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Westminster: The Fourth London Airport?

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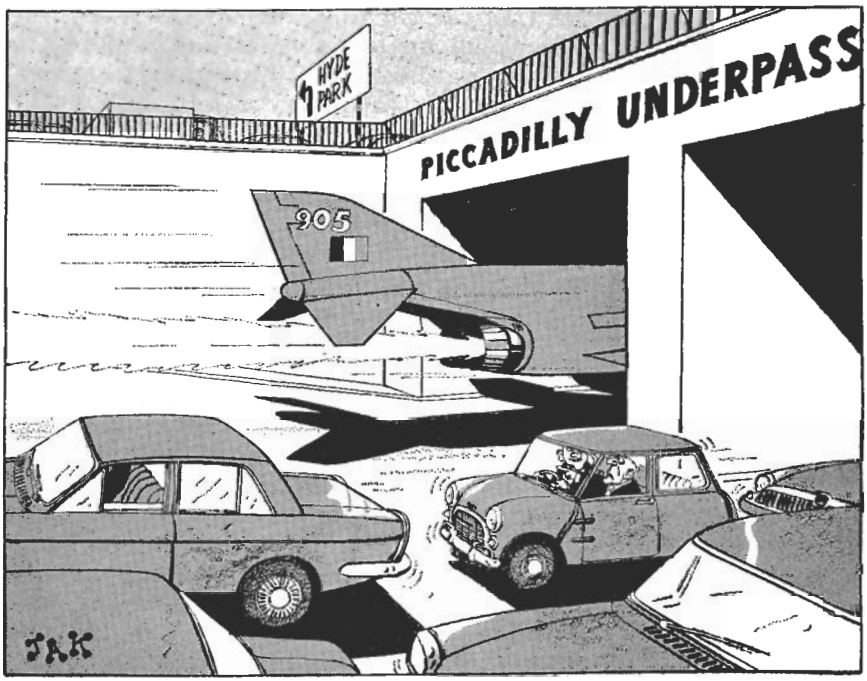
Traffic forecasts indicate that the number of passengers passing through London area airports annually will rise from 20 million in 1970 to over 200 million by the year 2000. On the basis of these predictions the British Airports Authority argues that London will soon need a third airport. However, although the greater London region apparently needs and wants greatly expanded air transport facilities, no particular part of the region wants the airport. This is easy to understand, for while the region as a whole would presumably benefit from an airport, most of the costs of noise, congestion, decline in property values and



"It's all right, they stop by parachute!"
with acknowledgements to *The Evening Standard*

other social costs would be borne by the small part of the region in which the airport was located.

The strength of local protest succeeded in forcing the government to abandon its approval of a third London airport at Stansted. Anticipating equally vehement objections from other localities the government saw the need for a clearly impartial investigation. It was important that possible alternative sites should be objectively weighed, and be seen to be objectively weighed, so that the inevitable opposition to the final selection could be effectively disarmed. While local opposition might still be understandable it would be morally indefensible if it could be 'objectively' demonstrated that the selfish interests of a few were blocking the greater benefit of the majority. Hence the Roskill Commission was appointed in 1968 to conduct an enquiry into the location and timing of new airport facilities for the London region.

The Commission's research programme has had two main objectives: first, to make as comprehensive as possible a comparison of the costs and benefits relevant to each of the four sites it selected (Cublington, Foulness, Nuthampstead and Thurleigh), secondly, to assess when the Third London Airport should come into service. Although its objectives can be stated very simply they define a task of staggering complexity. Every activity that would be disrupted by a new airport has connections with other activities that would also be affected, and they in turn have connections, and so on in an almost endless chain. Estimating the multiplier effect of the disruption of individual activities is by itself a difficult task. Measuring this effect for the simultaneous disruption of a large number of activities and establishments such as farming, recreation, schools, industry, and scientific and defence establishments is infinitely more difficult. Also, the scale of everything connected with the Third London Airport is enormous. It is estimated that 65,000 people will be employed and that a city as large as Bristol will develop near the airport. New roads and railways will be needed; thousands of acres of agricultural land will be consumed and as much as £73 million will be needed to shift defence installations that will be affected.

