GAP
Good Aviation Practice

Bird hazards

CAA
CIVIL AVIATION AUTHORITY
OF NEW ZEALAND
Te Mana Rererangi Tūmatanui o Aotearoa

Contents

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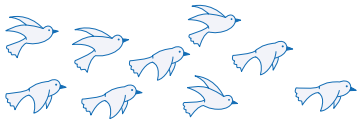
See the CAA website for Civil Aviation Rules, advisory circulars, airworthiness directives, forms, and more safety publications. Visit aviation.govt.nz.

Every effort is made to ensure the information in this booklet is accurate and up-to-date at the time of publishing. But numerous changes can occur with time, especially in regard to airspace and legislation. Readers are reminded to get appropriate up-to-date information.

Bird hazards

New Zealand bird incidents



Incident 1:

A flock of birds lifted off in front of a Metroliner during its takeoff roll. They struck the aircraft and were sucked into the right-hand engine. The takeoff was aborted and the engine shut down.

There was visible damage to the engine compressor blades as well as blood on the engine intake and across the aircraft.

Incident 2:

After takeoff a burning smell and abnormal vibration was noticed from the cockpit of the Boeing 737, and the decision was made to return to land. An overweight landing was safely completed. On inspection, the Boeing 737 was found to have ingested two small birds. Four engine fan blades were damaged beyond limits.

Incident 3:

A Cessna 180 struck a bird at 2100 feet. The aircraft made a precautionary landing at a nearby airfield. The wing leading edge and spar were severely damaged.

Photo courtesy of AOPA New Zealand.

Photo courtesy of Raewyn Adams.

Starling.

Mixing it in the skies

In the early days of flight, when both aircraft and birds were evenly matched, it was easy for the highly manoeuvrable bird to avoid the aircraft. The rapid increase in aircraft speed and the development of quieter aircraft has meant that it is now more difficult for a pilot to avoid a collision with birds.

Bird strikes tend to happen between 50 feet and 800 feet during the takeoff and landing phases. Bird encounters at altitude are rare, although, the highest ever recorded bird strike occurred over the West African coast when a jet collided with a bearded vulture at 37,000 feet!

In general, turbine-engine aeroplanes are more vulnerable to bird strikes than piston-engine aeroplanes because of their greater speed and lower noise level ahead of their flight path. Birds do not get enough warning to take evasive action, and when disturbed on the ground they tend to swarm up in alarm into the aircraft's path.

Helicopters fly in the same airspace as birds, often below 500 feet, and theoretically should face a higher bird strike risk. Birds, however, seem to perceive the presence of helicopters a lot easier than they do aeroplanes and move out of their path.

This could be for a number of reasons: the relatively low airspeed, the large amount of downwash air, and the noise.

Higher speeds have also led to greater impact forces and more serious consequences. In a collision, doubling the mass of the bird doubles the energy of the impact. When the speed of the impact is doubled, the energy of the impact is quadrupled! (See page 5 for worked examples.)

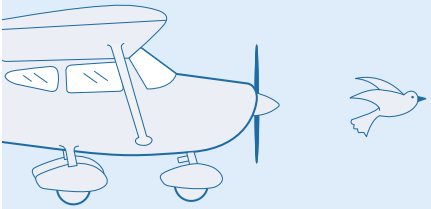
Even if a light aircraft travelling at 90 knots hits a small bird of 0.5 kilograms, the impact energy is approximately 536 joules. The forces involved are sufficient to badly dent or tear open aircraft skin surfaces, shatter windscreens, rupture hydraulic lines, damage oil coolers and air intakes, smash landing lights, or break off pitot heads.

Starling.

Although a collision with one bird can result in significant structural damage, it is the dense flock that creates the worst hazard.

Starlings weigh only about 85 grams each, but a flock of them has been responsible for at least one serious aircraft accident.

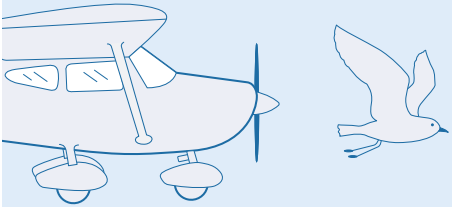
Starling flock.



The energy of the impact is proportional to the mass of the bird multiplied by the square of the speed of the impact.

