



BIRD HAZARD MANAGEMENT

BIRD DETECTION & MITIGATION TECHNOLOGY FOR AIRPORTS



robin
radar systems

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BIRD STRIKES ARE ON THE RISE

On 7th May 2022, an Easyjet Airbus A319-100, registration G-EZGR performing flight U2-6843 (Glasgow to Faro) was climbing from Glasgow's runway 23 when it suddenly stopped at about FL120. They reported a bird strike and decided to return to Glasgow.

The aircraft descended to FL070 and entered a hold for about 25 minutes before landing back on runway 23, 40 minutes after departure. No replacement aircraft was available. Passengers were offered rebooking onto other flights or cancellations, as well as hotel accommodation when needed.

The aircraft in question was returned to service after about 14 hours.

Around the world, events like this happen every day and they're on the rise, costing airlines as much as US\$1.36bn a year. But not all bird strikes are lucky enough to just end with inconvenience. Bird strikes have also caused catastrophic damage and loss of life throughout aviation history.

As a natural phenomenon, it's easy to discount bird strikes as something that's just going to happen. But, at a time when policy, societal change, and economic uncertainty threaten airports and airlines alike, the last thing you need is a bird strike.

And it's up to you to decide what to do about them.





BIRD STRIKES & IMPACT

Detection and mitigation of bird strikes are more important now than ever. In the first quarter of 2021, the rate of strikes in Europe jumped 205% compared with the same quarter in 2020, according to the European Union Aviation Safety Agency.

For the third quarter of 2021, the number of bird strikes was up more than 18% from the same quarter in 2019, at 240.8 strikes per million flights.

Airport executives, safety agencies and wildlife biologists blame quiet airports over the past two years for the rising rate of strikes

Airports handled fewer flights, and in some cases, smaller airfields weren't used at all for long stretches. Birds moved in, nesting atop parked aircraft, inside engines, and on unused gear like passenger bridges and boarding stairs.

Bird strikes in Europe have increased by **205%** since 2020



COMMON BIRD STRIKE SCENARIOS

SCENARIO 1

- Bird ingestion to three out of four engines of an aircraft occurs at 200ft.
- AGL after take-off.
- One engine is disabled completely, and two others are sufficiently damaged and produce reduced thrust.
- The pilot makes an emergency landing.

SCENARIO 2

- A twin-engine light aircraft flies into a single heron at 200ft AGL after take-off.
- The heron breaks through the windscreen and hits the pilot who temporarily loses control.
- Upon recovery, a forced landing ahead is the only option.

SCENARIO 3

- Wing root damage to a single-engine light aircraft caused by a bird strike.
- This causes so much structural damage that the pilot loses control, resulting in terrain impact.



FACTORS THAT CAN INCREASE THE PRESENCE OF BIRDS

HABITAT FEATURES

Trees, shrubs, and grass provide food and roosting sites, making them prime attractants. Water is important, too.

Airports in coastal locations often have a much higher level of bird activity than inland airports. But even water pooling on uneven pavements can be enough to attract birds.

BIRD MIGRATION PATHS

Migrating birds often follow well-defined flight paths in considerable numbers. If they intersect with your aerodrome, you'll see seasonal spikes in bird activity.

AGRICULTURAL ACTIVITY

Nearby farms of all kinds attract birds, not just ones that focus on plant agriculture.

For example, one site we help protect, RAF Lossiemouth, is surrounded by pig farms. These were identified as key factors in their wildlife management.

LANDFILL AND OTHER WASTE DISPOSAL SITES

These sites, if poorly managed, can provide rich pickings to large numbers of birds.





IMPACT

HOW MUCH DAMAGE CAN A BIRD DO TO AN AIRCRAFT?

There are several factors that impact the damage a bird can cause to an aircraft and the forces involved in bird strikes are huge.

A 6.8kg goose impacting an aircraft doing 200kts exerts a force of **16 tonnes**. Add just 50kts to the speed and the force is suddenly **26 tonnes**. At 280kts, the force is just over **32 tonnes**.

These are approximate figures, but the key takeaway is that likelihood of strengthening any engine or airframe to completely resist such a force is tiny indeed.

