

# Advisory Circular

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## GUIDANCE ON WILDLIFE HAZARD MANAGEMENT AT THE AERODROME

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### GENERAL

Advisory Circulars (ACs) are issued by the Director-General of Civil Aviation (DGCA) from time to time to provide practical guidance or certainty in respect of the statutory requirements for aviation safety. ACs contain information about standards, practices and procedures acceptable to CAAS. An AC may be used, in accordance with section 11 of the Air Navigation Act 1966 (ANA), to demonstrate compliance with a statutory requirement. The revision number of the AC is indicated in parenthesis in the suffix of the AC number.

### PURPOSE

This AC provides the guidance to demonstrate compliance with, and information related to the wildlife hazard management at aerodromes.

### APPLICABILITY

This AC is applicable to an operator who intends to or holds an aerodrome certificate or heliport certificate.

### RELATED REGULATIONS

This AC relates specifically to Regulation 25 of the ANR-139.

### RELATED ADVISORY CIRCULARS

AC 1-3 on Safety management system

### CANCELLATION

This is the first AC issued on the subject.

### EFFECTIVE DATE

This AC is effective from 1 March 2023.

### OTHER REFERENCES

- ICAO Airport services manual (Doc 9137), Part 3, Wildlife hazard management

- ICAO Manual on the ICAO birdstrike information system (IBIS) (Doc 9332)
- ICAO Safety management manual (Doc 9859)
- FAA AC150/5200-33C – Hazardous wildlife attractants on or near airports
- UK Civil Aviation Authority CAP 772 – Wildlife hazard management at aerodromes

## **1 INTRODUCTION**

- 1.1 Regulation 25 of ANR-139 requires the certified operator to take measures to minimise the likelihood of collisions at the aerodrome between wildlife and aircraft.
- 1.2 Each aerodrome location presents a unique habitat that influences the type and population of wildlife species present. The operator should carry out a wildlife hazard assessment to identify the risk areas and formulate the most appropriate and effective measures to manage the risks effectively and detail the measures in its wildlife hazard management programme (WHMP).
- 1.3 A strike is described as a collision between wildlife and an aircraft; a “near miss” is considered a potential wildlife strike.
- 1.4 The following events should be recorded and used for assessing and mitigating the risk of wildlife hazards:
- (a) any reported strike for which evidence in the form of a carcass, feathers, any other remains, or damage to the aircraft is found;
  - (b) any reported strike for which no physical evidence is found, but an indication of a collision exists (e.g. visual observation of the collision or acoustic perception of the impact);
  - (c) any wildlife found dead on an aerodrome without any other obvious cause of death; and
  - (d) incidents or observations where the presence of wildlife at or in the vicinity of the aerodrome could have an effect on a flight (e.g. missed approach, aborted take-off, etc.).

## **2 WILDLIFE HAZARD ASSESSMENT**

- 2.1 A wildlife hazard assessment provides the basis for the development, implementation, and refinement of a WHMP. It also identifies wildlife trends at the aerodrome (e.g. how the fluctuations in wildlife’s behaviour and abundance may affect aviation safety), with particular emphasis on wildlife strikes to aircraft. Based on the results of the assessment, specific measures or recommendations could be formulated to mitigate wildlife risk at the aerodrome.
- 2.2 The assessment should be conducted by a suitably qualified person with demonstrated expertise in wildlife hazard management and for a 12-month period so that an accurate assessment of the wildlife species observed at, and in the vicinity of the aerodrome at various times of the year can be evaluated and assessed.

- 2.3 Details of the assessment should include but not limited to the following:
- (a) Identification of the wildlife species, including the migratory species observed, their numbers, locations and movement patterns of the wildlife at different times of the year;
  - (b) Wildlife strike records and analysis;
  - (c) Airport and aircraft operational procedures;
  - (d) Identification, description and location of wildlife attractants at and in the vicinity of the aerodrome; and
  - (e) Mitigating actions for reducing wildlife hazards
- 2.4 General observation data and other information related to airport and aircraft operations regarding wildlife hazards (e.g. aeronautical information publications, wildlife strike reports) should be gathered and assessed if the information provided is adequate in communicating the wildlife hazards. In addition, the assessment should also take into account the size of wildlife species observed relative to the type of aircraft that normally operates at the aerodrome to assess the associated wildlife risk. Specific information regarding the wildlife hazards instead of a blanket advisory should be issued by the operator to the aerodrome users through the appropriate means (e.g. NOTAMS, airside ops notices, emails, etc.).
- 2.5 Assessment of air traffic control's involvement in identifying potential hazards as observed or relayed by pilots or airport personnel could include determining whether wildlife dispersal is coordinated with air traffic control such that hazards are not inadvertently increased by dispersing wildlife into the path of aircraft movements. Upon receipt of notice of a specific wildlife threat, air traffic control should issue appropriate warnings to aircraft operating at and in the vicinity of the aerodrome. In addition, air traffic control should provide the wildlife hazard management team access to manoeuvring areas, and also communicate with them during the implementation of mitigation measures to ensure dispersal paths are observed and de-conflicted with aircraft movements.

