ETHIOPIAN CIVIL AVIATION AUTHORITY

GUIDE LINE OF WILDLIFE HAZARD MANAGEMENT AT AIRPORT

WILDLIFE HAZARD MANAGMENT

Aerodrome safety and standard directorate

12/3/2012

The guideline deals with wildlife hazard at Ethiopian airports and the way how to mitigate the hazard in both passive and active management and problem species especially at international airports.

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GUIDE LINE OF WILDLIFE HAZARD MANAGEMENT AT AIRPORT | 2012

This Guideline for Wildlife Hazard Management at Airport has been prepared by Aerodrome Safety and Standard Directorate of Ethiopian Civil Aviation Authority to aid Ethiopian Airport Enterprise on the management of wildlife hazards at the Airports vicinity.

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The Director General of Ethiopian Civil Aviation Authority has here approving this guidance by the power given on proclamation No.616/2008 .The guidance can be amended from time to time up on introduction of new methods and techniques through the international Civil Aviation Organization (ICAO).

Contents

Introduction

As air travel becomes more popular, so grows the need for effective wildlife management at airports. Over the years, aircraft noise has diminished while the numbers of aircraft have increased dramatically. Not only are birds and mammals less able to avoid aircraft movements—there are fewer places left for these animals to find refuge.

The first recorded bird-strike fatality occurred in 1912, when an aircraft collided with a gull over the coast of California and crashed into the ocean, killing the pilot. Since then, the number of reported wildlife strikes has raised steadily. The number of strike reported to Ethiopian civil aviation is around107. Although none involved human fatalities, the strikes that adversely affected flight or inflicted damage incurred huge costs.

The direct costs—primarily to airlines—associated with replacing and repairing damaged aircraft parts pale in comparison to the indirect costs incurred through aborted takeoffs, rescheduled flights, passenger and crew accommodations, and missed connection arrangements. Perhaps most damaging are the affects to airline reputation and reliability incurred when customers are inconvenienced by wildlife-related incidents.

Through the implementation of effective wildlife-management plans—including active and passive wildlife-management techniques—the costs, risks and damages associated with wildlife strikes can be significantly reduced.

Overview of Wildlife Management

Introduction

The role of Ethiopian civil aviation headquarters is to develop and promulgate Regulations, standards and related applicable policies. EAE are responsible to deliver the program In accordance with functional direction. The ECAA does not play a direct Role in the implementation of wildlife control programs at individual airports, but does provide awareness material upon request or through the Normal cycle of distributing education and awareness material. Responsibility For program design and implementation now rests with management teams at each airport.

A successful wildlife-control management plan reduces hazards to aircraft and minimizes maintenance problems by rendering airport property less attractive to animals. The safety benefits are real for all concerned: airports, airlines, the public—and wildlife. Airport wildlife can be controlled by:

- managing habitat so that airports do not attract wildlife,
- excluding wildlife from airports through the use of fences or other means,
- dispersing wildlife from the premises, and
- removing wildlife, either dead or alive.

The best long-term control is achieved through **habitat management**; however, it is impossible to completely control wildlife in this way. Birds are particularly difficult to manage because they are mobile and they readily adapt to changing Environments. In most situations, active removal or dispersal of wildlife is Necessary, in conjunction with habitat management techniques.

Established Practices and Principles for Airports

Habitat management modifies and limits wildlife attractants on airport lands. By altering the airport environment, habitat management simplifies the task of excluding wildlife, and helps reduce the amount of time required to remove

Problem species. The need to initiate active dispersal or hazing against birds or Mammals often arises when habitat management plans have not been fully or successfully implemented.

Identification of site-specific problem species

The development of a habitat management plan begins with an ecological site study that identifies specific problem areas. This study creates an inventory of wildlife in the vicinity of airports and includes identification, population sizes, locations and movements of all species. The study describes the aerodrome features and areas that attract wildlife; problem areas are directly related to problem bird and mammal species on site. An effective reporting program is a key contributor to a successful ecological survey. The designated Wildlife Control Officer patrols the airport grounds and maintains a daily log of wildlife activity. Log entries include sighting times,locations, numbers and species observed, actions taken, and results obtained. From this data, activities and projects associated with the management plan can be ranked and executed accordingly.

Habitat modification

The most effective way to reduce wildlife hazards in the vicinity of airports is to ensure birds and mammals are not drawn to the grounds. All aspects of airport design should address and minimize the food, shelter, water and open Space that attracts wildlife. Modifying Natural and man-made environments—Following assessments of problem Species and their attractants—can render these areas unappealing and inaccessible to wildlife.

This is an effective long-term Solution that can minimize problem Species in specific areas.

Examples of airport habitat modifications Include:

• Modifying buildings and signs to reduce nesting and perching areas,

• designing drainage ditches to minimize Standing water, and

• removing vegetation from banks of Water Bodies.

Airport managers are also advised to consider site-specific grass-management programs which can deter many problem species and should, when leasing airport lands for agricultural purposes, prohibit the harvesting of certain crops and limit practices—such as ploughing—to certain times of the day.

Food source	**habitat**	**Shelter and safe areas**
Earth warm	Grass field	Abandoned runways
Fish/frog	Drainage ditch	Abandoned taxi ways
insects	Hedgerow	Brush/wooded areas
rodents	Marsh and swamp	Building
Seed producing grass or weeds	woodlots	Ponds/lakes
Snail/slug	Scrub land	Roof tops
Litter/garbage	Riparian vegetation	Short-grass field
Agricultural crop	Nest trees	
(grain,forage,legumes,etc)	Raptor perches	
	Open bodies of water	
	Retention ponds	
	Temporary ponding of water	
	Building(nest and roost site)	
	hangars	

Table number: 1 *Wildlife attractants at airport that may be managed by habitat modification*

Adjacent land-use activities

Airports that were once miles from city limits must now face wildlife-control issues raised by the close-proximity of incompatible land-use activities such as landfill sites, garbage dumps, agricultural activities, and coastal commercial fish-processing plants. Airport operators should communicate with regional and municipal governments as active participants in land-use planning decisions. Where incompatible land uses exist or are being considered, airport operators should work to minimize the adverse effects. Creating education and awareness

Programs and establishing co-operative working relationships with governments, interest groups, and stakeholders, usually lead to compromises that accommodate all parties.

Dispersal techniques

Scare tactics and auditory deterrents are perhaps the most common and widely used method of wildlife control. These first-line techniques, used to repel wildlife immediately from the airport, include shell crackers, pyrotechnics, and gas cannons. Unfortunately, the low cost, ease of application, and immediate realization of results from these methods has led to their over-use. Generally, their effectiveness is short-lived; they are inexpensive in the short run but require repeated applications for the control of persistent wildlife types. And while costs escalate with the number of applications, so does the likelihood of habituation and the requirement for new

measures and budget allocations when it becomes clear that problem species have not been deterred or eliminated.

The use of scare tactics and dispersal methods should not be considered a primary control method for persistent or resident wildlife species. These techniques can, however, provide the first line of defense for true transients and migrant species that cause periodic problems. In all other cases, dispersal techniques should be employed as components of integrated wildlife-control programs

Exclusion methods

Exclusion methods comprise man-made barriers such as fences and netting that keep wildlife away from areas at airports where food, water and shelter can normally be found. These barriers are commonly used to restrict mammal movement and manage bodies of water. When successful, these measures provide permanent solutions to wildlife problems in protected areas.

Removal methods

Generally, removal methods—trapping, shooting, and poisoning—provide short-term solutions to the presence of problem species. Removal methods will eliminate the species temporarily, but if the attractant is not removed the population will simply replenish itself. Trained personnel and, in most cases, permits are required to carry out these measures.

Wildlife-strike Statistics

Introduction

This section presents an overview of available wildlife-strike data as it pertains to aircraft and the animals with which they collide and the distribution of the damage in spatial, temporal, attitudinal, as well as other factors. it will also include damage due to bird strike.

Number of strikes

Available data shows that since 1912, 223 people have been killed worldwide in at least 37 bird-strike-related civil-aircraft accidents. In military aviation, 165 fatalities have occurred in 353 serious accidents since 1950. Anecdotal evidence suggests that these numbers represent only a fraction of the total bird-strike related occurrences.

Reported number of strikes in Ethiopia since 10/28/2007 up to 6/13/2012 is around 107 it indicate that the severity of the issue.

Countless strikes go unreported each year for a variety of reasons in globally including:

• Bird-strike reporting is not mandatory in most parts of the world;

• Some countries, airlines and airports are reluctant to publish bird-strike

Statistics due to liability concerns and negative public perception of flight safety;

• Loss of information occurs in many developing countries due to lack of funding, expertise, and media coverage; and

• Damage caused by bird-strikes is sometimes attributed to other causes.

STATISTICAL ANALYSIS FOR THE YEARS 2001-2007

Bird strikes by ICAO Region: For the years 2001 to 2007, 42 508 bird strikes were reported to ICAO by 51 States. These occurred in 145 States and Territories throughout the world. When and where the bird strikes occurred: 64 per cent of the bird strikes occurred during the day and 24 per cent occurred at night. Although bird strikes occurred throughout the year, the busiest months are July through October, as illustrated in Chart 4. The months with the least reported number of bird strikes were December and February. This monthly distribution also reflects the fact that the majority of the bird strikes were reported by States located in the Northern Hemisphere. Chart 5 illustrates that 96 per cent of the strikes for which location data was furnished occurred on or near the aerodrome. 39 per cent of these occurred during the take-off run or climb phases while 54 per cent occurred during the approach or landing roll phases.

When and where the bird strikes occurred

time of the strikes

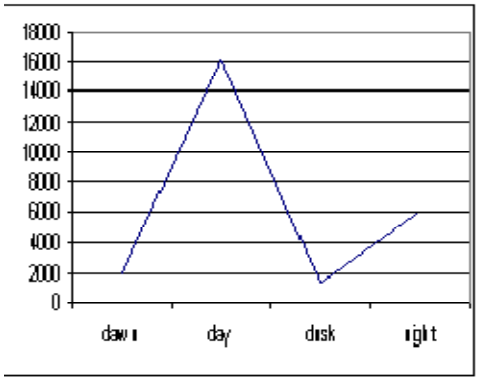


Chart 1: strikes reported according to time

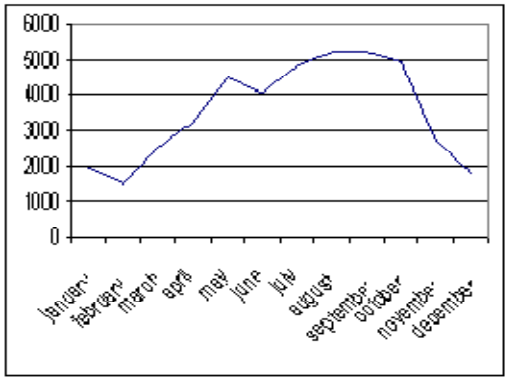


Chart 2: strikes reported according to season

Source ICAO

Source ICAO

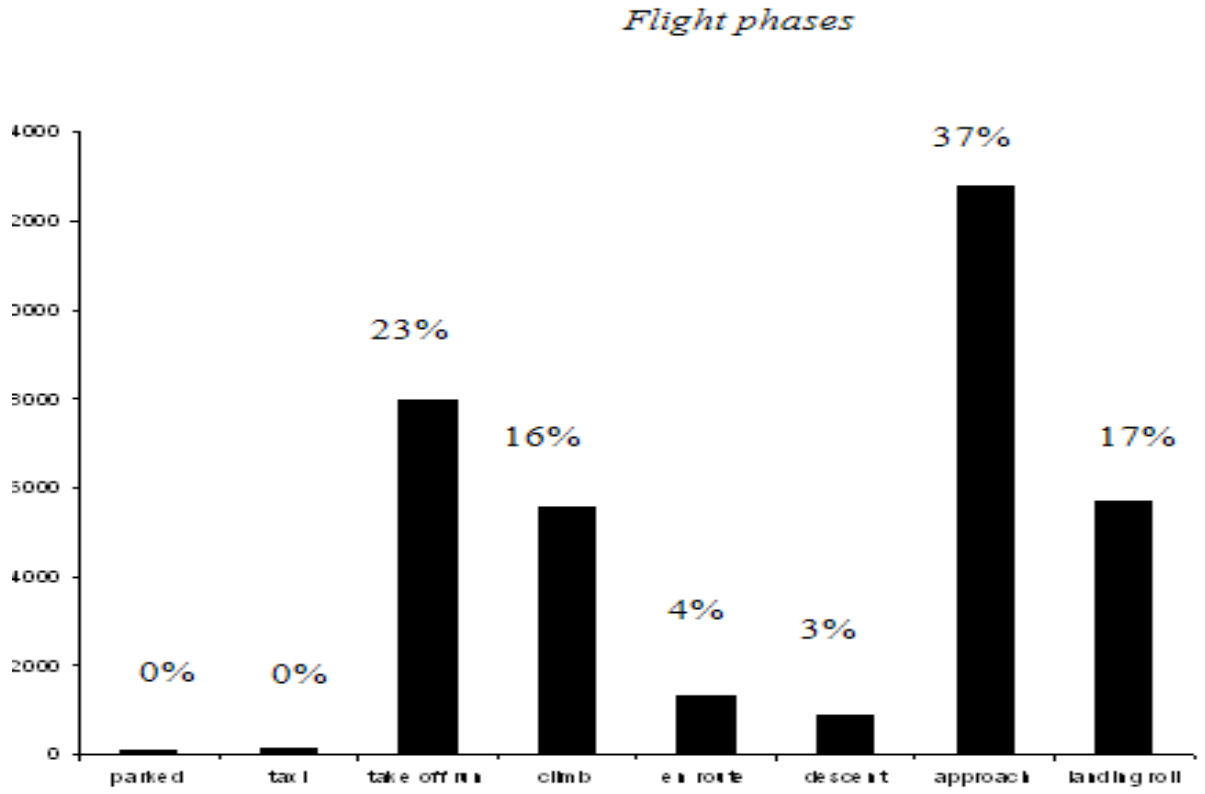


Chart 3: Bird strikes reported according to flight phases

Source ICAO

***Damage to the aircraft**:* The extent of damage to the aircraft was coded for 27 937 bird strikes, which is approximately 66 per cent of the total number of strikes reported. Of the bird strikes for which the damage was coded, three aircraft were destroyed, 753 or 3 per cent caused substantial damage to the aircraft, 2 120 or 8 per cent caused minor damage and 25 064 or approximately 89 per cent caused

no appreciable damage.

2.4 Bird types most frequently struck:

The bird type was unreported or unknown in 27 937cases, approximately 65 per cent. For the other 14 571 known cases, the species was reported. Most frequently struck species were: passerines with 4 517 strikes which represents 31 per cent, then gulls with 2 623 or 18 per cent of the reported species, birds of prey with 2 185 strikes or 15 per cent, pigeons with

1 457 strikes or 10 per cent, and waterfowls with 875 bird strikes or 6 per cent.

2.4.1 When damage to the aircraft was known, passerines (mostly small perching birds) caused damage to the aircraft 139 times or 4 per cent of the cases and gulls caused damage to the aircraft in 303 or 15 per cent of the cases. 19 per cent of the occurrences involving birds of prey and 11 per cent of the occurrences involving pigeons resulted in damage to the aircraft. Waterfowl caused the highest incidence

Of damage for the number of strikes reported with 43 per cent of the cases. The damage by bird types is shown in Chart 6. (Printing and inserting in to the doc)

Effects of the bird strike on flight

The effect the bird strike had on the flight of the aircraft was reported 31 767 times. In 28 576 cases, or 90 per cent of the time, such strikes had no effect on the flight. The other 3 191 bird strikes which had an effect on the flight represent 10 per cent. There were 2 351 aborted take-offs or precautionary landings, including five forced landings, due to bird strikes.

These disruptions account for 74 per cent of the strikes for which the effect was reported. There were eighty-one cases of engines being shut down. The airframe was penetrated three times, the windshield four times and the vision was obscured one time. These effects are shown in Chart 7. Abnormal aircraft operations such as aborted take-offs and precautionary or forced landings cause interruptions in the

Normally scheduled operations of the airport. These interruptions cause a loss in consumer confidence in addition to costing both time and money to the airport and the airline.

Parts of the aircraft struck and/or damaged:

Parts of the aircraft struck were reported 38 809 times. The parts most frequently reported as struck were the windshield, with 6 617 strikes followed by the engines with 5 100 strikes and then by the fuselage with 5 848 strikes. The parts most frequently reported as damaged were the engines with 1 688 damaging strikes. Charts 8 and 9 illustrate parts of aircraft struck and/or damaged and the frequency.

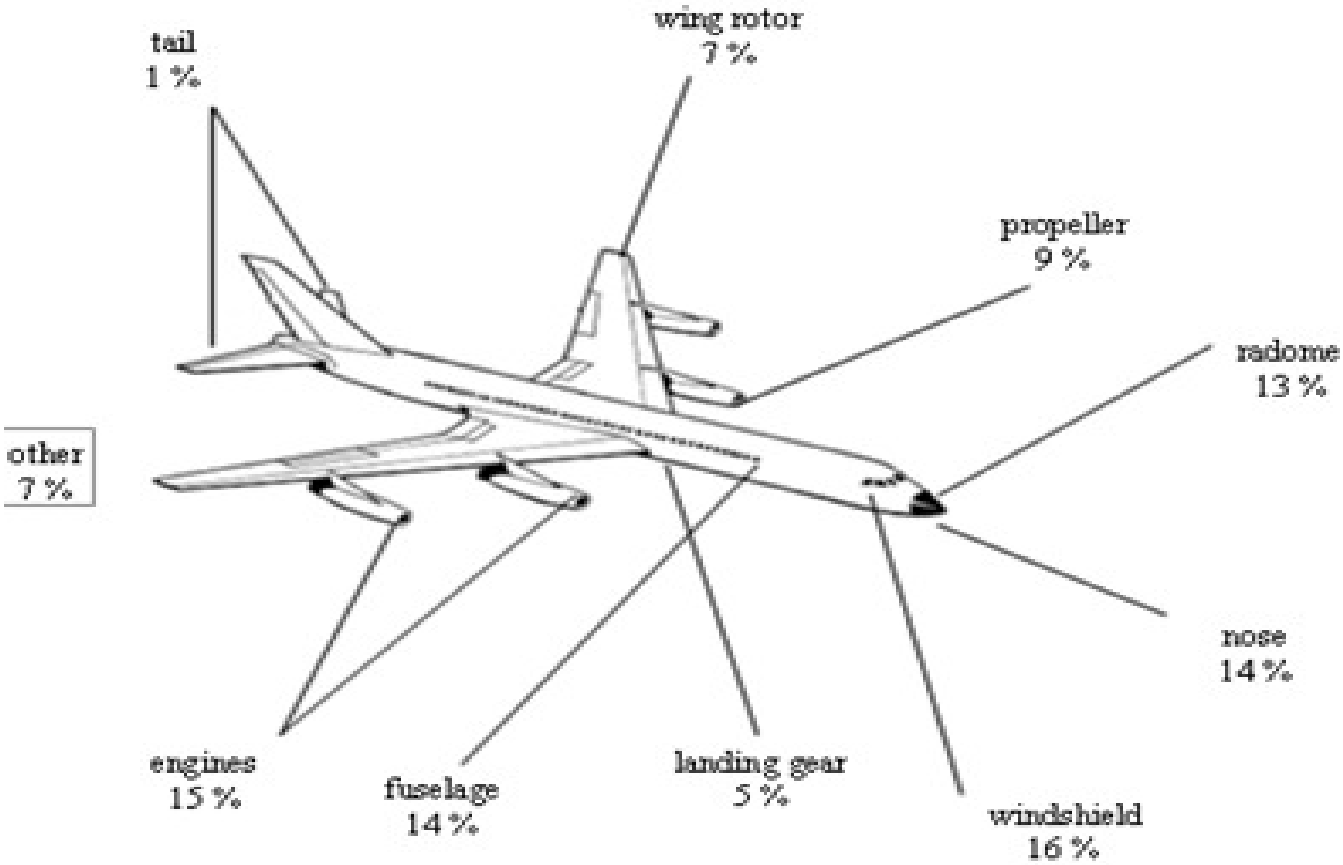


Chart 6 : parts of aircraft struck or damaged

Source: international civil aviation organization

1. Significant bird strike: A significant bird strike is when it has caused significant damage to the Aircraft or affected the flight.
2. The information on flight phase is not provided in some reports.
3. One strike may affect more than one part of an aircraft.
4. One strike may have more than one effect on flight

