

Subject: Heathrow Hub: Note for DfT on Market Assessments
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Date: 1st August 2008

1. Introduction

This note provides an introduction for DfT to the market analysis work, forecasts of changes in surface access mode share and rail-air substitution arising from the implementation of the Heathrow Hub.

These forecasts feed through into both the business case and the public benefit case for the Hub:

- Predicted numbers of Hub rail service passengers and car journeys are multiplied by rail ticket charges and charges for vehicle access to the airport to derive the principal revenue streams for the business case.
- Numbers of car journeys to and from the Hub affect predictions of CO2 emissions and local air quality; and
- Forecasts for the extent of rail-air substitution provide rail passenger numbers (to be added to the predictions from rail-road substitution to feed into the revenue forecast from rail services) and an assessment of the airport capacity (air slots) that could be freed up through the transfer of domestic and short haul air passengers onto high speed rail services. The associated reduction in flights also contributes to the assessment of the impact of the Hub proposal on CO2 emissions.

It must be emphasised that our assessments of both rail-road substitution (surface access mode choice) and of rail-air substitution are at this stage “high level”. For example it reflects none of the effects of “trip generation” that might be expected as a result of the Hub.

In the case of surface access we are carrying out work during this summer to make these forecasts more robust.

In addition to describing how the current forecasts have been derived, the note also discusses those areas in which we will be seeking in the next stage of development to refine the assessments – this is part of the work for which Heathrow Hub Ltd is currently seeking to raise further funding. We believe this is particularly important for rail-air substitution, an issue which is highly contentious with stakeholders.

Please note that the impact of Heathrow Hub on current international rail and domestic non-airport rail passengers who will also benefit from the provision of additional train services has not yet been quantified.

In this note we will describe our work on:

- Surface access mode choice;
- Rail-air substitution;

and draw some conclusions.

2. Surface access mode choice

Approach

Our approach has been designed to provide high level forecasts of the impact of provision of new rail services on surface access mode choice. We have only

considered air passengers in our analysis. Airport and airline staff, airport visitors have not yet been forecast and our business case assumes no revenues relating to the trips those people would make.

We have developed a passenger surface access mode choice model to derive our forecasts. Our approach includes:

- Identification of the road journeys which could be influenced through the Heathrow Hub project. This “addressable market” represents the total travel market which could benefit from the improvement in public transport journey times from the implementation of the Hub; and
- An assignment of journeys within this addressable market to surface access modes, under different levels of provision of rail services.

Inputs

The development of the Heathrow Hub proposition has taken place against a background of some inevitable uncertainty about the future. Amongst the issues which are unclear are whether:

- Heathrow’s runway 3 will be built, with impacts on airport passenger throughput;
- Development of services through regional airports will arise along the lines envisaged in SERAS and the Aviation White Paper; and
- The Airtrack project will proceed.

We have provided a separate note describing the illustrative new rail services facilitated by Heathrow Hub that we have modelled using the Arup passenger surface access model. We describe this as “Phase 1”. The new rail services have been described in terms of:

- Origin, destination and intermediate station calls,
- Frequency; and
- Journey time.

We have also considered the potential impact of extension of the UK High Speed rail network into Heathrow Hub station. We describe this as “Phase 2”. Phase 2 is not part of our current project, but has been defined both as an illustration of the scope for future train services and to allow an initial forecast of their impact on surface access demand. The illustrative new High Speed rail services have been described in the same three terms as have the Phase 1 services.

In producing the initial high level market analysis for the Heathrow Hub proposition, a number of key input assumptions have been made:

- The passenger surface access model has initially been run using the 2006 observed pattern of demand from the CAA passenger survey at Heathrow – an extract is provided below. Changes in the transport network or transport costs have been input to estimate revised modal shares;
- Initial outputs from the model were expressed in terms of “current” (i.e. 2006) demand. To generate 2030 forecasts, growth in demand at the airport has been applied globally¹. This means that differential growth by trip

¹ We have produced Low, Medium and High forecasts of ATMs and passengers for 2020 and 2030. The Low forecast is based on the current ceiling for ATMs at Heathrow, whilst the Medium and High forecasts are based on the projections provided in the R3 Consultation documents – medium reflects operation of the airport with mixed mode on R1 and R2, high reflects the operation of airport once R3 is built. The forecasts are summarised in the first part of Table 4 in this paper. A fuller account is given in Arup paper “Heathrow Hub: Without-Substitution Demand Forecasts, 28th November 2007”

purpose (business/leisure) or by geographical region has not been taken into account;

