CIVIL AVIATION PUBLICATION

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WILDLIFE HAZARD MANAGEMENT

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AGA 04

WILDLIFE HAZARD MANAGEMENT

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CHAPTER 1

GENERAL

1.1 Introduction

The Bahamas, as a signatory to the Chicago Convention on International Civil Aviation, has adopted all the provisions specified in Annex 14 to the Convention, published by the International Civil Aviation Organisation (ICAO). ICAO publishes standards and recommended practices (SARPs) that address the risk of a wildlife strike and a potential increase of the bird strike risk due to the presence or development of bird-attractant features on, or in the vicinity of, an aerodrome. These SARPs are contained in CAR AGA 1 and CAR AGA 3, as appropriate.

CAR AGA I and 3 states that "the wildlife strike hazard on, or in the vicinity of, an aerodrome shall be assessed through:

(a) the establishment of a national procedure for the recording and reporting of wildlife strikes to aircraft; and

(b) the collection of information from aircraft operators, aerodrome personnel and other sources on the presence of wildlife on or around the aerodrome constituting a potential hazard to aircraft operations; and

(c) an ongoing evaluation of the wildlife hazard by competent personnel

Note: The term wildlife is used throughout this Guidance Material and refers to birds, animals or reptiles.

CAR AGA 1 and 3 also states that "when a wildlife strike hazard is identified at an aerodrome, the appropriate Authority shall take action to decrease the number of birds constituting a potential hazard to aircraft operations by adopting measures for discouraging their presence on, or in the vicinity of, an aerodrome."

They also states that "the appropriate authority shall take action to eliminate or to prevent the establishment of garbage disposal dumps or any such other source attracting bird/wildlife activity on, or in the vicinity of, an aerodrome unless an appropriate aeronautical study indicates that they are unlikely to create conditions conducive to a bird hazard problem."

1.2 Requirements

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

The term "in the vicinity" is taken to be land or water within 13 km of the aerodrome reference point, and "garbage disposal dumps" refers to landfill sites (i.e. the disposal of waste by landfill) An "appropriate aeronautical study" is taken to be a study that focuses on the potential flight safety implications at the relevant aerodrome(s) that an existing or proposed bird attractant development may cause.

Such a study should consist of the overall assessment of the ambient bird strike risk at the aerodrome and a site-specific risk assessment relating to any development or site in the vicinity. An "appropriate authority" is deemed to be an authority that has the power to take action in a particular situation. A further explanation of risk assessment factors is detailed in Chapter 3.

In the Bahamas the Aerodrome Operator shall take all reasonable steps to secure that the aerodrome and the airspace within which its visual traffic pattern is normally contained are safe at all times for use by aircraft. The Aerodrome Operator is therefore responsible for the development and implementation of wildlife strike risk control measures. This document provides guidance on how the risk of a wildlife strike at, or in the vicinity of, an aerodrome may be assessed and what risk reduction measures. Wildlife strike risk management is an integral part of the Aerodrome Operator's Safety Management System (SMS).

The Aerodrome Operator shall take action to decrease the risk to aircraft operations by adopting measures to minimize the likelihood of collisions between wildlife and aircraft, including

(a) publishing procedures on the management of wildlife hazards on and within the vicinity of aerodromes, including the establishment of a wildlife hazard management programme (WHMP), wildlife risk assessment, land-use management and personnel training; and

(b) publishing procedures to follow in the event of conflicting interests between land use and aviation authorities, to ensure that aircraft safety is not compromised.

(c) an ongoing evaluation of the wildlife hazard by competent personnel.

1.2 References

- CAR AGA 1 and 3
- Annex 14 Volume I – Aerodromes (Eighth Edition July 2018)
- ICAO Doc 9137 – Airport Services Manual, Part 3 – Wildlife Control and Reduction (Fourth Edition 2012)
- CAR DEF – Definitions
- CAP GEN 01 – Safety Management Systems

CHAPTER 2

MANAGEMENT OF THE WILDLIFE STRIKE RISK

2.1 Principles and Objectives

As with other forms of aviation risk, the management of the risk of wildlife strike involves specialist knowledge and specific measures. These measures are aimed at deterring birds from flying on and in the lower flight paths in the vicinity of the aerodrome and primarily include the use of risk assessment, aerodrome habitat management, wildlife control procedures and safeguarding. However, the wildlife strike risk is not uniform across all types of aerodromes and flight operations, and therefore it is essential that the most appropriate measures are identified and adopted to suit the local situation. Effective techniques in risk assessment, wildlife control, habitat management and safeguarding exist that can reduce the presence of wildlife on aerodromes and the risk of a wildlife strike.

The basis of all wildlife strike risk management policy and action is the planning and the effective use of human resources, procedures and diligence which reflects the principles of safety management that an Aerodrome Operator is required to apply to aspects of aircraft operations within its responsibility.

The objective of wildlife strike risk management is to implement a wildlife strike risk management policy and those measures necessary to reduce the wildlife strike risk to the lowest practicable level.

2.2 Wildlife Control Management Plan (WCMP)

The Aerodrome Operator should develop a Wildlife Control Management Plan (WCMP) to assess the bird strike risk, and to define and implement the appropriate bird control measures to reduce or mitigate the risk. The plan should also record the results of bird strike risk assessments that are conducted and specify the bird strike risk mitigation measures that are in place. The measures should relate to the threat posed by each identified risk and, due to the relative unpredictability of bird activities, should be responsive to changes as the risk rises or falls. Those measures may include the bird control techniques detailed in this and other authoritative documents.

For Aerodrome Operators, the emphasis should be to minimise the presence of flocks of birds on, or in the vicinity of, the aerodrome as much as possible. However, this may be difficult outside the aerodrome boundary. Nevertheless, an awareness of wildlife /bird attractant activities taking place, such as farmers ploughing fields, and constructive dialogue with the landowner should permit timely and effective action to be carried out.

WCMP for a significant risk prone aerodrome should, include the following:

(a) The roles and responsibilities of aerodrome management and wildlife management personnel;

(b) The policies and procedures for:

- risk identification and assessment;
- on-aerodrome bird control, including when low visibility operations are in place;
- the recording of bird control activities;
- reporting bird control issues;
- bird control performance monitoring, measurement and improvement systems;
- personnel training and appraisal;
- recording and analysis of bird strike reports;
- the logging of bird species and data analysis;
- recording the results of bird strike risk assessments that are conducted;
- obtaining permissions for control measures, as necessary; and
- the periodic assessment and review of the bird strike risk recording and information system, bird control procedures and associated activities.

(c) details of the bird strike risk assessments that are conducted and the bird strike risk mitigation measures that are in place;

(d) the means to ensure that flocks of birds, whether resident or visiting, do not habituate on the aerodrome, achieved through the deployment of effective habitat management and bird dispersal and control measures to reduce bird activity on the aerodrome; and

(e) the activities employed by the Aerodrome Operator to control or influence areas in the vicinity of the aerodrome to minimise the attraction to birds, including the:

(f) establishment of a safeguarding process with the local planning authority for consultation on proposed developments that have the potential to be bird attractant within 13 km of the aerodrome;

(1) means to influence land use and development surrounding the aerodrome so that the bird strike risk does not increase and, wherever possible, is reduced;

(2) means to help encourage landowners to adopt bird control measures and support landowners' efforts to reduce bird strike risks; and

(3) procedures to conduct, and record the results of, site monitoring visits.

The WCMP should be referred to or included in the Aerodrome Manual and made available for audit by the Authority.

CHAPTER 3

ROLES AND RESPONSIBILITIES

3.1 Introduction

The roles and responsibilities of all personnel, including those applicable to Wildlife Management, are important elements of the Aerodrome Operator's Safety Management System and a contribution to the effectiveness of the WCMP. All personnel should have a thorough understanding of their roles within the plan and be able to collaborate actively with other organisations on and off the aerodrome, such as air traffic control and local landowners. The roles and responsibilities of personnel associated with bird control duties undertaken on a typical aerodrome are described in this chapter. The roles and responsibilities may be adjusted to suit an aerodrome's specific bird control circumstances.

3.2 Aerodrome Operator

Although the Aerodrome Operator has overall accountability for wildlife control, responsibility for the implementation of the WCMP at the aerodrome can be delegated and is usually delegated to the Aerodrome Manager or another senior person in the airside operations function. The core responsibilities of such a person, with respect to the WCMP, are to:

(a) assess the wildlife strike risk level

(b) determine policy and produce the WCMP;

(c) provide resources for the implementation of WCMP;

(d) implement the WCMP; and

(e) ensure that the WCMP reference or inclusion in the MOAS is correct.

