BIRD STRIKES IN GREECE

by Kostas Vassilakis
Hellenic Ornithological Society
53 Emm. Benaki str.
GR-106 81 Athens
GREECE

Summary

This paper presents the results of bird strike statistical analysis for the period 1975-1992 in Greece (number of bird strikes, bird species involved, strike seasons, risk per airport, altitudes, phase of flight, points of strike, influence on the mission). Finally this paper presents the methods coping with the problem in Greece.

Key words: Statistics, Attractants, Risk Assessment, Civil Aviation, Military Aviation, Country, Mishap Investigation

(Key words: Bird strike statistics, Greece)

1. INTRODUCTION

Covering an area of 131,990 Km^2, Greece is a relatively small country which is unique in Europe in that it combines its climate with a large variety and constant alternation of biotopes. This feature in conjunction with its geographical position makes Greece particularly important as regards the abundance and variety of the birds living there. Its position favours the concentration of many migratory birds when these travel over eastern Mediterranean to and from Africa. This paper refer to the consequences of the presence of birds in the Greek space as regards strikes with aircraft.

From 1973 to June 1995, the Greek Air Force (HAF) registered 72 bird strikes, which caused two major accidents leading to the loss of two fighters. The first accident occurred on 27 June 1975 when an eagle hit the canopy of an F-84F aircraft. The second accident occurred on 7 October 1992 when a large bird was sucked by the engine of an M-2000 aircraft. This accident was decisive for the study of accidents caused by birds in the Greek airspace. Bird strikes on Civil Aviation aircraft are much more numerous. According to information provided by the Civil Aviation Authority (CAA), bird strikes registered in our country for all airlines, from 1980 to 1992, were 420.

In Greece, the cost of strikes has not been calculated because no data has been regularly kept. According to the HAF, the replacement cost for an M-2000 is about $25 million, while it is estimated that about 1 jet engine, at a cost of $1.2 million, is lost every year due to the suction of a bird. As regards civil aircraft, it is calculated that the replacement cost for damages caused by birds to Olympic Airways aircraft is $1.4 million only for the period 1989-1990. However, Olympic Airways estimates the indirect cost of the damage to be 10 or 12 times higher, while in case a serious accident occurs, this is estimated to be 25 times higher.

2.METHOD

This paper is based on the elaboration of statistical data (note: only registered strikes in specific data collection forms) collected by the HAF and CAA for a series of years (HAF 1975-1993, 1994-1995 and CAA 1980-1992). This data is elaborated for the first time in this paper.

CAA started collecting detailed information on strikes in 1980 by using a special form, while HAF started collecting detailed data in 1994, when it published a questionnaire entitled "Bird strike form". This form is filled in by crews even when there is no strike but they just encountered birds during the flight. On the basis of this form, 18 strikes were reported which occurred from 1994 to May 1995 and were taken into account in the statistical analysis which follows.

The data used by CAA refers to 420 registered strike cases, which are a significant sample for statistical elaboration. The large difference in the number of strikes between CAA and HAF is due to different corporate data.

From 1975 to 1993, HAF collected data from strike reports which however were not that detailed. The analysis used data from 54 strikes which occurred in that specific time period, as regards the strike altitude, the phase of flight and the strike point.

As regards our analysis, the current problem is that no reports exist for all strikes and when they do, not all data has been filled in. Significant voids are noted in parts of the form referring to bird species and to the damage occurred by the strike.

A map (on a 1/1,000,000 scale) was drawn up showing areas of Greece presenting a high concentration of birds as well as the routes used by birds when they migrate. The selection of the areas was carried out on the basis of information provided by the Hellenic Ornithological Society (Mid Winter Counts), the data presented in older maps drawn up by HAF in 1988 on this purpose and pilot reports.

3.RESULTS

3.1. Bird species involved in strikes

In Greece, no special methods have been used up to now to identify birds (feathers, DNA) after each strike. Most strike reports do not mention bird species, this makes it difficult to draw precise conclusions, which may easily lead to erroneous estimations. Most data comes from CAA which in 25% of the cases refers to bird species as well. Species involved in strikes are among others gulls, swallows, sparrows, doves, owls and hawks.

