

# Annual Analyses of the EU Air Transport Market 2016

Final Report

March 2017

European Commission

MOTT MACDONALD

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Mott MacDonald, Mott MacDonald House, 8-10 Sydenham Road, Croydon CR0 2EE, United Kingdom
**T** +44 (0)20 8774 2000 **F** +44 (0)20 8681 5706 **W** www.mottmac.com

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# Content

# Executive Summary

## Foreword

The European Commission has concluded annual reports since 1998 as part of its function as an observatory of the European Air Transport Industry. The reports have highlighted developments on legislative and regulatory measures and covered analysis of capacity, traffic and financial performance of airlines and airports, as well as topics such as air traffic control, environment, consumer issues and aircraft manufacturing.

This 2016 report covers latest developments in the air transport industry during 2015 and the first half of 2016. It is structured in 9 chapters covering:

- Air Traffic Trends
- Airlines
- Airports
- Aircraft Manufacturing and MRO
- Air Traffic Management
- Market and Competition Issues
- Environment and Sustainable Development
- Aviation Safety and Security
- Consumer Issues

In addition to the above chapters, the report is also accompanied by the Statistical Annex. This Annex provides in tabulated format the key data-sets analysed to support various topics reflected in this report.

This Executive Summary provides highlights of the main report.

The key highlights are:

- For 2016, global traffic was expected to grow by 6.3% over 2015, with annual passengers surpassing 3.7 billion. This growth is a slowdown from the 7.1 per cent achieved in 2015 which was the highest annual growth rate since 2010, the year following the global recession of 2008-09. This growth is against a background of global GDP growth in 2015 of around 2.4%.
- Lower air fares (on average, 5% lower in 2015 vs 2014), driven by continuously low fuel jet prices, boosted passenger traffic growth in 2015.
- Air traffic is projected to grow in the long-term, driven by global GDP growth. Annual Revenue Passenger Kilometres (RPKs) are forecast to grow over the period 2016-2035 at a rate of 4.5% pa (Airbus) and 4.8% pa (Boeing).
- The fastest growth rates are anticipated in the developing Asian, Middle Eastern, Latin American and African markets. In the more mature markets, North American is expected to grow at 2.9% pa (Airbus) to 3.1%pa (Boeing), and European is expected to grow at an average rate of 3.7% pa (both Airbus and Boeing).
- Technology advances over the last six years have changed the face of aviation, with the introduction of more point-to-point flying using advanced aircraft such as the Airbus A350 and the Boeing B787 families of efficient and environmentally-friendly twin-engine aircraft.
- Airlines globally achieved record profitability in 2015 with operating margins of at an all-time high of 8.8%, while average air fares decreased by 5% against a backdrop of fuel prices averaging 44% lower than in 2014.
- Airline consolidation continued this year, the most notable between the three US majors, resulting in evident strong performances in relation to revenues, operating profits, RPKs and passengers. Low Cost Carriers' share of total 2015 passenger volumes may stand below 20%, but compared to 2014, this presented a 3% growth. The growth of megahub airports in the Gulf region continued the fastest

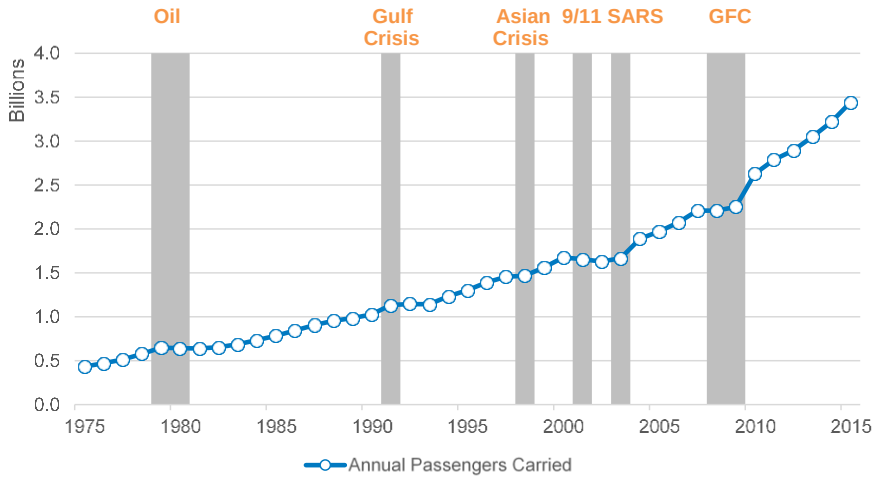
development worldwide, whilst political instability and terrorist threats in North Africa and a slowdown in commodity-driven economies hindered growth in Africa.

- Airport revenues grew by 8.2% in the most recent year reported (2014), and non-aeronautical revenues now make up 46% of total income.

## Air Traffic Trends

The number of air passengers carried worldwide grew by 6.3% to a record 3.7 billion in 2016, continuing the recovery trend since the global financial crisis on 2008/09. This growth was driven by 3.1% growth in the global economies and reductions in air fares aided by fuel prices averaging 43% lower in 2015 than in the previous year.