The Aerodrome Manager role should involve tasks that include the:

(a) monitoring and acting on habitat changes on and in the vicinity of the aerodrome and development of appropriate management and control activities;

(b) implementation of habitat management/long grass policy maintenance programmes in accordance with the WCMP, and to introduce modifications to the maintenance programmes as necessary;

(c) analysis and interpretation of log records of bird control activities, bird strike reports and bird count data;

(d) regular survey of bird concentrations and movements in the local area and liaison with local bird watchers for additional information;

(e) liaison with local landowners on mitigation action;

(f) liaison with local landowners, farmers and gamekeepers to obtain intelligence on farming plans, game conservation, etc.;

(g) monitoring of the effectiveness of any mitigation measures in place;

(h) identification of potential bird strike risks by collating local ornithological and other data;

(i) seeking of advice and assistance from outside specialists on matters requiring expertise not available at the aerodrome; and

(j) production and promulgation of reports on the development of WCMP and on specific topics, safety briefs and bird strike risk warnings as required.

3.3 Bird Control Coordinator

Whilst a senior manager has overall responsibility for wildlife control, a technical specialist, such as a bird control co-ordinator, may undertake day-to-day management and efficient implementation of the WCMP. In more detail, this role will involve key duties such as to:

(a) advise the Aerodrome Manager on all matters relating to wildlife and bird strike prevention, and to assist with the production and development of the WCMP;

(b) plan and organise bird control operations in accordance with the WCMP;

(c) supervise and monitor bird control operations to ensure that WCMP is implemented correctly;

(d) supervise bird control record keeping (log, bird counts, bird strike recording and reporting, bird dispersal, culling and habitat management diaries, etc.);

(e) provide technical supervision of bird control operators, intelligence gathering, and planning;

(f) facilitate the active surveillance, bird dispersal, culling and other field tasks;

(g) ensure that all necessary passes and permits are current;

(h) ensure the supply, safe keeping and correct maintenance of bird control equipment and consumables; and

(i) provide a communications channel between the aerodrome policy makers/ providers, bird control operators and other interested parties, such as airline operators and air traffic control.

3.5 Bird Control Operator

A bird control operator performs the frontline role and may be any suitably trained member of aerodrome staff. This role will involve key duties such as to:

(a) maintain surveillance of bird activity on the aerodrome and beyond, to the limit of visibility;

(b) implement active bird control measures in accordance with the WCMP to counter any detected bird strike risk;

(c) provide the air traffic service, where applicable, with details of a potential bird strike risk;

(d) record bird and bird control activity;

(e) record actual, potential or suspected bird strikes;

(f) advise senior personnel on improvements to the bird control task; and

(g) assist with surveys, etc.

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CHAPTER 4

RISK IDENTIFICATION

4.1 Introduction

This chapter describes those significant factors that should be considered in an assessment of the wildlife strike risk at an aerodrome.

4.2 Assessment of the Wildlife strike Risk

4.2.1 Risk Assessment

In order to manage the risk of a bird strike, the Aerodrome Operator should develop a systematic method of obtaining information regarding potential bird strike risks on and in the vicinity of the aerodrome on a regular basis and:

(a) assess those risks, in the context of aircraft operations;

(b) analyse wildlife strike records to identify how many birds/animals have been struck and which species;

(c) identify and target those birds/animals more likely to cause damage to aircraft, such as flocking and/or larger species; and

(d) develop a structured approach to wildlife control.

Before any risk assessment can be conducted with any degree of accuracy, the level of ambient bird strike risk, which is the level and type of bird activity that would occur in the absence of any monitoring or control measures, should be determined. This level provides a measure against which to assess the effectiveness of the plan.

Details of existing bird locations and bird movements relative to those locations and the aerodrome will need to be ascertained, both to establish an accurate database and to keep the information flow current. A risk assessment should therefore be conducted initially to provide a quantifiable benchmark and repeated thereafter on a periodic basis such that each potential bird strike risk can be assessed in detail.

Each risk can be quantified in the short and long term, dependent upon bird population and habitat seasonal changes;

(a) the potential risks can be assessed on a comparable basis;

(b) the continuing risk can be monitored; and

(c) control actions can be focused in a structured manner.

4.2.2 Risk Assessment Process

A typical risk assessment process may involve:

(a) a detailed hazard description, identifying wildlife species and associated habitats that influence the size and behaviour of bird populations in the area;

(b) an assessment of the probability of a bird strike with a particular species, taking into consideration the current mitigation procedures in place and seasonal factors;

(c) consideration of the species involved including size and numbers (e.g. solitary or in flocks), an assessment of the likely severity of the outcome of a bird strike;

(d) an assessment of the frequency of serious multiple bird strikes;

(e) the determination of the acceptability of the level of risk by summing the probability and severity, based on a probability/severity matrix, such as illustrated in Table 1 below (where the colours red, yellow and green may depict respectively unacceptable, marginal and acceptable risk)

(f) the identification of further risk management options available; and

(g) the development and implementation of an action plan to eliminate, reduce or mitigate unacceptable risks.

Aerodrome Operators should be able to develop a comprehensive and sustainable WCMP risk assessment using the process above. However, further review of bird movements and changes in populations, including the effect of mitigation action, and the environment is necessary to re-assess the residual risk once the WCMP is in place.

Note: Refer to CAP GEN 01 – Safety Management Systems Chapter 2 on risk assessments.

4.3 Bird Attractant Habitats: On-Aerodrome

The differing landscapes on the aerodrome may create a variety of attractants that need to be identified and assessed, to determine the appropriate prevention or control actions required. The following paragraphs may also apply to sites in the vicinity of the aerodrome.

4.3.1 Food

(a) Birds require high-energy foods and many species depend on earthworms, snails, slugs, spiders, millipedes, and insects (especially larvae) present in grassland and the underlying soil. Egret, Heron, Lapwings and Pied crows may occur in large flocks to feed on soil invertebrates on aerodromes. Carnivorous birds such as Kites and Hawks may feed on small mammals, such as rodents.

(b) Very few birds eat grass. Only Geese and some other Wildfowl graze grass and, then, only when it is short and in vigorous growth. Therefore, the grass itself is not a bird attractant but other plants among it can attract large numbers of birds. The leaves, flowers and seeds of weeds, such as clovers, dandelion, chickweeds and vetches are food for pigeons, game birds, Finches and other small birds.

(c) Therefore, consideration should be given to the need to minimise or eliminate such attractants through, for example, the use of herbicides. Parts of an aerodrome are sometimes let for growing crops. Although tall crops are mostly unattractive to birds, they have the potential to cause a variety of problems immediately adjacent to the movement areas. Activities like ploughing, harrowing and cropping which disturb the soil, and also sludge spraying, manure spreading, seed drilling, ripe crops, harvesting, and hay and silage cutting create feeding opportunities for Gulls, Lapwings, Corvids, Starlings and Pigeons. Such activities inevitably attract birds and will increase the resources required for bird control. Having fed, birds such as Gulls and Lapwings will rest in the vicinity for many hours.

(d) Wastes from in-flight and terminal catering areas, litterbins in car parks and viewing terraces, etc. attract Gulls, Feral pigeons, Corvids, Starlings and other Passerines (perching birds).

4.3.2 Open Terrain

Flat, open terrain is an inherent characteristic of an aerodrome, which cannot be modified. Expanses of grassland covering large areas between runways, taxiways and aprons and paved surfaces create bird attractions on aerodromes, as do buildings and other installations such as radar towers. The unobstructed view and open space provide security (plus, for flocking species, mutual protection from many pairs of eyes) and affords a warning of potential danger for large flocks. Open terrain attracts all species except those which avoid danger by living in trees or dense cover. However, maintaining the grass sward at an appropriate height can eliminate the open aspect on the grassed areas. The bird attractant aspects of open terrain are relatively simple and well understood, and effective countermeasures are available. The presence of other, less prominent features such as open drainage ditches, ponds, scrub, bushes and trees, earth banks, and waste food also provide more habitats, for larger numbers of birds and additional species, to exploit. Attention should be paid to grass reinstatement in areas after aerodrome works. Seasonal overflow car parks may provide out-of-season undisturbed refuges for birds.