3.2. Reasons for which birds gather around airports

Birds gathering around airports are the following: gulls, sparrows, doves, falconidae, starlings, turtle-doves, wood-pigeons, cervidae, partridges, geese, storks, ducks, water fowls, owls and lapwings. Data comes from local airport authorities.

Some of the most important reasons for which birds gather around Greek airports are the following:

3.2.1. Rubbish Dumps

Local administrations have recently been developing rubbish dumps according to modern technology and an effort is being made to put them farther than 5 kms from airports. At the same time an effort is being made for a relevant legal regulation. Recently, the problem caused by sewage treatment installations built near airports has been under study.

3.2.2. Water

In some cases there are small pools of water, streams or canals in airport sites. Due to Greek geomorphology, airports are built in deltaic plains, next to wetlands while most of them are near shores or small islands.

3.2.3. Crops inside and around airports

In airport sites, there are wide areas which are intended for the airport's future extension. In many cases these or neighbouring areas are cultivated with cotton, grain, clover, beet, tomatoes, vines, corn, potatoes, watermelons, melons, olive groves and cereals. Regardless of the type of crop, land ploughing brings worms and insects up to the surface, these attract birds and as a result the risk of bird strikes with aircraft is increased. It is notable that civil airports may not be cultivated according to a CAA decision. No crops exist at the airports of Iraklio, Hania and Santorini, as a result no birds are attracted.

3.3. Identification of areas where birds gather at large numbers and migratory routes

These areas are mainly wetlands, particularly coastal, because, due to their special conditions, they attract thousands of birds, mainly waterfowls, waders and gulls. Another large category of areas are the islands which attract birds

gathering at large numbers, mainly different species of gulls. The number of birds in such areas may vary from few hundreds to tenths of thousands.

The map (at a scale of 1/1,000,000) presents sites where birds gather at large numbers and the routes used by birds when migrating (West, central and east route). These main routes are connected to one another by lots of other smaller routes. The thickness of the route lines presented on the map is indicative and does not represent the real front of migration. In the same way, this map does not determine the time of migration. Only the use of radars in the future could provide us with accurate information as regards the precise dates and times at which birds migrate through these routes.

3.4. Strike seasons

The large number of strike reports by the CAA makes it possible for us to examine the distribution of strikes per month. According to these reports, there is an increase of strikes from May to October. This may be due to two main reasons: the first is that there is a significant increase in the number of flights (up to 100%) at this specific time of the year as regards civil aviation aircraft. The second reason is the presence of a large number of birds during this specific period because of spring and autumn migration.

By examining the species involved during the months when strikes increase, one finds out that there is a significant increase of strikes because swallows live in Greece at that specific period and because the increase of strikes noticed in June and July coincides with the period of separation of youngsters which, as regards gulls, have wide dispersion from their colonies.

3.5. Evaluation of the risk of strike per airport

On the basis of data from CAA, the risk of strike was evaluated for specific airports in the country. The evaluation is based on the percentage of the number of strikes that occurred in the period from 1980 to 1992 and of the number of flights for this specific period.

The airport of Chrissoupoli (0.14%) has the highest probability for bird strikes followed by the airports of Preveza (0.109%), Araxos (0.09%) and Corfu (0.06%). The airport of Thessaloniki (0.024%) is on the 9th place while the airport of Athens (0.002%) is on the 20th place as regards risk. This means that the Athens Airport has the lowest strike rate and thus is the country's safest airport.

3.6. Presentation of the results of the statistical analysis

3.6.1. Strike Altitudes

According to HAF (1974-1993), 57.4% of strikes occurred from 0-500', 11.11% from 501-1000', 7.41% from 1001-2000', 9.7% from 2001-3000' and 1.85% from 3000 up. About the same conclusion is drawn from the HAF data for the period from 1994 to 1995. This means that 50% of strikes occurred from 0-500', 22.22% from 501-1000 and 22.22% from 1001-2000'.

CAA data for the period from 1980 to 1992 present a slightly different image as 82.46% of strikes occurred from 0-500', 5.5% from 501-1000', 4.26% from 1001-2500' and 7.77% over 2500'.