Clearly it would be impossible to consider everything. The Commission had, of necessity, to select a limited number of factors that it considered to be the most important and then to make a large number of simplifying assumptions about the way in which these factors are related to each other. The major factors selected by the Commission for inclusion in the study and the costs associated with them are summarized Table 1.

The table reveals first, that the total costs associated with the construction and running of the Third London Airport are immense, over £2,200 million discounted to 1975; second, that this sum is completely dominated by two items, airspace movement and passenger user costs; and third, that the costs which fall on local interests, the costs which have aroused most of the public controversy, appear by comparison to be insignificant. Comparing Cublington, the lowest total cost site, with Foulness, the highest total cost site, we see that Cublington has higher capital costs, higher noise costs, and higher costs falling on local interests, and also that Foulness' amenity and capital cost advantages are dwarfed by Cublington's movement and user cost advantages.

In any study such as this the final outcome of the calculations will be greatly influenced by the simplifying assumptions on which they are based. When the outcome indicates that factors that are apparently of greatest public concern weigh so little in the balance, we can expect to find the explanation not only in

Table 1 Estimates of the Costs and Benefits (in £ millions, 1968 prices discounted to 1975)*

	Cublington	Foulness	Nuthampstead	Thurleigh
1. Total net costs	2264·6	2385·2	2273·9	2266·3
2. Airspace movement	960·0	973·0	987·0	972·0
3. Passenger user costs	887·0	1041·0	868·0	889·0
4. Costs falling on local interests (including loss of residential amenity, disruption of schools, hospitals, industry, agriculture, recreation)	54·5	44·9	65·7	54·5**
5. Capital costs	288·8	252·7	284·7	288·3**
6. Costs directly attributable to noise	14·3	11·1	23·9	14·4**

* Discounting refers to the practice of converting all costs to a base year value by reducing future costs by 10% per year compounded annually.

** Items 4, 5 and 6 are not mutually exclusive. 4 includes some capital and noise costs.

The above table was compiled from tables 29:1, 29:3 and 29:5 of Volume VII.

the calculations but also, and perhaps predominantly, in the initial assumptions. The Roskill study because of its ambitious scope promises to become a standard reference in the field of cost-benefit analysis. It is therefore instructive to look closely at the problems and potential dangers associated with some of its assumptions.

Air and Surface Movement Costs

Looking first at the airspace movement costs, we see that although the absolute difference between the least cost and the highest cost sites is fairly large, £27 million, the relative difference between them is small, less than 2·7%. The report does not describe the way in which these costs were calculated but does explain that they are based on the route structures used by the consultants who evaluated the air traffic management problems. In their report the consultants note that these route structures have not been 'optimized' and state that any optimization could alter the route mileages and flying times (Vol. VIII, 2. 2, p. 10 and 56). Because of lack of time it was perhaps necessary to assume that these 'non-optimized' route structures reflect the comparative airspace movement costs of the different airport configurations being considered. But, where the maximum difference found between the systems is less than 2·7%, the crudeness of the assumptions raises serious doubts about whether Cublington's £27 million advantage should be considered *significant*.

The maximum difference between the surface movement costs and benefits is larger, £173 million, and the objections to the manner in which it was calculated are somewhat more complicated. In order to compare user costs for the various sites the research team first had to predict the amounts of traffic that would flow to the different airports from the various parts of the country. To do this they used the following model:

$$T_{ij} = \frac{O_i \, D_j \, F_{ij}}{\sum_j D_j \, F_{ij}}$$

Where: T_{ij} = the number of trips between zone i and airport j.
O_i = the total number of trips generated in zone i. (i.e. the various part of England).
D_j = the total number of trips attracted to airport j.
F_{ij} = the cost or friction of distance between i and j.