0.5 kg

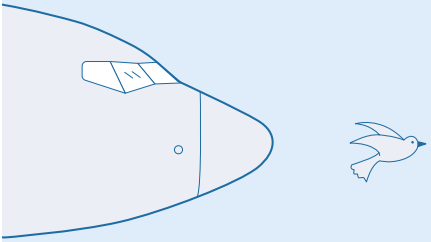
Impact energy = 1/2 x mass x velocity^2
= 1/2 x 0.50 x (46.3 m/s)^2
= 536 joules



If you double the mass of the bird then the energy of the impact will only double.

1.0 kg

Impact energy = 1/2 x mass x velocity^2
= 1/2 x 1.0 x (46.3 m/s)^2
= 1072 joules



If you double the speed, the energy of the impact will be quadrupled.

0.5 kg

Impact energy = 1/2 x mass x velocity^2
= 1/2 x 0.50 x (92.6 m/s)^2
= 2144 joules

Red-billed gull.

Photo courtesy of Raewyn Adams.

Understanding the problem

Aircraft of virtually every type and size have been victims of bird strikes, from Boeing 747s to Cessna 150s, and in most cases the pilots had little advance warning of the danger. The following points may help understand it from the bird's perspective.

Sight and vision

Birds see and hear well and rely on these senses to warn of danger. The more visible an aircraft and the more time the bird has to see or hear it, the greater the possibility that the bird will get out of the way.

An interesting twist is that when an aircraft is turning, birds cannot predict its flight path, and many strikes have occurred in this situation with the bird apparently flying directly into the aircraft's path.

Behaviour

Since aircraft are not part of their natural environment, birds are not instinctively equipped to cope with them. The way a bird reacts to the threat of an aircraft encounter can vary greatly.

Some waders will rest and feed only a few metres away from taxiing or departing aircraft. If it becomes necessary to move to avoid being run down, the birds may fly off a few metres and continue feeding. But if startled by an unusual movement or noise they may take to the air in panic and fly into the path of the aircraft.

Some birds will occasionally try to outfly an aircraft, turning out of its flight path only at the last second.

A hawk may even attack an aircraft, viewing it as potential prey when seen from a great distance, and discovering its error too late.

Avoiding bird strikes

For operations at certificated aerodromes, the responsibility of avoiding bird strikes falls entirely on pilots. Air traffic control can advise of possible hazards when they know about them, and aerodrome operators will endeavour to keep the bird numbers under control, but ultimately it is the pilot who must avoid them.

The best way to make an aircraft conspicuous to birds is to turn on all its lights. Landing lights and strobes should be on when operating on or near any aerodrome and in reduced visibility conditions.

Pilots who regularly fly below 500 feet agl for bona fide reasons can help protect themselves by becoming familiar with, and avoiding, bird nesting or feeding grounds and high-tide roosting areas in the proposed area of operation. Most birds are creatures of habit and tend to remain in the territory they inhabit and fly over. Even if you don't know where the local nesting sites are located, it is good policy to avoid flying too close to any harbour mouth or dune bank, as these are typical breeding and roosting areas for a number of waders.

Coastal aerodromes

Many aerodromes in New Zealand are coastal and therefore tend to have larger bird populations than those situated inland. The dangers of a bird strike are therefore very real indeed. One such aerodrome is Thames, which is in close proximity to an ecologically significant bird nesting area along the southern coastline of the Firth of Thames. The area is listed as a wetland of international importance for a large number of breeding, wintering and migrating bird species. It should be noted that there is an important wader roost, and gull breeding area immediately outside the airfield, as well as along the southern shore of the Firth of Thames.

Where possible, pilots should avoid over flying bird nesting/roosting areas either along the coast or other wetlands, or remain at least 1000 feet above them, to minimise the disturbance to birds. Doing so will also significantly lower the risk of a bird strike and reduce the need to lock more airspace up in Restricted Areas.

If weather conditions dictate that you do have to fly along the coastline at low level (ie, down to 500 feet agl), then be alert to the possibility of a bird or fishing kite strike, maintain a good lookout, and be prepared to take avoiding action.

Gull colony.

Bird nests

Birds' nests under the engine cowls or in the fuselage can pose a very real danger to flight safety. A bird's nest built in close proximity to the engine exhaust system, for example, will probably result in an engine fire, the consequences of which need no further elaboration. Similarly, a bird's nest that disrupts the airflow into the engine oil cooler will almost certainly cause the engine to overheat and possibly seize. Nests built in the fuselage or wing can foul the control cables and could result in a control surface jamming.

