European Union Network for the Implementation and Enforcement of Environmental Law

a

First impressions of the Birds @ Aerodromes project

Date of report: 2025/Feb/10

Report number: 2022(VII)WG5

Our "free-as-a-bird-3D-inspections" already started before touch down. The 2D access into the aerodromes required permission and guards.

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Introduction to IMPEL

The European Union Network for the Implementation and Enforcement of Environmental Law (IMPEL) is an international non-profit association of the environmental authorities of the EU Member States, acceding and candidate countries of the European Union and EEA countries. The association is registered in Belgium and its legal seat is in Brussels, Belgium.

IMPEL was set up in 1992 as an informal Network of European regulators and authorities concerned with the implementation and enforcement of environmental law. The Network's objective is to create the necessary impetus in the European Community to make progress on ensuring a more effective application of environmental legislation. The core of the IMPEL activities concerns awareness raising, capacity building and exchange of information and experiences on implementation, enforcement and international enforcement collaboration as well as promoting and supporting the practicability and enforceability of European environmental legislation.

During the previous years IMPEL has developed into a considerable, widely known organisation, being mentioned in a number of EU legislative and policy documents, e.g. the 7th Environment Action Programme and the Recommendation on Minimum Criteria for Environmental Inspections, and more recently in the General Union Environment Action Programme to 2030 and EU Action Plan: 'Towards Zero Pollution for Air, Water and Soil'.

The expertise and experience of the participants within IMPEL make the network uniquely qualified to work on both technical and regulatory aspects of EU environmental legislation.

Information on the IMPEL Network is also available through its website at: www.impel.eu

Title of the report: Implementation of the Bird and Habitat Directives at European Aerodromes (Birds @ Aerodromes)	**Number report:** 2022(VII)WG5
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Executive Summary

In 2023 and 2024, the Birds @ Aerodromes IMPEL project focused on collecting information at aerodromes to find win-win strategies to solve the presumed conflict between biodiversity / nature conservation and Wildlife Hazard Management to prevent animal – aircraft collisions (so called wildlife strikes), in line with the provisions of the Birds Directive, with a focus on Art 9.

The sensitivity by aerodromes and authorities to share information about the derogation and the wildlife strikes forced us to change our plans. First, we needed to build a relationship of trust with the aviation community.

Furthermore, since this subject was new to the IMPEL community, time was needed to get familiar with this aspect of the Birds Directive. We accomplished both by visiting 21 aerodromes in person.

To get more involvement and providing a platform to share experiences and data in a blame-free environment, we organized a conference attended by 55 IMPEL and aviation experts.

The years 2025, 2026 and 2027 will be dedicated to organise hybrid and online workshops to develop a Risk Assessment Tool (RAT) that will help both the departments that issue/oversee the Derogations as well as aerodromes to apply the most appropriate aircraft – wildlife strike prevention strategies with the best possible win-win methods for both flight safety (always highest priority) and biodiversity.

This report describes the current Wildlife Hazard Management and biodiversity practices at a selection of the European aerodromes, both civil and military, that we visited in person or were presented at the conference.

TABLE OF CONTENTS


IMPEL

0. Prologue

On a sunny autumn day in 2017, Alfred Dreijer calls me for help with the Birds Directive derogation application for an aerodrome in The Netherlands. Alfred works for the province in which the aerodrome is situated. The aerodrome wants to reduce the risk on wildlife strikes (collisions between aircraft and birds or other animals) which may jeopardize the safety of the aircraft, its crew and passengers (and the people living beneath the aircraft flight corridors).

One of the many methods that the aerodrome would like to deploy to decrease the wildlife strike risk is to kill the animals that are causing safety problems at the aerodrome. Therefore, the aerordrome requires a derogation from Article 9 of the EU Birds Directive. Alfred is looking for basic information about bird/wildlife hazard management. I give him a short masterclass.

Animal welfare parties are debating the derogation request as they see enough alternatives for killing birds at and around the aerodrome. This time, they put the aerodrome into court.

Spring 2020, on a sunny day, Alfred contacts me again – the judge ruled in favour of the Animal Welfare Party and declared the derogation null and void. Alfred has to redesign the derogation request. After shifting from killing to describing in more detail the preventive strategies, the derogation request is sent to Court again.

While waiting for the Court's decision, Alfred introduces me to the work of the IMPEL Nature Expert Group and is looking for my help to finish the report of the wildlife trafficking group.

"IMPEL? What is IMPEL?" Is my first reaction. After Alfred's enthusiastic introduction and an hour of surfing through IMPEL's website, I feel humble and honoured that Alfred invited me into the IMPEL family. I wish I had known about IMPEL from the start of my career in the field of Wildlife Hazard Management & Biodiversity at Aerodromes.

1. Getting started

Spring 2021, the call for new projects triggers Alfred and me to think out loud about the Birds Directive Art 9 derogation request for aerodromes around Europe. “Alfred’s aerodrome is for sure not the only aerodrome facing problems with the application?

The initial project proposal aimed to look for win-win situations for both flight safety and nature conservation/biodiversity at aerodromes (both civil aerodromes and military airbases) around Europe. This idea was strongly challenged by both IMPEL members as well the aviation community:

> *“I would be quite hesitant to recommend participating in a project like this. Biodiversity is important, but in my view it will be difficult to defend a potential increase in risk of collision with wildlife. We constantly work to minimize the risk and we do that by making the airfield less attractive for wildlife.”*

We needed to refute the dogma “more biodiversity means more birds and more birds means more bird strikes”. The door was left ajar with this quote that gave us a last straw to continue:

> *“But I would be very interested to learn how it could be possible to optimize the management of aerodrome habitats, and thus create a win-win situation resulting in 1) a lower aircraft – wildlife collision risk and 2) a higher biodiversity value.”*

Furthermore, departments overseeing the Art 9 derogations were hesitant to share information:

> *“Apologies – My superiors see a risk in sharing this information for your project. We kindly refer you to the aerodrome.”*

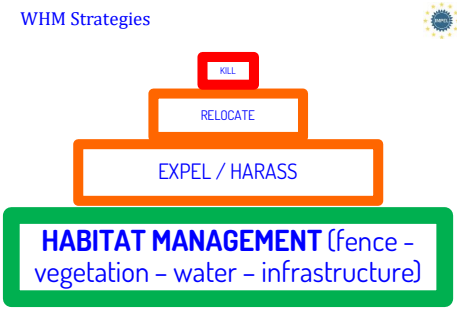
Apparently, the idea was too controversial. And the COVID-19 pandemic didn’t help either to get enough support. As I have to choose my battles, at one point, I told Alfred that I was at my wits’ end and was pondering how and even whether I should proceed. As Alfred was convinced that this topic was needed to be addressed within IMPEL, he advised me to contact Andris Širovs from Latvia.

It’s still a miracle to me how Andris did it, but Andris pulled me out of the Dutch swamp and suddenly we had the momentum. Heidi, Šárka, Igor, Vehbi, and Gert joined the project – the plane could take off.

2. Background / General information

Collisions with birds and other animals are one of the major flight safety hazards for aircraft, crew and passengers. These aircraft – wildlife collisions may result in damage and even crashes, jeopardizing human lives and costing billions of Euros annually. The collisions are always fatal for the animals.

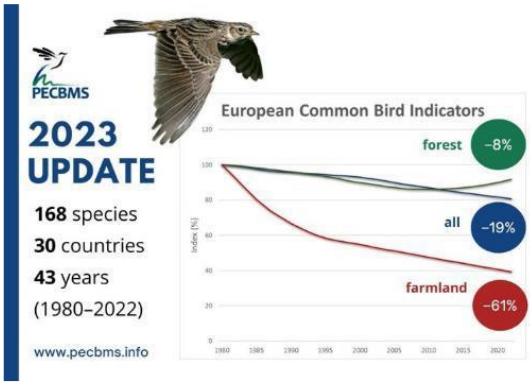
With (EC) Regulation 139 / 2014, aerodromes shall minimise the risk of aircraft – wildlife collisions. To minimise this risk, aerodrome wildlife control units work on 4 strategies for hazardous wildlife:



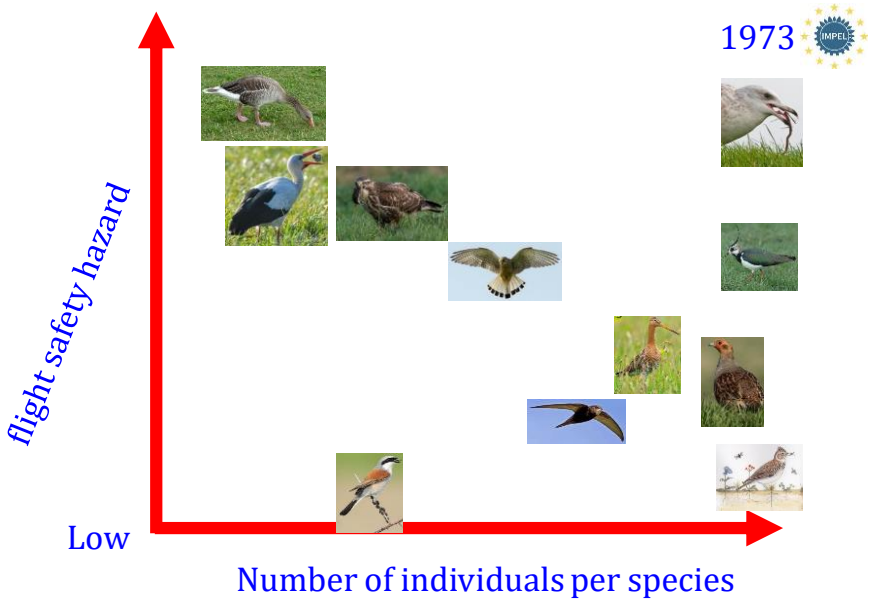
- habitat management to make the aerodrome unattractive
- harass away from the aerodrome
- trap and relocate
- if no other satisfactory solution is available, eventually kill

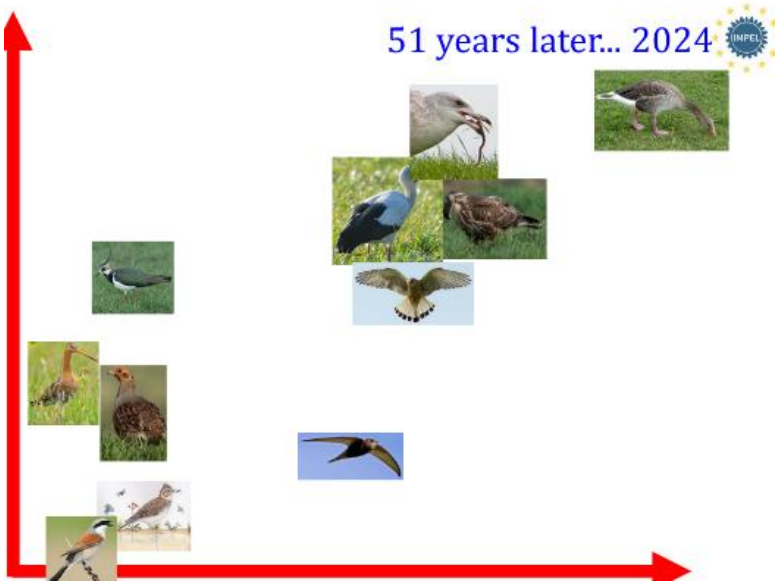
This is in conflict with the EU Habitat and Bird Directives which aim to protect Europe's nature; Art. 9 offers a derogation for flight safety. Each EU Member State is responsible to have a process to issue and control the use of the derogation permits following the 4 wildlife hazard management (WHM) strategies.

With the Biodiversity Strategy for 2030 (https://ec.europa.eu/environment/strategy/biodiversity-strategy-2030_en), the EU aims to halt and reverse the loss of biodiversity across Europe, with a special focus on plant and animal species that are in serious decline due to urbanization and agricultural intensification.



Although most aerodromes have no special biodiversity program, their biodiversity values are high compared to the surrounding built-up and agricultural areas. For decades, aerodromes have not been cultivated, fertilized and / or treated with chemicals. They are still in a condition comparable with Europe's farmland before the introduction of fertilizers and chemicals. In the aerodromes' vicinity, the change in agricultural practices has resulted in a change of the populations of many bird species in the farmland.





In half a century, the number of bird species ranking highest in flight safety hazard, has increased while the number of less, or even non-hazardous, bird species has decreased.

Shifting this 'back to the past' by decreasing the number of high-hazard species and increasing the number of low-hazard species will benefit flight safety and biodiversity. Since aerodromes in all parts of Europe are still hosting a wide variety of plant and animal species, aerodromes have the potential to – within the limits of aircraft – wildlife management strategies, contribute to the conservation of the threatened EU target farmland species.

3. Objectives & Methodology

The initial objectives of the Birds @ Aerodromes project were to investigate:

1. The number of animals, specified per species, killed by aircraft;
2. The number of killed animals and destroyed nests in name of the Art 9 derogation;
3. The level of compliance of the aerodromes with the Birds and Habitats Directives;
4. The methods that aerodromes execute to prevent aircraft-wildlife collisions;
5. The methods that could be applied to have a win – win situation for flight safety and biodiversity.

Due to the sensitivity of this topic, we had to scale down our objectives at the site visits and needed first to build a relationship of trust. Aerodromes were most informative about objective 4 and showed us all their methods and best practices that they have in place. In the next phases of the project, we will focus on the other objectives via workshops, questionnaires and webinars.

The regular IMPEL projects with site visits to inspect natural parks, or bird markets to check for wild birds being caught illegally in the wild, can be planned unannounced and only require coordination within the IMPEL project group. In contrary to this, inspecting aerodromes required the coordination within the group ánd permission from the aerodrome authorities. It was quite a puzzle every time to match our agendas with those of the aerodromes. All aerodromes that we contacted for a visit were willing to host us.

