

**Developing a  
sustainable framework  
for UK aviation:  
scoping document**

**The Mayor of London's  
response**

**Mayor of London  
October 2011**

	<b>page</b>
<b>Introduction</b>	<b>2</b>
<b>1: The aviation sector</b>	<b>3</b>
<b>2: International connectivity and hub airports</b>	<b>52</b>
<b>3: Regional connectivity and regional airports</b>	<b>93</b>
<b>4: Making better use of existing capacity</b>	<b>104</b>
<b>5: Climate change impacts</b>	<b>114</b>
<b>6: Local impacts</b>	<b>132</b>
<b>7: Any other comments</b>	<b>142</b>
<b>Appendix A</b>	<b>144</b>
<b>Appendix B</b>	<b>152</b>
<b>Appendix C</b>	<b>153</b>
<b>Appendix D</b>	<b>155</b>
<b>Appendix E</b>	<b>156</b>
<b>Appendix F</b>	<b>160</b>
<b>Appendix G</b>	<b>166</b>

# Introduction

**This publication comprises the Mayor of London's full response to each of the six themes and the 49 questions posed by the Government in their March 2011 scoping document: *Developing a sustainable framework for UK aviation*. The Mayor's key messages are set out in an accompanying summary publication. This document sets out the Mayor's position in detail together with technical evidence to support it.**

**We would like to thank York Aviation, Volterra Consulting, SKM Colin Buchanan, Professor Peter Tyler of the Cambridge University Department of Land Economy and Andy Rumfitt, Director of Innovacion, for providing advice and guidance upon a range of technical issues.**

# 1: The aviation sector

## Summary

The aviation sector is of vital importance to the whole of the UK. Of most significance is the enabling role commercial aviation plays in the economy, allowing people, goods and investment to flow between the UK and the rest of the world. This has allowed London, which is uniquely reliant on the aviation sector, to become one of the world's few truly global cities. The modern transformation of the character and nature of London would not have been possible without the city's global aviation links. They have made it internationally competitive by, for example, helping it become a leading international financial and business services centre. By allowing an exceptionally diverse city to connect with family and friends across the globe, aviation links also make a vital contribution to London's inclusiveness.

London's international competitiveness is particularly dependent on Heathrow, London's hub airport. Heathrow has delivered significant benefits to the whole country. London is the most productive region of the UK and accounts for more than one-fifth of the country's Gross Value Added. While the Mayor recognises the need to rebalance the economy, London will continue to play a crucial role in the economic success of the UK.

The rapidly expanding global economy will bring with it significant growth in aviation demand – forecasts from aircraft manufacturers suggest that worldwide demand is likely to more than double between now and 2030. Strong growth on established routes and between Europe and emerging longhaul destinations is expected.

If London is to maintain its global city status and if in turn the UK as a whole is to continue to benefit from this, substantial new hub airport capacity is needed. The Mayor believes this is of strategic national interest. Given the vital role that London plays in the national economy and the unique dependence it currently has – and will continue to have – on direct global connections, this new capacity must be provided in the southeast of England.

## **1. How does the aviation sector as a whole benefit the UK? Please consider the whole range of aviation activities including, for example, air freight, General Aviation and aerospace.**

**The aviation sector brings benefits to many parts of the UK. For example, the UK is home to the second largest aerospace industry in the world (behind the United States). While around half the population use commercial aviation services each year, London is uniquely dependent on first class aviation links. Its global air links support its role as a world**

city and serve the needs of its highly international population. They will also be important in enabling the UK to develop stronger regional economies. There are both competitiveness and inclusiveness benefits to this.

The aviation sector itself generates substantial direct, indirect and induced benefits in London and the South East. Heathrow Airport employs in the order of 76,500 people, which represents over 1 job per 1000 passengers per year. Estimates of indirect and induced employment vary, with a conservative estimate of a total of 840 jobs created in addition to each 1000 direct jobs.

Above all, however, there has been a virtuous circle of development between aviation links and the economy. The enabling effects of aviation on the economy, through gains from trade, are enormous, though they are difficult to isolate from other variables which determine economic performance over time.

In 2009 the value of the London economy was £265bn. Its regional Gross Value Added (GVA) was £34,200 per capita, which was 71% above the UK average. The value of London's exports of goods and services was approximately £66.4bn in 2008. While total employment over the past 40 years has remained broadly constant, its structure has changed radically with a loss of approximately 750,000 manufacturing jobs and a gain of a similar number of service sector jobs. GLA Economics estimates that London generated a tax export in 2006/07 of between £8.4 billion and £18.4 billion. This represents between 9.5% and 19.1% of all tax revenues generated in London<sup>1</sup>. The following examples give some indication of the contribution and importance of aviation links to this success:

- (i) The quality of London's global links are one of the factors which allowed it to attract over five times as many European headquarters as Germany between 1998 and 2009 (469 compared to 86.)
- (ii) Sectors which are particularly heavy users of aviation are banking and finance, in which there was an average spend on air travel in 2008 of over £2000 per employee, and insurance, with an average spend of over £4000. These two sectors spend approximately £2bn per year on air travel, about a quarter of the total by all business.
- (iii) London's highly productive economy has become dependent on globally footloose skilled labour which it attracts with good quality aviation links. The higher productivity is reflected in London salaries which are on average 37% higher than the UK average. 51% of London employees are qualified to at least NVQ4 level, compared to 37% in England as a whole. 41% of employees in London were born overseas compared to 15% in England as a whole.

---

<sup>1</sup> GLA, *Filling the coffers: London's tax export*, November 2008

- (iv) Foreign Direct Investment (FDI) is attracted to London for a range of reasons including the quality of its international links. It is estimated that FDI contributes more than £52 billion each year to London's economy. Foreign-owned firms created 42% of London's economic growth between 1998 and 2004;**
- (v) Because of its global links, in particular those at Heathrow, London plays a vital role in acting as a gateway for tourists from around the world. London attracted 16 million overseas visitors in 2007<sup>2</sup>. Many are only willing to travel to other UK regions as part of a main trip to London. Heathrow is the only UK airport at which the number of overseas leisure travellers exceed UK ones.**
- (vi) Air freight capability and capacity enables access to markets and can help grow demand for goods to which delivery speed adds value, as well as enable more efficient production practices. 69% of the total UK air freight is carried in the bellyhold of passenger aircraft, and the practice is most prevalent on longhaul routes. In 2005, freight carried by air accounted for around 25% of the UK's total visible trade by value and 55% of the value of UK manufactured exports to non EU countries. The availability of good air freight connections including express delivery networks is a further reason international companies locate in London.**

**In addition to aviation's impacts on the competitiveness of London and the UK there are also benefits in terms of social welfare or 'inclusiveness'. In particular, London has a high proportion of overseas residents (approximately one third of the city's population was born overseas). These people, plus the large numbers of others who have family connections to people abroad, need access to good aviation links to maintain these ties. The proportion of leisure trips accounted for by people visiting friends and relatives was 41.4% at London airports in 2009 (Heathrow was the highest with 53.8%), while only 17.8% of leisure trips were for this purpose at Manchester.**

## **Introduction**

- 1.1 The Mayor of London recognises that the aviation sector brings enormous benefits to the UK and that it is of vital importance to the country as a whole. To provide an example of just a few of the ways in which the sector contributes to the UK – it plays a profound enabling role in the wider economy, facilitating the flow of people, goods and capital; the UK is home to the second largest aerospace industry in the world (behind the United States) and there are thousands of jobs in the supply chain and the induced demand that the sector generates.
- 1.2 This answer does not attempt to identify all the benefits of aviation, but rather concentrates on demonstrating the main ways in which it contributes to the Mayor's overall aims and goals. These fall into two broad categories, competitiveness, and inclusiveness benefits.

---

<sup>2</sup> Greater London Authority, *The London Plan*, 2011

- 1.3 Air travel is simply a means to an end. The competitiveness benefits it brings arise principally through the interaction between London's air connections and its economy. Aviation is part of an integrated system of transport networks that allows London to compete as a leading global city and a powerful generator of wealth and opportunity for the UK. It is a central concern of the Mayor's that London continues to succeed in this role.
- 1.4 Aviation's impact on London's inclusiveness as a city raises a distinct set of issues, relating to the uniquely international character of London. Approximately one third of the city's population was born overseas and many other residents have family roots outside the UK. Maintaining links with established family and social networks overseas is important to many of these people.
- 1.5 It is not, however, the intention of this answer to take a parochial view of the benefits of the aviation sector, which ignores either the various interdependencies that exist between differing parts of the market or the mutual benefits which aviation offers London and other parts of the UK. In fact a number of such interdependencies and mutual benefits are highlighted, since they are central to the Mayor's main argument about London's future aviation needs.
- 1.6 This argument is ultimately one of national significance: firstly that unrivalled global aviation connections are vitally important to London's success and that this in turn is vital to the UK as a whole; secondly, that it is in London's interests for other regions of the UK to have better access to these global connections so that they are themselves in a better position to generate wealth and become less dependent on public sector expenditure supported by London's economy. This second argument is discussed elsewhere in this response, particularly Question 20.

## **Background: measuring aviation benefits**

### Types of economic impact from aviation

- 1.7 The impacts of aviation can be analysed in various ways, including the following:
- Impacts associated with the aviation sector itself. These include:
    - Direct effects - employment and output (at eg airports, or for airlines etc);
    - Indirect effects - employment and activity generated in the industry's supply chain;
    - Induced effects – employment or economic output created through the household spending of those employed;
  - Impacts outside the aviation sector;
    - Time and convenience related benefits to personal and business users of aviation arising from the availability of air connections of a particular quality (routes, frequencies etc);

- Wider economic benefits, arising for example through higher productivity and through improved competition associated with increases in the agglomeration of activities; and
  - Net gains from trade<sup>3</sup>, arising from greater specialisation of production in the economy as a result of improved aviation connections. This impact arises from the enabling effect of aviation on international flows of people, capital and goods. In the London context it is reflected in the presence of high value economic activities associated with its World City status and a highly skilled international workforce.
- 1.8 It is not possible to simply evaluate the above impacts and treat them all as separate benefits. Particular care is needed to distinguish between genuine net benefits and merely distributional effects and it is important to avoid the double counting of benefits. In fact the value of measuring the various impacts above will vary according to the purpose of the inquiry.
- 1.9 For example, in some areas where there are persistent economic and social problems it may be a legitimate policy objective to generate employment opportunities. However, measuring the numbers of jobs created by the aviation sector (direct, indirect and induced) is generally only relevant at the local and regional level. Evidence about the aviation sector's employment impacts are provided in Appendix A1.
- 1.10 User benefits and wider economic benefits (productivity and competition) are relevant to the evaluation of incremental improvements in connectivity and capacity, for example the construction of a new runway<sup>4</sup>. However this method of assessing aviation's impacts is less suitable for present purposes, which are to evaluate the overall benefit of the aviation sector at the London (and UK) level. These techniques are not designed to assess major structural changes to the whole economy which the aviation sector enables over a long period of time.
- 1.11 In order to capture the overall benefit of the aviation sector at the UK scale it is necessary to capture the dynamic relationship between aviation and the economy. This requires identifying how aviation enables flows of people, goods and investment to change the economy's productive and demand attributes and in turn its economic performance through, in effect, net gains from trade. These gains are long term and are difficult to estimate since they are part of a highly complex system involving a great number of variables.
- 1.12 Nevertheless a number of studies have been undertaken which essentially adopt this approach and provide a framework which can be used to set out the available

---

<sup>3</sup> Gains from trade in theory arise from specialisation in production arising from the division of labour, economies of scale, scope, and agglomeration and the relative availability of factor resources in types of output by ... businesses, location and economies. There is a resulting increase in total output possibilities and trade through markets from sale of one type of output for other, more highly valued goods. See for example, Paul R. Krugman, 1979. "Increasing Returns, Monopolistic Competition, and International Trade,". *Journal of International Economics*, 9(4), pp. 469–79; William C. Strange, 2008, "urban agglomeration," *The New Palgrave Dictionary of Economics*.

<sup>4</sup>For evidence about the scale of such benefits, see "The Economic Impacts of Hub Airports," British Chambers of Commerce, July 2009, which estimated the benefits arising from additional runway capacity at London's hub airport.

evidence. The analysis which follows examines the competitiveness benefits of aviation on London's economy, and has been based on these studies.

### The enabling impact of aviation on the economy

- 1.13 It is well established at the macro level that there is a strong link between air transport infrastructure and economic development. A 2009 MIT paper by Ishutkina and Hansman<sup>5</sup> reports work by the DfT and the World Bank<sup>6</sup>, and concludes that this is the case. It also notes that air travel has come to play a more prominent role in economic development as air transportation usage has increased worldwide and that its role is likely to increase since people tend to shift to faster and more expensive transportation modes as their income increases<sup>7</sup>. (See Question 12 for more details).
- 1.14 According to Ishutkina and Hansman, the enabling impact of air transportation is defined as the total economic impact on employment and income generated by the economic activities which are dependent on the availability of air transportation services. Appendix A2 provides background and key results from a number of studies which attempt to measure these impacts at the macro level. Such studies are useful in identifying linkages, but there is a clear danger that important local and regional variations are averaged out at this level of analysis. The nature of London's economy may be such that aviation links are more important to its operation and performance than in the economies of other cities and regions.
- 1.15 Ishutkina and Hansman provide an analytical framework for identifying the types of enabled flows which take place between an individual economy and the rest of the World, drawing on the above studies and their own individual case studies<sup>8</sup>. This is summarised in Appendix A3.
- 1.16 It is worth noting that this framework recognises feedback between 'aviation enabled' flows<sup>9</sup> and the demand for aviation since these enabled flows bring about changes in the attributes of the economy on both the demand and supply sides. The supply side effects include, inter alia, changes in factor conditions such as the availability of skilled labour, international firms' locational decisions, and the availability of international capital. The demand effects include higher levels of tourism and trade than would otherwise occur.

## **Evidence of competitiveness benefits in London**

- 1.17 As will be set out below, London, as one of the world's very few truly global cities, is vitally important to the UK economy. It generates more wealth and is much more productive than any other region in the UK. Therefore, while the

---

<sup>5</sup> Mariya A. Ishutkina and R. John Hansman, MIT International Center for Air Transportation (ICAT). Analysis of the interaction between air transportation and economic activity: A Worldwide perspective.

<sup>6</sup> R. Prud'homme. Infrastructure and development. In F. Bourguignon and B. Pleskovic, editors, *Annual World Bank Conference on Development Economics 2005: Lessons of Experience*, pages 153–189. World Bank and Oxford University Press, New York, NY, 2005.

<sup>7</sup> A. Schafer and D. G. Victor. The future mobility of the world population. *Transportation Research Part A*, 34:171–205, 2000.

<sup>8</sup> These cover 22 countries not including the UK.

<sup>9</sup> Aviation enabled flows include goods, services, knowledge, tourism, investment, remittances and labour

Mayor recognises the need to rebalance the economy, London will continue to play a crucial role in the economic competitiveness of the whole country.

## The London economy and its importance to the UK

### *Value and structure of London's economy*

- 1.18 London is a £265bn a year economy accounting for more than one-fifth of the UK's Gross Value Added (GVA), as shown in Table 1.1 below. It is the powerhouse of the UK economy and has grown at a significantly faster rate than the UK economy as a whole over the past decade. If London was a country then its GVA per capita would make it the third wealthiest in the world.

**Table 1.1: Regional GVA, 2009**

Region	Per head	Total GVA £(millions)
<b>UK</b>	<b>19,977</b>	<b>1,234,445</b>
North East	15,621	40,369
North West	17,263	119,079
Yorks & Humber	16,569	87,123
East Midlands	17,349	77,223
West Midlands	16,788	91,178
East of England	18,591	107,209
<b>London</b>	<b>34,200</b>	<b>265,171</b>
South East	20,923	176,500
South West	18,211	95,268
England	20,442	1,059,120

Source: ONS, *Regional GVA, 2010*

- 1.19 Approximately 4.3 million people are employed in London, 200,000 of whom are self-employed<sup>10</sup>. The last three decades have seen a significant shift from manufacturing employment in London, which has fallen by around ¾ million jobs since 1971, and a similar increase in employment in business services<sup>11</sup>.
- 1.20 Not only is London's service sector bigger and more productive, it is also far more export-orientated than those in other parts of the UK. While London employment accounts for approximately one seventh of the UK total, the city's service sector exports account for a third of the UK's total<sup>12</sup>. GLA Economics estimated that London's total exports of goods and services in 2008 totalled £66.4bn. Key service exports included: advertising & market research; computer & information services, engineering & other technical services, fund management and securities broking, insurance, legal services, telecoms, management consulting, monetary finance and other business services.

<sup>10</sup> NOMIS, *Business Register and Employment Survey*, 2009

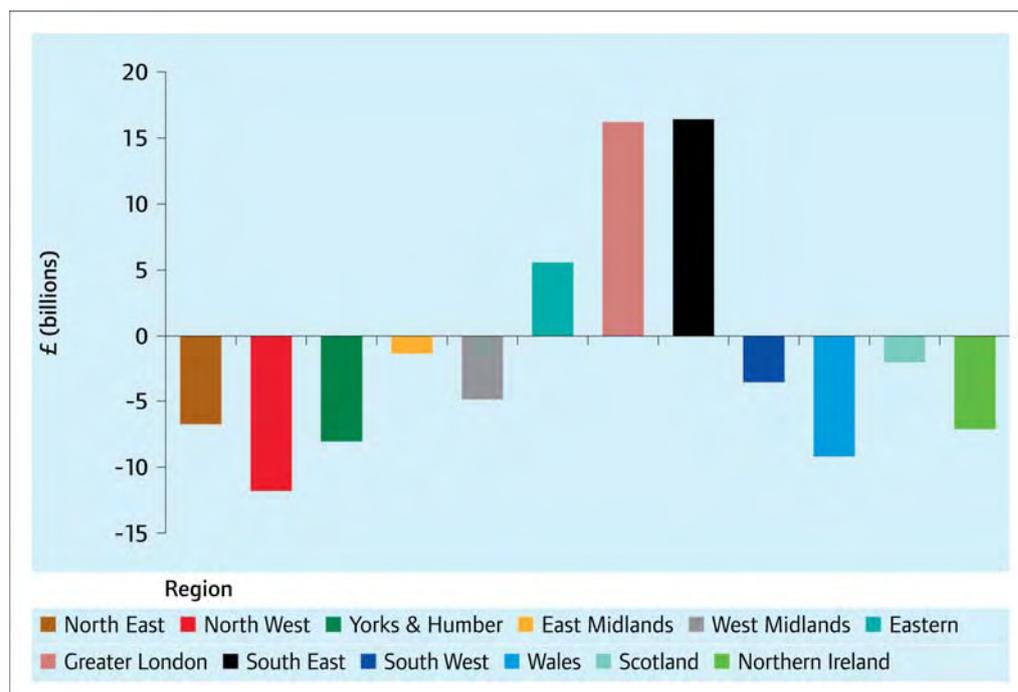
<sup>11</sup> GLA Economics, *Economic Evidence Base to support the London Plan, the Transport Strategy and the Economic Development Strategy*, May 2010

<sup>12</sup> *ibid*

### *Fiscal contribution of London economy*

1.21 For many years there has been a fiscal deficit in most regions of England and the other countries of the United Kingdom, while London and the South East (and to a much lesser extent the east of England) have been the only regions generating a fiscal surplus. The strong dependence of the rest of the UK on net contributions by London and the South East is shown in Figure 1.1.

**Figure 1.1: Regional fiscal contributions, 2006 – 2007**

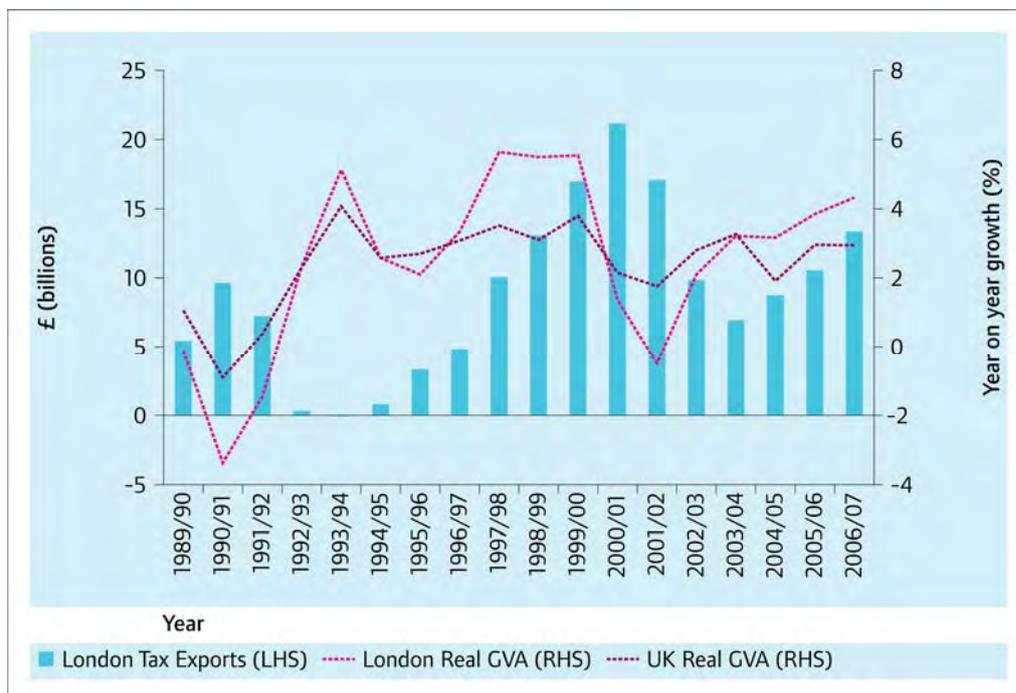


Source: *Innovacion, UK's engine for growth and prosperity: The Greater South East, 2010*

1.22 GLA Economics estimates that London generated a tax export in 2006/07 of between £8.4 billion and £18.4 billion. This represents between 9.5 and 19.1% of all tax revenues generated in London<sup>13</sup>. In fact, London has made a substantial 'tax export' in most years since 1990, as shown in Figure 1.2.

<sup>13</sup> GLA, *Filling the coffers: London's tax export*, November 2008

**Figure 1.2: London and UK real GVA growth and London's 'tax export', 2006/7 prices**



Source: GLA Economics calculations, Experian Business Strategies, 2009

- 1.23 Given the vital role that London plays in contributing to the economic competitiveness of the UK as a whole, the following section focuses on the links between aviation and London's economy.
- 1.24 Aviation is critical to this international competitiveness, and the commercial, air freight and business aviation sectors all help to generate significant economic benefits. Many of the industries and services that allow London to thrive and from which substantial economic benefits are derived are reliant on aviation. The aviation connectivity that London's airports provide has been critical in the decisions of many international firms to locate in the South East. This connectivity has also allowed London to develop a strong inbound tourism industry. Air freight and the business aviation sectors are also crucial in allowing London to compete. The following section outlines how each of these factors play a key role in supporting London's economy.

Commercial aviation and the economy

- 1.25 Commercial aviation is a vital factor in allowing London to play such a key role in the UK and world economy. London has a high level of aviation-reliant businesses and the connectivity aviation delivers is central to many international firms' decisions to locate in the South East. For example, Think London identify 'easy access to other markets and cities' as one of the three main strategic benefits which attract firms to locate in London<sup>14</sup>. This connectivity also allows London to attract Foreign Direct Investment (FDI), which is very valuable to the

<sup>14</sup> Think London, *£52 Billion: The value of foreign direct investment to London*, 2007.

UK economy; The role of inbound tourism is similarly important. These are all explored in more detail in the following paragraphs.

### *Business travel and locational decisions*

- 1.26 Research shows that the purpose of the largest proportion of business trips – both long and shorthaul – is for “internal business purposes for multi-site operations”<sup>15</sup>. These enable companies to share human resources and knowledge across divisions. Face to face contact improves collaboration and produces social network effects which improve firm performance and productivity.
- 1.27 The next most important purpose is to facilitate meetings with external customers. Research by Oxford Economics found that business travel contributes significantly to sales and profit<sup>16</sup>. Using econometric analysis based on data from 14 sectors over a period of 13 years the study found an average return of \$12.5 in revenue and \$3.8 in profits for every dollar spent on business travel in the US.
- 1.28 Firms also benefit by locating near agglomerations of related and supporting industries<sup>17</sup>, such as finance and business services, which in turn can benefit from outbound business travel to access markets beyond their local ones where they need to deliver their expertise to clients at their respective locations.
- 1.29 Business trips also stimulate demand in the local economy. In the US business travel for meetings, conventions, exhibitions and so on accounts for 17% of the air transport industry's operating income and generates more than 36% of the hotel industry's revenue<sup>18</sup>.
- 1.30 There are also links between firms' decisions to locate in a particular location and the availability of leisure travel as well as business travel. For example, locational strategies will be affected by firms' ability to attract high quality employees through the perceived quality of life associated with ready access to a wide range of other regions. Such employees are vital in enabling technology transfer and knowledge spillovers in the local economy. They are vitally important to the objective of establishing a more innovation led economy.

---

<sup>15</sup> See for example, CAA, *Flying on Business – a study of the UK Business Air Travel Market*, December 2010

<sup>16</sup> Oxford Economics USA, *The return on investment of US business travel*, September 2009

<sup>17</sup> Ishutkina and Hansman cite two types of agglomeration effects: localization, or scale, externalities due to the concentration of industries with similar activities, and urbanization, or scope, externalities which occur when heterogeneous industries are placed in proximity.

<sup>18</sup> Convention Industry Council, Alexandria, VA. *The Economic Impact of Meetings, Conventions, Exhibitions, and Incentive Travel*, 2004.

### *Key aviation-reliant sectors in the UK*

- 1.31 Two key pieces of research reveal the sectors with the highest propensity to use air transport services:
- A study by MDS Transmodal on the UK Air Freight Industry for the Department for Transport in 2000<sup>19</sup>, which analysed the purchases of air transport services by the sector based on 1996 input-output tables; and
- 1.32 A study on the contribution of the aviation industry to the UK economy by Oxford Economic Forecasting<sup>20</sup>. high expenditure per employee.
- 1.33 Table 1.2 sets out a refreshed version of the Oxford Economic Forecasting analysis (undertaken by York Aviation on behalf of TfL). This data has been produced using the 2008 UK Input-Output tables and on the basis of criteria similar to those used by Oxford Economic Forecasting in their original 1999 report. The table includes sectors for which aviation accounts for more than 20% of the total transport budget or where expenditure per employee on air transport is over £1,000<sup>21</sup>. There has been little change over time in the composition of sectors which meet these criteria, which indicates that there the set of sectors with a high reliance on air transport is relatively stable. Other than sectors in which transport is inherent to their nature, such as air transport itself, the banking and finance and insurance and pension funds sectors are notable for the high proportion of aviation in their transport expenditure and their high expenditure per employee.

---

<sup>19</sup> MDS Transmodal, *UK Air Freight Study*, 2009

<sup>20</sup> Oxford Economic Forecasting, *The Contribution of the Aviation Industry to the UK economy*, 1999

<sup>21</sup> This has been increased from the original £500 per head used by OEF in 1999 to reflect inflation and changes in the market since the original 1996 Input Output tables.

**Table 1.2: Air intensive sectors of the UK economy and spend per employee, 2008**

Sector	% of transport spend	Spend per employee
Air transport	91.7%	£10,161
Banking and finance	66.6%	£2,178
Membership organisations	63.8%	£183
Other business services	60.8%	£235
Owning and dealing in real estate	59.6%	£395
Market research, management consultancy	57.5%	£371
Insurance and pension funds	56.1%	£4,852
Recreational services	53.1%	£338
Aircraft and spacecraft	52.9%	£981
Letting of dwellings	43.8%	£190
Advertising	43.7%	£969
Postal and courier services	41.7%	£1,761
Auxiliary financial services	39.6%	£207
Other transport equipment	37.8%	£1,727
Accountancy services	36.8%	£319
Legal activities	35.8%	£296
Research and development	34.4%	£197
Computer services	33.8%	£175
Other service activities	31.8%	£145
Ancillary transport services	31.0%	£1,247
Shipbuilding and repair	27.8%	£143
Telecommunications	26.9%	£419
Oil and gas extraction	25.1%	£4,948
Sugar	24.7%	£14,035
Hotels, catering, pubs etc	22.9%	£100
Weapons and ammunition	22.2%	£272
Estate agent activities	21.3%	£42
Architectural activities & tech. Consult	21.1%	£168
Oils and fats processing	13.6%	£1,972
Tobacco products	10.8%	£1,220
Inorganic chemicals, organic chemicals	17.8%	£2,412
Water transport	3.0%	£3,540

Source: York Aviation, 2011

- 1.34 Table 1.3 shows spending on air transport by economic sector both in terms of actual spend and the proportion of total spend on the sector, for the largest spending sectors. The banking and finance sector spent some £1.3bn in 2008 on air transport which equates to 15.6% of all spend on the air transport sector. Over 30% of spend on air transport comes from these sectors, which indicates the degree to which they are dependent on international connectivity.

**Table 1.3: Sectors spending the most on air transport, 2008**

Sector	£ spend on air transport (millions)	% of total air transport spend
Banking and finance	1,284	15.6%
Air transport	901	10.9%
Insurance and pension funds	724	8.8%
Ancillary transport services	578	7.0%
Other business services	459	5.6%
Postal and courier services	447	5.4%
Wholesale distribution	423	5.1%
Recreational services	254	3.1%
Motor vehicle distribution & repair, fuel	248	3.0%
Public administration & defence	238	2.9%
Market research, management consultancy	192	2.3%
Hotels, catering, pubs etc	181	2.2%

Source: CSO, *Input-output tables, 2010*

- 1.35 Many of the service sectors which are found in London concentrate their activities strongly in London. Appendix B provides examples of London's international strength in the finance and business services sectors.
- 1.36 Table 1.4 shows those economic sectors that have a "location quotient" greater than 1.5<sup>22</sup>. These are principally business and financial services and the sectors listed account for a quarter of London's total employment. Although the categories do not match identically, it is clear that there is a high degree of overlap between the sectors highlighted in this table and those shown in high expenditure per employee.
- 1.37 Table 1.2 and Table 1.3. For example, financial and business services and leisure-related activities feature strongly in both sets of data.

---

<sup>22</sup> Those sectors for which the number employed in London is more than 50% higher than would be expected on the basis of a simple distribution of jobs arranged across London's employment base in relation to the UK total.

**Table 1.4: Sectors with a London location quotient greater than 1.5**

Economic sector	Location quotient
Programming and broadcasting activities	4.8
Motion picture, video and television programme production, sound recording and music publishing activities	3.3
Air transport	3.2
Publishing activities	2.5
Advertising and market research	2.4
Activities auxiliary to financial services and insurance activities	2.3
Activities of head offices; management consultancy activities	2.1
Legal and accounting activities	2.1
Financial service activities, except insurance and pension funding	1.9
Security and investigation activities	1.9
Other professional, scientific and technical activities	1.7
Activities of membership organisations	1.7
Computer programming, consultancy and related activities	1.6
Creative, arts and entertainment activities	1.6
Remediation activities and other waste management services	1.6

Source: NOMIS, Business register and employment survey, 2009

1.38 This analysis shows that there is great variation in the degree to which sectors tend to use transport and, within this, air transport. In particular there are a number of sectors which have a particular reliance on air transport and that they tend to be geographically concentrated in London.

#### *Location of key functions*

1.39 Evidence about location decisions regarding head office functions is also instructive. According to Ernst & Young's Inward Investment Monitor, reported by UK Trade & Investment, the UK has been chosen as the location for the vast majority of European headquarters, as shown in Table 1.5<sup>23</sup>. These decisions are made partly on the basis that London has good links to international networks of company facilities, access to highly skilled staff and specialised business services, all of which are part of the interconnected system which links international aviation and London's economic attributes.

<sup>23</sup> UKTI, *European headquarters in the UK: key facts*  
<http://www.ukti.gov.uk/uktihome/aboutukti/localisation/113922.html>, accessed 14 July 2011

**Table 1.5: Location of European Headquarters 1998-2009**

Country of investment	Number	% of Total
UK	469	49.7
Germany	86	9.1
Switzerland	80	8.5
Netherlands	78	8.3
France	77	8.2
Ireland	44	4.0
Belgium	38	2.3
Denmark	22	5.2
Others	49	4.7
<b>Total</b>	<b>945</b>	<b>100.00</b>

Source: Ernst & Young, *Inward Investment Monitor*, 2010

1.40 The importance of international air links is further demonstrated by the fact that offices are heavily concentrated in areas which are within approximately an hour's travel of Heathrow airport. While there is evidence of a concentration of head offices around Heathrow<sup>24</sup>, the main centre of gravity remains London's Central Activity Zone, as shown in Table 1.6.

**Table 1.6: Head office locations in the South East, with location quotient above 2**

District	Location quotient
Hillingdon	6.0
Westminster	4.6
Windsor & Maidenhead	4.5
Milton Keynes	4.3
Hounslow	3.8
Slough	3.3
Kensington & Chelsea	2.6
Surrey	2.5
Lambeth	2.2
Reading	2.1

Source: NOMIS, *Business Register and Employment Survey*, 2009

### *Importance of migration to business*

1.41 A further aspect of London's ability to attract the high value business activities on which the UK economy depends is the availability of labour, much of it of a highly specialized and skilled nature. Changes in the size and structure of the population of the UK's regions shed some light on this issue. London's

<sup>24</sup> The total number of offices in Hillingdon is far lower than in central London boroughs, so fewer head offices are required to increase the location quotient

population is currently close to 8 million, having grown over the last 20 years by 15%. This represents a faster rate of growth than any other English region, as Table 1.7 shows.

**Table 1.7: Population by English region, 1990 / 2000 / 2010, thousands and growth 1990 to 2010.**

Region	1990 (thousands)	2000 (thousands)	2010 (thousands)	Growth between 1990-2010
<b>London</b>	<b>6,799</b>	<b>7,237</b>	<b>7,825</b>	<b>15.1%</b>
East	5,088	5,375	5,832	14.6%
South West	4,668	4,917	5,274	13.0%
East Midlands	3,993	4,168	4,481	12.2%
South East	7,598	7,991	8,523	12.2%
Yorkshire & Humber	4,921	4,959	5,301	7.7%
West Midlands	5,218	5,270	5,455	4.5%
North West	6,829	6,774	6,936	1.6%
North East	2,584	2,543	2,607	0.9%
<b>England</b>	<b>47,697</b>	<b>49,234</b>	<b>52,234</b>	<b>9.5%</b>

Source: ONS, *Mid-Year Population Estimates, 2010*

- 1.42 While much of London's faster population growth is caused by internal migration, it is clear that migration from overseas to London is much higher than to other UK regions. At the time of the 2001 population census, London accounted for just under 14% of the population of England and Wales. This can be compared with the proportions of all England and Wales residents born in selected regions or countries who were residing in London at that time, as shown in Table 1.8. This varies from 31% for those in born in European Union countries to over 50% for those born in the Middle East, Japan and South America. In total 27% of London's population at the time of the 2001 Census was born outside the UK.

**Table 1.8: Proportion of residents in England and Wales, by selected regions of birth, who reside in London**

County/region of birth	Resident in London in 2001	Proportion of groups resident in England & Wales living in London
EU countries	213,475	31%
India	172,661	38%
Middle East	114,392	53%
USA	44,622	31%
South America	44,178	60%
Hong Kong	23,328	27%
Japan	19,185	53%
Malaysia	16,122	35%
China	13,776	28%

Source: ONS, *Population Census, 2001*

- 1.43 More recent data<sup>25</sup> on overseas-born residents does not provide the same level of detail but does show that 34.4% of London residents were born outside the UK compared to 12.2% in England and Wales as a whole. Some 41% of those in employment in London are overseas-born compared to just 15% for England and Wales.
- 1.44 The overall skill levels of London's workforce are also significantly higher than those of every other English region. It seems likely that this is in large measure attributable to London's ability to attract more highly skilled workers, rather than greater attainment by those educated in London than elsewhere. As Table 1.9 shows, while in all other regions the proportion of those in employment qualified to at least degree level (NVQ4) is around a third, or slightly higher, in London it is over half of the working population. London's highly skilled labour force contributes to London outperforming of the UK as a whole by 32.7% in terms of productivity<sup>26</sup>.

<sup>25</sup> ONS, *Annual Population Survey, 2010*

<sup>26</sup> GLA Economics, *Economic Evidence Base to support the London Plan, the Transport Strategy and the Economic Development Strategy*, May 2010

**Table 1.9: Percentage in employment with NVQ4+, aged 16-64**

Region	% with NVQ4
<b>London</b>	<b>51.0</b>
South East	38.3
South West	35.9
North West	35.0
East	32.9
Yorks & Humber	32.5
North East	32.5
East Midlands	32.2
West Midlands	32.0
<b>England</b>	<b>37.0</b>

Source: ONS, *Annual Population Survey, 2010*

- 1.45 London's highly skilled, internationally focussed and highly productive workforce is able to command higher salary levels than the UK average. Full time salaries in the private sector are 37% higher in London than for the UK as a whole<sup>27</sup>. This benefits overall demand in London and also contributes significantly to a London 'tax export', discussed previously.
- 1.46 The high quality of international air links available in London contributes to London's ability to attract and retain this highly skilled, migrant-dependent workforce. They allow workers to maintain social and family links outside the UK and give good access to overseas leisure destinations which will be taken into account as a quality of life issue in decisions about relocation.

### *Foreign Direct Investment*

- 1.47 The benefit of London's perceived accessibility in allowing investors to personally oversee and monitor their investment is a vital factor in the UK's traditional success as both a recipient and source of overseas direct investment. Over the last decade the UK has been the second largest recipient of Foreign Direct Investment (FDI), after the United States, and the second largest source, again after the USA.<sup>28</sup> In 2010/11, over 94,000 jobs were created and safeguarded in the UK by foreign companies' investments<sup>29</sup>. Data from the European Investment Monitor suggests London's share of all UK FDI projects between 1999 and 2009 averaged 33 per cent<sup>30</sup>.
- 1.48 FDI contributed £52 billion each year to London's economy in 2008 and foreign-owned firms created 42% of London's economic growth between 1998 and 2004. The importance of this is demonstrated by the fact that employees of

<sup>27</sup> ONS, *Annual Survey of Hours and Earnings, 2010*

<sup>28</sup> UNCTAD statistics database

<sup>29</sup> *UK Inward investment report, 2010/11*

<sup>30</sup> GLA Economics, *Economic Evidence Base to support the London Plan, the Transport Strategy and the Economic Development Strategy, May 2010*

foreign-owned companies are more than twice as productive as other London workers when measured across all sectors<sup>31</sup>.

- 1.49 The UK's continued ability to attract large scale foreign investment is vital, particularly as emerging economies such as China become increasingly important potential sources of capital (and also locations for UK overseas investment). Good aviation links are considered essential by overseas investors, and the UK has very good links with those countries with which it has long standing major investment links, such as the US. However, the UK has performed significantly less well than other European countries at developing new aviation connections to emerging countries such as China. This is also reflected in the relatively limited development of trade and inbound tourism with China compared with other major European countries. A significant factor is the limited capacity available at the UK's hub airport. This is discussed in more detail in response to Question 12.

### *Inbound tourism*

- 1.50 London, and in particular Heathrow as the UK's only hub airport, plays a special role in facilitating inbound tourism. According to VisitBritain, London airports account for 74% of all visitors arriving at UK airports.
- 1.51 This is reflected in the balance of UK and overseas residents' leisure trips. In 2008 16.8m UK residents used Heathrow for leisure trips while 23.2m foreign residents did so, a difference of 6.4m passengers<sup>32</sup>. At all other airports the number of UK residents' trips exceeds that of overseas residents<sup>33</sup>. Given the disparity between London's ability to attract international tourists and that of most other regions, the Mayor considers that efforts to boost regional performance in this regard are only likely to succeed if London is treated as a gateway, rather than as a rival.
- 1.52 Overseas tourists to the UK support jobs and investment by generating valuable export revenues. While the UK overall has a large trade deficit in international tourism, London remains a significant generator of inbound trips. London has a strong global image, and remains far more attractive as an international leisure location than most other regions of the UK. VisitBritain research over a long period has found that perceptions of Britain are dominated by London. The capital receives half of all the UK's 30m annual overseas visitors, compared to the 9% who visit Scotland and the 4% visiting Wales. London had 11 times as many visitors as Edinburgh, 18 times as many as Manchester, 20 times as many as Birmingham and 23 times as many as Glasgow.
- 1.53 The pattern of recent Brazilian travel to the UK illustrates this further. Visits from Brazil to London have more than tripled since 2003 (from 46,000 to 148,000 visitors in 2010), but travel to the rest of Britain has not followed the same course. Visits to England (22,000 to 30,000), Scotland (2,000 to 7,000) and Wales (negligible to 2,000) have all risen marginally in comparison. The Mayor considers that an aviation policy that penalises the South East will disproportionately penalise inbound tourism to Britain.

---

<sup>31</sup> Think London, *52 Billion: The Value of Foreign Direct Investment to London*, 1 April 2007

<sup>32</sup> CAA, *Passenger Survey Report, 2007 / 2008*

<sup>33</sup> While the situation reversed in the following year according to the CAA *Passenger Survey Report 2009*, with UK residents making 4.9m more leisure trips than overseas residents from Heathrow, this is considered likely to be a short term change reflecting abnormal world economic conditions.

- 1.54 London and the UK seem to be developing much more slowly as a destination for the potentially huge emerging tourism markets of Asia, than other countries in Europe. This is a major concern and is considered in detail in Question 12. It is reflected in the concern that VisitBritain have expressed about relatively slow growth in overall UK airline seat capacity. Figures from [www.capstats.com](http://www.capstats.com) show that between 2006 and 2010 airline seat capacity from international origin markets to the UK increased by 2.9%. In comparison, international seat capacity to France has increased by 6.3% while in Germany capacity has risen by 5.0%<sup>34</sup>.

### *Other personal travel*

- 1.55 It should also be noted that London's health and education sectors generate valuable export revenues, and demand in these sectors is enabled through air transportation. It is particularly important that aviation links are available to support flows of people from emerging economies such as China, for accessing educational institutions in London and the UK.

### *Air freight*

#### *Economic value of air freight*

- 1.56 In 2005, air freight accounted for approximately 0.5% of the UK's international goods movements by weight, compared to 95% by sea, but around 25% of the UK's total visible trade by value<sup>35</sup>. At that time it accounted for 55% of the value of UK manufactured exports to non-EU countries<sup>36</sup>.
- 1.57 Air freight enables access to markets; it can help grow demand for goods to which speed adds value and it is valuable in enabling more efficient production practices. It is commonly used for transporting high-value equipment, machinery and spare parts. Its speed and reliability give it a vital role in reducing inventory needs as part of just-in-time production practices through allowing the routine transportation of high-value components between remote locations within integrated supply chains as well as emergency deliveries. It allows businesses to obtain the benefits of low-cost production overseas while satisfying and stimulating the demand of affluent consumers in domestic markets. Air freight imports of components for just-in-time manufacturing in the UK were valued at £19.5bn per annum in 2005<sup>37</sup>.
- 1.58 Air freight is also used for fast delivery of high value-to-weight manufactured goods with short product life cycles, such as perishable foods and pharmaceuticals (71.3% of the UK's pharmaceutical exports to countries outside the EU travelled by air in 2005).
- 1.59 The products and practices associated with air freight are likely to become increasingly important for the future of UK manufacturing.

---

<sup>34</sup> Visit Britain. *UK Aviation Policy and Future inbound tourism*, October 2011

<sup>35</sup> DfT. *Focus on Freight*, December 2006

<sup>36</sup> Oxford Economic Forecasting, *The Economic Contribution of the Aviation Industry in the UK*, October 2006

<sup>37</sup> Oxford Economic Forecasting, *The Economic Contribution of the Aviation Industry in the UK*, October 2006

### *Express packages sector*

- 1.60 Evidence from UPS illustrates the importance of the express packages sector to London and the UK. A 2006 Oxford Economics Study estimated that each express cargo service generated £63,000 of economic benefit, which compares to £22,000 per passenger service. UPS emphasises the importance of express services to UK exporters, and note that most UK manufacturing is highly specialised in nature. Some of their customers may rely on the delivery of a single part from an overseas supplier to allow them to avoid interruptions in production. Pharmaceuticals, a key sector to the UK economy, often relies on express services to deliver medicines which in many cases are legally required to be transported and safely stored within 24 hours.
- 1.61 UPS also notes that one of the reasons international companies locate in London is the ability to connect to the express delivery networks which link their overseas markets. UPS claim that overall the express sector contributes £1.3bn of economic activity and facilitates £10bn of UK exports.

### Business aviation

- 1.62 Business aviation, which is the use of general aviation aircraft (typically very light jet's (VLJ's) for an exclusively business purpose contributed £19.7bn to the European economy in 2008, the equivalent of 0.2% of the combined GDP of the EU. In the UK it generated £4.2bn of GVA in 2007. It supports 50,000 direct jobs in manufacturing and operations and maintenance.<sup>38</sup> Eleven UK airports appeared in the list of top 50 busiest European airports in 2007.
- 1.63 Business aviation is important in serving the needs of London's economy. In 2007 it accounted for approximately 15% of all departures at London City airport (only 6% at peak times). Biggin Hill is also an important centre, employing around 100 people directly and generating 1,300 jobs in related activities. Farnborough also supports approximately 12,000 jobs in the region (9,600 locally). The availability of business aviation also contributes to the range of aviation services which have a vital enabling impact on London's economy, as discussed above.

