COULD TRAINS OVERTAKE PLANES?

Exploring the future of the passenger aviation industry

FOREWORD

PA Consulting Group and Oxera Consulting LLP have come together to think about some of the big issues affecting passenger aviation and how this industry is likely to develop over the next 20 years.

In this document we have developed some possible 'future world' scenarios. These range from a world where there is great expansion in the emerging economies leading to a host of new airports and destinations, through to a future where other transport modes – such as high-speed rail and driverless cars – erode the short-haul dominance of the aviation industry and lead to high-quality long-haul becoming the focus of the industry. For each of these scenarios we have considered the implications for investors, operators of airlines and airports, Original Equipment Manufacturers (OEMs), and the regulators and policymakers that will shape the future of the passenger aviation industry.

We show how these stakeholders may be affected through each of these scenarios: for example, how airlines of the future will need to adapt to changing consumer demands, and how drivers such as economic growth and consumer preferences may affect the future size and location of airports.

This document is supplemented by a number of digital products that summarise the insights we have developed and demonstrate what these could mean for the passenger aviation industry by 2034. These can be found at both **www.paconsulting.com** and **www.oxera.com**.

We hope you find this document thought provoking and interesting and we look forward to discussing the contents and implications with you.

Chris Lynch

Head of Global Aviation
PA Consulting Group
Tel: +44 (0) 207 312 4842
chris.lynch@paconsulting.com

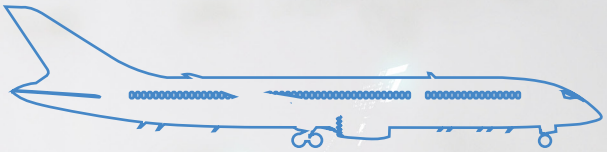
Andrew Meaney

Head of Oxera's Transport team
Oxera Consulting LLP
Tel: +44 (0) 1865 253028
andrew.meaney@oxera.com

CONTENTS

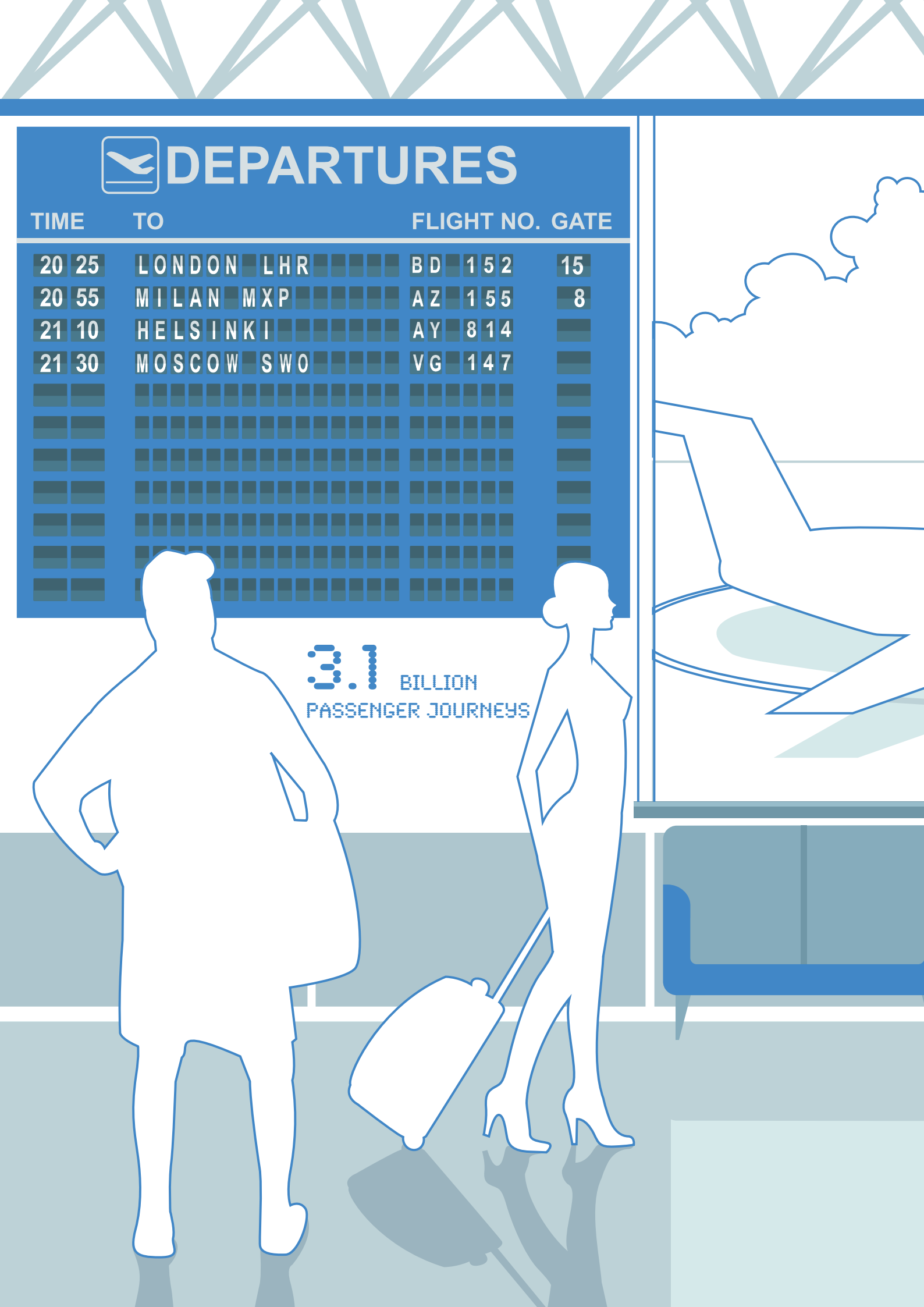
THE WORLDWIDE PASSENGER AVIATION INDUSTRY IN 2013

8.7 MILLION PEOPLE EMPLOYED



1.5
BILLION BARRELS OF FUEL CONSUMED

3,864 AIRPORTS


DEPARTURES
TIME TO FLIGHT NO. GATE
20 25 LONDON LHR BD 152 15
20 55 MILAN MXP AZ 155 8
21 10 HELSINKI AY 814
21 30 MOSCOW SWO VG 147
3.1 BILLION
PASSENGER JOURNEYS

THE WORLDWIDE PASSENGER AVIATION INDUSTRY IN 2013

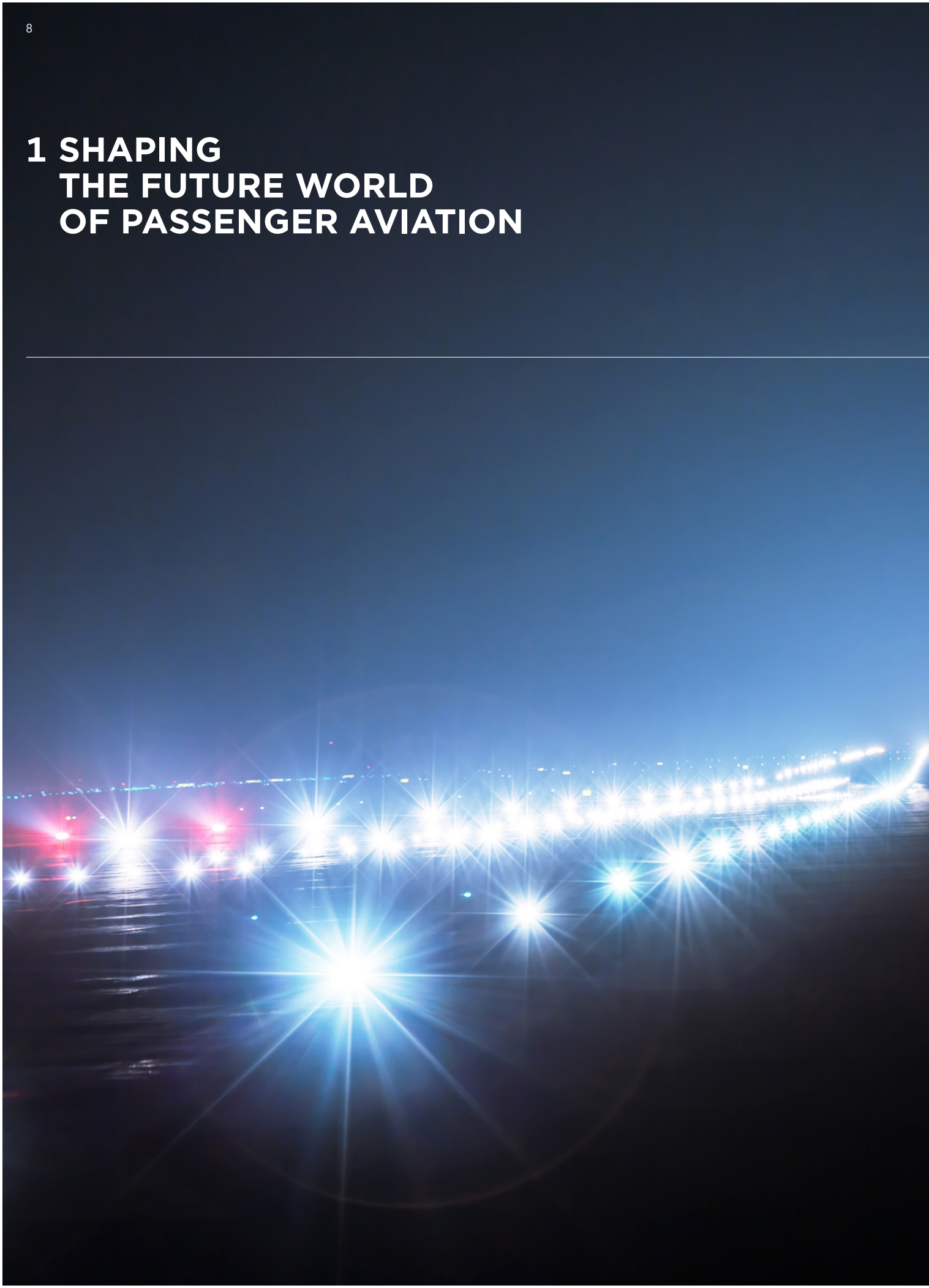
36.4 MILLION
COMMERCIAL FLIGHTS

1,397
COMMERCIAL AIRLINES

58%
OF PASSENGERS BOOKED FLIGHTS ON-LINE

SOURCES: WORLD BANK; IATA (2013; INTERNATIONAL PASSENGER SURVEY; IATA (2014); ECONOMIC AND SOCIAL BENEFITS OF AVIATION

1 SHAPING THE FUTURE WORLD OF PASSENGER AVIATION



1 SHAPING THE FUTURE WORLD OF PASSENGER AVIATION

There have been enormous changes in the passenger aviation industry since its inception 100 years ago. The introduction of the jet plane, the emergence of the jumbo jet, the sizeable reduction in air fares – driven recently by the low-cost carriers – and the changes in security processes have all contributed to shaping the industry we see today.

Some changes have been predictable – for example, the fuel efficiency of aircraft has increased over the last 50 years following the introduction of the Comet jet plane. Other changes have been less predictable – for example, the UK government's 2003 'The Future of Air Transport' White Paper barely mentioned the development of hub airports in the Middle East, yet only 10 years later airports such as Dubai and Istanbul have dramatically changed the global aviation industry. Airports, airlines and other industry participants need to plan in the face of this uncertainty.

So how do we predict what the future of the passenger aviation industry holds?

Scenario planning is widely used by businesses and governments to plan for uncertain futures. In this document we develop, explore and analyse a number of distinct scenarios based on key themes as a way of facilitating debate on the future of the industry. This approach allows us to think about the implications of the different ways in which the industry could evolve for airports, airlines and other industry participants.

While we do not predict that any of these future world scenarios will become reality, certain elements are likely to hold true. Equally, these scenarios may not reflect all the uncertainties facing particular businesses, but we hope they will stimulate the insight business leaders need to plan for their futures.

The structure of this document

The remainder of this document is structured as follows:

- Section 2: Key trends affecting the passenger aviation industry – this provides background on the factors that are likely to affect the demand for passenger aviation over the next 20 years
- Section 3: Future world scenarios for passenger aviation – this sets out the approach to developing and presenting the scenarios for the passenger aviation industry
- Sections 4 to 7: Scenarios – these sections provide a description of the four scenarios considered in this document, setting out the key themes and implications for aviation stakeholders
- Section 8: New challenges in the future world of passenger aviation – this section brings together the conclusions discussed in each of the individual scenarios.

