Present state of bird strike hazards at Spanish Airports. Index

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PRESENT STATE OF BIRD STRIKE HAZARDS AT SPANISH AIRPORTS

INDEX

ABSTRACT

The present state of strike hazards at Spanish airports is analyzed, focussing on the follow aspects : (i) administrative organization, (ii) the gathering of information, (iii) measures adopted on different time and (iv) future trends.

All aspects of strike hazards are dealt with by the Laboratory Services of the Spanish Airports Authority, working closely with the 38 airports and military bases open to civil air traffic. Their information sources are OACI questionnaires, maintenance technician's reports and general data from airport staff. The work of the Laboratory Services is aimed at increasing airport staff awareness of the problem.

The measures aimed reducing strike hazards are separated into three phases: (i) emergency measures, including falconry, detonating cartridges, gas explosions and acoustic alarm signals, (ii) short and medium-term measures aimed at substitutory or optimizing previous emergency measures and finally (iii) long-term measures to be taken in the future are analyzed, distinguishing those to be carried out within airport compounds from those in external areas.

INTRODUCTION

The subject of problems arising from bird strike hazards has been covered extensively. Spanish airports are not at all immune to the problem. The unique characteristics of Spain's landscape have give rise to one of Europe's richest and densest bird nesting grounds, to which a large flow of wintering and migrating birds must be added. This is evidently reflected in the number of birds that cause problems at airports. Measures have been taken to (i) foresee these risks and (ii) reduce them as much as possible.

The work at airports in the Spanish State aimed at reducing strike hazards is coordinated by the Spanish Airports Authority. Its role is to (i) analyse the information received from the different airports and airline companies, (ii) carry out the necessary studies to evaluate the problem correctly, and (iii) specify the necessary measures to reduce the risk, both in planning airport land

use and in installing and operating bird scaring equipment.

This work began with a series of urgency hazard reduction measures, including falconry and loudspeaker systems. These provisional methods are being revised in two ways. Firstly, via formal studies on bird populations causing risks at the most seriosuly affected airports, and secondly, via the improvement and optimal usage of available equipment.

To date of 19 airports with bird problems, 11 have been subject to studies lasting at least one year; 3 others of a similar nature are planned for 1988-89; while the remaining 5 have not commissioned any studies as yet given the lower level of presence and danger of their bird populations.

The present study analyses (i) the structure and function of the bodies responsible for the fight against bird problems at Spanish airports, (ii) the eradication methods used in the past and the present, (iii) the main results obtained from the studies already carried out, and (iv) the short, medium and long-term corrective measures considered necessary.

2.- LABORATORY SERVICES OF THE SPANISH AIRPORTS AUTHORITY

In the administrative organization in the Spanish State, all responsabilities relates to the use and management of any mode of transport are covered by the Ministry of Transport, Tourism and Communication. The airports have an Autonomous Body at the General Management level on the State administrative scale. This body, entitled the Spanish Aiports Authority, includes a Technical Subdirector-general in charge of the LABORATORY SERVICES (L.S.) (Fig. 1).

Among the responsibilities and activities of the Laboratory Services are : (i) the evaluation of airfields with respect to the state of their surface and pavement strength, (ii) the analysis of lighting, electrical equipment, etc., and (iii) the evaluation and control of noise, atmospheric pollution, and in general any disruption of the environment in and around airports.

This last group of activities are divided into two units composed of different teams of specialists. One, the Acoustics and Vibrations Unit responsible for disruptions produced by aircraft noise, and acoustic equipment at air terminals. The other, the Pollution and Ecosystems Unit, is responsible for the prediction and measurement of atmospheric pollution, water treatment and analysis, the preparation of guidelines for the definition of airport ecosystem uses, the study and observation of bird populations and means of reducing strike hazards. It is important to stress that the Laboratory Services work closely with the 38 airports and military bases that are open to civilian air traffic in Spain, either through the Technical Subdirector-general or with each one directly.

