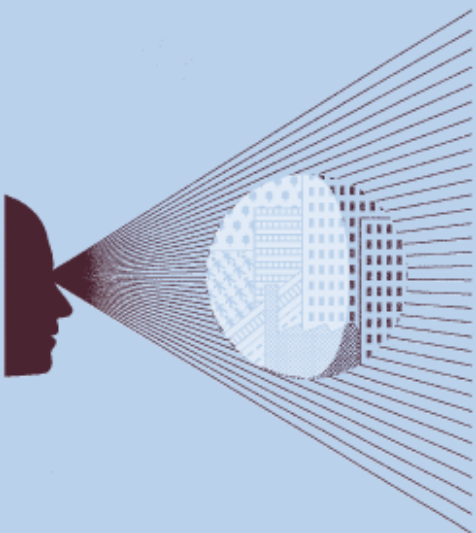


# Would a new hub airport be commercially viable?

Prepared for the  
Transport Committee

January 24th 2013



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## Executive summary

The Transport Committee is conducting an inquiry into the UK's aviation strategy.<sup>1</sup> Commissioned by the Committee and prepared by Oxera, this report assesses the conditions under which a new hub airport is, or is not, likely to be commercially viable.

The assessment does not evaluate a specific proposal for a new hub; rather, it includes a range of scenarios covering various airport designs, demand forecasts, cost estimates and assumptions about the level of airport charges.

In all of the examined scenarios, Oxera's analysis suggests that a new hub airport would not be commercially viable. Specifically:

- all the scenarios have a negative value at a rate of return that a private investor would require; and
- the analysis implies that substantial public support/subsidy would be needed (in the range of £10–30 billion in today's money for the base-case scenarios examined).

Nevertheless, from a public perspective, the project may still offer good value for money, depending on the scope of wider benefits that the airport could facilitate.

<sup>1</sup> See <http://www.parliament.uk/business/committees/committees-a-z/commons-select/transport-committee/news/aviation---tor/>.

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# 1 Introduction

- 1.1 The Transport Committee (the Committee) is conducting an inquiry into the UK's aviation strategy.<sup>2</sup> Commissioned by the Committee and prepared by Oxera, this report provides an assessment of the conditions under which a new hub airport is, or is not, likely to be commercially viable. As part of this review, Oxera has been asked to develop a set of questions for the Committee to use during its inquiry to probe the evidence put forward by witnesses.<sup>3</sup> These questions are presented in the boxes throughout the report.
- 1.2 The assessment is deliberately undertaken from the perspective of a private investor taking account of the private returns expected from the airport. This is a conceptually different assessment from one encompassing wider economic and social concerns, which might be conducted from the perspective of government. The review is also undertaken at a conceptual level, drawing on evidence from existing proposals, but not seeking to conclude whether any of the specific proposals for a new airport are commercially viable.
- 1.3 A new hub airport would provide a step change in the UK's aviation capacity, leading to a significant impact on transport users, the economy and the environment. It would involve a substantial capital investment. This review seeks to assess whether that investment could be made by the private sector alone, or whether some form of state support would be required.
- 1.4 Proposals for a new hub airport are just one option for enhanced aviation capacity in South East England. It is therefore appropriate to acknowledge upfront that there are other options for expanded capacity, including new runways at Heathrow, Gatwick, Stansted or elsewhere. (The report does not review these proposals in detail.) However, understanding the interaction between a new airport and existing airports, and the financial prospects for such an airport, is technically complex, and the proposals put forward to date do not generally include an extensive analysis of many of these issues.
- 1.5 Broadly, the areas where questioning is likely to prove beneficial include the following.
- **Scenarios**—what are the feasible designs and locations for a new hub airport?
  - **Demand**—how might changes in economic growth affect demand projections? How might demand be abstracted from existing airports and absorbed by the new hub? What categories of traffic would be most likely to volunteer to move from existing airports?
  - **Costs**—what is the range of likely costs for the construction and operation of the airport, including surface access?
  - **Charges**—what is the likely level of charges that could be supported at the airport, given competitive constraints?
  - **Funding**—are proponents of a new airport expecting it to be viable on a stand-alone commercial basis, or that public funding would be required? Can the funding of the proposed investments be split into components with different sources of funding?
- 1.6 The report proceeds by examining each of these areas in turn. It has deliberately been kept concise, with additional detailed supporting material being provided in a series of appendices.

<sup>2</sup> See <http://www.parliament.uk/business/committees/committees-a-z/commons-select/transport-committee/news/aviation---tor/>.

<sup>3</sup> Oxera Consulting Ltd was awarded the commission following a competitive tender process.

## 2 Scenarios

- 2.1 The viability of a new hub will be affected by its precise design details. Factors such as size and location will have different implications for revenues and costs, and hence for commercial viability. There is also uncertainty around factors that are outside the control of aviation policy. In this report, Oxera assesses a non-exhaustive range of combinations of these factors. Full details of the scenarios tested are provided in Table A2.1 in Appendix 2.

### Design factors

- 2.2 The design of the airport (for example, the number of runways and terminals) will inevitably influence the costs of the proposal (see section 4). All else being equal, the larger the airport, the greater the costs of the land and construction. Moreover, the designed facilities at an airport need to be considered in combination with policy towards existing airports—for example, the larger a new airport, the more likely it is that existing airports will close as a consequence.
- 2.3 The location of the airport will influence the amount of passengers (and air freight) who will be able to use it (and hence the demand for it), based on surface access times, and/or will affect whether new surface access links need to be built, and thus the costs of a new hub. The proposed airport locations of a selection of recent proposals are presented in Figure A3.1 in Appendix 3. Heathrow is situated close to a number of major motorways and has a direct, dedicated rail link from central London. A proposal for a new airport in a different location, such as the Thames Estuary, is likely to have very different access times, particularly for travellers from parts of Britain outside London. For example, Figure A3.2 in Appendix 3 gives examples of road catchment areas for Heathrow, and those for a proposal at Cliffe in Kent.

**Q: What would the policy objectives for a new airport be, and how would decisions be taken about location and design?**

**Q: Would the new airport be designed as a replacement for Heathrow, as a competitor, or as part of a managed multi-airport system in which government allocates traffic between airports according to traffic distribution rules?**

### External factors

- 2.4 Regardless of the precise details of the proposed scheme, a number of factors are inherently uncertain and beyond the control of aviation policy.
- 2.5 First, the level of future aviation demand will be influenced by the future development of the UK and world economies (see section 3). Given the recent changes in forecasts for short- and medium-term economic growth,<sup>4</sup> and the prospect that long-term growth has also changed, scenarios for different rates of growth in overall aviation demand are tested.
- 2.6 Second, the degree of abstraction of traffic from other London airports and other EU hubs will be critical in influencing the traffic that is available for the new hub (see section 3). This will depend on passengers' and airlines' willingness to switch airports. If the only traffic diverted from existing airports comes from Heathrow, the outcome for demand for the new hub will be substantially lower than if some traffic is also diverted from Gatwick, Stansted, other airports and other transport modes.

<sup>4</sup> See HM Treasury (2012), 'Autumn Statement', December.

- 2.7 Third, passengers and airlines' price sensitivity will influence the extent to which prices at a new airport could rise (in real terms) and how quickly in order to cover costs. (Alternatively, in some scenarios, charges at existing airports could be increased in order to pre-fund the new airport) (see section 5).
- 2.8 Lastly, the level of costs will be influenced by a range of external factors, such as wage rates. Some cost components are much more uncertain than others—for example, the cost of reclaiming land from the Thames Estuary is much more uncertain than the market price of agricultural land onshore (see section 4).

**Q: To what extent have the business cases for existing proposals been tested against external shocks, such as lower demand and cost overruns?**

**Q: What assumptions do the proposals make about developments at other airports in the South East, including the provision of extra capacity?**

### **Summary**

- 2.9 This section has considered the factors that could influence the commercial viability of a new airport. These are analysed further in sections 3 to 5 below.



### 3 Demand for aviation

3.1 In assessing whether a new hub airport would be commercially viable, the first consideration is the extent of future demand from passengers (and, to a lesser extent, air freight) for air travel. Demand forecasts are needed in order to calculate estimates of the revenue that could be earned from a new airport, and hence the expected cash flows (which have been modelled by Oxera, see Appendix A.8). There will be a relationship between outturn demand and the prices charged by an airport (see section 5).

#### New/generated demand

3.2 The DfT publishes official projections of constrained and unconstrained future UK aviation demand.<sup>5</sup> The latest edition was published in August 2011, selected results of which are shown in Table 3.1.<sup>6</sup> The constrained demand forecasts are reported for the ‘maximum use’ capacity scenario;<sup>7</sup> this assumes that no new runways will be built in the UK, but that airports will maximise their current potential runway capacity in the medium term. The unconstrained scenario allows for capacity expansion.

**Table 3.1 UK terminal passenger forecasts, central estimates (million passengers per annum, mppa)**

Forecast year	Unconstrained Date forecast made			Constrained (maximum use) Date forecast made		
	2007	2009	2011	2007	2009	2011
2010	270	260	211	270	260	211
2020	385	365	275	355	345	270
2030	495	465	345	425	405	335
2040	–	–	425	–	–	405
2050	–	–	520	–	–	470

Source: Department for Transport (2007), ‘UK Air Passenger Demand and CO2 Forecasts’, November, pp. 37–43; (2009), ‘UK Air Passenger Demand and CO2 Forecasts’, January, pp. 42–50; (2011), ‘UK Aviation Forecasts’, August, pp. 44–8.

**Q: Do you agree with the government’s assessment of the likely rate of growth in demand?**

3.3 The DfT’s figures show a substantial difference between constrained demand (470mppa) and unconstrained (520mppa) demand by 2050, which suggests that, without expansion, there will be a degree of unfulfilled demand. This constraint would be particularly severe in the South East, where it is predicted that, by 2030, Heathrow, Gatwick, Stansted, Luton and London City Airports will all be operating at full capacity. A new hub airport could provide a means for supplying this unmet demand.

<sup>5</sup> The DfT’s passenger demand forecasts are calculated using two models: the National Air Passenger Demand Model and the National Air Passenger Allocation model (see Appendix A4 for details).

<sup>6</sup> Department for Transport (2011), ‘UK Aviation Forecasts’, August.

<sup>7</sup> The maximum use capacity scenario is used for the central estimates of constrained demand in the 2011 forecasts. In the 2007 and 2009 forecasts, the ‘s12s2’ scenario was used for the central estimates—in which a second runway opens at Stansted in 2015 and a third runway opens at Heathrow in 2020.

**Q: How many extra runways/terminals would be required at a new airport to ensure that the unconstrained levels of demand envisaged by DfT are met, including in the 'high' demand case? What would be the operational requirements, including combinations of hours of operation and mixed/single mode at future dates?**

- 3.4 Table 3.1 also shows how the central estimates of future demand have changed across the past three forecasting reports published by the DfT. The table shows that central demand estimates have been revised downwards significantly since 2007. This hints at the variability in forecasting, although a large majority of the revision—particularly between 2009 and 2011—is likely to be a result of the financial crisis.
- 3.5 In general, short-term fluctuations in the macroeconomy are movements around a long-run trend and should make little difference to the overall assessment of long-term future demand. However, the outlook for the macroeconomy has changed substantially in the past few years in a way that goes beyond short-term variations. Indeed, a comparison of December 2012 forecasts with those of March 2011 shows a marked downward revision in the expected *level* of output in the medium term (with a 6% differential in 2015–16). The forecasts do not fully reconcile until around 2040.<sup>8</sup> In addition, according to its latest 'Economic and Fiscal Outlook', the Office for Budget Responsibility expects long-run growth to remain at 2.3%, although it did test a scenario of 1.5% (as well as revising down short- and medium-term growth).<sup>9</sup>
- 3.6 These more recent expectations for lower levels of output since 2011 suggest that the central case provided in the DfT's forecasts may well be considered a form of upside scenario—in particular, during the earlier years of the forecast—although the recent forecasts indicate that this effect may be reduced by the time a new airport is likely to be fully operational.

**Q: To what extent would prolonged lower economic growth reduce demand forecasts, and how would this affect the business case for, and timing of, new capacity?**

**Q: Does the progressive reduction in the economic outlook since the DfT's 2011 aviation projections materially reduce the need for new capacity?**

### Abstracted demand

- 3.7 The degree of competition from other UK and European hub airports is extremely important for the viability of a new hub. The willingness of passengers and airlines to move airports is interlinked with the choice of policy for the location and design of the new airport.
- 3.8 In addition to providing services to currently constrained traffic, if all traffic that would otherwise have used Heathrow transfers to the new airport, there would be an additional 85mppa available for the new hub in 2050 (assuming 100% transfer and dependent on the demand scenario). In Oxera's analysis, scenarios where Heathrow is closed assume 100% transfer from Heathrow to the new hub, while when Heathrow remains open no transfer is assumed.
- 3.9 There may also be some abstraction from Gatwick and Stansted, which together are expected to serve 70mppa in 2050,<sup>10</sup> although full abstraction from Gatwick, Stansted and elsewhere is unlikely. Oxera's base-case scenario has been to assume that there is no abstraction from these airports, and, in a high-case scenario, that there is abstraction of traffic from full-service carriers at Gatwick (30%) and Stansted (3%) that will transfer to the

<sup>8</sup> This implies that for the first 15 years of operation of the airport (from 2024), the level of GDP is now expected to be below the 2011 estimate (by up to 3.5%).

