The Chartered Institute of Logistics and Transport

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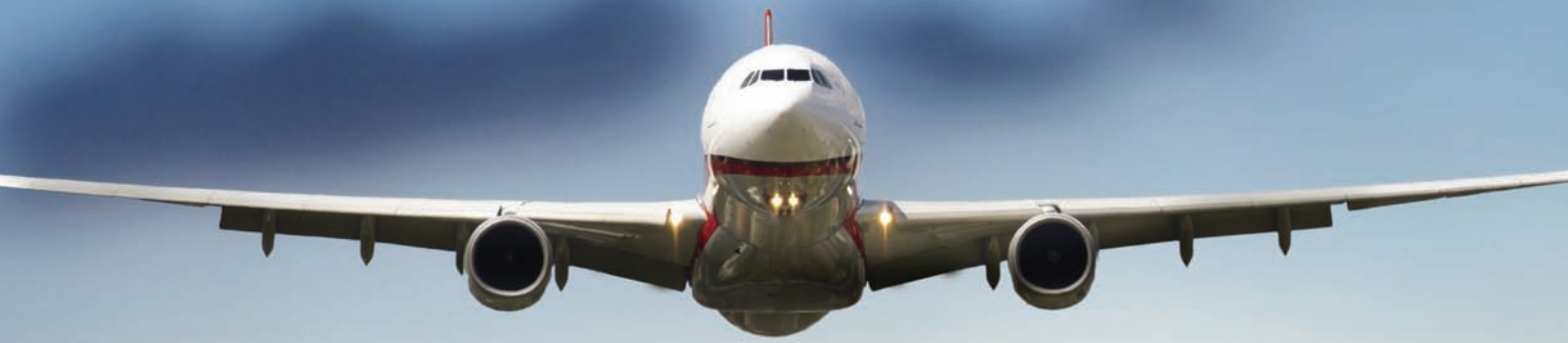
www.ciltuk.org.uk

The Future of Aviation

CILT VISION 2035
Transport, Logistics and the Economy



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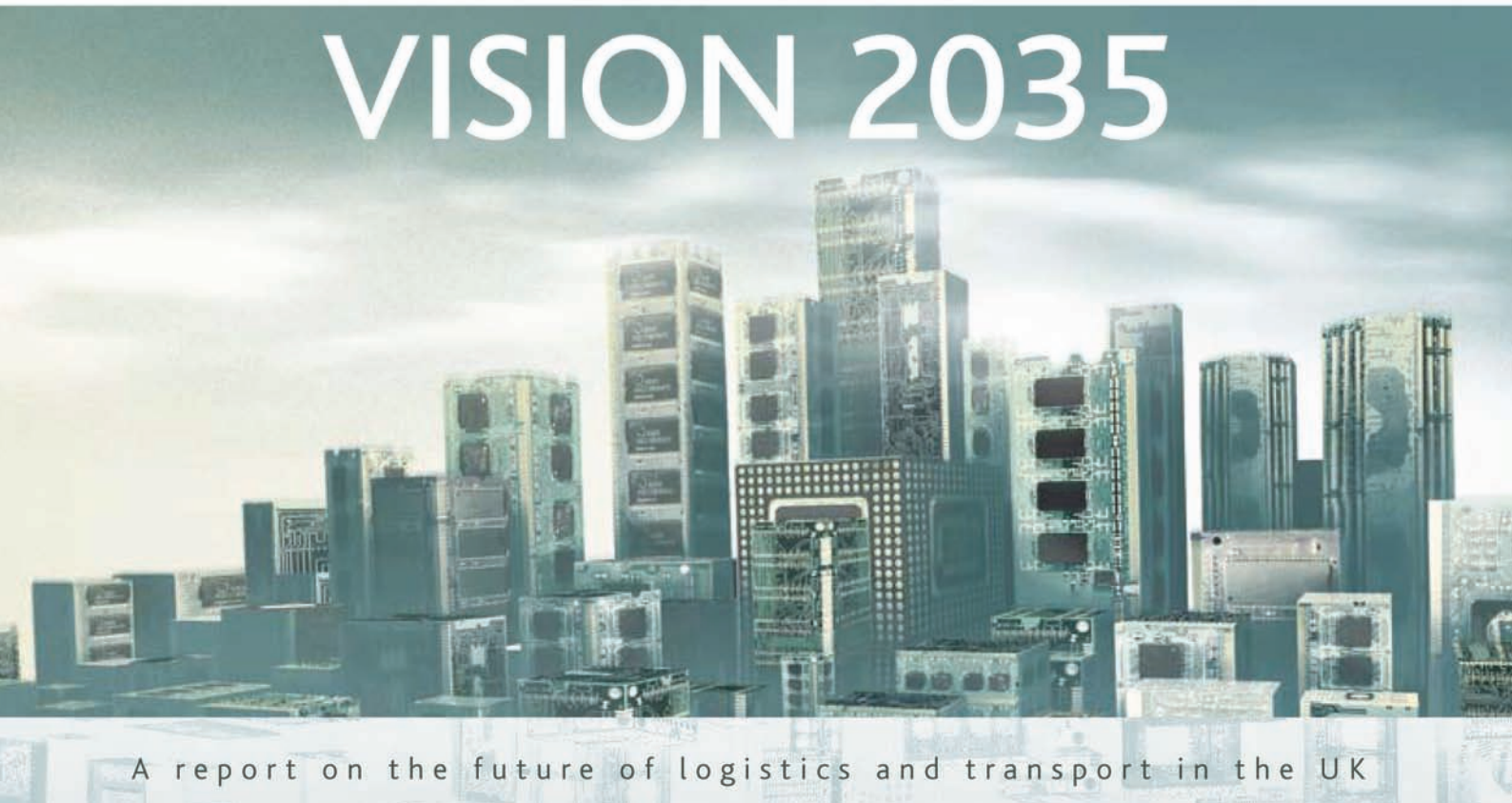
Introduction

Vision 2035: Transport, Logistics and the Economy



CILT's original 2011 Vision 2035 report paved the way for a series of new papers looking in detail at various aspects of the UK's future infrastructure and planning needs

The Chartered Institute of Logistics and Transport's (CILT's) well-received report Vision 2035 was published in September 2011. Its purpose was to look to the future and visualise how transport and logistics in Britain would develop, taking account of demographic changes, population growth, technological developments and social and political change. The aim was to identify the challenges the industry would face and the policy instruments needed to serve society as effectively as possible.

The main conclusions of the report were:

- Provision of effective freight transport capacity and reliable journey times must be key priorities to support recovery and growth
- Transport demand will be strongly influenced by population growth, an ageing population, and where these changes will occur
- The UK will never have sufficient capacity to meet all potential demands for transport services; the financial burdens on the UK limit its ability to fund new infrastructure over the next decade, and in the medium term the issue will be exacerbated by the fall in tax revenues from vehicle fuel duty
- Economic recovery can only be achieved if sufficient capacity can be released on, and added to, our transport networks. This requires demand management and behavioural change as well as additional infrastructure
- The logistics and transport sectors should take the lead in promoting a reduction in both freight and passenger traffic by supporting:
  - Alternatives to travel
  - Reduced commuting distances
  - Shorter, more localised supply chains
- Information technology has the potential to revolutionise the way we use and manage transport and logistics services and to make better use of capacity
- Transport planning must be integrated with economic and spatial planning and administered by organisations with regional or sub-regional powers.