The model allocates passengers from regions i to airports j in direct proportion to the attractiveness of the airports, D_j, and in inverse proportion to distance from i to j. Using this model and an accessibility measure derived from it, the Commission calculated the volume of traffic generated and its total costs. It reasoned that the more efficient the configuration of airports, the greater would be the total amount of traffic generated by it, and that this additional traffic constituted a benefit that could be assigned to the more efficient system. According to this reasoning Cublington generated £154 million more 'benefits' than Foulness; this advantage in user costs is more than two and a half times greater than *all* the costs falling on local interests at any of the potential sites.

Local opposition groups unfamiliar with the jargon and the methods of traffic planners could be expected to feel quite helpless when confronted with a sum so large and calculated with such sophistication. What is not made clear in the report is that these 'generated benefits' are derived purely and simply from assumptions built into the model. Gravity models have been used with considerable success to *allocate* given amounts of traffic among alternative destinations, but their ability to estimate the total amount of traffic *generated* by a network configuration is completely unproven.

The above model could be called a 'loosely attraction constrained' model. O_i, D_j and F_{ij} are *inputs* to the model and must be provided by the programmer; T_{ij}, the number of trips between i and j, is the *output*. A recursive solution procedure is used which permits O_i, D_j and F_{ij} to vary within certain limits but the total amount of traffic generated by the system is ΣO_i. O_i is a function of the population, income, and accessibility to airports, of the various zones of origin. Accessibility is calculated by:

$$\text{Accessibility of zone i} = \frac{\sum_j (D_j F_{ij})}{\sum_j D_j}$$

The calculation of the amount of traffic generated depends heavily both on the assumed capacities of the various airports, and on the assumption that the functional relationship between accessibility and traffic will remain constant while the volume of traffic increases tenfold. The first assumption is arbitrary and the second may be seriously questioned.

It is not disputed that efficient transport systems tend to generate more traffic than inefficient ones, but the Commission presents no proof that the differences it finds are *significant*. An analogy might make the point clearer. Imagine that British Rail is trying to decide whether to route all London-Glasgow trains from Euston Station or Liverpool Street Station. Euston might be more accessible to more people in London than Liverpool Street and hence would be the most 'efficient' choice, but it is unlikely that routing all trains from Liverpool Street would significantly affect the numbers of people going from London to Glasgow.

Comparing the per capita surface transport costs for Cublington and Foulness, it can be estimated from the report (tables 13:10, 13:15 and 13:18) that the Cublington system will be one shilling and five pence cheaper in 1991 and less than three shillings cheaper in the year 2000. Given that the average total cost

of an air journey is well above £20 the possible savings would appear to amount to less than 0·5% of the total journey cost. It is highly unlikely that savings of this magnitude would have any perceptible effect on the total volume of traffic. Indeed elsewhere in the report the Commission considers the probable effect of a 6% increase in the journey cost and concludes that 'it can hardly be considered significant'. (Vol. VII, p. 105). Yet it is calculated in the report that the savings resulting from the selection of Cublington instead of Foulness would induce an additional 11 million people to fly and generate benefits of over £150 million.

Costing Amenity Losses

The Commission acknowledges that it is extremely difficult to attach monetary values to benefits that are not customarily appraised in these terms but argues that it is necessary in order to make a fair comparison among the alternative sites. It also states that the attempt to value non-material benefits in monetary terms in no way implies a materialistic view of life (Vol. VII, p. 6). This is a questionable assertion for it is very unlikely that it would occur to a non-materialistic society to consider the problem in this way. But what seems to me to be beyond question is that the values the Commission attaches to non-material benefits reveal a very strong bias which is not only materialistic and philistine but also discriminatory against low income groups.