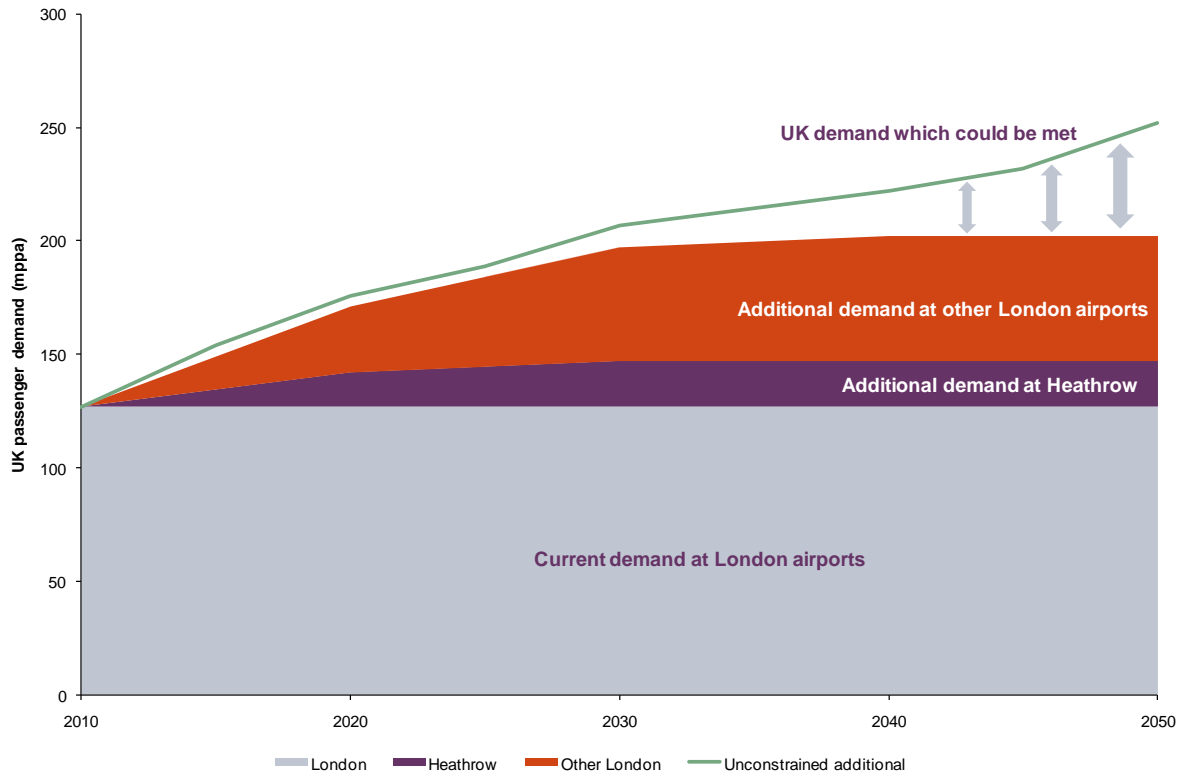
<sup>9</sup> Office for Budget Responsibility (2012), 'Economic and Fiscal Outlook', December, para 5.40.

<sup>10</sup> See Table A4.1.

new hub.<sup>11</sup> These assumptions should cover the full range of likely outcomes, with the outturn level of traffic transfer likely to be somewhere in between.<sup>12</sup>

3.10 The relative importance of unconstrained demand compared with existing demand at London airports is shown in Figure 3.1.

**Figure 3.1 Demand at London airports**



Source: Department for Transport (2011), 'UK Aviation Forecasts', August.

3.11 Competition with European hub airports is also relevant, but unlikely to be as critical as servicing end demand from the UK. The DfT's forecasts are primarily based on growth within the UK. Currently, transfer/transit traffic at Heathrow accounts for 35% of total demand. However, any substantial changes in the capacity that is available at Charles de Gaulle (Paris), Schiphol (Amsterdam) and Fraport (Frankfurt) are all likely to exert a degree of competitive constraint on any UK hub airport.

3.12 What the airport charges compared with other airports will influence the willingness of passengers and airlines (and indirectly passengers) to switch airports. If it is left to a commercial decision, this is likely to be one of the key factors. This question is returned to in section 5. However, there is also a role for policy, since forced closure of an airport(s) would force passengers/airlines to switch.

<sup>11</sup> See <http://www.caa.co.uk/%5Cdefault.aspx?catid=78&pagetype=90&pageid=12275>.

<sup>12</sup> Full details of the scenarios used are shown in Tables A7.1 and A7.2.

- Q: How would an enforced shift of services to a new airport affect airlines? Would it reduce their willingness to develop their networks and, if so, why?**
- Q: If Heathrow remained open once the new airport began operating, how much traffic would switch to it from Heathrow? Are there any estimates (or expectations) of the likely amount of demand that may move from other airports (UK and/or non-UK) to the new airport?**
- Q: What categories of traffic (eg, full-service, low-cost carrier, freight?) would be most likely to move out of existing airports?**

### Type of demand

- 3.13 An important consideration is whether there is a difference in demand for point-to-point services versus demand for hub services. The Civil Aviation Authority (CAA) distinguishes between passengers depending on whether they are:
- **point-to-point traffic**—passengers for whom the airport is either their starting or final destination;
  - **connecting traffic**—‘passengers whose sole business at an airport is to transfer from one flight to another, within 24 hours of arrival at the airport’.<sup>13</sup> In 2011 connecting traffic accounted for 34.6% of all passengers at Heathrow,<sup>14</sup> and 13% at Gatwick;<sup>15</sup>
  - **transit traffic**—passengers arrive at and depart from the airport on the same flight, normally remaining on board the aircraft. Transit passengers account for around 0.5% of total UK traffic<sup>16</sup> and are thus not a significant driver of demand.
- 3.14 The advantage of hub services is that, where there are a significant number of connecting passengers, airlines may be able to operate routes that would not be viable on the basis of local demand alone. As such, there may be circumstances in which a new hub airport might be able to cater for demand that could not be serviced by existing UK airports since the routes would not be commercially viable at airports unable to offer hub services.
- 3.15 There is, however, evidence to suggest that point-to-point services are becoming increasingly sought after and therefore viable, such that the need for connecting passengers to make routes viable may be diminishing. This trend was noted as far back as the 2003 Aviation White Paper:
- there is evidence to suggest that a combination of liberalised air markets, changing aircraft design and growing demand will increasingly mean that airlines will want, and be able, to fly point-to-point to a greater number of destinations. Demand in the South East will be strong enough to support more point-to-point services without the reliance on connecting traffic.<sup>17</sup>
- 3.16 The DfT has also noted that:
- at capacity constrained airports, increasing demand over time for travel from the local market tends to displace connecting passengers, since, in general, point to point traffic is higher yielding than connectors.<sup>18</sup>

<sup>13</sup> Civil Aviation Authority (2008), ‘Connecting passengers at UK airports’, November, p. 2.

<sup>14</sup> See <http://www.heathrowairport.com/about-us/facts-and-figures>.

<sup>15</sup> Civil Aviation Authority (2008), *op. cit.*, Table 5.1.

<sup>16</sup> Civil Aviation Authority (2008), ‘UK Airport Statistics, Terminal and Transit Passengers 2011’, Table 9.

<sup>17</sup> Department for Transport (2003), ‘The future of air transport’, December, p. 112, para 11.15.

<sup>18</sup> Civil Aviation Authority (2008), *op. cit.*, p. 3.

**Q: Why do proponents of a new hub airport believe that hub rather than point-to-point capacity is needed? What mix of traffic (ie, hub versus point-to-point) would a new airport need in order to compete successfully with Heathrow and other airports in the UK?**

#### **Location and surface access**

- 3.18 Passengers' ability to access the new airport is important, and the surface transport connections are therefore likely to be critical in determining the demand for the airport.
- 3.19 A new airport in the Thames Estuary is unlikely to be as well connected by road to the UK's regions as Heathrow is, given its proximity to a number of major motorways (although it also faces congestion problems). Figure A3.2 compares drive times from Heathrow with those from a potential site at Cliffe. It demonstrates that areas such as the West Midlands are better connected by road to Heathrow than areas to the east of London. However, a new airport located in Berkshire or Oxfordshire, for example, may also be similarly well connected.
- 3.20 In terms of rail access, a new airport might be comparably well connected if dedicated rail infrastructure were constructed to service the new airport. However, it is already the case that some existing airports are likely to have their rail connectivity improved, assuming that HS2 is completed as currently planned, which would enhance connectivity at Heathrow and Birmingham Airports. Any policy analysis would need to include a comparison of the relative costs and benefits of the surface access to the various proposed sites for airport expansion.

**Q: How could access to and from the new airport be ensured to enable as wide a range of the population as possible to travel to and from the airport at reasonable cost?**

**Q: To what extent would the precise location of the new airport in the South East affect how much traffic it attracts, and will this depend on the quality of the surface access provided?**

#### **Summary**

- 3.21 This section has considered the prospects for demand growth in aviation. Although the DfT expects continued growth, recent forecasts have seen downward revisions. There is an expectation of a substantial degree of demand being constrained unless extra capacity is developed, although the degree of churn from existing airports is as important. Based on this section Oxera's modelling has used the following assumptions.
- **The base-case demand scenario** is based on the central DfT 2011 aviation forecasts. It assumes that realisation of constrained demand accrues to the new hub, as does all traffic from Heathrow, but no traffic from Gatwick or Stansted.
  - **Low- and high-demand scenarios** are tested covering the low and high scenarios from the DfT forecasts respectively. Two scenarios are also considered for the transfer of full-service traffic from Gatwick and Stansted: either that no transfer occurs, or that all full-service traffic transfers (30% and 3% of total traffic respectively).

## 4 The cost of a new hub

- 4.1 The likely cost of a new airport will vary depending on the precise proposal (for example, in terms of location or number of runways). A range of recent proposals has been reviewed for this report and their cost estimates are collated in Table 4.1 (adjusted for inflation where necessary).

**Table 4.1 Simplified collation of cost estimates (£ billion, 2012 prices)**

	Design	Construction	Surface access (new)	Surface access and infrastructure (existing)	Total
<b>New hubs</b>					
London Jubilee International Airport <sup>1</sup>	Five runways	24	22	3	<b>49</b>
Thames Hub <sup>2</sup>	Four runways	20	20	10	<b>50</b>
Cliffe <sup>3</sup>	Four runways	14.2	2.2	–	<b>16.4</b>
Thames Reach <sup>4</sup>	Two runways	9.5	0.3	–	<b>9.8</b>
Goodwin Sands <sup>5</sup>	Three runways	24.8	11.4	3	<b>39.2</b>
<b>Indicative range</b>					<b>10–50</b>
<b>Expansion at existing airports</b>					
Heathrow <sup>6</sup>	Third runway	–	–	–	<b>8–9</b>
Gatwick <sup>7</sup>	Second runway and/or third runway	2.3–7.4	–	0.1–0.4	<b>2.3–7.8</b>
Stansted <sup>8</sup>	Second runway	–	–	–	<b>4</b>

Note: Oxera has adjusted forecast costs to 2012 prices using the Office for National Statistics CPI. Sources: <sup>1</sup> Testrad (2012), 'London Jubilee International Airport', November. <sup>2</sup> Foster and Partners, Halcrow and Volterra (2011), 'Thames Hub: An integrated vision for Britain', November, p. 30. <sup>3</sup> Helsey, M. and Codd, F. (2012), 'Aviation: proposals for an airport in the Thames Estuary, 1945-2012', House of Commons library, July 20th, p. 8. <sup>4</sup> Halcrow Group (2003), 'SERAS: Review of Thames Reach Airport Proposal', December, p. 7. <sup>5</sup> Beckett Rankine (2012), 'Cost estimate for Goodwin Airport', December, available at: [http://www.goodwinairport.com/?page\\_id=510](http://www.goodwinairport.com/?page_id=510). <sup>6</sup> DfT (2007), 'UK Air Passenger Demand and CO<sub>2</sub> Forecasts', November, Table 4.2. <sup>7</sup> The bottom end of the range corresponds to a second runway and the top end to a second and third runway. Department for Transport, Local Government and Regions (2003), 'SERAS Stage Two: Appraisal Findings Report', December, Table 8.2. <sup>8</sup> Department of Transport (2007), 'UK Air Passenger Demand and CO<sub>2</sub> Forecasts', November, Table 4.2.

- 4.2 On the basis of the most recent estimates presented above, a new airport would probably cost in the range of £20 billion to £50 billion. In general the offshore proposals are expected to be more costly than onshore proposals. The wide range of cost estimates is also driven by the differing estimates of surface access costs. While the proposals put forward at the time of the 2003 Aviation White Paper suggested surface access costs in the region of £0.3 billion to £2.2 billion (in 2012 prices), more recent proposals have indicated costs of up to £30 billion. The construction cost per runway is broadly £5 billion.
- 4.3 Since many of the proposals outlined above are indicative only, it is unclear whether they account for 'optimism bias'—the systematic tendency for business planners to underestimate

the costs that will be incurred in delivering a project.<sup>19</sup> The impact of such bias on cost projections is not trivial—‘cost overruns in the order of 50 per cent in real terms are common for major infrastructure and overruns above 100 per cent are not uncommon.’<sup>20</sup> A recent example is provided by the new Berlin Brandenburg Airport, which required a capital injection of €1.2 billion from its public owners to cover construction cost overruns (on an initial budget of around €3 billion).<sup>21</sup> It may therefore be appropriate to include an optimism bias adjustment in the assessment of the plausible range of costs. Based on the Treasury’s Green Book guidance, such an adjustment could be in the range of 6–66%.<sup>22</sup>

- 4.4 Such optimism bias can also affect the timing of the opening of a new airport. Unanticipated delays relating to environmental, operational and even archaeological factors can all result in longer delivery times, which further reduce the returns on investment in today’s terms. Indeed, in addition to cost overruns, Berlin Brandenburg Airport has seen its scheduled opening date slip from 2011 to 2014 following numerous delays.<sup>23</sup> Oxera’s analysis assumes that a new UK hub airport would open and be fully functional around 2025, which, from the proposals to date, appears to be a reasonable base case, although it is likely that a staged opening would occur in practice.
- 4.5 One aspect on which many of the proposals have provided few details is compensation. If Heathrow is forced to closed, there may need to be substantial compensation to existing airport owners/users. The current value of Heathrow’s regulatory asset base (RAB) is around £13 billion, and past estimates have suggested that total compensation for the closure of Heathrow could be as high as £20 billion when accounting for compensation to airlines.<sup>24</sup> Additional compensation may be needed if a new airport adversely affects nearby residents. This is unlikely to be the case for the Thames Estuary proposal, but this location does have the potential to incur costs related to environmental issues.
- 4.6 Operating costs at the new airport are also likely to be relevant, particularly if there is scope for efficiency gains to be realised from an improved design relative to existing airports (see Appendix 6).

