



ICAO DAKAR UNITING AVIATION

NO COUNTRY
LEFT BEHIND



Fundamentals of Wildlife Hazard Management (WHM)

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Wildlife can hit any part of the airplane



Causing catastrophic outcomes:

- **loss of human life**
- **damage to aircrafts, etc.**



World's Deadliest wildlife strike accident to date

- Occurred on 4 October 1960 at the Boston Logan International Airport
- A Lockheed Electra L188 struck a flock of European starlings (*Sturnus vulgaris*)
- Birds were ingested into aircraft's engines, causing the aircraft to lose power, stall and crash into the harbour
- **Sixty-two people died out of the seventy-two passengers and crew members on board.**





The presence of wildlife on or in the vicinity of aerodromes represents a threat to aircrafts' operational safety

ULTIMATE GOAL of WHM

- ✓ *Elimination/Reduction of wildlife strikes and negative wildlife impacts on and near the aerodromes*



Expectation is Safety!
Objective of WHM= to reduce the risks of wildlife strikes

WILDLIFE HAZARD IS A GLOBAL ISSUE

1 STEP

Each airport to assess risks, monitor trends and develop action plan at local level

2 STEP

Each state to develop national requirements, assess risks, monitor national trends and develop action plan at the national level

STEP 3

Each region to assess risks, monitor regional trends and develop actions at the regional level

STEP 4

ICAO to develop global requirements, monitor global trends and identify actions at the global level

Actions must be taken at all levels to ensure effective Wildlife management



Global level

Regional level

National level

Local Airport level



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Effective wildlife hazard management programmes are critical to ensure aircraft operational safety



FUNDAMENTALS OF
WILDLIFE HAZARD
MANAGEMENT



RISK ASSESSMENT



HABITAT
MANAGEMENT



ACTIVE WILDLIFE
CONTROL



TRAINING OF WILDLIFE
CONTROL OFFICERS



PUTTING EVERYTHING
TOGETHER: WHMP



Fundamentals of Wildlife Hazard Management

- Wildlife Hazard
 - Presence of wildlife on or near the aerodrome could result in wildlife strikes causing severe outcomes
- Wildlife strike
 - Collision between wildlife and an aircraft
- Wildlife hazard management
 - Set of tools , procedures, measures implemented to reduce the risk of wildlife strikes on or near the aerodromes



Manage hazardous Wildlife at the aerodrome

*Habitat management
Active management
Use of technology*

*Wildlife occurrence reporting
Wildlife surveys
Data analysis: Probability/Severity*

**Risk
assessment**



Monitoring and continuous improvement

Wildlife Hazard Management Programme

Land use management

Manage Hazardous Wildlife off the aerodrome





Wildlife Safety Risk assessment

**“If you can't measure it, you
can't manage it.”**

(Peter Drucker)



Wildlife Safety Risk assessment

- Ultimate goal
 - Understand the extent of wildlife hazards on or near the aerodrome that could lead to catastrophic outcomes
- Objectives of wildlife safety risk assessment
 - Assess the level of risk of each species present at or near the aerodrome
 - Prioritize actions, wildlife management techniques and methods

Knowledge of the wildlife living in the aerodrome and its vicinity, their movements and to which areas they are attracted, is essential for effective risk assessment



Wildlife Safety Risk assessment

- Data collection is critical
 - Wildlife Surveys/Wildlife patrols
 - Incident reporting : wildlife presence, wildlife strikes or near misses
 - Records



Wildlife Safety Risk assessment

- Events to be recorded
 - *any reported collision between wildlife and an aircraft for which evidence in the form of a carcass, feathers, any other remains, or damage to the aircraft is found;*
 - *any reported collision between wildlife and an aircraft for which no physical evidence is found, but an indication of a collision exists (visual observation of the collision or acoustic perception of the impact);*
 - *any wildlife found dead on an aerodrome without any other obvious cause of death; and*
 - *incidents or observations where the presence of wildlife on or in the vicinity of the aerodrome could have an effect on a flight (missed approach, aborted take-off, etc.).*



Wildlife Safety Risk assessment

- **Assessing Wildlife safety risks**

- Need to estimate the probability that a strike by a particular species will occur and the likely level of harm that may result.