In this report:

- Airline operators will gain insight on the key drivers affecting the magnitude and type of future demand and how this demand may materialise through each scenario
- Airport operators and investors will gain insight on the factors affecting the type, geographic spread and configuration of airports as the world economy shifts and passengers' expectations evolve
- Government and regulators will gain insight on some of the policy and regulatory issues which are likely to be prominent over the coming 20 years through each of our scenarios
- Aircraft manufacturers will gain insight into some of the factors which are likely to affect the passenger aviation industry over the next 20 years and the production and technological challenges these may present.

2 KEY TRENDS AFFECTING THE PASSENGER AVIATION INDUSTRY

In this section we present the key trends in the passenger aviation industry over the last 20 years, and provide a brief discussion of the factors that are likely to affect the demand for passenger aviation over the next 20 years.

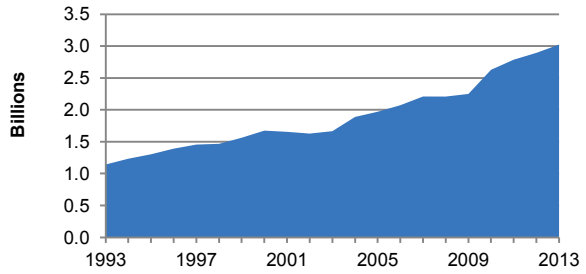

↑C50–C90

2 KEY TRENDS AFFECTING THE PASSENGER AVIATION INDUSTRY

Historical trends

The passenger aviation industry has increased dramatically over the last two decades. Figure 1 shows that the demand for global air travel has experienced a significant rise since 1993, with a compound annual growth rate (CAGR) of 5% or 165% growth in the last 20 years.

Figure 1: Global passenger numbers 2004-2014



Source: World Bank

Global passenger numbers have risen by 400% over the last 10 years

While passenger demand (and supply by airlines and airports) has increased in nearly all parts of the world, the growth rate has been unevenly spread, with some parts experiencing much faster growth than others. As shown in Table 1, on average over the last five years, passenger growth in Africa, Latin America, the Middle East and Asia-Pacific has exceeded the average global growth rate, while North America and Europe have lagged behind.

Table 1: Differences in regional growth rates

	Passenger traffic (Revenue Passenger)				
	2010	2011	2012	2013	2014
Global	8.0	6.3	5.3	5.2	5.8
N.America	4.5	5.9	1	2.2	2.7
Europe	4.3	8.4	4.5	4.0	4.7
Asia-Pacific	11.8	6.5	6.1	7.2	7.4
Middle East	17.8	9.9	9.9	11.9	13.0
Latin America	12.3	11.2	11.2	6.5	6.0
Africa	12.3	1.6	1.6	5.1	5.8

Source: IATA; Domestic and International traffic

This overall growth in passenger traffic may be explained by a number of factors. Some of the most commonly cited factors are population, GDP, the level of trade, and price[1].

Over the last 20 years, the global population has grown at an average rate of 1.3% a year, with much of the growth concentrated in less-developed countries[2]. This growth in population has been accompanied by urbanisation, with a rise in the number of people living in mega-cities (cities with more than 10 million inhabitants).

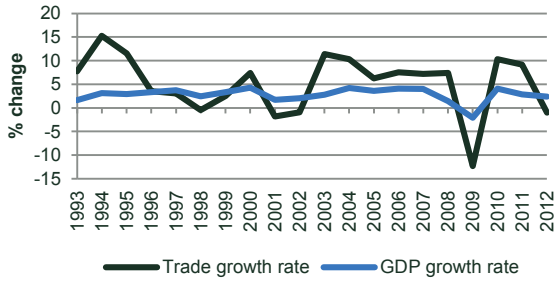
There has also been an annual increase in GDP every year since 1993, with the exception of 2009 (where, as with passenger traffic growth, there was a decline due to the financial crisis). As in the case of passenger traffic, there have been differences between regions, with emerging and developing countries in Asia experiencing approximately 8% growth per year over the last 20 years, and Canada and the USA averaging closer to 2.5% growth[3].

Trade has increased considerably over the last two decades, although the pattern of growth has been more volatile than that of GDP. While increased trade with a region or country can lead to a greater demand for flights, better air links also encourage more trade[4]. There is therefore a strong link between trade and the demand for aviation.

1. See, for example, Dargay, J. and Hanly, M. (2001), The determinants of the demand for international air travel to and from the UK
2. UN (2013) World Population Prospects; The 2012 Revision: Average annual rate of population change by major area, June
3. IMF World Economic Outlook database, April 2014
4. CBI (2013), Trading Places: Unlocking export opportunities through better air links to new markets, March, p. 2

Photo credit.

Figure 2: Differences in regional growth rates



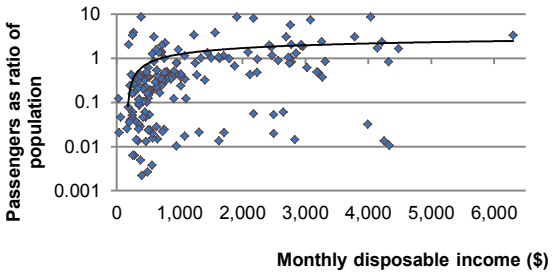
Source: World Integrated Trade Solutions, World Bank and UN

High growth in trade in the 1990s can be attributed to the end of the Cold War, the rapid growth of the Chinese economy, and the rise of the internet[5]. While these factors continued into the 2000s, their effect was less significant. The increase in trade also reflects (at least in part) more complex global supply chains – for example, 21 countries are involved in the manufacture of iPhones[6].

Similar to the pattern of increases in passenger traffic across regions, there have been regional disparities in GDP growth, with Asia growing relatively quickly and Europe growing much more slowly. There have also been differences in income growth experienced by people at different levels of the income distribution within countries. The Gini coefficient suggesting that while overall incomes have risen, a growing proportion of income has been concentrated in the hands of fewer people[7]. At the same time that population, trade and GDP have been growing, the price of air travel has declined by approximately 30% over the last 20 years[8]. This has occurred even though the price of oil has increased significantly. The rise in fuel costs has been partially offset by an improvement in the fuel efficiency of aircraft, with new generations of aircraft (such as the A350 and 787) being significantly more fuel-efficient than previous generations (such as the A320 and 747)[9] coupled with a trend towards increasing aircraft size and load factors[10].

The reduction in price is largely the result of the growth in low-cost carriers (LCCs) – beginning with Southwestern in the USA, developing with Ryanair and easyJet in Europe, and expanding to other markets such as Asia. This has led to a structural change in the passenger aviation market through increased competition in short-haul markets, enabling substantial numbers of people, who may otherwise not have travelled, to travel by air.

Figure 3: Disposable income versus propensity to fly



Source: World Bank and NationMaster.

Another factor that may have contributed to the declining price of air travel is the liberalisation of airspace. Open skies agreements are now in place between the EU and the USA, and there are multilateral agreements allowing air travel between multiple countries, such as the Association of South-East Asian Nations (ASEAN) countries agreement. Such agreements have enabled a significant increase in the number of destinations that can be served by an airline,

5. World Trade Organisation (2013), World Trade Report: Factors shaping the future of world trade, p. 57
6. Hillsberg, A., How iPhone is made, Finances Online, http://financesonline.com/how-iphone-is-made/ Accessed 13.08.14
7. Bourguignon, F. and Morrisson, C. (2002), Inequality among world citizens: 1820–1992, The American Economic Review, Vol92, No 4. pp. 727–744
8. IATA (2011), Vision 2050 Report, February, Singapore, chart 6, p. 7
9. See descriptions of new aircraft at Boeing (2014), Design Highlights, Available from: http://www.newairplane.com/787/design-highlights/#!/design-highlights/exceptional-value/dreamliner-advantages/dreamliner-advantages/ and Airbus (2014), A350: Eco-efficient, Available from: http://www.a350xwb.com/eco-efficient/less-is-more/
10. Airbus (2013), Global Market Forecast - Future Journeys 2013-2032, p.10. An aircraft load factor is the ratio of the number of passengers to the number of available seats on an aircraft.

as well as the number of airlines, flight frequencies and seat capacities that are permitted to operate to certain destinations. Much of this liberalisation is likely to have occurred as a result of the demonstrated economic benefits of such agreements[11].

Similarly, building or expanding airports, and the enhanced connectivity this brings, is often considered to be a way to stimulate or increase economic growth. As a result, some governments have adopted pro-aviation policies and subsidised the building and/or operation of airports. This has been a common feature in the building of new hubs in the Middle East, including in Qatar and Abu Dhabi[12]. In contrast, the EU has introduced restrictions on government subsidies to airports, focusing on preventing (or at least restricting) government funding of overcapacity.

However, the trends in the aviation industry in the last 20 years have not all been positive, with growing concerns in many countries (for example, the UK, Switzerland and Germany) over the noise, local air pollution and carbon dioxide emissions produced by the industry. These concerns have resulted in restrictions on the operation and development of capacity for airports in some countries, and in the European Union through short-haul flights in the EU Emissions Trading Scheme.

The last 20 years have also seen the introduction of more intrusive security requirements, following the Lockerbie bombing in 1988 (which led to the screening of hold baggage), the foiled 2006 transatlantic aircraft plot (which led to the no-liquids rule), and the events on September 11 2001. As a result, air travel has become more onerous, time-consuming and costly for passengers. Table 2 shows that security queues at the top seven UK airports cost passengers nearly £200 million in 2013.

Table 2: Cost of security queues at top seven UK airports[13]

Airport	Total passengers per year (million)	Queue time (average minutes)	Cost (£ million)
Heathrow	72.3	7.27	99.8
Gatwick	35.4	4.90	23.8
Manchester	20.7	7.39	23.5
Stansted	17.8	8.98	22.4
Edinburgh	9.8	6.08	11.5
Luton	9.7	8.44	11.2
Glasgow	7.4	3.32	4.4

Source: Data collated from Department for Transport (2014) TAG data book, Department for Transport (2013) Air passenger experience of security screening survey, & CAA (2013) UK Airport Statistics

Overall, the last 20 years have seen significant increases in passenger volumes, reflecting rising population, income and availability of flights, despite higher oil prices. However, when considering what the passenger aviation industry may look like in 20 years' time, it is far from certain that these trends will continue – for example, increasingly intrusive security is unlikely to be viewed favourably by airports, airlines and passengers. It is therefore useful to draw from these historical trends and consider the key factors that are likely to affect aviation in 2034.

Looking forward

What will determine the shape of the passenger aviation industry in 2034? This section considers five factors that are likely to be key drivers of the industry over the next 20 years and the uncertainties for the industry associated with each of them. The uncertainties provide insight into possible futures for the passenger aviation industry. The following sections

11. One study found that the result of liberalising 320 country pair markets that are not in open skies agreements could increase traffic growth by 63%. The same study reported that the Single European Aviation Market doubled the rate of traffic growth in Europe. See: Intervistas (2006), The Economic Impact of Air Service Liberalisation, p. ES-2. This traffic growth can also lead to wider economic benefits for the countries that liberalise. A recent study found that liberalisation between 12 key African markets could result in an additional 155,000 jobs and US$1.3 billion in annual GDP. See: Intervistas (2014), 'Transforming Intra-African Air Connectivity: The Economic Benefits of Implementing the Yamoussoukro Decision', July

12. Business (2010), Dubai Airports CEO cites need for global perspective and pro-aviation policy, 10 June, http://www.khaleejtimes.com/biz/inside.asp?xfile=/data/uaebusiness/2010/June/uaebusiness_June39.xml&section=uaebusiness Accessed 18.08.14; The Economist (2010), 'Rules of the new silk road', 3 June.

13. Value of time for business passengers is £22.69/hour and £5.07/hour for leisure passengers in 2010. Cost updated using UK inflation rates.

outline a number of scenarios about how the industry could look in 2034 and the implications of those scenarios for airports, airlines, OEMs, governments and regulators.

The key drivers are:

- Economics
- Technology
- Consumer experience
- Environment
- Government policy and regulation

Economics

How will the key economic factors that affect the demand for, and supply of, passenger flights evolve over the next 20 years? These factors include:

- **Demographics:** Over the next 20 years, the rate of population growth is forecast to decline (although the population will still increase), and much of the growth is expected to be in less-developed countries, particularly in Africa[14]. While the level and geographic distribution of population growth is important in considering the total passenger demand for aviation, whether those people are located in a few very large cities (such as Mexico City, Jakarta and Lagos) or spread across smaller towns and cities, will have implications for airline and airport business models.
- **Income:** The extent to which the increase in global population will translate into increased demand for passenger air travel will depend (in part) on increases in income and the distribution of income. There are significant uncertainties about how, and where, global income per capita will increase over the next 20 years. Increases in income per capita and the extent to which these lead to a rise in the disposable income of a new middle class, with the time and money to fly, will be an important determinant of the demand for passenger air travel in 2034.
- **Trade:** It is likely that as emerging economies become wealthier and the costs of production increase, supply chains will change over the next 20 years. Any changes in global supply chains would also lead to changes in passenger aviation as airlines reposition their networks to enable business passengers to travel to these destinations. In addition, if the significant free trade agreements that are currently being negotiated are signed (for example, between the EU and the USA), the level of global trade may increase significantly.
- **Commodity prices:** The prices of commodities are key determinants of airlines' costs and therefore which routes it is commercially feasible to operate. Commodity prices are difficult to forecast accurately, which means that business models will need to be robust to accomodate different possible outcomes.

