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BIRMINGHAM INTERNATIONAL AIRPORT DEVELOPMENT - THE LOCAL AUTHORITY'S NOISE CONTROL CONSIDERATIONS

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INTRODUCTION

Birmingham International Airport is situated approximately 8 miles south-eastof Birmingham City Centre and is sited within the Metropolitan Borough of Solihull.

The Airport was, until recently,owned and operated by the West Midlands County Council.

Since the Council's abolition in March 1986 operations have been supervised by a committee consisting of representatives from the 7 West Midlands District Councils.

Management of the Airport will be the responsibility of the newly-formed Birmingham Airport p.l.c. from April 1st 1987.

The Airport itself has two runways. The main one runs South-East to North-West and is crossed by a shorter, secondary runway perpendicular to it. There is a considerable amount of residential property in close proximity to the Airport boundaries, especially to the North. (See Fig. 1).

In common with the majority of Britain's major airports, Birmingham International has enjoyed a rapid development following its official opening in 1939. 1955 saw an annual passenger turnover of 30,000 and by 1975 this had increased to 1.14 million. It was the latter figure which prompted the County Council to apply for planning permission to construct a new terminal building to cope with the ever-increasing passenger throughput.

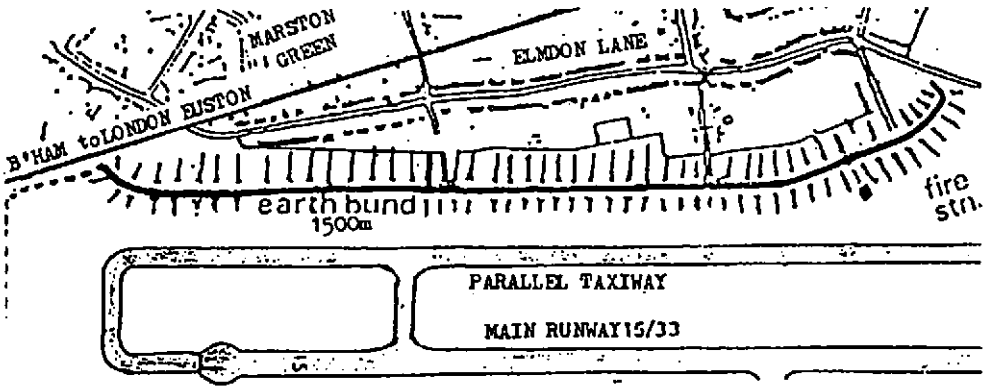
A suitable site for the development was chosen on the opposite side of the airfield to the existing terminal, and having regard to the fact that congestion of aircraft ground movements at peak times was increasing, the opportunity was taken to alter the taxiway layout. It was proposed that a new taxiway be constructed which would run parallel to the existing main runway bringing aircraft ground movements to within 190 metres of residential properties in Elmdon Lane; some 180 metres closer than the main runway. (See Fig. 1). At this time, Aircraft were using the runway itself to taxi to and from the terminal.

Owing to the scale and environmental implications of the proposed development, the Secretary of State for the Environment considered it necessary to determine the application for the new terminal, apron and taxiway by Public Inquiry.

The County Council commissioned Professor J B Large of I.S.V.R. to submit a proof of evidence to the Inquiry. One of the noise control recommendations was the construction of earth bunds. Calculations indicated that a bund 8 to 10 metres high would result in a 10 to 12dB(A) reduction in noise levels resulting from aircraft taxiing on the proposed parallel taxiway and consequently compensate for the increase in noise levels due to the closer proximity of these taxiing aircraft. (1)

Despite numerous objections by local residents the Secretary of State conditionally approved the application. One of these conditions required the construction of an earth-bund between the proposed parallel taxiway and properties in Elmdon Lane, Marston Green. In addition a shorter, secondary earth bund was required to shield properties from noise arising from the new terminal building and apron. (Fig 1).

Fig.1 The Main Earth Bund-B'ham International Airport.



