AUSTRALIAN
AIRPORTS
ASSOCIATION

MANAGING BIRD STRIKE RISK

SPECIES INFORMATION SHEETS

AIRPORT PRACTICE NOTE 6

CONTENTS

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INTRODUCTION

The Australian Airports Association (AAA) commissioned preparation of this Airport Practice Note to provide aerodrome operators with species information fact sheets to assist them to manage the wildlife hazards at their aerodrome. The species information fact sheets were originally published in June 2004 by the Australian Transport Safety Bureau (ATSB) as Bird Information Fact Sheets.

The AAA was prompted to revise and add additional fact sheets for supplementary species by the release of the ATSB Australian aviation wildlife strike statistics 2004 – 2013 report. This report listed Kites and Bat/ Flying Foxes as having the largest overall number of strikes in the 2012-2013 reporting period representing a demonstrated risk to safe operations. As a result of this report the AAA partnered with Avisure in consultation with the ATSB to update the existing fact sheets and create new species information fact sheets focused on managing the strike risk of these species at Australian airports.

These new and revised fact sheets provide airport members with useful information and data regarding common wildlife species around Australian aerodromes and how best to manage these animals. The up-to-date suite of species information fact sheets will provide aerodrome operators with access to data, information and management techniques for the species posing the greatest risk to safe aerodrome operations in Australia. It is hoped that this document will be a worthwhile and useful asset to aerodrome operators across Australia and the AAA would like to acknowledge the contribution of Avisure and the ATSB in the development of this project.

ABOUT THE AUSTRALIAN AIRPORTS ASSOCIATION

The Australian Airports Association (AAA) is the national industry voice for airports in Australia. The AAA represents the interests of more than 260 airports and aerodromes Australia wide – from local country community landing strips to major international gateway airports.

There are a further 130 corporate partners representing aviation stakeholders and organisations that provide goods and services to the airport sector. The AAA facilitates co-operation among all member airports and their many and varied partners in Australian aviation, whilst contributing to an air transport system that is safe, secure, environmentally responsible and efficient for the benefit of all Australians and visitors.

If you have any questions regarding this document please contact the AAA on 02 6230 1110.

This Airport Practice Note has been prepared on behalf of the AAA by:

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Data used in the report was collected and analysed by the Australian Transport Safety Bureau (ATSB).

Australian Government
Australian Transport Safety Bureau

1 SILVER GULL

Silver Gull
Larus novaehollandiae

Image provided by BirdLife Australia
Photographer: Andrew Silcocks

Background

Despite their relatively small size, Silver Gulls present a significant strike risk to aircraft because:

- their flocking behaviour often results in multiple strike incidents;
- their flight can be unpredictable; and
- they can congregate in very large numbers, particularly where there are abundant food sources, and when seeking refuge from inclement weather.

Strike History

Silver Gulls were involved in 324 strikes in Australia between 2003 and 2014, with 27% of strikes involving more than one individual (i.e. multiple strike), and 5% of strikes resulting in damage to the aircraft. Although other gull species such as the Pacific Gull and Black-tailed Gull have been involved in strikes, Silver Gulls account for 92% of all gull strikes in Australia[1].

1 data source: Australian aviation wildlife strike statistics 2004 to 2013 (AR-2014-075)

Gull Biology

Other Name	Seagull.
Size	Length 40cm; wingspan 94cm; weight 265-315g.
Identification	Adults: white head, neck and body; white eyes with red eye-ring; silver grey wings with black tips; red-orange bill and legs. Juveniles: black eye; dark grey-brown bill and legs; brownish patch near ear; mottled brown on grey wings.
Distribution	Australia-wide, primarily coastal.
Preferred Habitat	They congregate in a wide range of places including coastlines, estuaries, beaches, parks, sports fields, lakes, ponds, inundated grasslands, seafood industries, airports, sewer works, waste landfills and a variety of other urban habitats.
Food	They are opportunistic scavengers who consume almost any food matter including invertebrates, small fish, worms, insects, eggs and chicks of other birds, and human and agricultural food waste.
Behaviour	They are a highly social species who nest, roost and feed in large groups, and who can commute up to 40km from their roost or breeding colony to their feeding sites. They aggressively defend food and are often observed pilfering from rubbish bins or unattended food items.
Breeding	Breeding usually occurs between August and February on off-shore islands, headlands, breakwaters, and/or causeways; however, they also to nest on buildings and other urban infrastructure in coastal environments. In areas where food resources are abundant and predator pressure is low, breeding can extend for up to eleven months. One to three eggs are laid in a nest made of anything from rocks or seaweed to stems from nearby plants.

Gulls on Airports

The main attractions for gulls at airports are detailed below.

Water	Gulls can use any pond, lake, creek or drainage and retention system. They also take advantage of temporary water after rainfall that pools in ground depressions. High tides (may cause gulls to move from adjacent coastal habitats such as estuaries or mudflats to airports to loaf).
Food	As opportunistic scavengers, they will feed on any human food waste from uncontained rubbish bins. Worms and other invertebrates are readily consumed, particularly after rainfall where waterlogged soils make these prey items more accessible.
Loafing Areas/Shelter	Airports can be used as a refuge particularly during inclement weather, when the low predator-pressure is highly advantageous. The wide open flat spaces also allow gulls to feel safe by being able to see threats from people and animals
Transit Routes	Gulls can over-fly airports that are located between their foraging sites and roosting/ grounds, potentially conflicting with aircraft flight paths.

Gull Management

Active Management

Active bird management involves scaring or removing birds from the airport. There are numerous options available for the task, some of which have limited effect in the long term due to habituation. The most successful active management programs utilise a combination of tools and techniques, supplemented with passive management options (see next section).

Silver Gull active management options can include:

Dispersal	Disperse gulls using: » Pyrotechnics (short and long-range); » Portable distress callers (see recommendation 3 below); » Sirens; » Lights; » Stockwhips; and » Vehicles. **Recommendations** » Commence dispersal as gulls arrive. Gulls that have been given the opportunity to settle, particularly during inclement weather, can be difficult to disperse. » Execute a rapid sequence of actions to reinforce the dispersal intent. » Gulls often show a curiosity when exposed to gull distress calls, and this can be used to draw gulls out of critical aircraft movement areas.
Lethal Control	Occasional lethal control may be required in order to: » Occasionally reinforce the effectiveness of non-lethal dispersal equipment; and » Remove immediate and serious hazards. **Recommendations** » Make sure that appropriate firearm licences and lethal control permits are valid. » Always adhere to good animal welfare practices. » Use lethal control only as a last resort management option. » Never use lethal control as a primary management tool.
Trained Predators	The use of trained animals such as dogs, can be employed to disperse birds. It has been used successfully for many years throughout Europe and North America, and more recently in Australia. Its success is due to the: » Introduction of a real predator into the airport environment; and » Ability to train dogs to chase birds away from critical aircraft movement areas. **Recommendations:** » Only use specially trained animals with experienced handlers. » Always maintain strong situational awareness relative to aircraft movements. » Check state/territory permit requirements.

Communicating Hazards	Informing aircrew of hazards, particularly when an acute hazard exists, will help inform their operational decisions (e.g. to delay takeoff). Hazard communication can be achieved via: » Direct communication with aircrew; » Direct communication with ATC; » Distribution of Wildlife Hazard Notifications or Bird Watch Condition Reports; » Distribution of wildlife NOTAMs for short-term hazards; » Inclusion of a hazard warning in in the ATIS for short-term hazards; and » Inclusion of wildlife hazards in the ERSA for on-going hazards. All hazard notification options should provide as much detail as possible, including: » Species; » Location of the hazard on the airfield; » Height of the hazard; » Time of the hazard; and » Recommended actions.

Passive Management

All bird management strategies should seek to reduce the attractiveness of the airport to Silver Gulls, focusing on food, water and shelter availability. An assessment of the airport should be completed by a person qualified and experienced in identifying bird attractions and recommending site-specific modifications.

Reducing Silver Gull attraction to airports may require:

Water Management	Reducing access to water by: » Diverting watercourses away from critical areas such as runway undershoot areas; » Filling ground depressions that hold water after rain; and » Increasing the slope of drain sides (4:1) to reduce the loafing attraction.
Food Management	Limiting access to food by: » Ensuring bins are enclosed and emptied regularly; » Ensuring industrial bins are kept closed at all times; and » Mowing at night to limit the availability of invertebrates.
Habitat Modification	Restricting loafing areas by: » Maintaining grass lengths up to 300mm, this restricts invertebrate access as well as reducing predator detection; » Installing anti-perching spikes, wires or netting on buildings and other infrastructure where gulls are known to loaf; and » Removing islands in the middle of water bodies to eliminate safe refuges for gulls to retreat.

Monitoring Transit Paths	Silver Gulls transiting aircraft flight paths and movement areas en route to feeding and roosting areas can present a serious strike risk. Often a cooperative approach with relevant stakeholders such as airports, airlines, waste landfill managers, local councils and state government environmental organisations is required. Short-term management options may include: » Implementing a regular and standardised monitoring program; » Identifying gull movement trends (i.e. time of day, time of year, height of transit); and » Communicating identified hazards to airlines and aircraft operators. Long-term management options may include: » Encouraging airlines to reschedule flights if discreet trends are identified; » The implementation of management programs for off-airport land uses, such as landfill management or Silver Gull egg and nest management; and » Gull strike assessments for land use development applications within 13km of the airfield.

Off-airport Gull Management

Off-airport sites contribute to gull strike risk by providing foraging, nesting and roosting sites in close proximity to airports. Land uses close to airports often include significant gull attractants such as landfills, seafood processing facilities, designated fish cleaning stations and sewage and treatment plants. This results in increased numbers at and around airports thereby increasing the probability of a strike. Off-airport management strategies are provided in the Additional Information section.

2 MASKED LAPWING

Masked Lapwing
Vanellus miles

Image provided by BirdLife Australia
Photographer: Andrew Silcocks

Background

Masked Lapwings present a significant strike risk to aircraft because:

- They can form large flocks prior to their breeding season, increasing the chance of multiple-strike incidents;
- They establish breeding sites and aggressively defend them against people, other animals, and even aircraft; and
- Their preference for short grass, for breeding and foraging, makes many airports particularly attractive.

Strike History

Masked Lapwings were involved in 804 strikes in Australia between 2003 and 2014, with 16% of strikes involving more than one individual (i.e. multiple strike), and 4% of strikes resulting in damage to the aircraft[2]. Risk assessments often rank this species as moderate to very high risk due to their presence on airfields, particularly in critical aircraft movement areas such as flight strips, and their highly territorial behaviour.

2 data source: Australian aviation wildlife strike statistics 2004 to 2013 (AR-2014-075)

Masked Lapwing Biology

Other Names	Plover, Masked Plover, Spur-winged Plover.
Size	Length 34cm; wingspan 80cm; weight 230-400g.
Identification	**Adults:** black crown head, light brown upperparts, white underneath, and a yellow fleshy 'mask' at the base of the yellow beak. Red/orange legs. They have bony spurs protruding from their shoulders. Despite popular myth, these spurs are not venomous. **Juveniles:** similar to adults with duller colours and a mottled pattern on the upper wings.
Distribution	Throughout all eastern states, northern West Australia, eastern South Australia, and throughout most of the Northern Territory.
Preferred Habitat	With a preference for short grass and barren areas, they are often observed on sports fields, airports, median strips, golf courses, farmlands and urban parks.
Food	Their diet comprises a range of invertebrates such as worms, millipedes, crustaceans and a variety of insects. They occasionally consume leaves, seeds, and even frogs.
Behaviour	Just prior to the breeding seasons they can congregate in large flocks, before pairing off to establish breeding sites, which they aggressively defend against any intruder for the duration of the breeding season. Outside the breeding season, individuals generally remain within the same area, rarely moving very far from their established territory.
Breeding	Three to four eggs are laid in a scrape or shallow ground nest from June to October in southern regions and November to May in northern regions.

Masked Lapwings on Airports

The main attractions for Masked Lapwings are described below.

Grass/barren ground	As ground nesters, short grass or barren, rocky ground on airports provide an ideal environment for lapwings. Such areas not only provide easy access to food, but provide the birds with greatly enhanced predator detection (i.e. they can see what is coming).
Food	Invertebrates are readily consumed, particularly after rainfall when waterlogged soils make these prey items more accessible, and following grass mowing events.
Loafing Areas/Shelter	Airports are used to loaf and rest in a low predator-environment.
Lighting	Airport lighting attracts insects, in turn attracting insectivorous birds. During warmer temperatures, lapwings have been observed foraging at night on runways, taxiways and aprons.

Masked Lapwing Management

Active Management

Active bird management involves scaring or removing birds from the airport. There are numerous options available for the task, some of which have limited effect in the long-term due to habituation. The most successful active management programs use a combination of tools and techniques, supplemented with passive management options (see next section).

Dispersal	Disperse lapwings using: » Pyrotechnics (short and long-range) » Stockwhips » Vehicles. **Recommendations** **1** Commence dispersal as soon as detected, particulary early in the breeding season when site fidelity may be lower. **2** Be persistent as Masked Lapwings are notoriously difficult to disperse due to their territorial nature. Repeated dispersal attempts may be required for a single individual to ensure the hazard is managed. **3** Execute a rapid sequence of actions, with multiple tools, to reinforce the dispersal intent. **4** Be wary of their aggressive behaviour, particularly when eggs and chicks are present. Only disperse if the birds present a critical risk to aircraft operations. They will remain in close proximity to the nest. If a nest is in a critical area of the airport, acquire permit to relocate. **5** Always remain alert to aircraft movements when dispersing, as dispersal response (i.e. the direction in which the dispersed bird flies) can be unpredictable.
Egg and Nest Management	Eggs and nests are easy to access, and their removal can not only disrupt breeding success, but can diminish site fidelity (i.e. the desire to keep returning to the site). **Recommendations** **1** Destroy eggs and nests of nesting pairs (permits required). **2** Be wary of their aggressive behaviour.
Lethal Control	Occasional lethal control (shooting) may be required in order to: » Reinforce the effectiveness of non-lethal dispersal equipment » Remove immediate and serious hazards. **Recommendations** **1** Make sure you have the appropriate firearm licence and that the lethal control permit is valid. **2** Always adhere to good animal welfare practices. **3** Use lethal control only as a last resort management option. **4** Never use lethal control as a primary management tool.

Trained Predators	The use of trained animals, such as birds of prey and dogs, can be employed to disperse birds. It has been used successfully for many years throughout Europe and North America, and more recently in Australia. Its success is due to: » The introduction of a real predator into the airport environment; and » The ability to train dogs to chase birds away from critical aircraft movement areas. **Recommendations** **1** Only use specially trained animals with experienced handlers. **2** Always maintain strong situational awareness relative to aircraft movements. **3** Check state or territory permit requirements.

Passive Management

All bird management strategies should seek to reduce the attractiveness of the airport to Masked Lapwings, with a particular focus on grass management. An assessment of the airport should be completed by a person qualified and experienced in identifying bird attractions and recommending site-specific modifications.

Long Grass	Maintaining grass heights between 150 to 300mm to deter birds at airports has been implemented successfully all over the world. Long grass is effective because: » It compromises the ability of the birds to detect predators, particularly while foraging » Accessing prey items at the surface the soil is more difficult. **Recommendations** **1** Trial grass heights. Not all grasses can grow to a sufficient length and not all airports can grow dense swards of grass. A trial will help establish airport-specific preferences. **2** Monitoring the change of bird species composition as grass heights increase is important to not only assess the impact on grassland birds such as lapwings, but to determine if a different hazard is created. For example, in northern Australia, Magpie Geese have a preference for long grass for establishing nests. **3** Ensure airport markers and navigational devices are not obscured by longer grass. **4** Consider options other than grass where airports are located in sandy or low-nutrient soils. **Case study of heath reestablishment at Sunshine Coast Airport:** » They could not grow dense swards of grass on their sandy low-nutrient soils. » They let the natural seed-bank of heath grow. » This had the same impact as long grass in terms of bird deterrence, particularly of high risk species such as Ibis. » Established across a large area of the airfield. » A small population of the endangered Ground Parrot established in the heath whose strike risk was assessed as very low.