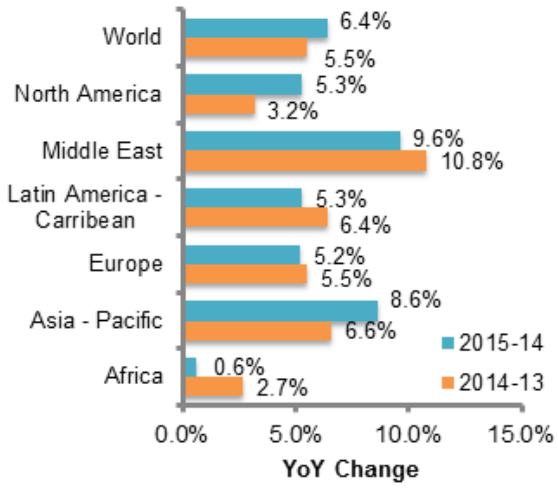
World Annual Traffic Expressed in Passengers Carried




Source: Airbus, ICAO

In terms of arriving and departing passengers handled at the world's airports, traffic reached 7 billion passengers in 2015, up 6.4% on the previous year. This was a faster rate of growth than the 5.5% seen in 2014. Growth accelerated in the North America and Asia-Pacific regions, offset slightly slower growth in other regions. The Middle East remained the world's fastest growing region with 9.6% growth driven by continued growth of the Gulf areas megahub airports, while the slowest growth was seen in Africa at 0.6% in 2015, sharply slower than in 2014 as result of instability and terrorist threats in North Africa and a slowdown in commodity-driven economies.

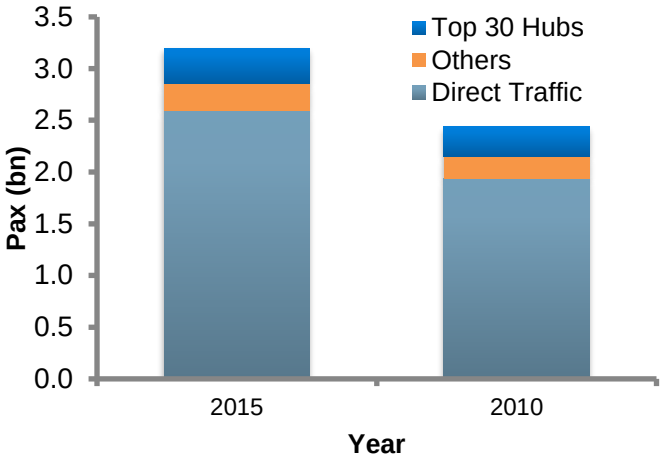
Airport Passengers Handled - Growth Rate by Region




Source: ACI World Airport Traffic Database, 2016

In the past 5 years there has been faster growth in direct air services than connecting flights – direct passengers grew at a rate of +6.0% pa between 2010 and 2015, while connecting passengers grew at a rate of +4.0% pa during the same period. This trend reflects increased use of the latest generation 'hub bypass' aircraft types, such as the Boeing 787 and Airbus 350 types now entering service.

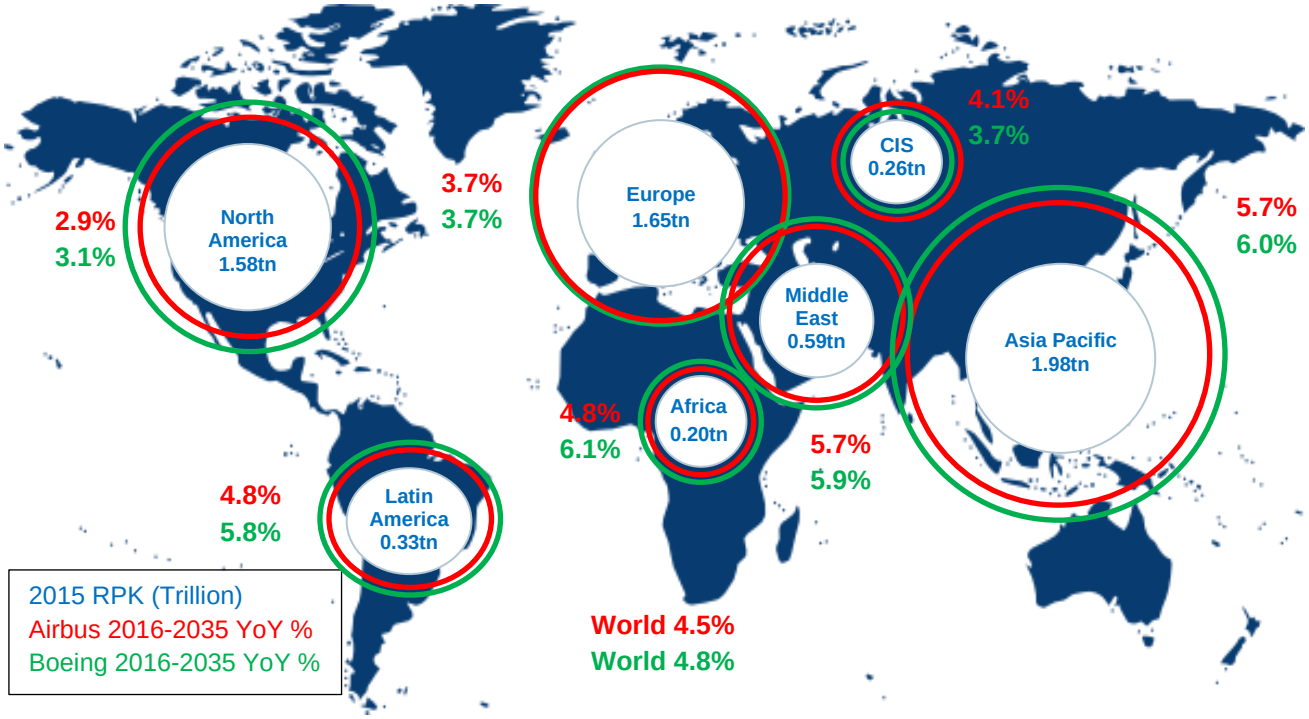
Direct & Connecting Passenger Splits (One-Way)




Source: Sabre ADI

Looking forward, global air travel measured in Revenue Passenger Kilometres (RPKs) is forecast to grow at between 4.5% pa (Airbus) and 4.8% pa (Boeing) over the next 20 years to 2035. The fastest growth rates of around 6% pa are expected in the emerging economies of the Asia-Pacific, Middle East, Africa and Latin America. The more mature European market is forecast to grow at 3.7% pa, while North America is predicted to grow at between 2.9% pa (Airbus) and 3.1% pa (Boeing).

