M-389

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

DR. W. JOHN RICHARDSON

December 1987

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Toronto, Ontario

WITNESS STATEMENT

DR. W. JOHN RICHARDSON

1. Dr. Richardson will present the results of his study entitled "Potential Bird Hazards to Aircraft Associated with the Proposed Sanitary Landfill (Site D) in Milton, Halton Region, Ontario" dated September, 1987.

2. Appendix I to this witness statement contains statistics in respect of reported bird strikes at three Ontario airports: Toronto Island, North Bay and Trenton. Two of these have sanitary landfill sites located in proximity. The landfill sites have attracted gulls to the vicinity. The third, Toronto Island Airport, has a large gull colony in proximity.

   There have been collisions between gulls and aircraft at each of these airports, despite bird control measures. (In the case of North Bay and Trenton such measures are taken both at the airport and at the landfill).

   These and other statistics indicate:

   - Gulls account for a larger proportion of bird strikes to civil aircraft in Canada than any other single group of birds.

- The great majority of gull strikes occur at altitudes below 500' which, in the case of civil aircraft, means near airports during takeoffs and landings.

- Bird strikes occur whether or not pilots have previous warning about the presence of gulls in the area.

- Although bird strikes generally occur throughout the year, they are most common in spring, summer and autumn.

- A vast majority of gull strikes occur during daylight hours.

3. Appendix II contains a report, referred to by Halton witness Linda Hellas in evidence but not tendered as an exhibit, entitled "Maple Gull Movement Study", March 1982, prepared by Ecologistics Limited. This study, among other things, indicates:

- that an existing small landfill site was the most consistent concentration area for gulls in their study area, notwithstanding the fact that there

were ploughed fields and an amusement park "Canada's Wonderland" in the study area;

- that a gull strike occurred at the Maple Airport during this short study period, which incident is not reported in ICAO/Transport Canada Statistics and there were other bird and aircraft incidents during this study period;

- that this airport located between a roosting site and a landfill site offering a source of food resulted in a good potential for aircraft/gull collisions;

- that once gulls are attracted to the vicinity of an airport, the airport itself becomes an attractive locale for gulls and other birds to rest;

- that at the time of this study the landfill site was used consistently by gulls whereas other locations in the area were used intermittently.

4. The literature in the area of bird hazards to aircraft indicates that gull strikes have caused crashes of aircraft ranging in size from small single engine planes to DC-10 planes. Incidents involving gulls and aircraft

in Canada occur over a wide range of aircraft types. Dr. Richardson will refer to the article by Thorpe "Accidents and Serious Incidents to Civil Aircraft Due to Bird Strikes" referred to in his report and found as Appendix III to this witness statement. He will also refer to a publication entitled "Bird Strikes to Canadian Aircraft - 1983 Summary Report" published by Transport Canada and an appendix thereto of "Bird Strike Statistics, Canada" prepared by the Canadian Aviation Safety Board (found as Appendix IV to this witness statement).

5. Dr. Richardson will also refer to and discuss the relevance of other authors' works which address the preferred location of landfills in relation to airports:

a) Blokpoel, Bird Hazards to Aircraft (1976) at pp.149-150, 89 (see Appendix V to this witness statement);

b) Blokpoel "Gull Problems at Ontario Airport: No Magic Solution" (1980):

> "Garbage dumps are major attractions for Herring Gulls and Ring-Billed Gulls. Dumps located near airports should be relocated because many gulls visiting a dump may fly across an airport or use its runways as a loafing area. In order to get rid of gulls at airports and/or dumps, persistent day-to-day harassment

of the birds is necessary. A variety of methods, including shell crackers, live ammunition, distress calls and falcons, used conscientiously and carefully by a highly motivated patrol team will produce the best results. Operations of such teams are expensive but their costs might be considered as a form of insurance against major disasters and/or claims of malpractice for inadequate airport maintenance. There are no magic, or cheap, solutions to solve the gull problem at Ontario's airports." [p.26]

c) The International Civil Aviation Organization (ICAO) "Airport Services Manual", Part 3 "Bird Control and Reduction", Section 6.2 "Garbage".

"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.

d) Writings of Victor E. F. Solman, formerly Chairman, Associate Committee on Bird Hazards to Aircraft, National Research Council of Canada:

(i) "Influence of Garbage Dumps Near Airports on the Bird Hazard to Aircraft Problem" (1973):

To improve air safety, we must try to keep birds and aircraft from using the same air space at the same time. Much of the bird problem relates to birds that frequent airport areas or that pass through airport areas at low altitudes in the course of moving between areas of interest. Three-quarters of civil aircraft collisions with birds occur on or near airports ....

The pattern involves the necessities of life of birds. Birds frequent areas where there is food, shelter for nesting and other purposes, and water. Sometimes all three occur together to form a very serious bird attraction. Obviously the way to reduce the number of birds near an airport is to reduce the amount of those three attractions, not only on the airport itself but on neighboring land....

In the Associate Committee, we have tried to bring together our best ideas and those of our colleagues in other countries who face the same problem. We believe the relationship between airports and edible garbage disposal areas should take account of the following points:

1. Food wastes usable by birds should not be exposed within 6 miles of the nearest part of an airport on which aircraft move under their own power.

2. Food wastes should not be disposed of in the open, at a location which would cause birds to cross an airport or its flight-ways on which aircraft move at low altitudes to reach areas they use for purposes other than feeding. In other words, if an airport is a few miles from the ocean, a large lake or a river frequented by gulls, don't put the garbage dump on the other side of the airport so that the gulls will cross the airport several times a day in moving between the water area and the garbage dump.

3. Try to insure that food wastes are exposed for the shortest possible time and, ideally, don't permit them to be exposed at a time when birds can feed on them. [pp.2, 5]

(ii) "Reducing Gull Use of Some Attractions Near Airports" (1984):
In the past we have been lucky to have so few fatalities caused by gull strikes. We must not depend on luck and must, therefore, try harder in future to keep gulls out of the paths of aircraft in order to avoid serious accidents and casualties. We have tried several

methods of gull control over the past thirty years including environmental modification of the airfield, and, with public assistance, also off the airfield. We have used a variety of scaring devices such as recorded distress calls; flying repellents, including live, trained falcons and falcon-shaped, radio-controlled model aircraft; and patrols using sounds, lights, exploding shotgun shells, live ammunition and automatic exploders.

All of those techniques work at some times and places but no single one works under all circumstances and all depend on human action and motivation, neither of which is infallible. [p.210]

(iii) Testimony Before the Environmental Assessment Board in the Matter of an Application by Quinte Sanitation Services Limited for a Provisional Certificate of Approval for the Expansion of a Current Landfill Site, Township of Sidney, County of Hastings, August 5, 1987; pp.3969-71 (See Appendix VI to this witness statement.

6. Dr. Richardson will also address certain of the testimony and exhibits offered by Halton Region in respect of the bird hazard problem.

a) With respect to Exhibit H-17, Dr. Richardson will indicate the following:

p.80 the inference drawn on this page that the population and congregations of the birds in the area of Site D after a landfill "should not change substantially" from those populations there before a landfill is established, is wrong; the landfill will inevitably cause a substantial increase in the number of birds in the area.

pp.92-98 Dr. Richardson will provided updated statistics with respect to the population of gulls on Lake Ontario that occur close enough to be attracted to Site D. He will agree that Site D and the Burlington Air Park are sufficiently close to Lake Ontario to be visited daily by foraging gulls from Hamilton Harbour and the northwestern shore of Lake Ontario. He will also discuss the relevance of the study referred to at page 94 by Ecologistics Limited in respect of the Maple Airport.

pp.104 -112 Various scaring and removal techniques: Dr. Richardson will discuss the techniques and

comments made by Ms. Hellas with respect to these techniques. In particular with respect to acoustical scaring techniques he will comment with respect to the dangers and nuisance that can be associated with acoustical scaring techniques, particularly when the location of use of such techniques is in the vicinity of residential dwellings. He will indicate that contrary to Exhibit H-17, scaring techniques have been instituted at landfill sites but will agree that such techniques have various problems or limitations associated with them.

pp.114
-129 Recommendations

With respect to these parts of Exhibit H-17, Dr. Richardson will indicate that this report places an unwarranted onus on the Air Park to control the problem of bird hazards to aircraft - a problem that will be almost entirely caused by the location of a landfill proximate to the Burlington Air Park. The understanding must be that the Air Park is the impacted sector, not the cause of any potential problem. Up to the present time the Air Park has been operating without bird

control measures and with only two known bird strikes having occurred to date, neither serious. Dr. Richardson will indicate that if a landfill site is established at Site D and if it follows "standard accepted practices of landfilling" as proposed in the THCL Design and Operation Report Site D at page 40, it will significantly increase the frequency of bird strikes. There is no doubt that large numbers of gulls will be attracted to the Air Park and its vicinity if no active bird deterrent measures are instituted at the landfill site. Any measures that the Air Park itself takes will not deal with a major part of the hazard, that is birds flying to the landfill from the lake in the morning and from it in the afternoon. Because there are many fields in proximity to the Air Park for gulls to loaf on between feeding periods at the landfill, the deterrent measures suggested by Ms. Hellas, even if used at Burlington Air Park, would not prevent increased numbers of gulls from occurring near the Air Park.

Dr. Richardson will also comment with respect to the practicality of using a "moveable net

cage over the active face" as suggested at page 115 of Exhibit H-17.

With respect to the use of a major bird scaring program, Dr. Richardson will indicate that a scaring program intensive enough to be effective has not previously been applied at a relatively small airport such as Burlington Air Park. The cost of such a program is a significant factor even at major airports. He will also indicate that the less intensive scaring procedures used at Toronto Island Airport have not prevented bird strikes by gulls and that in any event the experience at Toronto Island Airport is not directly relevant to the type of problem that will be created by siting a landfill proximate to the Burlington Air Park.

Dr. Richardson will indicate that "good house-keeping practices" will not by themselves "ensure that gull populations do not become a problem". He will indicate that the populations of gulls in the vicinity of the Burlington Air Park will [not "may"] increase. He will indicate that his opinion and that of

virtually every knowledgeable expert and publication on the topic is that "to prevent this problem from developing" the best method is to keep the landfill at least 5 miles from the airport and in particular to ensure that it is not located so that birds must cross the airport in order to get to the landfill. He will comment on the statement that "evidence from other airports situated near congregations of gulls indicates that it will be possible to operate the Burlington Air Park safely, with a minimum of modification to existing practices, with a landfill in the vicinity", and indicate that the establishment of a landfill at Site D will increase the bird hazard at Burlington Air Park.

b) With respect to Exhibit H-104, "Recommendations":

pp.3-4
paras 21
-29 Dr. Richardson will observe that even without such measures having been taken, there is at present no evidence of a significant bird problem at Burlington Air Park. If a landfill site is established at Site D, a problem can be expected to occur; this future problem will be caused by the establishment of the

landfill, not by the operation of the Air Park. With respect to the totality of recommendations 4-29, even if all are followed there is no doubt that large numbers of gulls will still come into the vicinity of the Air Park - as they fly from Lake Ontario to the landfill and return.

c) With respect to the testimony of Linda Hellas:

Vol. 4
p.816 Dr. Richardson's evidence will indicate that in fact turboprop aircraft do use the Air Park.

Vol. 6
p. 1208 Dr. Richardson will elaborate on the "greater potential danger to the public" with respect to the risk of collision between birds and aircraft. In particular, he will indicate that there are cases of persons on the ground killed or injured when birds collided with aircraft.

p.1215 Dr. Richardson will indicate that the most obvious location to attempt measures to prevent birds is at the landfill, not at the Air Park. He will point out that Ms. Hellas

is wrong where she indicates that control measures have not been instituted at landfill sites in the past.

p.1221 Dr. Richardson will indicate that it is an oversimplification to suggest that birds have been successfully mitigated at Toronto Island Airport.

7. Dr. Richardson will refer to a comment made by Transport Canada as follows:

> "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 would support a site farther from the airport that would not create bird movement in or near aircraft flight paths."
>
> [Letter dated December 17, 1986 from Transport Canada, to Dr. John Richardson, found as Appendix VII to this witness statement.]

8. Dr. Richardson will conclude that from the following perspectives, namely:

(i) public safety in aerial navigation;

(ii) nuisance impacts that could occur because of bird control measures necessitated by proximity of a landfill to Burlington Air Park;

(iii) the public and private costs of bird control measures that may be necessitated by a landfill in proximity to Burlington Air Park;

(iv) possible restrictions on future operations or growth of Burlington Air Park or on operations at a landfill at Site D because of bird/aircraft conflicts;

Site F is preferred.

INDEX TO APPENDICES

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REPORTED BIRD STRIKES

Summary of Statistics 1981-1985
Taken from Transport Canada Data Submitted to ICAO

TORONTO ISLAND AIRPORT

Number of Reported Bird Strikes	3 1 in 1982 2 in 1983
Number of Reported Bird Strikes involving Gulls	3
Type of Plane Involved twin turbo prop	1 Saunders ST-27 (a commuter type plane) 2 Piper 31 (small twin engine piston)
Phase of Flight at Time of Strike	1 on take-off run 1 climbing 1 on approach
Speed of Plane	101-150 knots
Altitude of Plane	2 at an altitude of less than 100 feet 1 at an altitude between 200 and 500 feet
Time of Year	June, July and September
Time of Day	All in daytime
Location of Strike	1 radome 1 engine 2 propeller 1 fuselage 1 landing gear
Number of Birds Struck	All involved gulls 1 involved between 2 and 10 gulls
Damage	minor in one case none in two cases
Effect of Flight	2 no effect 1 effect not reported

Warnings to Pilots re: birds	On two of these events the pilots had been warned of birds in the area.
Total Aircraft Movements/year*	1982: 208,006 1983: 194,195

NOTES:

1. An interview with Bill Yale, Assistant Airport Manager, Toronto Island Airport, indicated that a bird strike is not usually report unless some damage has been sustained to the aircraft. Toronto Island Airport also takes measures to destroy eggs and nests in the Spring and use a pyrotechnical device which sends off crackers and whistle shells.

2. In the vicinity, the Metropolitan Regional Conservation Authority indicated that they run a 3 month programme, April to late June, consisting of falconry, pyrotechnical devices and mock gulls in an attempt to keep birds from nesting. The cost of this gull deterrent programme is approximately $37,000 per year.

*Transport Canada, Aircraft Movement Statistics (1985)

TRENTON AIRPORT

Total Number of Reported Bird Strikes	62
Number of Reported Bird Strikes involving Gulls	8 1 in 1981 1 in 1982 2 in 1983 3 in 1984 1 in 1985
Type of Plane Involved	2 large jets (Boeing 707) 6 large turboprop planes L-382B
Phase of Flight at Time of Strike	2 on take-off 1 climbing 1 on descent 3 on approach
Speed of Plane	6 at 101-150 knots 1 at 151-100 knots 1 unknown
Altitude of Plane	1 at less than 100 ft. 1 at 201-500 ft. 4 at 501-1000 ft. 2 unknown
Time of Year	April, May, July, September, October, November and December
Time of Day	All in daytime
Location of Strike	3 nose 3 engines 2 wing 1 fuselage
Number of Birds Struck	5 involved 1 bird 1 involved 2-10 birds 2 unknown
Damage	6 no damage 1 minor damage 1 substantial damage

Effect on Flight	2 no effect 2 aborted take-off 4 precautionary landings
Warnings to Pilot re: birds	4 warned 2 no warning
Total Aircraft Movements/year	1981 46,850 1982 39,257 1983 41,133 1984 39,516 1985 40,559

NOTES:

1. "Because of the dangers posed by seagulls, the Department of National Defence instituted a bird control program in the early 1970's that operates both at the airbase and at the site. The program was upgraded in 1979. Four people work full-time using standard bird-scaring techniques - firing shellcrackers, releasing falcons to scare birds, shooting birds, throwing dead birds in the air and firing a propane-powered automatic cannon at irregular intervals. The annual cost is $133,000 which is borne entirely by the DND." EAB report EP-87-03 October 19, 1987 Quinte Sanitation Services Limited at page 37.

NORTH BAY AIRPORT

Total Number of Reported Bird Strikes	25
Number of Reported Bird Strikes involving Gulls	4 (at least) 1 in 1981 1 in 1983 2 in 1985
Type of Plane Involved	2 business jets (Falcon 20- a small turbo fan aircraft) 1 jet trainer (Lockheed T-33) 1 unidentified
Phase of Flight at Time of Strike	1 take-off 2 climbing 1 unknown
Speed of Plane	3 at 151-200 knots
Altitude of Plane	2 between 500-1,000 feet 1 between 1,000-2,500 feet 1 no category
Time of Year	2 in July 1 in August 1 in October
Time of Day	3 in daytime 1 no category
Location of Strike	1 engine 1 fuselage
Damage	1 minor 3 no damage
Effect on Flight	2 no effect 1 precautionary landing 1 unreported
Warnings to Pilot re: birds	1 of 3 cases 1 unknown

Total Movements of Aircraft/year	1981:	87,542
	1983:	100,826
	1985:	79,414

NOTES:

1. "Transport Canada has been operating its bird control program with airport staff and a contract employee who uses falcons and other bird-scaring techniques. The cost of this program, which is totally absorbed by Transport Canada, is between $75,000 and $80,000 per year." EAB report EP-87-04 November 4, 1987 City of North Bay at page 5.

MAPLE GULL MOVEMENT STUDY

PREPARED FOR:

WASTE MANAGEMENT OF CANADA, INC.

PREPARED BY:

ECOLOGISTICS LIMITED
WATERLOO, ONTARIO

MARCH, 1982

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1.0 INTRODUCTION

This study was commissioned by Waste Management of Canada to obtain background data on the present movement patterns and habits of gulls in the vicinity of Maple. Of primary concern was the airport at Maple. Airport officials were worried about the possibility of gulls moving between Canada's Wonderland and the proposed landfill site and creating a hazard to aircraft.

Gulls (primarily ring-billed gulls) are abundant in the study area. They apparently do not nest in the area, but wander up from Lake Ontario to forage. After the breeding season, many roost overnight without returning to Lake Ontario.

The ring-billed population has erupted on the Great Lakes in the last few decades. A recent population increase on the Leslie Street Spit in Toronto, only 28 km south of the study area, has been dramatic.

Ludwig (1974) summarized the changes in ring-billed gull populations on the Great Lakes. Apparently, between 1906 and 1925, no ring-billed gulls nested on the Great Lakes but they returned sparingly to Lakes Michigan and Huron in 1926. By 1930, there were 2,000 nesting pairs on Lake Ontario; 15,000 pairs in 1945 and 165,000 pairs in 1967. The total Lake Ontario population, including non-breeding birds, was estimated to be 412,500 in 1967, almost half of the entire Great Lakes population of 837,500.

The construction of the Leslie Street Spit has provided ideal breeding habitat for gulls. Now 4 species of gulls and terns nest here, including ring-billed gulls, herring gulls, common terns and Caspian terns. Ring-billed gulls form the majority of nesting birds.

Steers (1979) reported that 1973 was the first year that the spit was utilized as a nesting site, when 10 pairs of ring-billed gulls nested. In 1976, 10,382 pairs of ring-billed gulls nested, along with 12 pairs of herring gulls, approximately 1,500 pairs of common terns and 7 pairs of Caspian terns (Fetterolf and Blokpoel 1977). In 1977, over 20,000 pairs of ring-billed gulls nested (Haymes and Blokpoel 1978) and 45,470 pairs were present in 1978 (Steers 1979). Southern (1981) stated that the 1981 breeding population was approximately 67,000 pairs.

Haymes and Blokpoel (1978) estimated the breeding success of ring-billed gulls on the Leslie Street Spit and found that 1.35 to 1.76

young were being produced per nest. As a reproductive rate of only 0.63 birds per nest is required to maintain a ring-billed gull population (Ludwig 1974), the Toronto area population is irrupting.

This rapid increase in gulls on the Leslie Street Spit may be expected to continue until suitable nesting habitat on the headland is completely saturated. Southern (1977) showed that 90 percent of gulls that have nested in a colony return to the same area to breed in subsequent years. Ludwig (1974) found that, on even ground, gulls defended approximately 1 square yard so that nesting density was 2,208 nests per acre. On uneven grounds, birds defend only as far as they can reach. Nesting densities average around 4,670 pairs per acre with the highest density reported being 5,170 nests per acre on uneven ground.

Southern (1976) studied the migrational patterns of ring-billed gulls and found that they did not depart from the breeding range immediately after leaving the colony. From July through mid-October, they disperse throughout most of the Great Lakes region, with the mean distance from the colony gradually increasing with time.

Because of the high population of nesting gulls at the Leslie Street Spit, its proximity to the Maple study area and the post-breeding behaviour of the gulls, it is natural that they would be common in Maple. If the population explosion continues as expected, they will become even more abundant.