Grass Mowing	The physical action of mowing grass disturbs and kills insects. Airports often observe birds such as lapwings following mowers to take advantage of the enhanced foraging opportunity. This can increase the strike risk, particularly in grassed areas close to critical aircraft movement areas. Mowing should be timed to ensure grass seed heads are regularly removed. Allowing grasses to seed can create additional hazards associated with grainivorous birds and rodents. **Recommendations** **1** Ensure mowing equipment is capable of cutting grass at the desired heights. **2** Mow areas in, and adjacent to, critical aircraft movement areas outside of peak aircraft movement times. Consider mowing at night. **3** Do not allow grass to go to seed.

Off-airport Masked Lapwing Management

Off-airport sites contribute to Masked Lapwing strike risk by providing foraging and roosting sites in close proximity to airports. Masked Lapwings often loaf at off-airport locations during daylight hours before moving to airports at night to forage. This results in increased numbers flying on and around airports during periods of decreased visibility thereby increasing the probability of a strike. Off-airport management strategies are provided in the Additional Information section, but specifically for Masked Lapwing could involve egg and nest management and/or keeping vegetation long.

3 DUCKS

Pacific Black Duck
Anas superciliosa

Australian Wood Duck
Chenonetta jubata

Images provided by BirdLife Australia
Photographer: Andrew Silcocks

Background

Ducks can present a significant strike risk to aircraft because:

- Their flocking behaviour often results in multiple strike incidents;
- Their flight can be unpredictable, particularly when dispersed;
- Their relatively large body mass can result in serious damage to aircraft; and
- They are often active at dusk when low-light conditions make it difficult to detect them.

The Pacific Black Duck and Australian Wood Duck are the focus of this information sheet because they are involved in the majority of duck strikes at Australian airports; however, management recommendations provided below will assist the management of other duck species.

Strike History

Ducks were involved in 232 strikes in Australia between 2003 and 2014, with 29% of strikes involving more than one individual (i.e. multiple strike), and 12% of strikes resulting in aircraft damage. Although Australia is home to twenty duck species, Pacific Black Duck and Australian Wood Duck accounted for 22% of all duck strikes from 2003 to 2014[3]. Other duck species involved in strikes include Plumed Whistling-Duck and Pink-eared Duck.

3 data source: Australian aviation wildlife strike statistics 2004 to 2013 (AR-2014-075)

Duck Biology

Name	Pacific Black Duck	Australian Wood Duck
Other Names	Black, Brown, Grey or Wild Duck.	Maned Duck.
Size	Length: 55cm. Wingspan: 90cm. Weight: 1-1.1kg.	Length: 50cm. Wingspan: 80cm. Weight: 800g.
Identification	**Adults:** dark brown feathers with pale edges, giving a mottled appearance. A dark green and purple section is sometimes visible on the rear of the wing. The dark head has two pale stripes above and below the eye. Can be mistaken for the introduced Mallard (*Anas platyrhynchos*). **Juveniles:** similar to the adults in plumage.	**Adults:** distinctive brown head (darker in males), pale grey body, with a mottled throat and chest. There are two black stripes extending from their shoulder. Only males have a small black mane along the back of the head. **Juveniles:** paler than adult. Underparts are streaked with dark brown. Head and neck are greyish-brown with two white stripes on the face. Bill is paler than in adult male.
Distribution	Throughout most of Australia.	Throughout most of Australia.
Preferred Habitat	Almost any aquatic habitat including creeks, dams, estuaries, ponds, lagoons, and areas of ponded water. Urban parks, gardens, golf courses, and airports are often used.	Grasslands, woodlands, wetlands and a number of grassed urban environments such as airports, golf courses, sports fields, sewage treatment farms and parks.
Food	Insects, molluscs, crustaceans, grass seeds and a variety of aquatic vegetation. They will also scavenge food from people in urban areas.	Mostly grasses and other ground vegetation, but they also eat a range of insects.
Behaviour	Usually observed in small groups or pairs, they will upend when on water to forage for food. Gently sloping banks of wetland areas are often used to forage and rest.	Usually observed in pairs in open grassland areas.
Breeding	Generally occurs between June and December, however can occur outside these times if conditions are favorable. Ten to 12 eggs are laid in the nest that is constructed in tree hollows or in tall, dense ground vegetation.	Occurs from September to November in southern parts of Australia, and is generally responsive to rainfall elsewhere across the continent. Nine to 11 eggs are laid in a nest that is constructed in tree hollows.

Ducks on Airports

The main attractions for ducks at airports include:

Water	Ducks can use any pond, lake, creek, or drainage and retention system. They also take advantage of temporary pools that form after rainfall.
Food	Food items are readily available in grasslands and waterways of airports. The short grassland areas that are commonly maintained on airports provide a safe foraging environment with high predator detection.
Loafing Areas/Shelter	Airports are used to loaf and rest in a low predator-pressure environment. Overnight roosting by ducks on airfields is common.

Duck Management

Active Management

Active bird management involves scaring or removing birds from the airport. There are numerous options available for the task, some of which have limited effect in the long-term due to habituation. The most successful active management programs utilise a combination of tools and techniques, supplemented with passive management options (see next section).

Dispersal	Disperse ducks using: » Pyrotechnics (short and long-range); » Starter pistols; » Stockwhips; and » Vehicles. **Recommendations** **1** Commence dispersal as they arrive. Ducks that have been given the opportunity to settle can be difficult to disperse. **2** Although generally easy to disperse, they may seek shelter in aquatic vegetation if available, therefore repeated dispersal attempts may be required for a single individual to ensure the hazard is managed. **3** Execute a rapid sequence of actions, with multiple tools, to reinforce the dispersal intent. **4** Always remain alert to aircraft movements as dispersal response (i.e. the direction in which the dispersed bird flies) can be unpredictable. Ducks often try to return to the same spot from which they were dispersed and may make a large loop over the airport after a dispersal attempt. **5** Be vigilant to activity, particularly flight activity, during dusk periods. **6** Ducks often use airports to roost, therefore dispersal at night should be undertaken. **7** Dispersal must continue as ducks may return or move to more hazardous locations.
Lethal Control	Occasional lethal control may be required in order to: » Reinforce the effectiveness of non-lethal dispersal equipment; and » Remove immediate and serious hazards. **Recommendations** **1** Make sure you have the appropriate firearm licence and that lethal control permits are valid. **2** Always adhere to good animal welfare practices. **3** Use lethal control only as a last resort management option. **4** Never use lethal control as a primary management tool.
Trained Predators	The use of trained dogs can be employed to disperse ducks. It has been used successfully for many years throughout Europe and North America, and more recently in Australia. Its success is due to the: » Introduction of a real predator into the airport environment; and » Ability to train dogs to chase birds away from critical aircraft movement areas. **Recommendations** **1** Only use specially trained animals with experienced handlers. **2** Always maintain strong situational awareness relative to aircraft movements. **3** Check state permit requirements.

Communicating Hazards	Informing aircrew of hazards, particularly when an acute hazard exists, will help inform their operational decisions (e.g. to delay take-off). Hazard communication can be achieved via: » Direct communication with aircrew; » Direct communication with ATC; » Distribution of Wildlife Hazard Notifications or Bird Watch Condition Reports; » Distribution of wildlife NOTAMs for short-term hazards; » Inclusion of a hazard warning in the ATIS for short-term hazards; and » Inclusion of wildlife hazards in the ERSA for ongoing hazards. Hazard notifications should provide as much detail as possible in order to ensure aircrew are well informed. It is recommended that hazard notifications include: » Species; » Location of the hazard on the airfield; » Height of the hazard; » Time of the hazard; and » Recommended actions.

Passive Management

All bird management strategies should seek to reduce the attractiveness of the airport to ducks, focusing on food, water and shelter availability. An assessment of the airport should be completed by a person qualified and experienced in identifying bird attractions and recommending site-specific modifications.

Reducing the duck attraction to airports may require a combination of passive management strategies.

Water Management	Reduce access to water by: » Diverting watercourses away from critical areas such as runway undershoot areas; » Filling ground depressions that hold water after rain; » Increasing the slope of drain sides (4:1) to reduce the loafing attraction; » Installing underground pipes to eliminate surface drainage channels; » Install netting or wires over waterways to restrict access; and » Placing floatation devices, such as semi-permeable membranes, onto retention ponds to restrict access to water
Habitat Modification	Restrict loafing and foraging areas by: » Maintaining grass lengths up to 300mm as this restricts invertebrate availability as well as reducing predator detection; and » Removing islands in the middle of water bodies and reeds and other aquatic vegetation to eliminate safe refuges for ducks.

Off-airport Duck Management

Off-airport sites contribute to duck strike risk by providing foraging, loafing and roosting sites in close proximity to airports, particularly at and around water sources and especially in public parks where bird feeding occurs. This results in increased numbers at and around airports thereby increasing the probability of a strike. Off-airport management strategies are provided in the Additional Information section.

4 RAPTORS

Nankeen Kestrel
Falco cenchroides

Whistling Kite
Haliastur sphenurus

Brown Falcon
Falco berigora

Wedge-tailed Eagle
Aquila audax

Images provided by and BirdLife Australia
Photographer: Andrew Silcocks

Background

Raptors[4] present a significant strike risk to aircraft because:

- Some species have a relatively large body mass that can result in serious damage to aircraft;
- Their foraging and thermaling behaviours can put them in critical flight paths more often than other birds; and
- As apex predators, raptors do not generally expend energy detecting and avoiding predators as other birds do, which often makes them less aware of approaching aircraft.

Strike History

Raptors were involved in 1,443 strikes in Australia between 2003 and 2014, with 7% of strikes involving more than one individual (i.e. multiple strike), and 7% of strikes resulting in damage to the aircraft. Species-specific strike trends are summarised in the following table[5].

4 A separate Information Sheet has been created for Black Kite
5 data source: Australian aviation wildlife strike statistics 2004 to 2013 (AR-2014-075)

Raptor Strikes (2003 – 2014)

Species	Total Strikes	Multiple Strikes	Damaging Strikes
Unidentified Raptor	711	6%	8%
Nankeen Kestrel	568	4%	1%
Black Kite	308	7%	8%
Unidentified Kite	210	7%	5%
Whistling Kite	93	12%	5%
Brown Falcon	26	0%	8%
Wedge-tailed Eagle	20	5%	10%
Black-shouldered Kite	15	0%	0%
Brahminy Kite	13	0%	8%
Australian Hobby	10	0%	10%
Peregrine Falcon	9	11%	0%
White-bellied Sea-Eagle	9	0%	11%
Swamp Harrier	8	0%	0%
Collared Sparrowhawk	4	0%	0%
Osprey	4	0%	0%
Brown Goshawk	3	33%	0%
Unidentified Goshawk	3	0%	0%
Little Eagle	2	0%	0%
Grey Goshawk	2	0%	0%
Red Goshawk	1	0%	0%

This information sheet describes the ecology and behaviour of the four most struck identified species. Management recommendations provided will assist the management of all raptor species.

Raptor Biology

Name	Nankeen Kestrel	Whistling Kite	Brown Falcon	Wedge-tailed Eagle
Other Name/s	Australian Kestrel, Hoverer, Mosquito Hawk, Sparrowhawk	Whistling Eagle, Sea-Eagle, Carrion Hawk, Eagle Hawk	Brown Hawk	Eaglehawk, Bold Vulture, Mountain Eagle
Size	Length: 30-35cm Wingspan: 60-80cm Weight: 165-185g	Length: 50-60cm Wingspan: 120-145cm Weight: 700-850g	Length: 45-55cm Wingspan: 95-115cm Weight: 630-900g	Length: 81-106cm Wingspan: 182-232cm Weight: 2-5.7kg
Identification	**Adults:** smallest Australian falcon. Distinctive rufous/chestnut plumage on back and upper wings, wing tips charcoal, mostly white underneath with some black flecking. Wings long and narrow, wing tips level with tip of tail when perched. **Juveniles:** similar to adults.	**Adults:** medium-sized raptor with a light-brown head and underparts. The rest of the body is dark-light streaked mottled browns. The underwings show a distinctive pale 'M' shape when open. **Juveniles:** similar to adults but slightly darker above.	**Adults:** light and dark browns, mottled and mottled streaks. Underparts are lighter. The head is red-brown, with black streaks. Beaks are light grey/blue **Juveniles:** similar to adults but with a yellowish colouration on the face, throat and neck.	**Adults:** largest Australian raptor. Dark, long, broad and plank-like wings, long protruding head and distinctive diamond-shaped tail. Large, powerful beak. Mainly sooty-black plumage with some variation in buff to brown plumage around head and inner, upper wings. **Juveniles:** deep chestnut to dark brown plumage with buff flecking mid-wing.
Distribution	Throughout Australia.	Throughout Australia.	Throughout Australia.	Throughout Australia.
Preferred Habitat	Open grasslands and woodlands, croplands and low shrublands.	Open or partially-wooded areas, typically near water. Often observed near farmlands, abattoirs, landfills, etc.	Open grasslands and agricultural areas.	Observed from mountain to coastal environments, in wooded, forested areas, and open areas.
Food	Mice, small birds, reptiles, insects.	They are opportunistic hunters who prefer live food but will scavenge for carrion. Food items include fish, carrion, small birds and a range of reptiles, insects, small mammals and frogs.	Small mammals, insects, reptiles, and occasionally small birds.	Rabbits and hares preferred, and will take large lizards, birds >100gm and mammals >500gm.

Name	Nankeen Kestrel	Whistling Kite	Brown Falcon	Wedge-tailed Eagle
Behaviour	Usually observed individually or in the vicinity of other kestrels. They perch conspicuously and hover into wind while hunting. They are diurnal and are often attracted to fires and plagues of mice.	They use thermals and updrafts to forage and hunt.	Usually observed alone, often observed perching to look for food but will occasionally hover to hunt.	An aerial hunter with extended periods of soaring and thermalling. Prey is usually taken from the ground. They will loaf on the ground and in shallow ponds.
Breeding	Establish nests in tree hollows, caves, and on building ledges. Three to seven eggs are laid in late winter, with multiple broods occurring when conditions are good.	Monogamous pairs establish nests in the forks of trees, usually beside watercourses or water ways. Breeding is opportunistic, although generally extends between July to January in the south, and March to October in the north. Two to three eggs are laid.	Often uses nests constructed by other falcons but can construct their own nests in forks of trees, and occasionally in open tree hollows. Two to six eggs are laid during the breeding season which extends from June to November in the south, and November to April in the north.	Established breeding pairs are residential, with several nesting sites established but only one used per season. Nests are large and conspicuous, and they will roost on the ground when no trees available. The breeding season usually extends from April to September.

Raptors on Airports

The main attractions for raptors at airports are described below.

Water	Airports often provide access to permanent and reliable water sources. These water sources are particularly attractive to raptors in arid and dry environments.
Food	Airports offer ideal foraging opportunity with few visual impediments, particularly in areas of short grass. Animal remains airside (derived from a strike, by lethal control activity or natural causes) attracts scavenging raptors.
Loafing Areas/Shelter	Airports offer ample perching opportunities on fences, buildings and signs.
Transit Routes	For airports that are located in close proximity to raptor attractants such as landfills, abattoirs, agricultural fields etc., regular daily transits to access these sites can cause raptors to cross the airfield and critical aircraft movement areas. Thermals created over sealed areas, such as runways, attract raptors to aircraft flight paths for extended periods.

Raptor Management

Active Management

Active bird management involves scaring or removing birds from the airport. There are numerous options available for the task, some of which have limited effect in the long-term due to habituation. The most successful active management programs utilise a combination of tools and techniques, supplemented with passive management options (see next section).

Dispersal	Disperse raptors using: » Pyrotechnics (short and long-range); » Lights; » Stockwhips; » Presence (get out of vehicle and point at the bird/s and yell at them); and » Vehicles (by driving underneath foraging raptors). **Recommendations** **1** Commence dispersal as raptors arrive. **2** Execute a rapid sequence of actions, with multiple tools, to reinforce the dispersal intent. **3** Always remain alert to aircraft movements when dispersing, as dispersal response (i.e. the direction in which the dispersed bird flies) can be unpredictable.
Lethal Control	Occasional lethal control may be required in order to: » Reinforce the effectiveness of non-lethal dispersal equipment; and » Remove immediate and serious hazards. **Recommendations** **1** Make sure you have the appropriate firearm licence and that lethal control permits are valid. **2** Always adhere to good animal welfare practices. **3** Use lethal control only as a last resort management option. **4** Never use lethal control as a primary management tool.
Nest Management	If nests are located in trees located landside or airside, liaise with local environment authorities to coordinate nest removal and relocation.
Communicating Hazards	Informing aircrew of hazards, particularly when an acute hazard exists, will help inform their operational decisions (e.g. to delay take-off). Hazard communication can be achieved via: » Direct communication with aircrew; » Direct communications with ATC; » Distribution of Wildlife Hazard Notifications or Bird Watch Condition Reports; » Distribution of wildlife NOTAMs for short-term hazards; » Inclusion of a hazard warning in the ATIS for short-term hazards; and » Inclusion of wildlife hazards in the ERSA for ongoing hazards. All hazard notification options should provide as much detail as possible, including: » Species; » Location of the hazard on the airfield; » Height of the hazard; » Time of the hazard; and » Recommended actions.

