



WILDLIFE HAZARD MANAGEMENT





Why should we be worried about wildlife

- Increasing populations of many bird species hazardous to aviation .
- Adaptation of birds to urban settings.
- Increasing air traffic .
- Faster, quieter 2-engine jet aircraft .
- Increased liability issues with bird strikes .



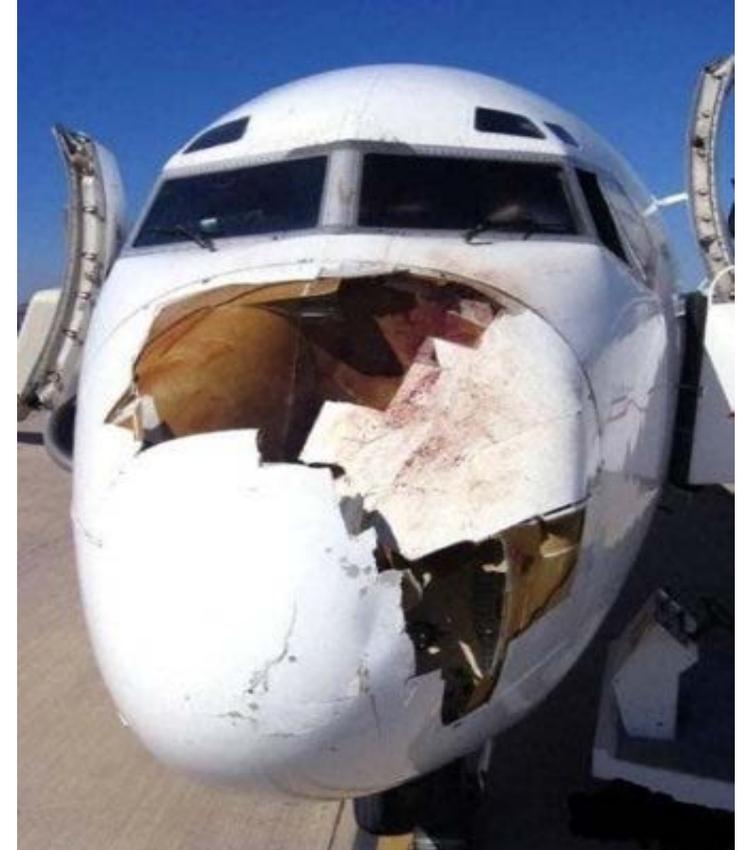


Wildlife Strike

Impacts from strikes in U.S.

1990 to 2008

- 9 strikes resulted in 16 fatalities
- 49 aircraft destroyed
- 393,521 hours of aircraft downtime
- \$308 U.S million in losses





Wildlife Strike

Amendment 10-A to Annex 14, Volume I

The presence of wildlife (birds and animals) on and in the aerodrome vicinity poses a serious threat to aircraft operational safety.

9.4.3 Amendment 10 to Annex 14, Volume I

9.4.1 The wildlife strike hazard on, or in the vicinity of, an aerodrome shall be assessed through:

- a) the establishment of a national procedure...
- b) the collection of information from aircraft operators, aerodrome personnel....
- c) an ongoing evaluation of the wildlife hazard by competent personnel.



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Airport Services Manual

Part 3
Wildlife Control and Reduction

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International Civil Aviation Organization



Bird Strike

Power of Birds





Bird Strike

Where are reported strikes occurring?

- 59% below 100 feet (30 m)
- 92% below 3,000 feet (900 m)
- Less than 2% above 10,000 feet (3000 m)
- Highest strike: 32,500 feet (10000 m)



Wildlife is attracted to aerodromes because they provide

- Food
- Water
- Habitat-cover
- Security





ICAO Wildlife Control Requirements & recommendations

- ICAO now has greater focus on the reduction of all wildlife hazards (not just birds)
- Certification to the Airports should “triggers” to require a Wildlife Hazard Assessment and a Wildlife Hazard Management Plan (WHMP)



ICAO Wildlife Requirements

Wildlife strike hazard reduction

- The wildlife strike hazard on, or in the vicinity of, an aerodrome shall be assessed through:
 - a) the establishment of a national procedure for recording and reporting wildlife strikes to aircraft; and
 - b) the collection of information from aircraft operators, airport personnel, etc. on the presence of wildlife on or around the aerodrome constituting a potential hazard to aircraft operations.
 - c) an ongoing evaluation of the wildlife hazard by competent personnel.



ICAO Wildlife Requirements

Wildlife hazard reduction

- Wildlife strike reports shall be collected and forwarded to ICAO for inclusion in the ICAO Bird Strike Information System (IBIS) database.

