M-394

CONSOLIDATED HEARINGS BOARD

IN THE MATTER OF the Region of Halton's Proposed Waste Disposal Undertaking at Site F or Site D in the Region of Halton

WITNESS STATEMENT

MR. PAUL McDONALD

Airports Authority Group
Professional & Technical Services
Transport Canada

December 1987

DAVID ESTRIN
Barristers & Solicitors
22 Scollard Street
Toronto, Ontario

WITNESS STATEMENT

PAUL McDONALD

1. Paul McDonald obtained a Bachelor of Environmental Studies Degree from the University of Waterloo in 1975 and has, since that time, worked with Transport Canada in the area of bird hazards to aircraft.

During that period he has:

- been responsible for the development and implementation of policies and guidlines with respect to environmental protection at airports;
- served as the secretary of the Bird Strike Committee Canada (1983 to present); and as secretary to the Interdepartmental Committee on Bird Hazards to Aircraft (1976-83);
- assisted in the writing of two manuals prepared by the Airport Authority Group of Transport Canada:

  The Manual of Airport Bird Hazard Control and the Manual of Airport Mammal Control;
- developed and administered Transport Canada's bird strike reporting program;
- prepared educational pamphlets, brochures and bulletins for distribution to the aviation public as well as assisted in training programs for Transport Canada officials and National Defence staff in respect of bird hazards to aircraft;
- presented papers on bird strikes at meetings of the International Civil Aviation Organization,

Canadian Wildlife Service and has served as Transport Canada's representative in respect of such matters with the Federal Aviation Administration in the United States. (His curriculum vitae is attached as Appendix I).

2. Mr. McDonald will explain the rationale for Transport Canada's concern with respect to the hazards created by birds to aircraft. He will speak to the statistics in Canada concerning reported bird strikes per year and the efforts of Transport Canada to develop measures that would prevent such strikes from occurring.

3. He will indicate that the reported bird strike statistics do not tell the whole story, i.e. that there are a large number of strikes happening at airports that are not reported. He will indicate Transport Canada's efforts to have more complete and accurate reporting occur, including reference to brochures and publications in that regard. See "Clear the Air: Report all Bird Strikes". (Appendix II). See also "Airport Wildlife Management Bulletin No. 1, April 1987, Bird and Mammal Hazards" (Appendix III).

4. Mr. McDonald will also refer to The Transport Canada publication "A Bird Strike Hazard - Garbage, Birds and

Airports" and indicate this was prepared because landfills are a major attraction to gulls and gulls are increasing in population and are creating problems for airports right across the country.

This brochure is aimed at municipalities and municipal administrators and has a specific objective of attempting to solicit the assistance of municipalities, senior governmental officials, consultants and planners in preventing a landfill site from being located within 8 kilometres of an airport.

5. Mr. McDonald will also refer to and screen a film initiated by Transport Canada and prepared through the National Film Board entitled "Stop Bird Strikes". Mr. McDonald was the contracting authority on behalf of Transport Canada for the film, developed the script, participated in the development of the material in the film, and supervised the actual filming. The film is an educational presentation meant to inform and motivate airport staff of the hazards of bird strikes and what can be done about them. It has been shown at approximately 60 to 70 airports across Canada and is used as part of Transport Canada's national training package at Transport Canada's national workshop. This video is 21 minutes long and was produced in 1981. It was also entered as an exhibit and shown at two

Environmental Assessment Board hearings concerning landfill sites:

(a) Application by the City of North Bay for the expansion of an existing landfill site in the City of North Bay, Environmental Assessment Board Report dated November 4, 1987, Exhibit 50;

(b) Application by Quinte Sanitation Services Limited for Certificates of Approval for short and long term use of an existing landfill, Township of Sydney, County of Hastings, Environmental Assessment Board Report dated October 19, 1987, Exhibit 107.

6. Mr. McDonald will indicate that in addition to reported bird strikes there are a significant number of aborted take-offs and precautionary landings every year because of bird strikes that are not classified as accidents or incidents from a safety point of view but which do have an impact on flight operations.

7. Mr. McDonald will indicate that bird strikes are not regular events but rather a random event, and that any strike is potentionally life-threatening. Many serious stikes happen at airports with very low reported bird strikes or even, in some cases, no reported bird strikes. He will indicate bird strike statistics show

that serious bird strikes do not happen necessarily at those airports with the highest number of strikes, or even at those airports with the highest bird strikes per 10,000 movement rate. Bird strikes can happen at any airport and it does not have to be an airport with a history of problems or a large number of aircraft movements.

8. Mr. McDonald will refer to manuals for the safe operation of airports developed by Transport Canada and indicate that the standards contained in them have been essentially adopted by the International Civil Aviation Organization as practices to be implemented at airports in countries that are members of the ICAO. Mr. McDonald will refer to Annex 14 to the Convention of International Civil Aviation, specifically Article 9.5 (found as Appendix IV to this witness statement).