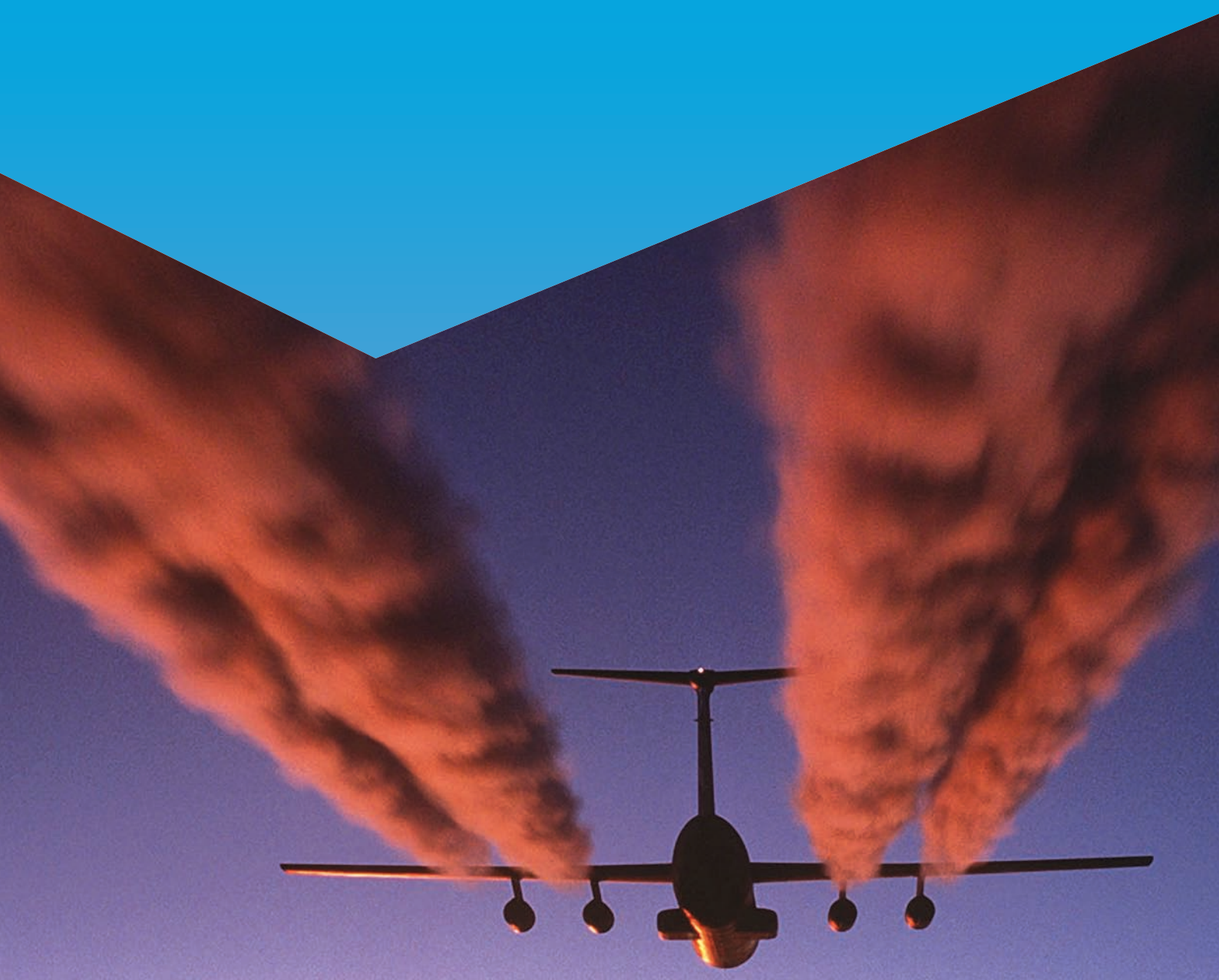
Vision 2035 did not claim to be the last word on the subject: neither should it be taken as established CILT doctrine. The Institute regards it as a starting point for continuing work on likely future changes and the development of more detailed ideas on how best to meet the likely demands on logistics and the transport system. The Institute is therefore promoting a series of studies, discussions and other activities to build on the original Vision 2035, update it and highlight new and emerging issues. Our new series of reports is called Vision 2035: Transport, Logistics and the Economy.

This report, The Future of Aviation is the second of the series. In due course, we will be publishing further reports, and holding discussion evenings and events on a number of topics ranging from transport planning to aviation. The first report, The Future of UK Freight, was published in March 2014.

The Institute hopes that this series of publications and events will stimulate debate, lead to a fuller understanding of future issues and generate ideas on how our own members and the transport and logistics sectors more widely can help to improve our response to them.

Executive summary

Vision 2035: Transport, Logistics and the Economy



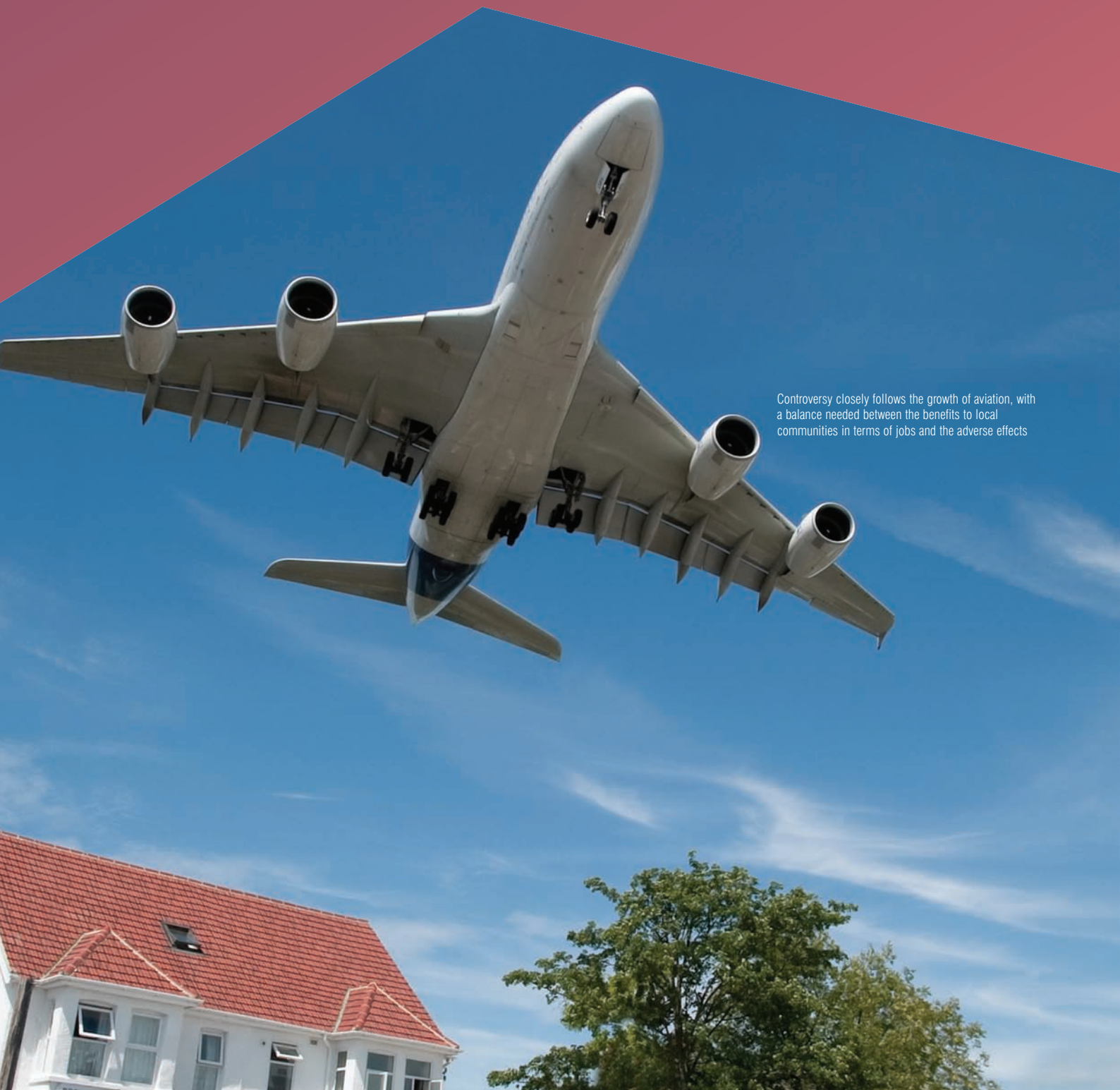
The vision is for a reduction and balance of the adverse environmental effects of aviation