4.3.3 Landscaping

(a) Landscaping developments include grass, tree and shrub planting and may involve the creation or enhancement of a water feature. Landscaping schemes have the potential to:

(1) creates dense vegetation that may become a roost;

(2) provide an abundant dry and rainy season food supply in the form of fruits and grains; and create standing water or watercourses which attract Gulls and waterfowl.

(b) Generally, in terms of bird attraction, landscaping schemes attract smaller concentrations of birds from a smaller area, have less potential for increasing bird strike risk than developments such as landfills, sewage treatment plants and wetlands, and have much in common with many natural and semi-natural features commonly found around aerodromes. Therefore, the bird attraction and potential bird strike risk of most landscaping developments, except for wetlands and starling roosts, is comparatively local in effect, i.e. usually limited to within about 6.5 km (4 miles) of the aerodrome, or less.

(c) Landscapes commonly include trees and shrubs, which may provide food and shelter for nesting and roosting. Gull, Pied crows and Quelea birds commonly feed on fruits and berries. Finch flocks will only move onto aerodromes where there is a weed seed food source, and native thrushes do not form flocks or visit the open spaces of aerodromes to a significant extent. Thus, in the autumn, masses of berries may attract large flocks to the aerodrome and, once the berries are all eaten, the flocks move onto the aerodrome to hunt earthworms, etc.

4.3.4 Nests and Roosts

(a) Many birds nest in trees and bushes. Rooks nest colonially in traditional rookeries in small woods and lines of mature trees but recently they have expanded into a wider variety of smaller trees and man-made structures, such as aerodrome lighting gantries and electricity distribution pylons. Wood pigeons' nest in dense bushes, hedgerows and woods.

(b) Buildings and structures with access holes and crevices provide nest sites and roosts, especially for feral pigeons and Starlings. Pigeons roost and nest on ledges on the exteriors of buildings and inside them.

(c) Derelict aircraft provide nesting and roosting sites for Starlings, Feral pigeons, Stock doves, Jackdaws and Pied wagtails.

4.3.5 Water

(a) Open standing water and watercourses attract Waterfowl that are nearly all large birds and may also occur in large flocks. Waterfowl resort to water for security and it is usually impossible to evict them with scaring devices. The more open water sites there are on and around an aerodrome, the more complex and frequent will be the movements of Waterfowl between them. There may be more activity at night than during the day.

(b) Wet and waterlogged grass attracts feeding Ducks (especially at night) and nesting Waders, and drainage should be installed or improved, wherever possible. Flooding flushes soil invertebrates to the surface making them very accessible to birds, attracting Ducks, Gulls and Waders.

(c) Larger, permanent waters, such as ponds, balancing reservoirs, etc., attract Ducks, Gulls, Egret and Lapwings.

4.3.6 Bird Attractant Habitats: Off-Aerodrome

Birds can travel long distances relatively quickly; therefore, an environment that does not meet all their requirements can be exchanged for one that does. Birds can establish nesting colonies or overnight roosts at sites remote from disturbance and commute to distant feeding grounds. If feeding sites are widely distributed and numerous (e.g. ploughed fields in autumn), daily dispersion may be diffuse or unpredictable, with the overnight roost the only constant feature. Flying from one site to another may establish bird flight lines that traverse an aerodrome or low-level aircraft arrival or departure routes. The aerodrome itself may be the birds' destination.

A food supply that is concentrated and abundant at only a few sites causes fixed dispersal patterns and more predictable dawn and dusk flight lines. Overnight roosts for birds such as Gulls, Hawks and Lapwings tend to be very stable and fulfil a social function as well as providing shelter and security.

Species that depend on abundant food supplies tend to roost in larger aggregations, and it is thought that the roost assembly provides a mechanism for the transmission of information on the location of food. Awareness and understanding of bird concentrations and movements can improve the efficiency of bird control on the aerodrome. For example, if the dusk return passage of Gulls over the aerodrome to a roost is understood, aerodrome bird control personnel may be able to warn air traffic control at the appropriate time. Similar precautions may be taken for dawn and dusk movements of egrets, or it may also be possible to locate the roost site and disperse the birds to another roosting site. Also, the spring build-up at a local rookery can be predicted and plans made for action to deny breeding success.

The Coast Sandy and muddy shores, especially around estuaries, support very large numbers of Gulls, Waders, and, sometimes, Wildfowl. Generally, coastal aerodromes have larger numbers of birds of more species, whose activity patterns are complicated by tide state and more affected by the weather, than at inland aerodromes.

4.3.7 Sand, Gravel and Clay Pits

(a) Mineral extraction does not itself attract birds. However, the large voids created sometimes fill with water either during working (wet extraction) or, when they are worked out, are allowed to flood and restored as amenity lakes or nature reserves.

(b) Sand, gravel and clay pits can sometimes be filled in with water, or their shape can be modified during or after excavation to break up the expanse of open water. Narrow causeways, piers and islands are usually insufficient and may increase the attractiveness to Gulls by providing inaccessible dry land roosting sites. Increasing the extent of shoreline by creating promontories, bays and islands increases the attraction to other waterfowl. Active scaring around dusk may remove a roost if it were to occur.

4.3.8 Agricultural Attractants

(a) Growing and harvesting crops inevitably attracts birds at some stage. However, the attraction usually arises suddenly and persists for only hours or a few days. The contribution of agricultural activities to the bird strike risk is mainly confined to local farms.

(b) Livestock can also attract birds. Free-range pig farming, for example, is comparable with a landfill in that the attraction continues for as long as the field is in use. Collared doves and feral pigeons occur in large colonies wherever grain is accessible, either as spillage or in store. Grazing cattle, sheep and horses keep grass short and maintain suitable feeding conditions for Gulls, Grassland plovers, Hawks and Egrets. Their droppings are breeding habitats for insects whose adults and larvae are also sought by birds.

4.3.9 Landfills for Food Waste

(a) Waste from household and commercial premises contain a high proportion of waste food which, in a landfill site, supports very large numbers of Gulls. Most waste containing food is disposed of by controlled land filling in which they are compacted into layers around 2 m in depth and covered daily with inert material. This does not limit access by Gulls, which feed as the waste is tipped, spread and compacted.

(b) Gulls congregating at landfills could contribute to the bird strike risk to nearby aerodromes in several ways.

(c) when not feeding, they spend most of the day on open sites within 6 km (4 miles) or more from the landfill and commonly soar up to 450 m (1500 ft) or more in clear weather.

(e) they may commute between the landfill and their roost, which may involve crossing an aerodrome or its approach and departure routes.

(f) Corvids and Starlings also feed on landfills, but their concentrations and flight lines are more local and less pronounced. They usually present no significant contribution to the bird strike risk except where the landfill is very close to the aerodrome.

4.3.10 Sewage Treatment and Disposal

(a) Modern sewage treatment plants, unlike their predecessors, do not attract large numbers of birds because of the lack of open availability of effluent.

(b) If the primary separation of solids from the liquid fraction is in open tanks, Gulls may visit them in relatively modest numbers. Percolating filter beds are breeding grounds for flies, and Black-headed gulls and Starlings may feed on the adult insects.

(c) The effluent from obsolescent or overloaded plants at some estuarine and coastal sites may contain sufficient organic solids to attract large flocks of Gulls to the outfalls. Where discharge is not continuous, but at certain times or tide states, Gulls learn the pattern and congregate at the appropriate times.

4.3.11 Reservoirs, Lakes and Ponds

Populations of birds with specialised aquatic habits are concentrated on and around freshwater bodies that may be relatively widely separated in the landscape. In addition, large water supply reservoirs (over 10 ha, 25 acres), canal feeder reservoirs, and other large lakes may be used as regular overnight roosts by tens of thousands of Gulls.

CHAPTER 5

RISK REDUCTION

5.1 Introduction

This section describes typical bird strike risk reduction and bird control measures that may be employed to reduce the risk of a bird strike.

The aerodrome should be made unattractive for birds by the adoption of all, or a combination of, habitat management and surveillance/dispersal strategies, depending upon the assessed bird strike risk. These measures are normally within the control of the Aerodrome Operator; however, bird concentrations near an aerodrome and within its associated airspace may be much more difficult to manage directly, are not easy to influence or are inaccessible to aerodrome bird control personnel. However, local authorities and landowners may co-operate in helping to reduce the bird strike risk by allowing access and control action or, even, taking action themselves when a bird attractant site has been identified and the risks pointed out.

Therefore, beyond the aerodrome boundary the control of bird species and populations is normally based on safeguarding and other methods that involve dialogue and cooperation with planners, developers and landowners. In particular, priority should be given to establishing contact with local landowners, developing working relationships with them and encouraging them to adopt measures to reduce the attractiveness of the site to birds or to mitigate the risk, especially in the immediate approach and departure areas.

