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HEATHROW AIRPORT - EVALUATION OF ALTERNATIVE RUNWAY OPERATING STRATEGIES

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INTRODUCTION

London Heathrow Airport handles over 50,000,000 passengers and more than 400,000 aircraft movements per year. There are a number of operational measures which have been adopted over the years to reduce or mitigate the effects of aircraft noise in the surrounding communities. The Noise Management Initiatives Sub-Group of the Heathrow Airport Consultative Committee asked Heathrow Airport Limited to assess the likely aircraft noise effects of altering the current arrangements for the westerly preference at Heathrow and of introducing runway alternation under easterly operation during the daytime.

The westerly preference describes a long standing arrangement by which aircraft approach from the east and depart to the west in preference to approaching from the west and departing to the east, even when there is a light tail wind from the east, provided that certain other conditions are satisfied. The westerly preference has the effect of reducing the number of departures that would otherwise occur over the heavily populated residential areas to the east of the airport, but it also increases the number of arrivals over smaller but still heavily populated areas to the east of the airport.

Alternation means that under westerly operation, there is a changeover at 1500 hrs every day between using the north or the south runway exclusively for departures and a corresponding changeover between using the south or the north runway for arrivals. This runway alternation is generally acknowledged as being beneficial because it provides periods of relief from aircraft noise according to a pre-arranged schedule. Runway

alternation is effectively prevented under easterly operation by the 'Cranford agreement' which restricts take-offs to the east off the north runway.

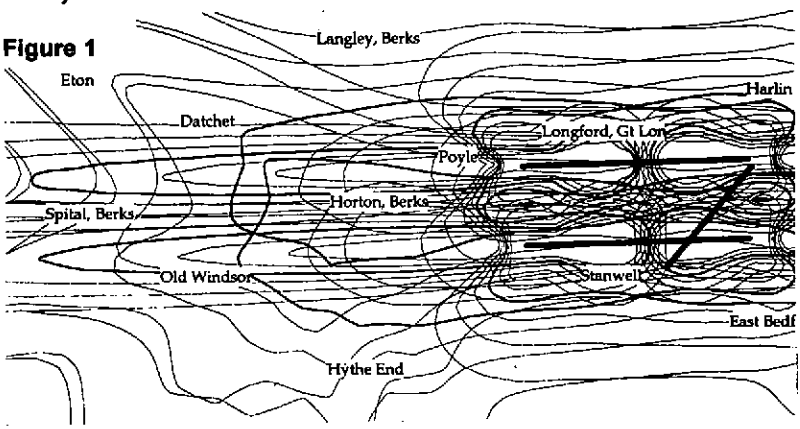
An assessment has been carried out by overlaying separate mode aircraft noise contours onto a geographically referenced population database for the Heathrow area. The main purpose of this paper is to illustrate this new approach as there are a number of advantages in terms of the amount of information that is thereby made available for decision makers.

AIRCRAFT NOISE CONTOURS

Separate mode aircraft noise contours are based on calculated aircraft noise levels for those periods when each runway operating mode is in use, and thus apply only at those times. Separate mode contours would normally extend to a greater distance from the airport than the more conventional average mode contours, but of course, they only apply for a limited proportion of the total time.

The main advantage of separate mode contours is that they show which areas around the airport are affected differently by each of the main runway operating modes. Figure 1 shows a magnified portion of a set of separate mode contours overlaid on a map showing key place names in the Heathrow area (The full charts have too much detail for clear reproduction). The differences between the approach contours which are long and relatively narrow and the departure contours which show relatively wide dispersion across a number of different routes can be clearly seen.