- The economic, social and environmental effects of aviation are likely to be optimised (in terms of balancing the adverse effects with the benefits) in a scenario in which the UK is prospering in line with the rest of the world.
- The UK aviation industry has been at the forefront of many developments, but as we prevaricate over long-term strategy, we may fall behind as other countries overtake.
- Airlines have fundamentally shorter term business horizons compared with airports, so future changes are more likely in the former. New airport runway capacity is only likely in a prospering scenario.
- Aviation technology still has the potential for improvement, although much of this could be in the unseen areas of electronics, materials and communications. Technology advances in airspace will reduce greenhouse gas emissions and CILT is confident that airspace management will not constrain air travel in 2035.
- Sustainability improvements, in line with Government targets, can be achieved with the prospering scenarios, but there could be a circular trend of lack of growth limiting investment in sustainability that in turn limits growth.
- UK airport strategy is at a critical point, with the Airports Commission's recommendations and the Government's decisions not due until 2015. There is plenty of spare runway capacity outside south-east England, and some within, where airports have opportunities to attract more activity in the short and medium term.
- Surface access improvements are a vital element of the potential for airport growth, with particular airports being able to demonstrate significant benefits from improvements. HS2 seems likely to go ahead in all the scenarios and will have a limited impact on domestic aviation, but may widen the catchment areas of airports directly served.
- This report of the future of aviation has been prepared as part of the Chartered Institute of Logistics and Transport's Vision 2035 and sits alongside other reports on related subjects.
- CILT's vision for aviation in 2035 is that growth will continue and will enable technological and environmental improvements to be achieved; but unless global stability and prosperity is continuous, this growth will be moderated. Policy for the longer term should therefore plan for modest growth under environmental and delivery constraints.

The Future of Aviation

Introduction

Aviation in context



Controversy closely follows the growth of aviation, with a balance needed between the benefits to local communities in terms of jobs and the adverse effects

The Chartered Institute of Logistics and Transport published: *Vision 2035: A report on the future of logistics and transport in the UK*[1] in 2011, since when it has continued to explore the subject through a series of daughter documents. This report, initiated by the Aviation Forum but benefiting from the input of colleagues from other Professional Sectors, as well as from all Nations and Regions in the UK, looks at various futures for the next 25 years for the aviation industry, its customers and other stakeholders.

Aviation growth is controversial, whether it is the climate change impact or the local effect on communities. It is also a key component of the economy, without which we could not enjoy the economic and social benefits it brings. For communities, businesses, investors, operators and the planet, it is vital that we achieve long-term certainty through political consensus. This report is intended to contribute to achieving that consensus.

The report first sets out a number of scenarios for the future, in terms of the global situation and technology. It then examines how a number of issues are affected by the different scenarios and the resulting economic effects. These issues are:

- Global changes in aviation
- Structural changes in airlines and airports
- Aviation technology
- Sustainability
- UK airports strategy
- Airport surface access

Table 1 gives some data (mainly from DfT Transport Statistics) that puts aviation activity in context. Lower passenger trip numbers than bus and rail are balanced by higher air passenger-km, in part because air transport is not a mode used significantly for journeys to work.

	Cars or lorries	Bus and coach	Rail	Air	Sea
Passenger trips		5.1 billion	2.7 billion	211 million	20 million
Passenger-km	600 billion	50 billion	68 billion	309 billion	–
Freight tonne-km	151 billion	–	21 billion	7 billion	43 billion
Tax revenue (support)	£32 billion	(£2.2 billion)	(£5.1 billion)	£2.8 billion	–
Greenhouse gas emissions tonnes	109 million	–	3 million	35 million	12 million

Table 1: **Aviation activity**

1. Logistics and Transport Vision 2035, CILT, 2011
2. Transport Statistics Great Britain 2013, DfT

The Future of Aviation

The scenarios

If there is to be any prediction of the most likely scenario, it is at the centre point where all the scenarios meet, and it is this area that we describe as our vision, with the scenarios as sensitivity tests.

The scenarios are, in part, based on those considered by the Airports Commission and set out in its Interim Report[3], but they also take account of scenarios used by Network Rail in its Long-term Planning Process Market Studies[4].

Figure 1 (see page 9) is a summary chart of the scenarios, where the vertical axis describes technological ability and the horizontal axis describes the degree of global involvement. Exogenous factors are noted in plain text, while policy decisions are underlined and economic effects are in bold. Random events that cause shocks may occur in any of the scenarios, but are overcome more quickly towards the top right. In particular, geographical stability is a key factor with, for example, some parts of the Middle East powering growth while other parts are deep in conflict.

Although the scenarios are for the future, past events can illustrate what the scenarios mean – for example:

- The mid 1970s was a classic period of Struggling in Global Turmoil, when Middle East conflict, oil price rises and inflation had a dramatic effect on world aviation.
- The more recent economic recession of the late 2000s may be more like Struggling in Isolation, as many regions maintained growth in this period. This was certainly an era of rapid growth of low-cost airlines.
- We may now (2014) be in a period of Prospering in Isolation, in particular in comparison with other parts of Europe, some of which are not recovering as well as the UK. The rise of Middle East hubs and carriers is particularly noticeable at present.
- The 1960s may have been a period of Prospering in Global Stability, with others in the late 1980s and early 2000s.

As with all scenario planning, no prediction is made as to the likelihood of any scenario. Indeed, over the 20 years to 2035, it is likely that there will be a drift in and out of each of the four scenarios. Instead, the summary and the paragraphs below describe what would happen in aviation if any of the scenarios came about. If there is to be any prediction of the most likely scenario, it is at the centre point where all the scenarios meet, and it is this area that we describe as our vision, with the scenarios as sensitivity tests.

Two other reports on the future of aviation have been considered, although are not directly drawn upon in this paper. The European Commission's: *Flightpath 2050*[5] study includes some specific goals and ambitions, but is too far into the future for our 2035 study. A Eurocontrol report entitled: *Challenges of Growth 2013*[6] is more relevant as its time horizon is also 2035 and it uses scenario planning. It concludes that the European capacity gap is of the order of 120 million passengers, with Turkey and the UK with the most unaccommodated demand.

Dubai International Airport showcases the powering growth of aviation in the Middle East

3. Interim Report, Airports Commission, December 2013
4. For example, see Long-term Planning Process: Long Distance Market Study, Network Rail, October 2013
5. http://ec.europa.eu/research/transport/pdf/flightpath2050_final.pdf
6. www.eurocontrol.int/sites/default/files/content/documents/official-documents/reports/201307-challenges-of-growth-summary-report.pdf