- Q: Offshore proposals appear to be more expensive than onshore proposals. How great are the benefits of an offshore site, and would they justify the additional cost?**
- Q: The range of cost estimates for a new airport is very wide. Can this be narrowed down at the moment, and what are the options for keeping costs down without impairing the service offered?**
- Q: What scale of compensation would be required if Heathrow were: a) restricted to certain traffic levels; b) allowed to continue operating; or c) closed down? How much would the availability of alternative uses for the site reduce this compensation?**
- Q: What would be the scope for greater efficiency at a new airport, and how far would this depend on its scale and design?**

<sup>19</sup> For example, Flyvbjerg (2009) found that, of a sample of 258 transport infrastructure projects, nine out of ten had cost overruns. Flyvbjerg, B. (2009), ‘Survival of the unfittest: why the worst infrastructure gets built—and what we can do about it’, *Oxford Review of Economic Policy*, 25:3, pp. 344–67.

<sup>20</sup> *Ibid.*, p. 346.

<sup>21</sup> European Commission (2012), ‘State aid: Commission approves capital injection to finalise construction of Berlin Brandenburg airport’, press release, December 19th.

<sup>22</sup> Based on the range for Non-standard Civil Engineering projects recommended in HM Treasury (2003), ‘Supplementary Green Book Guidance’, Table 1.

<sup>23</sup> Berlin Brandenburg Airport (2013), ‘Re Berlin Brandenburg Airport’, press release, January 7th.

<sup>24</sup> See Appendix 5.

## 4.7 Summary

This section has considered the likely costs of construction and operation for a new hub airport. These indicate a wide range of potential costs for both airport construction and surface access. Oxera has used the following assumptions, based on recent proposals, although Oxera has not tested the validity of these estimates:

	Base case	Low-cost case	High-cost case
<b>Airport construction costs</b>	(four runway hub)		(including 32% optimism bias)
New hub construction	30	10	40
Surface access	20	10	26
<b>Total construction costs</b>	50	20	66
Compensation (only if Heathrow closed)	20	20	20
<b>Total actual cost</b>	<b>70</b>	<b>40</b>	<b>86</b>

Source: Oxera analysis of cost forecasts.

In Oxera's scenario analysis, these cost estimates are used as follows.

- **The base-case cost scenario** is based on the range of costs above and assumed to be £30 billion for a new two-runway hub, £40 billion for a new three-runway hub, or £50 billion for a new four-runway hub (inclusive of surface access costs, which are £20 billion). In addition, in scenarios where Heathrow is closed, it is assumed that compensation of £20 billion is required.
- **Low- and high-cost scenarios** are tested covering, in the low-cost scenario, total construction costs of £20 billion,<sup>25</sup> and, in the high-cost scenario, a 32% optimism bias mark-up on the base-case costs.

<sup>25</sup> In practice, based on the cost forecasts provided, this scenario is likely to be consistent only with the smaller construction options, and therefore is likely to mean that both demand and airport value are also constrained.



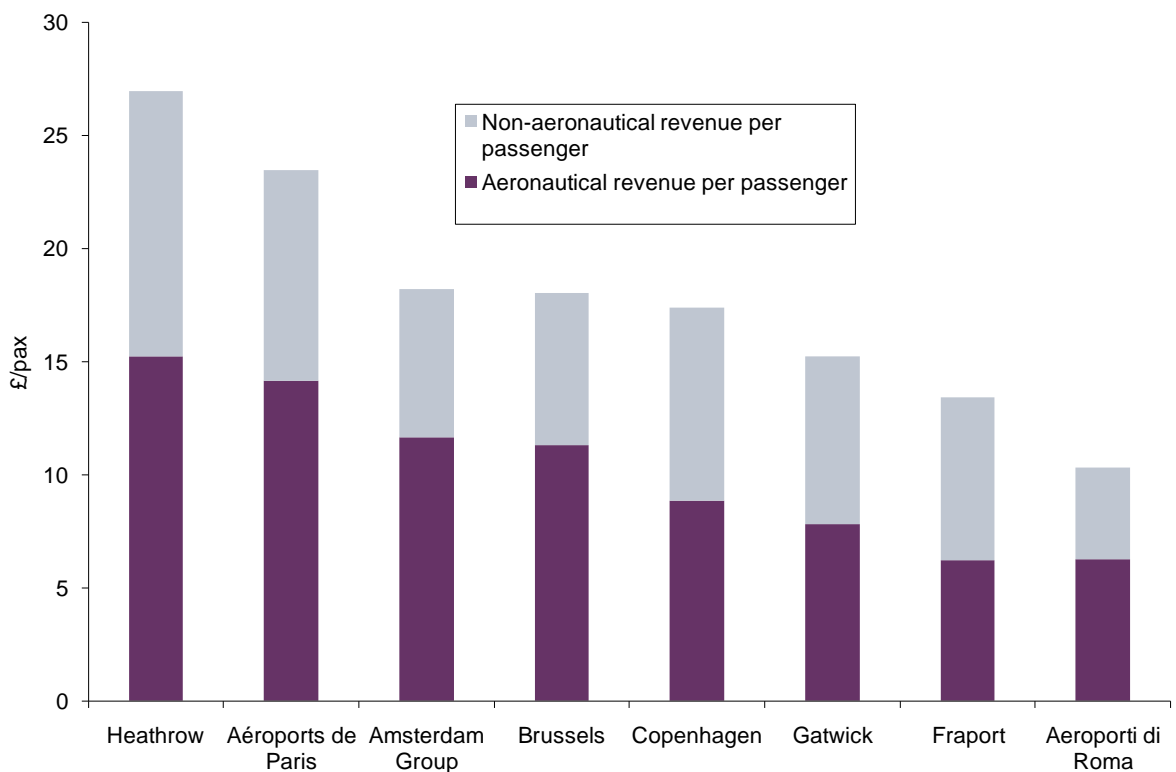
## 5 Implications for charges

5.1 Having assessed expected revenues and costs, the next step is to estimate the likely level of charges at the new airport. This is a complex process, since it interacts with the expected level of demand and will in turn determine the likely revenues that an investor may be able to recover.

### Current level of charges

5.2 A reasonable base-case scenario may be to assume that the prevailing level of charges levied at other UK or European airports could be charged at the new airport (see Figure 5.1). These charges appear to be sustainable in the aviation market since they are currently levied and the airports in question are utilised.

**Figure 5.1 Implied levels of current charges**



Note: Aéroports de Paris operates Charles de Gaulle, Orly, Le Bourget and ten general aviation airfields. Amsterdam Group owns and operates Schiphol, Rotterdam and Eindhoven (small regional airports) and Lelystad (a general aviation field). Fraport is the owner and operator of Frankfurt Airport. Aeroporti di Roma manages and operates Fiumicino and Ciampino.

Source: Leigh Fisher (2012), 'Airport Performance Indicators', October.

5.3 However, as Heathrow is a regulated entity, it is not appropriate to interpret its charges as the maximum level that the market could bear (if they were, there would be no need for regulation). Indeed, it might be that the market could bear higher charges, but that the current levels are deemed to be sufficient to provide investors with an adequate return as determined by the CAA's regulatory reviews.

5.4 Charges at a new airport could therefore potentially be higher than the existing level at Heathrow, subject to constraints from other UK airports and European hubs, and a policy desire to limit the market power of the new hub and existing UK airports.

5.5 In addition, as is the case at many other airports, Heathrow's charges are differentiated according to the type of traffic, and therefore the charges in Figure 5.1 should be interpreted as average charges. For example, Heathrow sets different charges for departing passengers depending on whether the flight is to a European (short-haul) or non-European (long-haul) destination. Similarly, like other hub airports, it charges less for transfer/transit passengers than for originating/ terminal passengers.<sup>26</sup>

### Interaction with demand

5.6 There is an interaction between the level of charges and the level of demand. If higher charges are required in order for a new airport to recover its investment, it is not sufficient simply to say that charges must rise to a particular level, since such an increase may lead to a decline in demand and hence have an offsetting effect on revenue.

5.7 Additionally, as noted above, proposals to increase charges will be constrained by what other airports charge. As an overall guide, should the charges be significantly different between UK and European hub airports, it is unlikely that the UK hub airport will be able to obtain the higher demand forecasts associated with significant hub expansion.

### Timing of changes to charges

5.8 The likely timing of changes to charges would also need to be considered. Increases to charges would not need to be implemented immediately, but could be phased in over time. Furthermore, if one of the existing airports takes an ownership stake or operates the new hub, it may be possible that charges could be levied on its existing passengers ahead of completion of the new airport (see Appendix A10). Even if not under common ownership, there might be an option where the government could allow higher charges for other airports and require some of this to be paid to a new airport. It should be noted, however, that this would represent a return to the cross-subsidy principle under which Stansted was built, and which was opposed at the time by airlines and subsequently rejected by the CAA in both the Q4 and Q5 regulatory reviews.<sup>27</sup>

**Q: Do you accept the principle that the development of a new airport to replace Heathrow could, or should, be funded in part by higher charges now for users of Heathrow and other airports? Which categories of cost should they be required to cover?**

### Non-aeronautical revenues

5.9 It is also important to consider commercial (non-aeronautical) revenues, which could be substantial and would reduce the level of aeronautical charges necessary to make the airport profitable. For example, in 2010, non-aeronautical revenues at Heathrow were £11.56 per passenger.<sup>28</sup> Heathrow has a 'single-till' arrangement, under which non-aeronautical activities can effectively cross-subsidise aeronautical activities.<sup>29</sup>

### Regulatory regime

5.10 As noted above, the main London airports are currently subject to economic regulation by the CAA. Under the terms set out in the Civil Aviation Act 2012, a new hub airport would be 'designated', and required to hold a regulatory licence, if it were determined that regulation was both necessary and beneficial. To ascertain whether this were the case, the CAA would be required to assess market power using three criteria, with regulation being introduced only if:

<sup>26</sup> Civil Aviation Authority (2012), 'Heathrow: Market Power Assessment', The CAA's Initial Views, February.

<sup>27</sup> Civil Aviation Authority (2003), 'Economic regulation of BAA London Airports (Heathrow, Gatwick, Stansted), 2003-2008', February; Civil Aviation Authority (2006), 'Airports price control review – Initial proposals for Heathrow, Gatwick and Stansted', December.

<sup>28</sup> Leigh Fisher (2012), 'Airport Performance Indicators', October.

<sup>29</sup> Some airports operate under dual- or hybrid-till arrangements, whereby the non-aeronautical revenue does not subsidise, or partially subsidises, the aeronautical activities.

- the airport has, or is likely to acquire, significant market power (SMP) in a market ('test A');
- competition law does not provide sufficient protection against abuse of that SMP ('test B');
- regulation by means of a licence will provide benefits that outweigh any adverse effects ('test C').<sup>30</sup>

5.11 There is, however, some scope for changes to the current regulatory regime at existing airports to help improve the viability of a new airport. This is so in the case of pre-funding (see Appendix A10). Also, if the existing airports remain open, the addition of a hub airport could increase the degree of competition between the UK airports and could therefore indicate that no regulation, or a change of regulation, would be appropriate (at least for some of the airports).<sup>31</sup>

5.12 If the new hub airport were regulated, it would be appropriate to consider how the regulatory regime would need to evolve to reflect the following:

- the greater risk from a new investment and the need to ensure that investors have the incentive to invest. A new airport would inherently carry greater risk than other airports until the demand emerged to cover the costs, and this would need to be reflected in the allowed return for investors, and might require some pre-commitment from the regulator;
- how commercial revenues (eg, retail) can be used to support the economic viability of the new airport;
- how the new airport would affect the regulation of existing airports;
- the potential for charges to rise above the levels currently observed at Heathrow and other airports in the South East, potentially to cover the costs of rising demand rather than to reflect an improvement in service.

**Q: Heathrow levies higher charges than competitor airports, while still attracting high levels of demand. What factors lie behind this, and could these be replicated at a new airport, permitting charges as high, or even higher, than at Heathrow?**

### Summary

5.13 This section has considered the likely charges that would be levied at a new hub airport. The estimates used by Oxera are based on the prevailing level of charges at existing London airports.

- **The base-case cost scenario** is based on the current level of aeronautical and non-aeronautical charges at Heathrow.
- **The low-charges scenario** is based on the current level of charges at Gatwick and the **high-charges scenario** on the charges at Heathrow plus a 50% mark-up.

<sup>30</sup> HM Government (2012), 'Civil Aviation Act: Part 1—Airports'.

