



Advisory Circular

CAA-AC-AGA608
July 2022

WILDLIFE CONTROL AND REDUCTION

INTRODUCTION

The Civil Aviation (Aerodromes) Regulations specify requirements for control of wildlife hazard and wildlife hazard reduction at aerodromes. This Manual provides guidance on measures to be taken to discourage the presence on, or in the vicinity of an aerodrome of wildlife that may constitute a hazard to aircraft operations. The Manual is intended to assist aerodrome operators in ensuring that adequate measures are taken to ensure compliances with the provisions of the regulations.

Wildlife and especially bird strikes have been a potential hazard to aircraft since the beginning of air travel. In the early days bird strikes were a minor risk as there were few aircraft in the sky travelling at relatively low speeds. Damage to aircraft was, therefore, limited to shattered windshields, dented leading edges, and some damage to the fuselage. The cost of repairs was small and aircraft operators and aerodrome authorities accepted bird strikes as a normal hazard of flying.

In time, the speed of aircraft increased and engine noise levels dropped with the development of newer generation turbine engines. Aircraft became too quick and too quiet for birds to sense and avoid and birds therefore inadvertently became a serious threat to aircraft safety as strikes became more frequent and more serious.

Damage to aircraft inflicted by a wildlife strike can cause aborted take-offs and precautionary landings and can result in a crash. The costs of down-time for inspection and repair of aircraft following damage caused by wildlife, in terms of damage, aborted flights, rescheduling of aircraft passengers and cargo, transfer of passengers to alternative means of transport, etc can often be very significant and damaging to airline operations. On the other hand, wildlife strikes may result in injury and/death to passengers and crew.

An analysis of wildlife strikes contained in ICAO Bird Strike Information System (IBIS) reveals that:

- a) 69 per cent of the strikes occur during daylight hours; while 15 per cent occur during night time with the remainder occurring at dawn and dusk;

- b) 65 percent of the strikes involve aircraft of over 27 000 kg mass;
- c) 29 percent of the strikes occur during approach while a further 25 per cent occur during the take-off run phase;
- d) 51 percent of strikes occur below 100 ft; and
- e) in 92 percent of the strikes the pilots were not warned of bird activity.

The analysis of wildlife strike data can reveal trends which will help aerodrome authorities recognize areas of concern which should be addressed through a well-managed wildlife control programme. The wildlife strike statistics can also be analyzed to determine those times of the year or day when wildlife control is needed most.

1.0 LEGISLATIVE REQUIREMENTS

The Civil Aviation (Aerodromes) Regulations specify as follows:

- a) An aerodrome operator shall, in consultation with the authority responsible for wildlife, take necessary action to control wildlife hazards at the aerodrome.
- b) An aerodrome operator shall ensure that procedures to deal with the danger posed to aircraft operations by the presence of wildlife in the aerodrome flight pattern or movement area are in place.
- c) An aerodrome operator shall provide for the conduct of an ecological study, acceptable to the Authority, when any of the following events occur on or near the aerodrome-
 - i. an air carrier aircraft experiences a multiple bird strike or engine ingestion.
 - ii. an air carrier aircraft experiences a damaging collision with wildlife other than birds.
 - iii. wildlife of a size or in numbers capable of causing an event described in this regulation, is observed to have access to any aerodrome flight pattern or movement area.
- d) The ecological study required shall contain at least the following:
 - i. analysis of the event which prompted the study;
 - ii. identification of the species, numbers, locations, local movements, and daily and seasonal occurrences of wildlife observed.
 - iii. identification and location of features on and near the aerodrome that attract wildlife.
 - iv. description of the wildlife hazard to air carrier operations.
- e) The ecological study required shall be submitted to the Authority, who shall determine whether or not there is a need for a wildlife hazard management plan.
- g) When the Authority determines that a wildlife hazard management plan is needed, the Aerodrome operator shall formulate and implement a plan using the ecological study as a basis.
- h) The plan shall include at least the following:
 - i. the persons who have authority and responsibility for implementing the plan;
 - ii. priorities for needed habitat modification and changes in land use identified in the ecological study, with target dates for completion;

- iii. identification of resources to be provided by the operator for implementation of the plan;
- iv. procedures to be followed during air carrier operations, including at least-
 - assignment of personnel responsibilities for implementing the procedures;
 - conduct of physical inspections of the movement area and other areas critical to wildlife hazard management sufficiently in advance of air carrier operations to allow time for wildlife controls to be effective;
 - wildlife control measures; and
 - communication between the wildlife control personnel and any air traffic control tower in operation at the airport.
- v. periodic evaluation and review of the wildlife hazard management plan for:
 - effectiveness in dealing with the wildlife hazard; and
 - indications that the existence of the wildlife hazard, as previously described in the ecological study, shall be re-evaluated; and
- vi. a training program to provide Aerodrome personnel with the knowledge and skills needed to carry out the wildlife hazard management plan.

- i) Notwithstanding the other requirements of this regulation, each aerodrome operator shall take immediate measures to alleviate wildlife hazards whenever they are detected.
- j) Unless otherwise authorized by the Authority, whenever the requirements of this regulation cannot be met to the extent that uncorrected unsafe conditions exist on the airport, the operator shall limit air carrier operations to those portions of the airport not rendered unsafe by those conditions.
- k) The aerodrome operator shall notify the Authority of any condition which do not meet the standards prescribed in this regulation immediately.
- l) The wildlife management plan of an aerodrome shall be approved by the Authority and shall form part of the aerodrome manual.
- m) An aerodrome operator shall, in consultation with the authority responsible for wildlife, take all reasonable steps to minimize the risks associated with wildlife strike hazards by establishing a wildlife hazard management programme
- n) An operator shall take practical measures to control the wildlife habitat at or around the aerodrome and to disperse birds, which are a potential hazard to aircraft operations.
- o) The aerodrome operator shall collect and forward wildlife strike reports to the Authority for submission to ICAO for inclusion in the ICAO Bird Strike Information System (IBIS) database.
- p) An 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.
- q) An aerodrome operator shall take action to eliminate or to prevent the establishment of refuse collection sites, garbage disposal dumps, including landfills, or any other source which may attract wildlife to the aerodrome, or its vicinity, unless an appropriate wildlife assessment indicates that they are unlikely to create conditions conducive to a wildlife hazard problem.
- r) Where the elimination of existing sites is not possible, the operator and the relevant

authorities shall ensure that any risk to aircraft posed by these sites is assessed and reduced to as low as reasonably practicable.