3.6.2. Phase of flight

The elaboration of the HAF data from 1974 to 1995 leads to the conclusion that bird strikes with aircraft mainly occur at low altitudes (most of them up to 500'), this is why most strikes occur during take-off, landing or low-level navigation.

The analysis of the data from 1974 to 1993 shows that in 65% of the cases strikes occurred during take-off, landing, T&G and low-level navigation. The remaining 35% of strikes is registered as "various phases".

The introduction of the questionnaire in 1994 made things clearer. Almost all (94%) strikes registered with this method from 1994 to 1995 occurred during low level navigation (72%), take-off (16.67%) and landing (5.56%). It is highly probable that 35% of the "various phases" registered for the period 1974-1993 is due to the fact that pilots did not notice the phase of flight at which the strike occurred or to the fact that this was not put down.

CAA data leads us to exactly the same conclusion. Strikes were registered at almost all phases: take-off run (27.32%), climb (20.24%), approach (32.44%) and landing run (18.75%). Only a very low rate of strikes occurred on-route (0.24%).

3.6.3. Points of Strike

HAF data (1994-1995) shows that 37.5% of strikes hit the engine inlet, 20.8% the radome, 12.5% the nose, 25% the engine and 4.17% the wing. As regards CAA (1990-1992) the radome, the nose, the windshield, and the engine present most strikes while the wing, the fuselage and the landing gear follow in second row.

3.6.4. Influence on the mission

According to the HAF's statistical data (1994-1995), in 50% of the cases the plane returned to the airport, in 5.5% take-off was cancelled and in 11.11% of the cases the aircraft had to land in the nearest airport. In 33% there has been no influence on the mission and in most of the cases crews noticed the fact after the end of the mission. The elaboration of CAA data shows some different results. On civil aviation flights, take-off was cancelled as precautionary landing was ordered in a small number of cases, while for most of the cases (96%) a bird strike with an aircraft had no influence on the flight.

3.7. Methods for coping with the problem in Greece

Greece is still at the first stages of coping with this problem. The management of environment in airports is something that has recently started to become the object of discussions. However, the problem due to the existence of crops and rubbish dumps has been realised and some first steps have been taken. More specifically, CAA has prohibited cultivation in all the airports it supervises and several efforts have been made to remove rubbish dumps which are close to airports.

However, certain bird intimidation and dispersion methods are applied, having different success rates, as described below:

3.7.1. Traditional Scarecrows

These are regular scarecrows used by farmers to frighten birds away from crops. This method has very little results because birds quickly become used to them and do not leave the airport.

3.7.2. Scaring Guns

This method is widely used in all of the country's airports. However, birds become used to it and soon this method brings no result. There is also the risk for birds to fly because of the detonation at an undesirable moment for instance when an aircraft takes off.

3.7.3. Traps

The usefulness of this method for capturing birds at airports is limited to certain species because it is extremely difficult to remove all birds in this manner. This method is more efficient when used against birds of limited number such as doves, owls, hawks and crows. This method has been successfully used at

110 Military Squadron in order to capture hawks in 1981-1984 and 1991-1995, when doves were used as bait in order to capture hawks.

3.7.4. Transmission of Bird Distress Calls

This method has been in application with great success by CAA at the airport of Chrissoupoli since 1989 and shall soon be applied in other civil aviation airports.

3.7.5. Hunting

Hunting is a method for reducing the number of birds, as provided for in HAF Permanent Order 10-1/85 "Measures for the Prevention of Accidents from FOD", by the creation of "bird exterminating squads". This method is of brief time range and does not solve the problem of bird concentration, because even if a certain number of birds is killed, the area continues to be colonised by others. This method should not be encouraged by airport authorities because almost all wild bird species are protected by Community and National legislation.

3.8. Future Research Directions

In the future it will be necessary to pursue co-operation between HAF, CAA, OA and the Hellenic Ornithological Society in order to implement a research programme on bird migration in Greece so that bird flights may be monitored by radar for about 5 years. This will help to put down the precise routes followed by birds when they fly over Greece as well as the altitude, the range and the frequency of migration in specific time periods. Moreover, this research shall offer the possibility for HAF and CAA to make predictions on the flights of birds and to actively participate in the warning system.

