



Forecasting Airport Demand

Review of UK Airports Commission Forecasts
and Scenarios



Country-Specific Policy Analysis

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THE INTERNATIONAL TRANSPORT FORUM

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Report prepared for the UK Airports Commission by the International Transport Forum with David Thompson and John Jamotta.

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Introduction

The UK Airports Commission was established to examine the scale and timing of any requirement for additional capacity to maintain the UK's position as Europe's most important aviation hub and to identify and evaluate how any need for additional capacity should be met in the short, medium and long term. It is to make recommendations to the Government, underpinned by a detailed review of the evidence in relation to the current position in the UK with regard to aviation demand and connectivity, forecasts for how these are likely to develop, and the expected future pattern of the UK's requirements for international and domestic connectivity.

The Airports Commission requires an external view on whether its forecasts yield plausible results, taking into account the ways in which the future of the aviation market may develop, prompted by comments received during stakeholder consultations on the forecasts and scenarios developed. The present report summarises a review of the forecasts prepared by the International Transport Forum together with independent experts John Jamotta and David Thompson. The team was asked to provide views on the appropriateness of the outputs produced, on the most robust central scenarios and on any scenario results that should be treated with particular caution. It was also asked to examine one aspect of the methodology used in developing the baseline forecast, the module allocating traffic between London's airports. The work builds on reports on likely airline responses to runway expansion under some of the scenarios prepared by the International Transport Forum together with SEO Economic Research (ITF/SEO 2014 and 2015).

The structure of the report is as follows. In Chapter 2 we assess issues raised about the National Air Passenger Allocation Model (NAPAM) that the Airports Commission used to forecast the allocation of traffic between different UK airports. In using the model, the Airports Commission adopted five scenarios to explore the different ways in which developments in airline business models might shape demand at different airports. In Chapter 3 we examine issues raised as to the relevance of these scenarios. SEO/ITF (2014) assessed potential airline responses – in terms of service provision – to expansion of runway capacity under the scenarios in order to estimate impacts on connectivity and welfare. The issues raised as to the likelihood of these responses are examined in Chapter 4.

Figure 1.1. Modelling sequence and structure of the report



The Airports Commission forecast scenarios were determined in the context of a bubble economy that had seen rapid expansion of Asian markets and then a deep recession following the 2007/8 financial crisis. Interest in direct connections from London to secondary airports in the fast growing Asian markets and fears of profound impacts of the crisis in shaping the long-term development of the global and European economies played a major part in designing the Scenarios, as did expectations that new aircraft technology would drive new airline business models. The scenarios were designed to provide contrast to test possible different development paths rather than to establish a range of forecasts to different degrees of probability around a central baseline projection.

The Airports Commission adopted the following five qualitative scenarios. These scenarios were developed for the Commission's Interim Report¹ and then updated for the purpose of the Commission's appraisal of its shortlisted options:

A. Assessment of need scenario.

The Assessment of need scenario develops a forecast of future demand determined primarily in relation to past trends and central projections of GDP, global oil prices, population etc. taken from external sources and used in economic projections produced by other government departments.

B. Global growth.

This scenario is characterised by higher aviation demand levels in the UK driven by strong economic growth in Asian economic and increasing economic integration. Existing major aviation hubs and alliances strengthen. Liberalisation of aviation markets continues. Continued growth of the middle class leads to strong demand growth. Middle East carriers continue to grow. Global airline alliances further strengthen the global hub network, benefiting from a new generation of fuel-efficient aircraft.

C. Relative decline of Europe.

This scenario also shows high aviation demand levels driven by strong economic growth in Asian economies and increasing economic integration. However, it assumes aggressive competition between the legacy carriers and new market entrants from emerging economies. This results in a decline in the importance of the European aviation hubs as European airlines are frequently out-competed by Middle Eastern and Asian carriers. Middle Eastern carriers use new aircraft technology to by-pass the major European hubs and fly directly into secondary European cities. The role of global alliances declines.

D. Low cost is king.

Scenario D assumes a growing role for low-cost carriers. They enter long-haul markets and self-connecting becomes more common for passengers. The importance of hubs and network carriers declines throughout the world. Liberalization of aviation markets worldwide continues. Low-cost carriers use new aircraft technology such as Boeing 787 and Airbus A350 to enter long-haul point-to-point markets. The low-cost carriers have little incentive to enter into formal alliances.

E. Global fragmentation.

Scenario E assumes a decline in global economic and aviation growth. The world economy fragments and liberalisation stalls. Countries turn inward, adopting protectionist and interventionist policies. Global aviation markets suffer from protectionism and a global economic slowdown. Airlines compete aggressively for a relatively small pool of passengers, resulting in a partial break-up of alliances. New long-range aircraft enable more markets to be served point-to-point.

1 <https://www.gov.uk/government/publications/airports-commission-interim-report>

The earlier reports prepared by the International Transport Forum with SEO Economics examined potential airline responses to expansion of runway capacity at either Gatwick or Heathrow airport under a selection of the scenarios and modelled the results in terms of changes in connectivity and welfare. The results of this exercise were released at the same time as the Airports Commission twelve-week consultation on shortlisted options for a new runway in the south east.² The principle documents reviewed in the present report are as follows; the Government reports are available through the Airports Commission website³ and a synthesis of the stakeholder submissions will be published in the summer of 2015.

Government Reports:

- Airports Commission Interim Report, December 2013.
- Strategic Fit Forecasts, Airports Commission, November 2014.
- UK Aviation Forecasts (National Air Passenger Allocation Model), Department for Transport, January 2013.
- Peer Review of National Air Passenger Allocation model, John Bates Services, October 2010.

Stakeholder Submissions:

- Board of Airline Representatives in the UK (BAR)
 - Response to Airports Commission public consultation Assessment of proposals for additional runway capacity at Gatwick and Heathrow airports.
- British Air Transport Association (BATA)
 - Response to Airports Commission consultation on its short-listed options and assessment.
- British Airways (BA)
 - Response to the Airports Commission Public Consultation on new runway capacity in the South East.
- EasyJet
 - Response to the Airports Commission consultation.
 - Report on future demand at London airports in the context of the work of the Airports Commission, Seabury Group.
- Gatwick Airport Ltd.
 - Supporting Traffic and Competition Analysis.
 - The Importance of Airport Competition on Air Fares Paid by Consumers, InterVistas.
 - Assuring Connectivity in the UK’s Air Transport Market, Issues in the debate on London air transport capacity, InterVistas.
- Heathrow Airport Ltd.
 - Projections on Future Airline Business Models and Response to International Transport Forum Report - Expanding Airport Capacity: Competition and Connectivity, JLS Consulting.
 - Airport Charges Structural Review consultation document.

2 <https://www.gov.uk/government/consultations/increasing-the-uks-long-term-aviation-capacity>

3 <https://www.gov.uk/government/organisations/airports-commission>

- Connecting for growth: the role of Britain's hub airport in economic recovery, Frontier Economics.
- Heathrow Hub Ltd.
 - Commentary on Gatwick airport expansion: Pricing issues, Oxford Economics.
- Independent Transport Commission
 - Response to the Airports Commission Consultation.
- Virgin Atlantic
 - Response: Airports Commission final consultation on shortlisted options for new capacity.

Allocating Traffic between London's Airports

In this section we examine issues relating to the National Air Passenger Allocation Model (NAPAM) and questions that have been raised about the validity and robustness of the modelling analysis used to forecast the allocation of traffic between different UK airports.

The Passenger Allocation Model

The purpose of the model is to estimate how passengers making trips to and from the UK choose between UK airports, and also how international-to-international transfer passengers choose between a UK and an overseas hub airport at which to interline (see Airports Commission (2014) for a detailed account). The model dis-aggregates passenger flows according to 455 districts of origin/destination in the UK, and according to foreign destination, nationality and journey purpose.

The factors that influence choice of airport and can be incorporated in the model are clearly identified. It should first be noted that surprisingly, despite considerable research, it has not proved possible to identify a statistically significant link between air fares and a passenger's choice of airport in the UK. This is perhaps because of difficulties in obtaining reliable fares data. The main factors which have been found to shape a passenger's choice of airport are surface access costs (time and money), flight frequency, flight time and the customer airport experience. The model also incorporates a factor designed to account for congestion at airports operating close to capacity. This factor is added to the cost function to bring demand into line with capacity in the model. This is effectively a shadow cost for congestion and represents the general inconvenience of using an overloaded airport (which might involve a local fare differential but which might also represent things like increased parking charges, longer transfer times, and so on). The strength of each of these factors in shaping choices is estimated statistically so as to maximise the model's accuracy in predicting current choices.

A review of the technical provenance of the aviation modelling system has been carried out for the Commission by Professor Andreas W. Schafer. The over-arching conclusion from his very clear assessment is that the “scale, capability and level of detail of the DfT aviation model system is impressive” and that he is not aware of “a Transport Department in any other country having this kind of apparatus available”. Specifically in relation to the National Air Passenger Allocation Model, Professor Schafer notes that the Commission “has extensively validated and extended NAPAM through reproducing the observed passenger flows, and related air traffic movements, at major UK airports and non-UK hubs for the 2011 base year”; and that repeating the exercise for 2013, using the 2011 coefficients, “resulted in only minor differences between model outputs and observations”.

This assessment provides a solid basis for confidence in the model's results. Nevertheless, the respondents to the consultation have raised a series of issues on the ways in which the model has been used to produce forecasts of future traffic levels at the different London airports. The issues which seem to us to be of the greatest relevance fall into four broad groups, as follows:

Recognising Gatwick's record of growth (section 2.2). The argument here is that the Commission's analysis fails to fully recognise Gatwick's record of relatively strong growth during the last decade. In consequence, it is argued, future growth at Gatwick is under-estimated and future growth at Heathrow over-estimated.

Reflecting air fares (and/or airport charges) in the analysis (section 2.3). The argument here is that the exclusion of air fares from this part of the analysis – despite the wider research evidence and commercial experience which together both strongly suggest that they should be relevant – will act to bias the results against those airports with lower fares/charges and in favour of airports with high fares/charges.

Air service levels shaping demand (section 2.4). The argument here is that air service levels don't shape demand (rather, they respond to it) and that to assume otherwise will result in biases to the results.