3. THE STUDY OF STRIKE HAZARDS

It was decided that the L.S. should coordinate decisions related to bird collisions at airports in order to make better use of its experience and information. This information comes from three sources :

- The OACI questionnaires. These should be filled out by pilots each time an incident occurs, whether or not there is a collision. They should then be submitted to the L.S. for analysis and to permit a wider knowledge of the potential danger.

  In reality, very few pilots comply with this reccomendation, and only return the questionaires when material damage or a serious in-flight incident occurs. These files used to be sent to the Civil Aviation General Management where a commission analysed all the circumstances and responsibilities derived from any accident. Until very recently, the reports were dealt with and filed away here, but recently a dialogue and information exchange has begun between this body and the L.S.

- Reports by Maintenance Technicians. If bird remains are found during motor revision, the airline must be informed of the damage. These reports are occasionally passed on to the relevant section of the L.S. Their common denominator is a lack of data on the species responsibles for the damage.

- Information collected at airports. Either air traffic controllers or other airport staff such as firemen note the details of any incident observed and pass them on to the L.S. This source has the advantage of being the only one taking a direct route to those responsible for bird studies. It is also, however the source which includes the least detail on each incident.

  In 1987 a coordinator was appointed at each airport for the study and eradication of its bird problem.

  The main role of the L.S. is therefore the improvement of the data collection process by increasing staff awareness.

4.- PROGRESS OF BIRD STUDIES AND STRIKE HAZARD REDUCTION MEASURES

The overall process may be divided into the following phases :

- Initial awareness of the existence of the problem
- Emergency corrective measures
- Studies on bird populations at airports, slightly out of step chronologically with the former phase.
- Having obtained the results from these studies, some of the emergency measures have been rejected, while others have been seen to be thoroughly reccommendable, with slight modifications in some cases. It has been possible to plan short, medium and long-term measures in order to minimize the effect of the problem.

5.- INITIAL EMERGENCY CORRECTIVE MEASURES

The main emergency measures taken were :

- Falconry. One of the first methods used. Based on the hunting ability of Falcons and other birds of prey, and the aversion of certain species of birds to their mere presence.

  Their use has proved particulary effective in the control of steppeland

birds such as the Little Bustard and some waders such as the Stone Curlew, and the Golden Plover. Satisfactory results, however, are only obtained when expert handlers are employed. It should also be stressed that the falcons used should be limited to individuals guaranteed to be birds raised in captivity.

To date, this technique has been used at three civilian airports (Table I) and two Spanish military bases. Results show it to be a generally effective method. Its continued use in the future is foreseen.

- Shotgun hunting. This may have been the first method used in chronological order, however positive results were never obtained. At present, the Spanish Hunting Law prohibits the use of firearms around inhabited areas, including airports. Its use may only be considered as a localized, restricted measure, in combination with other techniques. The state of conservation of the target species must also be considered.

- Gas cannon detonations. This equipment is in use at three Spanish airports (Table 1). It is highly effective initially after its installation, but becomes less so with time as the birds become accustomed to the noise.

To avoid this loss of efficiency, the detonators may be set to explode at random. This does imply, however, a risk to staff crossing the runways due to the unpredictable and dangerous streams of hot air emanating from the cannon.

- Loudspeaker systems with alarm signals. The first equipment used at Spanish airports was portable and was installed on vehicles which moved to the sites where birds gathered. Use and experience with this equipment at nine ariports (Table 1) suggests that maximum effectiveness is obtained by minimizing problems derived from :

  - Low acoustic quality of recordings. This may seriously detract from the transmitted message.

  - Scarcity of recordings of different species. The airport studies are

helping to overcome this problem by specifying the most numerous species.

Birds becoming accustomed to the recordings. This is notable, but may be avoided by restricting the use of the equipment, increasing the duration of the recordings, and changing them periodically.