2.0 METHODS

Observations of gulls were made from a car parked on the north side of Major McKenzie Drive at the end of one of the Maple airport's runways. The actual pull-off spot was a Bell Canada cable station a few metres west of Shur-Gain's driveway.

The study area was a rectangle defined by Jane Street on the west, the first fenceline north of Major McKenzie Drive, the trees along the headwaters of the Don River on the east and the bush south of the airport (Figure 1).

All gulls seen within this rectangle were recorded, as was the time, the number of gulls in each flock, their approximate altitude and direction of flight. For ease in the field, it was assumed that roads ran east-west and north-south. When it could be determined, their origin and destination were recorded as were any other behavioural features that were of significance.

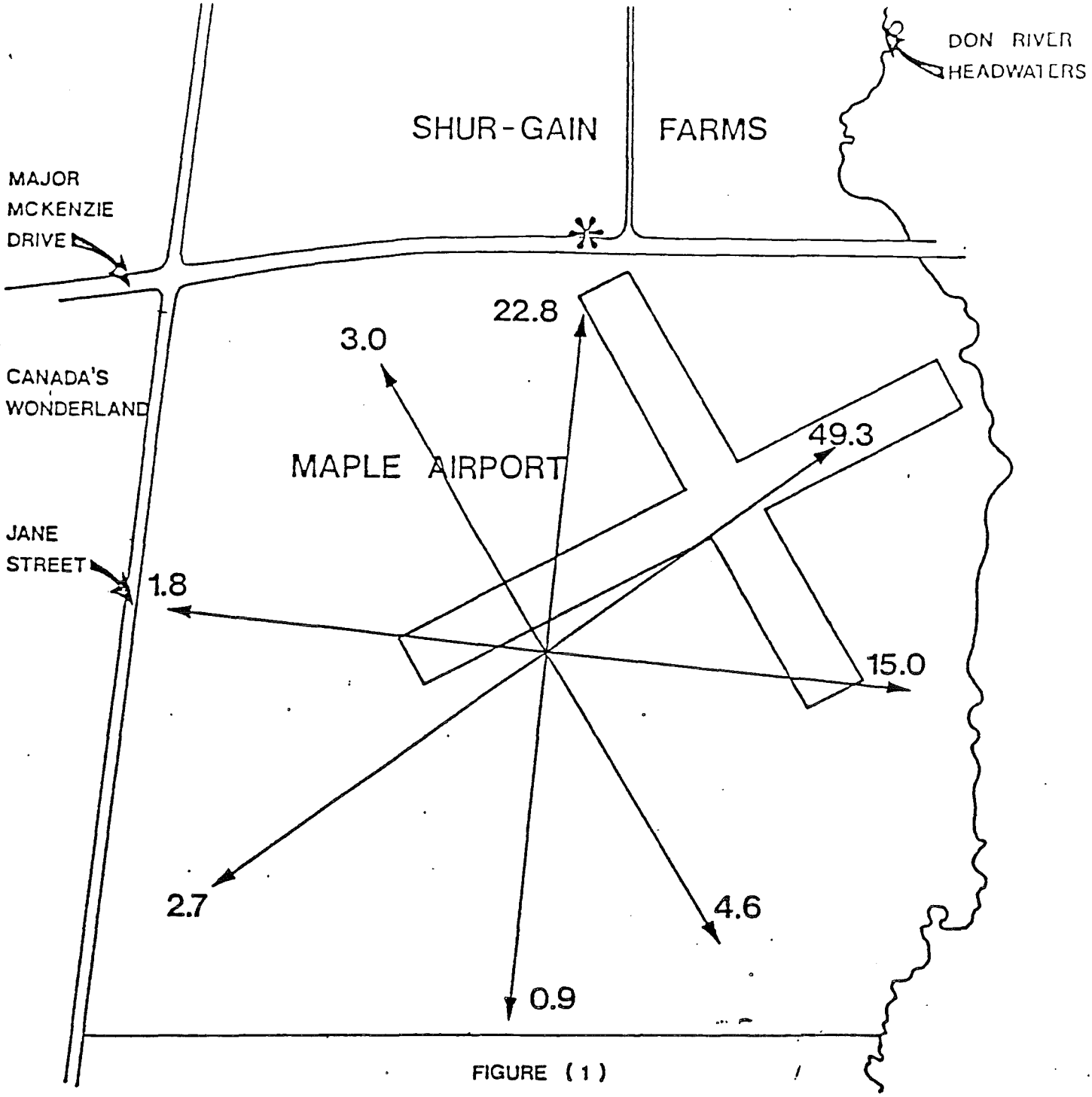

FIGURE (1)

LEGEND : * Observation Point
22.8 Percentage of Gulls Flying North

1: 8000

0 100 200 300 400 500

Directions of Flight of Gulls in Mornings

Other species of birds seen in the study area were also recorded. No attempt was made to count the numbers of other birds present, except when they appeared to be an aircraft hazard.

Observations began at, or shortly before, dawn and lasted a minimum of 3 hours. In the first four observation periods, an evening watch of 2½ to 3 hours was done before dusk.

The number of take-offs and landings at the airport was recorded during the observation period to determine possibilities of aircraft-gull collisions. Collisions, near-collisions and potential problems were also noted.

After the morning observations had been made, the surrounding area was driven around and any gulls seen were recorded. Notes were made on the number of gulls landed in each area and their foraging behaviour. The direction of flight of overhead gulls was noted. This study area, as shown on Figure 3, was bounded by Teston Road on the north, Bathurst Street on the east, Rutherford Road on the south and Jane Street on the west.

When it became apparent that gulls were roosting overnight in the study area, frequent pre-dawn visits were made to Canada's Wonderland and occasional notes were made on pre-dawn gull populations in the existing and proposed landfill sites.

Observations were made on a total of 14 days, starting on July 10, 1981. From July 23 on, observations were conducted at weekly intervals, terminating on October 15.

3.0 RESULTS

Tables 1 through 14 indicate the number of gulls observed and the number of take-offs and landings that occurred at the airport during each study period. So that times of most activity by gulls and aircraft could be identified, observation periods are sub-divided into hours, with dawn being time zero. The number of gulls landed on the airport and in Shur-Gain's hay fields were recorded each hour as was the maximum flock size seen.

Gulls were most active in the morning, particularly during the first hour after day-break. The number of gulls observed in the mornings

ranged from 6 to 391. Maximum numbers were seen in July, with sightings gradually tapering off until the minimum on October 15. The total number of gulls seen during the morning observation periods was 1,693, an average of 121 per morning. During July 189-391 were seen per morning, averaging 277; in August 34-173 were seen, averaging 97; in September 60-102 were seen, averaging 74; and in October 6-110 were seen, averaging 60.

As many as 150 gulls were seen during the first hour of daylight. During July and August, 40 to 60 percent of all gulls seen appeared in the first hour. In September and October, the gulls stayed active into the second hour with more gulls occasionally being seen during the second hour than the first. Gull movement dropped off as the day continued so that by the third hour of daylight, gull activity in the study area was negligible.

Gulls landed on the airport during 11 of the 14 morning observation periods, with a maximum of 54 being recorded at any given time. On the airport, they foraged on freshly-cut grass or roosted on the runways. They were relatively oblivious to airport traffic, rather casually moving out of the way of aircraft and then returning. On August 13, a twin engine Aztec landed, hitting and killing a gull that was slow in getting off the runway. There were several other apparent near-collisions during the study, but from the observation point it was difficult to determine how close gulls and aircraft came.

The Shur-Gain hay fields just north of Major McKenzie Drive were a favoured foraging spot, particularly shortly after the hay had been cut. They landed during 5 of the morning observation periods, with a maximum of 243 being present at one time. None was seen in the fields after August 27. While in the fields, gulls were constantly lifting up, circling around the field and dropping into another location. Maximum activity was during the first two hours of daylight, with most leaving by the third hour.

Most flocks of gulls were small, being only 2 or 3 birds. However, flocks in the magnitude of 10 were common. Larger flocks occurred in July when a maximum of 54 was seen flying together.

Evening gull activity around the airport was slight, so that only four sets of observations were made. A total of 194 birds was seen in the afternoon, an average of 49. From 32 to 90 gulls were seen during a single observation period.

No gulls landed on the airport in the afternoon and only 5 touched down on the hay fields. Most evening observations were of single birds, although one flock of 28 was seen.

Airport traffic was generally fairly light during the observation periods. However, almost all work was done on Thursdays and the first set of observations was made on a Friday. Presumably, weekends would be considerably busier.

Only one aircraft landed during the first hour of daylight throughout the study. This represents only about 0.5 percent of the 191 take-offs and landings recorded during the morning observation periods. During this same period 40.4% of the gulls observed in the mornings were seen. In the second hour of daylight, 12 take-offs and landings occurred (6.3% of total) and 529 gulls were observed (31.2% of total).

Afternoon aircraft traffic was considerably heavier than during the morning. In four afternoons, 508 take-offs and landings occurred, compared to 191 in 14 mornings. However, afternoon gull activity was negligible, averaging approximately 13 sightings per hour.

Table 15 shows the number of gulls observed flying in each direction during the study periods. In the mornings, the majority of birds (49.3%) were heading in a northeast direction. The directions north, northeast and east comprised 87.1% of all morning observations. Most of the eastern flights were gulls apparently coming from Canada's Wonderland and landing directly on the airport. Birds flying in a southerly direction formed only 8.2% of the morning flight.

In the afternoon, the dominant direction of flight was southwest (42.3%). The directions south, southwest and west comprised 68.5% of afternoon observations. Birds flying in a northerly direction formed 22.1% of the afternoon flight.

The percentage of birds headed each direction in the morning and afternoon is shown in Figures 1 and 2, respectively.

The majority of gulls observed were flying at an altitude of 5-20 m, with 10 m being the most frequent altitude. Fall birds appeared to be flying slightly higher and birds typically flew higher in the afternoons at 20-30 m.

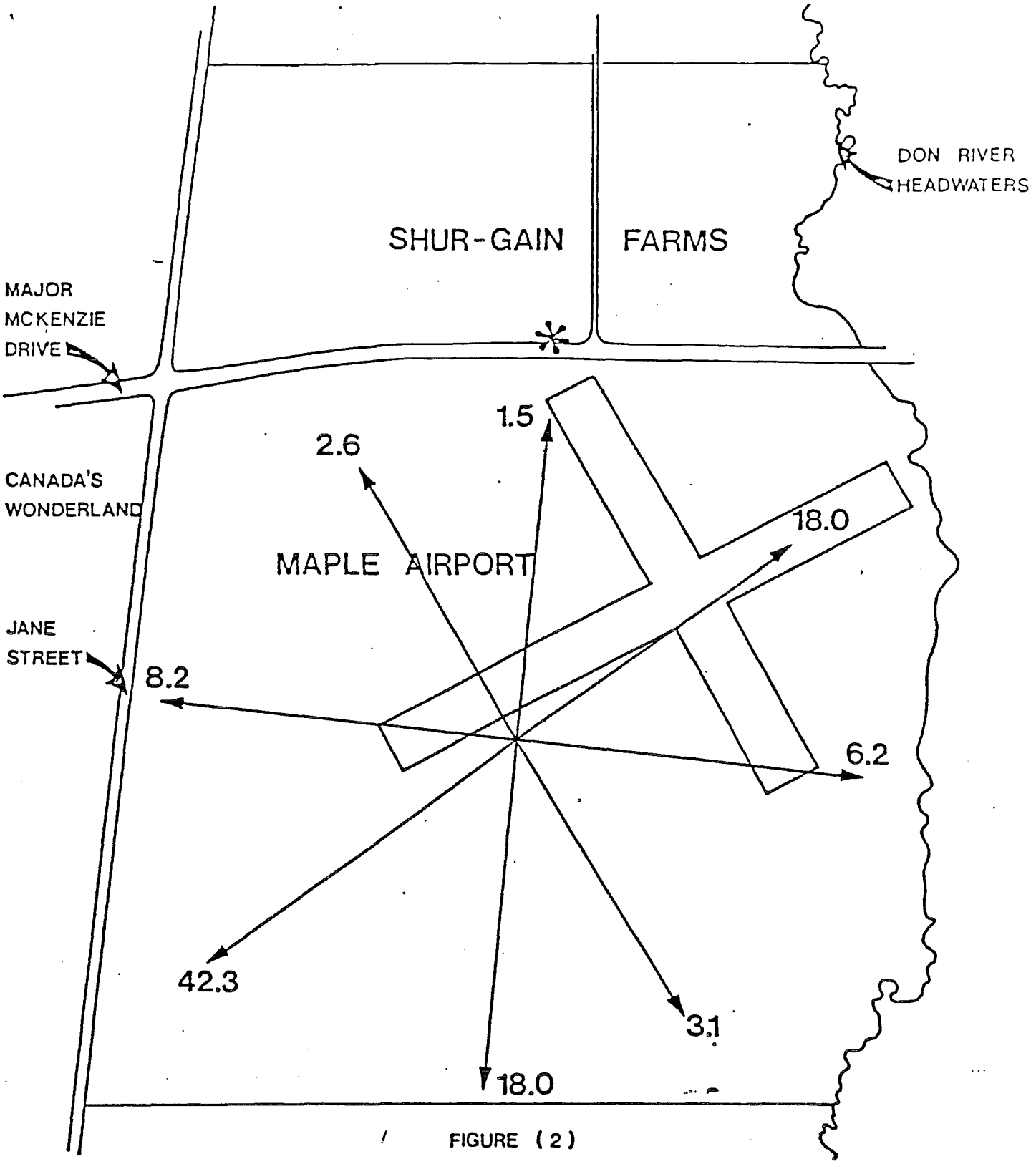

FIGURE (2)

LEGEND : * Observation Point
1.5 Percentage of Gulls Flying North

1: 8000

0 100 200 300 400 500

Directions of Flight of Gulls in Afternoons

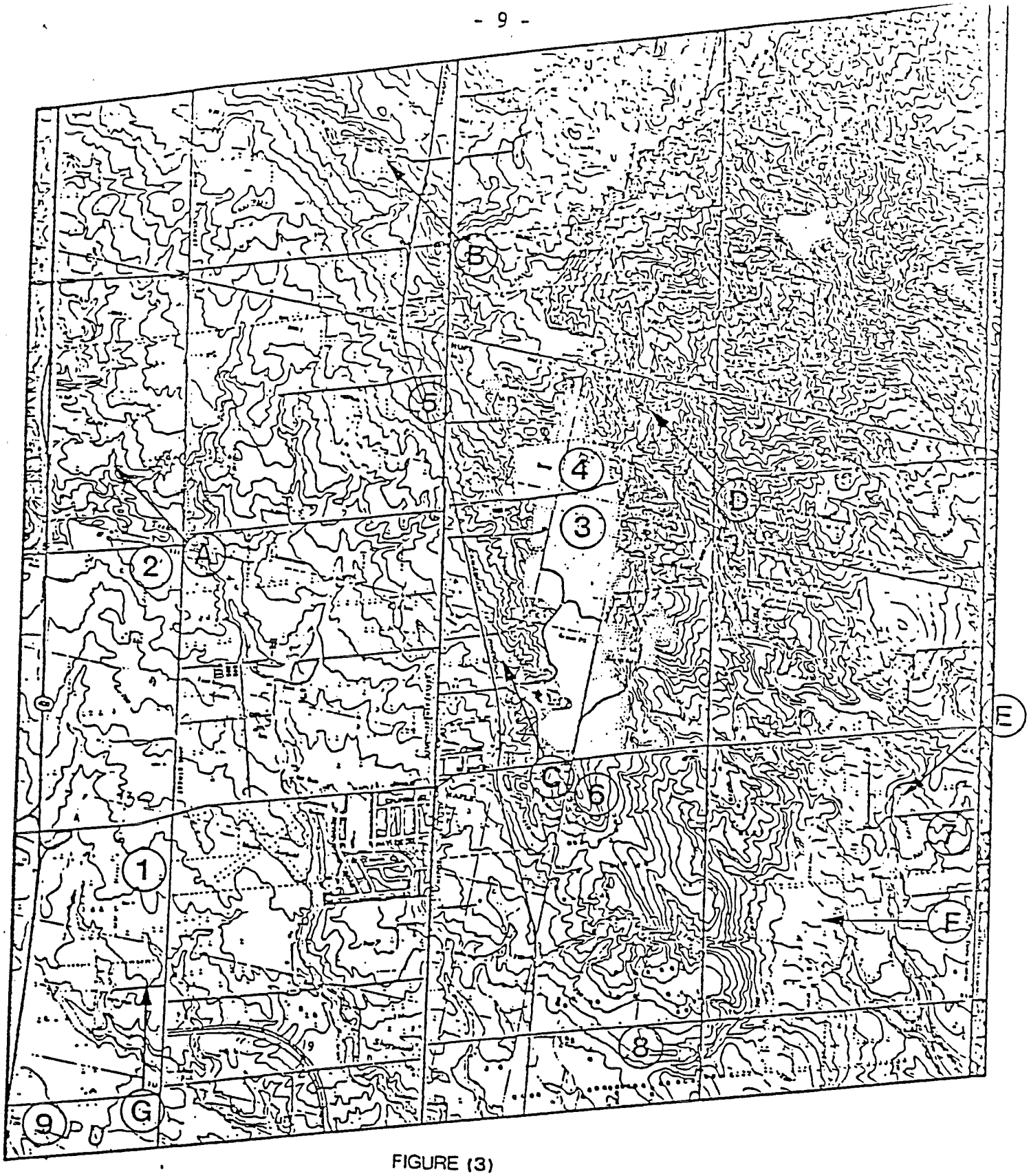

FIGURE (3)

LEGEND:

(2) Locations Where Gulls Were Seen Foraging

(B) Locations Where Gulls Were Seen Overhead, and Dominant Direction of Flight

Miles

.25 0 .25 .50 .75 1.0

N

GULL FORAGING AREAS AND DIRECTIONS OF FLIGHT

Only 97 gulls were observed in flight, with the maximum daily count being 36 and the largest flock being 25. The general flight pattern was either to the northwest out of the study area or towards the existing landfill site.

Table 20 indicates the number of gulls counted before dawn on Canada's Wonderland's parking lots. Unfortunately, it was not realized for some time that gulls were roosting overnight, so that the parking lots were not checked the first three weeks. Two other mornings were also missed. However, the data suggest that, while the park was open daily, up to almost 600 gulls were roosting overnight at Canada's Wonderland. Once the park was open only weekends or closed for the season, the gulls abandoned the parking lots as a roosting site.

The proposed landfill site was visited during the evenings of July 13 to 17, inclusive. Approximately 12 gulls were seen on July 17, indicating that the proposed landfill site was a rare gull roosting site in July. Once Canada's Wonderland was abandoned as an overnight roost, it is probable that more gulls stayed in the proposed landfill site. Unfortunately, no pre-dawn checks were made later in the season to verify this.

A pre-dawn visit to the existing landfill site was made on September 1, but no gulls were present.

It is difficult to estimate the total number of gulls that were present in the study area at any given time. The number of gulls landed around the region is probably the best estimate, but will be conservative as many gulls likely leave the study area during the first hour of sunlight. Based upon these figures and the number of gulls roosting overnight at Canada's Wonderland there were probably 600-700 gulls in the study area until mid-September. By October 8, there appeared to be only around 400 and approximately 200 a week later when the study terminated.

Almost all of the gulls observed were ring-billed gulls. Of course, not all gulls could be identified as many were seen at a distance and it was not possible to check all gulls in flocks. Two herring gulls observed in the landfill site on August 13 were the only positive identification made of another gull species during this study. Herring gulls were also seen during other visits to the study area: 4 on June 16, 3 on June 18 and 2 on June 24. The herring gull population appears to be quite small and represents 0.5% or less of the total gull population.

4.0 CONCLUSIONS

Gulls are common to abundant in the area around the Maple airport. Not only do considerable numbers of gulls fly through critical airspace, they often land on the runways, the mowed grass of the airport and Shur-Gain's hay fields.

Although peak times of gull activity rarely coincide with periods of heavy air traffic, there is a good potential for aircraft-gull collisions. One such collision was observed, as were a number of near misses.

Canada's Wonderland's parking lots are a preferred overnight roosting site until the park closes later in the season. At daylight, gulls disperse from Canada's Wonderland, primarily in a northeast direction to the existing landfill site or other preferred foraging areas such as ploughed fields, hay fields or the airport. This general direction of flight takes most of the gulls through the airport. Many gulls also remain to feed and roost at Canada's Wonderland.

There now appears to be established flight patterns between Canada's Wonderland and the existing landfill site.

A conservative estimate of gull numbers in the study area is 600-700. This number may increase annually if the gull population explosion on the Leslie Street Spit continues.

Mallards and Canada geese may also cause potential problems for aircraft.