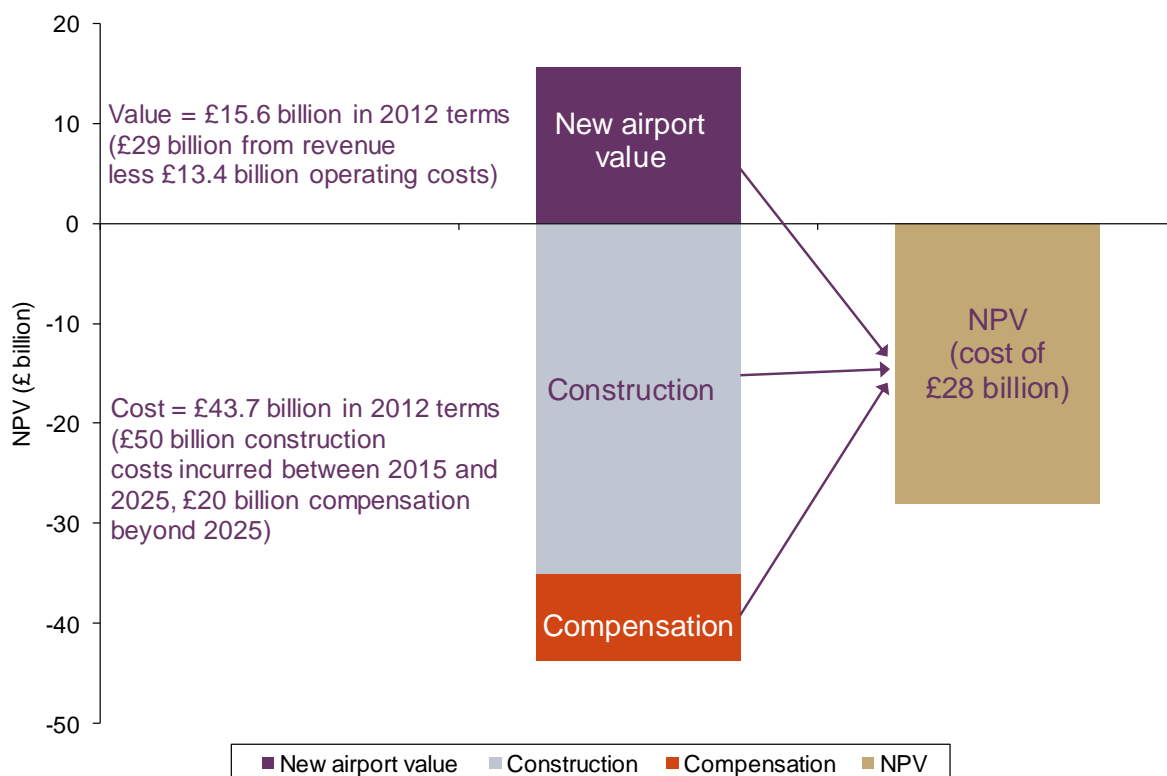
<sup>31</sup> Oxera notes that the CAA is currently reviewing the appropriate form of regulation at Stansted, Gatwick and Heathrow for the next control period, known as Q6, which starts in 2014. The CAA has indicated that it is 'minded to find...that the market power test as set out in the CA Act is met in relation to Stansted airport'. CAA (2012), 'Consultation on Stansted market power assessment', December, p. 2.

## 6 Is public funding likely to be required?

- 6.1 The above assessment of revenues, costs and charges (in sections 4 and 5) is sufficient to give an indication of the commercial returns that may be available from the project.
- 6.2 The assessment of costs and returns that follows takes account of both their magnitude and their time profile. The analysis below considers the net present value (NPV) of the projected revenues and costs of the airport. The NPV represents the amount at which a commercial investor would value the potential investment in the airport today.
- 6.3 This calculation would be based on the assumptions in the previous sections and is calculated as follows for an indicative scenario of a four-runway hub costing £50 billion, with Heathrow closed, assuming that 30% of Gatwick and 3% of Stansted traffic transfer to the new hub, and assuming charges and operating costs equivalent to Heathrow's current level.
- The **value of the new airport** is calculated by estimating the revenues from forecast passengers (as outlined in section 3 above), assuming that each pays the forecast charges (consistent with section 5) net of operating costs (consistent with section 4). These are then calculated in today's money using a 'discount factor' that reflects the time value of money between now and the period over which the airport is operating (ie, between now and the assumed opening date of 2025).<sup>32</sup> This results in a **value of £15.6m**.
  - The **cost of the new airport** is then calculated on a comparable basis by taking the cost estimates for a four-runway hub from section 4 above of £70 billion (including compensation). This is then calculated in today's money using a discount factor, assuming an investment programme over ten years to 2025 and compensation after the new airport becomes operational. This results in a **cost of £43.7 billion**.
  - The **value of the investment** or NPV is then calculated by subtracting the costs from the airport value. Given that the costs are significantly higher than the value, the net value of the investment is significantly negative, implying that a commercial investor would not undertake the investment.
- 6.4 Table A2.1 in Appendix 2 shows the expected NPV of a new hub airport under various scenarios. It can be seen that in the majority of cases a substantial degree of public subsidy would be required. The NPV of the indicative scenario is disaggregated in Figure 6.1.

<sup>32</sup> This is a commercial assessment based on an assumed discount rate of 9% applied to pre-tax cash flows. It is assumed that tax can be ignored, as the very significant investment costs mean that no tax is likely to be paid until late in the project's life, if at all. If HM Treasury's recommended social discount rate of 3.5% is used then many of the scenarios are found to have positive NPV. Furthermore, if a full social assessment is conducted, the addition of wider economic benefits and other factors will also affect the calculated NPV.

**Figure 6.1 Investment valuation within the illustrative scenario**



Note: This assumes a four-runway hub, with Heathrow closed, corresponding to Scenario 6 detailed in Table A7.1, also assuming that 30% of Gatwick and 3% of Stansted traffic transfer to the new hub. Airport value includes the 'terminal value', the value in today's money of the assumed value of the airport at the end of the modelling period (2060). Due to the time value of money, the current value of this is low (£2.2 billion). Source: Oxera.

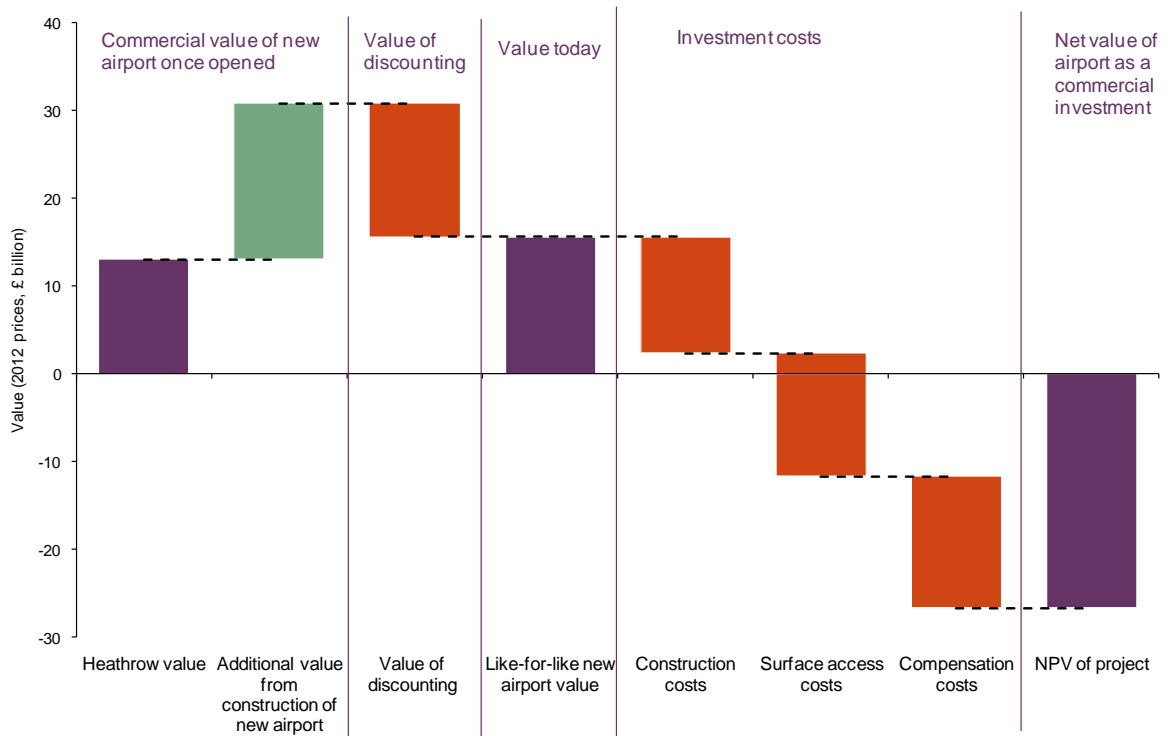
**Q: Do policy-makers accept that some public subsidy is likely to be required for this project? If so, how much subsidy would be justified given the wider economic and social benefits involved?**

### Understanding the likely need for public support

- 6.5 The intuition behind the likely need for subsidy can be explained in a number of ways.
- 6.6 First, consider the current value of airport assets. Heathrow is today worth about £13 billion.<sup>33</sup> The proposal is to create a new airport which can, in 20–30 years' time, expect to carry more passengers than Heathrow. The new airport would potentially be able to serve at least double the traffic that Heathrow can carry. If demand were to reach the upside estimate, this could grow three to four times in 40–50 years, and a new airport could therefore be worth significantly more than Heathrow.
- 6.7 Figure 6.2 below illustrates this effect for Oxera's indicative scenario. The new airport would have higher value, once opened, than the value that Heathrow would be likely to have in 2025, largely due to higher capacity, although Oxera's model also assumes that a new airport would require no further investment beyond the £70 billion construction cost, whereas Heathrow's current value will reflect the need for further future investment. However, this benefit is broadly offset by the fact that the new airport will not generate any revenues until it opens in 13 years' time.

<sup>33</sup> Based on enterprise value (debt + equity), using the RAB value as the basis for the value.

**Figure 6.2 Potential value of new hub relative to Heathrow**



Note: The value of discounting represents the economic approach of placing less weight on future costs and benefits than current costs and benefits. It is unrelated to discounting in the context of offering lower prices. Source: Oxera.

- 6.8 In summary, the value (on a valuation basis comparable to Heathrow today) of a new airport when it is launched would be around £20 billion–£30 billion in the base case. If demand turns out on the upside, it may be worth more, at around £30 billion–£40 billion. All of these estimates are higher than the current value of Heathrow (approximately £13 billion), due largely to the effect of greater passenger numbers.<sup>34</sup>
- 6.9 However, to put this valuation into context, it should be compared with the estimates of investment costs. Section 4 indicated that total costs (including surface access and compensation) for a four-runway hub could be around £70 billion, of which the construction cost of £50 billion has to be invested before the opening of the airport. Therefore, the costs are much higher than the value of the airport once built. The scenario analysis in Appendix 2 shows that even in Oxera’s upside scenarios, the value of the airport is always less than the cost, and it is clear from Figure 6.1 above that it would take a very significant deviation from the assumptions in the indicative scenario for the value to exceed the cost.
- 6.10 From a financial market investor’s perspective, in order to be commercially viable, the new airport would need to have a commercial value today equal to the investment cost at around £50 billion in 2012 prices (even excluding compensation). If this is compared with BAA’s London airport revenue (Heathrow and Stansted) in 2011 of £1.7 billion, or total revenue of £2.2 billion (including other revenue, such as Heathrow Express revenue), it is equivalent to a revenue multiple of around 23–30x. This would significantly exceed any comparable airport multiples for existing operators.
- 6.11 It therefore appears that:

<sup>34</sup> However, all valuations also include a premium which will take account of the impact of lower investment costs over time.

- the combined investment in a new airport plus associated infrastructure is unlikely to be a commercial investment—ie, the total cost of building the airport will exceed the value of the airport that exists at the end of the build phase;
- it might be possible to finance the investment in the new airport infrastructure of around £20 billion alone, but only through injection of substantial levels of public subsidy and investment for the surface access and compensation, which would comprise around 60–75% of the total investment cost;
- even in this case, the airport investment would be a risky investment, which would rely on the realisation of either significant volume growth or higher charges, and would therefore be likely to require government support to encourage investor participation.

6.12 This could be justified if the government concludes that the wider social and economic benefits of the airport outweigh the public investment costs. As discussed above, the government will generally give more weight to longer-term benefits when evaluating the public policy benefits of an investment. This is done within a cost–benefit analysis (CBA) by using a lower discount rate of 3.5%,<sup>35</sup> rather than a commercial rate of return as would be required by a commercial investor. It would also permit the inclusion of wider social and economic benefits created by the infrastructure investment, net of the associated social and environmental costs. If such benefits in net terms could be equal to around £8 billion per annum (using the base-case assumptions in this report), this would offset the investment cost in commercial terms. If the social discount rate of 3.5% were used, the wider benefits required would be significantly lower.

**Q: Would the new airport bring wider economic and social benefits that might justify any government subsidy required?**

**Would funding by government subsidy be compatible with EU state aid law?**

6.13 If the government did wish to subsidise the airport, it would be necessary to ensure that any subsidy granted were compatible with EU state aid law.

6.14 The EU Court of Justice has recently issued a judgment confirming that the construction of airport infrastructure can be treated as an economic activity that falls within the definition of state aid.<sup>36</sup> Central or local government funding support for the new hub airport may therefore need to be notified to the European Commission under state aid rules, and made the subject of a state aid approval process. This would involve determining whether the aid was compatible with the Treaty on the Function of the European Union, and if it was not, the aid could be blocked.

**Q: Has the compatibility of any government support with EU state aid law been considered?**

**Types of subsidy**

6.15 While direct subsidy is the most obvious form of public support that could be provided to the new airport, a number of other options could enhance viability. For example, explicit government guarantees might enhance the viability of a project by reducing the commercial risk of the project, and hence financing costs.

6.16 An alternative form of subsidy without direct reliance on public funds would be to impose some form of levy on interested parties (see the Crossrail example given in Appendix 9).

<sup>35</sup> HM Treasury (2011), 'The Green Book, Appraisal and Evaluation in Central Government', July, Annex 6.

<sup>36</sup> European Court of Justice (2012), 'Judgment of the Court (Eighth Chamber), Flughafen Leipzig-Halle GmbH vs European Commission', Case C288/11P, December.

