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A NOISE STUDY ON THE NEW LISBON AIRPORT

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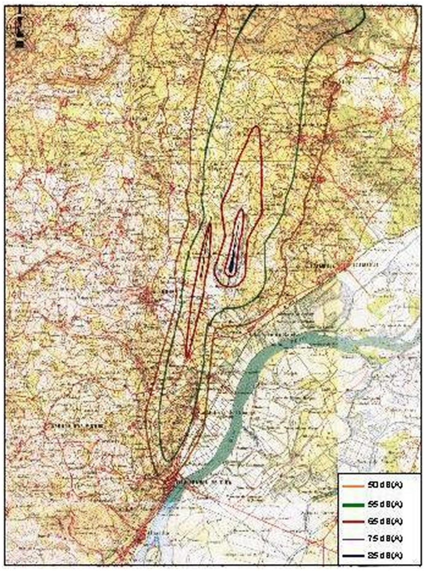
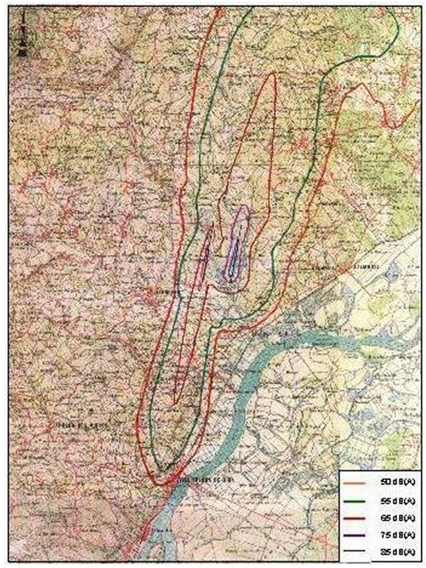
ABSTRACT
Lisbon airport is located practically within the city limits, since the city has developed towards the surrounding airport area. A new airport is being planned outside the city boundaries. A comparative noise study on two alternative locations was carried out to help the decision on the best location. The study included a survey of the ambient noise and the prediction of air traffic noise for two different scenarios of transport capacity. The reduction of aircraft emissions owing to technological evolution was envisaged and accounted for. Aircraft noise impact was assessed on the basis of the population exposed to noise levels, with 10 dB intervals above 55 dB(A). L_{Aeq} index was used in this study.

1 - INTRODUCTION
The planning of a new Airport in Lisbon has called for a noise study in the areas surrounding the two sites considered: Ota and Rio Frio. These areas are already fairly occupied especially by residential buildings. Therefore, noise problems were envisaged.
Airport noise contours were drawn, for each site and for the two scenarios under study: 12 and 25 million passengers per year. Noise from new roads and railway links was also considered.
The noise impact assessment was based on the population exposed to values of daytime L_{Aeq} above 55 dB(A). For values lower than this, annoyance was considered to be unimportant, during daytime.
Although the existing 1987 Portuguese Noise Act [1] restricts emissions for L_{Aeq}>65 dB(A) in areas with residential buildings, schools or hospitals, new legislation is being prepared, in line with the EU Green Paper on Noise recommendations [2]. The new Noise Act will consider limitations and require noise control procedures where $L_{Aeq} > 55$ dB(A) during daytime.

2 - METHOD
A comprehensive noise survey was carried out in the two planned locations for the new Lisbon airport. The survey was done in the area where daytime air traffic L_{Aeq} values would exceed 55 dB(A). The aircraft noise prediction model, TAER, developed by CAPS/IST Acoustics Group in earlier aircraft noise studies [3-4] defined the extension of that area. All measurements complied with ISO 1996. The main objective was the assessment of the noise levels prior to installation of the airport facility.
Noise maps were drawn for each passenger capacity scenario for approach and take-off operations in a 2-parallel runway configuration in each site. Meteorological conditions were also taken into account, namely the wind direction that determines the runway use. In both sites, prevailing winds blow from north. This means that aircraft operations will have south/north direction for the most part of the year.
Airport noise was predicted according to the aircraft mix, namely Fokker 100, Embraer, various types of Airbus and Boeing, for the hour of the day with higher traffic. Night traffic is very scarce and was not considered. Calculations were made using the Soundplan programme.
Noise contours corresponding to L_{Aeq} values from 50 dB(A) to 85 dB(A), with 10 dB(A) intervals were drawn for the two scenarios. For the 25 million passengers per year scenario, it was further decided that a technological development resulting in a 5 dB(A) reduction in current aircraft emissions could be expected.
The total population exposed to noise levels above 55 dB(A) and above 65 dB(A) was calculated by counting the number of inhabitants from the latest census. A comparative study was made for the different scenarios and alternative sites.



(a): 12 million passengers.



(b): 25 million passengers.

Figure 1: Noise contours for the new Lisbon airport, Ota.