Together, a consideration of these economic factors helps to create a picture of how many people are likely to want to travel, where those people are likely to want to travel to and from, and what the costs of providing those flights may be in 2034.

Technology

The pace and nature of technological change will be an important determinant of what the aviation sector looks like in 2034. In particular, there may be technological developments in aircraft fleets to respond to changes in external factors (for example, fuel prices), and/or technological advances in other industries that affect passenger aviation. As with the economic factors, there are many uncertainties, but there are four main ways in which technology could play a significant role:

- **Airline operating costs:** As discussed above, one of the key uncertainties for airlines is the cost of fuel. Despite a number of test flights using biofuel[15], the potential for significant changes to the fuel source used by aircraft over the next 20 years is limited.

14. UN (2013) World Population Prospects; The 2012 Revision: Average annual rate of population change by major area, June
15. National Research Council Canada (2013), Analysis of 100 percent biofuel tested in flight by NRC reveals reduction in emissions, 7 January, http://www.nrc-cnrc.gc.ca/eng/news/releases/2013/biofuels.html accessed 13.08.14

While the price of fuel is not controllable by airlines (except to a limited extent through hedging), aircraft manufacturers are responding by developing aircraft that are lighter and more fuel-efficient than the current fleets. This may become more important if environmental policy leads to price increases or fuel taxes in response to increasing concerns about climate change, as discussed below.

There could also be significant changes to the number of staff required by airlines as a result of technological advances, including the use of unmanned aircraft (which are already under development by a number of companies)[16], which would reduce staffing costs by removing the requirement to have two or three pilots on each flight. However, it is unclear whether this technology (which is currently at the experimental stage) will be sufficiently developed and widespread in 2034, and whether passengers will be willing to travel in remotely piloted aircraft.

While some consider ways in which airlines may be able to reduce costs, if it is possible to increase the number of passengers on an aircraft then running it becomes more commercially viable at any given level of cost. Therefore, the trend towards increasing aircraft capacity – by producing larger wide-body aircraft and increasing the capacity of single-aisle aircraft – is unsurprising and unlikely to change[17].

- **Security:** Given the increasingly intrusive and time-consuming nature of security checks, it is not clear that the trend towards more restrictive security can continue for the next 20 years. It is plausible that a combination of risk-based screening and new technology, such as walk-through security, may result in less time spent in security screening in 2034[18].
- **Airspace management:** New technologies and processes being developed could reduce flying times, saving airlines fuel costs. For instance, as part of the Single European Sky initiative, SESAR is developing a modernised European air traffic management system to reduce congestion and the environmental impact of air transport. However, the Federal Aviation Administration's (FAA) recent difficulties in rolling out a new air traffic control (ATC) system to enhance monitoring and management of aircraft highlights the barriers that need to be overcome.
- **Communications technology:** Communications technology has changed significantly in the last 20 years, with the advent of smartphones and video-conferencing. The speed of change does not appear to be slowing, and therefore new forms of communications technology are highly likely in the next 20 years. However, it is less clear whether these new technologies could act as a substitute for air travel[19]. In part, the impact of these technologies will depend on the particular market sector being considered. For example, trips to visit friends and relatives may become less common as it is easier to stay in touch, while travel for holiday and business are less likely to be significantly affected. In addition, as the use of electronic devices onboard aircraft is increasingly permitted, and if in-flight internet access becomes more widespread and reliable, travel by air may become more productive for passengers in the future. This would reduce the cost of air travel from a business (and leisure) traveller's perspective and would be expected to lead to a greater willingness to fly[20].

16. See, for example, http://www.baesystems.com/magazine/BAES_051920/look-no-hands
17. Ascend, cited in Boeing (2014), CMO 2014 Presentation, slide 9
18. World Economic Forum (2014), Smart Travel: Unlocking Economic Growth and Development through Travel Facilitation, June
19. See, for example, the product being developed by Inmarsat: http://www.inmarsat.com/aviation/air-transport/?proposition=Passenger+communications
20. Navigant research (2013), Three-Quarters of vehicles sold worldwide by 2035 will have autonomous features, 10 December,

It seems likely that technology will contribute to incremental increases in fuel efficiency and reductions in costs; however, opportunities for large changes by 2034 – for example, in airframe technologies – may be limited. On the other hand, significant developments in communications technology are highly likely.

Consumer experience

Consumer willingness to fly can be affected by many things, and in particular:

- **Perceptions of safety:** The safety of air travel is a key concern for many passengers. Compared with travelling by car, aviation is a relatively safe mode of transport, although the safety advantage of air travel is less clear when compared with high-speed rail. Nevertheless, an increase in the number of accidents may reduce passengers' willingness to fly, which would in turn reduce the demand for air travel.
- **Ease and cost of travel:** A customer's decision to travel by plane will be affected by the other options available and the ease of using these alternative modes. Automated cars are already being developed and it is predicted that 75% of the cars sold in 2035 will be likely to have autonomous features[21]. The expansion of driverless cars, increasingly efficient cars, and new technology that increases the connectivity of people while driving, are likely to make the car a more viable competitor to aviation over short distances than it has been historically. In addition, there is scope for more building and expansion of high-speed rail lines, particularly in Africa and the Americas, which could lead to more competition for aviation on short- and medium-haul journeys.
- **LCCs versus full-service carriers (FSCs):** Given the significant changes that have already occurred in the low-cost markets in Europe, Asia and North America, it is unclear whether growth can continue at the same rate in these regions for the next 20 years. However, in light of the relatively low market penetration of LCCs in other markets, such as in Africa and the Middle East, there may be similarly fast growth in these areas as has been experienced in Europe over the last 20 years. There may also be scope for growth in long-haul LCCs. For instance, AirAsia X is looking to expand in East Asia, while Norwegian has started flights between Europe and North America. One of the key questions is whether low-cost, long-haul travel is commercially viable in the face of volatile fuel prices, given the greater proportion of costs accounted for by fuel on long-haul routes and for LCCs. The extent to which long-haul LCCs are sustainable may also depend on how business passengers respond to them as many airlines rely on the revenue from business travellers to underpin the higher costs of flying longer distances. Some LCCs, such as Australia's Jetstar, have business class cabins, while Singapore's Scoot has launched a premium service aimed at business travellers.

There is also evidence that a number of airlines are combining the services of a network carrier with the cost base of an LCC[22]. While LCCs are upgrading their product offerings, FSCs are looking for ways to reduce costs and increase revenue. For instance, a number of FSCs charge additional fees for services that used to be included in the fare (for example, checking luggage)[23]. This convergence of LCCs and FSCs in short-haul flights seems likely to continue given the commercial pressures in these markets.

21. Navigant research (2013), Three-Quarters of vehicles sold worldwide by 2035 will have autonomous features, 10 December
22. Navitaire (2014), Delivering choice, versatility and flexibility to global hybrid carriers, Available from: http://www.navitaire.com/diff_hybrid.aspx
23. British Airways (2013), BA Response to CAA consultation of Gatwick Market Power Assessment of May 2013, 26 July.

- **Ability to self-connect:** Self-connecting – where a passenger buys two separate tickets and makes the connection themselves – has become more popular, particularly for those passengers flying on low-cost airlines. Some airports are starting to have a more active role in facilitating these connections. For example, Milan Malpensa Airport provides passengers with the opportunity to combine two or more routes from different airlines and guarantees them assisted transit services[24]. The extent to which self-connecting becomes simpler and more popular among passengers, is also likely to have implications for the future of airline alliances.

Consumers' experience of passenger air travel is likely to be an important component in determining the overall demand for air travel in 2034.

While aviation is likely to continue to be the only practicable way for most passengers to travel over long distances, there may be factors that affect customers' tendency to travel at all or to use alternative modes for short-haul journeys.

Environment

Concern about the environmental impacts of aviation has increased over the last few decades, particularly in Europe and North America. While the effect of increased environmental awareness on people's propensity to fly is not obvious, it has had a significant effect on government policy in a number of countries. For example, the European Commission has included short-haul aviation in the EU Emissions Trading Scheme.

A continued focus on the 'environmental agenda' may increase the costs of the aviation industry – for example, through the introduction of taxes or the implementation of operating and capacity restrictions at airports.

There may also be a more subtle effect as concerns about the environmental impact of aviation change at different rates in different parts of the world. For example, if consumers in South East Asia were to become environmentally conscious more quickly than consumers in South America, this could contribute to different growth rates in the industry between these two areas, or differences in the costs of aviation in these areas.

Government policy and regulation

There are various ways in which government policy and regulation may affect airports, airlines and airspace in the future:

- **Airports:** Different policies in different parts of the world may affect the competitive landscape for airports. It may be the case that international pressure leads emerging economies to reduce the aid provided to airports. Or, if consumer preferences move away from air travel, governments may become less pro-aviation and reduce the subsidies provided. This could affect the growth of aviation and the competitive dynamics between airports.
- **Airlines:** Future industry growth may be affected by the extent to which subsidies from governments are provided or taxes are levied on the industry. Growing concerns about the environmental impact of aviation, as discussed above, could also mean that taxes on airlines become more common, possibly

24. Airports Commission (2013), Airport Operational Models

on a global scale. In addition to the support and/or taxes imposed on airlines, government policy has a significant effect on ownership of airlines. National ownership restrictions affect the set-up of new airlines and mergers between airlines in different countries. The degree to which these restrictions are loosened could have an impact on the consolidation of the airline business going forward.

- **Airspace:** Given the economic benefits of open skies agreements, there could be a gradual shift by governments to allow for greater freedom in global airspace. However, political or other events could increase the need for (actual or perceived) national security and therefore encourage more protectionist policies. The slow progress of the Single European Sky initiative indicates the difficulties associated with these types of agreements.

Government policy towards aviation will have a significant impact on the shape of the passenger aviation industry in 2034 – by affecting both the competitive dynamics within the industry and the cost of air travel.

This may lead to significant changes in the geographic distribution of aviation activity as some regions in the world (such as the Middle East) pursue pro-aviation policies, while other regions pursue policies that are more focused on environmental protection or alternatives to air travel (for example, high-speed rail in Turkey.)

What does this mean?

This section has described some of the factors that are likely to have a significant effect on the passenger aviation industry in 2034. There are, however, substantial uncertainties around how they will evolve. For instance, to what extent will the emerging economies of Asia, the Middle East and Africa catch up to the developed economies of Europe and North America? To what extent will global economic growth be hampered by political conflicts and economic crises? How will airline business models respond to new technology and changing consumer preferences? Given the importance of these factors, it is crucial for the aviation industry to consider how it would react to the different possibilities.

The approach adopted by companies in the face of such uncertainty (starting with Royal Dutch Shell in the 1980s) has been to conduct scenario analysis. This involves companies assessing their business plans against a range of scenarios and thinking about how robust their business would be if the world were to end up looking different from their expectations.

In line with this approach, we have developed four scenarios which capture the uncertainties discussed. The remainder of this document sets out these scenarios. We would encourage you to think about what these (and other scenarios, since the ones set out below are only a sample) may mean for your business and whether there are steps that should be taken now to prepare for the future of the aviation industry – whether reviewing capital programmes, investment strategy or focusing on which markets offer the most appealing prospects for mergers and acquisitions.

3 FUTURE WORLD SCENARIOS FOR PASSENGER AVIATION

As described in the previous section, there are many factors that will influence and shape the future of the passenger aviation industry – from the distribution of the population and GDP growth, through to technological change, future government intervention and regulation, and changing consumer expectations.

In this section we describe the process for determining our future world scenarios for the passenger aviation industry, and set out the framework to describe these scenarios.

3 FUTURE WORLD SCENARIOS FOR PASSENGER AVIATION

Creating the future world scenarios

In developing the scenarios, we have considered how the passenger aviation industry may be affected by the five factors discussed in section 2, which are likely to be key drivers of the industry over the next 20 years.