### **3 WILDLIFE HAZARD MANAGEMENT PROGRAMME (WHMP)**

- 3.1 An operator should develop and implement a WHMP tailored to local conditions to reduce the identified wildlife risks at and in the vicinity of its aerodrome. The operator could also use the results from the wildlife hazard assessment to refine its WHMP. Though the scale and details of the WHMP may vary from aerodrome to aerodrome, it should contain the following information:
- (a) Roles and responsibilities of personnel involved in wildlife hazard management;
  - (b) Training programme for personnel involved in wildlife hazard management;
  - (c) Process for reporting, collecting and recording wildlife data;
  - (d) Analysis of wildlife strike data;
  - (e) Risk management and mitigation;

- (f) Evaluation of wildlife hazard management programme;
- (g) Wildlife attractants at the aerodrome;
- (h) Wildlife attractants in the vicinity of the aerodrome;
- (i) Techniques to curb the increase in the wildlife population; and
- (j) Liaison with relevant agencies on land use developments in the vicinity of the aerodrome.

*(A) ROLES AND RESPONSIBILITIES OF PERSONNEL INVOLVED IN WILDLIFE HAZARD MANAGEMENT*

- 3.2. The roles and responsibilities of personnel are important elements of the operator's safety management system and contribute to the effectiveness of the WHMP.
- 3.3 Senior management, or their designate, should be responsible for the overall management of the WHMP on a long-term as well as a daily basis at the site-specific level. This should include the nomination of Wildlife Hazard Management Officers, coordination of training, safety assurance and ensuring that the necessary resources are available.
- 3.4 Wildlife hazard management officers should ensure that patrol of the fence line i.e. the boundaries of the aerodrome, is done regularly. Any washouts, breaks, or other holes in the fence should be fixed as soon as they are discovered to prevent other wildlife species, especially dogs from entering the airside.
- 3.5 The wildlife hazard management officers should be responsible for:
  - (a) Surveillance of wildlife activities at and in the vicinity of the aerodrome;
  - (b) Establishing and maintaining the wildlife management log (e.g. strike data, details on wildlife numbers and activity, wildlife control measures undertaken, firearm use details, details on the use of lethal reinforcement, and monthly summaries);
  - (c) Filing of autopsy, wildlife strike and wildlife sighting reports;
  - (d) Reviewing and analysing wildlife strikes/wildlife sighting reports ;
  - (e) Coordinating the wildlife monitoring program (e.g., including wildlife hazard consultant, control tower, airfield inspection team and external agencies/contractors including aircraft operators);
  - (f) Preparing the wildlife strike report and submitting it to CAAS for inclusion to the ICAO Bird Information System (IBIS);
  - (g) Ensuring that aerodrome operations are consistent with the requirements of the WHMP;
  - (h) Periodic review and updates of the programme;
  - (i) Ensuring that the appropriate permits required for conducting deterrent activities such as culling of wildlife and handling of firearms are current and present on-site;
  - (j) Undertaking deterrent activities;
  - (k) Ensuring all activities undertaken follow strictly to the aerodrome Safety Management System (SMS) guidelines;
  - (l) Identifying equipment, resources and training needs of relevant personnel; and
  - (m) Provision of training and awareness programmes.

3.6 In addition, the operator should form a wildlife hazard management committee to discuss wildlife issues. This committee should be attended by representatives from the various divisions involved in wildlife control, airport planning, maintenance and operations. It should also include air traffic services, aircraft operators and other external agencies/contractors that may affect wildlife control. The committee can be used to review wildlife strike/wildlife sighting reports, safety indicators, and periodic activity records to determine effective control measures to curb wildlife activity on and in the vicinity of the aerodrome. It is also a channel to discuss and to make inter-divisional decisions relating to wildlife hazard management.

(B) *TRAINING PROGRAMME FOR WILDLIFE HAZARD MANAGEMENT OFFICERS*

3.7 It is imperative that wildlife hazard management officers are able to demonstrate competence, are trained by qualified personnel and are provided with the appropriate resources and equipment to carry out their jobs.

3.8 The operator should include the procedures for the training of officers involved in wildlife hazard management in its WHMP. The following areas of training and levels of skill are suggested for officers involved in the WHMP:

(a) Bird Identification

(i) There are many species of birds that reside in or migrate through Singapore. Some species are present in an area all year and others only in the migratory season (around September to April). All these species have unique vocalizations, behaviours and habitat preferences. Knowledge of these unique characteristics is useful to the officers in field identification of bird species. Thus, to become an expert in field identification of all bird species at a location requires many years of training and practice.

(ii) Bird species may also be different at different aerodromes, making bird identification more challenging for the officers. Officers require basic training, including on-the-job training so that they can identify these bird species found in the aerodrome.

(iii) Binoculars are essential for detailed, close-up observation. They are also useful for the detection and identification of birds at a distance.

(iv) Every officer should also be equipped with a wildlife identification field guide, to be carried in the vehicle while on patrol. As a learning aid, officers should be encouraged to make annotations in their field guides regarding the behaviour or appearance of wildlife.