Birds can strike aircraft in different places, resulting in variable affects. Damage to an engine or propellor naturally impact speed. Damage to the canopy affects control, while damage to vital sensors like pitot tubes can throw off air speed readings or worse. Not all scenarios result in death or injury.

FACTORS THAT IMPACT BIRD STRIKE DAMAGE

- Bird weight
- Bird density
- Bird rigidity
- Angle of impact
- Impact surface shape
- Impact surface rigidity



THE FINANCIAL IMPACT OF BIRD STRIKES

We know that bird strikes can occur at any point during a flight, but we also know that most bird strikes occur at the crucial moments between take-off and landing.

One study has shown that 85% of bird strikes involved aircraft below 800ft (i.e., in and around your aerodrome). According to the FAA wildlife strike database, 14,780 bird strikes were reported in 2021, with an estimated total cost of \$38 million.

And although the airlines suffer the damage, it's the airport's responsibility to have policies in place to mitigate the risk of a bird strike. When an airport lacks effective bird hazard management, this may result in the airport being held liable.

In 2016, a bird strike proved costly for Malta International Airport, which was ordered to pay \$250,000 in damages to Air Malta and an insurance company.

**SO, HOW CAN YOU AVOID A
LIABILITY CLAIM?**





OFFICIAL GUIDANCE

All airports are required to continuously evaluate bird hazards, and to decrease the risk to aircraft operations by adopting measures that minimise the likelihood of collisions between wildlife and aircraft. Official regulations place minimal requirements on airports.

EXAMPLES OF GUIDELINES

- EC Regulation 139/2014 and associated (EASA) Acceptable Means of Compliance and Guidance Material
- PANS Aerodromes (Doc 9981)
- ICAO Airport Services Manuals (Doc 9137)
- International Birdstrike Committee (IBSC) Standards and the ACI's WHM Handbook
- An Aviation Industry Guide to the Management of Wildlife Hazards, Canada, TP 13549 - Sharing the Skies

ROBIN RADAR'S TAKE ON BIRD STRIKE GUIDANCE

But many authorities offer optional guidance for those who wish to exercise greater safety.

With so much guidance available, airports deploy a variety of strategies to detect and mitigate bird strikes. To help you out, here's our expert view...

Essentially, airports need to do two things:

1. Reduce the presence of birds in and around the airport as much as possible
2. Control bird populations to minimise the likelihood of collisions between birds and aircraft

Airports with a low-risk profile will be able to do the minimum required by regulations. Larger airports with a low risk profile only need to meet the minimum level of compliance. Larger airports with a higher risk profile should follow the extensive guidelines provided by ICAO, ACI, AESA and the FAA.



BIRD DETECTION SOLUTIONS FOR CIVIL AVIATION

MANUAL OBSERVATIONS

Bird Controllers and Wildlife Management teams play a critical role in detecting potential bird strikes. Small airports can easily manage bird movement with trucks and binoculars. But larger airports have larger challenges:

- **Airport size.** The bigger the airport the bigger the area to manage. This affects resources, logistics, and productivity of Bird Controllers and their teams.
- **Detection tools.** Manual observations rely on bird controllers looking in the right direction at the right time. Visibility factors such as rain, fog, and darkness increase the challenge of detecting birds early enough to act.
- **Tracking & logging.** Without effective tracking and logging of bird strikes and bird activity, Bird Controllers will always be on the back foot. They need effective ways of gathering and interrogating bird data to help predict future bird activity.





CAMERAS

Automated cameras are a cost-effective mitigation solution that's suitable for smaller airports. Cameras use imaging to provide a wider coverage than manual observers.

Recent developments in camera technology, such as infrared and thermal imaging allow Wildlife Management teams to detect specific bird species. However, they aren't widely used as they don't perform well in adverse weather conditions and you need the more expensive thermal cameras if you want to use them at night.

