

**BIRD STRIKE HAZARDS AS A FACTOR IN THE SITE SELECTION  
PROCESS AND PLANNING FOR THE FUTURE NEW LISBON AIRPORT**

**S.Pessoa<sup>1</sup>, C. Sequeira<sup>1</sup> & H.Blokpoel<sup>2</sup>**

<sup>1</sup> NAER, Av. Sidónio Pais 8 - 5<sup>o</sup>, 1050 - 214 Lisboa, Portugal  
Email: geral@naer-novoaeroporto.pt

<sup>2</sup> LARUS INTERNATIONAL, 1115 Cromwell Drive, Ottawa, ON,  
Canada, K1V 6K3

**Abstract**

The New Lisbon Airport site selection process was started in 1969. By 1998, 12 of the 14 original candidate sites had been rejected. The two remaining locations were Ota, NNE of Lisbon and N of the Tagus River and Rio Frio, SE of Lisbon and close to the estuaries of the Tagus and Sado Rivers (both natural reserves, one with Special Protection Zone status).

NAER (Novo Aeroporto S.A., created in 1998 to conduct the new airport development process) set up a multi-criteria analysis of the 2 sites, to assess the technical, aeronautical, socio-economic, financial and environmental factors.

Bird studies (carried out within the framework of the environmental studies and including fieldwork during May-October 1998) concluded that Rio Frio is close to bird migration routes and thus affected by a high level of migratory movements. An airport in Rio Frio would in all likelihood, be exposed to bird strike hazards against which no mitigation measures are, as yet, available.

In another study, a mathematical model was developed to compare expected risks at the two locations. Despite its shortcomings, the model concluded that, at Rio Frio the risk would be moderate to high, whereas in Ota it would be low to moderate. The study also concluded that Rio Frio would always be affected by a high level of water bird traffic moving between the two nearby estuaries.

NAER hired the third author, via ICAO, to review these reports and he concluded that, despite a lack of adequate data, the Ota location was preferable since a larger number of migratory and local flights of high - risk bird species can be expected in Rio Frio. When the environmental studies concluded that the Rio Frio option was "not sustainable" from an

environmental point of view, the Portuguese Government decided to exclude it and, thus, approved the Ota location.

It was subsequently also decided to carry out in-depth bird studies and NAER hired the third author, again via ICAO, to advise on the terms of reference for those studies.

**Key Words:** Environmental, Local movements, Mathematical model, Migration, Plans, Risk assessment, Siting, Wetlands.

## 1. Introduction

The present Lisbon airport is situated in Portela de Sacavém and has been in operation since 1942. The total area of the airport is relatively small, less than 500 ha, and its development is very constrained, as the airport is completely surrounded by Lisbon's urban area.

Since the beginning of the 1970's the limitations of the airport's current location have been obvious and therefore the process of finding an alternative site for a new airport was initiated at that time. Fourteen possible alternatives have been studied, all within 50 km from the centre of the city. By 1997 after various studies the number of viable alternatives was reduced to two specific sites - Ota and Rio Frio.

In 1997 the selection process was re-initiated with the objective of reaching a final conclusion. Preventive restraints were established with regard to the land use at both potential sites in anticipation of their possible future development, and a working group was set up for the preparation of a new state owned company, with the responsibility for the execution of the necessary final studies.

The company, NAER,SA was created in 1998, with 90% of equity held by ANA, SA, the incumbent company responsible for the management of national airports. The remaining 10% of the share capital are directly held by the Portuguese Government. NAER, SA is responsible for structuring a public-private partnership to develop the new airport under a concession contract to be linked with the privatisation of ANA, SA.

In 1997 a consultant was contracted to assist NAER, SA in the selection of the final airport location. For this purpose air traffic projection were reviewed,

aerial and land accesses of both potential sites were analysed, a preliminary layout was proposed and several technical and economic studies were made.