The installation of new equipment has continued now that technical problems such as energy sources, currently solar panels, have been solved. The equipment is now fixed (Table 1) and sends out two types of signals :

- Alarm cries, ideal for immediate action on birds, bearing the previous reservations in mind.

- Electronic noise, which irritates birds due to its frequency and aids longer term eradication plans.

6.- BIRD POPULATION STUDIES

Both the planning of corrective measures to avoid bird collisions and the evaluation of the results, ought to be preceded by in depth studies on bird communities in airport compounds. This step was begun by the Laboratory Services of the Spanish Airports Authority after the first emergency measures were adopted.

As a first step, the 38 airports and military bases were catalogued according to the types of complaints received from pilots, maintenance staff and airport managers. In all, 19 were considered to have some type of problem, and these were classified according to their type of risk. In order to decide which airports should receive preferential treatment in the analysis of their problems, the level of danger at each one was considered alongside the desire for an overall view of the problems affecting each biogographical region, composed of 7 airports in the Cantabria-Galicia region, 14 airports in the Mediterranean region, including Melilla and the Baleares Islands, 7 airports in the Canary Islands region, and 10 airports in the Inland region.

This initial classification, based on purely biogeographical data, has since been confirmed in the analysis of the study results. It permits the prediction of the overall problems at the airports that were not analysed.

To date, 10 airports have been studied, another is currently underway and 3 are planned for 1988 and 1989 (Table 1). The 5 remaining airports are not considered to have particulary serious problems and at present their analysis is not planned.

The results obtained from the studies are set out in a general form below.

a) Species

The main species affecting air traffic at Spanish airports have been identified, along with their phenology, preferred habitats and behaviour at airports. The may be divided into the following groups:

- Wintering species, the largest group. They arrive in massive numbers when a cold spell hits Central Europe. Those which stand out are the Black-headed Gull (**Larus ridibundus**), the Black-backed Gull (L. fuscus), the Lapwing (**Vanellus vanellus**), the Golden Plover (**Pluvalis apricaria**), and the Starling (**Sturnus vulgaris**).

- Resident species, including many types of birds, some of which receive new contingents from Europe in winter. They include the Herring Gull (**L. argentatus**), the Stone Curlew (**Burhinus oedicnemus**), the Little Bustard (**Otis tetrax**), the Red-legged Partridge (**Alectoris rufa**), the Cattle Egret (**Bubulcus ibis**), and the Mallard (**Anas platyrhinchos**). The Domestic Pigeon (**Columba livia fª domestica**) is an individual species belonging to this group although its distribution is affected by its dependence on man.

b) Airport ecosystems

Birds are attracted to airports for varying reasons, and the understanding

of these aids bird eradictaion measures. Observations have shown that pasture and croplands within airport compounds are two main gathering points. Birds do not tend to gather in dangerous numbers in scrubland, however. Wetlands and woodlands are overrun at times by large numbers of dangerous birds, such as the cases of Starling roosts in Barcelona and Menorca, while in other cases their influence is minimal, as in the case of the lagoon at Santander Airport.

c) External areas

Some external areas directly affect the presence, flows, timing and behaviour of birds within airport compounds. Some nearby wetlands, for example, distract birds away from airports and may thus be considered to have a positive influence. Areas with a negative influence encourage the presence of birds by offering them feeding zones such as rubbish dumps and fish driers, from where many birds fly to a nearby airport to rest. Efforts will be made to eliminate or move these negative areas away in order to reduce the strike hazard.

d) Periods or Seasons

As mentioned above, the majority of the birds at our airports are wintering species. The strike hazard is thus highest during these months. At some airports large flocks of gulls are also seen in summer, as with the Herring Gull at Ibiza Airport. This occurs after the reproduction period in cases where the airport is near a breeding ground. Other airports suffer from being on the path of one of the main migratory routes that cross Spain in autumn and spring.