At some aerodromes, there was some hesitation because of the “inspector” qualification of IMPEL. Most aerodromes’ staff we visited initially thought we were EU employees. One aerodrome required a Non Disclosure Agreement that was discussed for 1 hour with two of their lawyers. While finding a way to get away from such an agreement, we had to face the fact that IMPEL has no system to deal with this. We as a project team of volunteers could not sign a Non Disclosure Agreement either.

Some phrases of the Non Disclosure Agreement:

> *“Confidential information” means all information, in whatever form, (i) labelled as confidential in verbal and written notices, (ii) that AERODROME discloses to Impel to the extent a reasonable person would consider such information as confidential in light of the nature of the information (such as business secrets, expertise, inventions, technical data or specifications, testing methods, company or financial information, research and development activities, product and marketing plans, development plans, customer and supplier information), and/or information on (iii) the existence and content of this Agreement.*

Any references to the existence of the Agreement, citation of AERODROME as reference and/or of AERODROME's logos/brands/images/videos shall automatically be ceased by Impel in the following circumstances: (i) withdrawal of AERODROME's earlier approval, (ii) expiry or termination of this Agreement (save in case of written approval by AERODROME for longer use), (iii) breach of this Agreement by Impel (including branding or other guidelines) or (iv) breach of applicable law by Impel.

Any breach of this provision shall entitle AERODROME – after prior notice of default which has remained without satisfactory effect during the reasonable period stated therein (if possible given the nature of the default) – to apply a compensatory fee of ***€10,000 per breach****, without prejudice to AERODROME's right to demand higher compensation for losses in so far as such losses are proven.*

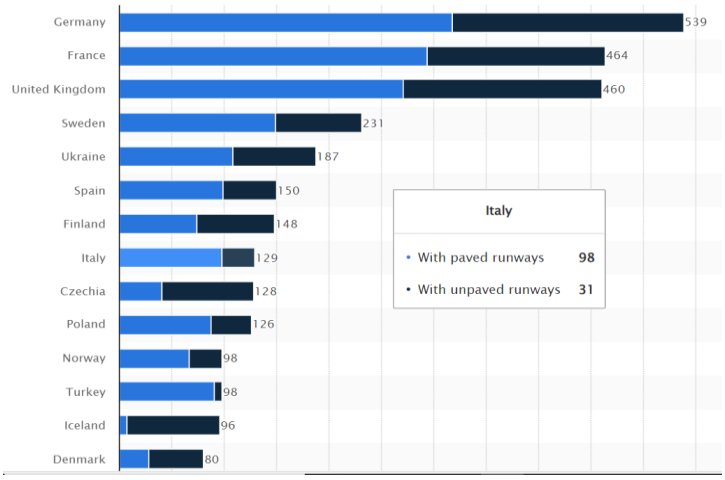
Although, we did not come to an agreement about the Non Discloruse Agreement, we were still welcome for the aerodrome visit. At the visit itself, the Non-Disclosure Agreement was not mentioned by the Aerodrome anymore. Actually, we received a lot of valuable and sensitive information instead.

All these experiences forced us to be cautious, humble and not pushing the limit to get information at the aerodrome visits. Therefore, we agreed with all aerodromes to treat their shared data confidential and to write the findings of each aerodrome anonymously in the report.

To get more involvement and providing a platform to share experiences and data in a blame-free environment, we organized the conference in Paris which has been appreciated highly by all participants.

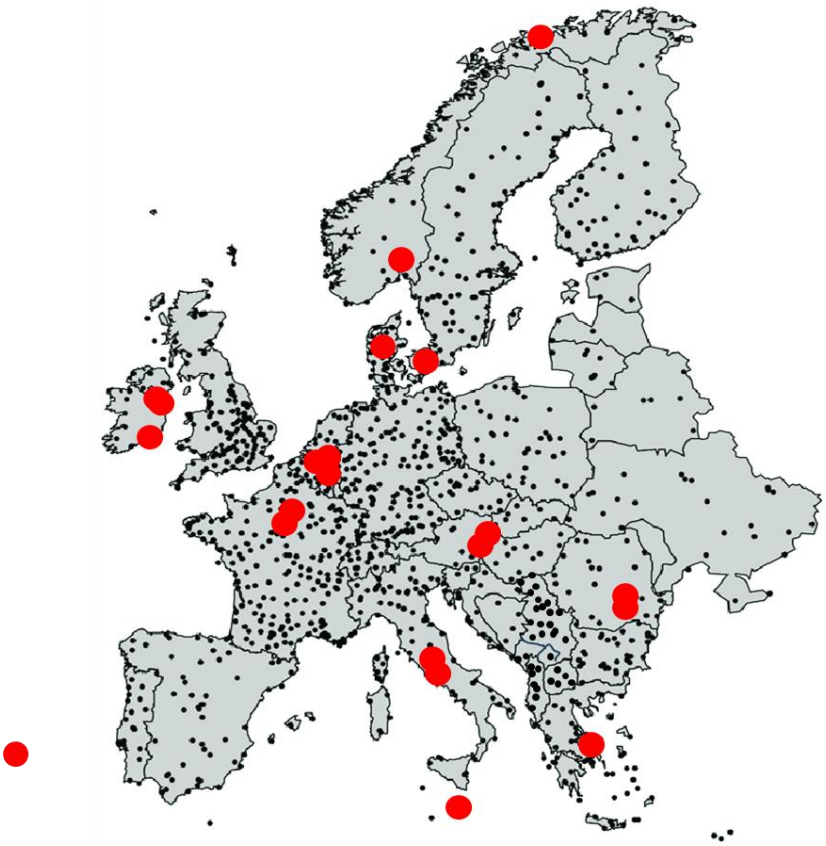
As a follow-up of the vegetation research proposal which was presented at the Paris conference, a webinar was organised and well attended. More webinars about different topics will follow.

4. Getting around



Europe has 3,818 aerodromes.
As time and resources were limited, we visited 21.

We planned our visits around the 20 degrees Celsius isotherm which gave us the opportunity to see the aerodromes in full glory, especially during the spring visits. Only once, it was freezing cold.
We have visited 14 civil and 7 military aerodromes (**dots**), covering all regions of Europe.



In total 16 IMPEL members from 10 countries participated in the 21 aerodrome visits.

At Paris Orly, IMPEL and Aéro Biodiversité organised a conference where IMPEL members and wildlife hazard management experts from all parts of Europe shared experiences, knowledge and friendship.

5. Why are animals a problem for aircraft?

Birds and other animals are, compared to large aircraft, relatively small. The impact energy of a plane or helicopter colliding with an animal at high speed (E = m * V * V) could be high enough to damage parts of the aircraft. Especially the wings, cockpit and engines are vulnerable.

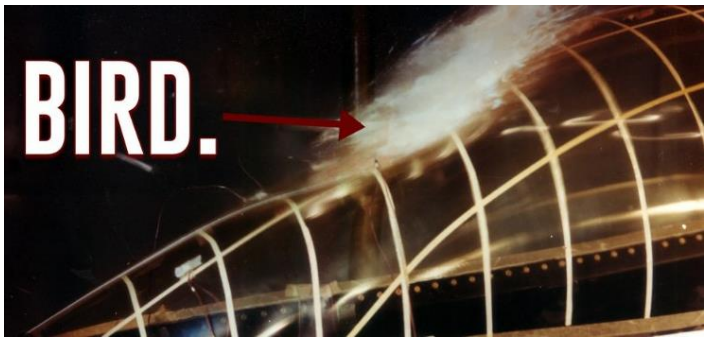
At cruising altitude, aircraft reach their highest speeds, up to 850 km/h. Only military fighters fly with those speeds in the air layers where most birds fly. Commercial aircraft operates in higher altitudes. Most birds fly at those altitudes where aircraft are taking off and landing. Large commercial and military fighters do that with a speed between 250 – 300 km/h. If an aircraft with a speed of 250 km/h hits a 5 kilogram goose, the impact energy is equivalent to hitting a 31 kg deer with a car that drives 100 km/h.

The most famous bird strike is the Miracle on the Hudson where captain Sullenberger landed his Airbus 320 on the Hudson river, downtown New York, 15 Jan 2009, after both engines ingested a flock of Canada geese (5 kg bird) during the take off climb. All 155 people survived.

Some examples of the effects of wildlife strikes, shared during the aerodrome visits and conference.

6. Aircraft certification standards

Although the great majority of reported bird and wildlife strikes have little or no effect on continued safe flight, a small number of incidents, usually with flocks of birds and especially flocks of heavy birds, can damage aircraft or their engines so badly that they cannot continue to fly.



Current aircraft certification standards therefore include requirements to demonstrate airframe, canopy and engine resistance to bird impact. The standards established by both the U.S. Federal Aviation Administration (FAA) and European Union Aviation Safety Agency (EASA) assure that certification standards are met by various means including ground testing using dead birds of specified weights and quantities, at representative impact speeds.

Apart from speed, a number of factors have been identified as influencing the damage a bird impact can cause. These are all considered during the design of both aircraft and engines in an attempt to understand the robustness of structures and engines to bird impact.

These parameters influence the possible damage:

- Animal's weight
- Animal's density
- Animal's rigidity (deformation by 50% of its shape)
- Angle of impact (90 degrees)
- Impact surface shape (flat)
- Impact surface rigidity (no deformity)

Current standards, for both multiple and single bird ingestions into a single fixed-wing aircraft engine. There are no standards which consider the ingestion of a bird into more than one engine on a multiengine type on the grounds that this a very low risk. However, the Hudson Ditch demonstrated that

it is not impossible that two large birds in a group can be ingested simultaneously by a large transport aircraft and cause sufficient damage to make flight completion impossible.

The basic requirements for engine ingestion were revised in 2000 to take account of both evidence of an increase in the size of birds impacting aircraft and issues raised by the development of very large inlet, high bypass-ratio engines. The requirements, to be demonstrated by testing, are as follows:

speed	Nr of birds	weight per bird	aircraft part	requirements
Climb/take off speed	Single	1.8 kg – 3.65 kg	engine	Shall not catch fire, suffer uncontained failure and shall enable at least 50% thrust during 14 minutes
Climb/take off speed	Single	1.35 kg	engine	Shall contain 75% thrust, shall not require engine shutdown within 5 minutes and shall not result in a hazardous engine condition.
Climb/take off speed	7	0.35 kg – 1.15 kg	engine	shall not cause the engine to sud-denly and completely fail, and it shall continue to deliver usable but slowly decreasing minimum thrust over a period of 20 minutes after ingestion.
Climb/take off speed	16	0.85 kg	engine	shall not cause the engine to sud-denly and completely fail, and it shall continue to deliver usable but slowly decreasing minimum thrust over a period of 20 minutes after ingestion.
Cruise speed	Single	3.6 kg	Airframe	Without damage
Cruise speed	Single	1.8 kg	Windshield	the inner ply must be non-splintering and the panes directly in front of the pilots must withstand, without penetration

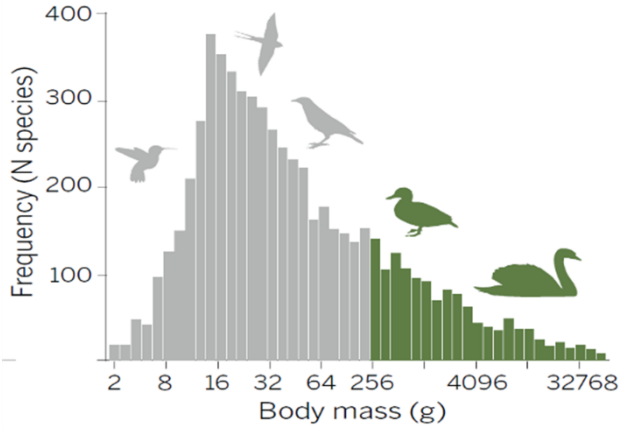
7. Aviation Ecology

As stated earlier, some people adhere to the dogma "*more biodiversity means more birds and more birds means more bird strikes*". As experienced at the aerodrome visits, not all birds are equally hazardous for the safety of aircraft, its crew and passengers.

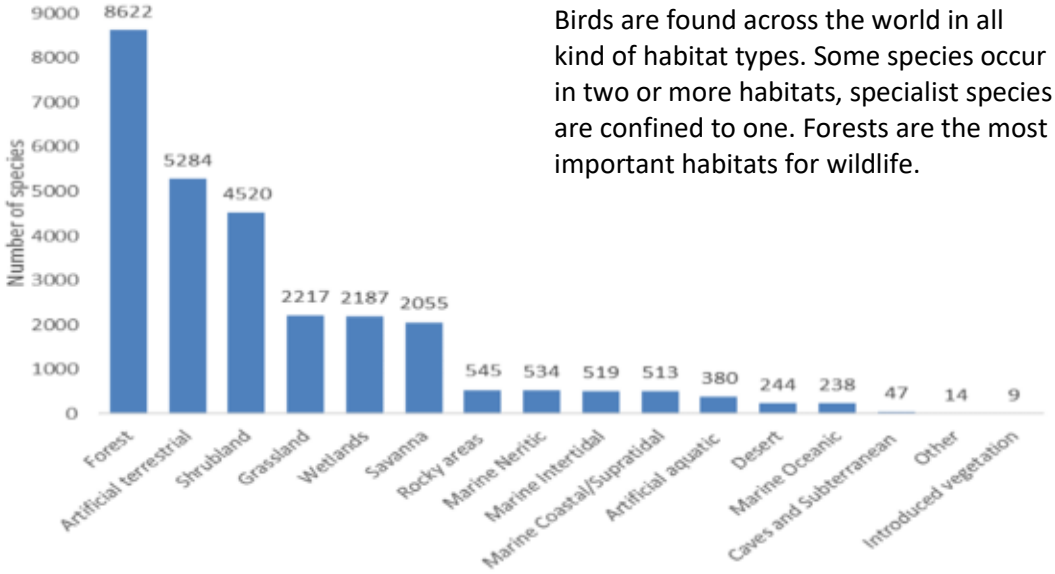
As discussed in the previous chapter, the weight of the animals is the most important parameter regarding their flight safety hazard. The Goldcrest, Europe's smallest bird, weighing 5 grams. The heaviest bird of the word is the Ostrich which is too heavy to fly with a body mass of 100+ kilograms. The Kori Bustard (Africa) is with 19 kilograms the heaviest flying bird. In Europe, it's the Great Bustard with 14 kg.