A research programme should also be implemented for the management of birds in airports in order to identify the intensity of the problem in each airport (collection of all registered bird strike cases, registering of aircraft types and frequency of movement etc.) and to offer management solutions with the help of experienced ornithologists, taking into account the bird species which cause the problem, their standard behaviour, the ecological conditions of each airport's site as well as the reasons for which birds are attracted to these airports.

Finally, it is necessary to set up in Greece as well a national committee in which it will be necessary to have the participation of delegates from all services dealing with this problem (HAF, CAA, OA, HOS, universities etc.)

4.ACKNOWLEDGEMENTS

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Tomorrow's methods.
The way ahead.

Co-operation for research

National bird strike committee.

Today's methods of prevention

Traditional scarecrows

Scaring guns

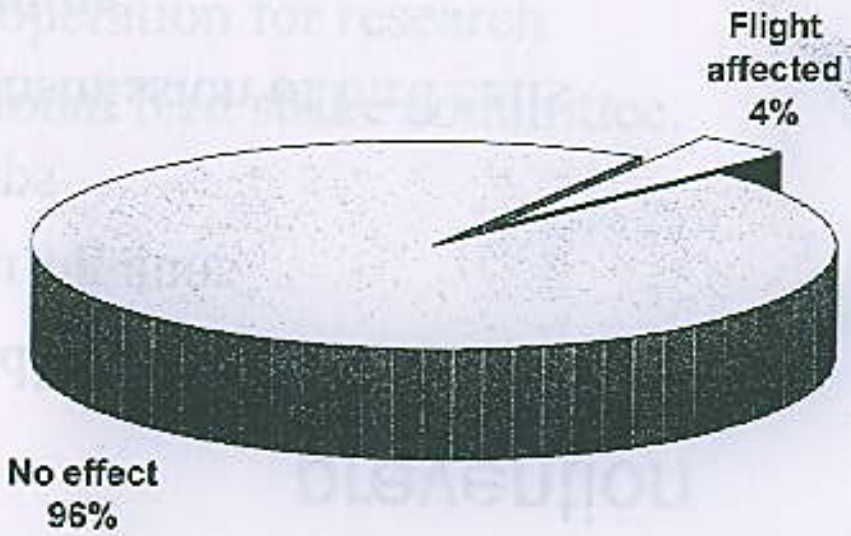
Traps

Transmission of bird calls

Hunting

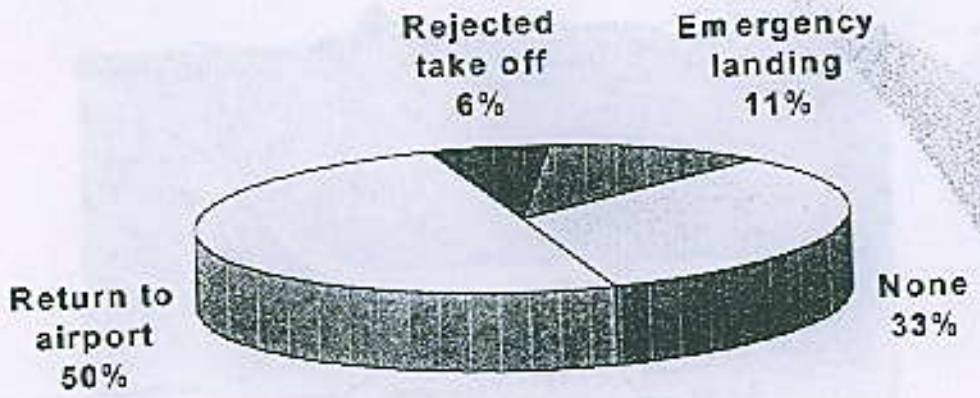
Influence on operation

(Civil 1980-92)



Influence on mission

(HAF 1994-95)