Wildlife safety risk = (probability of a strike) × (severity of damage caused)



Estimating the probability of a strike

- Data collected depends on the number of strikes and the reporting culture:
 - o Fewer operations may generate fewer collisions
 - o Bad reporting culture may lead to fewer collisions reported
- Limited data may not allow accurate estimation
- Data to be used could be qualitative or quantitative

Data is critical for wildlife risk assessment

Variables to consider :

- Wildlife incident data
- Data on the presence, location and behavior of wildlife
- Strike records
 - o When strike data is not available for a particular species, consider the potential risk of collision (the existence of wildlife and their movements at or near the aerodromes)
- Flight activity :
 - o more operations increases the probability of a strike
 - o Aircraft types : larger ,faster aircrafts increases the risk of a wildlife strike

The more knowledge about the presence and behavior of wildlife on, and in the vicinity of, the aerodrome the stronger the estimation of wildlife strike probability



Estimating the probability of a strike

Rank probabilities by using both quantitative and qualitative measurements of abundances of wildlife and number of strikes

Table 3-1. Example of impact probability categorization

	Probability category				
	Very high	High	Moderate	Low	Very low
QUANTITATIVE APPROACH Presence of wildlife (<i>number of days per year a species is observed on the aerodrome and its surroundings</i>)	> 200	100-200	50-100	50	10
QUALITATIVE APPROACH Presence of wildlife (<i>subjective evaluation</i>)	Permanent	Most	Some	Few	Occasional
QUANTITATIVE APPROACH Average number of strikes per year (5 years)	>10	3-10	1 - 2.9	0.3 - 0.9	0 - 0.2
QUALITATIVE APPROACH Strikes per year (<i>subjective evaluation</i>)	Very often	Often	Some	Occasional	Rare/None



Estimating the severity of a strike

Severity could be rated in terms of :

- aircraft damage and human casualty
- wildlife strikes with a consequence of damage to the aircraft
- number of events with an adverse effect on flights such as a missed approach or aborted take-off

Data is critical for wildlife risk assessment

Variables to consider :

- Size of the animal and its tendency to flock or congregate
 - heavier wildlife and greater flock size increases the probability of damaging an aircraft and impacting its flight performance
 - Flocking behavior could include multiple impacts or increase the probability of a strike.

The more knowledge about the presence and behavior of wildlife on, and in the vicinity of, the aerodrome the stronger the estimation of wildlife strike severity



Estimating the severity of a strike

Rank the expected severity of the impact or damage resulting from a strike event

Table 3-3. Example of safety risk severity

Catastrophic	<ul style="list-style-type: none">— Equipment destroyed; and— multiple deaths.
Hazardous	<ul style="list-style-type: none">— A large reduction in safety margins, physical distress or a workload such that the operators cannot be relied upon to perform their tasks accurately or completely;— serious injury; and— major equipment damage.
Major	<ul style="list-style-type: none">— A significant reduction in safety margins, a reduction in the ability of the operators to cope with adverse operating conditions as a result of an increase in workload or as a result of conditions impairing their efficiency;— serious incident; and— injury to persons.
Minor	<ul style="list-style-type: none">— Nuisance;— operating limitations;— use of emergency procedures; and— minor incident.
Negligible	<ul style="list-style-type: none">— No safety consequences;— no aircraft damage; and— near miss.



Estimating the risk level- Risk assessment matrix

3 levels of risks :

- Level 1 (Green) — Acceptable. The risk is acceptable as it is. No further action is required.
- Level 2 (Yellow) — Tolerable. The risk can be tolerated based on the safety risk mitigation. Review current action undertaken, identify possible further action.
- Level 3 (Red) — Intolerable. Take immediate action. Further action is required to reduce the risk.