For example, it may be possible to influence the timing of some farming activities to suit aerodrome operations or where seasonal ploughing by local farmers may cause a temporary increase in risk, liaison with the landowner could result in prior warning of the ploughing and allow time to apply the appropriate mitigation.

Aerodrome personnel employed to carry out bird control activities should be familiar with and competent to deploy the methods used.

5.2 Habitat Management

Birds visit places that provide habitats which offer food and/or security for foraging, resting and, sometimes, breeding, depending on the species. Birds will visit for as long as the attractions remain, with fluctuations in numbers and persistence dictated by factors such as migration, weather, breeding success and the effectiveness of the control activities. Not all birds are attracted by the same habitats and in the same circumstances; therefore, habitat management techniques should be aimed at the removal or reduction of these habitats according to the type of birds that are targeted.

If the attractants can be identified and eliminated, or minimised, influxes of birds will be similarly reduced. In addition to reducing the attractiveness of the site, it is also important to avoid creating new habitats. The potential habitat provided by a new development may not be obvious or established immediately.

5.3 Food

The attraction of fruit- and grain-bearing plants may be reduced by:

(a) eliminating the most attractive species

(b) reducing the number, distribution and proportion of the plants;

(c) using varieties which do not produce grains or, for some, male plants only; and

Bins and skips should be of designs that exclude birds (e.g. with drop down or swinging lids) and should be emptied before they overflow. Birds visit places that provide habitats which offer food and/or security for foraging, resting and, sometimes, breeding, depending on the species. Birds will visit for as long as the attractions remain, with fluctuations in numbers and persistence dictated by factors such as migration, weather, breeding success and the effectiveness of the control activities.

Not all birds are attracted by the same habitats and in the same circumstances; therefore, habitat management techniques should be aimed at the removal or reduction of these habitats according to the type of birds that are targeted.

If the attractants can be identified and eliminated, or minimised, influxes of birds will be similarly reduced. In addition to reducing the attractiveness of the site, it is also important to avoid creating new habitats. The potential habitat provided by a new development may not be obvious or established immediately.

5.4 Roost Removal

The complete destruction of any plantation is the only immediate and permanent means of removing a roost. However, the attractiveness of a potential roosting site may be reduced by lower planting density (e.g. to 4 m centres or lower), leaving open 'rides' (open lines of trees and shrubs), and thinning out early to ensure the site remains open. This in some cases is not compatible with a screening function, but staggered planting in rows may help.

Dilapidated buildings should be proofed and repaired to prevent access by roosting and nesting birds. Wherever possible, new buildings should be designed:

(a) to deny access to the interior and roof spaces;

(b) with self-closing doors or with plastic strip curtains or other mechanisms to prevent access by birds;

(c) without flat roofs; and

(d) with minimal roof overhangs and without ledges beneath overhangs and external protrusions.

All areas of rooftops should be easily accessible to enable action against nesting Gulls, which most commonly colonise large flat or shallow-pitched roofs. However, they will also use steeply sloping roofs where the nests can be lodged behind vents, skylights, etc.

Derelict aircraft should be removed or otherwise rendered inaccessible.

Specialist advice should be sought before taking action against lapwing roosts, rookeries, breeding Gulls and any birds inhabiting buildings.

5.5 Water

Watercourses and drainage ditches provide cover and food, especially for ducks and herons. Wherever possible, watercourses on the aerodrome should be culverted underground. Where culverting is not possible, effective bird exclusion or control systems such as netting enclosures extending to the aerodrome perimeter should be deployed as necessary to protect new developments and existing water bodies and watercourses. Channels should be maintained free of bank side and emergent vegetation to minimise flooding and damage to nets.

Netting enclosures are the most efficient approach but are practical only for smaller ponds and watercourses. However, an enclosure also removes the need for any other control measures or habitat modification. A less reliable form of enclosure is to 'cover' the open water with reed beds, or Carr (wetland alder or willow woodland) but there are practical problems with establishing and maintaining the vegetation and there exists the possibility of a Lapwing roost forming.

Drainage of wet and waterlogged grass should be installed, or the site regraded to eliminate hollows that hold standing water.

Appropriate measures should be taken to prevent access to emergency water supply tanks and oil separators on aerodromes.

If large permanent water cannot be eliminated and the water area is sufficiently small, it should be netted over. Wires suspended above the water surface cannot be relied on to exclude birds as most waterfowl can take off and land vertically. A less reliable means of denying bird access to open water is to plant reed beds over the entire area; however, specialist advice should be sought as reeds cannot tolerate major fluctuations in water level and it may be difficult to accommodate seasonal rainfall.

The following habitat controls can also reduce the attractiveness of the water to birds:

(a) the water should be as deep as possible (over 4 m) to minimise bottom growing vegetation;

(b) the shape should be as simple as possible (circular or square), with no islands or promontories, to reduce the length of shoreline and reduce nesting sites, especially for Canada geese;

(c) banks should be as steep as possible (preferably vertical), with minimal vegetation; to prevent birds from walking in and out of the water;

(d) there should be a vertical lip or fence to prevent birds from walking in and out of the water;

(e) on smaller lakes, wires suspended above the surface may deter birds that require long take-off and landing runs. The wires should be made visible with tags, to reduce the risk of birds colliding with them and sustaining injury;

(f) dense vegetation, which provides nesting cover, and short grass, which is grazed by wildfowl, should be avoided. The water should be surrounded with long grass or a sterile substrate; and

(g) the water should not be stocked with fish, and wildfowling is undesirable.

All water features, including those with bird exclusion systems, should wherever possible be sited so that the bird movements they create do not conflict with aircraft, taking into account their locations relative to both aircraft flight paths and other water bodies in the aerodrome vicinity.

5.6 Landfills and Sewage Treatment and Disposal Sites

A netting enclosure is inherently the most effective and reliable system to control birds at a landfill site and at sewage treatment and disposal sites with open tanks, and its operation is easier to monitor. Netting may not, however, be effective against all birds, for example Lapwings, and an active bird control programme should be provided as a back-up. When active bird control is provided, the necessary levels of vigilance and dispersal action need to be sustained to achieve an effective level of deterrence.

5.7 Aerodrome Grass Management

The most effective habitat control measure that can be applied on an aerodrome is the management of the grassed areas. Short grass provides security by enabling smaller birds to see over the wider spaces of the aerodrome for early warning of approaching dangers. It also increases populations of invertebrate animals on which many bird species rely for food. Short grass therefore does not deter most species of aerodrome birds and should be avoided.

Conversely, longer grass (typically above 400 mm) that falls over because it cannot support itself also has the potential to attract birds. Grass maintained at a height of 150 to 200 mm (6" to 8") makes it more difficult for birds to locate prey at or below the surface, spoils the security effect, and reduces populations of soil invertebrate food sources. If maintained at this height, bird numbers on the aerodrome can be reduced significantly, particularly waders, small Gulls, Osprey, Swallows and Lapwings. This method of grass management is often referred to as a long grass policy.

All grass areas within the aerodrome boundary, including the margins adjacent to runways and taxiways should be included in the grass maintenance scheme. As grass grows according to season, so does the presence of certain bird species; therefore, grass maintenance should be planned accordingly to deter the targeted birds when necessary.

Various types of grass maintenance schemes exist, such as the long grass policy and silaging, and each has its own advantages and disadvantages for aviation use.

The licence holder should employ the scheme most appropriate to the aerodrome. The risk assessment should be revisited to identify any additional measures that may be necessary to complement the scheme. For example, a long grass policy should be complemented by dispersal methods to deter other birds that may frequent the aerodrome.

Before a long grass policy is first established, and periodically thereafter, it may be prudent to have soil analyses carried out and any nutrient deficiency made good in spring.

When seeking advice from agronomists, who commonly advise farmers on grass crops and pasture and may be unfamiliar with the unique requirements for aerodrome long grass, the need for sustained strong growth of appropriate grass species, rather than a flush of rapid lush grass, should be stressed. General-purpose fertiliser in slow acting granular form, rather than a high nitrogen formulation, is appropriate. In almost all cases, good stands of long grass can be obtained by allowing the existing sward to grow taller. Re-seeding is rarely necessary.

Long grass regimes are usually effective only when the aerodrome bird control organisation is involved in planning, monitoring and regulating the maintenance programme. Long grass maintenance requires activity throughout the year. Several dates are given in the paragraphs below, but Aerodrome Operators should take account of local climatic conditions when planning their maintenance regime.