## **Evidence of inclusiveness benefits in London**

### Social equity arguments

#### *Importance of VFR trips in London*

- 1.64 London, one of the world's truly global cities, is home to a huge number of overseas migrants. Combined with the UK's historical links across the world, this means that trips to friends and relatives ("VFR trips") are an important part of the aviation sector and deliver significant benefits.
- 1.65 VFR trips have grown more rapidly than the aviation market overall, reflecting the increasing proportion of UK residents born abroad, particularly in London and other large cities, as well as the growing internationalisation of the labour market. There may also be good reasons for valuing the social utility of these

---

<sup>38</sup> PriceWaterhouseCoopers, *The Economic Impact of Business Aviation*, 2009

trips more highly than holiday trips. Visiting relatives overseas will be viewed as a necessity to many people in London and indeed for many the freedom to do this may be seen as a fundamental condition for their willingness to live and work in the UK at all. For others, particularly those on lower incomes with families in distant locations, the availability and affordability of good quality aviation connections is a matter of social justice.

- 1.66 There is generally less flexibility in the choice of destination for VFR trips than for some other types of non-business trips, such as holidays. Holidays can be substituted, so that following a fare rise to a particular destination, for example, a cheaper, possibly less distant, destination may be chosen in its place. However trips to visit friends and relatives cannot be substituted – the destination is fixed.
- 1.67 Furthermore, many VFR trips are longhaul and therefore expensive. People on lower incomes may have to save for years to be able to afford to make them. In these cases even a relatively small percentage increase in the fare may be prohibitive. Equally, such trips are likely to be very highly valued by the individuals concerned and their families. It seems therefore reasonable to pay particular regard to the effect of fare increases and associated taxes and duties on those making these types of trip - and by implication to London's airport capacity needs.
- 1.68 The proportions of leisure trips undertaken to visit friends and relatives amongst leisure travellers resident in the UK for each of the main London airports and Manchester are shown in Table 1.10.

**Table 1.10: VFR and other leisure within UK residents' international leisure trips, % and 000s**

Airport	VFR (%)	Other leisure	VFR (thousands)	Other leisure (thousands)
Heathrow	53.2	46.8	9,384	8,250
Gatwick	23.5	76.5	4,421	14,421
Stansted	52.4	47.6	4,417	4,010
Luton	47.8	52.2	2,230	2,434
All London	41.4	58.6	20,452	29,115
Manchester	17.8	82.2	2,084	9,616

Source: BATA, *Characteristics of Passengers, 2009* [from CAA data], 2009

- 1.69 This shows that there is marked variation in the purposes of UK residents' international leisure trips between airports. The proportion of VFR trips for all London airports is significantly higher than that for Manchester and in volume terms approximately ten times as great, reflecting the distinctively diverse character of London's population as well as its greater size<sup>39</sup>.
- 1.70 There are also major differences between the London airports, likely reflecting the types of destinations served. It is noteworthy that while Heathrow has a

<sup>39</sup> Overall the four main London Airports served six to seven times the volume of passengers as Manchester in 2009

lower overall number of leisure passengers than Gatwick, it has by far the highest number of VFR trips of any airport in the country.

- 1.71 The Mayor considers that to the extent that greater social utility and importance to London attaches to VFR trips than other trips (arising from their special family and social value to minority ethnic people, many of whom are economically disadvantaged) any general loss in connectivity should be treated as more serious to VFR users than to other types of user.

## **The future**

- 1.72 It is clear that the aviation sector delivers significant competitiveness and inclusiveness benefits to the UK, and it delivers these to London in particular. Through encouraging business to base themselves in London rather than in overseas cities, facilitating exports and allowing people to connect with friends and relatives across the globe, aviation plays a critical role in the success of the economy and society of the UK.
- 1.73 London must maintain the connectivity that the aviation sector provides if it is going to continue to thrive. As will be set out in response to other questions in this study, some of the enormous benefits that the aviation sector delivers will be lost if effective solutions are not found to the current and future aviation capacity constraints in the South East.

## **2 What do you consider to be the aviation sector's most important contribution to economic growth and social well-being?**

**The Mayor believes that some types of trip play a particularly important role in contributing to economic growth and social well-being, together with other related policy outcomes such as regional and sectoral rebalancing and addressing the fiscal deficit. In particular, business, inbound tourism, cargo and transfer passengers offer clear benefits in these respects. London's airports, and in particular its hub, play a unique role in serving them, which contrasts with the stronger role point to point airports play in meeting outbound leisure demand.**

**Within the outbound leisure market there are issues of inclusiveness which continuing growth is unlikely to resolve. Approximately 50% of the UK adult population travels by plane at least once in a given year. This proportion has been consistent since 2003 although there has been substantial growth in demand since then. Higher numbers of trips have in fact been taken by a relatively fixed pool of people.**

## **Introduction**

- 2.1 The Mayor of London believes that all aviation sectors make valuable contributions to both economic growth and social well being. The benefits of particular relevance to London were discussed in answer to Question 1. This

answer presents evidence to support the Mayor's view that (i) London's airports, and in particular the hub airport, play a uniquely important role in supporting those elements of the commercial aviation sector which make the most important contribution to economic growth and social well being, and; (ii) without sufficient London hub capacity, aviation services of this type would be under-provided at the national level.

- 2.2 The benefits aviation generates arise through its facilitative role in other activities. It could be argued that it is inappropriate to attempt to make judgments about the relative importance of these different activities and the aviation services which serve them. Some of these are consumption activities, such as holidays, while others, such as business trips and cargo, are associated with the production of goods and services. Since the ultimate objective of producing goods and services is consumption, benefits from the production side cannot be regarded as inherently more worthwhile than those on the consumption side.
- 2.3 In fact the Mayor believes that for many parts of the commercial aviation sector markets already work efficiently to allocate resources appropriately. In particular regional aviation markets for mainly shorthaul leisure trips are well served by regional airports and there are no clear reasons to be believe that this will not continue to be the case.
- 2.4 The Mayor recognises that provided relevant markets are functioning well, it will be difficult to justify promoting certain types of trips over others. The Mayor is very concerned, however, that markets may in fact be failing and in particular, there is a danger of future under-provision of direct longhaul flights which could have serious consequences both for the economy (competitiveness) and social well being (inclusiveness) in London and the UK more generally. The reason price signals cannot be relied upon to stimulate an 'efficient' level of provision in this market is that there are particularly high fixed costs associated with operating direct routes for business purposes alone. The range of direct destinations and frequencies which are served from London are therefore dependent on the consolidation of demand from leisure markets which a hub airport offers. Regulatory constraints on the supply of airport capacity, however, threaten to prevent airlines from being able to coordinate flights to the extent they need to for this 'hubbing' system to work. More evidence about this is presented in Question 13. The implication is that capacity at the hub has a different quality to capacity at other airports, and that spare capacity at non hub airports is not necessarily a good substitute for hub capacity.
- 2.5 The rest of this answer is concerned with demonstrating that the most important contribution to economic growth and social wellbeing would be made by ensuring there is sufficient hub airport capacity. It starts by briefly considering the broad Mayoral and Government policy context. This is followed by consideration of the ways in which the markets for different types of trip are likely to contribute to these policies as well as economic growth and social wellbeing more widely. It then examines the different roles of London airports and regional airports in terms of their respective shares of passengers by trip type. Finally there is an examination of who uses aviation for leisure purposes and how. This shows that continuing growth in the outbound leisure market

(which is much less dependent on hub capacity) should not necessarily be expected to benefit people who are currently excluded from aviation markets.

## Economic policies

- 2.6 The Mayor's economic objectives, which are focussed on promoting London's competitiveness as a global business location, are aligned with the government's economic goals, in particular those associated with the macro-economic rebalancing which is required in response to the fiscal deficit and wider financial crisis. London's economic success is vital to the realisation of these wider objectives. It generates exports through its highly productive service sector economy and it generates a large fiscal surplus (or 'tax export') which effectively subsidises all other regions outside the east and southeast of England (see Question 1).
- 2.7 The Mayor is also committed to making London a more inclusive city and an important aspect of this is ensuring that the aviation needs of residents with family and social connections overseas are properly considered in aviation policy.
- 2.8 Appendix C provides details of the London Plan policy context for London's global, economic and UK role. The Mayor's Economic Development Strategy sets five key economic objectives:
- to promote London as the world capital of business, the world's top international visitor destination, and the world's leading international centre of learning and creativity;
  - to ensure that London has the most competitive business environment in the world;
  - to make London one of the world's leading low carbon capitals by 2025 and a global leader in carbon finance;
  - to give all Londoners the opportunity to take part in London's economic success, access sustainable employment and progress in their careers;
  - to attract the investment in infrastructure and regeneration which London needs, and to maximise the benefits from this investment.
- 2.9 A key national priority is productivity growth. Work by the GLA<sup>40</sup> to support the new version of the London Plan stresses that openness to trade is needed to drive productivity growth. The Government's recent White Paper on trade states "*Trade and investment will be crucial to achieving strong, sustainable and balanced growth. Open markets and globalisation are key to growth*"<sup>41</sup>. It argues, based on long standing economic research, that trade brings greater competition

---

<sup>40</sup> GLA Economics, *Economic Evidence Base to support the London Plan, the Transport Strategy and the Economic Development Strategy*, May 2010

<sup>41</sup> Department for Business, Innovation and Skills, *Trade and Investment for Growth (the Trade White Paper)*, 2011

which in turn drives innovation and efficiency and enables greater specialisation and economies of scale thereby raising productivity.

- 2.10 The UK Government is also committed to the continuing attraction of foreign direct investment (FDI). Ministers recently stated in the annual report on FDI "Our standing in the world and our future prosperity depend on our ability to listen and respond to international business. We must show that we mean what we say, Britain is open for business<sup>42</sup>." While there have been changes in immigration policy the UK still welcomes skilled workers from across the world when they have relevant skills for the UK's economy. The importance of air links in generating trade and investment were considered in answer to Question 1.

## **Economic effects of different types of trips**

- 2.11 The Mayor's views about the benefits of commercial aviation are set out in detail in answer to Question 1. A summary of the broad ways in which the different elements of commercial aviation demand contribute to economic growth, social well being and a range of other policies appears in the table overleaf. The consumption, investment and exports / imports categories are included in order to capture the main ways in which aviation services contribute to economic growth<sup>43</sup>. Government expenditure, the other main category, is not included because it is not significant for commercial aviation.
- 2.12 The intention is not to provide a rigorous analysis of aviation's impact on the national accounts but rather to identify where there are positive and negative influences on growth and the achievement of relevant objectives. It is important to distinguish between direct effects and secondary effects. The former include for example, revenues generated by aviation services themselves while the latter might include the attraction of investment to London which business travel enables.
- 2.13 In addition to economic growth, separate columns showing impacts on tax revenues and inclusiveness are shown in order to capture the broad contribution to the other policies of interest, including contribution to addressing the fiscal deficit. For the purposes of considering the economic growth impacts, tax revenues are not however to be treated as additional benefits to, for example, consumption or export revenues, but rather as a transfer. Inclusiveness is included in order to illustrate the impact on regional and sectoral rebalancing and also the social inclusiveness agenda.

---

<sup>42</sup> Foreword by Secretary of States for Foreign & Commonwealth Affairs and Business, Innovation and Skills to *UK Inward Investment Report*, 2010/11

<sup>43</sup> Using the expenditure method:  $GDP = \text{consumption} + \text{investment} + \text{Government expenditure} + \text{exports} - \text{imports}$ .

	Consumption	Investment	Exports / Imports	Tax revenue	Inclusiveness
<b>Inbound leisure</b>	n/a	n/a	Expenditure by overseas visitors in the UK (net of tax) represents export revenues which contribute to economic growth. Inter alia, this supports investment in aviation services, tourist facilities, infrastructure etc.	Incoming tourists generate indirect tax such as VAT on expenditure in the UK and also direct revenues through APD.	London plays a vital role as the main aviation gateway to the UK. Many tourist visits will include travel beyond London and will generate regional benefits, which will help economic rebalancing.
<b>Outbound leisure</b>	Outbound leisure flights facilitate overseas holidays by UK consumers. This is final consumption expenditure which contributes to economic growth but that part of it which flows overseas is netted off as imports. It is not the case that all of this expenditure flows out of the UK. (Inter alia it also supports investment in UK aviation equipment and facilities etc.) Nevertheless the opportunity cost is likely to be lower consumption and investment in UK based tourism than would otherwise have taken place.		Expenditure overseas by UK visitors represents imports which are a negative item in national accounts for the purposes of calculating economic growth.	Outbound leisure passengers generate revenue through APD but other indirect taxes are foregone on expenditure made overseas which would otherwise have been made in the UK.	Approximately 50% of the population do not fly. Most aviation growth is accounted for by better off groups making more trips rather than previous non users starting to fly.  VFR trips are very important in London including those with family ties overseas in particular.  Leisure trips and education trips are important to people across society, helping to improve well being and quality of life.
<b>Business</b>	n/a	Business flights facilitate investment flows.	Business travel facilitates UK exports of goods and services.	Business travel generates APD. Corporation taxes on enabled activities (especially in London and SE) make a vital contribution to Government revenues, alongside income tax on employment income.	London plays a vital role as the main aviation gateway to the UK. A well connected hub airport should serve the whole UK allowing regional economies to benefit from the global connections it offers.
<b>Cargo</b>	Incoming cargo facilitates the production of finished goods in the UK, although it is not measured as a separate component of GDP. Those elements which are imported are netted off.	Air cargo is part of the supply chain for imported investment goods such as machine tools, which contribute to the economy's productive capacity (and economic growth).	Air cargo enables UK goods to be sold to overseas customers. Air cargo also enables imports of goods for consumption and imports of components for UK production (not separate item in GDP). UK based air cargo services used by overseas firms are a source of export revenue.	Customs duties are levied on goods produced outside the EU. Excise duties are levied on imported alcohol and tobacco products. Also, indirect taxes (VAT) are raised on final consumption of most imported goods.	Cargo services facilitate operation in overseas markets by regional manufacturing businesses and can play an important role in economic rebalancing.
<b>Transfer passengers</b>	n/a	Transfer passengers support the network of direct routes for business which facilitate investment flows.	Transfer passengers generate export revenues through their use of UK based airlines and expenditure in UK airports. Some of these benefits are transferred to UK consumers and businesses through allowing more direct routes and higher frequencies to operate, benefiting UK businesses and consumers.	Transfer passengers do not pay APD. However there is a positive contribution to UK revenues through taxation of UK airline profits and also any VAT paid on items bought during transfer.	n/a
Contributes to desired policy outcome(s)					
Impact contrary to desired policy outcome(s)					

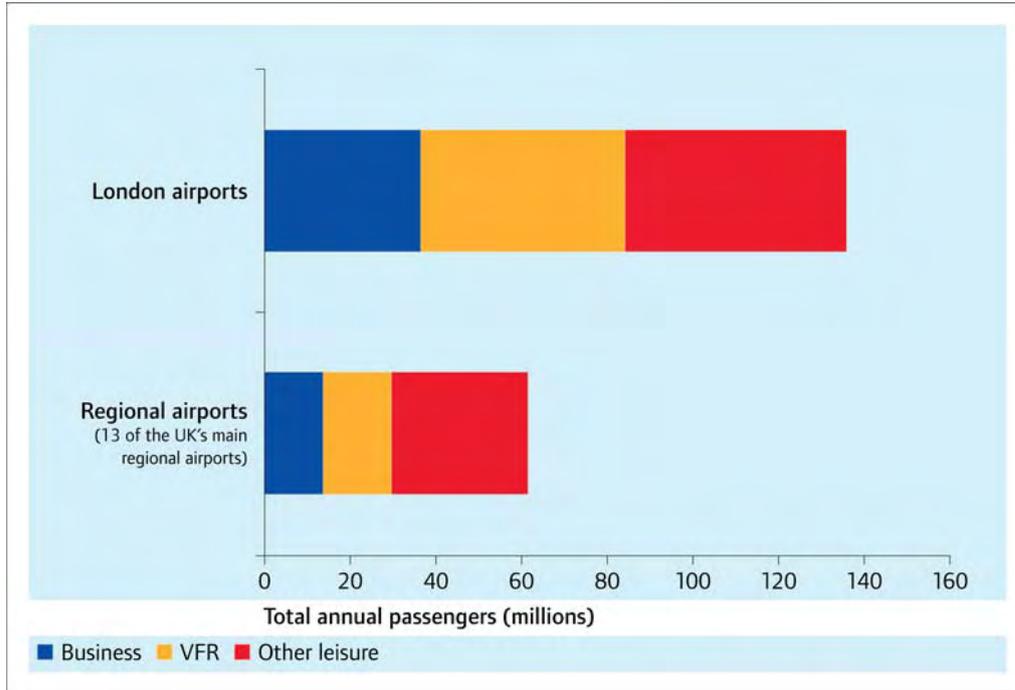
- 2.14 Overall aviation positively influences economic growth significantly, raises substantial tax revenues and benefits regional and social inclusiveness. There are no significant negative impacts from all the markets but one (inbound leisure, business, cargo and transfer passengers). There is a more mixed picture with outbound leisure. Although there are also some benefits associated with this market, it is associated with a negative impact on growth and the balance of trade through generating imports – aviation duties are offset by losses of other taxes as a result of expenditure overseas rather than in the UK. Regional differences in the pattern of aviation use, with respect to these categories of demand are explored in the following section.

## Regional variations in aviation markets

### *Leisure and business trips*

- 2.15 There is regional variation in the nature of the demand for aviation, reflecting the different economic role it plays in various regions. In London, a higher proportion of passengers travel for business purposes, which is a result of the peculiar aviation intensiveness of its economy. As Figure 2.1 shows, while the total volume of trips handled at the London airports is about twice as high as the total handled at the main regional airports, the volume of business trips is approximately three times as high. There are also higher volumes of trips to visit friends and relatives (VFR) from London airports because of the higher proportion of London's population with overseas family and social ties than in other regions. Just over a third of leisure trips at the London airports are for this purpose, which compares to just over a quarter of trips at the main regional airports.

**Figure 2.1: Share of business, VFR and other leisure trips at the London and main regional airports**

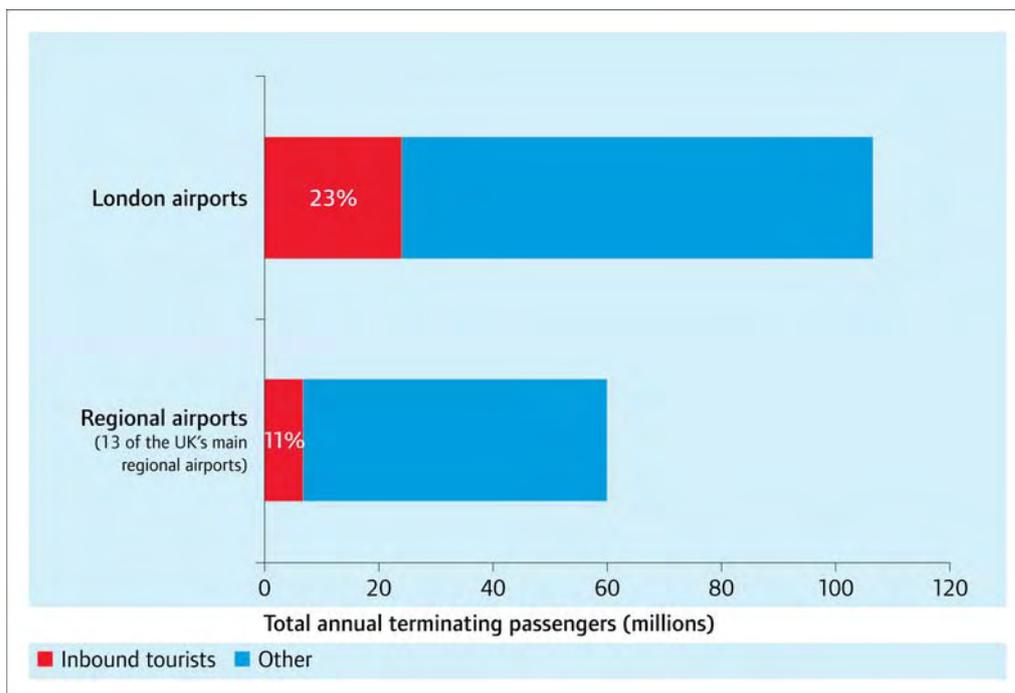


Source: CAA, *Passenger Survey Report, 2007/8, 2008, 2009*.

*(The regional airports sample represents approximately three quarters of total regional demand.)*

2.16 Also, whereas outbound tourists dominate regional airport usage, there is more balance between inbound and outbound tourists in London. While many tourists visit a variety of regions of the UK, they typically see Heathrow and London as the gateway to the UK (and to Europe in some cases). As Figure 2.2 illustrates, while the number of passengers handled at the London airports is less than double the number handled at the main regional airports, the London airports handle almost four times as many inbound tourists as the main regional airports.

**Figure 2.2: Share of all arrivals who are inbound tourists at London airports and the main regional airports**



Source: CAA, *Passenger Survey Report, 2007/08, 2008, 2009* (The regional airports sample represents approximately three quarters of total regional demand.)

### *Air freight*

- 2.17 69% of all UK air freight<sup>44</sup> is carried in the bellyhold of passenger aircraft. The practice is most prevalent on longhaul routes. Based on analysis of airline financial data, the CAA has calculated that bellyhold freight typically contributes between 5% and 10% of total revenue on longhaul services<sup>45</sup>. This contribution is not insignificant, particularly on lower volume (i.e. “thinner”) routes, where such revenues can help maintain the route’s viability and/or help increase frequencies. At the same time, by piggy-backing on passenger services, a direct freight connection can be provided to many more destinations than could be viably supported by a dedicated freighter flight.
- 2.18 In the UK, 87% of bellyhold air freight uses Heathrow, which reflects its status as the UK’s only hub, and dominant role in the provision of longhaul flights. In fact, this constitutes 60% of all UK air freight, and as such Heathrow’s network plays a vital role in supporting freight connectivity for the UK economy.

### Inclusiveness considerations

- 2.19 Aviation use has grown rapidly and, until the recent recession, almost continuously. Although it is clearly now available to a very broad section of the UK’s population for the purposes of overseas leisure demand, it is less clear that its benefits are continuing to spread to people who have not been users in the

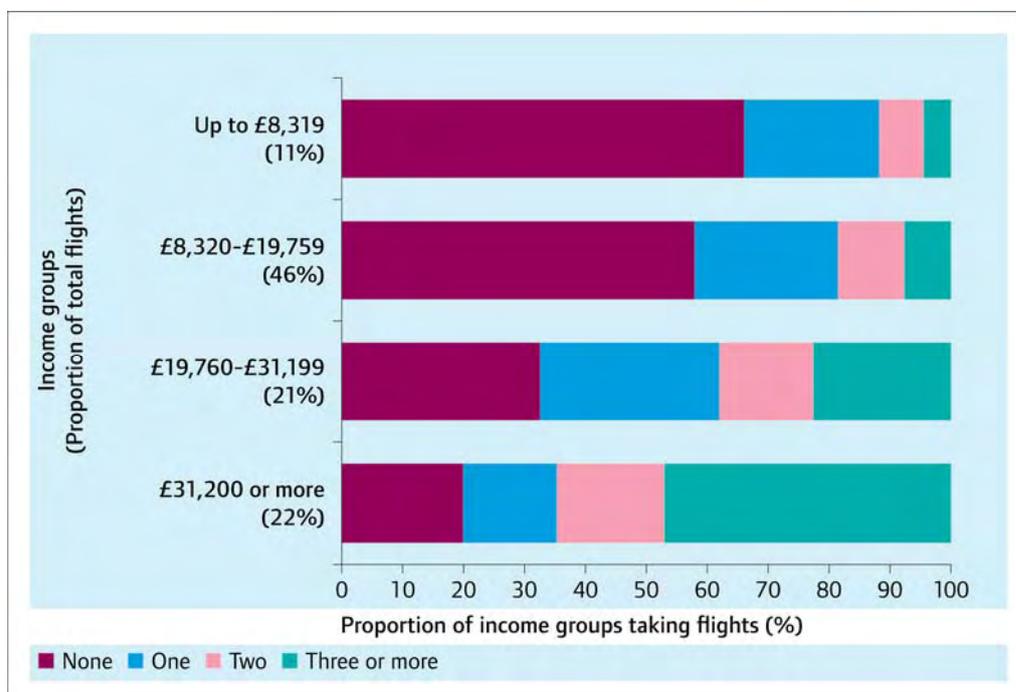
<sup>44</sup> CAA, *Annual UK Airport Statistics, 2010*

<sup>45</sup> CAA, *Connecting the Continents: Longhaul Passenger Operations from the UK, July 2007*

past. The purpose of this section is to examine the extent to which leisure travel by air is socially inclusive.

- 2.20 Traditionally air travel for leisure purposes has been thought of as a luxury, the consumption of which is strongly associated with higher incomes. The overall data relating to aviation use and income level gives some support to this view, since the market remains sensitive to the economic cycle.
- 2.21 Approximately 50% of the UK adult population travels by plane at least once in a given year and this proportion has been consistent since 2003. While there has been growth in demand since 2003, this has been concentrated within a relatively fixed pool of people, who have increased the number of flights they take in a year. The composition of the pool of commercial aviation users is strongly associated with income group, as Figure 2.3 shows.

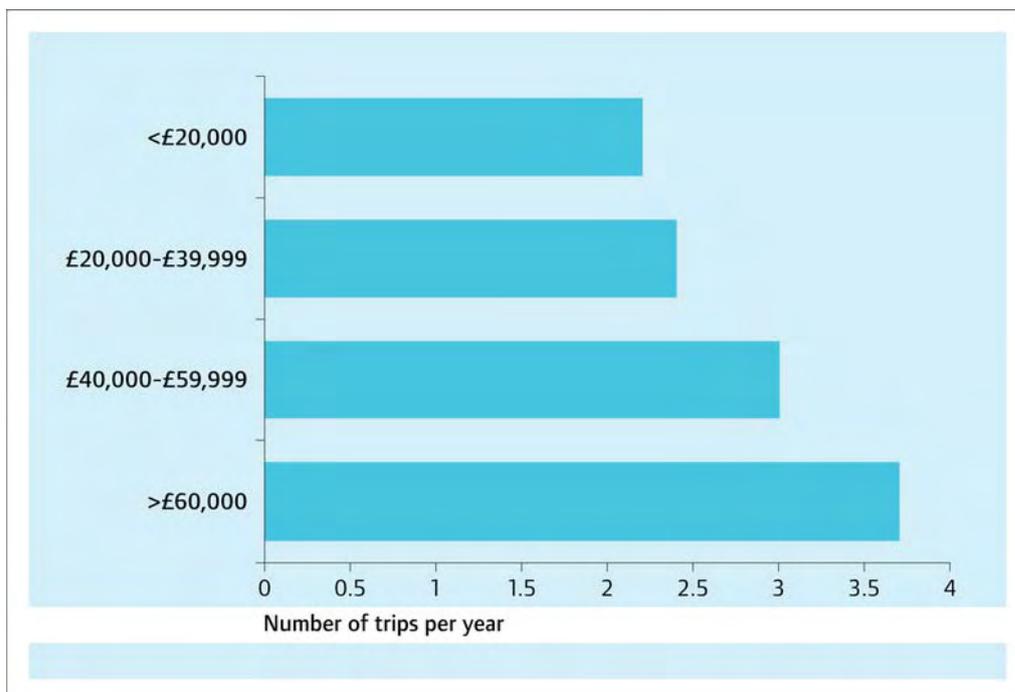
**Figure 2.3: UK air travel by annual income group**



Source: Committee on Climate Change, *Meeting the UK's Aviation Target*, 2009

- 2.22 Within the lower 57% of income distribution (up to £19,759), fewer than half of people use commercial aviation at all. In the upper 43%, the proportion of people who use it is 70% to 80%. Furthermore those in the lower income bands who are part of the pool of users tend to make fewer flights than those in the upper bands, as Figure 2.4 shows.

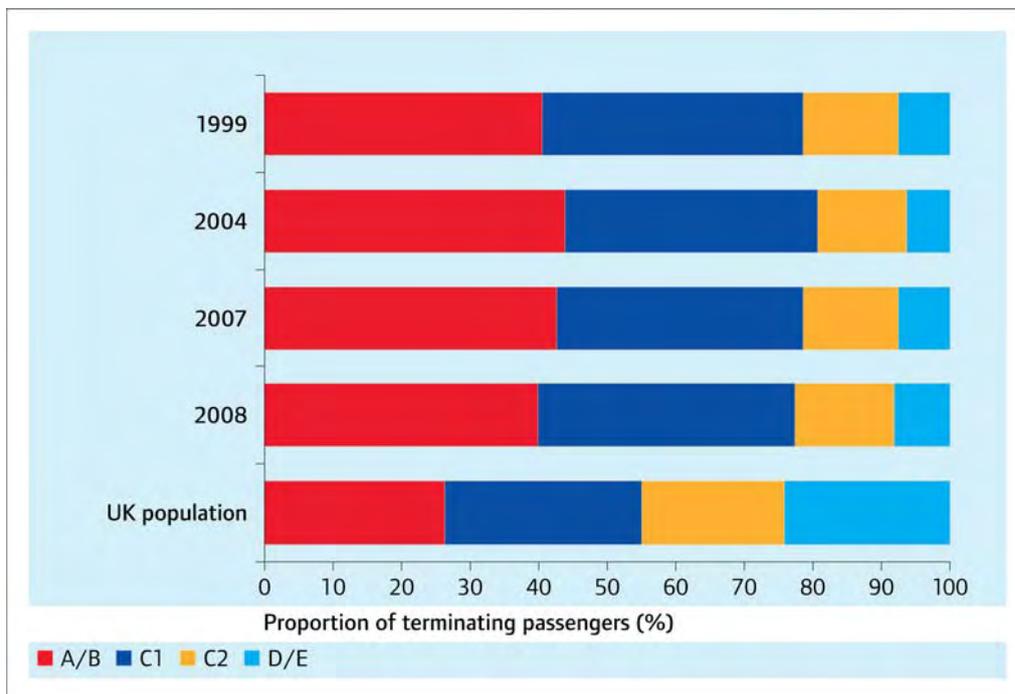
**Figure 2.4: Mean number of trips per air passenger by income group**



Source: *Committee on Climate Change, Meeting the UK's Aviation Target, 2009*

2.23 Aviation users with an income of less than £20,000 make on average two flights per year whereas those with an income of £40,000 to £60,000 make on average 3 flights per year, and those with incomes of £60,000 or more make over 3.5 flights per year on average. Income therefore appears to be an important factor in demand. Generally, the more people earn, the more they use commercial aviation. Data produced by the British Air Transport Association (BATA) bears out this picture. As Figure 2.5 shows, during the ten years from 1999 the relative share of commercial aviation use by each socio-economic group remained broadly constant. The A / B and C1 categories took around an 80% share of the total while only representing around 55% of the population, while the C2 and D / E categories accounted for only 20% or so of aviation use despite representing around 45% of the population. (This data is for all aviation passengers).

**Figure 2.5: Socio-economic groupings of terminating passengers**



Source: British Air Transport Association, *Characteristics of passenger, Various years*

- 2.24 This analysis suggests that it cannot be taken for granted that as aviation growth proceeds it becomes increasingly available to more people in society, i.e. socially inclusive. It is clear that there are very large differences in the rates of usage of aviation according to income and socio-economic class and that these differences are not diminishing. Rather it appears that there is a minority of people in higher income brackets who individually take increasing numbers of holiday flights each year, and account for a disproportionate share of aviation growth. This suggests that leisure demand for aviation generally behaves as a luxury good.
- 2.25 There is a significant caveat to this result. There are two broad categories of leisure demand: that associated with (i) visiting friends and relatives (VFR), and (ii) holidays. It seems less appropriate to view the VFR market as a luxury market than holidays. Overseas visits may be treated more as a necessity, particularly for those people born overseas or with family and social ties overseas. Furthermore VFR trips are less easily substituted than holiday destinations, about which there is more flexibility – holidays can be taken in different locations, and by different modes etc (see Question 3).

## Conclusion

- 2.26 The above analysis has shown, firstly, that there are strong economic benefits arising from most categories of aviation demand (inbound leisure, business, cargo, transfer passengers); secondly, these categories are more strongly represented in the London market, and particularly at Heathrow, the hub airport; thirdly, the benefits associated with outbound leisure are more mixed, both in terms of its impact on economic objectives and inclusiveness. This suggests there

is a policy case for valuing these categories of demand differently and responding to growing demand within them accordingly. The response to the next question considers the extent to which there are effective substitutes for each of these, and other, categories of demand, before concluding that there is a strong case for policy to specifically support hub capacity.

### **3 Are some sub-sectors of aviation more important than others? If so, which and why?**

**While some types of aviation trip can be substituted by other means, there are many trips for which there is no effective alternative:**

- (i) High speed rail can be an effective alternative mode on most domestic and some shorthaul routes in business and leisure markets but overall cannot be expected to play a big role in relieving capacity at Heathrow;**
- (ii) In the leisure sector, there is some potential to substitute alternative destinations in the case of outbound tourism;**
- (iii) In the business market, the evidence suggests that virtual meetings using electronic media can offer no more than a marginal role in reducing the need to travel to particular destinations for face to face meetings;**
- (iv) Alternative routes are feasible for some types of trip. For example most leisure travellers to longhaul destinations are willing to consider indirect as well as direct routes, particularly if they can save money in exchange for accepting the longer journey times and greater inconvenience;**
- (v) Business users place a high premium on the availability of direct connections and relatively high frequencies. For 20 sampled routes, while 24% of passengers travelled indirectly, 13% of business passengers did, i.e. the willingness of business travellers to travel indirectly was just over half that of passengers as a whole;**

**Airlines operate routes to serve a range of trip purposes, including business, tourism and visiting friends and relatives. The high fixed costs of operating individual routes mean that demand from different types of user could not be viably met without being consolidated.**

**Since some passengers, particularly leisure travellers, are willing to use indirect flights, it is possible to consolidate demand at hub airports. This generates benefits for the business travellers and others who require direct connections by broadening the range of destinations which can be viably served directly, and increasing frequencies which can be offered. It is therefore the Mayor's case that London's hub airport plays a vital**

**role by facilitating the viable operation of routes which serve the trips which can least easily be substituted.**

## Introduction

- 3.1 Clearly the commercial passenger and cargo aviation sectors are by far the most important in terms of the benefits they generate for London's economy and the welfare of its population. Within the commercial aviation sector it is possible to consider a number of distinct markets, both in terms of the operation of airline services (longhaul / shorthaul) and in terms of trip purposes by individuals, (business / leisure). Leisure trips can be further split into different kinds of trip according to whether they are for tourism or visiting friends and relatives. A further distinction is between trips by UK residents and overseas residents. A useful means of identifying whether some of the sub-sectors of aviation are more important than others is to identify the degree to which various categories of aviation demand can be substituted and this has been adopted in answering this question.

## Alternatives to travelling at all

- 3.2 The mechanisms by which air passengers play enabling functions in the wider economy were identified in Question 1. The question arises as to whether for some trips the same benefits could be realised by other means, such as conference calls and other forms of remote electronic communication. Evidence cited by Ishutkina and Hansman indicates that much business travel cannot easily be substituted by such means:

*"Since its introduction in the 1970s, it has been suggested that virtual intra-company meetings via videoconferencing would reduce the demand for business passenger travel. However, studies have had only inconclusive evidence regarding the actual impact, indicating that the substitution effect has been rather limited"<sup>46</sup>*

- 3.3 This seems to suggest that despite the 'information revolution', face-to-face contact remains, and will remain, an essential element in conducting business. Given the low cost of electronic alternatives, it seems clear that the business travel which is undertaken cannot be easily substituted by other forms of communication.

## Alternative destinations

- 3.4 The destination is fixed for many types of trip, including most business trips and personal trips, such as travel to visit friends and relatives, and travel for health and education reasons. Outbound tourism trips, however, can be considered to be more flexible, since holiday destinations are to a reasonable degree good substitutes for one another, although clearly individuals' preferences will vary in this regard. Inbound tourism trips are similarly flexible, and it should be noted that if the UK wants to attract more international tourists it should consider the quality of aviation connections which are likely to attract them.

---

<sup>46</sup> Denstadli, J.M, 'Impacts of videoconferencing on business travel: the Norwegian experience', *Journal of Air Transport Management*, 10(6):371–376, November 2004

## **Alternative modes**

- 3.5 High speed rail could in principle offer an effective alternative to flying for many domestic trips and some shorthaul trips. This is discussed in detail in Questions 18 and 19.

## **Indirect travel**

- 3.6 People travelling for certain purposes, such as visiting friends and relatives, appear to be more willing to trade off the journey time and degree of convenience associated with direct travel for other attributes such as lower prices. Business travellers however are far less willing to sacrifice journey time, convenience and frequency and are generally much less willing to take indirect flights, as Table 3.1 shows. The variation in the scale of the difference from route to route is largely due to available capacity and the range of alternative indirect hub options available. While leisure passengers will tend to be more price driven, the business passenger will pay a premium if necessary to enable them to take the most direct option when available, valuing the time and convenience of the direct option. In other words, if one is to support business travellers and their ability to trade internationally, one should be seeking to maximise international connectivity through the widest possible range of direct flights.

**Table 3.1: Split of Direct and Indirect Passengers by Selected Routes, 2010**

Origin/destination	All passengers		Business passengers	
	Direct	Indirect	Direct	Indirect
Accra	71%	29%	82%	18%
Auckland	25%	75%	72%	28%
Bangkok	53%	47%	88%	12%
Beijing	71%	29%	86%	14%
Delhi	79%	21%	73%	27%
Hong Kong	91%	9%	92%	8%
Hyderabad	23%	77%	26%	74%
Islamabad	78%	22%	70%	30%
Johannesburg	58%	42%	80%	20%
Karachi	63%	37%	66%	34%
Kingston	96%	4%	95%	5%
Lagos	84%	16%	89%	11%
Los Angeles	88%	12%	96%	4%
Melbourne	26%	74%	63%	37%
Mumbai	72%	28%	70%	30%
Nairobi	86%	14%	80%	20%
New York (JFK)	97%	3%	95%	5%
San Francisco	91%	9%	88%	12%
Shanghai	92%	8%	99%	1%
Sydney	41%	59%	66%	34%
<b>Average of sampled routes</b>	<b>76%</b>	<b>24%</b>	<b>87%</b>	<b>13%</b>

Source: CAA, Annual Passenger Survey, 2010

- 3.7 It would be tempting to argue on this basis that direct flights to business locations are more important since leisure passengers have more alternatives available to them. This however would fail to recognise that airline routes consolidate leisure and business demand (as well as cargo). Many longhaul routes require both 'high yield' business passengers and 'volume' leisure travellers to be viable. The survival of a number of direct routes may only be possible if UK based leisure travellers and 'interliners' from overseas use them in addition to business passengers. This is examined further in answer to Question 13.
- 3.8 A more appropriate approach would be to recognise that some routes are more likely to contribute to the complex economic enabling flows discussed in response to Question 1 than others and that these are highly concentrated at the London airports and in particular Heathrow, the only hub airport, as was demonstrated in answer to Question 2. This suggests that there may be good policy reasons for encouraging the limited aviation growth which is available to be concentrated at London's hub airport.

## 4 How do you think the global aviation sector will evolve in the medium and long term (twenty to fifty years)? What do you expect to be the most significant changes?

Forecasts from aircraft manufacturers suggest that worldwide demand is likely to more than double in the 20 years to 2030. Although the highest rates of growth are between and within emerging nations, mainly in Asia, established markets are expected to account for a large proportion of absolute growth, building on their existing base of demand. In fact, over a third of all aviation growth is forecast to take place within Europe or between Europe and other regional blocs. Growth between Europe and emerging longhaul destinations is expected to be very strong.

The aviation industry appears destined to continue to open up to new competition, allowing new players to enter the market; new technological solutions will be found to enable airlines to use bigger planes where demand warrants it and smaller planes on longhaul routes, which will allow previously unviable direct longhaul routes to be operated. This means London is likely to need much expanded hub airport capacity in order to benefit from economic and technological developments over this period.

In addition, it is likely that the number of hubs airports in Europe will decrease, with a small handful of mega hubs emerging. While London should be a leading contender to host one of these, its potential to do so is limited by Heathrow's severe capacity constraints. In the event that this handicap remains, London and the UK could become effectively a branch line destination, with a much reduced network of direct routes and lower frequencies.

### Passenger growth

#### Growth by world region

- 4.1 All the available evidence indicates that over the next twenty years, and beyond, the demand for aviation will grow substantially. Forecasts from aircraft manufacturers Airbus and Boeing suggest that demand is likely to more than double in the 20 years to 2030<sup>47</sup>.
- 4.2 Figure 4.1 below shows the distribution of expected global growth between 2010 and 2030. Over a third of all aviation growth is forecast to be within Europe or between Europe and other regional blocs. It is important to note that although growth rates in intra-European routes and routes to North America are not as high as for other world regions; the substantial starting demand base means that in absolute terms this element generates a higher number of additional flights.

---

47 Airbus, Global Market Forecast, 2011, and Boeing, Current Market Outlook 2011-2030, 2011

**Figure 4.1: Forecast percentages of overall global aviation growth by regional flow, 2010-2030**

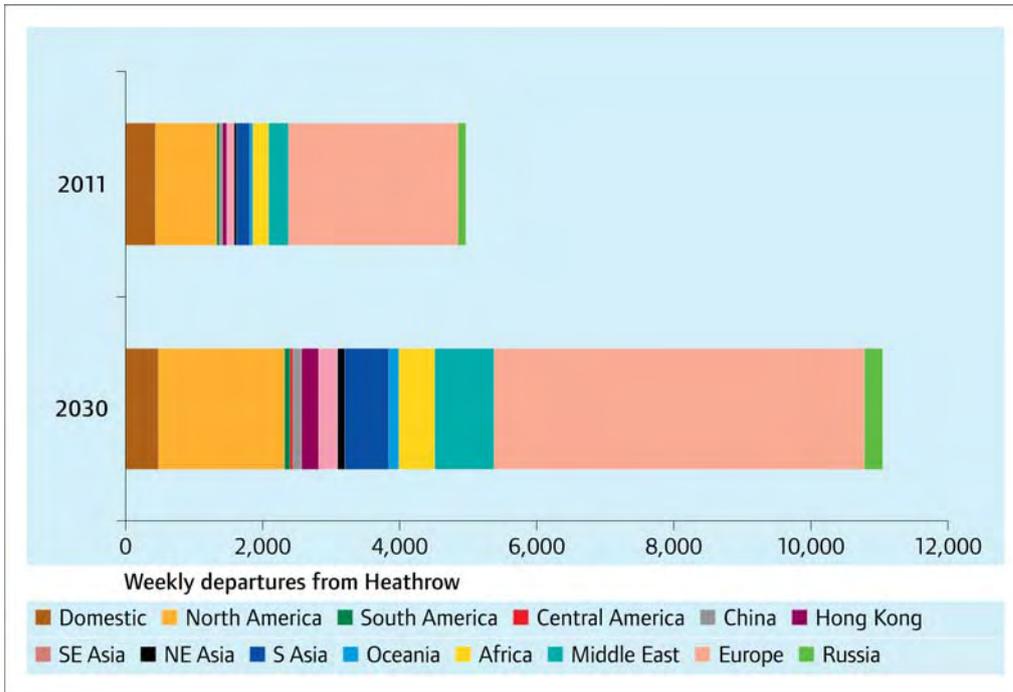


*\*No data for future Europe to Oceania traffic provided by Boeing*

Source: Boeing, *Current Market Outlook 2011-2030*, 2011

- 4.3 The implications of these market outlooks are that whilst attempting to cater for new demand from emerging destinations and fast growing routes, the UK will need to be able to accommodate an even greater quantum of growth on well-established routes.
- 4.4 Figure 4.2 illustrates how growth is forecast to occur on routes to and from Heathrow. The airport would need to expand significantly, more than doubling in capacity, if demand on its current network were to grow at the rates implicit in the Airbus and Boeing regional forecasts.

**Figure 4.2: Projected change in weekly frequencies from Heathrow, 2010-2030**

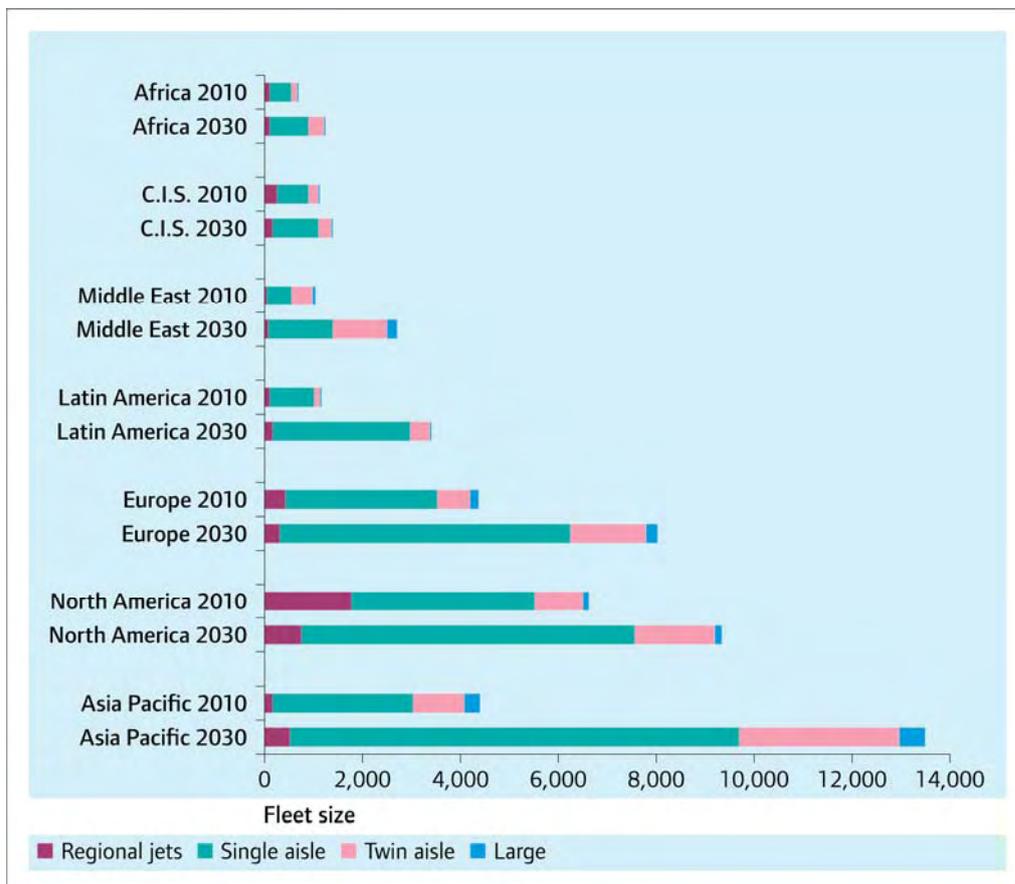


Source: OAG, OAG Schedules Data, June 2011 & Boeing, Current Market Outlook 2011-2030, 2011

### Aircraft fleets

- 4.5 Airlines are responding to growth by ordering more aircraft, chiefly from the two main manufacturers, Airbus and Boeing, and also replacing older aircraft with more fuel-efficient models. American Airlines recently placed the single largest ever order for new aircraft and will take delivery of 260 new Boeing 737s and Airbus A320s including 130 A320neos that promise lower emissions and fuel savings of as much as 15% over current engines. A host of Middle Eastern and Asia airlines are among others committed to similar orders.
- 4.6 Figure 4.3 shows the expected increase and regional distribution of different sized aircraft in 2030 compared to today.