Passive Management

All bird management strategies should seek to reduce the attractiveness of the airport to raptors, focusing on food, water and shelter availability. An assessment of the airport should be completed by a person qualified and experienced in identifying bird attractions and recommending site-specific modifications.

Reducing the raptor attraction to airports may require a combination of passive management strategies.

Food Management	Remove availability of food items by: » Collecting and disposing of all animal remains located airside or landside; » Ensuring rubbish bins do not overflow and are regularly emptied; and » Ensuring vertebrate pest management programs are in place in areas where rodents and rabbit/hares may be present.
Perch Management	Remove all unnecessary signs, fences and posts where raptors are known to perch, and install anti-perching spikes on structures that cannot be removed (e.g. lights).
Monitoring Transit Paths	Raptors regularly transit through aircraft flight paths en route to feeding areas and at times remain in critical areas due to the availability of food and thermals at airports. Short-term management options may include: » Implementing a regular and standardised monitoring program; » Identifying raptor movement trends (i.e. time of day, time of year, height of transit); and » Communicating identified hazards to airlines and aircraft operators. Long-term management options may include: » Encouraging airlines to reschedule flights if discreet trends are identified.

Off-airport Raptor Management

Off-airport sites predominantly contribute to raptor strike risk by providing foraging sites in close proximity to airports such as landfills, abattoirs, piggeries, and areas where roadkill or fires may be present. This results in increased numbers at and around airports thereby increasing the probability of a strike. Off-airport management strategies are provided in the Additional Information section.

5 IBIS

Ibis
Threskiornis Molucca

Image provided by BirdLife Australia
Photographer: Andrew Silcocks

Background

Australian White Ibis and Straw-necked Ibis present a significant strike risk to aircraft because:

- Their flocking behaviour often results in multiple strike incidents;
- Strikes involving ibis have a higher potential for damage because of their high body mass; and
- The urbanisation of ibis, particularly Australian White Ibis, often creates significant colonies in close proximity to airports.

Strike History

Collectively, Australian White Ibis and Straw-necked Ibis were involved in 135 strikes in Australia between 2003 and 2014. Of these, 11% of strikes involved more than one individual (i.e. multiple strike), and 15% of strikes resulted in damage to the aircraft[6].

6 data source: Australian aviation wildlife strike statistics 2004 to 2013 (AR-2014-075)

Ibis Biology

Name	Australian White Ibis	Straw-necked Ibis
Other Name/s	Sacred Ibis, White Ibis.	Farmers Friend, Dry-weather bird, Black-backed Ibis.
Size	Length: 70cm Wingspan: 118cm Weight: 1.7-2.5kg (male) / 1.4-1.9kg (female)	Length: 70cm Wingspan: 110cm Weight: 1.1-1.5kg
Identification	**Adults:** white neck and body, with black at the tip of the tail feathers. The black head is bare, and the long black bill curves downward. When breeding, the back of the head and underwings show pink/red skin. **Juveniles:** similar to adults but with a shorter straighter bill and a feathered neck and back of the head.	**Adults:** white underneath, with iridescent black-brown-green-purple on the upperparts. The head and long downward curved bill is black, with yellowish straw-like feathers down the front of the neck. **Juveniles:** similar to adults but with a shorter straighter bill and a feathered head. The neck feathers are white, and they lack the iridescence on the upperparts.
Distribution	Widespread throughout eastern Australia, across northern coastal regions, and in the south-western corner of West Australia.	Widespread throughout the continent excluding the central arid regions, and southern Tasmania.
Preferred Habitat	They are naturally distributed throughout sheltered marine areas and terrestrial wetland systems. However, their adaptability allows them to inhabit a range of urban environments including airports, sports fields, parks, and landfills.	They prefer open grasslands, and are commonly observed in pastures and farmland. Although less observed in urban environments than Australian White Ibis, they are seen at airports, parks, sports fields, and landfills.
Food	Although they have a preference for small aquatic animals such as fish, frogs and invertebrates, their diet is highly adaptable and they will consume any organic matter from any food source, including landfills and rubbish bins.	They consume a wide range of small animals and invertebrates, including freshwater crayfish, frogs, fish, insects and snails.
Behaviour	They are highly sociable birds that often forage in groups and nest in large communal roosts. Breeding colonies can comprise thousands of individuals. They tend to repeatedly use the same habitats to feed and roost. As ground foragers, they only use trees to roost, nest and seek refuge.	They will feed and roost in large groups. Breeding colonies can comprise thousands of individuals. They are seasonal migrants and are generally responsive to rainfall.
Breeding	The breeding season usually extends between June and January, but variations occur in different parts of Australia. Up to four eggs are laid in a stick nest that is established on branches, in vines, palms, or on the ground if protected from predators and humans.	Breeding occurs in response to rainfall and occurs in wetlands on islands and flattened reed beds. Up to five eggs are laid.

Ibis on Airports

The main attractions for ibis at airports are described below.

Grass	Short grass on airports provides an ideal environment for Ibis. Short grass not only allows easy access to food, but provides the birds with greatly enhanced predator detection.
Food	Invertebrates are readily consumed, particularly after rainfall when waterlogged soils make these prey items more accessible, and following grass mowing events.
Loafing Areas/Shelter	Airports are used to loaf and rest in a low predator-environment.
Transit Routes	Ibis can fly over airports that are located between their foraging sites and roosts, potentially conflicting with aircraft flight paths. **Case study involving Austrailan White Ibis strike at Gold Coast key points:** » Christmas Eve 1995, a Qantas Airbus ingested an ibis. » Estimates of $8 million (engine replacement, downtime and the cost of changing schedules). » An Australian White Ibis breeding site located under the flight path less than 4km from the airport supported more than 3000 ibis (largest for the region) and a key feeding site less than 20km south of airport (birds were transiting to and from each day). » A multi-stakeholder management group was created (airport and others) and an Australian White Ibis program implemented. Program included food reduction, breeding restriction, and public education. » The regions population, has been maintained at around half the peak and Ibis counts at the airport declined 75%.

Ibis Management

Active Management

Active bird management involves scaring or removing birds from the airport. There are numerous options available for the task, some of which have limited effect in the long-term due to habituation. The most successful active management programs utilise a combination of tools and techniques, supplemented with passive management options (see next section).

Dispersal	Ibis are generally wary of humans and vehicles, and attempting to disperse them too aggressively may result one or more Ibis flying irrationally and not in the direction you intend. Dispersing a flock aggressively may result in the flock splintering with individuals and smaller groups flying in several directions. Approach Ibis gradually, stopping at intervals when the Ibis is alert and moving again when the Ibis forages. This technique is called the stalk and chase method and mimics a natural predator, with the Ibis eventually dispersing when it feels it is under threat. Disperse Ibis using: » The stalk and chase method; » Pyrotechnics (short and long-range); » Portable distress callers; » Sirens; » Lights; » Stockwhips; » Starter pistols; » Arm wave; » Lasers; and » Vehicles. **Recommendations** **1** Commence dispersal as soon as detected, particularly early in the breeding season when site fidelity may be lower. **2** Repeated dispersal attempts may be required for a single individual to ensure the hazard is managed. **3** Execute a rapid sequence of actions, with multiple tools, to reinforce the dispersal intent. **4** Always remain alert to aircraft movements when dispersing, dispersal response (i.e. the direction in which the dispersed bird flies) can be unpredictable.
Lethal Control	Occasional lethal control may be required in order to: » Reinforce the effectiveness of non-lethal dispersal equipment; and » Remove immediate and serious hazards. **Recommendations** **1** Make sure you have the appropriate firearm licence and that lethal control permits are valid. **2** Always adhere to good animal welfare practices. **3** Use lethal control only as a last resort management option. **4** Never use lethal control as a primary management tool.

Communicating Hazards	Informing aircrew of hazards, particularly when an acute hazard exists, will help inform their operational decisions (e.g. to delay take-off). Hazard communication can be achieved via: » Direct communication with aircrew; » Direct communication with ATC; » Distribution of Wildlife Hazard Notifications or Bird Watch Condition Reports » Distribution of wildlife NOTAMs for short-term hazards » Inclusion of a hazard warning in the ATIS for short-term hazards » Inclusion of wildlife hazards in the ERSA for ongoing hazards Hazard notifications should provide as much detail as possible in order to ensure aircrew are well informed. It is recommended that hazard notifications include: » Species; » Location of the hazard on the airfield; » Height of the hazard; » Time of the hazard; and » Recommended actions.

Passive Management

All bird management strategies should seek to reduce the attractiveness of the airport to Ibis, focusing on food, water and shelter availability. An assessment of the airport should be completed by a person qualified and experienced in identifying bird attractions and recommending site-specific modifications.

Reducing the ibis attraction to airports may require a combination of passive management strategies.

Grass Management	Maintaining grass heights between 150 and 300mm to deter birds at airports has been implemented successfully all over the world. Long grass is effective because: » It compromises the ability of the birds to detect predators, particularly while foraging; and » Accessing prey items at the surface of the soil is more difficult. **Recommendations** **1** Trial various grass heights as not all grasses can grow to a sufficient length, and not all airports can grow dense swards of grass. A trial will help establish airport-specific options. **2** Monitor the change of bird species composition as grass heights increase to not only assess the impact of grassland birds, such as ibis, but also to determine if a different hazard is created. For example, in northern Australia, Magpie Geese have a preference for long grass for establishing nests. **3** Ensure airport markers and navigational devices are not obscured by longer grass. **4** Consider options other than grass where airports are located in sandy or low-nutrient soils.

	The physical action of grass mowing disturbs and kills insects. Airports often observe birds, such as Ibis, following mowers to take advantage of enhanced foraging opportunity. This can increase the strike risk, particularly in grassed areas close to critical aircraft movement areas. Mowing should be timed to ensure grass seed heads are regularly removed. Allowing grasses to seed can create additional hazards associated with granivorous birds and rodents. **Recommendations** **1** Ensure mowing equipment is capable of cutting grass as the desired heights. **2** Mow areas adjacent to critical aircraft movement areas outside of peak aircraft movement times. Consider mowing at night. **3** Do not allow grass to go to seed.
Water Management	Reduce access to water by: » Diverting watercourses away from critical areas such as runway undershoot areas; » Filling ground depressions that hold water after rain; and » Increasing the slope of drain sides (4:1) to reduce the loafing attraction.
Food Management	Limit access to food by: » Ensuring bins are enclosed and emptied regularly; » Ensuring rubbish skips are kept closed at all times; and » Mowing at night to limit the availability of invertebrates.
Habitat Modification	Restrict loafing areas by: » Maintaining grass lengths up to 300mm, this restricts invertebrate access as well as reducing predator detection; and » Removing islands in the middle of water bodies to eliminate safe refuges for ibis to retreat.
Monitoring Transit Paths	Australian White Ibis transiting aircraft flight paths and movement areas en route to feeding and roosting areas can present a serious strike risk. Short-term management options may include: » Implementing a regular and standardised monitoring program; » Identifying Ibis movement trends (i.e. time of day, time of year, height of transit); and » Communicating identified hazards to airlines and aircraft operators. Long-term management options may include: » Encouraging airlines to reschedule flights if discreet trends are identified.

Off-airport Ibis Management

Off-airport sites contribute to Ibis strike risk by providing foraging, nesting and roosting sites in close proximity to airports such as landfills, seafood processing facilities, designated fish cleaning stations, waste transfer stations, public feeding areas, parks, sports fields and sewage and water treatment plants. This results in increased numbers at and around airports thereby increasing the probability of a strike. Off-airport management strategies are provided in the Additional Information section.

6 GALAH

Galah
Eolophus roseicapilla

Image provided by BirdLife Australia
Photographer: Andrew Silcocks

Background

Despite their relatively small size, Galahs present a significant strike risk to aircraft because:

- They flock and are often involved in multiple strike incidents;
- Their flight can be unpredictable;
- They can congregate in very large numbers particularly where there are abundant food sources; and
- Their preference for foraging on short grass makes many airports attractive.

Strike History

Galahs were involved in 826 strikes in Australia between 2003 and 2014, with 37% of strikes involving more than one individual (i.e. multiple strike) and 6% of strikes resulting in damage to the aircraft[7].

7 data source: Australian aviation wildlife strike statistics 2004 to 2013 (AR-2014-075)

Galah Biology

Other Names	Rose-breasted Cockatoo, Pink Cockatoo, Grey Cockatoo
Size	Length 34-38cm; wingspan 75cm; weight 330g.
Identification	**Adults:** pink and white with grey wings and tail. The head crest is white. The male eye is brown, and the female eye is red. **Juveniles:** similar to adults but with greyish chest, and a grey eye-ring.
Distribution	Widespread throughout Australia excluding dense forested areas and desert regions.
Preferred Habitat	They have a preference for open areas with access to food and water. In urban areas they are often observed along roadsides and watercourses, on sports fields, golf courses, airports and other short-grassed areas. They can flock in large numbers in agricultural areas where there is access to grains and other crops and in arid areas near water sources.
Food	They are ground foragers that generally feed on seeds, but will consume a variety of organic material.
Behaviour	Galahs are gregarious and social, usually transiting, foraging and roosting in large groups. Flight can be erratic when they are disturbed. Adults tend to remain in the same territory, but young individuals tend to roam.
Breeding	Occurs between July and December in southern Australia, and February to June in the north. Tree hollows are used for nests, and up to five eggs are laid.

Galahs on Airports

The main attractions for Galahs at airports are detailed below.

Water	Airports often provide access to permanent and reliable water sources. These water sources are particularly attractive to Galahs in arid and dry environments.
Food	Grasslands on airports provide ideal forage with an abundance of seeds, particularly on airports where grass height is maintained short (less than 200mm).
Loafing Areas/Shelter	Airports are used to loaf and rest in a low predator-pressure environment. Airports also offer ample perching opportunities on fences, buildings and signs.
Transit Routes	For airports that are located in close proximity to Galah attractants such as sports fields, pastures, grain silos etc., Galahs may regularly transit operational airspace to access these sites.

Galah Management

Active Management

Active bird management involves scaring or removing birds from the airport. There are numerous options available for the task, some of which have limited effect in the long-term due to habituation. The most successful active management programs utilise a combination of tools and techniques, supplemented with passive management options (see next section).

Galah active management options can include:

Dispersal	Disperse Galahs using: » Pyrotechnics (short and long-range); » Lights; » Stockwhips; » Starter pistols; » Arm wave; » Lasers; » In-vehicle radio with speakers (generate crackling sounds using the radio); and » Vehicles. **Recommendations:** **1** Commence dispersal as they arrive. Galahs that have been given the opportunity to settle can be difficult to disperse. **2** Execute a rapid sequence of actions, with multiple tools, to reinforce the dispersal intent. **3** Always remain alert to aircraft movements as dispersal response (i.e. the direction in which the dispersed bird flies) can be unpredictable.
Lethal Control	Occasional lethal control may be required in order to: » Reinforce the effectiveness of non-lethal dispersal equipment; and » Remove immediate and serious hazards. **Recommendation** **1** Make sure you have the appropriate firearm licence and that lethal control permits are valid. **2** Always adhere to good animal welfare practices. **3** Use lethal control only as a last resort management option. **4** Never use lethal control as a primary management tool. **5** Where flocks of Galahs are present, lethal control an individual who interacts least with the other Galahs as it is less likely to be mated. Mated Galahs often remain with their deceased mates and may result in an increased strike risk. **6** Conduct necropsy to determine which plants are attracting Galahs to the airport.
Trained Predators	The use of trained dogs can be employed to disperse Galahs. It has been used successfully for many years throughout Europe and North America, and more recently in Australia. Its success is due to: » The introduction of a real predator into the airport environment; and » The ability to train dogs to chase birds away from critical aircraft movement areas. **Recommendations** **1** Only use specially trained animals with experienced handlers. **2** Always maintain strong situational awareness relative to aircraft movements. **3** Check state permit requirements.