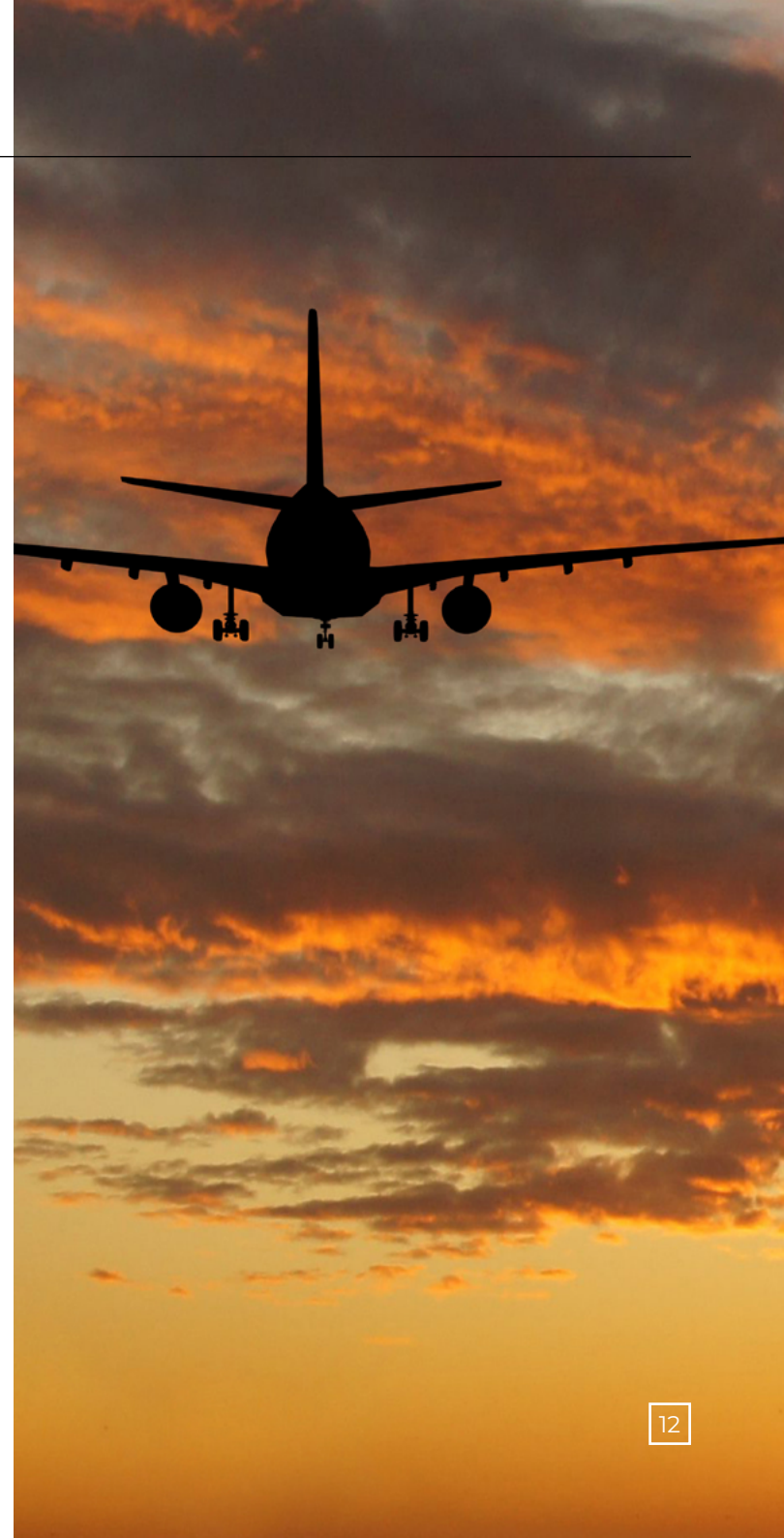
Unless integrated with other alert technology to prompt Bird Controllers to act, all a camera does is watch, which can be useful if you can capture and analyse the data. Some airports use cameras to monitor and observe bird behaviour and even bird strikes from various angles to inform future deterrent processes.

BIRD RADAR

Bird radar is the ideal technology to help teams on the ground work smarter. It complements a Bird Controller's ability to detect bird activity, while collecting data that all stakeholders can use to improve processes.

Avian radar, like MAX, automatically detects and logs hundreds of birds simultaneously, including their size, speed, direction, and flight path. MAX lets operators track activity in realtime, 24/7, all around their site. And it can be configured to the unique needs of any airport.

