

Bird Hazards

Bird Hazards

New Zealand Bird Incidents

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

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

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. Upon inspection the Boeing 737 was found to have ingested two small birds. Four engine fan blades were damaged beyond limits.

A Cessna 180 struck a bird at 2,100 feet. The aircraft made a precautionary landing at a nearby airfield. The wing leading edge was severely damaged as well as the wing spar and both the inner and outer leading-edge skins.



Photograph courtesy of AOPA New Zealand.

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.



Red-billed Gull. Photograph by Peter Blok courtesy of the Department of Conservation.

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 turbojet 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.



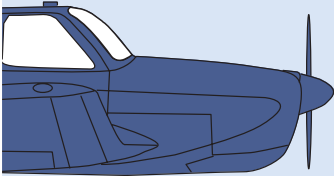
Male Starling. Photograph by Dick Veitch courtesy of the Department of Conservation.

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

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 Figures 1 to 3 for worked examples.)

Figure 1



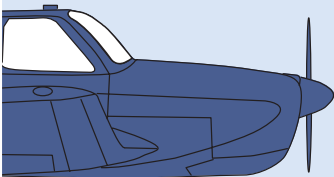
90 knots

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



$$\begin{aligned}\text{Impact Energy} &= \frac{1}{2} \times \text{mass} \times \text{velocity}^2 \\ &= \frac{1}{2} \times 0.50 \times (46.3 \text{ m/s})^2 \\ &= 536 \text{ Joules}\end{aligned}$$

Figure 2



90 knots

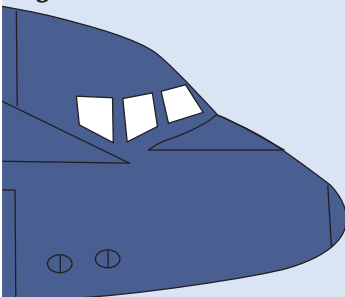
If you double the mass of the bird then the energy of the impact will only double.



1.0 kg

$$\begin{aligned}\text{Impact Energy} &= \frac{1}{2} \times \text{mass} \times \text{velocity}^2 \\ &= \frac{1}{2} \times 1.0 \times (46.3 \text{ m/s})^2 \\ &= 1072 \text{ Joules}\end{aligned}$$

Figure 3



180 knots

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



0.5 kg

$$\begin{aligned}\text{Impact Energy} &= \frac{1}{2} \times \text{mass} \times \text{velocity}^2 \\ &= \frac{1}{2} \times 0.50 \times (92.6 \text{ m/s})^2 \\ &= 2144 \text{ Joules}\end{aligned}$$

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.

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 have been responsible for at least one serious aircraft accident.

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



Juvenile Southern Black-backed Gull. Photograph by F. Kinsky courtesy of the Department of Conservation.

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



Photograph courtesy of Department of Conservation.

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 look out, and be prepared to take avoiding action.

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 over 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 Rule 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.



Red-billed Gull colony. Photograph courtesy of Department of Conservation.



A Wrybill nests on the foreshore. Photograph courtesy of the Department of Conservation.

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.

What Constitutes a Bird Incident?

A bird incident includes:

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

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 Safety Investigation Unit as an Aviation Related Concern (ARC) by calling 0508 4SAFETY.

Reporting Bird Incidents

The pilot in command should notify bird incidents to:

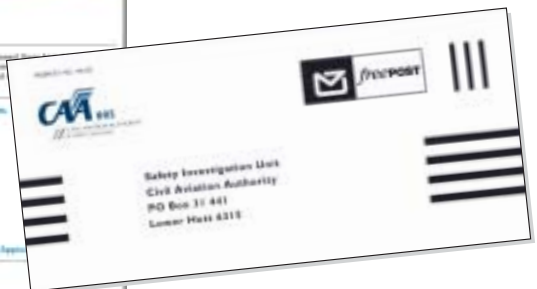
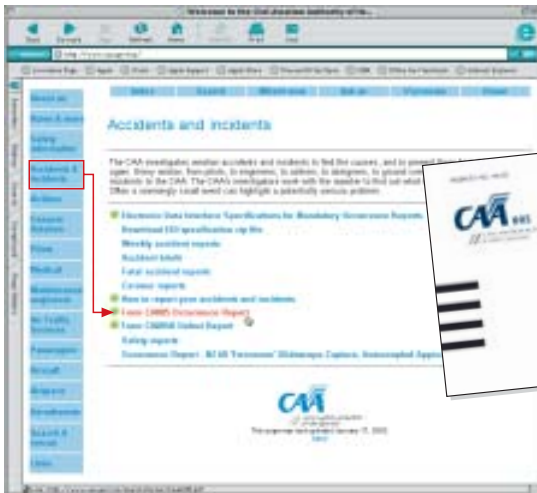
- The nearest ATS unit without delay, so that they can warn other pilots of the danger.
- The CAA as soon as practicable because a bird incident is an occurrence under Rule Part 12 *Accidents, Incidents and Statistics*. The specifics of the incident need to be detailed on CAA Form 005 and sent to the CAA within 10 days. These forms can be obtained from the CAA's Safety Investigation Unit (Tel: 0-4-560 9400) or printed off the CAA web site www.caa.govt.nz by clicking on **Accidents and Incidents/Form 005 Occurrence Report**.

Incident Details to be Reported

CAA Form 005 requires you to detail information about the date, time and location of the incident, aircraft type, number of birds seen, number of birds hit and species if known. This basic information, plus other information that the Form requires, will help the CAA and the aerodrome operator keep track of the bird hazard problem and allow steps to be taken if the problem reaches certain proportions.

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 – so please report them!



Spur-winged Plover ▶
 Photograph by Dick Veitch
 courtesy of Department of Conservation.





GAPs are produced by the Civil Aviation Authority of New Zealand.
Bird Hazards was published in April 2003.