- The Arup passenger surface access model uses typical travel times and costs for an average day in the year. We consider this to be a reasonable approximation and to be consistent with the forecasting method that was used by BAA's consultants for the Terminal 5 Public Inquiry. However, the latest BAA models differentiate between time periods of the day - this better reflects the fact that public transport is relatively poor for those accessing the airport at night time or in the very early morning. The Arup model may slightly overstate transfers to public transport in this respect;
- Our model does not reflect the impact of increasing congestion on the roads around Heathrow Airport over time. All other things being equal this may tend to encourage greater use of public transport. Analysis for surface access with the 3rd runway seems to indicate that the public transport share could be increased significantly by this change;
- The passenger surface access model does not reflect the impact of congestion on rail access to Heathrow. This could become a significant consideration in the future; and
- The values of time and other key parameters used in the surface access model are based on those used in the BAA HSAM model which was used in preparing evidence for the Terminal 5 Public Inquiry. The latest BAA surface access model is called LSAM. The values of time and other parameters have been re-estimated. However, this information was not available at the outset of the Hub project.

Current position for Heathrow surface access

We have taken as our starting point the 2006 air passenger survey undertaken by the CAA. This collected detailed travel characteristics of the surface access transport modes used by air passengers. The survey data provides this data for UK terminating passengers only. Therefore of 69mppa air passengers at Heathrow in 2006, about 44mppa were UK terminating passengers. The remainder were international interlining passengers.

The tables below show summary high-level trip data from the survey for UK terminating passengers.

Table 1 CAA 2006 UK Originating/Terminating Passengers – Trip Purpose

Trip purpose	Annual trips ('000s)	% of total
Non UK Business	7,370	16.7%
Non UK Leisure	10,140	22.9%
UK Business Domestic	2,060	4.7%
UK Business International	8,080	18.3%
UK Leisure Domestic	880	2.0%
UK Leisure International	15,690	35.5%
Total	44,220	100%

Table 2 CAA 2006 Originating/Terminating Passengers – Surface Access Modes

Trip Purpose	Surface Access Mode				
	Public Transport	Car-Park/Fly	Car Kiss/Fly	Taxi	Unspecified
Non UK Business	40%	7%	15%	37%	1%
Non UK Leisure	49%	5%	25%	21%	1%
UK Business Domestic	35%	15%	19%	28%	2%
UK Business International	20%	22%	21%	37%	1%
UK Leisure Domestic	44%	5%	35%	16%	1%
Total	32%	14%	32%	22%	1%

The tables show that in 2006, according to the CAA's survey, public transport had a 32% surface access share. Car kiss and fly – a mode which generates a double road trip for arriving or departing air passengers – had the highest non-public transport share also at 32%.

We are aware that Heathrow's surface access mode shares have changed since 2006. Indeed, at a public meeting on the 23rd July 2008, a BAA representative said that public transport was now accounting for 39.2% of journeys. To be consistent, however, we are continuing to use the 2006 CAA data as our source.

Outputs

Our forecasts suggest that the package of rail service improvements in our Phase 1 proposition, plus the committed Crossrail project, the so-far uncommitted Airtrack project and road user cordon charging would lift public transport mode share from 32% in 2006 to 52% on completion. Our initial assumption is that the road user cordon charge for cars and taxis entering the airport is £20.

A further 1% of air passengers would shift from road to public transport surface access with the HS rail services in Phase 2. This means that the great majority of the benefits from the proposition come from Phase 1.

These changes in surface access lead to an enormous expansion in public transport users. The table below illustrates the scale of the increased use of public transport to access the airport with Phase 1 and provides an indication of the switching of the existing level of longer distance users of road to rail with an HSL in Phase 2.

Table 3 Impact of the Heathrow Hub on public transport trips

Scenario	Phase 1 - public transport annual trips (million)	Phase 2 – increment on Phase 1 with an HSL (million)
2006 – observed by CAA	15.3	-
2030 – Heathrow Low Growth	34.6	0.5
2030 – Heathrow Medium Growth	37.9	0.8
2030 – Heathrow High Growth	44.5	0.9

The table on the previous page shows that Phase 1 can be expected, even at the lowest forecast of Heathrow's air passenger volume expansion, to more than double the number of public transport users to Heathrow by 2030.

Next steps

The work underway at Arup will provide for:

- Revalidation of the proposition based on a consistent definition of input assumptions on train services, transit between the Hub station and the airport;
- Investigation of the effects of different levels of road user cordon charging; and
- Provide an opportunity for DfT's questions and suggestions to be incorporated in the modelling.

3. Rail-air substitution

Approach

In our discussions with stakeholders in the development of the Hub proposition we have found this to be a contentious area, and one where we have found widely divergent views on the potential for impact. We have therefore based our forecasts on European experience, where data on the impact of accelerated rail services on air travel is available from a range of sources.

The data on which the current estimates for rail-air substitution are based on are shown in Table 4 (provided at the end of this note).