Wildlife hazard statistics by ECAA

TABLE 2: Wildlife hazard statistics by Ethiopian civil aviation authority

Bird Strike							
No	Aircraft Model	Date	Local Time	Location	Height AGL	Bird/wl species	Parts of Aircraft
1	ET-AKC, B757-200	10/28/2007	2215	A.A	T/of roll	-	One engine and 6 tyres
2	ET-AUC B737-700	7/13/2007	1129	25l	Role, INTL	Unknown	Landing gear
3	ET-ALP B767-300	4/13/2007	10.09AM	07Q	10-1Jft (taxe off run)	Ordinary eangle	Landing gear
4	ET-ALQ B737-700W	4/7/2007	18:34 (day)	17 HUN/EBB	On T/0 roll	Heron	Windshield
5	ET-ALK B737-700	6/19/2006	13:30 (day)	HRYR	Landing roll	Unknown	Engine 2
6	ET-AHB	11/20/2006	-	A.A	-	-	-
7	ET-ALL B767	5/8/2006	26		Land roll	-	-
8	ET-AJS B757F	10/22/2005	-	Legos	-	-	Fan Blade
9	ET-AIS B757	11/22/2005	07:00AM	A.A 07R	Lift off	-	Fan blade
10	ET-AKE B757-200	10/13/2005	-	A.A	-	-	Fan blade
11	ET-ALQ B737-700	4/27/2005	-	A.A	Land roll	-	No damage
12	ET-AKT	1/17/2005	08:42	Axum R35	Land roll 10ft		Lower fuselage
13	ET-AKE/B757	1/9/2005	-	Dubai	-	-	Fan blade
14	ET-ALP B767-300	4/13/2007	0709GHT	A.A	Take off	-	-
15	ET-AKC B757	4/1/2007	-	Lome	-	-	Fan blade
16	ET-AGZ Cessna R172K	3/22/2007	-	A.A	Take off	-	Lower engine cowling
17	ET-AJB B737-200	3/11/2007		Mekele			Fan blade
18	ET-ALN B737-700	6/21/2006	0622	A.A	Landing roll touchdown	-	Landing gear door
19	ET-ALH B767-300	5/29/2006	0910	A.A	Take off run 7625ft	-	Fan blade
20	ET-AIT DHC-6	1/22/2007	1300	/07R/ A.A	Approach 400ft		Wing leoding edge

Bird Strike							
No	Aircraft Model	Date	Local Time	Location	Height AGL	Bird/wl species	Parts of Aircraft
21	ET-ALL B767-300	12/14/2006	-	BRA22A V1LLE	-	-	Fan blade
22	ET-AIF B767-200	11/1/2006	-	A.A	-	-	Radom
23	ET-AKT F-50	10/24/2006	-	Dire Dawa	-	-	Vertical stab
24	ET-ALC B767-300	11/9/2006	-	A.A	-	-	Leading edge slat
25	ET-ALO B767-300	8/16/2006	-	A.A	-	-	Fan blade
26	ET-ALF B757-200	7/19/2006	08	Lome	T/of run	-	Fna blade
27	ET-ALH B767-700	7/22/2006	0745	A.A	Landing roll	Ground	Fan blade
28	ET-ALN B737-700	6/20/2006	-	A.A	-	-	Nose /Radom
29	ET-AKR F-50	7/15/2006	1515	A.A	Applroach	500ft	Right Nose
30	ET-ALC B737-700	10/5/2006	00:52	N'djamena	Landing roll	-	Windshield
31	ET-ALQ B737-700	9/20/2006	06:59	07R	Lift off	-	No injure
32	ET-ALQ	11/23/2006	13:18	Kigali	Landing roll	Eagle	Engine No. 1
33	ET-AJB B737-200	11/24/2004	night	Dire Dawa	Take off	Hyena	Crossed
34	ET-AKC B757-200	9/25/2004	-	A.A	-	-	Fan blade
35	ET-AJS B757-200	9/8/2004	-	A.A	Take off	-	No strike
36	ET-AKC B757-200	10/17/2004	0919	07R	7676 ft (take off)	Vulture	Fan blade
37	ET-ALK	10/10/2004	-	EBB	Land roll	-	-
38	ET-ALU	9/16/2004	-	Mekele	Take off	-	No. damage
39	ET-ALK	12/4/2004	06USA	HRYR	50ft /app/	-	No damage
40	ET-ALJ	3/30/2004	23157	A.A	A.A-DXB 14000ft	-	Window
41	ET-AKT F-50	10/16/2004	11:15AM	Mekele	20ft	-	Propeler
42	ET-AKU	10/16/2004	1437	07R	Take off	Eagle	blade
43	ET-AKT	9/18/2004		Dir/Nador/	Take off R33	-	Right enigne shut
44	ET-ALC	10/29/2003	-	Lagos	-	-	Leading adge
45	ET-AHY Cessna R172K	11/17/2003	-	A.A	-	-	Leading edge
46	ET-AKT	4/19/2003	11:50	Gonder	Landing roll	-	Propeler
47	ET-AKR	2/19/2003	-	Dire Dawa	-	-	Nose Radome

Bird Strike							
No	Aircraft Model	Date	Local Time	Location	Height AGL	Bird/wl species	Parts of Aircraft
48	ET-AKR	2/19/2003	0925	Gigiga	Clumb 19500ft	-	Nose radome
49	ET-AJB	2/6/2003	1320	R17 Entebbe	Take off	-	No damage
50	ET-AKC	2/10/2003	19:38	Entebe	Take off	-	Fan blade
51	ET-ALH	6/27/2009	06157UTC	A.A	10ft/climb	-	Leading edge
52	ET-ALN	5/31/2009	(night) 2308t	FTTJ (NDJ)	968ft	BAT	No Damage
53	ET-AIG	5/26/2009	0845VTC	A.A	8400ft	-	Leading edge
54	ET-AJK	4/23/2009	-	A.A	-	-	Wheel tyre
55	ET-ALY	1/26/2009	-	FCU(Rome)	Araival	-	Fan blade
56	ET-ALZ	1/10/2009	-	Liberville (Duala)	Take off	-	Fan blade
57	ET-AHT	11/22/2008	-	A.A	-	-	Leading edge
58	ET-AKE	11/14/2008	-	Ouggadopugu OUA	Landing	-	Flap damaged
59	ET-AJS	11/3/2008	-	A.A	-	Pigons	Fan blade
60	ET-AIH	10/2/2008	-	A.A	-	-	Leading edge
61	ET-AIH	9/6/2008	0900	A.A	1000ft /app/	-	Leading edge
62	ET-AMG	9/29/2008	-	25L	Taxing	-	Unknown
63	ET-ALZ	9/15/2008	-	Kinishasa	-	-	Acoustic panel
64	ET-ALD	1/14/2008	1704	Kigan Int	4874	-	Minor damage
65	ET-ALK	2/2/2009	-	-	-	-	HPC blades
66	ET-ALQ	5/8/2008	-	A.A	-	-	Leading edge
67	ET-ALL	2/19/2008	-	OKR	-	-	Fan blade
68	ET-AHB	3/13/2008	-	A.A	-	-	
70	ET-ALP(B767-300)	10/28/2009		ENTEBBE	-	-	RH engine and inlet cowl
71	ET-ALQ	11/11/2009	-	BJR		Eagle	-
72	ET-ALQ(Boing-767)	3/12/2009		AA		FOD	engine damage
73	ET_AKC	2/19/2010	-	ROB/MONROVIA		-	fan blade
74	ET-ALY	2/3/2010		Lagos			struck
75	ET-AME	12/10/2010		BZV			leading edge1
76	ET-ALH(B763)	3/23/2011	0050am	AA(07R)	12500ft		struck
77	ET-ALZ/B757-200	7/16/2010	1307pm	LFW	0		fan blades
78	ET-AKE/B757-200	11/2/2011		AA(07R)	1500ft		struck
79	ET_AKE/B-757	10/2/2011		AA			fan blades

Bird Strike							
No	Aircraft Model	Date	Local Time	Location	Height AGL	Bird/wl species	Parts of Aircraft
80	ET-ALK	2/18/2011		Zenzibar	50ft		struck
82	B575-200	5/25/2011	2215	ZHSC	6900	--	NONE
83	B777-200	5/5/2011	11:10	AA	50	---	engine
84	B767-300	5/5/2011	o5:00	AA	152	--	none
85	B757-200	10/6/2011	14:28	Augadugu	2600		engine damaged
86	B757-200	7/15/2011	11:30AM	A.A.	300	unknown	none
87	B757-200	3/8/2011	16:10	DKR	1000	----	nose gear
88	Q400	8/18/2011	15:20	ADD	160	pigeon	fuselage
89	B737-800	8/28/2011	17:04	NBO	lift off	----	engine
90	B757-200	8/14/2011		AA			
91	B737-800	7/30/2011		AA		vulture	
92	B757	9/15/2001	12:47	MALABO (SSG)			LEFT ENGINE
93	DHC8Q400	9/29/2011	13:55	MQX			RIGHT PITOT STATIC TUBE
94	B767-300ER	11/20/2011	12:40	Harare	take off	unknown	non
95	Boeing 737-800	11/15/2012	---	Bunjumbura	----	------	non
96	B767	2/15/2012	07:40	Addis Ababa	on take off	unknown	non
97		4/10/2012	07:15UTC	Addis Ababa		unknown	left wing tip
98	B757-200	4/8/2012		Addis	roll off	HAWK/AGLE	fan blade
99	B 763	4/22/2012	0400	TLV/LLBG	6000	unknown	WING/ROTOR
100	B 737-800	4/24/2012	0702	BOLE 07 R		unknown	ENGINE NUMBER1
101	B737-700	4/28/2012	02 21 PM	JUBA	2500	un known	ENGINE NUMBER1
102	B772LR	5/18/2012	09 38 LT	BOLE	take off	un known	wing
103	B737	5/19/2012	21:17	HAAB	1000	UN KNOWN	WIND SHIELD
104	BOEING 737-700	11/24/2011	1502	JUBA			wing and windshield
105	DH8D	6/13/2012	09;28	HASR	20		LANDING GEAR

Bird strike total by year	
year	How many
2001	1
2003	7
2004	11
2005	6
2006	17
2007	9
2008	11
2009	10
2010	4
2011	17
2012	11

TABLE3: Bird strike by year

BIRDESTRIKE BY MONTH	
Month	CountOfmonthbytext
DEC	3
JUN	4
AUG	4
JAN	6
MAR	7
JUL	7
SEP	10
MAY	10
FEB	10
APR	12
OCT	14
NOV	14

TABLE 4: bird strike by month

Habitat Modification — Passive

Introduction

Successful wildlife management inevitably results when airports alter the features that make these locations attractive to high-risk species. Referred to as *habitat modification*, this procedure involves fundamental and sometimes drastic alterations to both the natural and man-made aspects of airport environments. Sources of food, water and shelter (places to nest, feed, loaf, or roost in safety) are removed or modified, and the number of resident animals and species are reduced; as a result, strikes occur less frequently. While more costly than many other techniques, habitat modification offers the greatest possibility for a lasting solution. Although initial costs may be high, long-term wildlife-management costs are significantly reduced, as the need for ongoing scaring and killing activities is minimized. The key to effective habitat modification is to remove existing attractions without introducing new enticements that may appeal to other species. Many species are rarely involved in strikes—a robin nesting beside a hangar is of little Concern, yet action should be taken to prevent a flock of gulls from loafing on a runway. **Every species on the airport presents a risk**; however, larger flocking species are particularly hazardous and should therefore be dealt with first (see Section H). Therefore, habitat modification should be aimed primarily against those species that pose the greatest risk to aircraft safety.

The ecological survey (wildlife hazard assessment)

An ecological study that focuses on the conditions that attract hazardous

Wildlife to the airport should be completed before any major habitat changes are implemented. The ecological investigation of airports and their immediate vicinities should indicate:

- How many birds and other wildlife hazardous to aviation are in the area,
- Which species are involved?
- How the birds are distributed, both spatially and temporally,
- Why they are there, and
- How they move in relation to airports and aircraft flight paths.

Observations should be made during all hours of the day, and during all

Seasons to take into account daily and seasonal fluctuations

Studies should include data on geography, hydrology, soil, climate, vegetation, and building designs. Birds and other fauna in the area should be considered, as well as human activities such as agricultural and waste-disposal operations. The research will provide the factual information needed to understand why hazardous species are present at airports and, as a result, will also suggest what habitat modifications might be in order.

Taking action at airports

While animals can move freely between airports and adjacent areas,

Operational wildlife-management activities are generally limited to the zones where the majority of strikes occur—specifically, both the grounds inside perimeter fences and ***airspaces below 500-feet AGL on takeoff and below 200- feet AGL on approach It is in these areas that wildlife-control personnel have the greatest ability to introduce effective measures*** (*Bruce MacKinnon 2010*).

Transient and resident wildlife species

Birds and mammals can be grouped generally according to their activities and the time they spend at airport sites. Such species categorizations, including *transient* and *resident*, may be used to establish programs and procedures for the control of many animals.

Transient species are those that periodically inhabit airport sites, including migratory species that pass through airfields on a seasonal basis, and other species that visit daily while traveling between feeding and roosting sites. Transient species are attracted primarily by food sources and resting areas. Resident species are those that are native to airports for all or most of the year.

Such species forage at airports while relying on these locations for permanent shelter, as well as loafing, breeding and nesting sites.

As a rule, habitat modification techniques are the most effective control

Method for transient and resident wildlife types. While transients respond well to scare tactics and dispersal methods (not getting the opportunity to habituate to these methods), resident and daily-transient species require extensive, long term habitat modification programs.

Example of resident and transient birds at Bole International Airport

Table 5: Resident birds

No	**Resident birds**
	Purple Glossy Starling
2	Black Kite
3	Common Waxbill
4	Pied Crow
5	Vultures
6	Winding Cisticola
7	Yellow-shouldered Widowbird
8	Yellow-crowned Canary

SOURCE: Dr Zerihun weldu, etal….1997

Table 6: Transient birds

No	**Transient birds**	
1	***Infrequent***	***frequent***
2	Abdim stork	pigeons
3	Cattle egret	Sacred Ibis
4	Glossy Ibis	Wattled Ibis
5	Hammer kop	
6	Kittlitz Sand plover	
7	Open-billed stork	

Dr zerihun weldu, etal….1997

Table 7: Example of risky birds at BaharDar

no	*Name of the species*	*remark*
1	*cormorant*	
2	*geese*	
3	*crane*	
4	*vulture*	
5	*mallard*	
6	*Great black-backed gulls*	

Dr ayalew wende, etal…2011

Wildlife attractants at airports

As mentioned earlier, most birds and mammals are attracted to airports by sources of food and water, and by the availability of shelter, where they can safely rest, nest, and roost.

Food

Wildlife's are attracted by the presence of:

- Garbage (edible waste),
- Fruit-producing trees and bushes,
- Seed-producing vegetation,
- Green weeds,
- Grass,
- Aquatic vegetation,
- Agricultural grains,
- Large numbers of rodents or small birds, and
- Large numbers of insects and earthworms.

Eliminating bird-food sources at airports is a difficult task. For example, along-grass program might be implemented to deter gulls. Long grass, however, will attract rodents, and under some circumstances may lead to an increase in raptor populations. When it is unclear which food sources are the major attractants, it is also difficult to determine how to eliminate them. Additionally, most airports do not have the money and equipment required to purchase and apply chemical repellents, or to conduct large-scale removal of vegetation. All these obstacles point to the need for thorough ecological surveys at each site—surveys that will provide wildlife-management personnel with the critical knowledge they require to develop effective measures.

Table 8: Habitat management: food source

Food source	Management technique
Crop land	Keep cropland more than 1,200feet away from run way
	Reschedule cultivating and harvesting that attract flock of birds
Earth warm	Sweep worm off run way following heavy rains
	Prevent worms from crawling on to the tarmac
	Apply worm repellent along the edge of the run way
Garbage dump	Locate dump at least 8Km from airport reference points
Grass field	Site specific studies are required in order to determine optimum grass length
	Keep grass area free from broad – leaf weeds, which attract some mammal species and provide a food source
	Spray insecticides and herbicides beside runways to eliminate seed and insect

Water

Waterfowl and shorebirds are particularly attracted to surface and standing Water. As a general rule, all physical Features that hold standing water should be modified or eliminated. Pits or depressions that regularly collect water should be drained and backfilled; clogged waterways should be cleared. Using wire to cover bodies of water—such as lagoons—inhibits birds from landing. The banks surrounding

These areas should be graded to a 4-to- 1 slope to discourage birds from resting in the water—birds are less likely to frequent areas when unable to spot predators above the banks.

Water Habitat	Management Technique
Open Drainage/ Ditches	Increase the slope of banks to eliminate shelter areas
	Drain ditch bottoms to eliminate standing water used by birds and mammals
Water Bodies	Use herbicides and clearing techniques to limit vegetation (cattails, bushes) on the banks of all water bodies
	Set up barriers to prevent access to water using material such as nylon mesh and wires

Table 9: Habitat Management: Water Habitats

The regular clearing of drainage ditches minimizes bird and mammal attractants. When clogged with vegetation and eroded soil, ditches retained. Not only are birds attracted by the presence of water for drinking and bathing, they also benefit from the insect and aquatic life that flourishes in these locations. Ditches should be graded so that water runs off as rapidly as possible. Grass and other vegetation should be cut on the sloping banks. The ideal solution, when practical, is to replace ditches with buried drainpipes. Special attention should be paid to wetland areas such as swamps, bogs, fens, and marshes, which are not always easy to drain and fill. In some cases, Federal or Provincial regulations protect wetlands. Existing Federal and Provincial guidelines should be consulted before any wetland modification takes place.

Shelter

Shelter habitat includes safe areas where wildlife loaf, perch, roost, and nest. Depending on the species, birds will find natural or man-made shelter in the following areas:

• Forests;

• Dense brush;

• Dead trees;

• brush piles;

• Water bodies;

• Drainage ditches;

• Sewage lagoons;

• Open short-grass fields;

• building roof ledges, crevices, and holes;

• Overhead wires;

Old aircraft

Towers; and

Vents and ducts

Birds often seek the shelter of airport buildings and long-grass areas. These animals also find safety in open airport spaces that afford clear views of the surroundings, allowing birds to see approaching predators. Nesting also occurs at airport buildings and in long grass, as well as in shrubbery and forested areas nearby. In most cases, wildlife shelters—once identified—can be effectively managed with little cost and effort.

Attractive Habitat — Suggested methods of control

No two airports are ecologically or operationally the same, nor do they share identical wildlife problems. Consequently, it is difficult to prescribe a solution for a particular problem without first conducting a thorough investigation.

The following guidelines, however, provide a general overview of control methods as they apply to certain airport terrains.

Runways, aprons, and taxiways

Problem areas should always be prioritized in accordance with the hazards they pose to aircraft safety. Not surprisingly, runways take highest priority,

Including approach/departure paths and adjacent areas. When wildlife are kept clear of these areas, the hazards to incoming and departing aircraft are greatly reduced.

The hard surfaces of aprons, taxiways, and runways attract certain species:

• Gulls and shorebirds like to loaf on tarmac, as asphalt and concrete are often warmer then surrounding areas, especially in colder weather. During periods of heavy rain, these birds often feed on the worms that crawl onto runways. (At Heathrow Airport in England, several gull strikes occurred on a single day after extensive rains brought worms to the surface.)