This is particularly evident in its evaluation of recreational activities, churches, historic buildings, and residential amenities. For example, the cost assigned to the disruption of transferable recreational activities such as sightseeing and camping is simply the replacement cost of fixed facilities, if any, plus the additional time and travel costs of getting to an alternative site. If the activities associated with a site are considered unique and irreplaceable a price must still be attached to their loss. The report calculates this 'subjective' loss as the sum of what participants pay for an activity (admission fees and travel costs) plus any consumer surplus they enjoy. Consumer surplus is the difference between the price that participants actually pay and the price they would be prepared to pay if pushed to the limit. In practice this means that the value attached to a recreational site is simply the cost to the users of getting to it, plus their expenditure there, plus what they would be prepared to pay for the privilege of keeping it. But no matter how much someone may enjoy an activity, if it is free, and if he cannot afford to pay for it, then his loss if it is taken away has no cash value (Vol. VII, chap. 24).

The costing of churches is treated in the report in a similarly straightforward manner. It is argued that the payment of insurance premiums is a strong indication of the value placed on property and insurance values were accordingly used for the valuation of churches likely to be affected by the new airport. It recognized that this method did not fully take into account historic benefits but argued that such benefits are unlikely to be much greater than the insurance values. The obvious objection to this procedure is that insurance values must be related to market values or replacement costs. Since there is no market for the sale of old churches to collectors their market value is extremely small. Historic value is irreplaceable and quite unrelated to the cost of physically replacing a building (letters to *The Times*, 13 Feb., 1970).

In the summary table the cost of churches is included under the heading recreation. The total 'recreation' costs associated with the four sites are: Cublington—£6·7 million, Foulness—£0·3 million, Nuthampstead—£3·6 million, and Thurleigh—£3·8 million.

The values attached to the amenity losses that would be suffered by people living close to the potential sites reveal another interesting bias in the Commission's assumptions. The report states that the market value of house property represents not only the house itself but all the environmental advantages and disadvantages attaching to it. From this it is argued that the market value of a house very precisely reflects the value of the house as a totality and therefore the depreciation of real estate values will accurately measure the loss of amenity suffered (Vol. VII, p. 25).

This potential loss was estimated for residential property near the new airport sites by applying the depreciation rates found for similar property around Heathrow and Gatwick. It was found that depreciation was principally determined by three factors: noise levels associated with aircraft, general neighbourhood background noise levels, and the class of property. The higher the level of aircraft noise the greater was the depreciation suffered, but the higher the general background noise level the less was the effect of aircraft noise. However, of greater importance than either of the first two factors was property class. On average, for all noise levels, the percentage depreciation in value for high class property was four times the depreciation for low class property (Vol. VII, table 20.3). In other words, because their property values were little affected the poor were assumed, for quantifying purposes, to be little bothered, and small or nil values were attached to their amenity loss.

Benefits

Although the work is called a cost-benefit study it is mainly concerned with comparing the costs associated with alternative airport systems. The benefits mentioned so far have simply been the difference between the highest and least cost sites. But what are the benefits which justify the costs associated with the minimum cost site?

A fundamental assumption of the whole report is that London needs a new airport. Traffic, it is estimated, will reach 200 million by the year 2000 and traffic, it is assumed, is a benefit: 'To set against the net costs for each site there is what might be termed a 'base load' of benefits *not measured*, (my italics) but for the existence of which it would be wrong to proceed with a third London airport at all' (Vol. VII, p. 103). If we extrapolate the forecasters' trends a few more years into the future this 'base load' of benefits becomes absolutely astounding. Over the past fifteen to twenty years air passenger traffic has been growing at a rate in excess of 10% per year and the forecasters saw no reason to expect a slower rate in the future. If we draw a graph of this 10% growth rate we see that traffic doubles approximately every seven and a half years. Such exponential growth rates very quickly produce absurdly high volumes of traffic. The Commission recognized that infinite growth was not possible and so decided that a ceiling would be reached when each business man made six trips per year and each non-business passenger made two trips per year. It admits that there is no evidence for such a ceiling, it simply assumes it to avoid the absurd alternative. However, this 'ceiling' is not reached until around the year 2000; during most of the thirty year forecast period traffic is assumed to increase exponentially.

