AVIATION BENEFITS BEYOND BORDERS

Providing employment, trade links, tourism and support for sustainable development through air travel

ATAG
AIR TRANSPORT ACTION GROUP

MARCH 2012

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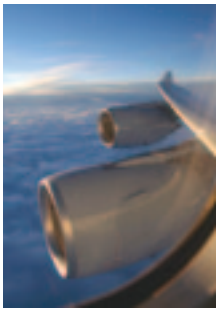

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The air transport industry is the global network of commercial aircraft operators, airports, air navigation service providers and the manufacturers of aircraft and their components. It is responsible for connecting the global economy, providing millions of jobs and making modern quality of life possible. The Air Transport Action Group (ATAG), based in Geneva, Switzerland, represents the full spectrum of this global business. ATAG brings the industry together to form a strategic perspective on commercial aviation's sustainable development and the role that air transport can play in supporting the sustainability of other sectors of the economy. ATAG's Board of Directors includes: Airports Council International (ACI), Airbus, ATR, Boeing, Bombardier, Civil Air Navigation Services Organisation (CANSO), CFM International, Embraer, GE Aviation, Honeywell Aerospace, International Air Transport Association (IATA), Pratt & Whitney and Rolls-Royce.

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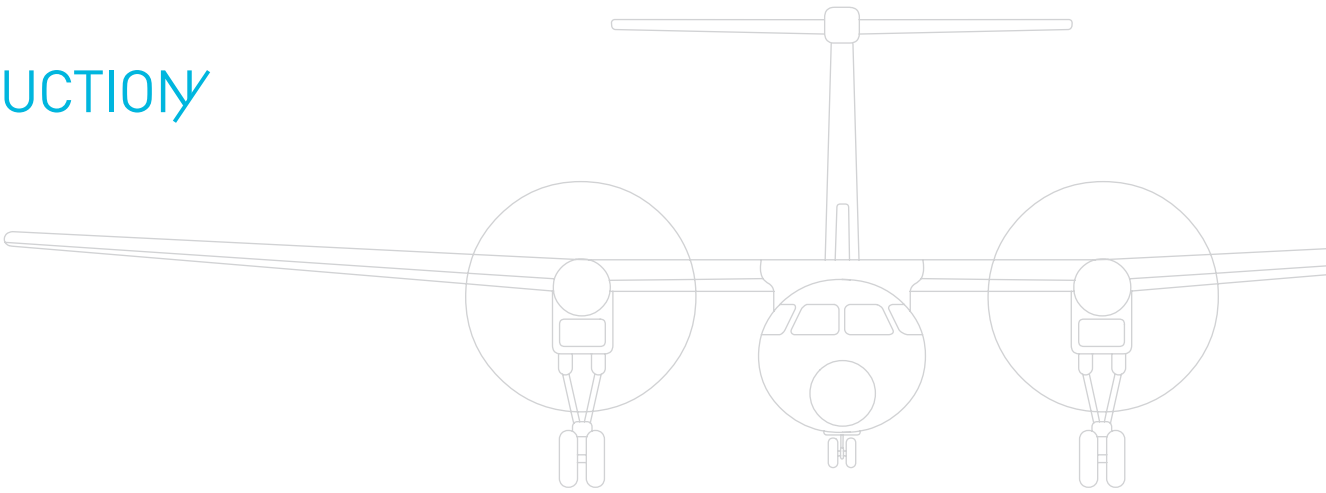
INTRODUCTION



I'm writing this from seat 32A on a flight from Shanghai to London. Around me are over 300 fellow travellers. Some are on business, some are visiting family or on holiday, a number are going to study in the UK and there will no doubt be a few for whom this is their first flight. We are all being transported over 11 kilometres above the earth's surface at a speed of 843 kilometres per hour. A couple of hundred years ago this journey took tea traders a year. By ship in 2012 it takes almost a month. Today's flight will last 11 hours and 42 minutes.

Apart from the people on board, tonnes of precious cargo are below my feet, part of a global electronics supply chain, or fresh produce making its way to market. This flight is not only a link between the mature markets of the west and the burgeoning new economies of the east; it is symbolic of the way that aviation is able to bring together people, business and communities like no other industry.

Yet I wonder how many of the passengers on board today's flight have given any thought to the thousands of people it took to put this aircraft in the air and the hundreds that are helping to keep us up here. Aside from the pilots and cabin crew, the check-in agents and the baggage handlers, there is an army of people who are not quite so visible that make up the global air transport system.

From the moment this aircraft was first dreamed of, a set of highly-skilled and innovative designers, engineers and operational staff have built it and helped keep it running in conditions that no other machine could handle, with impressive safety and reliability. Around the world, staff at airports have helped the several million passengers who have flown on board this aircraft over its life to reach the flight on time and collect their bags at the end of the trip. Right now, a number of air traffic control staff are guiding this flight and many other aircraft safely through the skies.

Those on board have taken advantage of the fact that the real cost of air travel has fallen dramatically in the last few decades. As the middle classes in the world's fast emerging economies continue to gain strength, their desire to see the world and do business globally will be met by new routes, new aircraft and a dedicated and passionate workforce.

While not everyone on earth can afford to fly today, the benefits of air transport spread far beyond the people involved in the flight itself. From the farmers supplying the food served on board and the produce carried in the cargo hold, to the people working in those parts of the tourism industry that air transport makes possible, aviation is a major creator of jobs.

With the sustainable development of economies and the creation of jobs comes the need to more carefully manage the resources we are using and the impact that we have on the world. It is comforting to know that the modern aircraft I am flying on today is many times more fuel efficient and quieter than the first planes to fly this route. Even more encouraging is that newer aircraft are being rolled out that will be more efficient in the coming years. The industry is also displaying impressive collaborative efforts to improve efficiency across the fleet, with all parts of the sector heavily involved.

The aviation industry is confident that its growth can meet the needs of economies and society in the coming decades, but will do so with a decreasing impact on the environment and in the safe, secure and efficient manner for which we are well known. We are committed to working in partnership with other industries, governments and people everywhere for the benefit of our global society. Welcome on board!

Paul Steele
Executive Director

BEYOND TAKE-OFFS, LANDINGS AND PEANUTS

Key facts and figures from the world of air transport

All figures are for 2010, unless otherwise stated, to give a single set of data for one year. Where available, the latest figures are also noted.

56.6 million

Jobs supported by aviation worldwide[1]

$2.2 trillion

Aviation's global economic impact (including direct, indirect, induced and tourism catalytic)[3]

3.5x

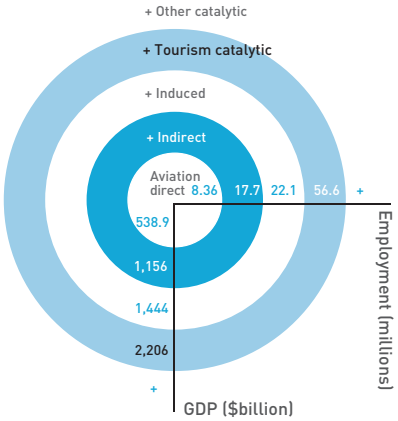
Aviation jobs are, on average, 3.5 times more productive than other jobs[6]

192

Air navigation service providers[8]

These figures represent the benefits that aviation activities deliver to the global economy. They do not include other economic benefits of aviation, such as the jobs or economic activity that occur when companies or industries exist because air travel makes them possible, or the intrinsic values that the speed and connectivity of air travel provides. Nor do they include domestic tourism and trade. Including these would increase the employment and global economic impact numbers several-fold[10].

Aviation's global employment and GDP impact[2]



3.5%

Of global GDP is supported by aviation[4]

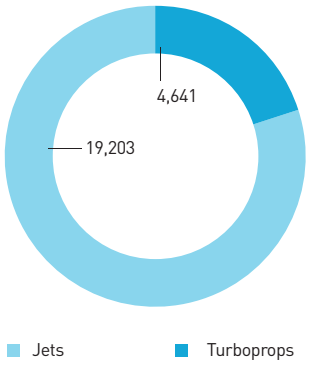
19TH

If aviation were a country, it would rank 19th in size by GDP[5]

23,844

Number of commercial aircraft in service[7]

Aircraft in commercial service[11]



EXECUTIVE SUMMARY

This report provides a global view of one of the most global industries. Oxford Economics has worked over the last two years to analyse the economic and social benefits of aviation at a national level in over 50 countries and used the results of that assessment to build the most comprehensive global picture of air transport's many benefits. Working with partners across the industry, the Air Transport Action Group (ATAG) has expanded the analysis to build a unique view of the air transport system that provides jobs, trade, connectivity, tourism, vital lifelines to many remote communities and rapid disaster response.

Air transport is a major contributor to global economic prosperity

Aviation provides the only rapid worldwide transportation network, which makes it essential for global business and tourism. It plays a vital role in facilitating economic growth, particularly in developing countries.

Airlines transport over 2.6 billion passengers annually with revenue passenger kilometres (RPK) totalling nearly 5 trillion in 2010. The USA followed by China and then the UK were the top three countries in terms of RPK.

Nearly 48 million tonnes of freight were carried by air in 2010, amounting to 172 billion freight tonne kilometres (FTK). The USA followed by China and then Germany were the top three countries in terms of FTK.

Air transport facilitates world trade, helping countries participate in the global economy by increasing access to international markets and allowing globalisation of production. The total value of goods transported by air represents 35% of all international trade.

Aviation is indispensable for tourism, which is a major engine of economic growth, particularly in developing economies. Globally, 51% of international tourists travel by air.

Connectivity contributes to improved productivity by encouraging investment and innovation; improving business operations and efficiency; and allowing companies to attract high quality employees.

Aviation's global economic impact (direct, indirect, induced and tourism catalytic) is estimated at $2.2 trillion, equivalent to 3.5%

3,846

Airports with scheduled commercial flights[12] (there are 43,982 airfields in the world, including military and general aviation[13])

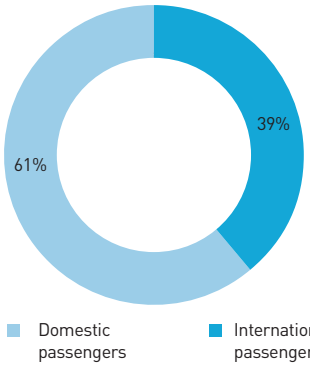
34,756

City-pair routes served globally[9]

1,568

Commercial airlines[14]

Global passenger split, international / domestic[15]



15,200kms

The range of a modern jet aircraft. The first jet had a range of 5,190 kilometres[16]

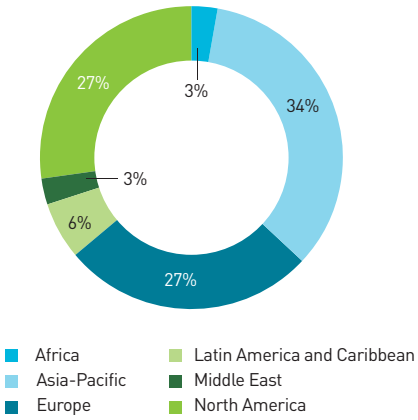
26,717,000

Commercial aircraft movements worldwide[17]

4,845,644,203,000

Kilometres flown by passengers (in 2011, it was 5.1 trillion)[18]

Regional passenger traffic split



41,647,000

Hours flown by commercial airlines in 2010[19]

51%

Of international tourists travel by air[20]

2,681,000,000

Passengers carried by airlines[21] (in 2011, it was over 2.8 billion[22])

of world gross domestic product (GDP).

These figures do not include other economic benefits of aviation, such as the jobs or economic activity that occur when companies or industries exist because air travel makes them possible, or the intrinsic value that the speed and connectivity of air travel provides. Nor do they include domestic tourism and trade. Including these would increase the employment and global economic impact numbers several-fold.

Over 1,500 airlines operate a total fleet of nearly 24,000 aircraft. They serve almost 4,000 airports through a route network of several million kilometres managed by around 190 air navigation service providers.

Air transport is a major global employer

The air transport industry generates a total of 56.6 million jobs globally.

It provides 8.4 million direct jobs: airlines, air navigation service providers and airports directly employ 7.6 million people and the civil aerospace sector (manufacture of aircraft systems, frames and engines) employs 0.8 million people.

There are 9.3 million indirect jobs generated through purchases of goods and services from companies in its supply chain.

Industry employees support 4.4 million induced jobs through spending.

Aviation-enabled tourism generates around 34.5 million jobs globally.

Air transport invests substantially in vital infrastructure

Unlike other transport modes, the air transport industry pays for a vast majority of its own infrastructure costs (runways, airport terminals, air traffic control), rather than being financed through taxation and public investment or subsidy (as is typically the case for road and railways).

In 2010, airports invested $26 billion in construction projects, creating jobs and building new infrastructure.

The benefits to society of research and development spending by the aerospace industry are estimated to be much higher than in manufacturing as a whole – every $100 million of spending on research eventually generates additional GDP benefits of $70 million year-after-year.

Air transport provides significant social benefits

Air transport contributes to sustainable

Key facts and figures from the world of air transport

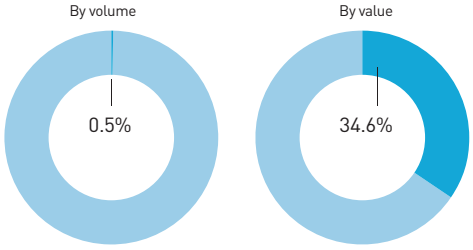
172 billion
Scheduled freight tonne kilometres[23]

$5.3 trillion
Value of cargo handled by air in 2010[26]

48 million
Tonnes of freight handled by air in 2010 (in 2011, it was 47.6 million tonnes)[25]

35%
Air transport carries around 35% of world trade by value and only 0.5% by volume[24]

Proportion of global trade transported by air[29]



1.7 weeks
Number of weeks it takes of the average Australian wage to pay for the lowest Sydney – London return airfare. In 1945, it took 130 weeks[27]

Top 10 airports by cargo tonnes, 2010[28]

Rank	City	Airport	Cargo (tonnes)
1	Hong Kong	HKG	4,165,852
2	Memphis	MEM	3,916,811
3	Shanghai	PVG	3,228,081
4	Incheon	ICN	2,684,499
5	Anchorage	ANC	2,646,695
6	Paris	CDG	2,399,067
7	Frankfurt	FRA	2,275,000
8	Dubai	DXB	2,270,498
9	Tokyo	NRT	2,167,853
10	Louisville	SDF	2,166,656

Climate targets[30]

1.5%
Aviation will improve its fleet fuel efficiency by 1.5% per annum between now and 2020.

Stabilise
From 2020, net carbon emissions from aviation will be capped through carbon-neutral growth.

50%
By 2050, net aviation carbon emissions will be half of what they were in 2005.

development. By facilitating tourism and trade, it generates economic growth, provides jobs, improves living standards, alleviates poverty and increases revenues from taxes.

Increasing cross-border travel is a reflection of the closer relationships developing between countries, both from an individual perspective and at a country level. In the same way, eased restrictions on the movement of goods and people across borders facilitates the development of social and economic networks that will have long-lasting effects. This improved flow of people and goods benefits both the host and the originating countries, encouraging increased social and economic integration.

Air transport offers a vital lifeline to communities that lack adequate road or rail networks. In many remote communities and small islands, access to the rest of the world – and to essential services such as health care – is often only possible by air.

Aviation's speed and reliability are perhaps most immediately apparent in the delivery of urgently needed assistance during emergencies caused by natural disaster, famine and war. Air services are particularly important in situations where physical access is problematic.

Air transport is working to mitigate its environmental impact

Airline operations produced 649 million tonnes of carbon dioxide (CO_2) in 2010 (and 676 million tonnes in 2011), just under 2% of the total human carbon emissions of over 34 billion tonnes.

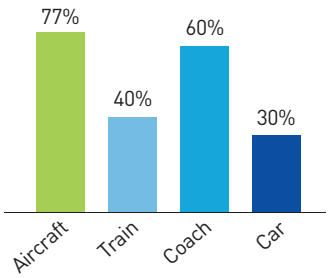
The aviation industry agreed in 2008 to the world's first set of sector-specific climate change targets. The industry is already delivering on the first target – to continue to improve fleet fuel efficiency by 1.5% per year until 2020. From 2020, aviation will cap its net carbon emissions while continuing to grow to meet the needs of passengers and economies. By 2050, the industry has committed to reduce its net carbon footprint to 50% below what it was in 2005.

Companies across the sector are collaborating to reduce emissions using a four-pillar strategy of new technology,

260,730,000,000

Litres of jet fuel used by commercial operators (in 2011, 271 billion litres were used)[31]

High occupancy[32]



77%

Average aircraft occupancy (in 2011, it was 78%)[33], this is much higher than other forms of transport

$140 billion

The amount the world's airlines paid for fuel (in 2011, it was $178 billion)[34]

649,000,000 tonnes

CO_2 emitted by airlines (in 2011, it was 676 million tonnes)[35]. This is just under 2% of the global human emissions of 34 billion tonnes. 80% of aviation CO_2 is emitted from flights over 1,500 kilometres in length, for which there is no practical alternative form of transport

Top 10 airports by passenger movements, 2010[36]

Rank	City	Code	Passengers
1	Atlanta	ATL	89,331,622
2	Beijing	PEK	73,948,113
3	Chicago	ORD	66,774,738
4	London	LHR	65,884,143
5	Tokyo	HND	64,211,074
6	Los Angeles	LAX	59,070,127
7	Paris	CDG	58,167,062
8	Dallas / Fort Worth	DFW	56,906,610
9	Frankfurt	FRA	53,009,221
10	Denver	DEN	52,209,377

Top 10 countries by passengers, 2004 - 2010[37]

Rank	2004	2006	2008	2010
1	United States	United States	United States	United States
2	United Kingdom	China	China	China
3	China	United Kingdom	United Kingdom	United Kingdom
4	Germany	Germany	Germany	Germany
5	Japan	Japan	France	United Arab Emirates
6	France	France	Japan	France
7	Australia	Australia	Gulf States	Japan
8	Canada	Canada	Canada	Canada
9	Singapore	Gulf States	Australia	Russian Federation
10	Netherlands	Singapore	Singapore	Ireland

efficient operations, improved infrastructure and economic measures to fill the remaining emissions gap.

Modern jet aircraft are 75% quieter than the first models that entered into service and each new generation of aircraft continues this downward trend.

Over 1,500 passenger flights operating partially on sustainable biofuels have taken place so far. It is expected that carbon reduction from moving to biofuels could be up to 80% over traditional jet fuel.

When implemented, Europe's Single Sky programme can deliver a 10-15% reduction in environmental impact alone as it will save 300-500 kilogrammes of fuel and 948 to 1,575 kilogrammes of CO_2 per flight. Similarly NextGen in the USA is expected to yield significant benefits in terms of reducing delays, fuel savings, additional capacity, improved access, enhanced safety, and reduced environmental impact.

Air transport will continue to provide jobs

In 2030, forecasts suggest that there will be nearly 6 billion passengers and aviation will support nearly 82 million jobs and $6.9 trillion in economic activity.

However, if growth were to slow by just 1%, the total number of jobs supported by the air transport sector (including air transport supported tourism) would be over 14 million lower than the base forecasts and the contribution of the air transport sector to world GDP would be $646 billion (2010 prices) lower, with an additional $542 billion lost through lower tourism activity.

Air transport is a vital component of modern life

When Iceland's Eyjafjallajokull volcano erupted in 2010, a week-long disruption of air traffic in Europe caused 10 million passengers to be affected and cost the global economy $5 billion.

It was not only passengers impacted: parts of the automotive industry were forced to slow production as supply chains remained grounded and African economies lost up to $65 million in exports of time-sensitive perishable goods.

A GLOBAL INDUSTRY

Aviation's global economic, social and environmental profile in 2010

AN ECONOMIC ENGINE

Aviation is a vital part of the increasingly globalised world economy, facilitating the growth of international trade, tourism and international investment, and connecting people across continents.

Direct impacts

The aviation industry itself is a major direct generator of employment and economic activity, in airline and airport operations, aircraft maintenance, air traffic management, head offices and activities directly serving air passengers, such as check-in, baggage handling, on-site retail and catering facilities. Direct impacts also include the activities of aerospace manufacturers selling aircraft and components to airlines and related businesses.

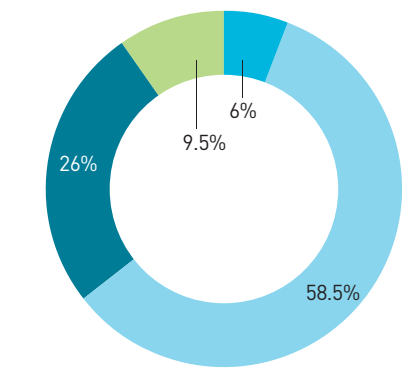
The world's airlines carry over 2.6 billion passengers a year and 48 million tonnes of freight. Providing these services generates 8.4 million direct jobs within the air transport industry and contributes $539 billion to global GDP. Compared with the GDP contribution of other sectors, the global air transport industry is larger than the pharmaceuticals ($445 billion), the textiles ($236 billion) or the automotive industries ($484 billion) and around half as big as the global chemicals ($977 billion) and food and beverage ($1,162 billion) sectors. In fact, if air transport were a country, its GDP would rank it 19th in the world, roughly equal to that of Switzerland or Poland.

Of the 8.4 million jobs directly generated by the air transport industry:

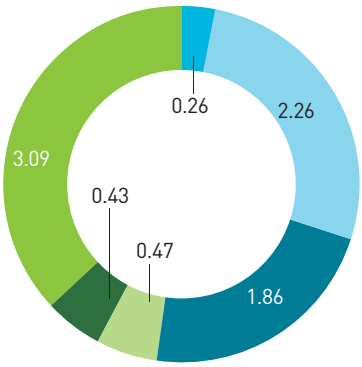
- 0.8 million people work in the civil aerospace sector, involved in the manufacture of aircraft systems, frames and engines.
- 2.2 million work for airlines or handling agents, including flight crew, check-in staff and maintenance crew.
- 0.5 million are employed by airport operators, in airport management, maintenance and security.
- 4.9 million have other jobs on-site at airports – for example, in retail outlets, restaurants, hotels and government border agencies.