CONSTRUCTION OF THE BUNDS

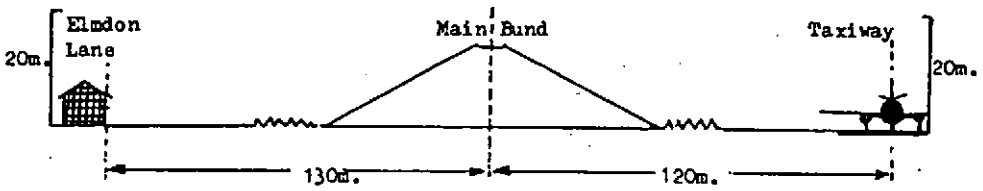
Although not directly resulting from aircraft noise the construction of the earth bunds gave rise to a large number of complaints. This is not surprising when one considers the scale of work and its proximity to homes of the main objectors to the development. The considerable task of transporting many millions of tonnes of soil to form an earth bund 1500 metres in length, 70m wide at its base with an average height of 14m was a civil engineering feat in itself.

Laing Construction, the principal contractors, requested prior approval for the works. Consent was issued by the Local Authority under Section 61 of the Control of Pollution Act 1974. Specific requirements of this consent included hours of working, details of piling operations required for the terminal and so on.

Complaints from local residents during the construction period were numerous. The layout of a road system used to transport earth and earth moving equipment the length of the bund was altered at the request of the Council following noise and dust complaints.

Following an extensive landscaping phase the bunds were completed at a total estimated cost of £1.5m. Figure 2 indicates the relative heights and distances involved in the siting of the main bund.

Fig.2 Relative Distances (Main Earth Bund.)



THE REACTION OF LOCAL RESIDENTS

Prior to the decision to redevelop the Airport, complaints from local residents were few and far between and related mainly to specific isolated incidents such as temporary flight-path changes.

The new-terminal and taxiway were brought into operation early in 1984 and were officially opened on May 30th of that year. The opening saw an immediate increase in complaints from local residents as received by the Environmental Health and Trading Standards Department. Those residents who ought to have received the major benefit of the main earth bund sound attenuation characteristics were generally the most vociferous.

The complaints could be grouped as follows:-

(1) A number of residents stated that they had purchased properties in the area because of the unusual views of the airport from the rear gardens. This view had subsequently been replaced by that of a grassed earth bank.

(2) Some complainants said that the noise problems associated with the airport were aggravated by the fact that the noise sources were no longer visible.

(3) Many complained that the noise experienced at their properties was, in fact, greater than before the bund's construction.

All of these, it was said, had significantly devalued their properties, and numerous approaches were made to Local Councillors and Members of Parliament.

The concern culminated in a petition signed by the vast majority of affected residents being forwarded to, amongst others, the Local Authorities Environmental Health and Trading Standards Department.

THE LOCAL AUTHORITY'S RESPONSE

Section 73 of the Control of Pollution Act 1974 exempts noise caused by aircraft from the noise nuisance provisions of the Act. As a consequence the Local Authority finds itself in the unenviable position of being in the "front-line" as far as complaints are concerned, but unable to take any statutory action should the complaints prove to be justified.

However, due to mounting concern over whether the main earth bund adequately compensated for the closer proximity of taxiing aircraft, the Council's Planning Committee decided that a noise survey was required. The details of the survey were left to the Environmental Health and Trading Standards Department.

THE 1983 SURVEY

Preliminary work was carried out in 1983. At this time aircraft were still using the main runway to taxi to and from the old terminal and the earth bunds were nearing completion. Part of the brief at that time was to assess the effectiveness of the main earth bund in attenuating aircraft taxi-ing on the main runway.

Sound pressure levels were measured simultaneously by two people positioned at equal distances either side of the main runway. One observer was positioned on the residential side of the bund and was, therefore, out of sight of the airfield. Measurements were taken at the moment when the taxiing aircraft was situated directly between the two personnel who were in radio contact throughout.

Results obtained over different periods and of different aircraft types were averaged out to minimise error. In addition allowances were made for wind speed and direction.

