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GENERAL AVIATION NOISE DISTURBANCE

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TRAVERS MORGAN PLANNING

1.0 Introduction

1.1 The subjective response to general aviation noise is an area of concern that has been receiving increasing attention. The SEAGA (South East Area General Aviation Study) assessment published in 1976 determined that there were some 500,000 people living within two miles of the 21 general airports in the South East. There are also a number of proposals to open up new general aviation airports or to increase the level of flying at others. These pressures have come about, not because of any large increase in the G.A. activity, but because, with the increasing pressure on Heathrow and Gatwick airports, general aviation flying has been discouraged from using these airports.

1.2 To be able to appraise a proposal for a new G.A. airfield it is necessary to know how people respond to general aviation aircraft. In this paper I shall discuss the subject of annoyance and the available methods of estimating annoyance from general aviation activity. I also suggest a method for determining a "cut-off" level for any assessment.

1.3 I believe that the LEQ index is the best index for determining the subjective response to general aviation noise. The other two methods that have been used in the past are the use of the BS4142 methodology and the NNI index. I consider both of these methods to be inappropriate for general aviation noise.

1.4 In another paper, my colleague will discuss methods for calculating the LEQ noise level from general aviation activity.

2.0 What is Annoyance?

2.1 The effects of aircraft noise can be gauged either by asking people subjected to noise to rate their response, e.g. "I am highly annoyed, very annoyed....., ... not at all annoyed", or alternatively, by questions designed to establish with which of their activities aircraft noise interferes (sleeping, talking, watching T.V. etc.).

2.2 The social surveys at Heathrow for the Wilson Committee relied principally on the latter method. A point was attached to the reported disturbance by an individual for each of 5 activities and added together to obtain what was called an annoyance rating. The mean ratings for people under particular noise levels were correlated with the NNI exposure as shown in Figure 1.

2.3 The values on the annoyance score scale (0-6) were then compared with so called "average opinions" obtained by averaging opinions expressed by individuals as to their self-rated degree of annoyance. The approximate relations advanced were:

annoyance rating	"average opinion"
0	not at all annoyed
2	little annoyed
3	moderately annoyed
4	very much annoyed

2.4 It is now widely realised that the idea of estimating an average opinion is entirely fallacious. Averaging is a process possible only with cardinal numbers, and opinions cannot be expressed in that way.

2.5 In a somewhat analogous way there are difficulties in describing the average of the reported disturbance scores as an annoyance rating, since there is no prima facie reason for supposing that one form of disturbance is equally as annoying as another form: nor for supposing that the same form of disturbance to two people can be taken to be equivalent.

2.6 I make these points in order to indicate that there are major difficulties in interpreting the significance of social surveys and that the "annoyance" as determined from the standard application of NNI is to be treated as a very "crude" and imperfect measure of impact on the community.

2.7 A more satisfactory means of using the data is to establish the proportions of people who state themselves to suffer various degrees of annoyance. We do not know whether in any fundamental sense one "very much annoyed" person suffers equally with another such person, but at least the information is used in the direct form in which it was obtained.

3.0 Methods of Estimating Annoyance

3.1 Departing from the government's approach to the use of NNI, Ollerhead has re-analysed the Heathrow data and similar data from Gatwick, Manchester and Liverpool and related the noise exposure to the proportions of people reporting various degrees of annoyance.

3.2 There is a reasonably consistent relationship between NNI and Leq, therefore, the relationships of annoyance to noise exposure developed by Ollerhead can be simply translated into annoyance versus Leq.

3.3 In Figure 2. I show the "Ollerhead" curves and relate to them results obtained from other researches for other countries, both for general and scheduled aviation. The curve labelled IPSO (Switzerland) was obtained from surveys adjacent to G.A. airfields. I am satisfied that the Ollerhead curves give as reasonable a description of self-rated cmmunity response to aircraft noise as is available at the present time.

3.4 The same figure also shows a curve (labelled Birnie) for the proportion of people expressing their annoyance by some form of public action (e.g. writing to a paper, joining a protest group); and two points (labelled Harris) identifying levels of noise at which complaints start to be generated by circuits (50 dB(A)) or by normal operations (55 dB(A)).

4.0 Cut-off Level for Noise Assessment

4.1 Generally speaking, an aircraft will be audible whenever the peak noise is greater than 5 dB(A) below the background L_{90} or L_{95} level. This means that a jet aircraft will be audible beneath its flight path for many miles from the runway and will be audible at considerable distances to the side of its path.

4.2 Thus reporting of annoyance can occur at low Leq levels of aircraft noise. The data set for Ollerhead's curves, (which were derived from the NNI data) includes observations at Leq levels as low as 35 dB(A).