- s) An aerodrome operator shall establish a local wildlife hazard management committee to manage wildlife hazard at the aerodrome.
- t) An aerodrome operator shall establish aerodrome wildlife control unit, adequately equipped to control and manage wildlife hazard at the aerodrome.
- u) The operator shall cause records of all aspects of wildlife hazard control to be kept and shall report all wildlife strikes to the Authority.
- v) An operator shall monitor the local environment including any activities that may attract wildlife and in designing the wildlife hazard management programme, shall consider that environment and the activities that may attract wildlife.
- w) An aerodrome operator shall give due consideration to aviation safety concerns related to land developments in the vicinity of the aerodrome that may attract wildlife.
- x) An aerodrome operator shall ensure that all staff involved in wildlife control are trained, competent and equipped for detection and dispersal tasks.
- y) A person shall not bring, permit or graze an animal in the restricted area of an aerodrome or cause any animal to graze or feed in the restricted area of an aerodrome. In this regulation, “animal” means a domesticated animal and a bird

2.0 GENERAL

A good organizational structure can provide for effective wildlife control and reduction through implementation of wildlife management policies. Effective wildlife control policies and programmes should be administered by the aerodrome operator.

2.1 The Role of the Aerodrome Operator

- a) The aerodrome operator should develop policies and procedures for control of wildlife hazard at its aerodromes including development and implementation of training programmes for its operational staff. Along with policy direction, the aerodrome operator should set up the national wildlife hazard management committee as described in Section 5 of this Manual and ensure local wildlife hazard management committees are established at the aerodrome level.
- b) Although all wildlife on the aerodrome and in its vicinity are a threat to aircraft safety, it is difficult to remove all wildlife from aerodromes. The wildlife population can however be reduced by biological and biotechnical provisions, especially by habitat management on the aerodrome and in its vicinity. The development of such environmental programmes should be set at a national level, with visits to aerodromes included in the responsibilities of headquarters to ensure that aerodromes and their vicinities are maintained in accordance with the various national policies.
- c) The headquarters should coordinate as necessary with the aerodromes management to ensure

that weaknesses in a wildlife control programme are noted and improved upon. Maintaining contact between the responsible government department and the committees at the aerodromes is important for fostering co-operation in the implementation of a local management plan.

- d) Long term activities such as building modifications, drainage and changes to vegetation within the aerodrome should be planned and budgeted for as part of the planning process. Recommendations for the development and implementation of wildlife control activities should form part of the planning process.
- e) The headquarters should direct adequate resources to aerodrome where they are needed and where the effectiveness of wildlife control activities can be measured.

2.2 Role of the Aerodrome Manager

- a) Because of the importance of wildlife control, each aerodrome manager has the responsibility to take any action deemed necessary to implement wildlife control policies and minimize the wildlife strike rate at the aerodrome. This includes the development and implementation of an aerodrome wildlife control programme.
- b) Each aerodrome will implement a program tailored to conditions on the site, with assistance from headquarters and other outside agencies. The aerodrome manager should appoint an aerodrome wildlife coordinator, wildlife hazard control officer and a wildlife control committee (wildlife hazard control co-ordinating committee) which will develop and implement the specific programme.

2.3 Role of the Wildlife Co-ordinator and the Aerodrome Wildlife Control Committee

- a) The wildlife control committee will include those offices involved in wildlife control or aerodrome planning and other aerodrome operators or organisations. This may include aerodrome maintenance, air traffic services, rescue and fire fighting services, security, duty managers, marketing, planning, finance, etc. The committee must review strike reports and daily activity records to determine effective control measures.
- b) The aerodrome wildlife co-ordinator should establish the responsibilities of the various offices involved. The officer's responsibilities must permit the time required to co-ordinate and be involved in wildlife control and reporting. The wildlife hazard co-ordinator at the site must review strike reports, daily activity records and maintenance reports to determine the requirement for short or long term control programmes. Proper cost-effective control measures need proper reporting.

2.4 Reporting of wildlife strikes

- a) A good wildlife control programme depends upon good reporting and is the basis of any

wildlife control programme. Data may come from wildlife sightings, maintenance problems, strikes, and wildlife control activities. Reporting must also involve pilots and aircraft operators as well as those at the site. Review of this data identifies problems at the site and may indicate the effectiveness of current wildlife controls. The report of near-misses is important as it indicates the presence of wildlife in the area of operating aircraft and can also represent a situation as serious as an actual strike. The concern should not be whether a strike occurred, but rather that wildlife are near operating aircraft.

- b) Determination of the reporting procedure should be co-ordinated by one office so that there is proper review and this procedure should be familiar to all aerodrome personnel. All reports should be directed to the wildlife control co-ordinator who should forward them to the Headquarters.
- c) Good reporting at the site reduces the aerodrome's liability in the event of an aircraft accident resulting from a significant wildlife strike. Proper reporting indicates that a wildlife control programme is in place and that aerodrome management takes action to reduce the number of wildlife strikes at the aerodrome.
- d) Although reporting of wildlife strikes is done at the national level, effective results are also achieved through an international programme. An international programme permits comparison of strike rates in different areas and also provides for information on a strike incurred by an aircraft operator operating in a foreign State to be returned to that State. For this purpose, ICAO has organized the ICAO Wildlife Strike Information System (IBIS). This system consists of the report forms, computer storage of strike reports and analysis of strike data.
- e) To implement a reporting system an office in the administration should be charged with the responsibility of distributing strike report forms, collecting completed forms and forwarding them to the CAA. It should be noted that the addresses to which the form is to be returned, as well as the address to which wildlife remains should be sent, need to be shown in the form. Wildlife strikes to aircraft should be reported using prescribed forms to:

Director Safety, Security and Economic Regulation
Uganda Civil Aviation Authority
P. O. Box 5536
Tel: +256312352141
Email: aviation@caa.co.ug

3.0 ORGANIZATION AND STAFFING OF AN AERODROME WILDLIFE CONTROL PROGRAMME

3.1 Organization

- a) An integrated approach is necessary for a successful wildlife control programme. The aerodrome ground staff who operate the programme (at most aerodromes) should ensure that all parties involved in aerodrome use are informed of operations. The concern for wildlife control should be made aware to those in air traffic control (ATC), aerodrome maintenance, planning, finance, marketing, as well as aircraft operators.
- b) Often ATC personnel will be responsible for requesting that ground staff clear certain areas of the aerodrome of wildlife. ATC must be kept up to date on the control initiatives in place. All field personnel must be aware of the control programme and the techniques in use. These people should be in contact with ATC so that if there is a problem on the field, they can tell ATC about it and take appropriate action.
- c) Those responsible for project planning and budgeting at the aerodrome must realize the importance and seriousness of the wildlife strike hazard. Planned projects must be carefully reviewed to ensure that they are not attractive to wildlife during and after construction. The determination of crop types as well as the practice of grassland use by mowing or cutting is important for projects involving agricultural leases of aerodrome lands. Crops and land uses attractive to wildlife should not be approved.
- d) Financial personnel and project planners may find problems in assessing costs and finding funds for specific projects. This can cause delays in the implementation of important wildlife control recommendations. Balancing of expenditures with the need for improved aerodrome facilities is therefore necessary. It is important that planning personnel be informed regularly of the requirements for projects required to reduce the attractiveness of the aerodrome to wildlife.
- e) Aircraft operators should be informed of aerodrome policy and operations regarding wildlife control. Aircraft operators may be able to offer their expertise and advise aerodrome personnel on control matters. Pilots should use landing lights on take-off and approach as this may help to lower the risk of a wildlife strike. The aircraft operators should stress the importance of notifying ATC of all wildlife strikes or near-misses and should additionally report all wildlife strikes through the established wildlife strike reporting programme.
- f) Field and ATC personnel must communicate to ensure proper control. Planning and financial personnel at aerodromes should ensure that planned projects do not attract wildlife and compound the problem. The allocation of monies for wildlife control should be a regular operating cost and procedure. Finally, aircraft operators using the aerodrome facilities

should be aware of control procedures and should agree to assist.

3.2 Staffing

- a) The first consideration in a wildlife control programme should be to implement environmental modifications to make the aerodrome unattractive to wildlife. Over time it will be most effective to apply a combination of environment management programmes and special scaring techniques.
- b) At some aerodromes, wildlife may pose a problem only for a short period of time due to migration or a temporary attraction at the aerodrome. Agricultural activity, weather or food may attract large numbers of wildlife that have to be scared off the aerodrome until the attraction is removed or goes away. This is usually for a short period of time ranging from a few hours to a few weeks or a month. On the other hand, at the larger, busier aerodromes, wildlife scaring goes on every day, all year to ensure that large numbers of wildlife are not present on the aerodrome.
- c) Wildlife scaring is usually conducted by aerodrome staff. Staff from aerodrome maintenance, rescue and firefighting personnel, or security will undertake the task as required. As the amount of time required increases, it becomes more difficult to allocate these human resources from within aerodrome personnel. When it is not possible to allot the required resources, the contracting out of aerodrome wildlife control becomes a cost effective alternative.
- d) The contracts should include the provision of personnel and equipment to be used for the control of wildlife. It should also specify that personnel have specific knowledge of aerodrome wildlife problems and control measures.
- e) When setting up a contract, it is necessary to ensure that the contract addresses the following:
 - i. hours of operation;
 - ii. species to be controlled;
 - iii. level of service;
 - iv. equipment to be provided by the contractor;
 - v. accountability of contractor's staff;
 - vi. deviation from the contract;
 - vii. tendering process deficiencies; and
 - viii. documentation of deficiencies.
- f) The effectiveness of the use of a contractor to control wildlife can be seen in the reduction of the number of wildlife constituting a potential hazard to aircraft operations at an aerodrome.

4.0 ESTABLISHMENT AND FUNCTIONS OF THE COMMITTEE ON WILDLIFE HAZARD MANAGEMENT

4.1 Establishment of the Committee

The Aerodrome operator shall set up the national committee on wildlife strikes in accordance with guidelines prescribed in this Manual. The national committee will be established to serve as a focal point to deal with analysis of the wildlife problem, aerodrome inspections, aerodrome and operator interface and research and development. The composition of the national committee should include all agencies associated or interested in the problem. It should be noted that the national committee may have very little authority in decision-making and therefore will act as an information source and exchange for those in the aviation industry.

4.2 Composition of the Committee

Ideally, the Committee shall include representatives from the Departments/Ministries of Transport, Local Government and Defence, aviation regulatory authority, major aircraft operators, major aerodromes operators, pilots' associations and the agency responsible for wildlife management. Departments of Environment and Agriculture may be advisors of the Committee from time to time. The Committee may incorporate other members as may be appropriate for the performance of its mandate.

4.3 Functions of the Committee

In setting up the committee, the first aim should be to deal with the more obvious hazardous conditions which prevail at each aerodrome taking into account the local climatological situation, the density of air traffic, type of aircraft normally using the aerodrome and an analysis of wildlife strikes made over a period of time. This may be done on the basis of current knowledge. Fundamental ecological studies and research will have to be carried out with committee members helping directly with a project. Since wildlife strikes present a persistent problem, studies must continually take place to reduce the hazard. This research may involve the review of current practices or new initiatives for incorporation into the aerodrome wildlife control programmes.