Air Traffic Growth Projections by Region for 2016-2035

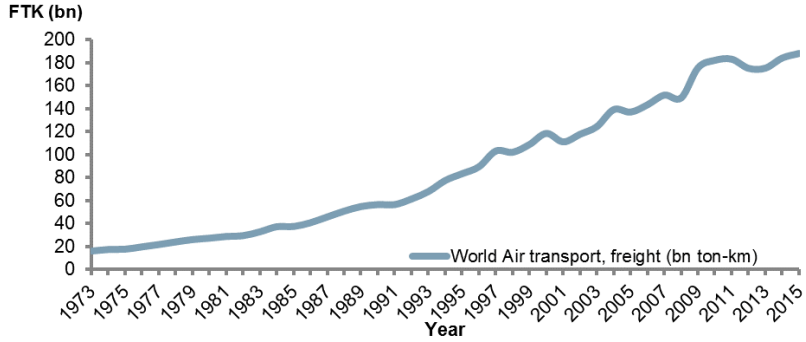



Source: Airbus/Boeing, 2016

*Air Cargo*

Global air cargo grew by a modest 2% in 2015 as growth in global trade stalled towards the middle of the year amid uncertainty emanating from Chinese manufacturing and globally weak industrial production. However, there is continued demand for the speed and reliability benefits that air freight offers. Industries that require transport of time-sensitive and high-value commodities such as perishables, consumer electronics, high-fashion apparel, and pharmaceuticals, as well as the logistics chains serving the rapidly growing e-commerce industry depend on the unique capabilities that air cargo provides and offers a new area of growth.

Global Air Freight Historic Volumes (FTK bn)

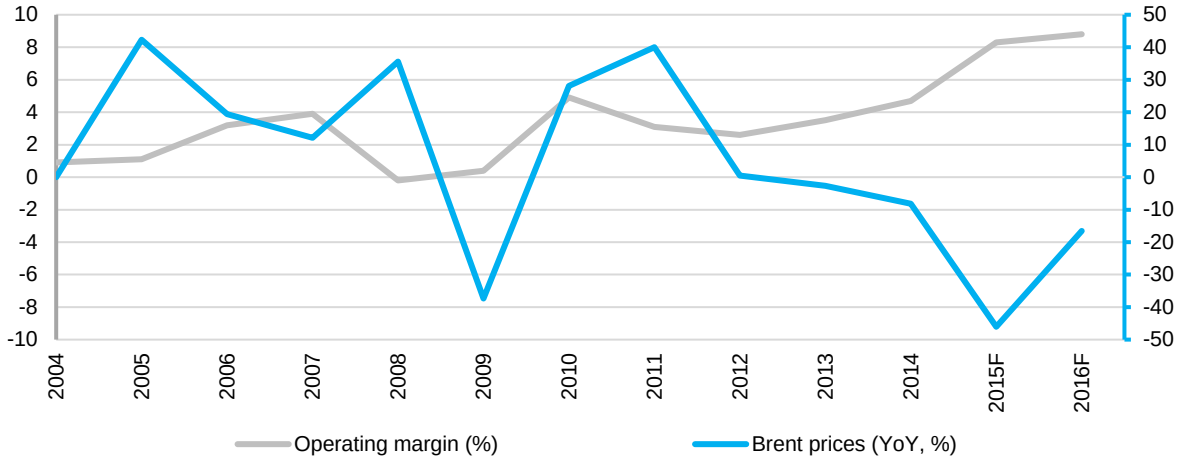



Source: World Development Indicators

## Airlines

The worldwide airline industry performed strongly in 2015, achieving record operating margins of 8.8% despite offering consumers lower air fares (on average, 5% lower in 2015 vs 2014), driven by continuously low fuel jet prices. At the same time, much of the industry also benefited from a period of relative capacity discipline. Airlines reacted to demand growth by cautiously adding capacity. Between 2014 and 2015, global market capacity increased by 5.6% compared with 6.5% passenger growth.

Airline Worldwide industry, Operating margin (%) and variation on crude oil prices, Brent (YoY %)




*Source: IATA Industry Forecast, June 2016*

US carriers have led global airline profitability in 2015. Following consolidation in the US industry, the three US majors (American Airlines, Delta Air Lines and United) are the top performers in all global rankings: revenue, operating profit, RPK and passengers. Worldwide, the operating profit reported by airlines has been increasing steadily in the past 5 years, with 18 airlines worldwide recording operating profits of more than $1bn during 2015.

European carriers also had a successful 2015. Despite low economic growth in the region (+1.6% GDP growth in the Euro zone in 2015 compared to 2014), European carriers surpassed 2014's operating profits: $7.4 billion in 2015 compared to $1 billion in the previous year. Europe's top three airlines for profitability were Lufthansa, Ryanair and IAG.