9. Mr. McDonald will also refer to the ICAO "Airport Services Manual" - Part 3 "Bird Control and Reduction", sections 6.1 and 6.2 (Appendix V to this witness statement). Mr. McDonald will note that the 6th European-Mediterranean Regional Air Navigation Meeting recommended that for airports in that region, garbage disposal dumps should not be located within 13 kilometres or 8 miles of the airport reference point.

While that is even more stringent than the standard established in Canada, it indicates the seriousness of the problem.

10. Mr. McDonald will refer to the "Manual of Airport Bird Hazard Control" published by Transport Canada dated 1983. In this manual Transport Canada has developed policy, standards and guidelines for the development of a bird control program. (Relevant excerpts from that manual are found as Appendix VI to this witness statement).

11. Mr. McDonald will explain the direct controls that are available to Transport Canada with respect to land uses presenting conflicts with airports (such as landfills) as well as the means by which Transport Canada attempts to ensure, where such direct controls to do not exist, that such adverse land uses do not develop. He will address the issue of zoning regulations made pursuant to the Aeronautics Act and indicate that although Transport Canada through the Aeronautics Act has the power to zone property to prohibit, for example, the location of garbage dumps on lands in the vicinity of airports, such zoning regulations require a lengthy consultation process, implicate the federal government to pay compensation by way of injurious affection, and are

considered not to be retroactive. Accordingly, it remains imperative that proper land use planning around airports be carried out through provincial and municipal procedures. In that regard he will refer to the Transport Canada publication "Land Use in the Vicinity of Airports: Planning Guidelines for the Use of Land Outside Airport Property Boundary" Nov. 1985 (Appendix VII to this witness statement)

12. Mr. McDonald will discuss Transport Canada's experience with measures to discourage and control birds. He will indicate that the most sensible and cost-effective measure is to prevent a land use known to attract birds from being located in the vicinity of an airport or, failing that, to remove it. He will indicate that the most problematic situations in terms of landfills and bird hazards to aircraft is where a landfill site has been located such that birds fly between a water body and the landfill food source, crossing the airport property in both directions en route.

13. Mr. McDonald will discuss the efforts made by Transport Canada in other situations to have garbage dumps removed from the vicinity of airports or to influence a municipality in selecting a location for a landfill that was least attractive to birds.

14. Mr. McDonald will indicate that Transport Canada has paid to ensure mitigation measures occur at landfill sites because of concern for its legal liability in the event that a bird strike caused injury or damage. He will also indicate that Transport Canada, in cases other than the Halton landfill environmental assessment, has been asked to comment on the planning suitability of contemplated landfills early in the planning process and before final sites are selected by the proponent. In at least one case, Fredericton, N.B., after Transport Canada comments and advice, the City of Fredericton decided on an alternative landfill site that presented a less hazardous situation from a bird hazard to aircraft perspective.

15. Mr. McDonald will also discuss the problems created at the North Bay Airport by a landfill in close proximity and the efforts made over more than 25 years to have that problem mitigated or solved. Reference will be made to a letter dated August 21, 1986 from the Regional Director General of Airports to the Ontario Ministry of Environment, Environmental Assessment Branch, which refers to Transport Canada's concerns with regard to North Bay, monies paid by Transport Canada in that regard and the Department's interpretation of the non-

retroactive nature of any zoning regulations made under the Aeronautics Act. (Appendix VIII).

16. Mr. McDonald will refer to previous correspondence to and from Transport Canada concerning the proposal before the Board (see Appendix IX). This correspondence indicates, among other things, that:

- Halton Region did not apparently solicit Transport Canada's opinion with respect to whether Site D should be included as a preferred landfill site having regard to the potential hazards and land use conflicts associated with Burlington Air Park;
- Halton Region apparently only obtained Transport Canada's opinion at a point in time (September 26, 1986) when Site D was chosen as a final alternative site;
- establishment of a landfill at Site D will contravene Transport Canada's criteria for location of landfills in relationship to airports;
- Transport Canada's criteria with respect to preventing landfill sites being located in the vicinity of airports is applicable regardless of whether the aircraft using an airport are piston, turboprop or jet-powered;
- Transport Canada considers the location of a landfill site near an airport to be a serious

detriment to aircraft safety. When the selection of a landfill site includes alternate sites that are farther away from an airport, Transport Canada supports a site farther from the airport that would not create bird movement in or near aircraft flight paths.

17. Mr. McDonald will indicate that if a landfill at Site D is established and impacts on the safe operation of the Burlington Air Park, the Department of Transport may have no option but to either remove the Aeronautics Act Public Licence issued to Burlington Air Park or, alternatively, take whatever measures are possible to limit the operation or cause the early closing of the Regional landfill site.