Prospering, technologically enabled

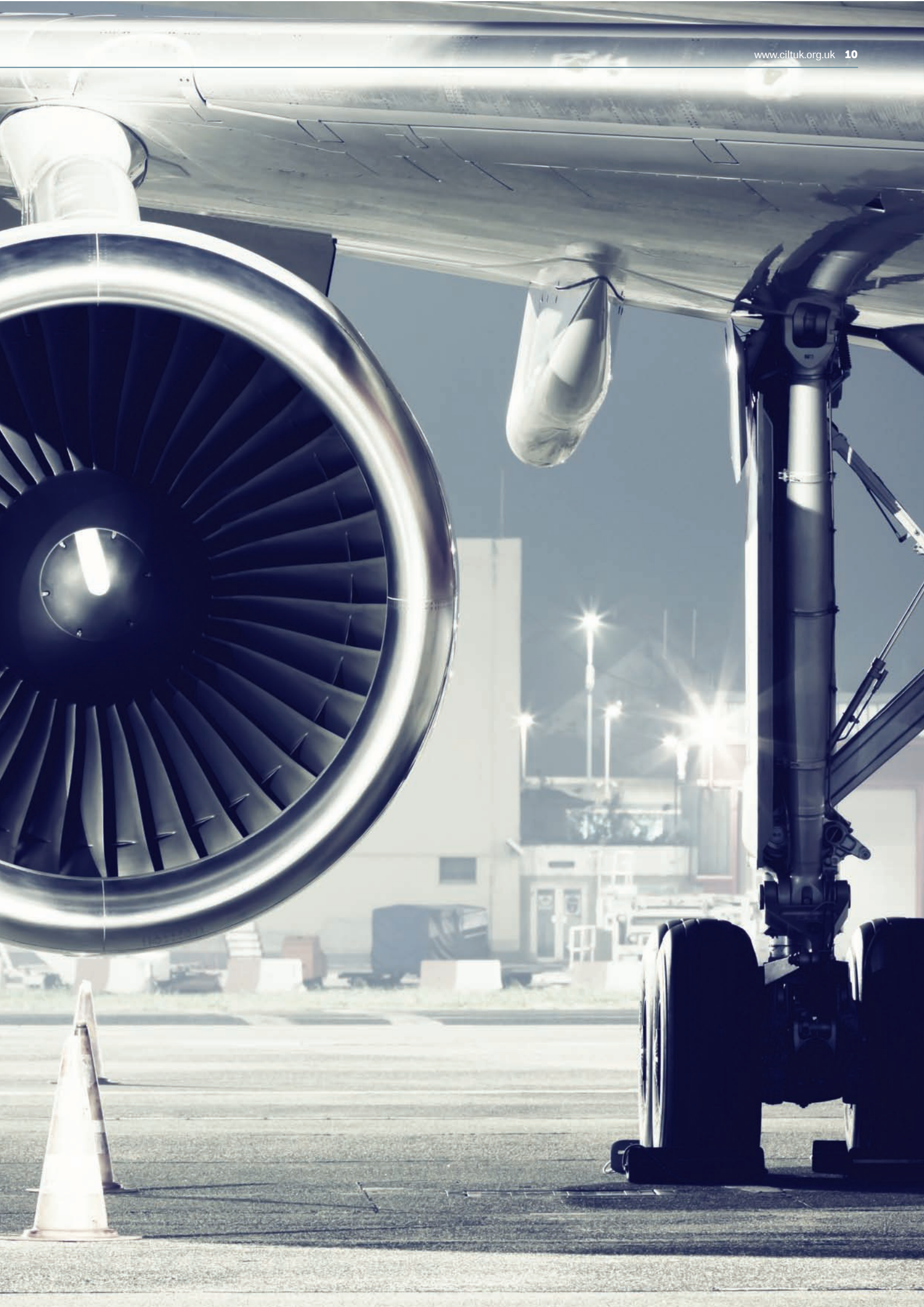
Insular, passive

Prospering in Isolation (Relative decline of rest of Europe)	**Prospering in Global Stability (Global growth)**
Rise of Middle and Far East hubs, relative decline in Europe, although UK prospers, therefore some markets grow Aircraft and engine technology improves to meet carbon targets, but non-UK operators may be slow to embrace it Sufficient reductions elsewhere in the UK to enable aviation to offset emissions *Marginal business case for additional runway capacity, hence only possible at Heathrow* *Several airports at capacity, with poor resilience* *High demand for air travel and air freight, but capacity constrained, therefore air fares and cargo rates rise* *UK regions and nations served by direct point-to-point services, transfers via EU and ME hubs and secondary London airports* *Some improvements to airport surface access*	Airline alliances strengthen, hub airports dominant Aircraft and engine technology improves to meet carbon targets, but targets constrain growth Sufficient reductions elsewhere to enable aviation to offset emissions *New UK runways, improved resilience* *High demand for point-to-point air travel and air freight* *UK regions and nations served by direct point-to-point services and via London and overseas hubs* *Airport surface access significantly improved to accommodate airport growth*
UK economic growth held back by limited aviation capacity and high costs of travel	**UK economic growth enabled by availability and low costs of travel**
Struggling in Isolation (Low-cost is king)	**Struggling in Global Turmoil (Stagnation and fragmentation)**
Low-cost and charter carriers in the majority Hub airports less dominant Fewer very large aircraft Lower GDP = lower demand for air travel and air freight Aircraft and engine technology does not improve sufficiently to meet carbon targets, but sufficient reductions elsewhere to enable some emissions to be offset *No new UK runways, but spare capacity enables resilience* *UK regions and nations less well connected by either direct services or via hubs* *Limited improvements to airport surface access*	Lower GDP + high travel taxes = lower demand for air travel and air freight Aircraft and engine technology does not improve sufficiently to meet carbon targets. Insufficient reductions elsewhere so aviation unable to offset emissions *Poor business cases for airport capacity investments* *No new runways* *No improvement to airport surface access* *UK regions and nations struggle to provide connections*
UK economic growth limited but not held back by aviation	**UK economic growth limited but additionally constrained by lack of air connections**

Global, active

Struggling, technologically limited

Figure 1: Vision 2035 aviation scenarios



The Future of Aviation

How will global changes in aviation vary by scenario and what will be the economic impact?

The Channel tunnel is the only 'surface' link Great Britain has with the rest of Europe, ensuring that aviation over short distances is a vital necessity to the country

Aviation is a global activity. Although most airlines are based in one country (with the notable exception of some low-cost carriers), most provide international services and air travel literally circles the globe. For long-haul passengers, there is no alternative to aviation, and the choice for freight is often clear because of the weight and time involved. For short haul, there is choice depending on distance, with rail providing a choice for passengers on many routes and road and rail being used for freight. For very short distances, aviation is unlikely to be economic, except for remote or island communities. However, Great Britain is, of course, an island, with the Channel tunnel as the only 'surface' link with the rest of Europe.

Aviation activity is strongly linked to GDP, so, not surprisingly, growth in recent years and in the future is linked to growing economies. The rise of the Middle and Far East economies is expected to continue to be faster than that of Europe and North America, with South America also growing strongly. Africa remains full of potential, but is not yet on a clear growth path. Investment in aviation in the Middle and Far East has been very high in recent years, and the infrastructure and capacity provided is likely to be available fully over the next 25 years. This means that major new airports and the airlines based there will move steadily up the league tables. Dubai/Emirates, Abu Dhabi/Etihad and Doha/Qatar are current examples, but there is also a rapidly expanding low-cost sector in the Middle East and other countries and airlines with ambitious growth plans. In the Far East; Singapore, Hong Kong and Kuala Lumpur are well established, but Chinese and Indian airports and airlines are rapidly expanding, and other countries – for example, Vietnam – are also expanding rapidly. These countries are starting from a low base, but have huge potential, although it is not clear if this will be realised by 2035. Japan's air transport market is relatively mature and unlikely to see rapid growth.

North America has the most mature aviation market, but it has changed and is still changing. Large airlines are merging and are often unstable because of limited margins and strong competitive pressures. Low-cost airlines are well established, but have not removed competition. The hub-and-spoke model used by many airlines, with franchised operators providing the smaller spokes, is particularly subject to variability.

Europe's air transport industry is probably the most diverse, with a few remaining state-supported airlines, a significant number of legacy carriers and low-cost airlines operating from multiple countries. However, growth has been patchy, because of the variability of economic performance.

Random global issues such as security may affect aviation in any of the scenarios. The effect of major world events, such as the 1974 oil price rise and the 9/11 attacks, are clear, although it is often the case that the effect on demand is only apparent for a year or two. The industry has adapted to meet such challenges – for example, by improving engine efficiency to reduce fuel usage, or by increasing security to reduce risk.

Over the next 25 years, we can expect to see Middle and Far East aviation activity growing strongly while North America and Europe will grow more modestly. All the scenarios considered assume this to be the case, but vary in the degree to which the UK aviation sector keeps up or falls behind. Global stability assumes an uninterrupted continuation of the trends, while global turmoil assumes significant interruptions and therefore a slowdown in growth or even decline in some regions. The insular scenarios assume that the UK strives to maintain economic growth without growing its contacts with the rest of the world. In aviation terms, these scenarios are somewhat of a vicious circle, as deliberate isolation is likely to restrict growth if potential exists.

As well as being strongly related to GDP on a national basis, there is also UK evidence that it is related to GVA per head of population on a regional basis, which has an impact on the location of airport capacity.