The response of the Commission was to plan for these volumes as if they were some natural and inevitable phenomenon. However, unlike natural phenomena with exponential growth rates, air traffic has no realistic 'natural' physical limit

at which it must ultimately level off. The limit is set by the facilities provided and the charge made for them. The experience of road traffic planners suggests that if travel continues to become cheaper and if roads are provided to accommodate an exponential growth rate, then traffic will continue to increase exponentially. At the present time those who fly are not charged for the privilege of disturbing those below. The Commission recognizes that this lack of compensation for loss of amenity could be considered a concealed subsidy for air travel, but argues that compared to the 'unmeasured base load of benefits' it is insignificant. Would it argue the same case in the year 2000?

Westminster Airport

The direction in which the Commission's assumptions are leading can be illustrated by repeating the exercise for the year 2000 by which time a fourth airport will be needed. If we add Westminster to the list of sites that might be considered and apply the Roskill cost-benefit criteria, what potential savings would be associated with a central London site? At a conservative estimate it would save one hour per journey plus the cost of ground transport. Given that a businessman's time in the year 2000 is valued at over £3·50 per hour and a tourist's time at over £·40 per hour we can very conservatively estimate the average savings at £1·50 per journey (constant prices are assumed throughout). Thus the savings in the year 2000 would be over £300 million per year and over the thirty year life of the airport would amount to £9000 million. It can be assumed that the annual increase in the number of passengers will cancel out the discount rate so that the total savings discounted to the year 2000 would be £9000 million.

Property values around Hyde Park are about £30 per square foot and drop to about £3 per square foot in Notting Hill. Valuing Hyde Park and Green Park and immediately adjacent land at the higher figure and additional land required at the lower figure it appears that a five square mile central London site could be purchased for about £2500 million. An additional seven square miles could be insulated against sound at £4 per square foot and its population generously compensated for depreciated property values for another £1000 million. Westminster Abbey could be insulated or moved and in any event would be unlikely to be worth much more than its insured value of £1·5 million. An additional £3000 million could be allowed for generous supplementary compensation and the total saving would still amount to £2750 million. These estimates, although admittedly rough, appear not unrealistic when compared with estimated cost of the London motorway system. The motorway scheme would require 20 square miles of land and displace between 60,000 and 120,000 people; its total cost, including construction costs, is estimated at between £1,100 and £2,200 million (Thompson, 1969, p. 130, 142).

The loss of the parks would represent a major amenity loss but this has been accounted for by the high values attached to the parkland and adjacent real estate. Also the airport itself would represent a major recreational amenity. It has been noted in the report that large numbers of people are attracted to Heathrow and Gatwick to watch the aircraft and listen to conversations between control tower and pilot.

The safety of those on the ground would appear to be an insignificant consideration. The report anticipates only one 'Third Party' accident over thirty years and the costs assumed are only £9300 for each fatality and £625 for each

injury. These costs could of course be discounted along with all other future costs (Vol. VII, p. 309.)