		PROBABILITY				
		Very High	High	Moderate	Low	Very Low
SEVERITY	Very High	Red	Red	Red	Red	Yellow
	High	Red	Red	Red	Yellow	Yellow
	Moderate	Red	Yellow	Yellow	Green	Green
	Low	Red	Yellow	Green	Green	Green
	Very Low	Yellow	Green	Green	Green	Green



Wildlife Safety Risk assessment

Case study

— A common resident species at the aerodrome, the common kestrel, produced nine impacts, causing minor damage to aircraft in two of them.

— The migratory barn swallow produced many impacts in spring and summer, although it was not possible to calculate the exact number of impacts. Due to the bird's size, it has never caused any damage.

— This year, griffon vultures appeared for the first time in the area for several days throughout the year. There are no historical records about the presence of vultures in the aerodrome, but due to the bird's size and possible formation of flocks, their possible hazard for operations must be taken into account.

Assessment

For the Common kestrel : Impact probability is HIGH. Its severity, taking into account the percentage of impacts that have caused damage, is VERY HIGH. However, knowing that the common kestrel is typically solitary, and weighs less than 300 g, its severity could be reduced to some degree, to MODERATE.

- **For the barn swallow : impact probability is HIGH. However, as its occurrence is seasonal, this could allow for reduction to some degree of the probability of impact. Its severity, because of the absence of damage, and its small size (20 g), is VERY LOW.**
- **For griffon vultures: although there have been no impacts yet, their new and persistent presence at the aerodrome should be taken into account. Its probability would be HIGH. Its severity, considering its size (more than 7 kg) and flight form, would be VERY HIGH.**



Wildlife Safety Risk assessment

		PROBABILITY				
		Very high	High	Moderate	Low	Very low
SEVERITY	Very High	Red	Griffon vulture	Red	Red	Yellow
	High		Yellow		Yellow	
	Moderate	Red	Common kestrel	Yellow	Green	Green
	Low		Yellow	Green	Green	
	Very Low	Yellow	Barn swallow	Green	Green	Green





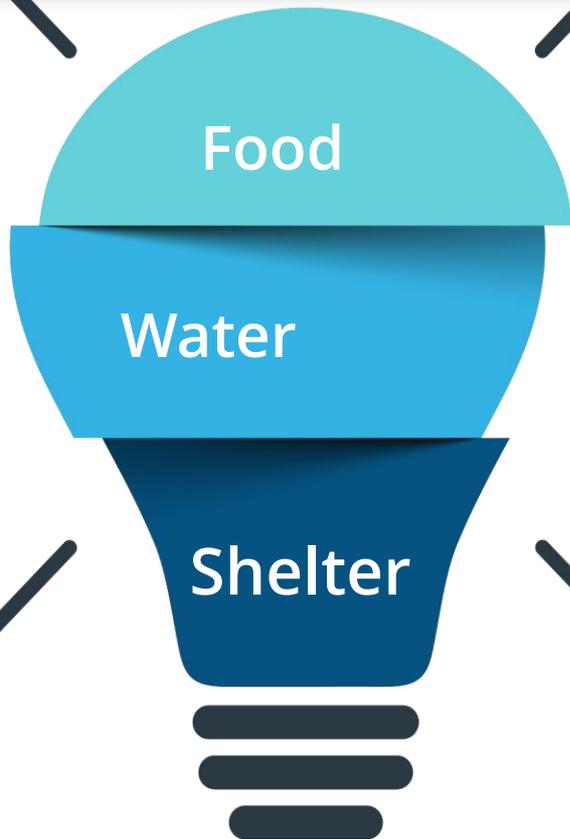
Habitat management

- Ultimate goal
 - Manipulating/modifying habitat and environment to reduce attractiveness of an aerodrome to wildlife
- Objectives of habitat management
 - Eliminate attractants to keep away wildlife from the aerodrome and its vicinity
 - Eliminate land use practices that attract hazardous wildlife population on, or in the vicinity of, the aerodrome