These are:

- Economic
- Technology
- Consumer experience
- Environment
- Government policy and regulation

We have created each scenario by examining the effects of changes in sub-components of each of these five factors, as shown in Figure 4. For example, we describe the changes in the economics driver through the levels of economic growth in the developing world, the developed world, and the level of urbanisation. These sub-components were derived from an extensive review of the likely sources of uncertainty for the industry.

Figure 4: Drivers used to create the future world scenarios

Economic

Technology

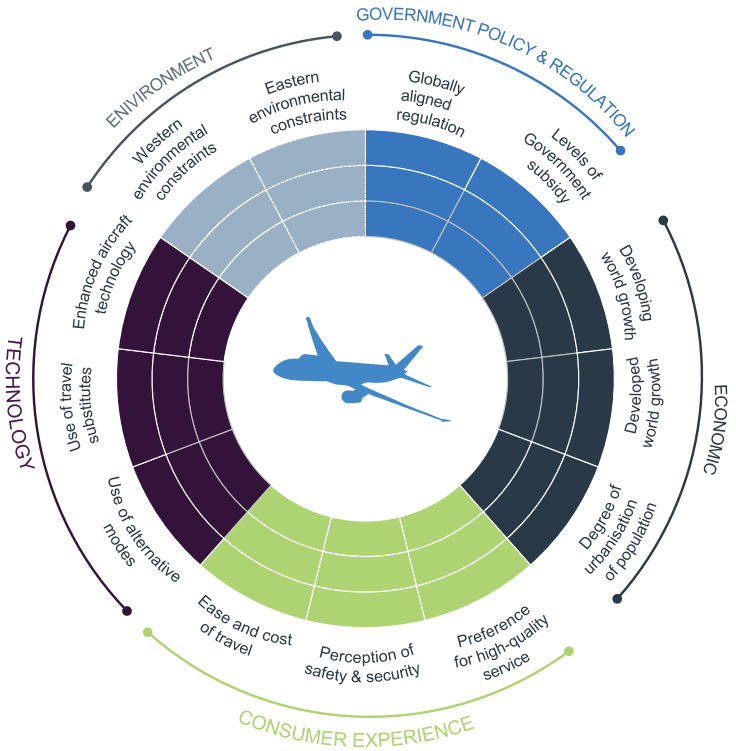
Consumer experience

Environment

Government policy and regulation.

Impact on scenario

Low Medium High Imoportance



Describing the future world scenarios

To facilitate and simplify the debate on what the passenger aviation industry may look like in 20 years' time, we present four scenarios. These reflect the extent to which these key drivers affect:

- How the economy will evolve: to what extent will global economic growth be powered by emerging economies, relative to growth in the developed markets?
- How the passenger experience will evolve: how will the combination of technology, regulation and customer preference affect passengers' 'flying experience'?

By exploring these dimensions we can develop a simple narrative to illustrate these scenarios.

How the economy will evolve

Over recent decades, the USA, and many parts of Western Europe have seen rises in disposable income, partly driven by an increase in service-based economies which many countries have exported around the world. This has happened in parallel with the development of the aviation industry and has led to a significant rise in the number of people flying for business, leisure (i.e. tourism) and to visit friends and family, as described in section 2.

What started out as an activity for the 'jet set', has grown rapidly with the rise of the middle class – with an expectation of foreign holidays to sunnier or snowier climates – and of LCCs. For example, 45% of people in England took at least one international flight last year, while 10% of people took at least three flights abroad[25].

There remains a large degree of uncertainty about how the economy will evolve and the effect on the aviation industry. Our future world scenarios assess the implications of the following questions:

- To what extent will the emerging economies (BRIC[26], Asia, the Middle East and South America) continue to grow, resulting in an increase in the middle class and leading to the opening up of many new markets?
- To what extent will the western economies grow – for example, by continuing to find new markets for their service-driven exports, diversifying their economies, and/or increasing the level of manufacturing activity located in these countries?

How the passenger experience will evolve

The passenger experience of aviation encompasses many elements – from the technology that enables us to plan and book our journeys, to the security procedures as we make our way through airports.

In the 100 years since passenger aviation began, the passenger experience has changed considerably. What started as a glamorous event for the wealthy is now seen as an experience that we need to endure rather than enjoy.

As technology, regulation and alternative travel options evolve, passenger expectations will also change. This will have an impact on the way airlines, airports and other aviation stakeholders operate to sustain and grow their market share.

Our future world scenarios assess the implications of the following questions:

- As technology and regulation change, will passengers see aviation as a more commodity-based item – something that we all want to do more of, in a convenient way, and for an ever cheaper price?
- Will alternative transport modes and travel substitutes, such as improved communications technology, squeeze the aviation market and lead to a retreat to a premium high-value, more expensive, service-based experience?

25. DfT (2014): National Travel Survey 2013: England

26. This refers to Brazil, Russia, India and China.

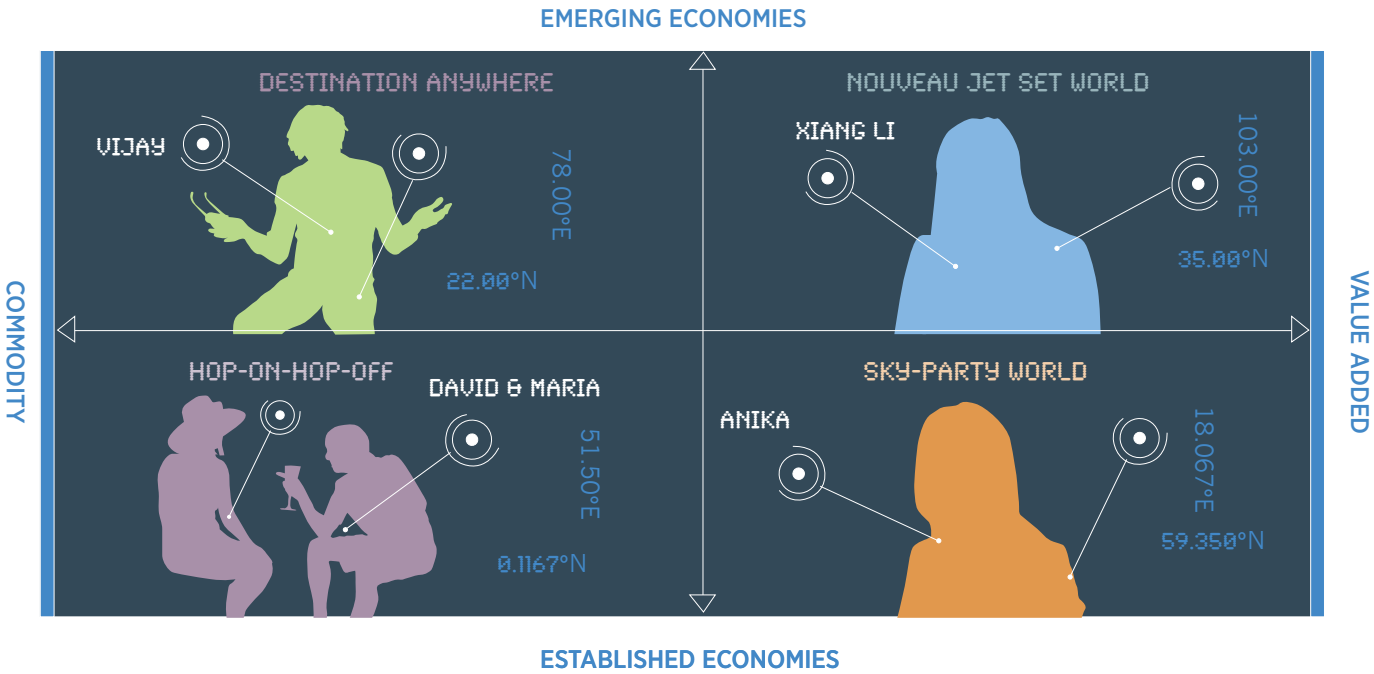
Four potential future worlds

Our four possible future worlds are:

- **Destination anywhere world:** where the rise of the emerging economies leads to many more passengers and a proliferation of new routes and regional airports.
- **Nouveau jet-set world:** where an expanding global middle class drives a greater demand for travel, but many journeys are undertaken using alternative modes or replaced by travel substitutes due to a significant increase in the cost of flying through high commodity prices and environmental taxation. This leads to aviation becoming a high-value activity undertaken much less frequently.
- **Sky-party world:** where there is increased pressure on the aviation industry, as the emerging economies grow more slowly due to high commodity prices, while in the West, other modes and substitutes to travel are seen as desirable alternatives, driven by an increasing awareness of the environmental consequences of the aviation industry. This leads to a drive for increased value and service.
- **Hop-on hop-off world:** where aviation continues to be driven by the western economies, with aviation becoming more akin to 'hopping on and hopping off' a bus – with passengers being driven by value, carrying their own luggage and bringing their own entertainment.

Each scenario presents different opportunities and challenges for airlines, airports, governments, regulators and aircraft manufacturers.

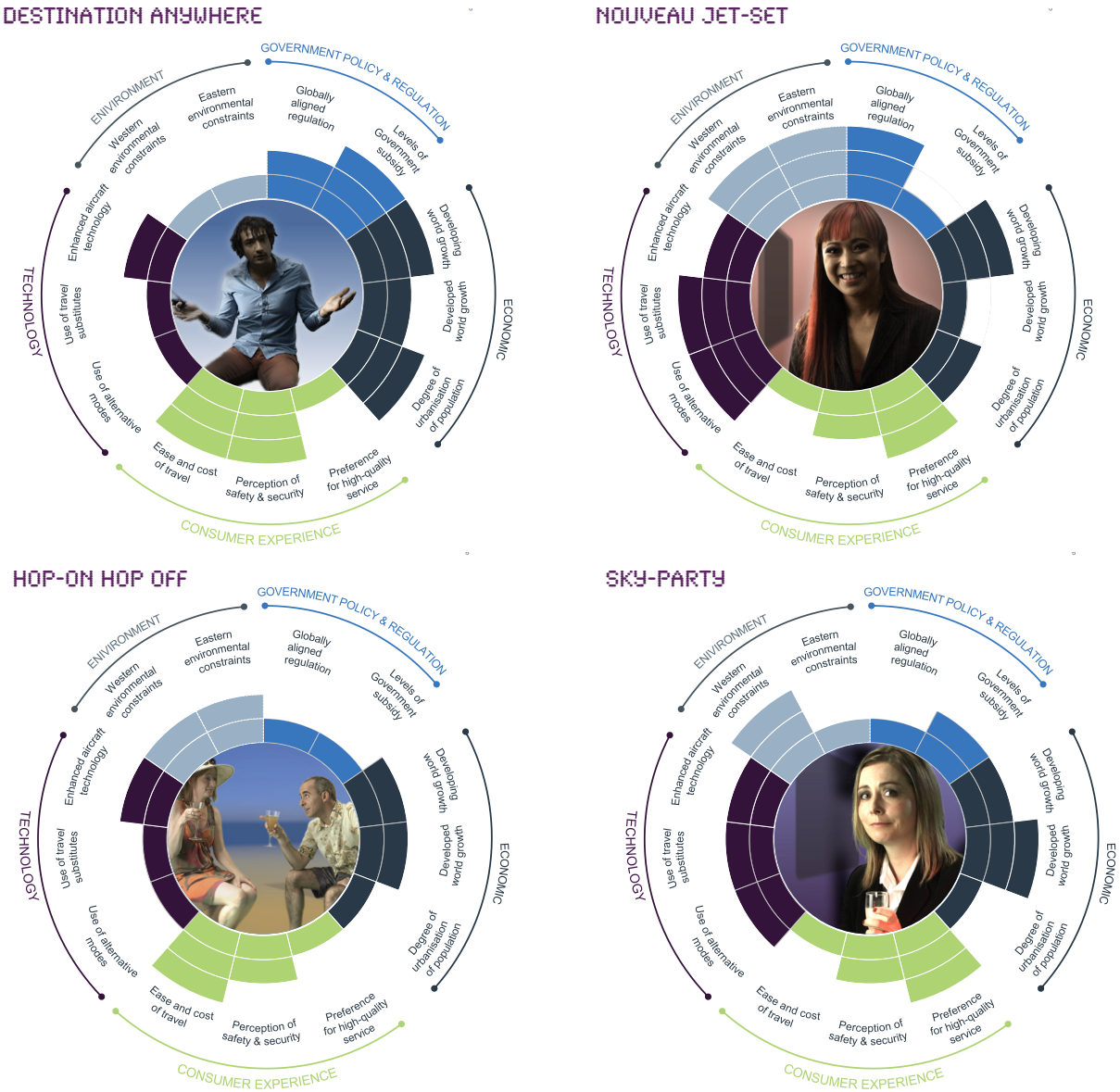
Figure 5: Four future world scenarios



These scenarios are deliberately simplified: no scenario can capture the complexities of the aviation industry. Therefore, while the scenarios may appear simple, they focus on the key aspects that we consider will be likely to shape the industry in 2034.