**Figure 4.3: Changing aircraft fleet sizes, by region blocs, 2010-2030**



Source: Boeing, *Current Market Outlook 2011-2030*, 2011

- 4.7 It is worth noting developments in the types of aircraft and their likely impacts on the shaping of the sector. In particular, a number of new longhaul aircraft have been (or are soon to be) introduced, which are expected to have a profound impact on the industry.
- 4.8 The launch of the Airbus A380, the biggest passenger plane ever built (carrying as many as 840 passengers in an all-economy configuration) and to- a lesser extent- the Boeing 747-8 will provide additional capacity between some of the world's biggest hubs. The A380 is being deployed both on the busiest longhaul trunk routes (e.g. London Heathrow-Singapore) and key domestic and regional routes (e.g. Beijing-Guangzhou). This offers a means of increasing the effective number of passengers which can be accommodated in a given a landing slot. However it is not clear to what extent such aircraft are able to increase overall capacity at runway-constrained airports such as Heathrow since demand to all destinations is not always conveniently 'parcelled' into units that lend themselves to the operation of very large aircraft at high frequencies. Also, while larger aircraft will increase the utilisation of scarce runway slots, their greater wing span will place more pressure on space for taxiways and stands, which is also highly constrained at airports such as Heathrow.
- 4.9 Other developments in aircraft technology will facilitate a broadening of the route network and enable viable operation of new longhaul routes. This will have the effect of reducing the average number of passengers on aeroplanes on

longhaul routes, with corresponding changes in the 'efficiency' of landing slots. In particular the Boeing 787 and the Airbus A350 will match the range of existing longhaul aircraft, but carry as few as 250 passengers at a cost per seat kilometre that is comparable to existing aircraft. They therefore have the potential to open up new longhaul routes between city pairs which do not have the demand to support the higher-capacity longhaul aircraft that are currently available. This development may also allow some broadening of longhaul networks at UK airports other than Heathrow.

### Route liberalisation

- 4.10 Historically, the aviation industry has been shaped by some of the strictest regulations and controls attached to any industry. Airlines have been limited in the routes they could operate, the airports they could serve, the frequency and capacity they could offer and even the prices they could charge. The industry is now subject to increasing liberalisation and it is likely that demand from foreign airlines wishing to fly to the UK will increase. It should, however, be noted that the London airport of choice for most airlines other than low cost carriers (LCCs) is Heathrow, which has a very limited availability of landing and take-off slots.
- 4.11 Existing bilateral agreements are likely to require renegotiating into multilateral agreements specifying how many flights can enter or leave the EU rather than individual member states. London may lose out as less constrained competitors' travel markets develop.
- 4.12 Although airlines have been slow to take full advantage of the rights enshrined in the EU's Open Skies Agreement with the US, there are likely to be more carriers who wish to serve the highly lucrative London to North America markets, particularly when the global economy recovers from the events of recent years. While this will be a positive development for London, it will put more strain on existing airport capacity.
- 4.13 Moreover, this is likely to be the first of several such deals. Similar agreements have already been reached with Georgia, Morocco and Jordan among others, but in the medium-to-long term, this will also likely include some of the major developing economies in the Far East and elsewhere. Tapping into the world's fastest growing aviation markets, again the likelihood is a very substantial increase in traffic to/from the EU.

### Industry consolidation

- 4.14 Over the last decade there has been a wave of airline consolidation as US and EU regulators have accepted the need for fewer, stronger carriers. Such mega mergers have included Delta-Northwest and United-Continental in the US and in Europe, Air France-KLM and British Airways-Iberia. Lufthansa has taken over Swiss, Austrian Airlines, Brussels Airlines and bmi. This consolidation is likely to continue in the future as economic pressures drive airlines to cut costs and governments move to further relax ownership rules. Over the next twenty years, this is likely to leave a handful of big carriers based in each region – some of which will in turn merge if inter-regional consolidation is permitted. In Europe, this process is likely to coalesce around the leading airlines in the existing three alliances, i.e. British Airways, Lufthansa and Air France.

- 4.15 The more developed US market suggests that this will be accompanied by rationalisation of routes and hubs. Today's European aviation market is characterised by many more hubs than the larger US market, where the 'hub and spoke' model is most advanced. It is not unreasonable to envisage that, as the industry's organisation becomes less nationally oriented, it will seek to operate fewer, bigger hubs, since this will maximise the efficiency of their operations.
- 4.16 This process is likely to leave airports unable to fulfil a major hub role in a position akin to a branch line, with a much reduced point to point network. It would therefore be to the UK's detriment if London did not survive as a major hub. While London should be a leading contender to host one of Europe's mega hubs, its potential in this regard is limited by Heathrow's severe capacity constraints.

## **5 How, and within what constraints, can aviation growth occur as technological developments and improved operating procedures reduce CO<sub>2</sub>, pollutant emissions and noise impacts?**

**The Government's Committee on Climate Change expects continuing advances in technology and operating procedures to facilitate substantial aviation growth. In 2009 they recommended that in a 'likely' scenario, the UK could meet its climate change targets if air passenger demand growth was limited to 60% between 2005 and 2050. The Mayor is fully aligned to this stance. Nevertheless, the Mayor believes that there is a strong case for prioritising growth at a London hub airport and that an increase in London's share of total UK demand from its current 60% is consistent with additional benefits accruing to the whole UK as a result.**

**Air pollution around Heathrow is significantly more intense than in other parts of outer London<sup>48</sup> and hundreds of thousands of the airport's neighbours are affected by the noise it creates. Technological improvements are unlikely to offer an adequate solution, even in the long-term. In order to protect the health and wellbeing of hundreds of thousands of Londoners, the Mayor will oppose any fresh attempts to build a new runway or introduce permanent mixed-mode operations at Heathrow. The Mayor believes that alternative locations for a hub airport could allow substantial aviation growth without causing unacceptable environmental damage.**

- 5.1 The 2008 Climate Change Act places a duty on the Government to ensure that UK industry-wide emissions of six key Greenhouse Gases are at least 80% lower in 2050 than they were in 1990<sup>49</sup>. The Mayor has set a target for London to

---

<sup>48</sup> Greater London Authority, *The Mayor's Transport Strategy*, 2010

<sup>49</sup> Climate Change Act Legislation, 2008

- achieve a 60% reduction in CO<sub>2</sub> emissions by 2025 when measured against 1990 levels<sup>50</sup>.
- 5.2 The recommendation of the Committee on Climate Change (CCC) report in 2009 was that aviation policy should be based on the assumption that passenger demand growth to 2050 does not exceed 60%<sup>51</sup> if aviation emissions in 2050 are not to exceed 2005 levels<sup>52</sup>.
- 5.3 This would result in a maximum throughput for the UK's airports in 2050 of 380 million passengers per annum (mppa) which equates to growth of about 150 mppa. Earlier in 2011 the Mayor set out the implications of these limits for London and the UK<sup>53</sup>. On the assumption that the proportion of the UK's passengers which use London's airports remains constant, this implies that they could accommodate an additional 85mppa in 2050<sup>54</sup>. Clearly, if the argument that a well functioning hub airport in London offers the most benefits not only to London but the whole UK is accepted, then there is a good case for arguing that London should handle a higher percentage of total UK demand than 60%.
- 5.4 The Mayor is confident that the CCC's 'likely' scenario includes reasonable and fair assumptions for aviation improvements. This has been reinforced through discussions between TfL officials and a number of organisations who have close involvement in technological developments in aviation. Key points are reported in Appendix D
- 5.5 The Mayor is responsible for ensuring continued improvements to the quality of life of Londoners. Irrespective of developments in aircraft technology, he views the local negative environmental impacts of London's airports, especially Heathrow, as a major issue which should rightly constrain *aviation growth at particular locations*. As Figure 5.1 shows, air pollution around Heathrow is significantly more intense than in other parts of outer London<sup>55</sup> and millions of the airport's neighbours are affected by the noise it generates.
- 5.6 In order to protect the health and wellbeing of hundreds of thousands of Londoners the Mayor will oppose any fresh attempts to build a new runway or introduce mixed-mode operations at Heathrow.

---

<sup>50</sup> Greater London Authority, *The London Plan*, 2011

<sup>51</sup> and 55% in terms of air traffic movements

<sup>52</sup> CCC, *Meeting the UK aviation target – options for reducing emission to 2050*, 2009

<sup>53</sup> Greater London Authority, *A new airport for London – Part 1*, 2011

<sup>54</sup> *ibid*

<sup>55</sup> Greater London Authority, *The Mayor's Transport Strategy*, 2010

**Figure 5.1: NO<sub>2</sub> annual mean concentrations (µg/m<sup>3</sup>), 2008**



Source: Greater London Authority, *The Mayor's Transport Strategy*, 2010

**6 How should decision-makers address trade-offs or competing interests, where these occur both (a) between different aviation objectives, e.g. CO<sub>2</sub> emissions versus local noise reduction, and (b) between aviation and other sectors, e.g. airspace use versus renewable energy objectives, or the use of land for maintaining a viable network of smaller airfields versus housing development?**

Aviation is highly controversial because not only does it generate enormous economic and social benefits and very substantial social and environmental disbenefits, the scale and nature of these operate over the long term and are difficult to measure. It is clearly important that decisions are fully informed by technical evidence, and through transparent decision-making processes. It is also inevitable that a degree of expert judgment will be required. The Government has the benefit of a highly respected and organised panel of experts to advise on the climate change impacts of aviation (the CCC for instance) but it is not clear that authoritative advice is available through similar means with respect to other important impacts, and in particular the economic impacts, which also operate over a long time period, and are both profound and to a degree uncertain.

- 6.1 Aviation polarises opinion and there will be many different views about how to balance the economic benefits of air travel with the sustainability challenges. The Mayor's position is one which is subject to such tensions. For instance, while it is in the Mayor's remit to ensure London's continued economic prosperity and world city status, he must also consider the quality of life and amenity enjoyed by those affected by the local environmental impacts of Heathrow and London City airports.
- 6.2 The noise impacts of aviation generate perhaps the most emotive debate. While new aircraft have become substantially quieter in recent years, the perception of noise is relative and residents' reports of disturbances have not decreased in this time. Noise from aircraft will continue to raise complaints as long as aircraft remain one of the loudest environmental sounds people regularly experience.
- 6.3 Aircraft are becoming cleaner and more efficient. Today, approximately five per cent of UK greenhouse gas emissions come from aviation. The aviation industry must continue to ensure that growth is sustainable, and emissions targets are met.
- 6.4 Trade-offs are also necessary between economic, environmental and safety issues. For instance, approaches to reduce the CO<sub>2</sub> emissions of aircraft can increase the noise produced. Likewise, while additional runways might reduce the need for aircraft to stack, reducing emissions, the additional flight paths opened up will increase noise exposure.
- 6.5 However, while it is unavoidable that trade-offs will need to be made in the development of aviation policy, some courses of action can minimise this need. For instance, a new hub airport in the Thames estuary could potentially offer a holistic, sustainable solution to both aviation and some of the UK's strategic energy needs, enhancing economic opportunities for local communities, and minimising exposure to aviation's local environmental impacts.
- 6.6 New capacity can only be acceptable if it values and takes into consideration a range of legitimate concerns. In the UK, the Civil Aviation Authority and a number of Government departments provide guidelines for decision-making. Government policy ensures that competing interests are balanced. Political decisions should be fully informed by technical evidence and the economic and environmental arguments should be properly understood.

## **7 Should some aspects of UK aviation be considered to be of strategic national interest (e.g. certain airports, air traffic control)? If so, based on what criteria?**

**Yes. The Mayor believes that a hub airport in the South East is of strategic national interest. A hub airport is necessary to ensure that there is adequate frequency and breadth of destinations available to serve business and leisure travellers' needs. Hub airports effectively 'correct' the market failure associated with the high fixed costs of operating air services, longhaul routes in particular. In the absence of**

**sufficient hub capacity being provided, there is a danger that there will be under-provision of such services in the UK– they will not simply transfer to smaller airports with spare capacity. As set out elsewhere, the vital role that London plays in the UK economy and the importance of aviation connections to this economic strength means that an effective hub airport must be located in the South East.**

**The requirements of an efficient hub airport are: efficient and resilient operations, the slot capacity to support extensive international and domestic route networks and permit hub 'wave' operations with competitive connecting times, sustainable and high quality surface access and the ability to offer a first-class experience to passengers.**

## **London hub as a strategic asset**

- 7.1 Our answers to Questions 2 and 10 argue that London's direct business connections to the rest of the world and their future development offer strong business competitiveness, and bring inclusiveness benefits to London and the UK. Moreover, we argue there are good reasons for supposing that there would be 'market failure' in the absence of available capacity at a large hub airport at which demand can be consolidated. In a constrained infrastructure scenario there is a danger that by relying on using available capacity at existing airports, such flights will be unviable and the vital benefits available to wider society from aviation would be lost. This would jeopardise London's position in the global economy and have severe consequences for the UK's international competitiveness. There are also legitimate concerns about the fairness of such a solution, as described in answer to Question 3. The fundamental reason for market failure in producing the most economically efficient result (i.e., penalising smaller but economically important categories of travel) is that the cost function facing airlines is 'lumpy'. In other words, aviation cannot be supplied in individual units but only in 'aircraft sized' units.
- 7.2 A direct longhaul route in particular requires a certain threshold of demand to be reached before it can be served. This means that passengers with different trip purposes and preferences have to be pooled. Even after this threshold has been reached, and the route is viable, there are additional benefits arising from a larger market, since higher frequencies can be achieved. This means that the bigger the market, the better the offer at the individual level – and the market failure which penalises small but important categories of travel diminishes. In short a hub airport provides an environment in which the more economically important flights can flourish. This provides a fundamental economic justification for a policy which favours and supports increasing hub airport capacity serving London.
- 7.3 The Mayor believes that the presence of an effective hub airport in London is thus of strategic national interest, together with the supporting infrastructure. This includes air traffic control which enables London and the South East to have some of the most intensively used airspace in the world.

## **Requirements of a national hub**

- 7.4 If a national hub airport is to fulfil its role effectively, then it needs to meet a number of objectives, set out below.

### Efficient, resilient operation

- 7.5 For a hub to be attractive to airlines and passengers alike, it needs to be able to function smoothly, even when placed under strain. This means the runway, apron and terminal must all be of sufficient capacity to minimise delays in its everyday operation and to maximise resilience in the face of major disruption caused by adverse weather etc.

### Slot capacity to support extensive international route network

- 7.6 Slot capacity enables the hub to serve the widest range of international destinations with good frequencies to meet the expectations of UK passengers and the UK economy's trade and investment needs, while also facilitating a competitive offer for the transfer traffic that ensures the UK continues to reap the benefits of having a hub airport.

### Slot capacity to support extensive domestic route network

- 7.7 Slot capacity will also ensure that regions across the UK can connect into the hub and share its connectivity benefits. Improved access to global markets will increase trade and investment opportunities for the UK regions.

### Sustainable, high quality surface access

- 7.8 Alongside a domestic route network, surface connections to both London and the regions are vital, maximising access to the hub and thus maximising the benefits for the UK. Public transport in general, and high speed rail in particular, has a key part to play in surface access, increasing the hub's reach and thus its attractiveness while at the same time encouraging environmental sustainability.

### Quality of offering

- 7.9 Overall, for the hub to be competitive and attract the direct and transfer traffic it needs to sustain itself, it must be able to provide passengers with the quality of experience that they can expect from a world class hub, in their journey to, through and from the airport. This includes the above elements, namely a hub operating as an efficient, resilient airport with excellent surface access and the slot capacity to support an extensive domestic and international route network. It also means state-of-the-art facilities, ideally unrestricted of an unconstrained site, offering a comfortable, hassle-free and ultimately appealing experience for travellers.

## **8 How might the cost of regulation to the aviation sector be reduced, while achieving the Government's objectives of promoting sustainable aviation, improving the passenger experience at airports, and maintaining high standards of safety and security for passengers and freight?**

- 8.1 The Mayor is fully supportive of the Government's desire to pursue a sustainable aviation policy, one that improves passenger experience, and maintains high standards of safety and security for passengers and freight. Efficient regulation is vital, and it is essential that it properly incentivises outcomes that benefit both passengers using the services on offer and the long-term economic strength of both London and the UK. Those operating the regulatory system should be held accountable so that regulation does not become excessively costly or burdensome to the industry which could place the UK at a competitive disadvantage.

## 2: International connectivity and hub airports

### Summary

International connectivity is vital to London's position as one of the very few global cities. This connectivity is to a large extent provided through the country's only hub airport, Heathrow. The Heathrow hub consolidates demand from London and elsewhere, allowing a wider range of destinations to be served directly and higher frequencies to be offered than would be possible from the UK in its absence. However, London's hub is approaching its maximum capacity and London's other airports will also be full within twenty years. The DfT's most recent demand forecasts envisage that by 2050 some 42 million people will travel from the South East to airports in other regions, while millions of others will be deterred from making a trip by air altogether. The Mayor's view is that it is unrealistic to expect passengers from the South East to travel to other regions in order to fly and that not providing effective capacity where it is needed would result in significant losses of connectivity that would have severe consequences for London and the UK. Furthermore, many of the UK's competitors, which have effective hub airports with adequate capacity, are already better able to establish connections to emerging cities around the world. It is the Mayor's view that because of constraints at Heathrow a new hub for London and the UK is needed in the South East.

### 9. How important are air transport connections – both international and domestic – to the UK at both national and regional levels?

**The UK is an island. There are a number of domestic and international links for which there are no viable alternatives to air travel. Four-fifths of trips to and from the UK are made by air. The economies of London and the UK depend to a great extent on the availability of excellent air connections. This evidence is set out in the responses to Questions 1 and 2.**

**Aviation connectivity has allowed London to capitalise on its geographical position, midway between North America and Asia. It has enabled London to become one of the very few truly global cities. Currently, all major international business cities are within reach of London by direct flights. This capability benefits the whole of the UK, but to a lesser extent than it could if there were adequate capacity at Heathrow. One notable manifestation of this constraint is that the number of UK airports with a connection to Heathrow has declined dramatically in recent years (from 18 to 7 in the last twenty years)**

**leaving many regions with better connections to continental cities with hub airports than to London and its hub.**

## **Historic Development of aviation in London**

- 9.1. Throughout the history of commercial aviation, at least until recently, London has been uniquely well served by its international air services. The UK was a leading country in the development of commercial aviation following the Second World War, drawing on its technological lead in the aerospace industry. This also reflected the importance placed on the creation of modern, efficient international transport links by an island nation with strong overseas ties. Furthermore, as an outward looking cultural and commercial centre London provided one of the strongest markets for aviation in the world.
- 9.2. This lead proved vital in enabling London's successful economic development in the intervening period, and in turn the city's development has helped develop its air connections, so that today air transport is a vital component of an economic system which has evolved on the basis of a series of critical interdependencies within it, as examined in answer to Question 1.
- 9.3. Today, aviation provides the UK's primary transport link with the vast majority of other countries. Indeed, four out of every five passenger trips to and from the UK are made by air. In total, 126 million passenger aviation trips are made from London's airports alone<sup>56</sup>.
- 9.4. Table 9.1 shows the top ten international and domestic destinations from each of London's principal airports together with annual passenger numbers. The list for Heathrow reflects its role as a global airport with longhaul routes to major business cities accounting for half of the top ten destinations. Shorthaul destinations account for the highest volume routes at the other airports, with a number of longhaul tourist destinations appearing in the Gatwick list.
- 9.5. It is clear that Heathrow plays a distinctive role in offering the vast majority of routes to destinations beyond Europe, reflecting its status as the UK's hub airport. Gatwick offers some longhaul services, which are generally not dependent on transfer passengers, catering for point-to-point demand (e.g. services to the West Indies). Stansted and Luton are mainly low cost point-to-point airports while City serves a discreet range of primarily business destinations.

---

<sup>56</sup> CAA, *UK Airport Annual Statistics for 2010*, 2011

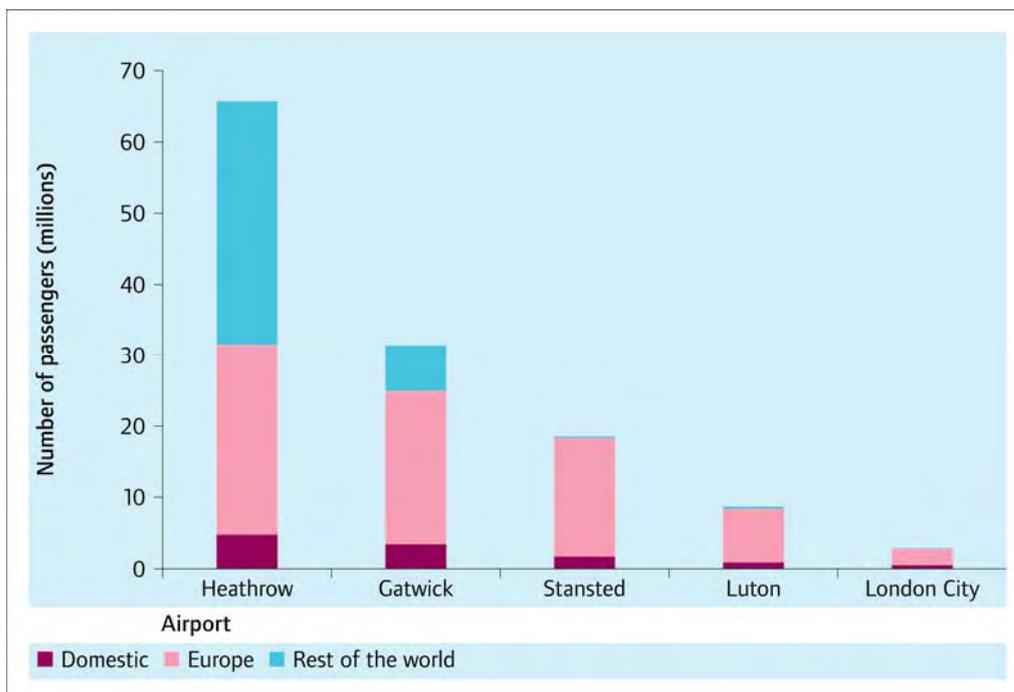
**Table 9.1: Top ten destinations served by London's airports, by total passenger numbers**

Airport	International	Annual passengers	Domestic	Annual passengers
<b>Heathrow</b>	New York	2,518,000	Edinburgh	1,244,793
	Dubai	1,788,000	Glasgow	1,003,344
	Dublin	1,493,000	Manchester	799,264
	Hong Kong	1,387,000	Aberdeen	617,693
	Amsterdam	1,333,124	Belfast City	467,826
	Paris CDG	1,333,000	Newcastle	424,251
	Frankfurt Main	1,300,000	Belfast International	284,029
	Los Angeles	1,266,000		
	Chicago	1,189,000		
	Madrid	1,138,000		
<b>Gatwick</b>	Malaga	909,237	Edinburgh	604,073
	Dublin	842,093	Jersey	534,303
	Orlando	676,265	Glasgow	488,774
	Alicante	672,228	Guernsey	335,937
	Faro	669,007	Belfast International	296,802
	Dubai	629,810	Manchester	246,842
	Geneva	624,130	Belfast City	218,943
	Madrid	602,267	Inverness	206,837
	Sharm el Sheik	579,541	Isle of Man	122,159
	Amsterdam	548,352	Aberdeen	129,948
<b>Stansted</b>	Dublin	720,672	Edinburgh	329,874
	Malaga	377,961	Glasgow	301,758
	Alicante	372,801	Belfast City	301,637
	Rome Ciampino	350,153	Belfast International	301,069
	Bergamo	335,104	Prestwick	224,570
	Faro	295,522	Newcastle	121,134
	Palma de Mallorca	288,972	City of Derry Eglinton	90,107
	Amsterdam	278,137	Jersey	27,668
	Stockholm Skavsta	277,806	Guernsey	22,077
	Frankfurt Hahn	276,350		
<b>Luton</b>	Budapest	334,416	Glasgow	247,681
	Warsaw	296,505	Edinburgh	242,100
	Dublin	269,096	Belfast City	170,023
	Geneva	253,862	Aberdeen	129,018
	Malaga	246,297	Inverness	90,264
	Amsterdam	234,411		
	Paris CDG	228,796		
	Bucharest Baneasa	223,483		
	Madrid	216,834		
	Palma de Mallorca	206,098		
<b>London City</b>	Zurich	403,811	Edinburgh	334,709
	Amsterdam	367,217	Glasgow	111,050
	Geneva	194,909	Isle of Man	52,224
	Dublin	193,231	Dundee	40,480
	Frankfurt Main	185,869	Jersey	10,121
	Luxembourg	147,745	Newquay	7,864
	Rotterdam	115,286	Plymouth	720
	Paris Orly	95,590		
	Antwerp	74,385		
	Basel Mulhouse	70,293		

Source: CAA, UK Airport Annual Statistics for 2010, April 2011

9.6. As Figure 9.1 shows, the profile of markets served by London's five principal airports differ widely from one to another.

**Figure 9.1: Breakdown of destinations served by London's five principal airports, by total passengers, 2010**



Source: CAA, UK Annual Airport Statistics for 2010, 2011

9.7. The UK's historically excellent international air connections have enabled London to become perhaps the most globalised and multicultural city in the world. In turn, this means that London is ever more reliant on these global aviation links to maintain its comparative advantage and for further economic growth. An account of the wider economic benefits of aviation which particularly apply to London is made in response to Question 1. The crucial importance of hub capacity in maintaining the all-important direct business connections is made in response to Questions 7, 11 and 13.

## **10. As long as people and goods can easily reach their desired destination from the UK, does it matter if they use a foreign rather than a UK hub airport?**

**At the individual level there is little difference between transferring or transiting at a UK airport and an overseas one, beyond considerations of fare, overall journey time and convenience. However, there are a number of reasons at the collective level why whether UK passengers use the UK's hub or a foreign hub matters.**

**Individual aviation decisions also generate positive externalities for other passengers. Each passenger generates benefits for all the others using a route by supporting its viability. When UK-based passengers use a foreign hub, this benefit is lost to the network of routes supported at the UK's hub airport and is transferred to the competitor hub. This**

**matters to passengers in London and to passengers in the UK regions.**

**The case for the UK to have a well connected national hub airport is strong and there are clear national benefits over the alternative scenario of UK regional passengers using foreign hubs. It is important to note that the Committee on Climate Change's methodology for a UK emissions cap discriminates against the former since it counts three air traffic movements for UK regional passengers transferring at Heathrow and only one for the same passengers transferring at foreign hubs. This could drive flights to foreign airports without delivering any climate change benefit, while denying the UK benefits which an aviation hub offers.**

## **Introduction**

- 10.1. This answer is divided into four sections. Firstly some basic economic conditions relating to the viability of aviation routes, and longhaul ones in particular are considered. These show that there are good reasons why consideration of the benefits of individual aviation decisions need to go beyond the individual making the decision. The next two sections consider the evidence supporting the case that there are overall benefits arising from UK travellers using a UK hub rather than a foreign hub. Passengers in London are considered separately from regional passengers. Finally an issue which arises in the way that trips via UK and foreign hubs are accounted for in the approach recommended by the CCC is considered. There is a danger that trips via foreign hubs are treated more 'favourably' in terms of their emissions impacts than trips via a UK hub.
- 10.2. It should be noted that this answer does not fully account for the benefits of a UK hub since it only considers the benefits of UK passengers transferring at Heathrow. In fact the benefits arising from overseas passengers, who account for a far higher proportion of transfer passengers at Heathrow, also need to be considered to provide a full answer to that question – see Question 13.

## **Individual benefits and route viability**

- 10.3. Clearly at the individual level there is little difference between transferring or transiting at a UK airport and an overseas one, beyond considerations of fare, overall journey time and convenience. However, there are a number of reasons why it matters at the collective level whether UK passengers use the UK's hub or a foreign hub.
- 10.4. The high fixed costs of operating individual aviation routes, and longhaul ones in particular, mean there is the potential for 'market failure' in their provision, i.e. the market can fail to meet demand. There is a threshold number of passengers needed before a direct route can be operated viably, and below which a direct service will not be commercially justifiable. By operating services from hub airports airlines can serve routes which would not be otherwise be viable by consolidating demand.
- 10.5. Even where routes would be viable without the need to consolidate demand, a hub offers benefits since airlines can operate routes at higher frequencies than would otherwise be possible. With the exception of London City Airport, the

frequency of flights available at Heathrow is over twice that provided at the other London airports. See Appendix E, Table E.1.

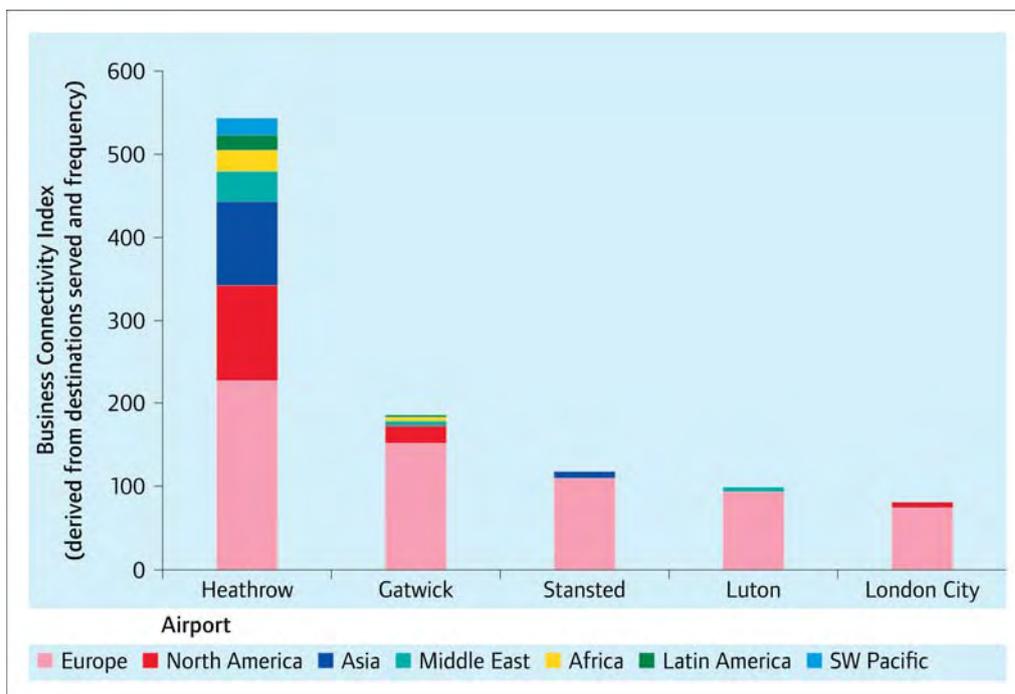
- 10.6. Effectively each passenger generates benefits for all the others using the route by supporting its viability. This clearly delivers connectivity benefits to both the hub airport's catchment area and those of its feeder airports. When UK based passengers use a foreign hub, these benefits are lost and transferred to the competitor hub. This matters both to passengers in London and to passengers in the UK regions.

## Passengers originating in London

### Heathrow's connectivity

- 10.7. Heathrow dominates the provision of longhaul business routes in London, as Figure 10.1 shows.

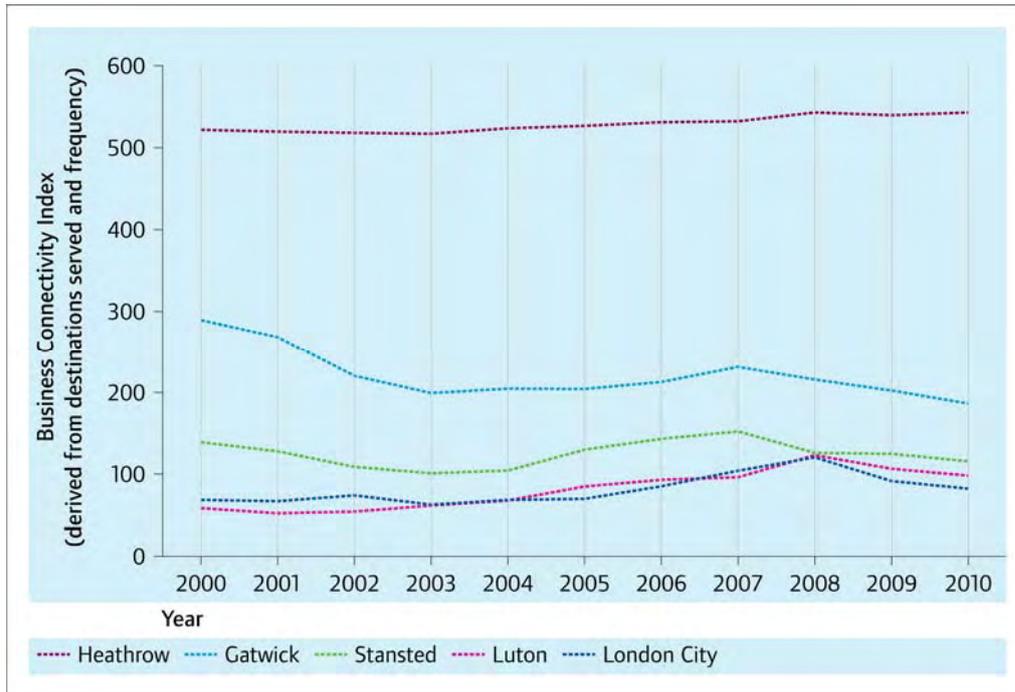
**Figure 10.1 Structure of business connectivity of London Airports, by World Region**



Source: York Aviation, 2011

- 10.8. London's economy is unusually dependent on a comprehensive network of longhaul direct flights with attractive frequencies, especially for business purposes but also for cargo. The reasons for this are set out in the responses to Question 1. Clearly most business passengers using these routes would not be willing to substitute a foreign hub for the UK hub since they treat Heathrow as a point-to-point airport and place a high premium on being able to do so.
- 10.9. The overall quality of Heathrow's direct business connectivity, in terms of the number of direct connections to cities in the Global World Cities Index, in relation to the other London airports (and over a ten year timespan), is shown in Figure 10.2.

Figure 10.2 Business connectivity at the London Airports

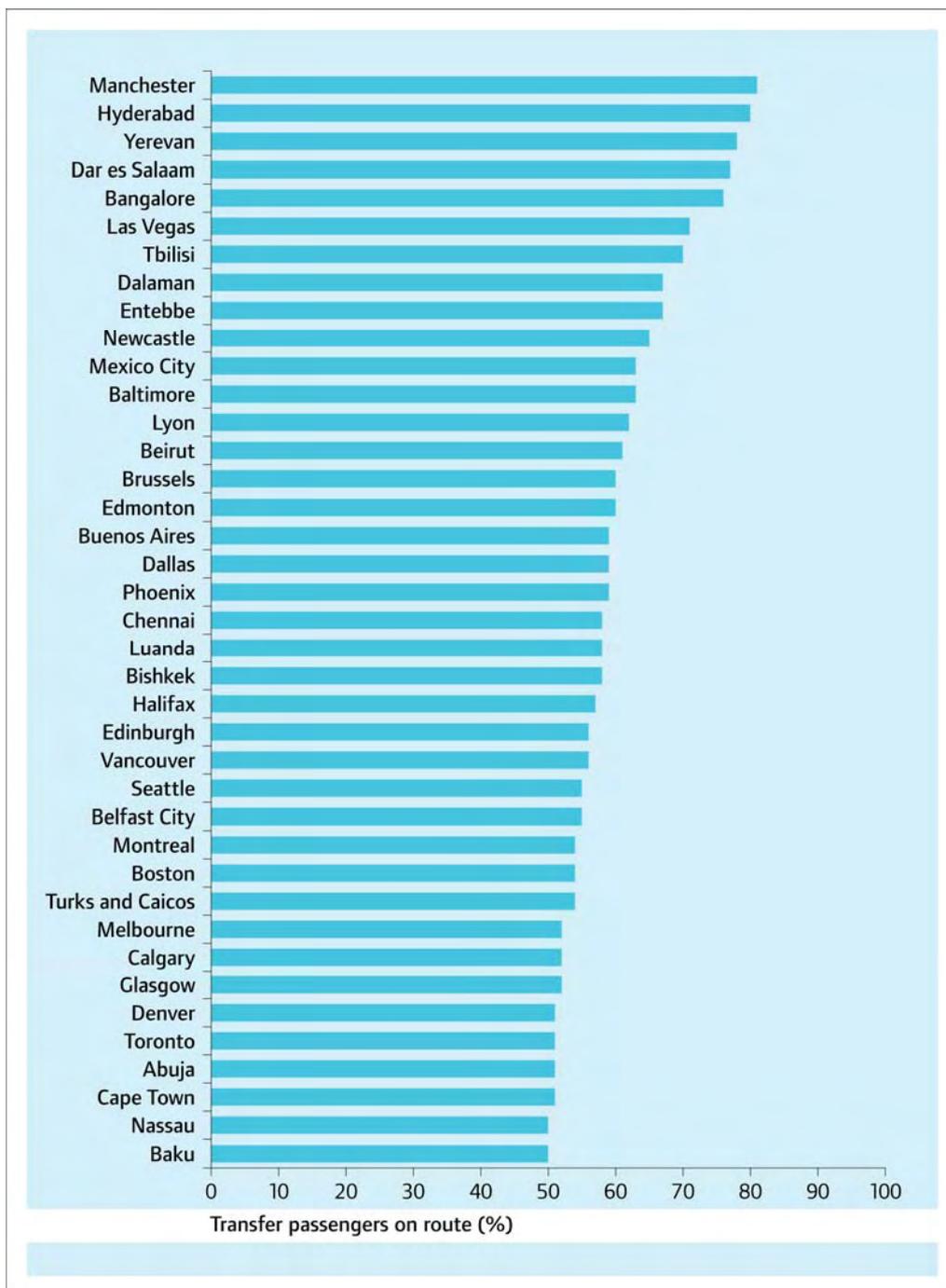


Source: York Aviation, 2011

### Heathrow's dependence on transfer passengers

10.10. Despite its size, however, London's own catchment is insufficient to support the network it currently provides. It relies on the consolidation of demand from other airports, both in the UK and overseas to support key routes. This dependence can be seen through the proportions of transfer passengers on certain routes as shown in Figure 10.3.

**Figure 10.3 The importance of transfer passengers in supporting use of Heathrow by transfer**



Source: York Aviation, derived from CAA UK Airport Annual Statistics for 2010, 2011

10.11. In 2010 there were 39 routes at Heathrow on which more than 50% of passengers were transferring and a further 92 routes on which this was the case for more than 25% of passengers. Routes to emerging cities such as Hyderabad, Bangalore, Mexico City and Chennai would face being lost outright without the necessary transfer traffic to feed them. Further details are provided in Appendix E, Tables E.2 and E.3.

## The role of UK domestic passengers

10.12. In the last twenty years, the number of domestic airports served from Heathrow has fallen from 18 to 7, and there has been a 34% decrease in domestic passenger numbers, which it should be noted is against a general trend of strong demand growth at the airport.

**Table 10.1: Domestic passengers to/from Heathrow, 1990 vs. 2010**

Airport	1990 (thousands)	2010 (thousands)
Aberdeen	465	618
Belfast City	-	468
Belfast International	1,117	284
Birmingham	117	-
Durham Tees Valley	197	-
East Midlands	89	-
Edinburgh	1,394	1,245
Glasgow	1,416	1,003
Guernsey	132	-
Humberside	24	-
Inverness	133	-
Isle of Man	123	-
Jersey	288	-
Leeds/Bradford	225	-
Liverpool	112	-
Manchester	1,037	799
Newcastle	389	424
Newquay	41	-
Plymouth	37	-
<b>Total</b>	<b>7,336</b>	<b>4,841</b>

Source: CAA, UK Annual Airport Statistics for 2010, 2011

10.13. There are some large flows of transfer passengers on flights between Heathrow and some UK airports, as shown in Figure 10.3. It is therefore clear that Heathrow's current route network is not dependent on UK domestic transfer passengers in the way that it is on international transfer passengers. Of the top 44 routes by number of transfer passengers (which account for two thirds of all transfer passengers), 17% were transferring to or from domestic as opposed to international routes.

10.14. It is nevertheless reasonable to assume that in the absence of capacity constraints, Heathrow would have sustained a much more comprehensive domestic route network. This would have not only benefitted those UK regions it served but also contributed to Heathrow's international route network by providing additional transfer passengers. This suggests that although Heathrow remains a major hub airport, it is not fulfilling its potential as a vital source of London's and the UK's economic success.

## Passengers from outside London and the South East

10.15. This section examines the use of Heathrow by passengers from outside London and the South East, and the effects of passengers using foreign hubs as a substitute.

### Use of Heathrow

10.16. Over a quarter of passengers boarding the first leg of flights at Heathrow originate outside London and the South East, with more than a million originating annually from each of the South West, east of England, West Midlands and East Midlands, as shown in Table 10.2.

**Table 10.2: Origin/Destination of terminating Heathrow passengers, 2009**

Region	(thousands)	%
East Midlands	1,353	3.3
East of England	3,828	9.4
North East	83	0.2
North West	427	1.0
Scotland	89	0.2
South West	2,835	6.9
Wales	746	1.8
West Midlands	1,186	2.9
Yorkshire & Humberside	570	1.4
<b>Regional total</b>	<b>11,117</b>	<b>27.2</b>
London	19,716	48.3
Rest of South East	10,020	24.5
<b>Grand total</b>	<b>40,853</b>	<b>100</b>

Source: CAA, *Passenger Survey Report 2009, 2010*

10.17. Improvements in surface access over time, most notably proposals for a high speed rail network to link London with much of the country, will further increase accessibility to the UK's hub airport for many across the UK. Nonetheless, above certain distances, and particularly for more time-sensitive business travellers, the effectiveness of high speed rail as a feeder for air passengers will be limited. For these regions and passengers, air links from the regions will remain the only realistic means by which they can access onward flights connecting them to the rest of the world.

### Longhaul flights from regional airports

10.18. While 45% of London airport passengers travel to or from locations outside the EU, only 18% of passengers using UK regional airports do so. The contrast between the availability of direct flights to longhaul destinations in London and that in other UK regions is shown in Table 10.3. London's five airports offer direct scheduled services to 100 countries, while a total of 41 countries are served by the other UK regional airports.

**Table 10.3: London vs. UK regional airports. Passenger numbers on scheduled flights from UK airports by world region, 2009**

World region	London (thousands)	UK regions (thousands)	Proportion flying from London
Western Europe EU	53,138	30,835	63%
North Africa	1,945	828	70%
Eastern Europe EU	6,517	2,650	71%
Middle East	4,994	1,886	73%
Western Europe non-EU	7,766	1,957	80%
Indian sub-continent	2,902	398	88%
USA	13,747	1,686	89%
Canada	2,712	292	90%
Eastern Europe Non-EU	1,239	65	95%
Caribbean	1,286	41	97%
Near East	1,190	34	97%
Far East	5,501	84	98%
Australasia	1,416	0	100%
South Africa	1,409	0	100%
West Africa	817	0	100%
East Africa	688	0	100%
South America	502	0	100%
Central America	244	0	100%
Central Africa	73	0	100%

Source: CAA, UK Airport Annual Statistics for 2010, 2011

10.19. Where longhaul routes from the UK regions have been established, they have mostly been either low-frequency leisure routes, such as to Florida and the Caribbean, or routes connecting to hubs in other continents, Newcastle-Dubai and Belfast International-New York Newark being two such examples.

10.20. Nevertheless it is clear that many passengers from the rest of the UK who would have used Heathrow as a hub in the past no longer do so and instead use either Continental hubs or Middle East ones in order to access longhaul destinations.

### Effects on regional passengers

10.21. The UK's regions lose out from the diminution in feeder services to Heathrow in a number of ways. Firstly, although many regional airports can support direct flights to continental European and Middle Eastern hubs, the frequency that could be supported on a London service is likely always to be greater on the basis of point-to-point demand. Without such high frequency feeder services to a first class UK hub airport, these regions may not be perceived to be as well connected as they otherwise would be, potentially deterring business investment.

10.22. Secondly, the lack of feeder flights may deter overseas tourists who are drawn to London from also visiting more distant regions of the UK. A link to a London airport other than Heathrow might not be sufficient since such tourists would be likely in many cases to want to transfer straight to their return flight at Heathrow

on return to London.

- 10.23. Thirdly, point-to-point connectivity with London would inevitably be lost, which means in some cases the regions would have worse access to the valuable financial and business services which London offers than cities in other countries which, again puts them at a disadvantage in attracting much needed business investment.

## **Accounting for domestic transfer trips**

- 10.24. A scenario in which an overseas hub airport takes some or all of the UK's aviation growth potential might appear beneficial in CO<sub>2</sub> terms following the methodology proposed by the Committee on Climate Change (CCC) for recording flights for the purposes of accounting for climate change emissions. However, an anomaly in the approach means that in that calculation, passengers travelling from a UK regional airport via a UK hub to an overseas destination register as three terminal passengers, i.e. departure from the UK regional airport, and arrival at and departure from the UK hub. By contrast, although it does not imply lower emissions overall, transferring via a foreign hub registers as just one terminal passenger, i.e. departure from the UK regional airport.