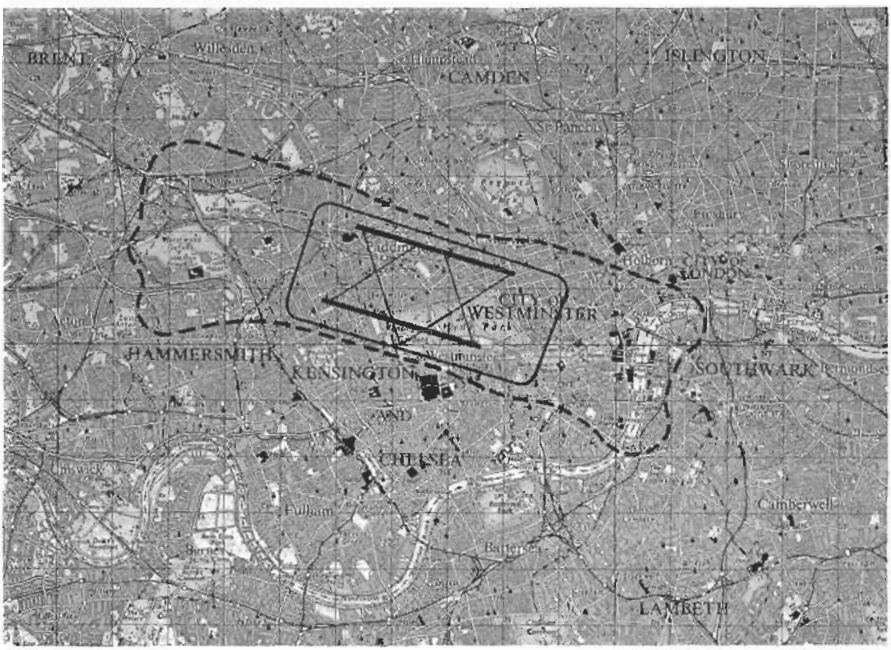


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Fig. 1. Proposed Site for Westminster Airport—Heathrow land area, runways, and 110 PnDb. (critical noise level) contour centred on Hyde Park. There are residential, commercial, industrial and recreational land uses encompassed by the 110 PnDb. contour at Heathrow. (Sealy, 1967).

It is possible that the accounting assumptions found in the report are an accurate reflection of generally held values. This was certainly the intention of the Commission. If they are, then there would appear to be a strong prima facie case for including Hyde Park in the short list of sites to be considered for a fourth London Airport.

Conclusion

Advances in telecommunications are very rapidly reducing the effect of distance on the flow of information. Along with increased affluence and developments in transport technology they are stimulating greatly increased traffic in goods and people. Problems similar to those confronting the Roskill Commission can be expected to become more common. As population densities increase and people become more mobile it will become more and more difficult to provide adequate transport facilities without disturbing large numbers of people. As the scale of disruption grows larger the traditional ways of measuring its cost will become completely inadequate. The character of whole regions will be altered and the general public will be called upon to put a price on its way of life.

The Third London Airport will perform what is essentially a London function for which there is no room in central London. The benefits will accrue largely to

London; the 'way of life costs' will fall entirely on the local region where the airport is located. The project thus implies a spatial redistribution of income. A cost-benefit analysis can be used to decide which site is cheapest from the point of view of transport costs, or construction costs, or land acquisition costs, or even church destruction costs. But it cannot decide whether saving millions of London passengers 5 minutes each justifies disrupting the way of life of mere thousands. That decision is not quantifiable.

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Royal Society European Programme

This programme, introduced in January 1967, is intended to further relations between research scientists in the university laboratories and other scientific institutions of western Europe. Substantial financial support for the programme has been received from several donors, and in addition the Royal Society administers a grant from the Department of Education and Science for long and short-term visits to and from western Europe where matching funds by other European countries are set aside by taking part in the scheme. The countries in the programme are Austria, Belgium, Denmark, Finland, France, German Federal Republic, Greece, Republic of Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

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2. *Study Visits*

The awards will be made to United Kingdom research scientists, senior and junior, for periods of one week to six months, to be spent in laboratories in western Europe, and may be used for acquiring new techniques, for consultations with scientific colleagues, or for carrying out research.

3. *Research Conferences*

The purpose of this part of the programme is to encourage scientists from western European countries to meet as specialists in their particular fields, in a relaxed atmosphere, and without publication of the discussions. In order to maintain the highest scientific level, provision is made for inviting a few leading authorities as speakers from countries outside western Europe. The amount of a grant will be determined by the circumstances of each case. The number of participants should usually be upwards of 25, and should not exceed 100, for meetings of 1 to 4 days.

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