INDEX TO APPENDICES

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TO BE SUPPLIED WHEN AVAILABLE

Transport Canada
Airports Authority Group

Transports Canada
Groupe de gestion des aéroports

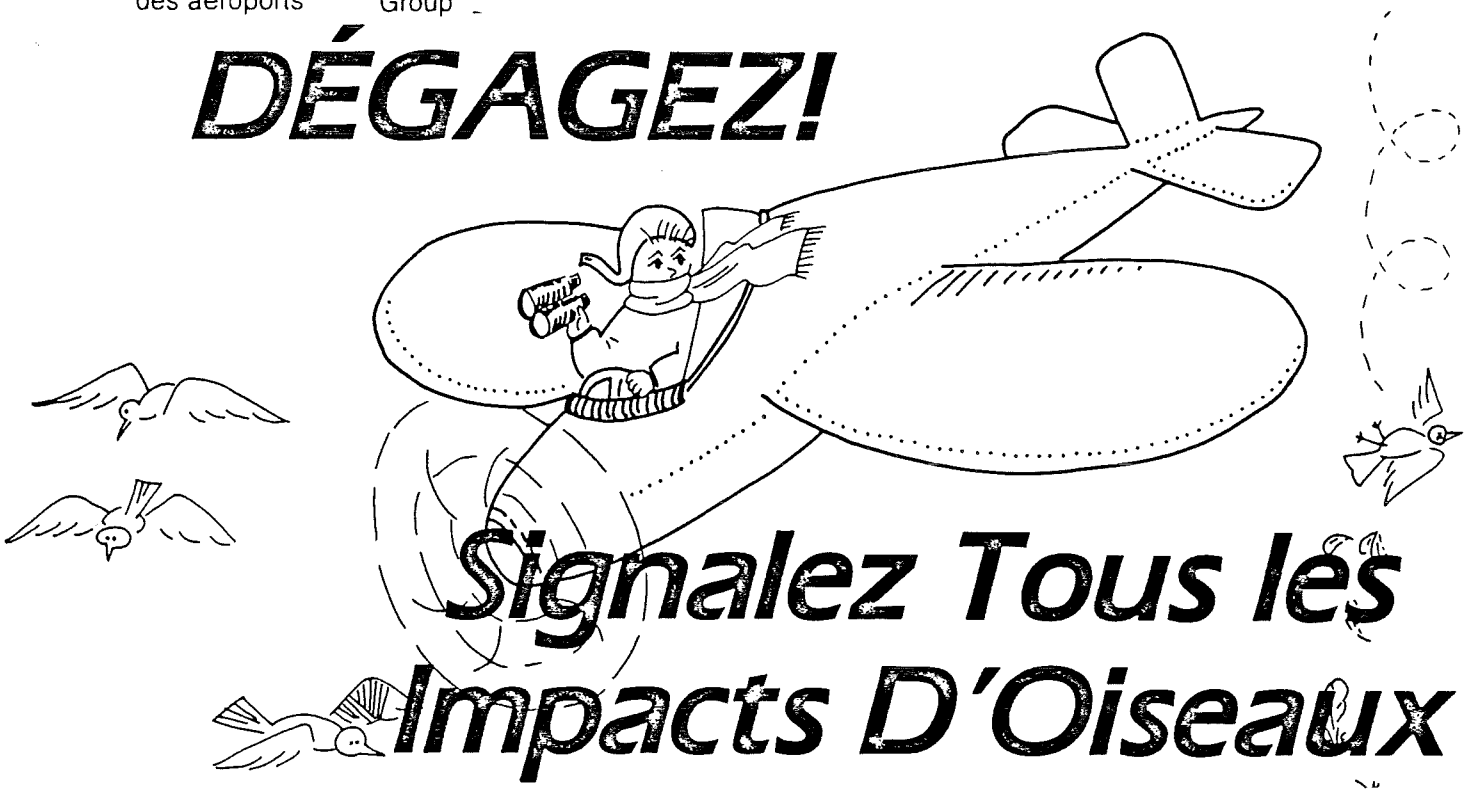
CLEAR THE AIR:

Report all Bird Strikes

Transports Canada
Groupe de gestion des aéroports

Transport Canada
Airports Authority Group

DÉGAGEZ!



Signalez Tous les Impacts D'Oiseaux

Transport Canada
Airports Authority Group

Transports Canada
Groupe de gestion des aéroports

CLEAR THE AIR:

Report all Bird Strikes

Birds pose a serious threat to aircraft. When they collide, the results can be severe — equipment damage, injury and sometimes, death. You can help reduce the threat by reporting bird strikes to Transport Canada.

This Could Happen to You

You're the pilot of a B737 taking off in light snow. Suddenly, several Snow Buntings smash into your windscreen, blocking your vision. You abort take-off, overheating the brakes and damaging the tires. Your passengers are shaken up. Fortunately, that's all. This happened at Halifax International Airport. It's not an isolated incident. In 1985, 863 bird strikes were reported by the Canadian aviation community. They included 20 aborted take-offs and 119 precautionary landings.

- A Marsh Hawk was ingested into the No. 1 engine of a Boeing 737 on take-off from Sydney. The pilot heard a loud bang and saw flames. He climbed to 800 feet on one engine and made an overweight emergency landing. This bird strike cost the airline more than $1 million for engine repairs and lost revenue.
- A Convair 580 turboprop carrying 45 passengers struck a gull on take-off from Grande Prairie. The bird entered the intake after passing through the propeller. With his left engine damaged, the pilot made a forced landing.