Current status of our forecasts

The last version of our presentation on the Hub included an estimate of up to 60,000 slots being freed up by the Hub Phase 1 proposals by 2030 and up to 130,000 slots being freed up if the Hub is also connected to a developed UK HS network (Phase 2). The addition of R3 is forecast to provide 152,000 slots over and above those forecast with mixed mode operation on the two existing runways – we therefore suggest that the Hub could provide between 40% and 85% of the capacity of R3.

The 60,000 estimate was based on the "High" forecast number of flights in 2030 to/from Heathrow and European destinations (i.e. the forecast assuming R3 is built) within 3.5 hrs train time from Heathrow, multiplied by assumed % of flights that rail will capture (based on the evidence from Europe on corridors served by both rail and air). For:

- Paris, Amsterdam, Brussels and Rotterdam we assume rail captures 80% of the forecast flights
- Cologne and Luxembourg we assume rail captures 40% of forecast flights (a lower % reflecting the European evidence showing % declining with distance/train times)

The 130,000 estimate illustrated the effect of adding 100% of flights to/from Manchester and 80% of flights to/from Edinburgh and Glasgow on the basis that the Hub is connected to a fully developed HS network to the north. We will be revising this figure downwards to 102,400 slots. There remains additional potential for some rail-air substitution relating to short haul flights from Gatwick, Bristol, Cardiff, Southampton, Bournemouth and Exeter.

We also made a third intermediate estimate of 84,000 freed up slots to take account of the argument that passengers making interlining flights would be more difficult to transfer to high speed rail due to airline pricing practices and time savings relative to one hop only flights.

We estimated that interlining flights on the Edinburgh, Glasgow and Manchester routes were 44%, 39% and 58% respectively. The estimate of 84,000 slots cautiously assumed that none of the transfer passengers on these routes transfer to air. We do not have corresponding estimates for interlining flights to/from the European destinations, but based on data provided in the DFT report ("Improving the Passenger Experience", November 2007) cautiously assumed that the scope for transfer will be a small percentage of flights.

Next steps

It can be argued that the current approach to estimating rail-air substitution overestimates the extent of point-to-point rail-air substitution and underestimates the interlining substitution. This is a very important issue as it drives the number of potential Heathrow slots freed up. We will therefore be carrying out further work in the next stage of project development to improve the forecasts. The issues we will be seeking to address include the following.

➤ *Assessment of percentage of point-to-point trips transferring to rail*

Whilst the European evidence indicates that rail can capture up to 80% of total trips on transport corridors served by both rail and air services, applying 80% to the number of flights in order to estimate the extent of the air market that rail will capture will automatically overestimate the extent of rail-air substitution. This is because the benchmark of 80% represents the ultimate rail share of a total market, including rail trips. To correct this bias we would use data on total trips for the O/Ds served as well as the % shares of rail and air services.

➤ *Interlining*

We have not yet taken account of interlining flights to/from Heathrow and the European destinations. To correct this we will use data on interlining flights to/from Heathrow and Paris and other European destinations.

➤ *Relative prices and the retailing of rail and air journeys*

Our analysis does not take sufficient account of the relative prices of rail and air travel in the UK which are not as favourable to rail as they are in continental Europe. This will require a sophisticated analysis to capture the effects. However, despite the price difference we note that Eurostar has been able to capture a similar modal share to its continental European counterparts on the London to Paris and Brussels routes.

Retail distribution is an important and changing factor in rail and air pricing and demand management. The introduction of Heathrow Hub opens more opportunities for rail- air multi modal products, comprising two-leg journeys or interavailability.

➤ *Origins and destinations of air passengers*

In terms of rail-air substitution, our analysis currently takes no account of where passengers travel from in order to get to Heathrow to catch a domestic or short haul

flight. For example, we know that 58% of existing Heathrow passengers travel from the South East and Inner London. A sizeable percentage of these could be expected to switch to high speed rail from St Pancras International and would be unlikely to travel to the Hub in order to catch a high speed train back through London to Europe.

This is a potentially a very significant issue which we would propose investigating further at the next stage.

To date we have also made no assumptions about the extent of likely rail-air substitution relating to flights from other airports, particularly in the south west.

4. Conclusion

We have shared with DfT the current position, our immediate work areas and an indication of the work to be carried out at the next stage, in this paper.

In summary:

- We have carried out initial analysis and have further work underway to improve the forecasts on the impact of Heathrow Hub on air passenger surface access. We will be able to share this with DfT during the summer; and
- On rail-air substitution, we have established a range of cases where Heathrow Hub will have an impact. The issues are complex and controversial and, we believe, should be further explored at the next stage of design and development. We are happy to share with DfT our work so far.

5. Recommendation

DfT are invited to comment on this paper.