Air transport also has important 'multiplier' effects, which mean that its overall contribution to global employment and GDP is much larger than its direct impact alone.

Direct employment by air transport globally, 2010[38]



Direct employment by air transport by region, millions, 2010[39]



Indirect impacts

These include employment and activities of suppliers to the air transport industry – for example, aviation fuel suppliers; construction companies that build airport facilities; suppliers of sub-components used in aircraft; manufacturers of goods sold in airport retail outlets; and a wide variety of activities in the business services sector (such as call centres, information technology and accountancy). Over 9.3 million indirect jobs globally are supported through the purchase of goods and services by companies in the air transport industry. These indirect jobs contributed approximately $618 billion to global GDP in 2010.

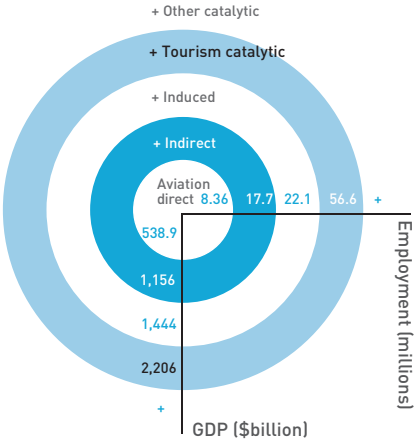
Induced impacts

The spending of those directly or indirectly employed in the air transport sector supports

The global air transport industry supports 56.6 million jobs worldwide and contributes $2.2 trillion to global GDP, equivalent to 3.5% of GDP.

jobs in industries such as retail outlets, companies producing consumer goods and a range of service industries (such as banks and restaurants). Worldwide, nearly 4.4 million induced jobs globally are supported through employees in the air transport industry (whether direct or indirect) using their income to purchase goods and services for their own consumption. The induced contribution to global GDP is estimated at $288 billion in 2010.

Aviation's global employment and GDP impact, 2010



Wider catalytic (spin-off) benefits

Air transport's most far-reaching economic contribution is via its contribution to the performance of other industries and as a facilitator of their growth. These 'catalytic' or 'spin-off' benefits of aviation affect industries across the whole spectrum of economic activity.

» Air transport is indispensable for tourism, which is a major engine of economic growth globally, particularly in developing economies.

» Air transport facilitates world trade, helping countries participate in the global market by increasing access to international markets and allowing globalisation of production.

» Air transport increases a country's connectivity which can help raise productivity, by encouraging investment and innovation; improving business operations and efficiency; and allowing companies to attract high-quality employees.

Air transport stimulates tourism

Tourism makes a major contribution to the global economy. It directly contributed $1.8 trillion to world GDP in 2011 and supported over 99 million direct jobs globally – 3.4% of total employment[40]. By 2021, the World Travel & Tourism Council (WTTC) expects direct employment in the tourism industry to be more than 120 million people globally.

Aviation plays a central role in supporting tourism. Over 51% of international tourists now travel by air. Tourism is particularly important in many developing countries, where it is a key part of economic development strategies. In Africa, for example, the jobs of an estimated 2.5 million people directly employed in tourism are supported by overseas visitors arriving by air, representing 34% of all tourism jobs in Africa.

The contribution of air transport to tourism employment and GDP:

» Direct: 14.4 million direct jobs in tourism globally are estimated to be supported by the spending of foreign visitors arriving

TRADE

Miami International: air freight drives jobs and economic benefits

Miami International Airport (MIA) has become one of the USA's busiest cargo airports and thanks to its key position as a hub for North American-Latin American trade now contributes over 280,000 jobs directly and indirectly to the local economy, or one out of every four jobs in Miami.

Over the past few decades, the airport has built up its niche role as the world's largest gateway from North America to Latin America and the Caribbean, handling 83% of all air imports from – these economically vibrant regions of the world. The airport and the nearby smaller general aviation airfields produce an annual economic return of $26.7 billion to the regional economy. The airport is a hub for the distribution of perishable products, hi-tech commodities, telecommunications equipment, textiles, pharmaceuticals and industrial machinery. MIA handles around two million tonnes of freight a year, or 89% of all flowers which are sent by air to the USA, and 73% of all fruit and vegetables flown into the country.

The value of MIA's total air trade for 2010 was $50.7 billion, or 41% of Florida's total air and sea trade with the rest of the world.

It is not all one-way traffic. Over 90 airlines use the airport as a transfer hub, providing a vital transhipment point for carriers based in the Americas shipping goods to high growth markets in Asia, Europe, the Middle East and beyond. MIA continues to build new business – in 2011 more new airlines flew into the airport than any other hub in the USA and routes to new Far East destinations are developing rapidly. In 2011, freight shipments between Asia and the airport rose 8.7% over 2010.

The airport's freight facilities now comprise 17 warehouses, providing over 2.7 million square feet of space, attracting nearly 300 customs brokers, over 1,000 freight forwarders and numerous local and multinational companies specialising in international trade, law, finance, importing and exporting.

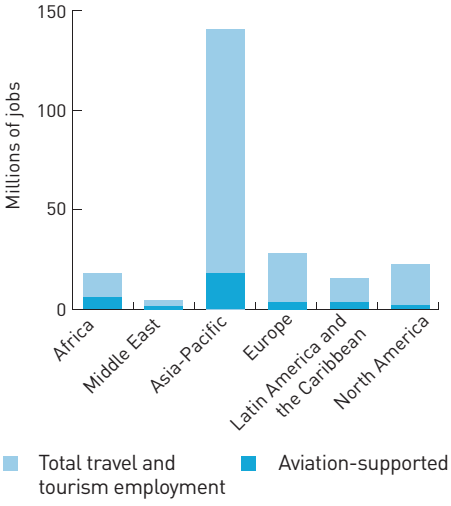
by air. This includes jobs in industries such as hotels, restaurants, visitor attractions, local transport and car rental, but it does not include air transport industry jobs.

» Indirect: A further 13.2 million indirect jobs in industries supplying the tourism industry are supported by visitors arriving by air.

» Induced: These direct and indirect tourism jobs supported by air transport generate a further 6.9 million jobs in other parts of the economy, through employees spending their earnings on other goods and services.

Air transport supports 34.5 million jobs within tourism, contributing around $762 billion a year to world GDP.

Employment in tourism supported by air transport, 2010[41]



$5.3 trillion of goods were transported internationally by air in 2010.

Contribution to world trade

As an important facilitator of international trade, aviation promotes global economic growth and development. Forecasts suggest that the world's economies will become even more dependent on international trade over the next decade. World trade is expected to nearly double, rising at more than twice the rate of global GDP growth, with China, India and other emerging markets leading the way.

Compared to other modes of transport, air freight is fast and reliable over great distances. However, these benefits come at a cost. Consequently, air freight is mostly used to deliver goods that are light, compact, perishable and have a high unit value.

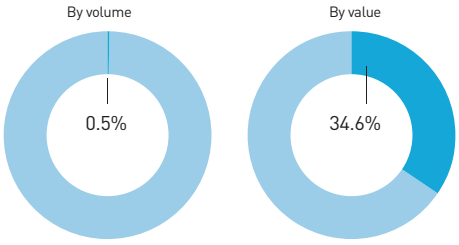
Today, air transport is a vital component of many industries' global supply chain, used primarily for the transfer of time-sensitive goods. Rapid delivery is particularly important to businesses whose customers are running streamlined production processes or who need urgent delivery of spare parts for machinery and equipment. High-value, lightweight and sensitive electrical components are transported by air from manufacturing facilities all over the world to be assembled.

The pharmaceutical industry also requires speedy delivery and relies heavily on air transport, particularly for delivering time-sensitive products such as vaccines. In the United States alone, over $30 billion worth of pharmaceutical freight was sent by air in 2008[42].

Exporters of perishable products such as food and flowers (many of whom are located in developing countries) can only reach export markets by air, providing steady employment and economic growth to regions that benefit from such trade. For example, it is estimated that 1.5 million livelihoods in Africa depend on such exports to the UK market alone[43].

These key characteristics of air freight are most apparent in the data on the modes of transport used in world trade. While accounting for less than 0.5% of the tonnage of global trade, air freight makes up over a third of the value of international trade.

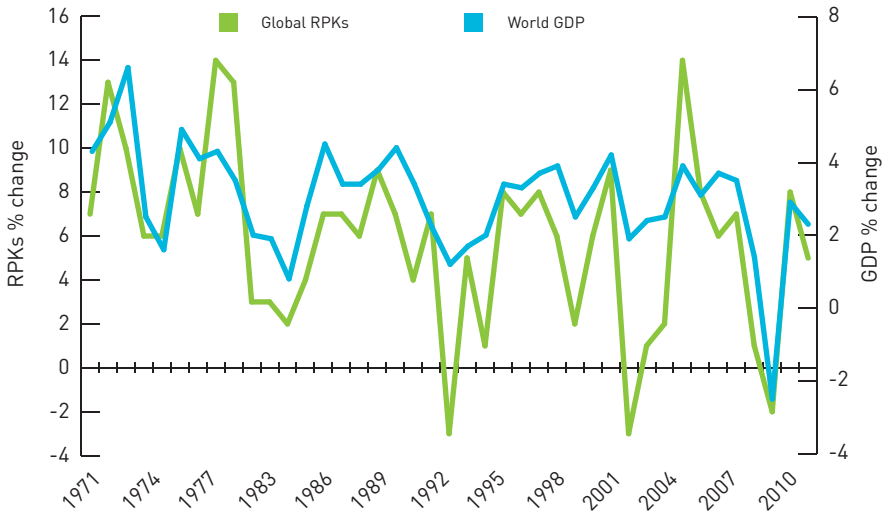
Proportion of global trade transported by air, 2010[44]



Passenger air services' role in international trade

Passenger air services are also vital for international trade development. While technologies such as video conferencing can be very helpful, many companies still consider that face-to-face meetings are essential for winning new business and developing client relationships. A recent

World air travel and GDP growth, 1971 - 2010[45]



survey[46] of over 2,200 business people found that 87% rate face-to-face meetings as essential for 'sealing the deal,' and nearly all (95%) agreed that such meetings are key to success in building long-term relationships. More than half (52%) said that restrictions on the numbers of flights they take for work would hurt their business.

In other recent surveys, corporate executives estimated that 28% of current business would be lost without in-person meetings. Further, they estimate that roughly 40% of prospective customers are converted to new customers with an in-person meeting compared to 16% without[47].

Paying our way

Unlike other transport modes, the air transport industry pays a vast majority of its own infrastructure costs (runways, airport terminals and air traffic control), rather than these being financed through taxation and public investment or subsidies (as is typically the case for road and railways). In addition, companies in the air transport industry make significant tax payments to national treasuries. Aviation infrastructure costs are funded through user charges (passengers and airlines) and airport commercial revenue. User charges, which totalled $64.1 billion in 2008[48], are generally included in the price of the airline ticket.

User charges are designed and applied specifically to recover the costs of providing facilities and services for civil aviation[49]. These include the costs of providing airports and air navigation services, including appropriate amounts for cost of capital

TRADE

Grown in Africa, served in London

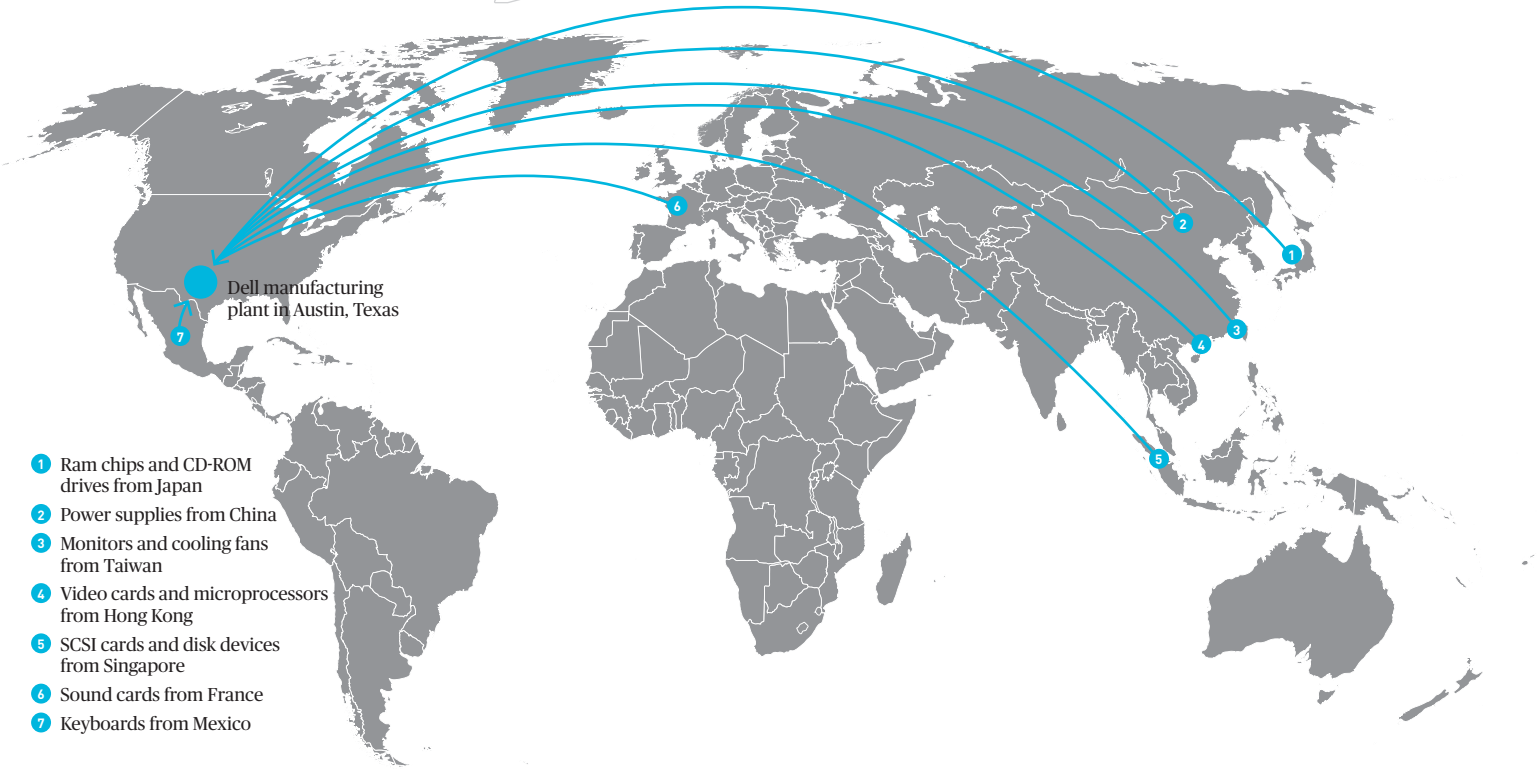
Many areas of Africa are well-adapted to growing fresh produce that is in demand in Europe. Such areas have many advantages over alternative locations. These include a year-round growing season and soils that require only traditional fertilisers such as cow dung. Aviation allows these advantages to be fully realised by providing a route to development that would otherwise be closed.

Supplying fresh vegetable products provides one of the few channels by which consumers in the UK and Europe interact economically with parts of Africa. An estimated 50-60,000 small-scale producers and larger farms are supported by fresh fruit and vegetable exports to the UK[50]. As a result, taking into account families and local suppliers, as many as 1-1.5 million livelihoods may depend in part on the supply chain that links production on African soil to consumption in the UK. This trade with the UK alone injects an estimated $320 million into rural economies in Africa each year.

Blue Skies Ghana is an organisation dedicated to the development of sustainable agriculture, providing training and support for over 150 farmers, 78 of whom are small-holder organic farmers. Blue Skies' fresh-cut fruit factory employs 1,700 people and, through wages alone, injects over $3.2 million into the local community every year. The company accounts for around 1% of Ghana's total exports. The current 5% growth of African economies is due partly to agricultural exports sent around the globe by successful companies like Blue Skies.

While some consumers are reluctant to buy produce that has not been "grown locally" due to perceived environmental impacts, fresh fruit, vegetables and flowers grown in Africa can in many cases have a smaller carbon footprint (despite the travel), due to more efficient growing conditions. The people whose livelihoods depend on such trade also appreciate the business, often using profits to fund community projects, such as providing clean water or education.

Dell's global supply chain, made possible by air transport[51]



and depreciation of assets, as well as the costs of maintenance, operation, management and administration. In some cases, airport user charges are offset by airport commercial revenues that result from the provision of airport facilities. In 2010, airports worldwide spent around $26 billion on capital expenditure on new infrastructure[52], building new capacity to meet demand growth, improving existing facilities to increase efficiency and building energy-efficient terminals.

In contrast, while road users pay fuel duties and vehicle excise taxes, most governments invest in new highways and in road maintenance. While some countries have different approaches, user charges are typically not applied except in the form of a toll charge on some highways.

In many parts of the world, rail services are also heavily subsidised by national, regional or local governments. Between 2007 and 2009 in Europe, state aid for rail services amounted to nearly $58 billion a year, compared to $440 million for aviation (funds used in most cases for commercially unviable services to remote communities)[53]. The cost of rail infrastructure is also state funded. For example, the latest high speed rail line in the UK is expected to cost taxpayers some $50 billion when fully completed[54].

Air transport: a stimulus for greater productivity

Arguably, the largest economic benefit of increased connectivity comes through its impact on the long-term performance of the wider economy through enhancing the overall level of productivity. A rise in productivity in firms outside the aviation

sector comes through two main channels: through the effects on domestic firms of increased access to foreign markets and increased foreign competition in the home market; and through the freer movement of investment capital and workers between countries.

Improved connectivity:

- » opens up new markets and boosts exports while at the same time increases competition and choice in the home market from foreign-based producers, encouraging firms to specialise in areas where they possess a comparative advantage;
- » can drive down costs and prices for firms that have a comparative advantage (such as innovative products and services), benefiting domestic consumers in the process;
- » opens domestic markets to foreign competitors, which can also be an important driver for reducing unit production costs, either by forcing domestic firms to adopt best international practices in production and management methods or by encouraging innovation;
- » can benefit domestic customers through competition by reducing the mark-up over cost that firms charge their customers, especially where domestic firms have hitherto enjoyed some shelter from competition.

Improved connectivity can further enhance an economy's performance by making it easier for firms to invest outside their home country, which is known as foreign direct investment (FDI). FDI necessarily entails some movement of staff: whether for technical know-how, management oversight, or servicing and meeting customers. Increased connectivity also allows firms to exploit the speed and reliability of air transport to ship components between plants in distant locations, without the need to hold expensive stocks of inventory as a buffer.

Less tangibly, but just as important, improved connectivity increases passenger traffic and trade. This, in turn, can lead to a more favourable environment for foreign firms to operate in – greater links to the outside world often drive a more conducive global business environment. In a survey of 625 businesses in five countries, respondents considered the absence of good air transport links to be one of the major determining factors in not making an investment. On average, 18% of firms reported that the lack of good air transport links had affected their past investment decisions. Of the investments that were affected, 59% were made in other locations with better air services, 18% went ahead anyway, but with significantly higher costs, while in 23% of cases no investment was made[55].

Measuring the impact on productivity

A number of recent studies have attempted to quantify the long-term impact on a country's GDP that results from an improvement in connectivity. This is not straightforward. Given that the supply-side benefits of connectivity come through promoting international trade and inward investment, any impact is likely to manifest itself gradually over time. This protracted adjustment makes it very challenging to disentangle the contribution that improved connectivity has had on long-term growth from the many other factors that affect an economy's performance. This issue is

COMPETITIVE ADVANTAGE

Business aviation also plays its part

Even as airlines prepare to transport unprecedented numbers of passengers to an increasing number of destinations worldwide, the sector private aviation also continues to grow.

According to the General Aviation Manufacturers Association, over 320,000 general aviation aircraft, ranging from two-seat trainers and civil helicopters to longer range turboprops and intercontinental business jets, are flying today. In 2011, some 1,865 new aircraft were delivered – this during a period where demand remained soft, especially in the established markets of Europe and North America.

Nowhere is this more apparent than in business aviation, where a growing number of companies – entrepreneurial start-ups and Fortune 500-level corporations alike – place a high value on productivity and flexibility in their business dealings. Interestingly, the majority of passengers using business jets are mid-level employees, including salespeople, engineers and technicians, who maximise their travel time to continue working, meeting with, or assisting customers in a secure, private environment.

Having a corporate aircraft available means they can plan a day's worth of travel, stopping in several locations and returning to their starting point at night. When travelling on board business aircraft, employees can meet, plan and work with each other en route.

In addition to fostering productivity, business aviation increases flexibility. Businesses don't always know in advance where or when opportunities will present themselves, so companies need to be nimble enough to move quickly. Business aviation allows them to respond to changing demands and circumstances with potential and existing customers, suppliers and other key stakeholders.

reflected, however, in the wide range of estimates that studies have reached for connectivity's impact on long-term growth.

Based on a conservative estimate[56], a 10% improvement in global connectivity (relative to GDP) would see a 0.07% per annum increase in long-run GDP. Given the increase in global connectivity due to air transport over the last couple of decades Oxford Economics estimate this impact to be worth over $200 billion to global GDP.

Analysis shows a strong positive relationship between higher connectivity to the global network – as a proportion of GDP – and labour productivity. Developing and transitional economies typically have low connectivity relative to their GDP and also relatively low labour productivity. At the top right of the chart below are the developed Asian, North American and European economies with high levels of connectivity and labour productivity[57].

Innovation

Air transport is a technology-advanced industry heavily involved in the production of high-specification products which drives research and development in a number of areas. This focus on research and innovation across the sector not only leads to more efficient aircraft technology and operational practices – with associated environmental benefits – but also helps build research capacity at universities and skills across society. The benefits to society of research and development spending by the aerospace industry are estimated to be much higher than in manufacturing as a whole – every $100 million of investment into research eventually generates additional $70 million in GDP year-after-year.