In some areas, rabbits may be a particular problem. Large populations of rabbits can make it impossible to grow effective long grass, and the rabbit population may need to be controlled accordingly.

5.8 Optimising a Standard Long Grass Policy Maintenance Regime

The standard long grass policy maintenance regime is devised to maintain aerodrome grass in a way that is less attractive to birds than traditional gang mowing. It is biased towards non-interference with aerodrome operations, rather than bird repellence. However, the best and most cost-effective bird deterrent swards will be achieved where expertise and control is exercised to fine tune maintenance procedures in a manner more sensitive and reactive to local conditions.

Introducing a flexible maintenance regime requires expertise to monitor and react to grass condition over a short time scale, which may require the availability of funds for maintenance operations to be carried out at short notice as the need arises.

5.9 Potential Effect of Grass Height on Navigational and Visual Aids

The height of the grass in certain areas on the aerodrome may affect the performance of aeronautical navigational and visual aids, especially the instrument landing system (ILS).

In damp or wet conditions the radiated signal as received by an aircraft or the signal received by the ILS field monitors may be distorted, affecting both the integrity and continuity of service of the system. The effect of grass on the ILS signal depends on the:

(a) type of grass (broad or narrow leaf);

(b) height of the grass and density of growth;

(c) water content within, or water from dew or rain on, the leaves; and

(d) height and type of aerials (transmitting and monitor).

The ILS glide path is probably affected more than the localiser and 100 mm (4") is considered to be the maximum permissible grass height from the glide path aerial to approximately 5 m beyond the monitors. A grass height of 200 mm (8") could be tolerated beyond this point up to the limit of the glide path critical area; however, for simplicity it may be preferable to limit the grass height to 100 mm across the whole area. For the localiser, a maximum height of 200 mm (8") should be acceptable.

However, sideband reference systems, with reduced height aerials, may need special consideration and 50 mm (2") may be all that can be tolerated in the immediate foreground of those systems with pairs of aperture monitors or with their aerials close to the ground.

The height of the grass should not obstruct the display of an aeronautical ground light, sign or other type of visual aid.

Aerodrome Operators are advised to consult the relevant technical organisation on the issues above.

5.10 Bird Dispersal on an Aerodrome

5.10.1 General

Whilst aerodrome habitat management is an important measure to reduce the bird strike risk, effective control measures should also be included in the bird control management plan. The following paragraphs identify those methods commonly used to control bird populations.

5.10.2 Scaring

Birds appreciate the potential danger of predators and take positive action to avoid them. Other birds or mammals' prey upon most birds; therefore, predators (and, possibly, scarers that mimic predators in some way) have a more sustained aversive effect than other devices. Bird scaring relies on persuading birds of the presence of such danger.

One of the key elements of effective scaring is to avoid habituation. Any scaring system used needs to be effective over large areas and not ignored by the birds after a limited period. Accordingly, the scaring stimulus should be taken to the target birds and used only when it is required.

Several types of bird scaring devices and techniques exist, some of which are examined in the following paragraphs. Birds react strongly to signals from other birds that indicate danger, distress (when captured by a predator) or death, and habituation does not readily occur. Some birds, typically social species that communicate with each other vocally (such as Gulls, Lapwings, Swallows and Pied crows) emit piercing repeated distress calls when captured by a predator. Young birds emit distress calls more readily than adults.

The use of recorded distress calls (bioacoustics) is considered the most efficient and cost-effective method for dispersing birds from aerodromes. However, although a distress call is a warning of potential danger, it is not a scaring device in the conventional sense in that the bird's response is not to depart immediately and quickly. In addition, this method is species-specific and may cause the birds to react defensively rather than disperse.

For instance, on hearing a distress call birds may become alert and take flight; approach the sound source and circle overhead or nearby, often emitting alarm calls; dive threateningly at a predator; or just disperse to a less risky location.

This inconsistent and unpredictable behaviour pattern demonstrates that a distress call should only be used when no aircraft are operating locally. It may take 10 minutes or more for birds to depart the aerodrome and there is no control over direction of dispersal; therefore, distress calls should only be used to deter birds when there is ample time between aircraft movements, or at the start of the day.

Alarm calls are produced by some species when they sight a predator. The function of alarm calls is to alert other birds to potential danger but, beyond that, any further reaction may depend on the actions of the predator. Thus, alarm calls are not normally used to disperse birds from aerodromes.

It is almost always impractical to use dispersal measures to exclude Waterfowl from water. They feel secure on the water and, if threatened, tend to remain there.

When any bird scaring technique or dispersal method is used, the behaviour of the birds in relation to aircraft movements has to be taken into consideration and care must be taken not to increase the risk of a bird strike as a consequence.

5.10.3 Dispersal by Distress Signals

Birds respond best to distress calls of their own species. They also react well to those of closely related species but may ignore others. It is therefore important to identify the target birds before attempting to disperse them. With mixed flocks, it may be necessary to broadcast several species' calls in sequence to disperse all the birds.

Gulls and Corvids typically react very well to recorded distress calls, Lapwings react fairly well (probably because of their ability to defend nests and young with aggressive flight manoeuvres), but Swallows have the weakest reactions and are difficult to disperse by this method.

Flocks react similarly to recorded distress calls played back in the field by taking flight and approaching the source of the call to investigate. However, in this instance, only the audible stimulus is presented; therefore, if the broadcast is continued the birds will probably continue to fly to and from for many minutes. When the broadcast is terminated the likely reaction is to gain height and depart (Gulls and Lapwings), or to resort to trees (Corvids) or water (Gulls) where they are safe.

The inability of birds to locate and identify a predator to assess the continuing threat is probably the most important element in causing them to disperse and seek a place that is less of a threat from predators. Birds have individual variations of temperament in the same way as humans.

Not all are equally sensitive to distress call broadcasts and very small flocks may not respond, possibly because they do not contain the one or two key nervous individuals that cause the remainder to follow suit.

Distress calls are commonly recorded on magnetic media or in digital software form. The recording should be clear, with no distortion or significant background noise.

If the birds cannot hear the calls properly, they cannot be expected to react appropriately. For each species, the sequence of distress calls should last for at least 10 seconds before repeating, with gaps no greater than 2 seconds in the sequence.

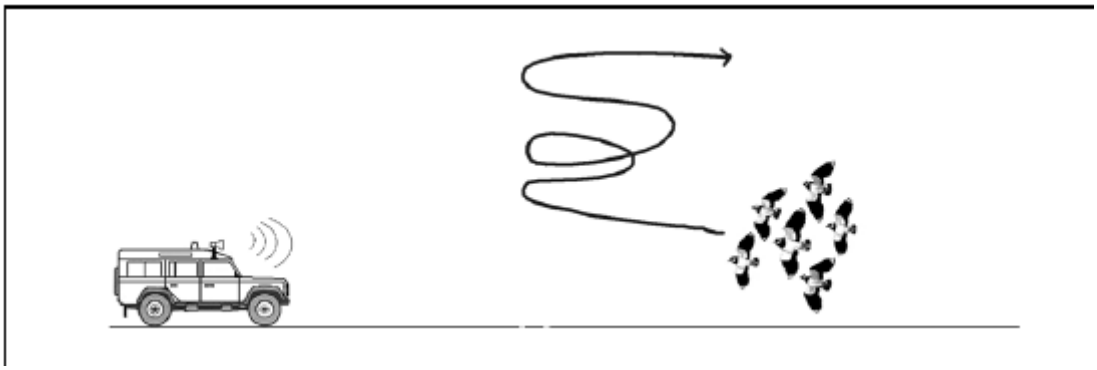
The distress call would typically be broadcast from a vehicle, using horn loudspeakers that have a directional beam. The loudspeakers should be mounted, facing forwards, at the front of the vehicle roof to minimise the chances of ground undulations masking the calls. The loudspeakers should be angled slightly downwards (around 2°) so that the centre of the cone of sound is aimed at birds on the ground about 100 m ahead, and to ensure that rainwater drains from the horn. Multiple loudspeakers should be set as far apart as possible or angled outwards slightly (about 15°). The amplifier should have sufficient power (typically 15-20 Watts) to cover the bird control area.