## **11. Are direct connections from the UK to some international destinations more important than others? If so, which and why?**

**London is a member of a 'super-network' of global cities, which also includes New York, Tokyo and Hong Kong. These cities offer frequent direct flights to one another which suit the needs of the global business activities which they host. It is clear that flows of people, goods and capital between London and these cities are of great importance, and more so than a host of secondary cities to which London is also connected.**

**However, as discussed in answer to Question 13, there are important interactions between the routes which form London's global aviation network because demand from various routes can be consolidated to increase their viability. It is therefore inappropriate to consider the importance of these on an individual basis. Rather, the key concern is to ensure that London is able to offer a network of sufficient connectivity for its future needs. As the global economy expands, the range of important business cities is likely to increase. Direct connections to these emerging destinations will be increasingly important. It is important that the role of feeder traffic in developing these new routes is recognised.**

## Route network characteristics

- 11.1. Three notable characteristics of Heathrow's international route network are as follows: firstly, that it provides frequent services to several key global cities; secondly, it is stronger where the UK has historic ties and; thirdly, while it provides frequent connections to many continental European destinations, many others have been lost, and it offers far fewer shorthaul destinations than competing Continental hubs. These are discussed below.

### Global connectivity

- 11.2. London sits at the heart of the global network of "world cities". This 'super-network' lifts its nodes to a different level of connectivity and competition from the other cities around them, sustaining and reinforcing a virtuous circle of productivity, competitiveness and cultural innovations. A.T.Kearney's report 'The Urban Elite' puts it as follows:

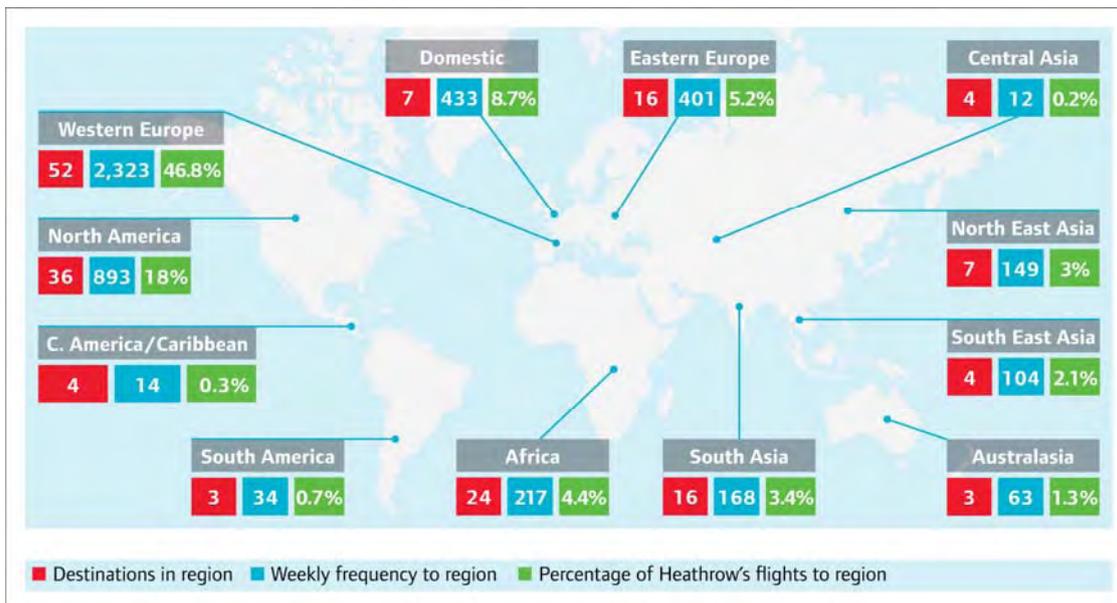
*"[Global cities] are the ports of the global age, the places that both run the global economy and influence its direction. The cities where decisions are made, where the world's movers and shakers come to exchange the latest news and information... In a word, they have clout."<sup>57</sup>*

- 11.3. In the rankings which formed the basis of the A.T. Kearney report, London was listed second, behind only New York. Time and again London holds similar positions when cities are ranked. It is this position in the global elite that the Mayor wishes to safeguard through appropriate aviation and other policies.
- 11.4. At present the distribution of flights from the UK's existing hub, Heathrow, is centred on the world's established economies. North America and Western Europe account for nearly three-quarters of total weekly flights, as shown in Figure 11.1. Gatwick also plays role in serving longhaul destinations, particularly in the Caribbean and other mainly point-to-point markets, but this relatively minor in comparison to Heathrow (see Question 9, Figure 1). Likely changes in the network of cities which will need to be served are discussed in answer to Question 12.

---

<sup>57</sup> A.T. Kearny, *The Urban Elite*, 2011

**Figure 11.1: Global distribution of weekly flight frequencies from Heathrow, June 2011**



Source: OAG, OAG Schedules Data, June 2011

### Historic ties

11.5. The pattern of Heathrow's route network also reflects the UK's historic ties. These explain its relatively high frequency services to parts of Africa and the Middle East, which contrasts with the much poorer direct connectivity with countries in South America, where the UK has had less historic involvement. Heathrow also offers a very strong network of routes to US cities. The importance of these ties in supporting the broader network is discussed below.

### European links

11.6. The European Union accounts for over half of the UK's overall trade and foreign investment and represents the world's largest single market with over 500 million citizens<sup>58</sup>. Despite the growth that will be seen in other regions of the world, EU countries will remain the UK's main trading partners, due not least to their geographical proximity. Notwithstanding the improvements to the European high speed rail network, discussed in answer to Question 19, direct connections to a range of European destinations will remain very important to facilitate trade and investment.

11.7. Across its five airports, London has unparalleled links with cities in Continental Europe. However in comparison with its Continental rivals, Heathrow's shorthaul (i.e. European) network has limitations. Whereas Paris CDG and Frankfurt offer 78 and 74 shorthaul destinations respectively, Heathrow offers only 46<sup>59</sup>. Despite this, it offers a comparable number of seats on its shorthaul network to these

<sup>58</sup> Department for Business, Innovation and Skills / Department for International Development, *The UK and the Single Market*, 2011

<sup>59</sup> Frontier Economic for BAA, *Connecting for growth: the role of Britain's hub airport in economic recovery*, 2011

airports (around 20m), which indicates that shorthaul routes operated at Heathrow offer on average approximately 2/3 more seats than those at Paris or Frankfurt<sup>60</sup>.

## **Interaction between routes**

- 11.8. There are important synergies between the routes which form London's aviation network. It is therefore inappropriate to consider the importance of these on an individual basis. Rather, the key concern is to ensure that London is able to offer a network of sufficient connectivity for its future needs. This is discussed in more detail in Question 13.
- 11.9. While there may be sufficient capacity to support point-to-point demand between London and European cities across London's five principle airports, it is clear that further feeder traffic which could help support the development of new routes is being foregone. The fact that frequencies are higher on those shorthaul routes which are served from Heathrow than at competing European hub airports suggests that Heathrow has significant unfulfilled potential as a hub airport.
- 11.10. The Mayor is concerned that Heathrow's capacity constraints may inhibit its ability to develop new direct routes. Because Continental hubs have no such constraints, this is likely to negative have implications for UK trade, tourism and investment over time.

## **12. How will the UK's connectivity needs change in the light of global developments in the medium and long-term (twenty to fifty years)?**

**There is a close relationship between GDP growth and aviation use. The number of countries participating in the global economy is increasing and a far greater proportion of the world's population is involved in this integrated economic system. By 2050, the world's GDP will be more dispersed, with less concentrated in Europe and North America and a higher share in Asia, Central and South America. The economies of Vietnam, India, Nigeria, China, and Indonesia are all forecast to grow at well over 5% each year to 2050.**

**While the UK will account for a diminishing share of world population and GDP and face increasing competition from energetic, lower cost countries, there are great opportunities for growing high value, specialised export markets in sectors in which the UK can maintain a comparative advantage. This will require excellent connectivity and given the larger role to be played by places further afield than the UK's traditional main trading partners, first class air links will be vital.**

**In order to maximise the opportunities for taking advantage of the**

---

<sup>60</sup> Ibid, based on Table 5

**expanding global economy, the UK must broaden its trade and investment base. The capacity constraints at Heathrow have meant that to accommodate new destinations and increased frequency of certain important services, the frequencies on other routes and, in some cases entire routes, have been sacrificed. This is not a sustainable policy given the synergies between routes at a hub airport. There is a limit to the number of feeder routes which Heathrow can lose before its function as a hub airport is severely impaired. The Mayor believes a bigger and better hub airport for London is needed to ensure that the UK maintains and enhances international links which are important to its future economic position.**

## Expected development of demand

### Aviation and national income

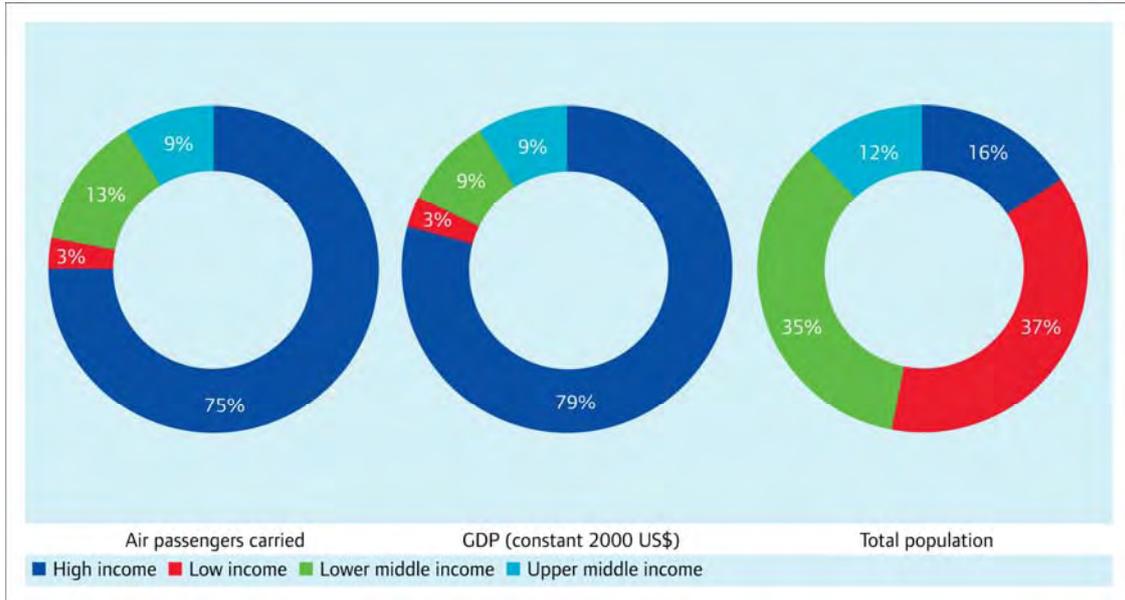
- 12.1. The global aviation industry has become increasingly responsive to demand through the process of deregulation and liberalisation which has taken place over recent decades. The factors which influence demand – including the availability of aviation links themselves – are explored in response to Question 1, particularly in the London context. This section explores the broader context of world economic development over the coming decades. It also examines some of the implications for the UK, where these have a bearing on likely aviation demand.
- 12.2. Research by MIT indicates a very strong relationship between GDP and aviation use at the aggregate level<sup>61</sup>. Historical analysis across many countries undertaken by Schafer and Victor<sup>62</sup> is cited, showing that time and income shares allocated to travel are stable over time and geography. On average, a person spends 1.1 hours per day travelling and devotes a predictable fraction of income to travel. Wealthier people devote resources to using faster modes of travel, which allow them to travel further. In Figure 12.1 countries are aggregated into different income categories, using 2005 data. The contribution of these country-groups to the total number of world air passengers, total world GDP and total world population are shown respectively in the three charts. There is a striking correlation between each group's share of air passengers and their share of GDP. In contrast the shares of total population are very different. For example, high-income countries account for almost 80% of all air passengers and total world GDP while accounting for only 16% of the world's population. This indicates that the inequality in access to aviation in the world is highly correlated to development and that as regions of the world develop, aviation use can be expected to follow closely.

---

<sup>61</sup> Mariya A. Ishutkina and R. John Hansman, MIT International Center for Air Transportation (ICAT). *Analysis of the interaction between air transportation and economic activity: A Worldwide perspective*, 2009

<sup>62</sup> A. Schafer and D. G. Victor. 'The future mobility of the world population', *Transportation Research Part A*, 34:171–205, 2000

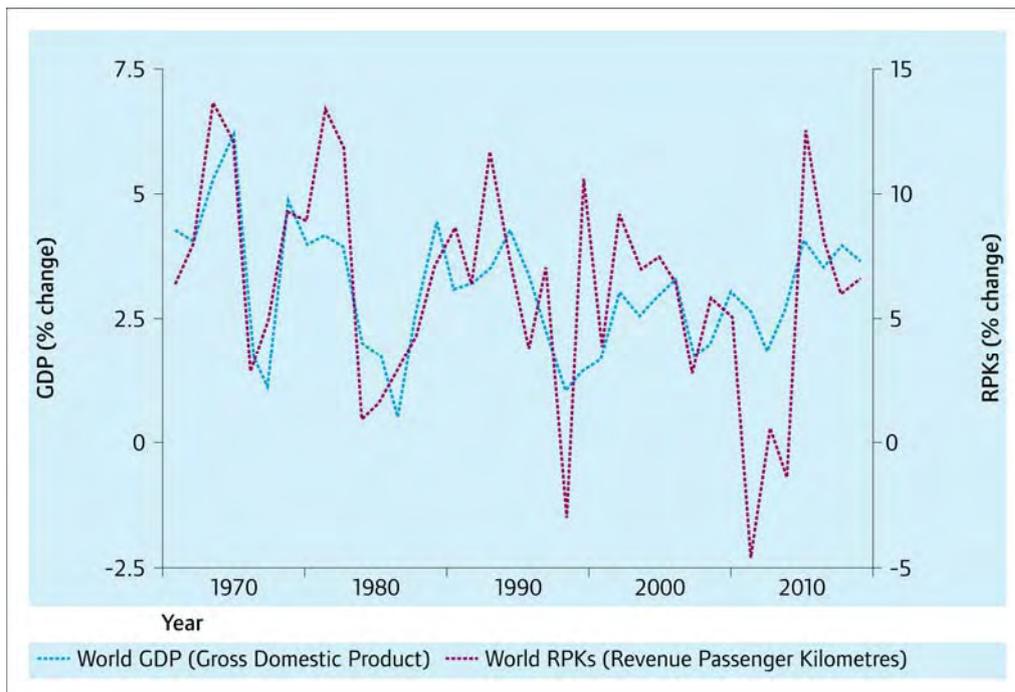
**Figure 12.1: Passenger, income and population shares when countries are aggregated into different income categories**



Source: Mariya A. Ishutkina and R. John Hansman, *MIT International Center for Air Transportation*, 2009

12.3. The relationship between GDP growth and aviation demand between 1970 and the present is illustrated in Figure 12.2. Aviation demand exhibits significantly more variation than GDP growth, with periods of accelerating and decelerating GDP growth corresponding to more pronounced changes in aviation use.

**Figure 12.2: Link between global GDP and aviation demand**



Source: Boeing, *Current Market Outlook, 2010-2030*, 2011

- 12.4. While there will be differences in the relationship between aviation use and GDP between different countries, it is clear that in the absence of global-level constraints on aviation growth, over the long-term, the forecast development of world GDP offers a useful forecast of global aviation demand.

### Development of world GDP

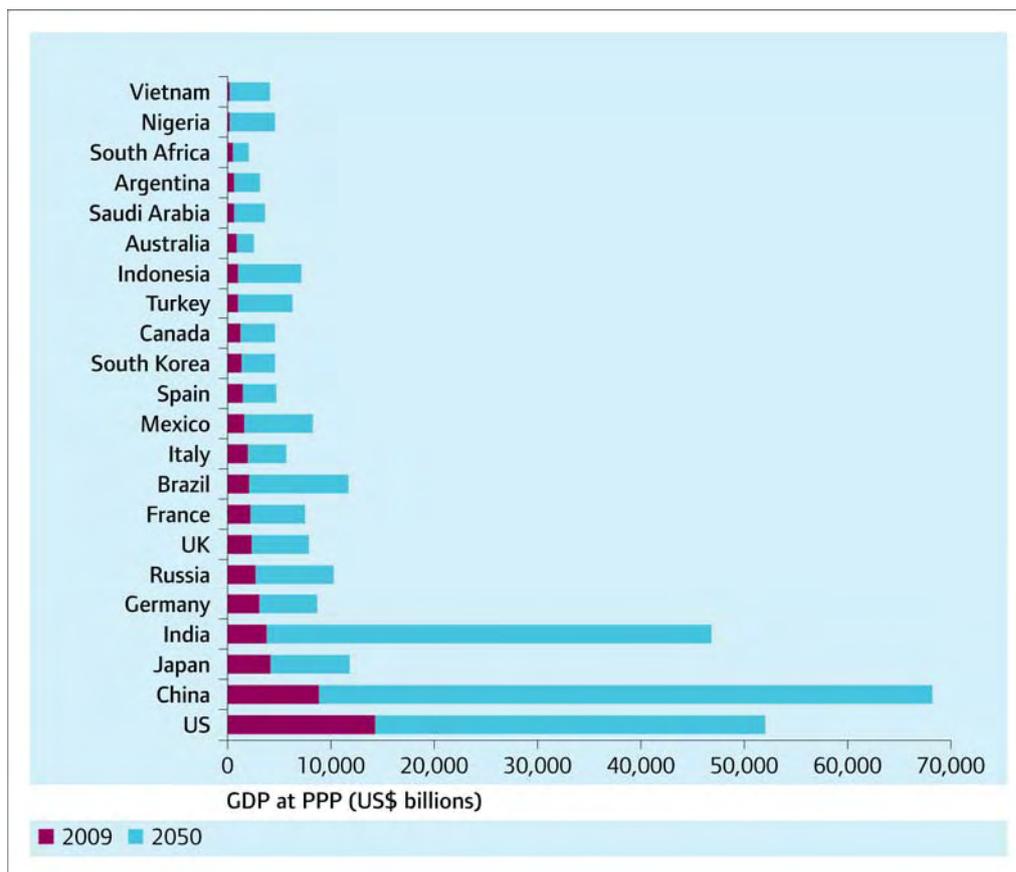
- 12.5. A report by PwC<sup>63</sup> has set out the potential for GDP growth to 2050 in a number of key countries including the G20 group, the E7 emerging economies<sup>64</sup>, Spain, South Africa, Argentina, Saudi Arabia, Nigeria and Vietnam.
- 12.6. The report forecasts GDP based on forecast changes to the following factors:
- Growth in labour force of working age;
  - Change in average education levels in the adult population;
  - Growth in capital investment; and
  - Total productivity growth, accounting for catching up by lower income countries with richer ones.
- 12.7. The forecasts are a measure of the potential for GDP growth and, as the report makes clear, are dependent on the countries following growth-friendly policies. Some emerging countries may therefore not be able to live up to their potential.
- 12.8. Figure 12.3 shows how the top twenty economies in terms of GDP at purchasing power parity (PPP) could change between now and 2050. China and India are expected to overtake the USA, and the top three economies in 2050 make-up a larger share of total global GDP than the top three today. The country ranked 20th in 2050, Argentina, will have an economy that is larger than the UK economy today (though the UK economy is forecast to more than double in the same period).

---

<sup>63</sup> PricewaterhouseCoopers, *The World in 2050: The accelerating shift of global economic power: challenges and opportunities*, 2011

<sup>64</sup> China, India, Brazil, Russia, Indonesia, Mexico and Turkey

**Figure 12.3: Growth in GDP of leading world economies, 2009-2050**



Source: PricewaterhouseCoopers, *The accelerating shift of global economic power: challenges and opportunities*, 2011

### Europe's changing world role

- 12.9. Whilst major European countries will move down the GDP rankings, they are all still forecast to grow significantly – GDP in both France and the Germany in 2050 are estimated to be higher than Japan's GDP today – and so international connections to these European destinations will remain important and need to be improved from their current levels in order to keep up with future growth.
- 12.10. The world's GDP will be more dispersed, with less concentration in Europe and North America and a higher share in Asia and Latin America. In terms of annual growth rates averaged over the period, the biggest growth is forecast in Vietnam (8.8%), followed by India (8.1%), Nigeria (7.9%), China (5.9%) and Indonesia (5.8%).
- 12.11. Two emerging groups of nations with rising income levels are (i) Brazil, Russia, India and China (the so-called "BRICs") and, (ii) Colombia, Indonesia, Vietnam, Egypt, Thailand and South Africa (the "CIVETS"). Of these countries the UK has high frequency services only to Russia, India and, to a lesser extent, Thailand. The number of direct services to South Africa is declining; Brazil and Egypt have a relatively limited number of services; and Colombia and Indonesia have no direct connection with the UK whatsoever.

## Emerging Global cities

- 12.12. A recent study by the McKinsey Global Institute (MGI)<sup>65</sup> looked at the potential performance of global cities in 2025. It compared the top 600 cities today (measured in terms of contribution to global GDP growth) with the top 600 cities in 2025. In both scenarios, the 600 cities will contribute about 60% of global GDP; however, the cities making up the 600 will change, encompassing more cities in Asia and fewer in North America and Europe. MGI expects 136 new cities to enter the top 600, all from the developing world. 100 of the 600 cities will be in China.
- 12.13. A comparison between the leading 25 cities by total GDP in 2007 and those expected in 2025 is shown in Figure 12.4. Seven cities in China (including Hong Kong) are expected to replace cities in North America and Europe.

---

<sup>65</sup> McKinsey Global Institute, *Urban world: Mapping the economic power of cities*, 2011

**Figure 12.4: Expected change in leading 25 Megacities by total GDP between 2007 and 2025**



Source: McKinsey Global Institute, *Urban world: mapping the economic power of cities, 2011*

12.14. The 25 cities with the fastest rate of GDP growth between 2007 and 2025 are shown in Figure 12.5. While a small number of cities in western countries are included, including London, New York, Los Angeles, and Tokyo, the vast majority of the remainder are in China and India.

**Figure 12.5: Fastest growing cities in terms of total GDP growth between 2007 and 2025**



Source: McKinsey Global Institute, *Urban world: mapping the economic power of cities*, 2011

- 12.15. These emerging 'megacities' (those leading either in terms of total GDP or growth in GDP) are expected to be the locus of a disproportionate volume of future international business activity. These cities are expected to experience very high growth in the number of people with incomes over \$20,000 p.a., which is considered a threshold for aviation usage. If London is to serve some of those trips, more hub capacity will be required.
- 12.16. Table 12.1 shows the top 25 cities in terms of GDP growth between 2007 and 2025<sup>66</sup>. Emerging cities which are 'underserved' from Heathrow are shown in bold. This list is dominated by Chinese cities, but of the thirteen identified, Heathrow currently serves only Shanghai and Beijing, which forecast to demonstrate the greatest growth of all. Shanghai and Beijing are significantly less well served than other cities much further down the list including Singapore (18th), Tokyo (20th), Mumbai (24th) and Hong Kong (25th).

---

<sup>66</sup> McKinsey Global Institute, *Urban world: Mapping the economic power of cities*, 2011

**Table 12.1: Current weekly frequencies from London to 25 cities with forecast highest GDP growth between 2007 and 2025**

City	2011 weekly frequency from London
<b>Shanghai</b>	<b>17</b>
<b>Beijing</b>	<b>14</b>
New York	191
<b>Tianjin</b>	<b>0</b>
<b>Chongqing</b>	<b>0</b>
<b>Shenzhen</b>	<b>0</b>
<b>Guangzhou</b>	<b>0</b>
<b>Nanjing</b>	<b>0</b>
<b>Hangzhou</b>	<b>0</b>
<b>Chengdu</b>	<b>0</b>
<b>Wuhan</b>	<b>0</b>
London	-
Los Angeles	70
<b>Foshan</b>	<b>0</b>
<b>Taipei</b>	<b>8</b>
Delhi	49
Moscow	72
Singapore	49
<b>Sao Paulo</b>	<b>14</b>
Tokyo	34
<b>Shenyang</b>	<b>0</b>
<b>Xi'an</b>	<b>0</b>
<b>Dongguan</b>	<b>0</b>
Mumbai	42
Hong Kong	61

Source: OAG, OAG Schedules Data, June 2011

12.17. The UK will need to improve its connections to a broad range of countries if it is to realise aviation's potential role in efforts to broaden its trade and investment base. As Table 12.2 sets out below, the frequency of flights between Heathrow and the UK's fastest-growing export markets (both in terms of goods and services) varies greatly.

**Table 12.2: UK's fastest growing export markets**

Services	2011 weekly frequency from Heathrow	Goods	2011 weekly frequency from Heathrow
Russia	77	Russia	77
Singapore	49	Chile	0
India	129	Pakistan	11
China & Hong Kong	31 & 63	China & Hong Kong	31 & 63
South Korea	12	Brazil	27
Taiwan	8	India	129
Turkey	52	South Korea	12
Thailand	34	Turkey	52
Chile	0	Singapore	49
Iran	10	Colombia	0

Source: ONS, *United Kingdom Balance of Payments: The Pink Book, 2010 & OAG, OAG Schedules Data, June 2011*

12.18. The UK must be in a far stronger position and better able to serve a much wider range of destinations with excellent direct aviation links if it is to respond to the enormous economic challenges it now faces.

### **London's response to demand from emerging economies**

12.19. The constraints at Heathrow have meant that to accommodate new destinations and increase service frequency on some routes, other routes have had their frequency reduced. In some cases the entire route has been sacrificed. Figure 12.6 below provides a summary of routes at Heathrow that have changed between 2002 and 2011.

12.20. Heathrow's capacity constraints have also encouraged BA to adopt a conservative approach to serving new routes. It is now increasingly common for overseas airlines to take the initiative on new links to emerging longhaul markets. For example, Vietnam has recently signalled a statement of intent to extend its global reach by establishing a service to London Gatwick and the national flag carrier, Vietnam Airlines, is simultaneously investing heavily in new aircraft. However, the airline has made clear it would prefer slots at Heathrow.

**Figure 12.6: Changes in destinations served by Heathrow, 2002–2011**



Source: OAG, OAG Schedules Data, 2002 & June 2011

- 12.21. London has already fallen behind others in serving some emerging economies, including mainland China. This means that airlines based at Heathrow are not able to act as ‘first-movers’ on many routes, thus missing out on all the advantages this brings. This issue is examined in more detail in response to Question 13.
- 12.22. While Heathrow offers a relatively poor level of service to destinations in mainland China, the UK’s historic link with Hong Kong supports a high frequency service of 63 flights per week<sup>67</sup>. Some would point to this as an additional ‘gateway’ into mainland China for the UK, with passengers transferring on to internal flights to other Chinese cities that London fails to serve. However, this appears not to be the case since only 2% of all passengers arriving at Hong Kong from Heathrow transfer to flights to mainland China<sup>68</sup>. See Table 12.3 below.

**Table 12.3: Connecting passengers at Hong Kong by airline, 2010**

Airline	Total annual passengers	Passengers connecting to mainland China	Percentage of UK passengers connecting to mainland China
Air New Zealand	62,132	0	0%
British Airways	381,225	1,100	0.3%
Cathay Pacific	898,455	26,500	2.9%
Qantas	94,525	0	0%
Virgin Atlantic	134,053	4,500	3.4%
<b>Hong Kong Total</b>	<b>1,570,390</b>	<b>32,100</b>	<b>2.0%</b>

Source: CAA, Annual Passenger Survey Report 2009, 2010

<sup>67</sup> OAG, OAG Schedules Data, June 2011

<sup>68</sup> the percentage may be slightly higher if ‘stopovers’ in Hong Kong en route to mainland China are taken into account

## 13. What are the benefits of maintaining a hub airport in the UK?

**The basis of the connectivity benefits associated with a UK hub airport is set out in response to Question 10. Heathrow's hub role enables higher frequencies to be supported on a number of highly beneficial longhaul routes – such as those between Heathrow and New York, Delhi and Mumbai. The presence of a hub airport in the UK allows carriers, particularly those that have a large base at Heathrow, to offer direct flights to a range of secondary cities in countries such as India, including Hyderabad and Bangalore.**

**Heathrow's capacity constraints have prevented similar benefits emerging on other routes, including those to mainland China, and Heathrow now clearly lags behind its Continental rivals in this and other emerging markets which are likely to be important to the UK's future.**

### Introduction

- 13.1. The principal aviation benefit of a hub airport serving a city such as London is that it allows higher frequencies to be offered and a wider variety of routes to be operated viably. The basic reasons for this are set out in response to Question 10, which should be read alongside this answer. The vital economic benefits which result are set out in response to Question 1. Further evidence about these direct connectivity benefits is provided here, together with an examination of the consequences of Heathrow's capacity constraints in terms of lost opportunities for better connectivity, particularly in emerging economies. This answer also sets out case studies comparing the quality of the UK's direct connections with China and India to those of other European countries with hub airports. Further benefits associated with the export revenues which international transfer passengers generate for the UK economy are set out in response to Question 14.

### Connectivity benefits of a UK hub airport

- 13.2. This section aims to illustrate the connectivity benefits to London by the presence of a hub airport. The most frequent transatlantic route operated between any pair of airports is London Heathrow to New York JFK. Of 121 flights per week in June 2011, 76 were operated by British Airways, Heathrow's main hub operator, an average of over ten per day. Approximately 39% of all passengers on the route transfer at Heathrow<sup>69</sup>, which is equivalent to 47 of the 121 weekly flights. In fact the very high frequencies of flights which the market can support on this route are highly valued by business users particularly in the business and financial services sectors, and are dependent on the mix of transfer and direct passengers that a hub airport provides.
- 13.3. The mutually beneficial nature of the network effects a hub airport generates are further illustrated in the converse role North American flights also play in supporting longhaul routes at Heathrow with thinner demand. As was illustrated

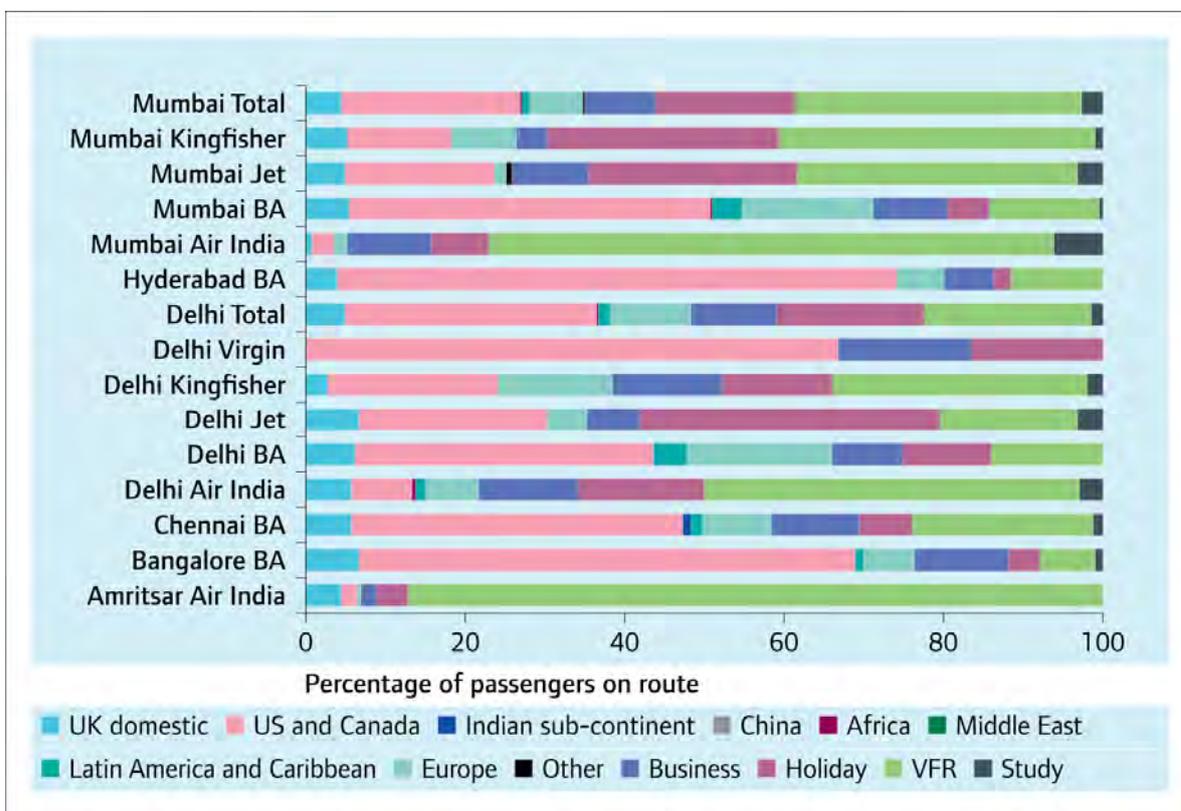
---

<sup>69</sup> CAA, *Connecting passengers at UK airports*, 2008.

in response to Question 10, there are many routes with high proportions of transfer passengers at Heathrow and most of these are international<sup>70</sup>. In fact on approximately 70% of Heathrow's routes transfer passengers account for more than 25% of the total.

- 13.4. The pattern of services on routes between Heathrow and India illustrates the connectivity benefits of the UK hub well. In Figure 13.1 the proportions of *direct* passengers by journey purpose (business, visiting friends and relatives, holiday, study) are shown in the four bars on the right of each row. *Indirect* passengers are shown to the left of this, with proportions by origin of passengers rather than journey purpose shown. For example, this shows that on the Hyderabad route only around 20% of passengers are travelling directly, with the majority travelling to visit friends and relatives; of the 80% of passengers travelling indirectly, the vast majority are travelling from the US and Canada.

**Figure 13.1: Proportions of direct passengers (by purpose) and indirect passengers (by origin) on flights from Heathrow to India**



Source: York Aviation from CAA Survey data, 2010

- 13.5. A number of observations can be made about the data. Firstly, there are significant differences in the share of transfer passengers across airlines. This reflects an apparent preference for airlines in each country to concentrate on consolidating demand at their own 'home' hubs. The proportion of indirect passengers using UK based airlines (BA and Virgin) is generally significantly higher than that using the Indian airlines, which reflects the availability of transfer passengers to them at Heathrow. In contrast, the Indian-operated

<sup>70</sup> Passengers with origins and final destinations outside the UK.

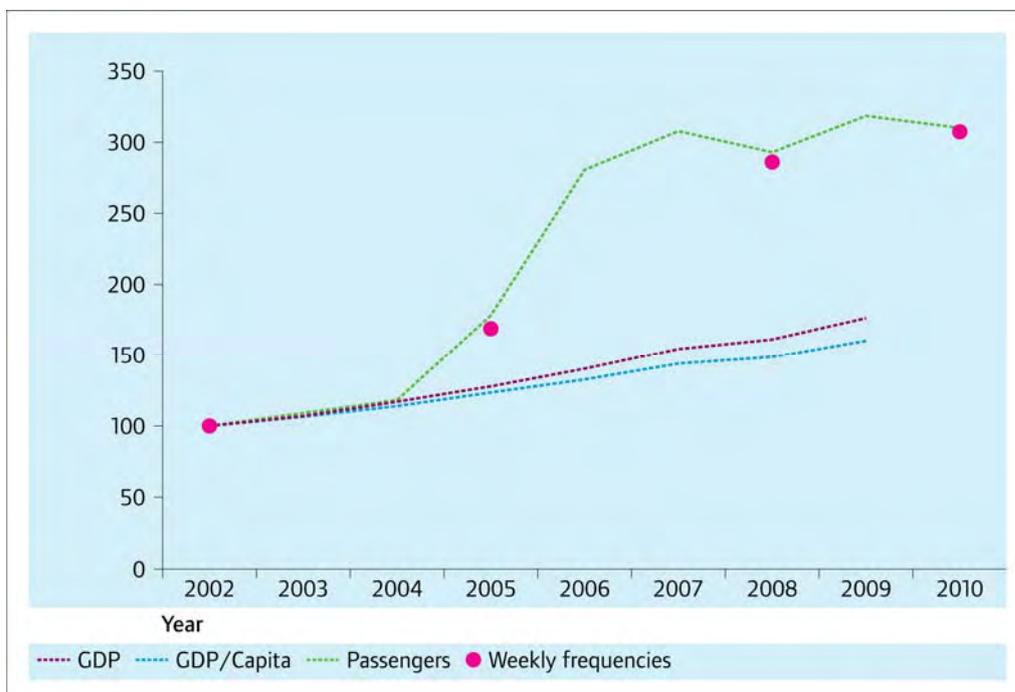
carriers rely far less on transfer passengers in the UK, and instead consolidate Indian domestic demand at Mumbai and Delhi. It appears clear that the transfer business available at UK and Indian hubs together allows higher frequencies on these hub-to-hub routes than would otherwise be possible. See Figure 13.4 below.

- 13.6. Secondly, a consequence of this is that direct flights to the second tier Indian destinations of Bangalore and Hyderabad<sup>71</sup> can be operated by BA once they have consolidated demand at Heathrow. Transfer traffic on these routes accounts for over 75% of demand and principally originates in North America. It seems clear that without the UK hub, direct flights to these destinations would not be available. See also Figure 13.4 below.

### London's connectivity with India and China

- 13.7. A comparison of the pattern of Heathrow's direct connections with India and China provides a useful case study of its varying success in developing new links to important emerging markets. Firstly, although both India and China are rapidly growing economies, and both are increasingly important for UK trade and investment, they have seen very different patterns of aviation development in recent years. Figure 13.2 and Figure 13.3 show the relationship between growth in GDP and GDP per capita and the development of weekly frequencies from Heathrow since 2002, in India and mainland China respectively.

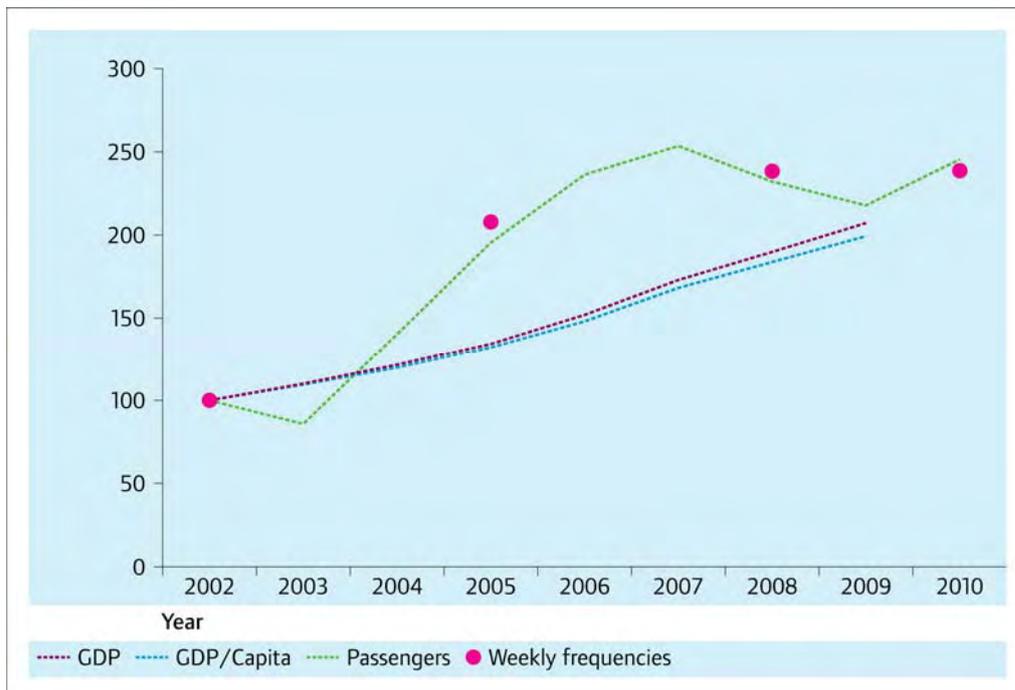
**Figure 13.2: Indexed Growth of Indian GDP, GDP Per Capita and UK Aviation Links**



Source: World Bank Data, CAA Statistics, and OAG, OAG Schedules Data, June 2011

<sup>71</sup> Air India's routes to second tier cities such as Amritsar involve service stops at Delhi.

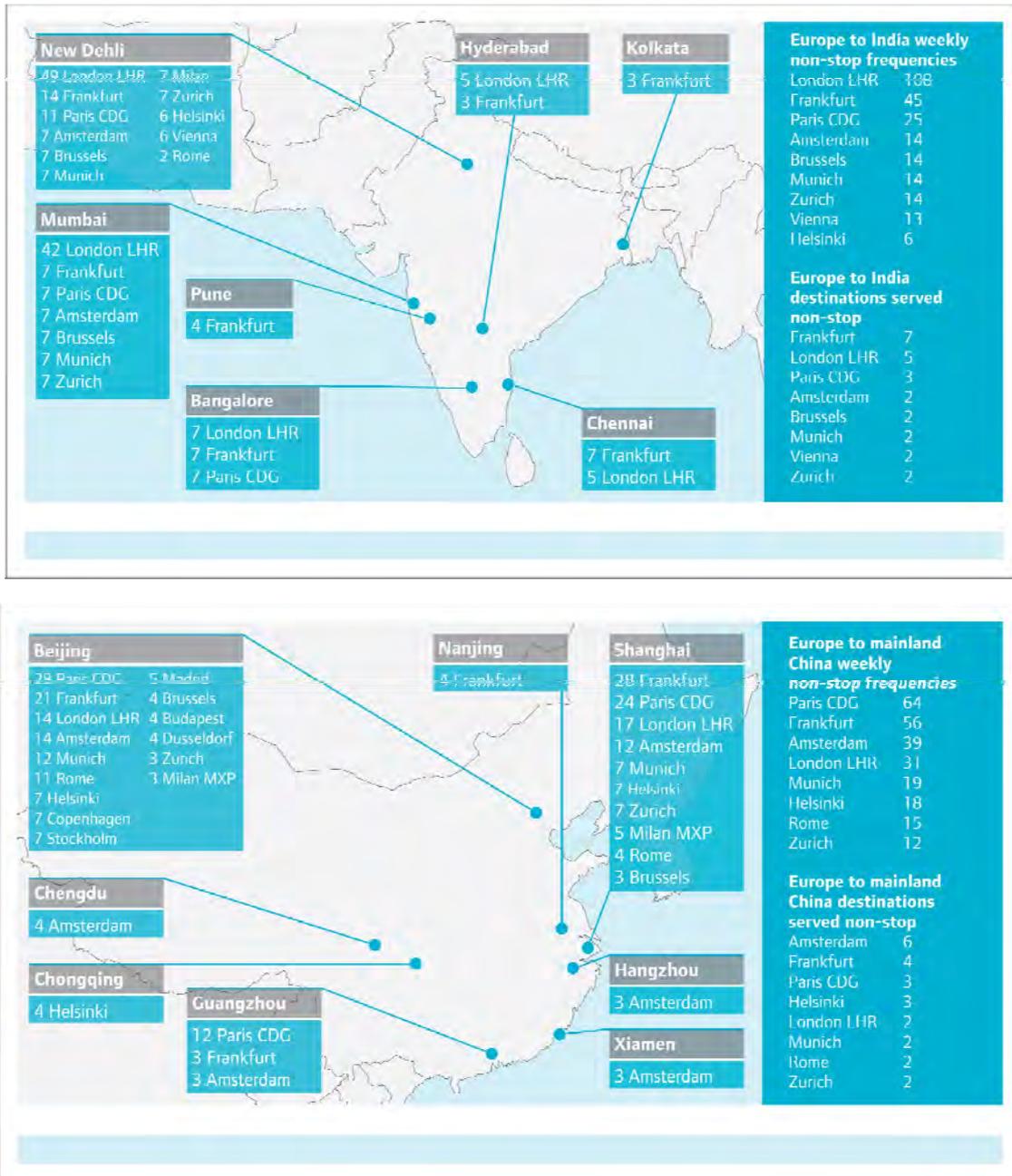
**Figure 13.3: Indexed Growth of China GDP, GDP Per Capita and UK Aviation Links**



Source: World Bank Data, CAA Statistics, and OAG, OAG Schedules Data, June 2011

- 13.8. Whereas the development of services between the UK and China has broadly tracked GDP growth over the decade, the growth of services between the UK and India has been substantially faster than GDP or GDP per capita growth. It is noteworthy that while both China's GDP and GDP per capita have grown at approaching twice the rate of India's over the period, the weekly frequency of flights between Heathrow and India grew substantially faster than that between Heathrow and mainland China. The reasons for this are explored further below.
- 13.9. Further detail about the patterns of non-stop direct services to and from Heathrow are provided in Figure 13.4. This shows that in terms of weekly flight frequencies to India, Heathrow has a commanding lead amongst European cities and that in terms of the number of destinations served, it is second behind Frankfurt. In contrast Heathrow lags well behind other European airports in the market between Europe and mainland China. Both Paris CDG and Frankfurt offer substantially higher frequencies to both Beijing and Shanghai. Heathrow is in fifth position in terms of the number of destinations served (2 compared with 6 at Amsterdam Schiphol), and fourth in terms of overall weekly flight frequencies, with less than half the frequency offered by Paris CDG, the leading European hub on this measure.