Communicating Hazards	Informing aircrew of hazards, particularly when an acute hazard exists, will help inform their operational decisions (e.g. to delay take-off). Hazard communication can be achieved via: » Direct communication with aircrew; » Direct communication with ATC; » Distribution of Wildlife Hazard Notifications or Bird Watch Condition Reports; » Distribution of wildlife NOTAMs for short-term hazards; » Inclusion of a hazard warning in the ATIS for short-term hazards; and » Inclusion of wildlife hazards in the ERSA for ongoing hazards. All hazard notification options should provide as much detail as possible, including: » Species; » Location of the hazard on the airfield; » Height of the hazard; » Time of the hazard; and » Recommended actions.

Galah Management

Passive Management

All bird management strategies should seek to reduce the attractiveness of the airport to Galahs, focusing on food, water and shelter availability. An assessment of the airport should be completed by a person qualified and experienced in identifying bird attractions and recommending site-specific modifications.

Reducing the Galah attraction to airports may require a combination of passive management strategies.

Long Grass	Maintain grass heights between 150 and 300mm. This strategy has been implemented successfully at airports all over the world. Long grass is effective because: » It compromises the ability of the birds to detect predators, particularly while foraging; and » Accessing prey items at the surface the soil is more difficult. **Recommendations** **1** Trial grass heights. Not all grasses can grow to a sufficient length, and not all airports can grow dense swards of grass. A trial will help establish airport-specific options. **2** Monitoring the change of bird species composition as grass heights increase is important to not only assess the impact on grassland birds, such as Galahs, but to determine if a different hazard is created. For example, in northern Australia, Magpie Geese have a preference for long grass for establishing nests. **3** Ensure airport markers and navigational devices are not obscured by longer grass. **4** Consider options other than grass where airports are located in sandy or low-nutrient soils.
Water Management	Reduce access to water by: » Increasing the slope of drain sides (4:1) to reduce the ability of Galahs to access the water from the drain's edge; and » Removing any unnecessary water, including the repair of leaking taps and other leaking water devices.

Monitoring Transit Paths	Galahs transiting aircraft flight paths and movement areas en route to feeding areas can present a serious strike risk. Short-term management options may include: » Implementing a regular and standardised monitoring program; » Identifying Galah movement trends (i.e. time of day, time of year, height of transit); and » Communicating identified hazards to airlines and aircraft operators. Long-term management options may include: » Encouraging airlines to reschedule flights if discreet trends are identified.

Off-airport Galah Management

Off-airport sites contribute to Galah strike risk by providing foraging and roosting sites in close proximity to airports such as sports fields, pastures and other agricultural fields, grain storage and handling facilities and golf courses. This results in increased numbers at and around airports thereby increasing the probability of a strike. Off-airport management strategies are provided in the Additional Information section.

7 AUSTRALIAN MAGPIE

Australian Magpie
Cracticus tibicen

Image provided by and BirdLife Australia
Photographer: Andrew Silcocks

Background

Despite their relatively small size, Australian Magpies present a significant strike risk to aircraft because:

- They can establish feeding territories on airports if left undisturbed;
- They aggressively defend breeding territories on airfields;
- They can congregate in foraging flocks on airports where the grass is short and food items are abundant; and
- New individuals to the airport, particularly juveniles, have poor avoidance of aircraft due to their inexperience and naivety.

Strike History

Australian Magpies were involved in 548 strikes in Australia between 2003 and 2014, with 6% of strikes involving more than one individual (i.e. multiple strike), and 4% of strikes resulting in damage to the aircraft[8].

8 data source: Australian aviation wildlife strike statistics 2004 to 2013 (AR-2014-075)

Australian Magpie Biology

Other Names	Black-backed Magpie, Australasian Magpie, White-backed Magpie.
Size	Length 38-44cm; wingspan 22-30cm; weight 200-390g.
Identification	**Adults:** black and white bird, whose patterns vary with sub-species. The bill is greyish with a pointed black tip. **Juveniles:** colouration is duller and mottled, and the grey bill is shorter.
Distribution	Throughout Australia, excluding the arid regions of West Australia, the northern regions of the Northern Territory, and parts of Cape York.
Preferred Habitat	Open areas with tall trees. In urban areas they are commonly observed on airports, sports fields, golf courses, and in orchards, parks and gardens.
Food	Primarily insects, of which they consume a wide variety, occasionally seeds and meat.
Behaviour	Outside their breeding season they are generally observed in small groups, with pairs establishing breeding territories of which they aggressively defend against any intruder. The aggressive behavior is most intense between September and October when the nest is full of eggs or chicks.
Breeding	Usually commences in June and finishes in December. Up to three eggs are laid in a nest made of sticks and grass and positioned in tree forks up to 15m above the ground.

Australian Magpie on Airports

The main attractions for Australian Magpie at airports are detailed below.

Grass	Short grass on airports provides an ideal environment for magpies. Short grass not only provides easy access to food, but provides the birds with greatly enhanced predator detection.
Water	Airports often provide access to permanent and reliable water sources.
Food	Invertebrates are readily consumed, particularly after rainfall when waterlogged soils make these prey items more accessible, and following grass mowing events.
Loafing Areas/Shelter	Airports are used to loaf and rest in a low predator-environment.

Australian Magpie Management

Active Management

Active bird management involves scaring or removing birds from the airport. There are numerous options available for the task, some of which have limited effect in the long-term due to habituation. The most successful active management programs utilise a combination of tools and techniques, supplemented with passive management options (see next section).

Dispersal	Disperse magpies using: » Pyrotechnics (short and long-range); » Portable distress callers; » Sirens; » Lights; » Stockwhip; » Starter pistols; and » Vehicles. **Recommendations** **1** Commence dispersal as they arrive in a critical area of the airfield or upon arrival of new magpies to the airport. Magpies that have been given the opportunity to settle can be difficult to disperse. **2** Execute a rapid sequence of actions, with multiple tools, to reinforce the dispersal intent. Once magpies have established territories, they can be very difficult to disperse, requiring persistence and patience. **3** Always remain alert to aircraft movements when dispersing, dispersal response (i.e. the direction in which the dispersed bird flies) can be unpredictable.
Lethal Control	Occasional lethal control may be required in order to: » Reinforce the effectiveness of non-lethal dispersal equipment; and » Remove immediate and serious hazards. **Recommendation** **1** Do not lethal control all magpies as resident populations are often aware of aircraft hazards and can quickly learn where you allow them to forage based on your dispersal attempts. Lethal control all magpies will result in new magpies coming to the airfield which can increase the risk of magpie strike. **2** Make sure appropriate firearm licence and lethal control permits are valid. **3** Always adhere to good animal welfare practices. **4** Target juvenile magpies or stubborn individuals that do not respond to dispersal techniques. **5** Use lethal control only as a last resort management option. **6** Never use lethal control as a primary management tool.

Trained Predators	The use of trained dogs can be employed to disperse magpies. It has been used successfully for many years throughout Europe and North America, and more recently in Australia. Its success is due to: » The introduction of a real predator into the airport environment; and » The ability to train dogs to chase birds away from critical aircraft movement areas. **Recommendations** **1** Only use specially trained dogs with experienced handlers. **2** Always maintain strong situational awareness relative to aircraft movements. **3** Check state/territory permit requirements.

Passive Management

All bird management strategies should seek to reduce the attractiveness of the airport to the Australian Magpie, focusing on food, water and shelter availability. An assessment of the airport should be completed by a person qualified and experienced in identifying bird attractions and recommending site-specific modifications.

Reducing the Australian Magpie attraction to airports may require a combination of passive management strategies.

Long Grass	Maintaining grass heights between 150 and 300mm to deter birds at airports has been implemented successfully all over the world. Long grass is effective because: » It compromises the ability of the birds to detect predators, particularly while foraging; and » Accessing prey items at the surface of the soil is more difficult. **Recommendations** **1** Trial grass heights as not all grasses can grow to a sufficient length, and not all airports can grow dense swards of grass. A trial will help establish airport- specific options. **2** Monitor the change of bird species composition as grass heights increase to not only assess the impact on grassland birds, such as magpies, but also to determine if a different hazard is created. For example, in northern Australia Magpie Geese have a preference for long grass for establishing nests. **3** Ensure airport markers and navigational devices are not obscured by longer grass. **4** Consider options other than grass where airports are located in sandy or low-nutrient soils.
Nest Management	Reduce the possibility of magpies establishing breeding territories on-airport by: » Regularly monitoring airside trees and infrastructure for nests; and » In consultation and corporation with local or state environment bodies, remove nests.
Food Management	Reduce access to food by mowing at night to limit the availability of invertebrates.
Habitat Modification	Restrict loafing areas by: » Maintaining grass lengths up to 300mm, this restricts invertebrate access as well as reducing predator detection; and » Installing anti-perching spikes, wires or netting on buildings and other infrastructure where magpies are known to perch.

Off-airport Australian Magpie Management

Off-airport sites contribute to magpie strike risk by providing foraging sites in close proximity to airports such as sports fields, pastures and other agricultural sites, golf courses and parks and gardens. This results in increased numbers at and around airports thereby increasing the probability of a strike. Off-airport management strategies are provided in the Additional Information section.

8 FERAL PIGEON

Feral Pigeon
Columba livia

Image provided by BirdLife Australia
Photographer: Andrew Silcocks

Background

Despite their relatively small size, Feral Pigeons present a significant strike risk to aircraft because:

- Their flocking behaviour often results in multiple strike incidents;
- Their flight can be unpredictable; and
- They can congregate in very large numbers, particularly where there are abundant food sources.

Strike History

Feral Pigeons were involved in 183 strikes[9] in Australia between 2003 and 2014, with 27% of strikes involving more than one individual (i.e. multiple strike), and 4% of strikes resulting in damage to the aircraft. Although other pigeon and dove species, such as the Crested Pigeon and Spotted Turtle Dove have been involved in strikes, Feral Pigeons account for 92% of all pigeon and dove strikes in Australia[10].

9 Includes strike reports that where 'unidentified pigeon' was identified

10 data source: Australian aviation wildlife strike statistics 2004 to 2013 (AR-2014-075)

Feral Pigeon Biology

Other Names	Rock Dove, Domestic Pigeon, Homing Pigeon.
Size	Length: 31-34cm; wingspan: 63-70cm; weight: 308g.
Identification	**Adults:** there are many colour variations that include various forms of grey, white, black, red, brown, blue and green. However, Australian populations tend to be mostly blue-grey with and green-purple metallic sheen on the neck. The under-wing and rump is white, and there is a light blue-grey coloration on the upper wing. **Juveniles:** similar to adults, however the colour is generally duller, and the metallic sheen is undeveloped.
Distribution	Throughout Australia, concentrated in urban areas.
Preferred Habitat	In natural habitats, they prefer coastal cliffs, however in urban environments they use structures that emulate cliff environments including various types of buildings and bridges, as well as hangars and other airport infrastructure.
Food	Seeds from various plants, as well as organic food waste.
Behaviour	They are usually observed in flocks perching and foraging in urban environments.
Breeding	Nests are created throughout their distribution on buildings and under bridges. Two eggs are generally laid, and time of breeding varies considerably.

Feral Pigeon on Airports

The main attractions for Feral Pigeon at airports are detailed below.

Water	Airports often provide access to permanent and reliable water sources. These water sources are particularly attractive to pigeons in arid and dry environments.
Food	Grasslands on airport provide ideal forage with an abundance of seeds, particularly on airports where grass height is maintained short (less than 200mm).
Loafing Areas/Shelter	Airports are used to loaf and rest in a low predator-environment. Airports also offer ample perching opportunities on fences, buildings and signs. Overnight roosts are often established in airport infrastructure such as hangars, terminal buildings and lighting structures.
Transit Routes	For airports that are located in close proximity to pigeon attractants such as sports fields, pastures and grain silos, regular daily transits to access these sites can see large flocks crossing the airfield and critical aircraft movement areas.

Feral Pigeon Management

Active Management

Active bird management involves scaring or removing birds from the airport. There are numerous options available for the task, some of which have limited effect in the long-term due to habituation. The most successful active management programs utilise a combination of tools and techniques, supplemented with passive management options (see next section).

Dispersal	Disperse pigeons using: » Pyrotechnics (short and long-range); » Starter pistols; » Sirens; » Lights; » Lasers; and » Stockwhips. **Recommendations** **1** Commence dispersal as they arrive. Pigeons that have been given the opportunity to settle can be difficult to disperse. **2** Execute a rapid sequence of actions, with multiple tools, to reinforce the dispersal intent. **3** Always remain alert to aircraft movements when dispersing, dispersal response (i.e. the direction in which the dispersed bird flies) can be unpredictable.
Lethal Control	Occasional lethal control may be required in order to: » Reinforce the effectiveness of non-lethal dispersal equipment; » Remove immediate and serious hazards; and » Reduce the resident population/s of pigeons to a nominated threshold. **Recommendations** **1** Make sure you have the appropriate firearm licence and that lethal control permits are valid. **2** Always adhere to good animal welfare practices. **3** Use lethal control only as a last resort management option. **4** Never use lethal control as a primary management tool.
Trained Predators	The use of trained dogs can be employed to disperse pigeons. It has been used successfully for many years throughout Europe and North America, and more recently in Australia. Its success is due to: » The introduction of a real predator into the airport environment; and » The ability to train dogs to chase birds away from critical aircraft movement areas. **Recommendations** **1** Only use specially trained animals with experienced handlers. **2** Always maintain strong situational awareness relative to aircraft movements. **3** Check state/territory permit requirements.

Communicating Hazards	Informing aircrew of hazards, particularly when an acute hazard exists, will help inform their operational decisions (e.g. to delay take-off). Hazard communication can be achieved via: » Direct communication with aircrew; » Direct communication with ATC; » Distribution of Wildlife Hazard Notifications or Bird Watch Condition Reports; » Distribution of wildlife NOTAMs for short-term hazards; » Inclusion of a hazard warning in the ATIS for short-term hazards; and » Inclusion of wildlife hazards in the ERSA for ongoing hazards. » Communication with local racing pigeon organisations All hazard notification options should provide as much detail as possible, including: » Species; » Location of the hazard on the airfield; » Height of the hazard; » Time of the hazard; and » Recommended actions.

Passive Management

All bird management strategies should seek to reduce the attractiveness of the airport to Feral Pigeon, focusing on food, water and shelter availability. An assessment of the airport should be completed by a person qualified and experienced in identifying bird attractions and recommending site-specific modifications.

Reducing the Feral Pigeon attraction to airports may require a combination of passive management strategies.

Long Grass	Maintaining grass heights between 150 and 300mm to deter birds at airports has been implemented successfully all over the world. Long grass is effective because: » It compromises the ability of the birds to detect predators, particularly while foraging; and » Accessing seeds at the surface of the soil is more difficult. **Recommendations** **1** Trial various grass heights as not all grasses can grow to a sufficient length, and not all airports can grow dense swards of grass. A trial will help establish airport-specific options. **2** Monitor the change of bird species composition as grass heights increase to not only assess the impact on grassland birds, such as pigeons, but also to determine if a different hazard is created. For example, in northern Australia, Magpie Geese have a preference for long grass for establishing nests. **3** Ensure airport markers and navigational devices are not obscured by longer grass. **4** Consider options other than grass where airports are located in sandy or low-nutrient soils. **5** Make sure seed heads are regularly removed. **6** In areas that require grass re-establishment (i.e. following airside ground works), consider netting the area to restrict access by pigeons, or increase the level of active dispersal until the grass has established.

Built Environment Modification	Airport facilities and structures can provide ideal perching, nesting and roosting habitat for pigeons, especially in and around hangars and infrequently used airside building. Pigeons can be deterred or excluded from such habitats by: » Installing pigeon exclusion devices such as netting and spikes; and » Ensuring all hangar doors are closed and hangars sealed when not required to be open to prevent pigeon access.
Water Management	Reduce access to water by: » Eliminating access to artificial water sources such as fountains; and » Remove any unnecessary water, including the repair of leaking taps and other leaking water devices.
Monitoring Transit Paths	Pigeons transiting aircraft flight paths and movement areas en route to feeding areas can present a serious strike risk. Short-term management options may include: » Implementing a regular and standardised monitoring program; » Identifying pigeon movement trends (i.e. time of day, time of year, height of transit); and » Communicating identified hazards to airlines and aircraft operators. Long-term management options may include: » Communicating strike risk to pigeon racing groups in the vicinity of airports; and » Encouraging airlines to reschedule flights if discreet trends are identified.