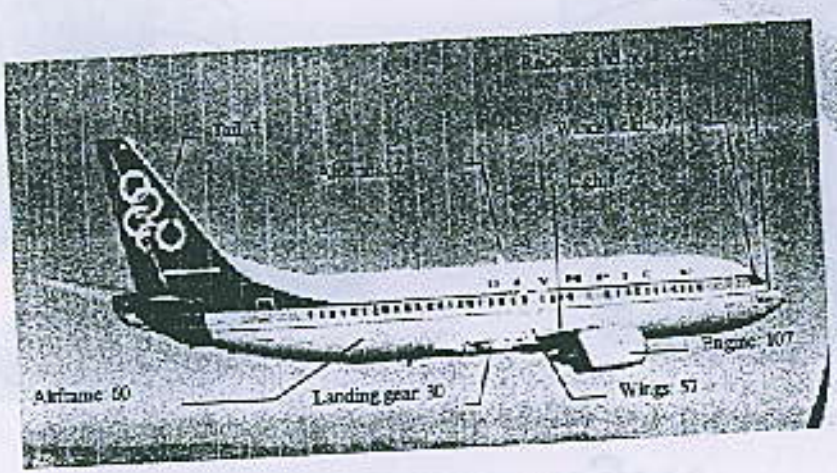


Points of strike

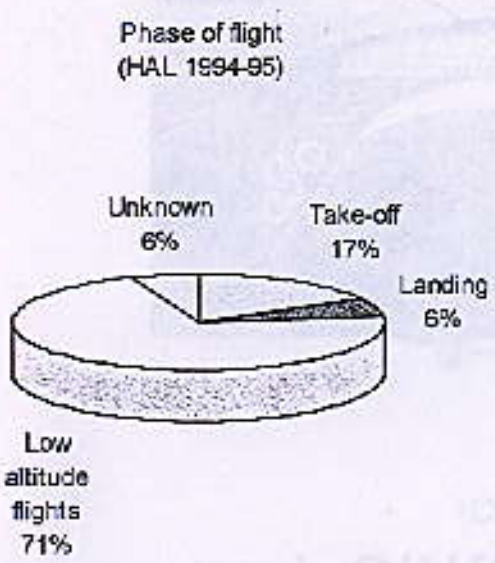
(HAF 1994-95)

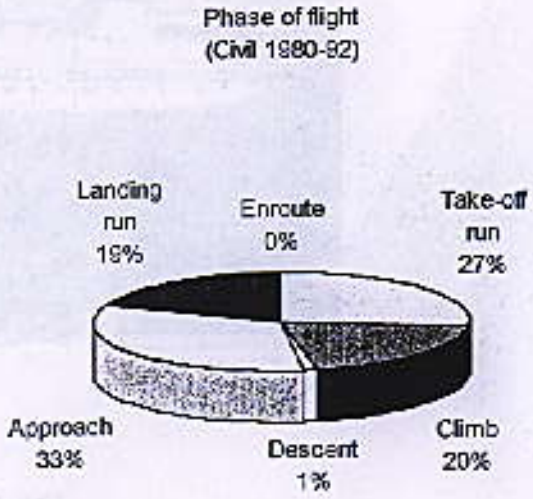
Points of strike

(Civil 1980-92)