Knowledge of the root causes of habitat used by wildlife on or near the aerodrome is essential for effective habitat management



ATTRACTANTS



Food

- Provides feeding
- Vegetation
 - Agriculture
 - Waste management (e.g.garbage bins/dump)



Water

- Provides drink, resting, food, security
- Water bodies
 - Wastewater management facilities
 - Quarries



Shelter

- Provides resting ,security, nesting
- Open areas
 - Forests
 - Nature reserves
 - Buildings





Habitat management

On-aerodrome management

Involves removal and alteration of habitat features that attract hazardous species

- Typical actions :
 - Adjusting the design of aerodrome buildings and structures,
 - preventing wildlife from accessing aerodrome property using fencing,
 - adjusting grass height,
 - pruning or removal of trees and shrubs,
 - management of waste and the removal of standing water (ponds, puddles).

Off-Aerodrome management

Involves implementation of compatible land use in the vicinity of aerodrome

- Typical actions :
 - Identify the area to be assessed(13km radius or +?)
 - communicate safety concerns with the local authority in order to raise awareness,
 - Prior planning to ensure that incompatible land use is not allowed to become established,
 - Regular monitoring of sites where hazardous wildlife is to be found
 - engage with local farmers to encourage them to choose least attractive agriculture practices
 - Coordinate with appropriate authority to prohibit or restrict the establishment of new or existing organic waste sites near the aerodrome



Active wildlife control

- Ultimate goal
 - Controlling wildlife on aerodromes to reduce strike risks
- Objectives of active wildlife control
 - Eliminate the presence of hazardous wildlife at aerodromes by using repellent techniques (expelling/deterring) and reducing habituation

Hazardous species may respond differently to expelling and deterring techniques. Understanding animal behavior is essential to identify appropriate techniques/methods to control hazardous wildlife



Active wildlife control

- **Each aerodrome is unique**
 - There is no single solution or set of procedures that is best for all situations.
 - Aerodrome operators should carry out a thorough review of any equipment before purchase to ensure that it is fit for purpose.
 - Equipment used by wildlife management personnel on the aerodrome to control hazardous wildlife should be appropriate to the aerodrome environment and species encountered
- **Each wildlife species is unique**
 - Each wildlife species is unique and will respond differently to various repellent techniques.
 - Factors such as food resources, weather, time of year or day and predation can clearly interact to diminish or enhance repellent effectiveness.
- **Using the same repellent techniques may cause habituation**
 - To lessen habituation: use each technique sparingly and appropriately;
 - use various repellent techniques in an integrated fashion;
 - if necessary, reinforce repellents with occasional lethal action directed at problem species.

Repellent techniques



Audio-repellents

Pyrotechnics,
distress calls,
electronic noise
generating systems



Visual repellents

Presence of humans
or vehicles, visual
objects, trained
predators, drones



Trap and relocate

Hazardous wildlife
can be caught and
released away from
the aerodrome.

Chemical repellents

Non-lethal chemical
repellents work by affecting
the animal's senses
through smell or taste
aversion