However, these may not be the same trends that shape your business, and we would encourage you to think about whether there are alternative scenarios in which your business is well positioned to exploit the opportunities offered, or is vulnerable.

Figure 6: Impact on future world scenarios

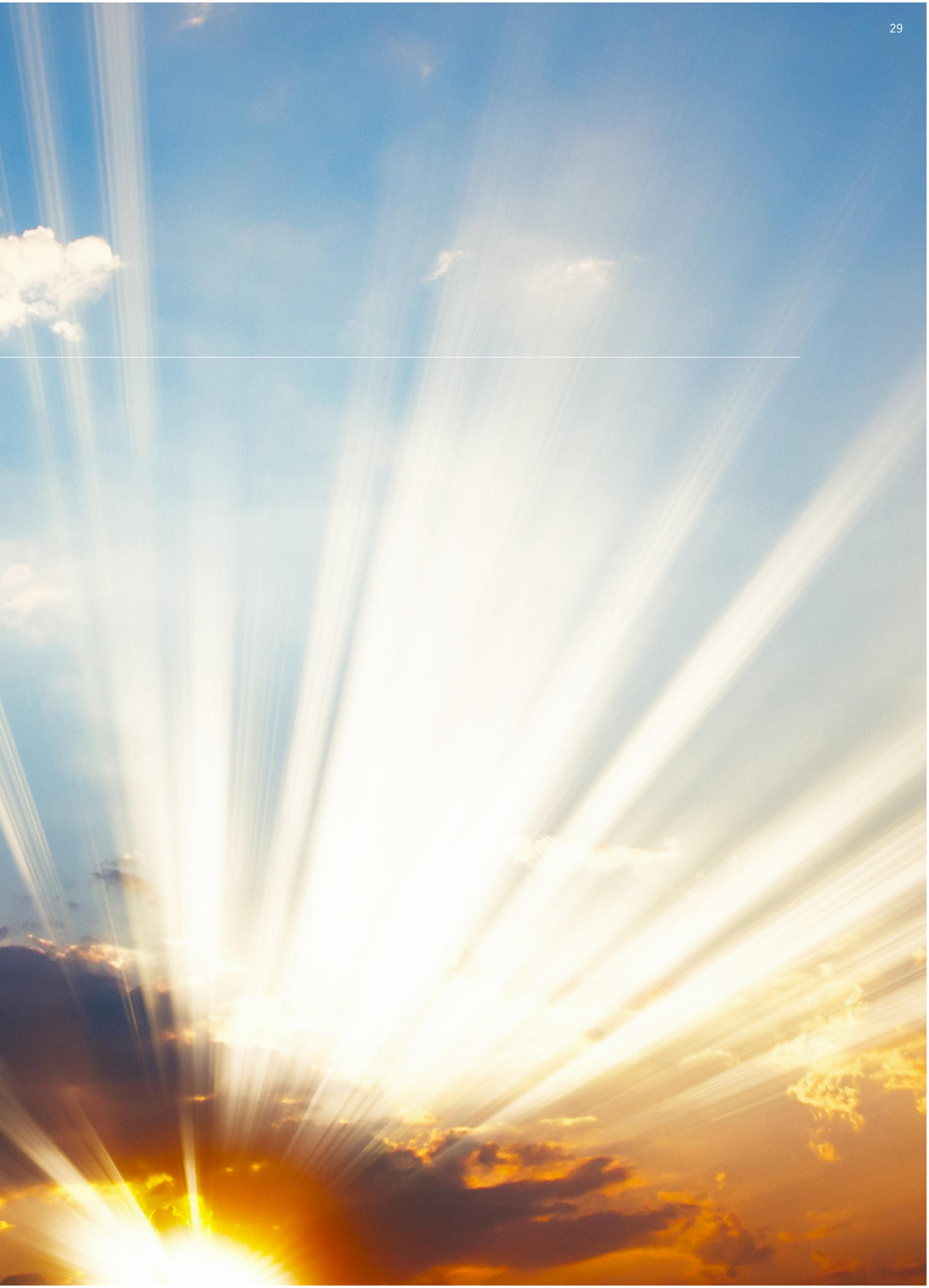


4 DESTINATION ANYWHERE WORLD

In this scenario, global economic growth is driven by the continued rise of the emerging economies, increasing disposable income and propensity to travel. There has been a rise of the 'emerging middle class', driven by urbanisation of the population, with mega-cities being the economic powerhouses creating both collective and individual wealth.

The emerging economies have begun to build many new airports. In addition, the pro-infrastructure governments in these regions have made subsidies available to expand the aviation industry and serve global demand – enticing many new airlines into the market. Alternatives such as high-speed rail have failed to gain the necessary investment, as they are seen as less convenient and less flexible than air travel.

This increase in wealth in the emerging economies, and the development of many new airports, has led to more flights to more destinations. Increased competition between airlines has driven prices down. This means that low-cost aviation travel for leisure, business and visiting friends and relatives dominates.



4 DESTINATION ANYWHERE WORLD

VIJAY CHOPRA

AGE:35

GENDER: MALE

ETHINICITY: INDIAN

LOCATION: LIVES IN PUNE, INDIA WITH WIFE AND CHILDREN

REASON FOR TRAVEL: VISITING FAMILY IN KOLKATA, WEST BENGAL FLYING WITH LOCAL BUDGET AIRLINE

Vijay's story: life in destination anywhere world

I've been working as a researcher in the Vaikunth Mehta National Institute of Co-operative Management at Symbiosis International University in India for the last five years, and live with my family in Pashan. I'm originally from Kolkata in West Bengal where my parents and many other family members still live and where I return regularly to visit.

The Indian economy has been growing rapidly and this has led to a lot of development of new residential and business properties around my home in Pune. The airport opened up a second runway in 2026 on land previously occupied by the Indian Air Force and this has greatly increased capacity. There are plenty of airlines operating out of Pune, offering flights across India and the wider region as well as international flights to Europe, China and the USA.

There is a great deal of competition on internal routes and this has worked out well for me as I can always find a great value fare when I wish to visit my parents or take a vacation or weekend break in another part of the country, often at short notice. It's all pretty easy to book too, my virtual assistant takes care of finding me the best deal for when I want to travel, and I am sent an itinerary that includes my transport options to the airport according to the preferences I have specified.

It all works pretty well – I'm kept constantly updated with information about the status of my flight and if I can receive directions to the gate and other information automatically when I'm at the airport.

Some planes are quite old – I think some may be refurbished planes bought from airlines in Europe – and the facilities are basic but comfortable. I always carry my own entertainment, and it's amazing how quickly the flight passes when I can immerse myself in a virtual reality game on my EyeWare glasses. If I want to catch up with some work, that's not a problem – connectivity on the flight is pretty good and I can access the services I need. It costs a bit extra but I can always claim that back from work. I sometimes feel bad about travelling so much by plane because even with all the engine improvements pollution is still an issue, but I really value the ease with which flying allows me to meet up regularly with my family.

The macro-level consequences of destination anywhere

Increase in passenger numbers

There are more passengers, from more countries, travelling to more destinations. Passengers are choosing between airlines on the basis of price and use technology to achieve the best experience for the best price. Passengers are booking more point-to-point journeys and using self-connecting software, facilitated by individual airports, to connect their journeys where necessary.

Flights are more commonplace, and are primarily driven by price due to the convergence in service levels across the industry.

Increase in the number of destinations

The continued rise of the emerging economies, as well as advances in aircraft technology, have made a much larger number of direct routes economically viable.

Increase in short-haul air travel

Expansion of the aviation market into the emerging economies has seen growth in these markets akin to that seen in the western economies 30 years ago. Many people who have moved to the new mega-cities, use short-haul air travel to return home to see friends and family and for business.

Significant investment in new airports

As there are more people, with greater disposable income, there is a significant investment in airports to meet the needs of the new middle class. Many countries see the development of a new airport as both a symbol of prestige and an investment in supporting further economic growth. There is plenty of government support in building these new airports as a result.

Airlines compete on price and destination

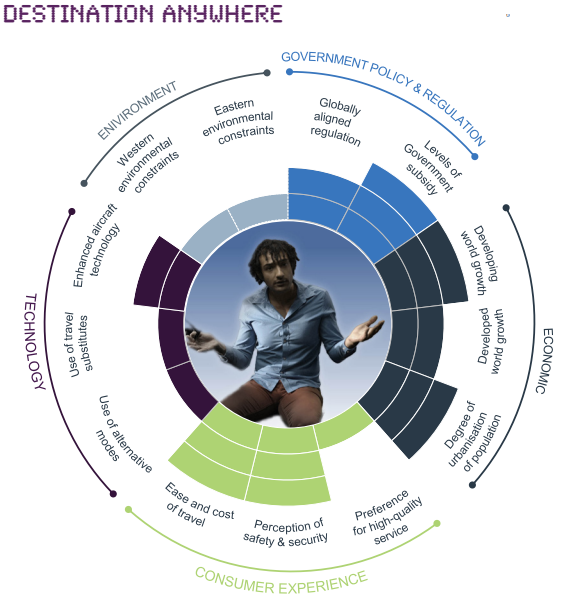
The proliferation of flights, and the emergence of new markets, has led to airlines seeking to position themselves in these markets by creating strong brands in particular geographies.

Strengthening of the Middle Eastern hubs

The eastern shift of the economy has seen an expansion of the Middle Eastern hubs, such as Dubai and Istanbul, where they can serve the majority of the world's passengers – leading in turn to a relative decline in hub traffic in Western Europe and South-east Asia.

Main drivers:

- **Growth of developing economies**
- **Urbanisation of population**
- **Low environmental concern**
- **High levels of government subsidy**
- **Preference for simple service and low cost**



The implications for aviation stakeholders

Airlines

The increase in passengers, and the fragmentation of demand across more countries, has seen many new airlines enter the market. Passengers' ability to self-connect has led to a decline in airline alliances, as each airline 'goes it alone' to compete on the point-to-point routes which passengers join up (with the help of airports) to make their own journeys.

There are many new local and regional low-cost airlines, mainly concentrating on the new short-haul routes within the emerging economies. The introduction of these airlines has brought about fierce competition. With many offering a similar, simple service, the battle lines are drawn around price, leading to slim margins and fragile business models.

Airlines are offering incentives to book early to ensure that planes are meeting minimum capacities, with late bookings incurring a premium.

New airlines have entered the market and were bought by existing airlines, leading to a buoyant market in mergers and acquisitions activity in the sector.

There will be a continued focus on reducing costs. Those airlines that are able to scale their operations quickly, that have strong brand recognition, and that are price-competitive will be best placed to exploit the vast opportunities presented by this scenario.

Airport operators and investors

There has been a rapid expansion of new airport capacity in the emerging economies to meet the increasing demand for flights in these geographies. However, there has also been an overall decline in the importance of hub airports, as low-cost airlines move into long-haul markets, using new technologies which make low-cost point-to-point flights feasible. The hubs that have remained are located in the Middle East – for example Dubai, which is located within eight hours' flying time of two-thirds of the world's population.

The European and South East Asian hubs have declined as the point-to-point market has increased, with many of the European airports becoming spokes servicing the major eastern hubs such as Dubai and Istanbul.

The growth in the number of airports has led to increased local competition, although government subsidies in many countries has provided greater certainty for infrastructure investors by guaranteeing minimum future revenue streams and backing long-term loans.

There are opportunities to develop new airports in many of the emerging economies – particularly for those that run current high utilisation airports and can bring the expertise to ensure efficient use of the airport's assets. Those airports that are flexible and can support a range of airline business models are likely to thrive in this scenario.

Government and regulators

Governments around the world, and particularly those seeking to ride the wave of increasing economic prosperity, are encouraging a more open skies policy. This is leading to cross-national regulation encouraging better use of airspace in order to meet the increased demand.

Those governments that believe that a large aviation industry is an important strategic asset, and that provide subsidies for airports, will see a larger proportion of the aviation industry locate in their countries. This leads to conflict between the European countries, with restrictive laws on the provision of state aid, and their neighbours, which do not have such laws in place.

With the increase in passengers, airports and traffic, there will be a greater drive for more globally aligned regulation. With more relaxed regulation in many emerging economies, particularly around state aid and intervention, the West will be under pressure to reduce regulatory control.

Aircraft manufacturers

The overall increase in demand is leading to boom times for manufacturers. There are record numbers of planes being sold and refurbished and a healthy pipeline of future orders.