• Crows have been reported to drop rats on runways to kill them.

• Grit from broken pavement and concrete is used by some birds to break down food in their gizzard.

Suggested control

Worm outbreaks are predictable, so airport authorities should conduct

Thorough clean-up operations with sweepers as soon as worms begin to invade runways. For pro-active, permanent solutions, consider these approaches:

• Apply vermicide (worm-killing chemical) to the grass strips beside runways.

• Apply worm repellent along runway edges.

Note: See Section E, Dispersal Methods, on the use of chemicals for killing earthworms along runways and taxiways.

When spraying for insects along the grassy strips beside runways, ensure a relatively broad area is treated, otherwise insects will quickly return. Because of the publicity regarding the undesirable side effects of many pesticides, use of these materials should be continually monitored to determine the effects on target and non-target species.

One reported success was at a U.S. Air Force base where starlings had caused extensive damage to a C-130 during lift-off. The 250 dead starlings found on the runway were part of a large group that was feeding on Crane Fly larvae in areas nearby. Subsequently, these areas were sprayed with a mixture of insecticide (diazinon) and moth crystals (Para-dichlorobenzene); the latter chemical was added as a starling repellent. The results were favourable and the starlings avoided the area. It is likely that they were driven away by the depletion of their food source, because subsequent studies have shown that starlings are not repelled by Para-dichlorobenzene.

Another attraction that draws birds to airport tarmacs is the presence of

Posts, light and markers. Many birds, especially birds of prey, like to perch rather than stand on the ground. Any unnecessary posts or structures on the airfield should be removed. Perching can be prevented by installing sharp spikes commonly known as porcupine wire with trade names such as Nixalite. If strips of porcupine wire are attached with hook and loop fasteners, they can be easily removed for maintenance purposes. Individual posts can be made less attractive by embedding a single large nail in the top of the post. Other techniques include the application of commercial products that leave a sticky residue which makes perching uncomfortable. Applying these materials should be continually repeated, however, as exposure to sun, rain and dust reduces their effectiveness. Furthermore, these products can interfere with routine maintenance activities on lighting fixtures etc. Apart from these specific measures, airport authorities should work diligently to ensure runways and taxiways are kept clean. Inspections should be routine, and all materials that might attract birds—such as carrion, spilled crops, and refuse—should be removed immediately.

Grassland

While grass may be aesthetically appealing, easy to maintain, and functional in absorbing water and snow melt, it is probably the dominant bird-attracting feature at airports. Both long and short grass can pose problems, as they each attract different species. In response, site-specific grass-management programs should be implemented, acknowledging airports' particular hazardous species.

Along runways, strips of short-cut turf—generally less that 10 cm high—should be firm enough to support aircraft that leave the runway, and to withstand braking. These grassy sections should also ensure visibility of signs and lights. Many airports also maintain short grass throughout infield areas.

Long-grass programs have been implemented around the world and have

Proven effective against some species, specifically gulls and starlings. (Long grass refers to grass that is greater than 15 cm in height).

Grassland during the wet season (August, 2010; Photo: Tsigereda Dessalegn)

Long grass also harbors' ground-nesting Birds (partridges, pheasants, ducks, owls,

Harriers), numerous small mammals (Mice, voles, hares, rabbits), and large

Numbers of insects. Birds such as gulls and plovers, however, do not generally

Frequent long grass because it obstructs their view, interferes With their movement, and impedes their Ability to achieve the Wing-beat needed For takeoff. Long grass is also dense, making it difficult for birds to find Such food as worms and insects. When employing long-grass programs, Potential insect infestations should be closely monitored.

The grassland during the dry season (February, 20011; Photo Tsigereda Dessalegn

Suggested control

In all over the world, there is no single recommended grass height that is effective at all airports. Wildlife biologist recommends that each airport should complete a site-specific study, then experiment to determine an appropriate, optimal grass height. The decision to maintain short or long grass depends primarily on which bird species pose the highest hazards.

So grass high research should be undertaken at a particular airport before deciding to manage the vegetation (grass).

The implementation of long-grass programs often raises the risk of insect infestations. Airport operators and wildlife-management personnel are therefore advised to establish working relationships with local agriculturists or pesticide contractors, as these experts are familiar with resident insects, and in some cases can either predict infestations before they occur, or suggest remedies during an outbreak.

Cropland

Many forms of agriculture—including fruit, vegetable, and grain farming, as well as many livestock activities—create food sources that attract wildlife. For this reason, agricultural practices in the vicinity of airports should be strictly monitored and—when possible—controlled.

Suggested control

Airport operators should carefully consider the potential risks associated with the leasing of airport lands before lease contracts are signed. Cereal grain, market vegetable, and other bird-attracting crops grown on such lands should be kept as far away from the runways as possible. Ploughing and harvesting activities, which attract flocks of birds to runway areas, should be relegated to hours of darkness or periods when the problem species are away from airports—during nesting season for birds.

Deciding what crops, if any, to allow at an airport requires important consideration. Farmers and airport operators should work closely throughout the planting and harvesting process. Remember, reducing the number of birds is in the farmer's interest as well as that of the public, as crop damage and aircraft damage are both minimize

Brush

Found on undeveloped airport grounds, brush, or wasteland, commonly

Features tall weeds, grasses, and shrubs—all of which attract birds and other wildlife such as monkeys.

Suggested control

Brush and bushy vegetation should be eliminated from airports; at the very least, it should be cleared to within the airport vicinity. Cutting, clearing and herbicide treatments can be employed for this purpose.

Woodlots

These parcels of tree-covered land provide a multitude of nesting, resting, roosting, and feeding opportunities for birds. Tree species that produce soft fruits, berries, or high numbers of seeds are especially attractive to all types of wildlife. Trees also provide cover for medium-sized and large mammals.

Large trees located at the edges of open areas provide excellent vantage points from which raptors can survey for food. In addition, trees can create an *edge effect*—an intermediate area often rich in bird life because it borders two different habitats, such as grassland and wooded areas.

Suggested control

Trees should be located as far as possible from runways, certainly not within 150 meters of runway ends or runway centre-line .If tree cutting is not feasible, all undergrowth should be removed. Trees can also be thinned at their tops to make them less attractive as roosting sites. Trees should be frequently inspected for colonies of nesting birds, like crows, and for roosts of such species as starlings

Landscaped areas

Many airports—civil and military—Landscape the areas surrounding buildings, roads and hangars for aesthetic Purposes. Decorative trees and shrubs, however, often produce seeds and Berries that attract birds, while also providing shelter, roosting, and nesting Sites. Dense stands of evergreen trees are particularly attractive roosting site for starlings and crows.

***Biden's sp.* during the wet season (September, 2010; Photo: Tsigereda Dessalegn)**

Suggested control

Trees and hedgerows should be cut back a minimum of 150 meters from runway or taxiway centre lines. Some varieties of trees and shrubs are acceptable; however, appropriate horticultural stocks should be selected on the basis of expert advice obtained from government or university scientists.

Water-body management

Birds in search of food, drink, shelter and bathing opportunities are attracted to all airport water features: shorelines, marshes, lakes, ponds, pits, creeks, canals, ditches, gullies, wet meadows, and pools—even puddles. In addition, water bodies—even temporary ones—often support large insect populations.

Water body (January, 2011);
Photo: Tsigereda Dessalegn)

Suggested control

Eliminating water bodies is the best solution, although measures such as replacing drainage ditches with buried culverts can be costly. If water-body elimination is not suitable, the following guidelines should be followed: All water bodies should be cleared of emergent and submerged aquatic vegetation by cutting, dredging, or through the use of herbicides. The banks should also be cleared of cover vegetation such as cattails and brush. The banks of water bodies (particularly ponds, streams) should be graded to a 4-to-1 slope, which will discourage burrowing by animals. Steep banks also discourage birds from using water, as they then find it more difficult to spot predators. Steep banks also create a clearly defined edge to which grass can be easily mowed, thereby reducing boundary habitats.

Low areas, where temporary pools form after rainstorms and spring melt, should be filled or fitted with improved drainage systems.

In areas where gulls and waterfowl cause major problems, physical barriers should be erected to prevent access to water. Barriers are available in the form of nylon mesh or wires that are strung across the surface to prevent birds from settling on the water.

Airport buildings and structures

Sparrows, starlings, pigeons, and crows have adapted to human development, and make full use of the many opportunities that human activity provides. The built-up areas of airports offer these so-called city birds a variety of nesting and resting sites, as well as sources of food.

Large buildings, such as hangars, provide many places for birds to nest and rest. Gulls and pigeons like to sit on roofs and ledges. Sparrows, starlings, swallows, and pigeons have been found nesting in and on hangars. During aircraft overhauls, bird droppings, feathers, and nesting materials can affect exposed electronic equipment.

Airport structures such as unused sheds, deserted farmhouses and outbuildings, old windbreaks and rotten fence posts also lure wildlife with the promise of nesting, resting, roosting, and feeding opportunities. These unused structures should be removed from airport lands.

Birds pose not only collision hazards in the vicinity of buildings; they also are a serious nuisance because they soil these locations. Bird droppings create a slippery mess, and can corrode the skin of aircraft. Droppings also deface the roofs and facades of airport buildings. These droppings are often sources of bird-borne disease, which are known as zoonoses disease.

Suggested control

Screening the many holes and openings in hangars is a first step in denying bird's access to these buildings. In active hangars, however, doors are opened frequently; even when they are kept closed there is usually some space above or below the doors through which birds can move. Flexible netting around hanger doors has proven most successful in these situations. Netting installed across the base of rafters has proven successful in excluding birds from the rafter system. Unfortunately, major architectural changes are expensive and rarely feasible.

Minor changes, however, can also be effective in reducing the bird presence.

• Block or cover all holes, such as access vents, using screen or similar

Material. Blocking or covering drains can also prevent rodents becoming a problem inside a building.

• Block and seal all crevices and holes on the outer surface of the building with screen, concrete, or brickwork.

• Slope building ledges to an angle of 45 degrees or greater using boards,

Plastic sheeting or concrete; this eliminates attractive roosting and nesting sites. Vertical plastic blinds installed in doors that are frequently left open will repel many birds from entering hangars or other buildings.

• Install netting, sheet metal, or other suitable barrier materials under

Overhanging eaves and ledges to prevent access by swallows.

• Fine parallel wires can be attached to antennae, towers, and overhead wires to discourage birds from perching and roosting. Spiked material such as porcupine wire can also be installed, although this is generally an expensive alternative.

Edible waste and edible-waste storage

Edible waste is created at airport Restaurants, flight kitchens, and at points where in-flight meals are prepared. Proper storage is critical to ensure the material is inaccessible to birds until it is removed to off-airport disposal sites. Airport property leases should contain clauses that address waste disposal and reduce bird attractions. Feeding of birds in taxi-cab stands should be prohibited. Gulls, crows, and pigeons regularly patrol terminal loading areas where food and

garbage is often dropped during aircraft servicing. Frequent and unannounced inspections by airport staff can help ensure that more care is taken in the disposal of edible material.

Garbage dumps
Often an eyesore and a health hazard, garbage dumps are also a major source of food for high-hazard birds. Waste disposal sites located at airports literally breed danger; removing such facilities from airport lands should be the first act in any program to reduce bird problems. If off-airport garbage disposal is impossible, edible refuse should be mixed with earth and buried immediately after being dumped. Disposal operations also attract fewer birds when conducted at night. Several airports—including Vancouver International airport— have eliminated their dumps and significantly reduced bird populations.

Perching and nesting sites
Perching sites are important for birds, offering vantage points that overlook the immediate surroundings. Perches are places from which birds sing, call and display. They also act as observation points, hunting lookouts and as places to rest, digest, preen, roost, and gather socially. As potential perches for birds, lone trees, hedgerows, fences, gates, posts, shrubs, stumps, junk, weed patches, and boulders should be removed from airport lands. Power lines are popular perches, and should be relocated underground. Although a labour-intensive solution, porcupine wire should be fitted to runway, approach, taxiway, and Apron lights to discourage their use as perches. Birds are quick to find whatever nesting opportunities are available. At Airports, they nest under bridges, in culverts, old shacks and work huts, and on radar towers.

Implications of Land-use Activities in the Vicinity of Airports

Introduction
Airports naturally attract many species because of both the wide-open and short-grass areas that provide basic protection from predators and humans. As discussed in Section C, airports also provide access to food and water sources. Wildlife-management programs at many airports effectively diminish the power of these attractants by modifying and managing habitats, as well as by using techniques to disperse birds.

However, even when airport bird-control activities are effective, they can be neutralized by the presence of attractive land-use activities that are outside the airport boundary and, therefore, beyond airport operators' spheres of influence. In these cases, hazardous bird species will persist in their use of airports as convenient stopovers and resting places before and after feeding at nearby locations. Particularly severe problems arise when birds make regular flights across airport properties—when they fly between roosts and feeding areas, for instance. The greatest problem at many airports is the presence of one or more waste disposal sites within the vicinity of the airport. These facilities provide food for a large number of birds, which may then use adjacent airports as loafing and resting sites. Where wildlife hazards are concerned, regulations that minimize attractants in surrounding areas should mirror procedures employed on airport lands. This regulatory harmony can be found through *compatible land-use planning*, a process that has resulted from the need to establish a co-operative environmental relationship between airports and the communities they serve.

While relatively simple, this concept has delivered, in practice, impressive results through the development of airport/community-system plans, as well as legislation for compatible land uses, easements, and zoning. Implementation, however, requires careful study, coordinated planning, cooperation, and compromise by experts and stakeholders in all related fields.

Planning in the vicinity of airports

The goal of airport zoning regulations is to prohibit hazardous land uses

Outside airport properties. These land uses include:

- Garbage dumps,
- Food-waste landfill sites,
- Sewage outlets,
- Fish plants,
- Fish piers,
- Abattoirs,
- Pig farms, and
- Bird-attractant agriculture

Where hazardous land uses are already established and prohibitions are not an option, remedial actions may be taken:

- to ensure that municipal officials responsible for planning and zoning

Enforcement are aware of existing guidelines;

- to inform owners and managers about the hazards their operations create;
- to develop management programs to minimize the attractiveness of the

Operations.

By-law development

The development of planning policies and planning statements is the first step toward ensuring compatible airport-vicinity land-use activities. On the basis of these documents, municipalities may then enact zoning by-laws, which are implemented to regulate land uses, and to set restrictions on various aspects of development.

Through these by-laws—which are occasionally amended to

Reflect changing needs and objectives—an ecological, social, and economic balance is maintained within municipalities.

In many cases, airports now face urban-development pressures that were nonexistent when the facilities were first built. Thus, it has become increasingly important for operators to be aware of and involved in decisions that pertain to land-use activities near airports. It is also important to form partnerships and communicate with all stakeholders in the area.

Extremely hazardous land-use practices

Food-waste landfill sites
An aviation analysis is often conducted to assess the bird hazards that may result when the landfills are established. If studies reveal that additional bird hazards are probable, then landfill operators or proponents can be responsible for establishing programs that will control or minimize bird activity. It is preferable that these programs reflect those in place at adjoining airports, and make use of the same dispersion techniques. The use of over-wiring or netting to cover the working faces of landfills—the area where waste is currently dumped—could prevent or greatly reduce gull use. It has been demonstrated at many sites that portable installation units allow the netting or wiring to be easily shifted as the dumping location changes. Landfills should also be covered daily with soil to reduce bird-food sources, or prior to any period when the landfill will not be attended such as weekends.

Case histories

San Francisco, California
The mix of gulls, garbage, and airports is particularly dangerous in the San Francisco Bay area. Gulls are not only attracted by garbage available on the face of the airport-area dump, they also forage immediately beneath the surface. Some estimates put the airport gull population as high as 15,000. Several different dumping methods were tried, including digging large trenches into which the refuse was tipped and immediately covered. This was partially effective, although the gulls continued to swarm the trenches during the short intervals the garbage was exposed. The birds also began feeding from the daily stream of arriving garbage trucks.

The airport ornithologist noted that the gulls arrived at the dump shortly

before dawn and left just after sundown. At night, the birds went to resting areas, some in shallow water near the coastline, others in water located on the airport itself—water that airport authorities drained immediately.

Meanwhile, household refuse was collected by day and stacked in a covered area that was inaccessible to birds. While this covered area was some distance from the airport, it was still easily accessible to the points of collection. After nightfall, the refuse was transported to the dump, deposited in open trenches and then covered with earth. When the gulls arrived the next morning, their food source was no longer available.

Not only was the gull population dramatically reduced—from approximately 15,000 to several hundred within one week—the risks to aviation safety also decreased significantly.

Coastal commercial fish plants
Coastal commercial fish plants are extremely attractive to several bird species, particularly gulls. These birds pose a high hazard to aircraft because of their large size, their behavioral characteristics (flocking and soaring), and their preference for airport environments. Gulls are also willing to undertake far ranging daily flights for food. Commercial fish plants are therefore strongly discouraged on lands adjacent to airports. As in the case of landfills, fish plants that must be located near airports should be mandated to adopt strict control programs that minimize and control all wildlife attractants.

Moderately hazardous land-use practices
Wastewater treatment and wastewater discharge plants

Any activity that creates bodies of water in the vicinity of airports also

Creates indirect hazards to aircraft safety. These facilities should be located as far as possible from airport lands, and should practice appropriate wildlife-control measures.

Crop production

Topographies and near-rural locations often make airport areas popular for agriculture. Some operators also promote the use of their lands for crop production, thereby increasing airport revenues. In any case, when land is used for crop production it is important that airport operators be involved, ensuring crop choices that minimize the attraction of hazardous species. All proposed uses and crop selections should also be reviewed by wildlife biologists. Grains and cereals are major bird attractants and should be avoided when possible. The following table lists some of the crops commonly grown around airports, and presents alternatives.

When wildlife problems occur, immediate action should be taken, perhaps to modify ploughing and harvesting practices, or change crop types. In extreme cases, termination of agricultural practices may be necessar

Recreational activities

• Drive-in theatres
• Golf courses
• Marinas
• Picnic areas
• Outdoor restaurants
• Beaches
•Racetracks

Managed and supplemented natural habitats

• Migratory waterfowl refuges
• Designated game and mammal refuges
• Wildlife feeding stations
• Bird-nesting colonies
• Roosting sites

Conclusion

Effective airport-area land management is fundamental to safe aircraft operations. Wildlife attractants should be eliminated or at the very least minimized.

Active Management Using Dispersal Techniques

Bird dispersal techniques

Dispersal techniques discourage birds by scaring them with visual devices such as scarecrows, or with auditory devices such as cannons and pyrotechnics. It is critical to experiment with a combination of methods, whether together or in rotation. This experimentation should be informed—and monitored—through the periodic analyses of daily wildlife reports, which will reveal:

• the effectiveness of applied control techniques for various bird species;

• the effectiveness of different dispersal techniques at different times of the day and under different weather conditions; and

• the amount of time birds remain dispersed.

Birds are naturally wary of unfamiliar sounds and objects in their environment. Unfamiliar noises, for example, may put them at alert, or cause them to take flight. Loud and abrupt noises, such as those produced by gas cannons, are initially most effective for many species of birds. Gradually, however, birds do become comfortable—or *habituated*—to all dispersal techniques. Birds that are flushed upon first hearing an unfamiliar loud noise may merely become alert the second or third time they are exposed to the sound. If birds repeatedly hear the same noise and do not associate the sound with actual danger, they will eventually stop responding. Under these circumstances, the most effective way to prevent habituation is to reinforce the threat by occasionally killing a few birds. Wildlife-control officers are advised to monitor bird responses to scaring techniques; the resulting information will assist in modifying and improving dispersal methods.

Even in cases where devices and techniques do work, they may not be effective on all problem species, or in all geographic areas. Perhaps most importantly, devices and techniques are only as effective as the wildlife-management teams that use them. Only skilled and persistent wildlife-management teams have the knowledge to ensure success.