(b) Biology and behaviour of bird species

(i) Officers should have some understanding of the biology and behaviour of these species. Understanding the daily movement patterns between roosting, feeding and loafing areas in relation to the aerodrome of the species of bird is one of the examples. This information will make the job of the officers more interesting and useful in anticipating problems and deploying control measures more effectively.

- (c) Other wildlife species identification
  - (i) Other wildlife species commonly found in Singapore aerodromes are dogs, cats, snakes, monitor lizards, otters, monkeys and tortoises. Officers should be trained to identify, not only by sight but also by signs (e.g. tracks, trails in grass and fecal material).
- (d) Documentation and Strike Reporting
  - (i) A key component of a WHMP is to develop a system to document the daily activities of the wildlife hazard management officers involved, log information about wildlife numbers and behaviour at the aerodrome, and record all wildlife strikes.
  - (ii) Reporting is necessary as a source of data for analysis. This information is extremely useful during evaluations of the WHMP and when revisions to the WHMP are proposed. Such evaluations could be annual or when there is a wildlife strike with aircraft damage or a sudden increase in wildlife strikes. Officers should be instructed on the importance of documentation and trained to record such information in a standardised format.
  - (iii) **Appendix A** shows a sample of the flowchart of the reporting procedures for reporting wildlife strikes and wildlife sighting by airside personnel and their respective forms. Operators should have their own reporting procedures in place.
- (e) Wildlife strike risk assessment, risk management principles and how they integrate with the aerodrome's safety management system.
  - (i) An understanding of the methods used for evaluating wildlife strike risk and how this can be applied to the aerodrome environment.
- (f) Passive and active dispersal techniques
  - (i) An understanding of how to disperse wildlife and the benefits and advantages of using different active and passive management techniques on an aerodrome and the applicability of techniques to different situations including safety aspects relating to the equipment and methods used.
  - (ii) To ensure that the wildlife hazard management officers maintain competence, annual refresher or another system of monitoring should be implemented by the operator.

(C) *COLLECTING, REPORTING AND RECORDING WILDLIFE DATA*

3.9 A good WHMP depends on good reporting. Data may come from wildlife sightings, wildlife strikes, wildlife control activities and aircraft maintenance problems. Review of this data identifies problems at the site and may indicate the effectiveness of current wildlife hazard management measures.

3.10 All wildlife strikes should be reported to the operator so as to obtain an accurate assessment of the wildlife risk. Wildlife management hazard officers should record all details in a consistent manner. Airline and other airport staff should also be

encouraged to report all details of the strikes. **Appendix A** contains a sample flowchart on the sequence of events that should happen and the recommended forms to use after a wildlife strike or sighting.

- 3.11 Daily wildlife surveys should be conducted to monitor the wildlife species and their habitats in the aerodrome so as to manage them effectively. The frequency of surveys should correlate to the severity of the wildlife hazard and the timing of the monitoring should be such to provide a complete coverage of wildlife activity as appropriate to the aerodrome. A record of the number, wildlife species and location of wildlife seen should be maintained. It should also contain the actions taken to disperse the wildlife and the results of this action.
- 3.12 In addition to monitoring wildlife in the aerodrome, the operator should also conduct wildlife monitoring in the vicinity of the aerodrome for any obvious concentrations of wildlife and/or sources of wildlife attraction (i.e. habitat, migratory routes, feeding and breeding areas) which could contribute to the risk at the aerodrome.
- 3.13 The outcome of the wildlife monitoring should be recorded and the records should be maintained to provide details of the wildlife populations and behaviour over time. This, combined with the strike records, will provide the basis for predicting when certain species may be present to cause a problem. In general, aerodromes will be well served by documenting all activities that are undertaken to reduce the presence of wildlife.

*(D) ANALYSIS OF WILDLIFE STRIKE DATA*

- 3.14 The review of wildlife strike data identifies problems at the site and may indicate the effectiveness of current wildlife control measures. It is important to note that due care must be exercised while interpreting the data collected. The straightforward total number of strikes at an aerodrome may not be a good indicator of risk, and examination of the data by species struck and the distinguishing of multiple from single strikes are critical. If an increase in recorded strikes is attributable to an increase in incidents caused by encounters with single small wildlife, whereas the number of strikes involving large wildlife species and/or flocks of wildlife is falling, then this may well be indicative of both better wildlife control and better reporting of strikes.
- 3.15 Actual wildlife strikes may not provide the whole picture. The recording (via routine safety reports of occurrences) of potentially hazardous wildlife activities or near miss events can also be very useful. Such data should also be analysed to give a better conclusion on the wildlife activity on and in the vicinity of the aerodrome.
- 3.16 Wildlife strike database should be analysed to determine a number of trends including but not limited to:
  - (a) Wildlife species that create problems overall and at particular locations;
  - (b) Problematic times of the day and year;
  - (c) Yearly strike trends by location;
  - (d) Phase of flight when strikes are most likely to occur;
  - (e) Types of aircraft most likely to be struck;
  - (f) Parts of the aircraft most likely to be struck;
  - (g) Effects of strikes on aircraft;
  - (h) Percentage of strikes that are damaging and affect flight;
  - (i) Costs associated with strikes; and
  - (j) Altitude at which strikes occur.