The 10,000 bird species around the world can be cateogrised in many ways – for example body mass (weight).

The figure shows that the vast majority of birds is within the certification requirements as discussed in chapter 6.



Furthermore, the need to specify birds within a family of species is paramount, for example GULLS. All gull species are regularly reported as "a gull". However, a collision with a Great Black-Backed Gull (left) of 1.75 kg has a 14-fold impact energy than a collision with a Little Gull (right) of 120 grams. This makes a big difference for their flight safety hazard.



Birds are found across the world in all kind of habitat types. Some species occur in two or more habitats, specialist species are confined to one. Forests are the most important habitats for wildlife.

Regarding the preferred habitat, only those species that frequent open areas feel comfortable to be in the grasslands adjacent to the runway. However, many bird species are agoraphobic and do not leave their sheltered areas of bushes and forests.

Another important parameter for the flight safety hazards is the flying behavior of the birds. The species we observed at the aerodromes inhabit mostly only one habitat type of which the grassland species may cross the runway regularly. Migratory species cross the aerodrome only twice a year.

There is a whole variety of flying behavior in between, for example aerial feeders like swallows and swifts. And commuting birds with multiple foraging and resting places over the day may cross the runway more often.

Two examples of the relation between the numbers of bird species interfering with aircraft and the total number of birds at the aerodrome / in its vicinity. Only 10% of the bird species in the area, including surroundings, are frequently interfering with the aircraft flights paths. This means that 90% of the bird species are not a flight safety hazard.

	Aerodrome 1	Aerodrome 2
Number of bird species present in vicinity of the aerodrome	150	300
Number of bird species present at the aerodrome	75	?
Number of bird species observed crossing the runway at least once	50	?
Number of bird species crossing the runway regularly	20	30

At all the aerodromes we visited, there is a similar pyramid of bird species distribution.

This shows that the "*more biodiversity means more birds and more birds means more bird strikes*"-dogma is an irrational fear. By far the majority of the bird species are not hazardous for aviation. They could well live at aerodromes / surroundings in good harmony with the wildlife strike prevention objectives.

8. Legislation

The United Nations have two sets of regulations that come together at aerodromes;

- International Civil Aviation Organization (ICAO): Wildlife Hazard Management at Aerodromes
- United Nations Environment Program: protecting nature, including animals at aerodromes

Their European equivalents are European Aviation Safety Agency and the EU Nature Directives.

EASA does not offer a derogation to solve the flight safety and nature conservation conflict; flight safety has always priority number 1.

EASA

Easy Access Rules for Aerodromes (Regulation (EU) No 139/2014)

Annex IV — Part-ADR.OPS

SUBPART B — AERODROME OPERATIONAL SERVICES, EQUIPMENT AND INSTALLATIONS (ADR.OPS.B)

ADR.OPS.B.020 Wildlife strike hazard reduction

Regulation (EU) No 139/2014

The aerodrome operator shall:

(a) assess the wildlife hazard on, and in the surrounding, of the aerodrome;

(b) establish means and procedures to minimise the risk of collisions between wildlife and aircraft, at the aerodrome; and

(c) notify the appropriate authority if a wildlife assessment indicates conditions in the surroundings of the aerodrome are conducive to a wildlife hazard problem.

The derogation is within the Birds Directive. This Directive came into force in 1979 and aims to protect all wild birds and their most important habitats across the EU. The Habitats Directive (1992) aims to protect 1,000 other wild animals and plants and circa 230 habitats. These protected habitats are to be restored and maintained to a favorable conservation status throughout their natural range within the EU.

Both Directives prohibit to

- deliberate killing / collecting
- deliberate disturbance
- deterioration /destruction of breeding sites

To accomplish this, it requires

- flexibility to establish the system of protection
- the application of concrete measure to promote and enforce those prohibitions
- to cover all wild birds species
- no temporal limitations
- no geographical limitations
- a definition of Deliberate = applies to actions taken by an actor who knows that their actions will most likely lead to a breach, and consciously accepts the foreseeable results of his action, or at the very least accepted the possibility of such an outcome

There is a derogation possibility in case of a lack of satisfactory alternatives and legitimate reasons, to prevent serious damage to

- Public health and safety, other social and economic overriding interests
- Air Safety. In aviation, the term is Flight Safety.
- Research and education

The derogation should reflect the need for a degree of flexibility and a careful balancing of the imperative need to ensuring the achievement of the conservation aims of the Directive. Prohibitions can be derogated from in limited circumstances, which can be applied on a case-by-case basis.

Prohibitions of the derogation have to be interpreted strictly: when granting derogations, the national authorities bear the burden of proving that the required conditions are present**.**

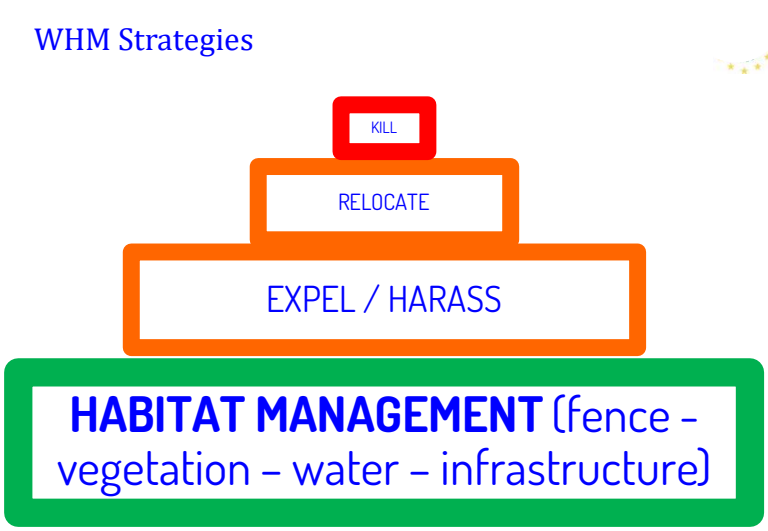
The *EU Court Justice has warned for*

- *the broad scope of the prohibitions, e.g. by broad interpretation of the term `deliberate`.*
- *derogation have to be interpreted narrowly & the use of a derogation always requires an objective in line with the scope of the Directive*

There are 3 tests for applying derogations under Article 9:

Test 1 : Demonstration of the reason for air/flight safety : aircrew, passengers and aircraft.
Concerns documented delays, damaged aircrafts, and even crashes, costing human lives and far-reaching financial repercussions for the aviation industry.
BUT: Collisions are always fatal for the struck birds, resulting in conservation issues when it involves endangered species.

Test 2 : No other satisfactory solutions



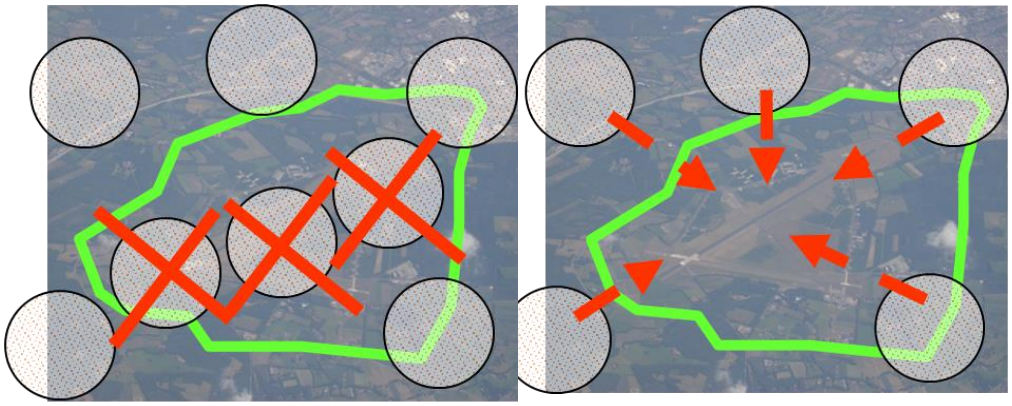
All aerodromes have the pyramid of
1. habitat management
2. expel / harass
3. catch & relocate
(4. kill)

With the idea that the most effective approach is a pro-active habitat management that is least attractive to hazardous wildlife.

Killing is seen as the last option. Some aerodromes have a zero killing policy, while others use the shotgun to enforce their harassment techniques.

Test 3: The derogation is in line with the overarching objectives of the Birds Directive

The Derogation should not be at odd with maintenance or restoration of wild bird species at favorable conservation status. The granting of derogations for species in unfavorable conservation status should only occur by way of exception, and in light of the precautionary principle when applied to the Birds Directive. There is a need to monitor the use of derogations and ensure cumulative impact of the aerodrome derogation with other pressures which kills birds (i.e. other aerodromes, wind farms, etc).



Killed or relocated animals will be replaced by animals that live in less favorable areas in the vicinity. They are non-familiar with aircraft and may pose a bigger threat.

Within the European Union, the **Corporate Sustainability Reporting Directive (CSRD)** requires reporting on sustainability in annual reports for companies, including aerodromes, with over 250 employees. The focus is on the topics of

- climate change
- pollution
- water resources
- Resource use and circular economy
- **Biodiversity and ecosystems**

For aerodromes, an impact analysis on biodiversity sensitive areas and how to minimize the impact is needed to see how the operations affect wildlife, especially threatened species. KPIs are still to be developed.
Effective land use planning, implementing green corridors, changing grassland management strategies, use of pollinator mixes, etc may be in balance with flight safety that always will prevail at aerodromes.

When Cranes (*Grus grus*) are allowed to breed and rear their chicks on an aerodrome, they do not pose a threat as long as they breed, rest, sleep and forage; i.e. during all non-flying activities. However, as soon as they take off to commute to other locations, they do pose a flight safety hazard when these flights interfere in time and space with aircraft.

9. Court cases

Wildlife Hazard Management at aerodromes is sometimes challenged by court cases for 2 reasons:

1. Appeal against the derogation request
2. Liability of an aerodrome in case of a damaging wildlife strike.

The in the prologue mentioned derogation request for the aerodrome was appealed by animal welfare associations. The Wildlife Hazard Management Plan of the aerodrome followed the pyramid of

- Preventive measures
- Grassland management
- Scare animals/birds
- Catch and release
- Killing

Number of shot birds at the aerodrome		
year	protected	unprotected
2018	31	38
2019	32	53
2020	10	22

The derogation was requested for 40 bird species and 17 other animal species.

The appeal focused on:

- There is no need to kill birds or animals for flight safety
- Birds and animals can de chased away
- With proper grassland management there are no birds or animals
- There is no scientific data to prove that every bird or animal is dangerous
- It's not proven that all birds and animals are present at the aerodrome
- It is not possible to kill birds or animals that are in an unfavourable state of conservation
- Helicopters are not vulnerable to a bird strike
- Airplanes can divert if there is a dangerous situation

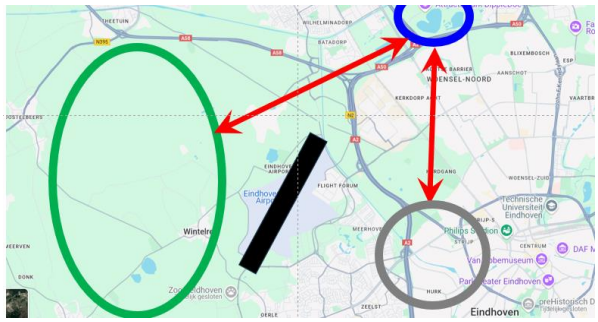
The appellant was framing the aerodrome:

- All that moves is shot at the aerodrome
- Not even at the national aerodrome this amount of animals is shot
- There are no flights because of COVID-19

As per date of this report, after multiple court sessions, there is no verdict yet.

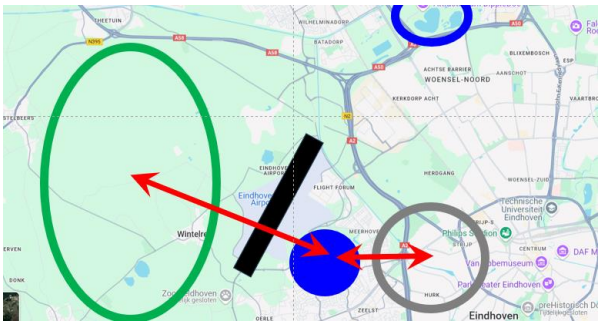
There have been many court cases in which an airline was appealing an aerodrome to get compensation for damage. When the aerodrome operator could prove it had taken all available measures to prevent the bird strike, it was not held liable for the damage. In 32 bird strike court cases, 21 ½ were in favour of the plaintiffs and 10 ½ for the defendant.

The responsibility of the wildlife hazard management team at aerodromes is huge. Negligence will jeopardize the safety of aircraft, its crew and passengers. An ‘overkill’ of giving priority to nature will not be appreciated either. How to find the perfect balance?



Another example is at an aerodrome where 10,000+ black-headed and common gulls are spending winter in the vicinity of the aerodrome. Their roosts are at the flat roofs of the industrial area, east of the aerodrome. In recreational pools, north of the aerodrome, the gulls drink and take a bath. Their feeding grounds are west of the aerodrome. All commuting flights are below the aircraft flights.

The municipality had the plan to build a new residential area between the runway and the gull roosts. A 50-hectare artificial lake would become the radiant centrepiece of the new plot.
As soon as the ground works started, shallow pools appeared during each rainy day. When they had standing water, the gulls shifted their flight paths, leading them crossing the runway at low altitude while commuting between the water and feeding grounds.