Three Steps to Reduce Bird Strikes

REPORT all bird strikes to Transport Canada through the Bird Strike Reporting Program. We need to know when and where they occur, and under what conditions.

IDENTIFY bird species on your strike report form. This information is crucial to finding solutions.

DEVELOP CONTROL PROGRAMS based upon strike reports and statistics. For example, our analysis of your reports frequently leads to eliminating ideal conditions for bird habitats. For example, Snow Buntings were attracted to grass and weeds exposed during snow plowing at Halifax International Airport. Snow removal practices have been changed so that birds now go elsewhere to find food.

Help Us Help You

Transport Canada can take meaningful steps to reduce bird strikes . . . but only if you report them to us.

PILOTS: Report all strikes to Air Traffic Control. Complete the Bird Strike Report "Pink Form", No. 23-0036, available from the flight service station, the airport manager or your airline.

AIRPORT FIELD STAFF: Report all evidence of bird strikes to the ATC Tower and Wildlife Control Officers as soon as possible.

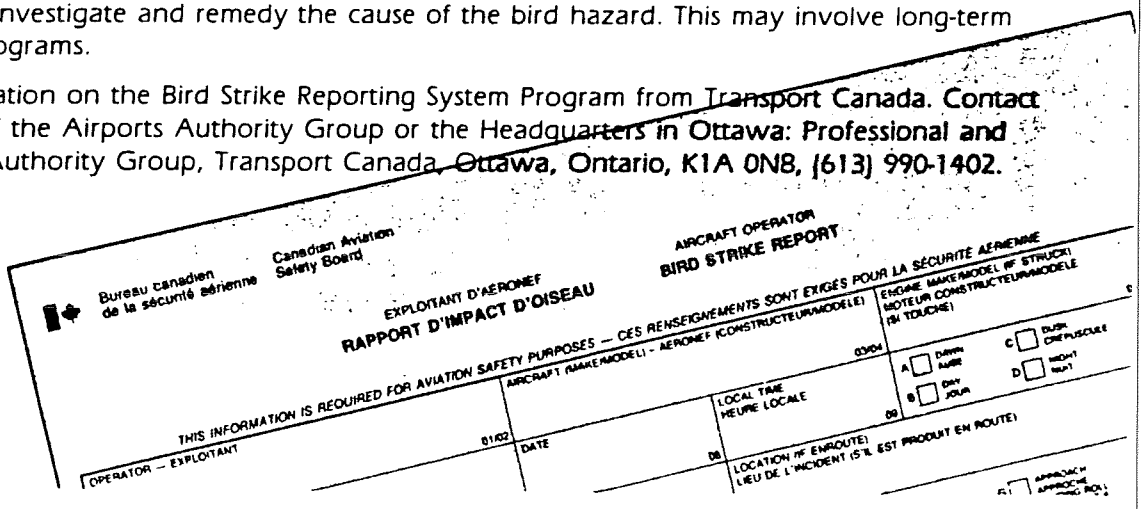
WILDLIFE CONTROL OFFICERS: Investigate all bird strikes and record information on the Airport Staff Bird Strike Report. Send all bird remains to The National Museum of Natural Sciences, Ottawa.

AIRPORT MANAGEMENT: Investigate and remedy the cause of the bird hazard. This may involve long-term or immediate bird control programs.

You can obtain more information on the Bird Strike Reporting System Program from Transport Canada. Contact the nearest regional office of the Airports Authority Group or the Headquarters in Ottawa: Professional and Technical Services, Airports Authority Group, Transport Canada, Ottawa, Ontario, K1A 0N8, (613) 990-1402.

TP 8144

Canada


Bureau canadien de la sécurité aérienne
Canadian Aviation Safety Board
EXPLOITANT D'AÉRONEF
AIRCRAFT OPERATOR
RAPPORT D'IMPACT D'OISEAU
BIRD STRIKE REPORT
THIS INFORMATION IS REQUIRED FOR AVIATION SAFETY PURPOSES — CES RENSEIGNEMENTS SONT EXIGÉS POUR LA SÉCURITÉ AÉRIENNE
OPERATOR — EXPLOITANT
AIRCRAFT (MAKE/MODEL) - AÉRONEF (CONSTRUCTEUR/MODÈLE)
ENGINE MAKE/MODEL (IF STRUCK) MOTEUR CONSTRUCTEUR/MODÈLE (SI TOUCHÉ)
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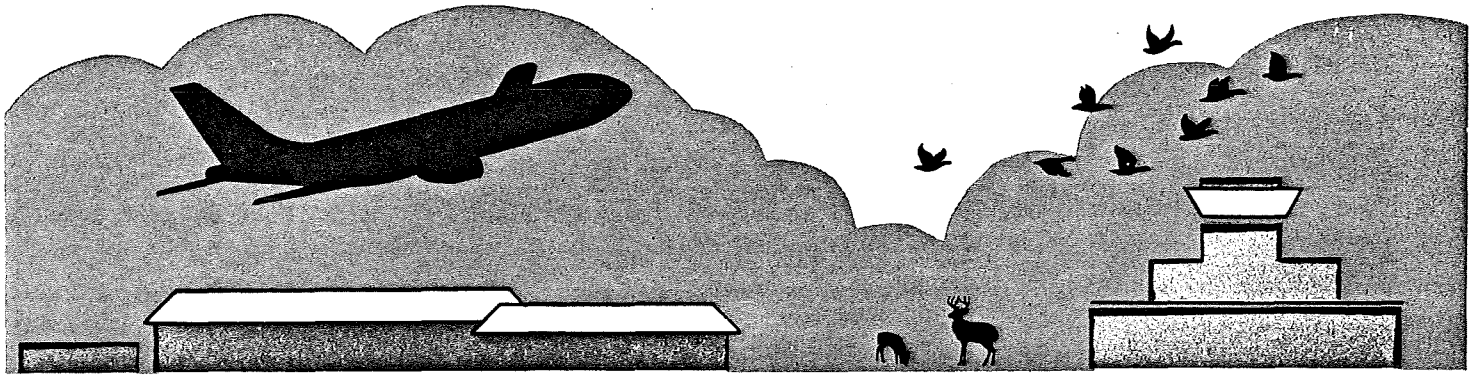
DAWN AUBE
DAY JOUR
DUSK CRÉPUSCULE
NIGHT NUIT
APPROACH APPROCHE