## Summary

6.17

This section has considered the commercial position of the proposals for a new hub airport, and therefore whether public subsidy is likely to be needed. Based on Oxera's modelling, the conclusion is as follows:

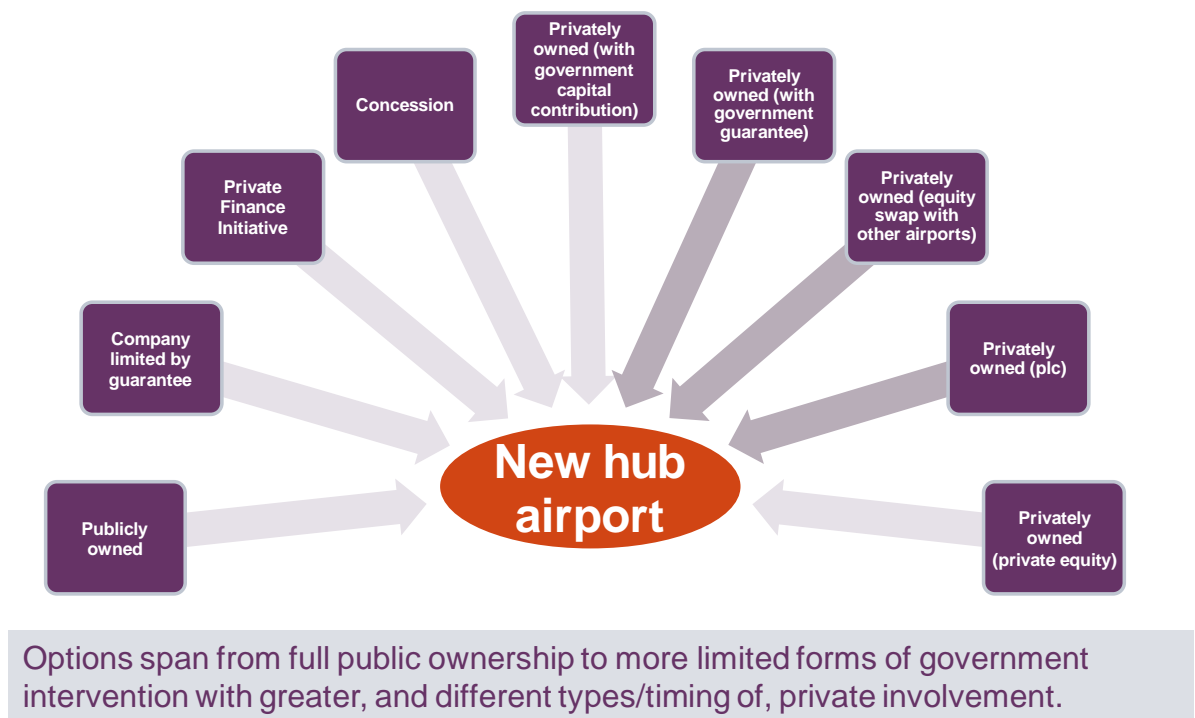
- **the new airport would potentially be valued at around £20–£30 billion at current prices**, depending on the ability to benefit from higher passenger numbers from Heathrow, or higher, if either demand is higher than the DfT's base case and/or charges can be increased without losing customers to other airports (albeit this latter effect could also be achieved at Heathrow);
- **public subsidy will be required** at a minimum for the surface access and any compensation costs, given that this value is significantly below the £50–£70 billion estimated for the combined costs of a new airport;
- **the airport as a stand-alone project could repay the investment**, but given the risks around demand forecasts and in respect of cost and time to complete, it would still represent a risky investment project.



## 7 Is it financeable?

- 7.1 Based on the above assessment of the funds likely to be required from the private and public sectors, the next question is whether, and how, adequate financing can be provided for the new airport in line with required timescales and risks.
- 7.2 In the context of the conclusions in section 6 above, Oxera has considered a range of funding sources used in comparable infrastructure projects, as shown in the figure below.

**Figure 7.1 Options for investment and ownership of a new hub airport**



Source: Oxera.

- 7.3 The analysis indicates that the most likely outcomes are as follows.
- **Public ownership.** Many European airports are publicly owned, and this is a legitimate option for the government, at least during the early stages of the project. The government could then seek to dispose of some or all of its investment as the project proceeds, or once the new airport is open.
  - **Private Finance Initiative (PFI) (or private–public partnership, PPP)**—this is the most common source within the UK for significant infrastructure projects that are not commercially viable on a stand-alone basis. PFI is generally used for projects where there is less of a natural commercial incentive and/or equity upside, and is focused on efficient management of costs, such as in the construction of public service infrastructure. It would therefore be potentially more compatible with the funding of surface access than of the airport itself. Appendix 9 gives some relevant examples.
  - **Privately owned (with government support).** There are a number of potential structures where the government could jointly invest in the airport project with a private investor. This could be done through the government either taking an equity stake, to

reduce the risk and provide a source of additional finance for a new investor, or providing a guarantee and/or direct debt investment.

- **Privately owned (including equity swaps with other airports).** Given the potential for very significant compensation to other airports, including Heathrow, an option for the government would be to seek to obtain equity investment in the new airport from existing airports, subject to wider considerations around competition and the timing and nature of compensation against investment costs.

**Q: Which parts of the investment cost would be potentially more suitable for public (or PFI-type) funding?**

## A1 Remit

A1.1 Following a competitive tender process, Oxera was commissioned to brief the Committee through this report. The scope of the analysis presented here focuses on one specific aspect of aviation policy. It is important that this analysis of a new hub is not considered on a stand-alone basis, but rather in the context of wider UK aviation policy, in line with the Committee's inquiry.

### **Wider policy context**

A1.2 The possibility of building a new hub airport is just one option in the context of wider UK aviation policy. Most forecasts suggest that airports in the South East of England will be at full capacity within the foreseeable future, if not already. Hence, from an economic perspective, there appears to be a case to expand capacity to alleviate capacity constraints. However, using a new hub airport to expand capacity is just one option. There has also been a long history of proposals for expansion at existing airports, covering ideas such as a third runway at Heathrow, a second runway at Gatwick or Stansted, or greater integration between airports (the 'Heathwick' proposal).

### **Commercial assessment versus economic assessment**

A1.3 Oxera has been asked specifically to assess the commercial viability rather than provide a full social CBA. This means that the review has considered purely whether commercial owners of a new airport would be able to make adequate returns to obtain finance.

A1.4 A full social CBA would also assess the wider economic impacts and environmental effects. Potentially, such an assessment could provide very different results to the commercial case due to the scope for substantial impacts generated by aviation on third parties. There are a number of well-established mechanisms through which aviation contributes to the wider economy.<sup>37</sup>

### **Concept versus specific proposals**

A1.5 Although this report makes reference to a number of specific proposals, it has focused on the overall rationale for the concept of a new hub. While this helps to abstract from proposal-specific issues, it has meant that estimates of revenues and costs have had to be calibrated using broad conceptual numbers, rather than proposal-specific estimates.

<sup>37</sup> See Oxera (2009), 'What is the contribution of aviation to the UK economy?', November, prepared for Airport Operators Association.

## A2 Assessment of scenarios

A2.1 The assessment of the viability of the hub airport is subject to a number of uncertainties. Oxera has sought to address these through a non-exhaustive set of scenarios, presented in Table A2.1 below, all of which assume that there is no public funding. Given the outcomes of these scenarios Tables A2.2–A2.5 assess an alternative set of scenarios that assume a degree of public funding. There are myriad different scenarios that could be tested, many of which will depend on the specifics of any individual scheme. It is therefore relevant to highlight the key assumptions that should be considered as influencing the outcome of the assessment, as follows.

### **Demand**

- long-term economic growth prospects (which are likely to differ from those underpinning DfT 2011 projections);
- churn from competing airports and previously unsatisfied demand, and the relationship with the destinations/connections offered;
- charges;
- the response of passenger demand to different charging levels, including churn;
- oil prices; and
- aviation taxes.

### **Supply**

- the number of runways/terminals at the new airport; and new runways/terminals at competing airports in UK and EU;
- whether Heathrow will close;
- whether Heathrow (or other UK airports) will form part of a consortium investing in new airport;
- the response of airlines to differential charge rates between airports, including migration to new airport, fare-setting, and the destinations/connections offered.

### **Charges**

- whether and how far Heathrow (or other UK airports) will raise charges during the construction period in order to fund the new airport;
- till arrangements;<sup>38</sup>
- the level and nature of public funding, if any;
- regulatory restrictions—judgement on the extent of competition, and possible fare caps;
- implications for required private returns of different risk levels associated with different supply and funding scenarios.

A2.2 A selection of these key assumptions have been modelled; the results are presented in Tables A2.1–A2.5 below.

<sup>38</sup> This refers to the treatment of non-aeronautical revenues in the setting of charges. Under a single-till regime, non-aeronautical revenues are used to offset aeronautical charges; whereas, under a dual-till regime, aeronautical charges are set solely with reference to the costs of providing aeronautical services and take no account of non-aeronautical costs and revenues.

**Table A2.1 How much subsidy is required?**

	Design	Impact on Heathrow	Base case <sup>1</sup>	Demand different from DfT forecasts <sup>2</sup>		Different transfer from other London airports <sup>3</sup>		Difference in charges <sup>4</sup>		Differences in construction costs <sup>5</sup>	
				Low	High	Low	High	Low	High	Low	High
Policy scenarios	Two-runway new hub <sup>6</sup>	Heathrow open	-18.1	-19.6	-11.4	—	-16.4	-19.7	-16.4	-11.1	-24.8
	Three-runway new hub <sup>7</sup>	Pre-financing from Heathrow	-14.1	-15.6	-7.4	-25.1	-12.4	-21.9	-6.1	-0.1	-32.3
	Three-runway new hub <sup>8</sup>	Heathrow closed	-22.7	-24.2	-16.0	-33.7	-21.0	-30.5	-14.7	-8.6	-40.9
	Three-runway new hub <sup>9</sup>	Heathrow closed Surface access publicly funded	-8.6	-10.2	-2.0	-19.6	-7.0	-16.5	-0.7	-8.6	-13.1
	Four-runway new hub <sup>10</sup>	Heathrow open	-32.1	-33.7	-25.4	—	-30.4	-33.8	-30.4	-11.1	-43.3
	Four-runway new hub <sup>10</sup>	Heathrow closed	-29.7	-31.2	-23.0	-40.7	-28.0	-37.5	-21.7	-8.6	-40.9
	Four-runway new hub <sup>10</sup>	Heathrow closed Surface access publicly funded	-15.6	-17.2	-9.0	-26.7	-14.0	-23.5	-7.7	-8.6	-22.4
	Phased-in two-runway new hub <sup>11</sup>	Heathrow closed	-14.0	-15.5	-7.8	—	-13.0	-15.4	-12.6	-8.5	-19.3

Note: For full details of assumptions, see Appendix 8. <sup>1</sup> Based on the DfT's 2011 aviation forecasts, assuming transfer of all traffic from Heathrow and full-service traffic from other non-London airports. <sup>2</sup> Oxera has adjusted the DfT's forecasts to account for possible lower long-term economic growth. <sup>3</sup> Unlimited transfer from London airports to the new hub up to the capacity constraint of the hub. <sup>4</sup> Passenger demand is less sensitive to changes in price. <sup>5</sup> Higher cost of construction. <sup>6</sup> New hub opens in competition with Heathrow. Surface access costs are paid for by the airport. Single-till regime. <sup>7</sup> New hub opens, having been pre-financed by charges at Heathrow. <sup>8</sup> Three-runway hub opens and Heathrow is shut in a single step. <sup>9</sup> Surface access costs are covered by public funding. <sup>10</sup> Larger new hub. <sup>11</sup> Slower phasing in of the new hub, one runway at a time. Short-term capacity constraints are alleviated by temporary mixed-mode flying.

Source: Oxera.

**Table A2.2 Three-runway hub (traffic light system)**

		Base case <sup>1</sup>	Demand forecast variations <sup>2</sup>		Construction cost variations <sup>3</sup>	
			Low	High	Low	High
Three runway hub Heathrow closed	No public funding	●	●	●	●	●
	Surface access publicly funded	●	●	●	●	●
	Compensation publicly funded	●	●	●	●	●
	Surface access and compensation publicly funded	●	●	●	●	●

Key: Viability is defined on a commercial basis—ie, incorporating only the expected cash flows of a private airport.

● Likely to be viable (positive NPV at a commercial discount rate of 9%)

● Marginal viability (NPV above -£5 billion)

● Unlikely to be viable (NPV less than -£5 billion)

Note: For a full table with quantified estimates, see Table A2.3. <sup>1</sup> The base case incorporates the following assumptions. Demand will be in line with the central case from the DfT's 2011 aviation forecasts. Demand at the new hub will be equivalent to the transfer of all traffic from Heathrow and all additional traffic that is currently unmet. Construction costs will be £40 billion, inclusive of £20 billion of surface access costs. The new owner will be liable for £20 billion of compensation to Heathrow and all entities disrupted by the construction of the new hub <sup>2</sup> These scenarios use the low and high versions of the DfT's aviation traffic forecasts respectively. <sup>3</sup> These scenarios vary in their construction costs. The low scenario assumes a construction cost of £20 billion for the new airport inclusive of £10 billion of surface transport costs. The high case adds a 32% optimism bias to a construction cost of £40 billion.

Source: Oxera.

**Table A2.3 Three-runway hub (base table)**

		Base case	Demand different from DfT forecasts		Differences in construction costs	
			Low	High	Low	High
Three-runway hub	No public funding	-22.7	-24.2	-16.0	-8.6	-31.6
Heathrow closed	Surface access publicly funded	-8.6	-10.2	-2.0	-1.6	-13.1
	Compensation publicly funded	-15.6	-7.4	-14.1	-0.1	-23.1
	Surface access and compensation publicly funded	-0.1	-1.6	6.6	7.0	-4.5

Note: See Table A2.2.

Source: Oxera.

**Table A2.4 Four-runway hub (traffic light system)**

		Base case <sup>1</sup>	Demand forecast variations <sup>2</sup>		Construction cost variations <sup>3</sup>	
			Low	High	Low	High
Four-runway hub Heathrow closed	No public funding	●	●	●	●	●
	Surface access publicly funded	●	●	●	●	●
	Compensation publicly funded	●	●	●	●	●
	Surface access and compensation publicly funded	●	●	●	●	●

Key: Viability is defined on a commercial basis—ie, incorporating only the expected cash flows of a private airport.

● Likely to be viable (positive NPV at a commercial discount rate of 9%)

● Marginal viability (NPV above -£5 billion)

● Unlikely to be viable (NPV less than -£5 billion)

Note: for a full table with quantified estimates, see Table A2.5. <sup>1</sup> The base case incorporates the following assumptions. Demand will be in line with the central case from the DfT's 2011 aviation forecasts. Demand at the new hub will be equivalent to the transfer of all traffic from Heathrow and all additional traffic that is currently unmet. Construction costs will be £50 billion, inclusive of £20 billion of surface access costs. The new owner will be liable for £20 billion of compensation to Heathrow and all entities disrupted by the construction of the new hub <sup>2</sup> These scenarios use the low and high versions of the DfT's aviation traffic forecasts respectively. <sup>3</sup> These scenarios vary in their construction costs. The low scenario assumes a construction cost of £20 billion for the new airport inclusive of £10 billion of surface transport costs. The high case adds a 32% optimism bias to a construction cost of £50 billion.