7.- SHORT-TERM CORRECTIVE MEASURES

These include some emergency measures already in use, such as falconry, which have proven to be effective. Other techniques will be extended to improve their effectiveness, as with new loudspeaker equipment. Their installation will assure maximum effectiveness when added to the equipment already in use using the precise information now available on bird gathering

points.

It is expected to coordinate the use of alarm cries from control towers. When planning action with this equipment, especially when using electronic noise, longer-term effectiveness ought to be born in mind.

Detonating cartridge launchers are another technique used for immediate effect in special situations, they have been supplied to the 19 problem airports (Table 1) for use in order to scatter flocks resting on runways or to detour bird flows away from them. Continual use may influence the routes of some species and force them to leave the airport, when used in combination with other techiques such as falconry, electronic noise etc.

8.- MEDIUM-TERM CORRECTIVE MEASURES

The main activity, already begun at some airports, is the modification of their ecosystems. Those posing the greatest danger are :

Crops. The first steps are the substitution of attractive plants, cereals, sunflowers, etc, with others that do not attract so many birds such as cotton or tobacco. Work on the soil should be carried out at night to permit the uncovered invertebrates to hide before the arrival of birds.

Pastures. Worms and snails here attract large numbers of waders and gulls. When the grass is cropped, pastures are used as resting places, while grass more than 20 cm tall is used by rodents which in turn attract certain birds of prey. This latter problem is not as serious as the former, but pastures should be substituted in any case by scrub.

Wetlands. These ought to be restricted or eliminated when their influence is seen to be negative. At Barcelona Airport, for example the duck and starling problem would be solved by this measure, while it would have no effect on safety at Santander Airport.

These land uses affect airports differently in each of the four regions. Flood-prone pastures are quite common in the Galicia-Cantabria region,

and many waders are thus present. Pastures, with waders and gulls, and croplands, are common at Mediterranean airports, while the latter landscapes are the most common inland. Sufficient data is not availabe as yet on the influence of airport ecosystems in the Canary Islands given that the problems noted to date have all been due to external areas.

9.- FORESEEN LONG-TERM MEASURES

This section includes direct action on troublesome external areas detected in the studies, as well as planning measures for the use of eradication equipment.

The main problems that must be dealt with urgency are :

a) The heavy pressure of hunters on areas around airports. These zones should be restricted to encourage birds to roost further away from airport boundaries.

b) Rubbish dumps and other feeding points. This subject has been dealt with by several writers. The aim is to avoid birds gathering at one site near an airport, or to avoid their having to fly over any runways in order to reach their feeding ground. There should be areas near rubbish dumps that are attractive as resting points and thus distract the birds' attention away from airports altogether.

   Other food sources such as fish driers and crops should be dealt with in the same way. Evidently the latter problem cannot be eliminated, but the type of crop and the timing of farm work may be altered.

c) Dovecots have also been frequently mentioned in studies on strike hazards. Domestic Pigeons move from their dovecots to wastelands, crops and pastures at airports in search of food and thus become a nuisance. The solution is simple, but often difficult : all such instalations should be eliminated.

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d) Along with the elimination of hunting pressure, measure a), external areas should be promoted which, due to their location and type, are capable of absorbing bird populations currently within airport compounds. The majority of species affecting Spanish airports have aquatic habits. Wetlands must therefore be encouraged or created specifically for the purpose, and those with any importance must be protected. These measures should be the result of collaboration between several branches of the Spanish government. A certain amount of time will thus be neccesary for the first results to appear.

e) The last and perhaps the most controversial measure from a conservation point of view is the direct population control of some of the most dangerous species. To a large degree, the negative influence of man has led many species to prosper in recent years to the point where they pose a problem for other species and many human interests. The best-known cases are seagulls, the Herring Gull and the Black-headed Gull in this case, which have an extremely negative influence on airports and prey on or displace other birds from their breeding grounds.

