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DEVELOPMENT OF THE AIRPORT OF BEOGRAD AND PROBLEM OF PROTECTION OF NEIGHBOURING SUBURB HOUSING FROM THE EXCESSIVE AIRCRAFT NOISE

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INTRODUCTION

The first master plan of the airport Beograd has been made in 1953 and the first phase was completed in 1962 when the airport went into operation. The master plan is characterized by a system of two parallel runways oriented in the direction 124^{o} - 304^{o}. The existing runway, with its take off and landing procedures presents some problems, however, those were previously several times analyzed and solutions for them suggested. At the present time a new development, namely the construction of the second runway, presents the problem of the acoustical protection of the suburban residential area of Surčin (Fig. 1). Here the closest houses are to be only 250 m distant from the runway. The proposed navigational procedures might vary, however, in any case a considerable part of Surčin will be in the critical zone. Land use zoning was done in NEF contours. According to the available data the situation is the following one:

NEF	Number of houses under impact
30 - 35	229
35 - 40	67
40	3

Therefore, it was necessary to analyse the possibilities and suggest the optimal acoustical protection where possible.

POSSIBLE INTERVENTIONS

As there are no legislative standards for the cases as this in Yugoslavia at the present time, the only possible approach was the comparative analysis of the existing solutions elsewhere. This had to include several aspects; efficiency, cost and availability. Also, it was considered as important to approach the noise reduction in two adjacent areas, however, as sepparate problems. The noise should be decreased by protection, firstly in the whole critical area, while the second problem is the "individual" protection to decrease the noise penetration in the houses.

For the solution of the first problem, three possibilities were taken in consideration : vegetation belt, wall protection and acoustical protection of individual houses. The analysis of the offered solutions for the protection by a wall, has shown that it would be too expensive considering the possible results. This mainly caused by the nearness of the second runway which limits the wall height. However, it was suggested that a suitable wall structure should be constructed around the engine run up area within the airport complex.

The vegetation belt considerations was a much better preposition. It is possible to establish a evergreen belt of the 80 to 120 m width between the second runway and the residual houses. Considering the absorption characteristics measured in similar conditions, the closest and most critical part of Surčin would have an actual decrease of noise for 25 - 30 dB(A) or even better. This because of the proposed configuration of the vegetation belt (Fig. 2). Nearness of the runway and the limiting factor of the transitional surface as concerns the height of trees led to the specific composition of the protection vegetation. The influencing factors were : climate, acoustic absorption, bird danger and maintenance. The result is a five zone belt (Fig. 2). The rist two zones (II) consist of low evergreens (such as : Iuniperus horizontalis, Juniperus communis hibernica and Thuisa orientalis), zones III and V should be also low wvergreens of different heights, in zone III lower to encourage better growth of zones II and IV (such as : Cotoneaster horizontalis, Lonicera pineata, Evonimus japonicum and Pyracantha coccinea),

while zone IV shall consist of coniferous trees of medium and tall growth (such as : Pina omorika "Pančić", Pinus nigra and Abies nordmaniana).

The vegetation belt would cover an area of approximately 150,000 m^2. The positive effects of it on Surčin would be several and not only noise reduction.

The second problem, the "individual" protection, is proposed to be solved by windows giving better acoustical protection in heating efficiency. Noise reduction expected would be up to 20 dB(A), depending on each case.

The overall effect expected, is that in the protected parts of the houses one may expect sound levels as low as 35 - 45 dB(A), which is very satisfactory.

The financial analysis shows that the whole project would increase the sum needed for the construction of the second runway only be approximately 2%.

LITERATURE

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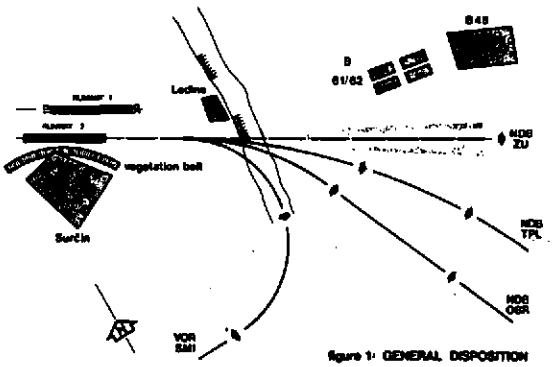

figure 1- GENERAL DISPOSITION

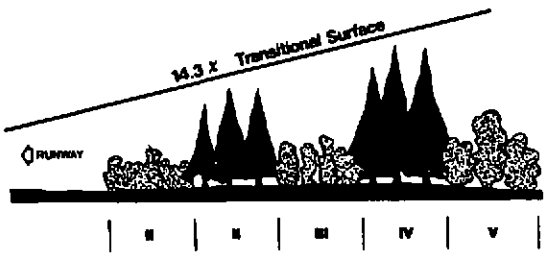

figure 2