Source: Oxera.

**Table A2.5 Four-runway hub (base table)**

		Base case <sup>1</sup>	Demand different from DfT forecasts <sup>2</sup>		Differences in construction costs <sup>5</sup>	
			Low	High	Low	High
Four-runway hub	No public funding	-29.7	-31.2	-23.0	-15.6	-40.9
Heathrow closed	Surface access publicly funded	-15.6	-17.2	-9.0	-8.6	-22.4
	Compensation publicly funded	-22.6	-14.4	-21.1	-7.1	-32.3
	Surface access and compensation publicly funded	-7.1	-8.6	-0.4	-0.1	-13.8

Note: See Table A2.4.

Source: Oxera.

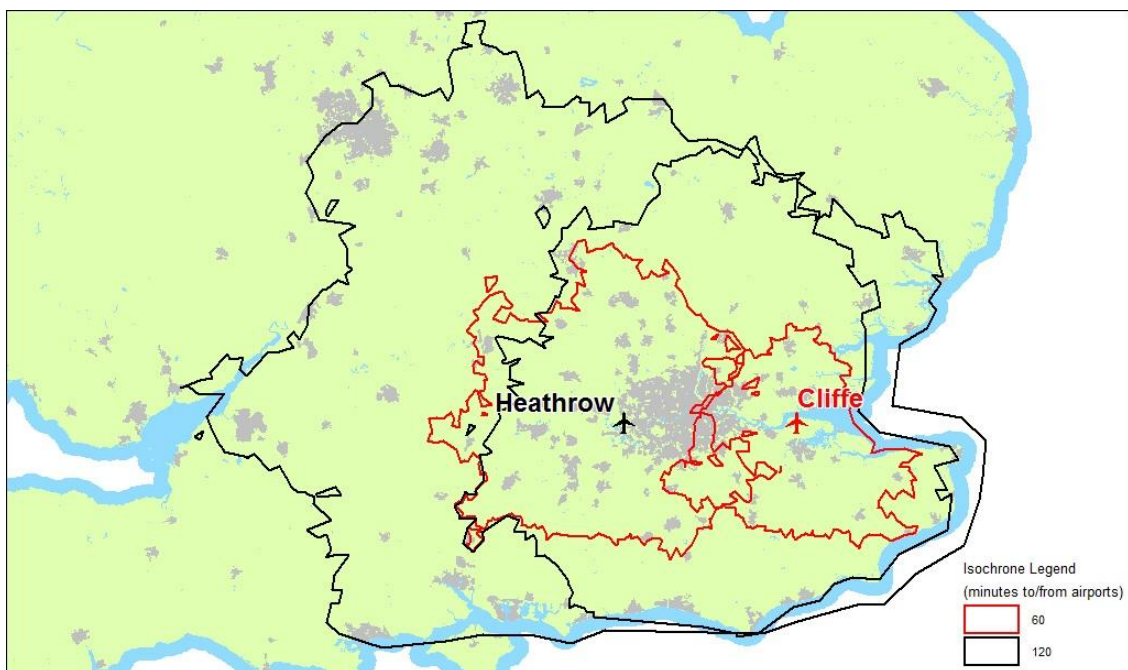
## A3 Location of existing proposals

Figure A3.1 Location of existing airports and selected proposals for a new hub



Source: Oxera.

Figure A3.2 Drive times from Heathrow and Cliffe



Source: Oxera.



- A3.1 Figure A3.1 above shows the location of the existing main South East international airports and of some of the proposals.
- A3.2 Figure A3.2 gives an illustration of the accessibility to Heathrow and one of the proposals—Cliffe—based on 60- and 120-minute drive times. This demonstrates that all of Greater London and the majority of the South East are within two hours' drive time of both Heathrow and Cliffe. In addition, the West Midlands, Bristol and Bournemouth are within two hours' drive of Heathrow.
- A3.3 Access to airports by road is only one of the surface access options. Most of the proposals for a new hub airport involve a rail link, either surface or underground, or both. The performance of such access may depend on ongoing projects, such as HS2 and Crossrail, which will also influence access to Heathrow.
- A3.4 Indeed, for a number of the proposals for sites in the Thames Estuary, the designs involve a landside terminal, in which case the access time to the terminal will be an under-representation of the full travel time, since there will be additional time between the terminal building and boarding the aircraft.

## A4 Construction of demand forecasts

A4.1 The DfT's terminal passenger demand forecasts are constructed using two models: the National Air Passenger Demand Model and the National Air Passenger Allocation Model. These models, and how they work, are summarised below.

### **The National Air Passenger Model**

A4.2 Used to forecast passenger demand assuming no future capacity constraints, the National Air Passenger Demand Model combines:

- analysis of the sensitivity of air passenger demand to changes in income and prices—how has demand for air transport changed historically in response to GDP growth and changes in air fares?
- assumptions around how the sensitivity of air passenger to changes in income and air fares will evolve as the market matures;
- projections of these demand drivers—how are GDP and air fares expected to change in the future?

A4.3 The GDP forecasts used in the DfT's modelling reflect the Office for Budget Responsibility's March 2011 projections and the International Monetary Fund (IMF) World Economic Outlook 2010. The central estimates of the Office for Budget Responsibility at that time assumed a trend growth rate of 2.35% per year to the end of 2013, and 2.10% thereafter.<sup>39</sup> Air fares are assumed to move in line with airline costs—split into fuel costs and non-fuel costs (eg, taxation, Air Passenger Duty, the EU Emissions Trading Scheme, etc).

### **The National Air Passenger Air Allocation Model**

A4.4 Used to allocate demand between airports, and thus to determine the extent of unmet demand, the National Air Passenger Allocation Model splits the UK into 455 zones and assumes that passenger demand at each of the airports depends on factors including:

- the time and expense of accessing the airport;
- passengers' value of time;
- passengers' preference for particular airports;
- flight duration and the frequency of service.

A4.5 Projections are made for unconstrained passenger demand growth in each zone, and the model calculates how much of the forecast demand to/from each zone will travel via each airport. If passenger demand exceeds a particular airport's (runway or terminal) capacity, a 'shadow cost' is calculated that estimates the extra cost of using the airport that would be needed to meet all the demand. This shadow cost is then added to the cost of using each airport where capacity constraints are expected, before the model is re-run until an equilibrium is found in which capacity is not exceeded at any airport.

A4.6 Table A4.1 below shows passenger forecasts at the South East airports, and for the UK as a whole, based on the passenger allocation model.

<sup>39</sup> Office for Budget Responsibility (2011), 'Economic and fiscal outlook', March.

**Table A4.1 UK terminal passenger forecasts (constrained maximum use<sup>1</sup>), South East airports (central forecast) (mppa)**

<b>Forecast year</b>	<b>2010</b>	<b>2020</b>	<b>2030</b>	<b>2040</b>	<b>2050</b>
Heathrow	65	80	85	85	85
Gatwick	30	35	40	40	40
Stansted	20	25	35	35	30
Luton	9	12	15	15	15
London City	3	7	7	7	7
<b>Total: London</b>	<b>125</b>	<b>155</b>	<b>180</b>	<b>185</b>	<b>185</b>
Others	80	115	150	210	285
<b>Total</b>	<b>210</b>	<b>270</b>	<b>335</b>	<b>405</b>	<b>470</b>

Note: Numbers may not sum to totals due to rounding.

Source: Department for Transport (2011), 'UK Aviation Forecasts', August, Table 2.15.

## A5 Compensation costs

### Compensation for home owners and businesses

- A5.1 Those living near to the site chosen for a new hub airport are likely to be entitled to compensation. As noted in the recent consultation on the HS2 first-phase compensation scheme, under the statutory system of compensation, homeowners would expect to be compensated for:
- the unblighted open-market value of the property (ie, the value of the property if no project were going ahead);
  - a home loss payment of 10% of the value of the property (up to a current maximum of £47,000);
  - reasonable moving expenses.<sup>40</sup>

A5.2 These compensation costs would be likely to be lower if a new airport were to be built in a relatively remote location, such as the Thames Estuary or Cliffe.

A5.3 However, if the compensation scheme went beyond the minimum statutory requirements, as that proposed for HS2 does, these costs could be even greater.

### Compensation for existing airports

A5.4 To assess the scenario in which Heathrow is forced to close (or loses substantial business), it would also be necessary to consider the additional costs that would be incurred to compensate some of Heathrow's stakeholders (and potentially Gatwick and Stansted). Furthermore, property and land prices could fall more generally in West London, although it is unclear whether there would be any accompanying compensation for this. In terms of the direct impact at Heathrow, the report would consider the effect on the following categories of stakeholders.

- **Equity investors.** Investors with an equity stake in Heathrow Airport Holdings (formerly BAA), including Ferrovial, would look to recover their investment in the company, which would likely be approximated by the equity value of the RAB. The total RAB value, including both debt and equity, was £12.7 billion at March 31st 2012.<sup>41</sup>
- **Bondholders.** A proportion of the RAB reflects debt financed through the issuing of bonds. Should the bonds default as a result of closure then bondholders would need to be compensated for the closure in line with this value.
- **Airlines.** Airlines that have made sunk investments at Heathrow, such as British Airways, would need to be compensated for these investments.
- **Air traffic control.** If a new hub were built in a different location to existing airports, flights using the airport would be likely to pass through different air space sectors and, hence, require air traffic control to cater for this.

A5.5 Estimates of the cost of compensation for the closure of Heathrow have suggested that it could be in the region of £20 billion.<sup>42</sup> This would need to be offset to the extent that the value of Heathrow is sustained under an alternative use, since it is likely that the government could redevelop the Heathrow site for other purposes if it were to purchase the site from

<sup>40</sup> Department for Transport (2012), 'High Speed Two: Property and Compensation for London–West Midlands', October.

<sup>41</sup> BAA (2012), 'Heathrow Airport Limited Regulatory Accounts–Year ended 31 March 2012', April.

<sup>42</sup> Helsey, M. and Codd, F. (2012), 'Aviation: proposals for an airport in the Thames Estuary, 1945-2012', House of Commons library, July 20th.

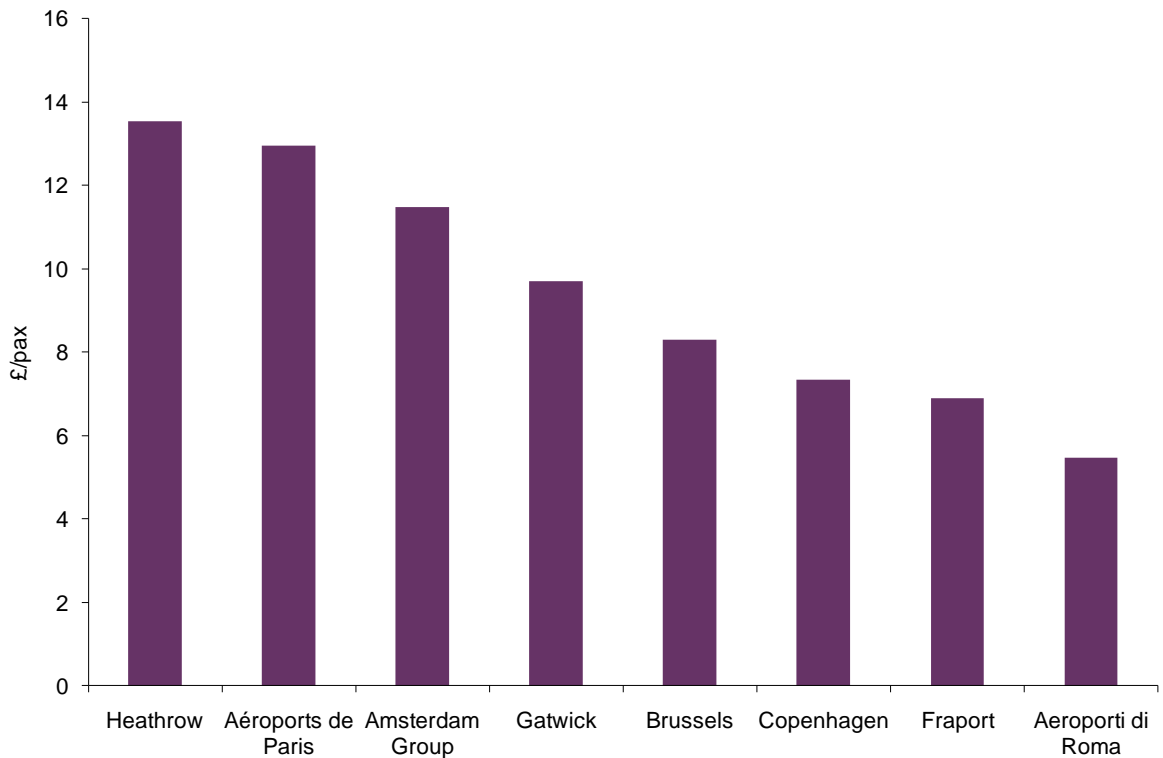
equity investors.<sup>43</sup> In practice, a key requirement in West London would be to create sufficient jobs to mitigate the loss of employment at airport and the resulting reduction in demand for the existing housing stock.

<sup>43</sup> This argument has been used previously by Foster + Partners when considering how the Thames Hub Airport could be funded.

## A6 Operating costs

A6.1 Following the construction of the airport there will be ongoing operating costs associated with its functioning. Figure A6.1 shows the current level of operating costs at some European airports.

**Figure A6.1 Operating costs (£/pax)**



Note: Operating costs include all non-staff cash costs, such as utilities, cleaning and maintenance, and excludes staff costs and depreciation. The exclusion of staff costs negates the issue that some airports have different approaches to resourcing security—ie, some have in-house security, while at others it is contracted out and/or not funded by the airport.

Source: Leigh Fisher (2012), 'Airport Performance Indicators', October.