Outside of Europe and North America, Chinese carriers continued their upward momentum with Air China, China Eastern and China Southern increasing their positions in the rankings in terms of RPKs and total passengers carried. In the Middle East, Emirates was the only airline placed amongst the top 10 most profitable airlines in 2015.

Top Airlines by Airline Groups and Airlines by Operating Revenue, Operating Net Profit, RPKs and Passengers in 2015

| Top 10 groups by revenue | |
|---|---|
| American Airlines Group | $41.0bn |
| Delta Air Lines | $40.7bn |
| United Continental Holdings | $37.9bn |
| **Lufthansa Group** | $35.4bn |
| **Air France - KLM Group** | $28.7bn |
| FedEx | $26.5bn |
| Emirates Group | $25.3bn |
| IAG | $25.2bn |
| Southwest Airlines | $19.8bn |
| China Southern | $17.8bn |

| Top 10 groups by net profit | |
|---|---|
| American Airlines Group | $7.6bn |
| United Continental Holdings | $7.3bn |
| Delta Air Lines | $4.5bn |
| Emirates Group | $2.2bn |
| Southwest Airlines | $2.2bn |
| **Lufthansa Group** | $1.9bn |
| **Ryanair** | $1.7bn |
| **IAG** | $1.7bn |
| Japan Airlines | $1.5bn |
| Air China | $1.2bn |

| Top 10 Airlines by RPK | |
|---|---|
| American Airlines | 358,823m |
| Delta Air Lines | 337,264m |
| United Airlines | 335,728m |
| Emirates Airline | 255,176m |
| Southwest Airlines | 189,057m |
| **Lufthansa** | 162,173m |
| China Southern Airlines | 153,749m |
| China Eastern Airlines | 146,291m |
| **British Airways** | 142,016m |
| **Air France** | 141,207m |

| Top 10 airlines by passengers | |
|---|---|
| American Airlines | 201.2m |
| Delta Air Lines | 179.4m |
| Southwest Airlines | 144.6m |
| United Airlines | 140.4m |
| **Ryanair** | 106.4m |
| China Eastern Airlines | 93.8m |
| China Southern Airlines | 84.0m |
| **Lufthansa** | 79.3m |
| **EasyJet** | 68.6m |
| Turkish Airlines | 61.2m |

*Source: Mott MacDonald analysis of ATW*

Labour was the second-largest operating expense for airlines after fuel during 2015.

Worldwide Industry Statistics

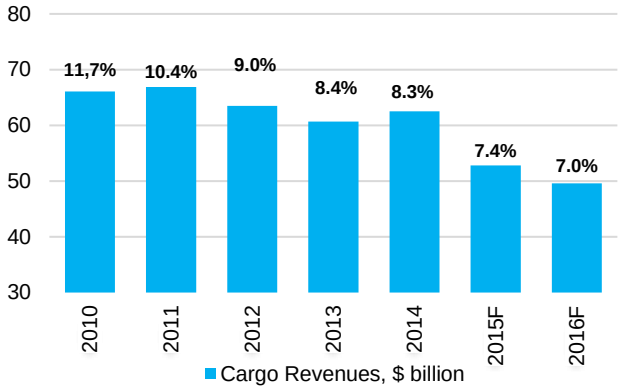
| Worldwide Airline Industry | 2014 | 2015 | 2016F |
|---|---|---|---|
| Labour costs, $ billion | 143 | 144 | 153 |
| % change over year | 4.8% | 0.6% | 6.4% |
| Employment, million | 2.47 | 2.54 | 2.61 |
| % change over year | 2.9% | 2.8% | 2.8% |
| Productivity, atk/employee | 463,996 | 479,745 | 495,912 |
| % change over year | 2.4% | 3.4% | 3.4% |
| Unit labour cost, $/ATK | 0.125 | 0.118 | 0.118 |
| % change over year | -0.5% | -5.4% | 0.1% |
| GVA/employee, $ | 95,646 | 95,143 | 100,186 |
| % change over year | 4.2% | -0.5% | 5.3% |

*Source: IATA Economic Performance of the Airline Industry, June 2016*

Airlines have generally been effective in controlling growth in labour costs and improving productivity in 2015, aided by underlying growth in traffic.

IATA estimates total employment by airlines reached 2.5 million in 2015, a gain of almost 3% compared to 2014. Productivity, measured in ATK/employee, was also higher in 2015, increasing by 3% compared to 2014, and is forecast to improve further in 2016. The average employee generated close to 480,000 ATKs in 2015. Wages and jobs also rose as employees shared the benefits of improved performance.

Worldwide Estimate of Cargo Revenues in the Airline Industry ($ bn) and % of total revenues




*Source: IATA Industry Forecast, June 2016*

With regards to air cargo, airline revenues decreased by 16% between 2014 and 2015 from $62.5 billion to $52.8 billion. The global economy softened towards the end of 2015 leading to weaker air cargo demand and downward pressure on cargo yields.

In contrast to the passenger side of the business, the airline industry freight load factor average was below the industry average for the first time since 2004. A combination of soft demand and significant capacity increases, particularly in belly-hold cargo capacity, contributed to the drop in load factor. Low freight loads directly impact yields and revenues.

## Airports

Worldwide airport revenues reached $142bn in 2014 (the latest year for which data is available), up 8.2% on previous year, on the back of strong growth in scheduled passenger traffic of 7.2%. Revenue growth was particularly strong in Latin America, Africa and the Middle East, but below the global average in Europe and North America.