From the results it was estimated that the main earth bund reduced aircraft taxiing noise by between 4 to 13 dB(A) depending on the measurement position. However the question still remained as to whether the bund would adequately compensate for aircraft ground movements 180 metres closer to the residential properties.

THE 1984/5 SURVEY

A further survey was undertaken when the new parallel taxiway was in regular use. The main problem, in this case, was how to obtain meaningful results using existing Departmental equipment and with the constraints on manpower faced by Local Authorities today.

It was decided the survey should be on the same lines as that carried out 12 months previously, so that the results would be, to some extent, comparable. Again, 2 Environmental Health Officers were involved.

Three sets of measurement points were chosen(see Fig 3) and each pair of points lay on lines perpendicular to the parallel taxiway. One observer was positioned on the apex of the main earth bund and the other at the boundary of the airport grounds with properties on Elmdon Lane. The boundary was chosen in preference to rear gardens simply because access was required at unsociable hours and at short notice. All measurements could therefore be taken on Airport land and, once security clearance had been obtained, access was possible as and when required.

Each Officer was equipped with identical C.E.L. 175 Integrating Sound Level Metres, C.E.L. 2980 Microphone Pre-Amplifiers and C.E.L. 186 Precision Measurement Microphones mounted on tripods 1.2 metres above ground level.

Instantaneous sound pressure levels (A-weighted) were chosen as the most representative units for the survey and each taxi-ing aircraft pass was treated as a separate noise event. Simultaneous readings were taken at both points as each aircraft drew level with them. The exact movement was signalled to the person behind the earth bund by the observer on the bund itself. The levels recorded on the apex represented sound pressure levels in a free field above a

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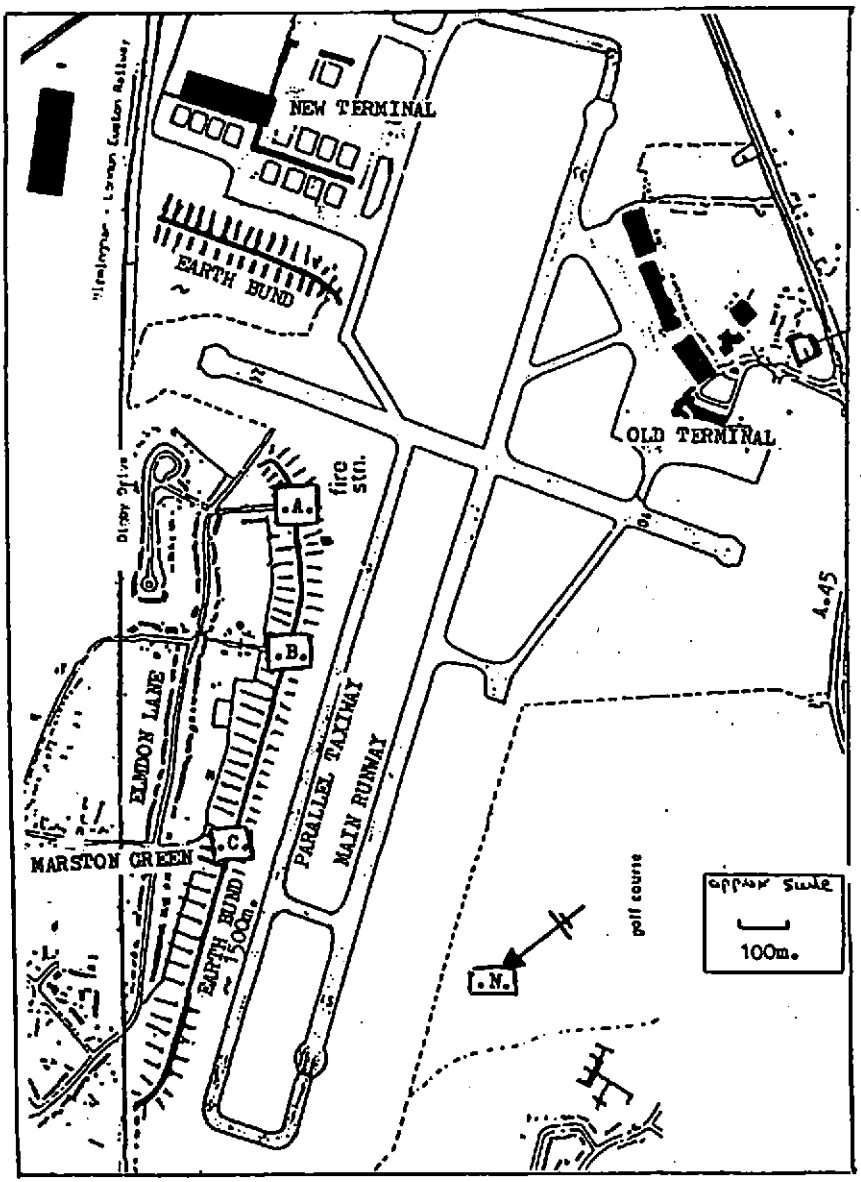