++ Table 4 follows on the next sheet ++

Table 4 Forecasts of Heathrow Air Passengers and Potential for Rail Substitution

		2007				2030			
		ANNUALS							
		2007		2030		2007		2030	
		ATMs	Pax	ATMs	Pax	ATMs	Pax	ATMs	Pax
Domestic		61,806	6,508,383	61,935	8,883,568	70,968	9,725,170	90,581	11,408,372
Short-Haul		270,403	32,956,542	270,968	44,983,766	310,484	49,245,408	396,280	57,768,662
Long-Haul		146,790	30,135,075	147,097	41,132,545	188,548	45,029,422	215,129	52,822,976
TOTAL		479,000	69,600,000	480,000	95,000,000	550,000	104,000,000	702,000	122,000,000
TOTAL ADDRESSABLE MARKET									
		2007		2030		2007		2030	
		ATMs	Pax	ATMs	Pax	ATMs	Pax	ATMs	Pax
Domestic		36,504	4,082,625	36,598	5,571,922	41,935	6,099,788	53,525	7,156,520
EDI		13,338	1,591,155	13,372	2,171,591	15,323	2,377,320	19,557	2,788,780
GLA		12,286	1,262,785	12,317	1,750,731	14,113	1,916,590	18,013	2,248,307
MAN		10,881	1,208,685	10,909	1,649,600	12,500	1,805,878	15,955	2,118,434
Short-Haul		52,660	5,867,010	52,786	8,007,231	60,484	8,765,810	77,198	10,262,970
CDG		18,252	2,242,095	18,299	3,059,987	20,968	3,349,880	26,762	3,922,667
AMS		18,252	2,148,900	18,299	2,932,795	20,968	3,210,639	26,762	3,766,326
BRU		10,530	1,129,455	10,557	1,541,468	12,097	1,687,502	15,440	1,979,569
RTM		2,106	76,950	2,111	105,021	2,419	114,970	3,088	134,888
CGN		2,106	145,350	2,111	198,372	2,419	217,165	3,088	254,752
LUX		1,404	124,260	1,408	169,589	1,613	185,565	2,059	217,788
TOTAL		89,154	9,949,635	89,384	13,579,152	102,419	14,865,598	130,724	17,438,490
ADDRESSABLE MARKET									
		New Market Size		2007		2030		2007	
		Route	ATMs	Pax	Route	ATMs	Pax	Route	ATMs
n/a		Domestic	16,553	1,847,837	Domestic	16,587	2,522,191	Domestic	16,587
80%		EDI	5,976	712,924	EDI	5,989	973,100	EDI	5,989
80%		GLA	5,997	625,228	GLA	6,010	864,765	GLA	6,010
100%		MAN	4,579	508,685	MAN	4,599	694,326	MAN	4,599
n/a		Short-Haul	40,716	4,595,754	Short-Haul	40,801	6,259,304	Short-Haul	40,801
80%		CDG	14,802	1,793,676	CDG	14,832	2,448,265	CDG	14,832
80%		AMS	14,802	1,719,120	AMS	14,832	2,346,500	AMS	14,832
80%		BRU	8,424	903,564	BRU	8,442	1,233,313	BRU	8,442
80%		RTM	1,685	61,560	RTM	1,688	84,026	RTM	1,688
40%		CGN	842	58,140	CGN	844	79,368	CGN	844
40%		LUX	562	49,704	LUX	563	67,843	LUX	563
TOTAL			57,269	6,433,601	TOTAL	57,388	8,781,496	TOTAL	57,388
% of Addressable Market									
Domestic		45.3%	45.3%	Domestic	45.3%	45.3%	45.3%	Domestic	45.3%
Short-Haul		77.3%	78.2%	Short-Haul	77.3%	78.2%	77.3%	Short-Haul	77.3%
Total		64.2%	64.7%	Total	64.2%	64.7%	64.2%	Total	64.7%

Assumptions:

Low and High forecasts as per BAA Consultation document
Medium forecast as per BAA High then SERAS from 2020 (i.e. when R3 would kick in)

"Domestic" includes all UK flights

"Short-Haul" defined as per DEFRA <3700km

"Long-Haul" defined as per DEFRA >3700km

"Domestic" includes MAN, EDI, GLA

"Short-Haul" includes CDG, AMS, BRU, RTM, CGN, LUX (i.e. up to 3.5 hours)

"Addressable" includes all pax and ATMs on above routes

The 2030 addressable market is the 2007 equivalent applied proportionally to the 2030 forecasts

The 2030 route breakdown is as per the 2007 split grown proportionally to the 2030 forecasts

Note: the 2007 domestic markets were then reduced by the following rates to account for the higher transfer %s found (CAA):

EDI transfer 44%. Therefore new addressable market = 891,155

GLA transfer 39%. Therefore new addressable market = 782,785

MAN transfer 38%. Therefore new addressable market = 508,685

The relevant substitution rate was applied to each route accordingly and then grown to 2030
This was carried out for EDI, GLA, MAN after the transfer pax were removed as above