



## IARO report 15.12

Heathwick

### *Illustrations*

London Gatwick North Terminal

London Heathrow Terminal 5

Hong Kong International Airport

## **IARO Report 15.12: Heathwick**

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## **1. Introduction**

When the present UK coalition government came into power in May 2010, a key element of policy was that there would be no new runways in the South East of England. With increasing demand for air travel in the region, this policy is leading to problems.

One response was the proposal which has come to be known as Heathwick.

The concept starts with an airside high speed railway connecting Heathrow and Gatwick Airports, with a 15 minute journey time. It is assumed that, with this in place, Gatwick and Heathrow would appear to the interlining passenger as one airport rather than two.

If Gatwick was effectively part of Heathrow, the value of Gatwick's slots would increase to nearer the value of Heathrow's. It is assumed that, if this happened, new entrant ("low cost") carriers now at Gatwick would sell the slots they used there and move to other airports – specifically, to Stansted, Luton and Southend.

This process would allow legacy carriers more access to the valuable Heathwick market, and would effectively create runway space for them by moving lower value flights to other airports.

This report starts from a position of polite scepticism, and tries to establish whether the proposal could work and if so, how. It does not advocate any specific option or policy discussed.

A similar concept was examined in IARO's report 13.10, "Can the Hong Kong - Shenzhen inter-airport high speed rail link work?" (see section 12 on page 38 for a summary).

It should be noted that this report makes no pretence whatever to accuracy. Given the nature of the project, this would be irrelevant. Instead, it uses easily accessible published figures, orders of magnitude, assumptions and approximations which look reasonable, validating these where possible. No liability whatever is accepted for the consequences of using this report.

As usual with IARO reports, comments, feedback and updates are welcome.

Andrew Sharp  
Director General

## 2. Abbreviations and acronyms

ATM	air traffic movement
BA	British Airways
BAA	BAA Ltd., a UK-based privatised airport operator, formerly the British Airports Authority and now owned by a consortium headed by Ferrovial
CAA	Civil Aviation Authority (UK)
cctv	Closed circuit television
CEO	Chief Executive Officer
CILT	Chartered Institute of Logistics and Transport
DfT	Department for Transport (UK)
DFW	Dallas-Fort Worth International Airport
dmu	diesel multiple unit
emu	electric multiple unit
ERTMS	European Railway Traffic Management System
GDP	Gross Domestic Product
GDS	Global Distribution System
GWML	Great Western Main Line
h	hour
HS2	High Speed 2 – the future second high speed rail link in Great Britain, connecting London and the West Midlands (and possibly beyond)
IARO	International Air Rail Organisation
IEP	InterCity Express Programme
JFK	New York John F. Kennedy International Airport
Km	kilometre
M	million
MCT	Minimum connect time
M25	London orbital motorway
mppa (c) IARO	million passengers a year

NATS	National Air Traffic Services (UK)
p	pence
RER	Réseau express régional (regional express network)
SSSI	Site of Special Scientific Interest (UK)
TGV	Train à grande vitesse (French high speed train)
TRB	Transportation Research Board
UIC	Union Internationale des Chemins de Fers (international railway union)
UK	United Kingdom
ULD	Unit Load Device (airline container)
US or USA	United States of America

Note that UK conventions are used for dates (day/month/year) and numbers (in 9,999.99 the comma , separates thousands: the full stop . is a decimal point). A billion is a thousand million, following US conventions.

There are occasions when UK (United Kingdom) is used for simplicity when the term Great Britain (the UK excluding Northern Ireland) would be more accurate.

### 3. The Heathwick concept

The basic component of Heathwick is an airside high speed railway connecting Heathrow and Gatwick Airports, with a 15 minute journey time. With this in place, Heathrow and Gatwick would, it is assumed, be seen as one single unified airport.

The value of Gatwick's slots would then increase, to closer to the value of Heathrow's.

It is further assumed that, if this happened, new entrant carriers now using Gatwick would sell the slots they used there and move to a cheaper and less congested airport like Stansted, Luton or Southend.

Those slots would be bought by network carriers, by airlines unable to get the slots they wanted at Heathrow.

This would move low fare new entrant carriers, specialising in point-to-point flows and using relatively small aircraft, to airports like Stansted and Luton which more closely meet their needs.

By doing this, capacity would be freed up at Heathwick for legacy carriers, keen to interline passengers. These carriers could then bring more flights and more passengers into the London airports system. Their flights, unlike those of the new entrant carriers, would carry substantial numbers of interlining as well as terminating passengers.

In addition, making the two airports into one would permit de-duplication: there would be no need for one airline or alliance to serve the same destination from both airports, as happens to a limited degree now.

By turning Gatwick into part of Heathrow, by moving new entrant carriers to airports more suited to them, by consolidation of flights to the same destination, capacity in the London airports system would be better used.

The concept seems to have been initially promoted<sup>1</sup> by Councillor Victoria Borwick, a member of the Greater London Authority's transport committee<sup>2</sup>. This led to criticism by the House of Commons Transport Committee, which said that, "It is unacceptable for debate on such major decisions to be conducted through a series of nods and winks in the press."<sup>3</sup>

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<sup>1</sup> As a medium term solution – see <http://conservativehome.blogs.com>, 7 November 2011

<sup>2</sup> See, for example, <http://conservativehome.blogs.com/platform/2011/11/victoria-borwick-we-need-a-solution-to-help-increase-aviation-capacity-either-growing-gatwick-or-a-c.html>

<sup>3</sup> "High Speed Rail" House of Commons Transport Committee Tenth Report of Session 2010-12, Volumes I and II published 8 November 2011, page 45



However, apparently the previous government had studied the idea too – but decided that it was unworkable<sup>4</sup>.

A subsequent paper from Cllr. Borwick in March 2012<sup>5</sup> suggested a second runway at Gatwick as part of this proposal. This would give an increase in capacity of 40 mppa, giving a maximum capacity for Heathwick of 160 mppa.

A key question is, would Heathwick work?

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<sup>4</sup> “Darling argues for third runway” by Jim Pickard and Andrew Parker in the Financial Times 19/4/12

<sup>5</sup> “Protecting London’s position as a world city: creating the first ‘virtual hub airport’”, by Victoria Borwick March 2012

## **4. Timeline of developments**

### **Introduction**

Other transport developments in the region may affect or impinge on this one. A timeline for these is given below, so that readers can have them in mind when they read the rest of the report.

### **Crossrail**

Plans are for the full Crossrail service to start by 2019.

The definition of the full service is difficult because, for political reasons, there is a reluctance to include Reading in it: the western terminus is normally described as Maidenhead. Crossrail trains are likely to be running to Heathrow (replacing Heathrow Connect) by May 2018, and working the full service between Shenfield/Abbey Wood in the east and Heathrow/Maidenhead (or Reading) in the west by December 2019<sup>6</sup>.

### **GWML electrification**

There are firm plans to electrify part of the Great Western Main Line (GWML). On this line, at the moment only Heathrow Express runs electric trains – on the main line between Paddington and Airport Junction (west of Hayes station), and then on its own infrastructure into the airport – so only the section between Paddington and Airport Junction is currently electrified.

Crossrail extends electrification to Maidenhead and Reading.

There are plans to continue this to Oxford, Newbury, Cardiff and Bristol, probably in nine phases.

Electrification to Oxford and Newbury is expected in 2016, and full completion is expected in December 2017<sup>7</sup> or 2018<sup>8</sup>.

### **Reading station reconstruction**

The Reading station area is a major junction, where lines between London and Bristol/South Wales cross the route between Southampton/Basingstoke and Oxford/Birmingham. There is much freight (especially container) traffic between Southampton Docks and the West Midlands and beyond. Currently, these freight trains have to cross the GWML on the flat.

A flyover is under construction to eliminate conflicts at the west end of the station complex.

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<sup>6</sup> “Great Western franchise replacement consultation” page 5. DfT December 2011

<sup>7</sup> “First pledges cooperation as franchise end nears” in *Modern Railways* August 2011 page 39 and “Greater Western will test franchising policy” in *Modern Railways* December 2011 page 32

<sup>8</sup> “Alignment is the only way forward” – interview with Sir David Higgins, Chief Executive of Network Rail, in *Modern Railways* November 2011 page 52

At the east end, a line for London Waterloo and Redhill trains terminates. More platforms are to be added for these trains, and a dive-under reinstated to further increase capacity and to create a through route to places like Oxford and Birmingham.

It is likely that Crossrail trains will terminate at Reading, so five new platforms are to be created on the north side of the station.

Work should be complete by Spring 2015<sup>9</sup>.

It was assumed that new trains for the Thameslink project would arrive in 2016<sup>10</sup>, allowing the present Thameslink emus to replace existing diesel trains on the Paddington – Oxford/Newbury services. There are substantial uncertainties around this.