The Future of Aviation

How will structural changes in airlines and airports vary by scenarios and what are the economic consequences?

Predicting changes in airline structure over the next 25 years is very difficult. Few people predicted the rise of low-cost airlines; just as few predicted the rise of personal computers.

Although there are a few state-supported airlines, most are now fully commercial and private and there is only limited state support for operations, certainly in Europe. It is easier to start up an airline than an airport, with assets being leased, expertise hired and route entry mostly free. It is also easy to exit. This gives rise to a very dynamic situation where routes and services are started and stopped very frequently, although the key trunk routes are always served.

Predicting changes in airline structure over the next 25 years is very difficult. Few people predicted the rise of low-cost airlines; just as few predicted the rise of personal computers. However, we can probably be certain that airline businesses will find ways of opening up new markets. Low-cost carriers are continuing to evolve, recently moving more towards serving business passengers.

Airports are fundamentally different because of the nature of their assets. Infrastructure has a long life – 30 years for buildings and 50 years for runways – so long-term decisions are required. Many airports remain publicly supported in all parts of the world, although business models vary. Most North American airports are owned by state or city authorities, although airlines often have long leases in buildings and other facilities and are able to invest for a longer period. Elsewhere airports are state owned, although some offer operating concessions. There are limited examples elsewhere, but only in the UK is there significant private ownership of airports, although even here it is not complete, with Manchester Airports Group being part owned by local authorities.

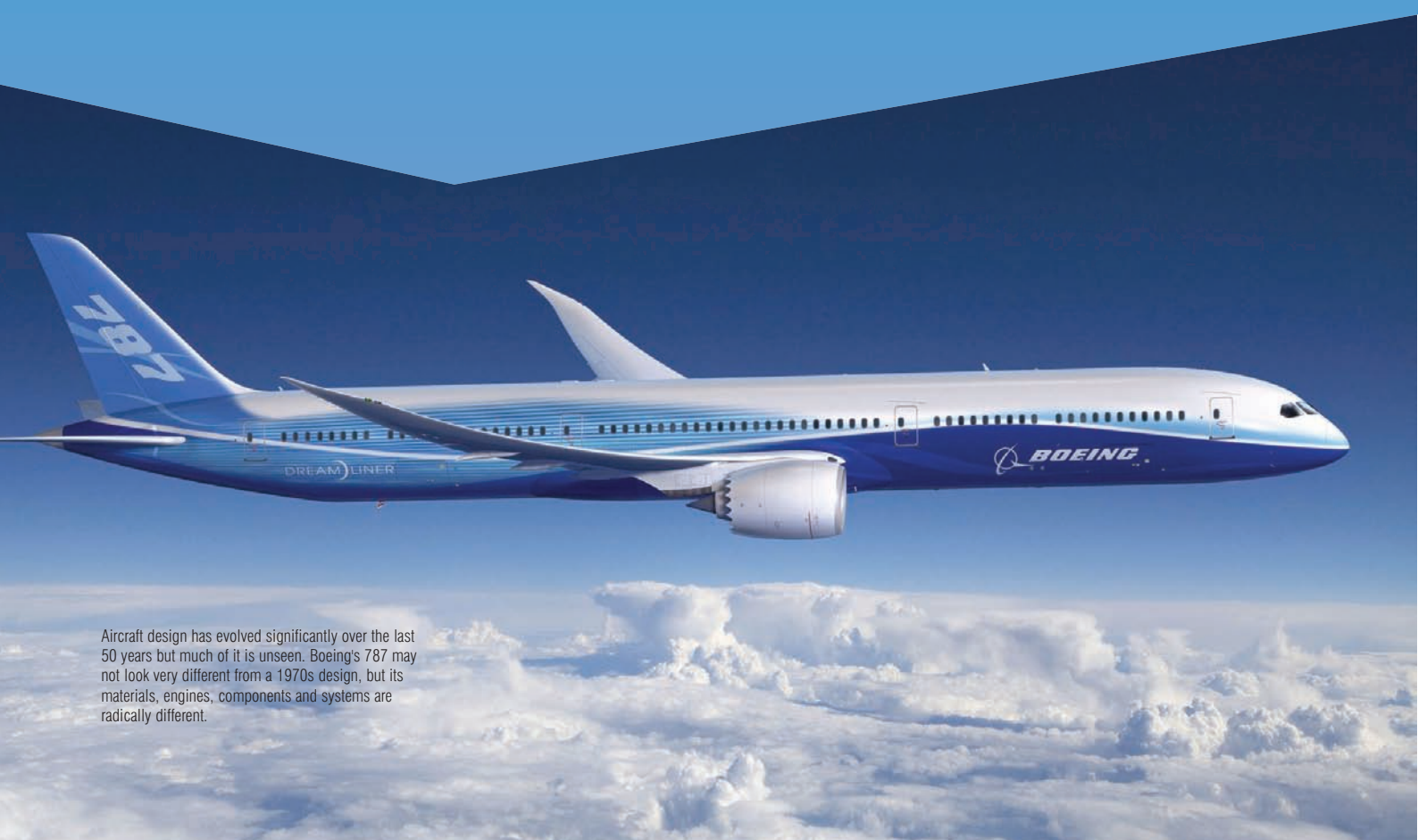
Because of the long-term nature of the assets, changes in airport ownership over the next 25 years are less uncertain than for airlines. In the UK, airports are likely to remain in diverse ownership, although there will be a number of changes, certainly in the small and medium-sized airports. Ownership of the large airports may well depend on the strategy adopted after the Airport Commission reports, with the requirement for funding a new runway. Any large airport requiring long-term major investment will require a particular owner willing to make that long-term investment, while others that can accommodate demand in the short and medium term will appeal to owners wanting shorter term, albeit ultimately limited, returns.

Only one of our scenarios, Prospering in Global Stability, would result in new runway capacity, as the others either have insufficient demand or, in the Prospering in Isolation scenario, a deliberate policy that would result in the frustration of demand for travel and a negative effect on economic growth. It is possible that this scenario may see Middle East interests investing in UK regional airports in order to feed their hubs. In the two struggling scenarios, there is likely to be a churn in ownership of regional airports, which will find it challenging to remain viable, with some even closing.

Contratrends in airlines can be seen in the top right (stronger alliances) and bottom left (low-cost is king) scenarios. Air freight is more suitable for alliances and hubs, so one economic effect of the bottom left scenario is less world trade.

The Future of Aviation

Aviation technology



Aircraft design has evolved significantly over the last 50 years but much of it is unseen. Boeing's 787 may not look very different from a 1970s design, but its materials, engines, components and systems are radically different.

Aircraft design has evolved over the last 50 years such that aircraft now look very similar to each other. Current trends are moving towards composite (and hence lighter) materials, improved engine technology and computer management systems. Futuristic designs exist – for example, blended wings – but are unlikely to be developed into service in the next 25 years. As airline fleets are replaced, there will be major improvements in economics and environmental impact, but these are likely in the first half of the period to 2035. Air freight may benefit from lighter-than-air technology, although if this happens it is as likely to eat into the shipping market as aviation.

Although there are experiments in alternative fuels for aircraft, we assume that these will have a relatively small effect by 2035 (Sustainable Aviation, a UK group made up of airlines, airports, manufacturers and airspace working towards improvements, predicts between 7 and 10% carbon reduction by 2030[7]) and will require oil to exceed $120 a barrel. The increasing use of alternative fuels for other transport and indeed power generally may mean that oil shortages do not impact on aviation and there is headroom for growth, although it is certain that the price of oil will rise (otherwise alternative fuels will not be viable).

Airspace management has great potential for change in the longer term, but there are few immediate prospects. In the UK, changes will be required if there are new runways and the changes resulting from the Single European Sky and London Airports Management Programme will provide improvements in the second half of the period to 2035. Airspace technology will also improve such that greenhouse gas emissions per seat-km will fall. Although there are some concerns about the ability of technology to achieve improvements in local air traffic control arrangements in the timescale, the overall view is that it will not constrain the growth of aircraft movements in the UK.