Off-airport Feral Pigeon Management

Off-airport sites contribute to pigeon strike risk by providing foraging, nesting and roosting sites in close proximity to airports. Known pigeon foraging attractants include sports fields, pastures and other agricultural fields, and grain storage and handling facilities, while buildings such as hangars, warehouses and factories may provide nesting and roosting habitat. This results in increased numbers at and around airports thereby increasing the probability of a strike. Feral Pigeons have a long history of being kept and released for sport. Flocks of between 50 and 100, and sometimes more, have been recorded transiting operational airspace at airports around Australia. This is usually observed when the release and destination sites are on either side of an airport. Effective management of the racing pigeon strike risk requires consultation amongst the pigeon keepers, local councils and the airport. Off-airport management strategies are provided in the Additional Information section.

9 FLYING-FOXES

Flying-foxes
Pteropus species

Photographer: Chris Tzaros from Birds Bush and Beyond.

Background

Flying-foxes, also known as fruit bats, present a significant strike risk to aircraft because they:

- Can transit over airports in groups of hundreds or thousands of individuals;
- Have a relatively high body mass for their size;
- Are nocturnal, making visual detection by aircrew and airport safety personnel difficult; and
- Are generally unresponsive to conventional active dispersal tools.

Strike History

Flying-foxes were involved in 923 strikes in Australia between 2003 and 2014, with 8% of strikes involving more than one individual (i.e. multiple strike), and 6% of strikes resulting in damage to the aircraft. Grey-headed Flying-fox was identified in less than 1% of incidents, with all remaining incidents reported as *unidentified flying-fox*[11].

11 data source: Australian aviation wildlife strike statistics 2004 to 2013 (AR-2014-075)

Flying-fox Biology

Name	Grey-headed Flying-fox	Black Flying-fox	Spectacled Flying-fox	Little Red Flying-fox
Other Names	Fruit Bat	Fruit Bat	Fruit Bat	Little Fruit Bat
Size	Length: 23-28cm Wingspan: 1m or greater Weight: 600-1000g	Length: 23-28cm Wingspan: 1m or greater Weight: 500-1000g	Length: 22-24cm Wingspan: 1m or greater Weight: 400-1000g	Length: 12-20cm Wingspan: up to 1m Weight: 280-530g
Identification	**Adults:** distinctive orange fur that encircles the neck. Rest of body is greyish, with a light grey head. Legs are furred. **Juveniles:** similar to adults.	**Adults:** black colouration all over, with a chocolate-brown colour on the back of the neck. Legs are unfurred. **Juveniles:** similar to adults.	**Adults:** distinctive straw-colored fur around the eye, giving the 'spectacled' appearance. The rest of the body is dark, with a light colouration around the shoulders and neck. **Juveniles:** similar to adults.	**Adults:** smallest of all four species. Colouration is reddish-brown, and the brown wings are semi-transparent. Legs are unfurred. **Juveniles:** similar to adults.
Distribution	Throughout eastern Australia including Victoria, New South Wales and southern Queensland.	Throughout northern and eastern Australia.	Restricted to particular regions of north Queensland and Papua New Guinea.	Most widely distributed flying-fox from Shark Bay in Western Australia around the northern coast of Australia, Qeensand, and New South Wales until northern Victoria. Highly nomadic in response to resource availability.
Preferred Habitat	Varied, including rainforest, mangroves, swamps, wet and dry sclerophyll forests and cultivated areas.	Tropical and subtropical forests and woodlands.	Rainforests, mangroves, paperbark forests.	Wide range from semi-arid areas to tropical rainforests, temperate forests and swamps.
Food	Nectar and fruit.	Nectar and fruit.	Nectar and fruit.	Nectar and fruit.
Behaviour	Departs roost site (camp) at dusk to forage. Returning at any time prior to dawn.	Departs roost site (camp) at dusk to forage. Returning at any time prior to dawn.	Departs roost site (camp) at dusk to forage. Returning at any time prior to dawn.	Departs roost site (camp) at dusk to forage. Returning at any time prior to dawn.
Breeding	Mating occurs January to March. Young are born September to October.	Mating occurs March to April. Young are born December to February.	Mating occurs March to May. Young are born October to December.	Mating occurs November to January. Young are born April to May.

Flying-fox on Airports

Airports have habitats that attracts flying-foxes, particularly natural areas and landscapes. The risk however, is usally related to flying-foxes transiting airport airspace and aircraft flight paths whilst en route to and from foraging and roosting grounds. The existence of fruiting and flowering trees on airports, either airside or landside, can result in the presence of flying-foxes on airports during night time.

Flying-fox Management

Active Management

Successful flying-fox management requires a focus on detecting the hazard and communicating the details to all stakeholders.

Communicating Hazards	Informing aircrew of hazards, particularly when an acute hazard exists, will help inform their operational decisions (e.g. to delay take-off). Hazard communication can be achieved via: » Direct communication with aircrew; » Direct communication with ATC; » Distribution of Wildlife Hazard Notifications or Bird Watch Condition Reports; » Distribution of wildlife NOTAMs for short-term hazards; » Inclusion of a hazard warning in the ATIS for short-term hazards; and » Inclusion of wildlife hazards in the ERSA for ongoing hazards. All hazard notification options should provide as much detail as possible, including: » Species; » Location of the hazard on the airfield; » Height of the hazard; » Time of the hazard; and » Recommended actions.

Passive Management

Because flying-fox strike risk tends to be primarily from over-flights, flying-fox management strategies should focus on detecting the hazard, communicating the details to all stakeholders, and monitoring the hazard. An assessment of the flying-fox hazard should be completed by a qualified and experienced person who can recommend airport-specific modifications.

Reducing the flying-fox attraction to airports may require a combination of passive management strategies.

Monitoring Transit Activity and Predicting Risks	Anticipate potential periods of increased flying-fox activity by: » Establishing ongoing and long-term monitoring of flying-fox transit activity over the airport to determine any predictable and repeatable trends in terms of time, height and expected hazard longevity; and » Establishing ongoing and long-term monitoring of flying-fox roost population dynamics to predict periods of high and low activity. Roost populations often swell and subside throughout the year in response to season and food availability, and in some instances roosts can be temporarily abandoned altogether. Therefore understanding roost trends can better equip an airport to predict periods of possible high or low risk.

Strike avoidance	Daily risk periods for flying-foxes are often concentrated around dusk during their regular camp fly-out. Knowing the time of acute risks can be used to avoid strikes by: » Scheduling flights outside of known risk periods; » Delaying take-off and landing until the acute risk period has passed; and » Executing short or full length departures, where appropriate, based on the known height and location of the flying-foxes.
Resource Management	Identify and remove all potential fruiting and flowering trees and shrubs from airside and landside landscaping that may be used by flying-foxes. Particular plant species to exclude and avoid, include (but are not restricted to): » Gum trees; » Paperbarks and bottle-brushes; » Banskia; » Grevilleas; » Hakeas; » Figs; » Lillipillies and various other rainforest trees; » Palms; and » Fruit trees such as mango, pawpaw and various stone-fruit trees.
Roost Management	In some instances, managing or relocating a flying-fox roost that is situated in close proximity to an airport can help mitigate the risk. This is a serious and complicated action that requires: » Consultation with local environment authorities who are charged with the responsibility of assessing and facilitating any flying-fox roost relocation works in Australia; » An assessment of the risk to determine if the roost is in fact contributing a high risk (e.g. monitoring may reveal that the population always departs in a direction away from the airport, therefore contributing zero risk); and » An assessment of the risk to determine if a new roost could be established by the relocated population that may contribute a more serious risk compared to their original roost location.

Off-airport Flying-fox Management

Off-airport sites contribute to flying-fox strike risk by providing roosting or foraging sites in close proximity to airports. Roosting sites (roost) can hold hundreds of thousands of flying-foxes that may leave the roost within a short period of time each day. Foraging sites include areas of native and attractive vegetation that may be visited by individuals or groups of flying-foxes throughout the night. This results in increased numbers at and around airports thereby increasing the probability of a strike. Off-airport management strategies are provided in the Additional Information section.

10 BLACK KITE

Black Kite
Milvus migrans

Image provided by BirdLife Australia
Photographer: Andrew Silcocks

Background

Black Kites present a significant strike risk to aircraft because:

- Of their relatively large body mass that can result in serious damage to aircraft;
- Their foraging and thermaling behaviours can put them in critical flight paths more often than other birds; and
- As avian apex predators, kites do not generally expend energy detecting and avoiding predators as other birds do, which often makes them less aware of approaching aircraft.

Strike History

Black Kites were involved in 518 strikes[12] in Australia between 2003 and 2014, with 7% of strikes involving more than one individual (i.e. multiple strike), and 7% of strikes resulting in damage to the aircraft. Although other kite species, such as the Whistling Kite, Black-shouldered Kite and Brahminy Kite have been involved in strikes, Black Kites account for 81% of all kite strikes in Australia[13].

12 Includes reports with 'unidentified kite'

13 data source: Australian aviation wildlife strike statistics 2004 to 2013 (AR-2014-075)

Black Kite Biology

Other Names	Fork-tailed Kite, Kite-Hawk, Kimberly Hawk, Allied Kite.
Size	Length 45-55cm; wingspan 120-140cm; weight 585g.
Identification	**Adults:** grey-brown head and neck. The upper body is dark brown, and the tail is medium brown. The underbody is medium to dark reddish brown, with dark brown streaks. The beak is black, and the legs and feet are yellow. The tail is forked, which distinguishes it from the Whistling Kite whose coloration and size are very similar, but whose tail is wedged, not forked like the Black Kite **Juveniles:** colouration is similar to adults, but paler and with a more prominent black eye-stripe.
Distribution	Throughout tropical and temperate regions of Australia. They are found in all rainfall zones, but not in the driest regions.
Preferred habitat	Found in wooded areas, open county and urban areas, particularly landfills, abattoirs, cattle yards, piggeries, as well as sites recently disturbed by fire or agricultural activity that exposes soil (e.g. ploughing activity).
Food	They are opportunistic hunters and often scavenge. Food items include fish, household rubbish, carrion, small birds and a range of reptiles, insects, small mammals and frogs.
Behaviour	They are a relatively gregarious raptor, often seen in large flocks above. They use thermals and updrafts to forage and hunt.
Breeding	They establish nests in the forks of trees, usually beside watercourses or water ways. Breeding can be opportunistic, but generally occurs from June to December and two to four eggs are laid.

Black Kite on Airports

The main attractions for Black Kite at airports are detailed below.

Water	Airports often provide access to permanent and reliable water sources. These water sources are particularly attractive to kites in arid and dry environments.
Food	Airports offer ideal foraging opportunities with few visual impediments, particularly in areas of short grass. Animal remains airside (either derived from a strike or by lethal control activity) attracts scavenging kites.
Loafing Areas/Shelter	Airports offer ample perching opportunities on fences, buildings and signs.
Transit Routes	For airports that are located in close proximity to kite attractants such as landfills, abattoirs, agricultural fields etc., regular daily transits to access these sites can cause kites to cross the airfield and critical aircraft movement areas. The thermals that are created over sealed areas, such as runways, can cause kites to remain in aircraft flight paths for extended periods.

Black Kite Management

Active Management

Active bird management involves scaring or removing birds from the airport. There are numerous options available for the task, some of which have limited effect in the long-term due to habituation. The most successful active management programs utilise a combination of tools and techniques, supplemented with passive management options (see next section).

Black Kite active management options can include:

Dispersal	Disperse kites using: » Pyrotechnics (short and long-range); » Stockwhips; » Lights; » Presence (get out of vehicle and point at the bird/s and yell at them); and » Vehicles (by driving underneath foraging kites). **Recommendations** **1** Commence dispersal as kites arrive. **2** Execute a rapid sequence of actions, with multiple tools, to reinforce the dispersal intent. **3** Always remain alert to aircraft movements when dispersing, dispersal response (i.e. the direction in which the dispersed bird flies) can be unpredictable.
Lethal Control	Occasional lethal control may be required in order to: » Reinforce the effectiveness of non-lethal dispersal equipment; and » Remove immediate and serious hazards. **Recommendations** **1** Make sure you have the appropriate firearm licence and that lethal control permits are valid. **2** Always adhere to good animal welfare practices. **3** Use lethal control only as a last resort management option. **4** Never use lethal control as a primary management tool.
Nest Management	If nests are located in trees located landside or airside, liaise with local environment authorities to coordinate nest removal and relocation.
Communicating Hazards	Informing aircrew of hazards, particularly when an acute hazard exists, will help inform their operational decisions (e.g. to delay take-off). Hazard communication can be achieved via: » Direct communication with aircrew; » Direct communication with ATC; » Distribution of Wildlife Hazard Notifications or Bird Watch Condition Reports; » Distribution of wildlife NOTAMs for short-term hazards; » Inclusion of hazard warning in the ATIS for short-term hazards; and » Inclusion of wildlife hazards in the ERSA for ongoing hazards. All hazard notification options should provide as much detail as possible, including: » Species; » Location of the hazard on the airfield; » Height of the hazard; » Time of the hazard; and » Recommended actions.

Passive Management

All bird management strategies should seek to reduce the attractiveness of the airport to Black Kite, focusing on food, water and shelter availability. An assessment of the airport should be completed by a person qualified and experienced in identifying bird attractions and recommending site-specific modifications.

Reducing the Black Kite attraction to airports may require a combination of passive management strategies.

Food Management	Remove availability of food items by: » Collecting and disposing of all animal remains located airside or landside; » Ensuring rubbish bins do not overflow and are regularly emptied; » Ensuring vertebrate pest management programs are in place in areas where rodents and rabbits/hares attract kites; » Avoid burning vegetation as this attracts Black Kites; and » Consider mowing at night to reduce food availability.
Perch Management	Remove all unnecessary signs, fences and posts where kites are known to perch, and install anti-perching spikes on structures that cannot be removed (e.g. lights).
Monitoring Movements	Kites regularly transit through aircraft flight paths en route to feeding areas and at times remain in critical areas due to the availability of food and thermals at airports. Kites often appear in large flocks within a short period of time and can disperse from the area as quickly. Short-term management options may include: » Implementing a regular and standardised monitoring program; » Identifying kite movement trends (i.e. time of day, time of year, height of transit); and » Communicating identified hazards to airlines and aircraft operators. Long-term management options may include: » Encouraging airlines to reschedule flights if discreet trends are identified.

Off-airport Black Kite Management

Off-airport sites contribute to kite strike risk by providing foraging, loafing and roosting sites in close proximity to airports. Foraging sites such as landfills, abattoirs, piggeries, and areas with roadkill or with recently disturbed soils are significant attractants to Black Kites. This results in increased numbers at and around airports thereby increasing the probability of a strike. Off-airport management strategies are provided in the Additional Information section. Liase with off-airport land managers to reduce food availability and limit burning vegetation. Landfill operations in particular need to limit food supply.

11 AUSTRALIAN PELICAN

Australian Pelican
Pelecanus conspicillatus

Image provided by BirdLife Australia
Photographer: Andrew Silcocks

Background

Although not regularly struck, pelicans present a significant strike risk to aircraft because:

- Their very large body mass often results in aircraft damage;
- They have been implicated in the only recorded fatal bird strike in Australia; and
- They can congregate in very large numbers, particularly where there are abundant food sources, and when seeking refuge from inclement weather.

Strike History

Pelicans were involved in 18 strikes in Australia, between 2003 and 2014, during which time no strikes involved more than one individual (i.e. multiple strike), and 44% of strikes resulted in damage to the aircraft. A fatal bird strike occurred in September 1977 with a RAAF F-111 that was conducting low-level exercises at Evans Head in northern NSW. The aircraft struck three pelicans, with one penetrating the cockpit. The pilot and co-pilot were unable to safely eject, and both were killed in the incident.