But it's not just about the here-and-now. Our radars allow you to undertake long-term analyses of patterns and behaviour. This lets operators strengthen and adapt their wildlife policies with robust, organised data.





MAX KEY FEATURES

Accurate tracking

MAX has 360-degree coverage and rotates at 60rpm, to provide tracking updates every second. This allows uniquely detailed 3D visualisation of bird flight paths in real-time.

With a 6-8km classification range for large birds and at least 1km (~3,280ft) altitude for 2-SAT targets, MAX easily covers the high-risk flight paths that could result in a bird strike. As a system that's specifically designed to detect birds, it keeps the focus on critical low-altitude areas, with an extremely wide coverage volume.

You can select and zoom in on individual coloured tracks, which show bird flight paths. The colours distinguish between small, medium, and large birds and flocks. A circle at the end of a track, varying in size of the bird, indicates each bird's present location. Each track in the viewer also offers altitude information.

Our bird radar provides the 360-degree coverage that personnel and cameras alone can't achieve. It works 24 hours a day in any weather, creating a dome of detection around a site that works in harmony with other hazard warning systems.

MAX SPECS

- FMCW
- X-Band 9650MHz
- 8900, 9250 MHz
- Real-time position and 3D tracking – in all directions all the time
- 44W average power output
- 1.0s track update rate
- 15km instrumented range





Mobile Viewer

Mobile Viewer is designed for day-to-day operations. It empowers bird controllers and wildlife hazard management to access realtime information easily on tablets that can also be installed and used in vehicles. Mobile Viewer also uses the tablet's GPS to pinpoint an operator's current location in relation to the activity around them.

Mobile Viewer gives airports full situational awareness by sharing real-time data with a centralised office and the people on the ground.

Turn observations into data

The intuitive interface enables users to manually link species to specific tracks or locations based on human observation, for later reference and/or reporting. You can also add ground observations to quickly store information not related to tracks.

Capturing data from many sources and pulling it into a single view is critical for achieving the level of data-led forecasting that can future-proof sites. In the long term, airports can share data to build a much clearer picture of how birds interact with civil aviation around the world.

Customisable alerts & classifications

MAX immediately notifies on-site teams of activity detected in areas of risk, giving precious time to react and mitigate a potential bird strike.

Runway funnel and graph colours change, giving a visual cue when the number of birds is higher than your chosen threshold. These critical zones are pre-defined with support from our experts and are easy to modify based on new insights or site requirements.

You can customise all classifications to give you the information you need, from bird sizes to the number of birds in flocks. It's also possible to classify non-avian threats, such as drones. When integrated with supporting solutions and countermeasures, you can detect and mitigate any encounter.

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SOLUTIONS FOR SCHIPHOL

Schiphol Airport uses Robin Radar Systems to provide full bird monitoring coverage of all six of its runways. Full coverage is achieved with four 3D Flex radars.