There is concern from aerospace industry leaders about the future threat of a lack of science, technology, engineering and mathematics graduates entering the labour pool. This is prompting resources to be focused on encouraging the next generation of engineers.

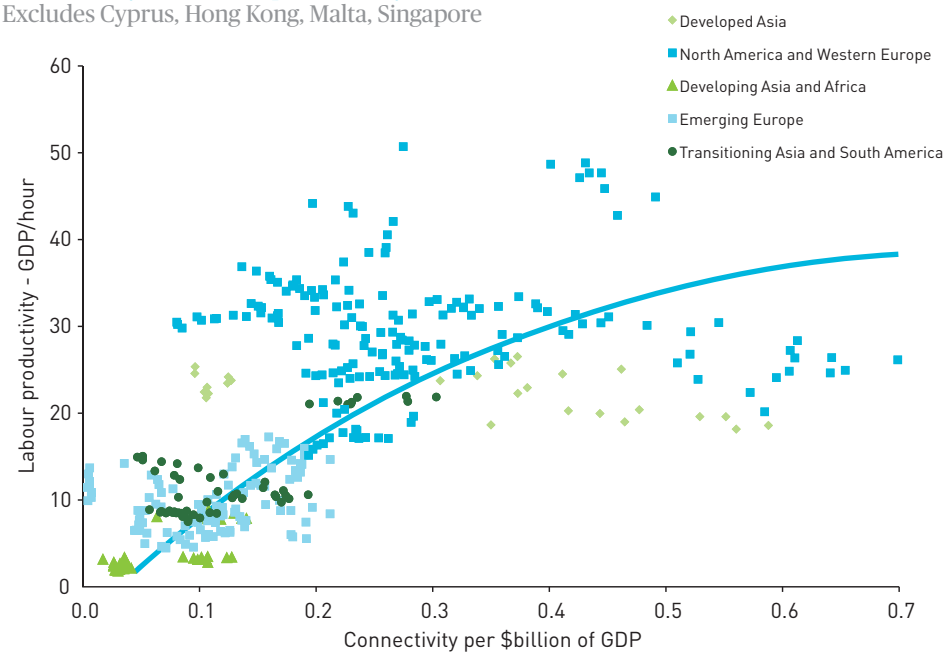
Research conducted for the Aerospace Industries Association (AIA) suggests that aerospace contributes almost $100 billion in export sales to the USA's economy and every dollar invested in aerospace yields an extra $1.50 to $3 in economic activity. The influence that aerospace has on the rest of the USA's high-tech economy is also considerable.

This explains why organisations such as AIA actively highlight initiatives to recruit and retain high quality workers, both to create new aerospace-centric jobs and as maintain the current levels of activity.

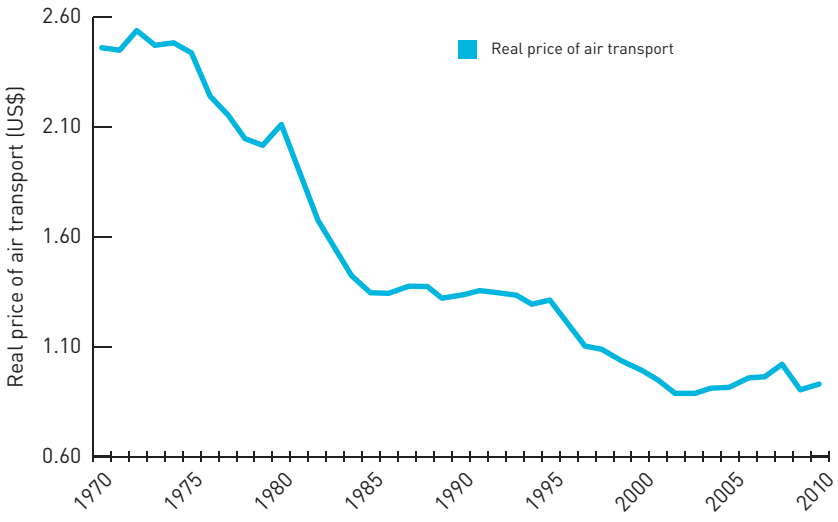
The cost of air travel

A key driver in the growth of passenger traffic has been the steady decrease in the real cost of air travel. Since 1970, the real cost of air travel has been reduced by over 60%, through deregulation of the aviation market in the 1980's and the introduction of low cost carriers. It is now more affordable for more of the population to travel by air.

Connectivity and labour productivity[57]
Excludes Cyprus, Hong Kong, Malta, Singapore



Real price of air transport per tonne kilometre, 1970 - 2010[58]



BEYOND DOLLARS, TRADE AND JOBS

People and businesses use air transport for many reasons. Individuals rely on it for holidays and visiting friends and family; while businesses use air transport for meeting clients and for the speedy and reliable delivery of mail and goods, often over great distances.

One of the most important economic benefits generated by air transport is the intrinsic value generated for its consumers, passengers and shippers. With its speed, reliability and reach, there is no close alternative to air transport for many of its customers. This means that many are likely to value air services more highly than simply the price they are willing to pay for the ticket. But this added value will vary from flight to flight and from consumer to consumer, making it difficult to measure[59].

A conservative estimate from Oxford Economics shows this additional benefit to be about a third of a passenger's typical airfare. The additional benefits are even higher for air freight shippers, reflecting the lack of alternatives to the speed and reliability of air transport.

Visiting friends and relatives

A measured rise in the number of travellers visiting friends and relatives reflects modern family demographics (with families spread over the world) and an increasingly

INVESTMENT

Airbus invests in China

Airbus China opened its Beijing office in 1990 and now employs nearly 300 people – the great majority of whom are Chinese nationals. Since the 1990s, the company has continued a programme of significant investment in China, establishing manufacturing, logistics, maintenance and training facilities in the country to support its regional and global programmes.

Set up jointly with China Aviation Supplies Import and Export Corporation in 1998, the Airbus Beijing Training Centre contains two full flight simulators and has trained thousands of aircrew, cabin crew and maintenance engineers – many from outside China. The Airbus Customer Support Centre stocks some 25,000 spare parts, has a dedicated avionics repair workshop and provides an operating base for a further 20 vendors to offer local and regional customer support.

In September 2008, Airbus opened the A320 Final Assembly Line and Delivery Centre (FALC), a joint venture between the Tianjin Free Trade Zone (TFTZ) and China Aviation Industry Corporation. The FALC also spreads environmental best-practise, operating to ISO 14001 and OHAS18001 standards. The first locally-built aircraft flew in May 2009. Production in Tianjin is scheduled to rise to the rate of four per month during 2012.

Additional co-operation with China is growing through Airbus ProSky, working with Chinese authorities to implement new air traffic management concepts, training and best practice. The same approach will be used in other countries.

globalised workforce. It further indicates stronger cross-border ties at both the individual and country level.

This is particularly visible within the European Union, where the free movement of goods and people between its member states has developed social and economic networks that have long-lasting effects. It also brings benefits to both the host and originating countries in the form of increased social and economic integration. The free movement of goods and people has also helped provide the cohesion and links needed to develop a regional identity and ensure the continued development of the European Union.

Labour mobility, which is a key contributor to long-term economic performance, is enhanced by air travel as it allows migrants to return home more often and allows friends and family to visit them in their new home. Also, once migrants return home, they have established new social (or family) networks in their country of stay, which will be more easily maintained via air travel.

One specific way in which air travel benefits economies is by strengthening the contact between migrants and their country of origin. Labour mobility is likely to encourage migrants to send money home and even to use trips home as an opportunity to take money across borders. For some countries, particularly in the developing world, these so-called 'remittances' are an important source of revenue. Although remittances are sometimes interpreted as a sign of large emigration from a country, with possible negative effects such as a 'brain drain', studies that attempt to look at the overall effects of remittances find that they significantly benefit the recipient economies:

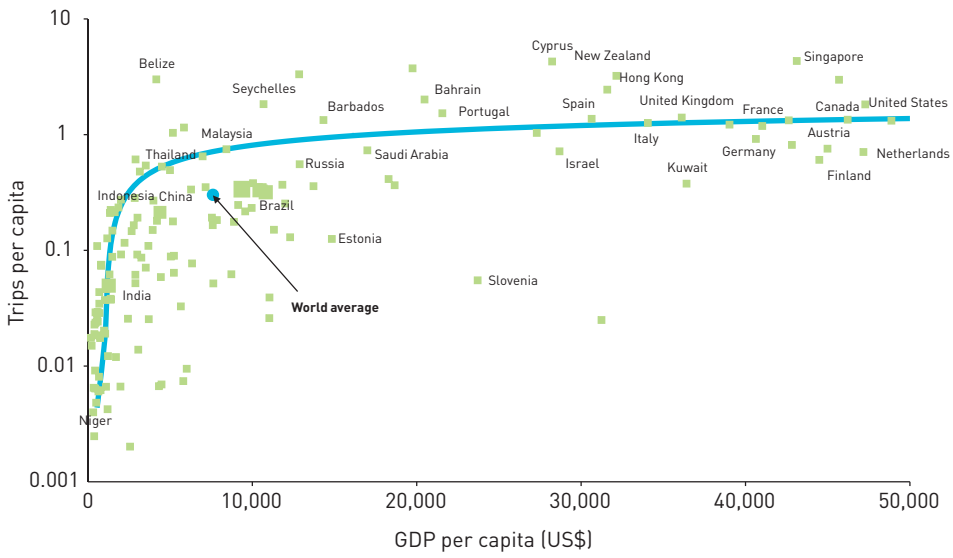
» According to the World Bank in 2007, official remittances were twice the level of official development assistance flows to developing countries[61]. These estimates are based on funds transferred via recognised banking channels, but as there are likely to be substantial flows through private channels, the actual amount is likely to be much larger.

» There is evidence that remittances rise during crises, natural disasters and conflicts, thereby contributing to the stability of the home economy. For instance, remittances to Indonesia rose during the 1997 Asian financial crisis[62].

» International remittances reduce the level and depth of poverty. According to World Bank research, a 10% increase in international remittances from each individual migrant will lead to a 3.5% decline in the share of people living in poverty[63].

» Each dollar of remittances generates $2 or more additional economic activity as money is spent to build or improve housing, on locally produced goods or invested in equipment and small businesses.

Propensity to travel, 2010[60]



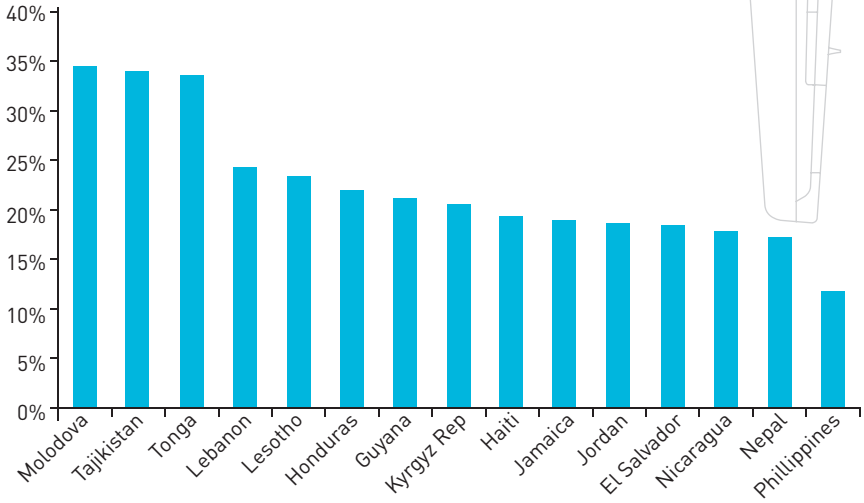
Highly-skilled workforce

Jobs in air transport cover a wide range of activities and skills. These include:

» skilled work by technicians building and maintaining aircraft;

» a diversity of technical engineering jobs from aircraft and engine design to component production;

Remittances as a percentage of GDP, 2007[64]



- air traffic control and airspace design planning;
- logistics for airlines and airports;
- complex information technology systems on board aircraft and in areas such as baggage handling systems design;
- service industry support jobs such as chefs in catering companies;
- creative positions in design and marketing;
- customer services occupations in airline ticketing, check-in, cabin crew and retail;
- manual labour on airfields;
- air traffic controllers and pilots; and
- emergency response personnel at airports;
- leadership, management and executive roles.

As this list indicates, many roles in the air transport sector require a highly qualified workforce and a significant amount of training. Value-added per employee in the air transport sector (direct employees, excluding non-airside activity at airports) generates 3.5 times as much value-added per employee than the economy as a whole – indicating a more productive workforce. This is particularly true for the large populations of Asia-Pacific, Africa and Latin America. In addition, growth in the aerospace sector is helping to drive innovation and skills development in countries that have not normally been associated with aircraft manufacturing.

In recent years, more than 100 aeronautics companies have chosen to establish aviation manufacturing, service

SKILLS DEVELOPMENT

Bombardier in India: going beyond aviation

When Canadian aircraft manufacturer Bombardier established an engineering office in Bangalore in August 2011, it signified another step in a long-term commitment to the Indian market. The new office was the latest investment in job creation and community involvement initiatives.

The establishment of this engineering services office allows Bombardier to take advantage of local expertise in an aviation market that is becoming increasingly important. The engineering service office in Bangalore provides support to Bombardier's aircraft programmes and will eventually staff 50 highly-skilled engineers.

Bombardier has established collaborative agreements with two Indian companies: Mahindra Satyam has 410 engineers supporting the engineering function on aerospace projects ranging from stress analysis to detailed design; and Capgemini currently dedicates 280 employees to Bombardier's technical publications.

In the short time it has had operations in India, Bombardier has quickly grown its operations there. Staff numbers have increased both at the engineering centre and the regional support office in Mumbai, created to assist operators of its business and commercial aircraft.

Three years ago, a committee of 12 employees from the Bombardier support team at Mahindra Satyam began looking for ways to see how the company could support the community further. At the government school in nearby Konappana Agrahara, the team has helped build a computer room, sponsored free dental and medical camps for students and community members, provided school supplies and equipment and shoes to all primary grade students. The committee has also set up a scholarship programme and financed the building of a laboratory at the Composite Girls' School in Mallaswaram, near Bangalore. This lab will enhance science classes by providing concrete experience opportunities to the students.

Bombardier is also helping India's communities through its customers. In 2010, Bombardier announced an order for 15 Q400 NextGen turboprops to India's SpiceJet, with options for 15 more. The low-fare carrier will use the aircraft to serve cities and industrial towns that have been traditionally underserved by larger jets thereby connecting communities that have been less accessible in the past. SpiceJet hopes to eventually serve up to 60 airports with the Q400 aircraft.

and training facilities in Morocco, where the aeronautics sector currently enjoys annual growth of around 25%. According to the Moroccan Aerospace Industries Association (GIMAS)[65], the country's strategic position, close to Europe and at the crossroads of transport links between North America and Asia, has persuaded companies to invest in manufacturing sites and jobs in the country. Some 8,000 highly qualified staff are now employed in centres across Morocco by a number of companies including Aircelle, Boeing, Bombardier, Daher, EADS, Labinal, Le Piston Français, Ratier Figeac, SAFRAN Engineering, SNECMA, Souriau and Zodiac Aerospace.

The sector offers a diversified industrial base, ranging from raw materials preparation and sub-structure manufacturing all the way through to avionics assembly and maintenance. Aircraft are manufactured predominantly from aluminium alloys, and Morocco has become an increasingly important centre for the manufacture of highly complex aluminium alloys, some of which are mixed with other metals such as titanium and nickel. The process involves a wide variety of design, development and manufacturing tasks, promoting skills development and innovation in this northwest African nation.

Manufacturing is not the only activity dominating the Moroccan aeronautics sector. The creation of the Institute for Aeronautical Businesses (IMA) has opened the door to training future generations of the sector's workforce. And GIMAS has an active programme of integrating research and development into an active national strategic partnership with national universities and international aeronautical research centres.

A lifeline to communities

For areas of the world with non-existent or poor road infrastructure, aviation is the community's lifeline. In the Russian, Canadian and Scandinavian far north, and in many other remote communities and small islands, access to the rest of the world and to essential services such as health care is often only possible by taking to the air.

Over 1,000 communities in northern Russia are inaccessible by road; the number in Alaska is more than 200. Throughout Norway, thanks to an extensive network of regional airports and airline services, 99.5% of the remote population is able to travel to Oslo and back on the same day; around 400,000 patients are transported annually on scheduled flights between their homes and hospitals. Small island states across the world rely on air transport to do business, connect to education and healthcare and provide access beyond the sporadic and infrequent boat services that would otherwise be their only connection with the world. In countries such as Indonesia, spread across 17,508 islands, air transport is relied upon for contact between communities and business links.

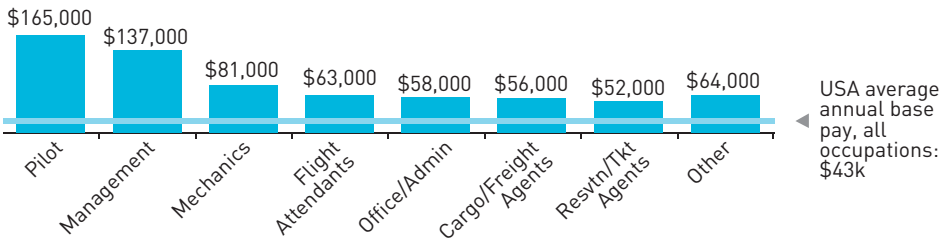
In Quebec, Canada, the area north of the 55th parallel, known as Nunavik, is home to 14 communities along the eastern shore of Hudson Bay, the southern shore of the Hudson Strait and the Ungava coast, totalling 10,000 people. Living in small family units, Inuit people in Nunavik exist by hunting, fishing and gathering. The area has no roads. For almost 30 years the community-owned airline Air Inuit has provided a fundamentally critical lifeline, through a mix of scheduled and charter services, cargo and emergency flights.

As a community-owned body, Air Inuit's services to its stakeholders go far beyond the provision of transport services and its 400 employees. By offering reduced rates for priority perishable foodstuffs, the airline contributes directly to the inhabitants' well-being, by making more easily available the means of combating some of the diet deficiencies common in Arctic communities.

Helping in times of need

Aviation's speed and reliability is perhaps most immediately apparent during times of natural or humanitarian emergency. Air services play an essential role in assistance to regions facing natural disasters, famine

Wages and benefits for USA scheduled airlines, 2011[66]



and war. They are particularly important in situations where access is a problem, delivering aid, search and rescue services and medical supplies. While many of these efforts are undertaken by military or specialist air services, a great deal of the support is provided by the commercial air transport system. Airports become staging points for rescuers and relief supplies, cargo deliveries, refugee transfers, and airlines assist with the evacuation of people stranded by natural disasters.

As the magnitude of the earthquake that devastated Haiti in January 2010 became apparent, public, private and corporate donors rushed to provide funding to meet the needs of children and families at risk. Airlines were able to offer one of the most important donations available in the immediate aftermath of a natural disaster – airlift capability to fly relief supplies. Without these aircraft and people volunteering to fly them, very little emergency airborne-relief aid would have reached Haiti. The cost of chartering a single all-cargo relief flight from Europe to Haiti is around $250,000 – a price not too many charities can afford.

According to UNICEF, British Airways was the first airline to volunteer its services. It flew two relief flights to Haiti, transporting Oxfam and UNICEF aid relief which included tools, wheelbarrows and water tanks[67]. The airline also donated $477,000 from its UNICEF Change for Good fund and a further $110,000, which had been collected by cabin crew on BA flights, to the Haiti Earthquake Children's appeal. A Boeing employee appeal was matched by a corporate donation that raised $1.8 million and EADS employees, together with the company, donated $460,000 to relief efforts as well co-ordinating two emergency flights to Haiti through Airbus.

Emirates dispatched several of its Boeing 747 freighters to Haiti, transporting tents, medicines and foodstuffs donated by various governments and aid agencies[68]. Etihad Airways shipped more than 6,700kg of blankets, foodstuffs and first aid kits which had been donated by members of its staff[69]. The staff also collected money, which they donated to Médecins sans Frontières in Haiti.

Both American Airlines and United Airlines transported relief aid and workers to Haiti and took those who wished to leave the devastated area back to the USA. In a separate initiative, United Airlines also raised money with an air miles scheme. Many other airlines played their part in this humanitarian crisis. But perhaps one of the biggest gestures came from Thai Airways which transported 1,000 tonnes of rice donated by the Thai Government on a 36-hour mission from Bangkok[70].

EFFICIENCY IN EVERYTHING WE DO

Sustainable growth calls for us to meet the needs of today without depleting the resources needed for future generations, or causing undue environmental degradation. The industry is conscious of aviation's environmental impacts and its contribution to climate change. Efforts to minimise these have always played an important role in aircraft design and engine manufacturing. Furthermore, every aspect of current operations both in the air and on the

DISASTER RESPONSE

Speeding aid to East Africa

In July 2011, for the first time in a generation, the United Nations declared a famine in East Africa and the global humanitarian community swung into crisis mode. With food, medicine and other aid relief being donated by countries across the world, UNICEF called on the world's airlines to donate or offer cheap air cargo space to help them get it there. They received an immediate response. FedEx offered a Paris-to-Nairobi flight, while other airlines, including UPS and Virgin donated cargo space to ensure urgently-needed supplies reached the disaster zone.

British Airways carried water tanks, tap stands, pipes and water pumps on a scheduled flight to Nairobi on behalf of Oxfam and later despatched a Boeing 747 freighter loaded with relief aid for both Oxfam and UNICEF. This cargo included 5,000 metres of piping used to supply water at the Dolo Ado refugee camp in Ethiopia, along with emergency food and medical supplies. The airline also flew 40 Oxfam relief workers to Kenya free-of-charge. Passengers also helped out and for two weeks in August 2011 all donations collected on British Airways flights were given to the Disasters Emergency Commission.