4.4 Mandate of the Committee

Activities of the committee may vary depending on the resources available. However, despite the available resources, the committee's mandate should be clearly defined to enable the development and implementation of the national wildlife control policy. Once the mandate is devised, the committee should meet at regular intervals, quarterly or semi-annually to keep apprised of new developments or serious issues and review the need for updating policy.

5.0 ROLE OF AIRCRAFT OPERATORS

- a) Different aircraft can be more at risk to wildlife strikes. As aircraft fly faster and more quietly, wildlife strikes become more of a problem. New generation aircraft with high bypass engines seem more susceptible to damage.
- b) It is the responsibility of the aircraft operators to participate in the national wildlife control programmes since it is the aircraft and the travelling public that the aerodrome authorities are protecting. Through operation of a wildlife control programmes, aerodrome authorities are assisting in making air travel safer.
- c) The majority of wildlife strikes reported are strikes to an airline-operated aircraft and, these airline strikes account for 90 per cent of all wildlife strikes. Aerodromes however should not overlook the effect that wildlife strikes may have on the general aviation community as well since at some aerodromes these represent the majority of the aircraft movements.
- d) In some cases, it is believed that an absence of wildlife strike reports is not due to strikes not occurring but is because fixed base aircraft operators, and the general aviation community, are failing to report them. Efforts to increase the involvement of the aircraft operators in wildlife strike reporting programmes will help increase reported strikes.

6.0 CLASSIFICATION OF WILDLIFE AS A POTENTIAL HAZARD

- a) It is difficult to establish whether a species of wildlife is a hazard to aircraft. The way to do this is to count the number of a certain species which is present and prevalent. The number of wildlife which pass over the aerodrome during migration is also a factor as well as wildlife populations and their movements in the area of the aerodrome itself and in its vicinity. Wildlife species inhabiting the open landscape are a greater hazard to aircraft than species living mostly in woodland areas.
- b) Any wildlife, including the smallest, has the potential to cause major damage to an aircraft. The larger the wildlife, the greater the damage expected from a single strike. There is also a greater likelihood of a strike if there is a great number of wildlife of the same species. Birds that fly at high altitudes are still a threat since their point of arrival or departure may be near the aerodrome site. Therefore, wildlife which represent a great threat to aircraft are large wildlife and flocking wildlife, while large, flocking wildlife species are the greatest threat.
- c) Aerodrome personnel and committee members must examine wildlife strike records to determine the risk posed by different species of wildlife. While it is impossible to drive all wildlife away from an aerodrome at all times, every reasonable effort to do so is crucial. The

collection of all available statistics for the aerodrome is important, including wildlife strike reports, type of aircraft, and number of aircraft movements. By analysing this data, the most hazardous wildlife species can be determined.

- d) In a large portion of wildlife strike reports, there is no mention of the species. This is often because no remains are found for identification. If a strike has occurred, the pilot can usually give some idea of the size of the wildlife involved be it small (sparrow), medium (gull), or large (goose). This information can assist in identifying the hazard. Identification of wildlife by an ornithologist is possible from even quite small specimens of feather. Universities and museums can usually assist in the identification of wildlife from the remains. It is therefore important for pilots, aerodrome ground staff, aircraft maintenance staff, etc. to ensure that any remains, including feathers, are collected for identification.

7.0 MANAGEMENT OF THE ENVIRONMENT

7.1 General

7.1.1 Wildlife occur on aerodrome property for various reasons; however, they are usually attracted by such essentials to life as food, water and shelter, often to be found on or in the vicinity of an aerodrome.

7.1.2 Modifications to the aerodrome environment can remove or limit the attractiveness of an aerodrome to wildlife, thus eliminating a large part of the hazard. Environment management is integral to wildlife control as it offers effective, long-term measures for reducing the numbers of wildlife that will come to an aerodrome. If direct action against wildlife is necessary it is usually because environment management has not yet been fully implemented or further measures are not cost effective.

7.1.3 Before undertaking an actual programme of environment management, it is important to first carry out an ecological survey of the area so that the plan can deal with specific trouble areas. These areas will be directly related to the problem wildlife species at the site. Good reporting programmes can provide the basis for an ecological survey. From this, prioritization of activities or projects within the plan may be done. There are many wildlife attractants that an environment management plan may control.

7.2 Removal of food sources

7.2.1 It is difficult to remove all food sources for wildlife on aerodromes. As grass is the common vegetation on an aerodrome, grassland management has an important influence on food available to wildlife. Activities like mowing or hay making attract wildlife due to exposure the surface of soil animals that act as food to other wildlife.

7.2.2 Wildlife may enter aerodrome lands in order to feed on mice, moles, earthworms, insects and spiders as well as on berries, seeds or agricultural crops. These sources of food are very attractive to a variety of wildlife. Chemicals may be used on aerodrome lands to reduce the foods available to wildlife.

7.2.3 Aerodrome land that is not used for aerodrome operations is often leased for agricultural production. This is done to generate revenue and minimize maintenance. However, because most agricultural crops, at some stage of their growth cycle, will attract wildlife, there is a need to understand which crops attract which wildlife species, when, and to what extent. Cultivation of aerodrome lands will however attract wildlife no matter what type of crop is cultivated.

7.2.4 Chemical spraying should, as far as is allowed by the national laws, be carried out at suitable intervals keeping in mind the type of grassland, plant species, animals, hydrological situation, ground water and environmental conditions.

7.3 Refuse dumps

7.3.1 The Civil Aviation (Aerodromes) Regulations specify requirements for establishment of refuse dumps in the vicinity of aerodromes. Whether or not a refuse dump attracts wildlife that are a potential threat to aircraft depends on the location of the dump in relation to the aerodrome, the type of refuse, and the types of wildlife expected in the vicinity. It is a requirement to provide wildlife control at any refuse dump site that is likely to affect operation of aircraft at an aerodrome to reduce its attractiveness to wildlife. Dumps which take only refuse such as building waste, with nothing to attract wildlife, may not be a hazard.