A6.2 Figure A6.1 shows that operating costs per passenger vary across the European airports used in this sample. Initially, Heathrow may seem the closest comparator for the costs of a new hub airport—both are hub airports and will face similar input costs from being located in the South East.

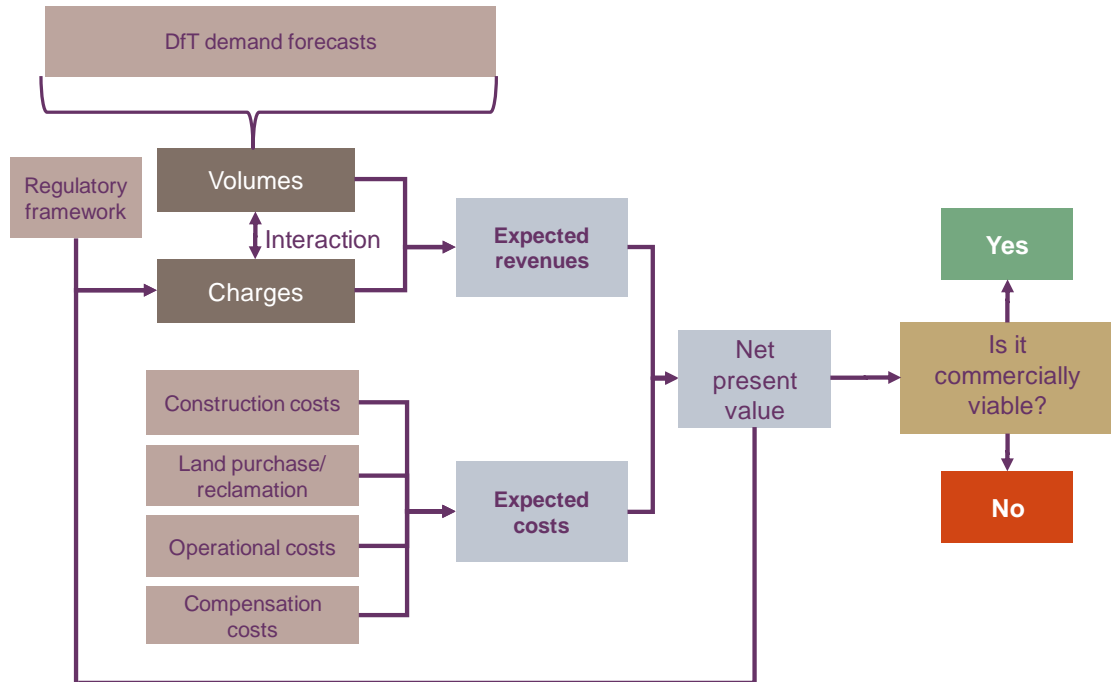
A6.3 However, a new hub airport would most likely be designed and constructed in a way that allows it to optimise its functioning (for example, baggage-handling systems, passenger connections between terminals) and potentially realise efficiency gains. A caveat to this is that proposals with split landside and airside passenger terminals are likely to incur increased operating costs due to the need to duplicate some staff and facilities.

A6.4 As OPEX costs may not be comparable across airports due to differences in the services provided (eg, policing at Fraport is state-funded), Oxera has assumed the operating cost value of Heathrow in its base-case assumptions.

## A7 Oxera's cash-flow modelling

A7.1 Oxera has constructed a simple cash-flow model in order to produce stylised calculations that underpin its assessment of the viability of a new hub airport. This model was used for the calculations in Appendix 2.

**Figure A7.1 Stylised representation of Oxera's cash-flow model**



Source: Oxera.

### Demand assumptions

- A7.2 The base-case demand assumptions are based on the DfT's 2011 aviation forecasts.<sup>44</sup> As noted in section 3, developments in the macroeconomy since 2011 may merit revisions to these forecasts. However, for the purposes of this study, the official forecasts have been retained, with an acknowledgement that there may be some downside to these values.
- A7.3 Oxera has created a number of scenarios for analysing demand at a new hub airport. All of these are purely indicative and intended to illustrate volume effects rather than representing specific demand scenarios. Oxera's base-case assumption has been that if Heathrow is closed, all Heathrow traffic moves to the new hub airport. If Heathrow remains open, the new hub soaks up all unmet traffic and attracts some of Heathrow's existing demand.<sup>45</sup>
- A7.4 The DfT's forecasts incorporate a degree of diversion from London airports to the rest of the UK as a result of capacity constraints at the London airports. Oxera has also tested a scenario whereby the London airports maintain their current market share relative to the rest of the UK. The results of this scenario are similar to those arising from using the DfT's high case demand forecasts, and are not shown separately in Table A2.1.

<sup>44</sup> Department of Transport (2011), 'UK Aviation Forecasts', August.

<sup>45</sup> The DfT's constrained forecasts used here are on a national basis; hence, this assumption is likely to have a favourable impact on commercial viability since not all of the constrained traffic may actually be associated with the South East.

A7.5 Oxera has assumed that there are no capacity constraints at the new hub airport. In the period examined, this means that the new airport can service unlimited demand growth. In the most favourable scenarios examined for this report, this would mean that the airport is servicing 150–200mppa by 2050.

### Cost assumptions

A7.6 Oxera’s construction and surface access cost assumptions are based on a broad range of evidence from existing proposals, as described in section 4. Oxera has taken these cost estimates as given and has not sought to independently verify their validity.

A7.7 Oxera’s operating cost assumptions are based on the current level of operating costs at UK airports. See Appendix 6.

### Price-setting assumptions

A7.8 In the base case Oxera has assumed that charges are equivalent to those at Heathrow (incorporating both aeronautical revenues and revenues earned from commercial activities).

A7.9 Oxera has also tested a low scenario where charges are equivalent to Gatwick’s current charges. Additionally, a high scenario has been tested where charges are 50% higher than Heathrow’s charges per passenger.<sup>46</sup>

### Summary of assumptions

A7.10 Tables A7.1 and A7.2 summarise the assumptions used in Oxera’s cash-flow modelling.

**Table A7.1 Detail of policy scenarios**

Design		Impact on Heathrow	Base case	
			Transfer from Heathrow	Total private construction cost (£ billion)
1	Two-runway new hub	Heathrow open	0%	30
2	Three-runway new hub	Pre-financing from Heathrow	100%	40
3	Three-runway new hub	Heathrow closed	100%	40
4	Three-runway new hub	Heathrow closed Surface access publicly funded	100%	20
5	Four-runway new hub	Heathrow open	0%	50
6	Four-runway new hub	Heathrow closed	100%	50
7	Four-runway new hub	Heathrow closed Surface access publicly funded	100%	30
8	Phased-in two-runway new hub	Mixed mode flying at Heathrow	0%	30

Source: Oxera.

<sup>46</sup> This value comes from indicative demand modelling conducted by Oxera to indicate the level of charges that might be sustainable by an unregulated monopolistic airport, assuming linear demand and the DfT’s estimate of current price elasticities.



**Table A7.2 Detail of external scenarios**

<b>External scenario</b>	<b>Scenario</b>	
Demand different from DfT central forecast	Low	DfT low scenario
	High	DfT high scenario
Different transfer from other London airports	Low	No transfer
	High	30% transfer from Gatwick; 3% transfer from Stansted
Difference in charges	Low	Equivalent to Gatwick
	High	Equivalent to Heathrow plus a 50% mark-up
Differences in construction costs	Low	Low end of corresponding range from section 4
	High	32% optimism bias mark-up on base case

Source: Oxera.

## A8 Financing options—transport precedent

A8.1 Financing of significant infrastructure projects can span from full public ownership to more limited forms of government intervention to full private ownership. However, as highlighted below, most recent infrastructure investments have tended to involve significant levels of public financing. As discussed below, there is relatively little experience of new infrastructure projects being directly privately financed.

### Government funding

#### Eurostar

A8.2 Eurostar was originally financed by the three shareholders: SNCF of France, SNCB of Belgium, and London & Continental Railways (LCR) of the UK, all state-owned.

#### Berlin Brandenburg Airport

A8.3 While Berlin Brandenburg Airport was originally intended to be funded at least in part through private investment, in practice the equity funding has all been provided by German government institutions, and the debt funding has all been subject to a full government guarantee.

### PPP/PFI

#### HSL Zuid (High-Speed Line South), Netherlands

A8.4 After nine years of construction, the HSL Zuid opened in 2009, connecting Amsterdam to Brussels, via Schiphol, Rotterdam and Breda. NS (Dutch Railways) Hispeed is the service operator, with a 90% share in the venture, and KLM owns 10%.

A8.5 At 2006 prices, the project cost was €6.9 billion,<sup>47</sup> and was financed through a PPP scheme led by the Infrasppeed BV consortium (which included Fluor Daniel, BAM/NBM, Siemens, Innisfree and Charterhouse Project Equity Investment). The banking consortium was led by Bayerische Hypo-und Vereinsbank, ING, KBC, KfW, Dexia Public Finance Bank and Rabobank.

A8.6 HSL Zuid will remain the property of the Dutch government, which will pay an annual performance fee to the operators. The contract covered a four-year construction period and maintenance up to 2030.

#### Sud-Europe Atlantique

A8.7 In 2011, the European Investment Bank (EIB) decided to provide financing of €1.2 billion for the Sud-Europe Atlantique high-speed rail line between Tours and Bordeaux, France, which is privately owned through a 50-year concession. The design and construction phase is due to take six years, and the line will connect Bordeaux and Paris in about two hours.<sup>48</sup>

A8.8 The EIB's financing structure is as follows:

- €1 billion of debt—mix of government-guaranteed debt under an economic stimulus plan, lending not guaranteed by the government, and equity bridging lending;
- a special loan guarantee of €200m provided by the Bank and the European Commission.

<sup>47</sup> Based on Railway-Technology.com, available at <http://www.railway-technology.com/projects/zuid/> accessed, January 11th 2013.

<sup>48</sup> EIB (2011), 'Tours-Bordeaux Sud Europe Atlantique high-speed line – RFF signs Europe's largest high-speed rail concession agreement with VINCI - Unprecedented EIB financing of EUR 1.2bn', press release, June 16th.

### **Birmingham highways**

- A8.9 In 2010, public services provider, Amey, won a 25-year highways maintenance contract worth £2.7 billion to upgrade and maintain Birmingham's infrastructure network.<sup>49</sup> The terms of this PFI deal included Amey investing £350m in road and pavement repair and providing street lights, with the DfT and Birmingham City Council funding the remainder of the project.

## **Franchising**

### **Rail franchising**

- A8.10 The majority of rail franchises in Great Britain operate with some form of government intervention, such as subsidy and/or a revenue share/support arrangement

## **Government funding with private capital contribution**

### **Crossrail**

- A8.11 The Crossrail project has been granted funding of £14.8 billion.<sup>50</sup> Fully owned by Transport for London, it is to be financed by the UK government and the Greater London Authority, with some support from London businesses. The funding participants are:

- the Greater London Authority;
- government via a grant from the DfT;
- Crossrail farepayers contributing to repaying the debt raised by Transport for London;
- certain London businesses; and
- additional financial contributions from some key beneficiaries of Crossrail (City of London Corporation, BAA, Canary Wharf Group, and Berkeley Homes).

- A8.12 However, the funding is not in the nature of traditional private finance, as it represents a contribution to an infrastructure project, the return on which will be indirect, through the benefits to the private investors' businesses from the funding.

## **Private funding with government guarantee**

### **Network Rail**

- A8.13 Network Rail is the GB rail infrastructure manager. It is a company limited by guarantee, and its debt financing from private capital markets benefits from a government guarantee. The proportion of debt to the regulatory value of the company (its RAB) is limited by the Office of Rail Regulation via a licence provision.

## **Private funding**

### **Existing airports and incremental infrastructure investment**

- A8.14 Many existing airports, including all the major London airports, are privately owned, and new infrastructure in those airports, such as the investment in Terminal 5 at Heathrow, is privately owned and funded.

<sup>49</sup> Wragge & Co (2010), 'Wragge & Co advises Amey on £2.7 billion Birmingham highways PFI project', June 10th.

<sup>50</sup> Based on Crossrail website, <http://www.crossrail.co.uk/railway/funding#.UO1BqZaNRu4>.

## A9 Recent proposals and international precedent

A9.1 This section looks at some of the evidence that has been used to inform the estimate used in this report, covering UK proposals and international precedent.

A9.2 Oxera considers that these proposals provide useful information on costs where this cannot easily be obtained elsewhere, and can also be used as a cross-check for other sources of information.

### UK proposals

A9.3 In forming estimates for the costs involved in building a hub airport that have been used in the cash-flow model, Oxera has drawn on the proposals that have been put forward for a new hub airport in the UK. These proposals have an advantage over international example, in that they should already incorporate some UK-specific factors, such as labour costs. The proposals outlined below are not an exhaustive list, but cover some of the most recent and substantiated proposals.

- **‘Testrad’**—the Mayor of London, Boris Johnson, has advocated a new hub airport on an artificial island in the Thames Estuary. In November 2008, he appointed Douglas Oakervee to carry out a feasibility study for such an airport. The Oakervee review considered a new airport to be additional to, rather than a replacement for, the existing London airports. It estimated the cost of building a two-runway airport, plus transport links, at £40 billion (while noting that this could be lowered).<sup>51</sup> Since then Testrad has been formed and its proposals for ‘London Jubilee International Airport’ were published in November 2012.<sup>52</sup>
- **Thames Hub.** Foster and Partners, Halcrow and Volterra have proposed a four-runway Thames Hub airport, which would be capable of serving 150mppa and would be integrated with a new high-speed orbital rail route. As well as benefiting from a fourth runway, it is proposed that the airport would have very low noise impact and would be able to operate 24 hours a day, since the approach to the airport would primarily be over water. The cost of the entire Thames Hub project is estimated at £50 billion, including the costs of the orbital rail route (circa £20 billion), enhancements to the Thames Barrier (£6 billion), and infrastructure improvements (£4 billion).<sup>53</sup> The cost of the airport alone is estimated to be around £20 billion.<sup>54</sup> The authors of the proposal estimate that it could generate £150 billion of economic benefits, of which £35 billion would come directly from the airport.
- **Cliffe.** In the process leading up to the 2003 White Paper on aviation, the DfT identified a site near Cliffe, on the Hoo Peninsula in Kent, as the leading candidate for a new hub airport. The site was chosen on the basis that ‘it offered enough land for large-scale development, the potential for good transport connections to key markets in and around London, support for regional planning objectives in the Thames Gateway, and the potential for 24-hour operation (of particular value to freight operators), with relatively low numbers of people affected by noise.’<sup>55</sup> This option was not supported by the White Paper owing to the high capital costs, lower benefits than expansion of existing airports, and the risk to financial viability posed by the high upfront construction costs. It was

<sup>51</sup> Oakervee, D. (2009), ‘Thames estuary airport feasibility review’, October.