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TABLES

TABLE 1: GULL AND AIRCRAFT MOVEMENT, JULY 10, 1981

Hour After Sunrise	Total No. of Gulls Observed	Max. Number of Gulls on Airport	Max. Number of Gulls in Fields	Maximum Flock Size	Number of Take-offs and Landings
0-1	157	2	111	34	0
1-2	57	1	7	14	0
2-3	19	0	7	3	3
3-4	10	0	6	2	13
4-5	6	0	3	2	17
5-6	6	0	0	2	21
6-6½	3	0	0	1	12
9-10	3	0	0	1	22
10-11	8	0	0	2	36
11-12	5	0	1	1	28
12-13	5	0	0	1	27
13-14	7	0	0	1	43
14-15	4	0	0	2	31
TOTALS IN MORNING	251	2	111		66
TOTALS IN AFTERNOON	32	0	1		187
GRAND TOTAL	283	2	112		253

Hours of Observation: Morning 05:15 - 12:00 6 3/4 hours
Afternoon 14:30 - 20:45 6 1/4 hours
Total 13 hours

TABLE 2: GULL AND AIRCRAFT MOVEMENT, JULY 23, 1981

Hour After Sunrise	Total No. of Gulls Observed	Max. Number of Gulls on Airport	Max. Number of Gulls in Fields	Maximum Flock Size	Number of Take-offs and Landings
0-1	150	0	114	14	0
1-2	135	0	243	46	1
2-3	98	0	5	54	5
3-3½	8	0	0	3	21
12½-13½	35	0	0	9	38
13½-14½	40	0	0	28	51
14½-15½	15	0	0	6	39
TOTALS IN MORNING	391	0	243		27
TOTALS IN EVENING	90	0	0		128
GRAND TOTAL	481	0	243		155

Hours of Observation:

Morning	3 1/2 hours
Evening	3 hours
Total	6 1/2 hours

TABLE 3: GULL AND AIRCRAFT MOVEMENT, JULY 30, 1981

Hour After Sunrise	Total No. of Gulls Observed	Max. Number of Gulls on Airport	Max. Number of Gulls in Fields	Maximum Flock Size	Number of Take-offs and Landings
0-1	86	10	5	10	0
1-2	38	12	13	6	0
2-3	39	12	20	7	5
3-3½	26	9	23	11	19
12½-13½	20	0	3	5	31
13½-14½	10	0	4	3	35
14½-15	2	0	4	1	25
TOTALS IN MORNING	189	12	23		24
TOTAL IN EVENING	32	0	4		91
GRAND TOTAL	221	12	27		115

Hours of Observation:

Morning	3 1/2	hours
Afternoon	2 1/2	hours
Total	6	hours

TABLE 4: GULL AND AIRCRAFT MOVEMENT, AUGUST 6, 1981

Hour After Sunrise	Total No. of Gulls Observed	Max. Number of Gulls on Airport	Max. Number of Gulls in Fields	Maximum Flock Size	Number of Take-offs and Landings
0-1	76	0	0	11	0
1-2	42	0	1	8	0
2-3	35	0	0	19	3
3-3½	20	0	0	6	16
12½-13½	11	0	0	3	22
13½-14½	11	0	0	3	57
14½-15	18	0	0	5	23
TOTALS IN MORNING	173	0	1		19
TOTALS IN EVENING	40	0	0		102
GRAND TOTAL	213	0	1		121

Hours of Observation: Morning 3 1/2 hours
Evening 2 1/2 hours
6 hours

TABLE 5: GULL AND AIRCRAFT MOVEMENT, AUGUST 13, 1981

Hour After Sunrise	Total No. of Gulls Observed	Max. Number of Gulls on Airport	Max. Number of Gulls in Fields	Maximum Flock Size	Number of Take-offs and Landings
0-1	57	0	0	9	0
1-2	19	8	0	4	0
2-3	20	13	0	3	1
3-3½	7	0	0	4	1
TOTALS	103	13	0		2

Hours of Observation: Morning 3 1/2 hours

TABLE 6: GULL AND AIRCRAFT MOVEMENT, AUGUST 20, 1981

Hour After Sunrise	Total No. of Gulls Observed	Max. Number of Gulls on Airport	Max. Number of Gulls in Fields	Maximum Flock Size	Number of Take-offs and Landings
0-1	22	1	0	5	0
1-2	9	0	0	3	1
2-3	3	0	0	1	9
TOTALS	34	1	0		10

Hours of Observation: Morning 3 1/2 hours

TABLE 7: GULL AND AIRCRAFT MOVEMENT, AUGUST 27, 1981

Hour After Sunrise	Total No. of Gulls Observed	Max. Number of Gulls on Airport	Max. Number of Gulls in Fields	Maximum Flock Size	Number of Take-offs and Landings
0-1	10	0	0	4	0
1-2	41	0	15	12	0
2-3	25	0	18	6	3
TOTALS	76	0	18		3

Hours of Observation: 06:10 - 09:10 - 3 hours

TABLE 8: GULL AND AIRCRAFT MOVEMENT, SEPTEMBER 3, 1981

Hour After Sunrise	Total No. of Gulls Observed	Max. Number of Gulls on Airport	Max. Number of Gulls in Fields	Maximum Flock Size	Number of Take-offs and Landings
0-1	14	6	0	8	0
1-2	28	14	0	4	0
2-3	26	18	0	13	0
TOTALS	68	18	0		0

Hours of Observation: Morning 06:00-09:00 3 hours

TABLE 9: GULL AND AIRCRAFT MOVEMENT, SEPTEMBER 10, 1982

Hour After Sunrise	Total No. of Gulls Observed	Max. Number of Gulls on Airport	Max. Number of Gulls in Fields	Maximum Flock Size	Number of Take-offs and Landings
0-1	31	28	0	6	1
1-2	21	27	0	2	0
2-3	13	54	0	6	7
TOTALS	65	54	0		8

Hours of Observation: Morning 06:15-09:15 3 hours

TABLE 10: GULL AND AIRCRAFT MOVEMENT, SEPTEMBER 17, 1981

Hour After Sunrise	Total No. of Gulls Observed	Max. Number of Gulls on Airport	Max. Number of Gulls in Fields	Maximum Flock Size	Number of Take-offs and Landings
0-1	16	0	0	4	0
1-2	57	22	0	11	0
2-3	29	29	0	7	0
TOTALS	102	29	0		0

Hours of Observation: Morning 06:40-09:40 3 hours

TABLE 11: GULL AND AIRCRAFT MOVEMENT, SEPTEMBER 24, 1981

Hour After Sunrise	Total No. of Gulls Observed	Max. Number of Gulls on Airport	Max. Number of Gulls in Fields	Maximum Flock Size	Number of Take-offs and Landings
0-1	26	6	0	6	0
1-2	29	2	0	10	4
2-3	5	0	0	1	22
TOTALS	60	6	0		26

Hours of Observation: Morning 07:00-10:00 3 hours

TABLE 12: GULL AND AIRCRAFT MOVEMENT, OCTOBER 1, 1981

Hour After Sunrise	Total No. of Gulls Observed	Max. Number of Gulls on Airport	Max. Number of Gulls in Fields	Maximum Flock Size	Number of Take-offs and Landings
0-1	15	11	0	11	0
1-2	23	4	0	11	0
2-3	72	15	0	23	0
TOTALS	110	15	0		0

Hours of Observation: Morning 07:00-10:00 3 hours

TABLE 13: GULL AND AIRCRAFT MOVEMENT, OCTOBER 8, 1981

Hour After Sunrise	Total No. of Gulls Observed	Max. Number of Gulls on Airport	Max. Number of Gulls in Fields	Maximum Flock Size	Number of Take-offs and Landings
0-1	30	23	0	9	0
1-2	26	42	0	7	6
2-3	9	46	0	4	0
TOTALS	65	46	0		6

Hours of Observation: Morning 07:10-10:10 3 hours

TABLE 14: GULL AND AIRCRAFT MOVEMENT, OCTOBER 15, 1981

Hour After Sunrise	Total No. of Gulls Observed	Max. Number of Gulls on Airport	Max. Number of Gulls in Fields	Maximum Flock Size	Number of Take-offs and Landings
0-1	1	0	0	1	0
1-2	4	4	0	2	0
2-3	1	4	0	1	0
TOTALS	6	4	0		0

Hours of Observation: Morning 07:15-10:15 3 hours

TABLE 15: DIRECTION OF GULL FLIGHTS

	NORTH		NORTHEAST		EAST		SOUTHEAST		SOUTH		SOUTHWEST		WEST		NORTHWEST		Total No. of Birds
	No. Birds	Percent	No. Birds	Percent	No. Birds	Percent	No. Birds	Percent	No. Birds	Percent	No. Birds	Percent	No. Birds	Percent	No. Birds	Percent	
July 10																	
morning	169	67.3	45	17.9	32	12.7	1	0.4	0	0	3	1.2	1	0.4	0	0	251
afternoon	3	9.4	13	40.6	7	21.9	0	0	0	0	2	6.3	5	15.6	2	6.3	32
July 23																	
morning	124	31.7	237	60.6	1	0.3	1	0.3	0	0	3	0.8	1	0.3	24	6.1	391
afternoon	0	0	12	13.3	3	3.3	3	3.3	30	33.3	31	34.4	11	12.2	0	0	90
July 30																	
morning	9	4.8	130	68.8	23	12.2	9	4.8	3	1.6	12	6.3	3	1.6	0	0	189
afternoon	0	0	7	21.9	1	3.1	2	6.3	0	0	22	68.8	0	0	0	0	32
August 6																	
morning	0	0	154	89.0	4	2.3	2	1.2	0	0	7	4.0	0	0	6	3.5	173
afternoon	0	0	3	7.5	0	0	2	5.0	5	12.5	27	67.5	0	0	3	7.5	40
August 13																	
morning	7	6.8	35	34.0	33	32.0	6	5.8	4	3.9	1	1.0	16	15.5	1	1.0	103
August 20																	
morning	0	0	28	82.4	0	0	2	5.9	0	0	3	8.2	0	0	1	3.0	34
August 27																	
morning	3	3.9	68	89.5	1	1.3	0	0	1	1.3	3	3.9	0	0	0	0	76
September 3																	
morning	0	0	7	10.3	0	0	47	69.1	0	0	10	14.7	0	0	4	5.9	68
September 10																	
morning	1	1.5	3	4.6	40	61.5	7	10.8	2	3.1	0	0	6	9.2	6	9.2	65
September 17																	
morning	2	2.0	25	24.5	75	73.5	0	0	0	0	0	0	0	0	0	0	102
September 24																	
morning	39	65.0	12	20.0	3	5.0	0	0	0	0	0	0	1	1.7	5	8.3	60
October 1																	
morning	4	3.6	78	70.9	18	16.4	3	2.7	1	0.9	2	1.8	1	0.9	3	2.7	110
October 8																	
morning	28	43.1	12	18.5	21	32.3	0	0	4	6.1	0	0	0	0	0	0	65
October 15																	
morning	0	0	1	16.7	3	50.0	0	0	0	0	2	33.3	0	0	0	0	6
Totals for Mornings	386	22.8	835	49.3	254	15.0	78	4.6	15	0.9	46	2.7	29	1.8	50	3.0	1693
Totals for Afternoons	3	1.5	35	18.0	11	6.2	7	3.1	35	18.0	82	42.3	16	8.2	5	2.6	194
GRAND TOTALS	389	20.6	870	46.1	265	14.0	85	4.5	50	2.6	128	6.8	45	2.5	55	2.9	1887

TABLE 16: OTHER SPECIES OF BIRDS OBSERVED AT MAPLE AIRPORT

Species	July 10	July 23	July 30	Aug. 6	Aug. 13	Aug. 20	Aug. 27	Sept 3	Sept 10	Sept 17	Sept 24	Oct. 1	Oct. 8	Oct. 15	No. of Dates Observed
Great Blue Heron		x	x						x	x				x	5
American Bittern					x										1
Canada Goose									x		x	x	x	x	5
Mallard		x	x	x		x	x	x		x		x	x	x	10
Black Duck													x		1
Gadwall												x			1
Pintail													x		1
Blue-winged Teal							x								1
Sharp-shinned Hawk									x		x				2
Red-tailed Hawk	x		x			x			x			x			5
Marsh Hawk											x		x		2
American Kestrel	x	x							x			x	x		5
Killdeer	x	x	x	x	x		x	x	x	x	x	x	x		12
Upland Sandpiper		x													1
Lesser Yellowlegs									x						1
Rock Dove	x	x			x		x		x	x	x		x	x	9
Mourning Dove	x	x		x	x		x		x		x		x	x	9
Common Flicker									x	x					2
Eastern Kingbird	x														1
Tree Swallow							x		x						2
Bank Swallow	x			x											2
Barn Swallow					x		x								2
Blue Jay							x				x				2
Common Crow	x	x	x	x		x		x	x	x	x		x		10
American Robin	x			x		x		x							4
Starling	x				x		x		x	x	x	x		x	8
House Sparrow	x	x		x	x	x	x		x	x	x		x		10
Eastern Meadowlark	x	x									x	x	x		5
Red-winged Blackbird	x				x		x				x	x	x	x	7
Common Grackle	x					x		x							3
American Goldfinch	x				x		x		x	x	x				6
Savannah Sparrow	x	x		x	x	x	x	x	x	x	x				10
Song Sparrow														x	1
Number of Species Observed	16	11	5	8	10	7	13	6	16	10	14	9	13	8	

Total Number of Species Observed: 33

TABLE 17: BIRD AND AIRCRAFT INCIDENTS

Date	Incident
August 6, 1981	While taking off, a plane has to take evasive action to avoid a flock of mallards.
August 13, 1981	While landing, a twin Aztec strikes a gull that is slow in getting off the runway. The gull was killed but the plane landed safely.
September 10, 1981	Fifty-four gulls were on the runway when a plane took off. The gulls wheeled away in front of the plane but 33 returned to roost on the runway. At the end of the study period there were still 18 gulls on the runway and one plane landed and another took off during this period.
October 8, 1981	Thirty-four to 46 gulls were on the runways all morning. Three planes landed and three took off during this period. Each time the gulls rose off the runway in front of the plane and then returned to the runway.

TABLE 18: NUMBER OF GULLS LANDED AT OTHER LOCATIONS

Location	July 10	July 23	July 30	Aug. 6	Aug. 13	Aug. 20	Aug. 27	Sept 3	Sept 10	Sept 17	Sept 24	Oct. 1	Oct. 8	Oct. 15	Totals
	Number of Gulls														
1. Canada's Wonderland		228	45	150	25	90	71	40	226	7		1	15		898
2. Ploughed fields in Village of Teston									40		140				180
3. Proposed landfill site					106	4	11		140	86	21	112	244	22	710
4. Existing landfill site	75	150	95	150	127	60	15	4	60	80	52	61	70	100	1099
5. Ploughed field west of Keele Street, north of Teston Road											10				10
6. Ploughed field south of Major McKenzie Drive										33					33
7. Ploughed fields along Bathurst Street, south of Teston Road										38					38
8. Ploughed field south of Rutherford Road					40				161						201
9. Ploughed field south of Canada's Wonderland									50						50
TOTALS	75	378	140	300	298	154	97	44	641	244	223	174	329	122	3219

TABLE 19: NUMBER OF GULLS FLYING AT OTHER LOCATIONS

Location	Number of Gulls														Totals	Dominant Direction of Flight
	July 10	July 23	July 30	Aug. 6	Aug. 13	Aug. 20	Aug. 27	Sept 3	Sept 10	Sept 17	Sept 24	Oct. 1	Oct. 8	Oct. 15		
A. Near Village of Teston									15	1	4	1			21	Northwest
B. Near Keele Street and Kirby Road		1	2									1	2	1	7	Northwest
C. Major McKenzie Drive, near gravel pit			3	4			1		1						9	Northwest
D. Near Dufferin Street and Teston Road		4	2		4					3		2		2	17	Northwest
E. Near Bathurst Street and Major McKenzie Drive						2									2	Southwest
F. Near Bathurst Street and Rutherford Road													25		25	West
G. Near Rutherford Road and Jane Street			1			2				4			9		16	North
TOTALS	0	5	8	4	4	4	1	0	16	8	4	4	36	3	97	

TABLE 20: NUMBER OF GULLS ON CANADA'S WONDERLANDS' PARKING LOTS
PRE-DAWN COUNTS

Date	Number of Gulls	Status of Park
July 10	No data	open daily
July 23	No data	open daily
July 30	No data	open daily
August 6	570	open daily
August 13	352	open daily
August 20	No data	open daily
August 27	156	open daily
September 3	No data	open daily
September 10	0	open until September 6
September 17	0	open previous weekend
September 24	0	open previous weekend
October 1	0	closed for season
October 8	0	closed for season
October 15	0	closed for season
TOTAL	978	

ACCIDENTS AND SERIOUS INCIDENTS TO CIVIL AIRCRAFT DUE TO BIRDSTRIKES

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ABSTRACT

The Paper contains detailed histories of accidents and serious incidents e.g. double engine ingestion, holed airframe, for the years 1981 to 1983. An attachment contains a summary of all fatal accidents due to bird strikes between 1912 and 1980. The paper is divided into three groups

- transport aeroplanes over 5700kg (12,500lb) and executive jets
- aeroplanes below 5700kg
- helicopters

No attempt has been made to analyse the information although it is apparent that for transport aeroplanes the critical area is engines and for light aeroplanes and helicopters the windshield may be critical.

INTRODUCTION

Surprisingly the first fatal accident caused by a birdstrike was when a Wright Flyer crashed after striking gulls in 1912. Since then there are known to have been 18 fatal accidents to civil registered aircraft and at least 34 aircraft destroyed. It is likely there are more, as information is only accurate for about the last 20 years. Of these fatal accidents, 5 involved public transport aircraft and 13 involved general aviation aircraft.

The number of fatal accidents to transport sized aircraft is thus quite modest, and there have been no fatal accidents involving jet airliners. The increased awareness of the problem, implementation of proper measures at a growing number of airports around the world, and tougher airworthiness criteria for aircraft and engines may account for this. However, there have been some very near misses in recent years such as the Kennedy Airport DC 10 and Belgian Boeing 737 write-offs when the occupants all escaped from the burning aircraft. There have also been many cases of multiple engine damage, fortunately with just sufficient power to return, or runway length in which to stop.

The author would welcome any new or additional information.

Serious Incidents to Aeroplanes over 5700kg together with Executive Jets

Date	Aircraft	Regn	Operator	Location	Total Aboard	Injury to Occupants
15.2.81	Fokker F28	VH-	-	Derby Australia	-	Nil

During take-off run struck a Nankeen night-heron (Nycticorax caledonicus weight 750gm). Take-off was abandoned after an uncontained failure of engine 1. Compressor case holed by 2 blades, but cowling not penetrated.

25.2.81	DC10	N-	-	New York JFK	-	Nil

During climb a flock of gulls was ingested in engine 2 & 3. There was medium damage to engine 2 and major damage to engine 3.

25.3.81	B707(JT3D)	-	-	Kanombe, Rwanda	-	Nil

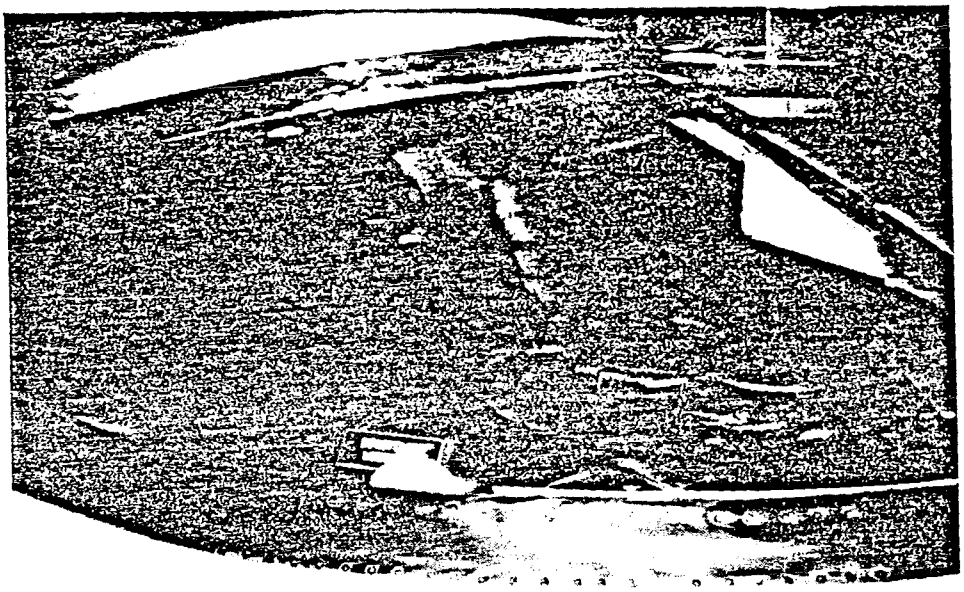
During landing birds of prey were ingested in engine 1 and 2. Aircraft was imobilized by engine damage.