The industry is yet to see a fundamental change in aircraft design, with only incremental developments of aircraft such as the B787 and A350 / 330neo – for example, double doors to decrease loading time.

With the industry increasingly focusing on emerging markets, manufacturers based in these markets will begin to erode the market dominance of Boeing and Airbus, providing cheaper (but less well-known) aircraft. It is highly likely that there will be a third major manufacturer in the world market.

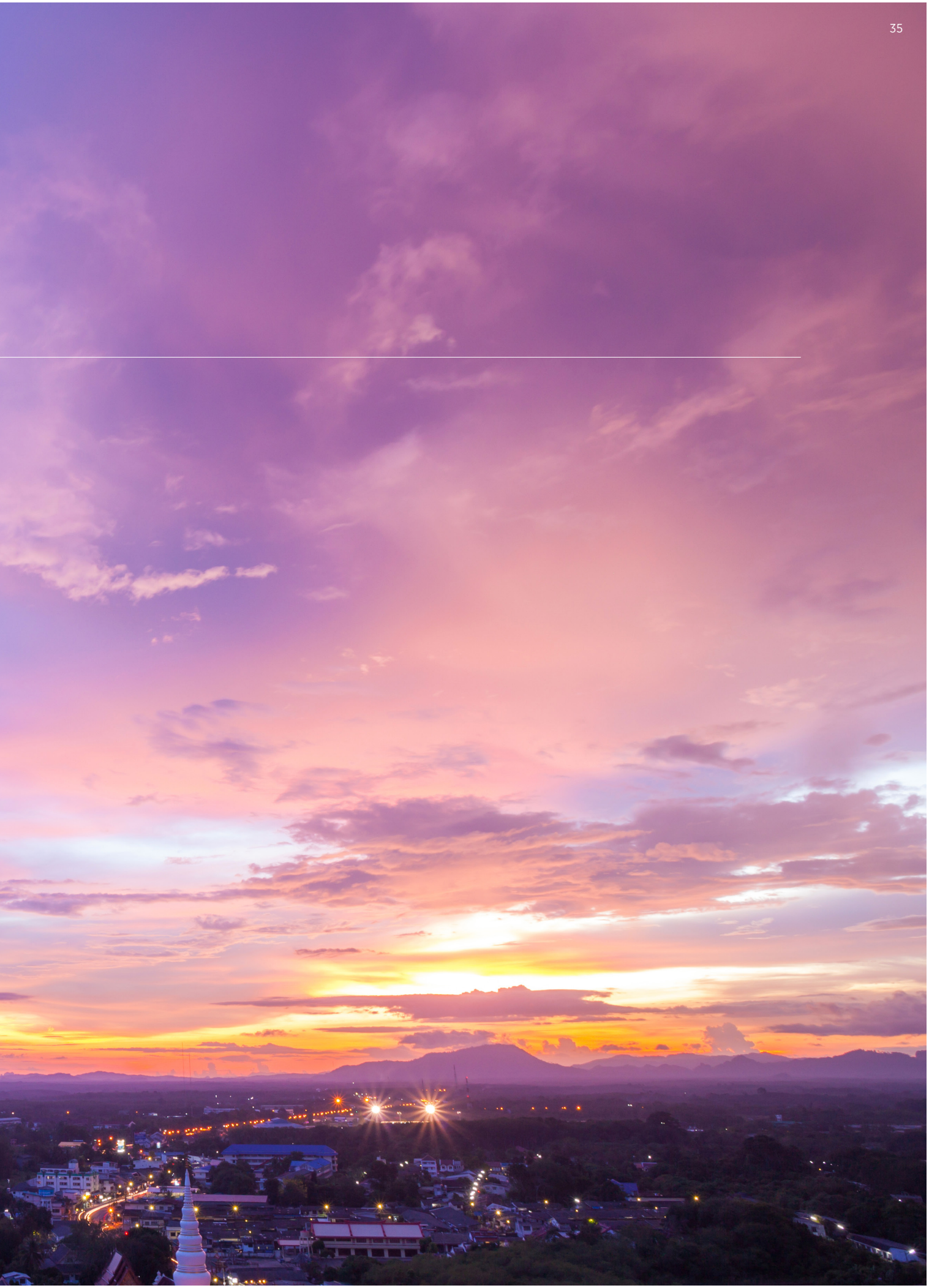
Aircraft delivery time will become more important in this scenario, as the opportunity to gain a first-mover advantage in the emerging markets becomes the key driver for airlines. With few major innovations, lean and timely operations will be the main objective for most manufacturers. This will drive increasing use of moving production lines (as pioneered by Boeing) and the use of autonomous composite manufacturing technologies.

5 NOUVEAU JET-SET WORLD

In this scenario, global economic growth mostly comes from the emerging economies, leading to an 'emerging middle class'. Many of the emerging economies have achieved similar levels of GDP per capita to the developed world. Individuals' disposable income and propensity to travel has increased correspondingly.

However, the environmental impacts of aviation have led to increased regulation – with carbon emissions being much more tightly controlled around the world. This has been accompanied by higher fuel prices and, although many parts of the economy have been able to diversify away from fossil fuels, aircraft are still mostly fuelled by hydro-carbons. This combination of factors has significantly increased the costs of air travel and driven the development of both alternative transport modes and substitutes to travel – for example, technological alternatives such as holographic video-conferencing. Furthermore, other transport modes have improved in both comfort and journey time, which has led to air travel becoming less popular. Air travel is seen as relatively more expensive, less convenient, and less pleasurable than many alternatives.

The increase in the cost of aviation and availability of alternatives has led to a greater focus by the aviation industry on business passengers and long-haul leisure passengers where alternative modes may not be a viable option. Also, as fares have increased, there is a greater expectation among passengers for an improved passenger experience and value-adding services as part of their journey.



5 NOUVEAU JET-SET WORLD

35.00 °N

103.00 °E

XIANG LI

AGE:	28
GENDER:	FEMALE
ETHINICITY:	CHINESE
LOCATION:	LIVES IN BEIJING
OCCUPATION:	MARKETING CREATIVE AGENCY
REASON FOR TRAVEL:	VISTING CLIENTS IN OTHER PART OF CHINA

Xiang Li's story: life in the nouveau jet-set world

I work for a creative agency in Beijing, developing marketing campaigns for a number of large Chinese companies. Our clients are global businesses and we have to be too. I spend a lot of time collaborating with colleagues in locations all over the world but rarely do I travel – most of my work today takes place in the collaborative virtual workspaces that allow us to work really effectively. We can interact with holographic 3D visualisations of products and can even feel their texture using haptic systems. Sometimes we'll use holograms and often we just use our local 3D fabricators to print off a product or design prototype.

There are loads of options for meeting with people from highly realistic and immersive telepresence suites that make it feel like we are all in the same room, virtual reality workspaces and even robotic avatars that can provide a physical presence.

Some of my older colleagues used to travel a lot more on business but the technology allows us to accomplish so much from our offices and even our homes that we just don't need to do it so much.

We sometimes visit our clients here in China for face-to-face meetings, but taking the Maglev train is so much quicker, and better for the environment too. Many of the smaller regional airports have suffered substantial losses of scheduled services, with some closing down, so we primarily have the big urban hubs for longer-haul travel.

I still like to travel abroad for my holiday each year, as do most people I know. It's nice to have some time off and treat myself, and the airlines provide a pretty good experience. You need to plan ahead though, as availability can be tight and the introduction of carbon trading in 2025 has pushed up the price of flying in general, which means I travel less but really make the most of it when I can.

The macro-level consequences of nouveau jet-set

More passengers making fewer journeys

There are more passengers (in line with the continued population growth), but each passenger makes fewer journeys. The journeys made are mostly longer-haul journeys for business and leisure. Passengers have switched to other modes for short-haul journeys, and use technological alternatives to travel where possible. This has led to passengers travelling further to larger airports to make longer flights.

As passengers are travelling less frequently, there is a greater focus on the travelling experience and on value-added services.

Decline in short-haul air travel

Both developed-world and emerging economies have seen a decline in short-haul air travel, as high-speed rail and driverless cars provide a cheaper, quicker, and more environmentally friendly travel experience.

Decline in the local airport and the rise of the 'mega-port'

The pressure from other transport modes has led to the decline of the local airport, and the rise of the mega-airport, catering almost exclusively to the business and long-haul leisure passenger.

There will be a smaller percentage of transfer passengers travelling through airports.

Passengers travel further to airports and primarily for long-haul journeys

Passengers are much more likely to travel further to an airport using an alternative mode of transport, as this can be achieved more quickly and cheaply than short-haul.

Passengers will mainly use airports to undertake long-haul journeys for business or leisure. However, people travel much less frequently for business and make at most one leisure trip a year for their main vacation.

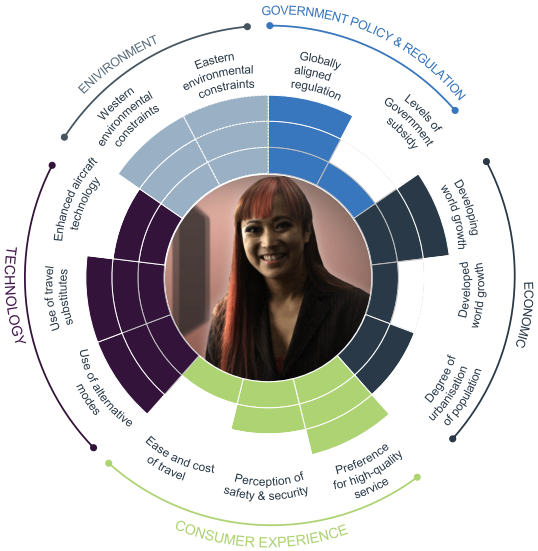
Airlines compete on service and experience

Due to the increased cost and lower frequency of use, passengers expect greater levels of service and a better overall flying experience. Flying becomes a luxury service again.

Main drivers:

- **Growth of developing economies**
- **High levels of environmental concern**
- **Increase in regulation**
- **High use of alternative modes and substitutes**
- **Preference for high-quality service**

NOUVEAU JET-SET



The implications for aviation stakeholders

Airlines

There are fewer, larger airlines with a greater global footprint as airlines respond to increasing costs by developing larger networks. Fares have increased due to increased regulation and higher oil prices, effectively ending the concept of an LCC. Airline alliances have slowly fragmented due to the consolidation in the industry.

However, competition between airlines remains strong, as most major routes are competed by two or more carriers, although the lines are drawn as much around service as price, as passengers are prepared to pay more for an enhanced service.

It has become easier for airlines to predict capacity, as airlines are more reliant on longer journeys which passengers tend to book well in advance.

In this scenario there has been a consolidation of major airlines – those that have ensured a place in the global market are the ones that have survived. These airlines have also retreated to the longer, more profitable routes.

Airport operators and investors

Many smaller regional airports have suffered a substantial loss of airlines and passengers due to fewer short-haul journeys and passengers using other modes to travel to airports. Airports have generally become larger, although there are fewer passengers transferring through airports as more people fly directly to their destination. Those hubs remaining are focused on international transfers – with those in the Middle East being best placed to consolidate 'very-long-haul' passengers.

There have been a number of new, larger airports built in the emerging economies, supporting the rise of the mega-city.

The passenger experience at airports remains important, although with fewer airports, airports compete less with one another, leading to underinvestment in some areas as the development of economic regulation has not evolved at the same pace as environmental regulation.

With a rationalisation of airports, only the strong (and well-placed) have survived. With other transport modes becoming more important, those airports with good surface access have managed to become the ones favoured by passengers – and have attracted airlines to offer sufficient flights to maintain and grow business.

Photo credit.

Government and regulators

With the rise of a global middle class which is more aware of the environmental impacts of their activities, there has been a greater drive for more environmental legislation. This has led to increased regulation and, in turn, increasing the cost of aviation.

Government policies have reacted to the greater environmental awareness by introducing incentives for alternative modes of travel for short-haul journeys. There have also been policies to develop the necessary legislation and incentives for the driverless car and 'platooned' vehicles moving in smoother-flowing reserved motorway lanes – with several governments setting out ambitious programmes to create more high-speed automated roads which will allow passengers to 'drive' much longer distances in much shorter timeframes. The improvements in the environmental performance of cars means that these new high-speed roads do not contribute to noise or air pollution in the way they would do if they were still powered by hydrocarbons.

With environmental impacts rising to the top of governments' agendas, there is a greater need for more inventive and imaginative policies to support environmentally sustainable modes of travel. Governments will need to either support investment directly or produce the right incentives to support the private investment market.
Regulators will need to focus on ensuring that aviation minimises environmental impacts – especially in terms of carbon dioxide emissions – through suitable incentive mechanisms.