Finally, if birds cannot be excluded from critical takeoff and landing paths, pilots should be warned about peak daily and seasonal bird-activity periods.

Habituation — A multifaceted approach

Habituation is the process whereby animals become accustomed to sights and sounds that might initially be frightening. Habituation occurs eventually with all scaring techniques when they are not reinforced with demonstrations of actual danger. The only exception is single-species distress cries; if used properly, they rarely result in habituation.

Environmental factors can affect the responsiveness of birds and therefore the rate of habituation. For example, feeding birds are less responsive to loud noises than resting birds—particularly if they are hungry. Small birds on open ground—far from protective cover—are more responsive than birds near cover.

Gulls, on the other hand, prefer to be able to see approaching predators; they may be more responsive when their view is blocked by vegetation. Some birds respond faster to loud noises in the morning than they do later in the day. Some birds respond in daylight and not at dusk.

Habituation occurs when birds learn that sounds or objects present no real danger. Most birds tend to avoid novel stimuli, unsure whether or not the threat is real. Certain curious species will investigate promptly. A flock of starlings may avoid a model of a hawk for only a few hours before realizing its harmlessness.

As habituation occurs through repeated exposure to the same scaring technique, it is necessary to continually change the appearance or location of the device, the combination in which devices are used, or the direction from which the sound originates. Even with all these dynamic adjustments to a dispersal program, birds may still become habituated. This is particularly true of gulls, which often must be re-educated to respond through the shooting of one individual. This demonstrates the true danger of the noises to the remainder of the flock. Should shooting become necessary, target individuals at the top of airborne flocks so that they fall past lower-flying birds? This approach has proven more effective than targeting members of resting flocks, or the last birds

in flying flocks. It is worth repeating that, as noted above, a mix of dispersal techniques should continually be altered—randomly—so that target species are kept off balance.

Vehicle use in wildlife management

The field vehicle is an essential part of any wildlife management program, providing transportation for officers as well as the necessary equipment for dispersing or removing wildlife. The vehicle should meet these general specifications:

Four-wheel drive: Off-road access at airports demands this feature, not just for mobility, but also for stability—four-wheel drive vehicles are less likely to chew up airfields and expose soil, which can attract birds.

FOD (Foreign Object Debris): resistant tires this is a critical feature, as these vehicles often travel among runways, taxiways and various off-road locations. The sharp debris found at landfill and waste-disposal sites also poses significant tire hazards. Wide tire 'footprints' improve flotation above mud and soft ground; wide tread patterns not only pick up less mud and fewer stones, they also shake off these adherents when they do become lodged between the treads.

Safety and communications: Equipment Amber rotating beacons are standard on all airfield vehicles. VHF radios are essential as well, tuned to ground-movement frequencies so all related personnel can remain in contact regarding bird movements. Adjustable spotlights are excellent for night observation of birds and large mammals. Cassette or digital playback components—including exterior-mounted loudspeakers—permit the broadcast of pre-recorded distress calls.

Auditory deterrents

An effective—but temporary—scaring technique involves the use of a variety of noises including sirens, car horns, human voices, amplified recordings, and pyrotechnics (firearms, cannons).

Natural bird-dispersing sounds include the alarm and distress calls of problem species, as well as the calls of their predators. A wide range of these calls is now commercially available.

Some manufacturers advocate the use of abstract sounds that are above and below the range of human hearing. As research has shown that birds hear the same sound frequencies as humans, products generating such abstract sounds are ineffective.

Birds are less likely to habituate to natural sounds that have meaning to them, such as the calls of flock mates in distress, or calls of predators. Habituation can also be reduced by frequently moving the sound sources, ensuring sounds are used sporadically, and through the occasional killing of birds to confirm that the sound does indicate danger.

Birds

Pyrotechnics (highly recommended)

Pyrotechnics are highly recommended for bird dispersal at airports. This technique can be extremely effective when used as part of a well-balanced and dynamic wildlife-management plan.

Pyrotechnics include various ammunitions that are fired from shotguns, starter and flare pistols, and purpose-built pyrotechnic launchers. They include shell crackers, flares, and firecrackers. The loud and abrupt noise emitted by some pyrotechnics is similar to that of shotguns, making them particularly effective against game birds that are familiar with the effects of weapons.

Safety and application: Precautions should be taken in any program using pyrotechnics, dispersal guns and shell crackers.

• Operators should wear eye and ear Protection at all times.

• Shell crackers should be fired from Open choke-type guns.

• Shell crackers may misfire, so gun Barrels should be checked regularly

For obstructions, particularly after a misfire.

• Cracker shells are corrosive, so guns should be cleaned daily.

• Pyrotechnics are fire hazards, and should not be used over dry vegetation.

• Pyrotechnics should not be fired from inside vehicles

Regular and proper gun cleaning is especially important. **First,** attach a bristle brush to a rod and push it through the barrel a few times to loosen all unburned powder. Repeat these steps with a brush. Next, use a clean cloth to coat the inside of the barrel with gun oil. Apply a thin layer of oil to the external surfaces of the gun to protect against moisture and rusting. Finally, check all parts of the weapon to ensure that they are in proper working condition.

The following firearm safety considerations should be observed:

• Never point the firearm at anyone, whether loaded or not. Keep the firearm pointed in a safe direction, usually straight upward.

• Never keep the firearm loaded, even with the breech open.

• Examine the firearm and liner daily. If either appears to have a fault, report it as unserviceable immediately. Before firing a pistol, ensure the barrel is dry.

• Never load firearms in or fire from inside a vehicle.

• Ensure that cartridges are handled carefully so as not to become distorted, damaged, or wet.

• Do not use excessive force when inserting cartridges into adapter sleeves. If cartridges do not slip in easily, set them aside and treat them as misfires.

• Wear gloves and long sleeves for protection against possible skin burns should cartridges misfire.

• Whenever possible, avoid firing cartridges directly up-wind.

• Use a pump-action shotgun because of its enclosed action or a breech-loaded single-shot gun because of the ease with which the barrel can be inspected.

• Never use choke-barreled guns, as they may impede the flights of the Second charges.

• Always pick up spent shells and, when doing so, be aware of the potential fire hazard of delayed second blasts.

• Avoid firing over runways.

• Always pick up FOD.

In general, volleys that explode in the air are more effective than those that explode near the ground. Use the minimum number of rounds required to achieve the desired results. The effect of additional rounds will only lead to habituation. The first shots flush the birds; closely following second shots often cause them to disperse. Ensure that the carcasses of all killed birds are quickly removed, there by Use of the scare cartridge, particularly with birds, requires cooperation between the user and ATC personnel so that birds are not dispersed into the path of oncoming aircraft. Generally speaking, a series of carefully placed shots can direct the birds to safer areas or off airport land entirely. A coordinated effort between two or more shooters can be highly effective.

Advantages

• Used correctly, pyrotechnics provide one of the most effective methods available for bird dispersal.

• The direction of dispersal can often be controlled by the placement of shots.

• Pyrotechnics are effective for both day and night.

• Pyrotechnics can be used as complementary devices with other deterrents.

Disadvantages

• Use of pyrotechnics is labour intensive.

• Pyrotechnics give rise to FOD on runways.

• Birds may habituate to pyrotechnics, especially if they are used improperly.

• There is a degree of fire hazard associated with these devices if used in dry conditions.

Effectiveness

The effectiveness of scare cartridges has been both overemphasized and maligned. This technique is most effective for the occasional dispersal of transient species. Although often used alone, the effectiveness of pyrotechnics can be greatly enhanced when they are used in association with taped distress calls and long-term habitat-management techniques. If used too frequently, habituation will occur. From time to time, reinforcement is necessary through the killing of individual birds.

Effective against:

• gulls, crows, starlings, and waterfowl.

Limited effectiveness against:

• Raptors when deployed at short range.

• Small birds,

Not effective against:

• Pigeons or House Sparrows

Permits required

Permits are required from EWCA (Ethiopian wildlife conservation authority) for all bird scaring or hazing activities that involve migratory birds if firearms are used. Permits may be required from federal wildlife authorities to scare other species, including mammals.

Distress Calls (highly recommended)

Use

Dispersal of many bird species.

Description

Many species of birds emit distress calls when they are captured, restrained, injured, or otherwise in danger. Distress calls signal danger and warn other members of the species to disperse. Specific to each species, distress calls—with a few exceptions—only affect other birds of the same species. Some species, including House Sparrows, are not known to have distress calls.

Application

Distress calls can be used to disperse starlings, blackbirds, and crows from night-roosting sites. Operators and equipment should be in position two hours before sunset. At least two sets of equipment should be used to vary the location of sounds, as two birds in distress signify a greater danger and therefore result in a quicker response.

If the roost is large and birds approach from several directions, more units may be necessary. Distress calls are then broadcast as each flock approaches the roost.

Broadcast may become continuous near sunset. On the first night, a substantial number of birds may enter the roost despite the broadcasts of distress calls. As these birds will not disperse

once they have settled into the roost, it is pointless to continue the broadcast; however, repetition of the procedure over three to five successive evenings should completely disperse the roost.

Advantages

• Because birds respond instinctively to distress cries, habituation tends to occur much more slowly than it does to man-made sounds.

• This technique can be used day or night—and in all weather conditions.

Disadvantages

• With few exceptions (see below), birds will only respond to distress cries of their own species. Some species do not emit distress calls.

• An assortment of tapes should be available, and the appropriate tape for each species should be used. Distress calls for some species are not yet available.

• Playback equipment should be of good quality for best results. Digital

Recordings are preferable.

• Some species, particularly gulls, may circle over the sound source to investigate the danger for several minutes before dispersing. The use of pyrotechnics can speed the dispersal once the birds are in the air.

Effectiveness

Used alone or in combination with pyrotechnics, distress calls are one of the most effective methods available for dispersing many bird species. There are, however, some variations in responsiveness both within and between species.

As noted above, most birds—except for some gull species that spend much of the year in mixed flocks—respond only to calls of their own species. Mixed flock gulls may respond to calls of the species with which they associate.

As noted above, even within a species, calls may vary with the location. One study showed that alarm calls that dispersed Herring Gulls in North America were ignored by Herring Gulls in Western Europe. If possible, it is advisable to obtain recordings of distress calls that were recorded close to the area where they will be used.

Alarm Calls (highly recommended)

Use Bird dispersal.

Description

Alarm calls are given by some gregarious bird's species when a predator is detected. The normal response of flock mates in the open is to flush and fly for cover. Like distress calls, alarm calls are species-specific.

Application

Alarm calls are employed in the same way as distress calls. Using alarm calls in combination with pyrotechnics and occasional killing enhances effectiveness.

Advantages

• Because the response to an alarm call is instinctive, the probability of habituation is reduced.

Disadvantages

• Quality alarm-call recordings are not available for many species.

• Bird alarm calls are higher in pitch and lower in volume than other calls. As a result, alarm calls do not carry as well over wide areas.

Effectiveness

Because of the difficulty in obtaining quality alarm-call recordings, few assessments have been made. As the alarm calls of many species tend to be similar, it has been suggested that a generic call might have broad effectiveness.

The study of a mixed-species flock feeding on grapes did find that all birds initially responded to the alarm call of one. Within a few days, however, this alarm call worked only on its own species. This suggests that the early response of the other species was to the sight of responding birds, rather than to the alarm call itself.

At least one species—the Herring Gull—is known to have a two-part alarm call. The first part alerts the flock; the second disperses it.

Predator Calls (limited recommendation)

Description

Calls given by hawks, falcons, and owls may be effective in dispersing birds.

Application

Predator sounds can be broadcast using the same equipment as distress or alarm calls. The use of these calls warns birds of the presence predators; birds respond with heightened awareness and, in some cases, take flight.

Advantages

• Habituation to the call of a natural predator is generally slow.

Disadvantages

• The predator call should specifically address the species to be dispersed.

Effectiveness

Only one perfunctory assessment has been conducted regarding the use of predator calls to deter birds. In that study, the calls of a Peregrine Falcon were successful in dispersing gulls at Vancouver International Airport. It should be noted, however, that predators usually hunt silently and do not announce their presence. The use of predator calls therefore seems to be an unnatural presentation of stimulus.

Chemical Repellents

Chemicals are used primarily to foul areas that are attractive to birds, such as perching, nesting, and loafing sites. Used with growing frequency for wildlife control at airports, chemicals either repel birds through taste, smell, or illness following ingestion. While certain bird-control products have proven effective at airports, mammal-repulsion products have had limited success; their development is ongoing.

A major advantage of this control method is that it is not subject to habituation. Most of these chemicals induce a physiological reaction to which animals do not generally become accustomed.

Taste repellents

Of the many kinds of chemical repellents that may be useful at airports, taste repellents are the most common. These bitter-tasting chemicals can be painted onto cables to prevent mammals from chewing. Taste repellents can also be used to deter deer from feeding on vegetation.

Behavioural repellents

The chemicals used to repel through ingestion may also be classed as poisons. Sufficient doses will kill individual birds. The most familiar and widely used of these chemicals is **4-aminopyridine**, marketed in several strengths under the brand name **Avitrol**. As the erratic behaviours and distressing cries of treated birds may disperse other flock members, this chemical is also considered a Behavioural repellent. Birds that ingest this product usually die. Other limited-use repellents act through odour or fumigation. For example, **Naphtha flakes** are

sprinkled on favoured perching areas of House Sparrows. At present, there are no studies to support the effectiveness of this treatment.

Tactile repellents

This class of control applications discourages problem birds from landing and roosting on building structures. Tactile repellents are generally sticky mixtures and may include a chemical that mildly irritates birds' feet. The repellent properties do not stand up well to variable weather conditions and dust, so these materials are best used indoors. Some require specific application procedures and occasional renewal to be fully effective. While they appear to offer only limited effectiveness, they are not affected to any large extent by habituation.

Behavioural Repellents (limited recommendation)

Behavioural repellents can cause visible signs of stress in birds, including disorientation and erratic behaviour. Frightened by such unstable behaviour, unaffected members of the flock often disperse Avitrol is the most common product available. The chemical should be placed in bait and eaten by the birds. Proper dilution of treated bait with untreated bait is therefore critical to prevent lethal control of large numbers of birds.

Use

Dispersing flocks of blackbirds, starlings, House Sparrows, pigeons.

Description

Avitrol (4-aminopyridine) is a poisonous chemical that kill birds when they ingest treated bait. This chemical causes visible signs of distress in birds when they are dying, causing other members of the flock to disperse.

Application - Blackbirds and Starlings

Commercial cracked-corn mixes of Avitrol are spread over feeding areas. The mix contains only six treated kernels per 100 so that only a small proportion of the flock is affected. In one case, a blackbird roost in a cattail marsh was dispersed through the use of Avitrol. Bait trays were placed above the level of the cattails to feed incoming birds. The trays were pre-baited for three days with untreated corn. On the fourth day, Avitrol bait—at a ratio of 1:10 treated-to-untreated

Kernels—replaced the pre-bait. Most of the birds were dispersed to other roost areas between 800 meters and 9.6 kilometers distant following four days of treatment. To protect non-target species, bait trays were placed two hours before sunset and removed in the morning.

Pigeons

Pre-baiting with untreated bait is essential for pigeon control. As well as

Accustoming pigeons to the bait, pre-baiting concentrates the population and draws the birds to preferred control areas. Elevated areas, such as roofs, are recommended as pre-bait areas; they are out of public view and deter non target species such as Mourning Doves, which prefer to feed on the ground. Pre-baits should be set out in numerous small piles of about 100 grams rather than in a smaller number of larger piles. On a roof 15 meters by 30 meters, 10 to 20 pre-bait piles are adequate. The response of the pigeons will dictate the duration of pre-baiting. If the pigeons have been exposed to Avitrol previously, and have become bait shy, as many as

three to four months of pre-baiting may be necessary. Longer periods may also be required if an attempt is being made

to move pigeons from their accustomed feeding areas. Normally, however, about two weeks of pre-baiting will be necessary.

Treated bait is provided once pigeons have been concentrated in the control area. Some pigeons may be killed by the bait. If there is concern about dead pigeons being found in public areas, the ratio of treated to untreated kernels should be 1:30. If this does not give adequate control after two weeks, the ratio should be increased to 1:20, and then to 1:10 after a further two weeks. If there is no particular concern about carcasses, treatments can begin at ratios of 1:15 or 1:10.

House Sparrows

A pre-mixed commercial grain is available specifically for sparrow control. Pre baiting is necessary and should be carried out in areas where non-target species will not be attracted. At airports, pre-baiting can take place near buildings and away from natural-habitat areas such as bushes and grass.

Advantages

• Flocks of birds can be dispersed by killing only a few birds if appropriate mixes are used.

• Avitrol can successfully disperse pigeons and House Sparrows—species for which other dispersal techniques are not effective.

Disadvantages

• Extensive pre-baiting may be necessary, and the pre-bait may itself attract additional birds.

• This product is recommended only for areas in which a direct threat to

Air craft safety is not posed, as the direction of dispersal cannot be controlled. (Affected gulls and blackbirds, for instance, may circle upwards and fly erratically into aircraft flight paths.)

• Improper dilution can result in large numbers of dead birds, which may lead to a negative public perception of bird control.

• To prevent habituation or bait shyness, it is important to vary the pre-bait food source. Not only is this time consuming, it also poses a challenge to maintain a constant dosage level through changing food sources.

Effectiveness

Blackbirds and Starlings

Avitrol is quite effective in dispersing large blackbird flocks (over 1000 birds) in crops. At airports, Avitrol is likely to be useful only in agricultural lease areas and in roost dispersal. Transient flocks feeding on the airfield itself can be more effectively controlled through pyrotechnics.

Use of Avitrol at roosts in trees and bushes has not been tested, but delivery of the bait would likely be more difficult in this habitat. Starlings cannot be dispersed from roosts with Avitrol.

Pigeons and House Sparrows

Avitrol offers limited effectiveness in dispersing pigeons and House Sparrows. As long as food or shelter remains attractive, the same or new individuals will re-invade the treated area

Visual Repellents — Birds

Visual repellents have been used for many years, commonly in the form of

Scarecrows. Some recent developments have involved the use of predator

Models that are often animated. Unfortunately, rapid habituation means their

Acceptance as an effective control method has not been widespread. When used in conjunction with taped distress calls and firearms, dead birds will sometimes scare away flocks of the same species. Placing fresh carcasses in open areas also offer limited effectiveness;

Agony posture

However, scavengers will also be attracted To dead animals. Some wildlife officers report success in dispersing flocks simply By tossing a recently dispatched gull into The air while playing distress calls. Such Acts should be carried out only with good Judgment, and with consideration for any Onlookers who might take offense.

Placing taxidermically-mounted gulls—prepared in what are termed *agony postures*— in open areas has also led to some success, although such models are unable to withstand harsh weather conditions.

Habituation is once again a major problem that is encountered in using these methods of control. Transient birds are the most likely to be scared by visual deterrents since the opportunity to habituate to these tactics do not arise. With problem resident birds, however, a combination of visual and auditory Deterrents—usually exploders—will increase effectiveness. Examples of visual deterrents include scarecrows, flags and streamers; flare Pistols, strobe lights, predator models, hawk kites, gull models, and helium filled balloons.

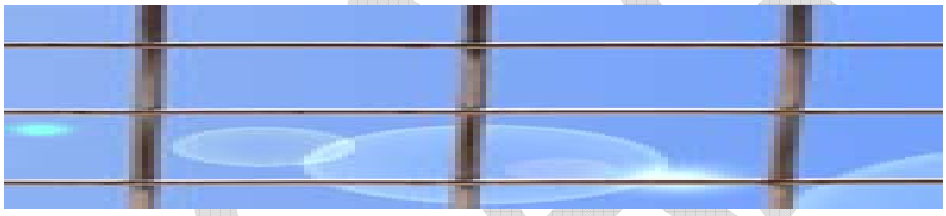
Active Management Using Exclusion Methods

Introduction

Airports provide the necessities of life—food, water, and shelter—for many wildlife species. Eliminating these necessities, and preventing access to them, dramatically reduces wildlife problems at airports. Netting is an effective method to prevent birds from roosting and nesting in and on airport buildings. A grid of fine wires stretched above a source of food or water deters some species of birds by interrupting their flight patterns. An alternative to wires is Bird Balls.