29.3.81	B727	N-	-	Nr New York JFK	-	1 Minor

During climb at 3,500ft geese were struck, inner and outer panes of first officers windshield shattered, but bird did not penetrate. First officer received facial cuts from glass fragments. Left wing holed.

7.4.81	Lear 23	N400PG	Private	Lunken Executive Cincinnati, USA	2	1 Killed 1 Minor

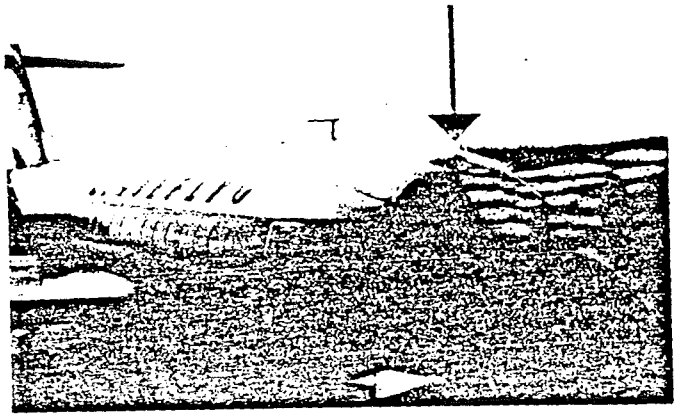
The aircraft was in a climbing turn at about 4000ft when the aircraft struck a Common Loon (Gavia immer weight 3.7kg). The bird penetrated the right windscreen and killed the co-pilot. Windscreen debris damaged No 2 engine which had to be shutdown. The pilot's arm was badly cut but a safe landing was made using the emergency brake chute and with no flaps. The weather was good, the flight being at 11.35 local time. The pilot did not see the bird. The Lear 23 is of an age such that the windscreen was not required to withstand a bird of even 4lbs.



18.4.81	NAMC YS11A	N173RV	Sced Pax	Sand Point, Alaska	39	Nil

The aircraft was on short finals when a gull struck the windshield centre post, the remains seriously reducing the pilots vision. The pilot misjudged distance and altitude, the main gear impacted an embankment on the approach, both main gear wheels were knocked off and the aircraft came to rest 1500ft beyond the threshold. The damage was substantial.

While flying at 8000ft and slightly above 300 kts the aircraft struck an Osprey (Pandion haliaetus, weight 1.5 kg). The bird penetrated the skin above the windshield damaging frames, looms etc and entered the flight deck causing considerable mess.



12.9.81	B747	-	-	Delhi,India	-	Nil

During approach struck vultures (Cathartidae). Engine 2 suffered uncontained failure holing No 2 fuel tank as a result of flying debris.

24.9.81	B737	-	-	Nagaya, Japan	-	Nil

Abandoned take-off after gulls were ingested in both engines. Blade damage was found in both engines.

16.10.81	A300B	F-	Air Inter	Paris, Orly	-	Nil

During approach at 150ft and 130kts struck a flock of Stock Doves (Columba Oenas weight 350gm). Birds ingested in both engines.

19.10.81	DC8-50	-	-	Makurdi, Nigeria	-	Nil

Engines 1, 2 and 4 ingested birds when the aircraft struck a flock during the take-off run. Landing gear and lights also struck. Two engines repaired at base, once changed.

19.10.81	A300B	F-	Air France	Tunis	-	Nil

Struck flock of birds at 150 kts during take-off run. Both Engines, Fuselage and wing struck. Three fan blades were damaged.

23.3.82	B747 (JT9D-7)	VT-EFJ	Air India	Jeddah, Saudi Arabia	-	-

During the approach the aircraft passed through a flock of birds causing the pilot to shutdown No 1 engine and bring No 2 back to idle. After touchdown No 2 was shutdown due to vibration. Both engine nose domes and all fan blades were damaged. There were holes in the nose cowl of No 2 engine and the tail cone was missing.

19.6.82	DC8-63	-	-	Yesilkoey, Turkey	-	Nil

Gulls ingested in engines 3 and 4 during landing run. Both engines changed.

11.7.82	B747 (JT9D)	G-AWNA	British Airways	Melbourne, Australia	91	Nil

At about 75ft on take-off the aircraft struck a flock of birds, loud bang from engine 3 which ran down and was shutdown with high JPT. Engine 4 vibration warning came on so was throttled to idle. Made immediate return, engine 4 shutdown after landing. Birds were racing pigeons (Columbia livia, wt 250 gm) released 100 miles away and returning to Melbourne. Believed 3-4 birds in engine 3 and 2-3 in No 4. The aircraft was at a very light weight. Both engines changed.

1.9.82	B737	G-BGDE	British Airways	Turin, Italy	-	Nil

During the take-off 07.20 hrs the aircraft passed through a flock of gulls at 50ft. Engine 2 indicated a vibration warning. Air traffic reported flames from No 2 engine. This was shutdown and the aircraft returned. Engine 2 was changed as it was severely damaged.

12.9.82	B707	G-BFEO	Tradewinds	Khartoum, Sudan	-	Nil

At 400ft on take-off the aircraft struck a large stork (Ciconiidae up to 3 kg). The left-hand windscreen was obscured by blood. The aircraft returned where it was found the radome had been severely holed, with large radial crack. The ILS glideslope aerial was broken.

13.9.82	B747CF	-	-	Luxemburg	-	Nil

During the take-off engine 4 ingested birds resulting in fan and nose cowling damage after it had been pierced by part of a fan blade. The aircraft returned.

3.11.82	DC10	-	-	Entebbe, Uganda	-	Nil

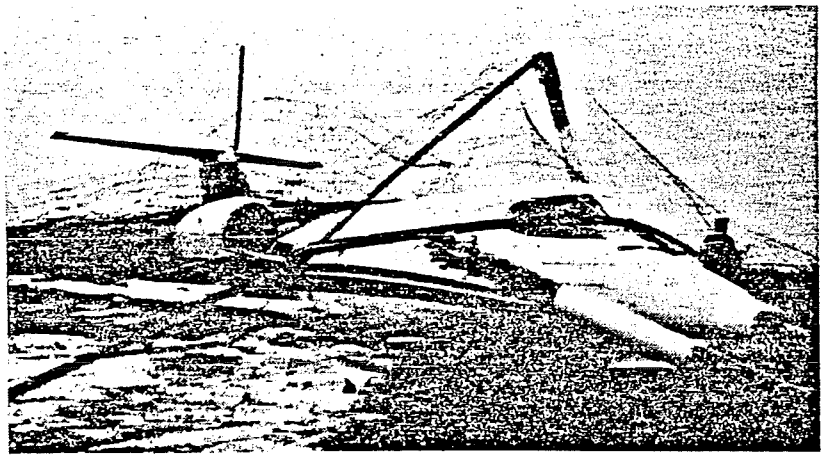
During the climb the aircraft encountered between 11 and 100 herons (Ardea sp, up to 1.8 kg), which were ingested in engines 1 and 3. Engine 1 was shutdown.

4.12.82	B747(CF6-50)	PH-BUN	KLM	Amsterdam, Netherlands	132	Nil

During the take-off run at 14.00 hrs GMT on runway 19L at about 1/3 of the runway at 135 kts the aircraft struck a flock of 100 Lapwings (Venellus vanellus, weight 250 gm) suffering multiple engine damage. The take-off was abandoned stopping with 800 metres left. The passengers desembarked via stairs at the end of the runway. Engine 1 beyond economic repair and changed, engine 2 had nine fan blades and some fan exit vanes changed, engine 3 had little damage and engine 4 had one fan blade changed. Wing trailing edge flaps also damaged. About 75 dead birds were found on the runway. Bird patrols were in continuous use.

6.12.82	Lear 35	HB-VFO	Private	Paris LBG	-	1 Serious

At about 8.30 local the aircraft abandoned take-off after V_1 as a result of striking a flock of black headed gulls (Larus ridibundus). The aircraft failed to stop and over-ran striking the ILS installation, seriously injuring the co-pilot. The aircraft was destroyed. The engines were not in fact damaged and there was one birdstrike on the wing.



12.12.82	B737	G-AVRN	Britannia	Manchester, UK	-	Nil

During the take-off at about 140 kts the aircraft struck a flock of lapwings, which were ingested in both engines. The aircraft returned. Engine 1 was changed, there was no damage to engine 2.

23.1.83	DHC-7	LX-AHA	Arika	Dov Airport Tel Aviv	-	Nil

During a night take-off the aircraft struck flock of gulls, which rose off the runway at rotation (85kts). Vision completely lost through left windscreen and partially lost through the right. No power was lost. After climbing to 1500ft, gear and flaps left down, the aircraft returned. Over 60 strikes were counted on the aircraft and 500 to 1000 dead birds were found. The prop spinner was damaged beyond repair, two others damaged. No 2 de-icer boot damaged. Bird remains found in all engine intakes, but no engines were damaged. Wing de-icer boots damaged. One VOR & one ADF aerial damged. Birds ingested in air conditioning system. Nose gear taxy light smashed. One over-centre spring cable on main gear was knocked off it's pulley. Crew praised aircraft's ability to cope with such a large flock with so little degradation of performance.

24.3.83	DC10 (CF6-50)	LN-RKA	SAS	Copenhagen, Denmark	160	7 Minor

During the take-off run a flock of gulls was struck as the aircraft rotated at 165 kts. An immediate return was made because of vibration and severe damage to engine 3. Overweight landing by 44 tons, necessitated 10 wheels changed. Emergency evacuation caused minor injuries to seven people. Engine 3 fan, nose cowl and pylon internal structure damaged. On bird passed through engine 1 fan. Runway was wet, fuel jettison and reverse thrust not used due to fire risk as ATC reported engine on fire.

-.6.83	A300B	F-	Air France	Bordeaux, France	-	Nil

At rotation speed on take-off the aircraft passed through a flock of birds, which were ingested in both engines. Take-off was abandoned at a speed almost equal to V_2. The aircraft was successfully stopped on the runway. Both engines were changed. At least one bird had entered each engine.

17.7.83	B737	G-BHVG	Orion	Bristol, Lulsgate, UK	-	Nil

At 50ft and 130 kts during approach struck flock of pigeons and gulls. Teleflex cable from landing gear was damaged resulting in loss of ground/air sensor and associated systems.

2.10.83	B747 JT9D-7Q	-	China Airlines	Anchorage, Alaska	-	Nil

During a down take-off ducks (Anas sp, weight up to 1.5 kg) were ingested in engines 1 and 2. The take-off was abandoned at 80 kts. Two fan blades on engine 2 exited the front engine cowl causing damage to the wing leading edge devices. Engine 1 overtemperatured during reverse thrust due to core damage, but no fan damage. Birds were flying low across the runway, probably on migration.

8.10.83	TU134	-	Aeroflot	Krasnodar, USSR	-	Nil

Struck flock of crows (Corvus sp weight up to 550g) on take-off, right-hand engine failed and fuel pump knocked off. Climb rate reduced to 200 ft/min and aircraft made immediate return.

9.10.83	B707	CS-TBA	Air Portugal	Birmingham, UK	-	Nil

Take-off was abandoned at 100 kts because of multiple bird strkes and small loss of power on engine 2. No damage found but birds struck engines 1, 2, 3.

31.10.83	DC10	OO-	-	Ostend, Belgium	-	Nil

During training touch and go large flock of birds were seen on the runway after take-off power had been selected. Aircraft returned to Brussels. Inspection revealed damage to engine fan with one blade separated, cowling holed and cabin window damaged. Engine 3 had signs of ingestion but no damage.

3.11.83	B737	G-BGYK	Britannia	Glagow, UK	-	Nil

At 50ft, 133 kts during landing round-out large flock of lapwings rose from the runway. Both engines, the wing, fuselage and landing gear were struck. Engine 2 was changed due to blade damage.

4.12.83	B747 (JT9D)	G-AWNE	BA	Muscat, Oman	327	Nil

At about 150 kts on the take-off run a small thump was felt and engine 2 N1 rpm started to fluctuate, with vibration felt and indicated. The engine was shutdown. After fuel was jetisoned the aircraft diverted to a convenient maintenance facility. Engine 2 fan blades damaged, nose cowl torn and accoustic lining holed. Engine changed.

Serious Incidents to Aeroplanes of 5700kg and Below

Date	Aircraft	Regn	Location	Total Aboard	Injury	Damage
25.4.81	C182	C-FTKQ	Near Cooking Lake Alberta, Canada	-	Minor	Substantial

Aircraft struck a duck (Anas sp) which jammed in carburettor intake causing loss of power. Aircraft forced landed into trees.

18.7.81	C152	G-BIOM	Near Lerwick, UK	1	Minor	-

While descending through 1000 ft at about 90 kts the aircraft struck a gull breaking the windscreen. The pilot suffered a cut nose.

6.8.81	Cessna 402	5Y-ATU	Near Musiara, Kenya	1	1 killed	Destroyed

Suffered birdstrike with a Ruppell's Griffon (Gyps rueppellii weight 7.5 kg) which penetrated the windscreen killing the pilot instantly. The pilot, the sole occupant was killed and the aircraft destroyed.

-.1.82	Microlight	G-	Nr Bolton, England	-	Nil	-

A flock of gulls were encountered and the engine exhaust was knocked off (falling near a house and going 3" deep into the frozen ground). The pilot glided to a safe landing.

2.2.82	Beech 200	EI-	Nr Nairobi, Kenya	-	-	Substantial

While on final approach the pilot attempted to avoid a large flock of birds, but shortly afterwards the pilot felt a large thump at the back end of the aircraft and it pitched up. After recovering a normal landing was made. The bird, a Marabou Stork (Leptoptilos Crumeniferus weight up to 7 kg) struck the fin leading edge, crushing the whole fin leading edge back to the front spar. The fin attachment was not damaged.

10.2.82	C404		Maya Maya, Congo	-	1 minor	-

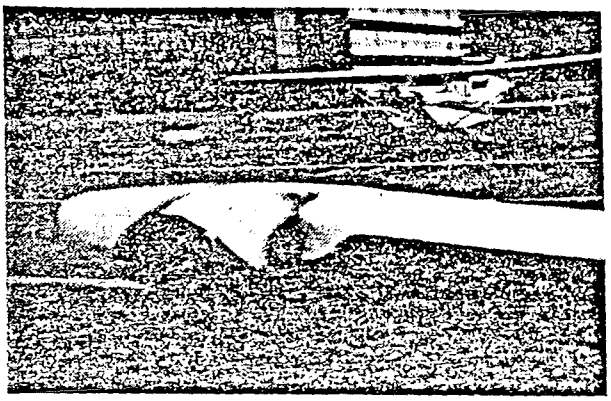
During approach the aircraft struck bats (Chiroptera) smashing the windscreen and slightly injuring the pilots face.

3..4.82	Cessna 172	F-	Sarre Union, France	-	Nil	-

Just before touchdown the pilot noticed two buzzards (Buteo sp) on the beginning of the runway so the pilot overshot and made a circuit. On his second approach both birds were in the air and the pilot took evasive action to miss one of them. The aircraft landed too fast, bounced and the landing gear and propeller were damaged. The bird damaged the left-hand wing leading edge.

30.7.82	Piper PA23	G-AYWF	Amsterdam, Netherlands		Nil	-

While making a night landing a thump was felt as the aircraft descended through 150ft. A Grey heron (Ardea cinerea, weight 1.8kg) had damaged struck the wing leading edge damaging ribs, stringers and holing the skin.



26.7.82	Piper PA23	VH-	En route Australia	-	Minor	-

An eagle penetrated the windshield, causing a deep cut to the pilots head and cuts to his hand. The aircraft was landed satisfactorily.

9.9.82	Wasmer Guepard	F-BXCA	Limoge, France	1	1 Serious	-

While descending through 1800ft at 140kts the aircraft struck an Osprey (Pandion haliaetus - weight 1.5 kg). The windscreen was shattered and the pilot's head and face badly cut.

31.10.82	Piper PA24	-	Bensbach, Papua New Guinea	-	Nil	-

The right-hand windshield was broken by a cockatoo (weight up to 900gm).

16.1.83	Cessna 152	G-BFKG	Middle Wallop, UK	1	Nil	Substantial

Loud bang at lift-off as the aircraft struck a bird. The pilot decided to re-land during which the nose wheel collapsed. Dead bird, probably lapwing found on the grass runway.

6.5.83	Piper PA23 Aztec	G-ASMN	White Waltham, UK	-	Nil	-

Just after lift-off the aircraft struck a pigeon. The wing leading edge was badly damaged and full rudder was required during landing.

24.5.83	Partenavia P68	SY-BDC	Keekorok, Kenya	-	Nil	-

During climbing turn at 400ft after take-off a Bataleur Eagle (Terathopius - weight 2.3 kg) struck the left-hand stabilator. There was severe leading edge damage but no adverse control effects.

Serious Incidents to Helicopters

Date	Aircraft	Regn	Location	Total Aboard	Injury	Damage
2.3.81	Bell 206	CF-	Vancouver State Canada	4	Four Killed	Destroyed

The helicopter went missing on a low altitude sheep count and was not found till Jun 8. When found at least one raven (Corvus corax, weight 1.2 kg) had struck the plexiglass front windscreen and probably entered the cockpit area. The helicopter crashed as a result, killing all 4 on board.

3.6.81	Bell 47	G-	Redhill, UK	-	-	Minor

While in the hover the rotor was damaged when a crow (Corvus sp weight 550 gm) flew into it.

2.1.82	Bell 206	G-BAUM	3 miles from Kelso Scotland	-	-	Minor

While cruising at 600 ft at 90 kts the pilot felt a slight yaw and simultaneous severe vibration. He shut down the engine and made an autorotative landing in a field. The tail rotor had been struck by a bird (leaving three small feathers) bending the leading edge of a blade out of alignment, and resulting in tail rotor drive shaft damage.

24.2.82	SA341 Gazelle	F-GAMK	Marseilles, France	-	Minor	-

While flying at 200 ft and 100 kts the aircraft struck a gull smashing the window in the door causing minor injury to the passengers.

13.4.82	SA 341 Gazelle	G-	New Seaton, UK	-	-	Minor

At 1800 ft, 125 kts a gull was seen to pass over the rotor, no impact was heard or felt. On landing the stabilizer "fibreglass" fin skin was found to be cracked and had to be renewed.

15.7.82	AS 332 Tiger	G-TIGG	Nr Montelimar, France	-	Nil	Minor

While en-route at 145 kts, 2000 ft the aircraft struck an eagle, holing the radome and jamming the radar scanner.

16.7.82	SA319 Allouette	F-	France	-	Minor	-

While flying at 1500ft and 200 kts a martin (Riparia weight 14 gm) penetrated the windshield injuring the pilot.

21.7.82	SA318 Allouette	F-	Lyon Satolas, France	-	Nil	-

While approaching to land at 500 ft and 6 kts the windshield was penetrated by a starling (sturnus vulgaris weight 80 gm).

-.-.82	Bell 206	N-	Detroit, U.S.A.	-	Minor	-

A Mallard Duck weighing 5lbs broke the windscreen knocking the pilot unconscious and breaking his nose. The helicopter was on autopilot (fitted at pilot's request) and the pilot came to at 700 ft and 110 kts over Detroit.

1.9.83	SA316 Alouette	F-BYCS	Montpelier, France	-	1 Minor	-

Approaching the aircraft at 150 ft and 85 kts the helicopter collided with a gull weighing 1.2 kg and 4 ft wingspan. The windscreen was shattered, the remains striking the pilot, who retained control and landed safely, in spite of cuts on his hands.