7.3.2 The civil aviation regulations establish firm requirements prohibiting the establishment of new dumps close to aerodromes and provide for the closure of existing ones if deemed necessary. The regulations provide that dump sites including landfills be established no closer than 13 km from the aerodrome property. The proper siting of dumps can reduce any hazard they might create near aerodromes. The opening of a dump even under strict control in the immediate vicinity of an aerodrome can create a hazard and therefore its location should be carefully analysed by a group of specialists on wildlife problems.

7.3.3 Very few methods are available for preventing wildlife from feeding at refuse dumps. Scaring techniques are of only limited value, and it is impossible to bury refuse sufficiently rapidly to prevent wildlife gaining access to some of it. The only method likely to be acceptable is to cover the tipping area by wires or a wildlife-proof net.

7.4 Managing water sources

7.4.1 Surface water is attractive to wildlife, and on aerodrome property it should appear as little as possible. Pits or depressions filled with water should be drained and clogged waterways should be cleared. By covering necessary water bodies, such as lagoons, with wires or netting, wildlife are inhibited from landing.

7.4.2 Drainage ditches clog up with vegetation or eroded soil and the flow of water is impeded. Insect and aquatic life flourishes in clogged ditches. Clearing the ditches at regular intervals is important. They should be graded so that the water will run off as rapidly as possible and help keep them clear. Grass and other vegetation should be cut on the sloping banks. Bank slopes of drainage ditches should permit mowing with conventional equipment to reduce cover. Where practicable, the situation can be improved by replacing ditches with buried drain pipes.

7.4.3 In the vicinity of aerodromes, artificial and natural lakes increase the wildlife strike hazard depending on the size and the shape of the lake, its trophological state and the surroundings. In every case an ornithologist/biologist should evaluate the ecological conditions of the whole vicinity as well as migration in the area, possibly by special radarornithological studies. The wildlife strike hazard can be reduced if the lake is made smaller and the shores steeper, and if fishing, hunting and water sports are forbidden. Filling a lake with soil or covering the surface with wires and nets are two of the better solutions to the problem.

7.5 Managing wildlife shelters and vegetation

7.5.1 Wildlife often seek shelter on aerodrome property, usually in hangars and in nooks of other buildings. Wildlife also use open spaces on aerodrome property for safety; this gives wildlife a clear view of their surroundings in all directions. Nesting will also occur on aerodrome buildings and on shrubby or forested areas or on the ground.

Trees provide food, protection, and nesting sites for wildlife and serve as look-out perches for predatory wildlife. Trees should be cut back to at least 150 m from the runway or taxiway centre line. The prevalent species of tree or type of forest determine what kinds of wildlife will be attracted to an area. Woodland areas, for instance, attract few wildlife of the open landscape. Planting trees, shrubs and hedgerows may, therefore, reduce the wildlife strike hazard. It is important, however, to choose plant species that do not provide seeds or berries that attract wildlife or that provide ample shelter, roosting and nesting sites. It may be necessary to check with an expert for the ones best suited to the task. In every case the ecology of the area must be taken into account.

7.5.2 Some form of grass is commonly used as ground cover at most aerodromes and there has been discussion regarding the height at which the grass should be cut. The height will vary depending upon which type of wildlife is a problem. Most wildlife dangerous to aircraft prefer short grass; there is only a small percentage of wildlife species which prefer long grass, e.g. partridges, pheasants and some small wildlife with low weights.

7.5.3 It is recommended that grass be maintained at a height of 20 cm or more. Gull-type wildlife often rest on short grass where they can see danger approaching; they also forage for food in short grass. By allowing grass to grow to a height of 20 cm or more, wildlife do not have good visibility and feeding is hindered. The only difference between the long and short grass technique is the way

it is cut.

7.5.4 It is possible to use special seed mixtures when planting new grassland areas .Such mixtures can limit the grass length to medium heights and the frequency of mowing can be reduced.

7.5.5 The application of organic and inorganic fertilizers as well as compost materials should be reduced to the minimum so as to decelerate the growth of the grass and reduce the frequency of mowing required.

8.0 WILDLIFE DISPERSAL METHODS

8.1 General

8.1.1 After environmental modifications of the site are complete, the dispersal of wildlife from the aerodrome may still be necessary. There are various dispersal methods which can be used with varying levels of success. Depending upon the situation at a particular aerodrome, many methods may have to be used. In most cases it is effective to use a combination of more than one method and by varying the approach used and the combination of scare techniques, effectiveness can be increased. Continual harassment has been found to greatly reduce the wildlife population at aerodromes.

8.1.2 Once a method has been chosen, it is necessary to note the response of the wildlife to the method. Scare tactics can include pyrotechnic devices, gas cannons, light and sound, chemicals, trapping and falconry.

8.2 Use of Auditory Deterrents

8.2.1 Auditory deterrents include:

- a) gas cannons;
- b) pyrotechnics;
- c) distress calls;
- d) alarm calls; and
- e) calls of predators.

8.2.2 The above auditory deterrents include both natural and man-made sounds used to disperse wildlife. Natural sounds that may be useful in dispersing wildlife include calls given by wildlife when they are alarmed or in distress, and calls of predators. Man-made sounds may include gunfire sounds produced by gas cannons or shell crackers, and abstract sounds produced electronically. It is

important to develop well devised strategies before using scaring devices to avoid having panic stricken wildlife fly into aircraft during landing or take-off operations.

8.2.3 Although auditory deterrents are extensively used to disperse wildlife from aerodromes, and can be effective, habituation is a problem. Habituation is the reduction of responsiveness to loud noises that occurs when wildlife learn that there is no danger. Wildlife are less likely to habituate to natural sounds that have meaning to them, such as calls of a flock mate in distress or calls of a predator, however, habituation will occur even to these sounds. To reduce this problem, the change in location of the sound source must be frequent, and the killing of wildlife must occur to convince the others that the sound really is dangerous. Auditory deterrents are more effective against occasional visitors or transient wildlife than against resident wildlife.