Transport Canada Transports Canada

BULLETIN No. 1 April 1987

AIRPORT WILDLIFE MANAGEMENT



BIRD AND MAMMAL HAZARDS

A Widespread Safety Matter

Millions of dollars in damage to aircraft and airport facilities is caused every year in Canada by birds and other wildlife. It's a safety factor which is all too often forgotten by those who work in the aviation industry but one which has a constant and costly impact on airport and aircraft operations.

Birds pose the most widely recognized wildlife danger to safe aircraft operation. Collisions between birds and aircraft can cause extensive damage. Birds can shatter windshields and pass right through into the cabin, injuring a pilot or passenger.

The most dangerous bird strike involves the engine, particularly on jet aircraft. Such collisions can result in temporary loss of power, costly damage to fan blades, or total destruction of the engine. Damage from such strikes has resulted in forced landings or even the total loss of the aircraft in a crash.

Wildlife behaviour which is damaging or disruptive to aviation can also be caused by insects, rats, muskrats and other rodents, rabbits, wolves and even larger mammals such as deer, bear and moose.

Although not as prominent, this disruption is extensive. Certain mammals chew electrical cables or break runway lights and markers. Others infest buildings, weaken foundations, nest in facilities or cause drainage and maintenance problems because of their burrowing. Birds and mammals regularly interfere with the take-off and landing of aircraft. Mammal strikes usually involve the undercarriage, sometimes causing damage.

A Costly Phenomenon

The cost of the damage is significant. Incidents in Canada involving a single bird have cost more than $1 million. In 1985, bird strikes to aircraft reported to the Airports Authority Group of Transport Canada numbered 863. But industry observers suspect that many bird strikes go unreported.

Aviation authorities in Canada estimate the annual average damage to civil aircraft caused by bird and mammal strikes to be $2 million, not to mention economic loss to airlines and passenger inconvenience. Commercial, private and military aircraft are all affected.

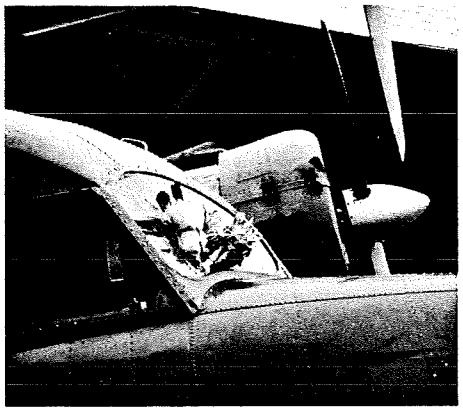
Damage on the ground is equally costly. Reports from airports across the country indicate that an annual bill of $2 million to prevent and repair wildlife damage to facilities would not be an unreasonable estimate of the problem's cost.

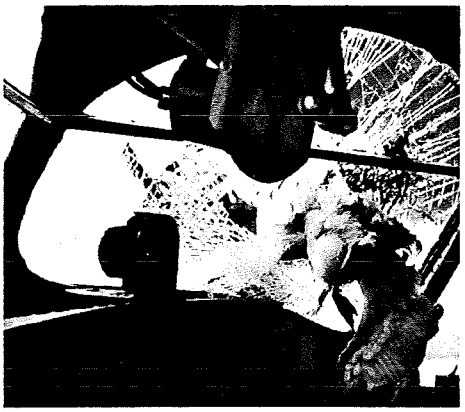
Coping with Nature

Airports require vast and levelled expanses which, by necessity, are usually some distance from urban areas. They are likely to be adjacent to farmland, wooded areas, a large body of water, or even garbage dumps — each supporting a natural food chain which attracts wildlife to the area.