In the end the Minister of Transport did not approve the lake – there is a nice park now, causing no issues for the aerodrome.

10. Aerodrome characteristics

Aerodromes have platforms, hangars / terminals and a runway surrounded by grasslands, shrubs and trees. Therefore, from a bird eye view, an aerodrome is part of the landscape.

Some aerodromes have relatively small built-up parts and large parts of grasslands, bushes and forests (left). Other aerodromes have larger built-up areas and less natural areas (right).

The runway and surrounding grasslands look like a steppe landscape, giving aircraft an obstacle free, flat and open flying zone.

In recent years, more and more solar parks are being built at the remote locations of aerodromes. If constructed well, they could contribute to flight safety ánd biodiversity.

11. Aerodrome Wildlife Hazard Management Units

At most aerodromes, the wildlife control duties are secondary duties of the Aircraft Rescue & Fire Fighter department, flight safety manager, or air traffic controllers (sometimes supervised by a dedicated wildlife hazard manager).

Just a few aerodromes have a full-time Team of Wildlife Hazard Management Controllers on duty.

The wildlife controllers (both full- and part-time) have the following duties:

* maintaining surveillance of wildlife activity on, and in the vicinity of, an aerodrome
* implementing active wildlife control measures and interventions to counter any detected wildlife hazards
* providing, where applicable, the details of potential wildlife hazards to ATS units
* recording all wildlife observed (on- and off-site)
* recording wildlife control activity and the effect of the control actions
* recording actual, potential or suspected wildlife strikes
* advising the management on improvements for the wildlife hazard management

At mostly all visits, we got a tour at the runway itself in the wildlife control vehicle. It is paramount that wildlife controllers need access on the runway to be able to scare away the hazardous wildlife that are on the runway. However, due to the aircraft movements, it is quite often not possible to enter the runway when needed.

The full-time versus part-time management of wildlife hazards has pro and con arguments:

> *"It's a lonely job in dark winter months when the birds have migrate south. In those days, I can easily assist the snow removal team."*
>
> *"It's nice to have this a subtask, I like birds and this gives me extra joy at my ARFF job."*
>
> *"We have a few times per week Bird Control shift for 2 hours, but that is too short to make us feel responsible. Sometimes, I have to expel the birds that my colleague didn't harass in his shift."*

For most of the aerodromes, the wildlife hazard personnel have no dedicated tasks in biodiversity, other than

"Don't destroy any nature unnecessarily" and
"Respect the Birds and Habitat Directives provisions for the derogations"

A few aerodromes have a dedicated department for biodiversity / nature conservation. Some aerodromes use external agencies to collect biodiversity data. When there is a conflict between the goals of biodiversity and flight safety, win-win solutions are always looked for, with flight safety always given the highest priority.

Most aerodromes have a local safety committee in which wildlife strikes are one of the topics.

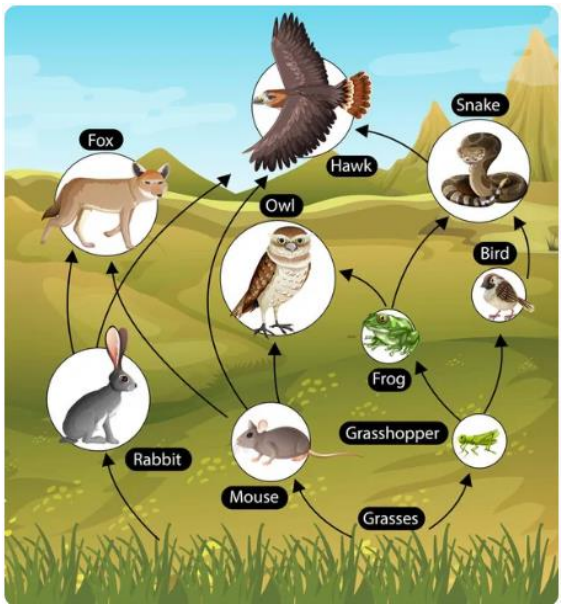
A few countries have a national wildlife hazard management committee or forum to promote wildlife hazard management awareness and allow for the exchange of:

- actual wildlife hazard management experiences
- new techniques and equipment
- new research and investigation studies
- national, environmental, and aeronautical legislation related to wildlife hazard management
- information about hazardous wildlife biology, behaviour, population trends, wildlife attraction points, etc.
- information on training standards for and/or emerging technologies
- national wildlife strikes information and trends.

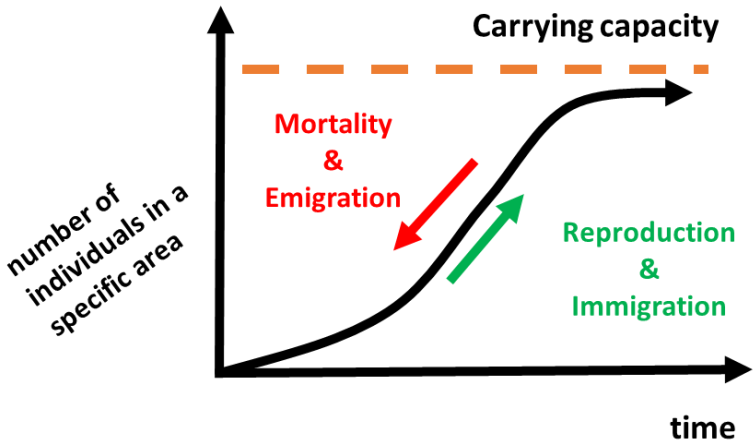
These are the members of the national wildlife hazard management committees:

- the State authority
- national departments (defence, agriculture, environment, planning)
- aerodrome operators
- ANSPs
- aircraft operators' association
- pilots' association
- environmental authorities
- wildlife subject matter experts and the scientific community
    - NGOs, ecological associations, conservation agencies
- regional authorities
- general aviation associations
- accident investigation board
- maintenance, repair and overhaul (MRO) organization
- airframe and engine manufacturers

12. Food at aerodromes



The most important aerodrome's attraction for wildlife is food. Each vegetation type (bare soil, short/tall grass, shrubs, forest) has its own food web, all starting with vegetation eaten by plant eaters which on their turn are eaten by carnivores.



Each geographical location has a species-specific ecological carrying capacity. The amount of food determines the number of animals that can theoretically be present in that geographical location.

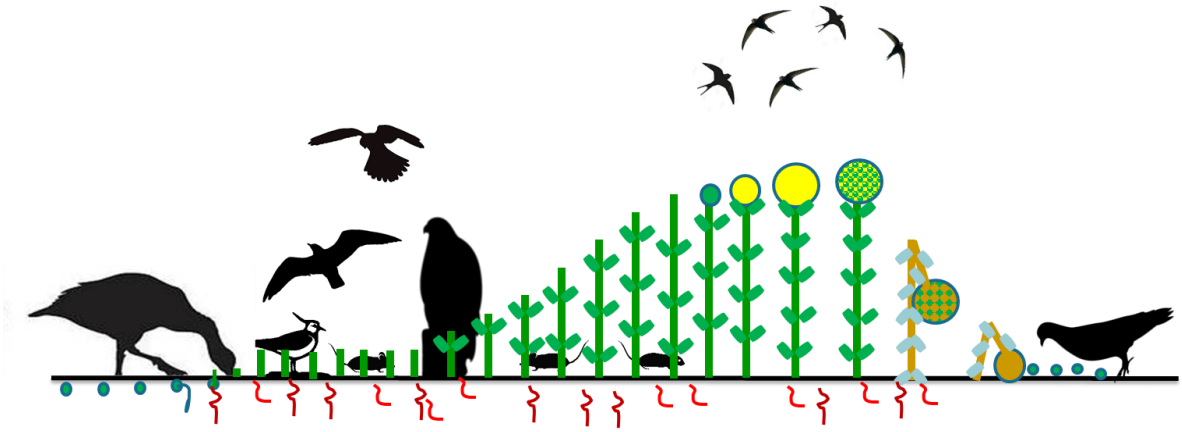
In due time, the carrying capacity will be reached and the number of animals will be in balance with reproduction and immigration versus mortality and emigration.

In order to lower the number of hazardous animals at aerodromes, the carrying capacity of the aerodromes can be decreased by reducing the amount of food availability and by harassing them.

Animals can be classified according to the type of food they consume:

Herbivores	plants, seeds	goose, duck, pigeon, sparrow, roe deer, rabbit, hare
Insectivores	insects	skylark, starling, swallow, swift, corvids
Vermivores	worms	gull, lapwing, wader birds, corvids
Rodentivores	mice, voles, rats	buzzard, kestrel, owl, harrier, heron, egret
Avivores	birds	peregrine, goshawk
Piscivores	fish	heron, cormorant, grebe, osprey, white-tailed eagle
Carnivores	animals	marten, fox, wolf

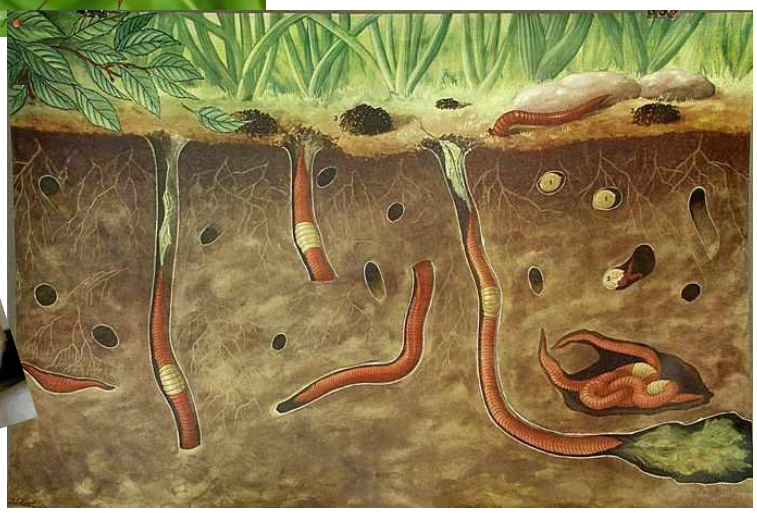
13. Food and biodiversity in grasslands



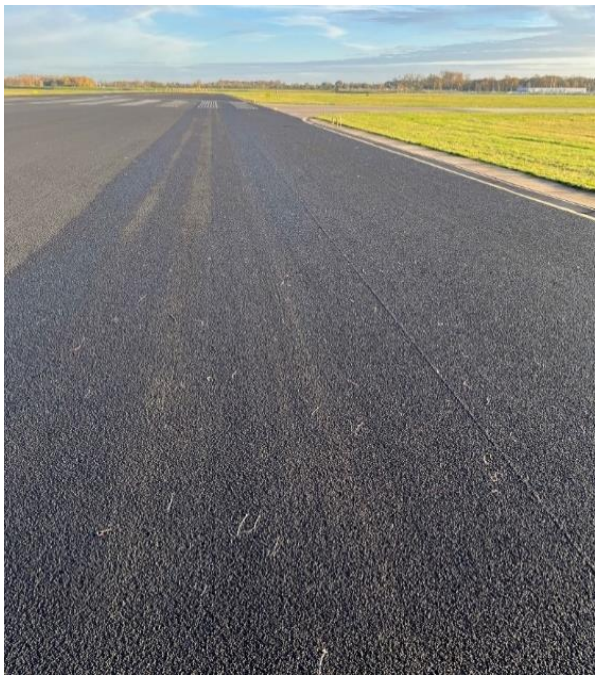
Plants have 8 phases with each having different food available for wildlife. All these different phases are present in the aerodrome grasslands.

Geese and ducks prefer the young, nutritious sprouts. Lapwings and gulls forage on worms and other invertebrates in short vegetation. Kestrels and buzzards hunt on mice in short and/or sparse vegetation. Swallows and swifts are aerial feeders, catching flying insects that are attracted by flowering herbs. At the end of a plant's life, its seeds are eaten by pigeons.

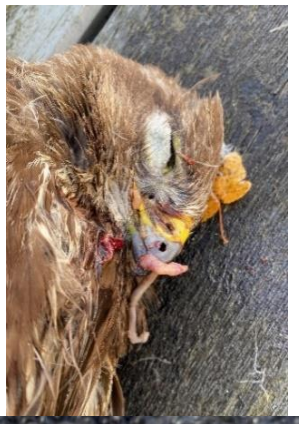
The worms, insect larvae and rodents are hidden in the soil of the aerodromes' grasslands. Birds can catch them in the soil, or wait for them to move to the surface. Rodents and worms eat those pieces of plants that grow above the ground. The larvae of beetles and crane-flies eat plant roots.



Best feeding conditions for birds are moist/wet soils and short vegetation which enables them to peck into the soil with their beaks.



During wet conditions, earthworms disperse and may end up at the runway being an easy prey for gulls and buzzards which on their turn then pose a bird strike hazard .

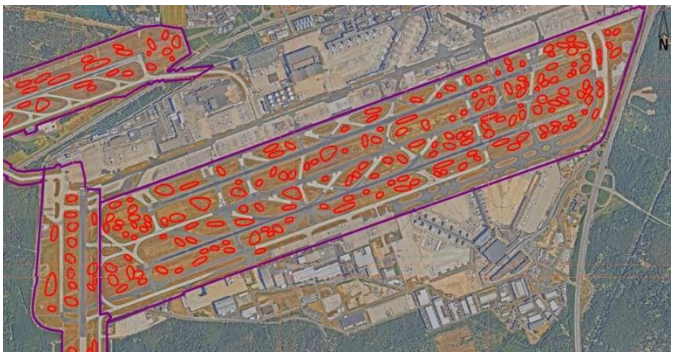


Orchid beetles live 11 months of the year as a larvae in the soil. When they fly out as an imago with thousands, it's a real feast for black-headed gulls.