- 3.17 It may also be important to periodically summarise information from the daily wildlife activities log and wildlife strikes records to provide baseline data for analysing and evaluating the WHMP. A logical approach is to conduct monthly summaries which are then incorporated into a quarterly or semi-annual report. These summaries do not need to be complex but must reflect the level of activity for the common control techniques deployed. For example, monthly summaries of runway sweeps to disperse birds, distress call deployments, number of wildlife removed may be useful.

(E) *RISK MANAGEMENT AND MITIGATION*

- 3.18 A hazard is defined as a condition or an object with the potential to cause or contribute to an aircraft incident or accident. In this context, a hazard is the presence of certain wildlife at or near an aerodrome.
- 3.19 Safety risk is the predicted probability and severity of the consequences or outcomes of a hazard. In this context, it is the probability of a wildlife strike by a particular group of wildlife multiplied by the severity of damage to the aircraft that might reasonably occur.
- 3.20 Risk assessment is an important part of a WHMP because it serves to ensure that wildlife management activities are directed at the species that create the highest risk, in a prioritised fashion.
- 3.21 **Appendix B** shows some suggested factors that should be included into a risk assessment matrix that could be used for the WHMP. Operators are strongly encouraged to conduct their own risk assessment. They should, at the same time, exercise due care to see what applies at their aerodrome, especially considering the different species of wildlife found at or in the vicinity of the aerodrome.
- 3.22 The risk assessment would need to estimate the probability that a strike will occur and the likely level of severity that it will result. Based on analysis of various wildlife strike databases around the world, there is a consistent relationship between wildlife mass and the level of damage to aircraft. Strikes involving flocks of birds (even small species) are also more likely to result in damage to the aircraft than strikes with single birds.
- 3.23 The most common form of risk assessment involves the categorisation of strike probability and likely severity into arbitrary levels for instance low, medium and high. Strike severity can be estimated based on the mass of wildlife involved, with a correction for their tendency to occur in groups. For strike probability, it would require some specialist knowledge of the behaviour of the wildlife species involved and how that behaviour is influenced by the environment around the aerodrome concerned. A typical option for risk assessment may involve using the number of strikes with different wildlife species over the recent past as a measure of the probability of likely future strikes. However, for this to work reliably, all or most of the wildlife strikes need to be reported consistently from year to year, with wildlife species involved identified correctly.
- 3.24 Once the risk assessment is completed, the operator should develop mitigating measures to deal with the risks identified. Operators should ensure that the measures are reviewed periodically so that the level of effectiveness is maintained



at an acceptable level defined by the aerodrome operator. Guidance material on risk assessment is contained in ICAO Safety Management Manual Doc 9859.

(F) *EVALUATION OF WILDLIFE HAZARD MANAGEMENT PROGRAMME*

3.25 The following questions are designed to assist in determining if there is an effective WHMP in place at an aerodrome.

- (a) Has a WHMP been developed?
- (b) Has the WHMP been implemented?
- (c) What is the wildlife strike rate at the aerodrome over the last five years (with and without damage to the aircraft)?
- (d) Is there a procedure to collect information about wildlife, both dead (carcasses) and living?
- (e) Has a wildlife hazard management officer at site been appointed and responsibilities assigned?
- (f) Has a training programme been developed to train those involved in the WHMP?
- (g) Has a wildlife hazard management committee been established with well-defined responsibilities?
- (h) Has a reporting procedure been developed covering all aspects of the WHMP?
- (i) Has a land-use plan been established with regard to effective land-use on and off the aerodrome as it pertains to the WHMP?
- (j) Has a list of all wildlife attractants at the aerodrome been completed and updated?
- (k) Has a list of all wildlife attractants in the vicinity of the aerodrome been completed and updated?
- (l) Have wildlife hazard management methods been researched and implemented at the aerodrome?

3.26 Wildlife species on and in the vicinity of aerodromes are constantly changing in response to changes in land use, state management policies, and environmental factors. In addition, wildlife might adapt or habituate to control strategies that were once effective, or they might develop new behavioural or feeding patterns on or near the aerodrome. New wildlife control technologies might become available, or established products or techniques might be withdrawn or banned. There might also be changes in wildlife hazard management and management personnel at an aerodrome.

3.27 Thus, once a WHMP is in place, there is a need to develop a process to evaluate the WHMP at least annually and update as needed to ensure that the WHMP remains current to the operating environment.

3.28 The foundation for these evaluations is the maintenance of consistent records of wildlife hazard management activities and wildlife strikes. Consistent records permit easy compilation of events and activities into monthly and annual statistical and narrative summaries. Once these summaries are available, objective examinations and comparisons can be made of trends in strikes, wildlife activities, control methods deployed, and other factors.

3.29 Lastly, indicators including leading and lagging indicators may be used as measures of the effectiveness of the WHMP. While lagging indicators (e.g. number of wildlife strikes per aircraft movement, percentage of strikes resulting in aircraft

damage) are generally used to measure the effectiveness, leading indicators (e.g. percentage of trained wildlife personnel) could also be used to measure the process being implemented.