Lufthansa Cargo donated two flights to carry relief supplies to Nairobi on behalf of the German humanitarian agency Luftfahrt ohne Grenzen (Wings of Help). The cargo, which included medical supplies and nutrient-rich foods was destined for the Dadaab Complex, the largest refugee camp in the world, as well as other drought-affected areas in East Africa where it was distributed by the International Medical Corps.

Many other airlines contributed to the famine relief. And two aid flights, using and A380 test aircraft, were arranged between the Federation of International Red Cross and Red Crescent Societies and the Airbus Corporate Foundation to fly 77 tonnes of high-energy food to support hunger relief efforts.

ground is being examined to see how the industry can be made cleaner, quieter and more carbon-efficient.

Airline operations produced 649 million tonnes of carbon dioxide (CO_2) in 2010 (and 676 million tonnes in 2011), just under 2% of the total human carbon emissions of over 34 billion tonnes. Around 80% of all aviation emissions are from flights over 1,500 kilometres, for which there is no practical alternative transport mode. All industries, governments and individuals have an obligation to reduce their carbon output and with aviation, the incentive is two-fold.

With airlines spending $140 billion on fuel in 2010 (at 26% of an airline's operating cost), the industry has a very good reason to reduce fuel consumption and has very aggressive programmes in place to do just that.

It was with confidence that the aviation industry collectively agreed in 2008 to the world's first set of sector-specific climate change targets. The industry is already delivering on the first target – to continue to improve fleet fuel efficiency by 1.5% per year until 2020. From 2020, aviation will cap its net carbon emissions while continuing to grow to meet the needs of passengers and economies. By 2050, the industry has committed to reduce its net carbon footprint to 50% below what it was in 2005 (see graphic on left).

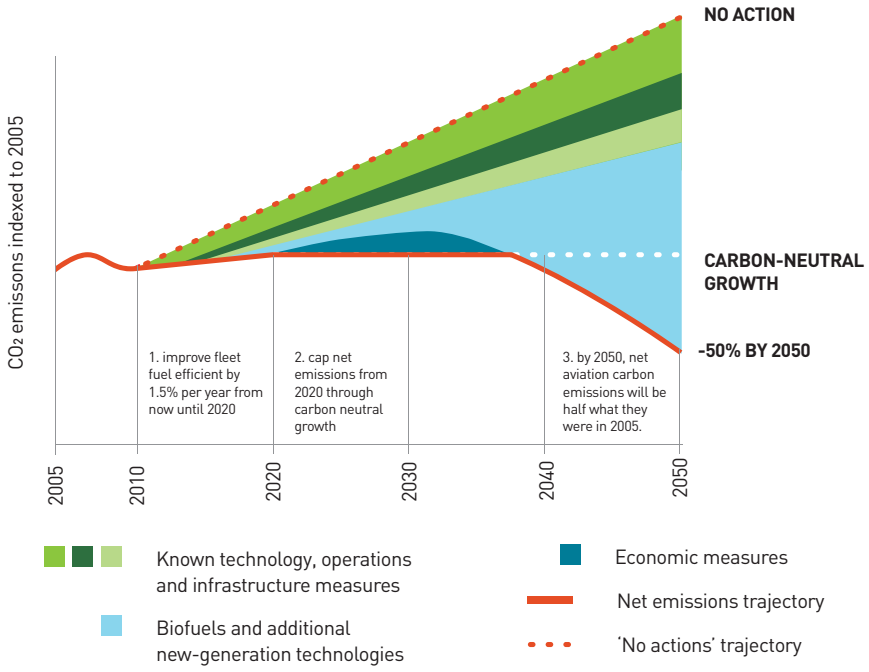
These targets will be reached using a range of different efficiency opportunities and by working collaboratively with the support of governments.

Technology

Air travel has always relied on advances in efficiency. The very nature of flight dictates that aircraft must be as light as possible and fuel is heavy. Airline economics dictate that costs have to be reduced; and fuel is expensive. Since the beginning of the jet age, aircraft have reduced fuel use per passenger kilometre by well over 70% and these efforts continue. In fact, compared to those first jets, aircraft can now either carry two and a half times as many passengers or fly two and a half times further for the same aircraft take-off weight. Of the billions of dollars spent each year on research by aircraft and engine manufacturers, more than 70% is used for measures that will improve fuel efficiency.

This research and technology includes new aircraft construction materials, aerodynamic components and new airframe designs. These efforts are most dramatically displayed in the step-change improvements made when new generations of aircraft enter service – typically each new aircraft is between 15% and 25% more fuel efficient than the model it replaces. Airframe manufacturers are currently at a peak of new aircraft model introductions, working with engine makers to deliver new ultra-efficient models such as the Boeing 787 Dreamliner, Bombardier CSeries, ATR 600, Embraer E-Jet and Airbus A380 and A350 XWB operating already, or due to enter service in the next few years. The two largest aircraft

Mapping out the industry commitments



manufacturers also have model upgrades due to enter service, with Airbus' A320 NEO and Boeing's 747-8 and 737 MAX set to provide further step-changes in performance.

Operations

Those aircraft already in the fleet can also be made more efficient as new technologies and materials are developed. Adding 'winglets' to the tips of an aircraft's wings has saved over three billion gallons of jet fuel so far, with the devices being retro-fitted to over 5,000 aircraft[71]. They are also being developed for other aircraft currently flying.

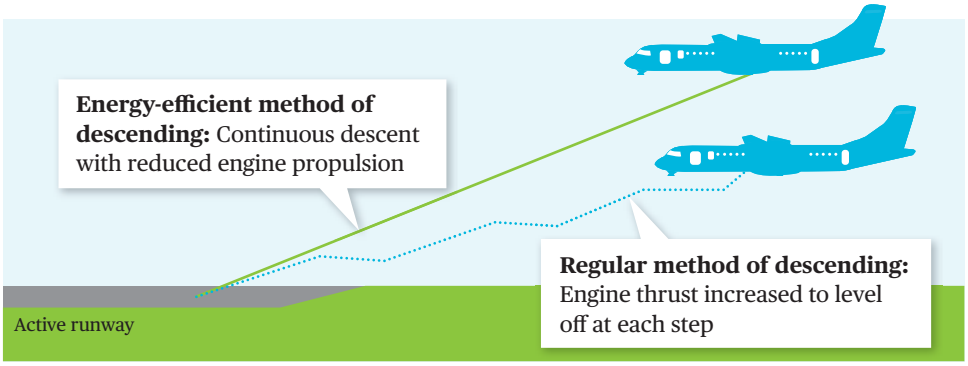
Another area providing significant savings is weight reduction through new cabin configurations, lightweight seats and new equipment. By simply replacing catering trolleys on-board its European fleet with a lighter model, Lufthansa estimates it will reduce carbon dioxide emissions by nearly 30,000 tonnes annually[72]. United Airlines provided iPads to its pilots which contain all navigational charts and save 300,000 gallons of fuel by eliminating the weight of the old paper charts[73].

A number of airports and airlines are trialling the use of 'green departures', allowing pilots to take-off and climb to the optimal cruising altitude in one smooth, continuous ascent. This is in contrast to the traditional method of climbing to the cruising altitude in several steps. By using this new departure method at Copenhagen Airport, some 10,000 tonnes of fuel and 32,000 tonnes of carbon dioxide were saved in one year alone[74].

Satellite-based and on-board precision navigation systems allows air navigation providers to re-design airspace and procedures so that aircraft can fly optimal fuel-saving routes into and out of the busiest airports in the world. These new departure routes have reduced departure delays by more than 2.5 minutes per flight at Atlanta Hartsfield Airport[75] since their introduction. Annual fuel savings are estimated at $34 million, with cumulative savings of $105 million from 2006 through 2008[76].

New fuel-saving procedures for approach routes into airports are being trialled,

Continuous descent operation



ENVIRONMENT

New engines offer ever-lower fuel burn and emissions

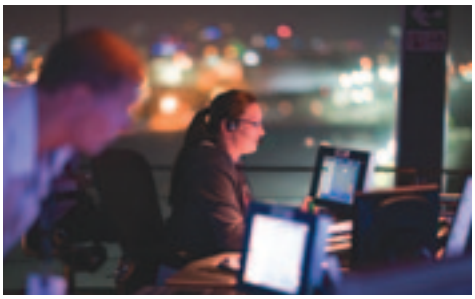
While aircraft efficiency has increased by well over 70% since the first jets, recent research created new concepts that will continue delivering improved fuel-efficiency in the coming years.

CFM International, a consortium of GE Aviation and SNECMA, is developing its LEAP-1A/B/C advanced high-bypass turbofan engine for entry into service in 2016. The new engine will incorporate new aerodynamic designs, materials, coatings, combustion and cooling technology, and improved integration between the engine and airframe. These engines will cut fuel consumption compared by 15%, lower emissions of NOx and reduce the noise footprint by 75%.

Pratt & Whitney's Pure Power 'geared turbofan' is also due to enter service. In this new design a gear system allows the engine's fan section to operate at a slow speed while hotter sections of the engine – the low-pressure compressor and turbine – simultaneously operate at much higher speeds. This increases engine efficiency, lowers fuel consumption, CO_2 emissions and noise. It will offer around a 15-20% fuel economy improvement over existing engines. It is due to enter service in 2013.

Rolls-Royce's latest Trent engine is currently under final testing for entry into service in 2014. The Trent XWB shows a 16% increase in fuel efficiency since the first Trent, which entered service in 1996. The new engine uses more advanced aerodynamics and materials as well as next generation clearance control, intelligent management of internal air systems, enabling next-generation bypass and pressure ratios.

Around 2025, a new generation of 'open-rotor' engines will enter the market. These are gas turbines driving two high-speed propellers moving in opposite directions. GE Aviation, Rolls-Royce and SNECMA are developing new aerodynamic and material technologies, which could result in the return of propeller-driven engine on larger aircraft, but with higher flight speeds and lower noise levels. Wind-tunnel tests on prototype models have shown that, thanks to new propeller designs, these engines could offer a 25% to 30% fuel efficiency improvement over current production engines, while meeting advancing noise standards.



especially continuous descent operations (CDO), where an aircraft descends towards the airport from its cruising height in a gradual, continuous, approach with minimum thrust – rather than via the conventional series of stepped descents. Savings of up to 150,000 tonnes of fuel a year, or 500,000 tonnes of CO_2, could be made in Europe alone if CDO approaches were more widely adopted[77]. The noise footprint of a CDO is also substantially smaller than conventional approach procedures.

Infrastructure

The next generation of air traffic management (ATM) network-enabled technologies are based on the Single European Sky ATM Research programme (SESAR) in Europe and the Next Generation Air Transportation System (NextGen) programme in the USA. They will improve efficiency by maturing and implementing ATM technologies and procedures.

The €2.1 billion[78] investment in the Single European Sky could deliver a 12% reduction[79] in environmental impact alone as it saves between 8 and 14 minutes of flight time, 300-500 kilogrammes of fuel, and 948 to 1,575 kilogrammes of CO_2 per flight[80]. The USA's Federal Aviation Administration (FAA) estimates that NextGen will reduce delays by 35-40% in 2018 compared with today's systems[81]. And every minute of delay saved also means a reduction in fuel use. SESAR and NextGen will enable air traffic control to evolve further, freeing the aircraft to fly at its most efficient profile possible while achieving new levels of safety in the air and on the ground.

By working together with airlines, airports and manufacturers, air navigation service providers are developing common procedures to ensure aircraft are flying the most efficient route through take-off, cruise and landing. As part of the SESAR programme, 18 aviation groups[82] are working on the Atlantic interoperability Initiative to Reduce Emissions (AIRE) project. By the beginning of 2010, over 1,150 flights had been performed in the AIRE framework, saving over 400 tonnes of CO_2 as a result of new procedures.

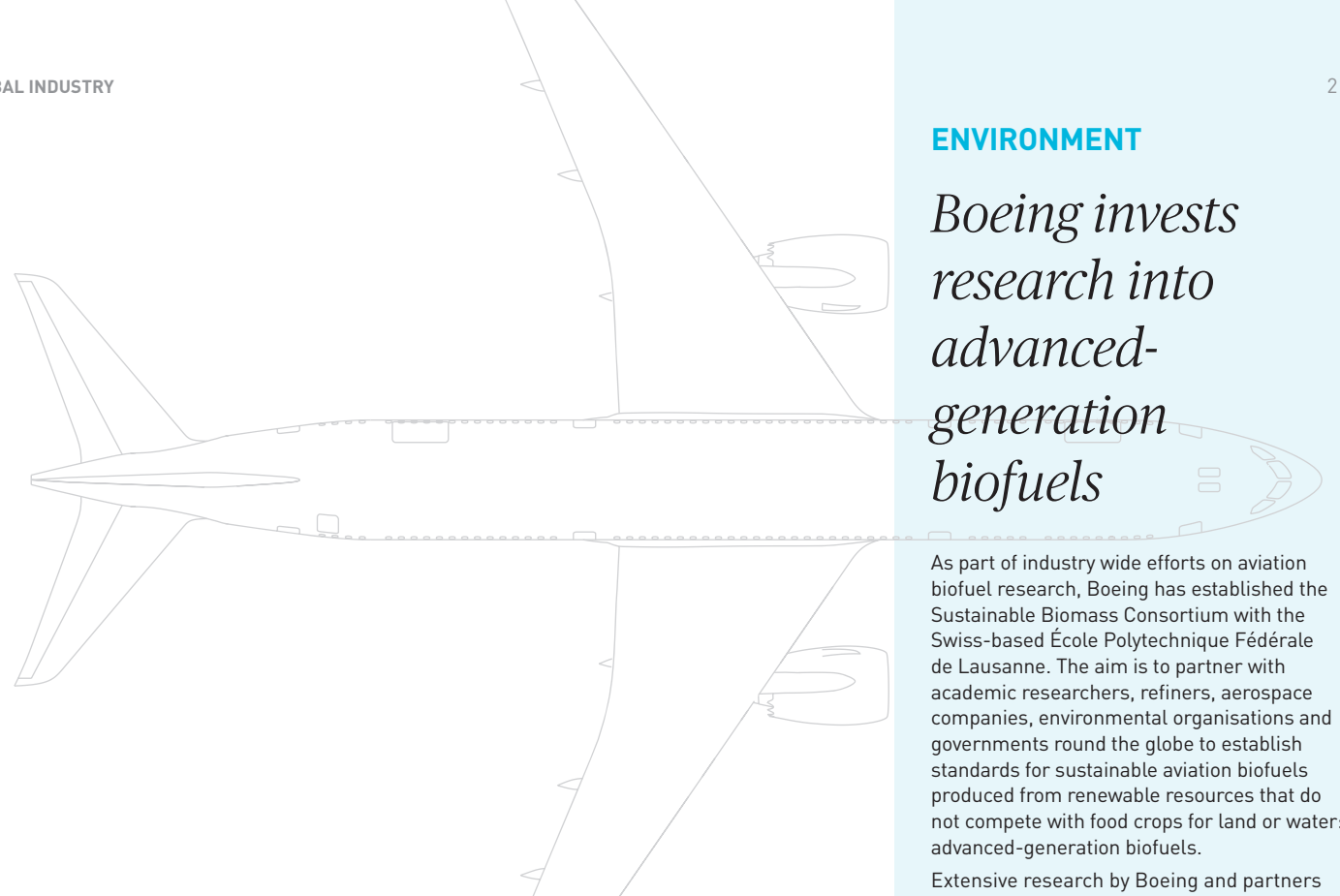
Flexible routes can also be deployed, allowing pilots and airline operations teams to take advantage of the very latest weather and wind data to plot the most efficient flight path, sometimes altering course mid-flight to save even more fuel. The iFlex project led by the International Air Transport Association (IATA) reduced flight-time by up to 17 minutes when deployed on the Atlanta to Johannesburg route, saving up to seven tonnes of CO_2 per flight.

The challenge now is to take the results of these various projects and make them an everyday occurrence across the network.

These advances in environmental performance illustrate the concerted efforts the aviation industry is making to reduce its environmental impact in the skies. However, it is also important to recognise the progress made on the ground. Programmes such as Airports Council International's (ACI) Airport Carbon Accreditation have had enormous success in Europe, saving over a million tonnes of CO_2 in its first two years of operation. It currently extends to airports representing 52% of all European air traffic[83].

Energy-efficient terminal building design often takes advantage of sophisticated environmental control technology to regulate lighting, cooling and heating within the airport. Most new airports are built using LEED certification[84] and a number of airports have installed on-site renewable energy sources such as wind turbines, photovoltaic panels and ground heat pumps. The solar panels at Athens International Airport have helped cut CO_2 emissions by 10,000 tonnes per year[85]. As major transportation hubs, many airports also have significant intermodal transport exchanges. Heathrow Airport in London, for example, has extensive public transport links, with only 30% of passengers arriving by private cars. Many airports also encourage on-airport staff to either take public transport or have organised car pooling schemes.

Many airports now provide fixed electrical ground power units. These plug the aircraft directly into the mains power so they do not use fuel to run on-board systems such as air conditioning while sitting at the airport gate. At Zurich Airport alone, installing these units on 50 gates has resulted in 33,000 tonnes of CO_2 reduced annually. Furthermore, many airports are taking advantage of hybrid, natural gas or electric vehicles for use by ground crews on the tarmac.



Biofuels

The industry is also making significant progress to develop sustainable biofuels for aviation. From a virtual dream in 2007 to regulatory approval being granted for passenger flights in 2011, the development of aviation biofuels has shown remarkable progress in recent years. Over 1,500 passenger flights have taken place so far and the consensus is that the lifecycle carbon saving from moving to biofuels could be up to 80% over that of traditional jet fuel.

The types of feedstock being investigated for aviation biofuels include non-food crops that can be grown in areas which do not impact food crops or water use: innovative use of by-products such as household waste, excess gases from industrial processes and the waste from agriculture and forestry, and micro-algae. The aviation industry took careful note of the negative impacts that occurred when the first generation of biofuels was deployed in road transport and is determined not to repeat those mistakes.

The major challenge now remains the production of large quantities of sustainably-produced biofuel at a commercially-competitive cost to airlines. Current prices indicate biofuel costs are around three times as much as conventional jet fuel. This is expected to fall as production capacity is increased beyond the current small-scale projects.

Noise

Modern jet aircraft are 75% quieter than the first models and each new generation continues this downward trend. While each new model has reduced its noise footprint significantly, the number of aircraft movements has grown and the sensitivity of people living under flight paths has also increased. However, according to the FAA, the number of people negatively impacted by aircraft noise in the United States decreased from seven million in 1975 to fewer than 300,000 in 2009, despite the more than doubling of flights during that time[86]. This trend is being replicated around the world: not only do aircraft get quieter, but airports and air traffic controllers work to provide operational noise mitigation measures and local governments work with the aviation industry to more appropriately zone areas around airports.

ENVIRONMENT

Boeing invests research into advanced-generation biofuels

As part of industry wide efforts on aviation biofuel research, Boeing has established the Sustainable Biomass Consortium with the Swiss-based École Polytechnique Fédérale de Lausanne. The aim is to partner with academic researchers, refiners, aerospace companies, environmental organisations and governments round the globe to establish standards for sustainable aviation biofuels produced from renewable resources that do not compete with food crops for land or water: advanced-generation biofuels.

Extensive research by Boeing and partners across the industry have identified early feedstock candidates for producing aviation biofuels. For example, studies of the "biomass" – plant (and sometimes animal) material used to produce the biofuel – have shown that Jatropha Circus (an inedible oil-producing plant) has the potential to be price-competitive with fossil fuel in just a few years if produced in a sustainable manner. It can also deliver strong environmental and socio-economic benefits by advancing the economic development of countries that haven't developed agricultural systems for the large-scale production of food, but have areas of land and water that are well suited for biomass production. Over the near-term, such projects will be developed in China, Africa, Latin America, Mexico and Australasia to examine the potential benefits of developing advanced-generation biofuel based on jatropha.

Other feedstock candidates include camelina, a cereal crop grown in rotation with wheat, halophytes, a species of saltwater-tolerant marsh grasses and other saline habitat species; and also algae.

Boeing is also a founding member of the Sustainable Aviation Fuel Users Group, the Commercial Aviation Alternative Fuels Initiative and sponsors the Algal Biomass Organization, whose mission is to promote the development of sustainable energy products derived from algae. All will play a vital role in exploring multiple processes and biomass sources for the regional production of sustainable aviation biofuels.

Research from analysis company Bloomberg New Energy Finance, forecasts that the cost of some biofuels – such as those based on non-food vegetable oils – could be close to that of conventional jet fuel by 2018, if production efficiency continues to improve.

For more information on what Boeing and other industry players are doing on biofuels, see **www.flyonbiofuels.org**

End-of-life

An aircraft will typically remain in service for around 20-25 years. During that time, it will fly on average 40,274,144 kilometres – over 1,000 times around the world – with some long-haul aircraft flying over 100 million kilometres, for several airlines[87]. Once it reaches the end of its useful life, an aircraft can be recycled not only to ensure proper disposal but also to take advantage of the many high-quality components and materials of which they are made. Organisations such as the Aircraft Fleet Recycling Association[88] are working with the manufacturers of aircraft and engines, component suppliers and operators to establish best practice guidelines for the disposal and recycling of aircraft. Manufacturers are also ensuring that new aircraft are designed not only for a long, safe and efficient life, but also for the end-of-life opportunities. The Airbus PAMELA project demonstrated that more than 70% of the airframe can be recycled, up to 85% can be sold for re-use or recycling and scrap metal can be reduced by 3-15%[89].

New materials such as carbon fibre present new challenges for aircraft designers to find ways of dealing with the materials once the product leaves service. Processes are being developed to allow these new materials to be recovered and potentially recycled once the aircraft reaches the end of its useful life. Major aircraft manufacturers are also ensuring that manufacturing facilities meet (and often exceed) global reporting requirements on environmental standards, with most major manufacturing sites certified to ISO 140001 standards.

REGIONAL AND GROUP ANALYSIS

AFRICA

Air transport supports 6.7 million jobs and $67.8 billion in GDP in Africa.