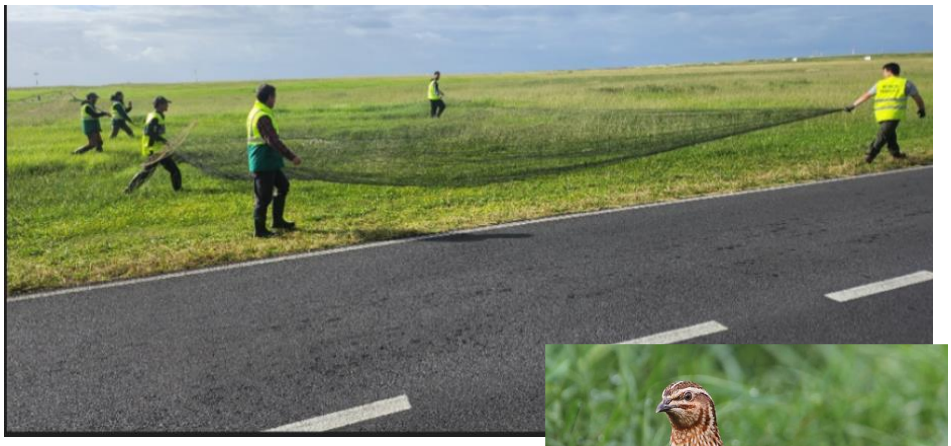
Collecting different food sources provides a lot of information about the species composition and the biomass of food in different parts of the aerodrome.

At one aerodrome, we were informed about an explosion of rodents in the recent past. Per square meter, multiple ‘mouse holes’ were still visible when walking in the grassland next to the runway. During the explosion of rodents, 150+ Buzzards, 50+ Great white egret, 60+ Kestrels and 50+ Grey herons simply had to wait for the mice to show up.

All aerodromes have higher biodiversity values than the agricultural fields in their vicinity. For many grassland plant, insect and bird species, the aerodromes are refuges. For example the Skylark (*Alauda arvensis*); in red all singing male Skylarks in the grasslands between the run-/ taxiways.



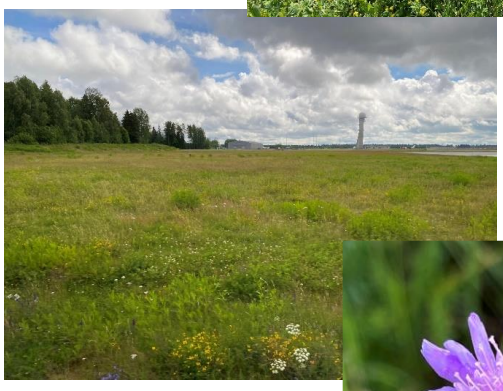
A few aerodromes have dedicated biodiversity programs – some even have a biodiversity department. These aerodromes have special biodiversity zones at the outskirts of the aerodromes where adaptive management of vegetation is applied to support flowers, pollinators, other insects and other flora and fauna species that are in decline in Europe. At these spots, the number of hazardous wildlife is minimal.



At one aerodrome, an endemic subspecies of the Quail is collected with nets and transferred to a reproduction centre to help reinforce their populations in suitable habitats in other parts where they were abundant in the past.

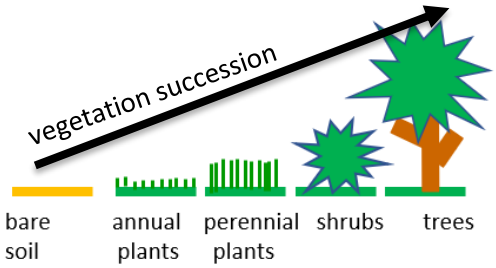
The Quail is often heard, but rarely seen. Quails stay well-hidden in the vegetation and avoid the open area of the runway. Therefore, they hardly pose a flight safety hazard.

An small selection of flora species observed at the site visits. Their numbers are declining in the agricultural areas surrounding the aerodromes.



14. Vegetation management

All visited aerodromes receive sufficient sun light, water and have a moderate temperature for vegetation to grow through the whole succession. Each succession stage is present at the aerodromes.



We planned our visits around the 20 degrees Celsius isotherm which gave us the opportunity to see the vegetation in full glory, especially the spring visits.

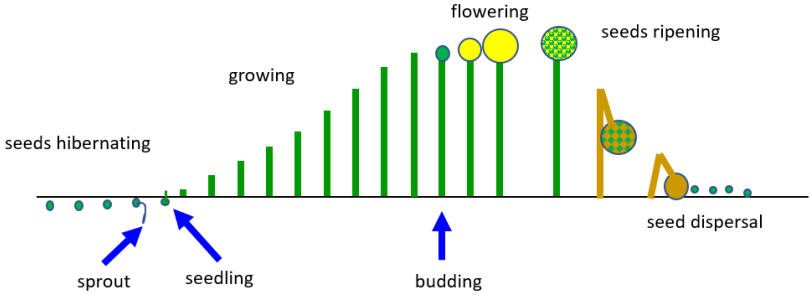
Although the other aerodromes were visited in autumn, the vegetation was still green and full of flowers. As an exemption, Malta's vegetation showed semi-arid and withered (despite the rainy day) in September.

In natural ecosystems, the vegetation succession is set back one or more stages by storms, floodings, fires and grazing animals. Human activities as logging, cutting and mowing have the same effects.

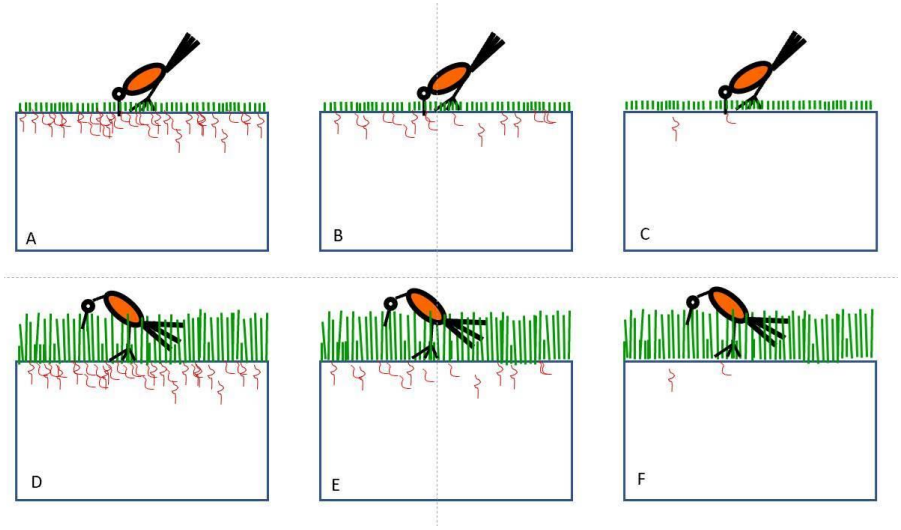
All aerodromes are managing their vegetation for 6 reasons, some for 7:

1. Security requires short vegetation at the fence to make it difficult for intruders to get inside without being detected by security cameras;
2. Obstacle management requires non-woody "frangible" vegetation along the runways;
3. Radar and ILS detection systems require non-woody vegetation to prevent beam disturbance;
4. Blast prevention requires well-rooted, dense vegetation;
5. Fire prevention requires fire-resistant, non-woody, vegetation;
6. Wildlife strike prevention requires vegetation that is unattractive to hazardous wildlife species;
7. Biodiversity requires vegetation that is attractive to those species with an unfavorable conservation status.

Each plant follows its own succession in 8 phases. Annual plants do the whole cycle in 1 year. Trees can live for 100+ years while having a budding/flowering/seeds producing cycle annually.



All aerodromes are looking for the optimal management strategy to get the vegetation that is least attractive to wildlife. It all depends on which species are most hazardous.

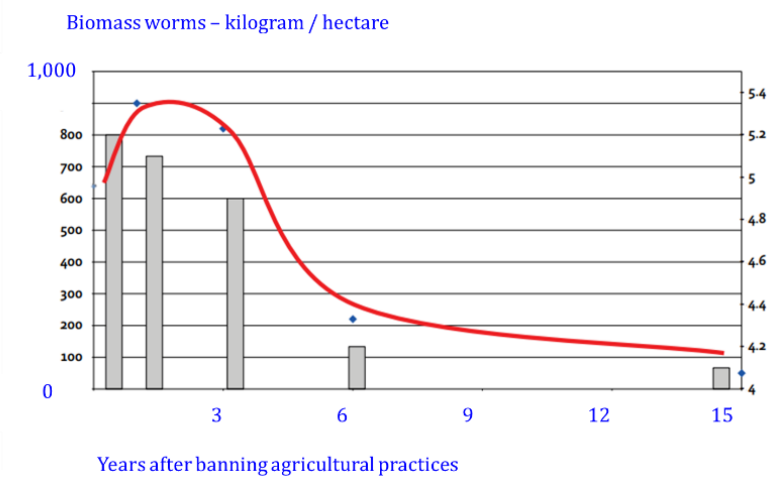


Important vegetation parameters:
* composition of the plant species
* height / structure of the plants

Which mowing strategy is ideal?
* date of mowing
* height of mowing

Besides sun, light and water, plants need nutrients (nitrogen (N), phosphorus (P) and potassium (K)) to grow. High concentrations of these nutrients will benefit the fast growing plant species like grasses. Soil with less nutrients will have a vegetation with flowers.

Heathland is the vegetation that can handle minimum levels of nutrients, resulting in low biomasses of worms, invertebrates and rodents. Therefore, low-nutrient vegetations like heathland have least hazardous wildlife.



After 15 years of banning fertilisers and removing the hay after the yearly mowing of the vegetation, the grassland of this aerodrome changed into a heathland where worm and rodent eating birds hardly find any food. The heathland is the domain of small non-hazardous, insectivorous birds like Skylark and Stonechat.

At the aerodromes we have seen all sorts of grasslands with different species composition, structure and height. Not only between aerodromes, but within aerodromes as well. Some aerodromes had a well-balanced dedicated vegetation management policy to support both flight safety and biodiversity.

Together with the search of the best vegetation type, many aerodromes are puzzling with

1. the vegetation height according to the most hazardous wildlife species at the aerodrome
2. the moment of cutting the vegetation according to the most hazardous wildlife
3. what to do with the cut grass according to the optimum nutrient level in the soil

If the cut grass is not removed (left), the soil will take the nutrients back. If the nutrients will be taken out of the cycle, the soil will have less nutrients for the plants to re-grow, resulting in low-nutrient soils which result in the end in less worms, invertebrates, insects and rodents.

Those aerodromes that consider high vegetation rely on the characteristics from a animal's perspective:

Wildlife need to be able to

- Find their prey
- Catch their prey
- Move through the vegetation
- See their predators

At one aerodrome with this woody plants, it was even for the human IMPEL team difficult to walk through.

Bird counts showed less bird activity above and in the vegetation at this part of the aerodrome with this type of woody, high vegetation.

At some aerodromes, the preference is not based on the birds' perspective, rather on the human perspective: *"in short vegetation we can easily see the hazardous birds so we can harass them."*

Furthermore, their argument is that lower vegetation has less insects and rodents, thus less attractive for hazardous birds.

All aerodromes take the following parameters into account when selecting the mowing date:

1. The food source that is becoming available during and after the mowing activities
2. Species of hazardous birds attracted to the food sources during mowing activities
3. The number of daylight hours that the hazardous birds are actively posing a risk to aircraft during the mowing activities
4. The number of aircraft movements that can collide with hazardous during mowing activities
5. The re-growing potential of the vegetation to grow back to a suitable height being unattractive for hazardous wildlife.

One aerodrome recently converted a natural heathland, generally considered to be the most optimal vegetation for that soil type, into a monoculture grassland with endophyte grass.

Results of the effect on hazardous bird populations are not available yet.

The aerodromes use equipment to mow and collect the grass.

15. Vegetation management – Research proposal

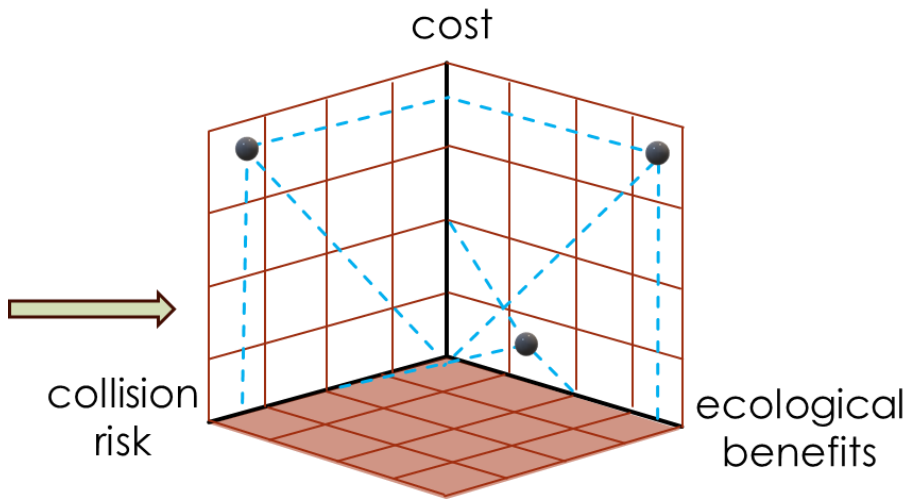
The University of Utrecht, NL, developed a **research proposal** to balance aviation safety with ecological considerations using non-lethal methods, based on vegetation management as a sustainable solution.

- ➔ Selecting vegetation management strategies that deters hazardous birds while maintaing ecological diversity for the long-term
- ➔ Determining what the most cost-effective strategy is for achieving this
- ➔ Assessing the effectiveness of alternative vegetation strategies in real-time using state-of-the-art monitoring techniques

As a general framework that is to be specified per location, depending on habitat conditions and embedding in the larger regional (or national) context, they propose to establish experimental plots (each ~200m x 200m) in randomized block designs to account for variations in local environmental conditions (e.g., soil, infrastructure).