### **HS2 phase 1**

The initial phase of HS2, between London and Birmingham, could open in 2026<sup>11</sup>. It should be noted that this will bring Birmingham Airport within 49 minutes travel time from London Euston – much the same journey time as between Euston and Heathrow Terminal 5.

### **HS2 phase 2**

The second phase of HS2, the Y-shaped network from Birmingham to Manchester and Leeds, is planned to open in 2032-33<sup>12</sup>.

### **HS2 Heathrow spur/loop**

Current plans for linking HS2 to Heathrow are that the airport is likely to be on a spur from HS2, with passive provision for a loop back again, as part of phase 2 (2032-33)<sup>13</sup>. The spur will allow trains to run between airport and the Midlands and north of England: the loop would allow them to run between London and the West Midlands through the airport.

### **Western access**

The Heathrow Western Access project is an extension of the Heathrow Express line north-westwards beyond Terminal 5 to the GWML facing west, towards Maidenhead and Reading.

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<sup>9</sup> “Great Western franchise replacement consultation” page 28. DfT December 2011

<sup>10</sup> See reference 7 on page 7

<sup>11</sup> “Initial industry plan England & Wales”. Proposals for Control Period 5 and beyond. RFOA, RIA, ATOC and Network Rail September 2011

<sup>12</sup> “High Speed Rail: Investing in Britain’s Future – Decisions and Next Steps”. DfT January 2012

<sup>13</sup> “High Speed Rail” House of Commons Transport Committee Tenth Report of Session 2010-12, Volumes I and II published 8 November 2011, page 44, and reference 12

This only needs a relatively short section of railway, but it probably means crossing the M25 London Orbital motorway, the M4 motorway between London and Bristol/South Wales, and the GWML itself.

There is much political traction and attraction to linking Heathrow directly by rail to South Wales and the West of England: these areas are poorly connected to the airport by public transport<sup>14</sup>.

A possible implementation date for this is 2020<sup>15</sup>.

### **Airtrack/Airtrack Lite**

The Airtrack project was an extension of the Heathrow Express line south-westwards beyond Terminal 5 to Staines. Trains would have used this to connect Reading, Woking and London Waterloo to Heathrow.

The project was formally dropped by BAA in April 2011 for a variety of reasons – mainly the fact that, with an airport restricted to two runways, earnings were unlikely to increase enough to pay for it.

There was also substantial local opposition because the project would have resulted in a significant increase in the use of level crossings along the chosen route into central London, resulting in delays to road traffic.

In October 2011, Wandsworth Council suggested a smaller scheme, with a different routing which would not have involved the increased use of those level crossings<sup>16</sup>. This became known as Airtrack Lite.

There are major uncertainties about timescales.

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<sup>14</sup> Connections are by long-distance coach or train plus coach

<sup>15</sup> “Great Western franchise replacement consultation” page 31. DfT December 2011

<sup>16</sup> “New Airtrack plan to connect Heathrow”

[http://www.wandsworth.gov.uk/news/article/10776/new\\_airtrack\\_plan\\_to\\_connect\\_heathrow](http://www.wandsworth.gov.uk/news/article/10776/new_airtrack_plan_to_connect_heathrow), 28 October 2011

## 5. London's airports today

### Use of London's airports

The London airports system currently serves 127 million passengers a year (mppa). Other UK airports serve 83 mppa, showing the dominance of the London system<sup>17</sup>. By comparison, New York's airports serve some 102 million passengers<sup>18</sup>.

Some of those using the London airports originate in the UK regions (for example Edinburgh – London passengers).

Some passengers originating in the UK regions will be interlining in London (making journeys like Newcastle – London - Hong Kong). Over the years, this kind of traffic has increasingly been attracted to near-Europe airports like Amsterdam Schiphol, Paris Charles de Gaulle and Frankfurt instead of London. High traffic volumes and limited capacity at Heathrow in particular have priced flights from the UK regions out of the London airports.

### Data sources

The sources of the figures below are as follows.

Figures for Air Traffic Movements are taken from table 2.4 of the DfT's "UK aviation forecasts", published in August 2011. They are in thousands, and relate to 2009.

Figures for passenger numbers (thousands) and the business:leisure split (percentages) were taken from CAA's "Passenger survey report 2010", and are from table 19.12 in that report.

These numbers vary slightly from those in some other sources: they are said to relate to "Terminal passengers", a term defined in CAA's Aviation Trends as only excluding passengers in direct transit – those arriving and departing on the same aircraft.

Statistics on transfer passengers have been taken from CAA's "Connecting passengers at UK airports" (published in November 2008). Data relate to 2007, except for London City Airport (2006). They are percentages.

### Heathrow

Heathrow is sometimes described as the UK's only hub airport – although this depends on an elusive definition of a hub airport. It is the most efficient two-runway airport in the world, with well over 30 million passengers /runway/year.

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<sup>17</sup> <http://assets.dft.gov.uk/statistics/releases/transport-statistics-great-britain-2011/aviation-summary.pdf>, accessed 22 December 2011

<sup>18</sup> "Upgrading to World Class". Regional Plan Association January 2011

The cost of this is the loss of resilience. It is reckoned to be 98% full, so it can take a long time to recover from any perturbation.

**Key figures:**

Air Traffic Movements (ATMs)	461
Passengers	65668
Of which, business	29.9
Leisure	70.1
Transfer passengers	35.1
Passengers/ATM	142

**Gatwick**

Gatwick is the most efficient single-runway airport in the world, with twice the number of passengers of its nearest competitor (San Diego).

It serves the area south of London particularly well especially because of its rail connections. Because the railway between Brighton (on the south coast) and Bedford (80 km north of London) goes through both Gatwick and St. Pancras International, it is also attractive to passengers from the north and north-east of London.

Whereas Heathrow has neither new entrant nor charter flights, Gatwick has both.

Some three years ago, BAA was forced to sell Gatwick, on the grounds that separation of ownership of London's two largest airports was in the best interests of passengers. There is an irony in the fact that it is now proposed to bring them back together as one airport.

**Key figures:**

Air Traffic Movements (ATMs)	247
Passengers	31009
Of which, business	14.4
Leisure	85.6
Transfer passengers	13.1
Passengers/ATM	126

## **Stansted**

Stansted was revived in 1993 as a third airport for London. Original intentions for it to be a major long-haul international gateway were never fulfilled: instead, it is now the airport of choice for all new entrant carriers.

In the past, some legacy carriers have tried long-haul scheduled flights from Stansted, but these have never really worked. The image of low quality and inaccessibility are thought to have deterred passengers – and certainly airlines.

### ***Key figures:***

Air Traffic Movements (ATMs)	157
Passengers	18471
Of which, business	16.3
Leisure	83.7
Transfer passengers	9.1
Passengers/ATM	118

## **Luton**

Luton was originally a municipal airport 50km north of London. It has a single runway: it is connected by bus shuttle to a parkway station which opened in 1999 close to the M1 motorway between London and the Midlands.

It has relatively basic facilities, and a strong passenger base in new entrant and charter airlines.

### ***Key figures:***

Air Traffic Movements (ATMs)	78
Passengers	8646
Of which, business	18.9
Leisure	81.1
Transfer passengers	4.1
Passengers/ATM	111

## London City Airport

London City Airport is London's near-city airport. Built on one of the former docks in London's Docklands, only a few types of aircraft are allowed to use it: there is also a significant weekend curfew.

Most of its traffic is domestic and near-Europe because of the restrictions on aircraft types.

However, BA recently started to fly an Airbus A318 (specially configured for the airport's steep approach<sup>19</sup>) between London City Airport and New York JFK airport. Because of the low take-off weight imposed by the short runway, the plane has to make a refuelling stop at Shannon Airport.

### **Key figures:**

Air Traffic Movements (ATMs)	74
Passengers	2777
Of which, business	62.8
Leisure	37.2
Transfer passengers	2.4
Passengers/ATM	38

## Other London area airports

There are other airports in the London area - notably Southend, newly upgraded. They have capacity, often just for short-haul flights, and generally cater for cargo and point-to-point passenger flights as well as General Aviation.

### **Expansion plans**

The throughput of all of these airports is likely to increase over time, with expansion plans and with more larger aircraft coming on stream. Gatwick, for example, has plans to increase passenger throughput to 40.5m by 2020/1 and 45m (on a single runway) by 2030<sup>20</sup>.

These plans do not invalidate the conclusions of this report, which is quite broad-brush. However, they need to be kept in mind when considering conclusions.

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<sup>19</sup> See <http://www.londoncityairport.com/aboutus/ViewRelease.aspx?id=1150>

<sup>20</sup> "Draft Gatwick Masterplan 2011", page 5



## **6. What might the aviation industry perspective be?**

### **The new entrant carrier**

The new entrant, low cost or low fare carriers are characterised by simplicity of operations and low costs. They usually have just one or two types of aircraft in the 100-200 seat range: they often do not encourage interlining. Most of their sales and much of the check-in operation is on-line. They work aircraft as hard as possible, ideally with 20 minute turn-rounds. This leads to a preference for the use of uncongested airports, both front and rear doors for loading and unloading, and stairs rather than jetways (which speeds up turn-rounds and reduces costs).

