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AERONAUTICAL NOISE: SESSION B: COMMUNITY NOISE

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The Practical Assessment of Aircraft Noise and Community Response.

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In the development of air transport, growth has been so rapid in the decade since the introduction of the turbo-jet engine that the industrial infrastructive has found it difficult to keep pace with the aircraft itself. The size of individual aircraft, the installed thrust and the demands for land in the aviation areas as well in the airport environs have grown so fast that the problems have arrived with little forewarning to Government or population. The most acute problems arising from noise have been met at the capital city airports of the world, and in the U.S.A. where 60% of world air transport is carried on, the problems have been presented earlier and on a larger scale than in Europe. However the dilemma is now widespread and outside London itself there are some 25 - 30 U.K. airports which are causing increasing annoyance to the surrounding population.

1. PLANNING ACTION AROUND AIRPORTS.

Pressure by local communities reacting to aircraft noise has now indeed become an important feature in airport planning decisions. Recent policy decisions by the Department of the Environment have emphasised the need for airport authorities to make careful examination of noise problems and to avoid any immediate development which may constrain future airport expansion. The Civil Aviation Act extends government powers over the control of aircraft noise to all airfields licensed for public use. Responsibility for meeting the requirements imposed by government will rest with airport authorities.
Many airport authorities will therefore find themselves more involved in aircraft noise problems and their alleviation on and off the airport.

The techniques of Social Survey and Noise Measusement can be utilised in order to investigate the possible level of disturbance from the airport by both day and night and in this way establish a measure of the present condition of airport noise annoyance. Noise contours can be superimposed on local maps to show present and future noise exposure. This basis can then be used to judge the effect of any change in airport operational procedures or indeed of the effect of changes in the population pattern of the community.

Our experience has shown that the key airport noise problems can generally be grouped under the following six headings:

1. Identification of the community noise problem areas
2. Potential for traffic growth and aircraft type development.
3. Noise abatement procedures.
4. The quantification of noise exposure.
5. Consequences of planning action.
6. Economic effects of procedures and planning.

2. AIR TRAFFIC GROWTH AND NOISE.

It is important to recognise four basic factors in the consideration of noise as it affects people on the ground, from these stem the principle lines of action now being pursued by Government, Planning Authorities, Airport and airline Managements and the aircraft and engine manufacturers themselves.

2.1 Noise at Source. Capable of reduction by improved aircraft and engine design, deeper understanding of the scientific principles involved and legislative action.

2.2 The distance of the Noise. This is affected by the take-off and approach paths, control of the flight procedures and may be effectively modified by new types of aircraft with short take-off and landing, or vertical climb and descent capability.

2.3 Frequency of the Noise Impact. This is affected by the directional use of runways, the selection of particular runways, and by the seasonal variation and annual growth factors.

2.4 Protection of Sensitive Areas. This is most readily achieved by the control of land use, by the wise allocation of land in the noisiest areas, and by the intelligent use of sound insulation in suitable buildings.

A major reason for the high degree of noise nuisance in the airport environment in the last decade has been the extension of runway lengths and the greater proximity of heavy transport aircraft during landing and take-off to the surrounding residential population. Shorter take-off and landing distances, and steeper approach and climb-out paths naturally ensure a greater physical remoteness of the terminal flight phases from the ground environment. In the current state of the art, there are rather limited means available for keeping loaded aircraft away from people in the immediate vicinity of airports. The most powerful means of achieving this remains largely in the long term future when Vertical Take-Off and Landing (VTOL), and Short Take-Off and Landing (STOL) should become commercially acceptable for large scale air transport operations. This solution will be found sooner in short and medium haul sectors than in long-haul inter-continental type operations.

We should note, however, the important contribution made by the steadily increasing size of transport aircraft. Aircraft movement rates at nearly all major transport airports have increased far less rapidly than that of the passenger and cargo themselves. With the lower noise levels of new generation aircraft this factor is significant in its influence on noise restraint through 1970's

Traffic forecasts are an essential input for the production of noise contours, and form a basis for other noise studies. Thoroughly tested empirical and mathematical techniques are available for air traffic forcasting.

