Nuanced approaches combat the call of the wild

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Author: **Ben Vogel**, London

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Airport operators have multiple tools and methods at their disposal to reduce the risk of bird strikes and wildlife intrusions

Bird strikes and other encounters between aircraft and wildlife are a perennial danger to aviation safety, accounting for about 3.6% of all aviation accidents in 2017 according to International Air Transport Association (IATA) – but airport operators and industry are working together to minimise the risk.

High- and low-technology solutions are available, but wildlife management planners who deal with the problem must consider societal pressure (from environmental groups, for instance) to avoid destruction of natural habitats. Speaking in November 2017 at the International Civil Aviation Organization (ICAO) Seminar on Green Airports in Montréal, ACI World director general Angela Gittens emphasised that good practice in airport environmental management should be developed in many areas, including management of wildlife near and on the airfield. This demands a nuanced approach, and not simply measures to kill birds or other animals.

Stats tell a story

In its most recent annual safety report, published in April 2018, IATA classified the top threats encountered by aircraft in runway safety events. The most important were environmental factors, specifically wind shear and gusty conditions (counted as a threat in 18% of the recorded accidents), but birds, other wildlife, and foreign object debris (FOD) incidents still scored 3%.

The IATA safety report showed that wildlife, bird, and FOD encounters contributed to 5% of all aircraft accidents worldwide, and 6% of non-fatal accidents, from 2013–2017. This category accounted for just 2% of runway or taxiway excursion, but 33% of runway collisions. The problem affected jet and turboprop aircraft equally (5%).

Bird strikes or wildlife hits cause damage to aircraft but they are rarely fatal. However, in September 2012 a Dornier Do-228 flying from Kathmandu to Nepal, with 16 passengers and three crew aboard, was on initial climb from Kathmandu when the crew reported a bird strike and engine failure. The crew attempted to return but the aircraft crashed outside the airport perimeter. All occupants perished and the aircraft was destroyed. The bird was identified as a black eagle.

Statistics presented by IATA in November 2017, at the Global Runway Safety Symposium in Lima, indicated that the number of wildlife-related incidents increased from 2011 until 2015, but the rate has remained stable since 2012. The rate per million flights in 2016 was much lower than in 2014, but there is no cause for complacency. In July 2017, for example, an Antonov An-74 operated by Cavok Air overran the runway at São Tomé and Principe Airport, after an aborted

takeoff due to a flock of birds.

Feathered foes

The risk of aircraft bird strike is greatest at low altitude (takeoff or approach) around airports. Guidelines and regulations are in place in many countries to ensure airport authorities minimise risk (for example, ICAO Annex 14 demands that member states log all bird strike data), but there are no uniform standards. Airport operators must bear in mind that bird hazards vary at an airport, according to the season or time of day, so the same plan cannot apply at all times.

However, matters are complicated by the fact that small and regional airports do not tend to employ a specific wildlife management team, leaving bird control in the hands of general maintenance crews.

Tools at the disposal of airport operators include habitat management (reducing the roosting opportunities for birds in trees and buildings inside the airport perimeter); and locality habitat reviews (ICAO defines a 13 km radius around an airport where birds could affect aircraft safety).

Airport operators require external expertise. UK-based Safeskys, for instance, provides wildlife control, management, and training services to 84 airports worldwide, such as Beijing Capital International in China. Similarly, fellow UK provider Birdcheck conducts bird hazard and bird control unit audits; ecological surveys; advice on the environment; conservation and reduction in bird hazards; and bird control unit formation and training. Birdcheck has worked on bird control and evaluation of dispersal techniques for Sydney Airport in Australia.

London City Airport in the UK installed artificial turf near its runway, to help deter wildlife. (Evergreen Aviation)

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Examples of habitat management include London City in the United Kingdom and Chicago O'Hare in the United States. In December 2017, the former became the first airport in Europe to install artificial turf in the jet blast area of a runway and taxiway, to reduce the risk of wildlife intrusions and bird strikes.