10.- CONCLUSIONS AND SUMMARY

It is undoubtedly necessary to define the problems clearly, analyse their causes and propose practical solutions. These three stages have been or are being covered by the Spanish Airports Authority and its Laboratory Services, in order to eliminate the strike hazard at each of Spain's airports.

a) Understanding of the problems is improving due to the collaboration of other bodies involved in data collection. Greater awareness on the part of pilots, ground staff and airport management will encourage their participation in this project and increase the flow of information to the Laboratory Services.

b) The problem source analysis is at an advanced stage as the study of the majority of airports with bird problems is almost complete. These studies should be revised periodically to permit a close watch on the evolution of bird populations at each airport and the effects of eradication measures

put into practice. There must be specialized staff at each airport, or at least at those with bird problems, whose job it is to collect data, analyze it and pass it on to the Pollution and Ecosystems Unit of the Laboratory Services. This phase has already begun with the designation of a staff member at each airport who is responsible for bird problems.

c) Solutions are to be applied in three phases, short, medium and long-term, in accordance with their location :

Measures to be taken within airport compounds

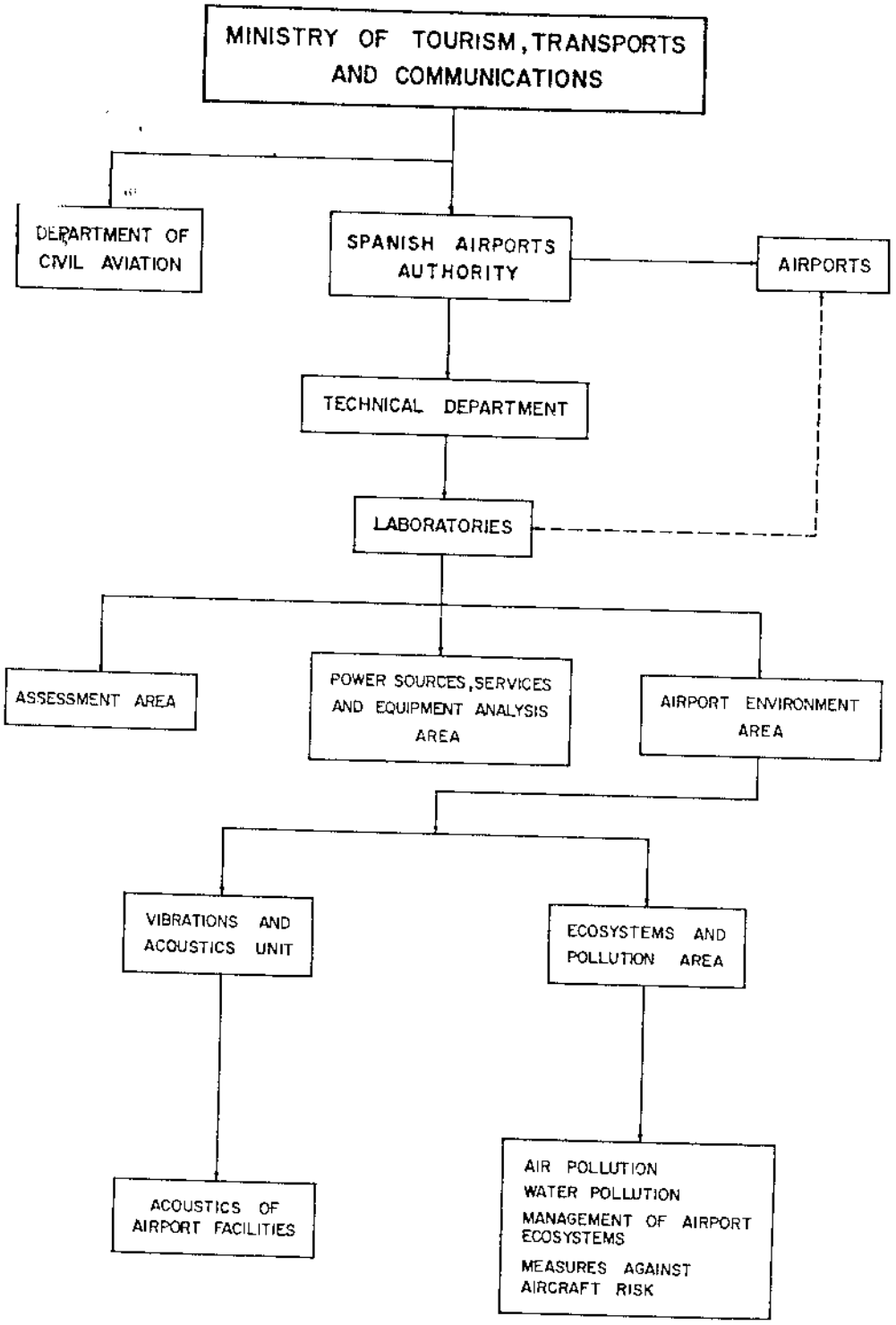
1) Falconry (short term)
2) Loudspeaker systems with alarm cries and electronic noise (short-term)
3) Modification of airport ecosystems, especially crops, pastures and some wetlands (medium-term).
4) Direct pressure on flocks and birds flows to push them away from airports (short and medium-term).