The vehicle should be positioned at about 100 m from the target flock. A closer approach may disturb the birds before the broadcast commences; and at longer ranges the calls may not be heard properly, especially if there is background noise from aircraft. The vehicle should be upwind and stationary, to allow the birds to approach and investigate the calls. Driving at speed along the runway with distress calls playing gives no opportunity for the 'approach and investigate' behaviour as by the time birds have taken flight, the stimulus has gone and they re-alight. In this way, the birds have frequent opportunities to hear distress calls (briefly) and habituation will develop as they learn that there are no harmful consequences.

The target birds should be identified and the appropriate distress call recording selected. If several species are present, the recordings of the most numerous species should be played first. The birds should become airborne within 20 seconds of hearing the distress calls and approach the speaker. Briefly waving a cloth gives an additional visual stimulus and usually causes the birds to take flight immediately. The cloth should be displayed very briefly: birds have keen eyesight and they will not be fooled for long. Ideally the cloth should be white for Gulls and black for Corvids, which resembles a struggling victim.

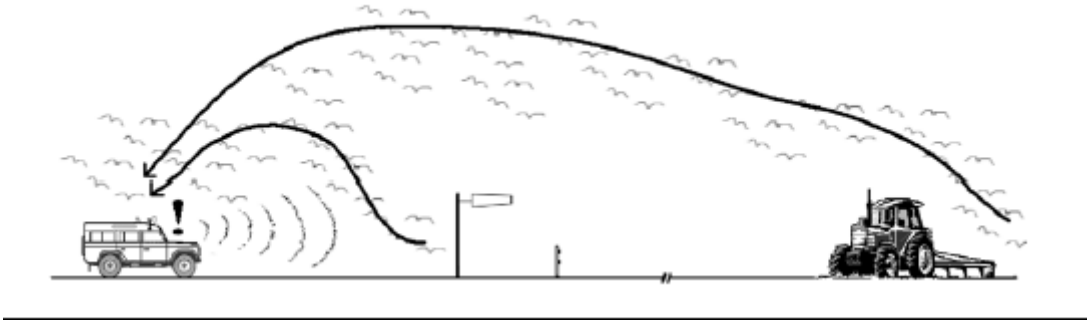
Once airborne, the flock will need sufficient time to approach and investigate the source of the calls before the broadcast is terminated. A broadcast should be of about 90 seconds duration. Species that do not have distress calls will sometimes follow the lead of those that do.

Lapwings often take flight and fly around in wide circles at some distance, without approaching, in which case it may be necessary to edge forward and turn the vehicle to keep the flock in the sound beam. In summer, Lapwing flocks may be mostly or entirely composed of juveniles and react poorly to distress calls.



Starlings commonly fly directly away, and it may be necessary to follow them slowly to prevent them from re-alighting. Local birds, especially Corvids, after repeated exposure to distress calls, may eventually omit the approach phase of the response and depart immediately on hearing the calls or, even, at the approach of the familiar vehicle. It may be necessary to follow to ensure that they depart the aerodrome.

High volume settings may attract birds onto the aerodrome, making the situation worse. It is good practice to start the broadcast at a low volume and increase it until the target birds start to respond.



5.10.4 Dispersal by a Pyrotechnic Bird Scaring Cartridge (BSC)

Use of a BSC is a common means of dispersing birds at aerodromes. Also commonly known as a 'shell cracker' or 'cracker shell', a BSC is, in its most typical form, a 12 bore shotgun cartridge case with the shot replaced by a projectile containing an explosive charge and delay fuse/light trace, so that the projectile detonates at some distance from the gun. The response is usually an immediate departure away from the detonation so some directional control is possible over birds in flight, and the scaring effect can be projected into areas beyond the firer's reach.

Several types of BSC are available. Generally, for use on an aerodrome, the BSC should:

(a) have a range greater than 80 m when fired at a 45° elevation (i.e. a flight time of 4 to 5 seconds before detonation) to allow firing from outside the runway strip and to provide a reasonably effective area;

(b) detonate between maximum and ½ maximum height when fired at a 45° elevation;

(c) produce a loud, sharp 'crack', with a bright flash; and

(d) not be a potential fire risk.

A trace may enhance the effect of the BSC, especially when used to move a flock in a desired direction, and illustrates the projectile's trajectory, especially when it is deflected by the wind. The trace should be visible in sunlight throughout its flight. The BSC is the only device commonly available to the bird controller that, within the limits imposed by its range, is more rapidly mobile than the birds.

Thus, it enables the direction of movement of target flocks to be controlled. By positioning themselves and aiming the pistol appropriately, a bird controller can place the detonations behind the birds to hasten their departure, and to either side to keep them on track and to hold the flock together. A BSC fired high in the path of an approaching flock will cause it to pause and orbit, even if it cannot be deflected altogether. However, birds will avoid a significant headwind (for Gulls and Lapwings this may be as little as 5 kts) and, no matter how far they are pursued or how many BSCs are placed behind and to either side of them, they will eventually turn back. Directional control of the birds is aided if the BSC has a bright "tracer" component and adequate range.

In many circumstances, it may not be permissible to fire a BSC beyond the aerodrome perimeter but, by firing vertically, its effect can be extended outwards over a considerable distance, including locations such as in the approach path.

It is generally much easier to persuade one large flock to leave the aerodrome than several smaller ones. Firing directly into a flock will probably fragment it and the birds may not re-group. This should therefore be avoided, unless the birds have ignored previous dispersal attempts and it is intended to increase the stress level, i.e. to achieve an effect similar to shooting. A very close detonation may be useful to disperse birds that re-group quickly, such as flocks of starlings.

If birds linger in flight over the aerodrome after a distress broadcast is terminated, BSCs may be used to hasten departure. However, a bird's behaviour on hearing distress calls is quite different from that of fleeing from a BSC; therefore, a BSC should not be fired during a distress call broadcast. BSC operators should be competent in their use, comply with relevant firearm and munitions legislation and be provided with appropriate personal protection equipment (PPE).

5.10.5 Manual Dispersal Techniques

Most birds are very distrustful of man, especially those that are commonly shot as pests (e.g. Corvids and Pigeons) and traditional quarry species (many Wildfowl and Waders). Indeed, the almost total absence of man on foot (and, therefore, recognisable to birds) may be a major factor in making an aerodrome so attractive to birds, despite the noise and risk levels. Birds that do not react to being passed over by the wings of a taxiing aircraft or, even, the bird control vehicle drawing to a halt nearby, will normally immediately become alarmed when a person alights. Even if they do not react by flying up en masse, they will commonly depart, perhaps in small groups, over the course of several minutes, if the person remains visible. Man is a very effective birdscarer, especially in combination with other dispersal techniques, and human-operated bird scaring devices are more effective than 'free-standing' methods.

Birds may recognise Raptors that hunt them by features of their wing beats. A particularly effective scaring technique that a person may adopt is slowly raising and lowering the outstretched arms, which may be interpreted by the target birds as the wing beats of a large raptor. The person should be silhouetted against the sky, or a plain background, and facing the target birds. The extended arms should be slowly (about 26-30 beats/min - one beat per two seconds) raised and lowered through a relatively small angle about the horizontal. Flapping the arms rapidly, with exaggerated bending at the elbow and wrist, does not work. Almost all species will react immediately by flying up and directly away. Birds to one side will not react, though birds behind may do so.

Arm scares may not cause birds to move very far, but departure is predictably directly away from the person. They are effective against all common species, can be used at short notice, where noise or pyrotechnics are unacceptable because of proximity to people or livestock, or because of fire risk, and have no cost.

5.10.6 Falconer's Lure

A falconer's lure is a stuffed leather body, usually with a bird's wings and a morsel of food attached, which is whirled round on a cord to attract the attention of a falcon that the falconer wishes to retrieve. Falcons have been used on some aerodromes to disperse birds and it was noticed that the lure itself could disperse flocks of birds. At first, it was assumed that, by association, birds had learned to recognise the lure as a signal that a Falcon attack could be expected.

However, it is apparent that use of the lure also has a strong aversive effect on many species where Falcons had never been operated.

Although whirling the lure is very effective, throwing it high into the air so that it falls to the ground with wings fluttering, almost invariably causes target flocks to fly up and directly away, at ranges of several hundred metres. The birds react as if the lure represented a bird 'in trouble'. They may even approach to investigate, as with distress calls, if the representation is sufficiently realistic and, as with rag fluttering, the lure also appears to enhance responses to distress call broadcasts.