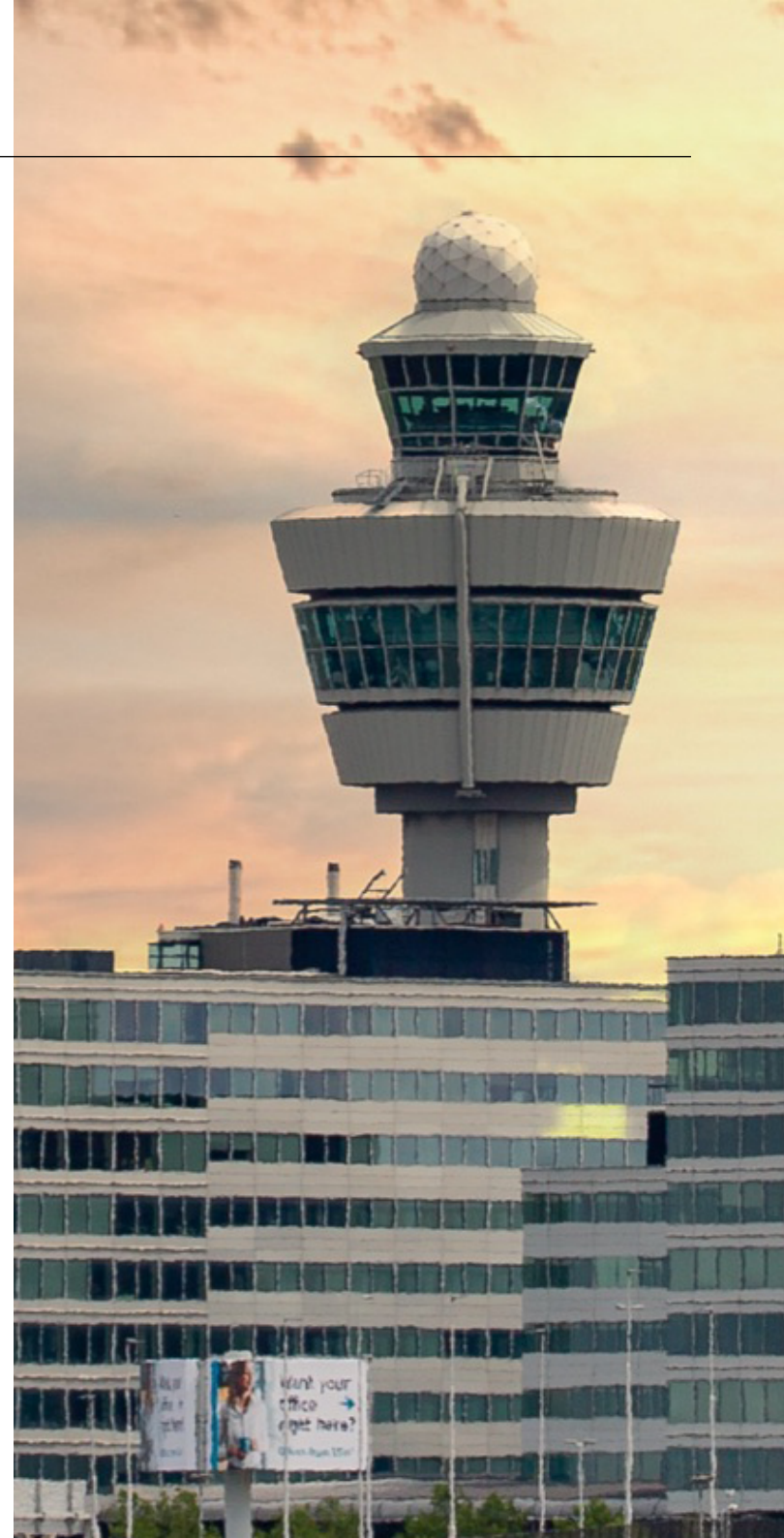
The first radar was installed at Schiphol's Polderbaan Runway in 2013. After almost three years of comprehensive trials and evaluation of our bird radar's performance, the system was extended to include an additional three 3D Flex radars.

Schiphol Airport uses its radars to obtain actionable information on bird movements within 10km of its airport.

The real-time monitoring of high-risk birds, such as geese, is particularly useful in reducing the risk of bird strikes. But the long-term data gathering and analysis are also proving useful as input for habitat management and generating KPIs related to reducing the risk of bird strikes.

“ We have a very large airport. If a bird controller was standing on the east side of the airport, then he couldn't see what was happening on the north side. There's only so much you can see with binoculars. ”

Ton Mens, Wildlife Hazard Manager



“ We can now give better answers to the questions we get asked. For example, ‘why are there X many bird strikes?’ Now we can say because there are more birds. It’s been a good Spring, good Summer, good breeding season, more bird migration, etc. And now we can show that with data. And because we can see where the birds are, at what time of the day, and the time of year – building up historical data – we can make better solutions to use our runways.

Ton Mens, Wildlife Hazard Manager

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MITIGATION SOLUTIONS FOR CIVIL AVIATION

HABITAT MANAGEMENT

Habitat management will vary depending on the location of your airport. But generally, this involves adapting the area around the airport to be less attractive to resident birds.

This can include reducing the number of trees, shrubs and other plants that provide food, shelter, or roosting sites. Even the height of grass can have an impact on bird activity.