**Figure 13.4: Current and planned weekly non-stop frequencies from Europe<sup>72</sup> to India and mainland China**



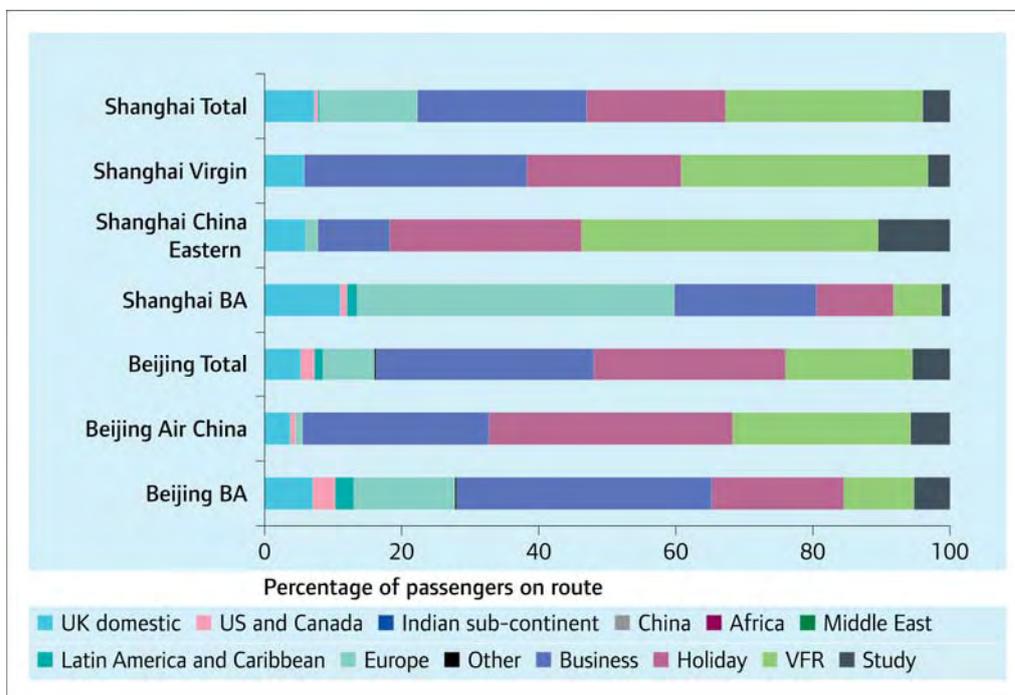
Source: Various Airline/Airport timetables, compiled by Tfl

13.10. It is notable that alongside this large discrepancy between Heathrow's success in developing direct services to India and its relative failure with services to China, there are very substantial differences in the respective roles of transfer traffic in the two markets. As Figure 13.5 shows, where there is significant transfer traffic on Chinese routes it is fed primarily by passengers originating in the UK and Europe rather than North America. The proportions of transfer traffic are in any case generally much lower on Chinese routes than Indian ones. While transfer

<sup>72</sup> Not including flights to and from EU 10 or European part of CIS.

passengers account for approximately 20% of the total Shanghai market from Heathrow and 15% of the Beijing market, they account for over 30% of Mumbai passengers and almost 50% of Delhi passengers, as shown in Figure 13.1, above.

**Figure 13.5: Proportions of direct passengers (by purpose) and indirect passengers (by origin) on flights from Heathrow to China**



Source: York Aviation from CAA Passenger Survey

- 13.11. While it is clear that Heathrow is not an attractive hub for passengers travelling between North America and China since routes via the Pacific are shorter, this is also the case for Europe's other hub airports, which have been relatively successful in establishing direct links. Other explanations are needed for Heathrow's failure to establish a leading offer in serving mainland China. The restrictions inherent in the UK's bilateral agreement with China appear to be a decisive factor.
- 13.12. Industry sources indicate that China is unwilling to liberalise the bilateral UK-China agreement because of the inability of Chinese carriers to obtain the slots they require. China's biggest airline, China Southern, does not serve the UK, citing access to Heathrow as the reason<sup>73</sup>.
- 13.13. In contrast, the rapid growth in Heathrow's market to India followed the signing of a new bilateral UK-India treaty in 2005. Previously, as much as half of the market between the UK and India was indirect, with transfer at hubs in third countries. The new bilateral agreement has allowed direct flights to grow and replace this. While similar treaties were agreed between India and the other European countries with hub airports, none of these has been able to reach the frequencies now offered at Heathrow. This difference, shown in Table 13.1 is underpinned by both a strong home market and high feeder demand from the

<sup>73</sup> The Independent, 'China's deep south or the frozen north? Head for Heathrow', 25 June 2011

frequent North American flights into Heathrow.

**Table 13.1: Utilisation of bilateral permitted weekly departure frequencies, Europe-India**

Destination	Permitted weekly departures		Weekly departures		Utilisation	
	Indian carriers	European carriers	Indian carriers	European carriers	Indian carriers	European carriers
Germany*	50	50	14	52	28%	104%***
France*	35	35	14	21	40%	60%
Netherlands*	21	21	0	7	0%	33%
UK**	112	112	77	52	69%	46%

**Notes**  
 \*2011 Departures only includes Amsterdam, Paris (CDG), Frankfurt and Munich  
 \*\*UK Permitted is based solely on current operating routes, but the total could increase should services be launched on routes not currently served  
 \*\*\*it is not clear how Lufthansa have exceeded their allowance as these are individual routes

Source: UK/India Bilateral Agreement and OAG, OAG Schedules Data, June 2011

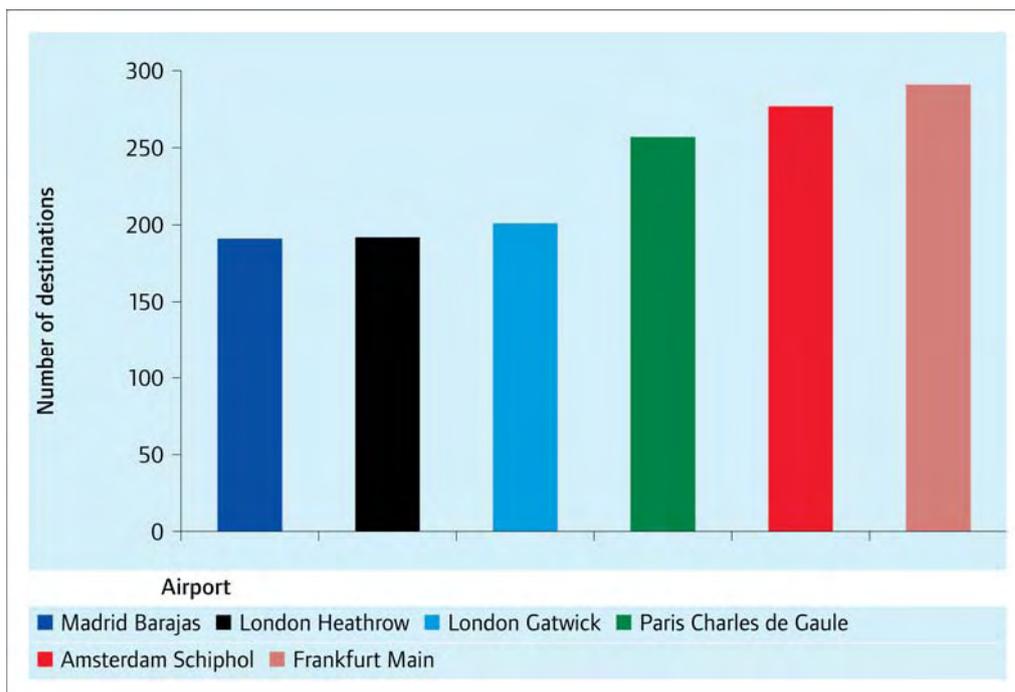
13.14. By contrast, the restrictive bilateral UK-China agreement does not allow for much more traffic than is required to meet the needs of the UK market, and with the exception of BA's services on which there is a significant volume of transfer traffic originating in continental Europe, the China market is less integrated in Heathrow's hub activities than most other major longhaul markets.

13.15. The importance of slot availability should not be underestimated. All of the bilateral agreements with India stipulate that the governments must make best endeavours to provide commercially acceptable slots at both ends of the routes. To some extent, this has not been so challenging given the service pattern of operations from India, typically arriving late afternoon/early evening and departing mid/late evening, avoiding conflict with the busiest periods at the European hubs.

## The challenge facing Heathrow

13.16. It is clear that Heathrow remains very effective as a hub airport on many routes, including between London and the US and London and India. The problem it faces is that today it does not have sufficient capacity to perform consistently well on all routes. It is consequently becoming increasingly specialised on its core markets and is allowing other European airports to take the lead elsewhere. The ultimate problem with this strategy is that a hub's effectiveness is related to the breadth of its route network. If it loses too many secondary routes its effective connectivity on the core longhaul routes will start to suffer as it loses the ability to generate sufficient transfer passengers. Heathrow is already slipping significantly behind its continental rivals in terms of the number of destinations it serves, as Figure 13.6 shows.

**Figure 13.6: Number of destinations served from key European airports, 2009**



Source: OAG, OAG Schedules Data, June 2011

13.17. In other important respects Heathrow is failing to perform as the leading hub London could and should support. A hub is most effective when it operates waves of incoming and outgoing flights which provide surges of arrivals and departures around a short connecting window that maximises the transfer options while minimising the time required to make the transfer. The peak nature of such an aircraft movement profile requires spare capacity, and as such this optimised model of hub operation is not one which Heathrow, with its significant capacity constraints, can employ.

## 14. How important are transfer and transit passengers to the UK economy?

**Transfer passengers make a vital contribution to the UK economy. They spend money while waiting for their connections, contributing for example, to the retail income of £350m that Heathrow generated in 2009. In large part this retail income represents export revenue. Some transfer passengers also generate tourism receipts by incorporating visits to the city in their trips. They tend to use UK-based airlines, generating commercial revenue, supporting UK jobs and generating UK tax revenue.**

**The few passengers who transit at Heathrow are mainly travelling on flights operated by non-UK airlines. In 2010, there were just 136,000 transit passengers, representing 0.2% of all passengers.**

**Above all, transfer and transit passengers support the network of routes offered at the UK's hub airport, and consequently support the enormous benefits this provides. This is examined in detail in Questions 10, 13 and 15.**

**Since airlines tend to operate hubs only in their home countries, or together with their alliance partners in their home countries, the presence of an efficient UK hub airport is a pre-requisite if the UK is to play a leading role in one of the three global airline alliances.**

**Capacity constraints threaten to reduce connecting passengers to about 20% of the total by 2030 and 10% by 2050. If not addressed, this could not only significantly damage the contribution of the aviation industry but jeopardise the wider economy if the longhaul route network offered in London suffers as a result. The Mayor strongly urges the Government to fully recognise in their aviation policy framework the benefits which transfer passengers in particular bring to London's hub airport.**

## **Introduction**

- 14.1. The few passengers who transit at Heathrow are mainly travelling on flights operated by non-UK airlines. In 2010, there were just 136,000 transit passengers, representing 0.2% of all passengers. An example is the Kuwait Airlines route which stops at Heathrow to pick up passengers. The through-passengers tend to remain on the aircraft while in transit, and do not purchase goods or services at the airport. They support the operation of a small number of routes that might not otherwise operate to or via Heathrow.
- 14.2. Transfer passengers, who change planes, play a part in supporting demand at many UK airports, and a very important role at Heathrow, as Table 14.1 shows. As explained in response to Questions 10 and 13, transfer passengers support the viability of routes from the hub airport, allowing more destinations to be served than would otherwise be possible, along with higher frequencies. The very important economic and social benefits this generates are examined in answer to Question 1.

**Table 14.1: Proportion of connecting passengers at selected UK airports, 2008**

Airport	Proportion connecting	Number of connecting passengers (millions)
Heathrow	35.1%	23.5
Gatwick	13.1%	4.5
Stansted	9.1%	2.2
Manchester	3.0%	0.6
Luton	4.1%	0.4
Aberdeen**	9.7%	0.2
Birmingham*	2.3%	0.2
Glasgow**	1.9%	0.2
Edinburgh**	1%	0.1
Liverpool	1.4%	0.1

Source: CAA, *Connecting passengers at UK airports, 2008* [some data for 2005\*, 2006\*\*]

## Export revenues

- 14.3. International transfer passengers make important contributions to the UK economy in a number of ways, particularly at airports like Heathrow, where around 35% of users are international passengers transferring between services. When overseas passengers transfer between aircraft at a UK airport, export revenue is generated in the form of airport fees and through any goods and services they purchase<sup>74</sup>. An indication of the importance of this is given through considering that Heathrow generated retail income of £350m in 2009, which represented a fifth of its overall income.<sup>75</sup>
- 14.4. Most transfer passengers fly with an airline which is based at the hub airport, so in the case of Heathrow, a UK based airline. For example, Virgin Atlantic Airways, which controls 4% of slots at Heathrow, sells 40% of its tickets outside the UK, generating receipts of £1.5 billion a year. 30% of Virgin Atlantic passengers at Heathrow connect to other flights.<sup>76</sup> Such activity supports UK jobs and provides income to UK businesses which generate UK taxation. Passengers transferring on foreign airlines also support UK jobs through administration, catering, ground handling etc.
- 14.5. By helping UK airlines offer more attractive services, transfer passengers also help them compete against overseas airlines. Given that addressing the persistent balance of payments deficit is a Government priority, this is beneficial. Other things being equal, UK-based passengers who choose to use a UK based airline effectively generate fewer import flows than those who choose an overseas based airline.

<sup>74</sup> The value of the imported component of goods purchased in this way should be deducted from the calculation

<sup>75</sup> Heathrow Airport Limited, *Annual report and financial statements for the year ended 31 December 2009, 2010*

<sup>76</sup> Unpublished information provided by Virgin Atlantic Airways during a meeting with TfL officials in August 2011

- 14.6. Stopovers at airport hotels are a source of income from overseas. This is particularly important for a number of outer London boroughs, including Hillingdon and Hounslow; the former has between 15,000 and 25,000 hotel rooms and the latter between 1,000 and 2,500.<sup>77</sup> Furthermore, some transfer passengers take advantage of travelling through London to visit the city, and this generates additional valuable tourism receipts.

## Commercial benefits

- 14.7. It should be noted that since airlines tend to operate hubs only in their home countries, or together with their alliance partners in their home countries, the presence of an efficient UK hub airport is a *sine qua non* for the UK to play a leading role in one of the three global airline alliances.

## Conclusion

- 14.8. This valuable contribution to the UK economy is under threat due to capacity constraints at Heathrow and to a lesser extent Gatwick. Work undertaken for TfL by York Aviation suggests that connecting traffic at Heathrow could fall to about 20% by 2030 and 10% by 2050. If this occurs, it could reduce exports, reduce feeder traffic, and narrow the range of direct services which are available from London. If not addressed, this issue could significantly damage the contribution aviation makes to the wider UK economy and consequently the country's overall economic performance.
- 14.9. In this period of economic turmoil, the Government is promoting a rebalancing of the economy towards more export-driven growth. Given this emphasis and the evidence of the contribution that transfer passengers to the UK economy discussed above, the Mayor strongly urges the Government to recognise the enormous benefits which transfer passengers at London's hub airport in particular generate.

## 15. What are the relative merits of a hub versus a point-to-point airport?

**Both point-to-point and hub airports have an important role to play in meeting the UK's aviation needs. Point-to-point airports cater for mainly shorthaul leisure demand and a chief benefit is that they offer convenient access to aviation for their users. However, a point-to-point airport can only support the level of connectivity justified by the demand in its hinterland, and as such is limited in the routes and frequencies that it can offer.**

**As explained in the responses to Questions 10 and 13, a hub airport offers particular benefits to London and the UK by offering a range of direct longhaul services which would not otherwise be viable, i.e. if the UK relied on point-to-point airports alone. Essentially it allows a better**

---

<sup>77</sup> Prepared for the Mayor of London by Grant Thornton, *Accessible hotels in London*, 2010

**point-to-point network to be operated by attracting transfer passengers.**

**Without this, London's and the UK's business needs could be underserved. Access to a network of direct longhaul destinations is important for some businesses and they tend to cluster in the relatively small number of cities that can offer it. However, even a city like London could not justify a network of frequent flights to a wide range of longhaul destinations on the basis of business demand alone. In fact, airlines rely on the additional revenue provided by leisure passengers (and cargo) to make viable the network of routes which suits international businesses, with adequate frequencies.**

**This works because leisure passengers are generally willing to fly indirectly (as discussed in Question 3), particularly since airlines price indirect flights more attractively. Leisure demand for longhaul destinations can therefore be consolidated at hub airports like Heathrow. There are also transfer requirements arising from business demand between second tier cities. In economic terms this means that each passenger effectively generates 'positive externalities' to all the others, including business passengers. This effect is magnified in hub operations, which effectively correct the market failure associated with the high fixed costs of operating direct long distance air services.**

**The infrastructure needs of transfer passengers at hub airports differ from those of other passengers. For example, when British Airways moved out of Terminal 4 upon the opening of Terminal 5, passenger traffic at the terminal fell from 17m to 10m passengers per annum. However, the share of terminating passengers increased from 50% to 95% and resulted in a net increase in terminating traffic of approximately 1m. This required changes in various aspects of airport infrastructure and operations, including immigration and security arrangements.**

## **Network benefits**

- 15.1. A point-to-point airport can only support the level of connectivity justified by the demand in its hinterland, and as such is limited in the routes and frequencies that it can offer. A hub airport combines point-to-point traffic with transfer traffic, together enabling more routes and frequencies than would be justified by local point-to-point demand alone.
- 15.2. The balance between the two varies from airport to airport. While some airports like London Heathrow and Chicago O'Hare are rooted in strong local demand, others such as Amsterdam and Dubai have deliberately set out to build route networks on the basis of strong transfer traffic since demand within their local catchment is weaker. But either way, the hub model brings a wide range of economic benefits to the country hosting the hub airport, both as a direct result of the increased connectivity it offers, and through export of aviation and aviation-related services to hubbing travellers.
- 15.3. As explained in the responses to Questions 10 and 13, a hub airport provides

particular benefits to London and the UK by offering a range of direct longhaul services which would not be viable if the UK relied on point-to-point airports alone. Essentially it allows a better point-to-point network to be operated by attracting transfer passengers. Without this London's and the UK's business needs could be underserved.

- 15.4. Access to a network of direct longhaul destinations is important for some businesses and they tend to cluster in the relatively small number of cities that can offer it. However, even a city like London could not justify a network of frequent flights to a wide range of longhaul destinations on the basis of business demand alone. In fact, airlines rely on the additional revenue provided by leisure passengers (and cargo) to make viable the network of routes which suits international businesses, with adequate frequencies. The importance of this is demonstrated by the fact that in 2010 there were 39 routes at Heathrow on which more than 50% of passengers were transferring, and a further 92 routes on which more than 25% of passengers were transferring.
- 15.5. This works because leisure passengers are more willing to fly indirectly than business passengers, particularly since airlines price indirect flights more attractively. Leisure demand for longhaul destinations can therefore be consolidated at hub airports like Heathrow. In economic terms this means that each passenger effectively generates 'positive externalities' to all the others, including business passengers. This effect is magnified in hub operations, which effectively correct the market failure associated with the high fixed costs of operating direct long distance air services.

## **Operational differences**

- 15.6. It is also worth noting that at a hub airport, point-to-point and transfer traffic have different needs. In particular, while transfer traffic requires efficient operations, point-to-point traffic places much greater strain on infrastructure, including requirements for check-in, security and immigration facilities, as well as adequate surface access. The switch of airlines at Heathrow's Terminal 4 illustrates the point. When British Airways moved out of the terminal, making way for a number of other carriers, passenger traffic at the terminal fell from 17m to 10m per annum. But because the mix of terminating/connecting traffic also changed as a result of the characteristics of the airlines (from 50/50 to 95/5), there was a net increase in terminating traffic from 8m to 9m. This required additional infrastructure to be provided.
- 15.7. The most successful airports, the key nodes on the global aviation network, are those which combine point-to-point and hub functions and can thus deliver the highest levels of connectivity, with the economic benefits that brings.

**16. Would it be possible to establish a new 'virtual' hub airport in the UK with better connectivity between existing London and / or major regional airports? Could another UK airport take on a limited hub role? What would be the benefits and other impacts?**

The operation of a 'virtual hub' airport linking Heathrow and Gatwick airports using a high speed rail connection is worth examination but it would be a "world-first" and would need to overcome considerable technical challenges. These include the need to offer attractive minimum connection times and effective security and baggage transfer. Furthermore, an effective hub has sufficient capacity to offer a high number of connections in waves of arrivals and departures. It is not clear that in the longer term a Heathrow - Gatwick hub would have sufficient capacity to perform this role with their existing runway provision.

A Heathrow-Birmingham hub would need to overcome similar challenges. The two airports are farther apart than Heathrow and Gatwick, which makes the provision of a competitive minimum connection time harder to achieve. Such a scheme would also erode the capacity benefits of High Speed 2 (HS2), since Birmingham airport would have to accommodate substantial passenger demand from London and the South East, as well as transfer trips. Furthermore, the flight paths of both airports cross densely populated areas.

## Introduction

- 16.1. The value of airport capacity depends on its location. Hub airport capacity, in particular, is only useful where there is sufficient demand to support it. While some airports in the South East have potential for growth, this may not be attractive for airlines providing longhaul services, or for alliances which rely on a critical mass of routes and demand to be profitable.
- 16.2. Establishing a 'virtual' hub airport in the South East has been talked about for a number of years and a number of options could be considered. However, there is currently no example of this anywhere in the world.

### Heathrow – Gatwick virtual hub

- 16.3. There are already some international airlines choosing to introduce new longhaul routes from Gatwick. The recent sale of the airport has afforded its new owners an opportunity to look at new markets. While rail access to Gatwick from central London is good, journey times from Gatwick to Heathrow are poor. There are currently approximately 100 scheduled commercial coach services between Gatwick and Heathrow per day which provide connections for passengers connecting between flights at each airport. This journey requires passengers to pass through immigration and border controls at each airport, can take up to 90 minutes and is subject to significant journey time unreliability.

16.4. Clearly a new fast, direct rail link between Heathrow and Gatwick would bring about a dramatic improvement to this situation and if integrated into the wider rail network beyond Heathrow could bring major improvements in surface access to Gatwick passengers. In order for a virtual hub to be effective, however, a range of performance requirements would need to be met:

- Competitive connecting times between arrivals and departures would be needed. Heathrow currently performs relatively poorly in this regard compared with a number of other European hubs, as shown in Table 16.1;
- reliable baggage transfer would be needed;
- an effective solution for the security needs of transferring passengers would need to be found;
- Any operational issues facing airlines would need to be understood.

**Table 16.1: Minimum connect times at selected European airports**

Airport	Minimum connecting time (minutes)	Connection type	Source
Heathrow	60	Intra-terminal	BAA
	75	T1-T3	BAA
	105	T5-T4	BAA
	90	Other terminal	BAA
Paris CDG	45		AdP
Frankfurt	45		United
Amsterdam	50	Intercontinental	KLM
	40	Europe	KLM
Munich	30	T2-T2 (LH/Star Alliance hub)	MUC
Zurich	35	Europe	Swiss

Source: various, airport operators and airlines, compiled by TfL

16.5. A route between Heathrow and Gatwick which broadly followed existing motorway corridors would be approximately 65km in length. If a fast direct rail link could average a 160 kph (100mph) journey speed, a journey time of approximately 24 minutes could be expected between the airport sites. At an average 240kph (150mph) the journey time could be 16 minutes. The challenge which would need to be overcome, however, is not an attractive point-to-point journey time between the airports but between each of the terminals at both airports. Given the existing difficulties in achieving fast transfers between terminals at Heathrow, this should not be underestimated.

### Heathrow – Birmingham virtual hub

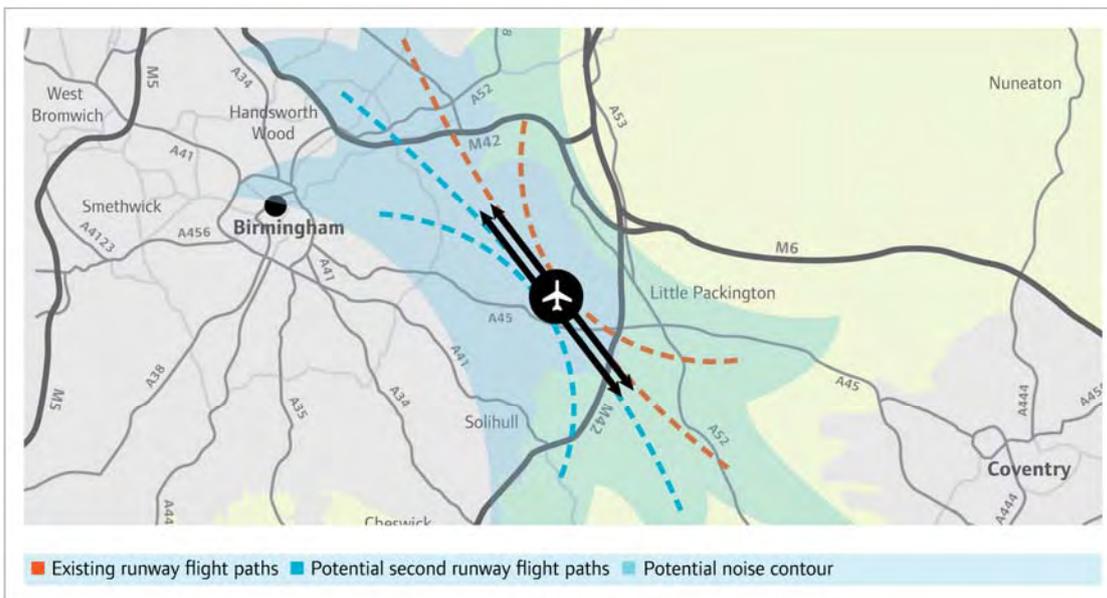
16.6. The most accessible major airport to London outside the South East, in a scenario in which the HS2 line is operational, is Birmingham. Other South East airports such as Southend, Manston and Southampton will be less accessible than Birmingham following any commencement of services on HS2.

16.7. While there is some potential for growth, Birmingham Airport is likely to reach its

full potential as a medium-sized international airport, accommodating in the order of 30 million passengers per annum. It is too constrained to offer a substantially greater role than this since a second, full-length runway would lead to significant noise impacts on large numbers of Birmingham residents, as Figure 16.1 shows.

- 16.8. Furthermore the benefits of HS2 could be eroded if significant capacity were consumed in catering for air passengers originating in London, and especially so if paths were taken up by a dedicated airside connection. Analysis undertaken by HS2 Ltd and by TfL shows that there will not be substantial spare capacity on HS2 to accommodate a step-change in demand at Birmingham airport, following opening of the full 'Y' network as currently proposed.

**Figure 16.1: Indicative flight paths of a two runway Birmingham International Airport**



### A hub elsewhere?

- 16.9. The essential benefit of a hub airport is the ability to maintain a network of direct flights to support the wider economy. To consolidate demand and allow this to operate efficiently requires flights to be organised into concentrated waves of arrivals and departures. The likely consequence is that multiple runways will be needed, albeit at lower overall capacity utilisation. An airport which is not capable of this type of operation is therefore unlikely to be able to achieve the required intensity of flights and is unlikely to succeed in the main objective described above.

London is, and will remain in the future, the focal point of the UK's economy and so it would not be in the nation's best interest to neglect the London market in favour of an attempt to establish hub operations at regional airports. The Mayor firmly believes that only London can sustain a true hub for the UK and that the Government should be considering the means by which London and the UK's hub connectivity might be best provided in the future. See answer to Question 20 for further discussion.

# 3: Regional connectivity and regional airports

## Summary

The Mayor's principle concern is for London, and it is important that the unique role that London plays in the UK economy is acknowledged. Nevertheless the Mayor recognises that aviation is also a vital concern in the regions. He also believes that London and regional interests are complementary rather than mutually exclusive in this regard. To a large extent it is through connections with a hub in London that many regional airports can connect the UK regions to the global economy. By contrast, spreading out capacity improvements across a host of regional airports is highly unlikely to offer a sufficient solution to the UK's aviation needs. Effective hub capacity, in addition to the more limited range of point-to-point services that would be offered at regional airports, is needed.

The DfT forecasts imply that beyond 2030, all growth will have to be at the UK's regional airports. In this scenario, some 42 million people would travel from the South East to airports in other regions by 2050, while millions of others will be deterred from making a trip by air altogether. Not only is this unrealistic, it would result in a loss of connectivity which would have severe consequences for London and the UK. In particular London would lose vital direct business connections which are only currently available because of the enormous volume of dispersed demand which is channelled through the hub airport, Heathrow.

## 17. **Can regional airports absorb some of the demand pressures from constrained airports in the south-east? What conditions would facilitate this?**

**The Government's demand forecasts published in August suggest that regional airports would have to accommodate all growth in demand to and from London and the South East after 2030, when the London airports are forecast to be full.**

**While the Mayor recognises the important role regional airports play in supporting the UK's demand for air travel, he does not consider it feasible that they absorb significant demand from elsewhere. For instance, the Government's demand allocation model assigns more than 2.5 million passengers from London and the South East to Humberside Airport each year, and more than 3m to Bristol. Even if passengers were willing to use these airports in principle, it would add substantial pressure to the already pressurised surface transport network.**

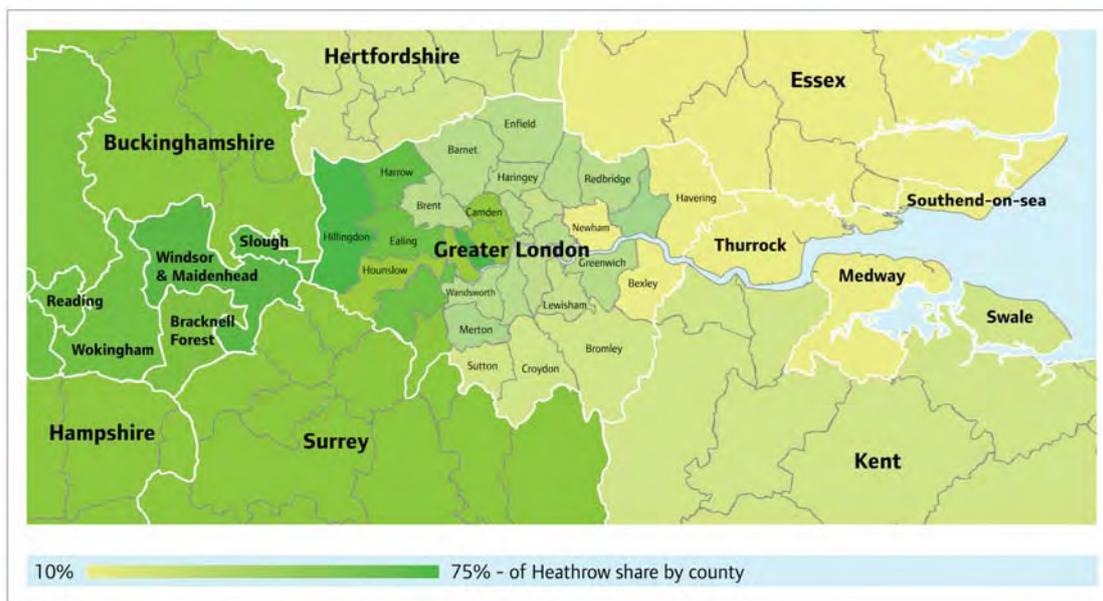
**The Mayor is also unconvinced that more than a very small number of**

**regional airports will be able to offer commercially viable longhaul operations to more than a handful of the most popular destinations. It is essential that the UK retains direct connectivity to a wide range of destinations, and for this a hub airport is needed.**

**Demand is so heavily concentrated in the South East that the vast majority of regional airports are not conveniently placed, in the absence of strong local demand, to offer airlines a commercially desirable alternative to locations in the South East.**

- 17.1. The Mayor recognises that airports in the South East are under pressure owing to limited capacity and that other airports could absorb some leisure demand to shorthaul destinations (and some longer-haul ones). However, such a solution would carry with it serious disadvantages.
- 17.2. Access to a network of direct longhaul destinations is important for many businesses and they tend to cluster in the relatively small number of world cities that can offer this. While London and the South East are easily Europe's preminent business regions, on its own the business demand they generate is insufficient to justify the network of frequent flights to a wide range of longhaul destinations which contribute to London's attractiveness as a place to locate. Airlines rely on the additional revenue provided by leisure passengers (and cargo) to make viable the network of routes which suits international businesses, with adequate frequencies. At Heathrow this demand includes the huge leisure demand from the London and South East market and a large number of predominantly international transfer passengers (see Question 10).
- 17.3. If London's airports were to lose large numbers of leisure travellers to other airports, both from their home market and interliners, the hub system which supports the network of routes would no longer work (see Question 15). It is clear that no other UK city has the critical mass of demand to support a hub airport and the UK would be left without such a facility. Consequently it would also lose the vital international business connectivity on which its economy depends. Furthermore, rival continental European hubs would benefit from London's failure, gaining more of the vital leisure trips which could support their own network of routes. In some emerging markets there is evidence that this process is already happening (see Question 13).
- 17.4. There are several reasons for this. Firstly, most demand at London airports is from London and the South East. People living in the catchment area of these airports will generally be unwilling to travel to regional airports. The overwhelming reason that airports in the South East are busier is because the population base and economic strength of the South East stimulates significant demand for aviation. Indeed, 60% of passengers taking flights from the UK travel from airports in the South East.

Figure 17.1: Heathrow airport catchment area



Source: York Aviation, 2011

- 17.5. Figure 17.1, above, highlights the local strength of Heathrow's catchment area. With this wealth of connectivity on their doorstep, it is highly unlikely that large numbers of residents of Berkshire, Surrey and Buckinghamshire would be willing to use an airport further from their homes, with fewer connections on offer.
- 17.6. Furthermore, many of the essential routes which are needed to support the wider London economy are dependent on hub feeder traffic. They cannot be provided at an airport other than the main London hub. Preventing feeder traffic from serving the London hub and diverting this growth to regional airports could threaten the viability of some of the essential hub routes.
- 17.7. Consequently, while regional airports can offer valuable additional point-to-point leisure services, they cannot be expected to adopt the role currently performed by Heathrow.

## 18. What more can be done – and by whom – to encourage a switch from domestic air travel to rail?

**The Mayor believes that where appropriate, every effort should be made to encourage a switch from air travel to rail. Rail, and high speed rail in particular, complements air connectivity. However, rail will never replace the need for air travel. In order for a destination to be attractive by high speed rail, the journey time needs to be less than three to three and a half hours.**

**The proposed High Speed 2 line will be capable of delivering great benefits to London and many regions to the north. However, large areas of the country will not be served. Unless a high speed rail network**

**capturing the whole of the UK is developed, there will always be a market for domestic aviation.**

- 18.1. Where there is a suitable, competitive alternative, the Mayor firmly believes that every effort should be made to encourage domestic air travel to switch to rail. However, further reducing the number of domestic flights will not solve the fundamental gap between demand and available airport capacity, which will continue to grow in the coming years.
- 18.2. The number and proportion of flights at UK airports which have a domestic origin or destination varies. The table below shows the figures for domestic air transport movements at selected UK airports in 2010. Edinburgh has the highest absolute number of domestic flights and Heathrow is actually below Edinburgh, Glasgow and Gatwick. However, given the much higher overall number of flights at Heathrow, it has a much lower proportion of domestic flights, approximately 10%.

**Table 18.1: Domestic Air Transport Movements at selected UK airports, 2010**

Airport	Domestic ATMs	Total ATMs	Percentage domestic
Edinburgh	62,793	100,584	62.4%
Glasgow	48,178	68,881	69.9%
Gatwick	48,014	233,553	20.6%
Heathrow	47,157	449,271	10.5%
Aberdeen	41,823	87,950	47.6%
Manchester	41,386	148,876	27.8%

Source: CAA, *UK Airport Annual Statistic for 2010, 2011*

- 18.3. While removing all domestic flights from Heathrow (and other congested airports) by shifting them onto rail might seem an attractive option in terms of freeing-up capacity, these flights do provide significant economic and connectivity benefits to both London and the regions. The scoping document acknowledges the need to continue to serve remote parts of the UK by air, with a particular note on Northern Ireland. Most importantly of all, even if all domestic flights were removed from Heathrow and Gatwick, only a relatively small proportion of the airports' capacity would be released.
- 18.4. In order for a destination to be attractive by high speed rail rather than by air, it is generally acknowledged that the rail journey time needs to be less than three to three and a half hours. For example, in 1996 Lufthansa suggested that rail based trips should replace flights for journeys of less than two and a half to three hours<sup>78</sup>. Such routes account for a small proportion of those served at Heathrow.

<sup>78</sup> Lopez-Pita, A. & Robusté Anton, F, 'The Effects of High Speed Rail on the Reduction of Air Traffic Congestion', *Journal of Public Transportation*, 6, 1, 2003

## **Potential shift stimulated by High Speed Rail**

- 18.5. TfL carried out a piece of analysis, based on journey times provided by HS2 Ltd for the full Y-network, looking at the potential for mode shift from air to rail. A mode-choice logit model was constructed which predicts that a significant mode shift could be achieved if the full Y-network (high speed track to Manchester and Leeds with services continuing on 'classic' lines to Glasgow and Edinburgh) is built. A conservative estimate for the Manchester, Leeds, Newcastle, Edinburgh and Glasgow air markets to London was a shift of the order of 40 to 50%. Similar results could be expected for a range of continental cities which are not currently served by Eurostar services but where the city-centre to city-centre journey time on a direct service from London would be comparable by rail and by air. Table 18.2 shows all UK airports which had a two-way flow of over 100,000 passengers to and from London's five main airports in 2010.

**Table 18.2: Domestic routes from/to London's five principal airports, 2010<sup>79</sup>.**

London airport	Non-London airport	2010 two-way flow
<b>Gatwick</b>	Aberdeen	129,948
	Belfast City	218,943
	Belfast International	296,802
	Edinburgh	604,073
	Glasgow	488,774
	Guernsey	335,937
	Inverness	206,837
	Isle of Man	122,159
	Jersey	534,303
	Manchester	246,842
	Newquay	105,968
	<b>Total</b>	<b>3,496,378</b>
	<b>Heathrow</b>	Aberdeen
Belfast City		467,826
Belfast International		284,029
Edinburgh		1,244,793
Glasgow		1,003,344
Manchester		799,264
Newcastle		424,251
<b>Total</b>		<b>4,840,832</b>
<b>London City</b>	Edinburgh	334,709
	Glasgow	111,050
	<b>Total</b>	<b>556,188</b>
<b>Luton</b>	Aberdeen	129,018
	Belfast International	170,023
	Edinburgh	242,100
	Glasgow	247,681
	<b>Total</b>	<b>937,452</b>
<b>Stansted</b>	Belfast City	301,637
	Belfast International	301,069
	Edinburgh	329,874
	Glasgow	301,758
	Newcastle	121,134
	Prestwick	224,570
	<b>Total</b>	<b>1,723,067</b>
<b>Total domestic passengers using London's five principal airports</b>		<b>10,686,885</b>

Source: CAA, UK Airport Annual Statistics for 2010, 2011

- 18.6. Further improvements to the National Rail network, particularly improvements to line speeds from the South West and Wales could also provide a shift from air to rail for cross-country routes.

<sup>79</sup> Only includes routes with a two-way demand of over 100,000 ppa. Total includes all domestic traffic.

- 18.7. It is therefore important that the Government works with a number of rail and air industry bodies in order to achieve this mode shift. For example, the Government should deliver an integrated high speed network which connects cities in the north with London's primary airport. The Government could, if it wished, consider measures to address the price disparities between air and rail.

## **19. How could the benefits from any future high speed rail network be maximised for aviation?**

**To maximise benefits for aviation, a domestic high speed rail network must serve the UK's hub. The Mayor believes the UK's long-term aviation strategy should inform the high speed rail strategy in this regard. In the first instance, the Mayor supports the inclusion of an interchange at Old Oak Common to serve Heathrow Airport. High speed rail has the potential to link city centres with the hub airport capacity, as the networks serving Paris Charles de Gaulle, Frankfurt, and Schiphol do successfully. It should be noted that high speed rail will also increase Heathrow's catchment area, potentially adding further pressure on its capacity.**

- 19.1. As the response to Question 18 shows, there is some potential for a mode shift from domestic air to rail which could bring significant benefits – reducing the number of domestic flights as long as alternative connectivity is provided. For example, Givoni<sup>80</sup> studied the case of integrating air and rail services on the Heathrow to Paris route, allowing passengers arriving at Heathrow to use existing high speed rail rather than an onward flight to complete their journey to Paris. He found that both local air pollution and climate change effects are improved significantly if air trips are transferred to rail and that there were also benefits to passengers and society from journey time savings and a reduced number of transfers. Similar benefits could be obtained from certain other international shorthaul destinations if further improvements were made to the high speed network.
- 19.2. A domestic high speed rail network linking city centres with the UK's hub airport would serve both the city-centre to city-centre markets, and those who wish to travel onwards by air.
- 19.3. A better integrated high speed network connecting London and the South East to northwest Europe could further reduce the number of flights between London and locations such as Amsterdam and Frankfurt, in a similar fashion to how Eurostar has abstracted demand from aviation on routes to Paris and Brussels in the seventeen years since it opened: in 2004, within 10 years of its opening, Eurostar carried 66% of passengers travelling from London to Paris by air or rail, and 48% of passengers travelling from London to Brussels<sup>81</sup>. Table 19.1 shows

---

<sup>80</sup> Givoni, Moshe, 'An Evaluation of Benefits from Aircraft and High-Speed Train Substitution', *Policy Analysis of Transport Networks*, 119-144

<sup>81</sup> Eurostar press release, 'Latest results signal new era for Eurostar', [http://www.eurostar.com/UK/x\\_euro/leisure/about\\_eurostar/press\\_release/press\\_archive\\_2004/12\\_01\\_04.jsp](http://www.eurostar.com/UK/x_euro/leisure/about_eurostar/press_release/press_archive_2004/12_01_04.jsp), 2005

the aviation demand in 2010 between London, Manchester and Birmingham's airports and cities in Benelux, northern France and western Germany. Only pairs with a two-way demand of over 100,000 passengers are included.

**Table 19.1: Annual demand between selected UK airports and selected European airports, 2010**

Country	Airport	UK Airport	Passengers
<b>Belgium</b>	Brussels	Heathrow	492,723
		Birmingham	100,093
		Manchester	148,788
<b>France</b>	Paris CDG	Heathrow	1,299,701
		Luton	228,796
		Birmingham	314,227
		Manchester	441,341
<b>Germany</b>	Cologne-Bonn	Gatwick	145,101
		Heathrow	131,912
		Stansted	175,045
	Dusseldorf	Gatwick	123,505
		Heathrow	541,152
	Frankfurt Main	Stansted	147,937
		Heathrow	1,266,240
		London City	185,869
		Birmingham	254,282
		Manchester	329,973
Dortmund	Luton	149,078	
Frankfurt Hahn	Stansted	276,350	
Niederrhein	Stansted	206,814	
<b>Luxembourg</b>	Luxembourg	Heathrow	147,745
<b>Netherlands</b>	Amsterdam	Gatwick	548,352
		Heathrow	1,333,124
	London City	367,217	
	Luton	234,411	
	Stansted	278,137	
	Birmingham	426,887	
	Manchester	437,279	
	Rotterdam	London City	115,286
	Eindhoven	Stansted	183,924
	<b>Total</b>		

Source: CAA, UK Airport Annual Statistics for 2010, 2011

- 19.4. Although the table shows that absolute demand on many of these routes is not particularly great, the aggregated effect of even a relatively small percentage of these passengers switching to rail could be significant.
- 19.5. It is important to bear in mind that air to rail mode shift is not the main goal of HS2 and that the proposals for the first phase do not serve Heathrow directly. A proposed Old Oak Common station would allow passengers to interchange from

HS2 to Crossrail for Heathrow, which the Mayor supports.

- 19.6. In order to serve Heathrow directly a spur is proposed off the Birmingham to London line (any trains serving the airport from Birmingham and beyond would reduce the number of trains that could serve Euston). The Mayor considers that it would be premature to set out long-term proposals for an expensive dedicated high speed connection serving Heathrow directly until the Government has set out its long-term aviation plans for future capacity.
- 19.7. International evidence of the effects of new high speed rail lines on aviation demand is provided in Appendix G.
- 19.8. In the light of the available evidence, the Mayor's view is that it is vital that national and international rail networks and the nation's aviation infrastructure are integrated to provide maximum benefits to the UK. Nevertheless, while a high speed rail network could significantly contribute to the UK economy, a coherent strategy for providing additional airport capacity is needed independently of the development of high speed rail routes. Furthermore, the Mayor feels that this strategy should inform the development of a high speed rail network.