Forecasts of the number of aircraft movements can be produced separately for passenger and cargo air transport in the various scheduled and charter categories and also for business, executive private and aero-club movements. Further analyses of seasonal movements and diurnal spread can be readily provided. Of equal importance to the forecast of movements is the likely mix of aircraft types, which have already been calculated by us for many airports.

Such forecasts would not be restricted to extrapolation of past trends, but would encompass future developments that are likely to affect the airport in the short or medium term. Existing trends which are of particular importance in the evaluation of airport noise problems include the widening spread of inclusive tour traffic and the introduction of the new generation of wide-body jet aircraft. Air traffic development for a five to fifteen year period would be an integral part of any study.

The introduction of new aircraft types will effect a major reduction in aircraft noise levels, and this should be taken into account when establishing any noise limitations. In particular, conditions and procedures which are exessively restrictive, and incapable of taking these developments into account, should be avoided.

The commencement of European operations by wide-bodied jets and notably the Douglas DC-10, the Lockheed Tri-Star and the A-300B European Airbus will significantly reduce fly-over noise levels.

Noise certification, applicable to most new jet transport aircraft operating in the United Kingdom and in Western Europe will ensure that future airline fleets achieve lower noise levels. Non-transport aircraft, in both the business executive and private spheres are also becoming quieter, and in particular aircraft mix is of equal significance in this context.

The geographical situation of airport and surrounding community is often such that the selection of a particular route for aircraft, or the preferred use of a runway direction, will considerably reduce the impact of aircraft noise. Often this can be achieved without imposing any cost penalty upon the operation of the aircraft or without employing the reduction of power that is called for by Noise Abatement Climb procedures. The type of aircraft likely to use an airport has, of course considerable effect upon the noise potential and this is especially significant today with the imminent introduction

of quieter aircraft into the airline fleets.

Thus it is not necessarily true to say that reduction of noise from an airport will always put a financial strain upon the operators, but it is certainly true that the study of an existing or developing situation, will show methods by which the impact of airport noise can be minimised.

Alternative noise minimisation procedures would be an integral part of any noise reduction programme. These would include not only procedures in the immediate vicinity of the airport, but air routings over a wider area when significant to the community.

The location and orientation of airport facilities can have valuable benefits in improving relations with the local community. A careful examination of the siting of apron areas, taxiways, engine run-up areas and maintenance facilities will often indicate an optimum solution which can greatly reduce aircraft noise in relation to residential concentrations, whilst retaining operational viability.

3. QUANTIFICATION OF NOISE EXPOSURE AREAS.

Investigation of the exposed areas around our major airports has shown the need for the correlation of physical noise measures with the surveyed subjective response. Where this work has been carried out it appears that the subjective reaction can be quantified by using an index of physical noise exposure which takes into account the actual noise level of the exposure and also the number of times that the noise level occurs during some reference period. One such index is termed the Noise and Number Index (NNI) which has achieved national and international standing for work of this kind. The calculation of this Index for a point on the ground is not particularly difficult but, in order to draw a contour of equal noise exposure, it becomes necessary to employ computer calculations. This necessity stems in part from the complexity of the interacting effects of flight path variation, thrust profile variation and distribution of the different types of aircraft which make up the total air traffic.

These contours can only be produced after a study of the total airport situation and can then provide a foundation of a method of study of the effects of any changes in airport traffic or layout on the surrounding population. Their use as a basis of a Land Use Zoning scheme is obvious and has the two fold merit of serving as an indication of the potential impact of the airport upon the community and also shows the advisability of increasing the population in any particular area. The setting up and application of the Policy for residential development control around Gatwick Airport is an example of the overall use of these methods and it is gratifying to see that this policy has now become the basis of the Department of the Environment Circular 10/73 on the control of development in areas subjected to aircraft noise exposure.

Any work on a subject which attempts to quantify human reaction to an external stimulus will always be constrained by the factor of human variability. This rather defines