Airport revenues are principally generated through aeronautical (aircraft and passenger charges) and non-aeronautical methods (terminal and landside concessions). The table below shows the trend of non-aeronautical revenues constituting a growing share of total revenues as airports seek to diversify their revenues streams.

Airport Revenue 2014 (USD m)

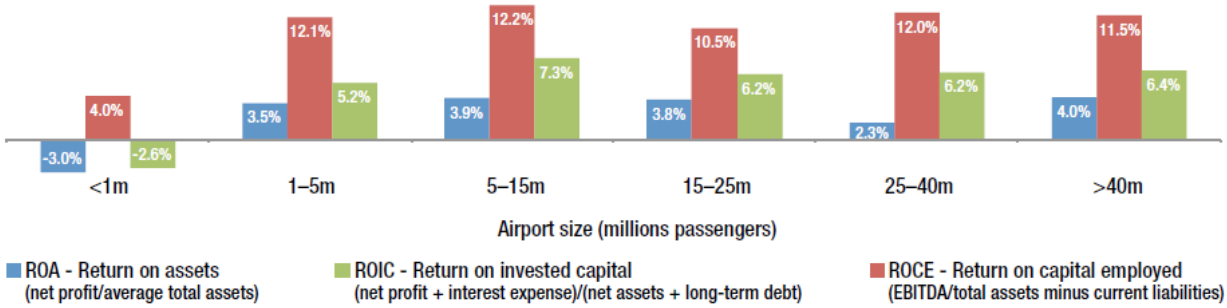
| Region | Total Revenue in 2014 | Growth vs 2013 | % Aero Revenue | % Non-Aero Revenue | Aero Rev Growth YoY | Non-Aero Growth YoY |
|---|---|---|---|---|---|---|
| Africa | 3,000 | 17.0% | 70% | 30% | 0% | 13% |
| Asia - Pacific | 41,800 | 8.3% | 49% | 51% | 10% | 16% |
| Europe | 50,800 | 7.0% | 59% | 41% | 0% | 5% |
| Latin America/Caribbean | 8,100 | 25.9% | 59% | 41% | 9% | 27% |
| Middle East | 10,900 | 13.0% | 48% | 52% | 18% | 33% |
| North America | 27,900 | 4.8% | 52% | 48% | 4% | 16% |
| **World** | **142,500** | **8.2%** | **54%** | **46%** | **5%** | **14%** |

Source: ACI Airports Economic Survey (2015)

Airport operating costs grew more slowly than revenues, by 7.3% in 2014, resulting in an overall increase in airport profitability. In 2014, Return on Invested Capital (ROIC) reached 6.3% for the industry as a whole. However, there were considerable variations depending on the region and size of the airports.

Small airports (less than 1 mppa) are markedly less profitable than larger airports, but profitability does not increase linearly with size – the most profitable airports are in the 5-15 mppa size band. Airports in emerging economies achieved 9.9% ROIC compared with 5.6% ROIC for airports in advanced economies.

Airport Returns and Size Comparison




Source: ACI 2015 Economics Survey

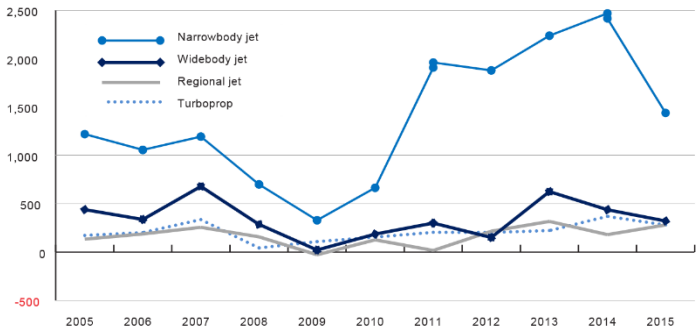
## Aircraft Manufacturing and MRO

There were 2,375 net commercial aircraft orders in 2015, down 30% on the previous years' orders. Airbus secured 1,100 new orders in 2015, down 37% on 2014 when over 1,700 orders were placed. Boeing on the other hand secured 840 new orders during 2015, a 45% reduction on 2014 (1,527 orders).

Narrowbody airliners represented close to two-thirds of total orders, although orders for these types were sharply down on previous years. Airbus secured 900 of these orders, mainly for the A320neo, while Boeing recorded 550 orders, most of them for its new 737 Max.

Despite this slowdown in new orders, both Airbus and Boeing have strong order backlogs and are increasing production rates to meet the long-run demand from airlines.