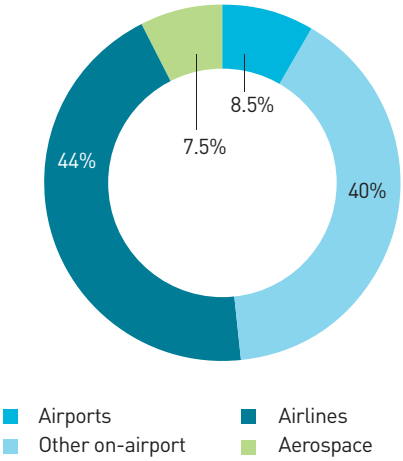
67,655,809 passengers[90]
165,553 million revenue passenger kms[91]
13,781 million revenue tonne kms[92]
762,000 flights

371 commercial airports
256 airlines
1,302 aircraft in service
56 air navigation service providers

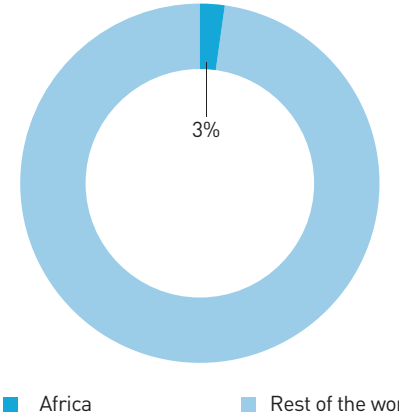
» The number of jobs created directly by the air transport industry is estimated to have reached 257,000 in 2010.
  · 113,000 people (44% of the total) work for airlines or handling agents (e.g. as flight crew, check-in staff, maintenance crew, reservations and head office staff).
  · 21,000 people (8.5%) work directly for airport operators (e.g. in airport management, maintenance, security, operations), while 104,000 (40%) work on-site at airports for government agencies such as customs and security, or provides services in retail outlets, restaurants, hotels, etc.
  · 19,000 people (7.5%) are employed in the civil aerospace sector (manufacture of aircraft systems, components, airframes and engines).
» In total (direct, indirect and induced impacts), air transport supports 688,000 jobs and over $21 billion to African GDP.
» In addition, there are nearly six million jobs supported through the catalytic impacts of travel and tourism.

Worldwide, Africa represents 12% of the total jobs and 3% of the GDP generated by the air transport industry, including the catalytic impacts.

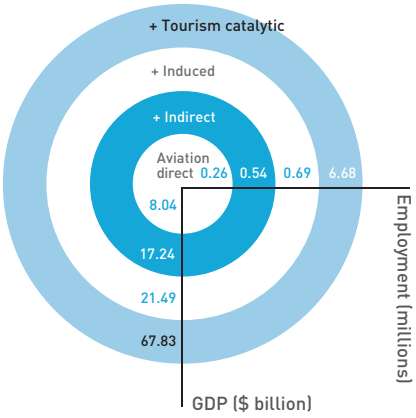
Direct jobs generated by air transport, 2010



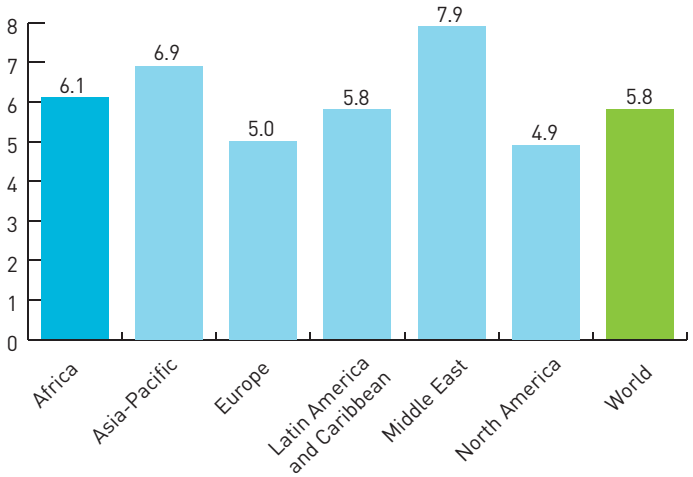
Africa's share of global passenger traffic, 2010



Africa's jobs and GDP generated by air transport, 2010



Projected annual growth rate for international traffic by region, 2010 - 2015[93]



Recent studies by Oxford Economics have quantified the significant economic impact that aviation generates across some of the major African markets. For example, in South Africa it is estimated that aviation directly contributed 56,000 jobs (0.4% of employment) and made a value-added contribution to GDP of ZAR 20.1 billion (0.8% of economy GDP) in 2009.

In addition, regional economies derive substantial benefits from the spending of tourists travelling by air. Including this catalytic impact and the indirect and induced impacts of aviation activity increases the impact of aviation on GDP in South Africa to ZAR 74.3 billion (3.1% of GDP).

Forecasts indicate that this impact is set to grow rapidly over the next 20 years. Passenger numbers in Africa are expected to expand from 67.7 million in 2010 to 150.3 million in 2030, with RPK growing at an average annual rate of 5.1%. Meanwhile, cargo volumes are projected to rise at a similar rate of 5.2% per annum.

Such an expansion in activity should generate significant economic returns. Oxford Economics forecast that aviation's direct contribution to GDP in Africa will increase by 5% per annum in real terms over the next 20 years helping to create an additional 66,000 jobs across the region by 2030. Moreover, when also accounting for catalytic effects in terms of increased tourism receipts, real GDP growth is projected at 7.3% per annum with implied job creation of 879,000.

Ensuring that aviation's growth potential is fulfilled will require policymakers to overcome a number of challenges. Infrastructure investment is not as pressing as elsewhere, although some of the region's larger airports do appear to be suffering from capacity constraints. However, skills shortages are posing a considerable short-term obstacle to growth with a lack of adequately trained pilots and other technical staff being a key area for attention.

DEVELOPING SKILLS

South Africa's aerospace sector

Extensive government initiatives are bringing South Africa's small but highly capable aerospace industry in line with the requirements of the global supply chain – and creating skilled and sustainable jobs.

The South African government identifies aerospace as a strategic development sector and aims to put it on a par with the country's successful automotive industry – if not in absolute numbers, then certainly in terms of quality, competence, innovation, skills and competitiveness.

Human resource development is central to this, especially transformation to address historical racial imbalances while creating a pipeline of qualified and competent talent. Similarly, attracting and, crucially, retaining highly skilled workers are key elements to its success.

One initiative is seeing the formation of an aerospace cluster near Pretoria. It is modelled on California's Silicon Valley and France's aerospace cluster in Toulouse.

In recent years over 1,500 new aerospace jobs have been created, many with small - and medium-sized companies which are flourishing alongside and supporting major aerospace groups such as Denel and Aerosud. Both of these are established suppliers to Airbus, Boeing, Saab, Turbomeca, BAE Systems, Spirit Aerospace and AgustaWestland.

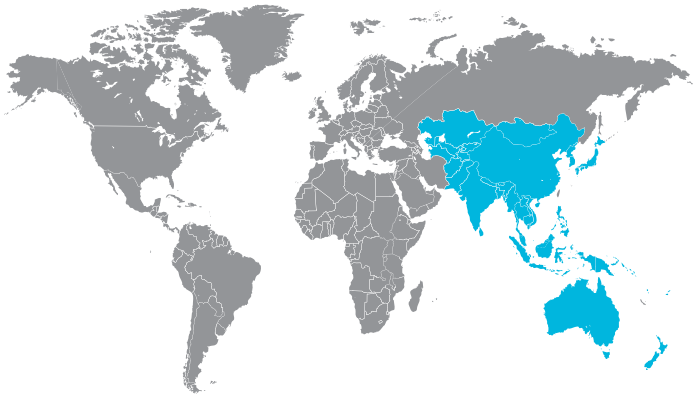
Similarly, in Cape Town, Cobham South Africa produces advanced satellite communications antennae equipment for Airbus and Boeing aircraft while AAT Composites has established itself as one of the world's biggest manufacturers of aircraft seat frames and other cabin equipment components.

Aerospace research is also flourishing in the country, with several universities and institutes partnering with Airbus to explore new technologies and solutions for the industry. Projects include studies in the application of natural fibres for aircraft cabin furnishings, new computational fluid dynamics methods for aircraft design and the environmental benefits of flying long-haul aircraft in formation.

The local aerospace sector may be small, but it is growing at a modestly significant rate. Technology areas such as composite materials, alloy technologies, additive layering manufacturing, ultra-light materials and aero-structures feature high on the list of expertise that the nation's growing aerospace workforce is bringing to the global market.

REGIONAL AND GROUP ANALYSIS

ASIA-PACIFIC



Air transport supports 24.1 million jobs and $470 billion in GDP in Asia-Pacific.

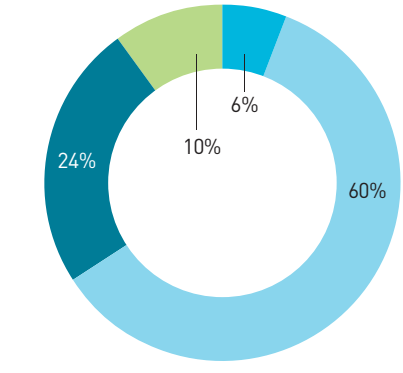
779,565,798 passengers
1,460,893 million revenue passenger kms
181,420 million revenue tonne kms
6,247,000 flights

1,207 commercial airports
359 airlines
5,886 aircraft in service
40 air navigation service providers

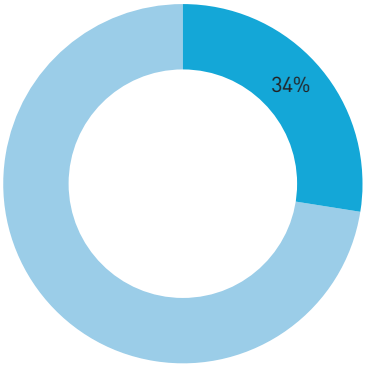
» The number of jobs created directly by the air transport industry is estimated to have reached 2.3 million in 2010.
  · 540,000 people (24% of the total) work for airlines or handling agents (e.g. as flight crew, check-in staff, maintenance crew, reservations and head office staff).
  · 138,000 people (6%) work directly for airport operators (in airport management, maintenance, security, operations), while 1.4 million (60%) work on-site at airports for government agencies such as customs and security, or provides services in retail outlets, restaurants, hotels, etc.
  · 227,000 people (10%) are employed in the civil aerospace sector (manufacture of aircraft systems, components, airframes and engines).
» In total (direct, indirect and induced impacts), air transport supports 6.1 million jobs and contributes over $258 billion to GDP in Asia-Pacific.
» In addition, there are over 18 million jobs supported through the catalytic impacts of travel and tourism.

Worldwide, the Asia-Pacific region represents 43% of the total jobs and 21% of the GDP generated by the air transport industry, including the catalytic impacts.

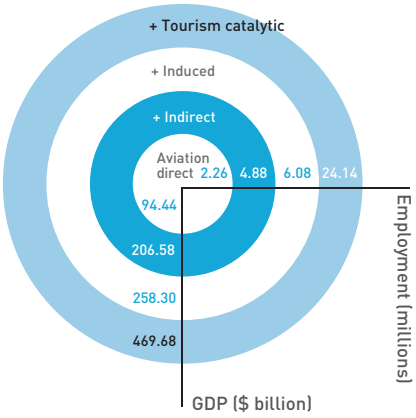
Direct jobs generated by air transport, 2010



Asia-Pacific's share of global passenger traffic, 2010



Asia-Pacific's jobs and GDP generated by air transport, 2010



Despite some turbulence in the global economy, the Asia-Pacific region has demonstrated considerable resilience in maintaining a faster pace of economic growth, with aviation playing a leading role in enhancing both regional and international connectivity.

Oxford Economics forecast that aviation's direct contribution to regional GDP will increase by 6.4% per annum in real terms over the next 20 years, helping to create an additional 1.4 million jobs across the region by 2030. Moreover, when also accounting for catalytic effects in terms of increased tourism receipts, real GDP growth is projected at an even more impressive 8.4% per annum, with implied job creation of 4.6 million.

Key drivers of the robust expansion of the region's air transport market include steadily rising incomes, and rapid urbanisation of the very large populations in China and India, as well as the other dynamic Asian economies.

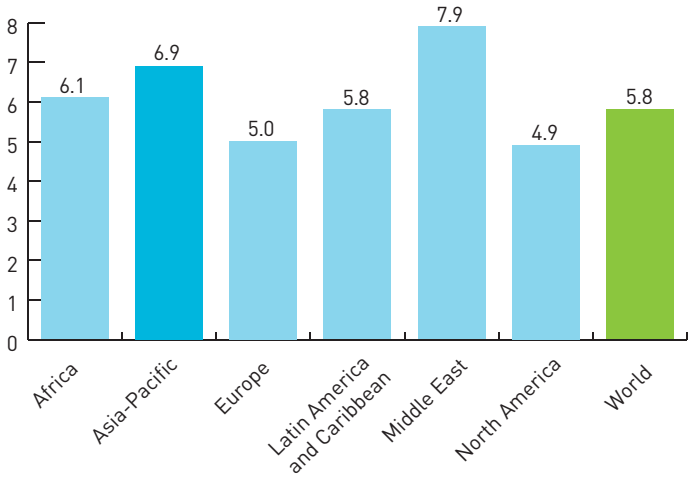
By way of illustration, recent studies by Oxford Economics have quantified the significant economic impact of aviation throughout the region, despite widely differing income levels. For example, in Thailand, in 2009, aviation directly contributed 79,000 jobs (0.2% of employment) and made a value-added contribution to GDP of THB 64 billion (0.7% of GDP). In Singapore, aviation directly contributed 58,000 jobs (2% of employment) and made a value-added contribution to GDP of S$ 8.7 billion (3.3% of GDP). Finally, in India, aviation directly contributed 276,000 jobs (0.1% of employment) and made a value-added contribution to GDP of INR 147 billion (0.2% of GDP).

In addition, regional economies derive substantial benefits from the spending of tourists travelling by air. Including this catalytic impact and the indirect and induced impacts of aviation activity increases the impact of aviation on GDP in Thailand to THB 818 billion (8.9% of GDP), in Singapore to S$ 23.5 billion (8.9% of GDP) and in India to INR 912 billion (1.5% of GDP).

The spectacular growth of Asia-Pacific aviation has been underpinned by progressive liberalisation of air services, and this trend is expected to continue, with further developments including multilateral agreements within the ASEAN countries, as well as expanding bilateral relations amongst other countries in the region and around the world.

Forecasts indicate that this impact is set to grow rapidly over the next 20 years. Passenger numbers are expected to almost triple in Asia-Pacific from 779.6 million in 2010 to over 2.2 billion in 2030,

Projected annual growth rate for international traffic by region, 2010 - 2015



with RPK growing at an average annual rate of 6.7%. Meanwhile, cargo volumes are projected to rise at a similar rate of 6.3% per annum.

Such an expansion in activity should generate significant economic returns. Oxford Economics forecast that aviation's direct contribution to GDP will increase by 6.1% per annum in real terms over the next 20 years helping to create an additional 1.3 million jobs across the region by 2030. Moreover, when also accounting for catalytic effects in terms of increased tourism receipts, real GDP growth is projected at 8.3% per annum with implied job creation of 4.6 million.

Significant investments are planned to meet this projected growth in demand, including fleet expansion using newer, more fuel efficient aircraft, as well as corresponding investments in building the necessary aviation infrastructure, including modern airports and air traffic management systems to support long-term sustainable development of the region.

TRADE

Why China relies on air freight

Air freight is the preferred mode of transport for the new global economy's high value-to-weight manufactured goods such as microelectronics, pharmaceuticals, aerospace components and medical devices. The electronics industry accounts for around 40% of the value of the entire international air cargo industry.

For the economies of Asia, where there is relatively little cross-border land transport compared to North America and Europe, air cargo is a vital bridge to the global market. Malaysia, China and Singapore have excellent ocean access to busy shipping routes but are also heavily dependent on air freight for imports and exports. They have been integrated into the global electronics production chain because they send their products to North America and Europe by air within 24 or 48 hours – by ship this would take up to 30 days. It may cost seven times more to carry goods by air than by sea, but when the cargo comprises time-sensitive products that rapidly suffer from obsolescence, such as computers, MP3 music players and cell phones, these goods have a relatively short marketing life and every day counts.

Nearly 60% of the world's air freight is carried on routes between North America, Western Europe and Southeast Asia. As air-freighted electronic goods are incorporated into an increasingly wide number of domestic and professional equipment throughout all sectors of the economy, large parts of the economies of Europe and North America have effectively become dependent on these trade routes.

The fastest growing air cargo market in the world is between China and North America with an annual growth rate of more than 10% year on year since 1995. Around 40% of air freight shipped from China to the USA comprises consumer goods and 29% high-tech products, such as computer electronics. China is now the second largest air freight market after the USA, and depends increasingly on air cargo to get its high tech goods to market.

REGIONAL AND GROUP ANALYSIS

EUROPE

Air transport supports 8.7 million jobs and $749 billion in GDP in Europe.

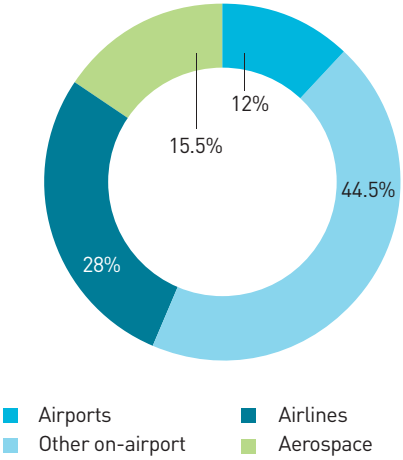
605,803,813 passengers
1,154,228 million revenue passenger kms
165,567 million revenue tonne kms
7,860,000 flights

701 commercial airports
448 airlines
6,585 aircraft in service
45 air navigation service providers

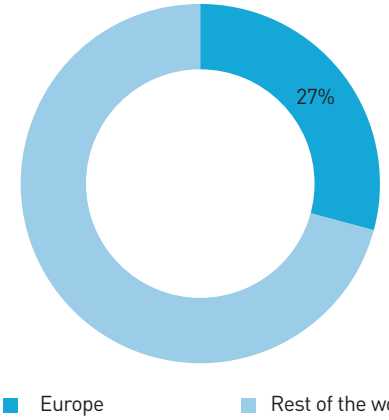
» The number of jobs created directly by the air transport industry is estimated to have reached 1.9 million in 2010.
  · 519,000 people (28% of the total) work for airlines or handling agents (e.g. as flight crew, check-in staff, maintenance crew, reservations and head office staff).
  · 220,000 people (12%) work directly for airport operators (e.g. in airport management, maintenance, security, operations), while 827,000 (44.5%) work on-site at airports for government agencies such as customs and security, or provides services in retail outlets, restaurants, hotels, etc.
  · 290,000 people (15.5%) are employed in the civil aerospace sector (manufacture of aircraft systems, components, airframes and engines).
» In total (direct, indirect and induced impacts), air transport supports 5.1 million jobs and contributes over $485 billion to GDP in Europe.
» In addition, there are over 3.6 million jobs supported through the catalytic impacts of travel and tourism.

Worldwide, the European region represents 15% of the total jobs and 34% of the GDP generated by the air transport industry, including the catalytic impacts.

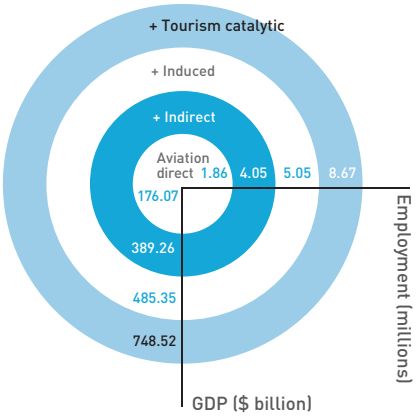
Direct jobs generated by air transport, 2010



Europe's share of global passenger traffic, 2010



Europe's jobs and GDP generated by air transport, 2010



Recent studies by Oxford Economics have quantified the significant economic impact that aviation generates across some of the major European markets. For example, in the UK, in 2009, aviation directly contributed 326,000 jobs (1.1% of employment) and made a value-added contribution to GDP of £21.3 billion (1.5% of GDP). In Spain, aviation directly contributed 120,000 jobs (0.6% of employment) and made a value-added contribution to GDP of €6.5 billion (0.6% of GDP). Finally, in Germany, aviation directly contributed 323,000 jobs (0.8% of employment) and made a value-added contribution to GDP of €22.2 billion (0.9% of GDP).

In addition, regional economies derive substantial benefits from the spending of tourists travelling by air. Including this catalytic impact and the indirect and induced impacts of aviation activity increases the impact of aviation on GDP in the UK to £70.3 billion (5% of economy GDP), in Spain to €54.3 billion (5.2% of economy GDP) and in Germany to €63.1 billion (2.6% of economy GDP).

Moreover, forecasts indicate that this impact is set to grow rapidly over the next 20 years. Passenger numbers are expected to almost double from 605.8 million in 2010 to nearly 1.2 billion in 2030, with RPK growing at an average annual rate of 4.3%. Meanwhile, cargo volumes are projected to rise at a slightly higher rate of 4.7% per annum.