Gates must close tightly and be snug to the ground. If fencing does not surround airport perimeters, it can be used around selected wildlife habitats that are attractive to mammals. For example, fencing around ponds is effective in barring animal's access to the water. Fencing also prevents access to crops that may be grown on airport lands. Rodents present unique problems at airports, often chewing electrical cables; copper and steel cable-sheathing products are available to prevent this kind of damage. Metal flashing and grates are effective in preventing rodents from gaining entrance to airport structures.

Birds – Netting



Use

Netting may be used in a variety of ways to prevent birds from gaining access

to food or roosting areas.

Description

Available nettings range from those that feature small 3- to 3.5-centimetre mesh openings, to fishnets with openings of several meters.

Application

To be effective, netting must prevent birds from gaining access to food, water, and shelter at airport buildings, netting can be used to:

• make curtains that can be hung across open hangar doors;

• create covers for smaller holes and openings;

• isolate the ceiling support structure so that birds cannot nest or perch in

Beams and girders;

• hang at 45o angles beneath eaves to prevent nesting by swallows.

Advantages

• Barring birds from roosting and nesting sites, reduces the

Overall numbers of birds in the area.

• Netting provides a long-term solution when installed in hangars to deny

Birds access to beams and girders.

Disadvantages

• Polypropylene netting deteriorates in sunlight and needs to be replaced regularly.

• The installation and removal of netting is labour intensive.

Effectiveness

As part of an integrated management plan, netting is effective in barring birds from airport lands and buildings.

Porcupine Wire (Nixalite)

Use

Porcupine wire, typically marketed as Nixalite, prevents birds from perching and roosting on flat surfaces such as ledges and signs.

Description

Nixalite is a system of stainless steel strips that feature needle-like wire prongs. The prongs project from a 0.5 centimeter base and come in two lengths – 5 and 9.5 centimetres. Strips are available in either single (90o) or double (180o) radius.

Application

The manufacturer of Nixalite supplies the application hardware and provides instructions on spacing the strips. To remain effective, the prongs must be kept free of all debris, specifically leaves, garbage and twigs that can be used as nesting material. It can be applied with Velcro strips for easy removal when maintenance is required.

Advantage

• Nixalite permanently excludes many birds from areas where it is installed.

Disadvantages

• Nixalite is expensive.

• Unless all ledges are treated, birds are likely to move to a new location nearby.

• Some birds, such as Red-tailed Hawks, have sufficiently long legs to perch on Nixalite-covered surfaces.

Effectiveness

When properly installed and maintained, Nixalite effectively prevents birds

From perching and roosting.

Fine Wires (large-area applications)

Use

Fine wires extended over specific areas restrict the access of gulls, waterfowl and crows to sources of food and water.

Description

A grid of fine wires or monofilament strands (less than 0.5 millimeter in diameter) is installed at 2.5- to 12- meter intervals above sources of food and water. The wiring should be strung no less than 1 meter aboveground or water.

Fine wires on water

Application

At airports, grids of fine wire should be installed over ponds, standing water and other wetlands.

Several general guidelines apply:

• Wire must be 0.5 millimeter or less in diameter—small enough to be difficult for birds to see.

• Stainless-steel wire is the most durable, although monofilament line and steel-core Dacron line are also acceptable if installed inconspicuously.

• Strands of wire should be installed in parallel and on a horizontal plane.

Advantages

• Following its initial installation, little labour is involved in maintaining the system.

• A grid of fine wires significantly reduces the attraction of water and food to many species of birds.

• Birds that gain access to areas covered with fine wires are extremely nervous and, therefore, more susceptible to scare techniques.

Disadvantages

• Wire systems must be checked regularly.

• Stainless-steel wire is difficult to handle during installation, as it frequently kinks and breaks.

• Monofilament wire deteriorates rapidly in sunlight.

• Some bird mortality may occur when birds fly into wires.

Effectiveness

Fine wire grids have been tested against, crows, Waterfowl, pigeons, shorebirds, and some small birds. In general, fine wire grids are ineffective against shorebirds, pigeons, and such small birds as blackbirds, starlings, and swallows. Wire is most effective against waterfowl when grids have been installed before waterfowl become attached to nesting territories. Unfortunately, fine-wire grids have not been tested against migrating waterfowl.

Mammals

Fences

Fences are the most important tool to control mammals at airports. A variety of fencing options are available to address the range of hazardous species:

Non-electric Fences

Galvanized steel chain-link fence

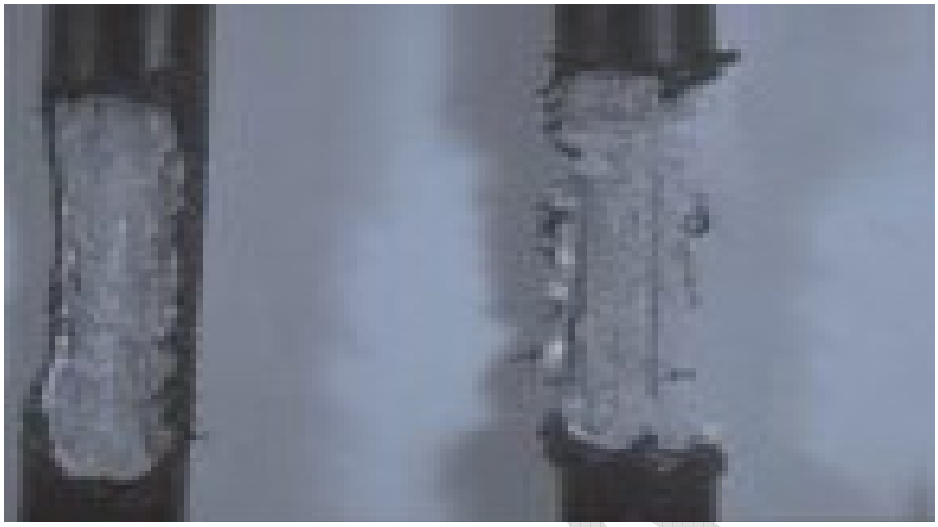
Use

Used to prevent mammals from accessing airport lands.

Rodent-proof buildings and exteriors

Commensally rodents (rats and House Mice) often live year-round in buildings. Some wild rodent species, however, will invade buildings only in the fall as they search for winter nest sites. Plugging all access holes during careful summer inspections of these buildings proves highly effective in limiting those animals seeking fall access.

Physical abilities of rodents; Rats and mice are able to climb most rough, vertical surfaces, including wood, brick, and weathered sheet metal. These animals gnaw through a variety of materials, including lead and aluminum sheeting, wood, rubber, and hard plastic.



Results of rodent chewing cable

Rats will not hesitate to dive through plumbing traps, and are capable of traveling considerable distances through sewer lines. Rodent teeth curve slightly inward, making it difficult for them to gnaw on hard, flat surfaces. These animals will quickly exploit edges: rats will work to enlarge holes as small as 1 centimeter in diameter. Mice can slip through holes as small as 6 millimeters.

Preventing access

Rodents and birds enter buildings through drains, openings in ventilation systems, as well as holes around pipes and wiring. Small holes can be temporarily filled with packed steel wool, but permanent sealing is recommended using cement, 24-gauge (or heavier) sheet metal and 19-gauge hardware cloth (1.3-centimetre mesh for rats, 6.3-millimetre mesh for mice). Drains should be covered with fixed grates. Rodents are able to crawl up the corrugations in some types of metal sheathing unless angle iron or metal flashing protects the bottom edges. House Sparrows will crawl into corrugations in sheet metal and nest within a wall, if the lower end is left open.

Active Management Through Removal

Introduction

Removing wildlife from airports through the use of traps, poisons, and firearms is necessary and effective in certain circumstances; however, wildlife control personnel should remember that animals are present at airports because of the availability of food, water, and shelter. The removal of individual animals—prior to eliminating these key attractants—may eliminate an immediate hazard but will not provide a long-term solution, as other animals will replace those that have been removed.

Wildlife removal may be effective in situations in which:

• The species involved is not mobile, and is unlikely to be replaced immediately;

• The species involved is of a solitary nature—high-density populations of this species are rare and unlikely to be found in areas surrounding airports;

• The immediate removal of a few animals is required—generally for short-term results;

• A large population of concealed animals (i.e., rodents) must be reduced; and the removal of a few animals by shooting enhances the effectiveness of non-lethal frightening tools such as pyrotechnics. Rodents present a special case. Neither far ranging nor particularly mobile, rodents are also major attractants to such predators as foxes, Coyotes, and raptors—themselves hazardous species at airports. Rodent removal can be, therefore, highly effective in reducing the numbers of various problem species. Site-specific rodent problems should be professionally assessed prior to initiating large-scale lethal-control programs; the population dynamics of many species ensure that removed animals are replaced quickly. The harsh nature of many removal programs requires sensitivity on the part of wildlife-control personnel. The integrity—and survival—of airport wildlife management programs depend on the respectful treatment of all animals; in poisoning, shooting, and trapping, their suffering should be minimized. When handling mammals, especially predators such as fox and raptors, extreme caution must be exercised to protect against such animal-borne diseases as rabies. Wildlife-control personnel should be vaccinated, and wear heavy gloves at all times. If these measures cannot be followed, professional wildlife exterminators should be consulted.

Lethal Chemicals

Chemicals used to kill wildlife fall into three categories:

• **Acute toxins** that kill after ingestion of a single lethal dose,

• **Anticoagulants** and decalcifies requiring the ingestion of several doses over a period of days

• **Fumigants** that suffocate burrowing animals in the ground.

Poisons are generally confined to use on small animals, specifically rodents, because:

• Bait placed in confined areas—including burrows—is not accessible by other animals,

• Small amounts of poison treat large rodent populations at relatively low costs, and

• Problems associated with rodent carcass disposal are minimized, as the carcasses are generally concealed in burrows, away from predators as well as the eyes of the public.

Occasionally, poisons are used against fox, which sometimes damage electrical cables and pose strike hazards. Lethal chemicals are also applied for killing pigeons, House Sparrows, and starlings.

Safety

Knowledge of proper handling methods is critical to ensure the safety not only of the user, but also the environment and non-target species. All chemical pesticide product labels include safety precautions and instructions for use. These products should be used only as directed. If not used properly, poisons may seep into soil and ground water. Poisoned animals may be consumed by predators; toxic carcasses could be eaten by scavengers, causing secondary poisoning. For these reasons, proper placement of poisons is critical, as is the removal of exposed dead animals

Mammals

Tracking Powders

Uses

Tracking powders are used to kill rats and House Mice.

Description

Tracking powders combine zinc phosphide with inert ingredients. Rodents

Pick up the powder on their fur and then ingest the poison while grooming

Application

Tracking powders are spread along rodent travel paths and placed in specially designed stations.

Advantage

Tracking powders may be used on bait-shy rodents.

Disadvantages

- For indoor use only.
- Must be kept away from food storage and preparation areas.
- Airport personnel may come in contact with tracking powder.

Effectiveness

The dispersal of tracking powder is difficult to control, making the product an unattractive alternative to toxic baits.

Permits required

Structural Exterminator licenses are required by federal law. Provincial regulations vary. Check with government and local pest-control authorities.

Traps

Two types of traps are available: kill and live traps. Kill traps dispatch animals quickly and efficiently. Live traps may simply restrain animals; complex live trap

Devices include those in which animals are captured and then killed through such secondary means as drowning. Live traps are often employed to capture and transport wildlife to release areas away from airport lands. As this method is time-consuming and costly, it is used mainly for protected and high profile species.

When using traps, careful handling is critical. Trap placements must be logged and mapped to ensure people frequenting the areas know where the devices are located. Trap locations should also ensure that the capture of non-target species are minimized. Check traps at least daily to minimize the suffering of snared animals, and to prevent scavengers from feeding on carcasses.

As effective trap use requires some knowledge of animal behaviour, airport personnel who are considering trapping programs should consult professional trappers and pest-control agents. Airport personnel must also determine which species are protected from trapping, and obtain any required permits.

Kill trapping

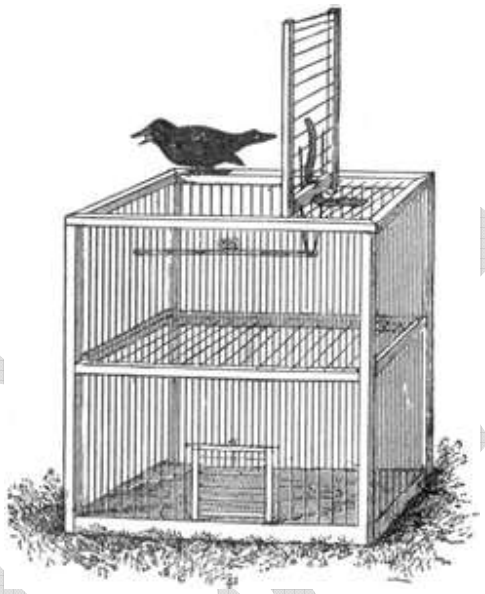
Kill traps are generally used on small animals. Although not strong enough to dispatch larger animals, these traps can still be dangerous when handled improperly. Airport personnel may trap rats, mice, moles, Groundhogs, and pocket gophers after consulting with knowledgeable authorities. Larger animals— Such as foxes, hyena, and warthog—should be left to experienced trappers.

Live trapping

Live traps range from simple restraining snares and leg-hold devices to box and barrel traps used to trap various sizes of animals. Live traps should be frequently checked to minimize the discomfort of trapped animals. Airport personnel should consult reference guides and knowledgeable authorities to learn proper methods for setting and baiting traps.

Birds

Live traps, as well as raptor traps, are used to capture birds that are then either killed or transported to pre-approved release areas away from airports. Time consuming and costly, live trapping is often employed against protected and high-profile species that are relocated from the airport.



Live traps

Use

Live traps are used to capture sedentary birds such as pigeons and House Sparrows. Other birds—such as starlings, blackbirds, and crows—may also be captured; however, trapping these species is often not an effective method for lowering their population numbers.

Description

A wide variety of traps are commercially available, including traps that use decoy birds and devices that catch several birds at once.

Application

Pigeons are easily trapped where they feed. Pigeon traps should be left open and baited for two or three days before being set. Decoy birds improve the effectiveness of pigeon traps. Pigeons are not easily trapped at their night roosting sites.

House Sparrows are readily trapped when bait areas are established prior to placing traps. When placing traps, the baited areas should surround the traps. Allowing some trapped sparrows to remain in the baiting area will cause other Sparrows to respond to the distress calls.

Advantages

• Live trapping of pigeons and House Sparrows is the preferable control method in airport public areas.

• Live trapping has proven to be the only effective way to remove House Sparrows.

Disadvantages

• Live trapping is labour-intensive.

• Traps must be checked at least once daily to remove birds and replace baits.

• Birds must be dispatched or moved to release areas.

• It is unlikely that all problem birds will be captured through live-trapping programs. Furthermore, unless the attractants are removed, captured and released birds may return

Effectiveness

Live traps are effective for capturing sparrows and pigeons. To trap sparrows,trigger devices—as well as those that deposit birds into a holding chamber when sprung—are more effective than funnel traps.

Mammals

Live Traps

Use

Live traps are used to capture mammals.

Description

Most live traps are made of galvanized wire, and are open at one or both ends. A trigger is tripped when mammals enter these traps, closing the door.

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Application

Traps are set near dens, in travel paths and at feeding areas of target mammals. Pre-baiting with traps that are fixed open increases the probability of capture. Trap manufacturers provide bait suggestions for several species. Trapped mammals should be removed to release areas at least 15 kilometers from airports. When releasing mammals, traps should be opened from a distance using a long piece of twine; this protects the handler and minimizes stress upon the animal. Although capturing most mammal species is straightforward. To minimize the likelihood of spraying, place a tarpaulin or other cover over traps to provide a dark and secure environment for skunks. Following each use—and the capture of all animals—traps should be steam cleaned to remove scents and odours.

Advantage

• Protected and high-profile problem mammal species may be captured and removed alive.

Disadvantages

• Live trapping is labour-intensive and highly inefficient in removing large numbers of mammals.

• Building or buying large numbers of traps is expensive.

• Live trapping often requires the expertise of trained personnel.

Mouse Traps

Use

Used to kill rats and mice. Standard snap-traps kill rodents individually; more elaborate multiple traps can kill up to 30 mice.

Application

Snap traps should be placed on rodent travel paths—usually along walls.

The edges of open areas—with triggers set against walls. When using double traps, set them side-by-side, with their triggers against the wall, or end-to-end with their triggers facing out. Mousetraps should be placed no further than 1.8 meters apart. As rats travel more widely, their traps may be spaced at greater distances. Effective snap-trap baits include bacon, nutmeats, peanut butter, and marshmallows.

Advantage

Carcasses are readily found and removed.

Disadvantage

Trapping is labour-intensive. Effective snap-trap baits include bacon, nutmeats, peanut butter, and marshmallows.

Multiple-capture traps

Several varieties of mechanical traps—which catch up to 30 mice at one setting—are available. Some multiple-capture traps attract mice to large bait reservoirs, while other devices merely take advantage of the tendency of mice to enter small dark holes. These traps should be set in areas of greatest mouse activity; the trap entry hole should be placed near the wall. Traps should be checked frequently. Drown live mice by emptying them into buckets of water.

Advantage

Carcasses are readily found and removed.

Disadvantage

Trapping is labour-intensive.

Live-ammunition shooting

Firearms are heavily restricted, and should be used only after all other control methods have failed, or in cases in which immediate removal of persistent animals is required. If firearms must be used, education programs should be instituted to raise public awareness. Although limited in their application, shotguns act in support of scare and dispersal tactics. With flocking birds such as gulls, for instance, the occasional shooting of one bird may be needed to illustrate the significance of loud, sharp noises to the rest of the flock. In removing large and particularly dangerous animals, firearms are required to deliver immobilizing drugs. This technique is particularly useful for removing problem bears, which are usually first snared or caught in culvert traps. When using firearms, empty casings should always be recovered; they can cause serious damage when ingested into turbine aircraft engines.

Effectiveness

For maximum effectiveness and safety, integrated control programs involving firearms require close cooperation among airport staff and skilled field biologists experienced with guns. Due to their short lethal range, shotguns are preferred over rifles. Shotgun volleys are also less likely to ricochet off flat surfaces such as runways.

Permits required

Airport personnel must receive special permits to kill such persistent and highly hazardous species.

Integrated Control Methods

Introduction

Effective control of birds at airports can only be achieved once existing species have been identified. Bird-identification skills, therefore, should be developed among wildlife-control personnel. Appropriate control measures—such as modifications to bird habitats—can then be implemented. Most birds can be identified by specific behavioural characteristics or unique physical markings, including:

Size
Shape
Colour and pattern
Habitat
Season and time of day
Geographic distribution
Group size
Flight pattern
Voice
Feet
Bills and beaks
Habits

Observing both the **bills** and **feet** is particularly important when examining bird remains. Bills provide information concerning the feeding habits of birds, while feet give evidence of habitats. Understanding feeding habits and habitat preferences helps wildlife-management personnel understand what has attracted specific birds to airports.

Bird-identification techniques

Field guides

Providing pictures, range maps, and written descriptions of birds, field guides are invaluable tools in bird identification. A number of excellent field guides to Birds of the Horn of Africa by Nigel Redman, Terry Stevenson, John Fanshawe. Each book groups birds into families based upon such physical and behavioural characteristics as beak and body shape, and food and habitat preferences.