The importance of thoroughly checking for birds' nests during the pre-flight (sometimes it may be necessary to remove cowlings to do a thorough check) can not be stressed enough. Be especially vigilant during springtime.

Bird control measures

Unnatural sounds such as loud bangs, and natural sounds such as bird distress calls, all work to some degree as scaring devices. But since birds have the same hearing range as humans, noises that birds find alarming soon become offensive to us.

This harassment loses its effect on birds if repeated without any harm being done, so it becomes necessary to reinforce this with periodic shootings. Birds are easily frightened, but they are also faced with the alternative that they must feed or perish, so they learn to live with some degree of anxiety and ignore threats to their safety.

In the case of aerodromes certificated under Civil Aviation Rules, Part 139 *Aerodromes – Certification, Operation and Use*, the aerodrome operator is required to have a wildlife management plan to manage the bird hazard. In order to fulfil their responsibilities they need advice of bird hazards, near misses and strikes. Where possible, aerodrome operators need to work with local authorities to mitigate the risks posed by bird-feeding sites (such as rubbish dumps or landfills) adjacent to the aerodrome.

Where an aerodrome is not certificated under Part 139, the pilot and aircraft operator are responsible for the safe operation of their flight. If birds are a hazard at any of the aerodromes they use, then operators may need to bring pressure to bear on the aerodrome owner to rectify this problem.

In order to reduce the likelihood of nesting, aircraft owners and operators should endeavour to keep the numbers of birds in their hangars to a minimum by implementing appropriate bird control measures.

Bird hazard and incident reporting

A bird strike can potentially cost operators a lot of money, and understandably they are very keen to see any bird hazards and incidents reported.

If you want some form of long-term protection from bird strikes – report all bird hazards, near misses and strikes. Without such information, there is no firm evidence to justify bird-control measures.

What constitutes a bird hazard?

A bird hazard includes:

- Significant populations of birds living on or in close proximity to the aerodrome.
- Erratic and unpredictable bird behaviour when disturbed by an aircraft.
- Bird flight paths which conflict with the circuit pattern of the aerodrome.

Bar-tailed godwit colony.

Photo courtesy of Raewyn Adams.

Reporting bird hazards

The pilot in command should notify bird hazards to:

- The nearest ATS unit without delay, so that they can warn other pilots of the danger. ATS can then pass the information on to the aerodrome operator for action.
- Pilots of other aircraft operating in the vicinity of an unattended aerodrome so that they are alerted to the danger.
- The aerodrome operator or owner if the aerodrome is unattended.
- If the bird hazard is considered to be serious, to the CAA as an Aviation Related Concern (ARC) by calling 0508 4SAFETY (0508 472 338), or by emailing isi@caa.govt.nz.

What constitutes a bird incident?

A bird incident includes:

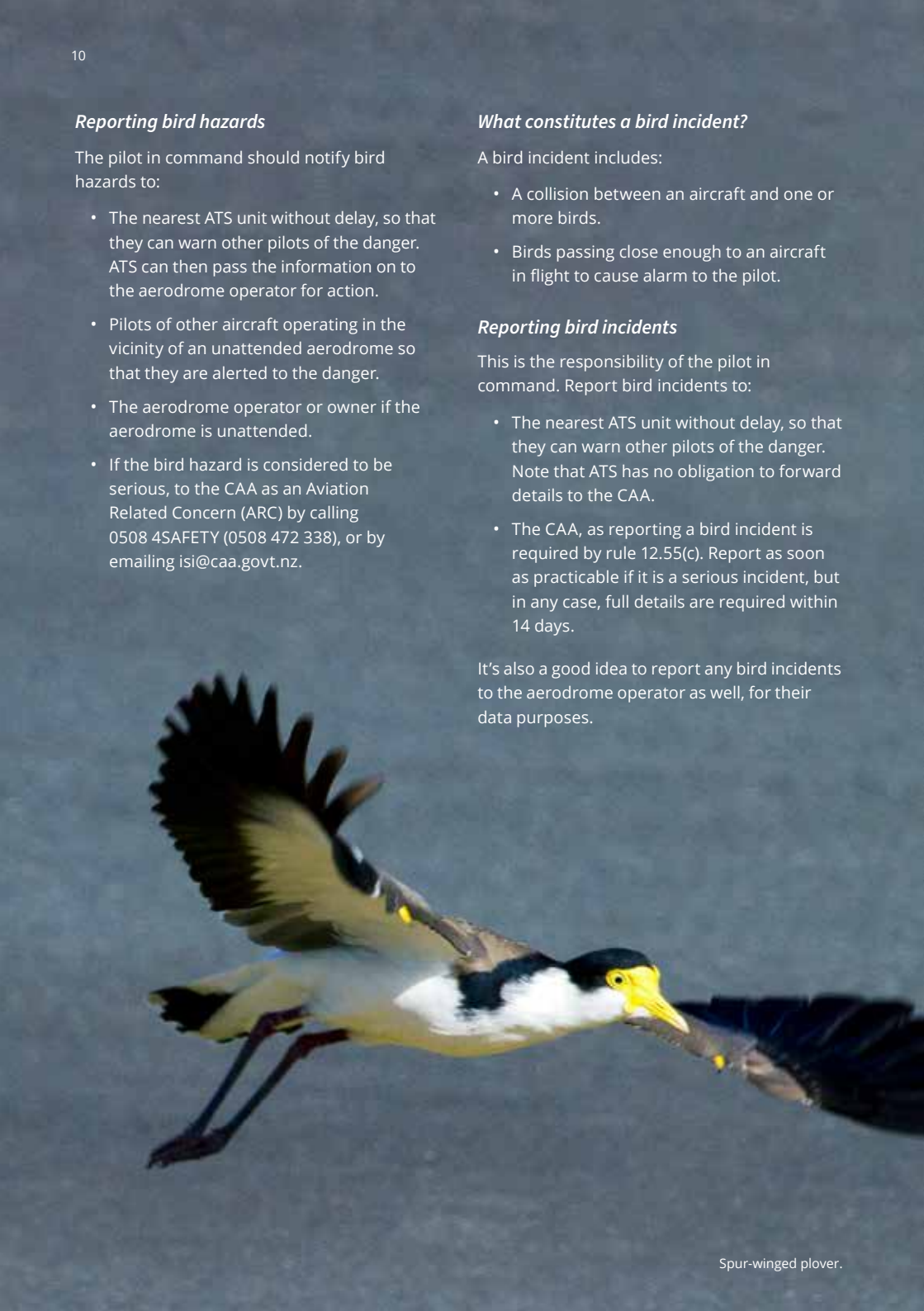
- A collision between an aircraft and one or more birds.
- Birds passing close enough to an aircraft in flight to cause alarm to the pilot.

Reporting bird incidents

This is the responsibility of the pilot in command. Report bird incidents to:

- The nearest ATS unit without delay, so that they can warn other pilots of the danger. Note that ATS has no obligation to forward details to the CAA.
- The CAA, as reporting a bird incident is required by rule 12.55(c). Report as soon as practicable if it is a serious incident, but in any case, full details are required within 14 days.

It's also a good idea to report any bird incidents to the aerodrome operator as well, for their data purposes.



Spur-winged plover.

How to report bird incidents

When reporting bird strikes or near strikes, you can use the CA005B Bird incident notification form. This is available on aviation.govt.nz/forms.

However, if you're reporting a bird strike that's resulted in damage to an aircraft, you need to submit a CA005 Occurrence report. You can do this online – just go to aviation.govt.nz/report and follow the prompts.

Remember that you must still notify an accident or serious incident as soon as practicable using 0508 ACCIDENT (0508 222 433).

Find out more

The CAA publishes bird incident rate reports. These are produced each quarter to help aerodrome operators meet their responsibilities for wildlife management.

Find these reports on aviation.govt.nz under the 'safety' section.

Read more about occurrence reporting in the CAA's *How to report occurrences* GAP booklet. It's available online, and you can request a printed copy by emailing publications@caa.govt.nz.

> Bird concentrations on and around aerodromes constitute a very real threat to aircraft safety.

Conclusion

Bird concentrations on and around aerodromes constitute a very real threat to aircraft safety. Without accurate statistics to support claims of bird hazards or incidents, no action can be taken by either the aerodrome operator or owner or the CAA.

Photo courtesy of Raewyn Adams.

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To request publications such as GAPs and posters email: publications@caa.govt.nz.

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