5.11 Repellents and Passive Deterrents

Repellents and passive bird deterrents rely on aversive stimuli that act through the senses of touch, smell and taste. Tactile repellents effective against birds include; sticky gels and filaments, used against roosting and nesting birds on ledges and beams on buildings, and lines strung over restricted sites, such as marshy areas. All injurious and lethal substances are now unacceptable and illegal. Birds have limited chemical senses and generally can only detect aversive agents when taken into the mouth on food.

Birds on aerodromes mostly feed on soil invertebrates or on vegetation. However, invertebrates are generally inaccessible for treatment with a repellent and the areas of vegetation to be treated with chemicals are very large and repeated application would be needed. Moreover, unless research with new non-toxic repellents provides a future viable option, cost and environmental aspects would normally rule out such measures.

5.12 Other Methods and Techniques

Other techniques include the use of Birds of prey, animals (dogs), unfamiliar objects and startling actions (such as brightly coloured windmills and gas cannons) and scarers that mimic predators such as radio-controlled hovercraft and model aircraft, imitation hawks and foxes, scarecrows, and kites and balloons.

A number of other measures have been used with varying degrees of success, including:

(a) flags made from fertiliser bags;

(b) brightly painted oil drums;

(c) windmills and rotating spinners, sometimes accompanied by painted representations of beating wings, or gongs;

(d) plastic tape that vibrates and hums in the wind;

(e) reflective balls;

(f) magnetic field generators;

(g) "ultraviolet" bird scarers; and

(h) weighted bird balls on water.

Bird scaring techniques using visible lasers are being developed. Although claims are made of their effectiveness, the use of lasers on an aerodrome is subject to requirements specified in ICAO Annex 14 Volume 1. Aerodrome Operators considering the use of lasers for bird control purposes should consult the CAA-B prior to their operational use.

All the above scarers should be evaluated for their effectiveness and used accordingly. Some may cease to be effective after a short time because of habituation.

5.13 Lethal Methods

There are several reasons for resorting to lethal control methods:

(a) to reduce overall numbers and thus to decrease the problem;

(b) for the deterrent effect it has on the surviving birds and to enhance the effect of other control techniques; and

(c) to remove individual birds which do not depart in response to scaring action, either because of sickness or disability, or because of aberrant behaviour.

If there is no other satisfactory course of action for preserving air safety, shooting birds is an effective means of control.

During the breeding season, local birds are vulnerable and accessible to lethal control methods because they must return regularly to nest sites, and it is normally only necessary to kill one member of a pair. Thus, the population may be reduced, and production of replacements prevented. However, the shooting of the most populous birds, such as Gulls, Lapwings and Starlings, with the intention of reducing numbers, is not usually effective, even on a temporary basis. Harassment is usually sufficient to prevent Lapwing colonies from becoming established. However, for some species, established breeders can only be removed by shooting. Removing eggs is less effective because Lapwings and some other waders will nest again. However, it may be possible to reduce numbers by taking action to prevent eggs hatching, by either pricking or oiling the eggs.

The aim of this is to make the adult birds believe that the eggs will hatch and thus they will remain with the nest. When it is time for the eggs to hatch it is usually too late in the breeding cycle for the adult pair to produce new eggs.

Most shooting is carried out on an aerodrome as a last resort against intractable flocks to deal with an immediate problem, but shooting can also be integrated into a control strategy to reinforce scaring action. If scaring is followed by an actual stressful event such as shooting, birds learn to avoid the scarer more strongly. The effect may be sustained even if shooting is only occasionally added because the birds may simply react to the scaring signal alone and depart quickly.

Non-lethal control methods are limited and only partially successful on Pigeons and it may be prudent to reinforce them with live shooting on aerodromes where Pigeons are numerous. Wood pigeons, especially, are commonly shot in fields to protect crops and, thus, are particularly responsive to shooting. However, this is only a partial and short-term substitute for control of the birds' food supply.

Successful trapping may require special skills and experience and the law may limit some actions; therefore, specialist advice should be sought before traps are introduced onto an aerodrome.

All wild birds and their nests and eggs are protected under Law. Arrangements for the issuing of Licenses to take or kill certain species of birds will vary between. Personnel should therefore be aware and take account of any legislation that may be in force to protect birds and they should ensure that all activities associated with bird control are legal.

5.14 Safeguarding

Safeguarding is the means by which an Aerodrome Operator assesses the impact that a proposed or existing development may have on the safety of flight operations on, or in the vicinity of, the aerodrome. The Aerodrome Operator may be made aware of proposed developments and other planning applications. Although safeguarding primarily addresses the potential infringement of flight safety surfaces, the potential for the proposed development to become a bird attractant site and increase the bird strike risk may also be addressed.

As outlined in Chapter 4, virtually all land types and land uses (including natural habitats) attract birds in some way. Safeguarding should address developments that, individually or as part of a cumulative process, could become bird-attractants with the potential to increase the bird strike risk at a nearby aerodrome.

Planning decisions in the Bahamas are the responsibility of local or central government, or appointed bodies. Aviation interests, and hence the CAA-B and the Aerodrome Operator, have no specific power to override a planning decision. However, the Aerodrome Operator may offer advice to the planning authority such that aviation safety or their commercial interests may be taken into consideration.

A safeguarding consultation process should be part of the planning process to address proposed developments with the potential to affect the safety of aircraft operations at certain civil and aerodromes.

All aerodromes should establish their own safeguarding consultation procedures with their local planning authorities.

The following factors should be taken into consideration when assessing the potential increase in risk:

(a) the numbers, including seasonal variations, and types of birds that may be attracted to the development;

(b) any proposed landscaping or habitat designs;

(c) the distance from the aerodrome;

(d) the location of the development relative to aircraft arrival and departure flight paths and within the visual circuit; and

(e) bird movements in relation to the aerodrome; for example, waterfowl move primarily between wetlands and along watercourses. Creating new bodies of water may cause more waterfowl movements and the increase of bird strike risk.

Ideally, informal discussions on a potential bird attractant development should take place between applicants and aerodrome safe guarders before the submission of a planning application. This may make it easier to achieve a mutually acceptable outcome with regard to bird strike risk management.

Where an assessment shows that the bird strike risk may increase or could increase under certain conditions in the future, and the licence holder and developer are unable to agree a solution, an Aerodrome Operator could object to the planning application on safety grounds. Aerodrome Operators may use local knowledge of bird populations and activities or an appropriate precedent of a similar safeguarding case to support the objection.

The Aerodrome Operator may request that the objection cannot be withdrawn until measures to ensure there will be no increase in risk are implemented. It may be possible to modify a development (e.g. exclusion of food wastes from a new landfill) or impose planning conditions that require specific action to exclude birds or reduce their numbers (e.g. an effective WCMP). Where a safeguarding case is resolved through the imposition of planning conditions, it may be appropriate for the conditions (and a WCMP) to be subject to a legal agreement between the planning authority and the developer or property owner, or its successors.

The WCMP should identify the aerodrome personnel holding responsibility for the assessment of a proposed development with the potential to attract birds.

After planning permission has been granted, the Aerodrome Operator should monitor the development for compliance with any planning conditions that are imposed and report any alleged breach or non-compliance to the appropriate authority.

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CHAPTER 6

REPORTING

6.1 INTRODUCTION

6.1.1 General

In the Bahamas most species of birds are protected by Law like "White Crown Pigeons, Laughing Gulls, Smooth Billed Ani or (black bird), Kill Deer, the raptors family of Common Night Hawks, Kestrels, Ospreys, the Great Heron, Egrets, and Night Herons, nevertheless these species were all at some time or some were involved in aircraft incidents within the Bahamas. To date none of these birds have been responsible for an aircraft accident or caused major damaged to any aircraft on record.

It is assumed that the bird strike rate has steadily increased over the past two decades; however, strike reporting is not consistent across all stakeholders (pilots, air carriers, airport operators, air traffic control personnel, etc.)

Operators are encouraged to maintain a well-established wildlife programme which will give priority to improving strike reporting. Aerodromes which fall under one of the three **Tier** Programs outlined in the **Stantec Report** (June 2016) such as certification, licensed or approved are part of the CAA-B programme within the country of 58 aerodromes; 28 are government owned which is about 48%.

The known strike reports to CAA-B comes from the Lynden Pindling International Airport (LPIA) which is a certified airport, whose reporting rates average about 0.4%, which is less than the required rate of 51%; to development a Wildlife Strike Data Base. (WSDB)

Wildlife activity is about four times higher on average as compared to what is known. The pattern of disparity in strike reporting rates for commercial air carriers into the country is minimal. However, the CAA-B believes the current proposed voluntary reporting programme to be established will increase the rate or reporting adequately to track national trends in wildlife strikes; to determine the hazard level of wildlife species that are being struck. This will provide a scientific foundation for CAA-B policies and guidance to draft effective mitigation and risk assessment analyst within the Bahamas.