Preferably, these experimental plots would need to established in the neighborhood of an (active) aerodrome currently employing classical vegetation management strategy or suit of mitigation measures to minimize avation – wildlife collisions. Each plot will be assigned one of three treatments with five replicates per treatment (yielding 15 plots).

In addtion to the proposal study on the relationship between vegetaton management and the occurrence and prevalence of birds, this proposal suggests to include a cost-benefit analyses as well that will compare the various strategies and extrapolate the associated costs. This will enable to provide a quantative measre for strategic decision making in mitigating risks of wildlife collisions at aerodromes.



The aimed deliverables:

- ➔ Experimentally verified results indicating how different plant species and compositions in aerodrome-adjacent areas influence bird presence and how these different compositions influence the ecological value the area, focusing on plant diversity and habitat suitability for non-hazardous wildlife species.
- ➔ A cost-benefit analysis that compares the economic costs and environmental impacts of different strategies of vegetation management on aerodrome grounds and long-term predictions of the most cost-effective methods.
- ➔ Protocols for monitoring approaches including all kind of data (visual surveys, if available, avian radar and UAV surveys) to monitor wildlife presence and behavior in response to vegetation changes over time and predictive models to forecast wildlifeh strike risks based on vegetation types, seasonal changes, and external factors.

  Note that these will be developed in collaboration with the local aerodrome authorities, taking into account what they are already doing as well as with regard to both practical limitations and applicability given the regional and/ore national context.

16. Shrubs, Bushes and trees

Most aerodromes in rural areas have additional to grasslands, large areas with shrubs and forests. One aerodrome is planning to remove the forest parts because of the deer population that is hiding in there.

Before starting to cut trees, the aerodrome is going to make an assessment:

1. How often are the deer crossing the runway?
2. How many deer are present in the forest?
3. Can the deer population be reduced by removing them? Hunting?
4. Is the aerodrome fence deer-proof or will new deer get easy access?
5. Is the forest strip keeping the sound of aircraft 'on the aerodrome' which gives less noise pollution for the neighbours?
6. Is there money to cut the trees? Even when the wood is sold, expenses for cutting are quite high.

Quite a few aerodromes encourage hedgerows, bushes and forest strips to decrease the pollution of noise and ultrafine particles to the vicinity.

At some aerodromes, nests of corvids and raptors are removed by the fire fighter department. This takes place in winter since the nests are visible in deciduous trees and it is outside the breeding season.

Flocking birds roosting in trees are harassed by the wildlife control unit till they have gone to an alternative roost.

The bushes, hedgerows and forests at aerodromes are habitats for many non-hazardous species that do not cross the runways. A few examples of species that have been recorded at aerodromes :









17. Water

Small lakes and water bodies are present at a few aerodromes. Others have water in the close vicinity. Water is a habitat for lots of non-hazardous animal and plant species. Hazardous species as gulls, herons, geese and ducks are attracted to drink, sleep, rest and look for food in the water as well.

During heavy rainfall, most aerodromes have problems with stagnating water near the runway. When the vegetation is short, the hazardous birds are foraging in the water puddles. Most aerodromes have a natural draining soil. Others require a man-made drainage system. Some lack budget for this.

1. An artificial retention water body close to the runway is covered in plastic balls to prevent waterfowl entering.

The lakes in 2 and 4 attract waterfowl of which most species do not cross the runway and therefore are not hazardous. When hazardous waterfowl arrive, a sound system (2) and a laser (3) scare them away.

Photo 3. Heavy rainfall, in combination with short vegetation and a weak drainage system create water puddles next to the runway, attracting geese, gulls and ducks. Due to their body mass and flocking behavior, collisions with gulls, ducks and geese could result in significant damage.

The lakes, swamps, moist soils at aerodromes are habitats for many non-hazardous species. A few examples of species that have been recorded at aerodromes:

Ruff (left) and Temminck's stint were allowed to breed at a remote area in the moist part of an aerodrome on a safe distance from the runway.

Cuckoo looking for nests of reed-breeding small birds to lay her eggs.

Kingfisher (left), Palmate newt (up), Tree frog (up right) and damselfly are all non-hazardous with a high biodiversity value.

18. Fence

Fences exclude non-flying hazardous animals from the aerodrome. All visited aerodromes have fences. The appropriate height and structure of fences depend on the jumping and burrowing capabilities of the hazardous animals present in the aerodrome's vicinity. A proper fence is:

- Anchored to exclude burrowing animals like wild boars, badgers and rabbits
- High to exclude jumping animals like roe deer
- Swallow-tailed on top to have an extra barrier for jumping animals
- Strong to prevent animals pushing it down
- Monitored frequently to inspect for holes and broken wires, poles
- Maintained immediately if holes or broken parts are discovered

Rollers perch on fences

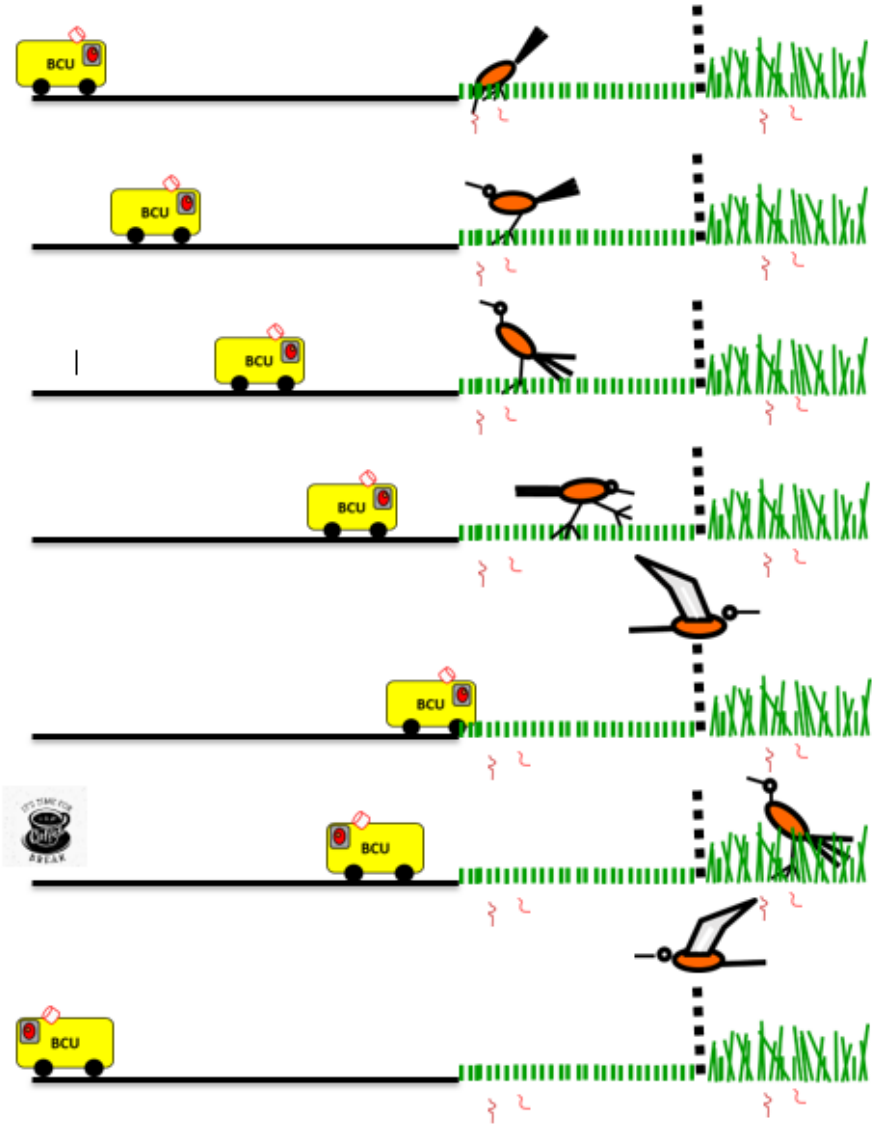
Most fences are suitable for excluding hazardous animals. Some even have a double fence. A few aerodromes have no proper fence due to budgetary constraints. They accept the risk of hazardous animals entering the aerodrome and rely on scaring and hunting activities to keep them away. The fences have no negative effect on the movement of non-hazardous species.

The aerodrome of this fence has regularly roe deer jumping over and wild boars burrowing under. Hunters try to regulate their numbers.

Despite these efforts, some of these hazardous mammals are observed crossing the runway and some have been hit by aircraft, causing damage.

19. Wildlife harassment

At each aerodrome, the wildlife hazard units have multiple machines, devices and tools to harass the hazardous birds and other wildlife.



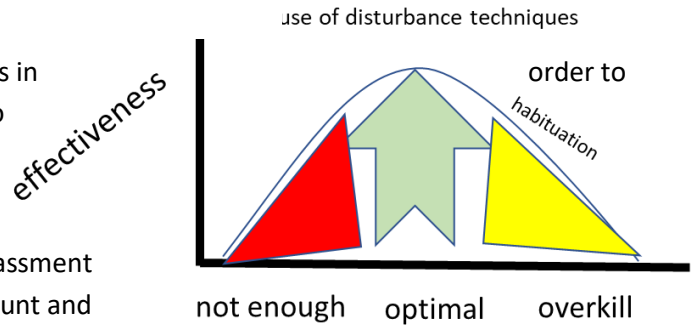
The effectiveness of disturbance depends on
* type of technique
* the intensity of the use
* duration of the use
* visibility and hear ability

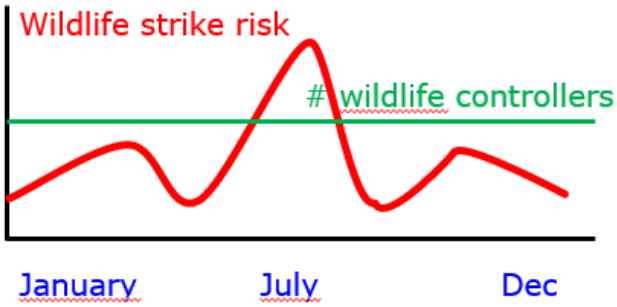
Each wildlife species responds differently:
* ability to detect the disturbance
* information processing time
* follow-up action (flee or hide)

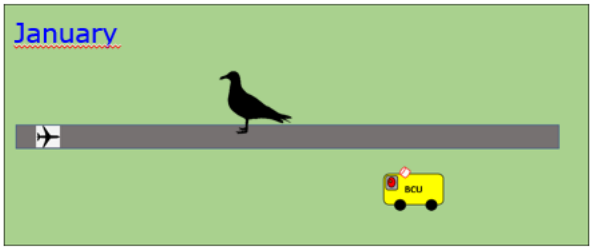
Within species, the individual response depends on
* character
* age
* condition

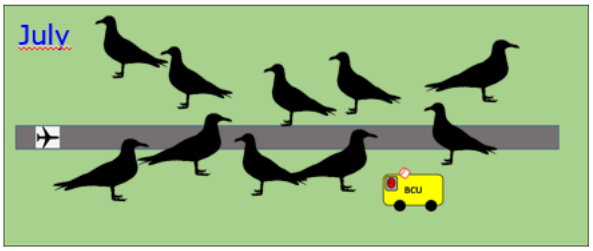
All aerodromes are using the harassment techniques in find the optimal effectiveness, preventing wildlife to habituate to the harassment techniques.

Persistence is very important, but all the wildlife controllers at all aerodromes are stress ing that harassment is only successful if the aerodrome reduces the amount and accessibility of food.









Although the wildlife strike risk at all aerodromes varies between seasons, just a few aerodromes have a flexible number of wildlife controllers on duty. Most do not adapt the number of personnel and vehicles to the wildlife strike risk.

The aerodromes indicated that lots of wildlife harassment companies advertise their products as silver bullets. Because none have been tested scientifically, each aerodrome is trying devices by trial and error.

That even the best vehicles might break down on the runway was experienced once. Luckily, there were no aircraft movements for the next 15 minutes which gave time to restart the vehicle on the runway itself.

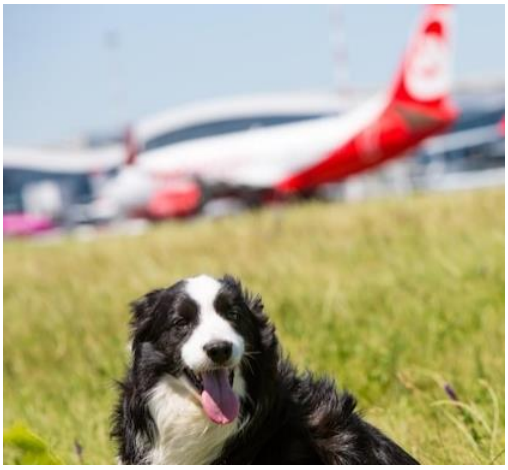
All aerodromes have dedicated **vehicles** for runway and aerodrome patrolling and monitoring. Their cars are equipped with communication systems and devices to harass wildlife.

Loud bangs to scare birds away are present in various ways.

Birds make 2 types of sound; singing to mark their territory and for display reasons to attract a partner.

The other sound is a distress call to scare off their opponent and to warn their fellows for any danger.

Most aerodromes use one or more optical devices like scary eye balls and laser beams.



Some aerodromes use natural predators to harass hazardous wildlife like border collies and falcons.