*(G) WILDLIFE ATTRACTANTS AT THE AERODROME*

3.30 Wildlife attractants at the aerodrome should be properly identified and reviewed in a WHMP. The operator should understand the behaviour of the wildlife and the reasons for their presence at the aerodrome. This would help in eliminating or reducing the number of wildlife strikes and wildlife sightings at these areas.

3.31 Airport development should be designed such that it will not be attractive to hazardous wildlife and no attraction will be created during construction. This may include denying resting, roosting and feeding opportunities for hazardous wildlife.

3.32 The following is a list (non-exhaustive) of potential wildlife attractants that may be found at the aerodrome:

- (a) Grass/Turf areas;
- (b) Water bodies, ditches and drains;
- (c) Other food sources such as food and beverages stores, food disposal bins;
- (d) Shelter in hangars and in nooks of other buildings; and
- (e) Trees and vegetation

*(H) WILDLIFE ATTRACTANTS IN THE VICINITY OF THE AERODROME*

3.33 In order to have a successful WHMP, the operator should also identify wildlife attractants in the vicinity of the aerodrome and notify the relevant authorities to remove the attractants if necessary. These wildlife attractants are often overlooked as there may seem to be no direct relationship between the number of wildlife strikes/wildlife sightings and the wildlife attractants found in the vicinity of the aerodrome. This process should be repeated as required to identify new sites or changes in the risk levels produced by existing sites. The following is a list (non-exhaustive) of potential wildlife attractants that may be found in the vicinity of the aerodrome:

- (a) Food sources;
- (b) Dumping facilities;
- (c) Favourable roosting and nesting areas;
- (d) Trees and vegetation;
- (e) Construction sites; and
- (f) Golf courses.

*(I) TECHNIQUES TO CURB THE INCREASE IN WILDLIFE POPULATION*

3.34 A successful WHMP should also include techniques to curb wildlife from coming to the aerodrome. There are passive and active techniques used all over the world and some of these techniques are listed in **Appendix C**. Operators may use this list as a guide to select the appropriate techniques for their aerodromes.

3.35 In addition, for the long-term, operators should be well informed on the latest wildlife hazard management techniques available in the industry and study its suitability and effectiveness. This would also mean that operators need to allocate the required resources towards the study and implementation of updated wildlife hazard management techniques.

*(J) LIAISON WITH RELEVANT AGENCIES ON LAND USE AND DEVELOPMENTS IN THE VICINITY OF THE AERODROME*

- 3.36 The operator should put in place systems to guard against new or increased wildlife hazards caused by developments both on and in the vicinity of the aerodrome. The WHMP should include details of activities employed by the operator to control or influence areas beyond the aerodrome boundary as determined by risk assessment and where practicable, could include:
- (a) Establishment of a process with the relevant agencies for consultation on proposed developments that have the potential to be a wildlife attractant in the vicinity of the aerodrome;
  - (b) Means to influence land use and development in the vicinity of the aerodrome such that the wildlife strike risk does not increase and, where practicable, is reduced; and
  - (c) Procedures to conduct and record the results of monitoring visits to off-aerodrome sites.

## APPENDIX A: REPORTING OF WILDLIFE STRIKE AND SIGHTING

This appendix presents samples of the reporting flowcharts for wildlife strike and sighting and the associated forms in various figures below.