- **Note:**

The IBIS is designed to collect and disseminate information on wildlife strikes to aircraft.

Information on the system is included in the Manual on the ICAO Bird Strike Information System (IBIS) Doc 9332



Risk Assessment of Wildlife Hazard & Wildlife Hazard Management Plan

Risk Assessment of Wildlife Hazard

- The first step of managing wildlife hazard is to assess the level of risk that each species of animal presents to aircraft operations at the aerodrome.
- This risk assessment is more than simply surveying the species found in and around the aerodrome; it involves assessing the likelihood of each species striking an aircraft and the probability and extent of damage that may result.
- This allows managers to prioritize their management actions to target the highest risk species. The Risk Assessment should also identify the biological factors that cause different wildlife species to present a risk to aviation safety.
- Identification of these factors will greatly aid in the formulation of a Wildlife Hazard Management Plan.
- There are several methods of conducting a Risk Assessment of Wildlife Hazards. In its most basic form, a Risk Assessment determines the level of risk that each species of wildlife presents based on the combination of the probability that it will be struck by an aircraft and the severity of the outcome



Risk Assessment of Wildlife Hazard & Wildlife Hazard Management Plan

Risk Assessment :

- Define the Area of Risk Assessment
 - ✓ The first step in a Risk Assessment of Wildlife Hazards is to define the area that will be assessed.
 - ✓ This generally includes the entire aerodrome.
 - ✓ The area of the Risk Assessment should include the take-off routes and landing approaches when significant wildlife hazards are present in these zones.



Risk Assessment of Wildlife Hazard

- Ranking the Probability of a Strike
- The next step of a Risk Assessment is to rate the probability that species will be involved in a strike.
- The example below uses a scale with 5 levels but fewer or more levels could be used.



Example of Risk Assessment Matrix for Wildlife

			Severity of Strikes				
			Catastrophic	Critical	Moderate	Minor	Negligible
Probability of Strikes			A/C Crash & Severe	A/C Crash & Light Casualty	A/C Severe Damage & No Crash	A/C light Damage	near miss
Definition	Meaning	Value	A	B	C	D	E
Frequent	5/10,000 movements	5	5A(Unacceptable)	5B(Unacceptable)	5C(Unacceptable)	5D(High)	5E(Moderate)
likely	4/10,000 movements	4	4A(Unacceptable)	4B(Unacceptable)	4C(Unacceptable)	4D(Moderate)	4E(Moderate)
Occasional	3/10,000 movements	3	3A(Unacceptable)	3B(High)	3C(High)	3D(Moderate)	3E(Low)
Seldom	2/10,000 movements	2	2A(Unacceptable)	2B(High)	2C(Moderate)	2D(Low)	2E(Very Low)
Improbable	1/10,000 movements	1	1A(Unacceptable)	1B(High)	1C(Low)	1D(Very Low)	1E(Very Low)



Risk Assessment of Wildlife Hazard

- The probability can be assessed qualitatively on a scale, for example, from Very Low to Very High. Species that shy away from aircraft noise or that learn to avoid aircraft could be rated as Low or Very Low. Birds that flock in large numbers to certain habitats in the flight path could be rated a High or Very High. Solitary animals might be rated as Medium but other behavioral factors might have to be taken into account. This probability might also vary with the season or other conditions such as grass length or rain and weather conditions.
- A quantitative approach could use historical strike records at the aerodrome expressed as the number of strikes (by species) per 10,000 aircraft movements. As a guide, 5 or more strikes per 10,000 movements would constitute a Very High probability of a strike, whereas less than 1 strike per 10,000 movements constitutes a Very Low probability.



Risk Assessment of Wildlife Hazard

Ranking the Severity of a Strike

- The next step is to rank the expected severity of the impact or damage resulting from a strike event. Sometimes called the Hazard Level Ranking, this can use a scale similar to strike probability scale. This ranking will depend on the size of the animal and its tendency to flock or congregate.
- Heavier animals have a greater capacity to damage an aircraft and impact its flight performance. As a guide, birds that tend to flock and weigh more than 1.8 kg can cause the most severe damage to aircraft. The birds (or bats) that are solitary and weigh less than 50 g might be expected to cause the least severe damage. Flocking behavior might mean that a strike event could include multiple impacts or it could increase the probability of a strike.
- Severity can be rated in terms of aircraft damage and human casualty. Negligible could mean near miss and aircraft damage. Minor could mean light aircraft damage. Moderate could mean severe aircraft damage. Critical might mean that the aircraft could crash with no human death, just wounded, and Catastrophic might mean an emergency situation with aircraft crash and severe wounds or death casualty. Each airport should determine its own scale. The range of aircraft sizes operating at an airport will also need to be taken into consideration, so clearly the views of the aircraft operators should be considered