## **20. How can regional airports and the aviation sector as a whole support the rebalancing of the economy across the UK?**

**The Mayor believes the prospects for establishing a regional hub to rival London's hub are very poor and consequently that a priority for regional airports should be to have good connectivity to an international hub airport in London offering onward global connections. This arrangement would offer the best prospects for regional economies to benefit from and share London's global competitiveness. This is discussed further in Question 2.**

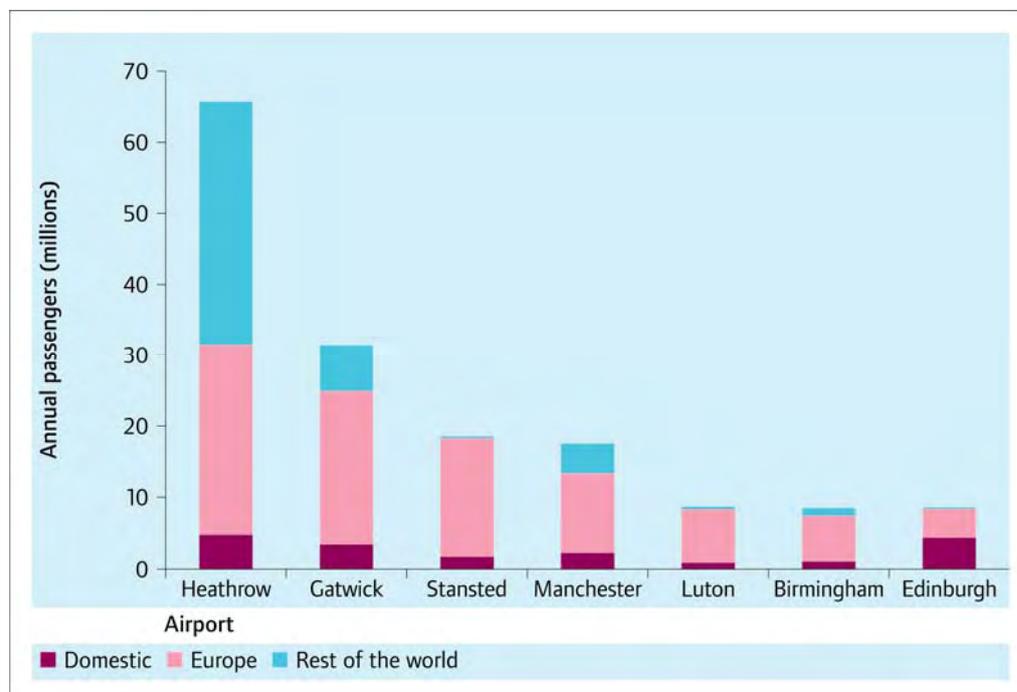
**A national hub airport in the South East would provide the global connectivity required for all of the UK to compete and help rebalance the economy. By offering greater capacity than is possible at Heathrow, the new airport would be able to serve as a truly national resource, unlike Heathrow today.**

**In contrast, growth at regional airports will, to a large extent, offer weaker links to foreign hubs and point-to-point connections serving outbound tourism (see Question 2).**

**The Mayor believes the Government should pursue an aviation policy that seeks to maximise and secure the nationwide benefits that derive from London maintaining excellent global aviation connectivity. Providing an effective hub that serves London and the South East efficiently in the long-term must be at the heart of this policy.**

- 20.1. As was shown in response to Question 1, only London and the South East have developed a highly aviation intensive economy. Through this and with their large population base, a high proportion of which participates in the aviation market, they can generate a sufficiently large base of aviation demand for the range of destinations a major hub airport serves. By contrast, other regions are not so well placed to offer this level of connectivity.
- 20.2. Manchester is arguably the best placed of all the regional airports to develop as a major hub but it has manifestly failed to do so. It is easily the largest regional airport, its catchment includes four major metropolitan areas (Greater Manchester, Merseyside, West and South Yorkshire) and it is the only UK airport other than Heathrow to have two operational runways. In 2009, Manchester handled 149,000 ATMs and 18.3m passengers, of whom 1.9% (0.35m) were transferring between aircraft there. In contrast, in the same year Heathrow handled 450,000 ATMs and 65.8m passengers, 37.8% (24.9m) of whom were transferring.
- 20.3. The lack of transfer traffic at Manchester and other regional airports is reflected in the character of the route networks they support. Figure 20.1 shows the numbers of passengers travelling on domestic routes, European routes and routes between the UK and the rest of the world at the UK's seven largest airports, which include Manchester, Birmingham and Edinburgh. It is clear that Heathrow is unique in terms of the number and proportion of passengers it serves who are travelling to or from locations beyond Europe.

**Figure 20.1: The unique role of the UK's hub airport in serving passengers travelling beyond Europe**



Source: CAA, UK Airport Annual Statistics for 2010, 2011

- 20.4. The Mayor therefore believes the prospects for establishing a regional hub to rival London's hub are very poor and consequently that a priority for regional airports should be to have good connectivity to an international hub airport in

London offering onward global connections. While recognising the importance to passengers in the regions of point-to-point flights for leisure travel, an effective hub in the South East offers the best prospects for them to benefit from and share London's global competitiveness.

- 20.5. Furthermore, the regions will reap greater benefits if their principal hub connections (either by air or by rail depending on distance) are to London's hub, rather than to foreign competitor hubs. This is because regional connections to London can be sustained at a higher frequency than they can at alternative European hubs because of the additional merits of a strong domestic (non-transfer) market. Regional demand – particularly that associated with revitalised UK regional economies – would support the success of the London hub. Thus there are mutual benefits for London and the regions associated with a well connected UK hub based in London.
- 20.6. Unfortunately Heathrow, through its intrinsic capacity constraints, has begun to fail the UK regions by not effectively fulfilling its role as the national hub airport. New hub capacity is urgently required to connect the UK regions more prominently to world markets and truly realise the regional benefits that are offered by aviation in the UK.
- 20.7. Capacity constraints at Heathrow mean that domestic connections have been lost in recent years, as can be seen Table 20.1 below, and these routes continue to remain vulnerable to further decline.

**Table 20.1: Weekly flights from Heathrow to domestic destinations**

Domestic	2002	2011
Aberdeen	80	84
Belfast	82	67
Edinburgh	206	109
Glasgow	208	52
Leeds/Bradford	25	0
Manchester	129	81
Teeside	20	0
Newcastle	86	39
<b>Total</b>	<b>826</b>	<b>432</b>

Source: OAG, OAG Schedules Data, June 2011

# 4: Making better use of existing capacity

## Summary

The Mayor does not believe that the historic reliance on incremental expansion is the correct approach to meet future long-term aviation capacity needs. Heathrow and Gatwick are operating very close to capacity, and Stansted is approaching capacity at peak times. A long-term solution that provides significant new aviation capacity for London and the South East must be found. Making better use of existing capacity is simply an attempt to find a short-term fix to a problem that requires a long-term solution.

## 21. To what extent do UK airports meet the needs of their customers? How might those needs be more effectively met within existing capacity? What is the right balance between competition and regulation?

**The extent to which UK airports meet the needs of their customers varies considerably. Whilst significant recent investment has gone into improving the customer experience at London's airports, particularly at Heathrow and Gatwick, the underlying capacity constraint is the single greatest issue adversely impacting customer needs.**

- 21.1. Passengers want to travel to their desired destination rapidly, comfortably, reliably and at a price which is within their budget. The Mayor believes competition plays a significant role in improving the passenger offer and providing appealing commercial conditions for airlines. The Mayor notes that passenger satisfaction surveys indicate a significant improvement in the last two years in the perception of passengers travelling through London's busiest two airports, and that airlines have generally been strongly supportive of the Competition Commission's rulings requiring BAA to divest Gatwick and Stansted.
- 21.2. The Mayor acknowledges BAA's significant investment programme at Heathrow in recent years on passenger concourse infrastructure, including the £4bn construction of Terminal 5, the £200m refurbishment of Terminal 4 and the current Terminal 2 construction project.
- 21.3. Nevertheless, a lack of capacity for flights has a very clear and direct impact on the quality of the customer experience at UK airports, as well as having a dampening effect on competition. For example, Heathrow is rated as a three-star

airport (out of five) by the Skytrax website<sup>82</sup>. With its runways operating at a 98.5% utilisation level, there is a constant pressure on take-offs and landings which regularly results in stacking, queuing on the taxi to the runway, and contributes to poor resilience.

- 21.4. A less constrained hub airport would enhance competition between airlines wishing to serve London, reducing barriers to entry into the market. This would allow the market to determine which routes would be viable, and allow carriers to open up new routes without sacrificing other routes. It would also allow specific economically and socially beneficial routes to be protected if necessary.

## **22. Can we extract more capacity out of the UK's existing airport infrastructure? Can we do this in a way which is environmentally acceptable? To what extent might demand management measures help achieve this?**

**It may be possible to extract more capacity out of the UK's existing airport infrastructure, but this must not be at the expense of the quality of life of Londoners. In any case, the Mayor believes that the solution to the UK's aviation capacity problem should not be the incremental and poorly planned expansion which has characterised much of the UK's historic airport development. This approach resulted in the continued reliance on an ill-suited location at Heathrow, and one which is now inadequate to meet the long-term needs of the nation.**

**A new, strategic approach to aviation capacity is needed, one that considers where it is best to provide capacity; how environmental impacts can be minimised and where the aviation benefits can be maximised.**

- 22.1. Proposals for improvements in airport efficiency are welcome but will be subject to scrutiny, particularly if they turn out to worsen the lives of Londoners living under flight paths. The Mayor believes the use of runway alternation with single mode operation at Heathrow brings valuable and predictable periods of respite for those affected by noise under the landing and take-off paths of overflying aircraft. The Government's mixed-mode trial must be fairly conducted and its consultation should be open-minded and responsive to the people in London who could be adversely affected. The Mayor believes such an initiative can only ever be a temporary solution.
- 22.2. A policy which fails to address the long-term capacity issues which face the UK's airports is by definition inadequate. Solutions which provide a step-change in capacity provision have very long lead times. It is only appropriate to consider the potential of existing infrastructure within the context of a long-term strategy that sets out a bold long-term vision.

---

<sup>82</sup> "Skytrax – the world's largest airline review site"; <http://www.airlinequality.com/>

## 23. How can we support Heathrow's hub status within the constraints of its existing capacity? Can we do this in a way which is environmentally acceptable?

**Heathrow connects the UK to the global economy. However, in the context of substantial global aviation growth, the Mayor believes that Heathrow's hub status cannot be sustained either environmentally or economically.**

**While more can be done in terms of low carbon surface access modes to reduce Heathrow's environmental impacts or connecting Heathrow to HS2 to help release some capacity (TfL estimates around 10%), such measures do not provide solutions to the capacity constraints in the long-term.**

**In light of the fact that the substantial growth needed at Heathrow to meet future demand would be unacceptable, an alternative must be found. The Mayor considers that the best way to manage the capacity issues in the South East, while continuing to ensure that aviation best contributes to the economic prosperity of the country, is through a new hub airport in the South East.**

- 23.1. The Mayor acknowledges the role Heathrow plays as the UK's sole hub airport and third busiest airport in the world. However, Heathrow is constrained by having only two runways, its terminal configuration and stringent noise and air quality restrictions. Taken together, these mean that the airport is operating at 98.5% capacity.
- 23.2. This puts Heathrow at a significant disadvantage against its European rivals, which are able to operate more flights per hour and serve more destinations, as shown in Table 23.1, below.

**Table 23.1: Comparison of major European airport infrastructure capabilities**

Airport	Runways	Current max flights/hour	Future max flights/hour	Current runway utilisation	Destinations served, June 2011
Heathrow	2	87	87	98.5%	192
Amsterdam	6	110	120	70%	277
Paris	4	114	120 (2015)	73.5%	257
Frankfurt	3*	83	126 (2015)	74.5%	291
Madrid	4	98	120	n/a	191

\*4<sup>th</sup> runway under construction and due to open in October 2011

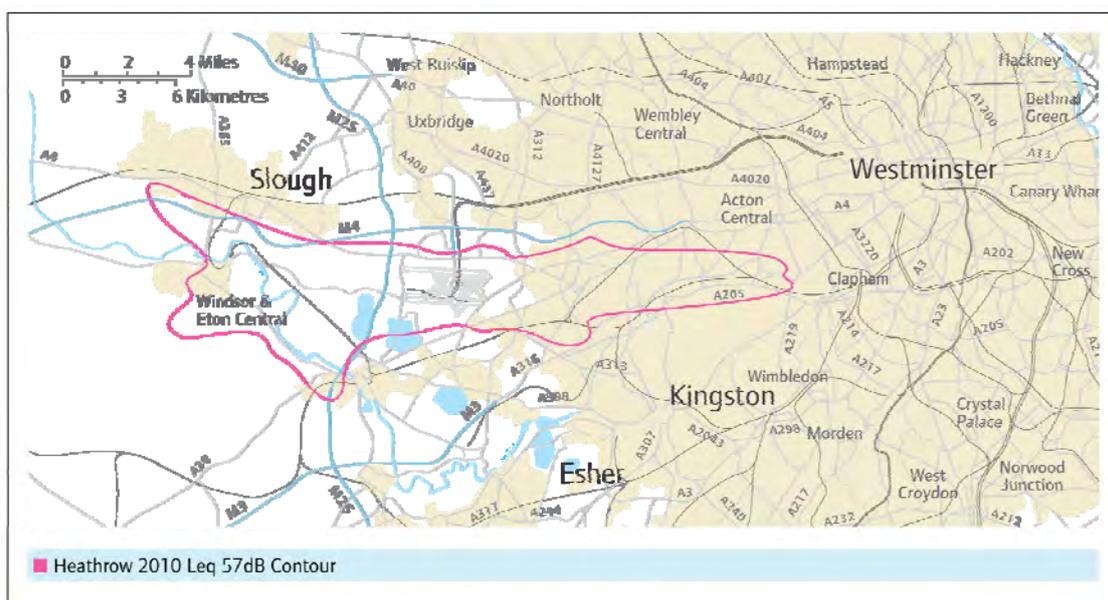
Source: Various operators, compiled by TfL

- 23.3. Over time, the constraints on capacity at Heathrow are likely to lead to the amount of connecting traffic to decline as a proportion of total traffic to approximately 20-25% by 2050, as higher yielding direct traffic replaces lower

yielding transfer traffic, and is borne out by the DfT's 2011 Aviation Forecasts<sup>83</sup>. Without such transfer traffic, Heathrow would witness a deterioration in the network of cities directly served.

- 23.4. The Mayor believes that Heathrow is unsuited to be London's hub airport in the long-term. Built in the 1940's before the era of the jet engine and when the area was still a rural outpost, Heathrow is now surrounded by residential areas and negatively affects too many Londoners to remain the UK's aviation hub in the long-term. The impacts are examined in detail in response to Question 40.
- 23.5. One of the most significant local impacts is noise. Figure 23.1, below, shows the extent of Heathrow's 57 dB noise footprint. In 2006, 314,350 homes, housing 725,000 people, were located within this contour.

**Figure 23.1: Heathrow's noise footprint**



Source: CAA, *Noise Exposure Contours for Heathrow Airport 2010*, ERCD Report 1101, 2011

- 23.6. Given its unsuitable location, Heathrow's hub status should only be supported in the short-term, as part of a clear long-term plan to establish an alternative hub. Heathrow is fundamentally unsustainable in environmental and logistical terms.

<sup>83</sup> Department for Transport, *UK Aviation Forecasts*, 2011 (See for example Table G7.)

**24. How important is increased resilience at the UK's major airports to reduce delays? How best could resilience be improved with existing capacity, e.g. how might trade-offs between existing capacity and resilience play a role in this?**

**It is very important that the UK and London's major airports have sufficient resilience to achieve high levels of operating efficiency. Airport delays and disruption reflect very poorly on both London and the UK and hamper its attractiveness as a location for business. However, improving resilience by sacrificing some of the available capacity is a short-term solution that will result in long-term problems. Substantial resilience can only truly be delivered by providing additional capacity in the form of a new hub in London and the South East.**

- 24.1. The Mayor will support initiatives that improve resilience with no net adverse noise and air quality impacts. However, true resilience is extremely difficult to achieve at an airport which is operating at close to capacity. At Heathrow, there is very little margin for error, and delays can build up through such seemingly trivial beginnings as a pilot pausing for too long once given clearance to take off.
- 24.2. For this reason, the Mayor considers that trade-offs between existing capacity and resilience at Heathrow would be unacceptable. To achieve the resilience required to ensure that London has an effective hub, new capacity must be provided.

**25. Could resilience become an issue at regional airports? If so, how might this be avoided?**

**The Mayor of London's principal concern is the resilience of London's airports, which are those most vulnerable to delays and disruption. However, it is important that all the UK's airports are able to operate reliably.**

**26. Could existing airport capacity be more efficiently used by changing the slot allocation process, for example, if the European Commission were to alter grandfather rights? If so, what process of slot allocation should replace it?**

**The Mayor does not believe that changing the slot allocation process will deliver a long-term solution to the capacity issues. Tinkering with slot allocation does not resolve the fundamental issue of constrained capacity and instead could, perversely, have negative consequences for UK connectivity.**

**The greater use of market mechanisms in slot allocation is endorsed in some quarters to promote the more efficient use of slots. However, at a capacity-constrained airport such as Heathrow, this would encourage airlines to focus more ruthlessly on the most profitable routes. On occasion, this might come at the expense of services which are less profitable but which may nonetheless have a far greater strategic importance for the UK. These routes would include domestic and other shorthaul routes, as well as less established longhaul routes. This would pose a grave risk of further eroding the breadth of connectivity offered, trading it off against the consolidation of a smaller number of the most lucrative routes.**

- 26.1. Capacity constraints at the busiest airports across Europe may be exacerbated to a degree by the system of 'grandfather rights', as stipulated in EU law<sup>84</sup>. While the regulation supports the fair allocation of available slots from the 'pool', it enshrines the right of airlines who already hold slots to keep them so long as they make continued use of them. At congested airports, this limits the number of slots that become available for the pool, making it exceedingly difficult for new entrants, or indeed existing airlines, to secure the slots to start a new service.
- 26.2. However, slots can also be made available through trading between airlines. While the buying and selling of slots is not formally allowed for in the EU regulation, a grey market has arisen at Heathrow (and other congested European airports), which enables the trading of unwanted slots. Given their scarcity, this places a value on slots at the most popular times of day which runs into the millions of pounds. In 2007, British Midland Airways Limited (BMI), holding the second biggest tranche of slots, 11% of Heathrow's total, valued its Heathrow slot holding on its balance sheet at £770m. This compared against no more than £30m for the rest of the airline's net assets<sup>85</sup>.
- 26.3. For many routes, a tipping point is thus reached at which the owner of the slot calculates that they can derive more value from selling the slot to another airline than operating a flight themselves. As a result, in recent years, a number of

---

<sup>84</sup> Council Regulation (EEC) No 95/93 on common rules for the allocation of slots at Community airports

<sup>85</sup> Flight International, *BMI values its Heathrow slot portfolio at £770 million*, 23 May 2008

generally smaller, financially less secure airlines have reduced frequencies or routes and in some cases withdrawn from Heathrow and even the UK altogether.

- 26.4. In response to the restricted access to slots at congested airports like Heathrow, various studies have proposed the introduction of primary and secondary trading mechanisms. The latter, by allowing for trading of slots, would simply formalise existing grey market practices. But the former would include such tools as auctions and higher posted prices (whereby slot prices are increased to suppress demand). It is difficult to deny that such market mechanisms would achieve their objective of a more economically efficient use of scarce slots. It is, however, less clear that it would necessarily improve the hub's attractiveness or indeed benefit the UK economy as a whole.
- 26.5. One such study into slot allocation schemes, undertaken for the European Commission in 2004<sup>86</sup>, identified that the expected results would include "an increase in the proportion of longhaul services [...] compared to shorthaul services" and that "within shorthaul services, for example, some regional services [...] will be withdrawn. Some of the least profitable longhaul services will also be withdrawn." The implied loss of further links between the UK regions and its main hub airport would, as has been discussed earlier, be detrimental to the UK economy. Similarly, there is a need for caution about the loss of shorthaul services to second tier European destinations, which might not be particularly profitable in their own right, but do contribute valuable transfer traffic and thereby support the overall network offering and viability of the hub. Further afield, links to new markets in the major developing economies, such as Brazil, Russia, India and China, are often strategically vital to the UK but cannot be justified by airlines who need to weigh up the risks of such a route against a more established – and more immediately profitable – route when slots are scarce.
- 26.6. These trends can already be witnessed to a considerable degree in recent developments at Heathrow, facilitated by grey market trading. But any moves towards a system whereby airlines are forced to pay for slots they currently hold would require them to choose to fly the most profitable routes more ruthlessly in order that they might recoup their slot costs. This would exacerbate the above trends as weaker airlines and less profitable routes were marginalised in favour of a smaller number of higher yield routes. In turn, this would reduce the breadth of connectivity that underpins the hub's viability, and undermine the strategic role that aviation should be playing for the UK economy.
- 26.7. Ultimately, tinkering with slot allocation does not resolve the fundamental issue of constrained capacity and instead could, perversely, have negative consequences for UK connectivity.

---

<sup>86</sup> NERA for European Commission, *Study to Assess the Effects of Different Slot Allocation Schemes*, 2004

## 27. What provision, if any, should be made for regional access into congested airports?

**There has been a steep decline in the number of regional airports served by Heathrow and in the frequencies of nearly all the remaining routes (from 1662 weekly flights to and from 9 domestic destinations in 2002, to 864 weekly flights to and from 7 domestic destinations in 2011). The focus of airlines has instead been on more profitable foreign routes. The Mayor believes that connections to and from the UK regions are essential to the future of both London's hub and the regions, whether these are by rail or air, as most appropriate for each route.**

- 27.1. As shown in response to Question 20, a consequence of having a capacity constrained national hub airport is the reduction in domestic flight destinations and frequencies. Table 20.1 shows the drop in the number of domestic flights at Heathrow between 2002 and 2011.
- 27.2. The Mayor believes that these connections are vital for the regions and for London and its hub, as answers to Questions 9 and 10 have established. The Mayor would like to see these connections expanded in order both to facilitate the rebalancing of the economy and improve London's hub connectivity.
- 27.3. It is noted that the EU put in place regulation EC 1008/2008 to protect regional services and that the previous Government set out guidance as to how applications would be assessed under a Public Service Obligation.

## 28. What provision, if any, should be made for general and business aviation access into congested airports?

**The Mayor believes that general and business aviation should not be permitted to compromise commercial aviation operations, particularly scheduled services. Whilst he recognises the value added to the UK by business aviation it is generally independent of and more transferable to smaller airports than commercial aviation.**

- 28.1. Airports such as Biggin Hill, Northolt and Battersea Heliport make a substantial positive contribution to the London economy and the Mayor acknowledges and supports their important role. However, General and Business Aviation make little contribution to the connectivity of the strategic hub airport, so it is difficult to justify their access if it is at the expense of scheduled services. In any case, their specialist needs are likely to be better met by smaller airports specifically focused on business and general aviation needs and equipped with the appropriate facilities.

## 29. What is the role of airspace design and air traffic management in making better use of existing capacity?

The management of airspace, based on political boundaries, has constrained capacity across Europe, helping to contribute to delays, which are estimated to cost European airlines between €1.3 and €1.9 billion a year. Airspace design and air traffic management have a clear role in short, medium and long-term solutions both to make better use of existing capacity, and to ensure that additional capacity can be safely and efficiently accommodated. The Mayor welcomes moves underway as part of the 'Single European Sky' initiative to make better use of effective airspace capacity, on which the UK's ability to meet future growth partially depends, and also ongoing work on SESAR, to develop the next generation of air traffic management systems.

While concerns have been raised about the 'complete redesign of the entire London terminal airspace' that a new hub airport might require, the Mayor sees this as a unique opportunity to rebalance the region's aviation airspace away from highly built-up areas towards less densely populated areas out to sea, with a material reduction in impact for many living under today's flight paths.

### *Towards a Single European Sky*

- 29.1. It is clear that for too long the management of airspace, based on political boundaries, has constrained capacity across Europe, helping to contribute to delays, which are estimated to cost European airlines between €1.3 and €1.9 billion a year<sup>87</sup>. The Mayor welcomes moves towards a 'Single European Sky' (SES), with the introduction of 'Functional Airspace Blocks' (FABs) that redesign airspace in a more rational arrangement that maximises its effective capacity.
- 29.2. Similarly, the Mayor welcomes the ongoing European workstream for SES ATM Research (SESAR) which seeks to develop the next generation of air traffic management (ATM) systems. This should further improve the efficiency of airspace management, improving capacity, as well as delivering environmental benefits.
- 29.3. The importance of these approaches to airspace capacity should not be underestimated. The House of Commons Transport Committee in 2009<sup>88</sup> said that "for the longer-term, the UK's ability to meet the White Paper growth forecasts will depend on the success of the Single European Sky (SES) initiatives." The Committee added that "the development and application of new technologies and air traffic management techniques are integral to improving flight efficiency...and increasing airspace capacity."

---

<sup>87</sup> European Commission, *Single European Sky* ([http://ec.europa.eu/transport/air/single\\_european\\_sky/single\\_european\\_sky\\_en.htm](http://ec.europa.eu/transport/air/single_european_sky/single_european_sky_en.htm)), updated 8 February 2011

<sup>88</sup> House of Commons Transport Committee, *The use of air space*, 10 July 2009

### *The challenge of runway capacity*

- 29.4. The lack of sufficient runway capacity at Heathrow requires many incoming aircraft to stack in holding patterns for much of the day, over relatively built-up areas, delaying flights, burning additional fuel and increasing emissions.
- 29.5. By contrast, were a hub airport to have the runway capacity to manage demand effectively, the requirement to place aircraft in holding patterns would be greatly reduced and with it the time, cost and environmental impacts of stacking.
- 29.6. NATS, as the commercial organisation that serves as the UK's air navigation service provider, has expressed its concern that a new airport would require the "complete redesign of the entire London terminal airspace." The Mayor sees this as a unique opportunity to rebalance the region's aviation airspace away from highly built-up areas towards less densely populated, with a material reduction in impact for many living on today's flight paths.

# 5: Climate change impacts

## Summary

Aviation plays a vital role supporting the economy and society, but it must not come at an unacceptable environmental cost. Unconstrained aviation demand would create unacceptable climate change-related emissions. The Mayor supports the recommendations made by the independent body that advises the Government on climate change. The Committee on Climate Change (CCC) states that “given prudent assumptions on likely improvements in fleet fuel efficiency and biofuels penetration, demand growth of around 60% would be compatible with keeping CO<sub>2</sub> emissions in 2050 no higher than in 2005”<sup>89</sup>. The CCC’s recommendations regarding air traffic movement and passenger limits may not prove binding. Nevertheless, they demonstrate that there is considerable scope for aviation growth within environmental limits. This is especially so given that some regard its underlying assumptions to be conservative.

It must be remembered that if effective capacity to support UK demand is not provided, foreign hubs such as Frankfurt, Amsterdam and Paris will grow instead. Indeed, the CCC recognises the potential danger for leakage to other foreign hubs if the UK is not careful in its application of the emissions cap. This leakage would do nothing to combat climate change and would instead severely damage the UK’s global competitiveness and UK jobs.

The DfT’s most recent national demand forecasts refer to the EU’s Emissions Trading Scheme (ETS) as the mechanism by which aviation demand should be managed. Based on current evidence, the Mayor also supports the inclusion of aviation in the EU’s Emissions Trading Scheme (ETS) and that ETS is the principal means by which aviation demand is managed in response to the climate change challenge.

Heathrow operates at 98% of its air traffic movement limit, resulting in environmental impacts which could otherwise be avoided. For instance, excessive fuel is burnt as a result of aircraft being held in stacks prior to landing, and as a result of long taxi and wait times before take-off. While the Single Sky research programme underway in Europe is expected to lead to substantial reductions in stacking and in unnecessary wait times, many people will still suffer noise disturbance and related health effects. Heathrow’s location is such that today, more than 250,000 people are significantly affected by noise in excess of 57dB (in comparison, Gatwick and Stansted affect 4,800 and 2,500 people respectively, at this level).

The Mayor’s position is that alternatives to Heathrow are required in order that London and the UK can meet their effective hub aviation capacity requirements, and remain competitive. The Mayor therefore seeks a sustainable aviation policy that minimises the environmental impacts of aviation whilst securing appropriate social and economic benefits. The Mayor believes that aviation growth should be pursued in a location where it will best assist growth and economic regeneration while minimising its adverse impacts.

---

<sup>89</sup> Committee on Climate Change (CCC), *Meeting the UK Aviation Target – Options for Reducing Emissions to 2050*, 2009

**30. What do you consider to be the most significant impacts of aviation, including its non- CO<sub>2</sub> emissions, on climate change? How can these impacts best be addressed?**

**The Mayor is committed to tackling both the causes and effects of climate change. Clearly the majority of climate changing gases associated with aviation are emitted during flights, but there are also substantial impacts associated with ground based emissions and supporting activities, including surface access journeys. Given the enormous benefits that aviation delivers (See Question 1), ways must be found to address aviation's impact on climate change while not unduly constraining air travel. This should cover all aspects of the aviation sector.**

**Efforts must focus on a wide variety of approaches and seek reductions in emissions wherever possible; maximising aircraft efficiency, improving propulsion technology and aerodynamics, enhancing the feasibility of alternative fuels, ensuring good surface access to airports by sustainable modes and optimising air traffic control regimes can all contribute to addressing the impact of aviation on climate change.**

**Airport operations can also play a crucial role in this. Capacity constraints at Heathrow lead to congestion in both the air and on the ground, leading to additional unnecessary emissions. LHR operates at 98% of its available capacity and at busy times incoming aircraft spend between 30 and 40 minutes in stacks circling London. The CO<sub>2</sub> emissions of aircraft stacking at Heathrow represent an amount equivalent to around 10% of the total CO<sub>2</sub> emitted during the landing and take-off cycle of aircraft arriving at and departing Heathrow.**

**A combination of appropriate infrastructure to manage the anticipated growth forecast, and technological and efficiency improvements in aircraft, will help address aviation's impact on climate change.**

- 30.1. CO<sub>2</sub> is generated by aircraft in flight, ground airport vehicles, and by passengers and staff accessing airports, as well as through emissions which are generated by the production of energy used in airport buildings, the manufacture of aircraft and the construction of airport infrastructure. CO<sub>2</sub> emissions from aircraft-in-flight are the most significant and perhaps best understood element of aviation's total contribution to climate change.
- 30.2. The main non-CO<sub>2</sub> impacts associated with aviation are oxides of nitrogen (NO<sub>x</sub>), condensation trails and cirrus cloud formation. The effects of these emissions however are complex and less well understood than the effect of CO<sub>2</sub> and the methods to account for the climate effects of non-CO<sub>2</sub> emission impacts are still to be established. Research to reduce the uncertainty surrounding these effects would help decision-makers assess their significance.

- 30.3. While the Mayor has few means available to influence the majority of CO<sub>2</sub> emissions from aviation, he is committed to working towards minimising those for which he is responsible, including ground-based emissions from aircraft within the GLA boundary. The Mayor's draft Climate Change Mitigation and Energy Strategy (CCMES) has identified emissions from aircraft taking off and landing to an altitude of 1,000m and taxiing in London to total 1.39 MtCO<sub>2</sub> in 2008.
- 30.4. Emissions trading schemes, improved surface access, airport infrastructure, air-traffic management, aircraft efficiency and technology and increased use of biofuels can all help to address the impacts of aviation on climate change. These issues are all discussed in response to Questions 32, 34 and 36-39.

### **31. What role should aviation play relative to other sectors of the economy in reducing greenhouse gas emissions in the medium and long term?**

**Currently, around 5% of the UK's greenhouse gas emissions come from aviation. While aircraft are becoming cleaner and more efficient, the aviation industry must continue to ensure that growth is sustainable, and that emissions targets are met.**

**Emissions should be considered as a whole and there is much that could be achieved by making day-to-day gains across society. It is likely that the unit costs of reducing aviation's carbon footprint are relatively high in comparison with other activities. For example, there are a number of relatively simple and yet very effective ways in which the energy efficiency of homes and businesses could be improved, yielding significant and prompt savings of fuel and emissions.**

**With the right mechanisms, the aviation industry can maximise its social and economic benefits, and also play a key role in ensuring that industry-wide targets and requirements are met.**

- 31.1. As a general rule, radiative forcing emissions have the same impact no matter where they are produced or what they are produced by. The Committee on Climate Change's (CCC) 2008 report, *Building a Low-Carbon Economy – the UK's Contribution to Tackling Climate Change*, sets out scenarios which might achieve an 80% cut in greenhouse gas emissions, economy-wide. These include early energy efficiency improvement and decarbonisation of the power sector (including use of nuclear power), with extension of low-carbon electricity to transport and heating. It is clear that there is much that can be achieved in day-to-day changes across in the economy and wider society. The pace of reduction that is achievable varies considerably by sector. Significant decarbonisation of electricity generation will play a crucial role over the next twenty years, enabling the use of low-carbon electricity in a wider set of applications – in particular surface transport and residential heat.
- 31.2. There are sectors where rapid early progress seems more difficult to achieve, and aviation is one of them. The reasons include the long life-span of the aircraft

fleet (aircraft retirements typically peak at an age of around 30 years<sup>90</sup>), which results in a slow turnover of assets, reducing opportunities to introduce newer technology. There is also very limited flexibility regarding aircraft fuel. The only fuel that has been shown so far to fulfil the very demanding criteria for fuelling aircraft, which includes cost, is kerosene.

- 31.3. A consequence of this reduced ability to decarbonise as rapidly as some other sectors is that aviation emissions will account for an increasing proportion of overall carbon emissions. The CCC has demonstrated that substantial growth in air travel is permissible, as part of an overall decarbonisation strategy which accepts a slower rate of progress in aviation than in other industries<sup>91</sup>.
- 31.4. Overall, the Mayor considers that significant growth in aviation is consistent with reducing overall climate changing emissions and that within the permissible growth the most economically and socially beneficial types of aviation should have priority. The Mayor believes that an appropriately located hub airport in the southeast of the UK is the best means of achieving these objectives.

## **32. How effective do you believe the EU ETS will be in addressing the climate impacts of aviation? Should the UK consider unilateral measures in addition to the EU ETS? If so, what?**

**The Mayor welcomes the inclusion of aviation in the ETS and considers this to be an effective mechanism for controlling aviation emissions. The Mayor believes that unilateral measures can be inappropriate. This includes the regulatory restriction of runway capacity. These are unlikely to further reduce aviation's greenhouse gas emissions internationally. There is a significant risk that carbon emitting activities, possibly including flights elsewhere in Europe, would simply purchase any allowances remaining from the UK. In the event, overall emissions across Europe would not be affected.**

- 32.1. Assessing the precise benefit of emissions trading schemes is challenging. It involves estimating what the level of pollution would have been, and its impacts, if the trading scheme was not in place.
- 32.2. It has been suggested that emissions trading could reduce the lifecycle CO<sub>2</sub> emissions for aviation, contributing as much as a 20% reduction in CO<sub>2</sub> emissions compared to a non-carbon trading scenario<sup>92</sup>.

---

<sup>90</sup> Morrell P. and Dray L., *Environmental Aspects of Fleet Turnover, Retirement and Life Cycle*, Cranfield University Department of Air Transport, School of Engineering, University of Cambridge, 2009

<sup>91</sup> Committee Climate Change, *Meeting the UK aviation target – options for reducing emissions to 2050*. 2009.

<sup>92</sup> Dray M., Evans A. & Schäfer A., *The Impact of Economic Emissions Mitigation Measures on Global Aircraft Emissions*, Institute for Aviation and the Environment, University of Cambridge, 2010

- 32.3. There must be strong international political will for any emissions trading scheme to succeed. The legal action currently being taken by North American and threatened by Chinese airlines against the inclusion of non-European airlines in the EU ETS highlights the difficulties associated with regulating an international industry.
- 32.4. While the EU ETS is an important step in addressing aviation's climate change impacts, the most effective emissions trading scheme is a global one. Aviation is by its very nature an international industry and policy measures developed at a global level will avoid the inconsistent imposition of targets and measures and the potential for conflicting and overlapping policies.
- 32.5. The Mayor does not believe that the UK should consider unilateral measures to address aviation's climate change impacts. The UK has already set itself challenging carbon reductions targets, and as mentioned in response to Question 31, the CCC has set out levels of permissible passenger growth within these targets. The UK taking unilateral measures to reduce aviation's climate change impacts, such as restricting capacity to reduce demand, would not deliver any further climate change benefits as flights would simply be moved to other European airports. This again highlights the importance of international regulatory approaches to manage what is a global issue.

### **33. What is the best way to define and quantify the UK's share of the CO<sub>2</sub> emissions generated from international aviation?**

**The Mayor believes CO<sub>2</sub> emissions can only be effectively managed through binding international agreement. The European Emissions Trading Scheme should provide such a mechanism. One of the benefits of such a trading scheme is that the cost of reducing emissions are incurred by those best placed to bear them. If this scheme goes ahead as planned, the UK's share should therefore emerge through trading by airlines in the market place for permits. This in turn will be determined by the airlines' prospective passengers' willingness to pay for these through their fares, relative to others' willingness to pay. The Mayor believes that in principle this is an efficient, appropriate means of defining the UK's share of CO<sub>2</sub> emissions.**

### **34. What is the potential for increased use of sustainable biofuels in aviation and over what timeframe? What are the barriers to bringing this about?**

**The Mayor's believes that biofuels could be a viable option for significantly reducing aviation emissions, and that their use could become widespread in the long term.**

- 34.1. Finding a sustainable alternative to kerosene that fulfils all of the specific requirements for aviation fuel, that can be produced in the required quantities, and that can be introduced globally, will be challenging. However, it is likely that increased use of aviation biofuels will eventually be both technically feasible and economically viable, and it is clear that such fuels offer the opportunity to contribute to carbon reduction targets. It is the Mayor's view therefore that sustainable biofuels will play an important part in helping to meet aviation carbon reduction targets in the longer term.
- 34.2. It is important to note that the CCC has demonstrated that even with limited penetration of sustainable biofuels, aviation passenger growth is still permissible within carbon reduction targets. The assumptions about aviation biofuel uptake in the CCC report are cautious, reflecting current significant sustainability risks. In its 'likely' scenario, from which the 85 million additional passengers per year in London and the South East is derived, the CCC assume that penetration of aviation biofuels will reach 10% by 2050. This reflects a situation where there are very limited resources available for use of biofuels in the aviation sector (either due to land constraints, limited progress developing biofuels from methods requiring less land input, or demand for biofuels from other sectors).

### **35. What mechanisms could the Government use to increase the rate of uptake of sustainable biofuels in the aviation sector? In particular, how can we accelerate the successful development of second generation biofuels?**

**The Mayor believes that there are a number of valuable voluntary initiatives which may have an impact on the rate of development of sustainable biofuels. However, relying on voluntary initiatives alone may be insufficient for the industry to achieve the degree of coordination and agreement needed to implement their widespread uptake. It is therefore important that the Government works with industry to incentivise and back their development. Policy measures such as mandating the use of biofuels or greater financial support for the research and trialling of alternative fuels should be considered.**

- 35.1. Programmes such as the European Advanced Biofuels Flight Path Initiative (comprising the European Commission, Airbus, and high-level representatives of the aviation and biofuel industries) can have an impact on the rate of development of sustainable biofuels. The "Biofuels Flight path" is a shared and voluntary commitment by its members to support and promote the production, storage and distribution of sustainably produced drop-in biofuels<sup>93</sup> for use in aviation. It also targets establishing appropriate financial mechanisms to support the construction of industrial "first of a kind" advanced biofuel production plants. Given a suitable level of Government involvement and any necessary

---

<sup>93</sup> A fuel which can be mixed with standard aviation fuel

incentivisation, this type of collaboration by key players in the aviation industry can go a long way to improving the viability of biofuels.

- 35.2. IATA's recently released document, *Powering the Future of Flight*<sup>94</sup>, sets out six ways of developing a sustainable aviation biofuels industry, including fostering research into new feedstock processes and providing incentives for airlines to use biofuels from an early stage. While the Mayor is not in a position to comment on specific fiscal or policy measures, this is one potential framework that could be supported through such Governmental mechanisms to help develop the production of biofuel which could lead to the voluntary adoption of usage by airlines.
- 35.3. Relying on voluntary initiatives may be insufficient for the aviation industry to achieve the degree of coordination and agreement needed to implement new sustainable fuel systems. It is therefore important that the Government works with industry to incentivise and back the development of sustainable aviation fuels, which can be produced in high volumes. In the absence of any regulatory requirements, even well-intentioned industry operators will find it more difficult to coordinate their development efforts. Policy measures such as mandating the use of biofuels (at specific, credible levels), or greater financial support for the research and trialling of alternative fuels should be considered.

## **36. Which technologies (e.g. for aircraft and air traffic management) have the most potential to help reduce aviation's CO<sub>2</sub> emissions (noting potential trade-offs with local environmental impacts)?**

**It is clear that technological improvements have already reduced aviation's rate of CO<sub>2</sub> emissions and will continue to do so. The CCC estimates that a combination of air traffic management and operational efficiency improvements could result in annual improvement in fleet fuel efficiency of between 0.8% and 1.5% per seat kilometre between 2005 and 2050. The Mayor therefore considers that these approaches will play an important part in meeting climate change targets and allowing aviation growth to continue.**

- 36.1. The CCC states that a combination of aircraft, air traffic management and operational efficiency improvements could result in a range for annual improvement in fleet fuel efficiency of between 0.8-1.5% per seat kilometre between 2005 and 2050. This projection, which informs part of the CCC's recommendations on the permissible level of aviation growth, is more conservative than some other estimates (e.g. Sustainable Aviation believes that the annual average improvements in efficiency to 2050 will be 2.1%).

---

<sup>94</sup> Air Transport Action Group, *Powering the future of flight*, 2011, available at: <http://www.atag.org/component/downloads/downloads/58.html>

- 36.2. The majority of efficiency improvements to date have been achieved through improvements in engine technology and it is likely this will continue to contribute to emission reductions. Aircraft emit CO<sub>2</sub> in direct proportion to the quantity of fuel burned, therefore reducing the fuel burn of an aircraft in flight is clearly important. Over the last 40 years, commercial jet airliners have become 70% more fuel efficient and are predicted to be a further 25% more fuel efficient by 2025.
- 36.3. It is in the airline industry's interests to continue to seek further reductions in fuel burn as this decreases costs – currently over a quarter of the operating cost of airlines is accounted for by fuel<sup>95</sup>. Improvements in new aircraft will therefore continue to contribute to reducing aviation's impact on climate change. Boeing, for example, states that the engines developed for the new 787 Dreamliner are expected to contribute as much as 8% of the increased efficiency of the new aeroplane.
- 36.4. Matching the advances in engine technology with more aerodynamic designs to reduce drag and the use of lightweight material can achieve further reductions in emissions, as noted in *Aviation Industry – Mitigating Climate Change Impacts through Technology and Policy*<sup>96</sup>. Aircraft manufacturers are also exploring the benefits of other technologies such as the use of winglets, fuselage airflow control devices and weight reductions. According to the Intergovernmental Panel on Climate Change (IPCC) they could reduce fuel consumption by 7%. In the long term, new aircraft configurations (such as a blended wing body) may achieve major improvements in efficiency.
- 36.5. In terms of engine design, it must be acknowledged that there are complex emission interrelationships that can make it difficult to modify design as a climate change mitigation strategy. As the question suggests, this often forces tradeoffs among individual pollutants as well as between emissions and noise. For example, reducing noise and improving fuel efficiency through one type of design may require higher engine pressure ratios, which increase engine temperatures, and hence generate more NO<sub>x</sub>. In the longer term it is to be hoped that these issues are overcome.
- 36.6. The volume of CO<sub>2</sub> emitted by aircraft is directly related to the fuel used, and therefore decreases as flight patterns become more efficient. There are many new and innovative approaches to managing air traffic that are currently being researched and offer scope to reduce emissions. These include changes to airspace management, air traffic flow management and air traffic control. These could reduce environmental impact by:
- Improving the precision of navigation to allow environmentally preferred routes to be flown more accurately;
  - Reducing the reliance on conventional “navaid” routes to allow more direct, efficient routing;

---

<sup>95</sup> Air Transport Action Group, Facts and Figures, available at:  
<http://www.atag.org/facts-and-figures.html>

<sup>96</sup> Capocci S., Khare A., Mildener U., 'Aviation Industry - Mitigating Climate Change Impacts through Technology and Policy', *Journal of Technology Management & Innovation*, 2010

- Integrating weather and emissions data more fully into the decision-making process to allow pilots and controllers to co-operate in the selection of minimum impact routes; and
  - Minimising delays and diversions associated with airspace and airport congestion (such as hold-stacks) to reduce unnecessary emissions.
- 36.7. The current air traffic management arrangements in Europe suffer from several inefficiencies, such as air traffic control boundaries that follow national borders. Once the Single European Sky becomes operational, this will help to reduce emissions through more coordinated air traffic control.
- 36.8. Currently, air traffic corridors that aircraft are required to follow can lengthen routes, causing higher fuel burn and emissions than are necessary. The International Air Transport Association (IATA) believes that better air traffic control, including straightening air routes and more efficient operations can reduce fuel burn by up to 18%<sup>97</sup>.
- 36.9. Continuous Descent Approach (CDA), while primarily a noise reduction measure, also reduces fuel burn and therefore aircraft emissions. However, this can be difficult to institute at airports which are very busy. In 2010, 83% of arrivals at Heathrow during the day achieved CDA<sup>98</sup>.

## **37. What more could be done to encourage the aviation industry to adopt new technology to reduce its climate change impacts?**

**Airlines and aircraft manufacturers should be suitably incentivised to be bold in the development and introduction of new technology. Incentives must cover the often long and expensive process of developing new initiatives and proving that they are viable. Caps and limits imposed to minimise aviation's impacts on climate change should be agreed at the international level and designed to incentivise improvements in the efficiency of the sector as a whole, should be binding, and must be enforced with appropriate penalties. However, they must be administered in such a way that recognises the vital economic role of the industry as well as its competitive and footloose nature.**

- 37.1. Technological responses have focused mainly on improving aircraft design and performance, primarily with the aim of reducing fuel burn. This has led to aircraft becoming much more efficient in recent years. However, as stated in "*Challenges of Growth*" *Environmental Update Study*, technological responses – both relating

---

<sup>97</sup> IATA, *Partner Brief*, Quarter 1 2008, available at:  
[http://www.iata.org/html\\_email/ns1001319/ns1001319\\_env.html](http://www.iata.org/html_email/ns1001319/ns1001319_env.html)

<sup>98</sup> BAA Heathrow Airport Ltd, *Arrivals Factsheet*, available at:  
[http://www.heathrowairport.com/assets/Internet/Heathrow\\_noise/Assets/Downloads/Statics/Arrivals11.pdf](http://www.heathrowairport.com/assets/Internet/Heathrow_noise/Assets/Downloads/Statics/Arrivals11.pdf)

to aircraft design and performance as well as alternative fuels – require substantial investment.

- 37.2. In the absence of regulation, market forces will continue to determine how and when the aviation industry adopts new technology. The rate of technological development is likely to be driven by future changes in fuel and carbon costs, with the widespread use of open rotor engines (which are more fuel efficient but noisier) and biofuels only occurring at higher oil and carbon prices and within an emissions trading scheme<sup>99</sup>.
- 37.3. The Government should work closely with the aviation sector to support and promote technological development so that the industry minimises its environmental impact while remaining a vital contributor to the UK economy.

