	1	1	0	0	0	0	1	4	6	4	1	3	0	0	1	0	2	4	1	0	1	1	2	0
Pacific Gull	1	0	0	0	0	0	2	3	4	2	3	1	1	0	1	1	0	2	1	0	0	0	0	0
Wedge-tailed Eagle	0	0	0	0	0	0	0	1	2	6	3	3	1	1	1	1	4	0	0	1	0	0	0	0
Hen	0	0	0	0	0	0	3	0	0	2	1	0	0	0	1	0	0	1	2	1	1	2	0	0
Magpie Goose	0	0	1	0	1	0	1	1	3	1	2	0	0	0	1	0	1	3	1	1	1	0	0	0
Pelican	0	0	0	0	0	0	0	1	0	2	1	2	3	1	2	0	0	1	2	0	0	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
Cormorant	0	0	0	0	0	1	2	1	1	2	0	2	0	2	0	0	1	0	1	0	0	0	0	0
Bustard	0	0	0	0	0	0	3	4	2	1	0	0	0	0	0	1	0	1	1	0	1	0	0	0
Kingfisher/Kookaburra	0	1	0	0	0	0	1	0	1	0	1	1	2	0	1	0	0	2	1	1	0	0	0	0
Myna	1	0	0	0	0	0	0	0	1	0	0	1	2	2	0	1	1	0	0	0	1	0	0	0
Wagtail	1	0	0	0	0	0	0	0	1	3	0	0	0	1	1	0	1	0	0	0	0	0	0	0
Robin	1	0	0	0	0	0	2	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Frigate	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	1	1	0	0	0	0	0	1
Cuckoo	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	2	1	0	0	0	0	0	0
Wren	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0
Swan	0	0	1	0	0	0	1	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
Oystercatcher	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0
Thrush	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX C: RESPONDING AERODROMES

Table 41: Aerodromes which responded to the CASA survey by aerodrome category

Climate Zone	Certified	Registered
Tropical & Equatorial	Aurukun	Bathurst Island
	Barrow Island	Bowen
	Broome Intl	Chillagoe
	Cairns/Cairns Intl	Georgetown (Qld)
	Century Mine	Innisfail
	Christmas Island	Kalumburu
	Cocos (Keeling) Island Intl	Oenpelli
	Coen	
	Cooktown	
	Darwin/Darwin Intl	
	Derby	
	Doomadgee	
	Fitzroy Crossing	
	Gove	
	Groote Eylandt	
	Hamilton Island	
	Horn Island	
	Karratha	
	Kowanyama	
	Kununurra	
	Lockhart River	
	Mareeba	
	McArthur River Mine	
	Mornington Island	
	Northern Peninsula	
	Onslow	
	Port Hedland	
	Townsville	

Continued

Climate Zone	Certified	Registered
Subtropical	Ballina	Brisbane/Archerfield
	Bundaberg	Kempsey
	Clermont	Southport
	Coffs Harbour	
	Gladstone	
	Gold Coast	
	Hervey Bay	
	Lismore	
	Lord Howe Island	
	Maryborough (Qld)	
	Middlemount	
	Proserpine/Whitsunday Coast	
	Rockhampton	
	Sunshine Coast	