Some birds and mammals seek out open space at airports, food which is more accessible on an airport's maintained areas, and food and shelter in areas surrounding an airport. Open areas also attract small burrowing mammals. Lakes, streams and ditches support insects, aquatic life, waterfowl and beaver. Airport buildings, adjacent trees and dense bush provide ideal cover and nesting areas. The presence of small birds and mammals in turn attracts larger predatory animals. Airports also impose hunting restrictions which yet again encourage a larger animal population on their property. In fact, the very airports which should harbour no wildlife actually contribute to the problem to a great extent because of unavoidable factors in their design and location.

The need for food and shelter is not the only factor involved in this relationship. Pilots and airport staff must contend with cyclical patterns of ani-





Bird Strikes cause costly damage.

mal behaviour. Bird strikes increase during spring and fall migrations, and in the latter months of summer as young birds learn to fly.

Taking Action

The safety of aviation operations is paramount in this encounter between people and nature. Efforts must be continuous in order to prevent disruptive or damaging incidents. The process begins with coordination, study and management such as that conducted by the Airports Authority Group of Transport Canada. The group has been charged with the responsibility of bringing to the Canadian aviation industry an effective and economic program to deal with the problem.

The first line of defence is to know what you're dealing with. The Airports Authority Group studies the numerous species of wildlife affecting aviation — their preferences, needs, habits and natural enemies. In close cooperation with specialists and concerned organizations, the Airports Authority Group has implemented a variety of programs to prevent contact between the aviation industry and wild animals. Among these activities are:

- ***Management and Coordination.*** With the continuing efforts of the Airports Authority Group, airport wildlife control has become recognized as a distinct and vital responsibility among airport officials and aviation authorities across Canada.
- ***Reporting.*** The Airports Authority Group manages programs involving airlines, commercial and private pilots, the military and international groups to promote the reporting of wildlife incidents.
- ***Facilities Modification.*** The program takes advantage of studies to determine the best ecological means to avoid destruction of and by wildlife. The Airports Authority Group encourages and supports the elimination of nesting, roosting and feeding attractions posed by the airport, its buildings and other facilities. The screening of eaves, fencing, and blocking of sheltered areas are part of this strategy.
- ***Artificial Deterrents.*** Wildlife control includes the use of scare equipment such as models and noise-makers, and chemical deterrents. The proper application and handling of chemicals deter roosting and nesting, and the chewing of cables and structures. The limited effectiveness of models and the familiar scarecrow is supplemented by noise repellants using speaker systems and the discharge of firearms and pyrotechnics. Although this method of scaring and dispersing animals and birds requires repeated application and is limited in its effectiveness, it can immediately clear an area in order to allow an airport to function safely.
- ***Grounds Maintenance.*** Cutting and clearing of vegetation and ditch maintenance are conducted with consideration of animal habits and preferences to eliminate attractions to wildlife.
- ***Habitat Modification.*** Work is conducted on streams or other bodies of water on or near airport property to make them less attractive to wildlife. Crews also clear away brush and growth that could encourage wildlife habitation.
- ***Farming Methods.*** Agriculture within airport property is closely controlled. Farmers in areas bordering airports are also consulted and encouraged to use techniques and crops which prove less attractive to wildlife.
- ***Removal.*** Live trapping and subsequent relocation is usually limited to particular cases involving larger animals such as deer, bear and moose. Trapping, poisoning and shooting are a last resort and are used in cases when other means have proven ineffective and aircraft safety is threatened.
- ***Airport Planning.*** Consideration of the surrounding countryside and of the placement and design of facilities within airports is gaining increasing importance as planners seek to deal with the wildlife problem.

Continuing Research

The emphasis of this program continues to be the study and application of the most effective wildlife control techniques. Effectiveness in this case is a combined measure of resources, economics and results.

The Airports Authority Group recognizes that the necessary research and control is a continuing process. It is seeking assistance from pilots, maintenance and ground crews, aircraft designers and engineers, airport planners and other individuals in all sectors of the industry.

The full reporting of each incident, and of damage to aircraft and facilities helps to establish patterns and habits. Such cooperation permits better allocation of limited and needed resources in this contribution to safe airport and aircraft operations.

For more information, contact:

Professional and Technical Services (AKPD)
Airports Authority Group
Transport Canada
Ottawa, Ontario
K1A 0N8

Canada

INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES

AERODROMES

ANNEX 14

TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

EIGHTH EDITION — MARCH 1983

This edition incorporates all amendments adopted by the Council prior to 23 November 1982 and supersedes, on 24 November 1983, all previous editions of Annex 14.

For information regarding the applicability of the Standards and Recommended Practices, *see* Chapter 1, 1.2 and Foreword.

INTERNATIONAL CIVIL AVIATION ORGANIZATION

9.4.14 **Recommendation.**— *The system of preventive maintenance employed for a precision approach runway category II or III should have as its objective that, during any period of category II or III operations, all approach and runway lights are serviceable, and that in any event at least:*

a) 95 per cent of the lights are serviceable in each of the following particular significant elements:

1) precision approach category II and III lighting system, the inner 450 m;

2) runway centre line lights;

3) runway threshold lights; and

4) runway edge lights;

b) 90 per cent of the lights are serviceable in the touchdown zone lights;

c) 85 per cent of the lights are serviceable in the approach lighting system beyond 450 m; and

d) 75 per cent of the lights are serviceable in the runway end lights.