-.11.83	Bell 206	-	Sandakan, Borneo	-	Nil	Minor

Large bird of prey attached the helicopter, the pilot managed to dodge the birds first attempt but when the pilot looked up the eagle was again diving with wings folded. At the last second the bird must have realised there was something odd about its "prey", as it spread its wings and attempted to torn away. The wing smashed the nose bubble and the body holed the honeycombe belly structure. Bird was Brahming Kite (Haliastur indus, weight 570 gm)

BIRDSTRIKES 1912 to 1980

Fatal Accidents and Destroyed Aircraft over 5700kg (12500lb) together with Executive J

Date	Aircraft	Location	Occupants	Deaths	Other
4.10.60	L188 Electra	Boston, USA	72	62	9 serious injuries
	Starling (Sternus vulgaris weight 85 gm) flock ingested into 3 engines, aircraft stalled and crashed.				
15.7.62	DC3	Lahore, W Pakistan	2	1	-
	Co pilot killed when vulture (Falconiformes) penetrated windscreen during cruise.				
23.11.62	Viscount	Haryland, USA	17	17	-
	At 6000ft whistling swan (Cygnus columbianus weight 8 kg) struck and removed left tailplane, aircraft crashed.				
28.7.68	Jet Falcon	Lake Erie, USA	3	Nil	Aircraft ditched
	Gulls (Larus spp) ingested into both engines on take-off causing severe damage, ditched in lake.				
23.7.69	DC3	Nr Djibouti, E Africa	4	Nil	Aircraft destroyed
	Cranes (Grus sp weight up to 5 kg) blocked carb intakes on both engines, ditched in sea.				
26.3.73	Lear 24	Atlanta, USA	7	7	1 third party serious injury
	Cowbirds (Molothrus ater weight 45 gm) caused damage on take-off and severe power loss on both engines. Aircraft crashed into buildings.				
12.12.73	Falcon 20	Norwich, UK	9	Nil	
	Gulls* caused severe damage to both engines on take-off, crash landed.				
14.6.75	NA265 Sabreliner	Watertown, USA	6	Nil	3 serious injuries
	Franklin's gulls (Larus pipixcan weight 260 gm) ingested in both engines on take-off, crash landed.				
12.11.75	DC10	Kennedy NY, USA	139	Nil	2 serious injuries
	Gulls+ ingested in Eng 3 which exploded, causing severe wing fire, abandoned take-off, aircraft burnt out.				
20.11.75	HS125	Dunsfold, UK	8	-	6 third party deaths
	Lapwings (Vannellus vanellus weight 300 gm) ingested in both engines on take-off, power loss, crash landed destroying car.				
6.2.76	Lear 24	Bari, Italy	2	Nil	Aircraft Destroyed
	Gulls ingested in both engines, power lost and crashed in field.				
12.11.76	Falcon 20	Naples, Florida USA	11	Nil	11 serious injuries
	Ring-billed gulls (Larus delawarensis weight 485 gm) caused both engines to fail just after lift-off, causing aircraft to crash.				
4.4.78	Boeing 737	Gosselies, Belgium	3	Nil	Aircraft Destroyed
	Wood pigeon (Columba palumbus weight 450 gm) ingested during touch and go, abandoned take-off and over-ran. Burnt out.				
25.7.78	Convair 580	Kalamazoo, USA	43	Nil	3 serious injuries
	Sparrow hawk (Falco sparverius weight 120 gm) ingested in one engine on take-off, auto feathered, crashed in field.				

see p.347 for details

* Common (Larus canus weight 400 gm) and Black-headed (Larus ridibundus weight 300 gm)

\+ Great black-backed (Larus marinus weight 1.8 kg) Ring-billed (Larus delawarensis weight 585 gm) and Herring (Larus argentatus weight 1.1 kg)

Fatal Accidents to Aeroplanes of 5700 kg and Below 1912-1980

Date	Aircraft	Location	Occupants	Deaths	Damage
3.4.12	Wright Flyer	Long Beach, Calif USA	1	1	Destroyed
	Struck gull while flying along the beach. Controls jammed and aircraft crashed drowning pilot.				
10.2.29	Arado	Madras, India	2	2	Destroyed
	Shortly after take-off struck large bird, aircraft crashed.				
-.-.55	Cessna	Aberdare Mtns, Kenya	1	1	Destroyed
	En-route struck vulture, pilot attempted to avoid but bird hit wing tip jamming ailerons.				
10.1.59	-	Serengeti, Tanganyika	1	1	Destroyed
	Struck a Griffon vulture (Gyps fulvus, 5.4 kg) and crashed.				
-.3.63	Beech 35	Bakersfield, Calif USA	1	1	Destroyed
	Common loon (Gavia immer wt 3.7 kg) which removed right hand tailplane.				
1.2.64	Turbulent	Nr Belfast UK	1	1	Destroyed
	Spun in from low altitude after striking or avoiding gull. Dead gull found 60 yards away and avian blood on windscreen of open single seater aircraft.				
2.7.71	Cessna 180	British Columbia, Canada	3	2	Destroyed
	En-route struck a Bald eagle (Haliaetus leucocephalus wt 5 kg).				
16.4.72	Mitsubishi MU2	Altantic City, USA	3	3	Destroyed
	While in climb struck flock of geese, windshield destroyed incapacitating one or both pilots. Uncontrolled descent into the sea.				
30.8.76	Saab MFJ15	Nr Awassa, Ethiopia	2	2	Destroyed
	Climbing through 200 ft struck Vulture. Aircraft went out of control and crashed vertically.				
23.4.77	Aero Commander 690	Chicago, USA	4	4	Destroyed
	Gull ingested in one engine, emergency procedures improperly executed and aircraft spun into the water.				
19.10.79	Swearingen Merlin	Palo Alto, Calif USA	-	2 killed 1 serious	Destroyed
	During approach a flock of birds clogged an engine intake (engine not damaged). Pilot attempted overshoot but lost control crashing inverted into parking area destroying or damaging 7 other aircraft.				

Fatal Accidents to Helicopters 1912-1980

Nil

TP 6725E

BIRD STRIKES TO CANADIAN AIRCRAFT

1983 SUMMARY REPORT

OPR:AAA/DKF/KFE/A

JULY 1985

BIRD STRIKES TO CANADIAN AIRCRAFT; 1983 SUMMARY REPORT

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BIRD STRIKES TO CANADIAN AIRCRAFT; 1983 SUMMARY REPORT

A. INTRODUCTION

The purpose of this report is to provide an overview of the bird strikes to Canadian registered aircraft (civil, commercial, military) during the calendar year 1983. Statistics provided in this report are produced by the Facilities and Environment Management Division (KFE/A) of the Airport Facilities Branch, Airports and Construction Services, Transport Canada, Ottawa. Primary numerical data and computer compilation of bird strike reports from all sources is provided to KFE/A by the Canadian Aviation Safety Board through the ICAO Bird Strike Information System (IBIS) and through other computer programs generated at the CASB. A copy of the 1983 bird strike data is provided in the Appendix. Aircraft movement statistics are provided by the Aviation Statistics Centre.

In 1983, there were a total of 736 bird strike reported to Canadian-operated Civil (commercial and private) and Military aircraft. Included in this total are 69 strikes which occurred outside of Canada, i.e. foreign airports or enroute. The 667 strikes that occurred in Canada is a slight increase over the 1982 total of 607, and combined with a decreased number of total national aircraft movements, gives a higher bird strike incident per 10,000 aircraft movement rate than in previous years. These figures are summarized in Table 1.

Table 1: Total Bird Strikes and Aircraft Movements, 1981 to 1983

National Totals*	1981	1982	1983
Total Bird Strikes	730	607	667
Total Aircraft Movements**	8,777,040	7,429,164	7,249,940
Bird Strikes per 10,000 Movements	0.83	0.82	0.92
Airport Sites Reporting	68	82	84

* All totals covering civil (commerical, private) and military aircraft operations within Canada.

** Total aircraft movements; itinerant and local.

B. CATA HEADQUARTERS ACTIVITIES IN BIRD STRIKE RESEARCH AND CONTROL - 1983

1. Staff of KFE/A attended the 12th and 13th meetings of the Interdepartmental Committee on Bird Hazards to Aircraft, on 12 May and 13 October respectively. Both meetings were held at Tower C, Place de Ville; the 12th meeting was chaired by Captain Wayne Thompson of National Defense, the 13th meeting was chaired by Major Jim Lucas of National Defense.

2. Cyclical revision of the KFE/A manual AK-75-10-000, Airport Bird Hazard Control, was completed with promulgation of the revised document in December.

3. A feasibility study for the erection of a suspended wire grid for gull exclusion at Quinte Landfill Site near CFB Trenton was completed and summarized in the KFE/A document AK-75-09-098, Use of Suspended Wire to Reduce Bird Hazards (December, 1983). The alternatives examined in this joint KFE/A-DND project, initiated in 1982, were found not to be feasible given the engineering problems encountered and the resources available. The Canadian Wildlife Service also participated in the study, including their report "Bird Observations and Bird Control Measures at a Sanitary Landfill Site near CFB Trenton" in the above-mentioned document.

4. The training package AK-77-75-10, Airport Bird Strike Control, was presented by KFE/A personnel at Charlottetown, St. John's, Mirabel, Saskatoon and Winnipeg International Airports.

5. The following studies were initiated by KFE/A, for completion in March of 1984:

   (i) Effects of Precipitation and Tides on Bird Strikes at Vancouver International Airport.

   (ii) Analysis of Engine Damaging Strikes at Canadian Airports, 1980 - 1982.

   Both studies were carried out by Aviation Planning Associates of Montreal.

6. The 16 mm training film "Stop Bird Strikes/Alerte des oiseaux", part of the training package AK-77-75-10, Airport Bird Strike Control, was awarded a Certificate of Merit by the National Committee on Films for Safety. The film was made available in the U.S.A. through the National Film Board's Chicago office, and was shown to airport staff in the Caribbean, Europe and New Zealand.

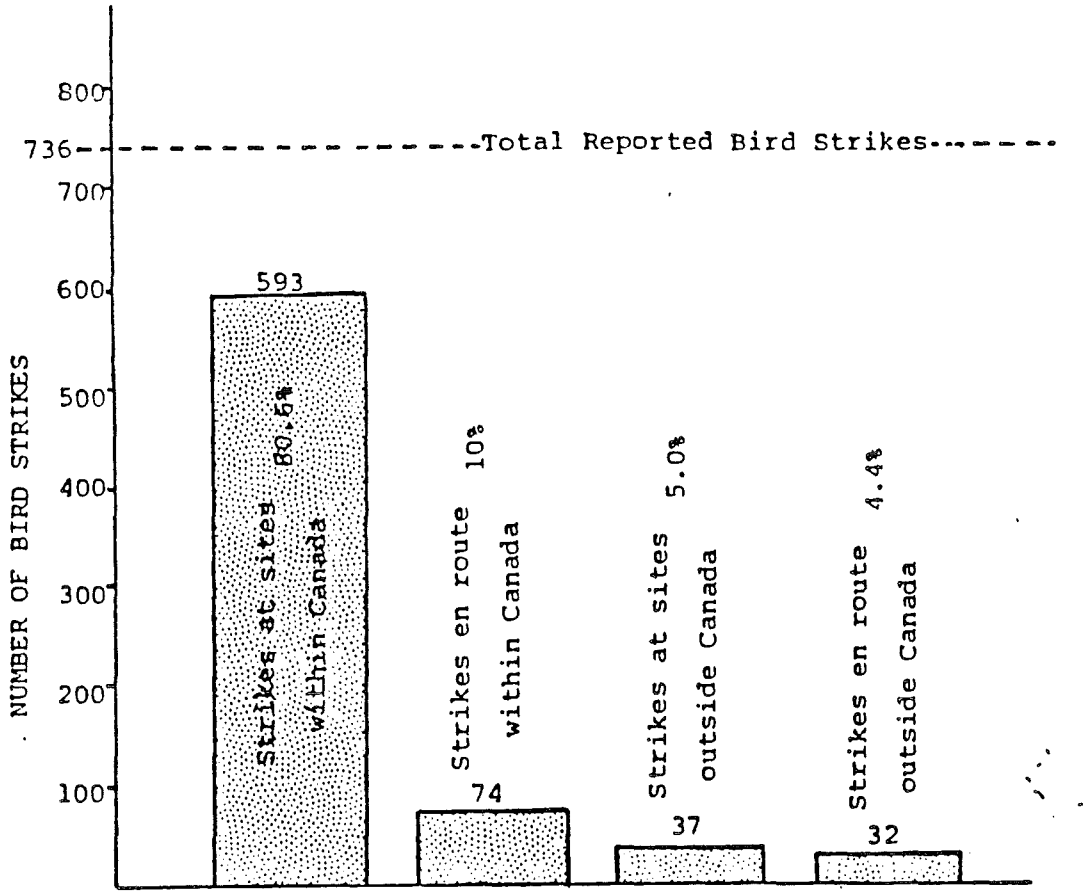
7. KFE/A initiated the development of a training package on Airport Mammal Control (AK-77-75-14). The purpose of the package is to familiarize airport staff with the common mammals (non-bird wildlife) encountered in airport environments, outline their ecological requirements, the hazards they cause to airport operations, and possible control measures. The training package is to be completed in March of 1984.

8. Tests of the chemical product "Dursban", initiated at Vancouver International Airport in 1982, for the control of crane fly larvae (a bird attractant) were completed. During 1983, the results were compiled and analyzed by DOW Chemical, the makers of the product. Dursban appears to be effective for crane fly control, and it is expected to be registered by DOW Chemical for this purpose in 1984.

C. BIRDSTRIKES TO CANADIAN AIRCRAFT - 1983

The 736 bird strikes reported to Canadian aircraft in 1983 include 208 to Department of National Defense aircraft and 528 to civil (commercial and private) aircraft. This total is further broken down in Figure 1 below.

Figure 1: Bird Strikes to Canadian Aircraft - 1983; Location*



IBIS p. 7, CASB.

The 15 Canadian airports with the greatest number of bird strikes reported during 1983 are listed below in Table 2 with their 1982 totals for comparison. The total number of aircraft movements (itinerant and local), and the bird strike per 10,000 movement rate are also illustrated.

Table 2: 15 Canadian Civil Airports with Highest Bird Strike Totals, 1983 and 1982.

	Airport	1983			1982		
		Total Reported Bird Strikes	Total Aircraft* Movements	Bird Strike Per 10,000 Mvmt. Rate	Total Reported Bird Strikes	Total Aircraft* Movements	Bird Strike Per 10,000 Mvmt. Rate
1.	Vancouver International	102	222,671	4.58	57	227,598	2.50
2.	Toronto - L.B. Pearson International	46	238,305	1.93	47	238,502	1.97
3.	Montreal - Dorval International	33	149,661	2.20	30	156,606	1.92
4.	Ottawa International	30	161,892	1.85	14	172,446	0.82
5.	Calgary International	22	187,731	1.17	15	198,467	0.76
6.	Winnipeg International	21	130,263	1.61	17	134,818	1.26
7.	Sault Ste. Marie, Ont.	17	50,566	3.36	6	53,246	1.13
8.	Edmonton International	16	75,867	2.11	6	80,885	0.74
9.	Yellowknife, N.W.T.	16	51,837	3.09	2	51,795	0.39
10.	St. John's, Nfld.	14	52,335	2.68	8	57,356	1.39
11.	Halifax International	12	61,466	1.95	3	79,598	0.38
12.	Montreal - Mirabel International	12	46,079	2.60	10	43,375	2.31
13.	Thunder Bay, Ont.	11	108,551	1.01	5	112,659	0.44
14.	Sudbury, Ont.	9	91.034	0.99	9	62,559	1.44
15.	Moncton, N.B.	8	86,137	0.93	8	83,896	0.95

*Total Aircraft Movements includes all reported movements (itinerant and local); provided by the Canadian Aviation Statistics Centre.

D. CATA BIRD STRIKE REPORTING SYSTEM

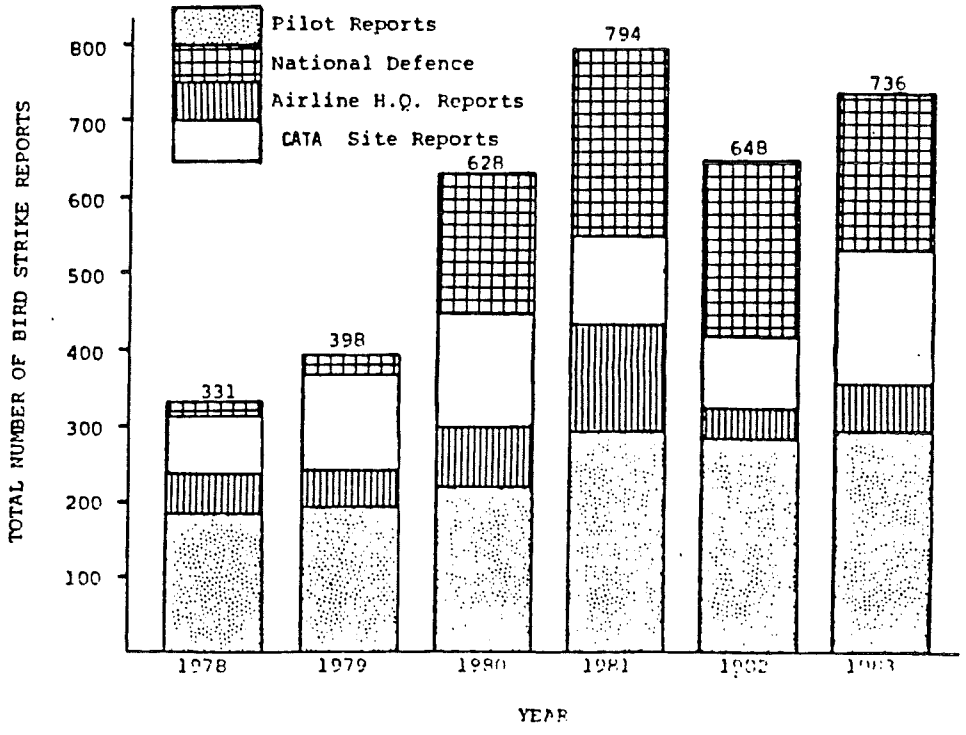
The sources of bird strike reports received by KFE/A (and the CASB) are shown below in Table 3. All reports have as their final destination the CASB. Pilot reports and Airline Head Office reports are submitted voluntarily. Pilots of all major Canadian airlines complete and send in the reports regularly, as this recording system helps the airlines themselves. Site reports are mandatorily completed and forwarded by employees at Transport Canada operated airports under Standards 4.(a) i-vi of AK-75-10-000, Airport Bird Hazard Control. DND reports are mandatorily completed by DND pilots under DND standards.

Table 3: Bird Strike Reporting Sources, 1982 and 1983

Report Source	No. of Reports*		% of Total Reports	
	1982	1983	1982	1983
Pilots	285	298	43.9	40.5
National Defense	231	207	35.6	28.1
CATA Site Reports	95	174	14.7	23.6
Airline Head Offices	37	57	5.7	7.7
Total, All Sources	648	736	100	100

*CASB Figure 2 below illustrates the proportion of the total reports accounted for by each reporting source. During 1983, site reporting increased significantly (+83%), indicating an increased awareness of the hazards of bird strikes among airport employees.

Figure 2: Bird Strike Reporting Sources, 1978 to 1983



E. BIRD SPECIES INVOLVED IN AIRCRAFT STRIKES

During 1983, the total number of strikes occurring in Canada with a specific type of bird reported was 406 or 60.9 % of the total strikes to aircraft (667). Forty-four species or types of birds were involved. Table 4 below lists the types of birds reported in 1983 and the number of separate strike incidents for each type.

Of the 44 bird species reported (Table 4), 6 accounted for 47.5% of total reported strikes, and 78.1% of all strikes where the type of bird was reported. These six types of birds are traditionally involved in the greatest number of strike incidents. Figure 3 below illustrates the proportions accounted for by gulls, swallows, sparrows, snow buntings, ducks, starlings and "other species" as well as the percentage of strikes where the bird species was identified for the years 1981 to 1983.