Pelican Biology

Other Name	Spectacled Pelican.
Size	Length 1.6-1.8m; wingspan 2.3-2.5m; weight 4-6.8kg.
Identification	**Adults:** Predominantly white bird with a black tail, and black coloration on the under and upper sides of the wings. The large pale bill has a fleshy pouch, and the short legs are pale blue-grey. This is the only pelican species to inhabit Australia. **Juveniles:** Similar to adults, but the black colouration observed on adults is brown on juveniles
Distribution	Widespread throughout the entire Australian coastal region, and throughout various temporary and permanent inland wetland systems. They are dispersive in response to rainfall, and are generally absent throughout dry arid regions.
Preferred Habitat	Terrestrial wetlands, estuarine and marine environments, lakes, reservoirs, rivers, billabongs, and throughout inland wetland systems, including large ephemeral systems. They generally prefer large open areas of water that are free of vegetation. In urban areas they can be observed in rivers and estuaries, on lakes in parks and gardens, and they congregate in areas where food sources are abundant such as recreational fish cleaning areas, seafood processing operations and landfills.
Food	They feed on fish predominantly, but also scavenge for a variety of food items including human rubbish at landfills, and various insects and crustaceans. They have also been recorded occasionally taking ducks and small dogs.
Behaviour	They are often observed thermaling at various heights, and have been recorded thermaling at 3,000m. They are often observed loafing on shores, mudflats, and landfills, often in large groups, particularly where food is abundant and accessible.
Breeding	They breed colonially on sandy islands, offshore islands and inland lakes and wetland systems where vegetation is sparse. There is no well-defined breeding season and is thought to be highly responsive to periods of rainfall, drought and water-levels.

Pelican on Airports

The main attractions for Australian Pelicans at airports are detailed below.

Water	Most water systems on airports are too small to attract pelicans. However, larger retention ponds at airports can provide access to permanent and reliable water sources. These water sources are particularly attractive to pelicans in arid and dry environments.
Food	Airports do not provide a significant source of food for pelicans, except where large permanent water features support aquatic animals such as fish and crustaceans, or where overflowing rubbish receptacles (i.e. bins and skips) provide access to food scraps.
Loafing Areas/Shelter	Airports can be used as a refuge during inclement weather, when the low predator-pressure is highly advantageous.
Transit Routes	For airports that are located in close proximity to pelican attractants such as landfills, lakes, estuaries and rivers, regular daily transits to access these sites may result in pelicans crossing the airfield and critical aircraft movement areas. Thermals created over sealed areas, such as runways, may cause pelicans to remain in aircraft flight paths for extended periods.

Australian Pelican Management

Active Management

Active bird management involves scaring or removing birds from the airport. There are numerous options available for the task, some of which have limited effect in the long-term due to habituation. The most successful active management programs utilise a combination of tools and techniques, supplemented with passive management options (see next section).

Pelican active management options can include:

Dispersal	Disperse pelicans using: » Pyrotechnics (short and long-range); » Sirens; » Stockwhips; and » Vehicles. **Recommendations** **1** Commence dispersal as pelicans arrive. **2** Execute a rapid sequence of actions, with multiple tools, to reinforce the dispersal intent. **3** Always remain alert to aircraft movements when dispersing, dispersal response (i.e. the direction in which the dispersed bird flies) can be unpredictable and slow.
Lethal Control	Occasional lethal control may be required in order to: » Reinforce the effectiveness of non-lethal dispersal equipment; and » Remove immediate and serious hazards. **Recommendation** **1** Make sure you have the appropriate firearm licence and that the lethal control permit is valid. **2** Always adhere to good animal welfare practices. **3** Use lethal control only as a last resort management option. **4** Never use lethal control as a primary management tool.
Communicating Hazards	Pelicans present the greatest hazard to aircraft operations when they are airborne during transit or thermaling. Pelicans frequently thermal on fine, cool days with few clouds. Informing aircrew of hazards, particularly when an acute hazard exists, will help inform their operational decisions (e.g. to delay take-off). Hazard communication can be achieved via: » Direct communication with aircrew; » Direct communication with ATC; » Distribution of Wildlife Hazard Notifications or Bird Watch Condition Reports; » Distribution of wildlife NOTAMs for short-term hazards; » Inclusion of a hazard warning in the ATIS for short-term hazards; and » Inclusion of wildlife hazards in the ERSA for ongoing hazards. All hazard notification options should provide as much detail as possible, including: » Species; » Location of the hazard on the airfield; » Height of the hazard; » Time of the hazard; and » Recommended actions.

Passive Management

All bird management strategies should seek to reduce the attractiveness of the airport to the Australian Pelican, focusing on food, water and shelter availability. An assessment of the airport should be completed by a person qualified and experienced in identifying bird attractions and recommending site-specific modifications.

Reducing the pelican attraction to airports may require a combination of passive management strategies.

Water Management	Reduce access to large, permanent waterbodies by: » Installing netting or wires over waterways to restrict access; and » Placing floatation devices, such as semi-permeable membranes, onto retention ponds to restrict access to water
Habitat Modification	» Restrict loafing areas by removing islands within water bodies to eliminate safe refuges for pelicans to retreat.
Monitoring Transit Paths	Pelicans transiting aircraft flight paths and movement areas en route to feeding areas can present a serious strike risk. Short-term management options may include: » Implementing a regular and standardised monitoring program; » Identifying pelican movement trends (i.e. time of day, time of year, height of transit); and » Communicating identified hazards to airlines and aircraft operators.

Off-airport Australian Pelican Management

Off-airport sites contribute to pelican strike risk by providing foraging, loafing and roosting sites in close proximity to airports in the form of water bodies such as lakes, canals, estuaries and water retention basins. This results in increased numbers at and around airports thereby increasing the probability of a strike. Off-airport management strategies are provided in the Additional Information section..

12 MARTINS AND SWALLOWS

Fairy Martin
Petrochelidon ariel

Welcome Swallow
Hirundo neoxena

Images provided by BirdLife Australia
Photographer: Andrew Silcocks

Background

Despite their small size, martins and swallows present a significant strike risk to aircraft because:

- Their flocking behaviour often results in multiple strike incidents;
- Their flight can be unpredictable;
- They are generally unresponsive to active dispersal attempts; and
- They can congregate in very large numbers, particularly where there are temporary, or ongoing, insect infestations.

Strike History

Martins and swallows were involved in 187 strikes in Australia between 2003 and 2014, with 11% of strikes involving more than one individual (i.e. multiple strike), and no strikes resulting in damage to the aircraft. Fairy Martins were identified in 52% of all martin and swallow strikes, followed by Welcome Swallows (42%), Tree Martins (4%), and Barn Swallows (3%)[14].

The focus of this information sheet is Fairy Martin *Petrochelidon ariel* and Welcome Swallow *Hirundo neoxena;* however, most of the management actions and recommendations can also be applied for Tree Martins and Barn Swallows.

14 data source: Australian aviation wildlife strike statistics 2004 to 2013 (AR-2014-075)

Martin and Swallow Biology

Name	Fairy Martin	Welcome Swallow
Other Name/s	Bottle, Cliff or land Swallow.	Australian, House or Pacific Swallow.
Size	Length: 12cm. Wingspan: 22cm. Weight: 9-14g.	Length: 16cm. Wingspan: 28cm. Weight: 9-20g.
Identification	**Adults:** small Martin with a short tail. Broad wings extend just beyond the tail. The forehead is a rufous-orange colour that is faintly mottled and streaked on the upper forehead. The upperparts and wings are blackish-grey, and the underside is mostly white. **Juveniles:** similar to adults, but with a duller colouration.	**Adults:** metallic blue colouration on the upperparts and top of the head, with a rufous-orange forehead, throat and upper chest. The underside is a pale grey colour and the long tail is forked with a row of white dots on each feather. **Juveniles:** similar to adults, but with a duller colouration.
Distribution	Widespread throughout Australia, excluding the most arid regions, with only a few observations in Tasmania.	Widespread throughout most of Australia excluding the dry interiors of West Australia, the Northern Territory and western Queensland. They are generally not observed along the north and north-western coastal areas.
Preferred Habitat	Generally occurs in airspace above open areas such as grassland, shrub land, woodland, and modified grassed areas including pastures and airfields. Often observed near water.	Generally occurs in airspace above open areas such as grassland, shrub land, woodland, and modified grassed areas including pastures and airfields. Often observed near water.
Food	Insects.	Insects.
Behaviour	Individuals and populations can be migratory, part-migratory or residents. On airports, they are generally observed in flocks aerially foraging, perched on fences or loafing on sealed areas such as runways and taxiways.	They are partial-migrants, but in many areas populations are residents. On airports, they are generally observed in flocks aerially foraging, perched on fences or loafing on sealed areas such as runways and taxiways.
Breeding	They nest colonially and construct mud nests in caves, rock crevices, under building eaves, under bridges and similar structures. Breeding season generally extends from August to January, and four to five eggs are laid.	The open nest is constructed of mud and grass, and usually attached to a vertical rock structure or building. Breeding can occur at any time, but mainly from August to December, and three to five eggs are laid.

Martins and Swallows on Airports

The main attractions for martins and swallows at airports are detailed below.

Water	Airports often provide access to permanent and reliable water sources. These water sources are particularly attractive to martins and swallows in arid and dry environments, with ample insects around the water source for forage.
Food	Martin and swallow activity is generally proportional to aerial insect activity, which fluctuates in response to rainfall, air pressure, and grass mowing activity.
Loafing Areas/Shelter	Fencing and other airport infrastructure is used to rest and perch during foraging periods. Martins and swallows frequently loaf on sealed surfaces such as runways and taxiways to rest and gain heat, especially in colder climates.
Nesting	Airports can provide suitable areas to construct nests, particularly drains and drain culverts, as well as building eaves and similar structures. Airport nest sites are utilised due to the available structure, as well as the availability of nearby food and water.

Martin and Swallow Management

Active Management

Active bird management involves scaring or removing birds from the airport. There are numerous options available for the task, some of which have limited effect in the long-term due to habituation. The most successful active management programs utilise a combination of tools and techniques, supplemented with passive management options (see next section).

Dispersal	Although generally unresponsive to active dispersal, attempts can be made using: » Pyrotechnics (short and long-range); and » Gas cannons. **Recommendations** **1** Commence dispersal as they arrive.
Short-term Environmental Modification	Martin and swallow behaviour is commonly related to airport environments which can be temporarily modified to remove the attraction. **Recommendations** **1** Where martins and swallows are foraging on airborne insects in a specific area, use a fine mist (e.g. from an airside fire response vehicle) to prevent the insects from continuing flight, thereby removing the foraging attraction. This strategy may need to be repeated prior to each aircraft movement where the hazard persists. **2** Wet sealed surfaces to cool them and make them less attractive to loafing martins and swallows.
Nest Removal	Remove nests as they are being constructed (permits required) prior to the laying of eggs or emergence of chicks. If chicks are present, wait until the chicks are fully fledged before destroying the nests.

Communicating Hazards	Informing aircrew of hazards, particularly when an acute hazard exists, will help inform their operational decisions (e.g. delay take-off). Hazard communication can be achieved via: » Direct communication with aircrew; » Direct communication with ATC; » Distribution of Wildlife Hazard Notifications or Bird Watch Condition Reports; » Distribution of wildlife NOTAMs for short-term hazards; and » Inclusion of a hazard warning in the ATIS for short-term hazards. All hazard notification options should provide as much detail as possible, including: » Species; » Location of the hazard on the airfield; » Height of the hazard; » Time of the hazard; and » Recommended actions.

Passive Management

All bird management strategies should seek to reduce the attractiveness of the airport to martins and swallows, focusing on food, water and shelter availability. An assessment of the airport should be completed by a person qualified and experienced in identifying bird attractions and recommending site-specific modifications.

Reducing the martin and swallow attraction to airports may require a combination of passive management strategies.

Food Management	Limit access to food by mowing at night to limit the availability of invertebrates.
Habitat Modification	Restrict nesting areas by: » Installing exclusion devices on drain culverts; and » Installing anti-perching spikes, wires or netting on buildings and other infrastructure where martins and swallows are known to perch and nest.
Monitoring Movements	Martins and swallows that regularly forage in or transit through movement areas can present a serious strike risk. Short-term management options may include: » Implementing a regular and standardised monitoring program; » Identifying martin and swallow movement trends (i.e. time of day, time of year, height of transit); and » Communicating identified hazards to airlines and aircraft operators.

Off-airport Martin and Swallow Management

Off-airport sites contribute to martin and swallow strike risk by providing nesting and roosting sites in close proximity to airports. This results in increased numbers at and around airports thereby increasing the probability of a strike. Off-airport management strategies are provided at the end of the Additional Information section.

ADDITIONAL INFORMATION

LEGISLATIVE PROTECTION GIVEN TO EACH SPECIES

Species	EPBC[1]	FFG[2]	TSC[3]	TSP[4]	NCA[5]	WCA[6]	TPWC[7]	NCA[8]	NPW[9]
Silver Gull	-	-	-	-	-	-	-	-	-
Masked Lapwing	-	-	-	-	-	-	-	-	-
Pacific Black Duck	-	-	-	-	-	-	-	-	-
Wood Duck	-	-	-	-	-	-	-	-	-
Nankeen Kestrel	-	-	-	-	-	-	-	-	-
Whistling Kite	-	-	-	-	-	-	-	-	-
Brown Falcon	-	-	-	-	-	-	-	-	-
Wedge-tailed Eagle	✓ (Tas.) E	-	-	✓ E	-	-	-	-	-
Australian White Ibis	-	-	-	-	-	-	-	-	-
Straw-necked Ibis	-	-	-	-	-	-	-	-	-
Galah	-	-	-	-	-	-	-	-	-
Australian Magpie	-	-	-	-	-	-	-	-	-
Feral Pigeon	-	-	-	-	-	-	-	-	-
Grey-headed Flying-fox	✓ V	✓ T	✓ V	-	-	-	-	-	✓ R
Black Flying-fox	-	-	-	-	-	-	-	-	-
Spectacled Flying-fox	✓ V	-	-	-	-	-	-	-	-
Little Red Flying-fox	-	-	-	-	-	-	-	-	✓ R
Black Kite	-	-	-	-	-	-	-	-	-
Australian Pelican	-	-	-	-	-	-	-	-	-
Fairy Martin	-	-	-	-	-	-	-	-	-
Welcome Swallow	-	-	-	-	-	-	-	-	-

Recommended Use

Any Management Plan

1 Commonwealth. *Environment Protection and Biodiversity Act 1999*: E=Endangered, V=Vulnerable
2 Victoria. *Flora and Fauna Guarantee Act 1988*: T=Threatened
3 New South Wales. *Threatened Species Conservation Act 1995*: V=Vulnerable
4 Tasmania. *Threatened Species Protection Act 1995*: E=Endangered
5 Queensland. *Nature Conservation Act* 1992
6 Western Australia. *Wildlife Conservation Act* 1950
7 Northern Territory. *Territory Parks and Wildlife Conservation Act* 2000
8 Australian Capital Territory. *Nature Conservation Act* 1980
9 South Australia. *National Parks and Wildlife Act* 1972: R=Rare

LAND USE PLANNING NEAR AIRPORTS

Part 139 of the *Civil Aviation Safety Regulations* 1998 regulates wildlife hazard management on Australian airports, but this does not address the wildlife hazard associated with off-airport hazards. In May 2012, the Department of Infrastructure and Transport released the National Airports Safeguarding Framework, which aims to develop informed land use planning regimes to safeguard airports and their adjacent communities.

Guideline C of the Framework, Managing the Risk of Wildlife Strikes in the Vicinity of Airports, provides recommendations for the management of wildlife hazards within the International Civil Aviation Organization defined radial distances from airports of 3km, 8km and 13km. The Framework allocates risk categories to incompatible land uses (very low to high) and recommends actions for both existing and proposed developments (incompatible, mitigate, monitor, no action).

The Framework encourages a coordinated approach between airport operators and land use planning authorities, and where risks are identified for new developments, the Framework recommends:

- Developing a management program
- Establishing management performance standards
- Allowing for design changes and/or operating procedures where the land use is likely to increase the strike risk
- Establishing appropriate habitat management
- Creating performance bonds should obligations not be met
- Monitoring by airport authorities
- Reporting wildlife incidents as per Australian Transport Safety Bureau requirements.