Communications technology is having a major impact on the way that customers buy aviation products and we can expect to see further evolution of this. Some ideas for the future of aviation travel and booking, including digital travel buddies, virtual reality and semantic search tools can be found in a recent Skyscanner study: *The future of travel 2024*[8].

The technologically enabled scenarios will involve significant progress in these areas, while the struggling scenarios will see a slower pace of change. However, over the 25-year period to 2035 there may not be much difference between the scenarios in terms of technology, so this is one area where the impact on the economic benefits of aviation does not vary significantly.

7. Carbon Road Map, Sustainable Aviation www.sustainableaviation.co.uk/wp-content/uploads/SA-CO2-Road-Map-full-report-280212.pdf
8. The future of travel 2024, Planning and booking, Skyscanner, www.skyscanner2024.com

The Future of Aviation

Sustainability

Social impacts are primarily related to the ability for passengers to visit other countries for cultural reasons and to contact their friends and relatives. These benefits are likely to be greater with the prospering scenarios.

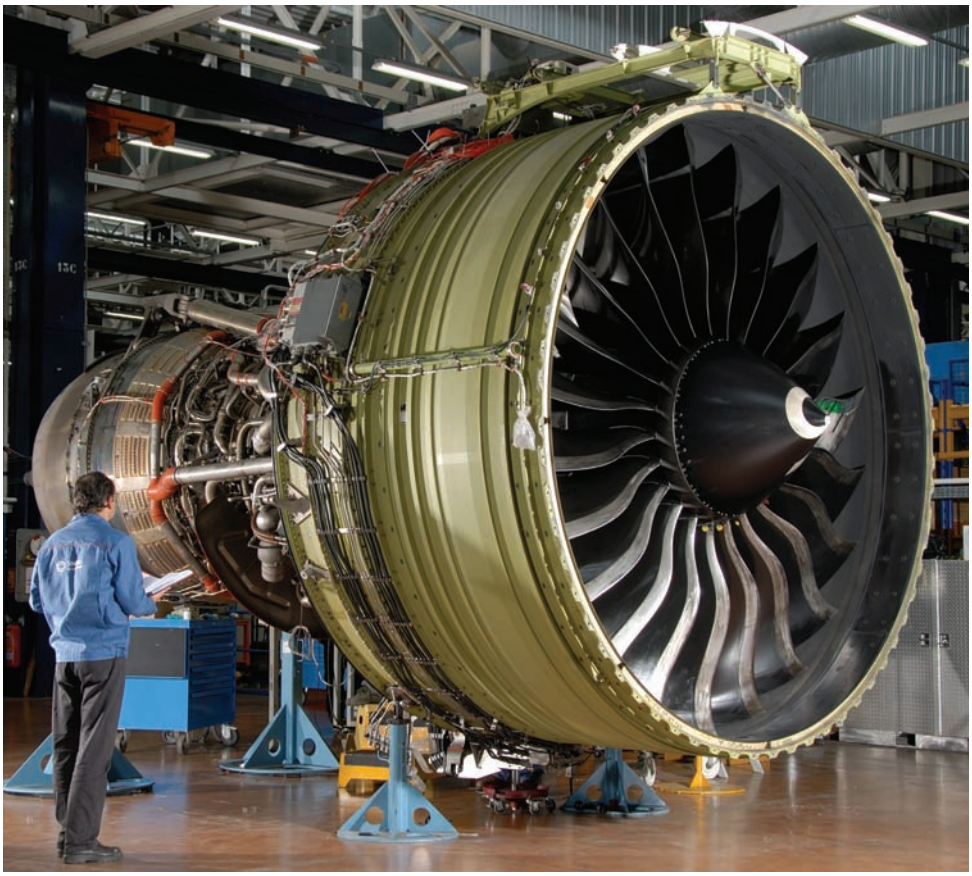
Although primarily driven by technology, there are non-technological issues involved. Sustainability has three pillars: environmental, social and economic.

For aviation, the environmental pillar includes global issues such as climate change from emissions, as well as local effects of noise and air quality. Sustainable Aviation has established road maps for emissions and noise that have been incorporated into government plans and targets. On CO_2 emissions, the key target is to achieve a 50% reduction compared with 2005, and the Committee on Climate Change has accepted that this can be achieved with a 60% growth of passengers through technological improvements and emissions trading. The noise road map shows that even if air transport movements nearly double, noise impacts will be less than current levels through the introduction of quieter aircraft, with further reductions possible through operational procedures and land use control.

The prospering scenarios will enable the faster introduction on environmental benefits, although this will be in part balanced by higher levels of activity. In the struggling scenarios, the improvements will be slower, with a risk that long-term targets may not be met. The isolation scenarios will also make it difficult for aviation to meet environmental targets, as non-UK operators do not keep pace with improvements.

Social impacts are primarily related to the ability for passengers to visit other countries for cultural reasons and to contact their friends and relatives. These benefits are likely to be greater with the prospering scenarios.

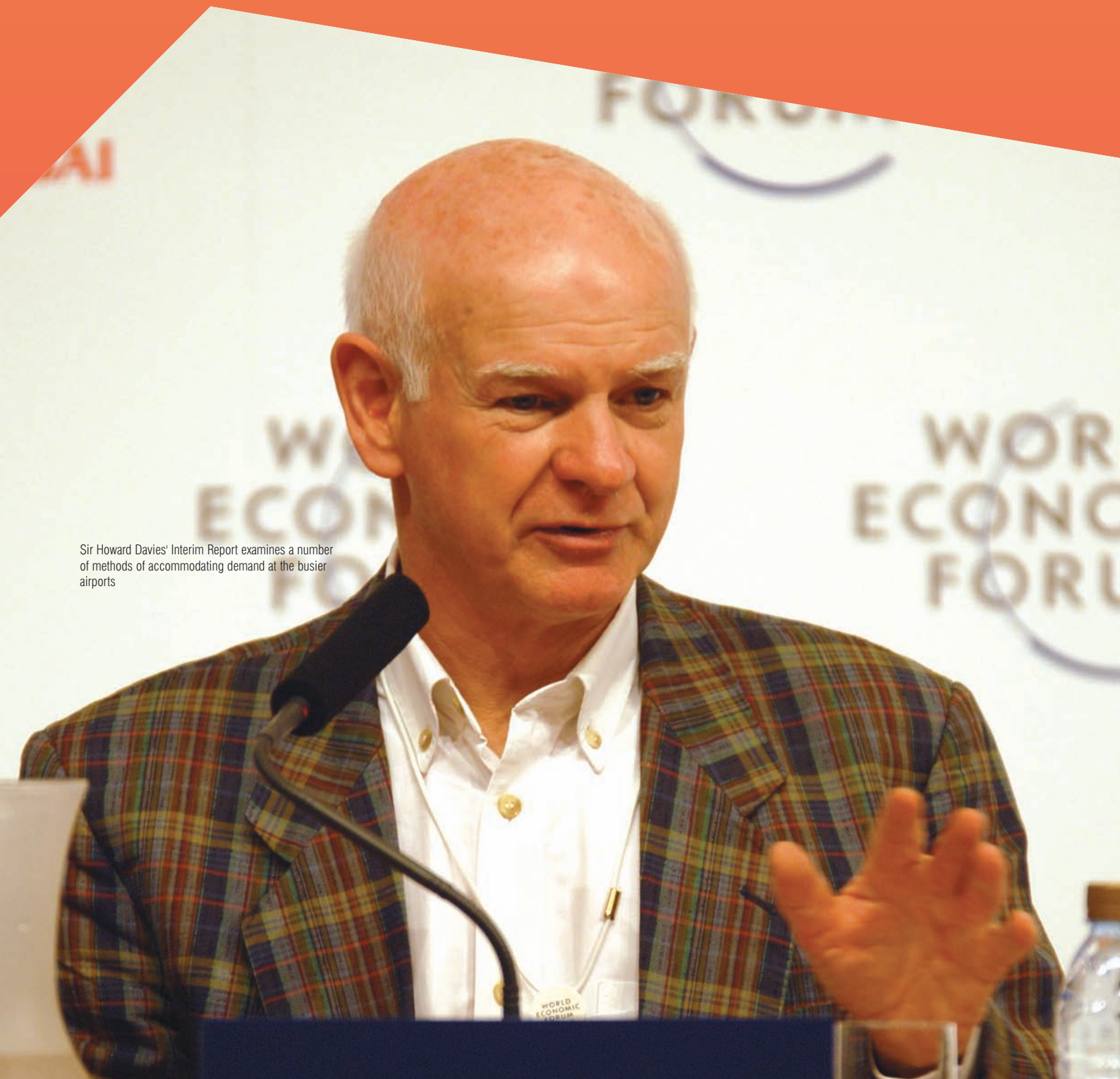
There are many studies on the economic value of aviation, from the number of jobs created to the wider opportunities for business. The only scenario in which aviation maximises its economic benefits is Prospering in Global Stability. By definition, maximising economic benefit can only result from prosperity, and the isolation side means that the international benefits of aviation are not maximised. Prospering in Isolation will result in potential economic growth being constrained by a link of connections. Struggling in Global Turmoil will also include lower economic activity, as will Struggling in Isolation, although in the latter scenario it will not be held back by a lack of aviation connections