To tackle wet grassland and areas of standing water, wildlife management teams must monitor weather patterns and develop processes to prevent transient formation of wetlands after heavy rainfall.

COMMUNITY ENGAGEMENT

Wildlife Management teams should liaise with local authorities to ensure that landfill waste sites and similar bird-attracting facilities are located far enough away from the airport. Similarly, airports should reach out to local farmers and work with them to limit the attraction of birds to fields.





ACOUSTIC DETERRENTS

Acoustic deterrents use loud noises to scare and deter birds from entering your aerodrome. These can be pistols firing blank rounds, and most typically, propane cannons.

[See how Berlin Airport uses our Mobile Viewer to remotely control Purivox propane cannons.](#)

Another form of acoustic deterrent is Bio-Acoustics. It allows Bird Controllers to broadcast a natural bird call to deter birds.

Typically, the call is a distress call that the birds recognise, but may also be the hunting call of birds of prey known to hunt the birds in question.

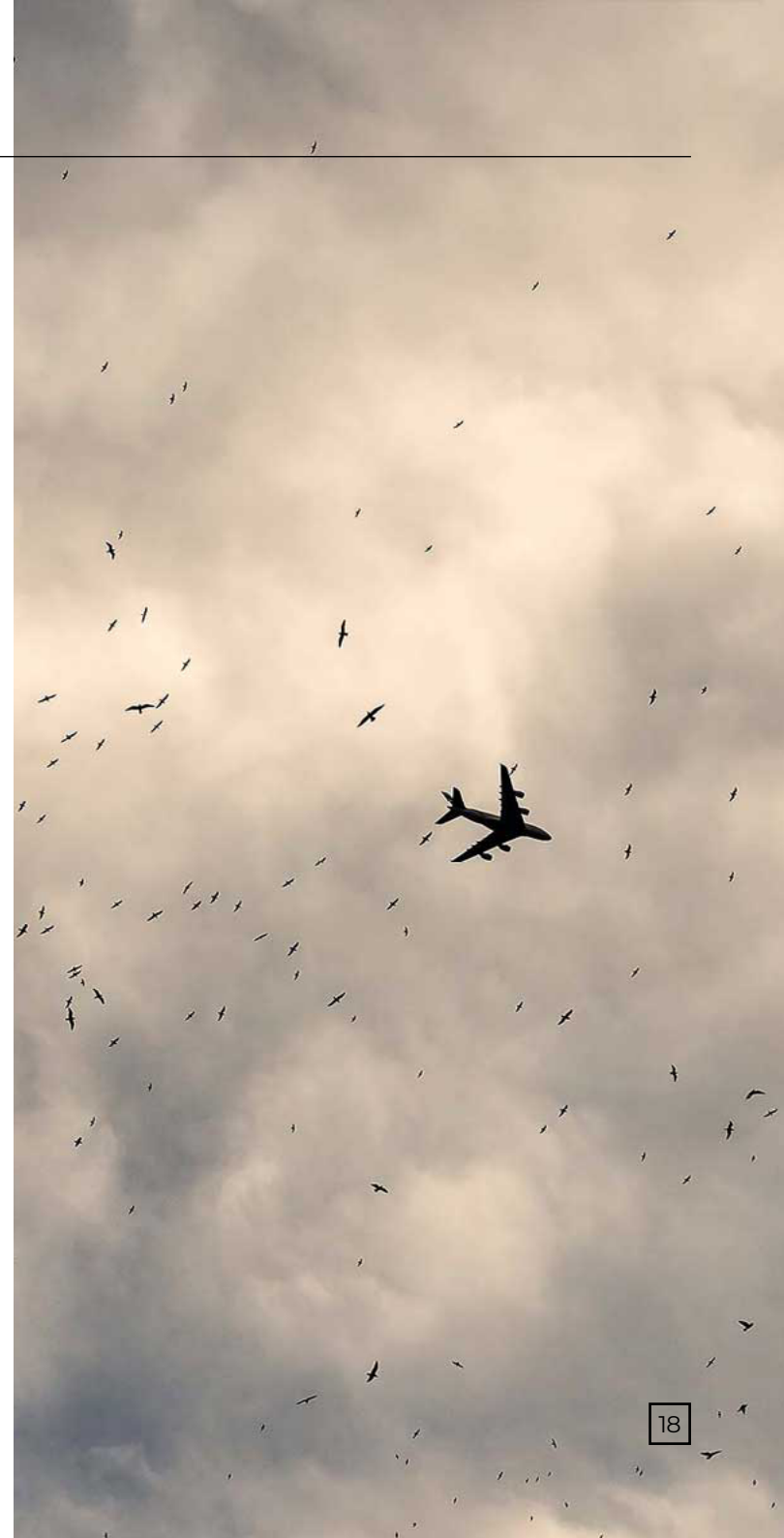
Different species of birds react in different ways when they hear a distress call. Bird Controllers need to understand how a species will react to ensure that they don't inadvertently direct them into a more dangerous position, or even attract them.