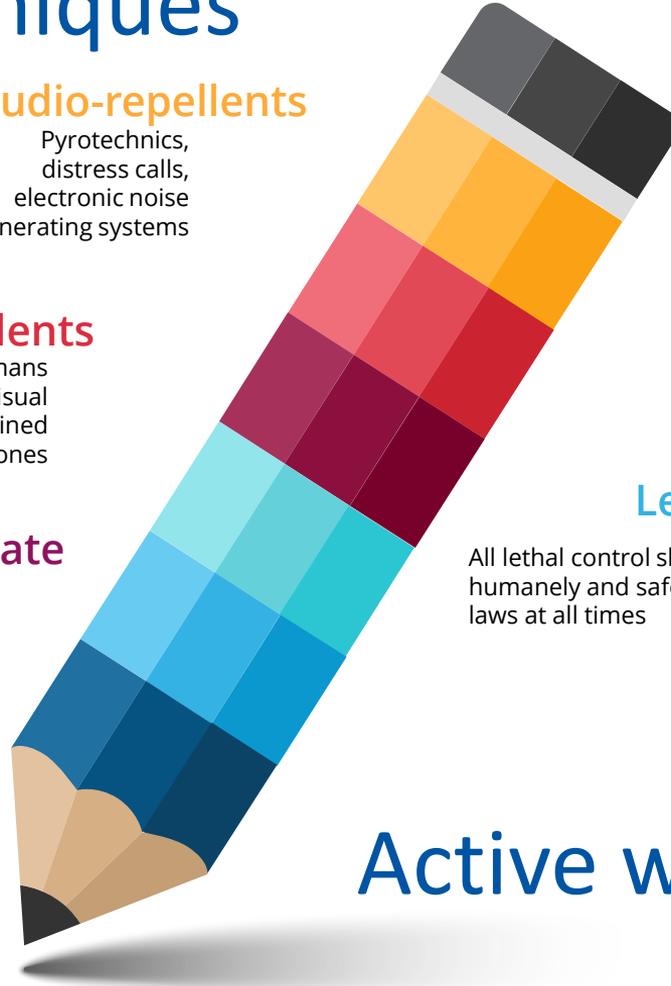


Lethal control

All lethal control should be undertaken
humanely and safely according to local
laws at all times



Active wildlife control





Training

- Ultimate goal
 - Ensure competency of wildlife hazard control personnel and managers for the effective management of wildlife hazards
- Objective of training of personnel
 - Provide knowledge, skills, attitude necessary to perform wildlife hazard management tasks



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 - Ensure competency of wildlife hazard control personnel and managers for the effective management wildlife hazards
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 - Provide knowledge, skills, attitude necessary to perform wildlife hazard management tasks



Training

Initial training

Should address as a minimum :

- An understanding of the nature and extent of the aviation wildlife hazard, and local hazard identification;
- An understanding of national and local regulations, standards and guidance material related to WHM
- A broad appreciation of local wildlife ecology and biology;
- The importance of accurate wildlife identification and observations, including the use of field guides;
- Local and national laws and regulations relating to protected species, and species of special concern and aerodrome policies related to them
- High-risk species identified in the wildlife risk assessment;
- Wildlife strike remains collection procedures, identification and reporting;
- Active/tactical measures, using well-established effective wildlife removal, dispersal, detection and control techniques;
- Documentation of wildlife activities, control measures and reporting procedures
- Firearms, drones and any other equipment and their use on the aerodrome,

Recurrent training

Should include:

- Changes in the local environment;
- Recent wildlife events at the aerodrome;
- Changes in active and passive measures;
- Any other matters that the aerodrome operator deems appropriate.



Wildlife Hazard Management Programme

- Ultimate goal
 - Ensure effective management of wildlife hazards on or near the aerodrome
- Objective of training of personnel active wildlife control
 - Describe the actions , procedures, roles and responsibilities and processes adopted by the aerodrome operator to address wildlife hazards