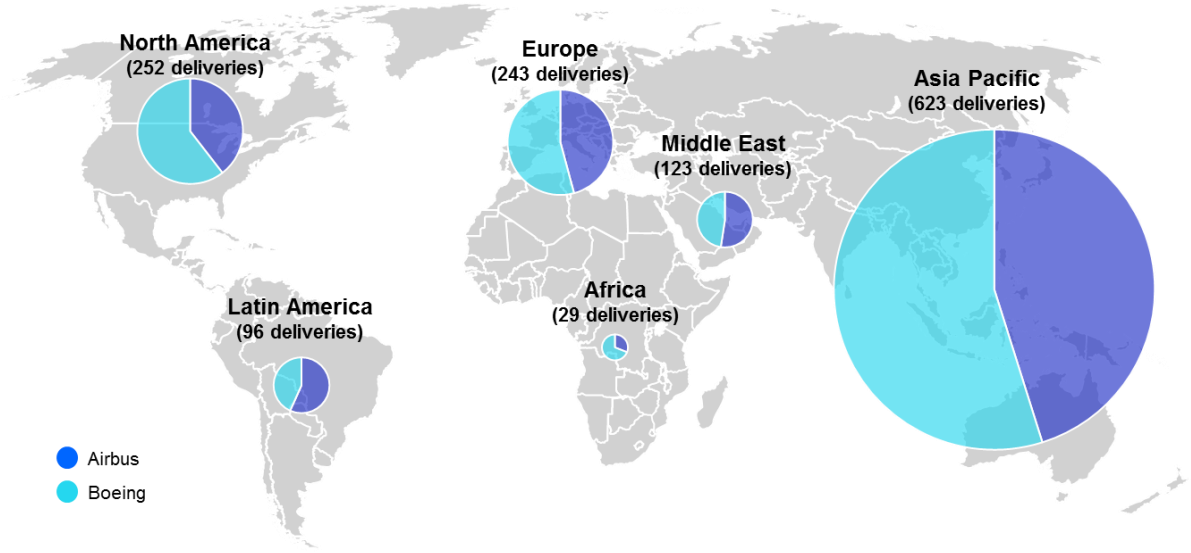
Airliner Orders 2005-2015




Source: Fleet Watch 2016, Flightglobal

Airbus and Boeing delivered 1,366 aircraft in 2015, with Boeing delivering a higher share globally and in all regions apart from Latin America and the Middle East. Of these deliveries, 46% were to airlines in the Asia-Pacific region.

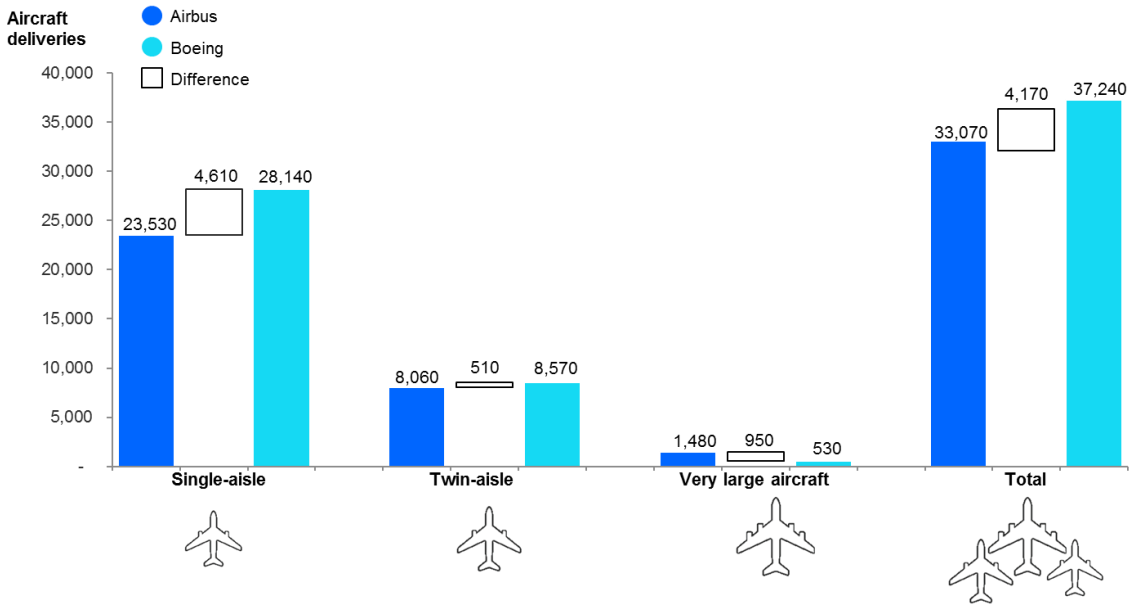
Airbus and Boeing Deliveries by Region (aircraft units) in 2015




Source: Aircraft & Engines 2016, Airline Business

Looking forward, between 2016 and 2035 growth in air travel demand is expected to result in delivery of between 33,070 (Airbus forecast) and 37,340 (Boeing forecast) new commercial jet aircraft (excluding regional jets). Airbus and Boeing broadly agree on the level of demand for wide-body aircraft, but Boeing sees greater demand for narrow-body aircraft, and only one-third of the number of very large aircraft.

Airbus and Boeing 2016-2035 Forecast Comparison




Source: Mott MacDonald analysis of Airbus Global Market Forecast 2016-2035 and Boeing's Current Market Outlook 2016

## Global MRO Activity

The global civil MRO spend in 2015 was $64.3 billion, up by 3.5% compared to the $62.1 billion spent in 2014. With the continuing growth of aircraft deliveries and the possibility of deferring older aircraft retirements (at least until low fuel prices keep reducing the economic benefits of using only new aircrafts and engines), the medium term prospect for this activity is also positive.

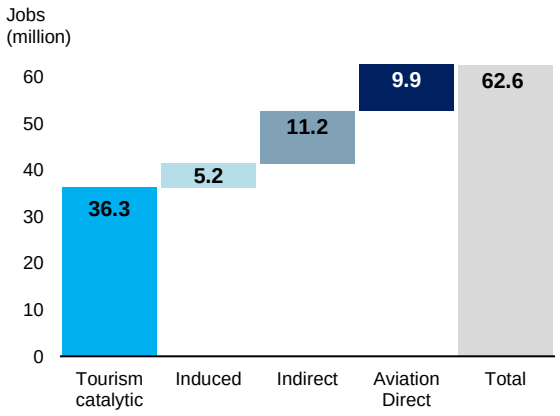
Looking at the MRO global market share by region, North America claimed the largest share in MRO activity (29%), with Asia-Pacific (28%) and Europe (26%) following close. Based on current aircraft orders, the Asia-Pacific share of the global MRO market is expected to increase and potentially become the largest global region for MRO activity in the coming years.