### **The legacy carrier**

The legacy or network carrier tends to operate flights as part of an integrated international network. Interlining is encouraged: feeder traffic to and from partner airlines is a valuable part of their revenue. They make extensive use of code-shares, and often more than one class of travel – although the model does vary.

### **So what might work?**

Given these two airline models, what might work along the lines of the Heathwick proposal?

It is clearly designed for interlining passengers, rather than those just going point-to-point. Therefore it needs to be used by network carriers.

### **The importance of the minimum connect time**

In order to attract interlining passengers, a low minimum connect time (MCT) is absolutely fundamental. A number of airports boast of this – Düsseldorf with 35 minutes and Frankfurt with 45 minutes (plane to plane or plane to train). 45 minutes is almost industry standard, almost a pre-requisite. It is the minimum time needed between the arrival of one flight and the departure of a connecting flight: both passengers and checked bags need to make the connection.

Why does MCT matter?

When a passenger asks a travel agent to check flights for a journey, the normal sort order on the travel agent's GDS screen is the elapsed journey time. Those with the shortest journey time will be displayed on the first screen-full of information – the one from which a sale is most usually made<sup>21</sup>. So it is vital to get onto that first screen.

Elapsed time for any multi-stage journey is the sum of journey time for stage one plus connection time plus journey time for stage two (plus connect times and journey times for other stages if necessary).

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<sup>21</sup> 75%, according to Jim Crites, Executive Director (Operations) for DFW Airport at TRB's Annual Meeting 2012

Rail has an inbuilt disadvantage because its average speed is lower: if, for whatever reason, the connect time is long too then a rail + air option is likely to be pushed back to later screens and will not be offered.

The fact that the rail segment is between airport and city and the air segment is between two airports is a distortion rarely explained. So a Stuttgart - New York journey will include air options from Stuttgart Airport via Frankfurt Airport to New York and rail options from central Stuttgart to Frankfurt Airport and then air to New York. Option 1 will be for a journey from airport to final airport: option 2 will be from city centre to final airport. This is not comparing like with like!

Be that as it may, a 45 minute MCT between Heathrow and Gatwick<sup>22</sup> is likely to be seen as essential.

It can be argued that it is not attained now at Heathrow. Some BA passengers need to transfer between Terminals 5 and 3; and some Star Alliance passengers between Terminals 1 and 4. For both of these, the transfer time is quoted by Heathrow Airport Ltd. as 90 minutes<sup>23</sup>.

But it is a future aspiration that all members of an alliance will be under one roof – however challenging this will be for One World alliance members in particular.

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<sup>22</sup> Compared with 3 hours today - [http://www.britishairways.com/travel/london-heathrow/public/en\\_gb](http://www.britishairways.com/travel/london-heathrow/public/en_gb), accessed 22 December 2011

<sup>23</sup> <http://www.heathrowairport.com/heathrow-airport-guide/flight-connections/connection-guides/international-arrival/international-departure> accessed 22 December 2011

## **7. How might Heathwick work?**

### **Introduction**

To take this assessment further, a number of significant assumptions needs to be made. Some of these assumptions are discussed in more detail below: while there is a logic to them, they need further explanation and justification.

The comment in the introduction – that in this report IARO is discussing proposed policies, but is not advocating any of the ideas considered – is repeated here for emphasis.

Moreover, there are major issues like competition policy which are ignored completely in this report.

### **Can Heathwick achieve an acceptable MCT?**

A major assumption is that BA will operate a split service spread over the two airports<sup>24</sup>. In consequence the airside Heathrow station is assumed to be under Terminal 5, below the Terminal 5 spine and aligned with the existing airside automated people mover.

Other assumptions include:

- The airside station at Gatwick will be under North Terminal
- Both stations will have direct lift connections between terminal and platform
- At Heathrow, access to the platforms at Terminal 5 will take no more time than access to the internal automated people mover today<sup>25</sup>: at Gatwick, transfer time would be much the same.

Train frequency is an important issue. If trains run four times an hour, maximum wait time is 14 minutes: the average wait time (7½ minutes – half the frequency) is less relevant.

A press report<sup>26</sup> said that the direct distance between the airports is 40 km and the estimated journey time is 15 minutes. 40 km in 15 minutes is 160 km/h: this is the maximum speed of a Heathrow Express train.

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<sup>24</sup> The company has said it would not move to another airport unless it was legally forced to, according to “Livingstone rejects estuary airport” in the Financial Times, 23 February 2012 page 4

<sup>25</sup> Three minutes from leaving aircraft to reaching the Transit, in a recent trip through Terminal 5B

<sup>26</sup> “Airports rail link fails to carry industry” by Andrew Parker, Jim Pickard and Mark Odell in the Financial Times, 8-9 October 2011, page 3

However, the actual route is unlikely to be direct. This part of the South East of England is either heavily populated or precious countryside or both; the storm over the plans for HS2 when they were announced show exactly what is likely to happen here.

So this report assumes a route length of 50 km rather than 40. With 48km at top speed and 1km at either end for acceleration and deceleration, a 15 minute journey time needs an average speed of 218 km/h<sup>27</sup>.

That speed is certainly feasible: it is just over the top speed of Airport Express Oslo. Eurostar trains have a top speed of 300 km/h.

It is probably safe to assume that, with stations under the terminals as suggested, a 15 minute journey time and a 14 minute maximum wait time, a reliable 45 minute MCT is not attainable.

The greatest impact on reducing the MCT is increasing the train frequency.

A five minute interval between trains would give a maximum waiting time of four minutes and therefore a worst case journey time of 19 minutes. That would leave 26 minutes for deplaning, reaching the train, and getting from train to gate within the 45 minutes.

Given that these are airside checked-in passengers, this is probably feasible. However, there is very little slack. A 10 minute interval would increase maximum train journey time to 26 minutes (9 minutes waiting, 15 minutes travelling) – probably too long.

### **Who would go to Gatwick?**

It was assumed above (on page 19) that it would be BA who would split their operation between the two airports. Why?

The proposed link is likely to take around 10 years to bring into operation. HS2 phase 1 is estimated to take 15 years to construct: that line is significantly longer, but length is relatively unimportant for assessing the time between decision and opening.

What will BA look like in 2022? It is very difficult to say, but certainly the relationship with Iberia is likely to be much closer. They may have acquired other airlines too<sup>28</sup>: this is certainly an aspiration. And the other members of the OneWorld alliance are likely to want to work much closer together.

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<sup>27</sup> “Rules for high speed line capacity” by Piers Connor, of PRC Rail Consulting Ltd., suggests that this is ambitious. It considers that it will take 4.6 minutes to reach full speed and 3 minutes to decelerate: this will take 18 km. If this is the case, the Heathwick trains will need to do the remaining 32km in 7.5 minutes, at an average speed of 256 km/h. This is certainly not impossible. The report concludes, from French and German experience, that, “if you can operate 12 trains/hour on a high speed line, you are doing as well as anyone”. See <http://www.railway-technical.com/Infopaper%203%20High%20Speed%20Line%20Capacity%20v3.pdf>

<sup>28</sup> As this report was being drafted, they were in the process of acquiring BMI from Lufthansa

At the moment, BA completely fills Terminal 5 at Heathrow – including the satellite terminals 5B and 5C. It also uses Terminal 3, as do its partners Iberia<sup>29</sup> and American Airlines. It seems unlikely that it will be possible to fit the complete OneWorld operation into a future Terminal 5, however much this is expanded and upgraded. It is also thought unlikely that the alliance will move to the future Terminal 2. So whatever happens, it will need to work from two terminals.

Effectively BA have a split operation between Heathrow and Gatwick now, although the Gatwick operation is much smaller and mainly for point-to-point European flights<sup>30</sup>. They used to serve both airports on a larger scale, with intercontinental flights at both too, at one stage, but pulled back to concentrate long-haul flights on the more popular Heathrow.

It is unlikely that any other airline would need to use more than one terminal, so it is likely to be very difficult to move any other airline or alliance to a split operation across two terminals. Some – the recently formed United/Continental – do now, but are likely to consolidate into Terminal 2. Any attempt to move a single airline or group of airlines from Heathrow to Gatwick is unlikely to be successful – and unlikely to be attempted.

Moving unaligned airlines like Emirates or Etihad<sup>31</sup> to Gatwick is likely to lead to major political issues.

Virgin Atlantic does have a split operation across the two airports. However it is likely that they would need a substantial inducement to move all of their flights to Gatwick, even a Gatwick 15 minutes from Heathrow. The general preference for Heathrow and historic rivalries with BA are likely to rule this out.