Seeding (section 2.5). The term “seeding” is used for off-model adjustments to increase service provision at some airports and to reduce it at others. The argument here is that these off-model adjustments will result in biases to the results through corrections that are not supported by evidence.

Recognising Gatwick's record of growth

The data show that the numbers of passengers at Gatwick have increased by more than at any other London airport over the last decade (see Table 1). In terms of percentage growth, Gatwick (at 21%) has been higher than Heathrow (at 9%) and the London airports as a whole (at 13%) although London City and Luton have seen even higher percentage growth over this period.

Table 2.1. Trends in passenger numbers at London's airports over the last decade (millions)

Airport	2004	2014	Increase	Growth
Heathrow	67.1	73.4	6.3	9%
Gatwick	31.4	38.1	6.7	21%
Stansted	20.9	20.0	-0.9	-5%
Luton	7.5	10.5	3.0	39%
London City	1.7	3.6	2.0	118%
London Total	128.6	145.5	16.9	13%

Source: CAA (2015).

Gatwick's relatively fast growth has not been carried forward into the Commission's Do-minimum (i.e. no new runway) forecasts; for example, in the period to 2030 growth in passenger numbers at Heathrow is forecast at 16% as compared to 11% at Gatwick under the Assessment of Need: Carbon Traded scenario (see Table 2). Furthermore, when we look at the Commission's analysis of the different options for new runways – again under the Assessment of Need scenario – we find that the forecast growth in traffic at an expanded Gatwick is slower than at an expanded Heathrow (see Table 3 for some illustrative figures).

Table 2.2. Do Minimum Forecasts of Passenger Numbers at London's airports (millions)

Airport	2014	2030	Growth	2040	Growth
Heathrow	73	85	16%	90	23%
Gatwick	38	42	11%	46	21%
Others	34	57	68%	60	76%
London	145	184	27%	196	35%

Source: CAA (2015) and Airports Commission Strategic Fit Forecasts, November 2014 (Table 5.1, Base Terminal Passenger Forecasts Scenario: Assessment of Need – Carbon Traded).

Table 2.3. Forecast growth in passenger numbers 2014 to 2030: alternative new runway options

Option	Heathrow	Gatwick	Others	London
Do Minimum	16%	11%	68%	27%
Gatwick second runway	16%	32%	51%	29%
Heathrow third runway	59%	3%	43%	40%
Heathrow extended runway	59%	3%	42%	40%

Source: CAA (2015) and Airports Commission Strategic Fit Forecasts, November 2014 (Tables 6.1, 6.3 and 6.5, Scenario: Assessment of Need – Carbon Traded).

Taken together, this seems to suggest some *prima facie* concerns with the validity of the model that allocates traffic between London's airports and it seems quite reasonable for Gatwick to raise these concerns. However, it is important to recognise that the level of traffic at an airport – and the trends in traffic levels – will, in some cases, be shaped not just by passenger demand but also by the availability of runway and terminal capacity to serve that demand at different airports. This is obviously particularly relevant in the present circumstances where there is already very strong pressure on capacity at Heathrow (as evidenced by emerging scarcity rents – see ITF/SEO (2015)) and where there are now also emerging capacity constraints at Gatwick. These emerging capacity constraints have several relevant implications for the interpretation of the trends in traffic levels (historic and forecast) at the various London airports.

First, as capacity constraints at Heathrow have tightened in recent years it would not be surprising to see faster growth at Gatwick than Heathrow. In fact it would be quite surprising **not** to see this; if this was **not** happening, then it would suggest that passengers regard Gatwick as a very weak substitute for Heathrow.

Second, looking forward, as capacity constraints start to increasingly tighten at Gatwick then we would expect – in the absence of an additional runway – that growth there will be slowed to a similar level to that which is being achieved at (capacity constrained) Heathrow, and this is what the forecasts in Table 2 show. That is, growth will increasingly be limited to what can be achieved through increasing passenger loads (on average, per air traffic movement (ATM)) and by adding ATMs in off-peak periods; there will probably be some differences in the scope for this at different airports.

Third, we might expect that when investment in a new runway removes the capacity constraint at an airport then this will result in a faster up-turn in traffic at the airport which has the biggest over-hang of frustrated demand. At present, this is Heathrow (as evidenced by the analysis of scarcity rents – see ITF/SEO (2015)).

Fourth, the relative strength in latent demand between Heathrow and Gatwick may change if there are material changes to the structure of the airline market in the decade leading up to the opening of a prospective new runway in London (and beyond, over the runway's operating life). This is the possibility which the Commission investigates in two of the scenarios it considers:

Relative decline in Europe – in which Heathrow's importance as a hub is diminished as a result of greater competition from hubs in the Middle East (as compared to that anticipated in the Commission's **Assessment of Need** scenario); and

Low Cost is King – in which point-to-point services become relatively less expensive to provide (to a greater degree than is anticipated in the Commission's Assessment of Need scenario), potentially reducing Heathrow's role as a hub and enhancing opportunities for Gatwick.

The Commission’s forecasts suggest that in the latter scenario – but not the former – there is predicted to be faster traffic growth at Gatwick after investment in a new runway, as compared to what is predicted at Heathrow, after similar investment; see Table 4 for some illustrative figures.

Table 2.4. **Forecast growth in passenger numbers, 2014 - 2030: alternative runway options**

Option	Heathrow	Gatwick	Others	London
Do Minimum	19%	16%	71%	31%
Gatwick second runway	12%	90%	68%	46%
Heathrow third runway	77%	5%	43%	49%
Heathrow extended runway	63%	11%	74%	46%

Source: CAA (2015) and Airports Commission Strategic Fit Forecasts, November 2014 (Tables 6.1, 6.3 and 6.5, Scenario: Low Cost is King – Carbon Traded).

Drawing this discussion together, this suggests that there is a plausible explanation for the various trends in traffic levels at the different London airports predicted in the Commission’s forecasts. Whilst the critics of the traffic allocation model used in the Commission’s forecasts point to seeming puzzles and anomalies in the forecast trends – and argue that these provide evidence of bias in the model – our conclusion is that these seeming puzzles and anomalies might equally be explained, and probably more plausibly so, by the interaction between demand growth and capacity constraints at the different London airports. Our study therefore provides assurance that the Commission’s forecasts are plausible.

Reflecting air fares (and/or airport charges) in the analysis

Fares are a key driver of air travel demand. Air fares are one of the key explanatory variables in the Commission’s forecasting models of overall future growth in passenger numbers using London’s airports. However, as noted in section 2.1, fares could not be explicitly included as a driver of airport choice in the NAPAM.

Research evidence on passenger choice in multi-airport metropolitan areas often identifies fares as a relevant explanatory variable (see, for example, ACRP (2013) for a review of studies and discussion of their findings). The successful growth of low cost carriers (LCCs) reflects in part the responsiveness to price of (potential) passengers in some segments of the airline market. For example, when additional capacity at lower fares was offered in regional markets in the USA – such as Baltimore-Washington International versus Washington Reagan National airport and T.F. Green / Manchester-Boston Regional airport versus Boston Logan International airport – market share shifted from the larger airport to the satellite airports. Moreover, when JetBlue started service at New York JFK, with multiple destinations and aggressive fares, market share shifted from the regional airport (Long Island MacArthur Airport) to New York JFK. Taken together, both research evidence and commercial experience together point to the potential importance of including a fares variable in the model.

However, since no statistically significant link to fares was found in the research on passenger choice between London’s airports it was not considered possible to incorporate airfares directly into the modelling. The exclusion of air fares from the airport allocation model is supported in a peer review of the NAPAM by one of the UK’s leading transport modellers (see Bates (2010)).

Nevertheless, the Commission has been able to make “off model” adjustments to the analysis of those scenarios – in particular, Low Cost is King – where lower air fares are likely to be an important route to airlines gaining market share (through “seeding”, as discussed further in 2.5 below). To this extent, the absence of air fares from the airport choice model has been, at least approximately, compensated for.

It is possible that the absence of a statistical significant link is a consequence of data problems – difficulties in obtaining accurate and representative fare data – or it may reflect the inherent difficulties in identifying the separate impacts on passenger choices of fares, service levels and airport capacity constraints, factors which often move in the same direction (and where the latter two sometimes help explain a “hub premium” on fares). This is something that might be rectified by further research in the future. It might also be worth considering a sensitivity test in which a parameter based on evidence from the research literature is included in the model. It needs to be recognised, however, that this approach would risk biasing the results to the extent that the impact would be based on the transfer of evidence from non-UK markets and which may involve rather different alternatives. It would also risk including an element of double counting, to the extent that differences in fares are already being partially picked up implicitly in the other variables in the model.

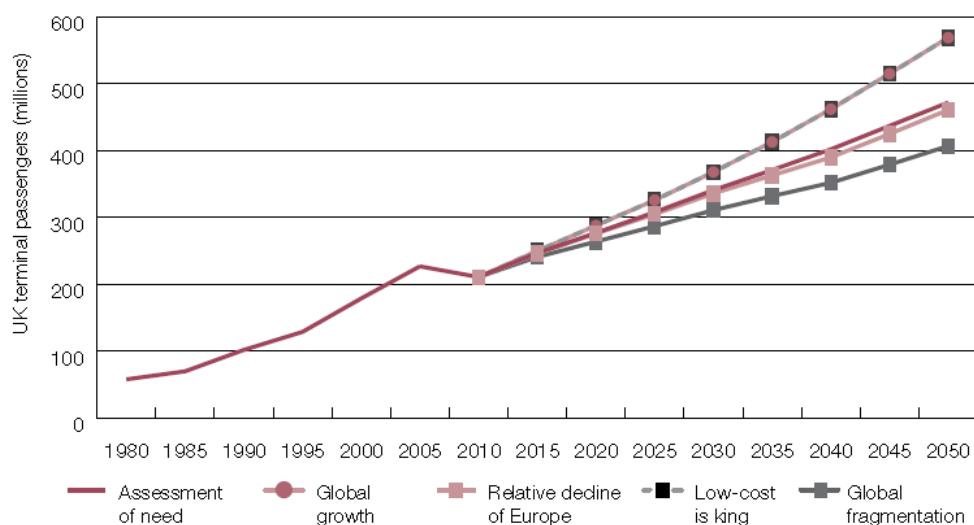
In summary, our conclusion is that the forecasters' overall approach to the question of whether, and how, to reflect air fares in the model is reasonable. First, in the absence of robust evidence to link airport choice in London to fares, it has not been possible to include these in the model but as noted earlier, the model provides a good fit to the data. Second, the off-model adjustments the forecasters have made (through seeding) in scenarios where air fares are likely to be particularly important to passenger choices provide some (approximate) compensating allowance for the absence of air fares from the model.