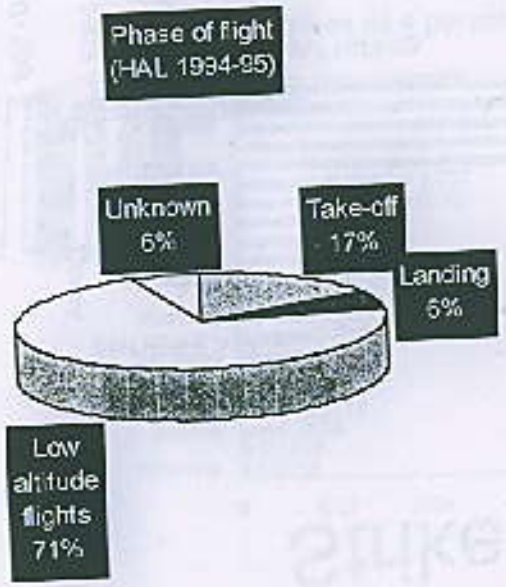


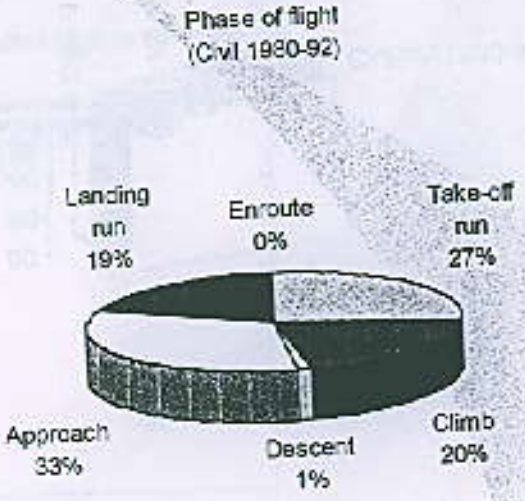
Phase of flight



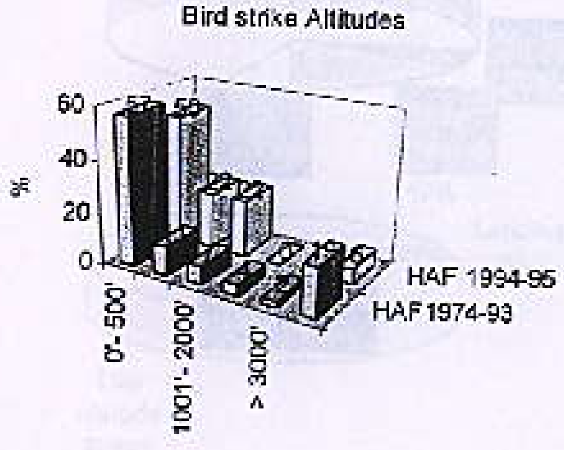


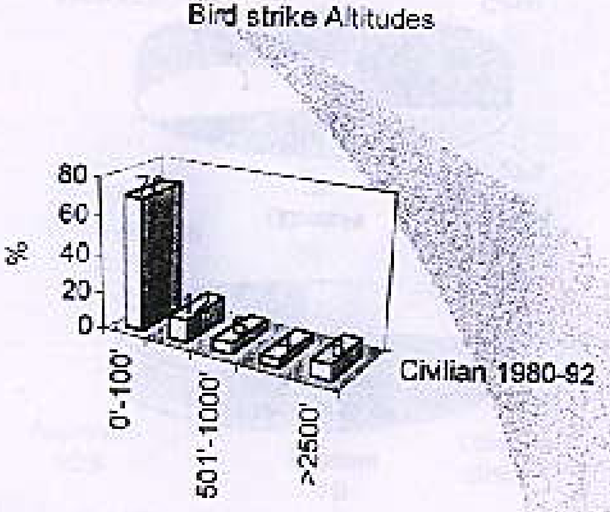
Phase of flight





Strike altitudes





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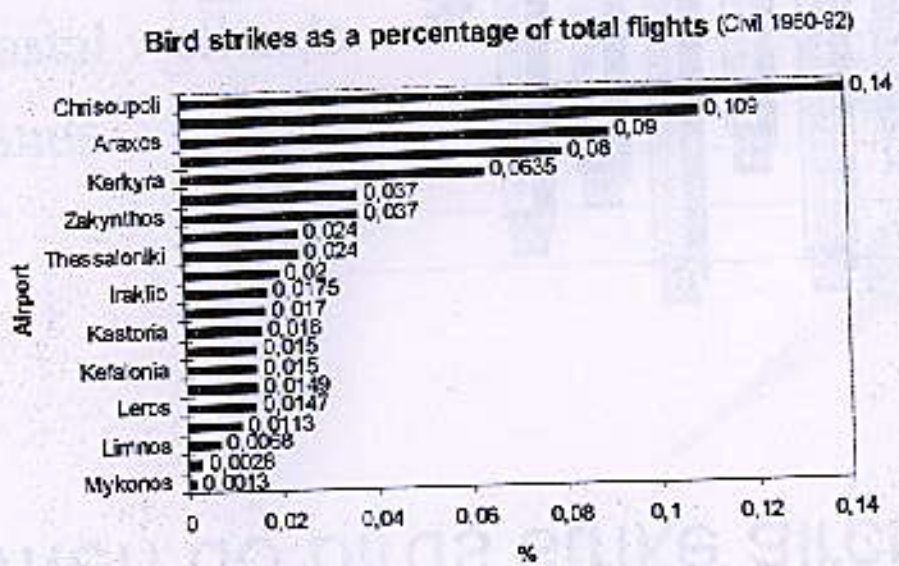
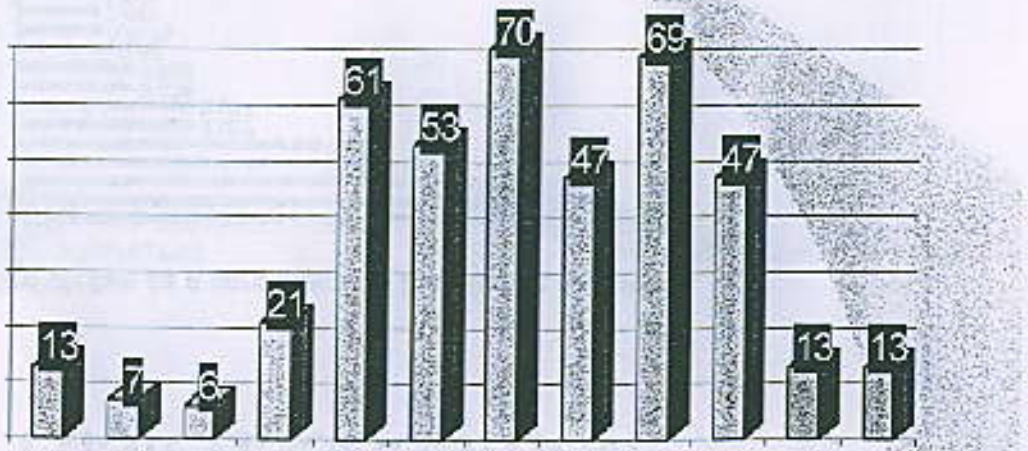


When do birds strike aircraft?