Recommended Use

Any Species Information Sheets

Table: Wildlife Attraction Risk and Actions by Land Use

Land Use	Wildlife Attraction Risk	Actions for Existing Developments			Actions for Proposed Developments/ Changes to Existing Developments		
		3km radius (Area A)	8km radius (Area B)	13km radius (Area C)	3km radius (Area A)	8km radius (Area B)	13km radius (Area C)
Agriculture							
Turf farm	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Piggery	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Fruit tree farm	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Fish processing / packing plant	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Cattle / dairy farm	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Poultry farm	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Forestry	Low	Monitor	Monitor	No Action	Monitor	Monitor	No Action
Plant nursery	Low	Monitor	Monitor	No Action	Monitor	Monitor	No Action
Conservation							
Wildlife sanctuary / conservation area – wetland	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Wildlife sanctuary / conservation area – dryland	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Recreation							
Showground	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Racetrack / horse riding school	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Golf course	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Sports facility (tennis, bowls, etc)	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Park / Playground	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Picnic / camping ground	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Commercial							
Food processing plant	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Warehouse (food storage)	Low	Monitor	Monitor	No Action	Monitor	Monitor	No Action
Fast food / drive-in / outdoor restaurant	Low	Monitor	Monitor	No Action	Monitor	Monitor	No Action
Shopping centre	Low	Monitor	Monitor	No Action	Monitor	Monitor	No Action
Office building	Very Low	Monitor	No Action	No Action	Monitor	No Action	No Action
Hotel / motel	Very Low	Monitor	No Action	No Action	Monitor	No Action	No Action
Car park	Very Low	Monitor	No Action	No Action	Monitor	No Action	No Action
Cinemas	Very Low	Monitor	No Action	No Action	Monitor	No Action	No Action
Warehousing (non-food storage)	Very Low	Monitor	No Action	No Action	Monitor	No Action	No Action
Petrol station	Very Low	Monitor	No Action	No Action	Monitor	No Action	No Action
Utilities							
Food / organic waste facility	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Putrescible waste facility – landfill	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Putrescible waste facility – transfer station	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Non-putrescible waste facility – landfill	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Non-putrescible waste facility – transfer station	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Sewerage / wastewater treatment facility	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Potable water treatment facility	Low	Monitor	Monitor	No Action	Monitor	Monitor	No Action

MANAGING BIRDS AT OFF-AIRPORT SITES

Where off-airport locations are known to support hazardous populations, whether through the supply of food, water or shelter, their contribution to the strike risk must be assessed. Such assessments may determine that the risk is too low to require action, or that a significant strike event is inevitable if left unmanaged. Professional expertise may be required, and developing relationships with external stakeholders is essential.

Identifying Hazards	Employ a regular monitoring regime at land uses that are known or potential attractants, including: » Landfills and waste transfer stations » Abattoirs and piggeries » Grassy areas such as sports fields, parks and golf courses » Pastures, crops and other agricultural fields » Estuaries, creeks, lakes and other water sources » Sewage and water treatment plants » Roads where roadkill is frequently present » Areas where controlled or regular burning-off occurs.
Assess the Risk	Assessing the contribution of a particular land use to an airport's strike risk can be completed in various ways including: » Reviewing historical strike data to identity strike frequency and consequence (strike assessments relative to aircraft movements are recommended, rather than total strike numbers) » Reviewing on-airport bird survey data to determine wildlife activity trends » Considering how the risk could change based on land use or airport operational changes. » Determining fligh path and height of aircraft over the location.
Managing Hazards	Once the extent of the hazard and its risk contribution has been determined, engage with relevant landowners to develop and implement appropriate management plans. For example, establish: » Communication mechanisms with agricultural landowners whose activity includes disturbance (i.e. controlled burns, planting corps, turning soil) to pre-warn the airport of pending events so the airport operator can proactively issue hazard notifications to stakeholders, and/or increase active management efforts for the duration of the event. » On-site management programs at landfills, sewage treatment plants and other sites to restrict access to foraging, nesting and roosting sites. » Active management at known breeding sites (i.e. egg and nest removal) and known roost sites (active dispersal).

Recommended Use

Any Species Information Sheets

MANAGING BIRDS AT WASTE MANAGEMENT FACILITIES

Waste management facilities (landfills and waste transfer stations) provide food for a variety of opportunistic wildlife, in particular Australian White Ibis, Australian Pelicans, Torresian Crows, Silver Gulls and Black Kites. This artificial food source can increase localised wildlife populations to unmanageable levels, and can present a significant risk where the facility is located in close proximity to the airport.
In addition, where airports are situated between waste management facilities and bird roosts, birds transiting through aircraft flight paths can present a serious strike risk.

Managing the food source at waste management facilities can contribute significantly to reducing the number and types of birds that present a risk. Good practices of keeping tipping faces small and covering waste will make the following options more effective:

» Netting the area to exclude bird entry;

» Suspending monofilament wire or nylon line horizontally over waste landfills at 5 metre intervals;

» Implementing an active dispersal program that uses a range of dispersal tools including gas cannon, distress caller, pyrotechnics and stock whip;

» Converting operations to closed waste systems where waste is turned into energy or composted;

» Converting operations to an enclosed transfer station; and

» Removing, or covering (i.e. netting) water retention ponds and other water features on site.

Any waste management program designed to manage birds to reduce the strike risk must be undertaken with close cooperation between the waste facility and airport operators.

Recommended Use

Silver Gull Species Information Sheet
Australian White Ibis Species Information Sheets

REDUCING THE WATER ATTRACTION

Water sources on airport are often permanent, reliable and easily accessible. In addition, and when coupled with short grass, waterlogged soils and areas that pond after rainfall create additional short-term water sources. These provide food, drink, shelter and sometimes nesting sites. The attraction of airport water sources can be greatly reduced as described below.

Method	Detail	Advantages	Disadvantages
Realignment of the watercourse	Diverting watercourses away from critical areas such as runway undershoot areas can reduce bird strike risk.	Removes the attraction of water from critical areas.	Very costly.
Underground piping	By piping water underground, exposed water is unavailable to birds.	Removes open water for birds.	Can be costly. Requires careful consideration of flood mitigation requirements.
Metal, nylon or monofilament wire	Placing a 2 to 6m wire grid over watercourses can limit bird access.	Inexpensive.	Requires maintenance to remain effective.
Netting	19 to 50mm netting placed over watercourses (or ponds) restrict bird entry.	Prevents bird entry to water. Excellent option for standing water such as lakes or detention ponds.	Requires regular maintenance, particularly if placed in flood prone areas. Small birds can become entangled in the netting.
Flagging tape	Tape placed next to watercourse flutters in the breeze to distract birds.	Inexpensive.	Birds quickly habituate (become used to) to the tape.
Humming wire	Wire positioned over watercourse which “hums” in the breeze to disturb birds.	Inexpensive.	Birds can habituate to it.
Floating plastic balls	Balls adjust to changing water levels preventing birds from landing. Balls need to be kept in a net to stop them from floating away.	Eliminates attraction for larger birds.	May require a net to contain the balls which could as easily be used as the primary means of preventing bird entry. Water quality could be affected by lack of light penetration.
Drain shape and water depth	Steep sided (4:1) watercourses make bird access to the bottom more difficult, particularly where water depth is greater than 500mm.	Effective means of reducing, but not eliminating, bird attraction.	Banks can slump unless concrete or rock inverts are installed which can be costly.

Recommended Use

Ibis Species Information Sheet
Silver Gull Species Information Sheet
Duck Species Information Sheet
Pelican Species Information Sheets

GRASS MANAGEMENT

Maintaining a dense grass sward of between 200 and 300mm has been common practice in the United Kingdom since the 1960s, and more recently on many Australian airports. Long grass effectively deters ground foragers, such as ibis, galahs, and magpies because it lowers predator detection which makes the bird feel less secure. In addition, accessing invertebrates on the surface of the soil can be more difficult for some birds.

Key considerations

- Grass management to deter birds is not a one-size-fits-all concept, site-specific assessments must be done to determine grass and bird species present, and to determine the suitability of maintaining long grass;
- Trials should be completed in order to determine the suitability of long grass as a management tool. For example, in some regions of Australia, long grass can attract a different suite of bird species, creating an equally hazardous situation;
- For airports on low nutrient or sandy soils, where dense grass swards are not achievable, other vegetation could be considered for establishment;
- Mowing frequency tends to be reduced, which not only reduces bird attraction, but can also save man hours and machinery costs;
- Mowing equipment needs to be able to cut grass at longer lengths. For some airports, this may mean purchasing new equipment;
- The activity of mowing disturbs and exposes insects, making the activity itself hazardous. Mowing at low-risk periods (i.e. at night, outside of peak aircraft movement times, and outside of peak wildlife activity times) can help reduce hazards;
- The emergence of weeds must be controlled so as not to attract birds; and
- Grass seed heads must be regularly removed so as not to attract granivorous birds, or granivorous rodents that can themselves attract raptors and owls.

Recommended Use

Galah Species Information Sheet
Australian Magpie Species Information Sheet
Masked Lapwing Species Information Sheet

REPORTING WILDLIFE STRIKES

It is mandatory, under the *Transport Safety Investigation Act* 2003, that all strikes are reported to the Australian Transport Safety Bureau whether or not they resulted in damage to the aircraft involved. Wildlife strikes are categorised as a routine reportable matter and must be reported within 72 hours of the occurrence (see *Transport Safety Investigation Regulations* 2003). All strikes should be reported, whether they occurred on or off airport, so that strike and hazard trends can be assessed. The report should be completed with as much information as possible, in some instances this may mean talking to aircrew, following up species identification, and talking to other airports where the strike occurred on departure.

Key information to include:

- The name and contact details of the person making the report;
- The day and local time when the strike occurred;
- The name of the airport, and if it occurred on, or in relation to a runway, the runway number;
- The nature and extent of any damage to the aircraft;
- Aircraft details;
- Phase of flight;
- Effect on flight;
- Meteorological conditions;
- Species struck;
- Number of individuals struck; and
- Possible bird attractants present at the time of strike.

Report online or download the form:
www.atsb.gov.au click on “Accident or incident notification”

Recommended Use

Any Species Information Sheets

USING PYROTECHNICS

Noise-making shells fired from shotguns, starter pistols and flare pistols (e.g. cracker shells, flares, firecrackers, rockets and mortars) are often the primary bird deterrent used at airports. In Australia, most airports use cracker shells which are expelled from a shotgun.

Pyrotechnics must be used carefully for maximum effect. The best approach is to:

» Carefully select shots;

» Use a minimum number of shots;

» Ensure that shots explode very close to the birds;

» Use pyrotechnics in conjunction with other deterrents; and

» Care should be taken in dry conditions as pyrotechnics may be a wildfire risk.

The user of pyrotechnics should always be positioned between the flock and runways to avoid sending birds across aircraft flight paths. Some bird species can habituate to pyrotechnics through overuse or inappropriate use and can quickly learn to stay away from the bird patrol vehicle, potentially moving to a more critical area from a flight safety point of view. Firearm licensing and training requirements should be satisfied and suitable safety protocols adopted.

Recommended Use

Any Species Information Sheets

KNOWING WHEN TO USE LETHAL CONTROL

Lethal control is a small, but important, part of an airport's wildlife management program. It can be used to manage hazards that are presenting an immediate and significant strike risk, and also to occasionally reinforce the effectiveness of non-lethal management tools. Consideration should be given to:

- The risk posed by the species (size, flocking nature, population, behaviour, persistence);
- Location of the bird (particularly if on runways, in runway strips and undershoot areas); and
- Ineffectiveness of other control measures on the particular individuals.

Personnel responsible for lethal control should:

- Be well-trained in identifying situations where lethal control should be applied (as opposed to non-lethal techniques);
- Understand and demonstrate good animal welfare practices so that the animal does not suffer any unnecessary pain;
- Demonstrate strong situational awareness to ensure that firearms are used safely (i.e. not towards houses or buildings, not when there are people or aircraft activity in the immediate vicinity);
- Be licenced to use firearms and be well-trained in their safe handling and use; and
- Understand the inclusions and limits of their lethal control permit.

Permits are required from state and territory government environment departments for the removal of any native fauna. Introduced species such as Feral Pigeons, Common Starlings and Common Mynas do not require permits for lethal control. Some species are listed under federal or state government acts for which alternative hazard management measures must be considered.

Recommended Use

Any Species Information Sheets

TYPES OF DISPERSAL TOOLS

The following recommendations for active management tools are derived from international research and experience and may or may not be relevant for individual airports. The recommended tools serve as a starting point for individual airports to trial. A dispersal tool kit should be developed that is commensurate with the individual airport's operations and wildlife hazards.

Successful hazard management programs incorporate both active dispersal and habitat modification. Active dispersal as a standalone management tool will not effectively manage hazards in the long-term. Recommendations are based on the overall long-term success of the tool.

Not Recommended	Limited Recommendation	Recommended
High-intensity sound	Phoenix Wailer®	Pyrotechnics
Microwaves	AV-Alarm® Electronic Device	Distress and alarm calls
Ultrasound	Bird Gard AVA Sonic Fence®	Shooting
Aircraft hazing	Bird Gard X 20 Sonic Fence®	Trapping & remote release
Smoke	Scarecrows	Dogs
Magnets	Reflecting tape	Stockwhip*
Aircraft engine noise	Predator models	Starters Pistol*
Infrasound	Hawk kites and balloons	Sirens*
Poisons	Gull models	Falconry
Animal effigies*	Chemical repellents	Lights
	Foam	Whistle*
	Predator calls	Gas cannons
	Lure areas	
	Surfactants and water spray	
	Model aircraft	
	Lasers	

Source (excluding): Sharing the Skies, Transport Canada 2001.*www.tc.gc.ca/civilaviation/aerodrome/wildlifecontrol/tp13549/menu.htm

Recommended Use

Any Species Information Sheets

WHAT IS SEPARATION-BASED MANAGEMENT?

Much in the same way Air Traffic Control endeavours to ensure separation between aircraft with other aircraft, wildlife separation-based management endeavours to separate, in real-time, aircraft and wildlife. There are two main elements:

1. Clearing wildlife away from aircraft movement paths.
2. Advising aircraft so that they can remain clear of wildlife movement paths.

Detection is achieved either visually, or via remote sensing devices such as radar, and in order for separation-based management to be effective, the following are necessary:

- Adequate on-ground facility for dispersing wildlife away from critical airspace;
- The ability to detect wildlife movements through critical airspace in a timely fashion;
- The ability to assess wildlife movements as likely or not to conflict with an aircraft in flight;
- The ability to communicate likely conflict to aircrew in a timely fashion;
- The ability of aircrew to quickly assess the information given to them and then decide on a course of action relevant to their operational imperatives; and
- Positive coordination by Air Traffic Control.

Recommended Use

Any Species Information Sheets

HOW TO USE DATA

An airport may have in place a fully integrated, well-resourced and active wildlife management program but its efficacy must be measured. The most objective and informed way to measure the progress of a wildlife management program is to review and analyse data against set targets and goals. Airports generally collect at a minimum airside bird count, strike and dispersal data. By collecting and analysing data, trends associated with time of day, time of year, phase of flight and species struck can be determined.

Data analysis types are numerous, and may include:

- Strikes per 10,000 aircraft movements;
- Damaging strikes per 100,000 aircraft movements;
- Mass struck per 10,000 aircraft movements;
- Strikes affecting planned flight per 100,000 aircraft movements;
- Critical area infringement rates per hour by all wildlife or specific species;
- Lethal controled animals per 10,000 aircraft movements; and
- Threatened species mortalities per 10,000 aircraft movements.

Recommended Use

Any Species Information Sheets

HEALTH AND SAFETY: HANDLING BIOLOGICAL REMAINS

Dead animals may carry diseases that are harmful to humans. Always wear gloves and if necessary, disposable coveralls, when handling carcasses or biological materials. Avoid direct skin contact with biological materials and avoid contaminating normal work clothing. Ensure that the outside of sample bags, vehicles and freezers are not contaminated. Wear a mask and eye protection if there is a risk of body fluids or organic material misting or splashing. Wash hands thoroughly when done and disinfect tools if necessary

Bats and Flying-foxes:

There is a low risk of Australian Bat Lyssavirus; therefore all bats and flying-foxes must be handled by experienced and vaccinated persons. If bitten or scratched, wash the wound with soap and water for five minutes and seek medical advice.

Recommended Use

Any Species Information Sheets

GETTING SPECIES IDENTIFICATION RIGHT

Good wildlife hazard management stems from understanding present risks. In other words, knowing which species are seen and struck. Accurate species identification helps airports to develop targeted species management, allowing programs to be more streamlined and effective. It also provides good data that can be used to conduct species risk assessments to determine high and moderate risk species and to identify any seasonal or long-term trends.