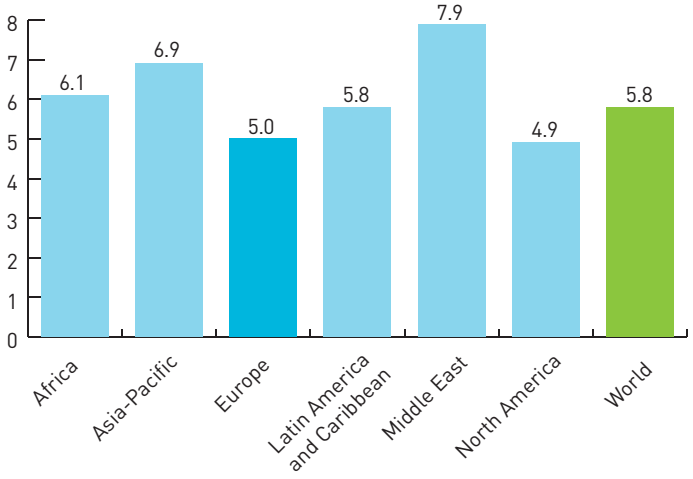
Such an expansion in activity should generate significant economic returns. Oxford Economics forecasts that aviation's direct contribution to GDP will increase by 4.4% per annum in real terms over the next 20 years helping to create an additional 841,000 jobs across the region by 2030. Meanwhile, when accounting for catalytic effects in terms of increased tourism receipts, real GDP growth is also projected at 4.4% per annum with implied job creation of 1.6 million.

Characterised by a mixture of mature and typically slower-growing markets in the west and more dynamic emerging economies in the east, forecasts still point to a significant overall increase in demand for aviation services, which current levels of capacity are ill-equipped to deal with. Therefore, it is crucial that investment in infrastructure be sufficient to ease congestion and increase connectivity.

Despite a substantially deregulated marketplace, which has stimulated competition and fostered the development of new airline business models, air transport in Europe is constrained by regulatory burdens heavier than in other parts of the world. These arise in many fields, including social affairs, consumer protection and environment. The sector is also a prime target for taxation.

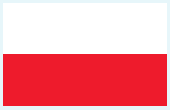
Meanwhile, escalating security-related costs need to be addressed, as they are impeding the ability of airports to function profitably. The inefficiency of the current system is starkly illustrated by ACI's estimate that 35% of airport operating costs are accounted for by security. Further investment in relevant technologies is a pre-requisite here, but increased harmonisation at the global level on security processes could also generate significant efficiency savings.

Projected annual growth rate for international traffic by region, 2010 - 2015



INVESTMENT

New investment in Poland's aerospace industry



Over the last decade there has been an influx of large aerospace companies from Western Europe and North America into the Podkarpacie region of Poland, centred around the southeastern city of Rzeszow. Now dubbed 'Aviation Valley', the area has been at the heart of Poland's aerospace sector since the late 1930s and is now being revitalised by new companies from outside the region setting up shop there.

Foreign investment in the Polish aerospace industry, such as the Anglo-Italian AgustaWestland's acquisition of Poland's helicopter manufacturer PZL Swidnik in 2010, has seen a complete overhaul of the country's aerospace industry since the days when Polish companies were geared entirely towards producing aircraft for the Soviet Union and its allies.

Now most Polish aerospace companies are foreign-owned and fully integrated into a global supply chain, including medium and small-sized companies that are growing and taking on new workers.

The total aerospace workforce in the region now stands at some 23,000. Companies such as Sikorsky (USA) and Pratt & Whitney (USA) have joined AgustaWestland in taking over former state-run companies, while others have started Polish operations from scratch. MTU (Germany), Hispano-Suiza (France), Goodrich (USA) and Avio (Italy) have all started operations in Poland in recent years.

Although labour costs are lower than in western Europe, Poland does not want to be seen as growing its aerospace business on the basis of cost alone. There is continued investment in the education system; with technical universities with specific aerospace disciplines; standards of English are high; and business standards are very transparent. This provides an environment in which Poles aspire to adding value in design, engineering, development and research, as well as assembly.

In recent years the Aviation Valley has grown to an aerospace cluster of almost 100 companies, representing 80% of Poland's aerospace industry.

REGIONAL AND GROUP ANALYSIS

LATIN AMERICA AND THE CARIBBEAN

Air transport supports 4.6 million jobs and $107 billion in GDP in Latin America and the Caribbean.

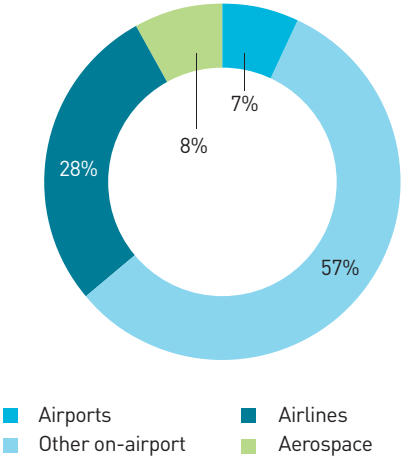
145,948,976 passengers
272,834 million revenue passenger kms
23,738 million revenue tonne kms
1,958,000 flights

521 commercial airports
227 airlines
1,925 aircraft in service
31 air navigation service providers

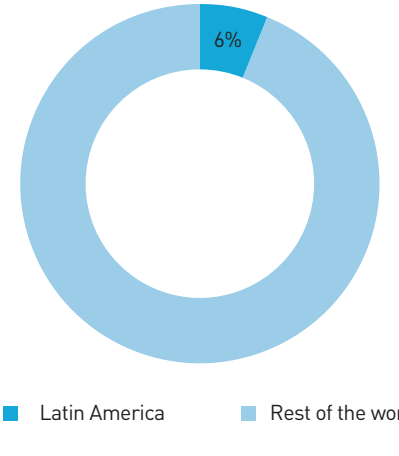
» The number of jobs created directly by the air transport industry is estimated to have reached 465,000 in 2010.
  - 131,000 people (28% of the total) work for airlines or handling agents (e.g. as flight crew, check-in staff, maintenance crew, reservations and head office staff).
  - 33,000 people (7%) work directly for airport operators (e.g. in airport management, maintenance, security, operations), while 266,000 (57%) work on-site at airports for government agencies such as customs and security, or provides services in retail outlets, restaurants, hotels, etc.
  - 36,000 people (8%) are employed in the civil aerospace sector (manufacture of aircraft systems, components, airframes and engines).
» In total (direct, indirect and induced impacts), air transport supports 1.2 million jobs and contributes over $48 billion to GDP in Latin America and the Caribbean.
» In addition, there are more than 3.4 million jobs supported through the catalytic impacts of travel and tourism.

Worldwide, the Latin American and Caribbean region represents 8% of the total jobs and 5% of the GDP generated by the air transport industry, including the catalytic impacts.

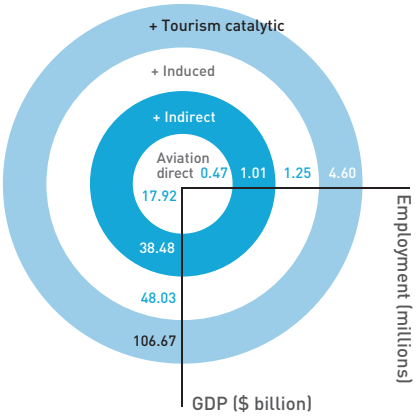
Direct jobs generated by air transport, 2010



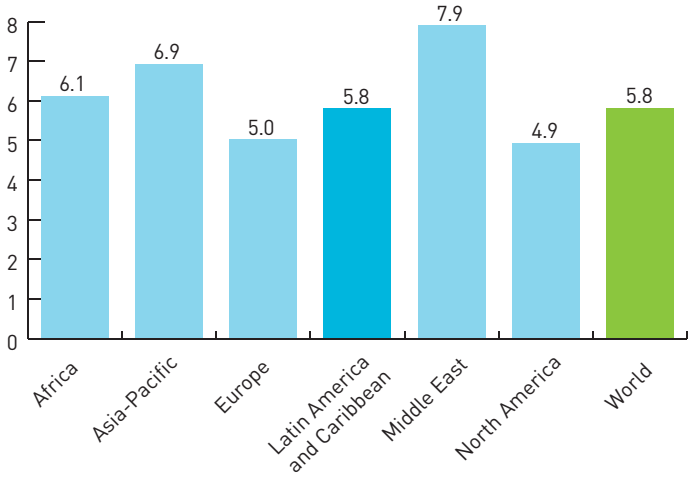
Latin America's share of global passenger traffic, 2010



Latin America and the Caribbean's jobs and GDP generated by air transport, 2010



Projected annual growth rate for international traffic by region, 2010 - 2015



Recent studies by Oxford Economics have quantified the significant economic impact that aviation generates across some of the major Latin American markets. For example, in Brazil, in 2009, aviation directly contributed 138,000 jobs (0.1% of employment) and made a value-added contribution to GDP of BRL 13.3 billion (0.4% of GDP).

In addition, regional economies derive substantial benefits from the spending of tourists travelling by air. Including this catalytic impact and the indirect and induced impacts of aviation activity increases the impact of aviation on GDP in Brazil to BRL 42 billion (1.3% of GDP).

Forecasts indicate that this impact is set to grow rapidly over the next 20 years. Passenger numbers are expected to triple from 145.9 million in 2010 to 438.9 million in 2030, with RPK growing at an average annual rate of 6.9%. Meanwhile, cargo volumes are projected to rise at a slightly lower rate of 6.1% per annum.

Such an expansion in activity should generate significant economic returns. Oxford Economics forecast that aviation's direct contribution to GDP will increase by 6.4% per annum in real terms over the next 20 years helping to create an additional 329,000 jobs across the region by 2030. Meanwhile, when accounting for catalytic effects in terms of increased tourism receipts, real GDP growth is projected at 6.1% per annum with implied job creation of 721,000.

Although the region has been somewhat of a "growth" star of the aviation sector in recent years, it is clear that infrastructure development could soon act as a bottleneck to performance. Investment in runways and other airport facilities is key to ensuring the continued rapid expansion of the aviation sector, particularly in light of the strength of projected cargo and passenger growth.

JOBS AND SKILLS

Embraer builds high-tech skill base in Brazil and beyond

With $5.3 billion in revenues in 2010, a workforce of over 17,000 and an order book of $16 billion, Brazilian aircraft manufacturer Embraer is one the great success stories of the country's high-technology manufacturing sector.

As a relative newcomer to the highly competitive global aerospace industry, education levels are particularly important to Embraer. With high school education as a minimum level for entry to the company, a total of 35% of the workforce has been educated to graduate and post-graduate levels. The company employs over 350 staff with PhDs.

As the company grows, it is developing links with communities throughout Brazil, increasing the chances for talented youngsters from all backgrounds to develop their skills within the company. The Embraer Education and Research Institute was created in 2001 to help contribute to social inclusion through education projects in the communities where the company has facilities. It has established the Juarez Wanderley High School in São José dos Campos. It provides full-time, free, high-quality instruction to 600 less-privileged students per year coming from the local public schools. Over 1,600 students have graduated since it was established in 2002, all of whom have been admitted to university. According to the Ministry of Education, it is the 4th best high school in the State of São Paulo, and the 30th in the nation. The Institute has also worked with Brazilian NGOs to establish 60 education projects in the three Brazilian regions where Embraer has manufacturing plants.

The company's direct and indirect employment footprint, however, is not limited to its home market. Companies from the USA provide over 70% of the components for the Legacy 600, Phenom 100 and Phenom 300 business jets. Over 7,000 existing USA jobs are supported – and some of them preserved – by Embraer's component purchases, according to the company and its USA partners. Embraer has had a presence in the USA since 1979 and directly employs almost 1,000 people there.

Elsewhere, Embraer is in the process of growing its business in Portugal. It now owns a 65% share of the Portugal's largest aircraft maintenance and aircraft manufacturing company OGMA.

REGIONAL AND GROUP ANALYSIS

MIDDLE EAST

Air transport supports 2.7 million jobs and $129 billion in GDP in the Middle East.

77,063,869 passengers
186,167 million revenue passenger kms
49,525 million revenue tonne kms
884,000 flights

70 commercial airports
65 airlines
1,029 aircraft in service
13 air navigation service providers

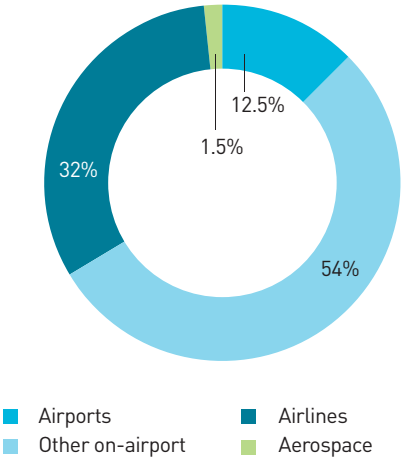
» The number of jobs created directly by the air transport industry is estimated to have reached 434,000 in 2010.
  - 140,000 people (32% of the total) work for airlines or handling agents (e.g. as flight crew, check-in staff, maintenance crew, reservations and head office staff).
  - 54,000 people (12.5%) work directly for airport operators (e.g. in airport management, maintenance, security, operations), while 234,000 (54%) work on-site at airports for government agencies such as customs and security, or provides services in retail outlets, restaurants, hotels, etc.
  - 6,000 people (1.5%) are employed in the civil aerospace sector (manufacture of aircraft systems, components, airframes and engines).

» In total (direct, indirect and induced impacts), air transport supports 1.1 million jobs and contributes nearly $76 billion to GDP in the Middle East.

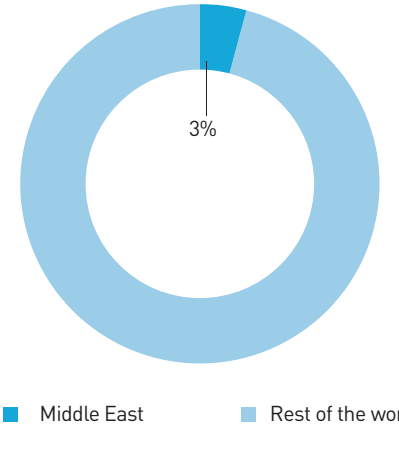
» In addition, there are over 1.6 million jobs supported through the catalytic impacts of travel and tourism.

Worldwide, the Middle East region represents 5% of the total jobs and 6% of the GDP generated by the air transport industry, including the catalytic impacts.

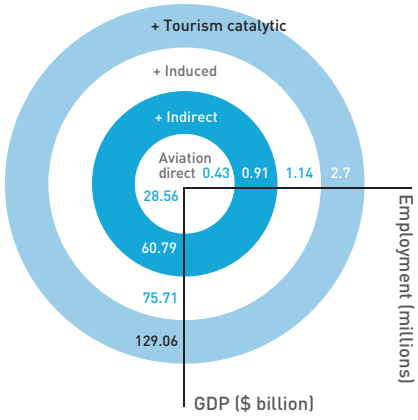
Direct jobs generated by air transport, 2010



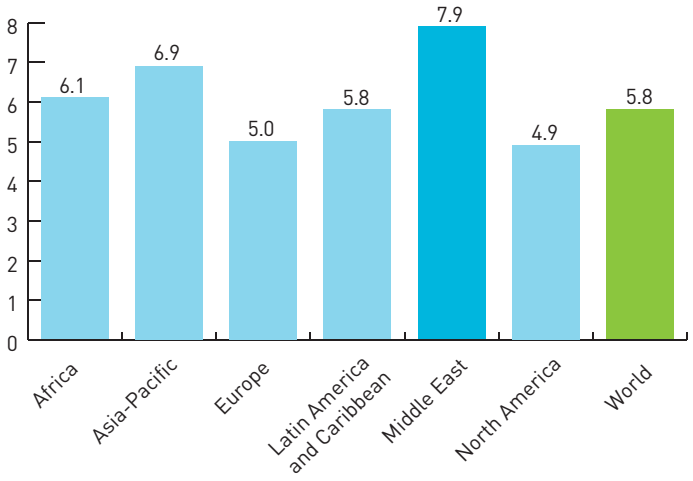
Middle East's share of global passenger traffic, 2010



Middle East's jobs and GDP generated by air transport, 2010



Projected annual growth rate for international traffic by region, 2010 - 2015



Recent studies by Oxford Economics have quantified the significant economic impact that aviation generates across some of the major markets in the Middle East. For example, in Jordan, in 2010, aviation directly contributed 12,000 jobs (0.7% of employment) and made a value-added contribution to GDP of JOD 193 million (1.0% of GDP). Meanwhile, in the United Arab Emirates (UAE) in 2009, aviation directly contributed 141,000 jobs (4.5% of employment) and made a value-added contribution to GDP of AED 35.2 billion (3.5% of GDP). Finally, in Lebanon, aviation in 2009 directly contributed 7,900 jobs (0.6% of employment) and made a value-added contribution to GDP of LBP 600 billion (1.1% of GDP).

In addition, regional economies derive substantial benefits from the spending of tourists travelling by air. Including this catalytic impact and the indirect and induced impacts of aviation activity increases the impact of aviation on GDP in Jordan to JOD 994 million (5.3% of GDP), in UAE to AED 145.8 billion (14.7% of GDP) and in Lebanon to LBP 8,933 billion (17% of GDP).

Moreover, forecasts indicate that this impact is set to grow rapidly over the next 20 years. Passenger numbers are expected to increase from 77.1 million in 2010 to 220.4 million in 2030, with RPK growing at an average annual rate of 6.6%. Meanwhile, cargo volumes are projected to rise at a slightly lower rate of 6.2% per annum.

Such an expansion in activity should generate significant economic returns. Oxford Economics forecast that aviation's direct contribution to GDP will increase by 6.3% per annum in real terms over the next 20 years helping to create an additional 294,000 jobs across the region by 2030. Meanwhile, when accounting for catalytic effects in terms of increased tourism receipts, real GDP growth is projected at 6.6% per annum with implied job creation of an additional 589,000 jobs.

Supporting such a growth in demand for air transport services and maintaining the region's hub status will require a material level of investment in infrastructure. In addition to the necessary "physical" investment, the region's current slow rate of market liberalisation and unco-ordinated regional competition for passengers are barriers to continued success. Appropriate regulatory reform that promotes regional competition will help to spur future growth and should help to generate significant efficiency gains.

FAMILY AND FRIENDS

The Lebanese community globally connected by air travel

Airlines do more than take business people to meetings, tourists to the beach and high-value freight to remote markets. They play a vital role connecting communities around the world who have been dispersed, either by political or social turmoil, or through economic migration.

Following the 1975 to 1990 civil war in Lebanon, thousands of Lebanese left the country to find new homes in North America, Latin America, Europe and Australasia. The Lebanese diaspora is now an integral part of the country's culture and economy – expatriate remittances account for around a fifth of Lebanon's economy.

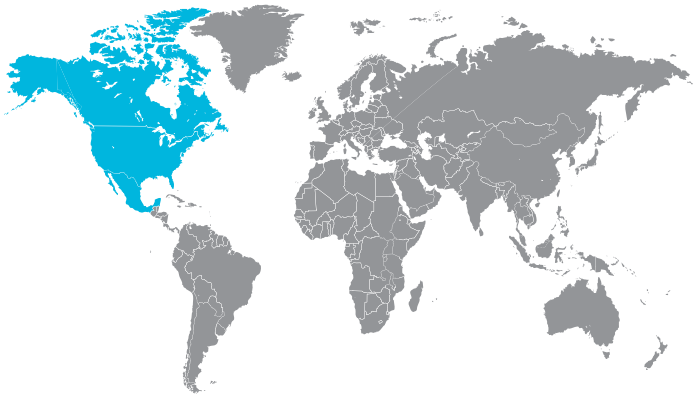
Over nine million Lebanese live abroad and, as new airline routes develop as a result of the country's economic recovery, they are connecting a global community keen to remember its roots.

There are an estimated three million Americans of Lebanese descent, 44,000 of whom have moved there from Lebanon since 1991 and a million people of Lebanese origin living in São Paulo, Brazil. Tickets to Beirut are particularly hard to find during election time – postal voting is not allowed and many citizens who left during the civil war are still eligible to vote. They combine a holiday in Beirut with the chance to make their mark on the ballot sheet. While most of these returning Lebanese stay with friends and family, the capital's hotels also tend to be booked out at election time.

Lebanon has a special relationship with the airline industry. The country's Middle East Airlines kept its aircraft flying throughout the long civil war to provide a vital air bridge from the beleaguered capital to the outside world, despite having its aircraft destroyed and its staff attacked. Now it is focused on developing a global network to bring its citizens together again, no matter where they live.

REGIONAL AND GROUP ANALYSIS

NORTH AMERICA



Air transport supports around 9.8 million jobs and nearly $685 billion in GDP in North America.

609,279,189 passengers
1,449,502 million revenue passenger kms
169,000 million revenue tonne kms
10,047,000 flights

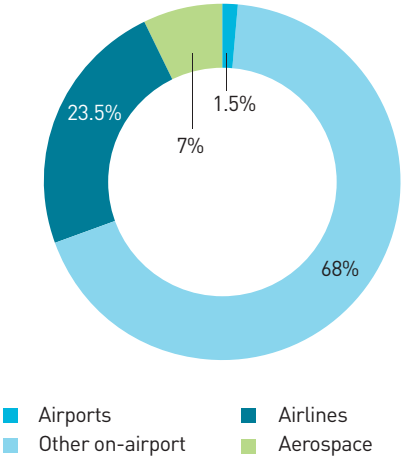
976 commercial airports
189 airlines
7,924 aircraft in service
3 air navigation service providers

» The number of jobs created directly by the air transport industry is estimated to have reached 3.1 million in 2010.
  · 729,000 people (23.5% of the total) work for airlines or handling agents (as flight crew, check-in staff, maintenance crew, reservations and head office staff).
  · 49,000 people (1.5%) work directly for airport operators (airport management, maintenance, security, operations), while nearly 2.1 million (68%) work on-site at airports for government agencies such as customs and security, or provides services in retail outlets, restaurants, hotels, etc.
  · 215,000 people (7%) are employed in the civil aerospace sector (manufacture of aircraft systems, components, airframes and engines).
» In total (direct, indirect and induced impacts), air transport supports nearly 7.9 million jobs and contributes nearly $556 billion to GDP in North America.
» In addition, there are nearly two million jobs supported through the catalytic impacts of international travel and tourism.
» With an approximate 90% share of total passengers in the region, the USA dominates the aviation market in North America.