<sup>52</sup> Testrad (2012), *op. cit.*

<sup>53</sup> Foster and Partners, Halcrow and Volterra (2011), ‘Thames Hub: An integrated vision for Britain’, November, p. 30.

<sup>54</sup> Foster and Partners (2011), ‘Foster + Partners, Halcrow and Volterra launch Thames Hub vision’, press release, November 2nd.

<sup>55</sup> Department for Transport (2003), ‘The Future of Air Transport’, December, pp. 112–3, para 11.19.

estimated at the time that the Cliffe airport would have cost around £16 billion in 2002 prices.<sup>56</sup>

### International proposals

- **Hong Kong International Airport** was designed as a replacement for the former international airport (Kai Tak Airport), which had limited expansion potential to cope with increasing air traffic. Hong Kong International Airport is run by the Airport Authority of Hong Kong, a statutory body of the government but which is financially independent. The airport came into operation in 1998 after six years of construction at a cost of about US\$20 billion. The government financed a proportion of this cost while consortiums of banks also provided loans. The new airport was constructed in parallel with the development of new road and rail links to the airport and land reclamation projects. Since the airport opened there has been continued investment in enhancement projects and the construction of a third runway is being considered.
- **Berlin Brandenburg Airport.** The opening of Berlin Brandenburg Airport was recently postponed again, from June 2012 to 2014, having been postponed from its original opening date in 2011, owing to various operational problems. Once opened, the airport will replace the existing multi-airport system: Tempelhof Airport has already closed, Tegel Airport will close when Berlin Brandenburg Airport starts operating, and much of the terminal infrastructure of the existing Schönefeld Airport is being incorporated into this hub, which is on a nearby site.<sup>57</sup> The owner of the Berlin airports was originally set up as a public operation with the states of Berlin and Brandenburg each holding a 37% share, and the Federal Republic of Germany the remaining 26%. In 2002, an investment consortium bought all the shares and agreed to provide capital and to acquire any additional land needed for airport expansion, in exchange for a concession to operate Berlin Brandenburg Airport for 99 years. Following this, there was a subsequent injection of capital from the government. The federal government has borne the costs for the railway and road infrastructure associated with the new airport. It is predicted that Berlin Brandenburg Airport will eventually handle 27m passengers a year, although it can be expanded for up to 45m passengers. A number of airlines have already made plans to expand their operations at this new airport.<sup>58</sup>
- **Montreal Mirabel Airport.** This airport was opened in 1975 at a cost of US\$1 billion and with forecasts of up to 50m passengers annually. It was expected that airlines would choose to move to Mirabel with its updated facilities and that it would replace Montreal's Dorval Airport. For a few years after opening, all international flights to and from Montreal were required to use Mirabel. However, the out-of-town location and poor rail and road links to the city led to criticism from airlines and passengers. Mirabel never handled more than 2.8m passengers annually and in 2004 became a cargo-only airport, while Dorval remained the main Montreal airport.<sup>59</sup>

<sup>56</sup> Helsey, M. and Codd, F. (2012), 'Aviation: proposals for an airport in the Thames Estuary, 1945-2012', House of Commons library, July 20th, p. 8.

<sup>57</sup> BER (2012), 'Press Kit', September 21st.

<sup>58</sup> Ibid.

<sup>59</sup> Krauss, C. (2004), 'End of Era Near in Montreal for White-Elephant Airport', *The New York Times*, October 3rd.

## A10 Pre-funding of aviation infrastructure via charges

- A10.1 Pre-funding<sup>60</sup> is the process of raising funding for future investment from existing users. It is known as pre-funding since it involves obtaining funds prior to an investment being made, rather than borrowing (or raising finance in another way) which is ultimately repaid by future users.
- A10.2 In the context of a new hub airport, pre-funding could come from raising funds from existing aviation users at existing airports, with the most likely method being via increased charges. Charges at Heathrow, Gatwick and Stansted are currently regulated.
- A10.3 In a regulatory context, infrastructure investments can be pre-funded through the advancement of revenues from later control periods. One way of doing this is to add the associated capital expenditure (CAPEX) to the RAB while the asset is still under construction, rather than waiting for that asset to become operational. This allows the infrastructure owner to earn allowed revenues on a larger asset base in the short term.
- A10.4 This appendix highlights the example of the CAA capping Heathrow's aeronautical charges at a level that incorporated an allowance for pre-financing of a future infrastructure investment (ie, Terminal 5), and considers the advantages and disadvantages of such an approach.

### Example: Heathrow Terminal 5

- A10.5 In February 1993, BAA applied for planning permission to develop a fifth terminal at Heathrow Airport. The development was the subject of a public inquiry that ended in March 1999. The first construction phase commenced after government approval in November 2001. The development costs of T5 are outlined in Table A10.1.

**Table A10.1 T5 development phasing and costs**

Phase	Commencing	Opening year	Capacity (mppa)	Construction costs (2002 prices, £m)
1	2002	2008	20–22	2,711
2	2007	2011	10	422
<b>Total</b>			<b>30–32</b>	<b>3,133</b>

Source: Competition Commission (2002), 'BAA plc: A Report on the Economic Regulation of the London Airports Companies (Heathrow Airport Ltd, Gatwick Airport Ltd and Stansted Airport Ltd)', November, p. 292.

- A10.6 The key issue in the regulatory treatment of T5 related to the addition of the CAPEX to the RAB. A typical regulatory approach is to allow an increase in the RAB upon completion of the project, since this is the point at which users can benefit from the investment. However, there were two main arguments as to why an advancement of revenues was appropriate in the case of a project of the size of T5. First, BAA argued that without revenue advancement it would have faced substantial financing problems during construction due to the mismatch in the timing of its financing costs and the revenues from T5. Second, as T5 would lead to a substantial increase in the RAB and thus Heathrow's price cap, concentrating the increase in

<sup>60</sup> Funding typically refers to who ultimately pays for a service, whereas financing refers to who covers any short-term shortfall and is later compensated by the funders. In the case of pre-funding, both funding and financing effectively occur simultaneously such that the terms pre-funding and pre-financing are often used interchangeably.

a one-off adjustment in the RAB would lead to a substantial jump in users' costs.<sup>61</sup> The CAA concluded that this would have led to an:

inefficient profile of pricing, by diluting BAA's investment incentives since large price increases in 2008/9 would have a low probability of being seen as credible or deliverable, and by making the delivery of BAA's investment programme more difficult. Not allowing revenue advancement for this review would increase the likelihood that a much larger revenue advancement, in future, or higher cost of capital would have to be adopted, now or in future, to compensate.<sup>62</sup>

A10.7 The solution devised was twofold. First, the CAA allowed a step-wise increase in the RAB, with compensation for assets under construction. The increases were linked to milestones in the construction process for T5. The achievement of these milestones then 'triggered' the increase in the RAB (see Table A10.2).

A10.8 Since a higher RAB implies both a greater depreciation charge and a higher return on capital, the step increases in the RAB fed through to greater allowed revenues that the airport could collect from its users. In turn, this allowed for higher charges than would have been the case, without adding assets under construction to the RAB. Consequently, Heathrow's users were effectively contributing to the costs of T5 before it was operational.

**Table A10.2 Triggers for RAB increases in T5**

Date	Trigger
2003	Earthworks complete
2004	First four stands operational Rivers diverted
2005	Control tower completed
2006	Terminal weather-tight Satellite weather-tight
2008	Terminal completed

Source: CSFB (2003), 'BAA', March 27th.

A10.9 The CAA also allowed an uplift to the cost of capital as recommended by the Competition Commission (CC). The CC identified a variety of factors when explaining the increase in the cost of capital, including systematic and non-systematic risks and financeability. Regarding systematic risk, the key consideration was the greater sensitivity of demand that BAA would face at all of its airports given the additional capacity of T5:

we believe that the scale of the T5 project and consequential increase in borrowings and gearing will increase BAA's risks: it represents a considerable investment, with very long-term returns, subject not only to construction risks, but also risks of uncertain demand.<sup>63</sup>

### Advantages

A10.10 There are two main advantages of pre-financing, as captured in BAA's arguments on the pre-financing of Heathrow's T5. First, front-loading revenues can help to ensure that there are sufficient cash flows to meet the upfront design and construction costs involved in large infrastructure projects. Second, pre-financing can help to smooth increases in charges,

<sup>61</sup> The CC calculated that a one-off price adjustment of approximately 80% would be needed when T5 commenced operations with no revenue advancement. Competition Commission (2002), 'BAA plc, report on the economic regulation of the London airport companies', November, p. 317, para 10.38.

<sup>62</sup> Civil Aviation Authority (2003), 'Economic Regulation of BAA London Airports (Heathrow, Gatwick and Stansted) 2003–2008: CAA Decision', February, p. 36.

<sup>63</sup> Competition Commission (2002), 'A report on the economic regulation of the London airports companies (Heathrow Airport Ltd, Gatwick Airport Ltd and Stansted Airport Ltd)', para 2.327.

rather than having step changes in charges at the point when new investments become operational.

### **Disadvantages and opposition from airlines**

A10.11 There may, however, be several disadvantages of pre-financing.

- In particular, pre-financing may raise intergenerational equity issues since it involves a transfer between current users and future users—ie, current users pay for facilities that will primarily be used by (and thus provide benefits for) future users. While in some cases these users may be the same (eg, at a corporate level, the new investment may be used by the existing airlines), there is no guarantee that they will be. Hence, there is potentially a transfer between individuals. This form of intergenerational subsidy is common to many types of investment, although it also goes against the normal approach of asking future generations to pay for investment because they are expected to be better off.
- It may weaken the incentives for the investment to be delivered in a costly and timely manner.
- It is likely to receive opposition from airlines: for example, the International Air Transport Association has argued that it is expensive, inefficient, unfair, unjustified and unnecessary.<sup>64</sup>

<sup>64</sup> International Air Transport Association (2012), 'Pre-financing', position paper, available at [http://www.iata.org/policy/Documents/Pre\\_financing.pdf](http://www.iata.org/policy/Documents/Pre_financing.pdf) accessed on January 11th 2013.



## A11 Potential uses of existing airport space

A11.1 A number of the scenarios examined in this report assume that Heathrow would be closed once the new hub was opened. If this occurred a decision would need to be taken about the use of Heathrow's existing land. Indeed, the use of the land may influence the commercial case since it may affect the amount of compensation required by the airport owners.

A11.2 This section describes several previous instances of the closure of international airports and how these sites were subsequently used for other purposes. In general, the areas have been used for a mixture of residential and commercial purposes.

Airport	City	Closed	Reuse	Reuse value
<b>Stapleton International</b>	Denver	1995	Residential and commercial redevelopment	\$4 billion

A11.3 Following the closure of Stapleton International Airport in 1995 the area occupied by the airport was converted into one of the USA's largest brownfield redevelopments. The site of more than 4,000 acres supported the construction of more than 12,000 homes and 10m square feet of office and industrial space.<sup>65</sup>

A11.4 A private sector developer is working in conjunction with the local authorities as part of a PPP to collaborate and finance the infrastructure and community facilities.

Airport	City	Closed	Reuse	Reuse value
<b>Robert Mueller</b>	Austin	1999	Mixed-use urban village	\$1 billion

A11.5 The site of the former Robert Mueller airport is being redeveloped into a mixed-use urban village with plans for 4,000 homes (25% of which will be 'affordable homes'), 140 acres of parks, commercial space and a town centre. Construction began in summer 2007.<sup>66</sup>

Airport	City	Closed	Reuse	Reuse value
<b>Munich-Reim</b>	Munich	1992	Shopping and community centre and residential and office space	–

The former airport has been converted into the Messestadt-Reim, a new development and borough for the city. It contains a new convention/community centre and 7,000 new homes.<sup>67</sup>

Airport	City	Closed	Reuse	Reuse value
<b>Tempelhof</b>	Berlin	2008	Urban parkland	n/a

<sup>65</sup> Greater Austin Chamber of Commerce, 'Intercity Visit Denver, CO'.

<sup>66</sup> Mueller Austin (2012), 'Fact Sheet by the numbers'.

<sup>67</sup> [http://www.messestadt-riem.com/msr/default\\_e.htm#](http://www.messestadt-riem.com/msr/default_e.htm#)

A11.6 Templehof was one of several airports serving Berlin that have been planned to close following the opening of the Berlin Brandenburg Airport.

A11.7 Since the airport has been closed it has been adapted into an area of structured parkland known as 'Templehof Freiheit'. The area is already open to the public, although further changes are expected to the environment. The terminal building is a protected landmark and remains open for public tours. The site is also used for international event fairs.

<b>Airport</b>	<b>City</b>	<b>Closed</b>	<b>Reuse</b>	<b>Reuse value</b>
<b>Tegel</b>	Berlin	2014 (planned)	To be confirmed	n/a

A11.8 Tegel Airport will be closed in 2014 once the Berlin Brandenburg airport opens. The future plans for the space left by Tegel Airport when it closes are currently unclear.

<b>Airport</b>	<b>City</b>	<b>Closed</b>	<b>Reuse</b>	<b>Reuse value</b>
<b>Schönefeld</b>	Berlin	2014 (planned)	Integration into new airport	n/a

A11.9 Parts of Schönefeld will be incorporated into the Berlin Brandenburg Airport once it opens. The new airport will share one runway with the existing one, although much of the old airport, including the terminal and apron areas, will undergo urban redevelopment.

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