Figure 1



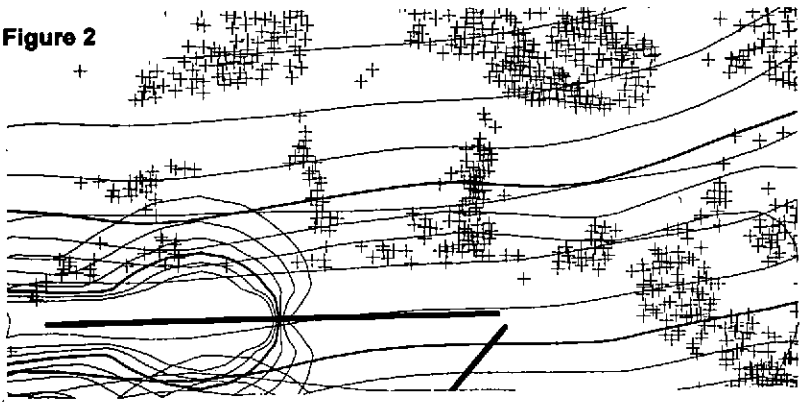
The particular sets of aircraft noise contours shown here were generated by National Air Traffic Services Ltd (NATS) for Heathrow Airport Limited

using the standard ANCON model, which includes the effects of flight track dispersion and has been calibrated over many years against aircraft performance measured at Heathrow. The contours are based on the actual 92 day summer air traffic mix for 1994, but of course, each separate mode contour set is based on the assumption that all traffic uses that particular mode. The contours for north runway departures to the east, which are entirely hypothetical because of the Cranford agreement, are based on the standard instrument departure routes which are laid down for this runway on those rare occasions when it is actually used and assume the same degree of flight track dispersion as has been measured for south runway departures to the east.

POPULATION DATABASE

It is important to be able to overlay the separate mode noise contours onto a geographically referenced population database, as they would otherwise be of rather limited use. The relative numbers of residents included within each of the different contour sets is a good aggregate measure of the overall amount of noise disturbance caused by that runway operating mode for the time that it applies. MVA Systematica provided a database translation programme so that the noise contour sets could be imported into MapInfo, which is a powerful PC-Windows based Geographic Information System (GIS). MVA Systematica also distributed 1991 Census counts across geographically referenced postcode location files for the Heathrow area according to the number of postcode locations found within each of the 1991 Census Enumeration Districts. Figure 2 shows sample separate mode contours overlaid onto a map showing postcode locations.

Figure 2



For the inner areas closest to the airport, MVA Systematica were also able to provide revised geographically referenced postcode locations based on

the average grid references for each residential address having that postcode, using Address Point data. Standard postcode locations are only given to a precision of 100m and might relate to the end of a street or the start of a postman's walk rather than to the average geographical position of all addresses with that postcode. The revised postcode locations are therefore much more accurate than the standard postcode locations, but these differences are unlikely to be significant away from the airport where the contours are quite widely spaced.

POPULATION COUNT TIMES EXPOSURE

As stated above, each separate mode noise contour set only applies for a limited proportion of time. These proportions of time need to be taken into account to form a true picture of any change. The method of this into account adopted in this work is simply to multiply the numbers of residents included within a separate mode contour area times the proportion of time that the particular runway mode is in use. For example, in the analysis of possible changes to the westerly preference criterion, the population counts do not change with changes to the criterion, but the proportion of time that the westerly runway modes are in use does change.

DIFFERENTIAL POPULATION COUNTS

Separate mode noise contours generally overlap to a greater or lesser extent depending on the distance from the runways and the extent to which the routes to and from each runway either converge or diverge. The GIS system can be used to count the numbers of residents which lie inside one contour set and outside another. This allows for a direct analysis of the effects of displacement of the contours from north to south or from east to west as a result of changes to the runway operating strategy.

CAVEATS

A detailed assessment of the likely aircraft noise effects of altering the current arrangements for operating the main runways at Heathrow during the 0700-2300 day has been carried out using the techniques described above. This assessment is restricted to; counting exposed populations, taking into account the relative proportion of time that the calculated exposure occurs, and calculating the aggregate numbers of residents who would benefit or disbenefit from any change. Irrespective of any overall benefits expressed in these terms, it is unlikely that any changes could be proposed which would not involve significant increases in aircraft noise for a minority of residents. The method of balancing benefits for some residents against disbenefits for others is outside the scope of this paper.