At the same time a study was launched to identify the environmental issues affecting both sites. An Environmental Impact Evaluation Commission (CAIA), a body of technical officials appointed by the Ministry of the Environment, followed the development of the studies and concluded about the main impacts.

The selection process was based on a multi-criteria analysis, including the environmental, aeronautical, technical, economic and social points of view.

The final capacity of the existing airport has been estimated as 12 million passengers/annum. This assessment along with projections concerning the evolution of air traffic led to the conclusion that the new airport should be fully operational by 2010.

## **2. Site characteristics**

Ota is situated north of the Tejo River, 45 km from Lisboa. It lies in a valley surrounded to the north and east by two small rivers. To the west, lie low limestone hills and economically important quarry sites.

The area is now partly occupied by an air base, which has been out of use since 1992 although a training function still remains in active operation. The remaining area is devoted to agricultural use with some of the area occupied by forestry.

In this location a single runway orientation (01/19) was considered.

Rio Frio is situated to the south of the Tejo River, 42 km. The Tejo Estuary is a Special Protection Zone under the European Directive for Wild Birds.

The area lies on a plain and is bordered by two irrigation dams, as well as a large area of Cork Oak woodland, a species that is subject to protection policies in Portugal.

Two runway orientations were considered, 17/35 and 08/26.

## **3. Studies development**

The Preliminary Environmental Impact Studies carried out for both Ota and Rio Frio were organised in a similar form to the Environmental Impact Studies as defined by the European Directive. They covered a wide range of environmental components and were carried out by academic specialists from Portuguese Universities. There was also a procedure of public consultation co-ordinated by the Ministry of Environment.

Within the environmental studies particular attention was focused on birds, due to the proximity of the nature reserves. The fieldwork at both sites was carried out during May-October 1998. For terrestrial birds the Transect-Time Method was used and for arboreal species the Point Count Method.

The study stressed that the Rio Frio location was close to migratory bird routes and that the measures to address bird strikes problems would conflict with the management of bird sanctuaries in the adjacent natural reserves. The Rio Frio site for an airport between the two estuaries, in an area with large bird populations would lead to a high level of bird strikes with little or no way to minimise such risk. In respect to Ota the risks were much smaller.

An evaluation supported by a simplified mathematical model was also attempted, based in the potential of different land uses in the proximity of the airport for bird generation. Despite the simplifications in the model, in which the local and migratory bird movements were not considered, it concluded that at Rio Frio the bird strike risks would be higher than at Ota.

In order to clarify this question NAER, SA hired the third author via ICAO. To achieve this task the consultant reviewed the above mentioned reports and analysed existing data about bird/aircraft collisions in the Lisbon region. The official's related to the data concerned were also contacted and field trips were made to each of the two potential locations.

Despite lacks of information, the consultant concludes that from the point of view of bird strike prevention, Ota location was a more suitable location. He also recommended further studies in order to lead to a more detailed understanding of the whole situation pertaining to local bird flights at the selected location. It was also recommended that a programme for bird control should be developed before the airport becomes operational, and the creation of a National Bird Strike Committee.

In a second mission the consultant completed these recommendations and proposed terms of reference for several studies forward mentioned.

#### **4. Location decision**

The final reports of the environmental preliminary studies were evaluated by the above mentioned commission (CAIA) using five key criteria, one being bird strike risk. The CAIA concluded that the location of Rio Frio was unsustainable from an environmental perspective. The Portuguese Government accepting this advice subsequently excluded Rio Frio, leaving Ota as the location for the new airport.

## **5. Further studies**

Detailed bird studies being identified as necessary, NAER, SA asked the third author again via the ICAO, to provide assistance with the drafting of the terms of reference for those studies.

### **5.1. Local Bird Movements in Ota**

The goal of this study is to detect and describe local bird's movements across the area of the future airport and to find out reasons for those movements. As no information about local movements is known in Ota area it will be necessary to observe the birds on a weekly basis from daybreak to sundown throughout the period of one year. Fixed observation points will be selected from which it is possible to observe all bird movements crossing the area.