Figure 3: Percentage of Strikes with Birds Identified; Bird Strikes in Canada, 1981 - 1983

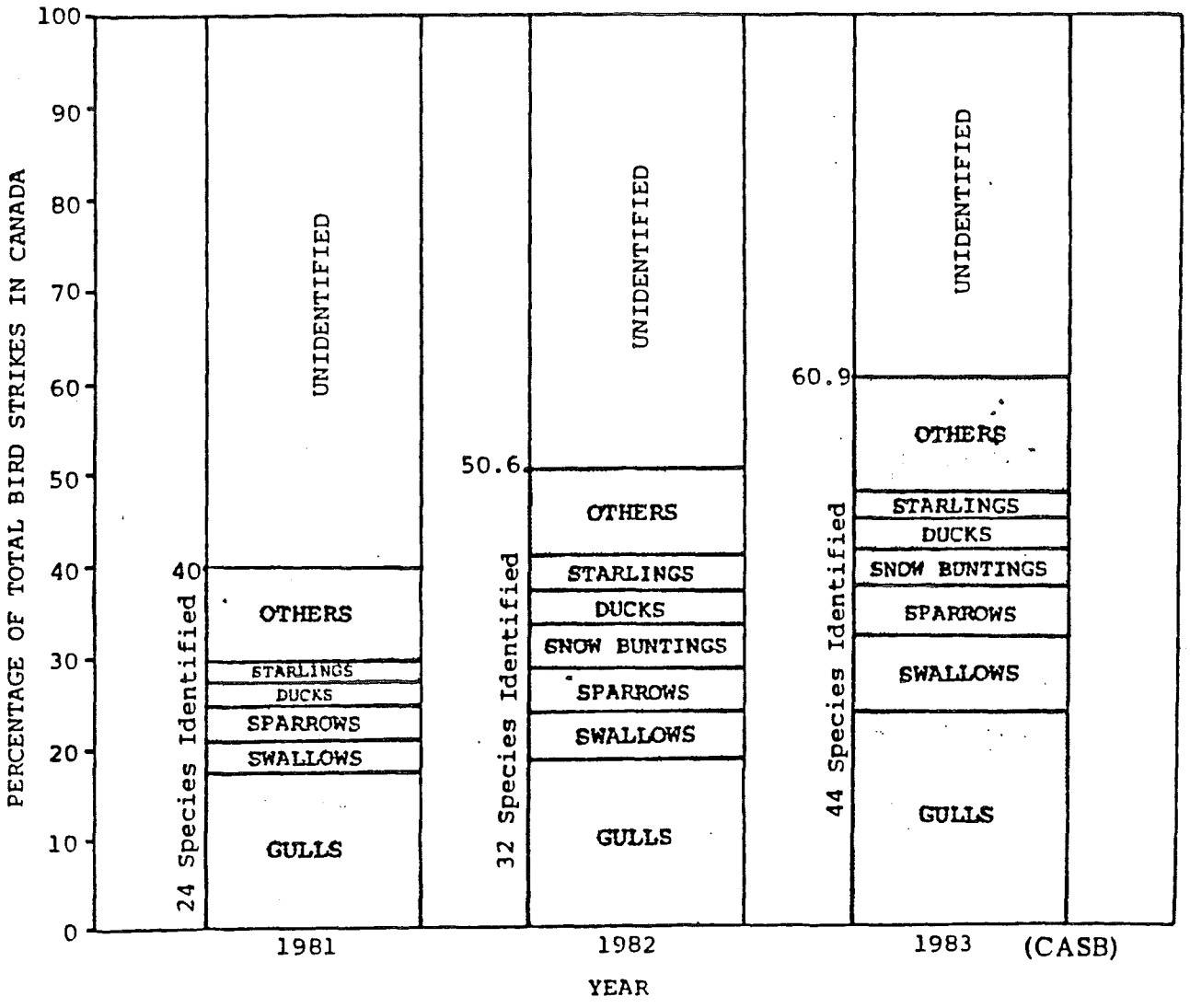


Table 4: Bird Types and Number of Incidents; Bird Strikes in Canada, 1983

Bird Type*	Number of Strike Incidents
Geese	2
Snow Goose	1
Ducks	18
American Wigeon	1
Teal	2
Mallard	2
Gulls	158
Herring Gull	1
Ring-billed Gull	1
Common Tern	1
Great Blue Heron	1
Sandhill Crane	1
Plovers	5
Killdeer	5
Sandpipers	4
Dunlin	11
Common Snipe	9
Western Sandpiper	2
American Woodcock	1
Grouse	3
Hawks	7
Red-tailed Hawk	1
Eagles	1
Osprey	1
Owls	4
Snowy Owl	2
Barn Owl	2
Pigeon	3
Mourning Dove	2
Woodpeckers	1
Larks	1
Horned Lark	3
Swallows	55
Swifts	1
Crow	5
Raven	1
Magpie	1
Chickadees	1
American Robin	3
Blackbirds	2
Western Meadowlark	1
Common Starling	17
Sparrows	35
Snow Bunting	27
Total Incidents, Bird Identified	406
Total Number of Bird Types Struck	44

* Bird type listed as reported on strike reports, data provided by the CASB.

F. OPERATIONAL EFFECTS OF BIRD STRIKES

Table 5 below indicates the various effects bird strikes had on aircraft during each of the years 1981, 1982 and 1983. Over these years, this factor has been reported with increasing efficiency. That is 70.4% in 1981, 80% in 1982 and 87% in 1983 of all submitted reports indicated the operational effects of the bird strike.

Table 5: Operational Effects of Bird Strikes to Aircraft; 1981 to 1983

	1981	1982	1983
Total Reports, Effects Indicated	554	518	640
No Effects	374	315	459
Operational Effects: Total (% of total reports)	180 (32.5%)	203 (39.2%)	181 (28.3%)
Aborted Takeoff	28	24	26
Precautionary Landing	146	157	137
Engine Shutdown	5	5	2
Forced Landing	1	1	2
Windscreen Penetration		3	8
Obscured Vision		13	6

IBIS p. 11

G. BIRD STRIKE DAMAGE TO AIRCRAFT

Table 6 below shows the total number of damaging bird strikes in 1981, 1982 and 1983, as well as a breakdown into the categories of non-engine strikes and engine strikes. Figure 4 illustrates the number of engine-damaging strikes for the years 1976 to 1983.

Table 6: Bird Strike Damage to Aircraft, 1981 to 1983*

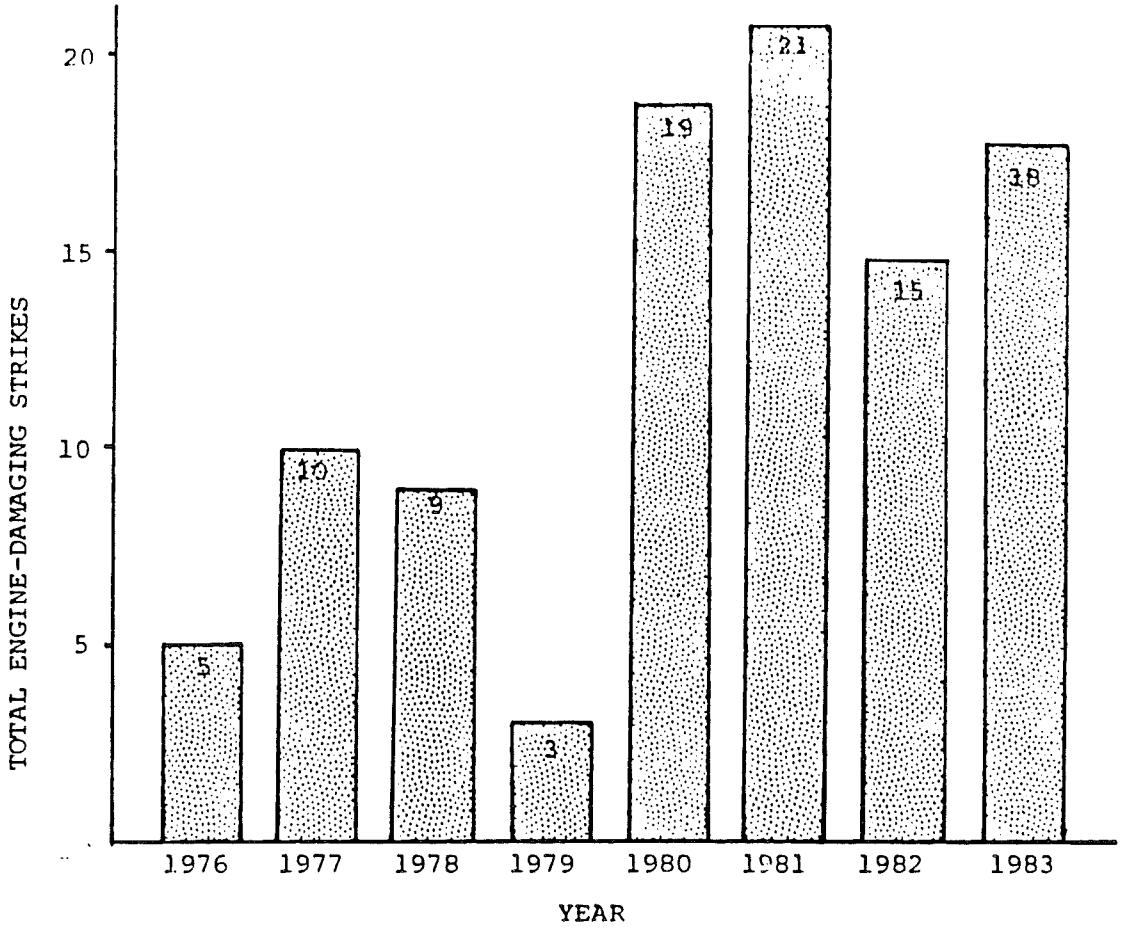
Strike Category	1981	1982	1983
Total Strikes**:	822	700	731
Damaging Strikes: - Total	76	84	75
- % of Total Strikes	9.2	12.0	10.3
Non-engine Strikes: Total	676	601	631
Damaging Non-engine Strikes: - Total	55	53	57
- % of Total Non-engine Strikes	8.1	8.8	9.0
Engine Strikes: Total	146	99	100
Damaging Engine Strikes: - Total	21	15	18
- % of Total Engine Strikes	14.4	15.2	18.0

* IBIS p. 9

** Total strikes for this field unequal to grand total bird strikes (1983 = 736) because of incomplete reporting.

Of significance in Table 6 is the increase in damaging engine strikes as a percentage of the total engine strikes. During the three years 1981 to 1983, this value has increased notably (14.4% to 18.0%) in comparison to the percentage of non-engine strikes that caused damage (8.1% to 9.0%). This increase may reflect a greater susceptibility of new generation turbofan engines to damage from bird strikes, although this parameter has never been quantified.

Figure 4: Engine Damaging Bird Strikes to Canadian Aircraft; 1976 to 1983



(IBIS p. 9)

H. SUMMARY

During 1983, total bird strikes to Canadian-operated aircraft amounted to 736, with 667 occurring within Canada. These totals represent a 13.5% and 9.9% increase over the 1982 total reported strikes (648) and strikes within Canada (607) respectively. Nineteen eighty-three also saw a slight decrease in total aircraft movements within Canada. These factors continued to provide a slightly higher bird strike per 10,000 aircraft movement rate than in 1982, although it still remains low on an international scale, at 0.92.

Bird strikes to military aircraft accounted for approximately 28% of the total strikes reported. A large proportion of these strikes occur during low level flights by smaller aircraft (non-passenger carriers).

Difficulty in obtaining damage/repair data and costs from the major airline headquarters in Canada, has led to the deletion of this data from the annual report. Continued discussion and meetings between KFE/A staff and airline representatives through forums such as the Interdepartmental Committee on Bird Hazards to Aircraft should rectify this situation.

The reporting of bird strikes by CATA airport staff increased notably in 1983 over 1982 (+ 83%). The number of incidents with bird type reported (approx. 61%), and the number of actual bird types identified in strikes (44) also increased significantly over 1982 totals. These increases indicate the continually heightening awareness of bird hazards among airport staff. As in previous years, gulls remain the major problem species, accounting for approximately 40% of strikes reported where the bird type was known. Engine-damaging strikes, considered the most dangerous type of bird strike, remained high as in recent years. This number expressed as a percentage of the total engine strikes however, indicates a rather significant and steady increase over the past 3 years, particularly in comparison to the percentage of total non-engine strikes that resulted in damage during the same period. This increase may give evidence to a higher level of susceptibility to damage from birds amongst the newer generation turbo fan engines although this has never been examined quantitatively.

APPENDIX: Bird strike Statistics, Canada 1983 (IBIS printout).

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###CANADIANAVIATIONSAFETYBOARD#ACCIDENT/INCIDENTDATASYSTEM#BUREAUCANADIENDELASECURITEAERIENNE#SYSTEMEDEDONNEESD'ACCIDENT/INCIDENT###
###CANADIANAVIATIONSAFETYBOARD#ACCIDENT/INCIDENTDATASYSTEM#BUREAUCANADIENDELASECURITEAERIENNE#SYSTEMEDEDONNEESD'ACCIDENT/INCIDENT###
###BUREAUCANADIENDELASECURITEAERIENNE#SYSTEMEDEDONNEESD'ACCIDENT/INCIDENT#CANADIANAVIATIONSAFETYBOARD#ACCIDENT/INCIDENTDATASYSTEM###
###C          VIATIO        YBOAR   CCIDENT/  CIDEN        YSTEM          NADIEN       CURITEAERIE       STEME  DON          CIDENT          T###
###           DIEN          RITE     ENNE#SY  EMED          D'AC          CIDEN         ANAVIATIO         OARD  CCI           DENT            ###
###  NADIAN   IAT   NSAFET  OAR   A   IDENT/  CID   TDATAS  TEM  UREAUC  NADI   DELASE  RITEAER  NNE#SY  EME  DON  ESD'AC  DEN   INCIDENT###
###  REAUCANADIE   ELASEC  ITE   RI   NE#SY  EME   DONNEE  'AC  DENT/I  CIDE   #CANAD  NAVIATI  SAFETY  ARD  CCI  NT/INC  ENT   TASYSTEM###
###  NADIANAVIAT   NSAFET  OAR   ACC   ENT/  CID   TDATAS  TEM  UREAUC  NADI   DELASE  RITEAER  NNE#SY  EME  DON  ESD'AC  DENT        NT###
###  REAUCANADIE           ITE   RIEN   #SY  EME          'AC  DENT/I  CIDE           NA    TI          ARD  CCI  NT/INC  ENTDA       M###
###  NADIANAVIAT           OAR   ACCID   T/  CID          TEM  UREAUC  NADI           RI    ER          EME  DON  ESD'AC  DENT/INCIDE   ###
###  REAUCA   DIE  ELASEC  ITE   RIENNE   Y  EME   DONNEE  'AC  DENT/I  CIDE   #CANAD  NAVIATI  SAFETY  ARD  CCI  NT/INC  ENTDATASYST   ###
###           IAT  NSAFET  OAR   ACCIDEN     CID   TDATAS  TEM          NADI   DELASE  RITEAER  NNE#SY  EME  DON         IDEN           ###
###B         ADIE  ELASEC  ITE   RIENNE#S    EME   DONNEE  'AC          CIDE   #CANAD  NAVIATI  SAFETY  ARD  CCI        IDENTD          M###
###CANADIANAVIATIONSAFETYBOARD#ACCIDENT/INCIDENTDATASYSTEM#BUREAUCANADIENDELASECURITEAERIENNE#SYSTEMEDEDONNEESD'ACCIDENT/INCIDENT###
###BUREAUCANADIENDELASECURITEAERIENNE#SYSTEMEDEDONNEESD'ACCIDENT/INCIDENT#CANADIANAVIATIONSAFETYBOARD#ACCIDENT/INCIDENTDATASYSTEM###
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**                                                                  **
**  THE CANADIAN AVIATION SAFETY BOARD INVESTIGATES                 **
**  OCCURRENCES FOR THE PURPOSE OF ADVANCING AVIATION SAFETY.       **
**  IT IS NOT THE OBJECT OF THE BOARD TO DETERMINE OR               **
**  APPORTION ANY BLAME OR LIABILITY.                               **
**                                                                  **
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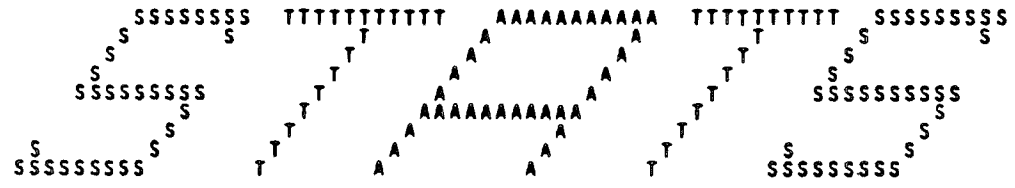

<----------------------- SUBJECT ----------------------->

1983 BIRDSTRIKES NO DUPLICATES

<---------------- CONVENTIONS ---------------->

PERCENTAGES PRINTED ARE ALWAYS BASED ON THE NUMBER OF CASES COUNTED, WHICH IS NOT ALWAYS IDENTICAL WITH THE NUMBER OF ACCIDENTS/INCIDENTS COVERED BY THIS REPORT. THE REASONS FOR THIS ARE:

1) SOME DATA FIELDS MAY NOT HAVE BEEN REPORTED IN A GIVEN ACCIDENT OR INCIDENT.
2) SOME DATA FIELDS ACCOMODATE MORE THAN ONE ENTRY - FOR EXAMPLE:

   A) THERE MAY BE ONE OR TWO TYPES OF OCCURRENCE AND RELATED PHASES OF FLIGHT IN A GIVEN ACCIDENT OR INCIDENT.
   B) THERE MAY BE UP TO THIRTEEN FACTORS ASSIGNED IN A GIVEN ACCIDENT OR INCIDENT.

WHENEVER POSSIBLE THE PRINTOUTS WILL SHOW THE PLAIN LANGUAGE EQUIVALENTS OF CODES.

A TABLE OF CONTENTS IS LISTED ON THE LAST PAGE OF THE REPORT.

1983 BIRDSTRIKES NO DUPLICATES

COLUMN HEADINGS ARE BIRD CODES LISTED AT THE BOTTOM OF THE PAGE

	TOTAL	NE1	YI	ZX3	ZX202	J21	YL001	N6013	K33	N6009	N51	N5111	N6	OTHER
OTAL	724	162	53	35	26	18	15	11	10	8	5	5	4	372
OPERATOR														
IR CANADA	220	51	20	8	8	2	8	6	1	1	1	1	1	112
ILITARY	210	31	11	13	3	2	4	0	4	1	0	2	0	139
.P. AIR	78	7	11	2	0	1	0	5	1	1	1	0	0	49
WA	69	13	6	6	11	6	2	0	1	2	0	0	1	21
USINESS	35	8	1	2	1	2	0	0	2	1	0	0	1	17
ORDAIR LTD.	29	18	0	0	0	0	0	0	0	1	0	0	0	10
RIVATE	23	10	2	1	0	0	0	0	0	0	2	0	0	8
.P.A.	18	5	2	2	0	0	0	0	0	0	1	0	1	7
UEBECAIR INC.	3	1	0	1	0	0	0	0	0	0	0	0	0	1
NITED	2	0	0	0	0	0	0	0	0	0	0	0	0	2
OVERNMENT	1	0	0	0	0	0	0	0	0	0	0	0	0	1
ACKEY INTERNATIONAL, INC.	1	0	0	0	0	0	0	0	0	0	0	0	0	1
ORTHWEST TERRITORIAL AIRWAYS	1	0	0	0	1	0	0	0	0	0	0	0	0	0
WISSAIR	1	0	0	0	1	0	0	0	0	0	0	0	0	0
	1	1	0	0	0	0	0	0	0	0	0	0	0	0
ARDAIR CANADA LTD.	1	0	1	0	0	0	0	0	0	0	0	0	0	0
AIRCRAFT CLASSIFICATION														
URBO FAN OVER 27 000	404	92	39	14	20	9	11	11	3	4	3	1	3	194
URBO JET OVER 27 000	12	7	0	0	0	0	0	0	0	0	0	0	0	5
URBO PROP OVER 27 000	12	2	0	1	0	2	0	0	0	0	1	0	0	6
URBO FAN UNDER 27 000	16	3	6	1	0	0	2	0	0	1	0	0	0	3
URBO JET UNDER 27 000	74	9	1	1	1	0	0	0	3	0	0	0	0	59
URBO PROP UNDER 27 000	36	8	1	4	1	0	0	0	1	0	0	0	0	21
ISTON OVER 5 700	4	0	0	0	0	0	0	0	2	0	0	0	0	2
ISTON UNDER 5 700	53	14	6	4	1	1	2	0	0	0	2	1	1	21
ELICOPTER	27	2	0	1	1	1	0	0	0	0	0	0	0	22
THER, UNK AND GLIDER	98	26	2	9	2	5	1	0	1	4	0	2	0	46

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TRANSLATION OF KEYS FROM THE TOP LINE

E1 :		GULLS	YI :	HIRUNDINIDAE	SWALLOWS
X3 :		SPARROWS	ZX202:	PLECTRO. NIVALIS	SNOW BUNTING
21 :		DUCKS	YL001:	STURNUS VULGARIS	COMMON STARLING
6013:	CALIDRIS ALPINA	DUNLIN	K33 :		HAWKS
6009:	GALLINAGO GALLINAGO	COMMON SNIPE	N51 :		PLOVERS
5111:	CHARA. VOCIFERUS	KILLDEER	N6 :	SCOLOPACIDAE	SANDPIPERS