Air service levels shaping demand

The argument here is that air service levels don't shape demand. For example, EasyJet argues that airlines cannot steer demand, and will fly from airports from which the demand is largest. BATA similarly argue that it is unlikely, in their view, that airline business models can change demand.

The first point to make here is that the main drivers of the Commission's forecasts of total UK passenger demand are the various macroeconomic trends – in particular, the growth in incomes and trade and trends in costs and fares. The forecasts illustrated in the Commission's November 2014 report (Figure 2) show that the different scenarios for airline network development have limited additional impact on future traffic levels for the UK as a whole. So there is no suggestion here in the Commission's work that airlines are steering demand growth at the aggregate, UK, level to any marked degree.

Figure 2.1 Airports Commission Strategic Fit Forecasts: Unconstrained capacity demand range under all five demand scenarios in the carbon-traded case



Source: Airports Commission(2014), Figure 5.2, on page 56.

Second, however, the emerging research evidence and recent commercial experience both show that air service levels can be an important factor in passengers’ choice of airport. Thus three of the most important factors shaping passenger choice between different airports in a region are 1) the airport’s effective catchment area – its accessibility to prospective passengers 2) various characteristics of the level of air service which is offered (ACRP (2013) surveys this evidence) and 3) airline marketing and promotional efforts directed to those swing zones where passengers are have two equal airport choices in terms of accessibility and convenience.

The Commission has considered both of these groups of factors (catchment area and air service levels) in the development of the airport allocation model and their analysis shows evidence for the relevance of both factors to the choices made by passengers in the UK, in line with both research evidence and commercial experience in other markets. The inclusion of air service levels in the airport allocation model is therefore well supported by the evidence.

Seeding: adapting the airport allocation model to reflect a different structure of airline services

“Seeding” is the approach the Commission has used to explore the potential impact of scenarios in which there might be major changes in the way that airline networks and services are organised over the next decade, prior to a prospective new runway being opened (and thereafter, when it is in operation).

In the Commission’s forecast in its **Assessment of Need** Scenario, it is assumed that airline networks and services are developed incrementally, responding to future changes in the pattern of demand and costs and to the constraints on capacity at each airport. The airport allocation model is designed to predict passengers’ choices between different airports in these circumstances. As noted earlier, the model aims to quantify the factors that shape passengers’ choices, using data for 2011. The model seems to fit the data well and the choice factors which are found to be relevant generally conform to the wider research evidence (although, as discussed above, it has not been possible to include air fares).

Prospective changes to the structure of airline networks and services can, however, be a major source of risk and uncertainty in airport passenger forecasts. Whilst the research evidence shows that levels of air service are an important factor in shaping passengers’ choices – and hence airport demand – the airline business decisions that determine service levels are less well researched and the findings are less clear cut (see ITF (2015) and ACRP (2013) for a discussion). The ACRP report also discusses the ways in which market conditions – and airlines’ consequent risk exposure – can act to either encourage or inhibit the development of new services.

In these circumstances, where there are large uncertainties of this kind, the best way forward is usually to develop alternative scenarios, both to reveal the prospective scale of uncertainty and to provide a basis for testing the robustness of a project to this uncertainty (again see ITF (2015)). The Commission has considered various scenarios to explore alternative paths for the development of airline services and networks including:

Global Growth – in which higher rates of economic growth and faster growth in passenger demand provide additional opportunities for new services, particularly at Gatwick. Hubbing at expanded Gatwick becomes so significant that the airport is assumed to successfully attract an alliance;

Relative Decline in Europe – in which Heathrow’s role as a hub is diminished by rising competition from hubs in the Middle East;

Low Cost is King – in which point-to point services become relatively less costly to provide, reducing Heathrow's role as a hub and creating new opportunities for low-cost carriers entering an expanded Heathrow, or taking advantage of opportunities for growth at Gatwick; and

Global Fragmentation – in which hubbing becomes less attractive to passengers.

The nature of scenarios of this kind is that no precise forecast can be made of what kinds of developments in airline business models might have taken place in ten years' time – when a prospective new runway would be scheduled to open – or over its subsequent operating life. Rather the aim should be to develop a scenario which expert judgement considers plausible, although perhaps low probability, so that the robustness of investment strategies can be tested against the scenario.

The question then is how to best reflect these scenarios in the airport allocation model. The Commission needed to follow an off-model approach – because the model is designed and calibrated for current networks and services, and progressively incremental changes to these, and because it has not been possible to include air fares in the model (for the reasons discussed in 2.3 above). The solution adopted is to shift some blocks of services between airports and then check for their commercial viability in their new setting; this approach also recognises the possibility that airlines supply may be “lumpy” in responding to the opportunities created by the opening of new capacity. This seems to us a reasonable, pragmatic solution in trying to predict the possible implications of different airline business models becoming more important in future decades, when a prospective new runway is in operation. Of course, it is possible to question the specific assumptions that the Commission has used. For example, it has been argued that the structure of airline business models used in the forecasts is too stylized and oversimplified. But in practice, as noted above, the current state of knowledge on the development of airline business models is only partial, the forecasts look several decades into the future and, in these circumstances additional detail and disaggregation is unlikely to improve the precision or usefulness of the forecasts.

In summary, the purpose of a scenario of this kind is to test uncertainty in circumstances where the current state of knowledge does not enable any precise or agreed forecast to be made – although the scenario should be judged plausible (an issue we consider in the next main section). We consider the approach to seeding to be an appropriate, pragmatic way of testing the uncertainties around the future development of airline business models.

Summary

In overall summary, then, we can conclude that the various trends in the Commission's traffic forecasts – as discussed above – are plausible, and that the various points raised by the consultees do not provide persuasive evidence that the airport allocation model is biased. The forecasts provide, in our view, a valid basis for the Commission to compare the impacts and relative merits of different options for investment in additional capacity at London's airports.

The scope of the present study does not enable us to reach a conclusion on the quantitative detail of the forecasts. On this, the very positive assessment of the model set out in Professor Schaefer's review, as noted earlier, provides support for considerable confidence in the model's results. The model's good fit to the empirical data in 2011 (the year against which it is estimated) and 2013 (a subsequent test year) also lends confidence to its results.

Given the range of criticisms made of the model by various consultees it could be useful, as part of the future development of the model, to carry out some further validation work on the model's results. In particular, we agree with the suggestion by Gatwick that it would be useful to “sense check” the model's

forecasts (although we are less persuaded of the value of their two specific proposals on this). Instead we suggest that it might be useful to consider the following three possibilities.

Sense check 1: Does the evidence on scarcity rents support the modelling analysis?

As noted earlier, the evidence set out in the ITF/SEO paper on scarcity rents supports the view that Heathrow has been operating close to capacity for several years whilst Gatwick is only now approaching capacity; and also that there is currently a (far) greater demand overhang at Heathrow than at Gatwick. It might also be worth considering whether the evidence from the developing market in slot trading supports this view.

Sense check 2: Does the model successfully forecast the past?

As noted earlier, the model’s parameters are estimated using cross-sectional data for a single year – 2011 – and the model’s predictive power has then been cross-checked against an adjacent year (2013). The model’s fit to the data in 2011 seems impressively close (noting Professor Schaefer’s suggestion that it would be useful to see some test statistics) and there also seems to be a good fit between the model’s predictions for 2013 and actual traffic levels at each airport in that year. However, the model is being used to make forecasts over a long run of future years. In this context, it would be useful to know how successfully the model could forecast the past – say over the last 10-20 years.

Sense check 3: What factors shape the predicted change in an airport’s share of total London traffic?

It would be useful to track through one or two worked examples to show how and why the model predicts a change in an airport’s share of total London traffic; this will likely involve changes to market composition (for example, by journey purpose or surface origin/destination), changes to service provision and changes to the demand/capacity balance (reflected in the shadow prices) at different airports. This would both aid understanding of a quite complex process, but would also help to provide assurance that the predicted changes are built upon plausible research evidence.

It would also be useful to compare the parameters used in the airport allocation model with the increasingly extensive research evidence on airport choice (see, for example, the review of studies in ACRP (2013)). This would be a considerable research project as the individual studies would have to be unpicked and the underlying modelling on which they were based identified and examined. Tracing all the underlying research would be time-consuming. It is not therefore considered appropriate or necessary to carry out such research prior to the publication of the Commission’s final report.

Relevance of Scenarios

In this section we examine issues raised as to the relevance of the scenarios put forward by the Airports Commission. To ensure that its forecasts sufficiently take into account risks and uncertainties in the market, the Commission did two things. First, they estimated a 60% confidence range around their Assessment of Need forecasts. This shows the estimated likelihood of different outcomes occurring, once account is taken of evidence on the historical variation in the key drivers of demand. The results are illustrated in Figures 5.1 and 5.3 of the Strategic Fit Forecasts. The Commission has developed alternative scenarios for future development of the aviation sector, to supplement the Assessment of Need scenario. The aim here is to reflect the kinds of risks and uncertainties that cannot be easily (or quantitatively) predicted from past events (such as the future development of airline business models) and cannot therefore be included in the 60% confidence range (see ITF (2015) for a discussion). Each scenario has different implications for the respective market shares of hub-and-spoke and point-to-point networks and for the inclusion of UK airports in global route networks.

Assessment of Need Scenario

The Assessment of Need Scenario is based on central long-term GDP forecasts from the UK Office of Budget Responsibility (July 2013) and the OECD Economic Outlook (June 2013). In this scenario, future demand is primarily determined in relation to past trends and central data projections (for GDP and oil prices). Airline business models are assumed to develop along the lines of recent trends. None of the submissions by the stakeholders specifically criticized the relevance and likelihood of the Assessment of Need as a reference scenario. Gatwick makes no explicit judgement on whether the Assessment of Need Scenario is appropriate as the reference case, but it does suggest that the projected number of passengers flying from Gatwick is too low in this scenario, as discussed in section 2.2.