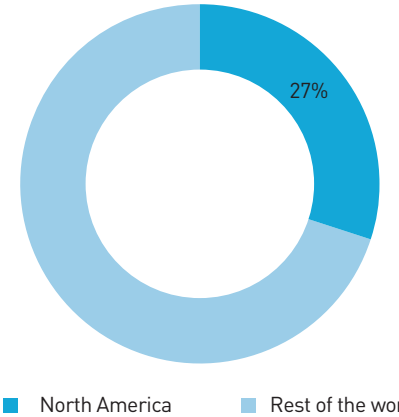
Worldwide, the North American region represents 17% of the total jobs and 31% of the GDP generated by the air transport industry, including the catalytic impacts.

In the USA, the FAA also collects economic impact data, with which these numbers are aligned. The FAA assessment further evaluates the much wider economic activity that is supported by air transport (including the general aviation and domestic tourism markets that this report does not include). Accordingly, with these wider catalytic impacts included, the total number of jobs supported by civil aviation in the USA is around 10 million, with a contribution to GDP of around $700 billion[94].

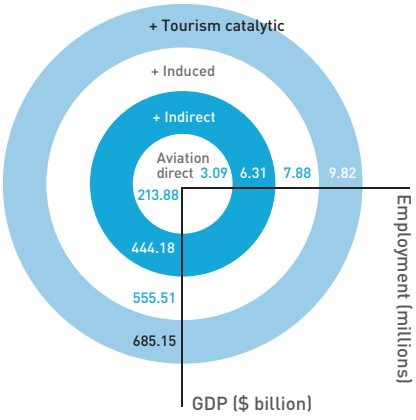
Direct jobs generated by air transport, 2010



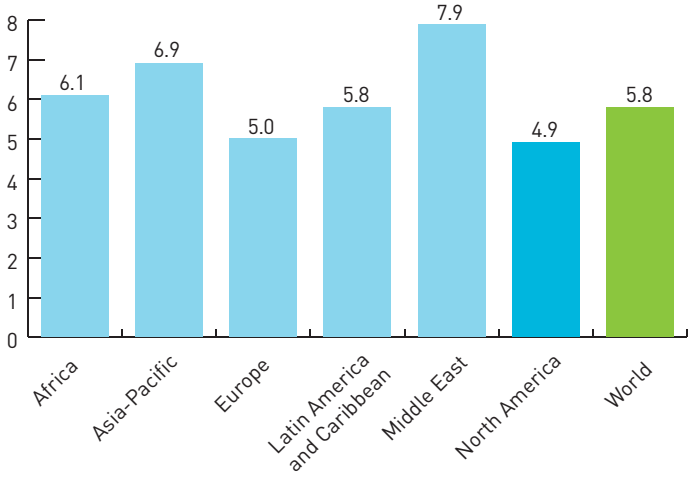
North America's share of global passenger traffic, 2010



North America's jobs and GDP generated by air transport, 2010



Projected annual growth rate for international traffic by region, 2010 - 2015



Recent studies by Oxford Economics have quantified the significant economic impact that aviation generates across some of the major North American markets. For example, in Canada, in 2009, aviation directly contributed 219,000 jobs (1.3% of employment) and made a value-added contribution to GDP of C$16.7 billion (1.1% of GDP). Meanwhile, in Mexico, aviation directly contributed 60,000 jobs (0.2% of employment) and made a value-added contribution to GDP of MXN 23.5 billion (0.2% of GDP).

In addition, regional economies derive substantial benefits from the spending of tourists travelling by air. Including this catalytic impact and the indirect and induced impacts of aviation activity increases the impact of aviation on GDP in Canada to C$42.4 billion (2.8% of GDP) and in Mexico to MXN 233 billion (2% of GDP).

Moreover, forecasts indicate that this impact is set to grow rapidly over the next 20 years. Passenger numbers are expected to increase from 609.3 million in 2010 to 946.3 million in 2030, with RPK growing at an average annual rate of 2.9%. Meanwhile, cargo volumes are projected to rise at a faster rate of 4.8% per annum.

Such an expansion in activity should generate significant economic returns. Oxford Economics forecast that aviation's direct contribution to GDP will increase by 4.0% per annum in real terms over the next 20 years helping to create an additional 874,000 jobs across the region by 2030. Meanwhile, when accounting for catalytic effects in terms of increased tourism receipts, real GDP growth is projected at 4.2% per annum with implied job creation of 3.1 million.

Supporting such growth in demand for air transport services will require a material level of investment in infrastructure. In the USA, it is vital that the NextGen air traffic control system being debated in Congress be implemented to replace the current antiquated ground-based system. Moving to a satellite-based system would bring significant efficiency savings in terms of reduced congestion while helping to maintain safety.

Meanwhile, industry growth will also imply stronger demand for particular types of skilled labour, particularly engineers. Addressing this potential skills shortage through appropriate educational reform will be an important impending challenge for North American policymakers.

TRADE

Aviation breathes new life into Mexican manufacturing

The rapid growth of the aerospace industry across Mexico has led to many job opportunities for Mexican engineers and technicians, not just for the low-paid, assembly line workers traditionally associated with maquilas (factories).

Teresa Jesus Rio Ramos, a production supervisor for Cobham – a defence systems manufacturing company that moved to Tijuana in 1997 – believes that aerospace and defence companies offer the most stable, best paid jobs of all the Tijuana maquilas.

Although Mexico's association with aerospace dates back to 1966, the industry's seeds were truly sown in 2006 when Canadian aircraft manufacturer Bombardier opened a plant in Queretaro to produce parts for its Global 5000 and 6000 jets. Currently employing 1,700 workers, the company recently decided to use the plant to build the exterior of the company's Learjet 85 – a new corporate jet due out in 2013. As a result Bombardier intends to increase its Mexican workforce to 2,500 by the end of 2012.

In total, the aerospace industry currently employs about 32,000 people across 16 states in Mexico, with almost half in Baja California and 7,313 in Tijuana alone. And confidence is high; the state government believes that by the end of 2012, another seven aerospace companies will have set up shop in Baja California.

REGIONAL AND GROUP ANALYSIS

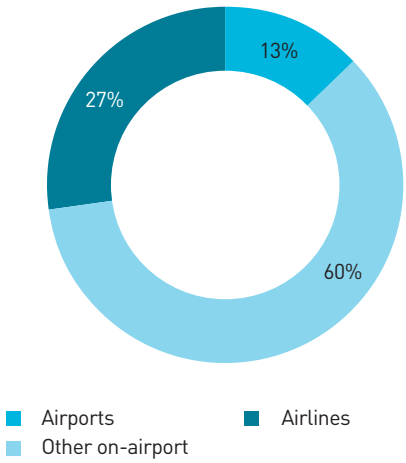
SMALL ISLAND STATES[95]

Air transport supports 1.4 million jobs and $22 billion to small island states combined GDP.

21,590,970 passengers	76 airlines
56,533 million revenue passenger kms	407 aircraft in service

- The number of jobs created directly by the air transport industry is estimated to have reached 78,000 in 2010.
  - 21,000 people (27% of the total) work for airlines or handling agents (e.g. as flight crew, check-in staff, maintenance crew, reservations and head office staff).
  - 10,000 people (13%) work directly for airport operators (e.g. in airport management, maintenance, security, operations), while 47,000 (60%) work on-site at airports for government agencies such as customs and security, or provides services in retail outlets, restaurants, hotels, etc.
- In total (direct, indirect and induced impacts), air transport supports 192,000 jobs in the small island states and over $3.8 billion to their combined GDP.
- In addition, there are over 1.2 million jobs supported through the catalytic impacts of travel and tourism.

Direct jobs generated by air transport, 2010



SKILLS DEVELOPMENT

Developing aviation skills in Fiji

Nadi International Airport handles 98% of all international visitors to Fiji. But the airport operator does more than manage this vital gateway: it provides a base for developing skills to the local population across a wide range of aviation-related activities. Airports Fiji Limited (AFL) also looks after air traffic management (ATM) services in the Nadi Flight Information Region (FIR), which includes the air spaces of Fiji, Tuvalu, New Caledonia, Kiribati and Vanuatu, covering an area of six million square kilometres, Nausori International Airport and the 13 other outer-island airports.

AFL employs 465 personnel across its 15 airports, which have a total asset base of $177 million. Its growing workforce has a range of skill sets from operational and technical support to commercial management and administration. The AFL Aviation Academy offers training programmes to meet local and regional airport market needs in areas such as ATM, aviation security, fire-fighting and rescue services.

Aviation is essential to the economic security of the islands. Domestic airports play a crucial role in the development of Fiji's regional economies, especially in the transport of tourists between the islands. Tourism by air accounts for around 25% of the islands' total GDP, worth $770 million in 2009. Aviation supports a total of 66,000 jobs in the islands, out of a total workforce of around 350,000.

Over the last five years, AFL has invested over $42 million in expanding and upgrading airports and related systems to international standards, pioneering new technologies such as automatic dependent surveillance broadcasts, which allow aircraft to be managed by controllers over great distances, far beyond the range of conventional radar.

The airport operator provides incentives in the form of financial incentives for its workforce to participate in tertiary education, to improve skills further.

TOURISM

Seychelles investing in youth for long-term success

Having weathered the economic downturn in 2008, this archipelago of 115 islands, off the east coast of Africa looks set to become a stable and prosperous region. The increasingly successful tourist industry, which accounts for 15% of all jobs on the islands, is spearheading growth for the next decade.

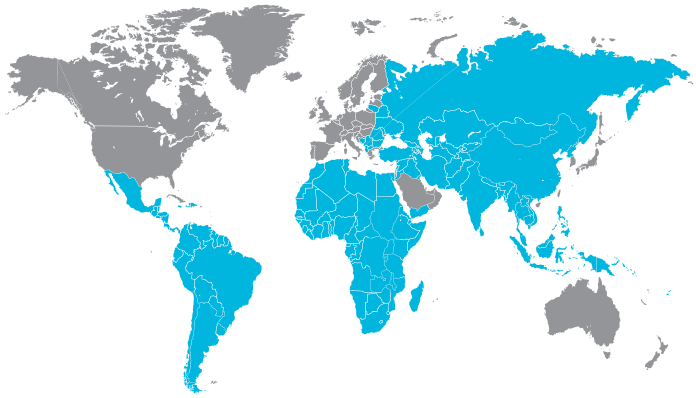
One example of this is the $20 million investment in Air Seychelles by Etihad Airways, which will revitalise the local airline, allowing it to fly to more destinations worldwide. This investment allowed Air Seychelles to develop its fleet from two Boeing 767-200s to its current size of five large aircraft operating internationally with Twin Otter and Short-360s flying to the various islands in the group.

When only considering the contribution linked to the spending of foreign visitors arriving by air, Oxford Economics estimates that in 2009 the travel and tourism industry directly employed 8,200 people and supported indirectly through its supply chain a further 4,500 jobs. A further 2,000 people were supported through the household spending of those people directly and indirectly employed by the travel and tourism sector.

This is all good news for students at the newly refurbished Seychelles Tourism Academy. Employment opportunities look set to expand as the influx of international travellers increases year-on-year. The courses at the Academy range from basic skills through to full-time, degree-level hospitality management courses aimed at addressing the shortage of managers in the tourism sector. Each year the Academy takes in approximately 500 trainees, and employs 70 staff. Students also have the chance to travel abroad as a way of improving their understanding of international tourists' expectations.

Without the tourism boom supported almost entirely by the airlines that serve the islands, the students at the tourism academy would not have the positive outlook and future they can expect. Currently 96% of all graduates achieve full-time employment.

REGIONAL AND GROUP ANALYSIS
DEVELOPING COUNTRIES[96]

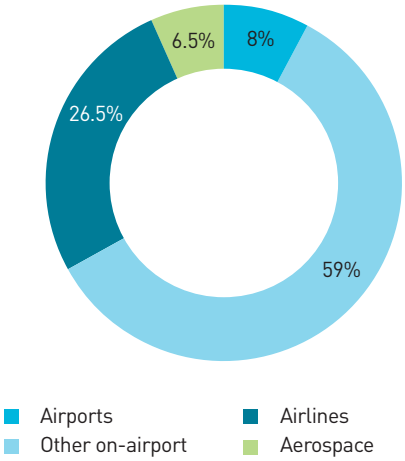


Air transport supports 35.9 million jobs and $490 billion in GDP in the developing world.

861,550,674 passengers	951 airlines
1,570,177 million revenue passenger kms	9,295 aircraft in service

- The number of jobs created directly by the air transport industry is estimated to have reached 2.8 million in 2010.
  - 735,000 people (26% of the total) work for airlines or handling agents (e.g. as flight crew, check-in staff, maintenance crew, reservations and head office staff).
  - 224,000 people (8%) work directly for airport operators (e.g. in airport management, maintenance, security and operations), while 1.6 million (59%) work on-site at airports for government agencies such as customs and security, or provides services in retail outlets, restaurants, hotels, etc.
  - 178,000 people (6%) are employed in the civil aerospace sector (manufacture of aircraft systems, components, airframes and engines).
- In total (direct, indirect and induced impacts), air transport supports 7.4 million jobs in the developing world and contributes $223 billion to GDP.
- In addition, there are 28.5 million jobs supported through the catalytic impacts of travel and tourism.

Direct jobs generated by air transport, 2010



SKILLS DEVELOPMENT

Airport community builds professional bridges

The aviation community is a global one. But differences in economic and technological resources between the developed and developing world can potentially create capability gaps. This is why members of the Airports Council International (ACI) trade association of airports have introduced a series of links between developed and developing-country airports, improving safety, security and efficiency throughout the global airport community.

The ACI Fund, launched in 1993, is financed by donations from airports across the world. Its purpose is to design, develop and conduct professional training seminars from airports in developing countries.

The seminars focus on practical training in the areas of safety, security and economics that build long-term staff competencies. The seminars are offered free of charge, including meals. The only cost to qualified participants is the airfare. Since 2009, ACI Fund has partnered with CIFAL Atlanta / UNITAR to deliver up to six seminars a year. Each seminar brings together airport managers from different nations and cultures in a practical training environment. Experts from airports and civil aviation organisations serve as instructors for 30 to 40 trainees, including staff from the host airport. The Fund has delivered around 50 seminars to over 1,500 participants, who are then able to take the knowledge back to their airport and apply it in daily operations.

The Fund also delivers courses in the regions that need them. After Lomé-Tokoin Airport in Togo became the first airport to sign up to ACI's new Airport Excellence in Safety Programme, the Fund ran a course on safety management systems at the airport. International experts presented to staff from Lomé as well as other member airports in the region.

The ACI Developing Nations Assistance programme provides scholarships for airports from less developed nations to participate in ACI Global Training Hub courses, in person and online. And ACI also provides links so that developed nation airports can sponsor the participation of developing nation airports to attend important ACI events, such as the World Annual General Assembly. This allows recipient airports to meet with their colleagues and exchange ideas on best practices.

TOURISM

Aviation provides vital gateway to Namibian national parks

Tourism generates $160 to $300 million every year in Namibia's economy.

Namibia is one of the most arid nations on the planet, receiving an annual average of less than 250mm of rainfall a year. Efforts to achieve sustainable development are hampered by the harsh climate, poor levels of nutrients in the soil and a fragile environment, with nearly two-thirds of the country classified as subject to moderate or extreme risk of degradation.

However, the country also possesses a wide variety of habitats and ecosystems, ranging from desert to savannah and subtropical wetlands, many of which are unique to Namibia. The government recognises that these habitats carry important potential advantages for development as a result of increased tourism. This potential is reflected in the fact that air traffic to and from Namibia has risen by 27% since 2000.

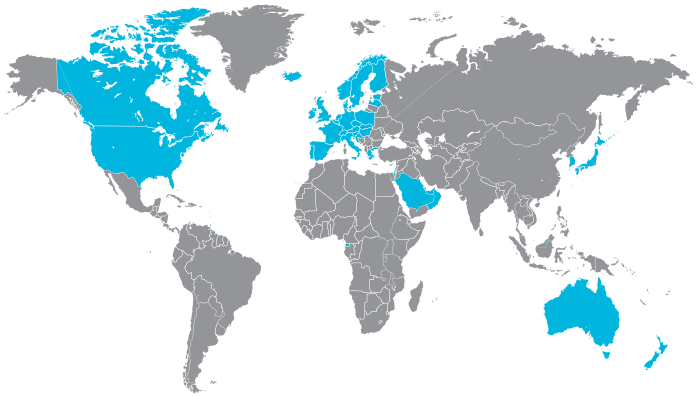
Not only do tourists arriving in Namibia, mainly by air, view the extensive wildlife and visit the unique habitats on offer, they also contribute to their preservation. The Namibian government has established a single entity, the Ministry of Environment and Tourism, to manage these closely allied issues.

The United Nations Development Programme is also heavily invested in development of Namibian tourism and has assessed that tourism of the protected areas in 2007 generated annual revenues of between $160 million and $300 million, far outweighing the estimated costs of the protected land system at under $16 million. Relatively modest increases in tourism will provide significant increases in related revenues, according to the United Nations' estimates, resulting in positive and potentially large returns for the programme.

Encouraging tourism through sustaining the environment also attracted grant funding from the USA under the Millennium Change Account, this included $67 million for the tourism sector, of which over $40 million was dedicated to the national park infrastructure. The Namibian government estimates that this financial contribution created 6,500 new jobs and will provide enhanced opportunities for youth employment.

REGIONAL AND GROUP ANALYSIS

DEVELOPED COUNTRIES[97]

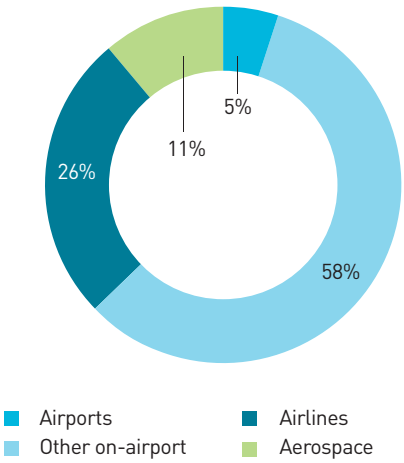


Air transport supports 20.7 million jobs and $1.7 trillion in GDP in the developed world.

1,422,746,885 passengers	594 airlines
3,119,499 million revenue passenger kms	15,364 aircraft in service

- The number of jobs created directly by the air transport industry is estimated to have reached 5.6 million in 2010.
  - 1.4 million people (26% of the total) work for airlines or handling agents (e.g. as flight crew, check-in staff, maintenance crew, reservations and head office staff).
  - 290,000 people (5%) work directly for airport operators (e.g. in airport management, maintenance, security and operations), while 3.2 million (58%) work on-site at airports for government agencies such as customs and security, or provides services in retail outlets, restaurants, hotels, etc.
  - 617,000 people (11%) are employed in the civil aerospace sector (manufacture of aircraft systems, components, airframes and engines).
- In total (direct, indirect and induced impacts), air transport supports 14.7 million jobs in the developed world and contributes over $1.2 trillion to GDP.
- In addition, there are 6 million jobs supported through the catalytic impacts of travel and tourism.

Direct jobs generated by air transport, 2010



DISASTER RESPONSE

Providing a lifeline to quake-hit Christchurch

The February 2011 earthquake that hit Christchurch, New Zealand, killed 181 people and caused widespread damage across the city, bringing down buildings, rupturing power lines and cutting off water supplies.

Aviation infrastructure provided a vital lifeline for the community and those involved in the rescue attempts. After carrying out checks on its runway to ensure there was no structural damage, Christchurch Airport quickly became the main conduit of search and rescue support from around the world. The airport also played a longer-term role in helping to get the city back on its feet, with the airport providing space for local businesses to re-start operations. Even as many Christchurch Airport staff themselves were personally impacted by the earthquake, they set up support desks in the airport terminal and brought USA and Australian embassy staff to assist with lost documentation.

The airport workers found temporary accommodation for stranded passengers and supported special evacuation or delivery flights. In the terminals, funds were raised for national earthquake appeals and the airport's IT department donated spare equipment to help Christchurch businesses get back on their feet. The airport also set aside a significant sum to work with tourist agencies to attract visitors back to one of New Zealand's key visitor destinations.

The usual show of solidarity from colleagues in the wider aviation industry resulted in Auckland Airport sending a technical and trade crew to Christchurch Airport to provide relief for airport staff and Air New Zealand offering low airfares for anyone needing to get into or out of the city. In seven days, the airline moved more than 45,000 passengers out of Christchurch and used every jet aircraft type in its fleet to do so, as part of a shuttle service to Auckland.

Since then, the airline has provided hundreds of free flights for individuals and groups wanting to leave Christchurch or to raise funds for the people there. This has included moving dozens of families all across New Zealand and overseas – and more than 500 children to Auckland for a 'Break from the Quake' as the aftershocks continued.

ENVIRONMENT

Virgin Australia helps pioneer biofuel research

By 2050, up to 40% of all aviation fuel sources at airports in Australia and New Zealand could be based on biofuels refined from renewable local resources, according to a development plan drawn up by the Australian chapter of the Sustainable Aviation Fuel Users Group (ASAFUG). Published in May 2011, the roadmap suggests that a fuel share of 5% for bio-derived jet fuel in the two nations could be possible as early as 2020.

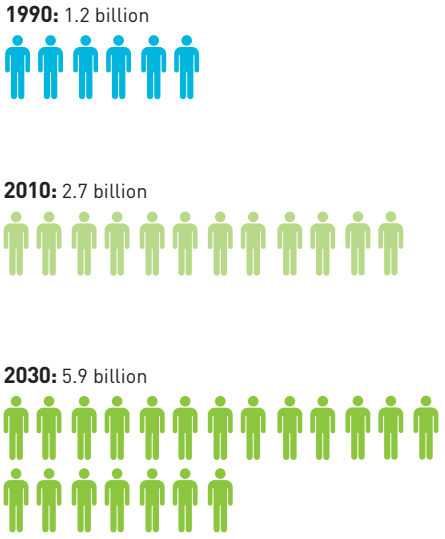
One of the founder members of this group is Virgin Australia, which is working with national and state governments to encourage funding of the essential research to address the issues surrounding scale-up from pilot to production quantities of fuel. Among the projects in which Virgin Australia has invested is an in-depth analysis by the University of Queensland on the potential for a local sustainable industry developing fuel from three distinct biomass sources; algae, pongamia (a species of legume currently found only in Papua New Guinea and threatened by habitat loss) and sugar cane.