4.3 If, however, one considers the type of noise assessment set out in BS 4142 or ISO R1996, one finds that there is likely to be little reaction and very few complaints at an Leq level less than 5 dB(A) above background. Therefore I consider that in practical terms it is reasonable to take 5 dB(A) above background as a cut-off level for trying to quantify the extent of annoyance caused to the community.

4.4 A typical background noise level on the quieter (uaually the rear) facades of housing in a country area will be about 40 dB(A). Applying the 5 dB(A) difference mentioned above gives 45 dB(A) Leq as the lowest level for which quantification of annoyance will be attempted.

4.5 I agree that the cut-off proposed above is at variance with the British Airports Authorities 35 NNI (which relates to a 60 Leq noise level) which is generally taken by the government establishments as indicating low annoyance. From figure 2., at this level about 45% of the population consider themselves to be moderately annoyed and about 25% consider themselves to be very annoyed.

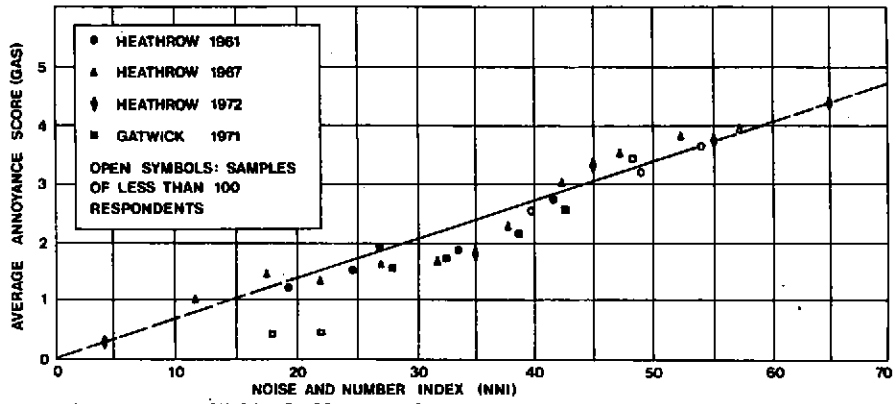

FIGURE 1 :- VARIATION OF AVERAGE ANNOYANCE WITH NOISE AND NUMBER INDEX

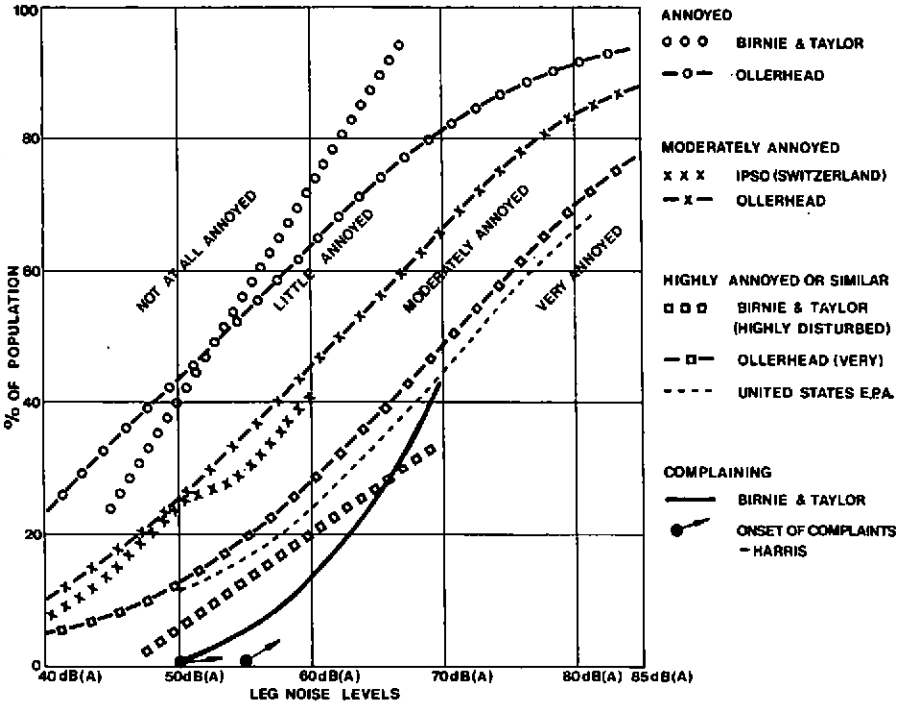

FIGURE 2:- RESULTS FROM VARIOUS NOISE SURVEYS