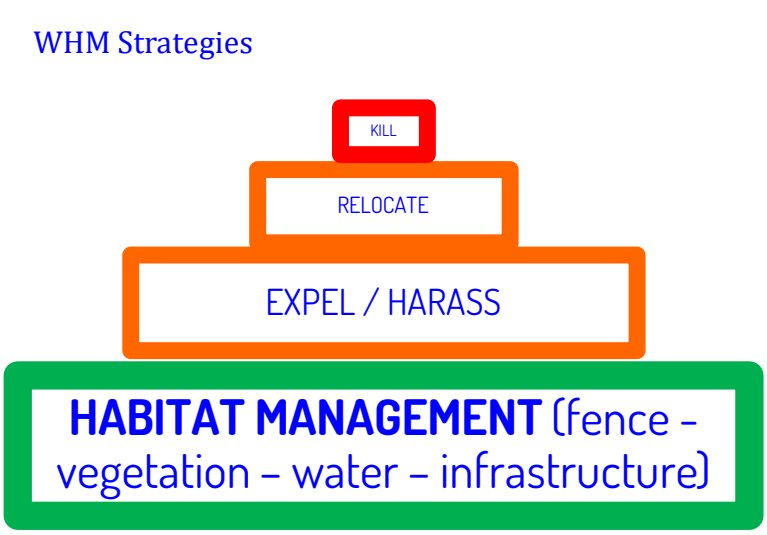
Many aero-dromes have different types of rifles and shotguns for lethal control.

20. Trapping and relocation

All kind of **cages** and **traps** are in use to catch corvids, raptors and foxes. Usually, the corvids and foxes are killed, the raptors relocated. For research purposes, the relocated raptors are ringed or wing-marked.

21. Derogation process

All aerodromes have a licence to harass / remove / kill hazardous wildlife. The process to get the derogation varies per country – the process follows these steps:



Prove all your efforts

1. Skilled, trained and properly equipped personnel

2. Exclusion (fence, waterbodies)

3. Vegetation management

4. Disturbance activities

5. Trap and relocate actions

6. Lethal control

Since countries have different landscapes, ecosystems, soil and vegetation types, the issue of the derogation is mandated to provinces or municipalities. In this way, tailor made derogations can be provided that fit the differences in ecosystems and characteristics.

Some aerodromes have a carte blanche license and have to report afterwards, others get a derogation for a selected list of species. One aerodrome has a licence to kill only 2 bird species, with limited numbers. For all aerodromes, the given derogations are sufficient – none of the aerodromes have problems with derogations that are too strict.

If more options are required, it is possible to apply for these. One of the problems that is experienced is the fact that it may take some bureaucracy. This is due to the fact that the derogation is issued by non-aviation ministries / departments, like nature conservation and environment.

And looking over time, it also depends on the political vibes of that time. However, nobody ever experienced a derogation officer who refused to issue a derogation for flight safety purposes.

The overview / auditing activities of the “derogation overview department” vary as well. Most have only on desk overviews when the annual reports are analysed. Some go in person to the aerodromes, either with an appointment, or unannounced. In one country, the officer is inspecting the wildlife control activities from outside the aerodrome using binoculars and telescope.

22. Use of chemicals

There is a variety of chemicals used at aerodromes affecting vegetation and animals. The chemicals can be categorised like this:

Chemical	Purpose	objective
Herbicides	Security	The perimeter fences at many aerodromes are kept free of herbs and shrubs by applying herbicides to make sure possible intruders (humans) are spotted by security and surveillance cameras.
Herbicides	Safety	At some aerodromes where poles, markings, detection systems, runway and taxiway lights are standing in the vegetation, herbicides are applied to make sure that the vegetation is not obstructing the functioning of these elements / systems. Especially at those parts where tractors with mowing machines are unable to manoeuvre. Other aerodromes use hand-held mowing machines to mow these small parts.
Herbicides	WHM	Some aerodromes spray herbicides to kill herbs before setting seeds that may attract seed eating birds.
Insecticides	WHM	At one aerodrome, insecticides are applied on a monthly basis in spring and summer to kill insects that attract swallows and swifts.
Rodenticides	WHM	A few aerodromes kill rodents like mice, voles and rats that are attracting rodent-eating wildlife by applying rodenticides in March (injecting tablets into the soil).

Detailed information about the chemicals was hardly provided. We did not push for it either.

These are amounts in stock at one aerodrome:

Raticide:	1,000 kg
Insecticide:	76 liter

.

Monsieur Sylvain Lejal, former wildlife hazard manager of Paris International Airport Orly is the founding father of a chemical free aerodrome (zéro phyto). It took him a lot of persistence to reach his goal.

To help all aerodromes successfully completing their transition and effectively manage their green spaces in zero phyto, the Union des Aéroports Français & Francophones Associés launched the “Aéroports Zéro Phyto” project at the end of 2021.

This project, carried out in collaboration with Groupe ADP, follows on from the initial work carried out by the French national aviation authorities (STAC) on aerodrome green space maintenance practices. Based on the cross-referencing and analysis of feedback, the objective is to support aerodromes in this transition.

23. Data

All aerodromes are collecting lots of data about the presence of wildlife, results of harassment actions, the use of the derogation and the wildlife strikes.

For monitoring reasons, wildlife hazard controllers use different kind of devices, like binoculars, telescopes, **thermal cameras**, **drone-mounted cameras**. One aerodrome has an avian radar,

World wide, the International Civil Aviation Organisation (ICAO) is collecting all wildlife strikes. The European Aviation Safety Agency (EASA) keeps the records for the European civil airports. The allies of the North Atlantic Treaty Organisation (NATO) used to share military wildlife strike reports as well. The bias in each of the 3 wildlife strike databases is unknown, but expected to be considerable. One of the main reasons is the lack of a common definition of wildlife strike, see the overview:

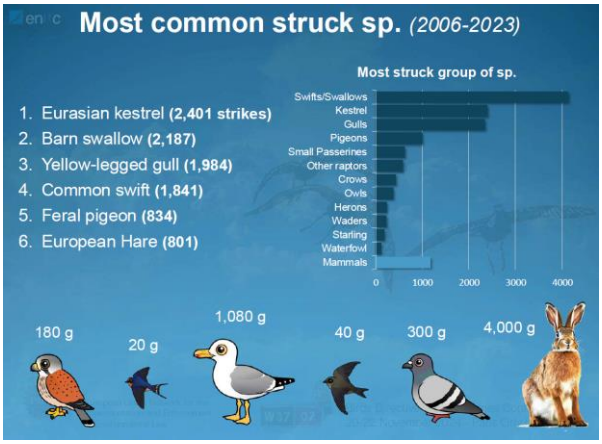
	Wildlife controller			Aircraft technician			Pilot			
Occurrence --- Organization	Injured Fox in runway strip	# Dead birds in RESA	Observes large flock near aircraft	Feathers in engine & damage	Smear on aircraft, no damage	Birds nest in aircraft	Observes a birdhit but no evidence	Rabbit hit during taxi	Stall warning when avoiding bird	Runway veer-off due avoiding a bear on runway
ICAO	No	Perhaps	"Near miss"	Perhaps	Perhaps	No	"Near miss"	Perhaps	"Near miss"	"Near miss"
FAA	Yes	Yes	"suspected"	Yes	Yes	No	"suspected"	Yes	No	No
EASA	?	?	?	?	?	?	?	?	?	?
RAAA	Yes	Yes	No	Yes	Perhaps	No	Yes	Yes	No	No
Eurocontrol	No	Perhaps	No	No	No	No	Yes	No	No	No
Other	No	Perhaps	No	Perhaps	Perhaps	No	Perhaps	No	No	No

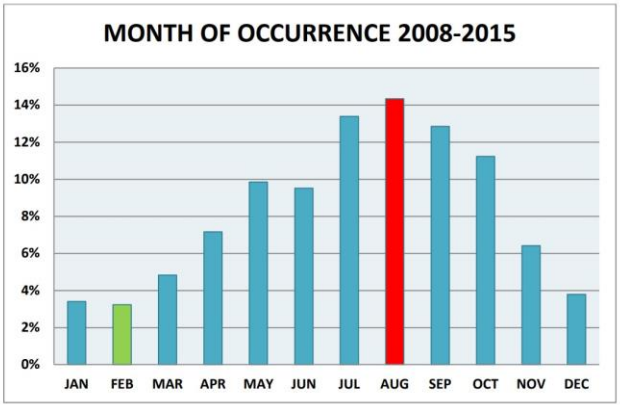
https://www.worldbirdstrike.com/images/WBA_Virtual_conference_2021/Plenary_2/20210109_WILDLIFE_strike_DEFINITION_propsal_for_WBA.pdf

The aerodromes indicated that their databases will have biases as well due to the fact that wildlife strikes

- are not always noticed by aircrew
- are not always noticed during post flight inspection
- are found as a carcass on the runway, but can't always be related to an aircraft
- that occurred en route and can't be linked to an aerodrome
- that it is not always clear at which aerodrome they occurred (departure or arrival)
- without any damage are not always reported (a blood smear is just cleaned)
- are not always reported due to time pressure by the crew
- are reported without collecting bird remains which hampers to identify the wildlife species

At a few aerodromes, we also noticed the reluctance to share data because of the assumed negative effects for the reputation of the aerodrome. Most aerodromes have an opposite approach and are proud of their *just culture* reporting standards – for example the number of wildlife strikes at all civil airports in country X, including data on the number of species and their body mass.





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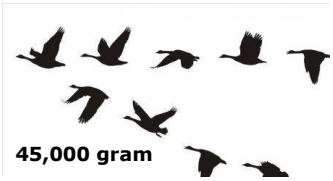


Most wildlife strike data are presented as equal events. 1 Barn swallow strike (August) is equal to 1 strike with 9 geese (February). If weight would be taken into account, February is the critical month.

ICAO reported 273,343 wildlife strikes in 194 states in the period 2016 – 2021, of which 43% lacked information about the wildlife species https://www.icao.int/Aerodromes/Ibis/Documents/03.%20EB%202023.30%20-%202016_2021%20WILDLIFE%20STRIKE%20ANALYSES/2016%20-%202021%20Wildlife%20Strike%20Analyses%20%28IBIS%29%20-%20EN.pdf)

Latin	English	number		%
FALCONIFORMES	hawks, eagles, vultures	42.353		28%
PASSERIFORMES	perching birds	41.960		27%
CHARADRIIFORMES	shore birds	27.377		18%
COLUMBIFORMES	pigeons, grouse	12.026		8%
MAMMALIA	mammals	7.642		5%
CICONIIFORMES	heron, stork, ibis, flamingo	4.782		3%
STRIGIFORMES	owls	4.208		3%
APODIFORMES	swift, tree-swift, hummingbird	3.325		2%
ANSERIFORMES	ducks, geese, swans	2.915		2%
PELECANIFORMES	pelicans, cormorants, boobies	2.671		2%

In Europe, for 35% the species was unknown in a dataset of 12,528 wildlife strikes at 157 European aerodromes in 6 countries for the period 03 / 2017 – 02 / 2021 https://www.stac.aviation-civile.gouv.fr/sites/default/files/impact_covid-19_on_aviation_wildlife_strikes_across_europe.pdf

species	# derogations	%
Not reported	3605	37%
Corvus corone	275	3%
Larus argentatus	265	3%
Columba palumbus	263	3%
Corvus monedula	251	3%
Larus canus	244	3%
Pica pica	235	2%
Corvus frugilegus	232	2%
Anser anser	216	2%
Sturnus vulgaris	215	2%
Buteo buteo	195	2%
Branta canadensis	185	2%
Anas platyrhynchos	173	2%
Vanellus vanellus	171	2%
Columba livia	167	2%
Larus fuscus	158	2%
Falco tinnunculus	152	2%
Larus marinus	139	1%
Numenius arquata	111	1%
Larus ridibundus	106	1%

Remarkably, the Art 9 Birds Directive derogation data in the period 2015 – 2023, with the legal justification "in the interest of air safety" have a similar 37% of unknown (not reported) species identification.

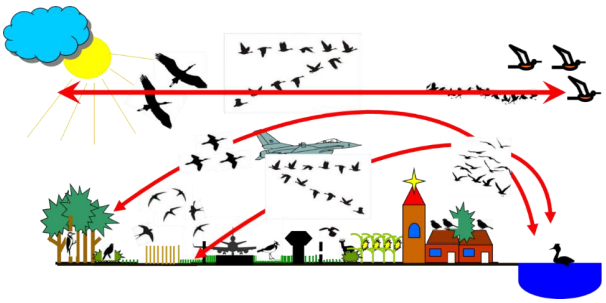
The species ranking is not closely correlated with the wildlife strike species composition.

For example, Corvids are high in the derogation list, but are not among the hazardous species at the aerodromes.

https://www.eea.europa.eu/en/analysis/maps-and-charts/overview-of-derogations-and-exceptions-dashboards.

24. Aerodrome vicinity

Many aerodromes have flight safety issues with birds that fly over the runway, coming and going to water, agricultural fields or forests located at each side of the aerodrome.



The species with daily commuting flights between sleeping and foraging places may cross the aerodrome twice a day.

And commuting birds with multiple foraging and resting places over the day may cross the runway more often.

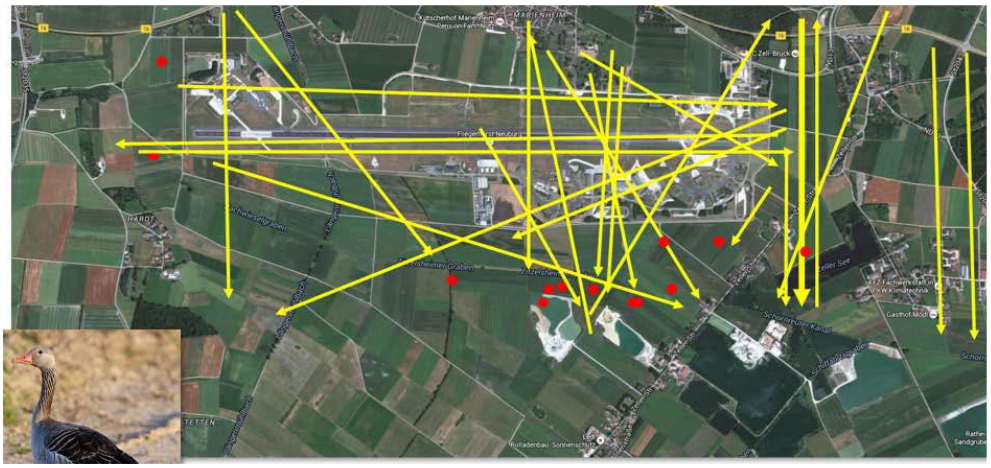
The European Aviation Safety Agency requires aerodromes to notify the appropriate authority if a wildlife assessment indicates conditions within the 13 kilometre surroundings of the aerodrome are conducive to a wildlife hazard problem (see page 31). Many aerodromes have notified the appropriate authorities about farming practices, however follow up actions are hardly taken place. Court cases were needed to cancel the plan for an artificial lake.