The data relative to the field study will be analysed in order to determine the patterns of local flights, establishing origins and destinations of such flights and identifying points of attraction that can be eliminated. The study of the local nocturnal movements will be carried out following the observations of diurnal movements.

### **5.2. Migratory Movements of Birds in the Ota area**

From safety point of view the concerns about bird migration pertains to high-hazard species that migrate across the runways and their approaches. Facing the lack of information it is necessary to learn more about those migrations and carry out observations about the routes, periods and characteristics of the daily and seasonal bird flights during spring and autumn seasons.

### **5.3. Other Environmental Studies**

#### Biological Inventory in the new airport area

The aim of this study is to determine the conservation value of the area for natural fauna, e.g. avifauna. The studies and surveys will be made during a typical year and the conservation value must be determined before the beginning of construction activity. This inventory will consist of an evaluation of the diversity, abundance and distribution of species present in the area. After the initial period of operation a new inventory must be carried out including a programme of bird control, followed by a new evaluation of conservation value. The changes in conservation values may then be used on planning and implementation of compensation/mitigation measures.

#### Inventory of non-compatible land uses in the vicinity of the future airport

Completing the local survey, the aim of this inventory is the identification of activities in the vicinity of the airport susceptible in attracting birds and the determination of measures required eliminating, or at least, reducing such problems.

As result of this study, elimination of habitats surrounding the airport because of their attractiveness for birds maybe necessary. If there are significant losses, compensation /mitigation measures will be considered.

## 6. Conclusions

The decision process followed to determine the site of the new airport started at the end of the 1960s and culminated in 1999 with the decision to locate the airport in Ota.

This process involved various criteria, one of them being the impacts on the local and regional environment.

Included in these were the risks of bird strikes with aircraft, given the proximity of the potential sites of important areas for breeding, feeding and resting of birds. This issue was part of the determining factors that led to Rio Frio being excluded as a final option.

Even after the decision has been taken it will still be necessary to continue the study of birds in the new airport area, in order to improve knowledge of bird species, local and migratory movements and also enable effective management and control of habitats.

## 7. References

- ADP/ PRET, 1999. Novo Aeroporto Internacional. Relatório para a preparação de uma proposta de escolha do local. Agosto de 1999.
- Blokpoel, H. 1999. Mission Report on evaluation of potential bird strikes at two candidate locations for New Lisbon Airport. ICAO Report POR/ 99/901.
- Blokpoel, H. 1999. Mission Report on drafting terms of reference for bird studies in relation to the new Lisbon airport at Ota. ICAO Project POR/ 99/901
- CAIA. 1999. Plano do Novo Aeroporto de Lisboa. Parecer Técnico da Comissão de Avaliação. DGA/INAG/ICN/IPAMB/DRA LVT/CCR LVT. Lisboa, Maio 1999.
- DCEA/FCT/UNL. Estudo Preliminar de Impacte Ambiental. Novo Aeroporto de Lisboa. OTA.1999.
- DCEA/FCT/Universidade Nova de Lisboa. Estudo Preliminar de Impacte Ambiental. Novo Aeroporto de Lisboa. Rio Frio.1999.
- Gomes, L., 1998. Biota Terrestre.Ota e Rio Frio. Estudo Preliminar de Impacte Novembro e Dezembro de 1998.
- NAER. 1999. Opções para o desenvolvimento do aeroporto na Ota. Relatório de Progresso. Outubro 1999.
- Paiva, M.R., 1998. Análise de factores de risco condicionado de colisão de aeronaves com aves para a localização do NAL em Rio Frio e Ota.

Versão de Novembro de 1998. GUECKO/DCEA, Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa.

Scott Wilson Kirkpatrick, 1994. Estudos Comparativos do Novo Aeroporto de Lisboa. Aspectos Ambientais e Sociais. Relatório Final. Setembro de 1994.