Risk Assessment of Wildlife Hazard

- **Risk Assessment Matrix**
- An example of a Risk Assessment Matrix is provided in Table below. The level of Risk for each species of bird, bat and terrestrial animal is determined as a combination of the Probability of a Strike and the Severity of the Outcome.
- In the example the Risk is also rated on a scale of 5 – Very Low, Low, Medium, High and Unacceptable. Alternatives might use a scale of 3 and the traffic light colors (Green, Amber, Red) to highlight the high priority species.
- The Risk Assessment will rank the risk of each species and highlight those species that should be prioritized for risk mitigation in the WHMP



Risk Assessment of Wildlife Hazard

Identifying Root Causes of Wildlife Hazard

- The final stage of the Risk Assessment of Wildlife Hazard is to identify the root cause of each wildlife hazard. Here, it is critical to understand the behavior and basic requirements of each hazardous species of wildlife.
- Remember, each animal has a basic requirement for energy and nutrients, including water. They must maintain their bodies core temperature, they must breed and reproduce, and they must avoid being predated by another animal. When identifying root causes of wildlife hazards, consider each species and its basic requirements. Then, observe the aerodrome and surrounding areas to determine how the different habitats may aid the species in fulfilling its requirements.
- This stage of the Risk Assessment should involve a trained wildlife biologist who is familiar with ecology and animal behavior. Ideal habitats for hazardous wildlife may not be readily apparent, and the attractiveness of aerodrome habitats may vary seasonally. Consider all stages of an animal's requirements throughout the annual cycle. Breeding seasons, annual migrations, seasonal weather patterns, and food availability are all factors that can contribute to temporal changed in wildlife hazard.



Risk Assessment of Wildlife Hazard

Using Advanced Risk Assessment Methods

- The Risk Assessment outlined above is one of the most basic that an aerodrome can utilize to quantify wildlife hazards. Aerodrome wildlife managers may wish to consider a greater set of variables, and therefore, assess risk more accurately.
- For example, the type of aircraft using the aerodrome will influence the level of risk; larger, faster aircraft will increase the risk of a damaging wildlife strike.
- When considering the probability of a wildlife strike, components of each species behavior can also be considered. This is especially valuable when detailed records of historical wildlife strikes are not available. Such factors as variations in a species annual abundance around the aerodrome, the animal's propensity to engage in "hazardous" behavior, and its relative ability to avoid aircraft can be considered.



Wildlife Hazard Management Plan

The Wildlife Hazard Management Plan (WHMP) is a document created to provide the strategy for reducing the risk that wildlife poses to safe airport operations.

The plan is based on the Risk Assessment of Wildlife Hazards. An effective WHMP should:

- ✓ Identify the wildlife species that are a priority for risk reduction;
- ✓ Prescribe the actions necessary to reduce the risk associated with the individual species;
- ✓ Clearly identify of the roles and responsibilities personnel are required to fulfill; and
- ✓ Describe a Communication Strategy for ensuring that the information necessary for managing wildlife risk is shared effectively;
- ✓ Outline a Training Program for the personnel involved in Wildlife Hazard Management;
- ✓ Describe a monitoring and evaluation strategy for the entire WHMP;
- ✓ Prioritize the specific research needed to advance the efficacy of wildlife hazard management on the aerodrome.



Mitigation of the risk for strikes

- To mitigate the risk for strikes beyond the airport fence, the general public and aviation community must first widen its view of wildlife management to consider habitats and land uses within 5 miles of airports. Wetlands, dredge-spoil containment areas, municipal solid waste landfills, and wildlife refuges can attract hazardous wildlife.
- Such land uses, as discussed, Hazardous Wildlife Attractants on or Near Airports, are often incompatible with aviation safety and should either be prohibited near airports or designed and operated in a manner that minimize the attraction of hazardous wildlife .
- Second, the aviation community needs to broaden the view of wildlife strike risks from a ground-based wildlife management problem solely dealt with by airports to an airspace management problem that also encompasses Air Traffic Control, flight crews, and aircraft manufacturers.
- Long-term goals include the integration of avian radar and bird migration forecasting into **airspace management** .
- The development of aircraft lighting systems to enhance detection and avoidance by birds is also needed as part of an integrated program.



mitigate the risk for strikes

- Finally, there continues to be a need for increased and more detailed strike reporting, especially for General Aviation aircraft. When reports are filed, relevant information should be provided whenever possible regarding species identification, number of wildlife struck, time and height of strike, phase of flight, and damage to aircraft components
- **A problem that is not understood and well defined cannot be properly managed.**