Investing in new aircraft will help to meet government environmental targets

The Future of Aviation

UK airports strategy



Sir Howard Davies' Interim Report examines a number of methods of accommodating demand at the busier airports

The Airports Commission under Sir Howard Davies has published an Interim Report and is due to produce a Final Report in 2015. The Interim Report contains short and medium-term recommendations to make better use of existing capacity and a short list of longer term options. By definition, the short and medium-term recommendations will dominate the first half of the period to 2035, while the longer term options will come into play in the second half.

The Interim Report examines a number of methods of diverting demand from the busier airports – for example, through taxation, rules or incentives. The Commission concludes that these methods would not reduce demand at Heathrow or remove the need for additional runway capacity in the south-east. However, the short and medium-term recommendations include the promotion of underutilised capacity, including the following outside the south-east:

- Support for the Rail North project and interventions to deal with highway congestion around Manchester airport
- Support for the Birmingham Gateway project
- Scottish Executive and Network rail to consider Glasgow airport rail link options, including light rail
- Overseas airlines to be encouraged to apply for fifth freedom rights at less congested airports

For the UK as a whole, the short and medium-term recommendations range from improved surface access through to better airspace management and more liberal regulation. The Airports Commission also published a discussion paper in June 2014 that looked at the available capacity within and outside the south-east. It considered the business models of non-London airports and their potential, as well as the constraints affecting London airports. Although the discussion paper seeks further evidence, the tentative conclusions are that it is the major non-London airports that have the greatest potential, while the constraints on London airports are considerable. Recent moves to support regional services with public subsidy will no doubt be valuable for the region involved, but will probably have little overall effect.

The extent of implementation of the short and medium-term recommendations will vary by scenario, but only to the extent of demand. Thus, the more that we are towards the top right (Prospering in Global Stability), the quicker that the recommendations will need to be adopted and the better will be their business cases. On the other hand, Struggling in Isolation means that the improvements are less likely to happen. The degree of insularity/globalisation and active/passive is probably less important than the strength of demand.

In the short and medium term, there will be no new runways anywhere, whatever the scenario. In the prospering scenarios, this will mean significantly increased pressure on scarce capacity with consequentially effects on prices, regional links to London and resilience. There is nothing to prevent airports outside the south-east from taking this opportunity to attract new services. They have the capacity, there is a liberal regulatory regime and, if they can demonstrate that there is a market, there are plenty of airlines willing to start services.

The Airports Commission is looking into the following long-term options for 2030:

- One new runway at Heathrow (two options)
- One new runway at Gatwick

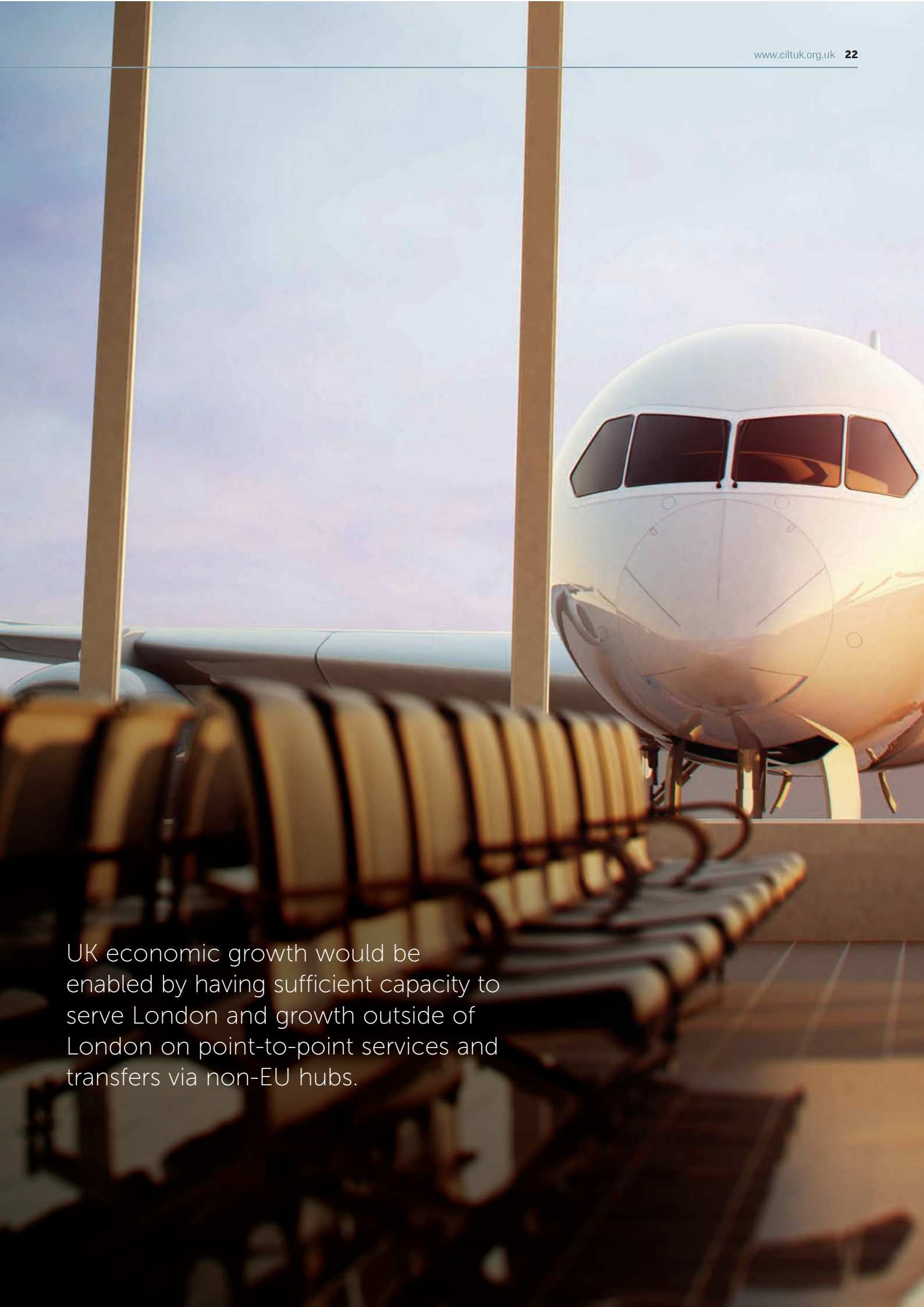
In addition, the Commission is to consider further a new hub airport in the Thames Estuary to see if meets the criteria for the shortlist of options. For the even longer term (2040+), the Commission suggests additional runways at Stansted and Birmingham. The options are not mutually exclusive and some could be implemented in combination. Note that the Commission has ruled out the option for no new South East runways.