In order to provide continuity of guidance, the allowable percentage of unserviceable lights should not be permitted in such a way as to alter the basic pattern of the lighting system. Additionally, an unserviceable light should not be permitted adjacent to another unserviceable light, except in a barrette or a crossbar where two adjacent unserviceable lights may be permitted.

Note.— With respect to barrettes, crossbars and runway edge lights, lights are considered to be adjacent if located consecutively and:

laterally — in the same barrette or crossbar; or

longitudinally — in the same row of edge lights or barrettes.

9.4.15 **Recommendation.**— *A stop bar provided at a taxi-holding position used in conjunction with a precision approach runway category III should not have more than two unserviceable lights; nor, unless the light spacing is significantly less than that specified, should it have two adjacent unserviceable lights.*

9.4.16 **Recommendation.**— *The system of preventive maintenance employed for a taxiway intended for use in runway visual range conditions less than a value of the order of 400 m should have as its objective that no two adjacent taxiway centre line lights be unserviceable.*

9.4.17 **Recommendation.**— *The system of preventive maintenance employed for a precision approach runway category I should have as its objective that, during any period of category I operations, all approach and runway lights are serviceable, and that in any event at least 85 per cent of the lights are serviceable in each of the following:*

a) precision approach category I lighting system;

b) runway threshold lights;

c) runway edge lights; and

d) runway end lights.

In order to provide continuity of guidance an unserviceable light should not be permitted adjacent to another unserviceable light unless the light spacing is significantly less than that specified.

Note.— In barrettes and crossbars, guidance is not lost by having two adjacent unserviceable lights.

9.5 Bird hazard reduction

9.5.1 **Recommendation.**— *The Appropriate Authority should take action, as necessary, to decrease the number of birds constituting a hazard to aircraft operations by adopting measures for discouraging their presence on, or in the vicinity of, an aerodrome.*

Note.— Guidance on effective measures for establishing whether or not birds, on or near an aerodrome, constitute a hazard to aircraft operations, and on methods for discouraging their presence, is given in the Airport Services Manual, *Part 3.*

9.6 Apron management service

9.6.1 **Recommendation.**— *When warranted by the volume of traffic and operating conditions, an appropriate apron management service should be provided on an apron by an aerodrome ATS unit, by another aerodrome operating authority, or by a co-operative combination of these, in order to:*

a) regulate movement with the objective of preventing collisions between aircraft, and between aircraft and obstacles;

b) regulate entry of aircraft into, and co-ordinate exit of aircraft from, the apron with the aerodrome control tower; and

c) ensure safe and expeditious movement of surface vehicles and appropriate regulation of other activities.

9.6.2 **Recommendation.**— *When the aerodrome control tower does not participate in the apron management service, procedures should be established to facilitate the orderly transition of aircraft between the apron management unit and the aerodrome control tower.*

Note.— Guidance on an apron management service is given in the Airport Services Manual, *Part 8.*

Doc 9137-AN/898
Part 3

AIRPORT SERVICES MANUAL

PART 3

BIRD CONTROL AND REDUCTION

FIRST EDITION – 1975

Approved by the Secretary General and published under his authority

INTERNATIONAL CIVIL AVIATION ORGANIZATION

Chapter 6
Environmental Management

6.1 GENERAL

6.1.1 Environmental management is modification of the airport with the aim of removing or cancelling the features that attract birds. When it is fully implemented, the airport will have little attraction for birds. Under these conditions there will be very few birds indeed on the airport. Thus bird hazards to aircraft will be correspondingly rare.

6.1.2 Environmental management therefore offers the best available remedy for bird hazards and bird strikes on an airport. Under some circumstances it is necessary to kill birds on an airport, or to scare them away from it. At times such action may be very important, but the need for it usually arises from the fact that environmental control has not yet been fully implemented on the airport where it is required.

6.1.3 With reference to bird hazards to aircraft on an airport, killing and scaring birds are therefore palliatives that should be temporary, but environmental management is the basic remedy.

6.1.4 Before undertaking an actual programme of environmental management, it is highly important to have an ecological survey of the area made by a trained biologist with experience in such matters. He will submit those recommendations that in his opinion are feasible and meet the needs of the individual situation.

6.1.5 In examining the recommendations to select items that can be done with the funds available, care should be taken to decide priorities with the biologist. For example, in one area, cleaning a clogged and slow-flowing drainage ditch might be more important than cutting down trees, while in another area the reverse would be true because of the species of birds in the area.

6.1.6 It is not possible in a document of this sort to list all of the things that an experienced biologist has learned over the years. On the other hand, it is most desirable to outline some of the more important observations that the biologist will report. These are points which it is hoped that the airport personnel, themselves, can see and correct.