Superficially the option of moving Virgin Atlantic is attractive, but the logic is not there. Their Gatwick flights are largely to long-haul leisure destinations, probably with relatively little interlining from their long-haul business operations currently at Heathrow<sup>32</sup>. So the concentration of all flights on one airport adds little in passenger marketing terms. This said, it may be better in operational terms – it would obviate the need for maintenance and check-in infrastructure at both airports.

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<sup>29</sup> Iberia's 8 daily Madrid flights started to use Terminal 5 from 25 March 2012 – [http://grupo.iberia.es/portal/site/grupoiberia/menuitem.0ffaf48bc2c1f79bf75771bf34e51ca/?ib\\_contentId=cf302331a9b55310VgnVCM1000005ffe15acRCRD](http://grupo.iberia.es/portal/site/grupoiberia/menuitem.0ffaf48bc2c1f79bf75771bf34e51ca/?ib_contentId=cf302331a9b55310VgnVCM1000005ffe15acRCRD)

<sup>30</sup> 4.5m BA passengers used Gatwick in 2010. "BA opens Gatwick extension" in "Airports of the World", January/February 2012 page 7

<sup>31</sup> The impact of the recent acquisition of a 29% stake in Air Berlin, which does serve Gatwick, by Etihad (which does not) is unknown

<sup>32</sup> 22% of Virgin Atlantic passengers at Heathrow were making connections, compared with 47% of BA's, according to "Connecting passengers at UK airports", CAA November 2008

But if one airline (especially one like Virgin Atlantic, with relatively little interlining with other airlines) moved all of its operations from one airport to another, there would be little logic to building the high speed line connecting the airports in the first place.

It would also complicate the decision about where to put the Heathrow station: one under the Central Terminal Area would be more difficult to build.

Virgin does code-share with a limited number of other airlines – notably Continental. However the future of this is uncertain now that Continental is part of United, a key player in the Star Alliance and likely to want to code-share and exchange traffic with its other alliance partners.

### **Would new entrant carriers move from Gatwick?**

Mr. O’Leary, CEO of Ryanair, was quoted<sup>33</sup> as saying that there was no way of moving budget airlines out of Gatwick. While probably true – it is likely that there is no legal way government or airport operator could force an airline to go to another airport – it is not the whole story. If the commercial incentive was sufficient, no doubt they would move.

If the move of a major part of the OneWorld operation to Gatwick led to a significant increase in the value of its slots<sup>34</sup>, new entrant airlines would be quite likely to sell them and acquire cheaper slots elsewhere – especially if that “elsewhere” suited their business model better than a quality airport like Gatwick. They like a quick turn-round: they do not like big congested airports.

Legacy carriers, by contrast, need big busy airports for their business model. So it is considered likely that enough carriers would move from Gatwick to make this work.

### **Conclusion**

The overall conclusion is that there are circumstances under which this proposal could work.

It does make a sweeping assumption that if a passenger can make the transfer in 45 minutes, so can their checked baggage. No doubt the baggage handling system will need enhancement at both ends to deliver bags to and from suitably equipped vehicles on the trains. They would need to go by rail to make the connection within the MCT.

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<sup>33</sup> “Airports rail link fails to carry industry” by Andrew Parker, Jim Pickard and Mark Odell in the Financial Times, 8-9 October 2011, page 3

<sup>34</sup> In a report on the sale of BMI by Lufthansa, it was reported that the value of its 56 slot pairs at Heathrow was around £500m (in “Lufthansa”, in the Financial Times, 23/12/11). In a report on the demise of Air Southwest, 4 pairs of slots at Gatwick were thought to be worth £3m - £5m (see “Gatwick slots could bring airline millions” in “This is Devon” 1 February 2011, accessed 21 February 2012 <http://www.thisisdevon.co.uk/Gatwick-slots-bring-airline-millions/story-11672754-detail/story.html>)

The baggage handling system at Terminal 5 is underground, with an underground transfer system to Terminal 3 undergoing final operational trials with full live operation expected in mid 2012<sup>35</sup>.

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<sup>35</sup> BAA (SP) Ltd. news release 22 February 2012: “Results for the year ended 31 December 2011”

## **8. Rail Traffic**

### **Introduction**

Current plans are in terms of an airside connection – rightly, since the system is unlikely to work with a wholly landside connection. The complications of passing through security at each end would add significant time to the journey, and add a major element of unpredictability to the connection time.

Good emergency procedures and contingency plans would be needed, because the passengers on the inter-airport trains would not legally be in the UK. The precedent of the Eurostar operation may be useful.

Could the system be used by people interlining from an international flight to a domestic flight?

People transferring from international to domestic flights need to go through Customs and Immigration controls at their port of entry to the UK before boarding their domestic flight.

It would probably be possible for such passengers to go through border controls at the airport from which their domestic flight departed. If they did and they needed to change airports, they could catch the inter-airport airside train, and then move from airside to landside through immigration before catching their onward domestic flight.

### **A separate landside link?**

Given that the main concept would only work with an airside link, is there value in considering allowing landside passengers to use the same inter-airport system – obviously, using completely segregated or possibly completely different stations or platforms at the airports?

These passengers could use separate trains, using different (landside) stations or platforms. Alternatively – and probably more efficiently – trains and platforms could be physically separated into landside and airside areas.

There is likely to be a demand from airline staff to move between airports, and this would be an efficient way for them to do this.

It would also potentially help with the problem of the international to domestic passengers outlined above: they could go landside at the airport of arrival and then catch the landside train to their airport of departure.

If separate platforms or stations were used, the need for high speed points and junctions needs to be borne in mind. Operating high speed trains reliably every five minutes is feasible (see footnote 27 on page 20), but any additional complications add risks.



It is interesting that the proposal for the Hong Kong – Shenzhen inter-airport connection started with an airside system and a possible domestic overlay – as suggested in the preceding paragraphs – and now seems to have moved to become a wholly landside system. However, it is not clear how far that could be used as a parallel. See section 12 on page 38 for more on this proposal.

### **Rolling stock needs**

The following discussion is an essential input into consideration of the scale of the rolling stock requirement.

There is a need to know likely passenger volumes in order to assess likely train sizes (and, to a degree, things like platform lengths: these will have an impact on infrastructure costs especially since the two stations are planned to be in tunnel under airports).

It is known that around 25 million (37%) of Heathrow's 67m annual passengers interline at the moment. Interlining figures for Gatwick are unlikely to be useful because traffic patterns are likely to change considerably under this proposal.

Probably the best way of forecasting Heathrow's interlining traffic is the following three-stage process.

First, assume the number of passengers/ATM at Gatwick in future is the same as that at Heathrow now.

This gives a likely maximum number of passengers using Gatwick. It is certainly possible to get more ATMs at Gatwick<sup>36</sup>, but it is also valuable to leave some white space in the schedule for resilience in the system.

Then assume that the interlining percentage at Gatwick in future is the same as at Heathrow today.

Thus the total number of interlining passengers at the combined airport is that percentage of Gatwick's future passengers plus the present number of Heathrow's interlining passengers.

Clearly, not all Heathrow passengers are OneWorld passengers, so that would be an upper limit. Equally, it is unlikely that all would interline between airports, so some percentage of the total needs to be taken – perhaps 75%.

Gatwick has 247 ATMs today, but 126 passengers/ATM compared with Heathrow's 142. If Gatwick attained Heathrow's passengers/ATM figure, that would give the airport 35m annual passengers, compared with 31m today – a 13% increase (see section 5 starting on page 13 for the base figures).

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<sup>36</sup> See footnote 20

These 4m additional passengers represent the capacity directly generated by Heathwick.

If 37% of Gatwick's passengers interline, that gives 13m: add these to Heathrow's 25m to get a total interlining number in a combined airport of 38m.

One then needs to move into assumptions about the likely percentage of these which are BA/OneWorld Alliance passengers, and of those the percentage likely to need to interline between airports, and the likely peak within that.

According to "Connecting passengers at UK airports"<sup>37</sup>, 15.3m or about 61% of Heathrow's interlining passengers are carried by OneWorld member airlines.

If 50% of those needed to interline between airports, that would give a maximum annual figure of 7.65m. So the peak day might see 1% of these (76,500) and the peak hour of the peak day a fifth of these (15,300, or around 8,000 in each direction).

The importance of frequency was highlighted on page 17, where it was suggested that a five minute interval between trains was the maximum necessary to reliably achieve a 45 minute MCT. 12 trains an hour carrying a total of 8000 passengers means nearly 700 on each train in the peak hour of the peak day.

A modern single-deck train can accommodate around 100 seated passengers in a carriage<sup>38,39</sup>. So each train would have to comprise at least seven cars, plus accommodation for checked interlining baggage.

It would, of course, be possible to have more than one class of accommodation. This would allow passengers flying in First and Business class to have an equivalent for their transfer: it might (by selling upgrades) earn some revenue. It would possibly need additional rolling stock, because the seating is likely to be less dense in a higher class of accommodation.

It may seem unnecessary to have two classes for a 15 minute journey – but Heathrow Express, after much research, found that it was valued and justifiable.