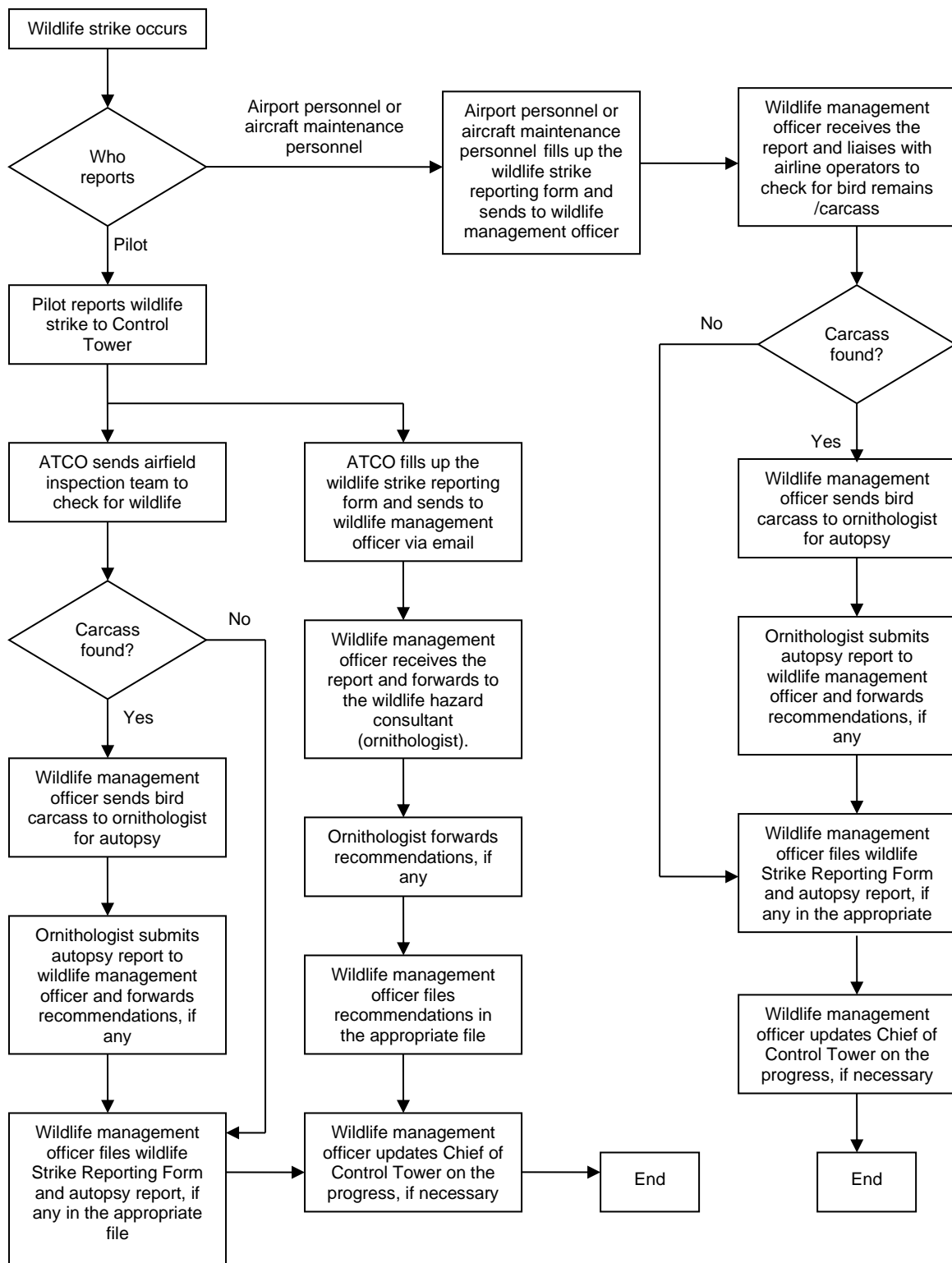


Figure A1: A Sample Flowchart for Reporting of Wildlife Strike

<b>WILDLIFE STRIKE REPORTING FORM</b> (This information is required for aviation safety)			
<b>OPERATOR OR CALL SIGN</b>		<b>AIRCRAFT TYPE</b>	
<b>ENGINE TYPE</b>		<b>AIRCRAFT REGISTRATION</b>	
<b>DATE (UTC)</b>		<b>TIME OF INCIDENT (UTC)</b>	
<b>RUNWAY USED</b>		<b>APPROX. GEOGRAPHICAL LOCATION</b>	
<b>HEIGHT AGL</b>	- ft		
<b>SPEED(IAS)</b>	- kt		
<b>PHASE OF FLIGHT</b>		<b>SKY CONDITION</b>	
		<b>PRECIPITATION</b>	-
<b>PART(S) OF AIRCRAFT</b>		<b>BIRD SPECIES *</b>	
<b>Radome</b>			
<b>Windshield</b>		<b>NUMBER OF BIRDS</b>	<b>Seen :-</b>
<b>Nose(excluding above)</b>			<b>Struck :-</b>
<b>Engine No.1</b>		<b>SIZE OF BIRD</b>	-
2			
3		<b>PILOT WARNED OF BIRDS</b>	
4			
<b>Propeller</b>		<b>LIGHTS USED:</b>	-
<b>Wing/Rotor</b>		<b>Landing</b>	-
<b>Fuselage</b>		<b>Strobe Anti-Collision</b>	-
<b>Landing gear</b>			
<b>Tail</b>			
<b>Light</b>			
<b>Other</b>			
<b>Specify</b>			
<b>EFFECT ON FLIGHT</b>		<b>Remarks</b>	
<b>Watch Manager Name</b>			
<b>Created By</b>			
<b>Modified By</b>			