8.3 Use of Visual Deterrents

The effectiveness of visual deterrents has been assessed primarily in terms of reduction of damage to crops; however, the techniques may also work in an aerodrome environment. Habituation is a problem with visual deterrents as well as with the auditory deterrents.

Transient wildlife are more likely to be scared by visual deterrents since the chance to habituate to these tactics does not arise. The problem remains with resident wildlife that are attracted to the aerodrome by its permanent features. A combination of visual and auditory deterrents (usually exploders) sometimes has increased effectiveness.

8.4 Building of Barriers

8.4.1 Aerodromes provide the necessities of life - food, water, and shelter - for many wildlife species. If a species cannot gain access to these necessities, they will be less likely to be a problem on aerodrome property. Use of physical barriers to prevent access can be a permanent solution to a wildlife problem.

8.4.2 Physical barriers that are useful against wildlife include several devices that prevent wildlife from roosting or nesting in or on buildings and ledges. Netting, for example, can prevent wildlife from nesting on buildings and may also prevent wildlife from feeding on crops on aerodrome agricultural leases. Barrier systems work by deterring wildlife from landing rather than physically excluding them. This system consists of a grid of fine wires stretched above the surface of the feature, such as a ledge or a food or water source that is attracting wildlife. Buildings and other structures designed to preclude the existence of convenient nesting or roosting places for wildlife, or using plastic or metal surface materials that prevent nesting are other examples of the use of barrier methods.

8.5 Use of Lethal Chemicals

8.5.1 Chemicals to kill wildlife fall into three categories;

- a) acute toxicants which kill shortly after ingestion of a single lethal dose,

- b) anticoagulants and decalcifiers which usually require ingestion of several doses over a period of days, and
- c) fumigants which suffocate burrowing animals and can also kill wildlife in confined areas.

8.5.2 The most common methods to poison wildlife include;

- a) poison perches; and
- b) bait stations.

8.6 Use of Repellent Chemicals

Chemicals may also be used to repel wildlife at some aerodromes. It is however necessary to establish if the use of these repellents are forbidden by law. Most often, chemicals are used to foul an area that a species of wildlife finds most attractive. By spraying the area with certain chemicals, wildlife will stay away; however, certain chemicals may only be successful on certain wildlife species. Once again, it is important to ensure that the use of any chemical repellents be safe to the environment and to non-target species, and not pollute runoff or nearby watersheds. There are two types of repellent chemicals, i.e. tactile and behavioural.

8.6.1 Tactile Repellents

There are several kinds of chemical repellents that may be useful in wildlife control on aerodromes. The most common type for wildlife are tactile repellents which are sticky substances that deter wildlife from roosting on ledges and other flat surfaces. Although application of the repellent is fairly labour intensive, the treatment is effective for up to one year.

The most common commercial tactile repellents are:

- a) Tacky- Toes Wildlife Repellent Paste;
- b) Wildlife Tangle foot; and
- c) Shoo Wildlife Repellent Paste.

8.6.2 Behavioural Repellents

These repellents can cause visible symptoms of stress in wildlife. Unaffected members of the flock are frightened by the behaviour of the affected individuals and disperse. The chemical must be placed in bait and eaten by the wildlife. Vitriol is the most common behavioural repellent.

8.7 Use of Third-Party Chemicals

These chemicals eliminate wildlife attractants on aerodrome property. It may include any pesticide

to control insects or mammals that wildlife eat, or any growth-inhibiting herbicide for grass or defoliant to control weeds, seeds, or berries that wildlife enjoy. Third-party chemicals should be used carefully and applied by trained personnel to ensure minimal environmental disruption. In some States these chemicals are forbidden by law.

8.8 Use of Traps

8.8.1 Traps can kill or capture wildlife alive for transport to a release area off the aerodrome. Since live-trapping is time consuming and costly, it is commonly used for protected species or for species with a high public profile. Live trapping of wildlife that are not protected can readily be undertaken by aerodrome personnel. In some States all wildlife species are protected by law and therefore trapping is allowed only on the basis of special regulations.

8.8.2 Trapping many species of wildlife requires knowledge of the animals' habits and skill in placement of traps and use of baits. In many cases the knowledge and skill required are fairly easy for aerodrome staff to develop.

8.8.3 Traps that may be used for wildlife include:

- a) live traps; and
- b) raptor traps.

8.9 Miscellaneous Techniques

There are other wildlife control techniques.

- a) Benomy and /or Kainite can control the earthworm population on aerodrome lands, especially along runways and taxiways. Ornitrol can reduce the fertility of wildlife and ultimately reduce the population. Methiocarb is a chemical applied on vegetation to deter wildlife from feeding, however high concentrations are necessary. In some States these chemicals are forbidden by law.
- b) Falconry is in use in some States. This involves the use of predatory wildlife such as falcons, hawks, or owls to drive wildlife away. The technique is considered highly expensive due to the planning, strategy, etc. required. In some States falconry is rejected as a wildlife control technique, usually because falcons and other raptors are threatened by extinction and it is not possible to breed them efficiently in captivity.
- c) Research in the area of dispersal of wildlife from an aerodrome should continue, to ensure that the most up-to date dispersal and detection techniques are used. As present techniques become inadequate, new technologies should be available as suitable replacements. Policy makers should realize the importance of on-going research in this field and should allot funds accordingly.

9.0 INCOMPATIBLE LAND USE AROUND AERODROMES

9.1 The concept of compatible land use planning focus on the environmental relationship between aerodromes and their community neighbours. This planning concept requires careful study and co-ordinated planning of land uses around an aerodrome. Implementation of compatible land use programmes may take the form of aviation system plans, legislation for compatible land uses, easements or land zoning.