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<sup>37</sup> CAA November 2008

<sup>38</sup> A double-deck train could well carry more, and if the internal space is properly designed, should not take longer to load and unload than a single-deck train. However, ideally with air passengers it is a good idea to eliminate steps. In addition, structures – in particular tunnels – would have to be bigger.

<sup>39</sup> Trains on HS2 will carry up to 1100 passengers in two 550-seat units, according to "High Speed Rail" House of Commons Transport Committee Tenth Report of Session 2010-12, Volumes I and II published 8 November 2011

If the journey time is 15 minutes end to end, then each train could easily manage one round trip each hour. This allows 15 minutes at each end for loading and unloading, as well as for terminal and preparation work. With a five minute interval – 12 trains an hour each way – that implies a need for 12 7-car train-sets in circulation, plus two maintenance spares.

Reducing the turnaround time to ten minutes reduces the requirement to ten trains in operation simultaneously: reducing it to five minutes brings it down to 8. However, this will impact on reliability.

## 9. What might it cost?

### The likely route

It is difficult to speculate on the likely route. The area between the two airports is either densely populated, or valued countryside, or both.

Assuming that the station at Heathrow is under Terminal 5, then it is possible that a western exit would be used. This was selected for the now-abandoned Airtrack project because it was so obvious: as far as Staines, the line could follow the track of a disused railway. However, even this raised local issues: Stanwell Moor, north of Staines, is a Site of Special Scientific Interest (SSSI) and therefore protected to a degree from development<sup>40</sup>.

The route obviously needs to be in tunnel at both ends: on the precedent of the HS2 route, much of the rest is likely to need to be in cutting or shallow tunnel.

At some point the railway would need to cross the M25 London Orbital motorway and the North Downs. The latter in particular is likely to need tunnelling – for landscape impacts, rather than to minimise gradients, which matter less than curves to modern high speed trains.

Speculation about the route in more detail than this is unlikely to be valuable. It needs more survey work than IARO is equipped to do.

Certainly there is no obvious route: apart from the disused railway between the Terminal 5 area and Staines, there are relatively few rail rights of way going in the right direction. The road distance – a route following the M25 – is 70 km<sup>41</sup>. Even that would not avoid sensitive countryside<sup>42</sup>.

Ms. Borwick's second report (see reference 5, page 9) assumes that the route will follow the M25, and that the journey time will be 'about 20 minutes' (see page 8 of the reference). It says that the line will 'hug the M25'<sup>43</sup>. It could be airside, which would achieve the fastest transfer time, or it could be a landside extension of HS2, with potential for use for freight (because 'over half of UK air freight passes through Heathrow').

The impact of some of these assumptions on the MCT appears not to have been thought through.

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<sup>40</sup> Which led to plans for Airtrack to use third rail, rather than overhead, electrification south of the airport

<sup>41</sup> "Airports rail link fails to carry industry" by Andrew Parker, Jim Pickard and Mark Odell in the Financial Times, 8-9 October 2011, page 3

<sup>42</sup> Leading to a reflection from Willie Walsh, Chief Executive of International Airlines Group, that it would be more difficult to deliver and more expensive than a third runway at Heathrow

<sup>43</sup> Presumably to reduce impacts on sensitive local communities, receiving little benefit from the service

In particular, achieving a robust MCT with a landside link appears doubtful because of the need to clear Customs and Immigration before boarding the train.

The M25 distance is said<sup>44</sup> to be 70km. 68 km in 15 minutes implies an average speed of 272 km/h, which is still feasible.

## **Construction**

Significant experience of the construction of high speed rail lines exists, especially on continental Europe. Spain seems to have the cheapest way of doing things, but UK experience is not insignificant – and perhaps even more relevant depending on progress with HS2.

In 2009, a major report on HS2 was published<sup>45</sup>. Chapter four of this gave valuable information about the likely cost of building a high speed railway. Figure 4.1i has been used as a key source, and the Annex to this report (on page 44) reproduces this and explains the exact calculation stages.

In the report, the mean estimated total cost for the basic London - Birmingham line (assumed for simplicity to be 200 km) is £16,514m at Q3, 2009 prices. This includes

1. four stations costing £1,630m,
2. “Additional items – people mover and rail reconstruction work” at £420m,
3. A rolling stock depot at £250m,
4. £175m in existing rail interface costs, and
5. £6,443m for risk - £2,226m in construction risk and £4,217m in additional scheme risk. The second figure is assumed to be around 40% of the pre-risk total.

To derive a cost/km with no risk allowance, these five items need to be deducted. The result needs to be divided by 200 to reach a cost/km: that needs to be multiplied by 50 to give a cost for Heathwick.

The cost of the two stations (Heathrow and Gatwick) needs to be added, together with the cost of a depot. Both, of course, would be smaller and therefore cost less than those required for the HS2 project.

The risk figure then needs to be re-calculated on the basis of the new total.

As explained in the annex (page 44), the resultant broad estimate of the likely capital cost is £4,494m.

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<sup>44</sup> See reference 41, page 27

<sup>45</sup> “High Speed Rail London to West Midlands and beyond – a report to Government by High Speed Two Limited”, December 2009

## **Rolling stock**

The previous section assessed the rolling stock needs as 14 7-car trains.

Figure 4.1j gives a unit cost/vehicle for a captive fleet of £2.45m: for the 98 vehicles assumed to be needed for Heathwick this gives a cost of £240m<sup>46</sup>.

The fleet size could be reduced by reducing turn-round times, which would increase reliability risk. This is discussed on page 27.

## **Total up-front cost**

Total initial capital outlay is therefore £4,734m.

## **Operations**

A recent report from the UIC<sup>47</sup> gives infrastructure, operating and maintenance costs for high speed rail in France and Spain. The costs include shunting and train operations, maintenance of rolling stock and equipment, maintenance of infrastructure, energy, and sales and administration.

For France, the cost is €56,800/km/year and for Spain, €67,000. These are at 2008 prices. €67,000 is approximately £56,000. A figure of £60,000/km/year for an 80 km railway gives a cost of £4.8m a year.

## **Validation**

The HS2 report cited above (see footnote 45 on page 28) has been used for validation of some of the UIC figures. The result is significantly higher: the higher figure has been used in this report.

Paragraph 4.1.24 gives an energy cost for a 200m train of £2.8/km. While the trains on the Heathwick route would be shorter, this latter figure has been used unchanged.

12 trains an hour each way over 50 km means 1,200 train/km/hr or 24,000 in a 20-hour day, giving energy costs of £8.76m/year.

Train crew numbers have been based on the Heathrow Express operation, which is assumed to be sufficiently similar to Heathwick to be a good comparator. Heathrow Express runs four trains/hour each way 19 hours a day: basic journey time is 23 minutes between Paddington and Terminal 5.

They employ just over 100 drivers (including supervisory and training staff): it is therefore assumed that Heathwick, with 12 trains/hour each way, would need three times this, at around £30,000 a year: total cost, £9m.

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<sup>46</sup> Rolling stock could be leased, of course, but someone has to buy it

<sup>47</sup> "High speed rail and sustainability", Paris November 2011, by SYSTRA for the UIC

As explained below<sup>48</sup>, it is assumed that there would be no charge, no fare, for the main (airside) component of the railway. This would be part of the air fare paid by the passenger. Hence there would be no need for ticket sales or revenue protection staff.

It is also likely that the stations and trains would be built to the highest modern standards, in particular with platform screen doors. This would simplify train dispatch arrangements – it would be much easier to prevent people from trying to board as the doors were closing. So it is assumed that there would be no platform staff either.

In practice, no doubt there would be, with cctv monitoring. Some level of accidents and incidents is inevitable. But the associated costs are assumed to be minimal.

Cost have recently been quoted for the TGV Rhin-Rhône, which opened on 11 December 2011<sup>49</sup>. The line, through relatively undeveloped countryside, is 140 km in length. It cost €2.5bn to build, plus €1bn for 30 TGV Duplex trains at €30m each.

The cost/train, at €30m for two power cars and 8 double deck trailers<sup>50</sup>, is in line with the £2.45m/vehicle in the Rolling stock section on page 30 above.

The cost/km of line, at €18m, is less than half the £38m calculated in the annex (page 44). This is presumably because of the nature of the line, with limited earthworks and structures being necessary.

### **Rolling stock maintenance**

Paragraph 4.1.24 gives a rolling stock maintenance cost of £2.8/km. 12 trains an hour each way over 50 km means 1,200 train/km/hr or 24,000 in a 20-hour day, giving rolling stock maintenance costs of £8.76m/year.

### **Track maintenance**

Track maintenance costs are more difficult to find.

Variable track access charges<sup>51</sup> have been quoted in the recent discussions of the IEP project in the technical press.