Figure A2: Wildlife strike reporting form

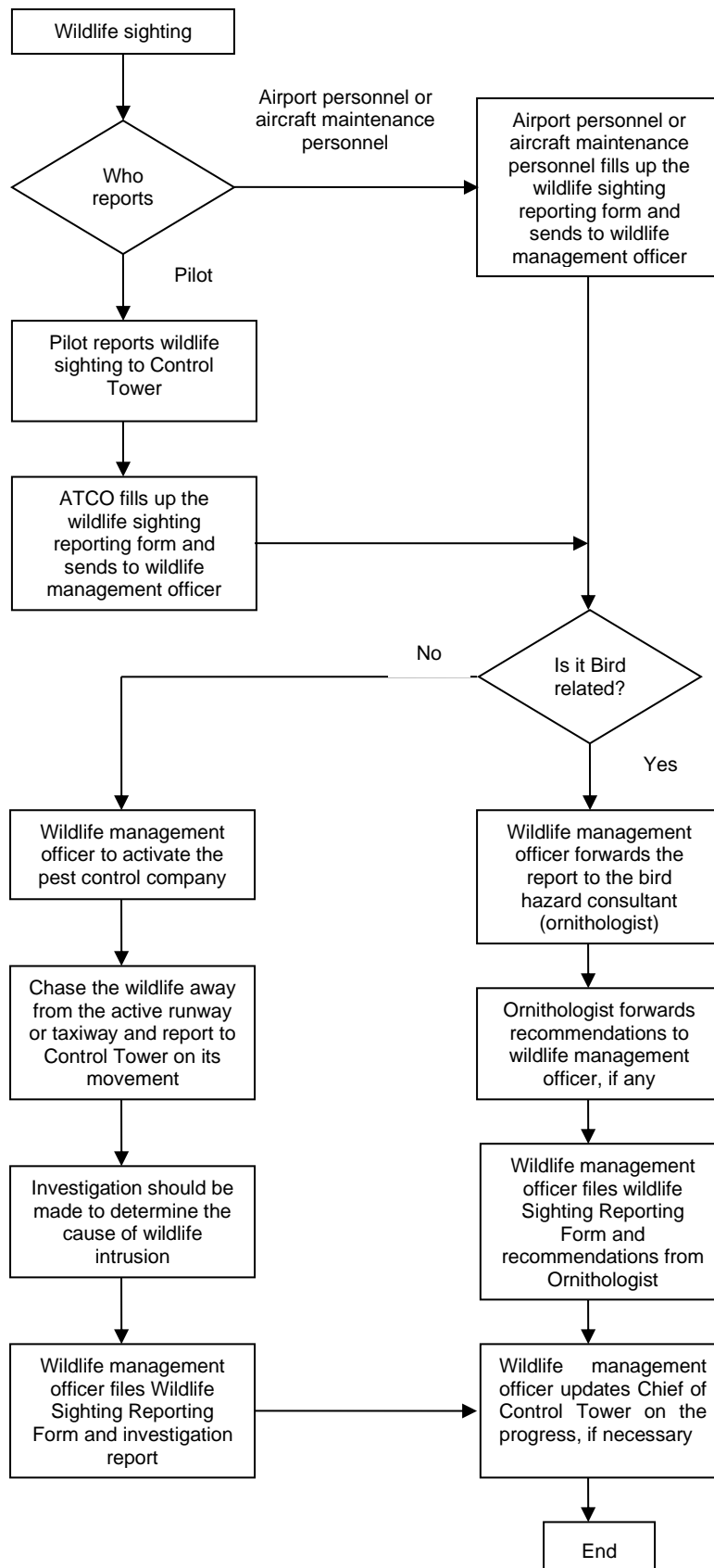


Figure A3: A Sample Flowchart for Reporting of Wildlife Sighting

**WILDLIFE SIGHTING REPORTING FORM**

(This information is required for aviation safety)			
OPERATOR OR CALL SIGN		AIRCRAFT TYPE	
ENGINE TYPE		AIRCRAFT REGISTRATION	
DATE (UTC)		TIME OF INCIDENT (UTC)	
RUNWAY USED		APPROX. GEOGRAPHICAL LOCATION	
HEIGHT AGL			
SPEED(IAS)			
PHASE OF FLIGHT		SKY CONDITION	
		PRECIPITATION	
PART(S) OF AIRCRAFT			
		BIRD SPECIES *	
Radome			
Windshield		NUMBER OF BIRDS	Seen :
Nose(excluding above)			Struck:
Engine No.1		SIZE OF BIRD	
2			
3		PILOT WARNED OF BIRDS	
4			
Propeller		LIGHTS USED:	
Wing/Rotor		Landing	
Fuselage		Strobe Anti-Collision	
Landing gear			
Tail			
Light			
Other			
Specify			
EFFECT ON FLIGHT			
		Remarks	
Watch Manager Name			
Created By			
Modified By			

Figures A4: Wildlife sighting reporting form

## APPENDIX B: RISK MANAGEMENT

- B1 The purpose of this appendix is to provide operators with a recommended list of factors to be considered in the risk assessment of WHMP. Each WHMP is unique to the particular aerodrome and it might require some specific types of risk management and measures to curb the increase in the number of wildlife strikes and wildlife sightings. Operators should fully understand these considerations in order to implement the WHMP effectively.
- B2 In risk management, operators should consider the identification of hazards (which are wildlife-related hazards), its consequences (which may be aircraft damages, loss of lives, etc) and the related risks (in terms of probability and severity) involved. This is in line with the aerodrome Safety Management System (SMS) that shall be put in place by the operator – an aerodrome certification requirement.
- B3 A risk assessment matrix should be used in a WHMP. Suggested factors that should be considered in a risk assessment matrix are as follow:
- (a) Types of aircraft/aircraft classification;
  - (b) Volume of air traffic movement;
  - (c) Wildlife species; and
  - (d) Size of wildlife/wildlife movements.
- B4 The probability and severity measures can be combined into a 5 x 5 risk matrix as shown in Table B1 below.