Continued

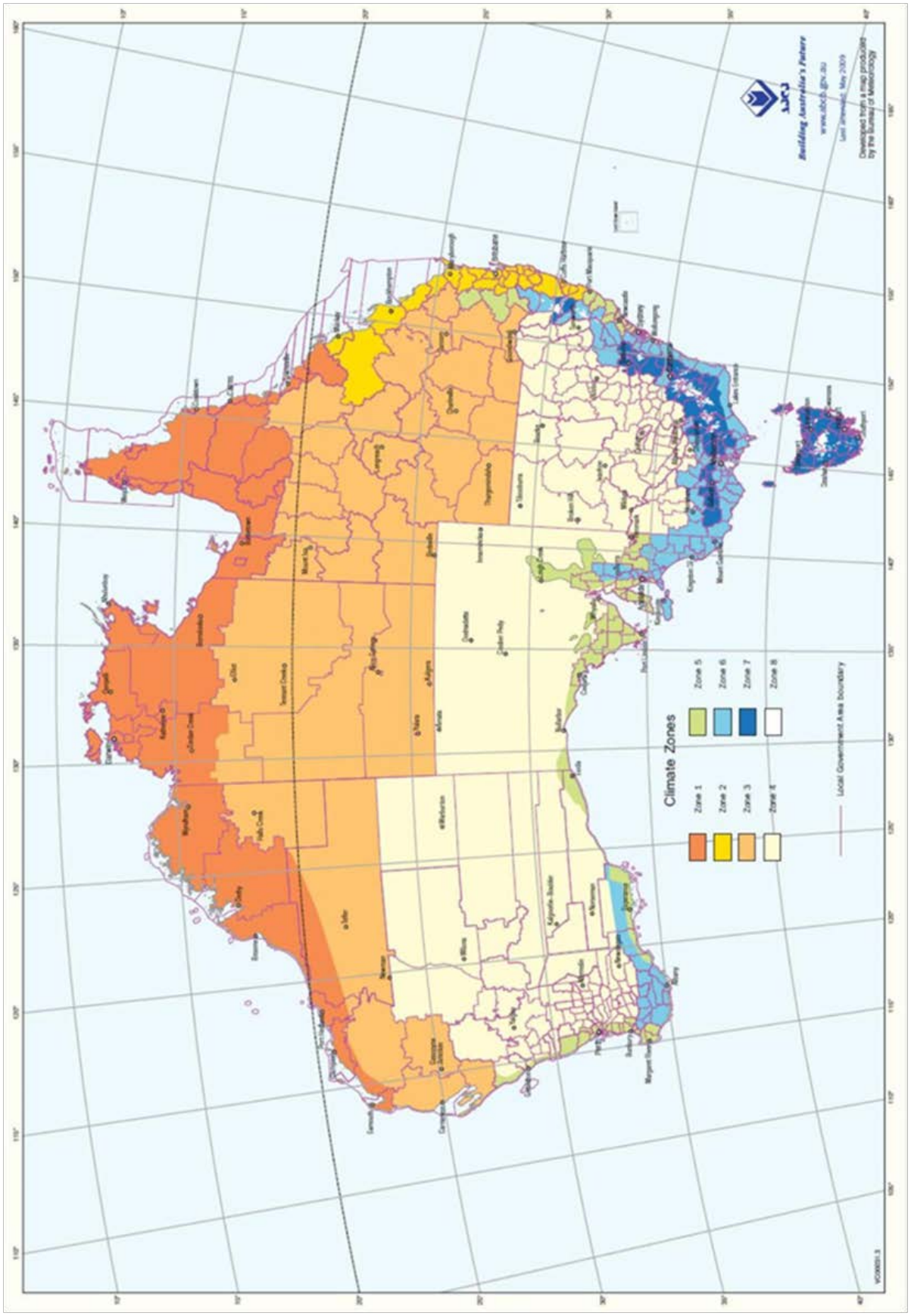
Climate Zone	Certified	Registered
Desert & Grassland - Hot	Alice Springs	Alpha
	Ayers Rock	Charters Towers
	Ballera	Chinchilla
	Barcaldine	Dirranbandi
	Barimunya	Gayndah
	Bedourie	Goondiwindi
	Birdsville	Stanthorpe
	Blackall	Taroom
	Boulia	Tennant Creek
	Brockman	Warwick
	Charleville	
	Cloncurry	
	Coondewanna	
	Elrose	
	Emerald	
	Halls Creek	
	Julia Creek	
	Longreach	
	Mount Isa	
	Osborne Mine	
	Paraburdoo	
	Quilpie	
	Richmond (Qld)	
	Roma	
	Saint George	
	Shark Bay	
	Telfer	
	Thangool	
	Thargomindah	
	The Monument	
	Trepell	
	Windorah	
	Woodie Woodie	

Continued

Climate Zone	Certified	Registered
Desert & Grassland - Temperate	Albury	Balranald
	Bellevue	Birchip
	Bourke	Bronzewing
	Broken Hill	Cobar
	Collarenebri	Coonabarabran
	Coober Pedy	Cootamundra
	Cowra	Cunderdin
	Cue	Deniliquin
	Dubbo	Donald
	Forrest	Echuca
	Forrestania	Forbes
	Golden Grove	Glen Innes
	Granny Smith	Hay
	Griffith	Hopetoun
	Jacinth Ambrosia	Inverell
	Kalgoorlie-Boulder	Kerang
	Laverton (WA)	Lightning Ridge
	Leonora	Narromine
	Meekatharra	Nhill
	Mildura	Nyngan
	Moomba	Pooncarie
	Moree	Port Pirie
	Mount Keith	Quirindi
	Narrabri	Saint Arnaud
	Narrandera	Sea Lake
	Olympic Dam	Shepparton
	Parkes	Tocumwal
	Port Augusta	Walgett
	Prominent Hill	Warracknabeal
	Sunrise Dam	Wentworth
	Tamworth	Wycheproof
	Temora	Yarrawonga
	Wagga Wagga	Young
	West Wyalong	
	Whyalla	
	Wiluna	
	Windarling	

Climate Zone	Certified	Registered
Temperate & Alpine	Adelaide/Adelaide Intl	Ararat
	Adelaide/Parafield	Bairnsdale
	Albany	Ballarat
	Argyle	Benalla
	Avalon	Bendigo
	Bathurst	Bunbury
	Canberra	Camden
	Ceduna	Coolah
	Cooma - Snowy Mountains	Corryong
	Esperance	Cowell
	Geraldton	Flinders Island
	Hobart	Goulburn
	Kalbarri	Hamilton
	King Island	Hobart/Cambridge
	Kingaroy	Horsham
	Kingscote	Kimba
	Launceston	Latrobe Valley
	Melbourne/Essendon	Leigh Creek
	Melbourne/Melbourne Intl	Loxton
	Melbourne/Moorabbin	Maitland
	Merimbula	Mangalore
	Moruya	Manjimup
	Mount Hotham	Naracoorte
	Mudgee	Renmark
	Orange	Saint Helens
	Perth/Jandakot	Scone
	Perth/Perth Intl	Smithton
	Port Lincoln	Stawell
	Port Macquarie	Strahan
	Portland	Streaky Bay
	Ravensthorpe	Tumby Bay
	Rottnest Island	Waikerie
	Sydney/Bankstown	Wangaratta
	Sydney (Kingsford Smith) Intl	Warrnambool
	Taree	West Sale
	Toowoomba	Wudinna
	Wollongong	Yarram
	Wynyard	

APPENDIX D: CLIMATE ZONES USED FOR CASA AERODROME SURVEY



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Research

ATSB Transport Safety Report

Australian aviation wildlife strike statistics: Bird and animal strikes 2002 to 2011

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