9.2 Land use around the aerodrome can influence wildlife strikes to aircraft. Wildlife can be attracted to areas near the aerodrome and in turn go to the aerodrome for food, water, resting or shelter. Some wildlife may also be struck outside aerodrome property, over a land use that attracts them. 21 per cent of wildlife strikes reported to the ICAO IBIS system occurred "off aerodrome". An "on aerodrome" wildlife strike is that which occurs between 0 to 60 m (0 to 200 ft) (inclusive) on landing and 0 to 150 m (0 to 500 ft) (inclusive) on take-off.

9.3 Land uses which have caused specific problems at aerodromes are:

- a) fish processing;
- b) agriculture;
- c) cattle feed lots;
- d) garbage dumps and landfill sites;
- e) factory roofs and parking lots,
- f) theatres and food outlets;
- g) wildlife refuges;
- h) artificial and natural lakes;
- i) golf-, polo-courses, etc.;
- j) animal farms; and
- k) slaughter-houses.

9.4 In applying the guidelines on incompatible land use, one must consider the location of a proposed land use in relation to the aerodrome. The location of attractive land use beyond the recommended distance could still create flyways over the aerodrome or through flight paths at the aerodrome. In some cases more than one possible use of an area may have to be considered to ensure that wildlife hazards will not be increased at or near the aerodrome. Prior planning is necessary to ensure that incompatible land uses are not allowed.

10.0 RISK ASSESSMENT OF WILDLIFE HAZARD

10.1 The first step of managing wildlife hazard is to assess the level of risk that each species of animal presents to aircraft operations at the aerodrome. This risk assessment is more than simply surveying the species found in and around the aerodrome; it involves assessing the likelihood of each species striking an aircraft and the probability and extent of damage that may result.

10.2 This allows managers to prioritize their management actions to target the highest risk species. The Risk Assessment should also identify the biological factors that cause different wildlife species to present a risk to aviation safety. Identification of these factors will greatly aid in the formulation of a Wildlife Hazard Management Plan.

10.3 There are several methods of conducting a Risk Assessment of Wildlife Hazards. This manual outlines a simple, qualitative method that can be used as a starting point for a more detailed Risk Assessment. In its most basic form, a Risk Assessment determines the level of risk that each species of wildlife presents based on the combination of the probability that it will be struck by an aircraft and the severity of the outcome.

10.3.1 Define the Area of Risk Assessment

The first step in a Risk Assessment of Wildlife Hazards is to define the area that will be assessed. This generally includes the entire aerodrome. The area of the Risk Assessment should include the take-off routes and landing approaches when significant wildlife hazards are present in these zones.

10.3.2 Ranking the Probability of a Strike

10.3.2.1 The next step of a Risk Assessment is to rate the probability that species will be involved in a strike. The example below uses a scale with 5 levels but fewer or more levels could be used.

10.3.2.2 The probability can be assessed qualitatively on a scale, for example, from Very Low to Very High. Species that shy away from aircraft noise or that learn to avoid aircraft could be rated as Low or Very Low. Birds that flock in large numbers to certain habitats in the flight path could be rated a High or Very High. Solitary animals might be rated as Medium but other behavioral factors might have to be taken into account. This probability might also vary with the season or other conditions such as grass length or rain and weather conditions.

10.3.2.3 A quantitative approach could use historical strike records at the aerodrome expressed as the number of strikes (by species) per 10,000 aircraft movements. As a guide, 5 or more strikes per 10,000 movements would constitute a Very High probability of a strike, whereas less than 1 strike per 10,000 movements constitutes a Very Low probability.

10.3.3 Ranking the Severity of a Strike

10.3.3.1 The next step is to rank the expected severity of the impact or damage resulting from a strike event. Sometimes called the Hazard Level Ranking, this can use a scale similar to strike probability scale. This ranking will depend on the size of the animal and its tendency to flock or congregate.

10.3.3.2 Heavier animals have a greater capacity to damage an aircraft and impact its flight performance. As a guide, birds that tend to flock and weigh more than 1.8 kg can cause the most severe damage to aircraft. The birds (or bats) that are solitary and weigh less than 50 g might be expected to cause the least severe damage. Flocking behaviour might mean that a strike event could include multiple impacts or it could increase the probability of a strike.

10.3.3.3 Severity can be rated in terms of aircraft damage and human casualty. Negligible could mean near miss and aircraft damage. Minor could mean light aircraft damage. Moderate could mean severe aircraft damage. Critical might mean that the aircraft could crash with no human death, just wounded, and Catastrophic might mean an emergency situation with aircraft crash and severe wounds or death casualty. Each airport should determine its own scale. The range of aircraft sizes operating at an airport will also need to be taken into consideration, so clearly the views of the aircraft operators should be considered.

10.3.4 Risk Assessment Matrix

10.3.4.1 The level of Risk for each species of bird, bat and terrestrial animal is determined as a combination of the Probability of a Strike and the Severity of the Outcome. In the example the Risk is also rated on a scale of 5 – Very Low, Low, Medium, High and Unacceptable. Alternatives might use a scale of 3 and the traffic light colours (Green, Amber, Red) to highlight the high priority species as indicated in Table 1.

10.3.4.2 The Risk Assessment will rank the risk of each species and highlight those species that should be prioritized for risk mitigation in the Wildlife Hazard Management Plan.

10.3.5 Identifying Root Causes of Wildlife Hazard

10.3.5.1 The final stage of the Risk Assessment of Wildlife Hazard is to identify the root cause of each wildlife hazard. Here, it is critical to understand the behaviour and basic requirements of each hazardous species of wildlife. Remember, each animal has a basic requirement for energy and nutrients, including water. They must maintain their bodies core temperature, they must breed and reproduce, and they must avoid being predated by another animal. When identifying root causes of wildlife hazards, consider each species and its basic requirements. Then, observe the aerodrome and surrounding areas to determine how the different habitats may aid the species in fulfilling its requirements.

10.3.5.2 This stage of the Risk Assessment should involve a trained wildlife biologist who is familiar with ecology and animal behavior. Ideal habitats for hazardous wildlife may not be readily apparent, and the attractiveness of aerodrome habitats may vary seasonally. Consider all stages of an animal’s requirements throughout the annual cycle. Breeding seasons, annual migrations, seasonal weather patterns, and food availability are all factors that can contribute to temporal changes in wildlife hazard.