### **38. What more can the UK aviation industry do to reduce the climate change impact of its ground operations and surface access to and from the airport (which can also help reduce local environmental impacts)?**

**It is vital that as many of the negative impacts of aviation as possible are mitigated, including those associated with ground operations and surface access by passengers and airport workers.**

**The Mayor supports efforts to maximise the number of people that travel to and from London's airports by low carbon modes, and recognises that this share has slowly but steadily increased in recent years. While much progress has been made at London's airports, which now have a public transport mode share average of around 40%, the leading international airports in this regard have a public transport mode share approaching 70%.**

**The ground operations at London's airports generate a substantial carbon footprint. Current capacity constraints at Heathrow result in long taxi-out and wait times, which lead to additional emissions. While taxiing, aircraft have to use their main engines, which is particularly inefficient for low-speed movements. The Mayor would like to see aircraft manufacturers work with airlines to continue to explore options for reducing these impacts.**

**Importantly however, the Mayor considers that a long term, strategic plan for the delivery of substantial new capacity for London and the South East is needed and that this could help to address aviation's impact on climate change. A properly planned, new hub airport – designed to manage the demands placed on it with excellent public**

---

<sup>99</sup> Dray L., Evans A., Reynolds T. and Schafer A., *Mitigating Aviation Carbon Dioxide Emissions: An Analysis for Europe*, Institute for Aviation and the Environment, University of Cambridge, 2010

**transport links – could ensure that emissions from aircraft operations and surface access were minimised as far as possible.**

*Surface access*

- 38.1. The Government's recently published 'Low Carbon Transport to Airports' endorses the Mayor's view that "greater use of low carbon surface access transport modes will assist in the reduction of CO<sub>2</sub> emissions as well as leading to less congestion and better air quality"<sup>100</sup>. A particular challenge in making public transport attractive to air passengers is accommodating the baggage they are travelling with and the need for seamless, step-free modal changes.
- 38.2. Road congestion around Heathrow caused, in part, by the large numbers of private vehicles and taxis used to access the airport increases the emissions for which aviation is responsible, albeit less directly. In the immediate vicinity of the airport, around 25% of vehicles on the M4 and at least 15% of the vehicles on the M25 are travelling to and from the Heathrow<sup>101</sup>. These roads have the some of the highest incidence of delay and poor journey time reliability in the UK. A variety of traffic management tools have been implemented on the M4 and M25 with some success, but their effectiveness in the longer run is likely to be limited as passenger numbers and non-airport traffic continue to grow and congestion intensifies.
- 38.3. In comparison with other major world cities and their airports however, public transport mode share at London's airports is relatively high. Table 38.1 illustrates how public transport mode share at London's airports compares against other world airports<sup>102</sup>.

---

<sup>100</sup> Department for Transport, *Low carbon transport to airports*, 2011

<sup>101</sup> BAA, *Working towards a sustainable Heathrow*, 2010

<sup>102</sup> This comparison of mode shares should be treated with some caution, as for some airports the reported public transport mode share could include passengers arriving at terminals on buses from long stay car parks outside of the airport boundary.

**Table 38.1: Public transport mode shares at selected world airports, 2009**

Airport	Public transport mode share (%)
Hong Kong	66
Oslo	64
Narita	59
Shanghai	51
<b>London City</b>	<b>48</b>
<b>Stansted</b>	<b>47</b>
<b>Heathrow</b>	<b>40</b>
Paris CDG	40
<b>Gatwick</b>	<b>37</b>
Amsterdam	37
Luton	33
Frankfurt	33
San Francisco	23
New York JFK	19
Atlanta	14
Dallas-Fort Worth	6

Source: Various<sup>103</sup>

- 38.4. Despite its location closer to central London, Heathrow's a public transport mode share is lower than Stansted's and comparable to Gatwick's. The Mayor is fully supportive of efforts to increase the public transport mode share at Heathrow and acknowledges BAA's stated ambition of having a public transport mode share of 45% in the future<sup>104</sup>. The London Plan, in Policy 6.6, is clear that improvements to airport facilities should "*ensure the availability of viable and attractive public transport options to access them.*"<sup>105</sup>
- 38.5. A more detailed analysis of access mode share at London's five largest airports is provided in Table 38.2. Taxis and minicabs make up a notably large proportion of passenger trips to and from Heathrow and City airports. This is principally due to their proximity to central London and greater use by business travellers.

<sup>103</sup> UK airports: CAA, *Passenger Survey Report 2009*, 2010;

Hong Kong: [http://www.hongkongairport.com/eng/pdf/media/publication/report/09\\_10/e\\_full.pdf](http://www.hongkongairport.com/eng/pdf/media/publication/report/09_10/e_full.pdf)

Others: Transportation Research Bureau, *Ground Access to Major Airports by Public Transportation*, 2008

<sup>104</sup> BAA, *Sustaining the Transport Vision: 2008-2012*, 2008

<sup>105</sup> Greater London Authority, *The London Plan*, 2011

**Table 38.2: Detailed breakdown of access mode shares at London's five principal airports**

	Heathrow	Gatwick	Stansted	Luton	City
Year	2007	2008	2009	2008	2009
Car	34.5	46.1	44.3	50	15
Taxi & minicab	26.8	14.3	7.9	12	34
Bus/coach	13.4*	6.2*	22.2*	15*	1
Train	9.9	31.2	25	22	-
Underground	15	-	-	-	-
DLR	-	-	-	-	47

Source: Various<sup>106</sup>

\* may include coaches transporting passengers from long-stay car parks

- 38.6. A key way to improve public transport usage is to ensure that public transport services match the operating hours of airports and provide a safe, secure and highly reliable means of reaching them. At London's capacity-constrained airports a number of flights take off and land early in the morning and late at night, particularly during the busiest times such as a Saturday in peak summer season. It can therefore be difficult to access or leave an airport at this time as the full public transport service may not be operating. The Mayor would urge the Government to work hard with transport providers and the airport operators to maximise opportunities for addressing any gaps in public transport provision when services arrive outside 'usual' daytime hours. Nonetheless, the Mayor is opposed to any amendments to operations that will worsen the noise impacts of aircraft at night for Londoners.
- 38.7. In addition to the current investment in Crossrail, there are a number of other opportunities to improve rail access to Heathrow. An example of this is a connection to the Great Western Mainline to allow trains to run westwards from the airport. More details on improving surface access to airports can be found in the response to Question 42.
- 38.8. Car parking forms a substantial proportion of many airports' revenues and policy-makers must remember that it can be to the airport operators' advantage to develop and maintain a large provision.
- 38.9. One possible method of reducing the number of passengers driving to and from airports, either to park or to be dropped-off or collected, might be to introduce local demand management measures around an airport. Various such scenarios have been suggested, including for example a local carbon-based congestion charge around Heathrow. Under such a scenario, any monies collected could be hypothecated for investment in surface access infrastructure at the airport.

<sup>106</sup> BAA Heathrow, *Sustaining the transport vision:2008-2012*, 2008; Gatwick Airport, *Sustainability Performance Review, 2009, 2010*; BAA Stansted, *Leading the way forward: Airport Surface Access Strategy -Review 2010*, 2010; London Luton Airport, *Interim Surface Access Strategy 2009-2011*, 2009; London City Airport, *2009 Annual Performance Report*, 2010

- 38.10. Surface access infrastructure serving London's airports should be carefully planned. Hong Kong's Chep Lap Kok airport, which opened in 1998, was built with surface access considerations in mind. It has a public transport mode share for passengers of 66% (and 96% for employees)<sup>107</sup>. Despite being 35km (by rail) from the centre of Hong Kong, Chep Lap Kok airport has a mix of frequent local and long-distance buses and a dedicated line on the mass transit system, the Airport Express, which offers a journey time of 24 minutes from Hong Kong Island and 21 minutes from Kowloon<sup>108</sup>. Both Hong Kong and Kowloon stations offer airline check-in facilities.
- 38.11. Whilst improvements could be made to the existing airports, a new airport designed with high-quality surface access connections as an integral part of the plans could provide a step-change in the mode share of airport access in the UK. In addition to links to central London, a new airport could be linked to the local, national and international rail networks.

### *Ground operations and airport infrastructure*

- 38.12. The Mayor's power to influence the CO<sub>2</sub> emissions from aviation is limited. Nevertheless, two commercial airports, Heathrow and London City, are located inside the GLA boundary, meaning that ground-based aviation emissions from these airports, including their take-off and landing cycles up to an altitude of 1,000m, are included in the monitoring, evaluation and action taken to minimise the capital's emissions.
- 38.13. For these reasons, the Mayor recognises the need to improve the carbon efficiency of aviation, as he states in Proposal 101 of his Transport Strategy: *"The Mayor, through TfL, or otherwise, will work with the DfT and other stakeholders, to promote research, investment and regulation to achieve improved aviation carbon efficiency"*<sup>109</sup>.
- 38.14. Aeroplane engines are very inefficient at low speeds and through having to queue at a congested airport such as Heathrow, each taxiing aircraft can burn up to 5 tonnes of fuel per movement, prior to takeoff.
- 38.15. Eurocontrol's 2009 report, *ATM Airport Performance Framework – Measuring Airport Airside and Nearby Airspace Performance*<sup>110</sup> provides evidence that shows that pre-departure delays at Heathrow are around five minutes on average<sup>111</sup>. This is more than double any of the other major European airports listed in the report (the next highest delays resulting from airside capacity constraints exist at Paris Orly at just 1.5 minutes).

---

<sup>107</sup> Hong Kong International Airport, *Our Green Airport: Annual report 2009/10*, 2010, available at: [http://www.hongkongairport.com/eng/pdf/media/publication/report/09\\_10/e\\_full.pdf](http://www.hongkongairport.com/eng/pdf/media/publication/report/09_10/e_full.pdf)

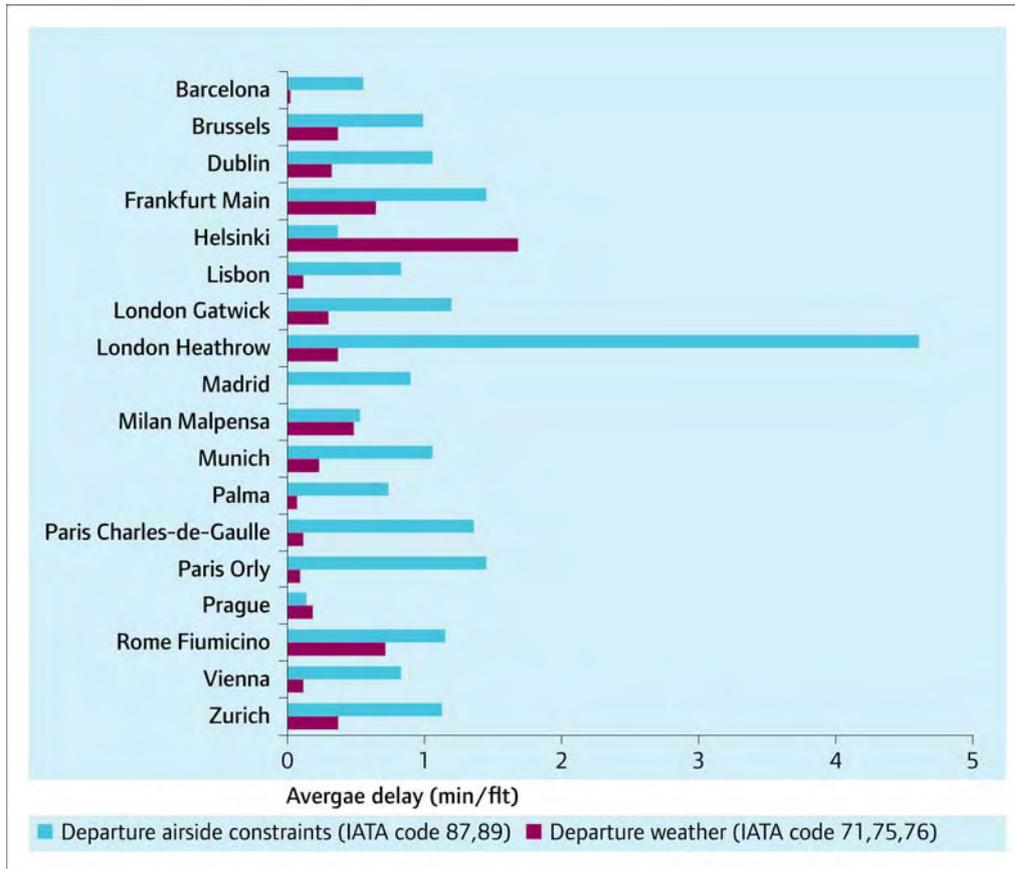
<sup>108</sup> Airport Express website, <http://www.hongkongairport.com/eng/transport/to-from-airport/airport-express.html>

<sup>109</sup> Greater London Authority, *The Mayor's Transport Strategy*, 2010

<sup>110</sup> Eurocontrol, *ATM Airport Performance Framework*, 2009, available at: [http://www.eurocontrol.int/prc/gallery/content/public/Docs/ATMAP\\_Report\\_December\\_2009.pdf](http://www.eurocontrol.int/prc/gallery/content/public/Docs/ATMAP_Report_December_2009.pdf)

<sup>111</sup> This relates only to the time between the aircraft leaving the stand and actual take off – not delays before the aircraft has left the stand.

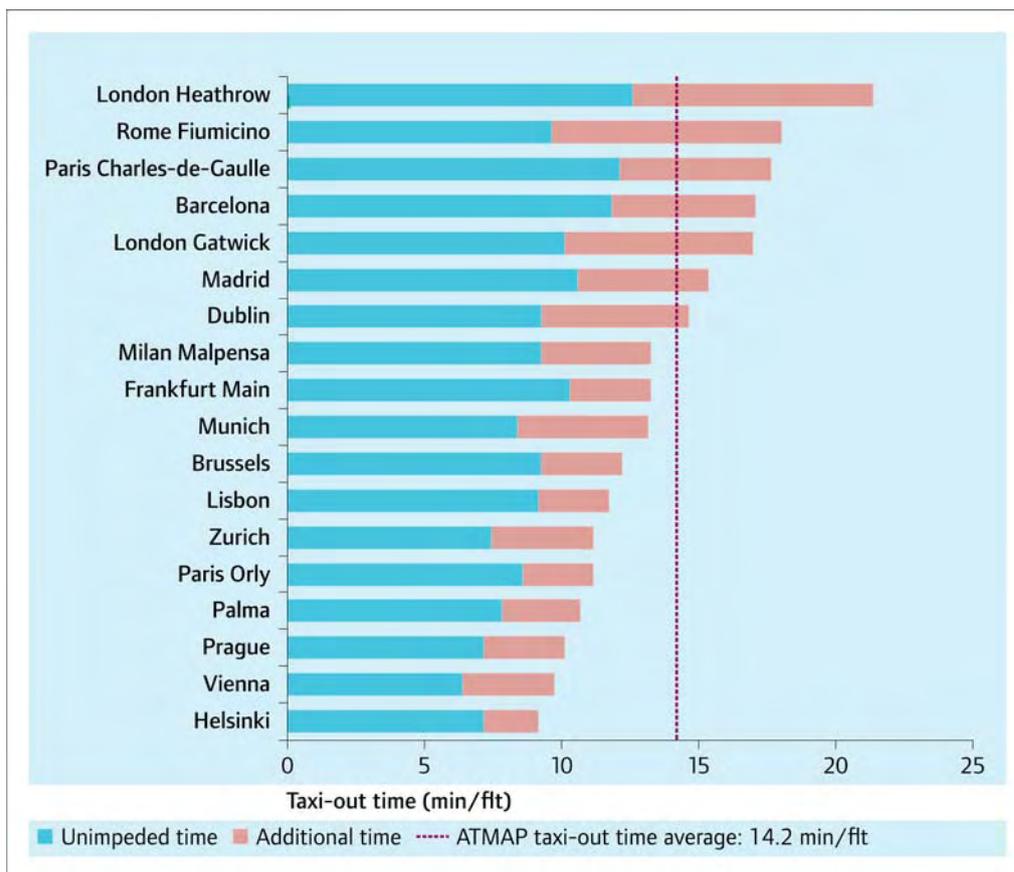
Figure 38.1: Pre-departure delays at selected European airports



Source: eCODA, 2008

38.16. Similarly, this report shows that at London Heathrow taxiing times are around 22 minutes, which is between four and thirteen minutes longer than the other airports featured in the report.

**Figure 38.2: Taxi-out times at selected European airports, 2008**



Source: eCODA, CFMU, 2008

- 38.17. Both London Heathrow and London Gatwick have high taxi-out times (with an additional six to ten minutes over unimpeded time per flight).
- 38.18. Strategies addressing aircraft taxi-out emissions through congestion mitigation (and fleet restructuring) can lead to significant reductions<sup>112</sup>. BAA, for example, has set out measures to attempt to reduce taxi-out and wait times at Heathrow. However, the ad hoc manner in which Heathrow has developed and its resulting layout means that only a certain level of reduction can be achieved. In the context of the scale of the climate change challenge, this will do very little to reduce aviation's impact.
- 38.19. The long taxi-out and wait times reflect, in part, the airports' infrastructure. If sufficient aviation hub capacity were made available at an appropriate location in the southeast of England, the additional impacts of congestion at Heathrow could be avoided. Aprons, taxiways, and terminals could be designed to ensure that aircraft taxi more easily to and from runways to minimise the time they run their engines on the ground. Arrival of aircraft could be better managed to avoid the need to stack them before landing.

<sup>112</sup> Levine B.S. and Gao H.O., *Aircraft Taxi-out Emissions at Congested Hub Airports and the Implications for Aviation Emissions Reduction in the United States*, Transportation Research Board Annual Meeting 2007

38.20. Additional infrastructure provision can positively influence the level of passenger growth permissible within environmental targets. The use of more environmentally sound routing and landing practices such as direct flight paths and CDA could be better employed. New infrastructure should also be built to the highest environmental standards. For instance, zero-emission vehicles could be used airside and the airport buildings could be less energy intensive. This would be much more effective than retrofitting existing infrastructure.

**39. What scope is there to influence people and industry to make choices aimed at reducing aviation's climate change impacts, e.g. modal shift, alternatives to travel, better information for passengers, fuller planes, airspace management (which can also help reduce local environmental impacts)?**

**All sectors of the economy, including aviation, will be required to reduce carbon emissions. It is important that people and industry are informed about and encouraged to use the most sustainable options possible.**

**Realistically however, there are many journeys that must happen and for which air travel is the only option – rail trips can only be competitive with air if the journey time is no more than 3 to 4 hours. Beyond this, aviation will dominate people's choices. It is therefore important that aircraft and aviation operations are as efficient as possible.**

**The aviation industry should provide more information on the carbon emissions from airport infrastructure and operations, and on individual airline routes. This information should be made more accessible to the public before and during the passenger experience.**

- 39.1. It is important to recognise the significant role that aviation plays in the UK's economy, and that for many journeys aviation is the only viable mode of transport. As the CCC has shown, there is considerable scope for aviation passenger growth whilst still meeting climate change targets.
- 39.2. In terms of modal shift, even with a step-change in provision and unprecedented investment, only a modest subset of London's current aviation destinations could realistically be connected to London by rail within a journey time of 3-4 hours (the point at which rail trips can no longer be competitive with air). In an analysis of European feeder connections to hubs, rail has been most successful in displacing air travel on relatively short routes with a high number of point-to-point trips – e.g., Paris-Brussels and Frankfurt-Cologne. On other routes, such as Paris-Lyon a substantial air market presence remains. For those connecting through a hub airport, the most attractive option for passengers is to make the shorter 'feeder' connection by air. Therefore, aviation will continue to play a vital role in transporting people long-distances.

- 39.3. As set out in response to Question 30, better airspace management and more direct routes can reduce fuel burn, which in turn reduces emissions from aircraft. The European Commission's Single European Sky initiative will also go some way to ensuring that routes are as efficient as possible.
- 39.4. As stated elsewhere, the Mayor supports the inclusion of aviation in the EU ETS. Managing aviation's emissions through the under-provision of capacity and the imposition of taxes such as Air Passenger Duty are far blunter instruments.

## 6: Local impacts

### Summary

Aviation delivers significant local economic benefits, including lower skilled job opportunities. However, there are a number of serious local impacts which need to be considered if decisions about the future use and potential growth of airports are to be properly informed. The negative impacts of an airport's operation upon the local environment and upon the lives of local residents inevitably influence both the capacity of an airport and its potential for future growth<sup>113</sup>.

The Mayor does not consider that further growth of Heathrow (or City airport) is acceptable, as this would result in severe local environmental consequences.

More than 250,000 people are exposed to aircraft noise in excess of 57dB generated by aircraft using Heathrow. The equivalent figures for Gatwick and Stansted are 4,800 and 2,500 respectively<sup>114</sup>. Large areas of London exceed the health-based air quality limit values set by the European Union and there are particular air quality issues around Heathrow (both because of the airport and because of the significant traffic it attracts onto surrounding roads).

There are potentially substantial benefits from concentrating growth in a less densely populated part of the South East, where local communities can take advantage of the benefits that aviation delivers, while being less affected by its adverse impacts.

#### 40. What do you consider to be the most significant impacts – positive and negative – of aviation for local communities? Can more be done to enhance and / or mitigate those impacts? If so, what and by whom?

**Aviation delivers significant local economic benefits, including job opportunities across a wide range of skill levels. However there are significant negative impacts including aircraft noise, polluting emissions affecting local air quality and a loss of amenity. These must all be properly considered in making decisions about the future use and potential growth of airports.**

**The Mayor strongly opposes the worsening of aircraft noise impacts at Heathrow notwithstanding the proposed changes to Heathrow's noise mitigation schemes. While the Mayor acknowledges the benefits of current occasional tactical arrangements to concurrently use runways for**

---

<sup>113</sup> Upham P., Thomas C., Gillingwater D. and Raper D, 'Environmental capacity and airport operations: current issues and future prospects', *Journal of Air Transport Management* 9, 2003

<sup>114</sup> BAA, *Corporate Responsibility Report*, 2008

**both arrivals and departures, he wishes to maintain the respite from noise that runway alternation provides. Furthermore, the Mayor continues to strongly oppose any increase in the current cap on movements at Heathrow.**

**Because the consequences either of expansion at Heathrow, or (as set out earlier in the response) of not providing effective hub capacity in the South East are too serious, the Mayor believes an alternative approach is required. A new strategy that looks to minimise the local impacts of aviation whilst ensuring that the local and wider economic benefits of aviation are maximised is needed.**

- 40.1. Aviation delivers significant local benefits, especially in relation to the opportunities for people with lower skill levels. However, air quality and noise issues around airports are two of the most significant negative impacts of aviation for local communities.

#### *Air quality*

- 40.2. Aviation's impact on local air quality arises from oxides of nitrogen (NO<sub>x</sub>) and particulates which are emitted by aircraft engines. The aircraft emissions around the airport are typically added to by emissions from road vehicles – road traffic attracted by the airport is a significant contributor to air pollution around Heathrow. BAA reports that airport-related traffic represents up to 30% of all traffic on major routes around Heathrow. This is estimated to contribute around 11% towards the average NO<sub>2</sub> concentration across all of Heathrow's monitoring sites<sup>115</sup>. However, with increasingly stringent air quality limits on ground-based transport modes and continued growth of aircraft movements, the proportional contribution of road transport may reduce over time<sup>116</sup>.
- 40.3. Heathrow's surface access strategy suggests that the most significant source of NO<sub>x</sub> emissions at Heathrow is ground-level aircraft operations (responsible for approximately 55% of the total). The second most significant source is landside vehicles (approximately 30%), followed by airside vehicles (approximately 8%). Stationary sources, such as boiler plant, are estimated to be responsible for approximately 6% of the NO<sub>x</sub> emissions at Heathrow<sup>117</sup>. Of the ground-level aircraft operations specifically, the contribution to NO<sub>x</sub> emissions of aircraft activities is broken down as follows:

---

<sup>115</sup> BAA Heathrow, *Working towards a sustainable a Heathrow*, 2010

<sup>116</sup> Rogers H.L., Lee D.S., Raper D.W., Forster P.M. de F., Wilson C.W. and Newton, P *The impacts of aviation on the atmosphere*, 2002

<sup>117</sup> BAA, *2007-2011 Local Air Quality Action Plan for Heathrow*, 2007

**Table 40.1: Ground-level aircraft NO<sub>x</sub> emissions, by flight phase, 2002**

Flight phase	% of NO <sub>x</sub> emissions
Take-off roll	47%
Auxiliary power-unit	18%
Taxi-out	16%
Taxi-in	9%
Hold	7%
Landing roll	3%
Engine testing	<1%

Source: *Local Air Quality Action Plan for Heathrow, BAA*

40.4. It is clear that exposure to pollutants, and therefore the scale of impacts associated with it, could be reduced if the hub airport were located in a much less populated, relatively unpolluted location.

### Noise

40.5. The principal source of disruptive noise affecting communities near airports is the aircraft themselves. During take-off and ascent the noise comes mainly from the engines. For approach and landing the airframe is a more significant noise source. Other airport noise sources include auxiliary power units (used to supply power for lighting, air conditioning and other electrical systems), ground support vehicles and systems, and passenger, staff and cargo surface access traffic.

40.6. Exposure to aircraft noise has been linked to health impacts, including an increase in vitality-related conditions like headaches and tiredness and increased use of medication and sedatives. In schools, high levels of aircraft noise can be a barrier to communication, impairing children's development of reading comprehension<sup>118</sup>.

### Conclusion

40.7. There are substantial benefits of locating new airport capacity in less densely populated parts of the South East, where the many benefits of aviation can still be captured, but its adverse impacts minimised.

---

<sup>118</sup> Williams V., Noland R.B., Majumdar A., Toumi R., Ochieng W. and Molloy J., 'Reducing environmental impacts of aviation with innovative air traffic management technologies', *The Aeronautical Journal*, 2007

**41. Do you think that current arrangements for local engagement on aviation issues, e.g. through airport consultative committees and the development of airport master plans, are effective? Could more be done to improve community engagement on issues such as noise and air quality? If so, what and by whom?**

In general, current arrangements to improve dialogue and local engagement on aviation issues work well. Wide-ranging membership assists with the mandate of consultative committees and bodies responsible for developing the airport master plans. It is important that these arrangements generate constructive dialogue between trustworthy parties who can present decision-makers with appropriate, transparent evidence.

The preparation of airport masterplans provides a structured way for Transport for London to be engaged in the airport planning process and the modelling of service demands. However, airport operators have overall control of their masterplan and as such have the ultimate say on which objectives and targets to pursue. This can lead to commercial rather than environmental factors driving their content.

Importantly, the Mayor, as the executive of the strategic authority for London, believes that he can make a valuable contribution to activities such as those conducted by the recent South East Airport's Taskforce. Indeed, the Mayor is directly responsible for some of the considerations of the Taskforce (such as connections to and from the airport) and also has direct interest in the local impacts of airports in London as a representative of its residents. For these reasons, the Mayor considers that he has a role to play in helping to shape aviation policy.

**42. Do you think that current arrangements for ensuring sustainable surface access to and from airports, e.g. Airport Transport Forums and airport surface access strategies are effective? Could more be done to improve surface access and reduce its environmental impacts? If so, what and by whom?**

In general, existing arrangements between airport operators and stakeholders, including TfL, work effectively in terms of engagement on surface access issues at both the political and officer level. However, because surface access strategies are developed by airport operators and

**commented upon by other stakeholders, these documents reflect the prevailing views of airport operators. It is essential that targets for improving sustainability, such as future public transport mode share targets, are ambitious and deliver demonstrable benefits.**

**A means of securing such improvements might be for the DfT or another independent party to set high level advisory targets for individual airports to pursue further surface access improvements. These might be linked to support and funding of schemes that are focused upon reaching such targets.**

**43. What are your views on the idea of setting a 'noise envelope' within which aviation growth would be possible, as technology and operations reduce noise impacts per plane? What do you consider to be the advantages and disadvantages of such an approach?**

**Aircraft noise is likely to continue to present a major challenge to the aviation industry for the foreseeable future. Even relatively low levels of noise can cause annoyance. The Mayor believes therefore, that irrespective of ideas such as 'noise envelopes', a long-term solution is needed that looks to ensuring that the local negative impacts of aviation are minimised for as many people as possible.**

- 43.1. The noise associated with individual aircraft has decreased over the past 10 to 20 years despite traffic growth<sup>119</sup> and the number of people exposed to noise around many airports has consequently declined. However, forecasts indicate that the number of people exposed to aircraft noise will grow again in the future, especially at airports where the rate of fleet renewal and of technological and operational improvements is exceeded by the rate of traffic growth. Consequently, aircraft noise is likely to continue to present a major challenge to aviation growth for the foreseeable future.
- 43.2. Furthermore, the Mayor acknowledges that people are becoming more annoyed by all levels of aircraft noise<sup>120</sup>. Even relatively low levels of noise can cause some annoyance, which rises as the noise increases<sup>121</sup>.
- 43.3. The Mayor's position is that aviation growth that is permissible within environmental targets must be facilitated, and that the best way to do this is through effective hub capacity in the South East. If growth is concentrated in an area of low population density, it would have fewer noise impacts compared to locations in more high density locations.

---

<sup>119</sup> Eurocontrol, "Challenges of growth" environmental update study, 2009, available at: [http://www.eurocontrol.int/statfor/gallery/content/public/documents/CG08\\_ENV%20Technical%20Report\\_final.pdf](http://www.eurocontrol.int/statfor/gallery/content/public/documents/CG08_ENV%20Technical%20Report_final.pdf)

<sup>120</sup> Department for Transport, *The Attitudes to Noise from Aviation Sources in England (ANASE)*, 2007

<sup>121</sup> Department for Transport, *Transport Trends*, 2009

- 43.4. A hub airport in an area of lower population density could also be designed to ensure that the impacts are minimised. Surface access infrastructure can also cause noise issues for those living along the route/s. A new hub airport, taking these issues in to account, could ensure that these noise impacts are minimised.

**44. Is it better to minimise the total number of people affected by aircraft noise (e.g. through noise preferential routes) or to share the burden more evenly (e.g. through wider flight path dispersion) so that a greater number of people are affected by noise less frequently?**

**The Mayor favours an approach that minimises the number of people affected by aircraft noise. He believes that long-term options are available for relocating the UK's principal hub airport to a less densely populated area where fewer would be affected by aircraft noise.**

- 44.1. The environmental capacity of an airport can be defined as, and equated with, the capacity of the receiving environment, both human and non-human, to tolerate the impacts of airport activity<sup>122</sup>. It is clear that Heathrow has reached its environmental capacity and alternatives must be sought to ensure that London and the UK has a fully functioning hub that can accommodate the projected number of passengers (within environmental limits).
- 44.2. Laying out runways so that air traffic patterns occur minimally over heavily populated areas is a practice now widely employed during runway expansion and in the development of new airports. Controlling the land use around an airport also helps reduce the interference of aircraft noise with the public. This is very difficult to do at Heathrow and is one of several reasons why the Mayor is opposed to its expansion.

**45. What is the best way to encourage aircraft manufacturers and airlines to continue to strive to achieve further reductions in noise and air pollutant emissions (notably particulate matter and NO<sub>x</sub>) through the implementation of new technology?**

**It is essential that the aircraft and engine manufacturing industries, are appropriately incentivised to continue to strive for improvements in these areas. The long lead-in times for developing aviation technology**

---

<sup>122</sup> Upham P., Thomas C., Gillingwater D, Raper D., 'Environmental capacity and airport operations: current issues and future prospects', *Journal of Air Transport Management* 9, 2003

**and the long in-service life times of aircraft, mean that the implementation of technological advancements are principally a medium-to long-term process. All technological responses require substantial investment and there is limited potential for radical change in the short-term.**

#### **46. What are the economic benefits of night flights? How should the economic benefits be assessed against social and environmental costs?**

**The economic benefits of night flights should be examined from both the demand and supply side of the industry and within the context of their severe environmental and social costs. A number of aviation services operate extremely valuable and profitable businesses that are dependent on a degree of night flying, including express delivery and charter flights. Highlighting the importance of fast delivery, UPS claim that overall the express cargo sector contributes £1.3bn of economic activity and facilitates £10bn of UK exports.**

**Regarding supply, the capability to offer night flights implies a greater utilisation of airport assets, improving their economic efficiency, and easing pressure on airport resources during busier periods. However, the social and economic costs of night flights are severe. Heathrow and City airports in particular are wholly inappropriate locations for night flights, owing to the surrounding populations which are susceptible to noise disturbance. The ability to use a suitably located modern hub airport for relatively unrestricted night flights offers a further set of benefits to those set out elsewhere.**

- 46.1. At major UK airports flight restrictions are in place between 23:00 and 07:00 flight restrictions, which limits landing and take-off. Additionally, between 23:30 and 06:00 these restrictions are tightened not only by a limit on aircraft movements, but also by a noise quota. The noisiest aircraft are banned during the night altogether (other than in emergency situations).
- 46.2. There are several key areas where night flights offer economic benefits: resilience for passenger services subject to delays; scheduled express delivery services; early morning departures to Europe and arrivals from Africa and Asia, and late night departures to Asia, central and southern Africa and Latin America ; charter flights in peak summer season; and efficient airport operability. These are discussed in turn below.
- 46.3. In spite of the restrictions, night flights are critically important for express (next-day) delivery of high-value goods and packages in global supply chain of companies operating in an internationally competitive environment. London and the UK's ability to partake in these activities contributes to UK GDP and supports jobs in the wide variety of companies which make use of such services. UPS, a leading international express delivery company, has calculated that a single

- express service flight slot contributes on average £63,000 in economic benefit to the UK economy.
- 46.4. Early morning flight departures on the fringes of night flight restrictions departing the UK to important business destinations in Europe are extremely valuable to the UK economy, as they allow business travellers to arrive at their European destinations in time for the start of the day's business.
  - 46.5. At Heathrow, a large number of flights arrive early in the morning, sometimes during the night flight period from a range of destinations around the world. At Heathrow's European rivals many more flights are able to arrive in the 0400 to 0600 period, and depart after 2300, serving a range of destinations in Africa, Asia and Latin America.
  - 46.6. At Gatwick, Stansted and Luton, charter carriers operate a significant number of flights in the shoulder periods and during night flight hours, particularly during the peak summer season.
  - 46.7. Regulated night flights utilise airport assets more effectively, result in economic efficiencies and ease pressure on strained airport resources during peak times. This helps to keep airport costs down which, when passed on, benefits freight and passengers in terms of lower prices for airport services. However, it is essential to remember that at night, the harmful social and economic impacts of flying are even more pronounced. Heathrow and City airports in particular are wholly inappropriate locations for night flights, owing to the large surrounding populations which are susceptible to noise disturbance.
  - 46.8. Night flights have a profound detrimental impact on the health, well-being, and productivity of tens of thousands of Londoners. There are strong links between disturbed sleep and poor health conditions. In making decisions upon night flights, their acute and wide-ranging socio-economic impacts must be fully considered.
  - 46.9. There are particularly large potential benefits that could be captured if the UK's hub airport could operate more intensively from a period commencing at around 0400 hours. This would be wholly unacceptable at Heathrow. Aircraft using Heathrow during the night at the moment are already hugely disruptive, and the Mayor strongly opposes any worsening of current conditions during the night.
  - 46.10. Thus, the impacts of night flights should be assessed in terms of:
    - their contribution to the UK economy (GDP);
    - jobs in the aviation industry, including those employed from local communities around airports;
    - jobs in the wider economy, and particular sectors such as express delivery whose unique selling point is intrinsically connected to night flights;
    - their contribution to the exchequer in terms of tax revenues;
    - airport operability including efficiencies gained from a more fuller utilisation of airport assets; and

- a full and comprehensive assessment of their adverse impacts on local communities (one report prepared for HACAN (Heathrow Association for the Control of Aircraft Noise) values the benefit of removing night flights at Heathrow at around £800M per annum<sup>123</sup>)

## **47. How can the night flying regime be improved to deliver better outcomes for residents living close to airports and other stakeholders, including businesses that use night flights?**

**The night flying regime is necessary because of the locations of London's airports which place the interests of residents and the businesses that use night flights in direct opposition. This tension is particularly acute at the commercial airports within the GLA boundary, where very large populations reside under the flight paths for Heathrow and City airports.**

**While the Mayor supports the business that night flights facilitate, he must balance this with consideration of the impacts of night flights on the quality of life and health of London residents.**

**Trends suggest the demand for night flights will increase. The Mayor recognises that the failure to provide a suitable location to accommodate this in London could have damaging economic consequences. It is therefore important that provision is made for this demand to be accommodated at a location which minimises its impacts on local communities. This would be achieved most effectively at a new hub airport in a much less densely populated location in the South East.**

- 47.1. The demand for night flights is likely to continue to grow in the future. Continued globalisation, the expansion of 24/7 business operating models and the growth in global cities in the new industrialising markets of China and India mean the demand for 24-hour airport operations will only grow.
- 47.2. London will lose out if rival European airports are able to offer greater scheduling flexibility in the accommodation of new passenger and freight services. London is already disadvantaged. Amsterdam, Frankfurt, Paris and Madrid all currently accommodate many more flights after 2300 and before 0600 than Heathrow. For instance, Paris Charles de Gaulle has 15 longhaul flights departing after 2300, at Heathrow there are none<sup>124</sup>.

---

<sup>123</sup> CE Delft, Ban on Night Flights at Heathrow Airport: Social Cost Benefit Analysis, January 2011

<sup>124</sup> OAG, *OAG Schedules Data*, June 2011

**48. Should extended periods of respite from night noise be considered, even if this resulted in increased frequency of flights before or after those respite periods?**

**Periods of respite are very important to local communities significantly affected by aircraft noise. Communities are likely to resist any further intensification of noise before or after the night respite period even if it meant a considerable reduction in noise during the respite period itself, which encompasses the most unsociable hours of the night.**

**The Mayor believes that there are a number of long-term airport infrastructure options that must be considered, which will minimise this conflict, as well as meeting many of the Mayor's wider goals and objectives.**

## 7: Any other comments

### **49. If you have comments on any strategic issues not covered in this scoping document, which you consider to be relevant to the development of the aviation policy framework, please include them in your response.**

**Aviation is strategically vital for the UK. The benefits it generates are significant, supporting trade and investment, promoting growth, attracting a highly skilled labour force and connecting people with relatives and friends. A central part of this aviation network must be a fully functioning hub in the South East – without this, the benefits of the aviation industry cannot be maximised and will in fact decline, seriously jeopardising UK competitiveness.**

**The Mayor believes that the Government must develop a long-term strategy for increasing hub aviation capacity in London and the South East, including an examination of options for a new Thames Estuary Airport.**

**The Mayor will launch a report later this year setting out in detail the case for a new hub airport to address the capacity gap and maintain the UK's competitiveness and a potential strategy for its delivery**

- 49.1. A clear picture has emerged: aviation is strategically vital for the UK. The benefits it generates are significant, supporting trade and inward investment and promoting growth and jobs across the UK. These benefits are underpinned by having a London hub, which draws on its unique catchment area to offer a wide range of flights and destinations, which in turn attract transfer traffic that supports additional routes and frequencies. The result is a largely unsurpassed degree of international connectivity that places London and the UK at the heart of the global economy, with all the advantages that brings.
- 49.2. For London to maintain its global position and for the UK economy to thrive, effective hub capacity in the South East is required. Heathrow is unable to provide sufficient capacity to fulfil the requirements of a global city. The UK's only hub is already losing out to its competitors, and if it cannot function effectively, its service offer and all the benefits associated with this will continue to be eroded.
- 49.3. For a hub to fulfil its potential, it needs to have the runway, apron and terminal capacity to operate efficiently and with resilience. It must also offer the best possible connectivity and passenger experience. It is increasingly clear that Heathrow is unable to provide sufficient capacity to meet London's hub needs, and, given its severely constrained urban setting, will never be able to. If

London's hub cannot function effectively, its service offer will be eroded, as airlines choose instead to develop routes serving rival hubs overseas. This is already occurring.

- 49.4. There are no easy answers as to how London and the UK's long-term hub capacity needs are provided. An optimal hub, offering the level of connectivity necessary, would require at least four runways. A third runway at Heathrow has rightly been ruled out, and that degree of expansion at another airport currently serving London would be hugely challenging.
- 49.5. The Mayor believes that the Government should develop a long-term strategy for increasing aviation capacity in London and the South East. This includes a full examination of options for a new Thames Estuary Airport. The Mayor will launch a report later this year setting out in detail the case for a new hub airport to address the capacity gap and maintain the UK's competitiveness.
- 49.6. The analysis to support this report will focus on three infrastructure scenarios responding to global economic growth projections, demand forecasts and potential environmental policy outcomes. The scenarios are 'doing nothing', incrementally increasing capacity at a number of locations, and developing a new hub airport. The potential economic impacts, potential locational merits, and circumstances in which each scenario could succeed will be carefully examined.
- 49.7. Initial analysis has already identified significant net benefits from developing a new hub airport for London.
- 49.8. The Mayor recognises the daunting scale of intervention required to pursue such a strategy. But bold, decisive action is required if the long-term prosperity, international competitiveness, and growth prospects of both London and the UK are to be secured.

# Appendices

## Appendix A1: Evidence of direct, indirect and induced economic impacts of the aviation sector in London

- A1. A frequently used rule of thumb is that every 1,000 passengers passing through an airport support one direct job. The actual ratio depends on a wide range of factors including whether the airport is principally used by low cost or full service carriers and the balance of longhaul and shorthaul flights. According to BAA total employment at Heathrow Airport in 2010 was in the order of 76,500 people. Since it had a throughput of 65m passengers (2010), there were in fact 1.16 jobs per passenger<sup>125</sup>. As at other airports this ratio has fallen over time as productivity has increased. The direct employment benefits of London's airports principally accrue to the local area. Approximately 45% of Heathrow's workers come from its five neighbouring boroughs of Hounslow, Hillingdon Ealing, Slough and Spelthorn<sup>126</sup>.
- A2. According to the Unite Union for every 1,000 jobs gained or lost at Heathrow, approximately 570 indirect jobs will be created or lost, and 270 induced jobs gained or lost – a total of 840 jobs. Other sources, including evidence submitted by the Mayor of London to the SERA consultation in 2003 suggests the indirect and induced effects could be far larger. This is shown in Table A.1, which also provides data concerning the remaining London airports. More recent data is not available.

**Table A.1: Passenger movements and employment, 2000/2001**

Airport	Passengers		Freight		Jobs		
		(millions)		(tonnes)	Direct	Indirect & Induced <sup>127</sup>	
Heathrow	2001	64.3	2001	1.3m	2001	68,000	245,000
Gatwick	2001	32.1	2001	0.3m	2001	30,000	11,000
Stansted	2001	12.3	2001	0.2m	2001	10,000	2,700
Luton	2000	6.1	2000	0.04m	1999	6,000+ <sup>128</sup>	n/a
City	2000	1.6	2000	0	1999	1,400+ <sup>129</sup>	n/a
<b>Total</b>		<b>116.4</b>		<b>1.84m</b>		<b>115,400+</b>	<b>258,700+</b>

Source: *The Mayor of London's Response to the Consultation Document, 'The Future Development of Air Transport in the United Kingdom: South East', June 2003*

<sup>125</sup> BAA, Heathrow Airport facts and figures, <http://www.heathrowairport.com>

<sup>126</sup> BAA, Towards a sustainable Heathrow, <http://www.heathrowairport.com>

<sup>127</sup> BAA estimate

<sup>128</sup> LRC estimate

<sup>129</sup> Excludes direct employment by airlines

## Appendix A2: Selected studies of the enabling economic impact of air transportation

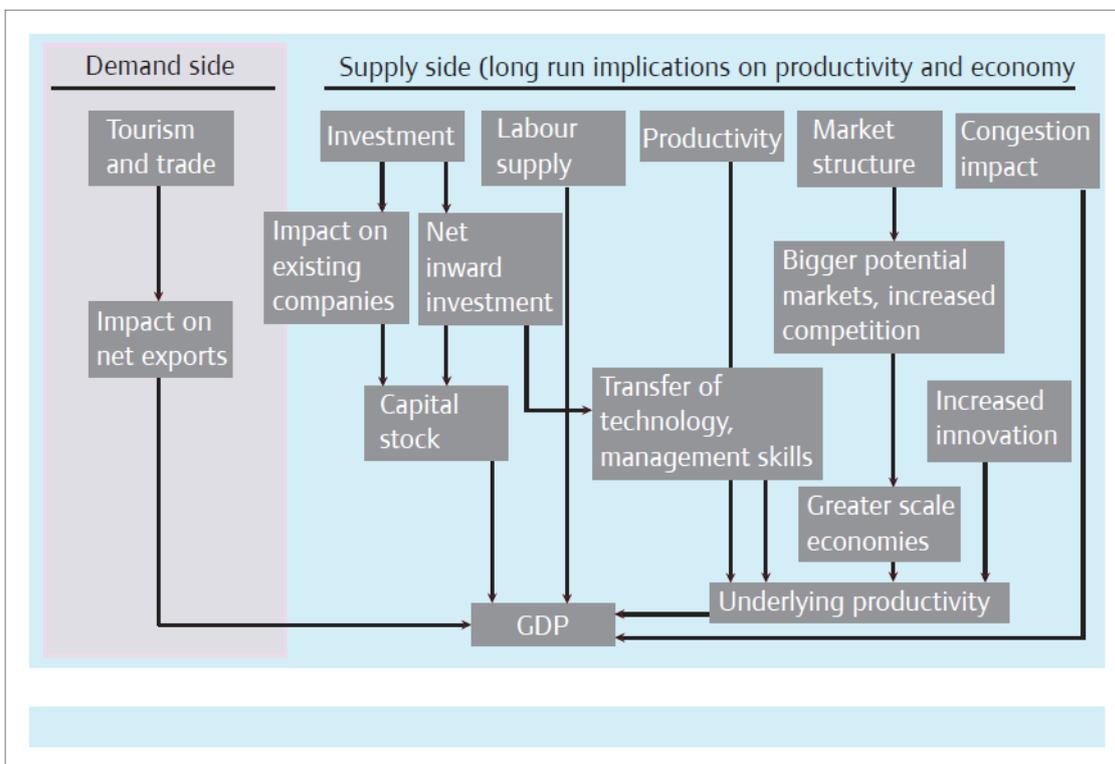
- A3. As Ishutkina and Hansman report, the multiplier studies which are used to measure the direct, indirect and induced impacts of aviation on the basis of input-output analysis do not typically capture the enabling impacts of aviation and hence underestimate the total impact of air transportation services. The enabling impact of air transportation is more difficult to quantify because it is difficult to isolate the impact of air transportation from other uncontrolled variables, such as globalisation or institutional effects. Therefore, even though the wider socioeconomic benefits of air transportation are usually acknowledged in air transportation studies, only a limited number of studies attempt to evaluate this impact. Two studies which have attempted to do so are the Eurocontrol<sup>130</sup> study, which covers the EU and the worldwide Air Transport Action Group (ATAG) study<sup>131</sup> both of which were undertaken by Oxford Economic Forecasting.
- A4. The ATAG study estimated that the air transport industry generates a total of 29 million jobs globally through direct, indirect and induced jobs in aviation, civil aerospace manufacturing and tourism. The global economic impact was estimated to be around 8% of world GDP.
- A5. The complex interaction between the economic catalytic impacts of air transport and their effects on GDP were illustrated in the Eurocontrol Study. This is shown in Figure A.1. There is an important distinction between demand side and supply side effects.