Bird-remains identification

The remains of birds involved in aircraft strikes are often difficult to identify, especially when they have been ingested by jet engines. Identification in these circumstances relies on a number of techniques, usually associated with the identification of feather remains. Feather identification is not only an important tool in wildlife control, it is also a useful aid to manufacturers who apply the knowledge acquired through the various techniques in the design and modification of aircraft engines, windshields, and airframes.

Ranking the hazard levels of birds and other wildlife

Most of the time bird strike occurs in Ethiopia due to the following species;

- Speckled pigeon
- Black kit
- Vulture(including Egyptian vulture ,hooded vulture, whit backed vulture)
- Mourning dove
- Other soaring birds like eagle.

Source: data base of ECAA

As far as the birds other wildlife may cause hazards to the air craft like hyena, fox, bat,. These animals can cause a potential hazard to wildlife.

Weather

Weather conditions affect both bird movement and behaviour. The short-term forecasting of bird movements can benefit from information available at meteorological offices. Keep in mind, however, that bird behaviour is influenced by weather not only near airports, but also by conditions tens or hundreds of kilometers away.

Wind

Three wind factors affect bird movement and behaviour:

Wind-chill: Birds expend a great deal of energy maintaining normal body temperatures in cold weather.

Wind direction: As previously described, birds often preserve energy by delaying Migrations until winds are blowing in the direction of their flight. Determining wind direction can be helpful in predicting the numbers of birds on airfields and along proposed air routes.

Wind speed: As a rule, wind speed is greater at high altitudes as opposed to low altitudes, where friction caused by the ground decreases wind speed. As a result, birds flying at lower altitudes take more time to travel given distances when facing strong head winds—thereby increasing their time in the air and the likelihood of strikes.

Temperature

Temperature plays a significant role—especially as it affects bird migration patterns—in determining the food sources available to birds. Seed-eating birds, for instance, will migrate earlier when faced with a shortage of food. High temperatures also drive insects deeper below ground, further decreasing food availability. Extreme heat also creates unique meteorological effects, such as thermals. These rapidly rising currents of heated air are sometimes over 1000 meters in height; birds—especially raptors—harness these thermals to quickly gain altitude. As they often occur over the open asphalt found at airports, thermals contribute to a heightened risk of strikes between birds and aircraft.

Visibility

In poor visibility—in mist and fog, for instance—birds are reluctant to leave familiar surroundings. Bird dispersal under these conditions can therefore be difficult. It should be noted, however, strikes are less likely in these conditions, as bird movements are minimal. Obviously, any birds attempting to rest on runway surfaces during these conditions must be dispersed.

Rainfall

An obvious hazard to aircraft flight, rain also poses the following indirect hazards:

• In wet weather, invertebrate animals—such as worms—rise to the surface

and provide an attractive food supply for insectivorous bird species.

• After rainfall, birds may be drawn to the driest areas, which may include the short grass adjoining runways and taxiways, or the tarmac itself.

• Rainwater collects in puddles and ponds, in which birds bath.

Bird Profiles

The following guide provides fundamental tables and descriptions for use in the identification of various problem bird species. For the purposes of this basic guide, information concerning each bird species falls under the following.

BIRDS Biology

Describes and discusses:

• Sizes,

• Appearances,

• Body, bill, head and wing shapes,

• Legs and feet,

• Common colour forms,

• Flight and movement characteristics,

• Geographic locations,

• preferred habitats, and

• Major behavioural characteristics such as typical flock size, human interaction, feeding actions, and habits at airports food and attractant Lists typical sources of food and other common attractant

PROBLEM ANIMAL IN ETHIOPIAN AVIATION INDUSRY

Species that can be hazards to aircrafts in Ethiopia

- Black kit
- Speckled pigeon
- Pied crow
- vulture(including Egyptian vulture ,hooded vulture, whit backed vulture)
- mourning dove
- red eyed dove
- white collard pigeon
- Swift
- Spotted hyena
- Ungulates(dik dik, warthog,)
- Fox
- dogs
- Reptiles
- Spurred tortoise

European bee eater

This species, like other bee-eaters, is a richly-coloured, slender bird. It has brown and yellow upper parts, whilst the wings are green and the beak is black. It can reach a length of 27–29 cm (10.6–11.4 in), including the two elongated central tail feathers. Sexes are alike.

This is a bird which breeds in open country in warmer climates. Just as the name suggests, bee-eaters predominantly eat insects, especially bees, wasps and hornets which are caught in the air by sorties from an open perch. Before eating its meal, a European Bee-eater removes the sting by repeatedly hitting the insect on a hard surface. It eats some 250 bees daily. Lizards and frogs are also taken.

These bee-eaters are gregarious, nesting colonially in sandy banks, preferably near river shores. They make a relatively long tunnel in which the 5 to 8, spherical white eggs are laid

around the beginning of June. Both the male and the female take care of the eggs, which are brooded for about 3 weeks. These birds also feed and roost communally.

Purple Starling

also known as the **Purple Glossy Starling**, is a member of the starling family of birds.

Distribution and habitat

It is a resident breeder in tropical Africa as well as Ethiopia passerine is typically found in open woodland and cultivation.

Description

The adults of these stocky 22–23 cm long birds have a metallic purple head and body, and glossy green wings. They have a short tail and a yellow eye. The sexes are similar, but juveniles are much duller, with grey underparts and a brown iris.

Behaviour

This is a gregarious and noisy bird, with typical starling squeaks and chattering.

Breeding

The Purple Starling builds a nest in a hole. The normal clutch is two eggs.

Feeding

Like most starlings, the Purple Starling is omnivorous, eating fruit and insects.

Common Waxbill

The **Common Waxbill** also known as the **St Helena Waxbill**, is a small passerine bird belonging to the estrildid finch family. It is native to sub-Saharan Africa .

Description

It is a small bird, 11 to 13 centimetres in length with a wingspan of 12 to 14 centimetres and a weight of 7 to 10 grams. It has a slender body with short rounded wings and a long graduated tail. The bright red bill of the adult is the colour of sealing wax giving the bird its name. The plumage is mostly grey-brown, finely barred with dark brown. There is a red stripe through the eye and the cheeks and throat are whitish. There is often a pinkish flush to the underparts and a reddish stripe along the centre of the belly depending on the subspecies. The rump is brown and the tail and vent are dark. Females are similar to the males but are paler with less red on the belly. Juveniles are duller with little or no red on the belly, fainter dark barring and a black bill.

Distribution and habitat

Native range

There are about 17 subspecies distributed widely across much of Africa south of the Sahara.

Reproduction

The nest is a large ball of criss-crossed grass stems with a long downward-pointing entrance tube on one side. It is built in a cavity, usually low down amongst dense vegetation. A rudimentary second nest ("cock's nest") may be built on top where the male sleeps. Four to seven white eggs are laid. They are incubated for 11 to 13 days and the young birds fledge17 to 21 days after hatching. Both parents take part in incubating the eggs and feeding the chicks. The timing of the breeding season varies in different parts of the world. Nests may be parasitized by the Pin-tailed Whydah which lays its eggs in the nests of estrildid finches.

Feeding

The diet consists mainly of grass seeds but insects are also eaten on occasions, especially during the breeding season when more protein is needed. The waxbills typically forage in flocks which may contain hundreds or even thousands of birds. They usually feed by clinging to the stems with their long, spindly claws and picking from the flower heads but they will also search for fallen seeds on the ground. They need to drink regularly as the seeds contain little water.

Augur Buzzard

Augur Buzzard

The **Augur Buzzard** (*Buteo augur*) is a 55–60 cm long African bird of prey. This is a species of mountains (most typically at about 2000 m altitude, but up to 5000 m), and adjacent savannah and grassland. It is resident and non-migratory throughout its range. It is normally found from Ethiopia to southern Angola and central Namibia

Description

The adult Augur Buzzard is strikingly plumaged. It is almost black above with a rufous tail. The primary flight feathers are blackish and the secondary's off-white, both barred with black. Below the chin and around the throat is mainly white, and the rest of the underparts and the under wing coverts are rich rufous. The flight feathers from below are white, tipped with black to form a dark trailing edge to the wing.

The juvenile Augur Buzzard is mainly brown above and rufous brown below and on the tail. It can be confused with wintering Steppe Buzzard, but has broader wings and an unbarred under tail.

The adult Augur Buzzard has white underparts and under wings. The female has black on the lower throat. Juveniles are brown above and buff below, the underparts later becoming white. There is a melanistic form of Augur Buzzard, all black, except for grey and black-barred flight feathers and a chestnut tail. About 10% of birds are melanistic, but the proportion rises in forested areas with high rainfall to as much as 50% in some areas.

Behaviour

Pairs have noisy aerial displays, including outside the breeding season. The large (up to 1 m wide) stick nest is built in a tree or on a crag, and is often reused and enlarged in subsequent seasons. Two creamy or bluish white eggs are laid and incubated by the female only, although food is brought to her on the nest by the male.

The eggs hatch in about 40 days, and after a further 56–60 days they can attempt flight. At 70 days they become independent of the nest, but young birds may then be seen with the adult pair for some time.

The diet of the Augur Buzzard is mainly small ground mammals, but snakes, lizards, small ground birds, insects, and road-kill are also taken. Typically, the raptor drops on its prey from a perch or hover.

Pied Wheatear

Pied Wheatear


A pied wheat ear is a wheatear, a small insectivorous passerine that was formerly classed as a member of the Thrush family Turdidae, but is now more generally considered to be an Old World flycatcher, Muscicapidae.

In summer the male is a white and black bird. The white crown tinged with grey contrasts with the black face and throat. The female is browner, and the head is washed with sandy buff. Females are darker than Northern Wheatear, look smaller and showed less white on the rump.

The tail and rump are white, with an inverted black T giving a pattern like Black-eared Wheatear. This 13.5-14.5 cm bird nests on open, stony, sparsely vegetated habitats, laying 4-6 eggs in a rock crevice. It eats insects and berries.

Speckled pigeon

The **Speckled Pigeon** or **(African) Rock Pigeon** (***Columba guinea***) is a pigeon which is a resident breeding bird in much of Africa south of the Sahara. It is a common and widespread species in open habitats over a good deal of its range, although there are sizeable gaps in its distribution.

This species builds a large stick nest in a tree and lays two white eggs. Its flight is quick, with the regular beats and an occasional sharp flick of the wings which are characteristic of pigeons in general.

This is a large pigeon at 41 cm in length. Its back and wings are rufous, the latter heavily speckled with white spots. The rest of the upperparts and underparts are blue-grey, and the head is grey with red patches around the eye. The neck is brownish, streaked with white, and the legs are red. The call is a loud *doo-doo-doo*.

Sexes are similar, but immature are browner than adults.

The Speckled Pigeon is frequently seen around human habitation and cultivation. Most of its food is vegetable, and it gathers in large numbers where grain or groundnuts are available.

Black kite

The **Black Kite** (*Milvus migrans*) is a medium-sized bird of prey in the family Accipitridae, which also includes many other diurnal raptors. Unlike others of the group, they are opportunistic hunters and are more likely to scavenge. They spend a lot of time soaring and gliding in thermals in search of food. Their angled wing and distinctive forked tail make them easy to identify

The Black Kite can be distinguished from the Red Kite by its slightly smaller size, less forked tail, visible in flight and generally dark plumage without any rufous. The sexes are alike. The upper plumage is brown but the head and neck tend to be paler. The patch behind the eye appears darker. The outer flight feathers are black and the feathers have dark cross bars and are mottled at the base. The lower parts of the body are pale brown, becoming lighter towards the chin. The body feathers have dark shafts giving it a streaked appearance. The cere and gape are yellow but the bill is black (unlike in the Yellow-billed Kite). The legs are yellow and the claws are black. They have a distinctive shrill whistle followed by a rapid whinnying call

Food and foraging

Black Kites are most often seen gliding and soaring on thermals as they search for food. The flight is buoyant and the bird glides with ease, changing directions easily. They will swoop down with their legs lowered to snatch small live prey, fish, household refuse and carrion, for which behaviour they are known in British military slang as the shite-hawk. They are opportunist hunters and have been known to take birds, bats and rodents. They are attracted to smoke and fires, where they seek escaping prey This behaviour has led to Australian native beliefs that kites spread fires by picking up burning twigs and dropping them on dry grass. The Indian populations are well adapted to living in cities and are found in densely populated areas. Large numbers may be seen soaring in thermals over cities. In some places they will readily swoop and snatch food held by humans Black Kites in Spain prey on nestling waterfowl especially during summer to feed their young. Predation of nests of other pairs of Black Kites has also

been noted .Kites have also been seen to tear and carry away the nests of Baya Weavers in an attempt to obtain eggs or chicks.

Pied Crow

The **Pied Crow** (*Corvus albus*) is a widely distributed African bird species in the crow genus.

Structurally, the Pied Crow is better thought of as a small crow-sized Raven, especially as it can hybridise with the Somali Crow (Dwarf Raven) where their ranges meet in the Horn of Africa. Its behaviour, though, is more typical of the Eurasian Carrion Crows, and it may be a modern link (along with the Somali Crow) between the Eurasian crows and the Common Raven.

It is approximately the size of the European Carrion Crow or a little larger (46–50 cm in length) but has a proportionately larger bill, slightly longer tail and wings, and longer legs. As its name suggests, its glossy black head and neck are interrupted by a large area of white feathering from the shoulders down to the lower breast. The tail, bill and wings are black too. The eyes are dark brown. The white plumage of immature birds is often mixed with black. It resembles the White-necked and Thick-billed Ravens but has a much smaller bill

Voice

The voice is described as a harsh *"ar-ar-ar-ar"* or *"karh-karh-karh"*

Behaviour

Pied Crows are generally encountered in pairs or small groups, although an abundant source of food may bring large numbers of birds. The species behaves in a similar manner to the Hooded and Carrion Crows.

Diet

Most of its food is obtained from the ground such as insects and other small invertebrates, small reptiles, small mammals, young birds and eggs, grain, peanuts, carrion and any scraps of human food and fruit.[6] It has been recorded killing and eating roosting Fruit Batsand is frequently seen (sometimes in huge numbers) scavenging around slaughterhouses

Reproduction

The nest is usually built in tall, isolated trees, though sometimes smaller specimens are used, depending on availability. The cross supports of telephone poles are also frequently used, and both sexes build the nest. A clutch of 3–6 eggs is laid from September to November (depending

on latitude) and are pale green spotted with various shades of brown. The eggs are normally covered when the incubating female leaves the nest. Incubation is 18–19 days and the young are usually fledged by around 45 days. Both sexes rear the young

Hooded Vulture

The **Hooded Vulture** (*Necrosyrtes monachus*) is an Old World vulture in the order Accipitriformes, which also includes eagles, kites, buzzards and hawks. It is the only member of the genus *Necrosyrtes*.

It breeds in a stick nest in trees (often palms) in much of Africa south of the Sahara, laying one egg. Birds may form loose colonies. The population is mostly resident. This is of the smaller vultures of the Old World. They are 62–72 cm (25–28 in) long, have a wingspan of 155–165 cm (61–65 in) and a body weight of 1.5-2.6 kg (3.3-5.7 lbs).

Like other vultures it is a scavenger, feeding mostly from carcasses of dead animals and waste which it finds by soaring over savannah and around human habitation, including waste tips and abattoirs. It often moves in flocks, and is very abundant. In much of its range, there are always several visible soaring in the sky at almost any time during the day.

This vulture is typically unafraid of humans, and frequently gathers around habitation. It is sometimes referred to as the “garbage collector” by locals.

The Hooded Vulture is a typical vulture, with a bald pink head and a greyish “hood”. It has fairly uniform dark brown body plumage. It has broad wings for soaring and short tail feathers. It is a small species compared to most vultures.

If these birds are disturbed when at their nest, they utter a squealing cry of "MAMA MAMA". Formerly classified as Least Concern by the IUCN, it was found to have been rarer than previously believed and thus its status was up listed to Endangered on the 2011 Red List of Threatened species.

White-backed Vulture

The **White-backed Vulture** (***Gyps africanus***) is an Old World vulture in the familyAccipitridae, which also includes eagles, kites, buzzards and hawks. It is closely related to the European Griffon Vulture, *G. fulvus*. Sometimes it is called **African White-backed Vulture** to distinguish it from the Oriental White-backed Vulture—nowadays usually calledIndian White-rumped Vulture--to which it was formerly believed to be closely related.

The White-backed Vulture is a typical vulture, with only down feathers on the head and neck, very broad wings and short tail feathers. It has a white neck ruff. The adult's whitish back contrasts with the otherwise dark plumage. Juveniles are largely dark. This is a medium-sized vulture; its body mass is 4.2 to 7.2 kilograms (9.3–16 lb), it is 78 to 98 cm (31 to 39 in) long and has a 1.96 to 2.25 m (6 to 7 ft) wingspan.

Like other vultures it is a scavenger, feeding mostly from carcasses of animals which it finds by soaring over savannah. It also takes scraps from human habitations. It often moves in flocks. It breeds in trees on the savannah of west and east Africa, laying one egg. The population is mostly resident.

As it is rarer than previously believed, its conservation status was reassessed from Least Concern to Near Threatened in the 2007 IUCN Red List.[5] In 2012 it was further up listed to Endanger .

The Red-eyed Dove

The **Red-eyed Dove** (*Streptopelia semitorquata*) is a pigeon which is a widespread resident breeding bird in Africa south of the Sahara. It is a common, if not abundant, species in most habitats other than desert.

This species builds a stick nest in a tree and lays two white eggs. Its flight is quick, with the regular beats and an occasional sharp flick of the wings which are characteristic of pigeons in general.

Red-eyed Dove is a largish, stocky pigeon, typically 34cm in length. Its back, wings and tail are pale brown. When flying, it shows blackish flight feathers. The head and underparts are dark vinous-pink, shading to pale grey on the face. There is a black hind neck patch edged with white. The legs and a patch of bare skin around the eye are red. The call is a loud *doo-doo-du-du*.

Sexes are similar, but juveniles are duller than adults, and have scalloping on the body feathers.

Red-eyed Doves eat grass seeds, grains and other vegetation. They often forage on the ground.

Like several other species in this genus, they are not particularly gregarious and often feed alone or in pairs.

White-collared Pigeon

The **White-collared Pigeon** (***Columba albitorques***) is a species of bird in the Columbidae family.

The species is endemic to the Ethiopian highlands in Eritrea and Ethiopia. It occupies countryside surrounding rocky cliffs and gorges. Also common in town centres[1]

Description

32 centimetres (13 in) long. This large grey-brown pigeon has an obvious white hindcollar contrasting with a dark slate head. In flight it shows prominent white wing patches formed by white inner primary coverts.

African Palm Swift

The **African Palm Swift** (*Cypsiurus parvus*) is a small swift. It is very similar to the Asian Palm Swift, *Cypsiurus balasiensis*, and was formerly considered to be the same species.

It is a common resident breeder in tropical Africa. The down and feather nest is glued to the underside of a palm leaf with saliva, which is also used to secure the usually two eggs. This is a fast flying bird of open country, which is strongly associated with Oil Palms.

This 16cm long species is mainly pale brown in colour. It has long swept-back wings that resemble a crescent or a boomerang. The body is slender, and the tail is long and deeply forked, although it is usually held closed. The call is a loud, shrill scream. Sexes are similar, and young birds differ mainly in their shorter tails. Palm Swifts have very short legs which they use only for clinging to vertical surfaces, since swifts never settle voluntarily on the ground. These swifts spend most of their lives in the air, living on the insects they catch in their beaks. Palm Swifts often feed near the ground. They drink on the wing.

Egyptian Goose

The Egyptian Goose (*Alopochen aegyptiacus*) is a member of the duck, goose, and swan family Anatidae. It is native to Africa south of the Sahara and the Nile Valley, and has been introduced to parts of Western Europe.

Egyptian Geese were considered sacred by the ancient Egyptians, and appeared in much of their artwork.

Description

It swims well, and in flight looks heavy, more like a goose than a duck, hence the English name.[*citation needed* It is 63–73 cm long.