## Aviation's Economic Contribution

Aviation's global economic impact (direct, indirect, induced and tourism catalytic) is estimated at $2.7 trillion, equivalent to 3.5% of the world GDP in 2014. At the same time, air transport is a major global employer. The Air Transport Action Group (ATAG) reports that the air transport industry indirectly generates more than 62 million jobs globally.

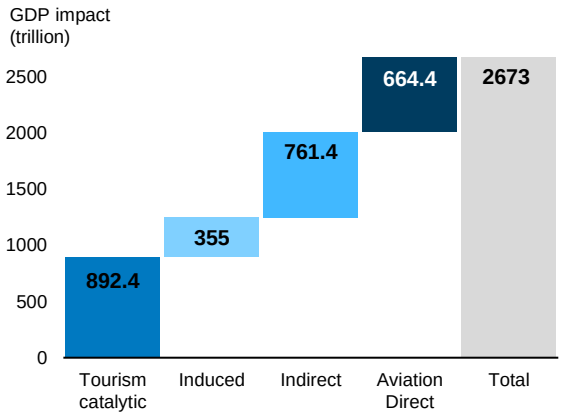
Directly, the industry employs over 450,000 people working for airport operators, over 5.5 million working for other on-airport business (such as retail, car rental, freight services, etc.); close to 2.7 million are employed by airlines and over 1.1 million are working in civil aerospace for air navigation service providers.

Aviation Global Employment Impact, 2014 (latest report)




Source: Aviation Benefits Beyond Boarders, ATAG

Aviation Global GDP Impact, 2014 (latest report)




Source: Aviation Benefits Beyond Boarders, ATAG

## Air Traffic Management

Considerable progress was made in the development and global harmonisation of ATM technology in 2015 and this continued in 2016. This contrasted with a lack of change in the political and regulatory framework in the industry. The costs of this and importance of ATM were highlighted in several economic studies sponsored by airspace users.

Both the SESAR programme in Europe and NEXTGEN in the United States continued research and demonstrated innovative ATM solutions in the en-route and terminal airspace domains and increasingly including airports as part of the emerging network based future trajectory based management systems. Similar initiatives are occurring in Asia, the Middle East, Africa and South America as states fulfil the requirements of the ICAO Global Navigation Plan Block Upgrade Programme. However, the key strand is one of incremental implementation over a long period rather than large scale change in a short time frame. The change is coming from the deployment of particular key enablers such as ADS-B, PBN, datalink, SWIM and new trajectory based flight data processing systems. In addition, safely accommodating and enabling access to airspace for unmanned aerial systems and drones has become an urgent part of the research and deployment streams

2016 was marked in the US by a rejection of transforming the air traffic organisation of the FAA into a NAVCanada style not for profit entity. In Europe minimal progress was made in realising further provisions of the Single Sky legislation. However, as air traffic rebounds in and between both continents, ATM deployment is not being impaired by this lack of political change. In the US, upgrades to the national airspace system are being rolled out as incremental deployment of NEXTGEN technology and in Europe, SESAR had moved firmly into deployment with corresponding funding in line with the ATM Master Plan.

2016 saw Aireon make final preparations for the deployment of the initial phase of its space based ADS-B global surveillance programme and signed additional agreements with ANSPs. This is set to revolutionise CNS across the oceans and remote areas from 2018 as well as fulfilling ICAO and IATA requirements for enhanced tracking following the 2014 failings.

Cooperation between SESAR, NEXTGEN and other upgrade programmes in other states are increasingly leading to a harmonised development of global ATM which together with such initiatives such as Aireon, are going to revolutionise future ATM for the benefit of all airspace users.

## Market and Competition Issues

One key factor influencing the EU's aviation development is the Commission's Aviation Strategy document which has both focused regulatory activity in the field of aviation on common macro-economic objectives. The EU Aviation Strategy thereby also underpins the broad impact of aviation on connectivity for regions, international competitiveness of the European industry and thereby takes a new EU "holistic" approach to aviation.

Within the EU, the Commission's Aviation Strategy has triggered a political debate amongst Member States about the need to secure connectivity for their respective national interests – these national interest find their limitations in the State Aid Guidelines. The analysis of the key decisions taken by DG COMP in the Reporting Period shows that the recently modified Guidelines are evidently applied on each case, on the basis of a consistent policy. However, the application of the Guidelines does not always reflect the thrust of the Aviation Strategy. The market issue facing airlines and governments from peripheral regions or thinner, underserved markets is whether the Guidelines could not become one of several regulatory instruments to improve connectivity in otherwise underserved markets.

Internationally, the Commission's Aviation Strategy has shifted the focus from increasing the number of Open Skies agreements of the EU to more comprehensive agreements with key destination areas which not only improve market access opportunities, but seek to ensure fair competition within these markets. Such negotiations are currently undergoing.

The market is beginning to see structural changes. For European financial and strategic investors to be even more attracted to investments, the Aviation Strategy recognises the need for interpretative Guidelines on Ownership and Control restrictions. In the international markets, new structured for commercial co-operation are being developed by airlines and airline groups, which likewise will require regulatory attention.

The Aviation Strategy has placed the EU aviation policy on the political radar internationally.