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<sup>48</sup> See section headed “Rail operators” on page 33 below

<sup>49</sup> “Rhin-Rhône TGV opens to the public” in Modern Railways January 2012, page 74

<sup>50</sup> <http://tgveurofrance.com.pagesperso-orange.fr/materiel-roulant/tgv-duplex/indexen.htm>, accessed 13 January 2012

<sup>51</sup> not the same thing, of course

Informed Sources in Modern Railways August 2011<sup>52</sup> quotes a Parliamentary written answer of 20 June to the effect that a 5-car electric IEP would have a variable access charge of £1.03/mile (roundly 20p/vehicle-mile). The article thought that these were high, citing 12.53p/vehicle-mile for a class 185 Siemens Desiro dmu, 14.06p for the motored car of a class 390 Pendolino or 11.07p for a Siemens class 444 emu.

The issue was followed up in the same column a month later<sup>53</sup>. This gave Network Rail figures of £1.07/mile for a 9-car bi-mode IEP.

If one takes £1.07/train mile (£0.66/train-km) for a 7-car Heathwick train, one gets a figure of £5.8m a year (using the train/km figure calculated above).

In Railway Technical Review issue 1 2008<sup>54</sup>, it was noted that annual infrastructure maintenance costs were around €70k - €90k /line km. Taking the €90,000 (£75,000) figure and multiplying by 50 km, one reaches a cost of £3.75m.

It is concluded that the maintenance of 50 miles of dual high-speed line is likely to cost around £5m/year.

### **Summary**

The calculations on page 30 above show a likely capital cost (including rolling stock) of £4,734m<sup>55</sup>.

The likely annual operating cost is

£8.76m energy

£9.0m drivers

£8.76m rolling stock maintenance and

£5.0m track maintenance

which gives a total of just over £31m a year.

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<sup>52</sup> Page 26: "IEP – Theresa’s amazing numbers don’t add up"

<sup>53</sup> Page 28: "IEP Weird numbers update"

<sup>54</sup> Page 6, "UIC Highspeed 2008"

<sup>55</sup> Reassuringly similar to the £5bn quoted in "Heathwick: two become one?" by Paul Clifton in Rail Professional, November 2011 page 14



## 10. Who would pay for this?

### Who pays?

Who would pay for the project is a key question, with no easy answers.

One beneficiary will be the air transport industry, if the proposal works as planned. More passengers will be able to go through the London airports system – which, of course, now more than in the past has a fragmented ownership.

Society too, it could be argued, is another beneficiary, assuming that air travel has a positive impact on GDP and happiness.

### Airlines

Assuming that it is BA who accepts the split airport operation, their operating costs are likely to increase. They have some facilities at both airports today, but are likely to need more. In addition, it is virtually certain that a split operation will reduce the probability that key assets are in the right place when wanted.

So while they are likely to make more money by being able to carry more people (by acquiring more slots at Gatwick), they will also incur higher costs.

Other Heathrow-based airlines are unlikely to be willing to pay. They will see no real benefit, unless a significant number of BA slots at Heathrow is relinquished.

Airlines assumed to move from Gatwick to other airports will receive a windfall gain on the slots they sell<sup>56</sup>. These airlines could be targets for a government in search of funding. However, if those windfall gains are taxed too much, they will not be worth having: it will not be worthwhile for those airlines to move airports.

### Airports

Airports (apart from Heathrow – see “Potential impact on Heathrow” on page 35) are likely to gain traffic and therefore increase their landing fees, parking revenue and retail and catering income.

This could be significant – hypothetically, with the move of all low fare traffic from Gatwick to Stansted and Luton, and much new long-haul business traffic at Gatwick.

Whether this is enough to expect a specific contribution to the project from those airports, or whether normal business taxation is all that can be reasonably expected, is a matter for debate.

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<sup>56</sup> Around £5m/slot pair – see footnote 34 on page 21

## **Rail operators**

Airside traffic, and landside transfer traffic (international to domestic) will effectively be free of charge. Passengers will pay for the transfer within their fare: it would be unreasonable to expect them to pay more for (arguably) a lower quality journey! Presumably the fare for an interlining journey will be the same whether the interlining is within a terminal, between terminals or between airports.

There could be some scope for additional earnings from landside traffic – mainly aircrew, probably. As discussed in the next section, there may be scope for other operators to use the railway too. Income from these is likely to be trivial.

## **Government**

It is concluded that substantial government funding is likely to be necessary.

The justification for this is that the proposal implements government policy, improves tax revenue and helps solve the problem of London area runway capacity.

## **11. Beyond Heathwick**

### **Introduction**

The potential impacts on individual airports and on other parts of the UK transport network are interesting.

The following possibilities are highlighted.

### **Potential impact on Heathrow**

Heathrow is likely to experience a small loss of passengers.

BA is unlikely to give up any of its existing slots at Heathrow. Instead, it is likely to start to serve currently un-served destinations or fly to places it currently serves but more often.

Either way, the likely result is that it will use smaller aircraft with fewer seats and therefore fewer passengers/ATM.

It is likely that other airlines will see no change in passenger numbers from the project.

### **Potential impact on Gatwick**

Gatwick is likely to see a major increase in passenger throughput, as legacy carriers displace new entrant carriers and use larger aircraft.

The financial impact of this is likely to be positive.

The Mayor of London has been quoted as saying that a second runway at Gatwick is essential to the scheme<sup>57</sup>. That would further increase the potential of Heathwick.

### **Potential impact on Stansted and Luton**

These airports are likely to see a substantial increase in traffic, in their classic markets (especially low fare). This will be the result of flights moving from Gatwick.

To make a broad assessment of this, it is assumed that both Luton and Stansted will reach the same annual ATM figure as Gatwick today, but will have the same number of passengers/ATM as they do today.

Both are, like Gatwick, single-runway airports so conceptually each could achieve the same number of ATMs as Gatwick (although there may be legal or logistical impediments to doing so).

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<sup>57</sup> "Heathwick: two become one?" by Paul Clifton in Rail Professional, November 2011 page 15

Their traffic mix is likely to remain the same – predominantly new entrant and charter traffic – and the carriers are unlikely to change their fleet mix. The Boeing 737 and Airbus A320 families fit their needs very well.

From the section starting on page 14, it is known that Gatwick has 247,000 ATMs a year, Stansted 157,000 and Luton 78,000. Passengers/ATM at Stansted are 118, and at Luton 111. The number of additional passengers possible by increasing the annual ATMs to Gatwick's level is therefore 10.6m at Stansted<sup>58</sup> and 18.8m at Luton<sup>59</sup>, a total of 29.4m.

28m passengers at each of these airports may look high, but it is in line with the figures produced in connection with the major government consultation on air transport ten years ago<sup>60</sup>. This said that Stansted's capacity was 35m and Luton's 31m (in the latter case, with a realigned or moved runway)<sup>61</sup>.

Again, the revenue impact is likely to be positive, from landing fees, duty free sales and parking revenue. Associated costs, particularly at Luton, are likely to be high.

This is not a Heathwick effect as such – it could happen without the project – but it is likely to be accelerated by Heathwick.

### **Potential impact on Birmingham and Manchester**

The impact on these two airports will depend on other uses of the new railway.

It is highly likely that the new line will only be usable by trains with the same performance characteristics as the inter-airport trains – trains which can achieve an average speed well in excess of 200 km/h, and can use the signalling, electrification and control system used by them.

With a landside connection between Heathrow and Gatwick, and with an HS2 connection into Heathrow, it would be possible to run trains from Birmingham and Manchester (and further north) into Gatwick as well as into Heathrow (making the not unreasonable assumption that the trains would be compatible with both HS2 and the new line).

This may be something a train operator would wish to do: it is unlikely to be in the interests of Birmingham and Manchester airports. Better connections together with a wider range of flights is likely to attract traffic away from those airports.

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<sup>58</sup> (247m -157m) x 118

<sup>59</sup> (247m – 78m) x 111

<sup>60</sup> See “The future development of air transport in the United Kingdom: South East” second edition, February 2003

<sup>61</sup> Pages 77 (Stansted) and 94 (Luton)

The operational risk to the core service also needs to be considered here. A five minute interval service of airside high speed trains is perfectly feasible<sup>62</sup>. This report has discussed super-imposing a separate landside service, possibly serving different platforms at the two airports. Adding to that a long-distance service is possible but it does increase the risk of conflicts and delays. Adding junctions adds to the complexity and reliability risks: it may also add to journey time because of the limits to the maximum speed attainable over a junction.

That said, with appropriate design, it is likely to be possible to run trains every 2½ minutes. One design feature likely to be necessary is a high-speed junction between airside and landside systems, at the two airports. Trains will need to be able to run as fast as possible as far as possible: the faster they can approach the stations the better. This demands high speed points.

### **Air cargo**

Given that the trains will have to carry checked baggage, could they also carry air cargo? Or could additional cargo trains be run?

This is unlikely to be feasible except in highly specific cases. The cargo area of Heathrow is close to Terminal 4, some distance from Terminal 5, so ordinary aviation cargo is likely to have to travel too far to get to the station. However, possibly BA's air cargo – at least, that part carried in passenger planes – might be able to be transferred between airports in this way.