Where do birds gather?

Coastal wetlands

Islands

Where do birds gather?

Coastal wetlands

Islands

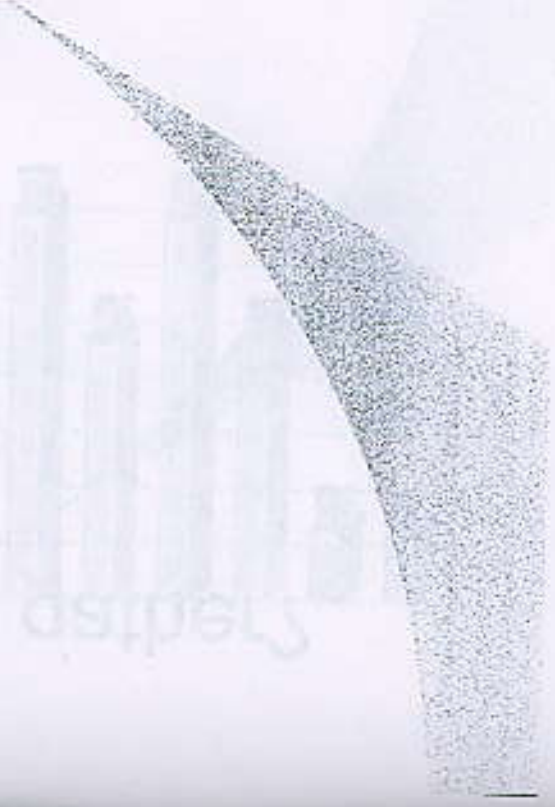
Why do birds gather around airports?

Rubbish disposal areas

Water

Crops

- cotton
- grain
- clover
- cereals



Cost

HAF

M-2000 => $25 million

1 jet engine per year

Olympic Airways

1989-1990 =>$1.4 million

Indirect cost => x 10 - x 12

Accidents => x 25