Figures 1 and 2 show the aircraft noise maps for 12 and 25 million passenger capacities for Ota, considering also a 5 dB(A) reduction in the latter.

3 - DISCUSSION

It was established that nuisance from aircraft noise could occur for noise levels above 55 dB(A). Two noise areas were defined: one between 55 dB(A) and 65 dB(A) and another one above 65 dB(A). The number of inhabitants in each area would determine the extent of aircraft noise annoyance. Predictions were also compared to measurements to determine the increase in the environmental noise. As expected, the population exposed to noise levels above 55 dB(A) rises with the increase of airport capacity for the two locations. Nevertheless, when a 5 dB(A) reduction in aircraft emissions is considered, as a benefit of technological development, the population exposed to L_{Aeq} values above 55 dB(A) is quite similar for the two scenarios and even decreases for levels above 65 dB(A).

These results helped to show that the introduction of new noise control technologies would compensate for higher aircraft traffic. The investments of the airport authorities on noise measures and procedures for the new airport will then be valid and effective for a long period of time.

ACKNOWLEDGEMENTS

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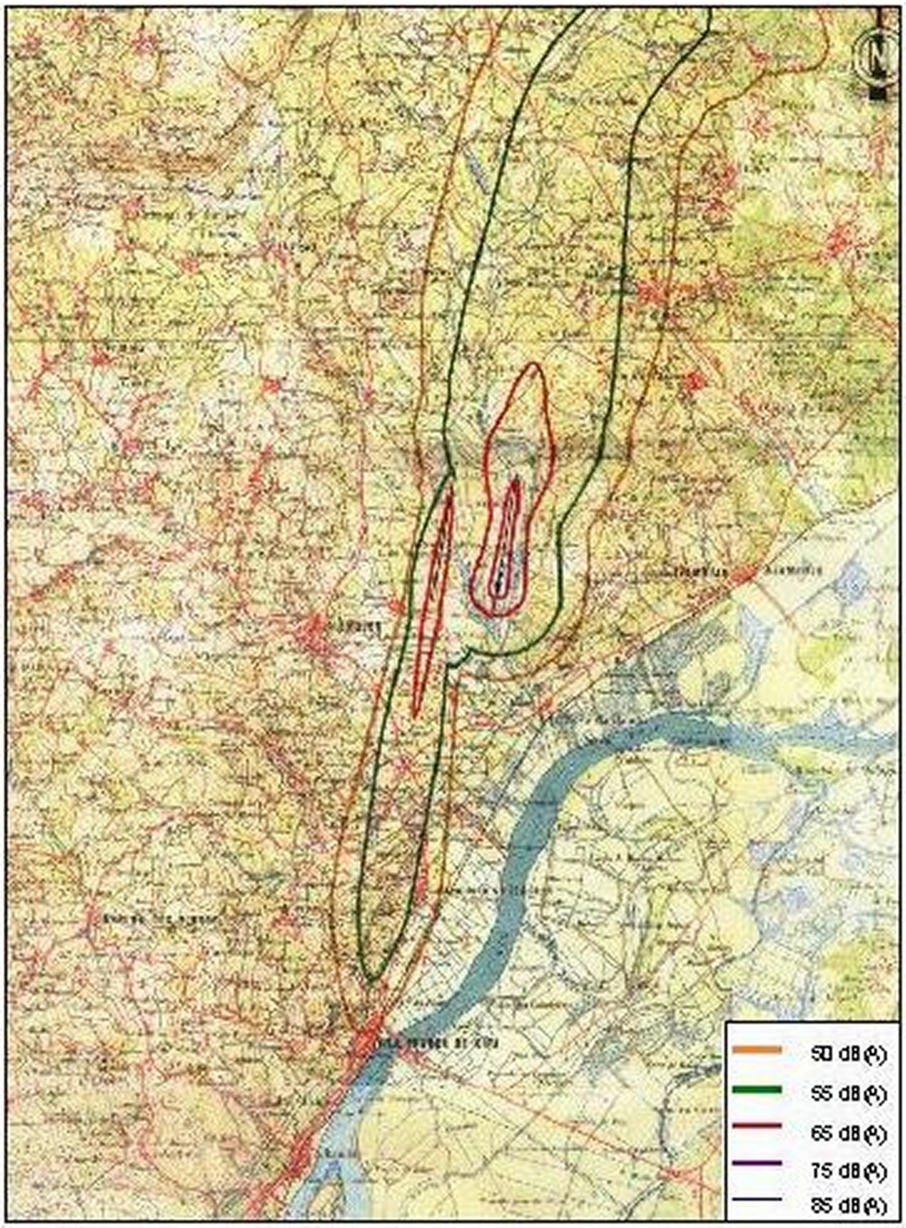

Figure 2: Noise contours for the new Lisbon airport, Ota: 25 million passengers, with a 5 dB(A) reduction on current aircraft emissions.