---

<sup>130</sup> A. Cooper and P. Smith, *The Economic Catalytic Effects of Air Transport in Europe*, EUROCONTROL. Experimental Centre, 2005

<sup>131</sup> Air Transport Action Group, *The Economic and Social Benefits of Air Transport*, October 2005.

**Figure A.1: Summary of the economic catalytic impacts of air transport**



Source: Cooper and Smith, *The economic catalytic effect of air transport in Europe*, Eurocontrol Experimental Centre, 2005

A6. Figure A.2 provides estimates of the scale of the effects at the EU-25 level and also for the EU-15 and EU-10. It shows that the demand-side effects over the decade to 2003 have been small, while supply-side effects have contributed up to 4% of the European Union GDP.

**Figure A.2: Demand and supply enabled effects of air transportation in the EU**

Demand side effects (impact of net outbound tourism and trade flows by air on GDP)	EU-25		EU-15		EU-10	
	2003	2025	2003	2025	2003	2025
Tourism	-0.3%	-0.2%	-0.4%	-0.2%	+0.4%	+0.1%
Trade	+0.6%	+1.5%	+0.6%	+1.7%	-0.4%	-0.7%
Supply side effects (contribution of growth in air transport usage)						
Impact of GDP on location and investment decisions	+2.0%	+1.2%	+1.8%	+1.1%	+4.8%	+1.7%
Impact on underlying productivity	+2.0%	+0.6%	+1.8%	+0.6%	+4.6%	+1.0%

Source: Cooper and Smith, *The economic catalytic effect of air transport in Europe*, Eurocontrol Experimental Centre, 2005

A7. The impact on investment was estimated using statistical analysis of cross-sectional data across 24 European countries over a ten year period to 2003. This

indicated that historically the annual growth in business investment would have been 0.6% lower over the decade if air transport usage grew no faster than GDP. Over that time period, GDP increased around 2% a year while air transport usage increased by 5.1% a year. The analysis also showed that if air transport usage were to increase by 10% (relative to GDP) then business investment would increase by 1.6% in the long run.

- A8. The impact of air transport usage on total factor productivity was estimated while controlling for the effects of other drivers (such as R&D intensity and tertiary education share). This indicated that the air transport usage over the decade raised the level of productivity by 2.0% in the EU as a whole, and by 4.6% in the ten accession economies. The model also estimated that if air transport usage were to increase by 10% then the total factor productivity would increase by 0.56% in the long run.
- A9. Ishutkina and Hansman go on to cite a sample of additional studies describing the enabling impact of air transportation in the United States, Europe and Southeast Asia. The following references are selected on the basis of their relevance to the issues which face London:
- A10. Irwin and Kasarda<sup>132</sup> studied air passenger linkages and employment growth in U.S. cities using regression analysis with data spanning a 30-year period. The analysis showed that expanding the airline network serving a metropolitan area has a significant positive impact on regional employment, particularly in the service sector.
- A11. Button et al.<sup>133</sup> described the relationship between high technology employment and hub airports. In particular, they showed that traffic at hub airports has a positive effect on creation of high-tech employment in the surrounding areas. This effect, when controlled for population and other characteristics, is greater than that of non-hub airports. The study also used the Granger causality test to support the claim that airport traffic in fact causes the employment growth.
- A12. A study by Button and Taylor<sup>134</sup> described the relationship between the availability of European international services and new economy employment in U.S. metropolitan areas. The econometric analysis showed that increasing passenger enplanements by a thousand results in an additional 44 to 73 new economy jobs in the metropolitan area. Since the economic benefits of additional services and destinations diminish as the international services provided by an airport increase, the impact of additional destinations is relatively smaller in more mature markets like Miami and Boston.
- A13. Another study<sup>135</sup> linking employment and airline traffic concluded that a 10% increase in passenger enplanements in a metro area leads to approximately a 1%

---

<sup>132</sup> M. D. Irwin and J. D. Kasarda, 'Air passenger linkages and employment growth in U. S. Metropolitan areas', *American Sociological Review*, 56:524–537, August 1991.

<sup>133</sup> K. Button, S. Lall, R. Stough, and M. Trice, High-technology employment and hub airports', *Journal of Air Transport Management*, 5:53–59, 1999.

<sup>134</sup> K. Button and S. Taylor, 'International air transportation and economic development', *Journal of Air Transport Management*, 6:209–222, 2000.

<sup>135</sup> J. K. Brueckner, 'Airline traffic and urban economic development', *Urban Studies*, 40(8):1455–1469, July 2003.

increase in employment in service-related industries. The statistical analysis also showed that airline traffic has no effect on manufacturing and other goods-related employment, suggesting that air travel is less important for such firms than for the service-related businesses.

- A14. A University of Barcelona study<sup>136</sup> linked the role of airports and the resulting availability of intercontinental flights to the location of headquarters in European cities. In particular, their analysis showed that a 10% increase in the supply of intercontinental flights resulted in a 4% increase in the number of headquarters in major European urban areas. In addition, their analysis showed that headquarters of knowledge-intensive sectors, which rely more on information exchange, are much more influenced by the supply of direct intercontinental flights than are those of sectors which are not knowledge-intensive.
- A15. Researchers at the University of North Carolina published several papers<sup>137</sup> describing the mutual causality relationship between air cargo usage, trade and gross domestic product. In addition to these analyses, the authors used statistical tools to show that aviation liberalisation and customs quality positively correlate with freight volume, trade, GDP, and foreign direct investment, while corruption has a negative effect on these variables.
- A16. Another study of the enabling effect of air cargo on employment and earnings in the U.S. was done by P. Cech. The statistical analysis showed that air cargo services have a generally positive effect on employment and earnings. However, the effect is not generalisable since it varies widely from airport to airport and from region to region.

---

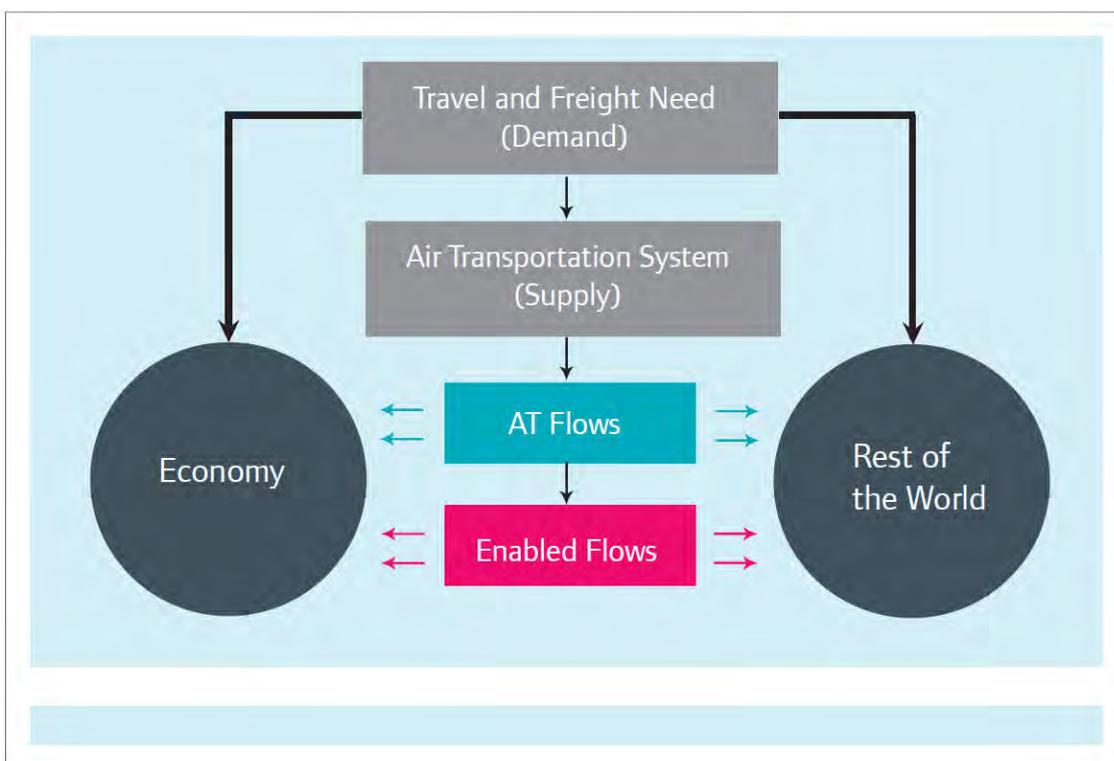
<sup>136</sup> G. Bel and X. Fageda, 'Getting there fast: Globalisation, intercontinental flights and location of Headquarters', September 2005. Available at <http://ssrn.com/abstract=849165>

<sup>137</sup> J. D. Kasarda, 'Air cargo: Engine for economic development', *The International Air Cargo Association: Air Cargo Forum*, September 2004 and J. D. Kasarda and J. D. Green, 'Air cargo as an economic development engine: a note on opportunities and constraints', *Journal of Air Transport Management*, 11:459–462, 2005.

## Appendix A3: The relationship between aviation enabled flows and economic attributes

A17. Figure A.3 provides an overview of the feedback mechanisms between the physical flows of people and goods which the air transportation system facilitates and certain enabled flows which affect the economic attributes of the economy. This suggests that over time the economic attributes of the economy can be expected to respond to the aviation flows which take place.

**Figure A.3: Feedback model of air transportation flows and the economy's economic attributes**



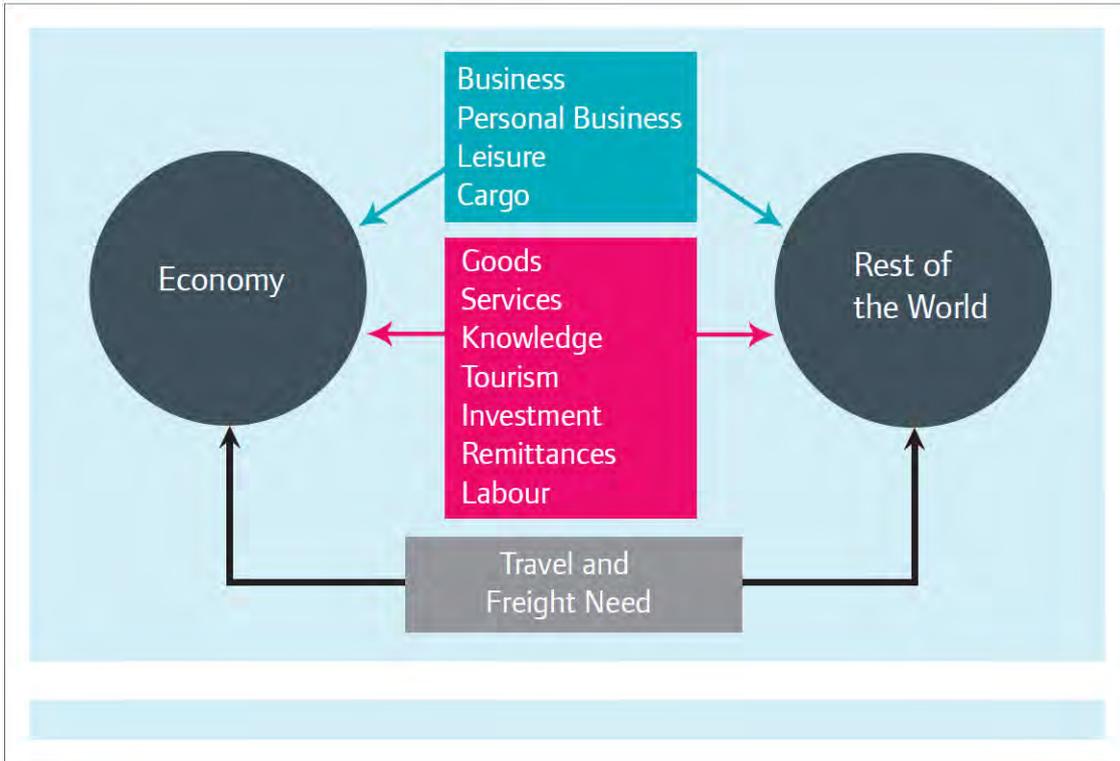
Source: *Ishutkina and Hansman, Analysis of the interaction between air transportation and economic activity, MIT ICAT, 2009*

A18. The various categories of air transportation flows and enabled flows are distinguished in Figure A.4, in addition to flows of goods, services and monetary flows (investment and remittances). Knowledge, labour and tourism are separately identified. An example of how aviation connections enable flows of services is that they offer access to markets so that local skilled services employees are not constrained to the local market and they allow companies to share human resources and knowledge across divisions. Knowledge is treated as a separate flow because, despite its economic importance in, for example, raising the skill level of the labour force, it is often not traded. Tourism is such a significant traded service for both aviation and economy that it warrants separate treatment.

A19. An example of how air transportation flows enable investment flows is that they allow investors an opportunity to oversee and monitor their investment, thereby

enabling access to financial capital. London's ability to attract a highly skilled workforce in a wide range of specialisms is also an enabled flow.

**Figure A.4: Air transportation flows and enabled flows**



Source: *Ishutkina and Hansman, Analysis of the interaction between air transportation and economic activity, MIT ICAT, 2009*

A20. The relationship between air transportation flows and enabled flows is summarised in Figure A.5.

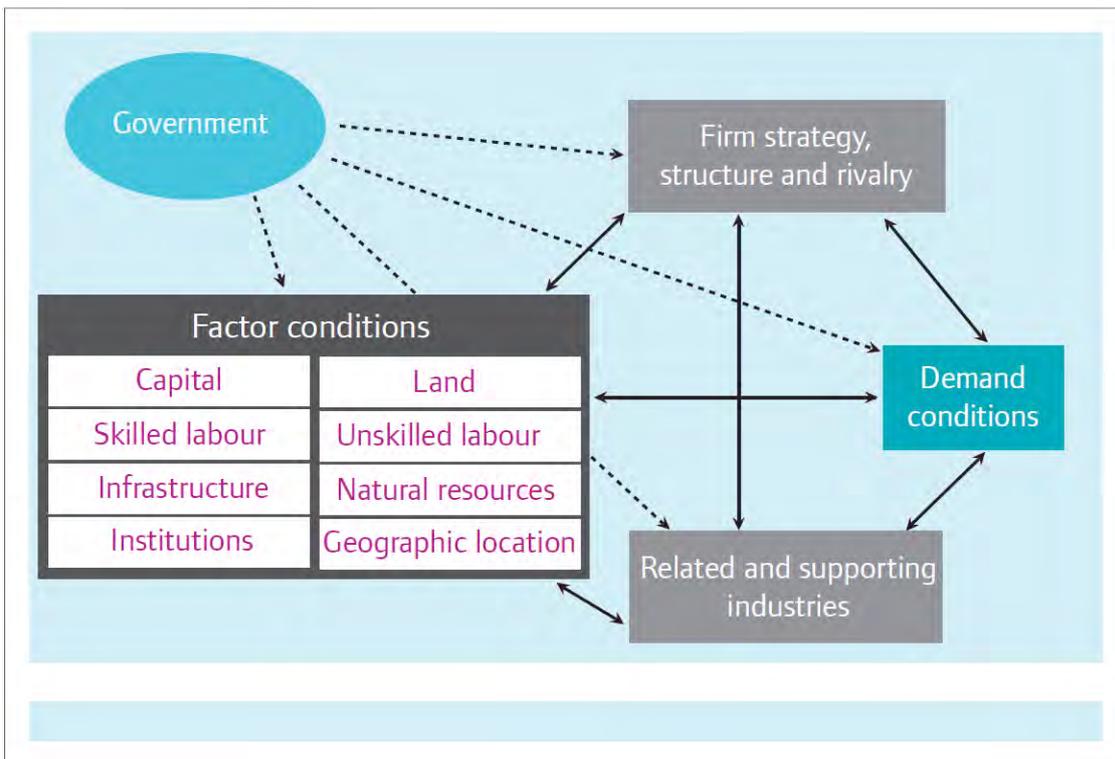
**Figure A.5: Relationship between air transportation flows and enabled flows**

	Goods	Services	Knowledge	Tourism	Investment	Remittances	Labour
Business		✓	✓		✓		✓
Personal Business		✓	✓		✓	✓	✓
Leisure				✓			
Cargo	✓						

Source: *Ishutkina and Hansman, Analysis of the interaction between air transportation and economic activity, MIT ICAT, 2009*

A21. Figure A.6 below provides a summary of how the flows described above affect the economy. It is based on the notion of four economic attributes (factor conditions, firm strategy, demand conditions and related and supporting industries) which form an inter-connected feedback system determining the character and performance of a regional economy such as London. Government and exogenous factors, such as the degree of globalization of trade in goods and services, also play an important role. Together these define the air travel and freight needs between the economy and the rest of the World.

**Figure A.6: System of aviation enabled flows and economic attributes**



Source: *Ishutkina and Hansman, Analysis of the interaction between air transportation and economic activity, MIT ICAT, 2009 (adapted from Porter, The competitive advantage of Nations, 1990)*

A22. A summary of the relationship between air transport and economic attributes is provided in Figure A.7.

**Figure A.7: Specific links between air transportation flows and economic attributes**

	Capital	Skilled Labour	Unskilled Labour	Firm Strategy	Demand Conditions
Business	✓	✓		✓	✓
Personal Business	✓	✓	✓		✓
Leisure					✓
Cargo	✓			✓	✓

Source: *Ishutkina and Hansman, Analysis of the interaction between air transportation and economic activity, MIT ICAT, 2009*

## **Appendix B: International strength of London's finance and business services sectors**

A23. The importance and international focus of London's financial and business services is illustrated by the fact that London has / is:

- over 250 branches and subsidiaries of foreign banks, more than any other centre worldwide;
- around half of European investment banking activity;
- management of the vast majority of European hedge-fund assets ;
- the world's largest international insurance market;
- the world's largest foreign exchange market;
- the highest number of foreign-listed companies on its stock exchange;
- accounts for 70% of trading in the international bond market;
- the biggest market in the world for traded over-the-counter derivatives ;
- the main centre for Eurex trading;
- the world's leading exchange for euro short-term interest rate derivatives and equity options;
- the London Metal Exchange is the biggest non-ferrous metals exchange in the world;
- the world's most liquid spot market for gold and for gold lending and the global clearing centre for worldwide gold trading;
- Europe's largest centre for commodities trading accounting for around 15% of global trade in commodities;
- the leading Western centre for Islamic finance;
- the world's most comprehensive range of specialist maritime services;
- one of the two leading centres for international legal services, alongside New York; and
- a leading centre for international dispute resolution.

## Appendix C: London Plan Policy 2.1: London in its global, European and United Kingdom context

- A24. The Mayor and the GLA Group will, and all other strategic agencies should, ensure:
- a that London retains and extends its global role as a sustainable centre for business, innovation, creativity, health, education and research, culture and art and as a place to live, visit and enjoy;
  - b that the development of London supports the spatial, economic, environmental and social development of Europe and the United Kingdom, in particular ensuring that London plays a distinctive and supportive part in the UK's network of cities.
- A25. The Mayor will continue to seek appropriate resources and investment from Government and elsewhere to ensure London excels among world cities and as the major gateway to Europe and the UK.
- A26. Throughout its history, London has been a city that has had to face the world and take account of developments far beyond its borders. This openness to global change will continue to be essential if the vision and objectives outlined in this Plan are to be delivered.
- A27. London is a world city with a role in the global economy rivaled only by New York. As such, it fulfils functions and attracts investment that other cities in the United Kingdom – and in Europe – do not. It has a distinctive role to play in the spatial development of the country and continent as part of a polycentric network of cities and urban areas, and the Mayor recognises the importance of ensuring London does this in ways that promote sustainable success at European, national and city region levels. He recognises the importance of this to the continued prosperity and well-being of London and its people.
- A28. The vision and objectives set out in this Plan support the European Union's Growth and Jobs Strategy aimed at ensuring Europe has the most competitive, knowledge-based economy in the world by 2010 and the emerging Europe 2020 strategy for smart, sustainable and inclusive growth that will The London Plan 2011 London's places replace it. London will have a major part to play as one of the continent's most important global gateways. This Plan also adopts the key concepts outlined in the European Spatial Development Perspective – an approach to spatial planning and development promoting economic and social cohesion and balanced and sustainable development, particularly through 'polycentric urban systems', co-ordinated approaches to transport and communications and management of natural and cultural heritage to help conserve regional identity and cultural diversity in the face of globalisation.
- A29. London forms part of North West Europe, along with Paris and the Ile de France, the Randstadt cities (like Amsterdam and Rotterdam) in the Netherlands, Brussels and the Rhine/Ruhr cities like Essen or Dortmund. These cities face common challenges, such as economic changes, community cohesion, infrastructure investment and delivery and local and global environmental threats. While the Spatial Vision for North West Europe prepared by the North

West Europe Interreg IIIB Spatial Vision Working Group highlights London as one of the pivotal centres of the world economy, it also identifies the London area as a 'bottleneck' to cross-Europe movement, reinforcing the importance of improving transport infrastructure around and within the capital. The Mayor will support joint work and strategies to help meet these challenges, in particular looking to national governments and European institutions for help in addressing strategic transport issues such as ways of moving international through traffic around London, instead of through it. Heathrow is currently the UK's only hub airport, and the Mayor recognises its critical importance to the London economy and the central place which it plays in London's international competitiveness and status as a world city. The Mayor is also supporting joint work to address the challenges climate change pose to Europe's cities, particularly on the role of green infrastructure.

- A30. London's success is inextricably bound up with that of the United Kingdom as a whole. It has unique economic specialisation in fields such as finance, business and law that are not, and could not be, replicated anywhere else in the country. As the nation's capital, it is a centre for government, law and administration. It has a leading role in the UK's visitor economy, as a gateway to the rest of the country. Overall, it makes a substantial contribution to national prosperity (for example, by making a substantial net contribution to the rest of the UK through taxation). The Mayor strongly supports working with the other nations, cities and regions within the UK to help ensure that London's success supports that of the country as a whole, and that it makes its proper contribution to a sustainable and balanced polycentric network of core cities.

## **Appendix D – TfL discussions about expected developments**

- A31. Rolls-Royce Group Plc, one of the world's leading aircraft engine manufacturers, confirmed that it spends about 6 to 7% of its annual turnover on research into environmental improvements and that it is a signatory to the Advisory Council for Aeronautical Research in Europe (ACARE) targets. Rolls-Royce is also working on developing suitable biofuels for aviation which could replace kerosene. It stresses the need to ensure that the full-life emissions are taken into account and that land is not diverted from vital food production in order to produce fuels, a position the Mayor supports.
- A32. TfL has also learnt of the 'Perfect Flight' project undertaken by Rolls-Royce, NATS, British Airways and BAA. The Mayor wholeheartedly supports progress enabling more efficient flights.

## Appendix E: Heathrow's unique function

**Table E.1: Route structures of the London airports**

	Heathrow				Gatwick				Stansted				Luton				London City			
	2008		2010		2008		2010		2008		2010		2008		2010		2008		2010	
	Dest	Frq	Dest	Frq	Dest	Frq	Dest	Frq	Dest	Frq	Dest	Frq								
Africa	23	212	21	224	18	81	23	82	2	2	8	8	1	4	5	11	0	0	0	0
Asia	30	445	26	422	3	12	2	6	0	0	1	8	0	0	0	0	0	0	0	0
Central/ Eastern Europe	15	240	16	281	26	210	16	142	24	164	20	168	16	152	25	183	1	6	0	0
Western Europe	58	2,802	62	2,771	101	2,079	129	2,113	124	1,544	143	1,333	45	692	85	539	33	934	29	647
Latin America	8	62	8	45	19	67	22	84	0	0	0	0	0	0	0	0	0	0	0	0
North America	28	871	30	960	24	214	21	89	1	32	3	2	1	13	2	0	0	0	1	11
Middle East	17	283	17	295	3	34	3	30	1	3	1	0	2	10	3	12	0	0	0	0
Australasia	3	63	3	63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	182	4,978	183	4,961	194	2,697	216	2,546	152	1,745	174	1,520	65	771	121	745	34	840	30	658
<b>Freq. per destination</b>	<b>27</b>		<b>27</b>		<b>14</b>		<b>12</b>		<b>11</b>		<b>9</b>		<b>12</b>		<b>6</b>		<b>28</b>		<b>22</b>	

Source: York Aviation, 2011

**Table E.2: Routes to/from Heathrow with the highest numbers of transfer passengers, annual passengers, 2010**

Route	Transfer passengers	Route	Transfer passengers	Route	Transfer passengers
Frankfurt	661,725	Washington	269,333	Warsaw	171,231
Amsterdam	532,020	Berlin	262,388	Dallas	164,710
New York JFK	491,904	Manchester	258,651	Delhi	163,763
Dublin	479,028	Milan Linate	258,015	Milan Malpensa	157,800
Paris	464,842	Istanbul	252,240	Newcastle	157,730
Edinburgh	441,713	Hamburg	247,891	Prague	146,540
Glasgow	440,041	Singapore	242,374	Doha	144,954
Dubai	437,277	Oslo	238,176	Miami	141,028
Munich	427,300	Rome	236,876	Tel Aviv	134,283
Zurich	399,013	Los Angeles	231,636	Cairo	133,230
Geneva	395,928	Boston	231,287	Bahrain	132,574
Madrid	385,787	Johannesburg	218,252	Philadelphia	132,114
Copenhagen	361,826	Barcelona	215,498	Bangkok	123,347
Hong Kong	358,160	Helsinki	211,052	Stuttgart	121,947
Stockholm	343,733	Athens	203,739	Shanghai	114,523
Chicago	329,011	Toronto	202,511	Nice	112,857
Dusseldorf	322,291	San Francisco	197,107	Belfast International	111,008
Aberdeen	307,660	Moscow Domodedovo	196,297	Moscow	106,482
Vienna	291,727	Houston	189,432	Cologne	102,186
Lisbon	286,919	Mumbai	183,722	Abu Dhabi	101,202
Brussels	279,301	Tokyo	181,383	Cork	100,870
New York Newark	276,489	Belfast City	172,690		

Source: York Aviation, 2011

**Table E.3: Routes from Heathrow with the largest of transfer passengers and proportion of transferring business passengers, 2010**

Route	Transfers %	Business Share of Transfers %	Route	Transfers %	Business Share of Transfers %	Route	Transfers %	Business Share of Transfers %
Frankfurt	17	31	Washington	41	22	Warsaw	26	25
Amsterdam	30	26	Berlin	41	30	Dallas	59	36
New York	34	17	Manchester	81	22	Delhi	48	14
Dublin	37	17	Milan	27	22	Milan Malpensa	31	21
Paris	37	24	Istanbul	18	24	Newcastle	65	24
Edinburgh	56	17	Hamburg	37	36	Prague	36	23
Glasgow	52	26	Singapore	32	26	Doha	25	40
Dubai	20	38	Oslo	41	24	Miami	48	20
Munich	23	28	Rome	31	14	Tel Aviv	33	17
Zurich	26	35	Los Angeles	48	15	Cairo	34	28
Geneva	27	39	Boston	54	25	Bahrain	49	38
Madrid	26	33	Johannesburg	44	25	Philadelphia	37	46
Copenhagen	31	25	Barcelona	46	28	Bangkok	22	21
Hong Kong	30	28	Helsinki	35	32	Stuttgart	33	24
Stockholm	33	24	Athens	30	19	Shanghai	22	44
Chicago	46	28	Toronto	51	16	Nice	33	19
Dusseldorf	25	30	San Francisco	38	21	Belfast International	29	48
Aberdeen	49	40	Moscow Domodedovo	25	46	Moscow	13	74
Vienna	33	29	Houston	43	38	Cologne	15	80
Lisbon	28	39	Mumbai	35	29	Abu Dhabi	23	36
Brussels	60	39	Tokyo	31	23	Cork	45	21
Newark (NY)	29	22	Belfast City	55	25			

Source: York Aviation, 2011

**Table E.4: Top 20 transfer routes at Heathrow, 2010**

Origin	Destination	Annual transfer passengers
Manchester	Hong Kong	64,652
Dublin	Kula Lumpur	60,786
Edinburgh	Hong Kong	55,645
Delhi	Newark (NY)	55,267
Edinburgh	New York	53,969
Dublin	Singapore	45,948
Los Angeles	Paris	44,436
New York	Paris	42,986
Delhi	New York	41,650
Stockholm	Hong Kong	40,449
Milan	New York	40,256
Delhi	Vancouver	39,225
Dublin	Chicago	38,338
Tokyo	Barcelona	37,454
New York	Amsterdam	36,063
Stockholm	Miami	36,009
Manchester	Singapore	35,785
Delhi	San Francisco	35,539
Tokyo	Madrid	35,742
Hong Kong	Paris	35,077

Source: York Aviation, 2011

## **Appendix F: Development of European routes to China and India**

- A33. This technical note considers the pattern of traffic growth in recent years on services from Europe to two primary developing countries, India and China, and some of the reasons behind the growth. Whilst we have not directly considered the economic growth of each of the countries, it must be recognised that this has played a part in air service growth, generating both increased volume of travel and also increased value of travel (i.e. the yield) as more people travel for business. The development of services between key European hubs and points within these countries has been driven by a number of factors, including:
- A34. Historic and cultural links between the nations, partly as these may have driven economic links;
- A35. Trade agreements and synergies between the economies, for example the synergy of manufacturing between Germany and China, or the synergy of business services and the financial sectors between the UK and India;
- A36. The permitted route structure negotiated between nations as part of bilateral agreements;
- A37. The relationships between hubs at both ends of the route and airline alliance alignments.
- A38. The economic growth of India and China not only leads to growth in business demand in both directions, but also to tourism growth as nationals of these countries seek to visit Europe and as European travellers become more interested in visiting these nations as tourism infrastructure develops. The formerly restrictive nature of travel to and from China for tourism and leisure has allowed growth in this market, particularly as countries have been given Approved Destination Status (ADS) by the Chinese Government to permit travel by Chinese residents.
- A39. Cultural and historical links clearly play some part in demand - the links between the UK and India are representative of this. In addition to passenger demand associated with Visiting Friends and Relatives, the links between the nations have permitted businesses to trade more easily, bound by a more common culture and the common use of English as a language. Furthermore, for much the same reasons and with the addition of an interest in our historical ties, tourism from the UK to India has been long established. This has generated the mix of traffic which is so important to airlines to operate profitably. With the exception of pockets of the Chinese community living in Europe generating VFR traffic, these cultural synergies do not exist between China and any particular European country, meaning that growth is underpinned by the economic growth of the country. For these reasons, business travel is a greater proportion of traffic on the Chinese routes than on the Indian services.
- A40. All the nations with hubs in Europe signed new bilateral air service agreements with India in 2005. Of these however, only services to the UK/London have seen explosive growth. Table F.1 summarises the negotiated capacity between the nations with the

primary hubs in Europe and India, along with the actual weekly frequencies at present and highlights the available capacity within most of the current bilaterals.

**Table F.1: Utilisation of Bilateral Permitted Weekly Departure Frequencies, Europe-India, June 2011**

Destination	Permitted Weekly Departures		Weekly Departures		Utilisation	
	Indian Carriers	European Carriers	Indian Carriers	European Carriers	Indian Carriers	European Carriers
Germany*	50	50	14	52	28%	104% ***
France*	35	35	14	21	40%	60%
Netherlands*	21	21	0	7	0%	33%
UK**	112	112	77	52	69%	46%

Source: UK/India Bilateral Agreement & OAG, OAG Schedules Data, June 2011

Notes:

\*2011 Departures only includes Amsterdam, Paris (CDG), Frankfurt and Munich

\*\*UK Permitted is based solely on current operating routes, but the total could increase should services be launched on routes not currently served

\*\*\*It is not clear how Lufthansa have exceeded their allowance as these are individual routes

A41. Table F.2 provides a breakdown of the UK market and highlights the limit having been reached to Delhi/Mumbai by the Indian carriers.

Table F.2: Utilisation of Bilateral Permitted Weekly Departure Frequencies, UK-India, June 2011

Destination	Permitted Weekly Departures		Weekly Departures		Utilisation	
	Indian Carriers	British Carriers	Indian Carriers	British Carriers	Indian Carriers	British Carriers
Ahmedabad	7	7	7	0	100%	0%
Amritsar	7	7	7	0	100%	0%
Bangalore	14	14	0	7	0%	50%
Chennai	14	14	0	5	0%	36%
LHR - Delhi & Mumbai*	56	56	56	35	100%	63%
Hyderabad	7	7	0	5	0%	71%
Kolkata	7	7	7	0	100%	0%

Source: UK/India Bilateral Agreement & OAG, OAG Schedules Data, June 2011

Notes:

\*Delhi and Mumbai have a combined total within the bilateral although the split of frequencies between these is not indicated

Services are permitted on any other routes between the UK-India at a frequency of 7 departures per week each way by UK and Indian Airlines

- A42. It is interesting that in the period immediately following the new bilateral being signed with India, the Indian airlines initially showed interest in serving London from secondary cities within India, such as Kingfisher's initial plan to launch Bangalore services. This service was launched, but later suspended indicating the desire by the Indian airlines to operate into their own hubs within India. This suggests that the most likely source of connections to secondary cities will be with a UK carrier (i.e. British Airways), with the Indian carriers preferring to serve these points through consolidated services in Delhi and Mumbai. Conversely, this would suggest that growth by the Indian carriers to the UK is most likely to come through services to regional points such as Manchester and Birmingham, taking the opportunity to 'steal' BA's traffic at Heathrow by providing connections to their own hubs in India.
- A43. The role played by alliances must also be recognised because these go some way to substituting for the effect of carriers wishing to serve their own hubs. Through alliances, there may be some scope for attracting regional points in China and India from those nations' carriers by allowing them to pick up the feed traffic in Europe. An example of this would be the alignment of services by Air China in Frankfurt and Munich and by China Southern in Amsterdam and Paris, albeit the scale of the market means these are still to the principal cities. This does not appear to have affected the decision by carriers to serve important destinations directly from the key hubs and this includes London, which is also served by Air China.
- A44. The restrictive attitude of the Chinese Government, both to travel and also allocations of traffic rights within the bilateral means that it is difficult to establish the true nature

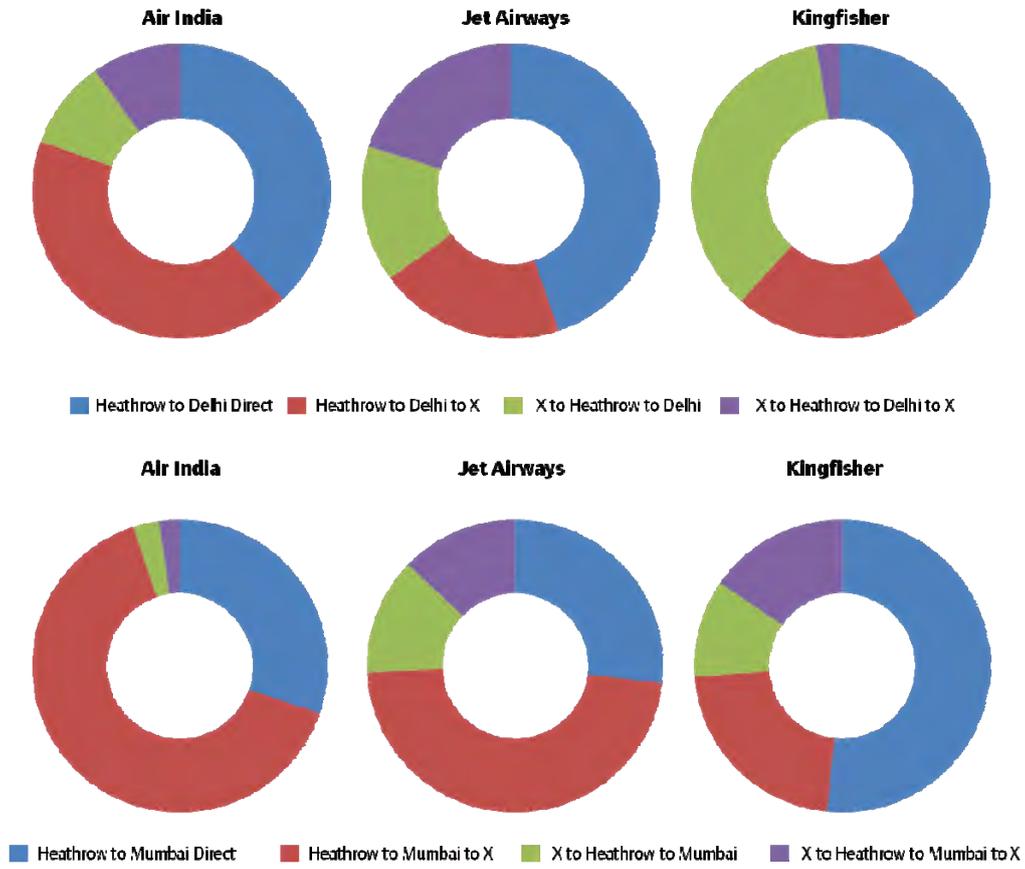
of demand because initially Air China, China Eastern and China Southern (the only three airlines permitted to fly to Europe) were allocated the hubs they must operate from in China and also the destinations they must operate to in Europe, of which there was no overlap. For example, China Eastern was not initially permitted to serve London as this was an Air China European point. This has now been relaxed to some extent. However, it may be reasonable to assume that these carriers and any potential new entrants permitted by China would still aim to serve their hub airports rather than bring in direct frequencies to more regional points, and this view is perhaps supported by the Lufthansa service to Nanjing from Frankfurt based on the hub the carrier has at the European end of the route.

- A45. Recently, each of the airlines has however reduced seat capacity on their European destinations whilst retaining frequency levels. In all cases, larger aircraft such as the Boeing-777-200, Boeing-747-400 and Airbus A340-600 have been substituted by the smaller Airbus A330-200. This is perhaps a reaction to the overall level of demand not currently being sufficient to sustain larger aircraft, but it does indicate that there is scope for aircraft size growth over the short to medium term even if slots are not readily available for substantial frequency growth.
- A46. Slot availability does not, so far, appear to have been a restriction on growth of services from London, and unlikely to have been a concern to date at the remaining European hubs with their greater spare capacity. The Indian carriers and their choices to consolidate operations on Mumbai/Delhi indicate that this is the way they wish to serve the markets and they have managed to obtain slots for the maximum currently permitted number of services per week. Slots have been obtained from a variety of sources, although it is not clear exactly the source of all the slots, though we are aware that some have come through 'handbacks' (where another carrier has given up slots at London Heathrow) and through leases from other carriers, which may mean that these could be vulnerable should airlines recall these slots. All of the bilaterals with India indicate that the governments must make best endeavours to provide commercially acceptable slots at both ends of the routes, and in some respects the service pattern of operations from India and China, i.e. typically arriving late afternoon/early evening and departing mid/late evening means that these services are not in conflict with the peaks of longhaul demand from Europe which are for early morning arrivals and mid-morning departures.
- A47. As highlighted in Paragraph 9 of this note, whilst Indian carriers had the option to serve non-hub cities within India, they have progressively moved away from such services towards operations to their hubs. Table 3 shows the reliance of these carriers on hub traffic in India to underpin the current services. This table also includes the two primary Chinese carriers operating into London and also illustrates the two carriers operating to Seoul as a comparison with an economically strong, and less developing nation in Asia.
- A48. As can be seen, the percentage of passengers making connections at each carrier's respective hub is significant and in most cases will underpin the frequency of services seen. Therefore, if it is desirable at this time to have 8 daily services to Delhi or Mumbai with Indian carriers in order to meet the demands of business travellers to have access to high frequency services, then it is essential that these airlines do not

jeopardise their services by launching more direct Indian services. Given that a typical longhaul route will require 100,000-140,000 passengers per annum (depending on aircraft size) then it is clear that the current level of frequency by foreign carriers to Shanghai, Mumbai and Delhi could not be sustained without the hub operation. In essence, this is a mirror image of the pattern seen on British Airways' services at the Heathrow hub.

- A49. Additionally, whilst this analysis has not taken account of passengers travelling via intermediary hubs, such as those in Europe or the Middle East, if it were assumed that the Indian and Chinese carriers had a similar draw on passengers for direct services as they do for those connecting via their hubs (on the basis that if you have to connect somewhere then your decision making will turn to other factors such as airline quality and fare), then there are no destinations that generate sufficient demand for these carriers to justify launching direct services if it was assumed that the minimum weekly frequency would be 3 flights/week (equating to approximately 45,000 passengers per annum).
- A50. A further important aspect is the apparent desire by airlines to hub in their home country, rather than in Europe. In doing so, the airlines can underpin a wider overall array of destinations and frequencies. Furthermore, they can operate point to point services on the key routes in order to attract the high yield passengers that underpin any service. Where airlines could not operate point to point from their home cities (such as Delhi or Shanghai) but instead relied on a European hub, they would be prone to greater competition for two reasons:
- (i) passengers who would not have the option of direct services would have several options as to which hubs they could fly through, whether that be a European carrier's hub or one in the Middle East;
  - (ii) if they did not take advantage of hubbing in their home nation, but instead relied on feeders in Europe then they may not be able to compete with direct services from a given city, for example British Airways services from London, which may be favourable for the higher yielding passengers.
- A51. The one exception to this would be the hubbing undertaken in Brussels by Jet Airways whereby they rely on Brussels Airlines to feed their services to India and the USA, however this is less a reaction to serving Brussels, and more a way of supporting their India-USA services which to date have not generated sufficient traffic to justify direct services.

**Figure F1: Reliance on hubs by foreign carriers**



Source: York Aviation, 2011

## Appendix G: Further evidence about the effects of High Speed Rail on aviation demand

- A52. On many routes significant air connections remain, even where high speed rail networks are introduced and directly connected to airport terminals. For example, Paris CDG to Lyon has a journey time of approximately two hours on TGV and an hourly service<sup>138</sup>. Despite this there are on average six flights a day from Charles de Gaulle to Lyon St Exupéry<sup>139</sup> and three from Orly<sup>140</sup>. Madrid and Barcelona are also linked by 23 high speed train services per direction per day, with journey times of around three hours, with non-stop services taking 2 hours and 38 minutes, yet there are still approximately 31 flights a day from Madrid to Barcelona<sup>141</sup>. Similar patterns of duplication can be seen on many routes, including London to Brussels and London to Paris. While Eurostar services have abstracted a significant proportion of air traffic, both remain busy air routes<sup>142</sup>.
- A53. Brussels also sits on the main high speed line from the Netherlands to Paris, giving it good journey times to both. There are now only 20 flights a week between Brussels and Charles de Gaulle and 38 a week between Brussels and Amsterdam<sup>143</sup>.
- A54. One of the key features of the success of high speed rail in continental Europe is the direct connections that the major airports have to the network. Charles de Gaulle airport is on the TGV Interconnexion line which bypasses the centre of Paris, giving excellent access from the regions without having to change in Paris. Schiphol sits at the northern end of the recently constructed high speed line from Amsterdam to the Belgian border, providing better access to the wider high speed network.
- A55. Germany offers an interesting case study of the effects of introducing high speed rail. In 2002 a new line was introduced between Frankfurt and Cologne, allowing trains to reach 300kph and providing a journey time of just over an hour between the two city centres. The consequence of this link is that Lufthansa ceased operating flights between the two. A station at Frankfurt Airport provides for the air feeder services and stations in both city centres serve the intercity market. Cologne-Bonn airport is also served via a spur from the main line.
- A56. The Frankfurt to Cologne link also cut journey times between Frankfurt and Dusseldorf to one and a half hours. Despite this relatively fast journey time, there are still six flights

---

<sup>138</sup> SNCF website, [www.voyage-sncf.com](http://www.voyage-sncf.com)

<sup>139</sup> OAG Data, June 2011

<sup>140</sup> Aeroports de Paris website, [www.aeroportsdeparis.com](http://www.aeroportsdeparis.com)

<sup>141</sup> RENFE website

(<http://horarios.renfe.com/HIRRenfeWeb/buscar.do?O=MADRI&D=BARCE&AF=2011&ID=i&MF=07&DF=22&SF=5>)

<sup>142</sup> Lopez-Pita, A. & Robusté, F, 'Impact of High-Speed Lines in Relation to Very High Frequency Air Services', *Journal of Public Transportation*, Vol. 8, No.2, 2005

<sup>143</sup> <http://www.raileurope.co.uk/default.aspx?tabid=101#divBasketTotalLink>, <http://www.railway-technology.com/projects/frankfurt-cologne-high-speed/>.

a day between the two airports. It is also possible to take an ICE service between Frankfurt and Munich, which has a journey time of three and a quarter hours, and yet there are still eleven flights per day.

- A57. Further afield, South Korea introduced the KTX, a high speed rail spine from Seoul to Daegu in 2004; an extension to Busan was opened in 2010. From 2000 to 2009 there was a drop in domestic air passengers in Korea of 35% from 20 million to 12.7 million and it is expected that the extension will result in further falls<sup>144</sup>.

---

<sup>144</sup> Article on Anna Aero website, 2010, <http://www.anna.aero/2010/03/09/korean-intl-traffic-still-growing/>