Only the Prospering in Global Stability scenario would provide the demand and technological conditions required for more than one new runway. In this scenario, whichever of the options is recommended in 2015, the Government of the day would be able to support it, and the promoter would be able to invest. If a new hub airport is recommended in 2015, there will be a major impact on Heathrow and west London. However, CILT has taken a view that the new hub options (and even a four-runway Heathrow) are unlikely to be recommended in the Final Report. There then remain two options for the first new runway (Heathrow or Gatwick), with the second, later, at Stansted or Birmingham.

In the Prospering in Isolation scenario, the relative decline of European hubs means that the business case for any new runway is difficult, but it might still be possible at Heathrow, although environmental improvements may not be as fast as in the global scenarios and this may constrain permitted growth. UK economic growth would be enabled by having sufficient capacity to serve London and growth outside of London on point-to-point services and transfers via non-EU hubs.

In the struggling scenarios, it will be difficult for an investor to justify the investment required for a new runway. Struggling in Isolation means that demand growth is low from all parts of the UK, although low-cost carriers enable many short haul point-to-point links, and progress and improvements are slow. Struggling in Global Turmoil likewise means low growth in demand in all sectors.

Only the Prospering in Global Stability scenario would maximise the economic benefits for the UK. Struggling in Isolation would see lower economic growth it would not be held back by aviation, rather the reverse that lower economic growth holds back aviation. This would also be partly the case in Struggling in Global Turmoil although additionally international connectivity could be limited by the lack of capacity. In Prospering in Isolation, economic growth would be clearly constrained by high costs and limited capacity.



UK economic growth would be enabled by having sufficient capacity to serve London and growth outside of London on point-to-point services and transfers via non-EU hubs.

The Future of Aviation

Surface access

The Airports Commission's Interim report includes recommendations for a major enhancement at Gatwick Airport Station

The Airports Commission's Interim Report includes a number of surface access recommendations, some of which the Government has quickly adopted. These include:

- A major enhancement at Gatwick Airport station
- Improved Gatwick Express trains
- A study of the Brighton main line
- Improved motorways to Gatwick
- A study of the Lea Valley line
- Improved rail ticketing
- A study of a Heathrow southern link
- Continued support for the Northern Hub proposals related to Manchester
- Support for the Birmingham Gateway project
- Improved motorway access at Luton
- A study of rail link options at Glasgow
- Higher priority for transport investments at other airports

Some of these are associated with the longer term options, so their likelihood under the different scenarios matches that of the option. Thus the major Gatwick schemes are associated with a new runway and are likely under the Prospering in Global Stability scenario, but not with the others. Improved Gatwick Express trains and improved rail ticketing are more likely in the technologically enabled scenarios. The Lea Valley line, Heathrow southern link studies and the schemes outside London, are likely to show better business cases in the prospering scenarios. Higher priority for airport transport investments is likely to be the case under all scenarios, but the total available for investment is likely to be higher in the prospering scenarios and lower in the struggling scenarios.

There are a number of other schemes, such as a Heathrow western rail link and HS2, that are outside the Airport Commission's remit but still very significant. The Heathrow western rail link is in Network Rail's CP5 plans, due for completion in CP6 around 2021, and appears likely to go ahead unless there are major shocks in aviation growth in the next 10 years.

HS2 is also now proceeding through its parliamentary process, with Phase1 likely to be completed by the mid-2020s. All political parties appear to back HS2, so it seems likely to go ahead. It is also likely to go ahead whatever scenario happens. If there is strong economic growth, the case for more rail capacity becomes stronger while, if economic growth is weaker, Government is likely to promote HS2 for its economic benefits in rebalancing the economy. Rail journey times between London and the north of England and Scotland will be reduced and this will have an impact on the rail/air share. However, it is unlikely to eliminate domestic aviation, as passengers will still want to transfer at a London airport and some journeys will still be quicker by air – for example, London–Scotland and interregional routes. Phase 1 includes a Birmingham Interchange station with direct access to Birmingham airport. This will improve the attractiveness of Birmingham airport by widening its catchment area. Phase 1 will also include a connection to Heathrow via Old Oak Common, although it is not clear how attractive this would be to air passengers from the Midlands and the north. A direct link to Heathrow is an option in Phase 2, but the financial business case for it (net of the Phase 1 link from Old Oak Common) is unlikely to be strong unless there is a third runway. It would also require the aviation industry to subsidise it, something it is not keen to do. Phase 2 includes a station at Manchester airport, which could have a similar effect to Birmingham in widening the airport's catchment area. HS3, in the form of a link to help create a northern powerhouse, could also have significant positive benefits on airports in those regions, albeit towards the end of the 2035 period we are currently considering.

Economic effects would be most positive where surface access improvements enable a significantly better use of airport capacity. Thus surface access improvements at Gatwick, which is highly dependent on rail access, could achieve significant benefits. Similarly, the benefits from improving rail access at Stansted – the only major London airport with current spare runway capacity – and airports outside the south east would be significant. Heathrow already has good rail access and the proposals would only bring marginal economic benefits.

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Conclusions: the vision

At the midpoint of the scenarios, there is probably enough demand to justify additional runway capacity in South East England and to optimally use existing runway capacity at other airports throughout the UK

This glimpse into the future or, more accurately, into a number of futures shows that, from several different perspectives, the economic, environmental and social benefits of aviation are only likely to be maximised in a scenario in which the UK is prospering in line with the rest of the world. Aviation is such an international activity that it would not be possible to achieve improvements in isolation. Neither would these benefits be achieved if technology does not improve at the same rate as in the past. If the lack of an adequate UK long-term strategy continues, it is likely that much of the economic benefit will be lost as high-quality airport developments are undertaken in the Middle and Far East.

In terms of global aviation, our vision for 2035 is that current trends in the airport sector are likely to be maintained. Unless there is massive political upheaval, most growth will appear at Middle East and Asian airports (although we should note the potential for instability in some countries in these regions), rather than in Europe or North America. Some changes in airport ownership may occur, but the public/private share is unlikely to change significantly. On the other hand, airlines will react more quickly to changing circumstances and new models, routes and products will come and go.

Our vision of aviation technology for 2035 is difficult to see, literally, because many of the changes will not be visible. Indeed, infrastructure and vehicles will probably not look much different from today. However, aircraft will be made from different materials, be much more efficient and feature much more electronics. The passenger will be served through many new communications developments. The more global stability there is, the more chance there is of technological improvements, while global turmoil and insularity will not enable technology developments to be progressed.

We have a positive view about the sustainability of aviation. Growth will be driven by the need to reduce fuel costs and will enable that reduction. Lack of growth may reduce the ability to improve, but the lower level of activity will reduce impacts. Either way, emissions, noise and other impacts will be reduced in absolute terms, enabling the UK to achieve its targets.

At the midpoint of the scenarios, there is probably sufficient demand to justify one additional runway in the south-east and modest growth throughout the UK. In the short and medium term, airports with spare runway capacity, including those outside the south-east, have an opportunity to attract additional activity. However, high rates of growth are unlikely, so the business and economic cases may be challenging. In these circumstances, UK airports strategy is particularly sensitive to political events. History shows that recommendations are not acted on and decisions are overturned (Maplin 1974, Heathrow 2010). Perhaps the only durable policy is one where the least bad strategy is adopted, where the impacts and the benefits are limited. This would also ensure that growth is accommodated within environmental and deliverability constraints.

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What should be done

The future of aviation may include changes in aircraft design, but will certainly involve technology in operations and customer interfaces

By Government
Decide on a policy that is acceptable to most interests, and stick to it

By the industry
Make your plans and commitments clear, and implement them

By transport professionals
Understand every stakeholder's perspective and design and operate transport systems that balance these views

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Acknowledgment

Vernon Murphy FCILT (28th July 1944 – 14th July 2014) contributed significantly to the publication of this report. Vernon was an active and valued member of CILT for 30 years and chaired the CILT Aviation Forum for eight years (2006-14). He was an esteemed member of the Institute's Public Policies Committee and was a hugely influential and respected figure in the aviation industry.

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Notes

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