Bio-acoustics are only effective if you know the species and direction of the oncoming birds.

SCARECROW

Scarecrow is a Robin company and a pioneer in sophisticated bird dispersal and data logging systems based on bio-acoustic technology. [Scarecrow](#) is well known in the market, and controls the largest database of bird distress calls in the world. These sounds imitate the evolutionary communication used by birds to warn one another, instructing birds to leave areas, because they're in danger.

Scarecrow works with clients to identify which sounds to use at which sites, for which species, and when. Bird controllers can also log their own observations, activity, and actions in real-time through their bespoke data logging software.





BALLISTICS

There are a variety of ballistic “countermeasures” to bird activity, but one of the most common is CAPA cartridges. Bird Controllers fire these cartridges to frighten high-flying birds in an aerodrome using a 4-calibre signal launcher (a flare gun). The four primary components that make up the cartridge are:

1. Primer
2. Ignition propellant composition
3. Delay composition
4. Sound composition

When engaged, the primer ignites the propellant, quietly boosting the entire cartridge to nearly 1,000ft AGL within seven seconds. Then, a small secondary charge detonates the sound composition, creating a 150dB bang.

These cartridges are inherently dangerous and expensive, requiring training, certification, and permission to use.

LASERS

A combination of optics, filtering, and light frequencies creates a laser that deters birds. Due to their visual abilities and instincts, birds perceive a laser beam as a physical object, which they will naturally avoid. It’s safe, silent, and considered impossible for birds to get used to, so they’re unlikely to adapt to fly straight through them.

This is a silent and less disruptive way to deter birds. Laser systems are available as automated systems and portable tools for Bird Controllers to deploy when needed.

But even a low-powered laser can cause temporary or permanent blindness to humans. If the beam blinds a driver or pilot, this could cause a serious incident resulting in loss of life.



INTEGRATING DETECTION & MITIGATION SOLUTIONS

It's more than likely that the best bird detection solution for you is going to be a mix of the above technologies.

But which mix, exactly?

That's going to be dependent on your circumstances. We work with world-class integrators who integrate our radars into modular mitigation systems, so you don't have to. This solves the headache of dealing with multiple vendors and means you don't need to integrate technology and processes together.



ABOUT ROBIN RADAR SYSTEMS

Specialised in radar detection of birds and drones; our bird radar monitoring subscription provides you with actionable data of bird activity on and around your airport, allowing you to take control of your bird hazard issue, with a low-cost monthly fee instead of a large capital expenditure.

With the provided KPIs related to real-time, 24/7 monitoring of bird activity, such as runway crossings and bird presence in and around take-off and landing areas, you can reduce the risk of bird-hazard-related safety incidents.

Long-term monitoring KPIs, like near-misses, bird activity hotspots, and bird activity responses to long-term habitat management measures, provide the actionable information you need to justify which measures should be implemented, and to prove their effectiveness afterwards.

After experiencing the value our radars create for bird hazard management teams, many of our customers have installed additional radars to increase coverage, and some have even used the data they provide to successfully defend against claims of liability for bird strike damage from airlines.

Our radars can also be found on military air bases and wind farms, providing 24/7 bird detection to those most at risk. To detect modern hazards, our drone detection radars can be deployed to reduce disruption and improve security.

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