Identifying species can involve:

- Providing species identification training to airport personnel;
- Collecting biological material from strike remains for forensic analysis (i.e. DNA analysis, feather analysis);
- Photographing wildlife for identification by an ornithologist or aviation ecologist; [15]
- Retaining struck wildlife carcasses for identification by an ornithologist or aviation ecologist; and
- Utilise a DNA based species identification service.[16]

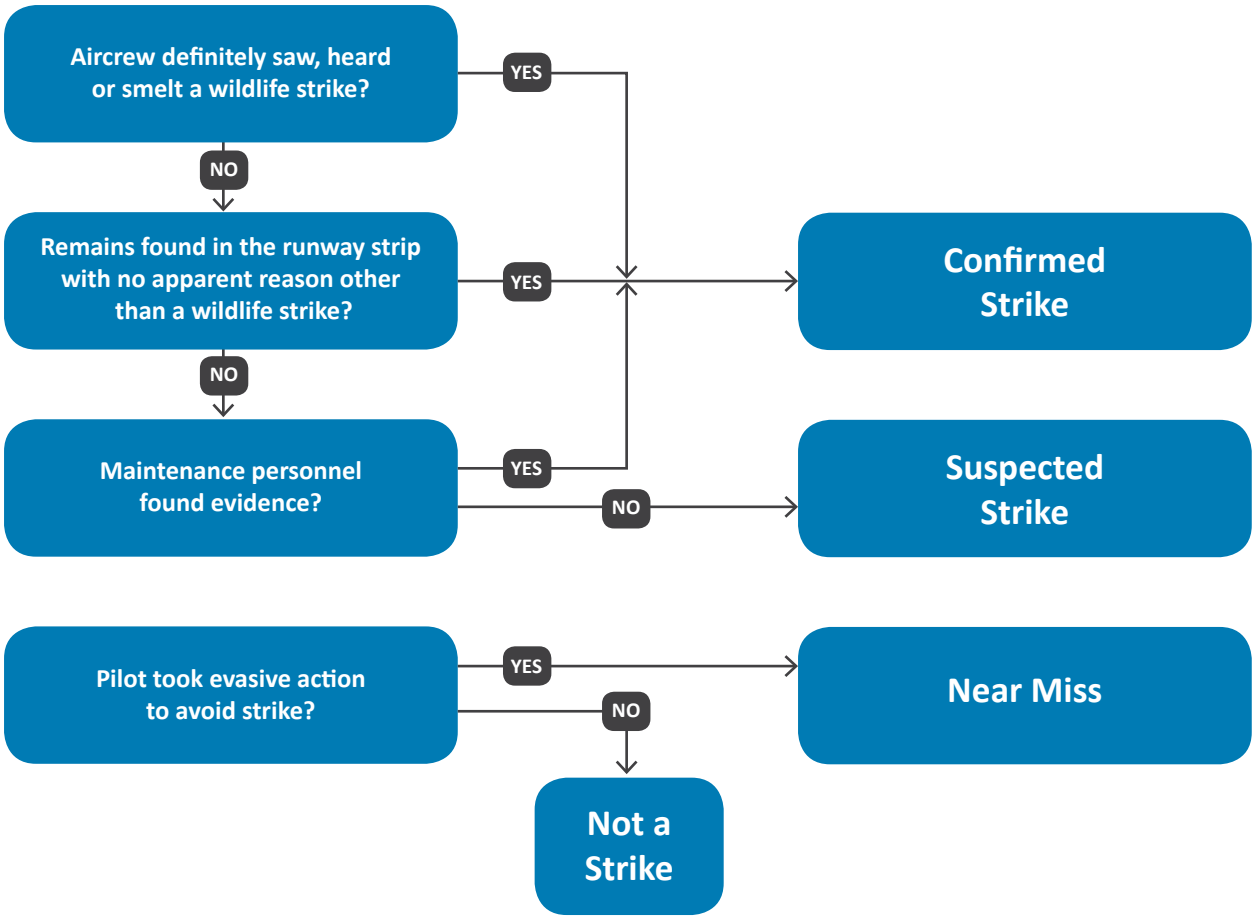
Recommended Use

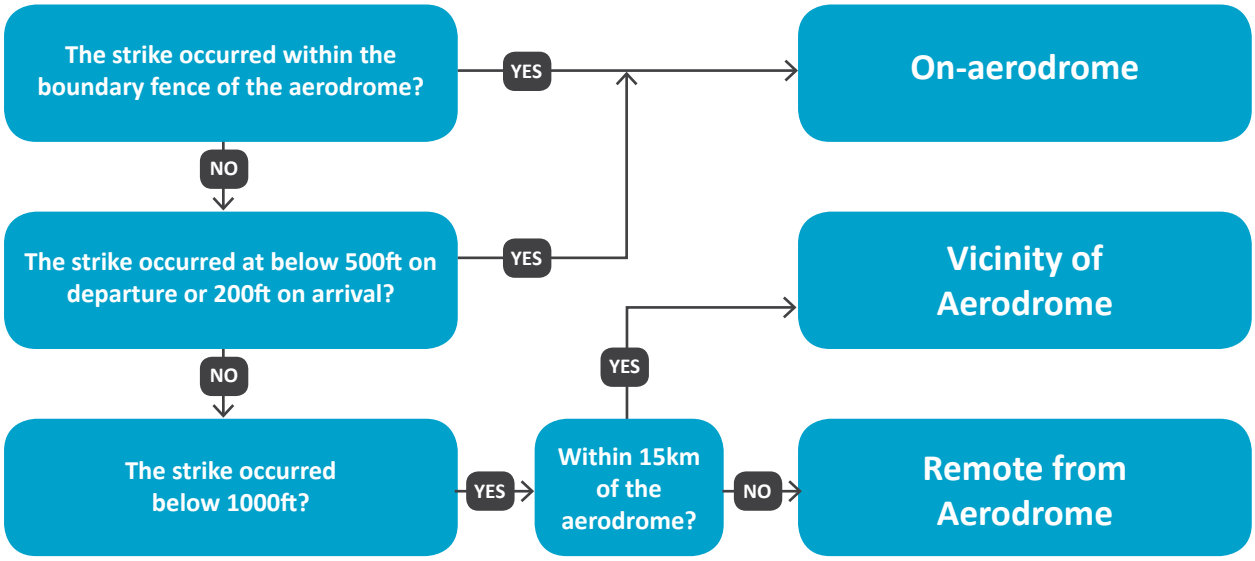
Any Species Information Sheets

15 resources: Avisure - http://www.avisure.com/services/bird-identification-service

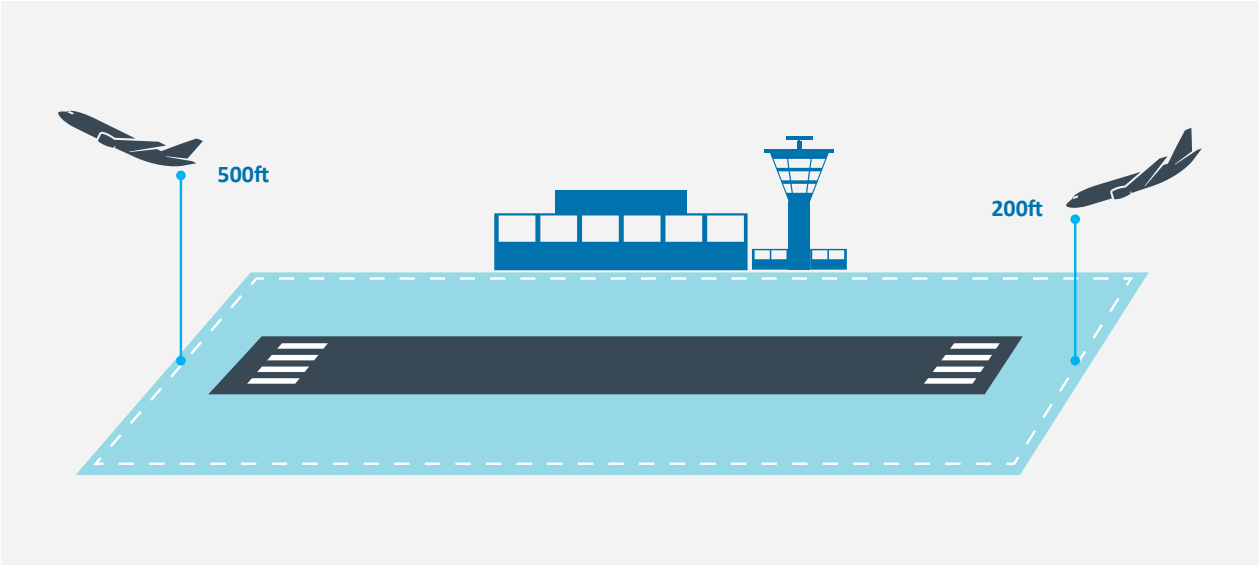
16 resources: Australian Museum DNA Service - http://australianmuseum.net.au/bird-strike

DEFINING WILDLIFE STRIKES

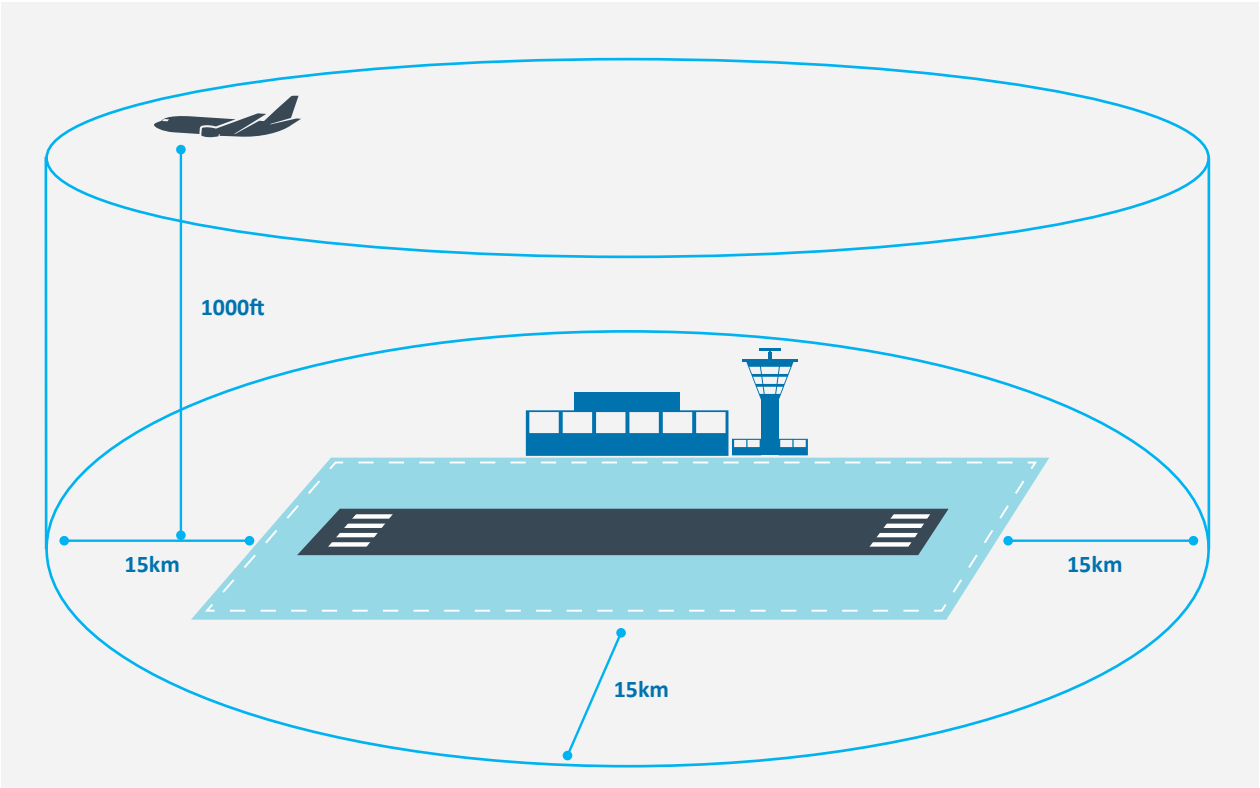




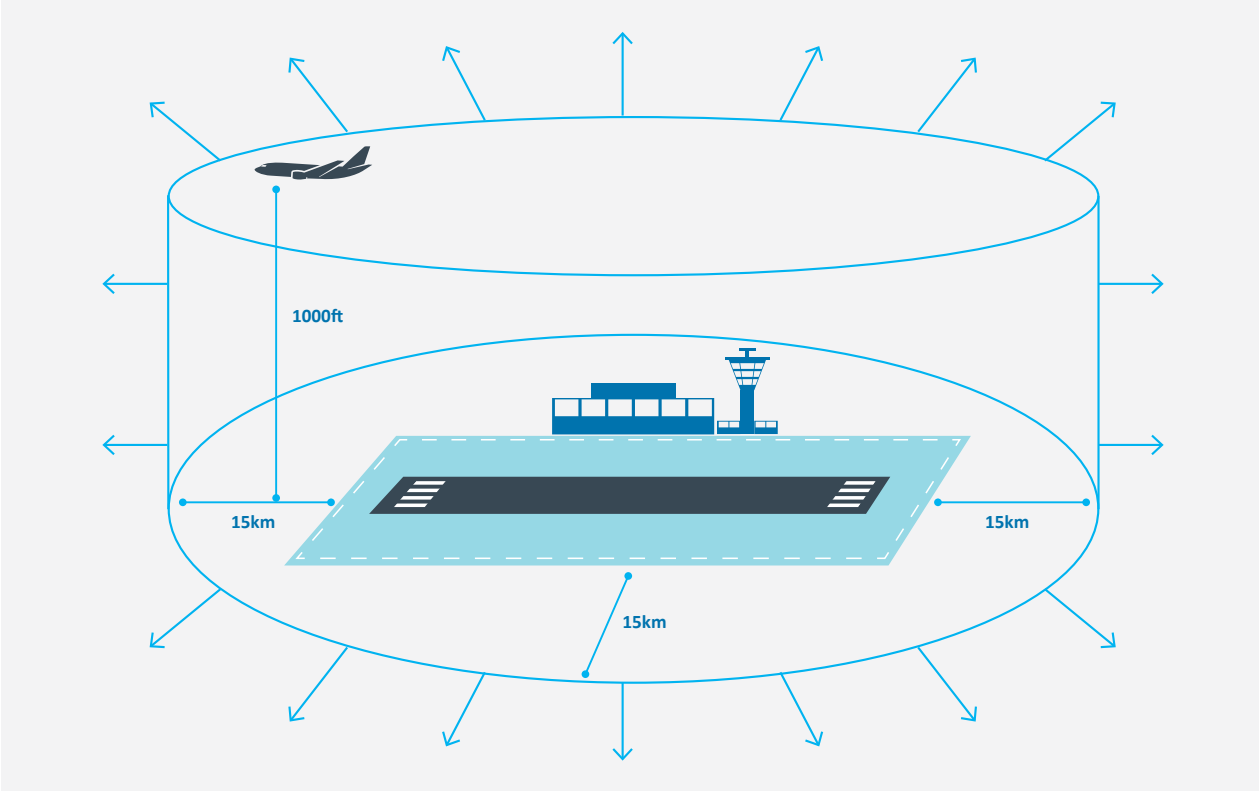
On-aerodrome



Vicinity of Aerodrome



Remote from Aerodrome



Recommended Use

Any Species Information Sheets

This Airport Practice Note and the revised species information fact sheets are intended as information documents for airport members, providing useful information and data regarding common wildlife species around Australian aerodromes and how airports can manage these animals. The fact sheets are for general information purposes only and are not intended to be prescriptive or be an exhaustive set of information on matters that should be taken into account for the management of wildlife hazards at airports. Before making any commitment of a financial nature or otherwise, airports should consider their own specific needs and circumstances and seek advice from appropriately qualified advisers. No material contained within this guideline should be construed or relied upon as providing recommendations in relation to any particular development or planning outcome or decision.

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References

1. Australian Transport Safety Bureau (ATSB) for strike reporting - online and form download
2. Civil Aviation Safety Authority (CASA) for regulation (MOS Part 139 S10.14) and advisory circular (AC126-0)
3. Australian Aviation Wildlife Hazard Group (AAWHG) for general industry support and Recommended Practices (RP). Finalised RPs at the time of compiling this information includes:
   - RP1.3 Wildlife risk assessment and analysis final;
   - RP3.2.10 Firearms Safety;
   - RP3.2.3 Laser Safety FINALReleaseVersion;
   - RP5.1 Training and competency Aerodrome final; and
   - RP5.2 Training and competency Flight crew (working draft).
4. Australian Transport Safety Bureau (ATSB) - Australian aviation wildlife strike statistics 2004 to 2013 Report

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