Virgin Australia has been working to develop a biofuel using a pyrolysis process from a feedstock of mallees, a native eucalypt tree that can be grown sustainably in many parts of Australia. The airline also has a Memorandum of Understanding with Australian biofuel company Licella, which has invested in developing a potential breakthrough technology that converts waste into aviation fuel. The Licella solution cuts through many of the complexities of current alternatives and proposes a single-step process, converting woody waste into high quality bio-crude oil, resulting in a cleaner, faster and much more cost-effective procedure.

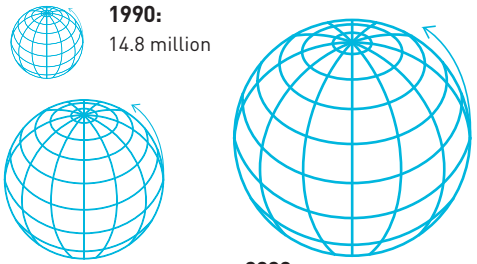
BEYOND TODAY

A comparison of aviation's global reach in 1990 and 2010 and forecast to 2030[98]

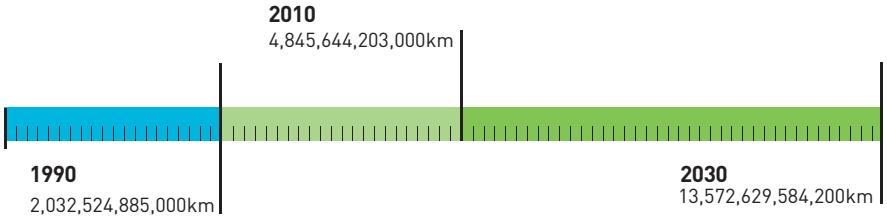
Passengers



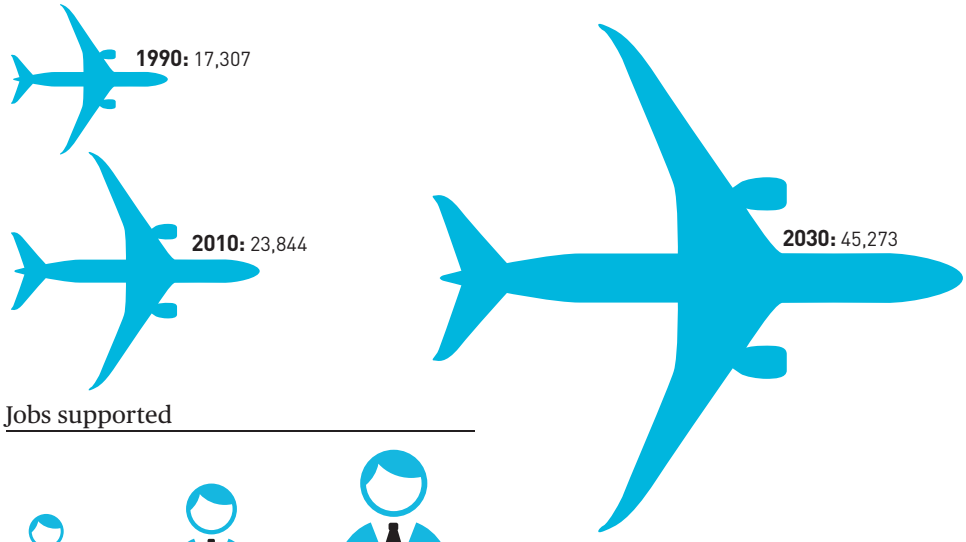
Aircraft movements



Passenger kilometres flown



Aircraft in service



Jobs supported

The contribution of the air transport industry in 20 years

Combining the forecasts of Boeing, Airbus and Bombardier with Oxford Economics' model, it can also be estimated that – excluding catalytic impacts on tourism – the air transport industry will, in 2030, contribute:

- directly, around 12.1 million jobs and $1.4 trillion of GDP (at 2010 prices) to the world economy;
- with indirect and induced contributions, around 32 million jobs and $3.7 trillion in GDP (at 2010 prices).

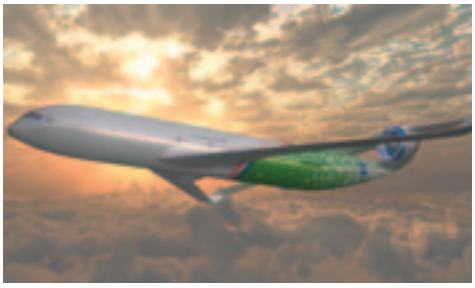
Furthermore, if tourism is added, the total contribution of air transport industry amounts to over 82 million jobs and $6.9 trillion in GDP in 2030.

Air transport is forecast to support 82 million jobs by 2030.

The impact of lower growth

Long-term forecasts are by their nature sensitive to a number of unforeseen factors. How the economic contribution of aviation would be impacted by these potential unknowns can be explored through a sensitivity analysis of future growth in passenger and cargo traffic. For example, should growth in passenger and cargo traffic be one percentage point lower during the period 2010-2030, then in 2030:

- There would be nearly 2.1 million fewer direct jobs in the air transport sector.
- Taking into account the indirect and induced impacts, the number of jobs supported by air transport would be 5.6 million lower.
- Adding the impact of tourism (direct, indirect and induced), the total number of jobs supported by the air transport sector would be over 14 million lower than the base forecasts.
- The direct, indirect and induced contribution of the air transport sector to world GDP would be $646 billion (2010 prices) lower, with an additional $542 billion lost through lower tourism activity.



AIRCRAFT IN 2030 AND BEYOND

Despite the rapid rate of growth in passengers and aircraft movements from 2010 to 2030, the industry is confident that its emissions reduction targets will see a capping of net CO_2 emissions from aviation in 2020. For the next target – reducing aviation CO_2 to half of what it was in 2005 by the year 2050 – the industry will have to tap into its long history of innovation.

Sustainable, advanced-generation aviation biofuels will certainly play a large role in reducing emissions. Operational and infrastructure improvements (as outlined from page 19 of this report) will also be an important building block. But new aircraft technology is going to be one of the most visible signs of that progress. While it takes many years to design and produce new aircraft, around the year 2030 passengers could be noticing some fairly radical changes in the way aircraft look and perform.

Aerodynamicists are currently exploring new aircraft designs for the future. By some measures, the most efficient aircraft model is a 'blended wing' design where the entire aircraft becomes a lifting device, effectively a flying wing. Super lightweight materials and new systems will be required to implement the concept. The 'Very Efficient Large Aircraft' project has already researched blended wing concepts which would deliver per-seat fuel consumption improvements of up to 32% over current aircraft designs[99].

How these aircraft could be designed to fit into current airports and how passengers may react to a windowless journey, however, are subjects for further research.

The success of first-generation winglet designs has inspired further research into a new generation of devices, including spiroid wing tips (which in tests have demonstrated 10% improvements in lift efficiency[100]) and fixed multiple winglets (a 15-20% lift-to-drag improvement)[101]. Actively controlled winglets that change shape in flight and could replace conventional control surfaces such as ailerons, elevators and rudders, may offer efficiency savings that are potentially higher still.

In late 2010, NASA awarded contracts to three teams – from Lockheed Martin, Northrop Grumman and Boeing – to study advanced concept designs for aircraft that could take to the skies in the year 2025. Each design looks very different, but all final designs have to meet NASA's goals for: less noise; cleaner exhaust; lower fuel consumption; to fly up to 85% of the speed of sound; cover a range of approximately 7,000 miles; and carry between 50,000 and 100,000 pounds of payload, either passengers or cargo. Each aircraft has to be able to do all of those things at the same time, which requires a complex dance of tradeoffs between all of the new advanced technologies that will be on these vehicles[102].

Airbus has provided a glimpse into the future with their concept aircraft – the result of brainstorming between their engineering and design staff as to the most efficient potential technologies and materials for aircraft construction. Another European research project is looking at the possibility of a new aircraft model – the Claire Liner – for short-to medium-range flights which could provide very large reduction in fuel use and noise. It combines various revolutionary concepts including multi-fan embedded engines, 'box wing' configuration and optimised cabin capacity.

Even if these concept aircraft don't eventually fly, research into these designs is producing a lot of the valuable innovation needed to produce the next generation of aircraft and helps the debate on decisions that must be made about environmental practices.

WHEN THE SYSTEM STOPS WORKING

An analysis of the impact of the 2010 Icelandic volcano

In 2010, a week-long disruption of air traffic in Europe resulted in 10 million passengers being affected and a cost to the global economy of $5 billion.

On 14 April 2010, Iceland's Eyjafjallajokull volcano erupted with an ash plume that rose over three kilometres and, with the help of winds, blew across much of Europe's airspace. Safety concerns over the negative effects of volcanic ash on aircraft engines caused an interruption in global air traffic to an extent not seen since 11 September 2001 and the largest disruption to European civil aviation since World War II. The closure of large portions of European air space for a week between 15 April and 21 April impacted global travel, trade and business demonstrating the integral role of air transport in society and commerce.

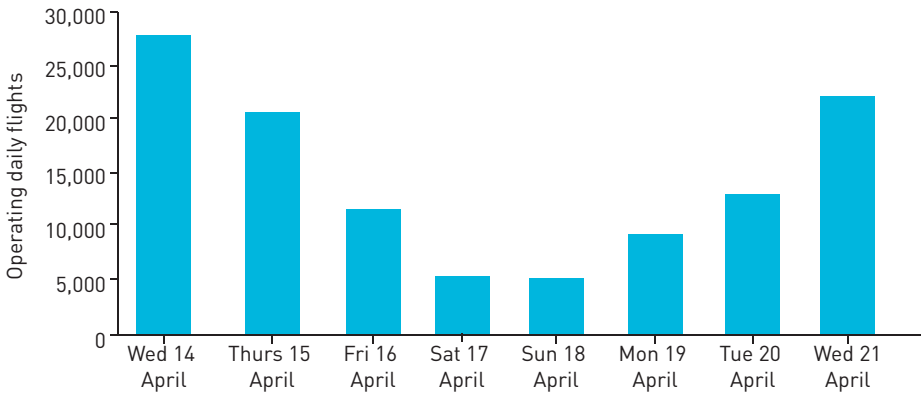
Scheduled commercial flights were first affected on 15 April, declining 27.1% from the previous week, according to Eurocontrol[103]. Traffic steadily declined over the following days as the cloud moved over the continent with cancellations reaching their peak of 80% on 18 April. Air traffic movements were nearly 20,000 lower than in the previous week at around 5,000 flights a day (compared with 25,000).

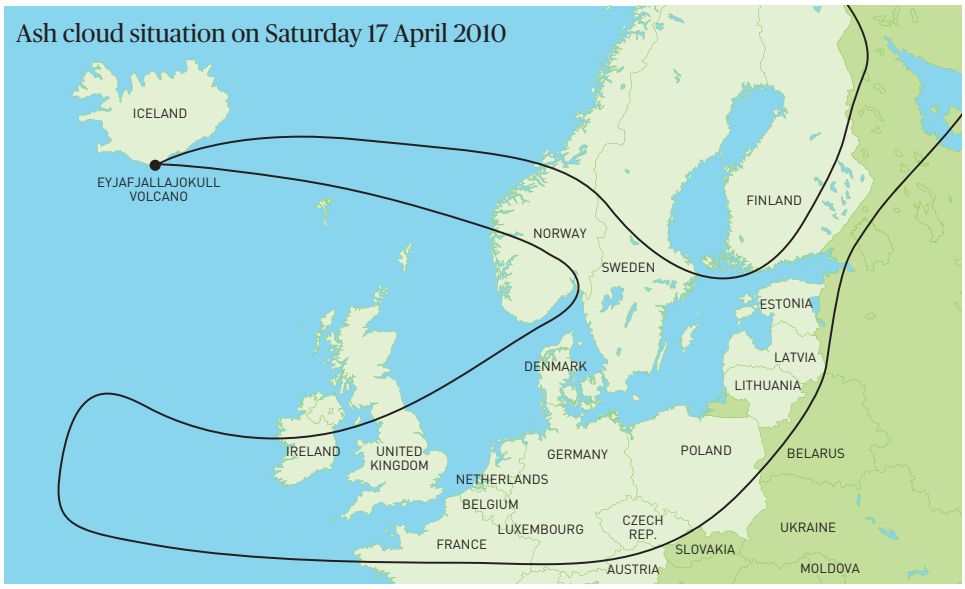
Oxford Economics has quantified the economic impact of the disruption to air travel, including direct, indirect (via the supply chain), induced (due to the lost spending of employees) and catalytic (via reduced international trade and lost output due to workers being stranded) effects.

- Around 10 million passengers were disrupted during the entire period of disruption[105].
- Over 100,000 flights were cancelled during the first week of ash cloud disruption[106].
- Total disruption at its peak meant just under a third of total global air traffic capacity was affected[107].
- 313 airports representing 80% of European airport capacity were impacted[108].
- Global aviation sector losses in the first week tallied $2.6 billion. However, when factoring in deferred business and leisure travel (and airlines able to avoid jet fuel costs), the net aviation sector impact was $2.2 billion.
- The visitor spending impact realised by destinations around the world has been estimated at $1.6 billion in lost revenues, primarily to the hospitality sector.
- Productivity losses stemming from stranded workers have been estimated at $490 million.
- International trade was also severely disrupted as a result of the flight restrictions – particularly for perishable goods and for just-in-time production processes (e.g. high-value items which are also low-weight such as electronic parts and machine components).
- The total impact on GDP caused by the first week's disruption amounts to approximately $4.7 billion.

Following the massive airspace shutdown in the first week, another 5,000 flights were sporadically cancelled. This added an additional 5% to the first week's impacts, bringing the total cost to $5 billion lost GDP between 15 April and 24 May 2010.

Flight operations in the first week of disruption[104]





A GLOBAL HIT

While European travellers were most affected, the disruption had a global reach.

Europe

Given the high proportion of cancelled flights in Europe, the costs to the aviation industry within the region was relatively high, with 85% of the $1.6 billion gross impact on the industry being ultimately realised at a cost of $1.4 billion in net revenue. Oxford Economics estimate European destinations experienced an estimated $867 million in lost sales. The total GDP impact for Europe is estimated at $2.6 billion or 0.67% of GDP for Europe in an average week.

Americas

In absolute terms, destinations in the Americas took the largest hit from the disruption for destinations outside of Europe. Over 462,000 passengers were affected costing aviation $336 million in revenue (of a potential gross loss of $396 million). Destinations realised 58% of potential losses amounting to nearly $378 million. The total effect on GDP amounts to 0.24% of GDP for the week ($957 million).

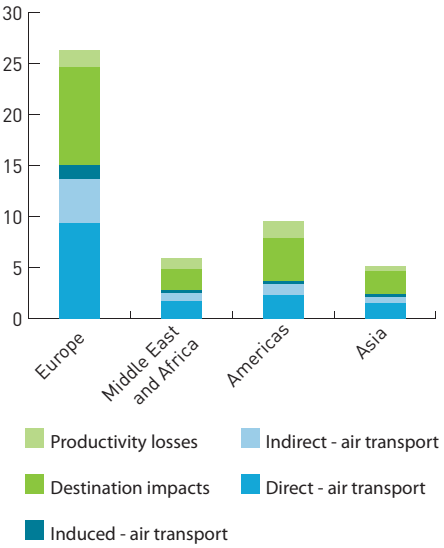
Middle East and Africa

The net impact on the air transport sector in the Middle East and Africa was $253 million. Destinations in the region saw net losses of $194 million. The relative impact on GDP, however, was the greatest of all regions, costing the region $591 million, 1.8% of a week's GDP.

Asia

The global effects of the disruption on GDP were the smallest in Asia at $517 million equivalent to around 0.16% of the region's GDP for the week. Lost spending in Asian destinations was $211 million (58% of destination impact, on par with the Americas). With the fewest travellers affected (less than 250 million), the net aviation impact in Asia was $216 million.

Total GDP losses around the world[109]



INTERNATIONAL TRADE

International trade was severely disrupted as a result of the flight restrictions. While some of the disrupted trade can simply be deferred, that is not the case for products that are either fast-perishing (fresh-cut flowers, vegetables such as green beans, exotic fruit) or crucial for just-in-time production processes (high-value items which are also low-weight such as electronic parts and machine components).

Perishable goods – fresh cut flowers, fruit and vegetables

The impact on producers of flowers and fruit and vegetables in African countries such as Kenya, Zambia and Ghana was widely reported, with delays in transportation meaning large quantities of fast-perishing produce rotted, leading to losses for producers. World Bank president Robert Zoellick stated that African countries lost $65 million due to the effect of the airspace shutdown on perishable exports.

Data from Eurostat shows that over three-quarters of fresh cut flowers exported to the EU in 2009 came by air, with a total monthly value of $81 million in April 2009. Oxford Economics estimates that the week-long cancellation of flights meant losses of just over $11 million for the African flower industry. Kenya, which accounts for about two-thirds of flower exports to Europe, is expected to have lost over $7 million in a week.

Exports of flowers to Europe are also important to South America. Just under $300 million worth of flowers were exported to the European market from Latin America by air in 2009, $21 million in April 2009 alone, with most of this coming from Ecuador and Argentina. A week long halt to flights to Europe would have cost Latin American flower producers around $3 million based on these trade figures.

In April 2009 alone, $24 million worth of green beans were imported by air into the European market. Over 90% came from Africa during that month ($15.6 million), while Kenya alone accounted for 54% ($9.3 million) of the total. These figures imply losses for African and Kenyan exporters of

green beans of $3.9 million and $2.3 million respectively as a result of the week-long shutdown of airspace.

Electrical and machine parts and equipment

In total, $48 billion of electrical and machine parts and equipment were supplied to the rest of the world from European producers in 2009. Meanwhile, an estimated $76 billion was imported into Europe from the rest of the world in 2009, of which $6.3 billion occurred in April 2009. The vast majority, around three-quarters came from Asia-Pacific, with around 20% from North America. Within this context, the Korea International Trade Association has stated that losses for domestic industries between April 16 and 19 were an estimated $112 million, with suppliers of mobile phones and semi-conductors the hardest hit. In Europe, car maker BMW had to temporarily shut down three of its factories as high-value components from BMW suppliers were unable to reach their destinations[110]. And on the other side of the world, both Honda and Nissan production was impacted by lack of component deliveries from European suppliers. Nissan shut two factories as its supply of pressure sensors from an Irish supplier were grounded.

Lost output from stranded passengers

The closure of large parts of European air space left hundreds of thousands of passengers stranded around the globe unable to return home when they had originally planned. Oxford Economics estimate that, once allowance has been made for passengers returning by alternative modes of transport, European 'stranded passenger days' totalled around 2.8 million, part of a global total of 7.8 million.

There are a number of factors that helped to mitigate the impact of this lost work on GDP including: workers' ability to work remotely; colleagues covering for stranded workers; workers were be able to catch up on some work when they got home; workers may have be able to take the time stranded as holiday.

The impact on GDP of stranded passengers is estimated by multiplying 'stranded employment days' by per-day productivity giving a potential lost GDP figure of $1.4 billion. Adjusting for the mitigating factors listed above leads to a final actual loss to global GDP of between $280 and $700 million.

Alternative forms of transport

When the flights stopped, passengers immediately looked for alternative forms of surface transport. Ships, rental cars and train services quickly became overwhelmed by the volume of people wanting to return home or reach their destination. Demand for ferry and train tickets was so high that booking websites were sent crashing[111]. Despite Eurostar – the train service linking the UK with the European continent – adding 41 extra trains over the weekend alone, it could not cope with demand. Similarly, P&O ferries which operate the same route via sea did not have space available either on its service between Dover in southern England and Calais in France. Even the luxury cruise ship Queen Mary 2 was sold out for its transatlantic crossings. Similarly, Eurolines had to add capacity shortly after the airspace closure as bus services also sold out rapidly[112].

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ACKNOWLEDGMENTS

This report was prepared by Oxford Economics for ATAG, with the assistance of the following people and organisations:

Dan Elwell, **Aerospace Industries Association** (www.aia-aerospace.org)

Nicholas E Calio, Nancy Young and John Heimlich, **Airlines for America** (www.airlines.org)

Angela Gittens, Xavier Oh and Rafael Echevarne, **Airports Council International** (www.aci.aero)

Kevin Goddard, Jacqueline Martinez de Rosso and Thierry Nowaczyk, **Airbus** (www.airbus.com)

Andrew Herdman, **Association of Asia-Pacific Airlines** (www.aapairlines.org)

Victoria Moores, **Association of European Airlines** (www.aea.be)

Mario Formica and Jean-Yves Bonzon, **ATR** (www.atraircraft.com)

Billy Glover, Terrance Scott and Robert Peterson, **Boeing** (www.boeing.com)

Hélène Gagnon, Leo Knaapen, Bruce Parry and Anne-Josée Laquerre, **Bombardier** (www.bombardier.com)

Francis Couillard, **CFM International** (www.cfm56.com)

Tim Hoy, **Civil Air Navigation Services Organisation** (www.canso.org)

Guilherme Freire, **Embraer** (www.embraer.com)

Steve Csonka, **GE Aviation** (www.geaviation.com)

Brian Davis, **Honeywell Aerospace** (www.honeywell.com)

Brian Pearce, Michael Moosberger, Andrea Navares, George Anjaparidze, Julie Perovic, Daniel Xu, Andreas Hardeman, Chris Goater and Tony Concil, **International Air Transport Association** (www.iata.org)

Sam Moore, Oliver Salmon, Philip Thomas and Henry Worthington, **Oxford Economics** (www.oef.com)

Alan Epstein, **Pratt & Whitney** (www.pw.utc.com)

Jon Hart, **Rolls-Royce** (www.rolls-royce.com)

Nancy Gautier, Claus Basse, George Triggs and Philip Butterworth-Hayes

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