Of the 21 visited aerodromes, 16 have a NATURA 2000 site within a distance of 13 km. The designated wetlands cause most problems due to commuting waterfowl. Some forests as well as starlings and pigeons use these as roosts. One aerodrome has a area protected for harriers nearby. Some of these harriers are foraging at the aerodrome. One aerodrome declared itself a bird sanctuary to be able to be independent from hunting associations.

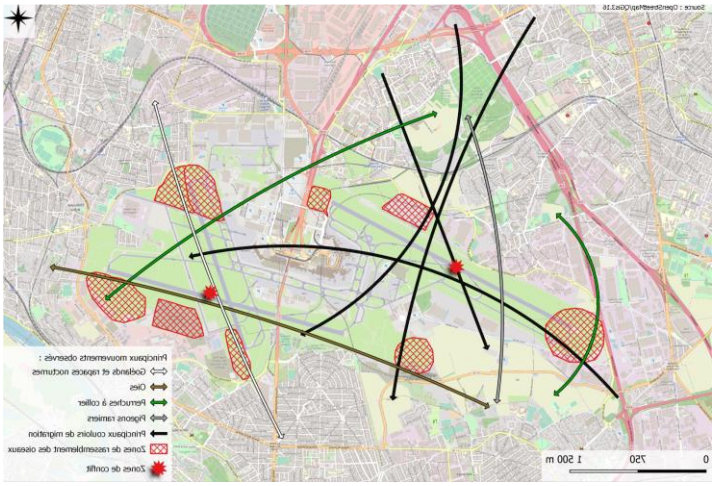
For farmland, there is only one lawsuit in which the aerodrome won its case that the farmer was no longer allowed to grow bird-attracting arable crops at the other side of the fence. Some aerodromes have agreements with neighbouring farmers, but only on a voluntary basis.

The most attractive arable crops for birds are maize, wheat, barley, sugar beets and potatoes.

25. Tracking flight movements

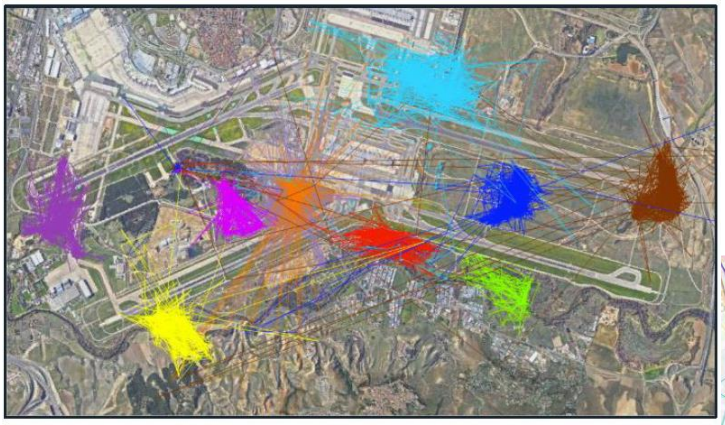


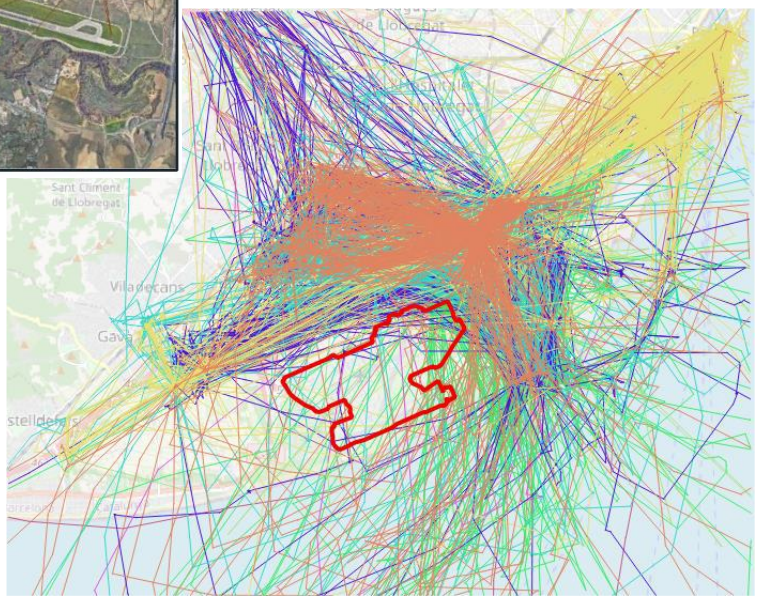
As data are essential to solve the problem with the neighbours and/or to get a derogation, many aerodromes are collecting data of flight movements. The most used method is drawing lines on a map.



To be more accurate, GPS tracking gives three-dimensional data with short time intervals (seconds), as is done at a few aerodromes to study the movements of gulls (left), buzzards (right) and vultures.

The GPS tracks can be combined to show territorial and commuting flights. Within species, there is a lot of variety in individual flying behaviour.





26. European Goose Management Platform

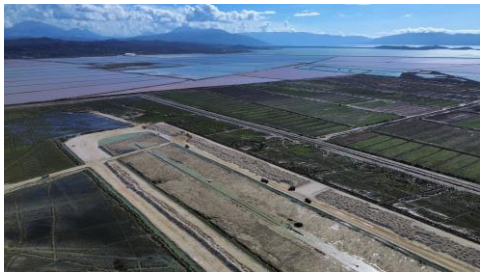
A few aerodromes have geese in the vicinity that commute over the runway(s) twice a day. The growing goose populations are causing more and more problems to flight safety. This concern is raised in the AEWA/EGMP International Single Species Management Plans for the Barnacle Goose and Greylag Goose.

The European Goose Management Platform (EGMP) was established in May 2016. The platform functions under the framework of the African-Eurasian Migratory Waterbird Agreement (AEWA), which provides for the conservation as well as the sustainable use of the migratory waterbird populations it covers. The EGMP addresses the conservation and management of declining, as well as growing, goose populations in Europe by a coordinated flyway approach amongst all Range States concerned.

The goal of the EGMP is to provide the mechanism for a structured, coordinated and inclusive decision-making and implementation process for the sustainable use and management of goose populations in Europe, with the objective of maintaining them at a favourable conservation status, while taking into account concerns of relevant stakeholders and the pertinent legislative frameworks and regulations.

The goal of the Flight Safety Task Force, established in 2023, is to reduce the geese – aviation strike risk. By sharing experiences of effective (and not effective!) measures and data about geese populations, movements and strikes.

27. Vlora airport, Albania (contribution by Z. Vorpsi)

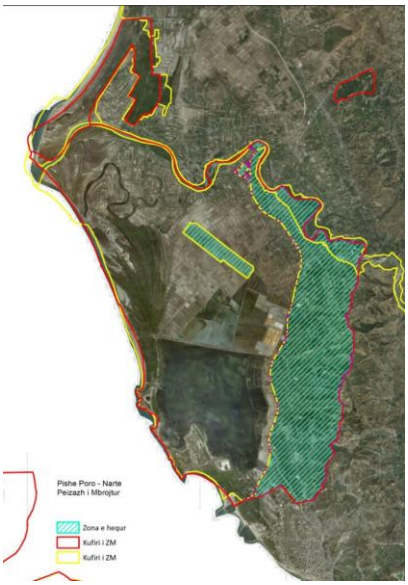


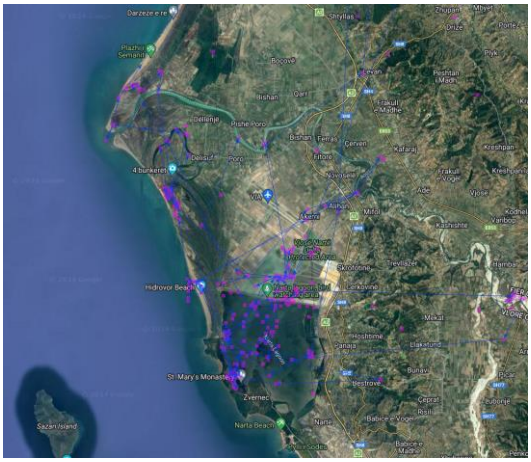
Vlora airport is being built in the Vjosa River delta, also known as the Vjosa-Narta Protected Landscape (Albania). The area is a key stopover along the Adriatic Flyway, A Key Biodiversity Area, (KBA), Important Bird Area (IBA) and a Candidate Emerald Site under the Bern Convention.

From the conducted monitoring, it results that the area holds the thresholds of 1% or more of populations of wild birds in different biogeographic regions of Europe. The species with such threshold are pied avocet, collared pratincole, Dalmatian pelican and greater flamingo.

The construction of the airport started in a rush in November 2021, avoiding legislative obligations such as an environmental declaration, following a procedure and publishing an EIA or even worse, starting the construction without a construction permit. A construction permit was granted only in February 2023.

To pave the way for the legalization of Vlora International Airport, the authorities in October 2022 removed the protection from the 300 ha, in the middle of the protected area, coinciding precisely with the area where the airport was being constructed, arguing that now the airport is not in a protected area anymore. Surely, after the removal of the patch from the protected area, the site kept being part of the ecosystem and sustaining wildlife and kept being part of the international migration route for birds. The 2 green plots are removed from the protected area.





The final EIA, published after the construction had already started, was highly opposed and is subject to a court case. The EIA presented that big birds such as pelicans were avoiding the airport while flying back and forth from Karavasta lagoon to Narta lagoon.

The data of GPS tagged pelicans showed another reality, and the flight safety hazard. Moreover, the migration counting data, show that the area has active migration of soaring birds.

Until now, during the construction phase, the airport has caused the decrease in population of wild birds, such as Calandra lark that is a species of Annex I of EU Birds Directive. There is already a 70% loss of its breeding population due to the removal of its habitat.

Meanwhile, the airport is attracting other investments on the site, such as parking lots, shops and resorts along the coast of the protected area. To pave the way to these developments, the Albanian authorities changed the law on protected areas, which now allows the construction of high-end tourism resorts inside the protected areas. Now, the delta of Vjosa river, the first wild river national park, is under the threat of high end resorts planned to be built there, supported by the airport that is under construction.

In a written opinion, the Swiss Ornithological institute stated that: "*The control of birds, which is most effective by reducing the habitats for birds, is incompatible with the conservation goals of the EU concerning the threatened birds in Vjosa-Narta Protected Area.*" In addition, they explain that there is a huge threat of collision between aircraft and big birds using the area.

28. Conclusions

During the 21 aerodrome visits and the conference, lots of data have been collected about the current practices for Wildlife Hazard Management to prevent animal – aircraft collisions (so called wildlife strikes) and the biodiversity values and potentials at the aerodromes.

Due to all the flight safety procedures that are in place at the aerodromes, we never encountered wildlife safety risks and we all felt extremely safe to fly in and out of the aerodromes. However, the increasing numbers of high risk bird species (geese, vulture, raptors) require more and more awareness and research to find best solutions to reduce their flight safety hazards.

Although the majority of the aerodromes have no special biodiversity policy, all aerodromes host plants and animals of high nature conservation values while not causing safety issues due to their low body mass (weight) and behaviour (solitary, not crossing the runway).

If the right objectives and methods are used, there is a well-balanced approach possible to have a win-win situation for both biodiversity and flight safety at most all aerodromes.

The sensitivity of sharing data about the use of the derogation for flight safety, forced us to change plans and to focus the first part of the project to build up good relationships with the aviation sector by visiting aerodromes in person in order to explain our goal. This approach was well appreciated and the news about this IMPEL project was spreading quickly ánd positively within the aviation community. This led to the great success of the conference held in November 2024.

Furthermore, since this subject was new to the IMPEL community, time was needed as well to get familiar with this aspect of the Birds Directive. We accomplished that as well.

29. Recommendations

It is recommended to organise hybrid and online workshops in years 2025, 2026 and 2027. Getting people together in workshops will have the effect that

- data will be shared in a safe blame- and shame-free environment
- more data about the actual use of the derogation will become available
- more data about bad and good practices will become available
- a better understanding of the current practices
- defining knowledge gaps for wildlife hazard management
- defining research projects to obtain more knowledge about wildlife hazard management

With this data, a Risk Assessment Tool (RAT) can be developed that will help both the departments that issue/oversee the Derogations as well as aerodromes to apply the most appropriate aircraft – wildlife strike prevention strategies with the best possible win-win methods for both flight safety as biodiversity.

At the conference (November 2024), plenty of time was allocated to come up with recommendations:

- Get together in Europe every (other) year with this group / a bigger group / all stakeholders.
- Get support from European organisations.
- Provide templates for EU guidelines to deal with habitats and wildlife hazard management?
- Share information on legal issues and liability. Include insurance companies in this respect.
- Continue to cooperate with civil and military aviation.
- Sharing best practices and failures on wildlife hazard management ánd biodiversity topics at and around aerodromes.
- Lobby with ACI Europe, IATA in order to get guidance towards building new airports including protection of biodiversity and not only flight safety.
- Develop sound KPIs for the balance of flight safety and biodiversity.
- Liaise with stakeholders in aerodrome vicinity.
- Get more involvement of IMPEL in this subject.
- Continue with the scientific approach for vegetation management and GPS monitoring.
- Extra attention via IMPEL on CSRD at aerodromes.
- Involve the scientific community.

All these recommendations will be put in the Birds @ Aerodromes Working Plan for 2025 – 2026 – 2027.