Long-term measures to be taken outside airport compounds

1) Supression of hunting pressure
2) Elimination of rubish dumps and other large sources of food for birds.
3) Elimination of dovecots
4) Protection or creation of external areas, preferrably wetlands, that serve as bird refuges.
5) Population control of some particularly abundant and dangerous species.

All of these measures will be coordinated by a member of each airport's staff who will evaluate the results and propose further solutions according to the specific situations observed.

FIG. 1


MINISTRY OF TOURISM, TRANSPORTS AND COMMUNICATIONS
DEPARTMENT OF CIVIL AVIATION
SPANISH AIRPORTS AUTHORITY
AIRPORTS
TECHNICAL DEPARTMENT
LABORATORIES
ASSESSMENT AREA
POWER SOURCES, SERVICES AND EQUIPMENT ANALYSIS AREA
AIRPORT ENVIRONMENT AREA
VIBRATIONS AND ACOUSTICS UNIT
ECOSYSTEMS AND POLLUTION AREA
ACOUSTICS OF AIRPORT FACILITIES
AIR POLLUTION
WATER POLLUTION
MANAGEMENT OF AIRPORT ECOSYSTEMS
MEASURES AGAINST AIRCRAFT RISK

MITIGATION MEASURES (EQUIPMENT QUANTITY) / AIRPORTS WITH PROBLEMS	FALCONRY	GAS CANNON DETONATIONS	PORTABLE LOUDSPEAKERS (ALARM CRIES)	FIXED LOUDSPEAKERS (ALARM CRIES)	FIXED LOUDSPEAKERS (ELECTRONIC NOISE)	DETONATING CARTRIDGES	BIRD STUDIES
VIGO		1	1			2	X
ASTURIAS						1	X(1)
SANTANDER			1			1	X
BILBAO						1	X
SAN SEBASTIAN						2	X(1)
VITORIA						2	X(1)
MADRID-BARAJAS	X					1	X(1)
SEVILLA	X		1			2	X
GRANADA	X		1			1	
BARCELONA		4	2	8	16	2	X
MENORCA		1	1		8	1	X
PALMA DE MALLORCA			2	8	16	2	X
IBIZA			1	4	4	1	X
ALMERIA						1	
MALAGA			1			1	X
LANZAROTE						1	
LA PALMA						1	
TENERIFE-NORTE						2	
TENERIFE-SUR				3	8	1	

(1) In progress or planned

TABLE 1. BIRD ERADICATION MEASURES AT SPANISH AIRPORTS