Approach to Development of Alternative Scenarios

The scenarios were designed to provide contrast, to test the possible impact of different development paths, rather than to establish a range of forecasts to different degrees of probability around the baseline projection. To do this the scenarios were formulated by establishing packages of changes to technology (new aircraft), business models, patterns of market entry and economic growth trends to test the credible extremes. Each scenario made different assumptions as to the degree of realisation of developments in five key areas (see Annex for detail):

- Globalisation – the strength of global growth and the degree to which this growth involves international trade;
- The rise of Asian economies – affecting demand and relative market share of Middle East and Asian network carriers and in some scenarios entry of long-haul low cost carriers;
- The development of airline alliances and partnerships – covering the penetration of Asian network carriers, Gulf carriers and in some scenarios Asian long-haul low-cost carriers;

- Technological change – introduction of new aircraft, specific aircraft models are seen as strengthening hub and spoke operations in some scenarios and strengthening point-to-point operations in other scenarios;
- The nature of any global climate-change agreement.

The Commission is to be commended on the thorough and sophisticated ways in which it has addressed the risks and uncertainties intrinsic to an investment with a long lead time, a long asset life and relative inflexibility once built.

However, making business model developments dependent on three different ‘key areas’, and having a different responsiveness of business models to changes in each key area under different scenarios makes the exercise unnecessarily complicated and the impacts difficult to untangle. This approach has resulted in a large volume of analysis that is difficult to absorb. And the choice to test sensitivity with scenarios that combine multiple changes in packages opens the door to piecemeal criticism.

One response to this might be to focus analysis on a single scenario. This would clearly be the Assessment of Need scenario. The best approach would be to simplify the scenarios by:

- a) Separating out the parts of the scenarios dealing with macroeconomic trends from those dealing with airline business models (as suggested by BATA and discussed in section 3.4);
- b) Focusing on a central, most likely scenario, the Assessment of Need Scenario, and then testing against plausible, but less likely, alternatives one at a time.

Nevertheless both the use of scenarios to test the case for runway expansion and the relevance of the scenarios developed conforms to good practice and is the kind of analysis usually used to support expansion proposals submitted to chief marketing and chief executive officers in airline businesses.

Likelihood of the Low Cost is King Scenario

The Low Cost is King Scenario assumes a growing role for low-cost carriers. They increasingly enter long-haul markets and self-connecting becomes more common for passengers. By 2040, charter and low-cost carriers are assumed to take 50% of the market, while the importance of hubs and network carriers declines throughout the world. Liberalization of aviation markets worldwide continues. Low-cost carriers are assumed to use new aircraft technology such as Boeing 787 and Airbus A350 aircraft to serve thinner long-haul point-to-point markets. They are not expected to enter into formal alliances in this scenario.

The ITF/SEO (2014) study modelled airline responses under this scenario and assumed that LCCs would expand both short and long-haul services at all London airports, including Heathrow. More specifically, in this scenario it is assumed that Oneworld carriers lose market share at London Heathrow to low-cost carriers such as EasyJet and Vueling. In long haul markets Virgin and leisure carriers gain frequencies with respect to Oneworld. In its submission to the Airports Commission EasyJet endorses this assumption by stating that it is interested in operating a significant fleet of planes from an expanded Heathrow (Paragraph 5.1.1). This is in line with the overall expectation that LCCs will continue to increase their overall market share as assumed in this scenario, but EasyJet’s plans do nothing to support the assumption made in this scenario that LCCs role in long-haul markets and self-connecting will rapidly increase. This assumption was contested in most of the submissions by stakeholders.

Frontier Economics casts doubts on the assumed growth of long-haul services to Gatwick on opening of a new runway in this scenario. It views this as unrealistic given significant evidence of the difficulties of applying the low cost model to long haul services. The important issue is which carriers would move long-haul services to Gatwick. The Airports Commission was certainly right to consider the possibility of such a development, but it is unlikely that BA would cede any of their position at Heathrow even under

the circumstances of continuing constraints at Heathrow and expansion at Gatwick. Their first move would probably be to compete in price and service levels to keep customers from switching to new products at Gatwick.

The JLS consulting report for Heathrow Airport Limited concludes that, considering the numerous commercial and operational risks for long-haul LCCs outside of certain suitable market conditions, its scope appears limited, particularly for ultra-long routes to Europe from Asia for leisure travel and visiting friends and family. It is also relevant that the backlog for new aircraft deliveries is at an all-time high and therefore it is possible to identify the carriers for the majority of deliveries to at least 2020. Low-cost airlines do not feature noticeably in wide-body aircraft orders. In fact, JLS points out that smaller new generation wide body aircraft, the production lines of which are booked-up five to six years ahead, are largely being ordered by legacy hub airlines. Furthermore, JLS expects that new medium size wide-bodied aircraft like the Boeing 777-X will strongly strengthen the hand of hub carriers and the rationale for the hub model.

Norwegian Air Shuttle is currently the only European LCC that offers a significant number of intercontinental destinations. It does not provide details on the financial performance of these flights separately from the rest of its services, but from its financial statements it can be concluded that Norwegian's overall profits turned into losses since it started flying long-haul. In addition, a CAPA⁴ analysis reveals that Norwegian's fares for transatlantic services, for example, do not appear to be substantially lower than the average all-inclusive economy fare of Association of European Airlines member airlines between Europe and North America. Further, the competition effects that may take place after expanding Gatwick, and which are supported by the InterVISTAS study (April 2014) on air fares, relate to short-haul and not to long-haul flights.

In our view, additional capacity at either airport will probably not significantly alter the way airfares develop over the long term. It appears safe to assume that by 2040s there will be more unconstrained demand for travel to London than there is the physical ability to accommodate on one extra runway. It can therefore be concluded that it is reasonable to expect that additional capacity at Gatwick will increase short-haul competition more than competition in long-haul markets, as the long-haul low-cost business model is not yet proven (see also ITF/SEO 2014).

Heathrow Airport Limited criticized the assumption that LCCs at Gatwick will become feeder services for long-haul in the Low Cost is King Scenario. Ryanair claimed that it is willing to consider feeding long-haul carriers 'for the right price', but Heathrow correctly points out that there has been only limited experience of this actually happening. Even though some further developments along these lines seem plausible, the consistency of such an assumption with the core elements of the LCC operating model needs to be considered; particularly what LCC's might also lose in the process as ensuring connections entail considerable costs. We do think Heathrow has a valid point here and the JLS Consulting paper elaborates on the issue. LCC and ultra-LCC airlines will see online or interline connections as a major change to their business models. During the last recession, South West Airlines increased connections in a deliberate move to attract business passengers. Revenues were successfully increased but at the cost of much more complicated and more costly operations. The airline is struggling to find a way to tap into these revenues without upsetting its business operating model with all its attendant consequences.

Any airline examining whether or not it is in their interest to provide services at the expanded airport will ask themselves whether or not they need to change their business model, their core competencies, in order to be relevant. For any LCC the first question is whether or not the expanded capacity can be

4 <http://centreforaviation.com/analysis/long-haul-lccs-on-the-north-atlantic-ryanairs-michael-oleary-has-talked-eur100-fares-219313>

utilised profitably with their existing business model. EasyJet evidently sees competing for short-haul business passengers in the Heathrow OD market, as well as leisure travellers, as suited to its evolving business model. Given the competitive nature of the markets, however, any other LCC that has a major brand presence in Gatwick but none in Heathrow would probably be shy about trying to compete in Heathrow with the dominant players there.

Overall, the growth of the low-cost long-haul flights and low-cost feeder flights assumed by the Commission in the Low Cost is King Scenario are both possible but there is a significant amount of uncertainty involved.

Relevance of Relative Decline of Europe scenario

Frontier Economics casts doubts on the Relative Decline of Europe scenario (p.25). This scenario assumes strong economic growth and increasing globalisation. It also assumes aggressive competition for legacy carriers from Gulf carriers and other airlines in emerging economies. This results in a decline in the importance of the European aviation hubs as European airlines are frequently out-competed by Turkish, Middle Eastern and Asian carriers. The role of global alliances is also expected to decline. Middle Eastern carriers use new aircraft technology to by-pass the major European hubs and fly directly into secondary European cities.

Frontier Economics believes the scenario is not plausible. They argue instead that strong growth in demand from Asia would more likely be met by carriers operating a larger number of direct links between the UK and Asia. We agree that the likelihood of the originally specified scenario is small as it generally holds that if OD demand is sufficient it is taken up by direct services, provided that air service agreements allow for this.

JLS Consulting points out that there is no evidence that Gulf carriers have adversely impacted growth in the London market or damaged BA. BA is strengthening links with Qatar Airways via the Oneworld Alliance and the recent announcement that Qatar Airways has taken a 9.9% stake in IAG, the parent company of BA. In the near future joint ventures between the two airlines are likely.

It appears that BA's hub operations at Heathrow will be less affected by competition from airlines in the Middle East and Turkey than, for example, Lufthansa's hubs. The air service agreements between the UK and Middle Eastern countries are already quite liberal and, as a result, airlines from the latter have already increased their supply into various points in the UK. Partly because IAG focuses much more on the transatlantic market than on the Asian market it has not been affected much by this increased competition. On the other hand, Lufthansa group has the largest supply of seats to Asia of the three European airline groups. It used to codeshare with Turkish Airways on some of these routes, but it unilaterally terminated this partnership in late 2013. This leaves Lufthansa to compete with Turkish which currently serves more than ten German cities, undermining Lufthansa's strategy of funnelling Asia-bound traffic from secondary markets via its hubs at Frankfurt, Munich and to some extent Dusseldorf. The Germany-UAE air service agreement still prevents the UAE carriers from serving more than four German cities. If this agreement were to be liberalized it is likely that output from the Gulf carriers would increase rapidly. Given that Lufthansa is also the only European carrier that does not collaborate with any of the Gulf carriers it is likely to be much more affected by increased competition from the Middle East and Turkey than BA.

Nevertheless, we do think it makes sense to include what is effectively a worst case scenario for Heathrow's hub status in the evaluation by the Commission. Given the competitive pressure on Europe's hub carriers from low-cost carriers and carriers from Turkey and the Gulf states, a scenario in which the hub carrier ceases to exist or has to downsize its operations significantly is a threat that needs to be considered in scenario analysis, particularly because history has shown that quite a number of airports have lost their hub status, even in metropolitan areas of considerable size.