Off - Airport Habitats

- **The land use and habitat management** on areas near an airport are also an important consideration, although an airport operator may have limited ability to control off-site land use and will need to work in partnership with local landowners and stakeholders.
- In principle, the habitats off-site should be more attractive to wildlife than the airport site itself. However extreme cases such as a land fill or garbage dump might attract so much wildlife that it may pose an increased hazard on airport land.
- Off-site land uses and activities that can affect wildlife and might need careful consideration might include the following:



Off - Airport Habitats

- Nature conservation and recreational areas;
- Local agricultural practices;
- Land fill and solid waste management;
- Storm water and waste water treatment plans;
- Water bodies including reservoirs, lakes, rivers and the sea;
- Wetlands including marshes; and
- Gravel pits and quarries.





Recording and Reporting

Recording All Daily Activities

- Keeping records of all activity related to wildlife hazard management is fundamental to the WHMP.
- Data is required in order to be able to assess a whole, as well as specific trends such as habituation.
- There is an increased tendency towards airlines and/or their insurers to pursue legal action to recover the costs of wildlife strike damage from airports at which they occur.
- It is important that airports record the wildlife control actions that they take in order to be able to demonstrate that they had an adequate WHMP in place at the time of an incident and that the Plan was functioning properly. Data gathered as part of a plan is also important in assessing the effectiveness of the actions taken.
- A number of different methods for recording this data exist, from simple paper records to sophisticated devices including laptops, tablet PC or other electronic devices. The latter save time and effort, especially if the data is to be subsequently entered into a computer for further analysis.
- Whatever the means of recording used, the important issue is that a comprehensive record of the bird control activities is kept in order to demonstrate that the airport is following its own policies and procedures. Records need to include the time, location and nature of the following:



Recording and Reporting

- Each patrol or inspection and the route taken;
- Observation of any unusual condition of the habitat or site such as the state of the vegetation, trees, water bodies or perimeter fence;
- Species of wildlife sightings including any particular activity such as feeding or resting, and the discovery of any carcasses, dropping or other signs of activity;
- Interventions that are made;
- The outcome of any intervention, the response of the wildlife and the effectiveness of the hazard elimination.
- Incidents such as wildlife strikes on aircraft and near misses. (Systems will also be in place for such reporting by pilots, airlines and ground staff.).



Equipment

Portable Equipment

Portable equipment, that requires a staff member on the airfield to operate it, is generally regarded as offering the best control, providing that the staff members involved are properly trained and motivated. Devices such as pyrotechnic, pistols, or vehicle mounted distress call generators produce an impression of a direct threat which can be continually varied in time and location by the operator in a manner not available to static systems. This is to prevent wildlife habituating to a static device as they learn that it is not a serious threat.





Equipment

Static equipment

- In general, static wildlife scaring devices, such as gas cannons or other sound generators, gradually lose their effectiveness over time. Although some of the more sophisticated devices, which generate a variety of sounds in random or pre-programmed order, may delay this habituation. They are generally more suitable for providing short-term wildlife deterrence from limited areas (e.g. ground being reinstated after building works).





Equipment

The use of distress and alarm calls are one of the most challenging control methods to use. Not only is their effect somewhat subtle, the proper application of the method is challenging. As a result, few controllers use the method appropriately and effectively .

Fixed and mobile noise makers, such as propane canons, can also be a potential means of dispersal for certain species. If properly equipped with remote control, the advantage of this method is that staff in the control tower can operate them when necessary. If the wildlife hazard prevention patrol is on the other side of the airfield, this method can allow them to extend their range by activating a device remotely.





Habituation

- The classic challenge for wildlife hazard management is that most animals will become accustomed to certain dispersal interventions or find new ways to settle themselves safely in the airport environment.
- Therefore, it is vital for airport operators to continuously adjust and vary the measures taken.
- An airport should proactively seek different or new ways to reduce the wildlife hazard.





Understanding the Different Roles

- Aerodromes must understand the importance of aircraft safety from a habitat and wildlife management perspective.
- This importance will be highlighted in an Aerodrome Safety Management System and will be supported by comprehensive Aerodrome procedures to manage the habitat and wildlife management plans.
- A named senior manager will have overall responsibility for the plan and will be supported by a wildlife subject matter expert.
- Additional support will be provided by the aerodrome wildlife committee and local runway safety team.
- The dedicated wildlife management team should be properly resourced and receive comprehensive training for the specialized role they perform.



Thank You

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Safety Director BADR Airlines