1983 BIRDSTRIKES NO DUPLICATES

COLUMN HEADINGS ARE BIRD CODES LISTED AT THE BOTTOM OF THE PAGE

> AIRCRAFT MANUFACTURER/MODEL		TOTAL	NE1	YI	ZX3	ZX202	J21	YL001	N6013	K33	N6009	N51	N5111	N6	OTHER
BEECH	23	2	0	0	2	0	0	0	0	0	0	0	0	0	0
BEECH	99	1	1	0	0	0	0	0	0	0	0	0	0	0	0
BELL	206 SERIES	16	0	0	0	1	0	0	0	0	0	0	0	0	15
BELL	212	7	0	0	1	0	1	0	0	0	0	0	0	0	5
BOEING	707	12	7	0	0	0	0	0	0	0	0	0	0	0	5
BOEING	727200	66	16	6	1	1	1	2	2	1	0	0	0	1	35
BOEING	737200	144	38	16	6	11	4	3	5	1	2	1	0	2	55
BOEING	747100	15	1	2	0	0	0	0	0	1	0	0	0	0	11
BOEING	767200	9	1	0	0	0	1	0	0	0	1	0	0	0	6
BRITISH AC	1-11	1	1	0	0	0	0	0	0	0	0	0	0	0	0
BRITTNORMAN	BN2A	2	0	0	0	0	1	0	0	0	0	0	0	0	1
CANADAIR	TUTOR	39	7	0	4	0	0	0	0	0	0	0	0	0	28
CANADAIR	CF-5	21	3	0	1	1	0	0	0	0	0	0	0	0	16
CANADAIR	CF-104	47	3	0	0	0	0	0	0	3	0	0	0	0	41
CESSNA	180	2	1	0	0	0	0	0	0	0	0	0	0	0	1
CESSNA	185	1	1	0	0	0	0	0	0	0	0	0	0	0	0
CESSNA	310	1	0	0	0	0	0	0	0	0	0	0	0	0	1
CESSNA	340	1	1	0	0	0	0	0	0	0	0	0	0	0	0
CESSNA	401	1	0	0	0	0	0	0	0	0	0	0	0	0	1
CESSNA	414	1	0	0	0	0	0	0	0	0	0	0	0	0	1
CESSNA	421	1	0	0	0	0	0	0	0	0	0	1	0	0	0
CESSNA	CITATN	1	0	1	0	0	0	0	0	0	0	0	0	0	0
CESSNA	402	1	0	0	1	0	0	0	0	0	0	0	0	0	0
CESSNA	152	3	1	0	0	0	0	0	0	0	0	0	0	0	2
CONVAIR	240	1	0	0	0	0	0	0	0	0	0	0	0	0	1
CONVAIR	640	1	0	0	0	0	0	0	0	0	0	0	0	0	1
CONVAIR	CV580	5	1	0	1	0	0	0	0	0	1	0	0	0	2
DASSAULT	FAL20T	1	0	0	0	0	0	0	1	0	0	0	0	0	0
DEHAVND CAN	DHC6	2	1	0	0	0	0	0	0	0	0	0	0	0	1
DEHAVND CAN	DHC5	5	0	0	0	0	0	0	0	0	0	0	0	0	5
FAIRCHILD	FH227	1	0	0	0	0	0	0	0	0	0	0	0	0	1
GATES LEAR	23	1	0	0	0	0	0	0	0	0	0	0	0	0	1
GATES LEAR	25B	2	2	0	0	0	0	0	0	0	0	0	0	0	0
GATES LEAR	35	1	1	0	0	0	0	0	0	0	0	0	0	0	0
GRUMMAN	G21	2	1	0	0	0	0	0	0	0	0	0	0	1	0
GRUMMAN	G159	1	1	0	0	0	0	0	0	0	0	0	0	0	0
GRUMMAN	G1159	1	0	0	0	0	0	0	0	0	0	0	0	0	1
GRUMMAN	CS2F	4	0	0	1	1	0	0	0	0	0	0	0	0	2
GRUMMANAMER	GA-7	1	0	0	0	0	0	0	0	0	0	0	0	0	1
HAWKER-SDLY	HS125	1	0	0	0	0	0	0	0	0	0	0	0	0	1

TRANSLATION OF KEYS FROM THE TOP LINE

NE1	:	GULLS	YI	: HIRUNDINIDAE	SWALLOWS
ZX3	:	SPARROWS	ZX202	: PLECTRO. NIVALIS	SNOW BUNTING
J21	:	DUCKS	YL001	: STURNUS VULGARIS	COMMON STARLING
N6013	: CALIDRIS ALPINA	DUNLIN	K33	:	HAWKS
N6009	: GALLINAGO GALLINAGO	COMMON SNIPE	N51	:	PLOVERS
N5111	: CHARA. VOCIFERUS	KILLDEER	N6	: SCOLOPACIDAE	SANDPIPERS

1983 BIRDSTRIKES NO DUPLICATES

COLUMN HEADINGS ARE BIRD CODES LISTED AT THE BOTTOM OF THE PAGE

> AIRCRAFT MANUFACTURER/MODEL	TOTAL	NE1	YI	ZX3	ZX202	J21	YL001	N6013	K33	N6009	N51	N5111	N6	OTHER
HAWKER-SDLYHS748	11	2	1	2	0	0	0	0	0	0	0	0	0	6
ISRAEL IND.1123	1	0	1	0	0	0	0	0	0	0	0	0	0	0
ISRAEL IND.1124	1	1	0	0	0	0	0	0	0	0	0	0	0	0
LOCKHEED 9	19	2	6	1	0	0	2	0	0	0	0	1	0	7
LOCKHEED 382B	12	2	0	1	0	2	0	0	0	0	0	1	0	6
LOCKHEED L1011	24	6	2	0	0	1	1	0	0	0	0	0	0	14
LOCKHEED T-33	8	3	0	1	0	0	0	0	0	0	0	0	0	4
DOUGLAS DC3	2	0	0	0	0	0	0	0	0	0	0	0	0	0
DOUGLAS DC4	1	0	0	0	0	0	0	0	0	0	0	0	0	1
DOUGLAS DC8	9	0	1	0	2	0	0	1	0	0	0	0	0	5
DOUGLAS DC9 30	116	27	12	7	5	1	5	3	0	1	1	1	0	53
DOUGLAS DC1010	19	2	0	1	1	0	1	0	0	0	1	0	0	14
DOUGLAS F-101	13	2	5	1	0	0	1	0	0	1	0	0	0	3
NA ROCKWELL112	1	1	0	0	0	0	0	0	0	0	0	0	0	0
PIPER PA18	1	1	0	0	0	0	0	0	0	0	0	0	0	0
PIPER PA23AP	1	1	0	0	0	0	0	0	0	0	0	0	0	0
PIPER PA23AZ	2	1	0	0	0	0	0	0	0	0	0	0	0	1
PIPER PA25	1	0	0	0	0	0	0	0	0	0	0	0	0	1
PIPER PA28	2	0	0	0	0	0	0	0	0	0	0	0	0	2
PIPER PA31	6	3	0	0	1	0	0	0	0	0	0	0	0	2
PIPER PA34	3	0	0	0	0	0	0	0	0	0	1	0	0	2
SAUNDERS ST27	3	1	0	0	0	0	0	0	0	0	0	0	0	2
SIKORSKY S52	4	2	0	0	0	0	0	0	0	0	0	0	0	2
SWEARINGEN MERIVA	1	1	0	0	0	0	0	0	0	0	0	0	0	0

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TRANSLATION OF KEYS FROM THE TOP LINE

NE1 :		GULLS	YI :	HIRUNDINIDAE	SWALLOWS
ZX3 :		SPARROWS	ZX202:	PLECTRO. NIVALIS	SNOW BUNTING
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N6013:	CALIDRIS ALPINA	DUNLIN	K33 :		HAWKS
N6009:	GALLINAGO GALLINAGO	COMMON SNIPE	N51 :		PLOVERS
N5111:	CHARA. VOCIFERUS	KILLDEER	N6 :	SCOLOPACIDAE	SANDPIPERS

1983 BIRDSTRIKES NO DUPLICATES

COLUMN HEADINGS ARE BIRD CODES LISTED AT THE BOTTOM OF THE PAGE

	TOTAL	NE1	YI	ZX3	ZX202	J21	YL001	N6013	K33	N6009	N51	N5111	N6	OTHER
> YEAR OF OCCURRENCE														
1983	736	163	55	35	26	18	16	11	10	9	5	5	4	379
> MONTH OF OCCURRENCE														
JANUARY	14	2	0	1	0	0	1	0	0	0	0	1	0	9
FEBRUARY	15	3	0	0	3	1	0	0	1	0	0	0	0	7
MARCH	37	2	0	3	3	1	0	0	0	0	0	0	0	28
APRIL	69	19	0	3	4	3	1	2	0	0	0	0	0	37
MAY	81	13	2	8	9	1	0	0	0	0	0	0	0	48
JUNE	45	8	5	3	0	0	2	0	2	0	0	0	0	25
JULY	96	28	4	2	0	2	2	8	2	0	0	0	0	48
AUGUST	139	43	22	5	0	3	5	1	3	0	1	4	3	50
SEPTEMBER	115	16	20	2	0	1	3	0	1	0	1	0	0	64
OCTOBER	59	11	0	5	3	3	3	0	0	0	3	0	1	30
NOVEMBER	40	11	0	1	4	2	1	0	0	1	0	0	0	20
DECEMBER	14	6	0	0	0	1	0	0	1	0	0	0	0	6
> LIGHT CONDITIONS														
DAWN	14	10	2	0	0	0	0	0	0	0	0	0	0	2
DAY	481	111	48	30	18	6	15	9	7	4	3	3	2	225
DUSK	39	12	3	1	2	0	0	1	2	1	1	0	2	14
NIGHT	90	14	0	1	1	1	0	1	0	0	1	0	0	65

TRANSLATION OF KEYS FROM THE TOP LINE

NE1 :		GULLS	YI :	HIRUNDINIDAE	SWALLOWS
ZX3 :		SPARROWS	ZX202:	PLECTRO. NIVALIS	SNOW BUNTING
J21 :		DUCKS	YL001:	STURNUS VULGARIS	COMMON STARLING
N6013:	CALIDRIS ALPINA	DUNLIN	K33 :		HAWKS
N6009:	GALLINAGO GALLINAGO	COMMON SNIPE	N51 :		PLOVERS
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1983 BIRDSTRIKES NO DUPLICATES

COLUMN HEADINGS ARE BIRD CODES LISTED AT THE BOTTOM OF THE PAGE

> CITY	/AIRPORT	TOTAL	NE1	YI	ZX3	ZX202	J21	YL001	N6013	K33	N6009	N51	N5111	N6	OTHER
ST-PIERRE-MIQUELON	/SAINT-PIERRE	1	0	0	0	0	0	0	0	0	0	0	0	0	1
SAULT STE MARIE,ONT	/SAULT STE MARIE	21	12	0	2	0	0	0	0	0	0	0	0	0	3
HALIFAX,NS	/SHEARWATER CFB	3	2	0	0	0	0	0	0	0	0	0	0	0	1
ST ANTHONY,NFL	/ST ANTHONY	1	0	0	0	1	0	0	0	0	0	0	0	0	0
BAGOTVILLE,QUE	/BAGOTVILLE	4	0	0	1	0	0	0	0	0	0	0	0	0	2
BRANDON,MAN	/BRANDON	1	0	0	0	0	0	0	0	0	0	0	1	0	0
CAMBRIDGE BAY,NWT	/CAMBRIDGE BAY	2	0	0	0	0	1	0	0	0	0	0	0	0	1
CASTLEGAR,BC	/CASTLEGAR	2	0	0	0	0	0	0	0	0	0	0	1	0	1
CHATHAM,NB	/CHATHAM CFB	11	2	5	2	0	0	0	0	0	0	0	0	0	2
DEER LAKE,NFL	/DEER LAKE	2	2	0	0	0	0	0	0	0	0	0	0	0	0
DAUPHIN,MAN	/DAUPHIN	1	0	0	0	0	0	0	0	0	1	0	0	0	0
DAWSON CREEK,BC	/DAWSON CREEK	5	3	1	0	0	0	0	0	0	0	0	0	0	1
EDMONTON,ALTA	/NAMAO CFB	5	1	0	0	0	0	0	0	0	1	0	0	0	3
EDMONTON,ALTA	/EDMONTON INTL	16	5	0	1	0	1	1	0	0	0	0	0	0	8
INUVIK,NWT	/INUVIK	1	0	0	0	1	0	0	0	0	0	0	0	0	0
FREDERICTON,NB	/FREDERICTON	7	0	2	0	1	2	0	0	0	0	0	0	0	1
FORT SIMPSON,NWT	/FORT SIMPSON	2	0	0	0	0	0	0	0	0	2	0	0	0	0
FORT GOOD HOPE,NWT	/FORT GOOD HOPE	1	0	0	0	0	0	0	0	0	0	0	0	0	1
MONTREAL,QUE	/ST HUBERT	5	1	0	0	0	0	0	0	0	1	0	0	0	3
HAY RIVER,NWT	/HAY RIVER	7	3	0	0	3	0	0	0	0	0	0	0	0	1
HALIFAX,NS	/HALIFAX INTL	12	1	1	2	2	0	0	0	0	0	0	0	2	4
STEPHENVILLE,NFL	/STEPHENVILLE	3	2	0	0	0	0	0	0	0	0	0	0	0	1
KAMLOOPS,BC	/KAMLOOPS	4	2	0	0	1	0	0	0	0	2	0	0	0	0
KELOWNA,BC	/KELOWNA	1	0	0	0	0	0	1	0	0	0	0	0	0	0
MOOSE JAW,SASK	/MOOSE JAW CFB	14	5	1	0	2	0	0	0	0	0	0	0	0	7
FT MCMURRAY,ALTA	/FT MCMURRAY	3	1	1	0	0	0	0	0	0	0	1	0	0	1
MONTREAL,QUE	/MIRABEL INTL	12	4	1	0	1	0	0	0	0	0	0	0	0	5
COLD LAKE,ALTA	/COLD LAKE CFB	5	1	0	0	0	0	0	0	0	0	1	0	0	4
OSHAWA,ONT	/OSHAWA	1	0	0	0	0	0	0	0	0	0	0	0	0	1
OTTAWA,ONT	/OTTAWA INTL	30	9	0	0	3	0	0	0	0	0	0	0	0	14
PORTAGE,MAN	/PORTAGE CFB	6	0	0	1	3	0	0	0	0	0	0	0	0	5
PRINCE RUPERT,BC	/PRINCE RUPERT	2	0	1	0	0	0	0	0	0	0	0	0	0	1
QUEBEC CITY,QUE	/QUEBEC	4	1	0	1	0	0	0	0	0	0	0	0	0	2
THE PAS,MAN	/THE PAS	2	1	0	0	0	0	0	0	0	0	0	0	0	1
RED DEER,ALTA	/RED DEER INDUSTRI	1	0	0	0	0	0	1	0	0	0	0	0	0	0
WINDSOR,ONT	/WINDSOR	4	3	0	0	0	0	0	0	0	0	1	0	0	0
YARMOUTH,NS	/YARMOUTH	5	1	1	0	0	0	0	1	0	0	0	1	0	1
MONCTON,NB	/MONCTON	8	2	2	0	0	0	0	0	0	0	1	0	0	4
COMOX,BC	/COMOX	5	1	2	0	0	0	0	0	0	0	0	0	0	2
REGINA,SASK	/REGINA	6	2	0	1	0	0	0	2	0	0	1	0	0	0

TRANSLATION OF KEYS FROM THE TOP LINE

NE1	:	GULLS	YI	: HIRUNDINIDAE	SWALLOWS
ZX3	:	SPARROWS	ZX202	: PLECTRO. NIVALIS	SNOW BUNTING
J21	:	DUCKS	YL001	: STURNUS VULGARIS	COMMON STARLING
N6013	: CALIDRIS ALPINA	DUNLIN	K33	:	HAWKS
N6009	: GALLINAGO GALLINAGO	COMMON SNIPE	N51	:	PLOVERS
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1983 BIRDSTRIKES NO DUPLICATES

COLUMN HEADINGS ARE BIRD CODES LISTED AT THE BOTTOM OF THE PAGE

> CITY	/AIRPORT	TOTAL	NE1	YI	ZX3	ZX202	J21	YL001	N6013	K33	N6009	N51	N5111	No	OTHER
YELLOWKNIFE,NWT	/YELLOWKNIFE	16	1	0	4	9	0	0	0	0	0	0	0	0	2
PORT HARDY,BC	/PORT HARDY	6	0	1	0	0	1	0	0	0	0	0	0	0	4
SEPT-ILES,QUE	/SEPT-ILES	1	1	0	0	0	0	0	0	0	0	0	0	0	0
GREENWOOD,NS	/GREENWOOD CFB	13	0	6	1	0	0	1	0	0	0	0	0	0	5
SOLLINGEN	/SOLLINGEN	13	1	0	0	0	0	0	0	2	0	0	0	0	10
LAHR	/LAHR	3	1	0	0	0	0	0	0	0	0	0	0	0	2
DUESSELDORF	/DUESSELDORF	2	0	0	0	0	0	0	0	0	0	0	0	0	2
LONDON	/HEATHROW	2	1	0	0	0	0	0	0	0	0	0	0	0	1
NEWCASTLE	/NEWCASTLE	1	0	0	0	0	0	0	0	0	0	0	0	0	1
PRESTWICK	/PRESTWICK	1	1	0	0	0	0	0	0	0	0	0	0	0	0
AMSTERDAM	/SCHIPHOL	1	0	0	0	0	0	0	0	0	0	0	0	0	1
FORT LAUDERDALE,FL.	/FORT LAUDERDALE-H	1	0	0	0	0	0	0	0	0	0	0	0	0	1
LOS ANGELES,CA.	/LOS ANGELES INTL	2	0	0	0	0	0	0	0	0	0	0	0	0	2
NEW YORK	/LA GUARDIA	1	0	0	0	0	0	0	0	0	0	0	0	0	1
ST. PETERSBURG FL.	/CLEARWATER	4	1	0	0	0	0	0	0	0	0	0	0	0	3
PARIS	/CHARLES DE GAULLE	1	0	0	0	0	0	1	0	0	0	0	0	0	0
DECIMAMANNU	/DECIMAMANNU	2	0	0	0	0	0	0	0	0	0	0	0	0	2
LISBOA	/LISBOA	2	0	0	0	0	0	0	0	0	0	0	0	0	2
ZUERICH	/ZUERICH	1	0	0	0	0	0	0	0	0	0	0	0	0	1
EN ROUTE		94	9	0	4	0	2	0	0	1	0	0	0	0	78
SITE UNSPECIFIED*		12													

* THESE STRIKES ASSUMED EN ROUTE IN CANADA (KFE/A)

****

TRANSLATION OF KEYS FROM THE TOP LINE

NE1	:	GULLS	YI	: HIRUNDINIDAE	SWALLOWS
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1983 BIRDSTRIKES NO DUPLICATES

COLUMN HEADINGS ARE BIRD CODES LISTED AT THE BOTTOM OF THE PAGE

	TOTAL	NE1	YI	ZX3	ZX202	J21	YL001	N6013	K33	N6009	N51	N5111	N6	OTHER
> HEIGHT AGL (FT)														
0 - 100	376	108	39	24	16	3	13	7	8	4	1	3	2	148
101 - 200	26	7	1	1	1	0	0	1	0	0	0	0	0	15
201 - 500	44	7	1	3	1	1	0	0	0	0	0	0	0	31
501 - 1000	69	9	0	1	2	1	0	0	1	0	0	0	0	55
1001 - 2500	52	7	0	1	0	2	0	0	0	0	0	0	0	42
OVER 2501	22	2	0	0	0	2	0	0	0	0	0	0	1	17
> AIRCRAFT SPEED (IAS - KT)														
0 - 80	16	5	0	2	1	0	0	0	0	0	0	0	0	8
81 - 100	28	3	0	2	0	0	1	0	2	1	0	0	0	19
101- 150	275	71	29	15	11	3	11	5	2	0	1	1	1	125
151- 200	60	15	5	2	3	1	0	0	1	0	0	0	0	33
201- 250	43	10	0	1	1	0	0	0	0	1	0	0	0	30
OVER 250	59	3	0	1	0	2	1	0	1	0	0	0	0	51
> FLIGHT PHASE														
PARKED	2	0	2	0	0	0	0	0	0	0	0	0	0	0
TAXI	6	0	3	1	0	0	0	1	0	0	0	0	0	1
TAKE-OFF RUN	176	43	22	9	9	2	4	2	5	0	5	1	0	74
CLIMB	77	22	2	5	4	2	3	0	0	1	0	0	0	38
EN ROUTE	84	6	0	3	0	1	0	0	1	0	0	0	0	73
DESCENT	11	3	0	0	0	0	0	0	0	0	0	0	0	8
APPROACH	138	26	5	5	5	4	2	1	0	0	0	1	1	88
LANDING ROLL	130	40	14	8	3	1	6	4	3	3	0	0	2	46

****

TRANSLATION OF KEYS FROM THE TOP LINE

NE1	:	GULLS	YI	: HIRUNDINIDAE	SWALLOWS
ZX3	:	SPARROWS	ZX202	: PLECTRO. NIVALIS	SNOW BUNTING
J21	:	DUCKS	YL001	: STURNUS VULGARIS	COMMON STARLING
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1983 BIRDSTRIKES NO DUPLICATES