6.2 GARBAGE

6.2.1 Garbage is a never-ending problem. The quantity discarded per person is increasing and acceptable areas for dumping are becoming scarcer. Drive-in theatres and related outdoor activities may also result in large quantities of discarded food over a large area. Unless clean-up is prompt and thorough in the evening, the food available at dawn may support the early morning feeding flights of gulls, starlings and other birds which may be a hazard to aircraft.

6.2.2 If a refuse dump is located at or in the vicinity of an airport, it is recommended that the dumping of garbage or refuse be carried out in such a way that in the opinion of the civil aviation authorities it does not attract birds which are a potential hazard to aircraft. Whether or not a refuse dump attracts birds which might be a potential hazard to aircraft using the airport depends on the location of the refuse dump in relation to the airport, the type of refuse dumped therein and also the types of birds which would be expected in the vicinity of the dump. Refuse dumps which only take refuse such as builders' waste with nothing in them to attract birds are, of course, not considered a bird hazard problem.

6.2.3 If a dump must be present in the vicinity of an airport it should be placed in relation to the airport so that the birds it attracts can have no effect on aircraft operations. For instance, if a water body exists in the vicinity of the airport the refuse dump and the water body should be on the same side of the airport. If a garbage dump is situated so that the airport is between the dump and the sea or a large body of water, then

birds may continue to fly over the airport on their way from the water to the dump and back and, in some instances, will rest on the airport between meals. If the birds which are attracted by a dump constitute a potential hazard to aircraft operations, consideration should be given to engaging the services of a qualified nd experienced ornithologist to overcome the bird .azard problem. Paragraphs 6.2.5 to 6.2.12 describe the measures taken by one State to control the dumping of refuse in the vicinity of an airport.

6.2.4 The Sixth European-Mediterranean Regional Air Navigation Meeting (1971) recommended that for airports in that region, garbage disposal dumps should not be located within 13 km (8 miles) of the airport reference point. However, this general figure must be carefully examined as measures such as those described in 6.2.5 to 6.2.12 may overcome the bird hazard problem even if the garbage dump is located nearer to the airport.

6.2.5 The following paragraphs describe the situation and measures taken by one State where a refuse dump was recognized to constitute a problem to a nearby airport located near the coast. The birds involved were silver gulls. Their feeding grounds were the coastline and the small estuaries, fields under cultivation and some refuse dumps in the vicinity of the airport. The services of a trained ornithologist were engaged to overcome the bird hazard problem. The study made by the ornithologist revealed that the problem was caused by several refuse dumps at which household refuse was being dumped and one in particular adjacent to the boundary of the airport.

6.2.6 Dumping was carried out from the trucks used to pick up the household garbage and refuse and this was then covered over by bulldozing earth on top of it. It was virtually impossible to get any thick and effective earth cover of all the garbage by this method. The gulls were first attracted by the garbage showing through the surface, then they foraged for more beneath the surface. Bird counts at that time put the airport population of gulls as high as approximately 15 000.

6.2.7 A number of different dumping methods were tried. One, for example, was to dig large trenches in the area on which the dumping was taking place, to dump the refuse into these and cover immediately by bulldozing earth on top of it. This was effective as far as the ground itself was concerned but the gulls then turned their attention to the garbage trucks which were coming into the area in a steady stream each day. In addition to raiding the trucks there was also the inevitable short interval between dumping and covering which attracted them.

6.2.8 The solution was found, in the end, by the following method. It had been noted by the ornithologist that the gulls arrived at the dump shortly before dawn and left just after sundown. They went to resting areas, some in shallow water near the coastline and others in some shallow water which was in the airport area itself. This latter area was drained and so this potential resting area was removed from the airport.

6.2.9 Household refuse was collected by day but instead of dumping it by day it was stacked in a covered area which was inaccessible to birds, at some distance from the airport but still adjacent to the points of collection. After nightfall, the refuse was then taken to the dump adjacent to the airport, dumped into open trenches which had been dug during the day to receive it, and then earth was bulldozed over the top. When the gulls arrived the next day there was no food and only a clean earth-covered area to be seen.

6.2.10 The reduction in the gull population at the airport was quite dramatic. Within one week of this dumping procedure being put into force, the population had decreased from about 15 000 to several hundreds, and the refuse dump which had been a serious offender was quite free of them.

6.2.11 The population of birds other than silver gulls was markedly decreased by removing their sources of food supply as, for example, by closely cutting the grass anywhere in or adjacent to the airport movement area and thereby driving out small rodents, lizards, etc. which had been attractive to crows.

6.2.12 It is to be noted that the ornithologist recommended against the closing of other dumps in the vicinity of the airport because they were so located in relation to the flight paths of aircraft using the airport that they drew the gulls away from the airport and to areas where their presence would do no harm. In this respect it should also be noted that the gull is a relatively low-flying bird and the same procedure might not be so advantageous in the case of another situation with another bird population.

6.3 EARTHWORMS

6.3.1 Earthworms are a very attractive food for a variety of birds. They are particularly hardy and are not easily poisoned by material that can safely be used on large areas.