SEVERITY	PROBABILITY				
	Very high	Moderate	High	Low	Very Low
Very high	3	3	3	2	2
Moderate	3	3	3	2	2
High	3	3	2	1	1
Low	2	2	1	1	1
Very Low	1	1	1	1	1

Table B1: A Sample of a 5 x 5 risk assessment matrix

- B5 With the risk assessment matrix put in place, the risk indexes should be classified into different categories for example, green, amber and red. An example of such classification and its suggested criteria is as shown in the Table B2.

Category	Suggested Criteria
<b>Red</b>	Risk from this species is currently very high. Additional management actions should be implemented for this species as soon as possible.
<b>Amber</b>	Risk from this species merits further review of available options and action if appropriate. Current risk management for this species should be reviewed and additional steps taken if appropriate.
<b>Green</b>	Risk from this species is currently low. No further action is required beyond the risk management measures currently in place.

Table B2: A Sample of Risk Categories



- B6 Operators may modify this table to suit their own WHMP. It is essential that the actions are followed up, particularly for those under the Red region, a list of available actions should be developed in consultation with wildlife management specialist. It is also equally important that the effectiveness of these options is evaluated at appropriate intervals after they are implemented. It is recommended to repeat the risk assessment process annually to determine if the risk is falling to an acceptable level.
- B7 More guidance material on risk assessment is contained in ICAO Safety Management Manual, Doc 9859.

## APPENDIX C: SUGGESTED LIST OF TECHNIQUES COMMONLY USED

C1 There are numerous techniques used by different aerodromes all over the world to curb the increase in the bird population. Generally, these techniques can be divided into 2 categories: Passive techniques and Active techniques.

### Passive techniques

C2 Passive techniques are generally those that alter habitat or permanently exclude entry (See Table C1 below). The operator should know which measures are applicable and effective for its aerodrome.

Examples	Suggested Approaches
<b>Grass/Turf areas</b>	<ul style="list-style-type: none"> <li>• Manage height according to hazards at the airport</li> <li>• Adaptive management, experimental manipulation at individual aerodrome</li> </ul>
<b>Buildings</b>	<ul style="list-style-type: none"> <li>• Ensure entry holes/crevices blocked, screened, netting</li> <li>• Influence design of new buildings, slope ledges</li> <li>• Porcupine wire, electric shocking, sticky caulking</li> <li>• Minimise exposed areas that birds can use for perching and nesting</li> </ul>
<b>Open water, ponds, ditches, drains, poorly drained areas</b>	<ul style="list-style-type: none"> <li>• Drain, improve drainage</li> <li>• Over-wire, netting, BirdBalls™</li> <li>• Grade slopes steeply, remove vegetation</li> </ul>
<b>Shrubs, trees, brush, hedges, woodland</b>	<ul style="list-style-type: none"> <li>• Remove, including undergrowth and understorey layers</li> <li>• Reduce biodiversity, habitat niches</li> <li>• Thinning the canopy of trees or selectively removing trees to increase their spacing</li> <li>• Avoid plants that produce fruits and seeds desired by wildlife</li> </ul>
<b>Infield perching features</b>	<ul style="list-style-type: none"> <li>• Remove when possible</li> <li>• Apply spikes when required</li> </ul>
<b>Waste storage</b>	<ul style="list-style-type: none"> <li>• All disposal containers must be wildlife proof</li> <li>• Eliminate dumps on the airport</li> </ul>
<b>Fencing</b>	<ul style="list-style-type: none"> <li>• Proper fencing with suitably sized grilles</li> <li>• Regular inspection to fix any washouts, holes</li> </ul>
<b>Outdoor picnic areas</b>	<ul style="list-style-type: none"> <li>• Signage</li> <li>• Provide wildlife proof garbage containers</li> </ul>
<b>Aircraft</b>	<ul style="list-style-type: none"> <li>• Ensure that bird nesting does not occur within parked aircraft through regular inspections. Nettings/covers can be installed to prevent such access as applicable.</li> </ul>

Table C1: A Sample of Passive Techniques

### Active techniques

C3 Active techniques fall into two major subgroups. There are:

- (a) Dispersal (various kinds of deterrents, hazing); and
- (b) Removal (live capture, killing)

C4 Birds often habituate to non-lethal threats within a few weeks, hence in the long-term, dispersal techniques are seldom effective unless a clear and present danger

is presented to the birds (e.g. with a dog or live gunshot). Table C2 below shows some examples of active techniques that can be used to deter/reduce birds from coming to the aerodrome.

Technique		
<b>Non-lethal</b>	Audio repellents	Pyrotechnics
		Propane cannons
		Electronic noise-generating systems
		Playback of distress calls – remote system
		Playback – mobile
	Visual repellents	Presence of humans/vehicles
		Hand-held laser projectors
		Reflective tapes
		Remotely piloted aircraft systems (RPAS) and drones
		Flags
		Use of trained predators e.g. Falconry or Border Collies
	Chemical repellents	Dead specimen birds
Chemical – irritants		
Live trapping and relocation	Chemical - behavioural repellents	
	Use of bait or decoys	
<b>Lethal</b>	Lethal trapping	
	Chemical – lethal control	
	Chemical – Benomyl/Tersan fungicide	
	Oiling of bird eggs	
	Surfactant water sprays	
	Live-ammunition shooting	

Table C2: A Sample of Active Techniques