Gatwick's analysis (Gatwick: Supporting traffic and competition analysis (p.64/65)) is in line with this reasoning. That is, it states that airline responses involving hub traffic growth are far from assured. More explicitly Gatwick claims that a full hub operation would not be financially viable for BA at Gatwick or consistent with BA's existing strategy, which would require major fleet expansion. This argument is indeed convincing. In addition, the Commission's forecasts support the view that there is limited potential for more transfer traffic than currently accommodated at Gatwick.

Are any other scenarios of interest?

BATA is sceptical about combining the modelling of demand with changes in airline business models and states it would be better for the Commission to separate out its modelling of demand and airline business model effects. This would have been a more straightforward approach, as discussed in section 3.2 above. Furthermore, BATA thinks it is unlikely that airline business model changes can change demand. They may be able to better reflect it, but they are unlikely to be able to change it. As a result BATA is sceptical of analysis that suggests that a certain profile of airline business model will on its own lead to significantly different passenger flows. We have set out our reasons for disagreeing with this second point in section 2.4 above.

Taking into account BATA's comments, an alternative way of modelling would be to use a range of scenarios based on the expected developments of different business models and a range of scenarios based on different macro-economic demand forecast projections.

Separating out macroeconomic trends from airline business models

There are several good reasons for separating macroeconomic trends from changes to airline business models. First, combining mechanisms masks cause-effect relationships. The **Low Cost is King Scenario** combines a particular business model with high economic growth; in consequence, it is quite difficult to make comparisons with the other scenarios and to understand what is driving the results. There is no necessary or strong connection between the low cost business model and high economic growth that needs to be reflected in this way. The impact of the two factors (business models and macro trends) upon the analysis is largely separable. Second, the macroeconomic trends are important to overall UK traffic growth but the different business models have little additional impact. On the other hand, the airline business models can make a material difference to the allocation of traffic between the London airports but the additional impact of the macro trends in this respect is probably limited (working via the effects of any changes to values of time and/or overall traffic composition).

Separating out factors in the scenarios in this way would enable the forecasts of total UK traffic – and the overall case for investment in additional capacity – to be tested against scenarios for macro trends; and forecasts for individual airports – and the best location for extra capacity – to be tested against scenarios for airline business models. Such an approach is illustrated by the Office of Budget Responsibility (OBR) GDP growth projections, taken over into the Airports Commission Assessment of Needs Scenario. The Office of Budget Responsibility (OBR) tests its central GDP projection for sensitivity to changes in population (Table 3.1).

Table 3.1 Real GDP growth scenarios for the UK under variant population projections

	Annual GDP growth, per cent				
	2012-13 to 2022-23	2022-23 to 2032-33	2032-33 to 2042-43	2042-43 to 2052-53	2052-53 to 2062-63
OBR central ¹	2.2	2.5	2.4	2.4	2.3
Old age structure	2.2	2.4	2.2	2.3	2.1
Young age structure	2.2	2.7	2.8	2.8	2.7
Zero net migration	2.2	2.4	2.1	2.1	1.9
High migration	2.2	2.7	2.7	2.7	2.5
Natural change ²	2.1	2.0	1.9	1.9	1.9

¹ Equivalent to the ONS's 'low migration' population variant.

² The 'natural change' variant assumes zero gross and net migration.

Source: OBR Fiscal sustainability report, July 2013. <http://budgetresponsibility.org.uk/fiscal-sustainability-report-july-2013/>

Focussing on the most likely scenario and testing against plausible, but less likely alternatives

For long-term macro trends, the Airports Commission forecasts are based on OBR and OECD projections of GDP and IEA oil price forecasts. These are used to establish the central Assessment of Need Scenario. The **Assessment of Need Scenario** provides in our view an appropriate reference forecast. It is constructed in a manner entirely consistent with best practice and in particular addresses uncertainty effectively by designing scenarios to explore potential developments to which probabilities cannot be assigned. The Assessment of Need Scenario should be regarded as the most likely forecast, and no stakeholder submissions take issue with that. The **Global growth** and **Global fragmentation** Scenarios are less likely and their macroeconomic assumptions can be regarded as reasonable upper and lower sensitivity tests.

As far as airline business models are concerned, the business models implicit in the **Assessment of Need Scenario** (continuation of recent trends) can be taken as the most likely scenario (again this was not contested by stakeholder submissions). The **Low Cost is King** and **Relative Decline of Europe** scenarios provide less likely, but still sufficiently plausible trends to be worth including as a sensitivity test in the evaluation of alternative runway options. The nature of such scenarios for airline business model development is that they are difficult to forecast, almost by definition. Their role is to test the robustness of the proposed investment strategy and to help identify whether an alternative or more flexible approach would better respond to risk and uncertainty. Given the inevitable limitations of the exercise, we consider the Scenarios tested by the Airports Commission do provide a reasonable test of sensitivity to possible changes in prevailing airline business models.

In summary then, despite confounding macroeconomic trends and potential changes in dominant business models in the construction of Airports Commission Scenarios it is possible to use them as a reasonable test of sensitivity to each trend separately, and the range of outcomes produced is a useful reflection of the relevant spectrum of possibilities. The procedure followed in assessing welfare impacts by modelling airline responses under each scenario, i.e. on top of the basic trends in business models and macroeconomic developments, is not fundamentally different from what would have been done if a sequential approach to testing sensitivity to macroeconomic trends and changes in dominant business models had been followed.

Airline responses to additional runway capacity

Chapter 3 addressed issues raised by stakeholders in relation to the demand scenarios put forward by the Airports Commission. In chapter 4 we examine issues raised as to the likelihood of potential airline responses to expansion of runway capacity under the scenarios. Potential airline responses were examined for the Airports Commission in SEO/ITF (2014). That report assessed how airline behaviour may change taking into consideration the driving factors for each airline segment and the characteristics of the London airports. Alternative airline responses have differing impacts on the structure of traffic in the London airport system as well as on connectivity, competition and the extent to which expansion reduces airline rents to the benefit of the consumer. These impacts were modelled in terms of socio-economic benefit for a range of combinations of scenarios and airline responses (see figure 1 in the introduction).

The following paragraphs examine the most important issues raised as to the likelihood of the modelled responses. They elaborate on the assumptions criticised and assess in a qualitative way how the modelled impacts would be different if these assumptions were to be changed.

Effect of a second runway at Gatwick

Gatwick stresses the importance of airport competition in its official submission to the Airports Commission. InterVISTAS (2014) confirmed the benefits of airport competition in their study of short-haul city pair markets in Europe and the United States. The InterVISTAS report does not look at the long-haul market, but it has been suggested that similar benefits could arise in this market too. Currently, two UK-based long-haul carriers compete at Heathrow despite the capacity constraints, which is a rather unique feature of the UK market. It has been suggested that London may have the catchment area to sustain two hub airports, provided that there is sufficient airport capacity. This section assesses the likelihood of future hub operations Gatwick, by any airline, if it were to be expanded.

Expansion of Gatwick with a second parallel runway could increase peak-hour capacity from 50 to 98 movements per hour, with 560 000 aircraft movements per year. This capacity level is similar to the current levels of Copenhagen, Madrid, Rome and Heathrow, but lower than Paris or Amsterdam⁵. It is much lower than the projected capacity levels of hub airports in the Middle East and Turkey.

Several studies have pointed out that in order to maximize connectivity and efficiency it is better to increase the capacity of the larger airport to a scale that is at least similar to competing airports, than to have two medium sized airports. ITF (2013) gives several examples and points out that cities with split hub operations, such as Tokyo in the past, achieve a lower level of connectivity than would have been possible in the case of one large hub operation. In addition, it was concluded that in most cases where cities have multiple airports they tend to serve different market segments, with one providing capacity for network service carriers to operate a hub and others catering mainly to low cost carriers, charter flights, regional aviation and other point to point services. Cities where two airports support hubs for network carriers are unusual. The New York region seems to be an exception, although it can be argued that the two main airports largely serve spatially separate markets on the landward side. That is, Newark

5 See ITF/SEO (2014) Figure 5.4.

and Teterboro airports to the west of the Hudson River have much better accessibility from New Jersey, while JFK and La Guardia are better located to serve the east.

The London area is not marked by any such physical divide, and accessibility depends on the main road network across the south-east region and connection with London's surface and underground rail network. Heathrow's location may give it some advantages over other sites in terms of accessibility to centres of economic activity and to higher income households. The Crossrail development, that will add 10% to London's underground rail capacity, will enhance this advantage.

A large expansion at Heathrow would probably result in the addition of new O/D services whose viability is dependent on hub economies, and which might therefore not arise as a result of expansion of a secondary airport. Because of hubbing economies, BA (and its alliance partners) can add services to new destinations at lower O/D demand levels than other airlines operating out of London airports. The scale of its Heathrow operations makes BA more competitive than any network carrier operating a secondary hub in London. If a third runway is built at Heathrow, this advantage will be maintained. If capacity were to be doubled in Gatwick with no third runway at Heathrow, a rival hub operation might theoretically be able to compete with BA, especially if airport charges were lower than at Heathrow. It would need to reach critical hubbing mass by competing for traffic in the most profitable existing markets and only then would it be able to support services to new O/D markets that depend on hubbing economies to be viable (ITF, 2013).

Any such new hub would have to compete for traffic not only with Heathrow, but also with other major European hubs (particularly Paris, Frankfurt and Amsterdam). During the last decade the number of intercontinental hubs in Europe and the United States has decreased and it seems that losing hub status is generally irreversible. In Europe, the largest hubs have been growing while the relative growth of the medium sized hubs has stagnated. This is mainly a result of airline consolidation which has enabled larger airline groups to rationalise their networks by funnelling growth through their largest hubs while reducing hub operations at nearby airports that are smaller and generally more exposed to competition from low-cost carriers.

British Airways is likely to remain the only carrier to operate a hub in London and it has stated that it 'does not intend to operate a dual hub at Gatwick and will only grow operations at Gatwick as a result of organic demand growth in the London point to point leisure market'.⁶ It emphasized that it previously attempted to operate dual hubs at Heathrow and Gatwick, and this strategy did not succeed for a number of reasons, including:

- Restricted size of Gatwick passenger catchment and overlap with Heathrow;
- Lack of adequate connecting feed at Gatwick without expensive duplication of short-haul routes;
- Key short-haul business routes require high frequency, which can best be delivered from one base;
- Cost inefficiencies due to the need for dual organisations.