Fig.3 Plan of B'ham International Airport indicating approximate positions of measurement points.

reflective plane, whilst those taken at the boundary would take into account any attenuation provided by the intervening bund.

Measurements were taken over a period of 6 weeks and times were chosen such that climatic conditions were favourable and, therefore, had a negligable effect on sound propogation. Recordings were taken of a variety of aircraft including the BAC 1-11, Boeing 737, Focker F.27 (Friendship) and F.28 (Fellowship). All noise events were averaged at each measurement point. Using sound pressure levels recorded on the apex of the bund it was possible to calculate approximate, theoretical sound pressure levels at the boundary measurement points discounting attenuation due to the bund. The following equation was used assuming the jet engines to be point sources.

$L = Lo - 20 \log R/R$

where L = dB(A) at distance R from source.

Lo = dB(A) at distance Ro from source.

The distance between the measured and theoretical levels at each pair of measurement points represented the attenuation provided by the bund and ground absorption. A further 3 dB(A) was deducted from all average readings to take account of ground absorption.

Final results were as follows:-

	Average dB(A) Reading Without Bund *	Average dB(A) Reading With Bund *	Average Attenuation Due to Bund
Point A	68.7	52	16.7
Point B	73.4	57.7	15.7
Point C	72.4	57.4	15.0

* Figures include adjustments to take into account distant discrepancies.

Conclusions:

The result of the 1984/85 survey indicate that the main earth bund is effective at attenuating the noise from taxiing aircraft, noise levels being at least 15 dB(A) lower at the boundary of the nearest residential property than they would be without the presence of the bund. Results obtained at three positions along the bund showed a good degree of consistency.

Mathematical calculations, again using the above equation, indicate that the sound pressure levels currently experienced at the nearest residential properties are approximately 7 dB(A) lower than the theoretical levels for aircraft taxiing along the main runway prior to the construction of the earth bunds (i.e. the original situation prior to 1984).

Objective measurements have proved conclusively that the increase in noise levels complained of by residents in Elmdon Lane is purely objective; obviously the siting of the earth bund has had psychological implications. As explained previously many residents moved to the area because of the views

of the open airfield. The fact that the noise sources are longer visible could account, to some extent, for the subjective increase in noise levels.

During the survey it was noted that a sharp increase in noise levels is now experienced as departing aircraft appear above the bund relative to the observer in Elmdon Lane. Prior to the construction of the bund, take-off noise would have built up gradually to a peak before tailing off. This surprise effect may, again, partially explain the intolerance of local residents to aircraft noise in general.

CONCLUDING REMARKS

The Local Authority's response to complaints on this occasion indicated that the main earth bund is an effective noise barrier. Some degree of acceptance of the situation is confirmed, perhaps, by the rapid reduction in complaints from local residents following the announcement of these results.

REFERENCE

[1] J. B. Large. "Public Inquiry into the Proposed Development of Birmingham International Airport. Proof of Evidence, August 1979.