The sexes of this striking species are identical in plumage, though the males average slightly larger. There is a fair amount of variation in plumage tone, with some birds greyer and others browner, but this is not sex or age related. A large part of the wings of mature birds is white, but in repose the white is hidden by the wing coverts. When it is aroused, either in alarm or aggression, the white begins to show. In flight or when the wings are fully spread in aggression the white is conspicuous. The voices and vocalizations of the sexes differ, the male having a hoarse, subdued duck-like quack which seldom sounds unless it is aroused. The male Egyptian goose attracts its mate with an elaborate, noisy courtship display that includes honking, neck

stretching and feather displays. The female has a far noisier raucous quack that frequently sounds in aggression and almost incessantly at the slightest disturbance when tending her young. Both sexes are aggressively territorial towards their own species when breeding and frequently pursue intruders into the air, attacking them in aerial "dogfights".

Distribution

This species breeds widely in Africa except in deserts and dense forests, and is locally abundant. The Egyptian Goose is one of the species to which the *Agreement on the Conservation of African-Eurasian Migratory Water birds* (AEWA) applies.

Behaviour

This is a largely terrestrial species, which will also perch readily on trees and buildings. Egyptian geese typically eat seeds, leaves, grasses, and plant stems. Occasionally, they will eat locusts, worms, or other small animals.

This species will nest in a large variety of situations, especially in holes in mature trees in parkland. The female builds the nest from reeds, leaves and grass, and both parents take turns incubating eggs. Egyptian Geese usually pair for life. Both the male and female care for the offspring until they are old enough to care for themselves.

The **Hamerkop** (*Scopus umbretta*), also known as **Hammerkop**,**Hammerkopf**, **Hammerhead**, **Hammerhead Stork**, **Umbrette**, **Umber Bird**,**Tufted Umber**, or **Anvilhead**, is a medium-sized wading bird (56 cm long, weighing 470 g). The shape of its head with a curved bill and crest at the back is reminiscent of a hammer, hence its name. Vocalizations include cackles and a shrill call given in flight. Hamerkops are mostly silent except when in groups.

Distribution and habitat

The Hamerkop occurs in Africa south of the Sahara, in all wetland habitats, including irrigated land such as rice paddies, as well as in savannas and forests. Most remain sedentary in their territories, which are held by pairs, but some move into suitable habitat during the wet

season only. Whenever people create new bodies of water with dams or canals, Hamerkops move in quickly.

Behaviour and ecology

The Hammer kop's behavior is unlike other birds. One unusual feature is that up to ten birds join in "ceremonies" in which they run circles around each other, all calling loudly, raising their crests, fluttering their wings. Another is "false mounting", in which one bird stands on top of another and appears to mount it, but they may not be mates and do not copulate.

Breeding

Partial view of nest. A piece of bright-coloured plastic is visible in the center.

The strangest aspect of Hamerkop behavior is the huge nest, sometimes more than 1.5 m across, comprising perhaps 10,000 sticks and strong enough to support a man's weight. The birds decorate the outside with any bright-coloured objects they can find. When possible, they build the nest in the fork of a tree, often over water, but if necessary they build on a bank, a cliff, a human-built wall or dam, or on the ground. A pair starts by making a platform of sticks held together with mud, then builds walls and a domed roof. A mud-plastered entrance 13 to 18 cm wide in the bottom leads through a tunnel up to 60 cm long to a nesting chamber big enough for the parents and young.

Food and feeding

Hamerkops feed during the day, often taking a break at noon to roost. They normally feed alone or in pairs. The food is typical of long-legged wading birds, and the most important is amphibians. They also eat fish, shrimp, insects and rodents.

The **Tawny Eagle**

(*Aquila rapax*) is a large bird of prey. Like all eagles, it belongs to the family Accipitridae. It was once considered to be closely related to the migratory Steppe Eagle, *Aquila nipalensis*, and the two forms have previously been treated as conspecific. They were split based on pronounced differences in morphology and anatomy; two molecular studies, each based on a very small number of genes, indicate that the species are distinct but disagree over how closely related they are.

It breeds in most of Africa . It is a resident breeder which lays 1–3 eggs in a stick nest in a tree, crag or on the ground.

Throughout its range it favours open dry habitats, such as desert, semi-desert, steppes, or savannah, plains.

This is a large eagle although it is one of the smaller species in the *Aquila* genus. It is 60–75 cm (24–30 in) in length and has a wingspan of 159–190 cm (63–75 in). Weight can range from 1.6 to 3 kg (3.5 to 6.6 lb) It has tawny upperparts and blackish flight feathers and tail. The lower back is very pale. This species is smaller and paler than the Steppe Eagle, although it does not share that species' pale throat.

Immature birds are less contrasted than adults, but both show a range of variation in plumage colour.

The Tawny Eagle's diet is largely fresh carrion of all kinds, but it will kill small mammals up to the size of a rabbit, reptiles and birds up to the size of guineafowl. It will also steal food from other raptors.

The call of the Tawny Eagle is a crow-like barking, but it is rather a silent bird except in display.

Spotted hyena

The **spotted hyena** (*Crocuta crocuta*), also known as the **laughing hyena** or **tiger wolf**, is a species of hyena native to Sub-Saharan Africa. It is listed as Least Concern by the IUCN on account of its widespread range and large numbers estimated between 27,000 and 47,000 individuals. The species is however experiencing declines outside of protected areas due to habitat loss and poaching. The species may have originated in Asia and once ranged throughout Europe for at least one million years until the end of the Late Pleistocene. The spotted hyena is the largest member of the Hyaenidae, and is further physically distinguished from other species by its vaguely bear-like build, its rounded ears, its less prominent mane, its spotted pelt, its more dual purposed dentition, its fewer nipples and the presence of a pseudo-penis in the female. It is the only mammalian species to lack an external vaginal opening.

The spotted hyena is the most social of the Carnivore in that it has the largest group sizes and most complex social behaviours. Its social organization is unlike that of any other Carnivore, bearing closer resemblance to cercopithecine primates (baboons and macaques) with respect to group-size, hierarchical structure, and frequency of social interaction among both kin and unrelated group-mates, However, the social system of the spotted hyena is openly competitive rather than cooperative, with access to kills, mating opportunities and the time of dispersal for males depending on the ability to dominate other clan-members. Females provide only for their own cubs rather than assist each other, and males display no paternal care. Spotted hyena society is matriarchal; females are larger than males, and dominate them.

The spotted hyena is a highly successful animal, being the most common large carnivore in Africa. Its success is due in part to its adaptability and opportunism; it is both an efficient hunter and a scavenger, with the capacity to eat and digest skin, bone and other animal

waste. In functional terms, the spotted hyena makes the most efficient use of animal matter of all African carnivores. The spotted hyena displays greater plasticity in its hunting and foraging behaviour than other African carnivores; it hunts alone, in small parties of 2-5 individuals or in large groups. During a hunt, spotted hyenas often run through ungulate herds in order to select an individual to attack. Once selected, their prey is chased over long distance, often several kilometers, at speeds of up to 60 km/h.

Warthog

Ecology

The warthog is the only pig species that has adapted to grazing and savanna habitats. Its diet is omnivorous, composed of grasses, roots, berries and other fruits, bark, fungi, insects, eggs and carrion. The diet is seasonably variable, depending on availability of different food items. During the wet seasons warthogs graze on short perennial grasses. During the dry seasons they subsist on bulbs, rhizomes and nutritious roots. Warthogs are powerful diggers, using both snout and feet. Whilst feeding, they often bend the front feet backwards and move around on the wrists. Calloused pads that protect the wrists during such movement form quite early in the development of the fetus. Although they can dig their own burrows, they commonly occupy abandoned burrows of aardvarks or other animals. The warthog commonly reverses into burrows, with the head facing the opening and ready to burst out if necessary. Warthogs will wallow in mud to cope with high temperatures and huddle together to cope with low temperatures.

Yellow baboon

Cynocephalus literally means "dog-head" in Greek due to the shape of its muzzle and head. It has a slim body with long arms and legs and a yellowish-brown hair. It resembles the Chacma baboon but is smaller and its muzzle is not as elongated. The hairless face is black, framed with white sideburns. Males can grow to about 84 cm, females to about 60 cm. It has a long tail which grows to be nearly as long as the body. The average life span is roughly 20–30 years.

The yellow baboon inhabits savannas and light forests in the eastern Africa,. It is diurnal, terrestrial, and lives in complex mixed gender social groups, with anywhere from 8 to 200 individuals per troop. It is omnivorous with a preference for fruits, but it also eats other plant parts as well as insects. Baboons are highly opportunistic eaters and will eat almost any food they come across.

Baboons use at least 10 different vocalizations to communicate. When traveling as a group, males will lead, females and the young stay safe in the middle, and less dominant males bring up the rear. A baboon group's hierarchy is such a serious matter, some sub-species have developed interesting behaviors intended to avoid confrontation and retaliation. For example, males have frequently been documented using infants as a kind of "passport" for safe approach toward another male. One male will pick up the infant and hold it up as it nears the other male. This action often calms heated nerves and allows the former male to approach safely.

Baboons are important in their natural environment not only serving as food for larger predators, but also aiding in seed dispersal due to their messy foraging habits. They are also efficient predators of smaller animals and their young, keeping some animals' populations in check.

Baboons have been able to fill a tremendous number of different ecological niches, including places considered adverse to other animals such as regions taken over by human settlement. Thus, they are one of the most successful African primates and are not listed as threatened or endangered. However, the same behavioral adaptations that make them so successful also cause them to be considered pests by humans in many areas. Raids on farmers' crops and other such intrusions into human settlements have made baboons subject to organized exterminations projects. It is important to remember however, that habitat loss is the driving force behind baboons' migration toward areas of human settlement.

African spurred tortoise

The **African spurred tortoise** (*Centrochelys sulcata*), also called the African spur thigh tortoise or the sulcata tortoise, is a species of tortoise which inhabits the southern edge of the Sahara desert, in northern Africa. It is the third largest species of tortoise in the world and the largest species of mainland tortoise (not found on an island).

Its generic name is a combination of two Greek words: *geo* (γαῖα) meaning "earth" or "land" and *chelone* (χελώνη) meaning "tortoise". Its specific name*sulcata* is from the Latin word *sulcus* meaning "furrow" and refers to the furrows on the tortoise's scales.

Range and habitat The African spurred tortoise is native to the Sahara Desert and the Sahel, a transitional eco region of semiarid grasslands ,savannas, and thorn shrub land s found in ethiopia (Somali jijiga airport).

Size and lifespan

The Sulcata is the third largest species of tortoise in the world after the Galapagos tortoise, and Aldabra Giant Tortoise; and the largest of the mainland tortoises.[4] Adults are usually 24 to 36 inch long (60–90 cm) and can weigh 100-200 pounds (45 – 91 kg). They grow from hatchling size (2-3 inches) very quickly, reaching 6-10 inches (15–25 cm) within the first few years of their lives. The lifespan of an African Spurred Tortoise is about 30–50 years, though can live much longer. (The oldest in captivity is 54 years, located in the Giza Zoological Gardens, Egypt, 1986).

Diet

Sulcata tortoises are herbivores. Primarily, their diet consists of many types of grasses and plants. A small portion of their diet also consists of fruit. Their diet is high in fiber and very low in protein. The consumption of too much protein can cause their shells to take on a pyramid appearance.

Breeding

Copulation takes place right after the rainy season, during the months from September through November. Males combat each other for breeding rights with the females and are vocal during copulation.

Sixty days after mating, the female begins to roam looking for suitable nesting sites. For five to fifteen days, four or five nests may be excavated before she selects the perfect location in which the eggs will be laid.

Loose dirt is kicked out of the depression, and the female may frequently urinate into the depression. Once it reaches approximately 2 feet (60 cm) in diameter and approximately 3-6 inches (7–14 cm) deep, a further depression, measuring some eight inches (20 cm) across and in depth, will be dug out towards the back of the original depression. The work of digging the nest may take up to five hours; the speed with which it is dug seems to be dependent upon the relative hardness of the ground . It usually takes place when the ambient air temperature is around 78 F (27 C). Once the nest is dug, the female begins to lay an egg every three minutes. Clutches may contain 15-30 or more eggs. After the eggs are laid, the female fills in the nest, taking an hour or more to fully cover them all.

Improving Awareness of Wildlife-management Issues

Section I

Roles and responsibilities I.1

Budgetary considerations I.2

Research papers I.

Roles and responsibilities

Effective, comprehensive wildlife-management programs depend on the participation and co-operation of all airport personnel. While airport field personnel require precise operational awareness of specific measures at their airports, relevant working knowledge of wildlife-management policies and procedures should also extend to air-traffic service providers (ATS),airport maintenance, planning, finance, marketing, and airline personnel. Authoritiesshould ensure that awareness programs are in place to properly inform allairport workers. The critical minute-to-minute operational communication between ATS providers and airport field personnel should also include co-ordination in planning efforts. Not only should ATS providers be involved in the development of wildlife-control programs, but also they should be consulted and informed regarding any changes to these initiatives. Measures should be in place to ensure that airport-development practices are obliged to carefully consider the ramifications for wildlife control. Such wildlife hazard reviews ask key questions aimed at ensuring a safe environment.

• Are new hazards being created?

• Will existing hazards be compounded?

• Will existing wildlife-control programs be affected?

• What are the budgetary considerations for wildlife control?

Indeed, the operating costs of new wildlife-management programs—as well as initiatives upgraded to accommodate development—should be factored into the budgets of all construction projects.

The negotiation of airport agricultural leases should also respect the safety concerns of wildlife-management programs. All agreements should not only ban crops known to attract birds, but also they should allow for the immediate removal of crops that are found to draw new problem species to airports.

Budgetary considerations

Airport wildlife-management programs are not luxury items—they are critical expenditures that, in the long run, save money. Wildlife dispersal activities, for instance, ensure that taxiways and runways remain clear, ensuring airline schedules—and revenues—are unaffected. Habitat-management efforts reduce the numbers of hazardous birds—and the number of wildlife strikes. Fewer aircraft airframes and engines are damaged, saving literally millions of dollars in expensive maintenance. Finally—and in addition to the direct financial savings enjoyed through effective wildlife management—safer skies mean a confident fare-paying public, and demonstrate that wildlife control is, in fact an investment. Airlines should be considered active partners in the development and day-today implementation of wildlife-management programs. Airlines possess unique expertise and may be helpful in advising airport field personnel in effective control methods.

Research papers

There are two studies documented by the collaboration of Ethiopian airport enterprise and external bodies like educational institutions (Addis Ababa universities and bahir Dar University) about the ecology of the airport vicinity as well as near places to determine wildlife attractants inside as well as outside of the airport. The studies namely

1. ***Ecological diagnosis and analysis of bird hazard at bole international airport (zerihun woldu PhD, afewerk bekele PhD, Elizabeth yohannes Msc,***
2. ***Ecological investigation, Analysis of Birds and other animal Hazards Survey Report at bahir dar airport by ayalew wendie PhD, derege w/yohannesPhD, shimeles Aynalem Msc***
3. *Species Diversity and Abundance of birds of Addis Ababa bole International Airport*

By: Tsigereda Dessalegn

Evaluating Wildlife-management Programs

Record keeping

As all wildlife-management programs should be closely monitored and evaluated on an on-going basis, maintaining complete and accurate records is critically important. Record keeping can be conducted using traditional paper records, but this approach limits the ability to effectively analyze data. Software is now available which permits not only the recording and analysis of airport wildlife management data, but also the efficient development of risk assessments and management plans. Canadian suppliers of wildlife-management software are listed at the end of this section. At a minimum, records should include:

- Wildlife species and numbers both prior to and during the implementation of control programs
- Details of wildlife-control methods, such as types of control and frequency of application.
- Long-term record keeping assists airport authorities by:
- providing complete histories of wildlife movements and preferred habitats;
- measuring the overall effectiveness of wildlife-control initiatives;
- predicting the arrival times of major migrant species;
- determining major wildlife trends at airports; and
- estimating the costs of wildlife control program

Daily recording forms

Completed on-site by airport personnel directly involved in wildlife-control activities, daily recording forms contain information on:

- Dates and times of animal observations,
- Details of animal actions,
- Species identification,
- Estimated numbers of observed animals,
- Locations where observations took place,
- Control methods implemented, and
- Immediate effects, if any

A sample recording form—*Wildlife Control Activities*—is provided in Appendix 4.

This standardized form provides entries under the following headings:

Date:

Recording the dates of wildlife observations assists in identifying seasonal trends, and allows follow-up investigations on factors such as weather patterns.

Time Start:

When used in combination with "*Time Finish*", this information accurately Indicates the time devoted to particular control methods, as well as person hours Required to employ them.

Numbers and Type:

Using field guides for reference, information concerning the types and numbers

of bird or mammal species should be entered as accurately as possible.

Control Method:

Recording the control methods used to counter problem species assists in the evaluation of the effectiveness of wildlife-control programs.

Result/Effects and Comments:

Allows for concise observations of the immediate effects delivered through the applied control method.

Location:

This should be habitat-specific, identifying such areas as short or long grass, ponds or runways. The accurate identification of problem locations allows airport personnel to target specific attractants.

Weather:

Weather conditions should be limited to one or two descriptive terms, such as

Cloudy/rain or sunny/windy.

Initials: This section identifies the airport personnel who recorded the data.

A preliminary checklist

As critical a task as it may be, developing an effective airport wildlife-control program is also a monumental challenge. Authorities will face a number of questions throughout the process, and perhaps the following list should be among them. Far from exhaustive, this list may nonetheless provide important if the answer to any one of these questions is *"no,"* then the work of preparing an airport to counter the many hazards posed by wildlife may be far from over:

• Has an airport-specific wildlife risk assessment been conducted?

• Has a wildlife-management plan been developed?

• If so, has the plan been implemented?

• Has an on-site wildlife-control officer been appointed and assigned responsibilities?

• Has a program been developed to train those involved in wildlife control?

• Has a wildlife-control coordinating committee been established and provided with well-defined responsibilities and terms of reference?

• Has a memorandum of understanding been signed by all concerned parties, including ATS providers, wildlife-control officers, and airport operations managers?

• Has a reporting procedure been developed to cover all aspects of the wildlife-control program?

• Has a land-use strategy been established regarding lands on and near the airport?

• Has an ecological survey been conducted?

• Has a list of all on-site attractants been completed?

• Has a list of all attractants in the surrounding area been completed?

• Have control methods been researched and implemented at the airport?

Appendixes

Appendix 1

Further Reading (Bibliography)

- Wildlife control procedure and manual, transport Canada safety and security aerodrome safety branch, Canada2002.
- John L. Seubert Vienna, 29 August to 2 September 1994
- Eschenfelder, Captain P. Wildlife Hazards to Aviation. Shannon, Ireland:
- International Society of Air Safety Investigators, October 2000.
- Towns vill airport WHMP towns vill ,australia2011.

Appendix 2

Common Bird Zoonoses

	Type	Arboviral encephalitis	Histoplasmosis	Psittacosis
	Description	Inflammation of the brain caused by Arboviral infection.	Infection by the pathogenic fungus Histoplasma capsulatum	Infection by the bacterium Chlamydia psittaci.
	Birds Involved	Many species such as waterfowl and wild birds	No birds directly involved as the fungus, H. capsulatum, does not infect birds.	Found in both wild and domesticated birds but is more commonly found in the latter.
	Source or mode of infection	Transferred to birds from blood-sucking insects such as mosquitoes and ticks). Humans acquire it from infected mosquitoes.	Acquired through inhalation of spores from fungus in soils contaminated by bird droppings .	Transmitted to host through inhalation of aerosolized particles or by ingesting contaminated food; also acquired through direct contact with infected bird tissues, feces and secrets.