The CAA-B is initiating several programs to address this important safety issue, including the collection, analysis, and dissemination of wildlife strike data. The effectiveness of a Wildlife Hazard Management Plan (WHMP) by Aerodrome Operators is to reduce wildlife hazards both on and near an aerodrome. The re-evaluation of all facets of damaging or non-damaging strikes from year to year requires accurate and consistent reporting.

6.1.2 Memorandum of Understanding (MOU) – Other Agencies

The Bahamas National Trust, government agencies and other cooperation's are partners in the national committee addressing the outstanding and pending issues relating to wildlife management; with a view to establishing any needed Memorandum of understanding (MOU) in support of aviation related concerns.

Golf courses within the vicinity of the aerodromes and any open space were standing water can attract birds and MOU will have to be established to manage these areas.

6.2 REPORTING

6.2.1 Wildlife Types for Reporting Purposes.

(a) All birds.

(b) All bats.

(c) All terrestrial mammals larger than 1 kg (2.2 lbs.) (e.g., raccoons, domestic dogs and cats, feral dogs and cats, livestock, snakes, frogs also rats and mice which attract owls, etc.). If in doubt, report the incident with a note in the comment section, and the Database Manager will determine whether to include the report into the WSC based on body mass.

(d) Reptiles larger than 1 kg (2.2 lbs)

6.2.2 When to Report a Wildlife Strike or Near Miss

A wildlife strike has occurred when:

(a) A strike between wildlife and an aircraft has been witnessed.

(b) Evidence or damage from a strike has been identified to an aircraft.

(c) Bird or other wildlife remains, whether in whole or in part, are found,

(d) Bird/wildlife incidents should be defined in 3 categories:

(1) Confirmed strikes

(2) Unconfirmed strikes

(3) Serious incidents

Near miss: is an occurrence when a bird/animal crosses the path of an aircraft on approach or landing.

Incursion: a bird/animal enters the manoeuvring area and is spotted by pilot or control tower on the runway before take-off or on landing and either tower or pilot initiates ago around or delays take-off.

It is recommended that any signs of dead birds or animal within 250 feet of a runway centreline or within 1,000 feet of a runway end, unless another reason for the animal's death is identified or suspected.

On a taxiway, apron or anywhere else on or off the airport that one has reason to believe was the result of a strike with an aircraft. Examples might be:

(a) A bird found in pieces from a prop strike on a taxiway or apron.

(b) A carcass retrieved within 1 mile of an airport on the final approach or departure path after someone reported the bird falling out of the sky or a probable wildlife strike.

6.2.3 How to report a Wildlife strike

The CAA-B strongly encourages Pilots, Air Operator Certificate (AOC) holders, Airport Operators, Aircraft Maintenance Personnel, Air Traffic Control personnel, Mechanics, or anyone else who has knowledge of a strike to report it to the Wildlife Strike Coordinator (WSC). The CAA-B makes available an online reporting system at the Wildlife Hazard website (WHW) web site (https://www.CAA-Bbahamas.com/wildlife), or via number 242-397-4700

Other sources of reporting can be done via Bahamas National Trust (BNT) website http://www.bnt.bs/home anyone reporting a strike can also print the CAA-B's Bird/Mammal Wildlife Strike Report Form (Form WL 0001-1) or download it from the web site to report strikes. Paper copies of Form WL 000-1 may also be obtained from the appropriate Airports District Offices (ADO), Flight Standards Inspectorate Offices (FSI), Air Accident Investigation Department (AAID) and Aeronautical Information Service (AIS) or from the Aeronautical Information Publication Manual (AIPM). Paper forms are pre-addressed to the CAA-B. Postage is needed if the form is mailed in or out of the Bahamas:

c/o Civil Aviation Authority Bahamas,
P.O. Box N-975,
Nassau
Bahamas.

It is important to include as much information as possible on the Wildlife Strike Reduction form.

Note: This form is also to be used to report strikes that do not have bird remains associated with them, (instructions with addresses for sending remains to the Bahamas National Trust Lab, by the aerodrome operators is on the Wildlife/Animal Strike Report Form 0001-1. Instructions for collecting and submitting Bird/Wildlife remains for Identification are listed above). ***Please do not send bird remains to the CAA-B.***

6.2.4 The National Procedure for recording wildlife strikes and data analysis

This procedure is applicable for all operators handling aircraft up to 25,000kg or greater as is stated in CAR AGA 1, 2 and 3. It requires the Aerodrome Operators or personnel responsible to collect wildlife data pertaining to wildlife hazards to have data available for analysis. The CAA-B has a Wildlife Coordinator to collect and analysis this data. To determine mitigating factors that may be employed to help assist the operator in reducing wildlife strikes and report to ICAO.

6.2.5 Procedures for Reporting and Sighting of Birds

(a) The operator is responsible for recording the sighting of bird activity within the aerodrome which must be logged, along with their species, the location, numbers and activity.

(b) The logging of birds must be identified by the aerodrome personnel responsible for wildlife or the airport manager for smaller aerodromes.

(c) All log reports (electronic) must be sent to the CAA-B every quarter for data analysis.

(d) Bird strikes which are more comprehensive shall include a strike report and must be filled either by the Pilot-in-Command or the Air Traffic Controller or the Aerodrome Operator.

(e) Sighting of birds in and around the aerodrome must also be reported, it's the responsibility of the Aerodrome Operator to report sightings or make available sighting forms for the aviation public to report such sightings.

(f) The form is self-explanatory and can be obtain from the aerodrome operators' website, office or by facsimile or their social media site. Additionally, the Civil Aviation Authority Bahamas has promulgated this document on its website

6.3 OCCURRENCE REPORTING

6.3.1 Incident Strike Reporting

(a) Once a wildlife strike strikes occurs and which does not preventing the continuation of flight, it's the responsibility of the Pilot-In-Command to report the incident to Air Traffic Control giving all relevant information.

(b) Air Traffic Control must call the Aerodrome Operator out to the runway to remove any debris or remains left from the strike if found.

(c) Air Traffic Control is responsible for collecting the information from the pilot and completing a wildlife strike form.

(d) The completed strike form copy, must be sent to the Aerodrome Operator

(e) The Aerodrome Operator must collect the form and carry out and investigation as necessary.

(f) The Aerodrome Operator is responsible for sending the completed form and the completed investigation report to the CAA-B for filing and analysis.

(g) The CAA-B will produce quarterly data analysis base on this data and report such findings to the industry.

6.3.2 Accident Reporting

(a) If the wildlife strike is catastrophic or major in that a runway is closed, a formal investigation is required.

(b) The aircraft is to remain at the accident location or the resting position of the wreckage.

(c) Only the Aircraft Accident Investigation Authority (AAIA) can authorize the removal of the aircraft.

(d) The Airport Operator must activate the Emergency Operation Centre (EOC) and contact Aircraft Accident Investigation Authority then Civil Aviation Authority Bahamas.

(e) The AAIA will have jurisdiction over the investigation and security and police activity will only be to safe guard property.

(f) All of the protocols for a major accident or incident must follow the Airport Emergency Plan activating all necessary government agencies.

(g) After which, a completed form must be sent by the pilot-in-command or Air Traffic Control to the Aerodrome Operator and the Aerodrome Operator must then contact the Wildlife Coordinator advising him/her of the incident and to expect a complete review of the occurrence and the completed forms.

(h) The incident or accident must be logged by the operator if made aware by at the time of the occurrence.

(i) Once this occurs the operator must carry out a formal investigation and gather the details of any damage to the aircraft, the location of the strike, witnesses and if possible, determine what could be the attractant or reason the bird/s were in the vicinity.

(j) Once the Aerodrome Operator has contacted the Wildlife Coordinator and notify the AAIA by way of phone call or sending in the completed strike form.

(k) The CAA-B coordinator will ensure all strike reports consistent of error-free data before entering a single, consolidated report into the database. This information is supplemented with non- duplicated strike report forms or other sources.

(l) Strike occurrence quarterly reports will also be sent to the Bahamas National Trust for species recording.

Every quarter, the CAA-B will post an updated version of the database on the web site. The CAA-B will send a current version of the database to the International Civil Aviation Organisation (ICAO) for incorporation into ICAO database. The CAA-B will also prepare and make available reports summarizing wildlife strike results

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