Virgin Atlantic, the second UK carrier that operates long-haul services from London, is currently abandoning its own short haul operations and does not seem interested in building up a fully-fledged hub in London. The same applies to competing European carriers, which so far have not succeeded in operating any significant hub activities outside their home countries. Lufthansa operated a mini-hub at Milan Malpensa for some time, but this did not prove to be successful. It also acquired British Midland

6 British Airways response to the Airports Commission Public Consultation on new runway capacity in the South East, 3rd February 2015. Section 4.1, page 5.

to get access to Heathrow and expand its operations from this airport, but decided to sell it to BA after several years of losses.

It seems therefore unlikely that foreign EU carriers will try to establish hub operations at London Gatwick. Given the large OD market of London, foreign non-EU carriers could be interested in increasing the number of long-haul services from an expanded Gatwick. Their ability to do this will largely depend on the traffic rights they are given. Recently, the United Kingdom has signed several air service agreements that allow for increased market entry and competition. As an example, in 2007 Singapore signed an open skies agreement with the United Kingdom that removed all restrictions on passenger and all-cargo air services operated by Singapore- and UK-designated carriers. This goes well beyond conventional "open skies" agreements that provide unlimited third and fourth freedom access as it also accords unlimited fifth, seventh, and even eighth and ninth freedom. It allows Singapore Airlines to station aircraft at any UK airport and actually operate these as hubs. That is, it could provide flights within the United Kingdom and feed them into flights to, for example, the United States without having to include Singapore as part of the itinerary. However, as it does not have the rights to provide feeder services from EU destinations outside of the UK it is very unlikely that it will be able start a hub operation of a significant scale in London, without an extensive number of partnerships with EU airlines.

So far only a few non-EU airlines have tried to offer long-haul services (other than 3rd and 4th freedom services) from European airports, and with mixed results. Jet Airways India operates a stand-alone scissor⁷ hub at Brussels connect India with the US, using a portfolio of 5th freedom traffic rights. However, during the financial crisis it had to reduce this network due its poor financial performance.

The Gulf Carriers could be considered as the airlines that have the best prospect of benefiting from the availability of 5th freedom rights to organise services from Asia to North America via Europe (for example Gatwick). Etihad is acquiring equity shares in various airlines around the world to build its global network and generate feeder demand on endpoints in their own network. A similar step could be envisaged in the UK market, which provides an opportunity to build up a network out of Gatwick, backed by a financially strong foreign carrier. Also Emirates has spoken of "connecting the dots" and offering greater fifth freedom services.⁸ It has offered Milan-New York since 2013, but it cancelled Hamburg-New York due to tough competition. It therefore seems unlikely that it will be able to exercise 5th freedom rights out of London.

Low Cost business models and expansion strategies

EasyJet focus on Heathrow

One of the questions raised by the Commission's consultation is whether low-cost airlines would operate from Heathrow. Contrary to the hypothesis put forward in the ITF/SEO report of November 2014 suggesting that LCCs will find little attraction to operate at Heathrow, there is now clear evidence that there is in fact serious interest.

EasyJet states in its submission to the Airports Commission that 'with great confidence EasyJet would operate from Heathrow if a new runway is built. Currently there simply are not the slots available

7 Using 5th freedom rights, Jet Airways flies into Brussels airport from multiple origins in India within a single time-window, using wide-body aircraft. Passengers change planes at Brussels and the aircraft depart within a single time-window to various destinations in North America.

8 [Http://centreforaviation.com/analysis/emirates-airline-considers-expanding-fifth-freedom-flights--with-mixed-success-so-far-121979](http://centreforaviation.com/analysis/emirates-airline-considers-expanding-fifth-freedom-flights--with-mixed-success-so-far-121979).

at Heathrow for an EasyJet operation to be viable. We have worked with the airport to confirm that the infrastructure is suitable for our operation, just like it is at the many other hub airports across Europe we operate from, including Amsterdam Schiphol and Paris Charles de Gaulle. When we enter an airport with limited low-cost airline presence, we typically provide fares 40% below those of the legacy network airlines. We also bring a wider range of destinations. We have developed an indicative network for Heathrow, and it contains 19 destinations new to the airport, including 3 within the UK.'

EasyJet's business model has evolved over the years and it is increasingly targeting business passengers. It is therefore expanding its operations at congested primary airports and hubs such as Amsterdam, Paris Charles de Gaulle and Rome Fiumicino where it operates multiple frequencies on numerous routes in competition with legacy carriers.

EasyJet points out that Heathrow has the largest local catchment of all the London airports and particularly for business customers. It also notes that British Airways has been successful in operating to new short haul leisure destinations at times of weak business demand such as on Saturdays and in the summer period. This provides Heathrow with a vast pool of leisure demand too. EasyJet claims that airlines cannot steer demand. Airlines will fly from airports from which the demand is the largest. In addition, several low-cost carriers are increasingly targeting business passengers and operating out of larger and more expensive airports. An EasyJet operation at Heathrow would be a clear contrast to the losses experienced (prior to acquisition by IAG) by British Midland on its largely short haul network. It was a higher cost airline, not easily able to differentiate on price and heavily reliant on low yield connecting traffic from other airlines.

Excluding LCCs from Heathrow in the Low Cost is King Scenario because of airport charges

In the modelling for the ITF/SEO (2014) report, it is assumed that LCCs will operate from Heathrow. EasyJet's submission endorses the assumption that it is likely that at least some LCCs will start operating from Heathrow if it is to be expanded. EasyJet has been expanding services from primary airports, which are more expensive, but also have a larger share of high yield passengers which makes them profitable. As a result it even opened a base in Amsterdam. It therefore seems that EasyJet manages to more than offset higher airport charges by the higher fares that it can charge at hub airports. This contrasts with the assumption that LCC will not operate from Heathrow due to its relatively high airport charges.

The expansion of Gatwick would probably lead to a large increase in its airport charges per passenger with the increase applying ahead of the runway opening. It would be levied on passengers who are predominantly flying short-haul and 85% of whom are travelling for leisure. Therefore the impact of this airport charge increase will probably be greater than at Heathrow, where the increase in charges is lower relative to existing charges, and where the burden will be shared more with premium passengers. Therefore partial pass-through of the charges by the airlines to consumers (as assumed by ITF/SEO, 2014) may negatively affect consumer welfare more in the case of Gatwick expansion. In case of no pass-through and airlines already competing at marginal cost, aero-charge increases may lead to network deterioration or slower network growth, with implications for passenger demand and thus negative impacts on consumer welfare. ITF/SEO elaborates on this extensively in a separate note on for the Airports Commission on scarcity rents.

Impact of assuming fewer transfers at Gatwick under the Low Cost is King Scenario

Several submissions pointed out that the low-cost long-haul model remains unproven and might only work in very large long-haul markets. They also suggest that developments dependent on passengers 'self-hubbing' rather than relying on alliances between airlines to facilitate connecting from short-haul flights to long-haul flights at Gatwick are exaggerated in the Low Cost is King Scenario. As a result the ITF/SEO (2014) study might have overstated the number of transfer passengers at Gatwick in this

scenario. It is therefore useful to examine what the impact of assuming a lower number of transfer passengers at Gatwick under this the Low Cost is King Scenario would be.

Taking the Airports Commission forecasts for the total number of passengers flying out of Gatwick in each scenario as fixed, the ITF/SEO (2014) model can be adjusted to change the share of transfer passengers assumed (a sensitivity test to changes in the proportion of transfer passengers is provided in ITF/SEO 2015). This will change the welfare effects because price elasticity in the transfer market is different from that in the OD market. Transfer passengers are more price-elastic than OD passengers because they can travel via different hubs and therefore have more travel options. ITF/SEO (2014) uses a price elasticity of -3 for the transfer market and an elasticity of -1 for the OD market. If we constrain the model to carry a lower share of price-sensitive transfer passengers it accommodates a higher share of price-insensitive OD passengers. To balance supply and demand in the model, fares for OD passengers have to decrease substantially to maintain the total forecast number of passengers flying out of Gatwick in the underlying scenario. In other words, in order to fill the expanded capacity of Gatwick with a higher share of OD-passengers a decrease in average fares is required. This results in increased welfare benefits overall, as the welfare benefits are larger with a bigger reduction in prices.

Excluding LCC from Heathrow in all Scenarios

In the modelling of welfare changes in ITF/SEO (2014) it is assumed that additional capacity at Heathrow allows some LCC operations at Heathrow. Several studies have pointed out that competition from LCCs has a much larger fare reducing effect than competition from network carriers, including the InterVISTAS report for Gatwick. This is acknowledged in SEO's fare model, which incorporates a dummy to account for low-cost competition on top of a market concentration level indicator that measures airline competition. If we now assume that no new LCC services will be operated from Heathrow, the competition effect will be smaller than in the ITF/SEO (2014) study. Overall welfare gains decrease a little due the decrease in competition. It is important to note that this effect is relatively small. As the Frontier Economics and ITF/SEO study point out, by far the largest part of the projected fare reductions will be a result of a decrease in scarcity rents rather than a direct increase in competition. Moreover, the reason a LCC like EasyJet would enter the Heathrow market is to compete for higher yielding traffic. In an environment where demand is likely to grow beyond capacity, profit maximising strategies will see higher prices than in more typical LCC markets.

Impact of assuming more viable new routes at Heathrow than at Gatwick

The welfare impacts estimated in ITF/SEO (2014) depend, among other factors, on how many new destinations are offered if capacity at either Heathrow or Gatwick is expanded. One of the questions raised by the Commission's consultation is how the welfare impacts would change if the number of new destinations is different from that produced by the assumptions in ITF/SEO (2014).