	Clinical signs of infection in people	First symptoms: fever, chills and headache. More serious symptoms: drowsiness, nausea, coma, confusion, rigidity and convulsions; may cause death.	Different indications of symptoms depending on severity: ranging from asymptomatic to permanent pulmonary calcification and permanent lesions.	Mostly asymptomatic or mild. Mild symptoms: similar to flu. Severe symptoms: fever, chills, malaise, myalgia, loss of appetite, headache, cough and chest pain
	Precautions and preventions	Prevent mosquito bites by wearing protective clothing; use repellents scare tactics and mosquito netting and screening; modify habitats.	Clean up bird droppings regularly; moisten droppings to prevent spores from becoming airborne; wear facemasks, disposable coveralls, gloves, boots, surgical caps and goggles during clean-up.	Wear gloves to prevent bird bites and direct contact with feces; wear facemasks, protective clothing and surgical caps; moisten and spray a 1% solution of household disinfectant on the dropping to prevent the bacteria from becoming airborne.

Appendix 3

Birds or wildlife strike report form

AIP ETHIOPIA

ENR 1.14-8
18 DEC 08

ETHIOPIAN CIVIL AVIATION AUTHORITY

BIRD STRIKE REPORTING FORM

Send to.....
Operator ET 01/02
Aircraft make/model B763 ..... 03/04
Engine make/model PW4060 ..... 05/06
Aircraft registration ET-AMQ 07
Date 22 day 04 month 12 year 08
Local time 0400 09
Dawn A day B dusk (C night) D 10
Aerodrome Name TLV / LLBG 11/12
Runway used 08 13
Location if en route 14
Height AGL 6000 ..... ft 15
Speed (IAS) 250 ..... kt 16
Phase of flight Approach 17
Parked ☐ A
Taxi ☐ B
Take-off run ☐ C
Climb ☐ D
enroute ☐ E
descent ☐ F
approach ☒ G
landing roll ☐ H

Effect on flight

None	☒	32	☐
Aborted take-off	☐	33	☐
Precautionary landing	☐	34	☐
Engines shut down	☐	35	☐
Vision obscured	☐	36	☐
Sky condition		37	
No cloud	☒ A		
Some cloud	☐ B		
Overcast	☐ C		

Precipitation

fog	☐ 38
rain	☐ 39
snow	☐ 40
Bird Species	41

Number of birds	**Seen** 42	**Struck** 43
1	☐ A	☒ A
2-10	☐ B	☐ B
11-100	☐ C	☐ C
More	☐ D	☐ D

Part(s) of Aircraft		**Struck**		**Damage**
Radome				
Windshield		☐	18	☐
Nose (excluding above)		☐	19	☐
Engine no.	1	☐	20	☐
	2	☐	21	☐
	3	☐	22	☐
	4	☐	23	☐
Propeller		☐	24	☐
Wing/rotor		☒	25	☐
Fuselage		☐	26	☐
Landing gear		☐	27	☐
Tail		☐	28	☐
Lights		☐	29	☐
Other (specify)		☐	30	☐
		☐	31	☐

Size of bird 44

Small	☐ S
Medium	☐ M
Large	☐ L

Pilot warned of birds

Yes ☐ no ☒

Remarks (describe damage, injuries and other pertinent information)

Civil Aviation Authority
Addis Ababa

Amendment 2/08

ETHIOPIAN CIVIL AVIATION AUTHORITY

Supplementary bird strike reporting form
Operator costs and engine damage information

A.BASIC DATA

Operator.....ET.....
Aircraft make/model...B763.....
Engine make/model...PW 4060.....
Aircraft registration.....ET-AMQ.....
Date of strike day.22...month.04.....year.2012.....
Aerodrome/location if known...TLV / LLBG.....

B. COST INFORMATION

Aircraft time out of service.....NIL.....hours

Estimated cost of repairs or replacement U.S$ (in thousands).....Ø.....
Estimated other costs
E.g. loss of revenue, fuel, hotels) U.S$ (in thousands).....Ø.....

C. SPECIAL INFORMATION ON ENGINE DAMAGE STRIKES

Engine position number	1	2	3	4
Reason for failure/shut down				
N/A.				
Uncontained failure	☐	☐	☐	☐
Fire	☐	☐	☐	☐
Shutdown-vibration	☐	☐	☐	☐
Shutdown-temperature	☐	☐	☐	☐
Shutdown-fire warning	☐	☐	☐	☐
Shutdown-other (specify)	☐	☐	☐	☐
Shutdown-unknown	☐	☐	☐	☐
Estimated percentage of thrust loss*	–	–	–	–
Estimated number of birds ingested	–	–	–	–

Bird species.....
*These may be difficult to determine but even estimates are useful.

Send all bird remains including feather fragments to...

Reported by. CAPT. CARL. 97217

This information is required for aviation safety

Appendix 4

Wildlife Control Activities

Daily Log

Date: _____W.C.O_____

…….	…….	…….	…….
Time Start/Finish:	Type (Species):	Control Method:	Weather:
…….	……..	…….	……
Location:	Number:	Result/Effects and Comments:	Initials:
……..	…….	…….	……..
Time Start/Finish:	Type (Species):	Control Method:	Weather:
……..	…….	…….	…….
Location:	Number:	Result/Effects and Comments:	Initials:
…….	……..	……..	…….
Time Start/Finish:	Type (Species) :	Control Method:	Weather:
…….	…….	…….	…….
Location:	Number:	Result/Effects and Comments:	Initials:
…….	……..	…….	……..
Time Start/Finish:	Type (Species):	Control Method:	Weather:
…….	…….	…….	…….
Location:	Number:	Result/Effects and Comments:	Initials:
…….	…….	…….	…….
Time Start/Finish:	Type (Species):	Control Method:	Weather:
…….	…….	…….	……..
Location:	Number:	Result/Effects and Comments:	Initials:
…….	…….	…….	…….
Time Start/Finish:	Type (Species):	Control Method:	Weather:
…….	…….	…….	…….....
Location:	Number:	Result/Effects and Comments:	Initials:
…….	…….	…….	…….
Time Start/Finish:	Type (Species):	Control Method:	Weather
…….	…….	…….	…….
Location:	Number:	Result/Effects and Comments:	Initials:
…….	…….	…….	…….
Time Start/Finish:	Type (Species):	Control Method:	Weather:
…….	…….	…….	…….
Location:	Number:	Result/Effects and Comments:	Initials:

Sightings: (A - Airfield, V - Vicinity)

Birds: …….. Mammals:……

Appendix 5

Wildlife Hazard

Management Assessment

Wildlife often cause hazards to aviation and many airports have developed wildlife management programs to alleviate these hazards. For example, in recognition of this problem at certified civil airports in the United States, Federal Aviation Administration regulations require the development of wildlife hazard management plans if ecological studies show that wildlife cause safety problems (FAA 1987). The purpose of this paper is to propose a system for assessing the implementation of existing wildlife hazard management programs at either certified or uncertified civil airports. The only papers found describe various methods for evaluating bird management on military aerodromes (Lucid and Slack 1980, Roseleaf 1981, Kull 1984).

This paper concerns civil airports and employs different methods. As the result of a review of pertinent literature, personal knowledge, and discussions with individuals directly involved in controlling wildlife hazards to aviation, I have identified key elements of wildlife hazard management programs. (For the purpose of this paper, domestic animals are included under wildlife.) Management functions and control techniques for mitigating wildlife hazards are listed; and habitats, land uses, and food sources are identified that are attractive to wildlife on or in the vicinity of airports. In this system, the elements described in Tables 1-4 are assessed as to the degree that management programs are being implemented. Assessments should be periodic, at least twice a year, so that shortcomings and improvements can be detected (Exhibit

A). the table listings are not intended to cover every possibility – the lists can be changed to meet differing situations. The proposed system would provide a rapid means of assessing civil airport programs to control wildlife hazards. This would provide benefits to airport administration/management, government agencies responsible for aviation safety, or other organizations that assist in programs to enhance safety, such as aviation insurance underwriters, or consultants. Four assessment categories are used to indicate how well airport wildlife hazard management plans are being implemented. If an assessor finds that an airport has initiated action to reduce a wildlife hazards according to plan and is on schedule, the action would be considered satisfactory, and the assessment symbol (AS) checked (") would be “S”. If no measures have been taken, the assessment would be unsatisfactory – “U”. If implementation of a control measure was behind schedule or only partially accomplished, the assessment could be either needs improvement “NI”, or unsatisfactory “U”, depending on the seriousness of the hazard. If it is apparent that certain listed techniques or items are not applicable, the assessment would be “NA”. If an assessment is either “NI” or “U”, a comment by an assessor is required (Exhibit A). (*John L. Seubert Vienna, 29 August to 2 September 1994)*

Examples of assessments requiring comments are as follows:

A. Management functions related to wildlife hazards on or in the vicinity of airports (Table 1).

• If permits have not been obtained (Code 1.1) for shooting or trapping birds and/or mammals the AS would be “U”.

• If animal remains found on runways are being counted to document bird strikes, but are not being identified by species (Code 1.9) the AS would be “NI”.

B. Bird control on or in the vicinity of airports (Table 2).

• If bioacoustics were not being used (Code 2.4) the AS would be “U”.

• If the installation of plastic or steel wires (Code 2.11) over two airport ponds was behind schedule the AS could be “NI” or “U”, depending on the degree of potential hazard.

• If the raptors were not being trapped and relocated (Code 2.24), the AS Would be “U”.

C. Mammal control on or in the vicinity of airports (Table 3).

• If fencing (Code 3.3) was in need of repair the AS would be “NI”.

• If rodenticide (Code 3.12) were not being used to control a rodent population attracting raptors, the AS would be “U”.

D. Airport habitat and food sources related to wildlife hazards (Table 4).

• If airport litter control was inadequate (Code 4.17), the AS would be “NI”.

• If vegetation used as a roost site (Code 4.29) was not being eliminated or made unattractive, the AS would be “U”.

Examples of off-airport land uses and food sources are listed in Table 5. Wildlife hazards to airports frequently are attributable to these attractants, but airport managers have no authority over the use of private property. On rare occasions, relief might be obtained if a business or a landowner has not complied with zoning, health, or safety regulations (e.g. garbage dumps). Airport managers should initiate programs to reduce/eliminate the hazards of off-airport wildlife attractants (e.g., garbage dumps, certain agricultural activities), by informing local jurisdictions and landowners of the hazards, and suggesting ways of alleviating them. (*John L. Seubert Vienna, 29 August to 2 September 1994)*

Table: 1 Management Functions Related To Wildlife Hazards On Or In The Vicinity of airport

assessment

CODE		S	NI	U	remark
1.1	Acquiring wildlife control permits from federal, state, and local agencies				
1.2	Arranging for ecological assessments, studies, and monitoring, as needed, to evaluate the hazard potential of wildlife attracted by habitats, land uses, and food sources located on or in the vicinity of airports.				
1.3	Ensuring that airport habitats are managed to reduce or eliminate wildlife attractions.				
1.5	Ensuring that airport policy prohibits the feeding of wildlife and the exposure of food wastes.				
1.6	Establishing a communication capability between wildlife control and ATC personnel.				
1.7	Evaluating wildlife hazard management programs – at least twice a year				
1.8	Interacting with local jurisdictions and land owners about zoning, land use, and the resolution of wildlife hazard problems in the vicinity of airports.				

1.9	Maintaining wildlife control log books that would be a daily record of wildlife control activities, environmental changes, wildlife interactions, and animal remains identified by species.				
1.10	Maintaining a system for warning pilots about wildlife hazards (NOTAMs, ATC, BIRDTAMs, RADAR observations, etc.).				
1.11	Monitoring bird concentrations (e.g. local movements).				
1.12	Operating a wildlife patrol system with a trained field staff (wildlife specialists, control officers, etc.), conducting surveillance/inspections of critical airport areas (runways, etc.), and effecting wildlife control when needed or requested.				
1.13	Reporting all aircraft wildlife interactions to aviation authorities (e.g. bird strikes).				
1.14	Supervising, implementing, and coordinating airport wildlife hazard management programs.				
1.15	Training personnel responsible for implementing airport wildlife hazard management programs, especially the field personnel				

Table-2 CATEGORY -2 BIRD CONTROL ON OR IN THE VICINITY OF THE AIRPORT

CODE	TECHNIQUE FOR DISPERSE, DETER,EXCLUDE,REMOVE BIRDS	S	NI	U	NA
2.1	Birds patrol in vehicle				
2.2	Electronically generated noise				
2.3	Shooting to scare				
2.4	Over head wires for pond ,ditches, roof etc				
2.5	Grass management				
2.6	Dead bird removal				
2.7	Chemical capture				
2.8	Nest and egg destruction				
2.9	Trapping and relocation				

Table -3 CATEGORY - 3 MAMALLS CONTROL ON OR IN THE VICINITY OF AIRPORT

CODE	TECHNIQUES USED FOR DISPERSE AND REMOVE	S	NI	U	NA
3.1	fencing				
3.2	Vehicle patrol				
3.3	Controlled hunting				
3.4	Live trapping and relocation				
3.5	shooting				
3.6	Cattle guard				

Table -4 CATEGORY- 4 Management of habitat and food source on airport property related to wildlife hazard

code	Agriculture and vegetation management	S	NI	U	NA
4.1	Brush, shrubs, flowering plant				
4.2	Agricultural crops (especially grains and sun flowers)				
4.3	Nesting site (e.g. tree)				
4.4	Landscaping(fruits and roost sites attractive to birds				

CODE	Waste management/sanitation	S	NI	U	NA
4.5	Food waste storage(cafeteria and catering service)				
4.6	Garbage dump				
4.7	Sewage treatment ponds/lagoons/outfalls				
4.8	Weeds ,construction debris, junk yards				

code	Water source and other attractants	S	NI	U	NA
4.9	Aquatic vegetation				
4.10	Canal, ditches, creeks, waterways				
4.11	Retention pond				
4.12	Water fountain				
4.13	Earth warm and insect prevention				
4.14	Fish processing plant				
4.15	Marsh swamp mud flats				
4.16	Structures(hangers, tower, sign, poles)				
4.17	Any wildlife protected area(reserve, park etc)				

S = **satisfactory** if an assessor finds that an airport has initiated action to reduce wildlife hazard according to plan and schedule the assessment would be “satisfactory”.

U= **unsatisfactory**. If no measures have been taken according to plan and schedule the assessment would be “un satisfactory”.

NI**= needs improvement**. If an assessor finds that an airport implementation behind schedule or only partially accomplished.

NA=**not applicable**. If it is apparent that certain listed techniques or items are not applicable to the airport.

Each point in this checklist can be modified based on the complexity of the airport that can be assessed.

Appendix 6

Habitat management: management of shelter

Shelter/ Safe Areas	**Management Technique**
Woodlots	•Remove all undergrowth •Thin treetops to make them less attractive as roosting sites •Inspect trees frequently for colonies of nesting birds
Hedgerows/ Nest Trees	•Cut back at least 150 m from the runway or taxiway center line
Buildings	•Eliminate holes, crevices, roosting ledges and general access to buildings •Block, cover and seal all holes, crevices and drains by using screening, concrete or brickwork •Apply special materials to perches to keep birds away •Slope ledges to eliminate roosting and nesting sites by using boards, plastic sheeting and concrete •Perform routine inspections of all airside buildings and structures •Remove old airside buildings that are no longer in use
Trees, Structures	•Monitor trees around the fenced perimeter and remove if required •Remove all large single trees as well as small clumps of trees on airside lands
Runways, Aprons & Taxiways	•Carry out inspections and remove all materials that attract birds •Put spikes on runway lights, approach lights, taxiway and apron lights to eliminate perching and nesting sites •Spray insecticides and herbicides beside runways to eliminate seeds and insects •Keep runways and taxiways clean

APPENDEX 7

Land Use that may Create Wildlife Hazards in the Vicinity of Airports

Agriculture

Crops (grains, forage legumes)
Livestock feedlots, pig farms
Pasture lands Plowing, haying, harvesting
Vineyards
Orchards, berry farms

Recreational Areas

Drive-in theatres
Golf courses
Marinas
Picnic areas
Outdoor restaurants
Beaches

Food Processing

Abattoirs
Coastal fish processing plants
Fish-waste outfall

Wildlife Concentration Areas

Wildlife refuges
Bird feeding stations
Bird nesting colonies
Roosting sites

Waste Facilities

Garbage dumps
Waste-transfer stations
Landfills holding organic waste
Compost facilities

Natural Areas

Marshes/swamps
Mud
Flats/shorelines
Bush or woodlots
Hedgerows
Riparian habitat

Water Bodies
Sewage lagoons
Sewage outfalls
Oxidation ponds
Storm water retention ponds
Reservoirs and lakes

Glossary

Active Management: The use of short-term management techniques such as distress calls, pyrotechnics, trapping and culling to disperse or remove wildlife.

Airside: The movement area of the airport, adjacent terrain and buildings or portions thereof within the airport security fence line.

Bird or animal strike :A "*reported bird or animal strike*" is deemed to have occurred whenever. (all must be reported)

- A pilot reports a strike to the ATSB
- Aircraft maintenance personnel find evidence of a bird or animal strike on an aircraft
- Personnel on the ground report seeing an aircraft strike on or more birds or animals
- Bird or animal remains are found on the airside pavement area, or within the runway strip, unless another reason for the bird or animal's death can be found.

A "*suspected bird or animal strike*" is deemed to have occurred whenever a bird or animal strike has been suspected by aircrew or ground personnel but upon inspection:

- No bird or animal carcass is found, and
- there is no physical evidence on the aircraft of the strike having occurred

A "*confirmed bird or animal strike*" is deemed to have occurred whenever:

- Aircrew report that they *definitely* saw, heard or smelt a bird strike
- Bird or animal remains are found on the airside pavement area or within the runway strip, unless another reason for the bird or animal's death can be found
- Aircraft maintenance personnel find evidence of a bird or animal strike on an aircraft

A "*bird or animal near miss*" is deemed to have occurred whenever a pilot takes evasive action to avoid birds or animals.

An "*on-aerodrome bird or animal strike*" is deemed to be any strike that occurs within the boundary fence of the aerodrome, or where this is uncertain, where it occurred below 500feet on departure and 200feet on arrival.

A "*bird strike in the vicinity of an aerodrome*" is deemed to have occurred whenever a bird strike occurs outside the area defined as "on aerodrome" but within an area of 15 kilometers radius from the aerodrome reference point (ARP) or up to 1,000 feet above the elevation of the aerodrome. Town's vill Wildlife Hazard Management Plan December 2011 - Version Number 4.6

A "*bird or animal strike remote from the aerodrome*" is deemed to have occurred whenever a bird strike occurs more than 15 kilometers from an aerodrome or more than 1,000 feet above the elevation of the aerodrome.

Consequence: The outcome of an event expressed qualitatively or quantitatively, being a loss, injury, disadvantage or gain. There may be a range of possible outcomes associated with an event.

Foraging: When wildlife search for and obtain food.

Habituation: The tendency for wildlife to become accustomed to certain stimulus when repeatedly exposed to it.

Hazard: A source of potential harm or a situation with potential to cause loss.

Migration: When wildlife pass periodically from one region to another.

Nocturnal species: A species which is most active during the night.

Passive management: The modification of habitat to render it less attractive to wildlife.

Probability The likelihood of a specific event or outcome, measured by the ratio of specific.

Events or outcomes to the total number of possible events or outcomes.

Risk: The chance of something happening that will have an impact upon objectives. It is measured in terms of consequences and probability.

Risk Treatment: The process of selection and implementation of measures to modify risk.

Roosting: When birds repeatedly return to a particular place in numbers to loaf or spend the night.

Transit When birds fly from one place to another.

A "*bird or animal strike remote from the aerodrome*" is deemed to have occurred whenever a bird strike occurs more than 15 kilometers from an aerodrome or more than 1,000 feet above the elevation of the aerodrome.

Wildlife: refers to animals that may pose hazards to aircraft when struck. This includes birds, bats and terrestrial mammals such as rabbits, hares, foxes, dogs as well as reptiles and amphibians.

Wildlife Count: Scheduled counts conducted by airport staff or outside body.