Denmark-based Evergreen Aviation installed its Aviation Grade Artificial Turf (AGAT) on a 400 m ^{2} area around the runway and Taxiway M. The short length of the turf and the absence of flora means that birds and animals are not attracted to the area to hunt for food or seek shelter. The AGAT ground cover is also ready for immediate use after installation with no need for curing or growing time.

At O'Hare, a herd of grazing animals was redeployed in August 2018 to manage natural vegetation on the airfield. The herd – comprising goats, East Friesian cross sheep, and a donkey named Jackson – grazed on 16 acres of land on the west side of the airfield until the area was fully cleared.

Animals provide an environmentally friendly and sustainable method of reducing natural vegetation that attracts birds and wildlife. Following consultations with the US Department of Agriculture, airport officials at O'Hare began using animals to manage vegetation in 2013. To ensure operational safety, all grazing areas are located in areas away from the airfield, or fenced off from it.

UAVs and AI

On-airport wildlife control or dispersal technologies are available. Clear Flight Solutions, for example, blends expertise in unmanned aerial vehicles (UAVs) with ecological management. Its Robirds operate with a patented flapping wing to mimic the movement of birds; they are integrated fully with daily operations at Edmonton International Airport in Canada.

Another UAV-based concept of use was unveiled by UK-based startup OneCo in July 2018 at the Farnborough International Airshow. Its single mobile operations centre can co-ordinate bird deterrence operations, in which tethered UAVs are placed in areas where birds are known to nest. The UAVs are released with an appropriate bird scaring acoustic signal, rising above the nesting areas and causing the birds to leave the airport area.

A team of US researchers say that UAVs with advanced artificial intelligence could keep birds away from flight paths and runways. (Getty Images)

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In the United States, engineers at Caltech have developed an artificial intelligence (AI) algorithm that enables a commercial off-the-shelf quadcopter UAV to herd birds away from airspace around an airport. After testing the algorithm on a flock of birds near a field in South Korea, the team found that a single UAV could keep a flock of dozens of birds away from designated airspace.

To teach a UAV to herd birds autonomously, Caltech researchers studied and adapted a mathematical model to describe how flocks build and maintain formations, how they respond to threats along the edge of the flock, and how they communicate that threat through the flock. Their work improves on algorithms designed for herding sheep, which only needed to work in two dimensions instead of three.

Caltech researchers reverse-engineered the mathematical description of flocking behaviour, to determine how flocks would respond to external threats. This information formed the basis of the new herding algorithm, which produces ideal flight paths for incoming UAVs to move the flock away from a protected airspace without dispersing it.

The UAV requires careful positioning: if it is installed too far away, the flock of birds will not react; and if too close, it would scatter the flock in an uncontrollable fashion. The effectiveness of the algorithm is only limited by the number and size of the incoming birds, and the Caltech team intends to scale the project up for multiple UAVs to deal with more than one flock.

Other technological solutions are based on radar, and can be dual-purposed to detect other small targets such as UAVs. Netherlands-based Robin Radar Systems has developed sensors with

software that can plot individual tracks and distinguish the size of birds, for accurate risk profiling. In 2017, it launched the MAX 3D radar specifically for avian detection. At the time, company officials told *Jane's* that the radar is capable of detecting, tracking, and updating in real time, with an instrumental range of 15 km. Using a phased array with 360˚ rotating radar head, MAX delivers full 3D data on bird activity near an airport, especially around runways. Data is displayed to users in intuitive dashboards.

Recent avian radar installations in 2018 include Istanbul New Airport in Turkey by Accipiter Radar Technologies, which is also under contract to deliver its 3D Total Coverage avian radar system to Vancouver International Airport. The Canadian airport required avian radar technology because of its location amid a migratory bird path.

Accipiter 3D Total Coverage is based on its Radar Intelligence Network platform for scalability and flexibility. Additionally, the Surveillance-to-Intelligence capability from Accipiter delivers live, historical, and analytical data for risk assessment, mitigation, and integration with safety management systems at an airport.