The ITF/SEO report analysed how many OD passengers travel indirectly from Heathrow and Gatwick to their final destination via another hub airport. OD demand on these indirect connections was extrapolated to 2030. Using minimum demand, capacity and frequency thresholds, destinations that might have enough demand potential for direct services to be added between now and 2030 were identified. These new destinations were added to the unconstrained network, for which generalised travel costs were calculated at the individual carrier-destination level. The SEO model assumes that a new direct connection will stimulate demand (market generation) based on IATA's demand stimulation curve, and depending on the level of existing demand in the market. Modelling connections in this way is

discussed in Sismanidou et al. (2013).⁹ The ITF/SECO analysis assumes that transfer passengers that currently travel via other hubs will use the new direct flight. For short-haul and long-haul flights it assumes a minimum required average load factor of 90%. This may lead to a conservative estimate of the potential for new long-haul destination. This is because some network airlines are prepared to accept lower load factors for new long-haul destinations if these are part of their long-term strategy. An example is the extensive network that Air France-KLM has in China. Lowering the load factor threshold would generate more new direct connections and so it could be argued that the ITF/SEO report underestimates the number of new viable long-haul routes. As currently most network airlines only offer long-haul services from Heathrow, and Heathrow is expected to maintain this dominant position, any underestimation is likely to affect Heathrow most.

The empirical literature concludes that there is a minimum frequency threshold for a new route to be sufficiently attractive, especially for business passengers. For leisure destinations the threshold is lower. As a rule of thumb, the ITF/SEO analysis therefore assumed that at least a daily frequency is needed for competitive services. In reality, on some routes and for some airlines lower frequencies may apply. The assumption can therefore be challenged. If it is relaxed, the number of new viable destinations will increase. This is especially true for Gatwick, which currently accommodates long-haul services with a less than daily frequency, while the average frequency of long-haul destinations from Heathrow is relatively high (also compared to other European hubs).

For long-haul, the minimum aircraft size threshold was set at 214 seats, equivalent to the capacity of a Boeing 787 aircraft. Again if it is assumed that smaller aircraft become available in the future, it could be argued that this would increase the number of viable long-haul destinations out of both airports. In the case of Heathrow this will mean that BA can improve its hub system by offering higher frequencies and/or serving smaller markets. As a result, connectivity will be increased as well as the share of transfer passengers, while generalized cost and travel time will be reduced. This increases the number of unique destinations that are viable for BA.

If new planes become available that are smaller and/or cheaper to operate, the number of new long-haul destinations that can be served with mainly OD passengers will also increase. The latter is especially relevant for Gatwick, because its long-haul flights rely more on OD passengers than the long-haul flights from Heathrow. The welfare benefits from serving these new destinations might be slightly understated in the ITF/SEO model. That is because the model does not specifically take into account the fact that new direct connections decrease generalized travel costs by saving travel time and schedule delay time for passengers that would otherwise have travelled indirectly.

Overall, altering assumptions in the model to increase the number of viable direct services to new destinations will tend to increase modelled welfare benefits slightly, with some changes increasing benefits more at Heathrow, some at Gatwick. Any potential bias towards expansion at one or the other airport inherent in the thresholds chosen is therefore limited.

Realistic degree of substitutability between Gatwick and Heathrow

The Airports Commission's analysis shows a considerably larger population within two and three hours public transport journey time of Heathrow compared to Gatwick (2 and 4 million people respectively). The largest centres of population and demand for air travel which are to the north and west of London and Heathrow states that the 'centroid' of UK demand for Heathrow is approximately 10

9 Sismanidou, A., Tarradellas, J., Bel, G. and Fageda, X. (2013). Estimating potential long-haul air passenger traffic in national networks containing two or more dominant cities. *Journal of Transport Geography*. Volume 26, January 2013, Pages 108–116.

miles to the north west of the airport.¹⁰ Heathrow is also better connected to the road and rail network of the United Kingdom. New rail links (such as Crossrail by 2019 and Western Rail Access by 2021) will increase its accessibility by public transport. EasyJet commissioned a study by Seabury to assess the future demand at London airports and showed that the demand for flights from Heathrow will remain highest.

This explains partly why the majority of the airlines, including the ones that only intend to serve the OD market, such as EasyJet, have expressed a preference for expanding Heathrow. Airlines that target transfer passengers have additional reasons to serve Heathrow rather than Gatwick as they rely on feeder services and partnerships with other network airlines that mostly operate out of Heathrow.

JLS consulting concludes that it is demonstrable that while Heathrow is currently constrained and with higher landing charges than Gatwick, there is no significant growth in long-haul network operations from Gatwick. JLS states that it is extremely unlikely that long-haul network carriers currently at Heathrow would move operations to an expanded Gatwick and claims that they will be more interested in the potential offered by major hub airports outside the UK. Higher density routes connecting to overseas hubs would likely consider Manchester rather than Gatwick for expanded UK operations beyond Heathrow according to JLS consulting.

Historically network carriers have shown a clear preference for Heathrow. Before the EU-US open skies agreement came into force in 2008 only two American (United and American) airlines were allowed to fly into Heathrow, while the rest (Delta, Northwest, US Airways and Continental) had to use Gatwick. Since these restrictions were lifted the latter four airlines have all moved their services to Heathrow. Despite high slot prices and airport charges at Heathrow and the cheaper capacity available at Gatwick, there is little evidence that airlines are willing to locate long haul services there. Recently, Air China and Vietnam Airlines moved their services to Beijing, Hanoi and Ho Chi Minh City from Gatwick to Heathrow.

As demand for long-haul services in the London airport system will be much larger in 2025 it can be expected that at least a part of the long-haul OD-demand will be accommodated by Gatwick if it were the only London airport to be expanded. However, given the clear preference for Heathrow, it is likely that part of this OD-demand growth will be met by airlines operating even larger planes at Heathrow. In addition, as most long-haul services will continue to rely on a significant share of transfer passengers, and thus on feeder services, it can be expected that growth of these services will occur at other European hub airports, such as Paris Charles de Gaulle and Amsterdam Schiphol, rather than at an expanded Gatwick.

For these reasons the modelling of welfare impacts in ITF/SEO (2014) assumed that no network carriers would shift long-haul services from Gatwick to Heathrow in any of the scenarios. Instead it is assumed that extra capacity at Gatwick will be filled by low-cost and point-to-point carriers. In addition, in the Low Cost is King Scenario it also assumed that at least part of these new services will be low-cost long-haul services. This assumption has been challenged, as is discussed in paragraph 3.2. If we therefore were to assume a lower number of long-haul services the welfare benefits of expanding Gatwick would be lower than estimated in ITF/SEO (2014).

10 Heathrow Airport Response (2015), section 1.3.3, page 12.

Conclusion

The forecasts used by the Airports Commission in preparing the November 2014 Consultation Document are reviewed in the present report in three respects:

1. Is the forecasting model robust in the way it allocates passengers between London's airports?
2. Are the scenarios developed by the Commission plausible, which are most relevant and could alternative scenarios provide useful insights?
3. How sensitive are modelled impacts of socio-economic welfare to changes in model assumptions challenged by stakeholders?

On the first issue, our review finds the approach followed by the Airports Commission is very well adapted to modelling the London airport's system – the technical quality of the model is high and it is well grounded in both the evidence on passengers' airport choices and in commercial experience. Given the model's importance in shaping forecasts for individual London airports, it is not surprising that it has been subject to intensive scrutiny in the consultation; responses divide between those perceiving a bias against Gatwick (and towards Heathrow) and vice versa. We do not, however, find that the responses provide any persuasive evidence that the model is biased. The main arguments for bias against Gatwick are that the model fails to allow for the airport's relatively fast growth over the last decade and that it omits fares as a direct variable in determining passenger choice between airports. The first argument does not recognise the importance of emerging capacity constraints in shaping demand whilst on the latter, extensive research has been unable to isolate a clear relationship between fares and airport choice in London and, furthermore, the Commission's analysis includes compensating off-model adjustments in scenarios where air fares are likely to be particularly important in shaping passengers' choices.

The main arguments for bias in favour of Gatwick question whether improved service levels can stimulate demand and whether adjustments made to reflect prospective new airline business models are appropriate. On the first issue, the modelling approach is supported both by extensive research evidence and by commercial experience. On the second issue, in our view the adjustments are appropriate and this is a sensibly pragmatic approach to testing the impact of different scenarios for future airline business developments. We find therefore that the model chosen to allocate passenger demand is both appropriate and the best available (although the scope of the present study does not enable us to reach conclusions on the quantitative detail of the forecasts). We note that some tests of its ability to forecast demand over the short term show a highly successful fit to the data on passengers' actual airport choices and we suggest some additional tests of robustness.

In relation to the forecast scenarios developed by the Commission, we find that they cover an appropriately wide range of potential developments in macroeconomic conditions and changes in dominant airline business models. The decision to use packages of selected combinations of macroeconomic and airline business trends to test the sensitivity of forecasts to uncertainty makes scrutinising the results complicated. Testing macroeconomic and business trends separately and sequentially would have been preferable. Nevertheless the Scenarios developed are an effective way to examine the inherently unpredictable risks for investment in a long lived asset with a long lead time in

the dynamic international air transport market and the range of outcomes produced provides a robust test of sensitivity.

Our review confirms that the Assessment of Need Scenario is the most likely scenario for development of the market and provides the most suitable central forecast of passenger demand and traffic allocation. If only one scenario were to be retained for modelling impacts on welfare and connectivity it would be the Assessment of Need Scenario – although we believe that it is important to test the robustness of key results against less likely, but plausible, scenarios – particularly those for future airline business models.

Responses to the November 2014 Consultation Document questioned a number of the assumptions made in modelling airline responses to airport expansion and quantifying the impact on socio-economic welfare. Adjustments to assumptions in the airline response modelling to accommodate the criticisms were found in most cases to make only a small difference to outcomes. Scepticism towards the viability of a potential second hub operation for a network carrier in an expanded London airport system in a number of submissions is largely supported by the analysis in this review. A number of submissions questioned assumptions over the viability of low cost carrier operations, of different sorts, under several of the modelled airline response paths. It was suggested by some responses that LCCs should be ruled out of operation at Heathrow and by others that a much larger LCC operation should be modelled at Heathrow. The potential for self-hubbing for LCC passenger was seen by several responses as exaggerated. The range of comments suggests the response paths chosen struck a reasonable balance. Making adjustments to model assumptions to accommodate the criticisms would not make a fundamental difference to outcomes.

Overall then the review finds the forecasts and scenarios produced by the Airports Commission to be appropriate and robust.