Aircraft manufacturers

Aircraft manufacturers have yet to overcome the environmental impacts of aviation – leading to fewer planes being sold overall. The airlines are seeking to buy larger, more efficient planes focused on meeting the long-haul demand and minimising the environmental impact per passenger.

Many airlines are awaiting the change – hoping that there will be a break-through in aviation design which will allow aviation to compete on a level environmental footing with other transport modes.

Manufacturers will compete over size, efficiency and environmental impact, while working their R&D teams hard to find the differentiators that will lead to the next generation aircraft. More manufacturers will begin offering alternatives to the market – for example, introducing the Box (Prandtl) wing would be more aerodynamically efficient, but carry substantial risk in terms of airport integration and manufacture.

6 SKY-PARTY WORLD

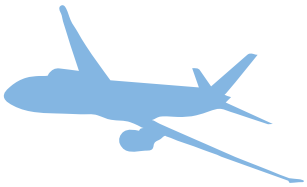
In this scenario, the emerging economies grow more slowly, leading to slower growth in disposable incomes and relative wealth, while the western economies continue to grow.

However, western passengers now see alternatives such as high-speed rail and driverless cars as more viable, low-cost alternatives to short-haul air travel in North America and Europe. This is driven, in part, by increased concerns about the environmental impacts of aviation. This leads to a levelling off in the overall demand for air transport. At the same time, people increasingly view aviation as a leisure activity rather than as a mode of transport – driving a desire for 'luxury' experiences where air travel becomes an enjoyable part of the journey and not just a means of getting to a destination.

Airlines have begun reacting to these changes, with a focus on long-haul and trips broken into short 'hops' between cities, resorts and sites of natural beauty – the provision of the so-called 'sky party'. Many low-cost operators have re-focused on value-added, re-located operations to the developing world or gone out of business, with the traditional 'flag carrier' airlines offering premium services from developed countries.

6 SKY-PARTY WORLD

59.350 °N



18.067 °E

ANIKA LINDQVIST

AGE:	45
GENDER:	FEMALE
ETHINICITY:	SWEDISH
LOCATION:	LIVES IN STOCKHOLM WITH HER HUSBAND AND HER CHILDREN
OCCUPATION:	CEO OF SPECIALIST ROBOTICS COMPANY IN SWEDEN
REASON FOR TRAVEL:	VISTING SUPPLIER IN BOSTON, US FLYING LONGHAUL

Anika's story: life in sky-party world

Anika is the CEO of a specialist robotics company based in Sweden. The company builds robots for use in high-intensity agriculture, market gardening and vertical farming, and has customers all over the world. Anika travels for both work and leisure and prefers to use the high-speed rail network for European trips. Several times a year, however, she will travel to meet partners, suppliers and customers in Asia and the USA, and for these journeys and her annual vacation she always chooses to fly long-haul with her local carrier.

Today, Anika is travelling to meet a supplier in Boston and for meetings with academic partners based at MIT. At 07.30 a small driverless passenger transport pulls up outside her apartment in the centre of Stockholm to take her to the airport. She carries only a small bag despite the fact that after her business concludes she will spend a few days visiting family and friends in New York. Her baggage was collected by courier the night before, as it will be travelling to Boston separately on a cargo drone. When she checks into her hotel, her luggage will be waiting in her room.

The journey to the airport is quick. The special lanes reserved for the driverless vehicles operate efficiently, and during the journey Anika is able to review some of the new designs that she is discussing in Boston while enjoying a coffee dispensed onboard.

The transport pulls up outside the priority boarding area – as a regular flyer for many years Anika is entitled to pass directly through security. The advanced scanners, biometric authentication, and the fact that most passengers travel with the bare minimum of luggage means that Anika reaches the lounge within minutes of arriving at the airport. There is no shortage of activities to keep travellers entertained at the airport, with many leisure travellers beginning their travel experience with some fine dining, immersive infotainment, or relaxation treatment at the airport. Anika is travelling primarily for business reasons today, so decides to enjoy a light breakfast in the lounge. She doesn't have long to wait as her flight will soon be boarding.

Anika's plane is one of the latest models and has recently been refitted. The fact that many passenger planes no longer carry significant baggage has led to onboard space being designed for a range of activities including bars, shopping and entertainment. Many passengers opt to use the immersive virtual reality booths and headsets for both business and

entertainment purposes. On some long-haul routes passengers can even pay a premium for their own private cabin pods.

Anika's flight passes smoothly and she, as always, enjoys a high-quality meal that is prepared and served according to her own preferences and specifications, as well as taking some time to have a massage treatment.

On landing in Boston, Anika passes swiftly through US border control. Her accommodation details and planned itinerary had already been supplied to the authorities and a range of biometric and other intelligent authentication systems allow her to walk straight to where another passenger transport is waiting to take her to her hotel.

The macro-level consequences of the sky-party

Fewer passengers seeking better service

Passengers are seeking increased levels of service, personalised to their individual needs and making the flying experience as simple, easy and enjoyable as possible.

While this has led to increased costs, technological efficiencies have offset many of these increases, enabling airlines to differentiate their services through the value and experience they are able to provide.

Plateau in the global demand for air travel

The expected increase in demand from emerging economies has failed to materialise, while in the developed world, competition from other modes and substitutes means that there is a 'levelling-off' in the total global demand for air travel.

Convergence of low-cost and full-service carriers

Increased competition from other modes for short-haul travel in countries in Europe, North America and Asia, and the desire for higher-quality air travel has seen the low-cost airlines adapt their business models to support more premium service in these markets.

Airlines compete on service as well as price

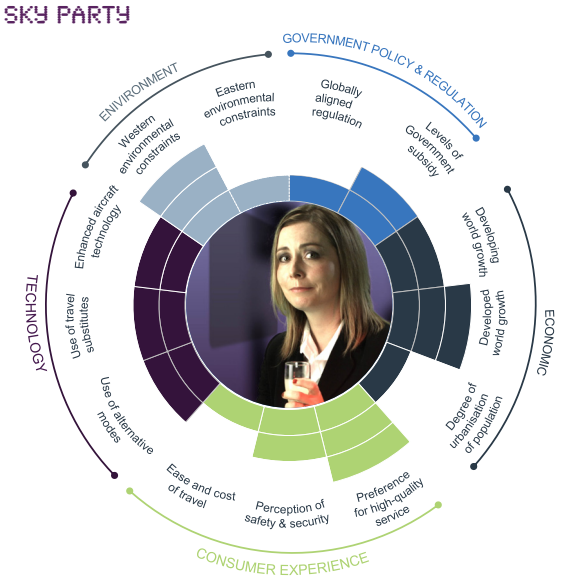
Due to the increased cost and lower frequency of use, passengers expect greater levels of service and a better overall flying experience.

Western hubs continue to grow

Larger airports, focusing on longer-haul travel, and based on supporting the developed world, continue to perform well, whereas there is a general decline in local airports. The eastern hubs (Singapore/Hong Kong) struggle, as there is less growth in the eastern markets than previously expected, leading to large amounts of underutilised airport capacity.

Main drivers:

- **Slower growth in developing economies**
- **High environmental concern**
- **Increased use of alternative modes and substitutes**
- **Low levels of government regulation**
- **Preference for high-quality service**



The implications for aviation stakeholders

Airlines

Growth of the industry has slowed and a round of mergers and acquisitions has led to further consolidation so that there are now a smaller number of regionally (for example, European and Middle Eastern) aligned carriers. The alliances continue to dominate the industry and have tightened their hold on the market.

Airlines are achieving greater margins, but higher operating and capital costs mean that the industry becomes highly leveraged. Debt levels rise as airlines compete to innovate and offer the latest technologies and 'experiences'. Some governments have intervened to prevent the sale of national airlines, providing subsidies to 'their' airlines. These subsidies have distorted the international market, resulting in tensions between those countries that support 'their' airlines and those that prefer a free market approach.

In this scenario, there has been a consolidation of major airlines as those with high brand value and government support will be successful.

Airports

The predicted boom in air travel did not happen, resulting in an over-supply of airport capacity which, when combined with improved surface access and a drastic reduction in noise pollution and emissions over populated areas (brought about by innovative technologies), has made it easier for the key North American and European hubs to grow at the cost of smaller regional airports. There have been greater strategic links between major airports and airlines.

Investment in new airport infrastructure has been essential as customer expectations around safety and efficiency have increased rapidly, but this infrastructure is focused on meeting customer expectations, not increasing capacity.

Larger airports with a greater focus on service and value will be more attractive to the airlines. There will be greater collaboration between airlines and airports with a greater focus on 'co-branding' the experience of flying. Airports offering a high-quality service will do well. Old and congested airports have either invested in new facilities or have stagnated.

Government and regulators

Western government policies have not supported the aviation industry, with governments preferring to fund the expansion of alternative modes and increasing the cost of aviation through environmental regulation. Airlines have continued to operate in a broadly competitive market. Nevertheless, some governments in the emerging economies have supported aviation as a matter of pride, resulting in 'their' flag carriers remaining independent, even if they would have been acquired by a competitor in a free market.

There has been liberalisation in the use of unmanned aerial vehicles (UAVs) – leading to many cargo planes being pilotless. This is expected to grow further over coming years.

Governments will need to develop inventive and imaginative policies to support environmentally sustainable modes of travel.
Governments will also need to work through policies and potentially complex regulation on the use of UAVs, particularly across international boundaries.

Aircraft manufacturers

Airlines have been moving to smaller fleets – leading to fewer overall orders for aircraft. Furthermore, there has been a gradual shift from smaller to larger aircraft. This has led to an overall increase in the cost per aircraft, but a dramatic reduction in the environmental impact of aviation.

Aircraft that provide greater flexibility of internal space, allowing airlines to adapt to different configurations, have proved to be more popular.

Airlines are seeking greater flexibility of internal design and greater choices in configuration – allowing increasingly innovative designer finishes to aircraft. Manufacturers that can provide this flexibility, while moving to a more service-based business model such as a 'maintain and upgrade' approach are likely to be successful.

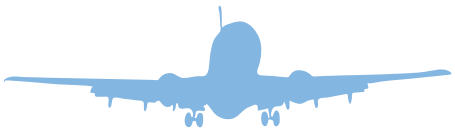
7 HOP-ON HOP-OFF WORLD

In this scenario, the emerging economies grow more slowly, leading to slower growth in disposable incomes and relative wealth. The western economies dominate demand for air transport.

For many in the West, air travel is a regular occurrence – taking short flights to visit friends and relatives or taking weekend breaks. Air travel is seen as the easiest, cheapest way to make short-haul journeys, as other modes such as high-speed rail and driverless high-speed roads have lacked the investment required to make them viable alternatives.

Airlines are offering a low-cost, no-frills approach to air travel. The ease of booking and of getting to and from airports are driving an aviation culture that views flying as being akin to hopping on and hopping off a bus – with people bringing their own entertainment.

7 HOP-ON HOP-OFF WORLD



51.500 °N

0.1167 °W

DAVID & MARION BRYANT

AGE:	43/42
MARRIED COUPLE	
ETHINICITY:	BRITISH
LOCATION:	LIVES IN MANCHESTER FAMILY HOME
OCCUPATION:	NOT SPECIFIED
REASON FOR TRAVEL:	FAMILY HOLIDAY TO TURKEY FLYIMG BUDGET AIRLINE TO DALAMAN VIA MANCHESTER

The Bryant family's story: life in hop-on hop-off world

The school holidays have just begun and the Bryant family – David, Marion and their children Stephanie and Nic – are about to head off for their summer vacation to a resort on the south coast of Turkey. The family look forward to their two weeks away – the European economy has been up and down for the past few years and the middle class has been squeezed by a combination of the increasing automation of work, slow growth, and largely stagnant wages. Money is tight and most people prioritise value and are content with a basic but efficient service.

For a family trip to Turkey it makes most sense to fly – high-speed rail is a good option for many trips across Europe, but not all regions are well served. Competition is fierce between airlines and there is a good choice of destinations that can easily be accessed directly from the Bryants' local airport in Manchester, including Dalaman. Some airlines have even opened up their own airports in popular growth destinations and are doing good business across a wide range of routes. The unsettled economic situation drives a lot of migration, as people move around in search of work or return home to catch up with friends and family. Growing concern over the environment has led to carbon pricing being factored into the business model of most airlines, which has driven improvements in aircraft efficiency and range.