COLUMN HEADINGS ARE BIRD CODES LISTED AT THE BOTTOM OF THE PAGE

	TOTAL	NE1	YI	ZX3	ZX202	J21	YL001	N6013	K33	N6009	N51	N5111	No	OTHER
> PARTS STRUCK														
RADOME	73	14	8	6	4	0	3	0	0	0	0	0	0	38
WINDSHIELD	121	11	10	10	2	2	1	0	1	2	1	0	0	81
NOSE	107	23	14	5	7	0	2	1	1	2	1	0	0	52
ENGINE 1	55	10	3	2	4	1	2	0	0	1	0	0	0	32
ENGINE 2	30	8	2	0	5	0	1	0	0	0	0	0	1	13
ENGINE 3	11	1	2	0	0	0	0	0	1	0	0	0	0	7
ENGINE 4	4	1	0	0	0	0	1	0	0	0	0	0	0	2
PROPELLER	10	6	0	0	0	0	0	0	0	0	0	1	0	3
WING/ROTOR	124	24	8	7	7	3	4	1	1	1	0	1	1	66
FUSELAGE	109	21	9	5	9	0	3	1	2	1	0	0	0	58
LANDING GEAR	44	12	4	3	1	1	2	1	0	0	0	0	0	20
TAIL	12	1	2	0	0	0	0	0	0	0	0	0	0	9
LIGHTS	6	1	0	1	0	0	0	0	0	0	0	0	0	4
OTHER PART	25	4	0	1	0	1	0	0	1	0	0	0	0	18
> PARTS DAMAGED														
RADOME	6	4	0	0	0	0	0	0	0	0	0	0	0	2
WINDSHIELD	6	1	0	0	0	0	0	0	0	0	0	0	0	5
NOSE	6	4	0	0	0	0	0	0	0	0	0	0	0	2
ENGINE NO 1	14	4	0	0	0	1	0	0	0	0	0	0	0	9
ENGINE NO 2	3	1	0	0	0	0	0	0	0	0	0	0	0	2
ENGINE NO 3	1	1	0	0	0	0	0	0	0	0	0	0	0	0
WING/ROTOR	20	3	0	0	0	2	0	0	0	0	0	0	0	15
FUSELAGE	6	2	0	0	0	0	0	0	0	0	0	0	0	4
LANDING GEAR	2	1	0	0	0	0	0	0	0	0	0	0	0	1
TAIL	4	0	0	0	0	0	0	0	0	0	0	0	0	4
LIGHTS	5	1	0	0	0	0	0	0	0	0	0	0	0	4
OTHER	2	1	0	0	0	0	0	0	0	0	0	0	0	1

****

TRANSLATION OF KEYS FROM THE TOP LINE

NE1	:	GULLS	YI	: HIRUNDINIDAE	SWALLOWS
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1983 BIRDSTRIKES NO DUPLICATES

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	TOTAL	NE1	YI	ZX3	ZX202	J21	YL001	N6013	K33	N6009	N51	N5111	N6	OTHER
> SKY CONDITION														
NO CLOUD	202	28	13	12	4	3	3	1	4	0	0	1	2	131
SOME CLOUD	212	51	17	12	6	5	5	1	1	1	0	1	0	112
OVERCAST	98	31	8	1	7	1	5	6	1	1	0	0	2	35
> PRECIPITATION														
FOG	17	10	1	1	0	0	1	0	0	0	0	0	0	4
RAIN	51	19	3	1	0	1	3	6	1	1	0	0	1	15
SNOW	6	2	1	1	0	0	0	0	0	0	0	0	0	2
> BIRD SIZE														
LARGE	39	2	0	1	0	12	0	0	1	0	0	0	0	23
MEDIUM	248	155	0	0	1	4	0	0	6	1	1	1	0	79
SMALL	330	1	55	34	25	0	16	10	2	8	3	3	4	169
> NUMBER OF BIRDS SEEN														
2-10	104	41	11	5	1	1	3	3	0	1	1	0	1	36
11-100	81	20	9	6	8	1	4	2	0	1	0	0	0	30
1	70	18	4	1	0	0	1	0	0	0	0	1	0	45
100 +	21	4	1	2	8	0	1	0	0	0	0	0	0	5
> NUMBER OF BIRDS STRUCK														
1	472	116	25	21	5	14	9	1	9	2	1	4	3	262
2-10	179	36	25	11	12	3	6	10	1	5	2	1	1	64
11-100	18	0	4	2	9	0	0	0	0	0	0	0	0	3

****

TRANSLATION OF KEYS FROM THE TOP LINE

NE1	:	GULLS	YI	: HIRUNDINIDAE	SWALLOWS
ZX3	:	SPARROWS	ZX202	: PLECTRO. NIVALIS	SNOW BUNTING
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1983 BIRDSTRIKES NO DUPLICATES

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	TOTAL	NE1	YI	ZX3	ZX202	J21	YL001	N6013	K33	N6009	N51	N5111	N6	OTHER
> EFFECT ON FLIGHT														
NONE	459	121	48	23	14	11	13	11	6	8	5	4	2	193
ABORTED TAKE-OFF	26	9	2	0	2	0	2	0	1	0	0	0	0	10
PRECAUTIONARY LANDING	137	22	2	9	2	3	1	0	1	1	0	0	0	96
ENGINE(S) SHUTDOWN	2	0	0	0	0	0	0	0	0	0	0	0	0	2
FORCED LANDING	2	0	0	0	0	0	0	0	0	0	0	0	0	2
PENETRATION OF WINDSHIELD	8	4	0	0	0	0	0	0	0	0	0	0	0	4
VISION OBSCURED	6	1	1	0	0	0	0	0	0	0	0	0	0	4
> AIRCRAFT DAMAGE														
MINOR	73	24	0	0	0	3	0	0	0	0	0	0	0	46
NONE	663	139	55	35	26	15	16	11	10	9	5	5	4	333
> INJURY INDEX														
MINOR	2	0	0	0	0	0	0	0	0	0	0	0	0	2
NONE	541	125	47	29	11	11	12	8	7	8	5	3	3	272
> PILOT WARNED														
NO	369	85	15	19	11	5	9	4	4	1	1	2	1	212
YES	114	21	19	4	6	1	3	0	3	1	0	0	0	56

****

TRANSLATION OF KEYS FROM THE TOP LINE

NE1 :		GULLS	YI :	HIRUNDINIDAE	SWALLOWS
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1983 BIRDSTRIKES NO DUPLICATES

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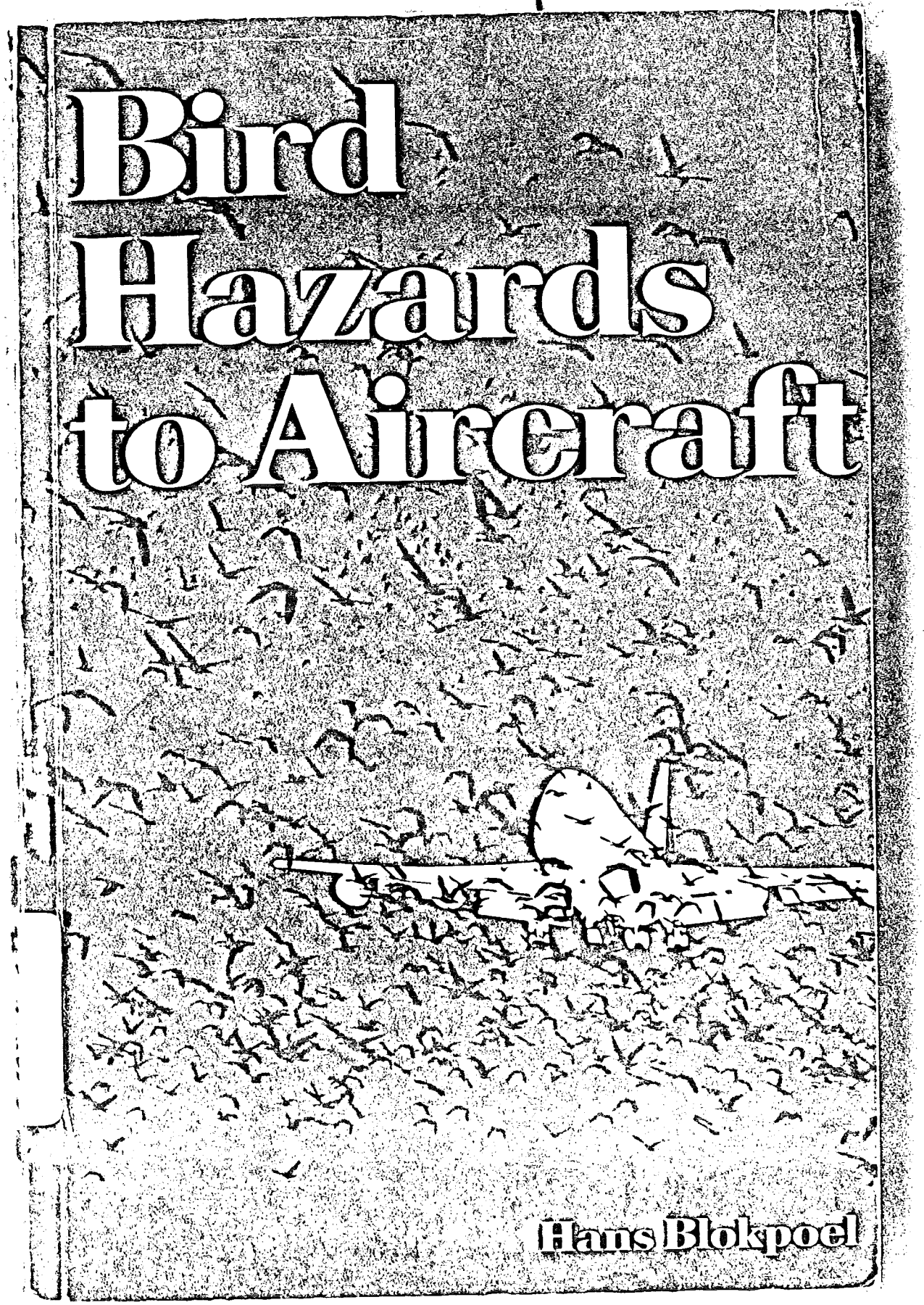
Bird Hazards to Aircraft



Hans Blokpoel

BIRD HAZARDS TO AIRCRAFT

Problems and Prevention of Bird/Aircraft Collisions

H. BLOKPOEL

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AREAS OUTSIDE THE AIRPORT BOUNDARY

This chapter deals with methods to prevent bird strikes at or over airfields, but to get rid of birds at a certain airport it is often necessary to remove an attraction outside the airport boundary. The next chapter describes ways and means of preventing bird strikes that occur away from airports, especially during climb-out and descent. The distinction between these two classes of bird strikes helps to give a clearer picture of the different aspects of the problem. Here, however, it causes some overlap. Gulls loafing on the runway may cause an "at-or-over airport strike," but when flying to a nearby garbage dump they may become involved in an "away-from-airport strike." Thus, closing the garbage dump would probably reduce the incidence of both types of strikes. This section briefly mentions a few garbage-related airport bird problems, and the next chapter deals with bird concentrations and flight routes outside airports.

Some bird attractions near an airport are difficult to remove, but many others can be largely eliminated, or their appeal can be reduced to a minimum. A seashore cannot be relocated, but garbage dumps, sewage outlets, fish plants, fish piers, abattoirs, and pig farms can be relocated or managed so as to attract fewer birds.

As an airport authority has no direct control over matters outside its territory, it is often extremely difficult to implement the recommendations made by experts. Progress is usually slow for a variety of organizational, legal, financial, and political reasons. It is easy for a visiting biologist to recommend that the garbage dump at the end of the main runway should be closed, but it is a different matter for the airport manager to apply that advice.

Although changes in habitat and commercial activities outside the airport require lengthy negotiations, it has been evident that where good proposals have been followed through, significant improvement in the bird situation has resulted.

A case history of a Canadian airport makes this clear. Up to 1960, Lakehead Airport (now Thunder Bay), which is located about three miles from the shore of Lake Superior, had only a minor bird hazard problem, mostly during the autumn migration. In 1960 the city of Fort William closed the municipal garbage incineration plant and opened a sanitary landfill area adjacent to Lakehead Airport property. Immediately, Herring Gulls began to frequent the airfield, and despite intensive efforts during a 2½-year period the gulls could not be driven off the airport. Often as many as 2,000 gulls were seen on airport property. A representation to

the Fort William Council by the Bird Hazard Committee resulted in the decision to discontinue the landfill and to return to the incineration of municipal garbage. As soon as the dump was closed, gull numbers at the airport decreased greatly and the bird hazard was again at an acceptable level (116).

Windsor, Ontario, may serve as an example of how such things should work: when the municipal landfill area was full, the city considered several new sites, one of which was next to the airport. The Bird Hazard Committee, called on for advice, recommended that the site farthest from the airport and close to a river be developed. Despite higher costs associated with this more remote area, the city followed the recommendation and a serious bird problem was prevented. In contrast to these favourable outcomes, some airports in Canada have been unable to arrange the removal of a nearby garbage dump, even after several years of effort.

In other countries also, the practice of dumping garbage has created serious problems. A huge dump of the city of Marseilles in southern France was used by large numbers of Herring Gulls and Black-headed Gulls. Their daily flights, monitored by radar, between the dump and their favourite roosting ponds were a serious concern to nearby military and civil airports (257). Near Sydney Airport, Australia, the closing of one garbage dump, and the change at another to dumping and covering at night, reduced local gull numbers from over 10,000 to less than 2,000 (423).

The problem of gulls, garbage, and airports is probably nowhere more complex than in the San Francisco Bay area in the US, with more than 30 solid-waste disposal sites, 7 major and 13 minor airports, and a wintering gull population of about 140,000. Experiments with marked birds showed that individual gulls were not restricted to a particular dump in the area, but often interchanged. This means that any appreciable reduction of the overall hazard will require regional or at least subregional control of the solid-waste sites (111, 112).

PLANNING OF NEW AIRPORTS

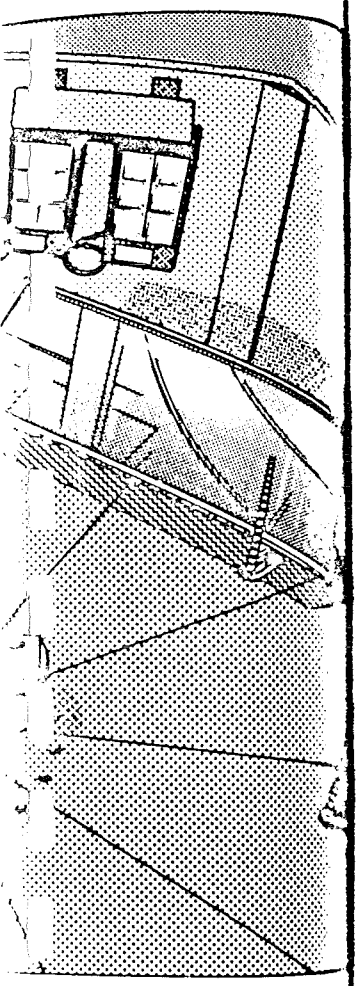
All too often, airports have been built at great cost without any anticipation of bird problems. As an afterthought, strike hazard reduction schemes at disproportionally high cost are reluctantly

CONCLUSIONS

In recent years turbine engines, windshields, and tail structures have been developed that meet current airworthiness requirements. This represents a great reduction in the bird strike hazard. The chances of a disaster resulting directly from the impact of a bird strike on a modern, fully certified aircraft would now seem to be extremely small. Nevertheless, as discussed in Chapter 2, several close calls have occurred even on modern certified aircraft, and further research and development in this area is fully justified. In addition, there may be a need for stricter bird strike requirements for certain components or aircraft types.

There remains also the risk that a bird strike will cause a potentially disastrous accident in an indirect way. These "multiple causation accidents," which often include some misjudgment or error by the pilot, are mentioned in Chapter 2.

Even if bird-proofing efforts are greatly increased, it is not likely there will ever be a completely bird-proof aircraft that will also be able to fly. Thus there is good reason to look into other methods to reduce the bird hazard, while continuing bird-proofing work at the same time. The next chapter describes the search — unsuccessful to date — for an on-board device that would get rid of birds in front of the aircraft.



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ENVIRONMENTAL ASSESSMENT BOARD

IN THE MATTER OF Sections 30 and 33 of the Environmental Protection Act, (R.S.O. 1980, c. 141) as amended;

- and -

IN THE MATTER OF an application by Quinte Sanitation Services Limited for a Provisional Certificate of Approval for the expansion of the current landfill site located on Part of Lots 17 and 18, Concession I, Township of Sidney, County of Hastings, from 101.8 hectares to 109.1 hectares and for the continued use of the current fill area for a period of approximately 2 years;

- and -

IN THE MATTER OF an application by Quinte Sanitation Services Limited for directions in respect of an application for a Provisional Certificate of Approval for the expansion of the current fill area from 12.9 hectares to 30 hectares at the landfill site as expanded located on Part of Lots 17 and 18, Concession I, Township of Sidney, County of Hastings;

- and -

IN THE MATTER OF an application by Quinte Sanitation Services Limited for a Provisional Certificate of Approval for the expansion of the current fill area from 12.9 hectares to 30 hectares at the landfill site as expanded, located on Part of Lots 17 and 18, Concession I, Township of Sidney, County of Hastings.

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HELD at the Centennial Hall, Sidney Municipal Offices, Tucker's Corner, Wallbridge-Loyalist Road, Belleville, Ontario on August 5, 1987.

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VOLUME 15

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BEFORE:

R. Eisen, Q.C. - Chairman

Alan Roy - Member

* * * * *

mode on the way in for landing. Some occur on the ground during the takeoff acceleration period, so the fact that a few occur immediately over the landfill is interesting, but the fact is that a lot of gulls are attracted to the general area of the base by the landfill and if you are a pilot and you are faced with bird damage to your aircraft it doesn't matter whether it is just as you are rotating off the runway or even before that point or are climbing over the landfill or are climbing beyond the landfill. You still have an emergency field width and sometimes you can deal with that emergency effectively and sometimes you can't.

I have to tell you about a couple of incidents in this context. You were shown a slide yesterday by Major Watkins of an aircraft type that was used out of this base, a Convair type aircraft and those aircraft with turbine powered propellor complexes are just as vulnerable to bird strikes as is a Georgette like the 707. The twin engine aircraft to be certified have to be able to maintain flight on one engine. So if you lose an engine you can still keep the airplane in the air if you do everything right and you say the crews are trained to do everything right.

I have to admit, say indeed that is true, but under the stress produced by a bird strike, this is an unusual occurrence, thank goodness it is unusual, people do the wrong thing. I would like to just mention a case of a Convair 580 which is almost the identical aircraft to the ones being flown out of here in a situation -- this is a very brief report and there is a picture of the aircraft afterwards -- this is a Convair 580 passenger service out of Kalamazoo, Michigan with a crew of three and 38 passengers. On takeoff the aircraft hit a sparrow hawk. That sparrow hawk is about a third the size of the ringbilled gulls we are talking about here.

One engine shut down and the pilot who had 5000 hours experience on this type of aircraft should have carried out a routine operation of going straight ahead until he had ample speed to manoeuvre and then circle back and land. There should have been no problem with that. The one catch in the single engine operation on a twin engine aircraft is if you make a turn you have to be sure you are going fast enough to carry out the turn, and you never turn with a dead engine in a position where the wing it is supporting can stall.

Okay? To be brief, this chap turned the wrong way and spun into 300 feet. Fortunately into a ploughed field. The aircraft was very seriously broken up. In fact it was a write-off. The passengers were not killed and the National Transportation Safety Board who investigated the accident said and they used very polite language, the National Transportation Safety determined the probable cause of the accident was the failure of the captain to follow the prescribed engine op procedures which allowed the aircraft to decelerate into a flight regime from which he could not recover.

Now I put that in for two reasons. We haven't said much about the stress and what it may do to the crews' reactions. Indeed I worry as much about crew reaction under stress as I do about the physical damage to the aircraft itself in a bird strike. You know, if you need a few more examples I have got lots of them, but this sort of thing happens and whether we like it or not it has happened in many places. It could happen here. If you want to go into the Lear jet side I will refer you to an incident at one of the smaller airports at Atlanta 10 or 11 years ago of a Lear jet which is comparable to the Falcon aircraft the

Transport Canada
Transports Canada

Airports Authority Group
Groupe de gestion des aéroports

Ottawa, Ontario
K1A 0N8
December 17, 1986

Your file Votre référence

Our file Notre référence

5158-0104-20
(AKPD)

Mr. John Richardson
LGL Limited
22 Fisher Street
P.O. Box 280
King City, Ontario
L0G 1K0

Dear John:

Thank you for your telephone call concerning the location of a new landfill site near Burlington Airport. Transport Canada has no regulatory authority on lands not owned by the Department that are not zoned for the operation of aircraft at or near the airport. For this reason, we cannot regulate the location of landfill sites on lands not controlled by the Department.

We are presently developing a publication to inform communities and those consultants that may be involved in the location or development of landfill sites of the increased hazard to flight safety when these facilities are located near airports. We will provide you with a copy when it is available.

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 would support a site farther from the airport that would not create bird movement in or near aircraft flight paths.

During the selection of a landfill site, the proponent should also consider future growth at the airport. Change in aircraft usage or increased flights can have an impact on flight safety if a landfill is located near an airport. Legal liability and compensation should also be considered if flight safety is impacted by the location of a landfill site.

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I would like to thank you for your interest in flight safety and the location of landfill sites near airports.

Yours Truly,

Paul McDonald
Office of the Chief
Facilities and Environment
Professional and Technical Services