It would need a direct connection between the surface cargo area and the underground railway. Transfer facilities would be necessary – as they would for checked baggage.

A normal objection to carrying air cargo by rail is the incompatibility of airline containers – optimised for aircraft shapes – and trains. However, since this is a new railway, running along a purpose built dedicated line, rolling stock and infrastructure could be built with this in mind.

Dedicated cargo trains could run between dedicated cargo terminals. Containerised cargo can be carried on passenger trains, although loading cargo containers<sup>63</sup> onto trains carries a time penalty. It was assumed above that each train would have a 15 minute turn-round at each end of the journey. This is probably adequate for the volumes likely. Carrying cargo on passenger trains is likely to be more cost-effective than dedicated cargo trains – again, because of the relatively low volumes likely.

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<sup>62</sup> Two mixed traffic (freight and passenger) lines in Switzerland, equipped with ERTMS, achieve high speed at 110 second headways, according to “ERTMS in operation” by Clive Kessall in “The Rail Engineer”, January 2012 page 11

<sup>63</sup> Including, of course, pallets and other ULDs

## **12. Hong Kong – Shenzhen: project summary**

Hong Kong International Airport serves mainly international destinations, with relatively few flights to mainland China. Shenzhen's Bao'an airport is largely domestic, with virtually no international flights.

The initial concept was a 50 km airside high speed line connecting the two airports.

It was anticipated that passengers travelling between interior cities in China and international destinations would fly to Shenzhen, use the high speed line to access Hong Kong International Airport, and catch their international flight from there.

The line would be almost all in tunnel – under ground or (at the Hong Kong end) under water.

It would replace some if not all of the airside ferries which connect Hong Kong International Airport to a number of ports in the Pearl River Delta (including Shenzhen).

There were major uncertainties about whether or not it would work. The concept is fine, but airlines and passengers are likely to prefer a plane-to-plane interchange, transferring elsewhere.

Shenzhen is the hub of Shenzhen Airlines: Hong Kong the hub for Cathay Pacific, a member of the OneWorld Alliance. Because Cathay Pacific is a member of OneWorld, it is not likely to be interested in giving traffic to Shenzhen Airlines: it is likely to want passengers to use its subsidiary Dragonair to Hong Kong instead. Similarly other network carriers are likely to want their passengers to interline at Guangzhou or Beijing rather than Hong Kong/Shenzhen.

Other complications include border formalities (while Hong Kong is part of China, it has different entry requirements), and the planned Pearl River Delta bridge connecting Macau and Zuhai with Hong Kong (the point of entry to Hong Kong is close to the airport). There were also concerns about Hong Kong airport losing all its mainland China flights.

During development of the project, an opportunity was seen for the new line, the Western Express Line, to become a multi-purpose railway to facilitate the planning and development of Qianhai and the north-western part of the New Territories. This led to the line being seen as a landside connection, rather than an airside one.

The current status of the project – which has political support within China – is unknown. The main focus today is on the separate high speed line now under construction between Kowloon, Shenzhen and Guangzhou.

### 13. Similar projects elsewhere

#### Introduction

There are no precise parallels anywhere for what is being proposed.

There are many cities with more than one airport: there are several where more than one is rail connected and there are a few where two airports are directly connected by rail.

But only in one other place has this solution been proposed to solve a capacity problem.

#### Thailand

Phuket International Airport is reportedly congested and unable to expand. One solution put forward is a high speed rail link between the airports of Phuket and Krabi<sup>64</sup>. The journey time would be under an hour, at speeds of 180-200 km/h.

The concept here is slightly different to Heathwick, however. The two airports would not be integrated: instead, Krabi would take the traffic Phuket cannot. The railway would connect the two airports and other west coast resorts.

#### Dubai

The next nearest parallel is in Dubai.

At various times during the planning of Dubai's Jebel Ali (Al Maktoum) airport, there have been plans for a high speed inter-airport connection. While there are now plans for two metro lines – the Blue Line and the Purple Line – the initial ideas have been scaled down.

In 2005, it was intended that the Red Line would connect the two airports<sup>65</sup>. In addition, there was to be a new high speed underground metro line to link Dubai international airport with Jebel Ali airport. This would provide a five minute non-stop ride, and would open when the new airport started to receive passengers<sup>66</sup>.

In 2007, various reports showed developments to this idea.

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<sup>64</sup> See "Fly-Rail Link to 'Save Phuket Tourism'" by Chutima Sidasathian and Alan Morison in Phuketwan Tourist News, 20 February 2012, <http://phuketwan.com/tourism/fly-rail-link-krabi-aims-save-phuket-tourism-choking-death-15531/> accessed 19 March 2012

<sup>65</sup> Railway Gazette International April 2005 p186, "Dubai metro bids opened"

<sup>66</sup> Travelvideo.tv ([http://travelvideo.tv/news/more.php?id=4452\\_0\\_1\\_10\\_M56](http://travelvideo.tv/news/more.php?id=4452_0_1_10_M56), 16 March 2005 accessed 17 August 2005)

The Roads & Transport Authority announced that the 49 km 4-station Purple Line was to go ahead. It would provide express service between the existing airport and Jebel Ali airport, and would have in-town check-in<sup>67</sup>.

Another report<sup>68</sup> said that, “For at least the next several years Dubai is planning on having two airports. A dedicated 40 km light rail link will connect them in 20 minutes and a separate train will serve both airports along with 30 other stops along the Sheik Zayed Road”.

In 2008, there was a report<sup>69</sup> that a special bonded rail and road connection would connect Dubai and Al Maktoum airports, 40 km apart.

By 2009, the Purple Line seemed to have been downgraded to an ordinary metro, connecting the two airports<sup>70</sup>.

### **Australia**

At the conceptual stage is a heavy rail link between the airports of Brisbane and Coolangatta. It is unclear from the available documentation exactly what the rationale is, but there is certainly a plan to connect the two airports by an express rail link. The existing railway serving Brisbane airport, to the north of the city, continues south of the city to Robina, at the northern end of the Gold Coast resort area. Plans are for it to be extended southwards to Coolangatta Airport.

### **Other inter-airport rail connections**

In Paris, Charles de Gaulle and Orly airports are connected by the RER Line B, a multi-stop commuter railway. At Orly, passengers need to access the terminals by automated people mover.

Both airports are on the Grande Ceinture orbital route round Paris, although the station serving Orly is a 20 minute shuttle-bus ride away from the terminals. There are proposals to enhance the Orly quadrant of the line, with a TGV station nearer to the two terminals.

In London, Gatwick and Luton airports are connected by the Thameslink north-south cross-city commuter railway. At Luton, a shuttle bus connects airport and station.

There are proposals for a subway connection between Istanbul’s two main airports.

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<sup>67</sup> Railway Gazette International June 2007 p336.

<sup>68</sup> in Airline Business June 2007 p42, “Daring to dream” by Ghanem Al Hajri

<sup>69</sup> in Janes Airport Review June 2008 p10

<sup>70</sup> see Tramways and Urban Transport February 2009 p67, “PB picked for Dubai consultancy”



There is a direct connection between Narita and Haneda airports operated by the Keihin Railway: it opened in 1998, with a journey time of 105 minutes.

There are plans for a faster connection, although the status of these is unknown. Until 2010, Haneda was almost exclusively used by domestic flights and Narita almost exclusively by international ones: however, a new runway and a new international terminal at Haneda opened on 21 October 2010 and many international flights started to use it. So the need for an inter-airport railway diminished.

In Seoul, Incheon and Gimpo airports are on the same commuter railway.

## 14. Conclusions

### Overall conclusions

The key conclusion is that the project could work and that overall benefits could arise.

However, it will be neither easy nor cheap.

It is estimated that the capital cost will be around £4,734m and the annual operating cost £31m.

Based on the calculations on page 26, Heathwick itself will add 4m (3%) to the annual passenger throughput of London's airport system: moving new entrant carriers to Luton and Stansted could add a further 29m at those two airports. The capacity of London's airports could therefore increase by 25%.

Construction of a 50km high speed railway through sensitive landscape, and persuading a major international airline group to split its operations between two airports – reversing a move made some years ago – will be challenging.

However, if it all works, the result could be 25% more passengers through the London airports system. This might be at the expense of regional airports.

### Alternatives

The alternative ways of facilitating more ATMs seem to be to build a new airport or to build new runways – and there were plans to do this at Heathrow, Gatwick and Stansted.

A new runway could be built – with some loss of historic sites – at Heathrow, or with less loss at Gatwick or Stansted. If it was built at Heathrow, it would give capacity for around 100m passengers/year<sup>71</sup>. An authoritative cost figure for this has proved difficult to find. However, Frankfurt's fourth runway cost €600m<sup>72</sup> (approximately £500m).