Planning and booking a trip can be done very easily online, with support from intelligent booking agent customer support systems that can plan and integrate multiple modes of transport into a seamless journey. The Bryants are pleased that their ticket will also include all the appropriately scheduled transport arrangements to take them to and from the airport at each end. Onboard, the experience is largely 'no frills'. The majority of people bring along their own entertainment and other technology to allow them to work and connect with friends and colleagues if they wish.

For the Bryants, the trip to the resort passes efficiently and the family regard it as differing little from a coach or train journey. The holiday has started well and the Bryants are relaxed; now all they need is for the weather in Fethiye to be an improvement on the rain they left behind in Manchester.

The macro-level consequences of hop-on hop-off

Slow rise in the global demand for air travel

While the expected increase in demand from emerging economies has failed to materialise, the West continues its passion for aviation, driven by short-haul travel.

Passengers have become accustomed to basic levels of services, but enjoy the freedom, flexibility and ease of booking integrated journeys using online and intelligent booking-agent customer support systems. Passengers often seek out the cheapest deals, but expect somewhat basic levels of service.

Dominance of low-cost carriers

While there remains some demand for FSCs (primarily driven by long-haul, business travel), LCCs dominate the short-haul market and have gained a strong foothold in the long-haul market.

Airlines compete primarily on price rather than service

There is a buoyant low-cost market, with strong demand for short-haul travel leading to new entrants and a more competitive market.

Local airports remain strong

Across the developed world, relatively small, local airports continue to perform well, underpinned by strong local demand for aviation.

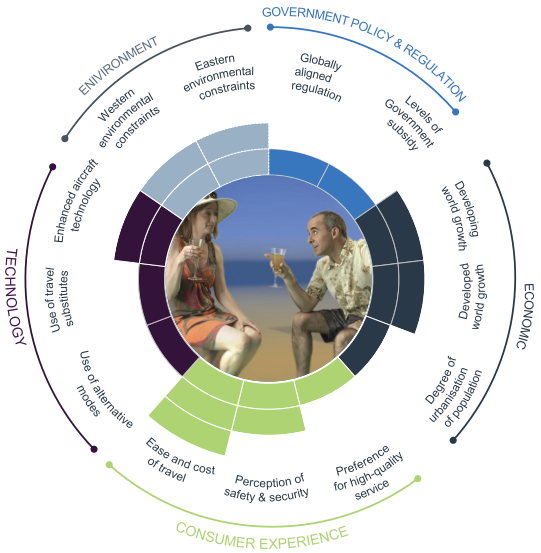
Hubs become less important

The Middle Eastern hubs struggle, as there is less growth in the eastern markets than previously expected. Similarly, the western hubs become less important, as there is less transfer traffic and more short-haul point-to-point.

Main drivers:

- Slower growth in economies
- Low environmental concern
- Low use of alternative modes and substitutes
- Low levels of government regulation
- Preference for simple service and low cost

HOP-ON HOP OFF



The implications for aviation stakeholders

Airlines

LCCs dominate the market, creating more routes across the developed world, while only making minor incursions into the developing economies because of the lack of economic growth. There have been several new entrants into the market, further driving competition and putting even more pressure on FSCs. The alliances remain, but are less relevant in a world where low-cost short-haul is king.

Airlines offer basic levels of service, with passengers becoming more accustomed to bringing their own entertainment.

Price competition will drive airlines to reduce costs and optimise operations – those that can meet this challenge, while not degrading service standards, are likely to gain market share and to be successful in this scenario.

Airport operators and investors

Airports in the developed economies have continued to do well, increasing passenger numbers and offering flights to a greater number of short-haul destinations. However, the continuing dominance of the western economies has seen a reduction in the number of Middle Eastern hub airports – with many airports such as Istanbul with surplus capacity.

The western airports have remained strong, but now provide for a much greater number of point-to-point carriers, with more passengers self-connecting. Many airports have also created stronger links with individual carriers.

Quick aircraft turnarounds, low landing charges, and fast, efficient passenger throughput will be important for airports in this scenario.

Government and regulators

Government policies have continued to support the aviation industry in facilitating economic growth. There has been little change in the approach to regulating the industry, with regulators providing the economic frameworks to protect passengers from monopolistic positions of airports. Airlines have continued to operate in a broadly competitive market.

Governments will need to ensure that regulation continues to evolve with the market, making sure that there are suitable conditions to support a range of airlines, in particular the LCCs. Cross-border controls will continue to be enforced, but governments will need to incorporate new technologies and improved business processes to support faster airport transition times.

Aircraft manufacturers

Airlines have been slowly increasing the size of their fleets – leading to an overall increase in orders for aircraft. Most orders have been for more efficient planes like the B787 and A350, making low-cost, longer-range point-to-point more feasible. These body-wing-two engine configurations remain ubiquitous and have been further refined, making them more commoditised.

Aircraft have reduced noise levels and carbon dioxide pollution levels, facilitating the continued prevalence of aviation throughout the developed economies.

Low production costs and fuel efficiency will be key requirements for airlines in this scenario. Basic aircraft fit-outs, which provide no-frills comfort for passengers, will remain standard.

8 NEW CHALLENGES IN THE FUTURE WORLD OF PASSENGER AVIATION

By exploring the scenarios in the previous sections, we see there are a number of different ‘future worlds’ for the passenger aviation industry.

In this final section we present some of the main themes and challenges for the industry set out throughout this document.


ELEC
AIR
CARGO SMOKE
VENT
ANTI ICE
END START
CABIN PRESS
WIPER
AUTO BRK
OXYGEN
TCAS
FLAPS
UNLOCK
LOCK

8 NEW CHALLENGES IN THE FUTURE WORLD OF PASSENGER AVIATION

The future cost of flying

The cost of oil and other commodity prices will affect the overall long-term cost of aviation. Furthermore, unless more environmentally friendly technologies are developed within the sector then there is the risk that environmental regulation and other government taxes will lead to increases in the cost of flying, making travel alternatives more attractive, or leading people not to travel at all.

Competition from alternative modes and substitutes

The rise of LCCs has led to an increase in the number of people taking short-haul journeys. However, it is difficult to predict how increased investment and growth in other modes will affect this market. Investment in high-speed trains is already happening in many countries, for example China, but the effect of more automated, potentially driverless cars could also have a significant effect on some markets – for example, the introduction of high-speed automated highways could affect the internal North American market.

Future airline business models

There are a number of factors that may affect the future of the airline industry, and in particular the types of business model. These include:

- Enhanced competition on short-haul routes, which may lead to more LCCs moving into long-haul
- More options to self-connect by using LCCs, which may create pressure on FSCs on their long-haul routes
- Mergers and acquisitions, which may lead to a consolidation of airlines
- Government intervention, which may lead to the dominance of 'flag carrying' airlines.

Investing in new and emerging markets

With the increase in demand from many of the emerging economies, understanding when and to what extent to invest in these markets remains challenging. The trade-off between potential first-mover advantage and the risk of undertaking investments with long pay-back periods needs to be carefully considered.

Future airport models

There has been an enormous level of airport expansion over the last decade, with the rise of the Middle Eastern hubs in Dubai and Istanbul. If the emerging economies continue to grow, there is the potential for this to continue. However, there remain a number of uncertainties surrounding the type and location of airport capacity. In particular:

- Will the additional hub capacity continue to be utilised? Or will there be large surplus capacity?
- Will consumer preferences, and the efficiencies and greater economies of new aircraft, facilitate more point-to-point travel rather than the use of hubs?
- Will urbanisation of the population lead to an increasing number of 'mega-ports'? Or will there continue to be a mixture of regional and larger airports?
- Will large 'mega-cities' support a number of competing airports?

Impact of threats and security

The threat of terrorism and the perception of aviation security are likely to have an impact on future demand for passenger aviation. Furthermore, how airports ensure passenger safety, without security procedures becoming more time-consuming or invasive, will affect customers' willingness to fly. For example, for our hop-on hop-off world to become a reality, new technology and processes are likely to be required to minimise the time impacts of undertaking necessary security checks.

Government intervention and regulation

The EU state aid laws limit the circumstances in which national and local governments can invest in aviation – leading to a market-based system driven by competition. This is in contrast to other parts of the world, notably in the Middle East, where there is a blurring of the public and private sector with a number of essentially state-owned airports and airlines.

With opportunities to expand into new markets and geographies, different levels of state aid and regulation are likely to have a major effect on the global market.

AUTHORS

Chris Lynch is a partner at PA Consulting Group and leads PA's global aviation business. He can be reached at **chris.lynch@paconsulting.com**

Rob Gear is a futurist and expert on emerging technologies and trends and leads PA's Innovation Unit. He can be reached at **rob.gear@paconsulting.com**

Dominic Gibbeson is a senior consultant in PA's Strategy and Decision Sciences practice. He can be reached at **dominic.gibbeson@paconsulting.com**

Andrew Meaney is a partner at Oxera and head of Oxera's Transport team. He can be reached at **andrew.meaney@oxera.com**

Matt Shepherd is a senior consultant in Oxera's Transport and Modelling teams. He can be reached at **matthew.shepherd@oxera.com**

Michele Granatstein is a senior consultant in Oxera's Transport and Regulation teams. She can be reached at **michele.granatstein@oxera.com**

APPENDIX

APPENDIX
KEY IMPLICATIONS

	Scenario 1: Destination anywhere	Scenario 2: Nouveau jet-set
Airlines	• How do we reduce costs whilst not affecting operational performance? • How can we scale our operations quickly to take advantage of new routes? • How do we improve our global brand recognition?	• What is our strategy to thrive in a vastly different market? • How do we ensure we are prioritising and concentrating on the most profitable routes?
Airport operators and investors	• Where should we consider investing in new airport capacity? • How do we ensure the efficient use of our assets? • How do we ensure we can support a range of evolving airline models?	• How do we align our services with other competing transport modes? • How do we engage with our customers to ensure we continue to attract the major airlines?
Government and regulators	• How do we work towards globally aligned regulation to deliver an efficient global market? • How will western regulators strike the balance between regulation and global competition?	• How do we develop our policies to support more environmentally friendly modes of travel? • How do we best support and encourage the necessary investment in a challenging market?
Aircraft manufacturers	• How do we ensure we can meet demand in a growing market? • How will we ensure a critical presence in the emerging economies?	• What will be the next differentiators in manufacturing to meet the 'environmental challenge'? • How do we best support our R&D departments to deliver new innovations?

	Scenario 3: Sky-party	Scenario 4: Hop-on hop-off
Airlines	• How do we develop our brand to differentiate us in the market? • How do we better understand the needs of our customers to adapt and evolve our product and service offerings? • How do ensure we continue to innovate in the market?	• How do we optimise operations and reduce costs whilst not significantly affecting service standards? • How do we ensure we are focusing on the optimal routes and markets?
Airport operators and investors	• How do we ensure we deliver higher levels of service without significantly increasing costs? • How do we better collaborate with airlines to improve the customer experience?	• How do we ensure we minimise landing charges and provide quick aircraft turnaround times? • How do we optimise throughput of passengers through the airport?
Government and regulators	• How do we develop our policies to balance environmental impact whilst supporting a sustainable aviation industry? • How do we develop polices and regulation to support the growth in the use of UAVs?	• How do we develop policies and regulation which will support a range of airline models? • How do we develop cross-border controls and introduce new technologies to support faster airport transition times?
Aircraft manufacturers	• How do we improve the configuration of aircraft design to allow greater choice for airlines? • How do we develop our business model and commercial approach to provide greater flexibility and improved service offerings?	• How do we further reduce production costs whilst continuing to meet airlines' needs? • How do we continue to develop even more fuel efficient aircraft through the use of new technology and production techniques?

Oxera advises companies, lawyers, policymakers, and regulators on any economic issue connected with competition economics, finance or regulation. We have been doing this for more than three decades, gathering deep and wide-ranging knowledge as we expand into new sectors. We have a reputation for credibility and integrity among those we advise, and among key decision-makers. Today we have offices in Oxford, Berlin, Brussels and London, and are able to advise our international clients in a highly flexible way.

Oxera Head office

Park Central
40/41 Park End Street
Oxford
OX1 1JD
United Kingdom

www.oxera.com

CONSULTING
TECHNOLOGY
INNOVATION

We are an employee-owned firm of over 2,500 people, operating globally from offices across North America, Europe, the Nordics, the Gulf and Asia Pacific.

We are experts in energy, financial services, life sciences and healthcare, manufacturing, government and public services, defence and security, telecommunications, transport and logistics.

Our deep industry knowledge together with skills in management consulting, technology and innovation allows us to challenge conventional thinking and deliver exceptional results with lasting impact.

DSP1959-28

Corporate headquarters

123 Buckingham Palace Road
London SW1W 9SR
United Kingdom
+44 20 7730 9000

paconsulting.com