10.3.6 Using Advanced Risk Assessment Methods

10.3.6.1 The Risk Assessment outlined above is one of the most basic that an aerodrome can utilize to quantify wildlife hazards. Aerodrome wildlife managers may wish to consider a greater set of variables, and therefore, assess risk more accurately. For example, the type of aircraft using the aerodrome will influence the level of risk; larger, faster aircraft will increase the risk of a damaging wildlife strike.

10.3.6.2 When considering the probability of a wildlife strike, components of each species behaviour can also be considered. This is especially valuable when detailed records of historical wildlife strikes are not available. Such factors as variations in a species annual abundance around the aerodrome, the animal’s propensity to engage in “hazardous” behaviour, and its relative ability to avoid aircraft can be considered.

			Severity of Strikes				
			Catastrophic	Critical	Moderate	Minor	Negligible
Probability of Strikes			A/C Crash & Severe	A/C Crash & Light Casualty	A/C Severe Damage & No Crash	A/C light Damage	near miss
Definition	Meaning	Value	A	B	C	D	E
Frequent	5/10,000 movements	5	5A (Unacceptable)	5B (Unacceptable)	5C (Unacceptable)	5D (High)	5E (Moderate)
likely	4/10,000 movements	4	4A (Unacceptable)	4B (Unacceptable)	4C (Unacceptable)	4D (Moderate)	4E (Moderate)
Occasional	3/10,000 movements	3	3A (Unacceptable)	3B (High)	3C (High)	3D (Moderate)	3E (low)
Seldom	2/10,000 movements	2	2A (Unacceptable)	2B (High)	2C (Moderate)	2D (Low)	2E (Very Low)
Improbable	1/10,000 movements	1	1A (Unacceptable)	1B (High)	1C (Low)	1D (Very Low)	1E (Very Low)

Table 1 Example of Risk Assessment Matrix for Wildlife

10.3.7 Taking Action to Reduce Risk

10.3.7.1 Once the risk presented by various wildlife species is prioritized, a series of actions for reducing that risk is outlined. The actions needed to reduce the risk can take several forms and include managing aerodrome habitats so that they are less attractive (fulfill fewer of the animals basic requirements); dispersing wildlife with behavioural stimulants; physically excluding wildlife from the aerodrome; physically removing wildlife from the aerodrome; and strategies for managing habitats that are within the vicinity of the aerodrome but outside its boundaries.

10.3.7.2 The actions should also include a system for communicating the risk of bird strikes to critical personnel, including pilots, air traffic controllers, and wildlife management personnel

11.0 RECORDING AND REPORTING

11.1 Recording All Daily Activities

11.1.1 Keeping records of all activity related to wildlife hazard management is fundamental to the WHMP. Data is required in order to be able to assess the effectiveness of the Plan as a whole, as well as specific trends such as habituation.

11.1.2 There is an increased tendency towards airlines and/or their insurers to pursue legal action to recover the costs of wildlife strike damage from airports at which they occur. It is important that airports record the wildlife control actions that they take in order to be able to demonstrate that they had an adequate WHMP in place at the time of an incident and that the Plan was functioning properly. Data gathered as part of a plan is also important in assessing the effectiveness of the actions taken.

11.1.3 A number of different methods for recording this data exist, from simple paper records to sophisticated devices including laptops, tablet PC or other electronic devices. The latter saves time and effort, especially if the data is to be subsequently entered into a computer for further analysis. Whatever the means of recording used, the important issue is that a comprehensive record of the bird control activities is kept in order to demonstrate that the airport is following its own policies and procedures. Records need to include the time, location and nature of the following:

- a) Each patrol or inspection and the route taken;
- b) Observation of any unusual condition of the habitat or site such as the state of the vegetation, trees, water bodies or perimeter fence;
- c) Species of wildlife sightings including any particular activity such as feeding or resting, and the discovery of any carcasses, dropping or other signs of activity;
- d) Interventions that are made;
- e) The outcome of any intervention, the response of the wildlife and the effectiveness of the hazard elimination.

- f) Incidents such as wildlife strikes on aircraft and near misses. (Systems will also be in place for such reporting by pilots, airlines and ground staff.).

11.2 Monthly Reporting

11.2.1 Daily records can be summarized into monthly reports, which aid in the evaluation of trends in wildlife numbers, control actions, and wildlife strikes. Monthly reports should be reviewed by the Airport Wildlife Committee of stakeholders to assess performance of the Wildlife Management Plan. The Committee should be involved in the creation of Performance Indicators for managing wildlife at the aerodrome.

11.2.2 Performance indicators can encompass any metric associated with reducing risk to aircraft operations, including reducing the number of wildlife strikes, reducing the total mass of wildlife strikes, reducing the average mass of wildlife strikes, or reducing the number of hazardous wildlife around the aerodrome.

12.0 EVALUATING THE WILDLIFE CONTROL PROGRAMME

The following questions are designed to assist aerodrome management in determining if there is an effective wildlife control programme in place at the aerodrome. If the answer to any one of these questions is "NO", an effective wildlife control programme may not be in place at the aerodrome;

- a) Has a wildlife control programme been developed?
- b) Has the wildlife control programme been implemented?
- c) Has a wildlife control officer at the site been appointed and responsibilities assigned?
- d) Has a training programme been developed to train those involved in the wildlife control programme?
- e) Has a wildlife control co-ordinating committee been established with well defined responsibilities?
- f) Has a reporting procedure been developed covering all aspects of the wildlife control programme?
- g) Has a land use plan been established with regard to effective land use on and off the aerodrome as it pertains to the wildlife control programme?
- h) Has a list of all wildlife attractants at and in the vicinity of the aerodrome been completed?
- i) Have wildlife control methods been researched and implemented at the aerodrome?



Director Safety, Security and Economic Regulation