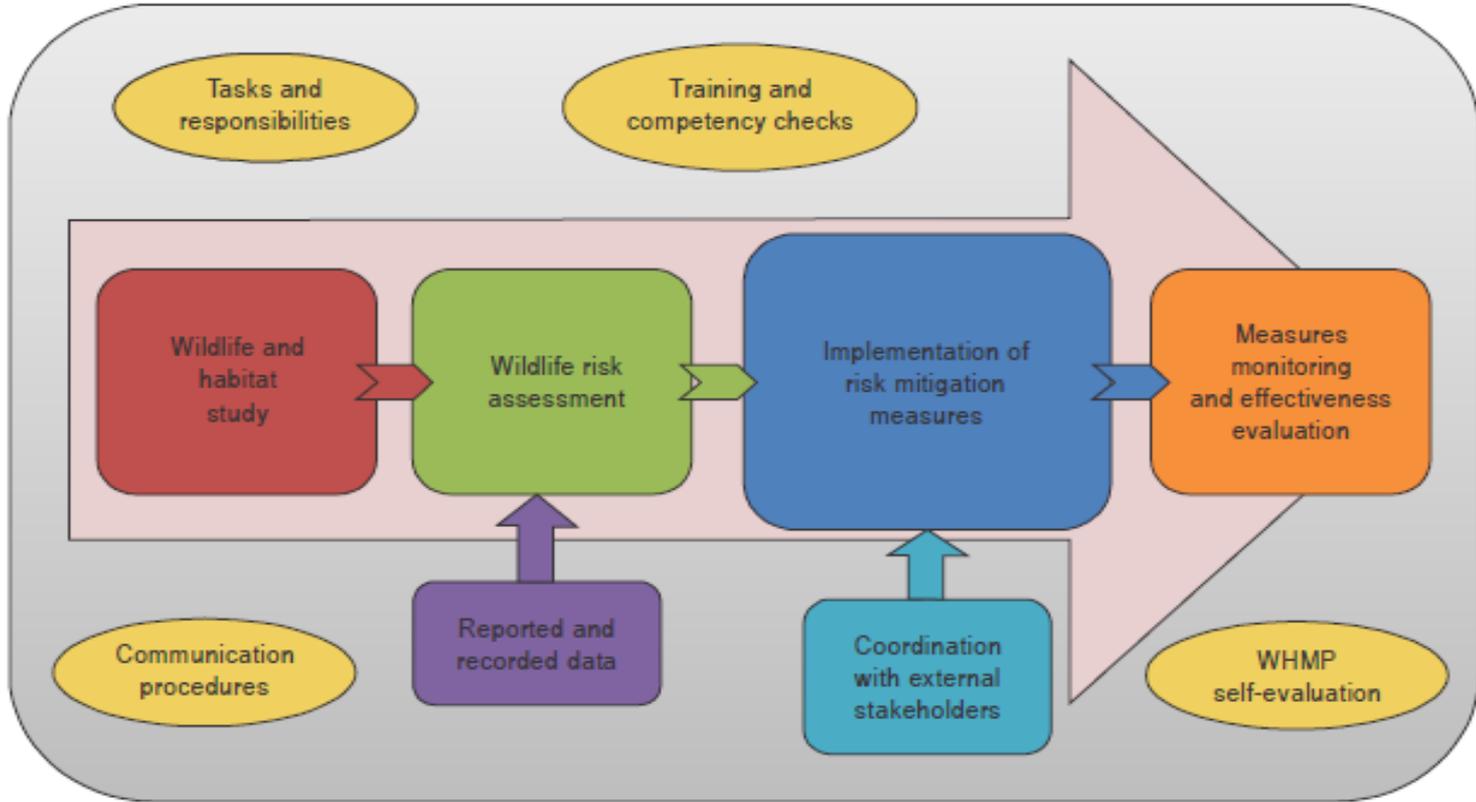


WHMP should include

- a description of the organization, roles and tasks in the WHMP;
- procedures for collecting, reporting and recording data on wildlife strikes and observed wildlife;
- a wildlife safety risk assessment method and procedure, including annual reviews;
- procedures, means and staff for habitat and land management;
- procedures, means and staff for the expelling and deterring of wildlife;
- procedures for coordinating with other stakeholders;
- procedures, means and provisions for the training of staff



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WHMP KPIs

Leading indicators examples

- ❑ completeness of wildlife strike reports;
- ❑ completeness of wildlife management logs;
- ❑ percentage of wildlife species identification in strike events;
- ❑ percentage of personnel receiving wildlife management training;
- ❑ percentage of wildlife management actions completed; and
- ❑ frequency of meetings of wildlife committees.

Lagging indicators examples

- ❑ number of wildlife strikes per aircraft movements,
- ❑ percentage of strikes resulting in damage or effect on flight,
- ❑ Monthly high-risk species strikes per movement
- ❑ Number of Wildlife incidents with adverse effects

KPIs are essential to monitor the effectiveness of the airport 's WHMP



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THANK YOU