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<sup>71</sup> Based on "Expansion of Heathrow", House of Commons Library research paper 09/11, 4 February 2009 – 705m ATMs at 142 passengers/ATM

<sup>72</sup> "Frankfurt moves forward" by Tom Allett in Airports International December 2011, page 16

A new airport – and one in the Thames Estuary has been suggested on several occasions – is likely to cost £50bn and take 25 years to build<sup>73</sup>. It would give capacity around 150m passengers/year (although it is unclear if this assumes replacement of Heathrow<sup>74,75</sup>).

So Heathwick at around £5bn would give a 25% increase in the passenger capacity of London's airports: a new estuarial airport at ten times the cost would double the existing passenger capacity. A third runway in the South East is likely to cost £½bn and give a 20% - 25% increase in passenger numbers.

According to DfT forecasts, passenger numbers are likely to increase by 260% to 335m a year by 2050 (central forecast) – a downgrade from the previous estimate of 455m<sup>76</sup>. By implication, even one major additional airport for London will be insufficient.

### **IARO's role**

As has been noticed in other areas of air-rail intermodality, a number of different solutions has evolved in different places to solve similar problems.

The role IARO can play is to inform organisations about those different solutions and, where possible, their benefits and disbenefits. This approach is especially valuable to people wishing to introduce similar systems, but will also be of use to those already running them.

### **The future**

We hope to expand this report and keep it updated. Feedback from readers would be welcome.

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<sup>73</sup> "Connecting for growth: the role of Britain's hub airport in economics recovery" by Frontier Economics Ltd. for Heathrow, September 2011

<sup>74</sup> The promoters left the question open, but appeared to think that a two-hub system would not work so their airport would have to become the predominant one. See "Aviation : proposals for an airport in the Thames Estuary, 1945-2012" by Melvyn Helsey and Fintan Codd: House of Commons Library Standard Note SN/BT/4920, updated 19 January 2012

<sup>75</sup> In "Estuary life" by Bruce Hales-Dutton (Airports International January/February 2012 page 14), he quotes a House of Commons debate where the Chairman of the All-Party Aviation Group stated that NATS do not believe that a four-runway airport could operate with Heathrow the size it is today

<sup>76</sup> "UK aviation forecasts", DfT August 2011, <http://assets.dft.gov.uk/publications/uk-aviation-forecasts-2011/uk-aviation-forecasts.pdf>

## Annex

The steps in the process for deriving a construction cost for the high speed rail element were outlined briefly in section 9, “What might it cost?”, starting on page 28.

These steps are described in more detail here.

The process uses information from Chapter 4 of “High Speed Rail London to West Midlands and beyond – a report to government by High Speed Two Limited”, published in December 2009 and available on the DfT web-site at <http://webarchive.nationalarchives.gov.uk/20110202231927/http://www.dft.gov.uk/pgr/rail/pi/highspeedrail/hs2ltd/hs2report/>.

Figure 4.1i of that report is reproduced on the next page.

The process of getting from the cost of a 200 km high speed railway with four stations in that report to Heathwick’s 50 km line with two stations is as follows.

1. Deduct the two risk related entries
2. Deduct those entries which are not distance related – the stations, the depot, the people-mover and the rail interface costs
3. Divide by 200 to get an approximate cost/km
4. Multiply by 50 to get a cost for a 50 km railway
5. Add non-distance related items (stations and depots)
6. Add risk.

The total cost of phase 1 of HS2 is £16,514m.

Step 1 - Deduct risk (£2,226m and £4,217m) to give £10,071m.

Step 2 - Deduct stations (£1,630m), depot (£250m), the “Additional items – people mover and rail reconstruction work” at £420m, and the existing railway interface costs (£175m) to give a distance-related cost of £7,596m.

Step 3 - Divide by 200 to give a cost/km (£38m)<sup>77</sup>.

Step 4 - Multiply by 50 to give a cost for a 50 km railway (of £1,900m).

Step 5 - Add costs for two, rather than four, stations (assumed to be £750m) and a depot (assumed to be half the cost of the HS2 one - £125m). This gives a before-risk figure of £2,775m.

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<sup>77</sup> This is broadly in line with figures quoted in “High speed rail: international comparisons final report”, February 2004 (page 41) by the Commission for Integrated transport. These range from €10m to €48m/km (excluding the very high figure for the second phase of HS1, involving major tunnelling under London).

Step 6 - Add risk - construction risk at 22%, and 40% optimism bias (which appears to be added to the total before construction risk). The risk figure is £1,720m.

This gives a total cost for the new railway of £4,494m.

Figure 4.1i from the HS2 report.

Item	£m	Includes
Rail systems	349	Railway track, ballast, fencing, drainage, junctions
Control systems	200	Signalling Control and telecommunications
Traction Power systems	252	Overhead line equipment and power supply
Stations	1,630	Euston, Old Oak, Birmingham Interchange and Fazeley Street
Earthworks	686	Earthworks and retaining walls
Structures	561	All structures (primarily viaducts)
Tunnels	1,466	
Roads	143	Including major highways/motorway reconfiguration
Utilities	171	
Additional items	420	People mover and rail reconstruction work
Contractor administration costs	938	Preliminaries, site supervision, testing, training, spares
<b>Total Construction Cost</b>	<b>6,816</b>	<b>Excluding risk</b>
Ancillary Items	215	Primarily additional environmental mitigation
Land costs/compensation	930	Land acquisition/compensation plus administration of schemes
Rolling stock depot	250	Main depot and London stabling
Project overheads	727	Client and project management costs
Design	758	All design costs and topographical/ground investigation surveys
Existing rail interface costs	175	Possession/isolation management and TOC Compensation
Statutory charges	200	Consultation and planning consent related costs
Construction risk	2,226	Route section and route-wide construction risks from the Quantified Risk Analysis
Additional scheme risk provision	4,217	Provision for external risks in line with HM Treasury Supplementary Green Book Guidance
<b>Estimated Total Cost (Mean)</b>	<b>16,514</b>	<b>At Q3 2009 prices</b>


## **IARO's Air/Rail conferences and workshops**

Copies of the published reports of the earlier workshops and other research reports are available price £250 (free to IARO members). See [www.iaro.com/publications.htm](http://www.iaro.com/publications.htm). Papers presented at more recent workshops are available on CD-ROM at the same price.

Workshops are very focused, dealing in detail with a restricted number of key issues, and complement the regular Air Rail Conferences. Workshops and conferences (with site visits) have been held as follows.

- 1993 - Zürich
- 1994 - Paris
- 1996 - London (Heathrow Express, Stansted Express)
- 1997 - Oslo (Airport Express Train)
- 1998 - Hong Kong (Airport Express Line)
  - Frankfurt (with the AIRail station and the Cargo Sprinter)
- 1999 - Workshop 1: Berlin (the Schönefeld link)
  - Copenhagen (the Øresund Link)
- 2000 - Workshop 2: Milan (Malpensa Express)
  - Paris (plans for CDG Express)
  - Washington (Baltimore-Washington International Airport)
- 2001 - Zürich airport: Air rail links - improving the partnership
  - Workshop 3: Madrid (and its airport rail links)
  - London Heathrow (Heathrow Express)
- 2002 - Workshop 4: Amsterdam, for railways serving airports but not as their main job - "Help - there's an airport on my railway".
  - New York (the Airtrain projects)
- 2003 - Workshop 5: Barcelona. Today's design and funding issues for airport railways
  - Frankfurt (The AIRail project)
  - Workshop 6: Newark. Practical air rail intermodality
- 2004 - Workshop 7: Oslo. Leisure passengers - a market for airport railways.
- 2004 - Brussels (Thalys:Air France code-share)
- 2005 - Chicago (Chicago's future in an era of successful air-rail intermodality)
  - Shanghai study tour
  - Workshop 8: Edinburgh. Security on airport railways.

- 2006 – Workshop 9: Baltimore (BWI). Security on airport railways.
- Regional meeting 1: Stockholm
  - Workshop 10: Marketing and ticketing innovations (e-air-rail) Düsseldorf
  - Regional meeting 2: Kuala Lumpur
- 2007 –
- Los Angeles: Air/Rail East/West
  - Baltimore: The seamless journey
  - Vienna (Wien): Communications
- 2008 -
- October - London Gatwick. One-day conference on ticketing
- 2009
- June - Hamburg, with site visit to the new S-Bahn
- October – Vancouver: light rail to airports
- 2010
- October – Lyon, with a site visit to the LesLYS express tram to the city
  - November/December – Far East study tour (with AREMA)
- 2011
- October – Venice



Planned workshops and conferences

Please note that in future, it is planned to have IARO events around May and November each year

- 2012
- September – Berlin
- 2013
- June - Salt Lake City
- 2016
- May - Denver

Details are available from IARO, or on [www.iaro.com](http://www.iaro.com): you can sign up for details of future events in different parts of the world on [www.iaro.com/events.htm](http://www.iaro.com/events.htm)

Future plans are, of course, subject to change.