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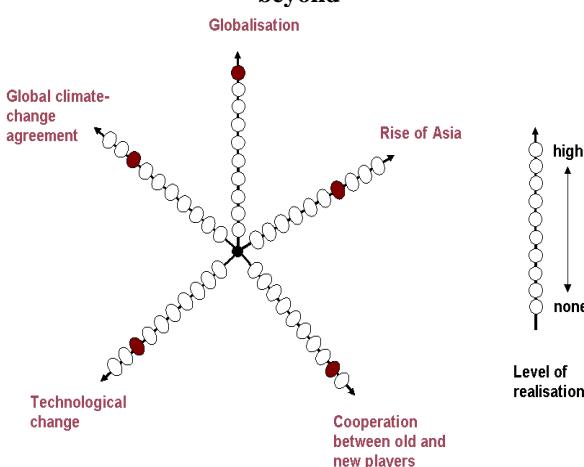
Annex: airports commission scenarios

Extract from Airports Commission Interim Report, December 2013 (paragraphs 2.75 to 2.82).

Scenario A: Global growth

Hub-and-spoke dominates the aviation market; Europe within major global traffic flows.

Figure A.1 Scenario I sees the role of major hub airports and airline alliances strengthened in Europe and beyond



Source: Airports Commission

This scenario is characterised by strong economic growth in an increasingly global economy, with technology used successfully to mitigate climate change and other sustainability challenges. This results in continued rapid growth in aviation demand, with the role of major aviation hubs and airline alliances strengthened around the world.

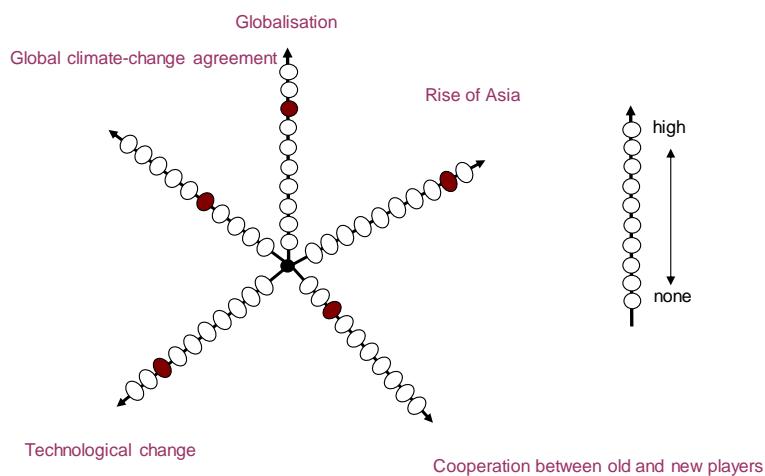
For this scenario to materialise, the following need to happen:

1. **Globalisation:** Continued liberalisation of the global economy, including in the aviation sector where countries sign a global Open skies agreement.
2. **Rise of Asia:** Continued growth of middle-class and affluent populations in Asia, leading to strong demand growth, and strengthening the position of Far East aviation hubs and carriers.
3. **Alliances and partnerships:** Alliances and partnerships between US, European and Asian carriers enhance the global hub network.
4. **Technology:** Rapid growth in the new generation of fuel-efficient wide-bodied aircraft, A350s and Boeing 787 Dreamliners supports hub-and-spoke networks by providing more feeder routes into hubs.
5. **Climate change agreement:** A global deal is signed that ensures a level playing field between airlines.

Scenario B: Relative decline of Europe

6. Hub-and-spoke dominates the aviation market; Europe outside major global traffic flows.

Figure A.2 Scenario II sees a decline in the relative importance of European hubs as Middle and Far Eastern carriers develop their dominant role



Source: Airports Commission

Scenario B also sees strong economic growth and increasing globalisation. However, this scenario is characterised by more aggressive airline competition, especially between legacy carriers and new market entrants from emerging economies. This results in a decline in the importance of European aviation hubs, as European airlines are frequently out-competed by Middle Eastern and Asian carriers.

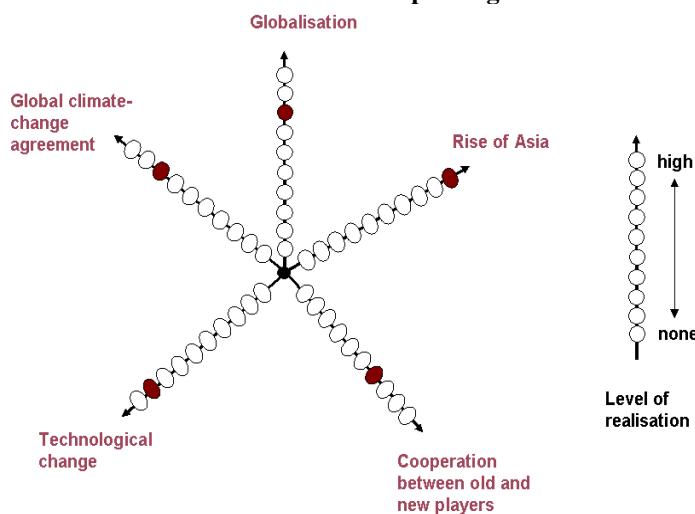
For this scenario to materialise, the following need to happen:

7. **Globalisation:** Continued liberalisation of the global economy, including in the aviation sector.
8. **Rise of Asia:** Growth of middle-class and affluent populations in Asia, leading to strong demand growth, and strengthening the position of Far East aviation hubs and carriers.
9. **Alliances and partnerships:** Middle and Far Eastern carriers and airports develop a dominant role through aggressive competition and selective bilateral partnerships as the role of global alliances declines.
10. **Technology:** New longer range aircraft like A350s and Boeing 787 Dreamliners enable Middle and Far Eastern carriers to bypass European hubs and fly directly to second-tier European airports.
11. **Climate change agreement:** Partial climate-change agreement that creates inequality between airlines in the developing and developed worlds.

Scenario C: Low-cost is king

12. Point-to-point dominates the aviation market; Europe within major global traffic flows.

Figure A.3 Scenario III sees a global decline in the importance of hub airports as LCCs take over long-haul routes and some of the transfer passenger market



Source: Airports Commission

Scenario C sees a decline in the importance of hubs throughout the world as low-cost carriers move into the long-haul market and self-connecting becomes more common. By 2040, low-cost and charter airlines capture over 50% of the market, transforming the shape of the aviation sector.

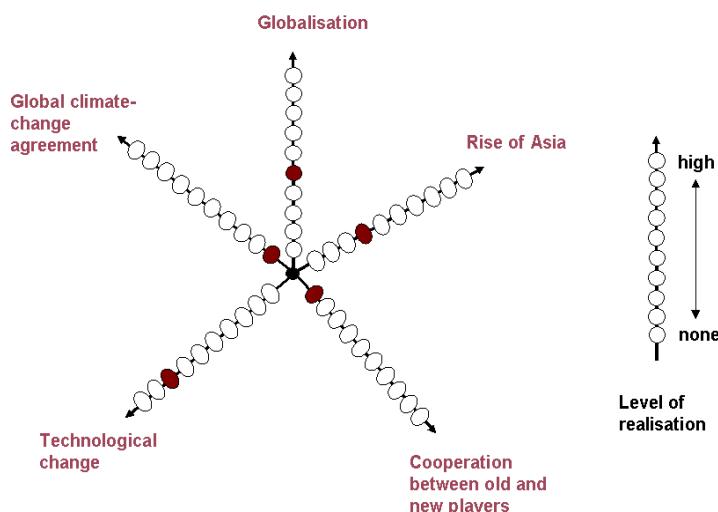
For this scenario to materialise, the following need to happen:

13. **Globalisation:** Continued liberalisation of the global economy, including in the aviation sector.
14. **Rise of Asia:** Growth of Asian middle classes results in increase in price-sensitive leisure traffic, which increases the market-share of low cost carriers at the expense of network airlines.
15. **Alliances and partnerships:** Low-cost Asian carriers become key players in the global aviation sector, and they have few incentives to enter formal alliances.
16. **Technology:** New longer range aircraft like A350s and Boeing 787 Dreamliners' enable more people to fly point-to-point.
17. **Climate change agreement:** Global climate-change agreement that levels the playing field between airlines.

Scenario D: Global fragmentation

- Point-to-point dominates the aviation market; overall relative decline in global traffic flows.

Figure A.4 Scenario IV: Global Fragmentation



Source: Airports Commission

Scenario D involves a combination of pessimistic assumptions. The world faces a decline in global growth prospects and the fragmentation of the world economy, as the strong growth and liberalization of the late 20th century increasingly looks like a one-off ‘blip’. Countries turn inwards, adopting more interventionist and protectionist policies. While technological developments keep on changing the airline industry, there is no political appetite for a global ‘Open Skies’ agreement or a global climate-change deal. This pessimistic scenario of stalled growth and hindered global governance results in a more negative outlook for the aviation market.

For this scenario to materialise, the following need to happen:

- **Globalisation:** Countries try to insulate themselves from the perceived ‘downsides’ of globalization, such as volatile capital flows and mass migrations, by creating explicit or implicit barriers.
- **Rise of Asia:** Slowdown in growth of prospects in Asia, as global markets suffer from a rise in protectionism.
- **Alliances and partnerships:** Airlines compete aggressively for a relatively smaller pool of passengers, resulting in the partial break-up of global alliances.
- **Technology:** New longer range aircraft like A350s and Boeing 787 Dreamliners enable more people to fly point-to-point.
- **Climate change agreement:** No global climate-change agreement.

Forecasting Airport Demand

Review of UK Airports Commission Forecasts and Scenarios

The Airports Commission was established by the Government of the United Kingdom to take an independent look at the UK's future airport capacity needs. It was tasked with setting out the nature, scale, and timing of steps needed to maintain the UK's status as an international hub for aviation, setting out recommendations on how to meet any need for additional airport capacity in the longer-term by the summer of 2015. Its recommendations to the Government are underpinned by a detailed review of the evidence as to how demand is likely to develop and the expected future pattern of the UK's requirements for international and domestic connectivity.

The Airports Commission asked the International Transport Forum for an external view on whether its forecasts yield plausible results, taking into account the ways in which the future of the aviation market may develop. The present report reviews the forecasts and discusses the appropriateness of the outputs produced and the robustness of the scenarios. This includes an examination of the approach to allocating traffic between London's airports. The work builds on reports on likely airline responses to runway expansion under some of the scenarios prepared by the International Transport Forum together with SEO Economic Research already published.

This report is part of the International Transport Forum's Case-Specific Policy Analysis series. These are topical studies on specific issues carried out by the ITF in agreement with local institutions.