However, disruptive challenges appeared in the wake of the UK referendum on the leaving the EU. The new US Administration has likewise given rise to uncertainty on how the US will position itself on future international trade agreements and whether it will continue to pursue a market-oriented aviation policy.

2016 was thus a year of progress, both in terms of delivery on the targets set forth in the Strategy paper, as well as increased growth of the sector albeit amidst structural changes; 2017 is thus far too uncertain to warrant substantiated forecasts.

## Environment

Aviation delivers social and economic benefits to European citizens and to citizens across the world. However, these benefits come at an environmental cost. Improvements in technology have mitigated some of aviation's environmental impacts, however environmental issues remain. Chapter 7, Environment and Sustainable Development, provides an overview of the main environmental and sustainability issues faced by the sector, and how these are being addressed though initiatives and technologies during 2015.

During 2015 there were numerous advances in climate change mitigation. Significant progress towards a global Market-Based-Mechanism (MBM) for managing carbon emissions was made at the International Civil Aviation Organisation (ICAO). Research into more efficient Air Traffic Management (ATM) was undertaken under the SESAR research program, and research into new technologies intended to provide more efficient engines, and reduced drag were undertaken under the Clean Sky research program. Airports continued to join the Airport Carbon Accreditation program, which aims to reduce carbon and increase airport sustainability, and progress on bringing alternative jet fuels to market continued.

Air quality issues also continued to be important for airports. In the UK, the debate about airport expansion in the South East continued to be influenced by air quality issues. In the rest of Europe airports implemented projects to improve air quality ranging from electric air side vehicles, to promoting model shift in travel to airports. Noise has also been an issue for airports. In 2015 the EC launched a consultation on the evaluation of the Environmental Noise Directive (END) (2002/49/EC), which will impact upon the management of noise by airport, and EC's Science for Environment Policy published a document capturing the latest research on 'Noise impacts on health'.

At European level, the Advisory Council for Aeronautics Research in Europe (ACARE) represents 40 members including the EC, as well as airlines, airports, regulators and research establishments. ACARE's environmental research is driven by five goals to be achieved by 2050. These are:

- $CO_2$ emissions per passenger kilometre reduced by 75%, NOx emissions by 90% and perceived noise by 65%, all relative to the year 2000.
- Aircraft movements are emission-free when taxiing.
- Air vehicles are designed and manufactured to be recyclable.

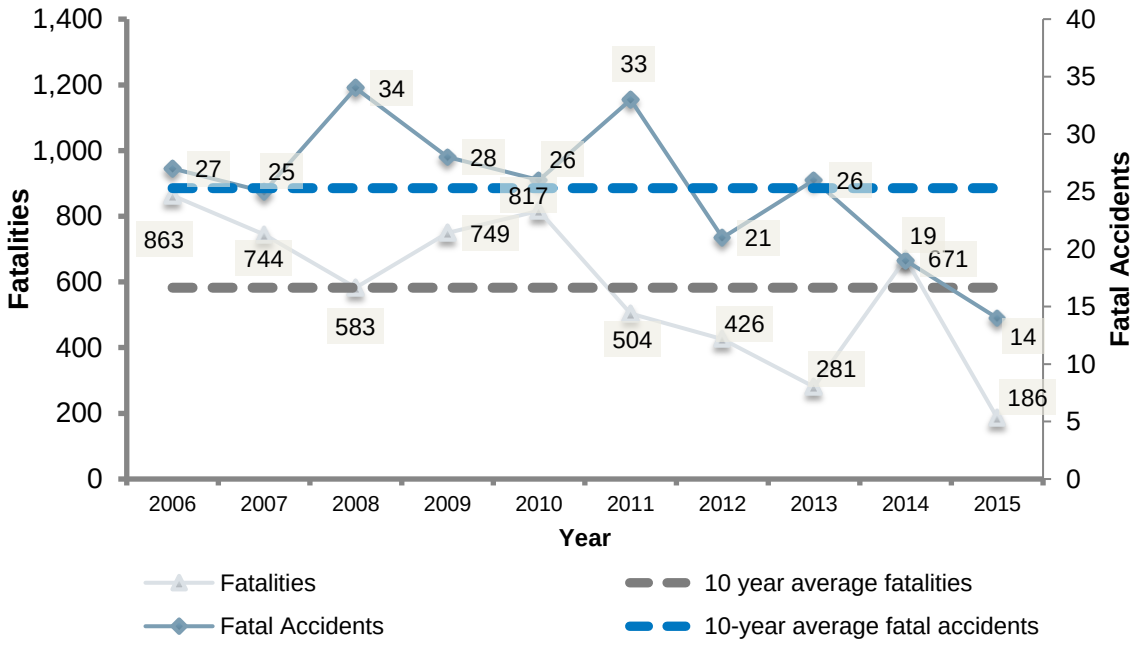
- Europe is established as a centre of excellence on sustainable alternative fuels, including those for aviation, based on a strong European energy policy.
- Europe is at the forefront of atmospheric research and takes the lead in formulating a prioritised environmental action plan and establishes global environmental standards.

## Security and Safety

### Safety

In 2015, there were in total 186 fatalities from 14 accidents, of which there were no fatal accidents involving jet aircraft. This makes 2015 the safest year in history. These statistics exclude the Germanwings co-pilot suicide and the MetroJet mid-air explosion following takeoff from Sharm-el- Sheikh airport deemed to be "fatal and non-fatal self-inflicted injuries or injuries inflicted by other persons". Following the Germanwings accident, the "2-persons-in-the-cockpit" rule was revisited and reconfirmed. Questions also arose with regards to the adequacy of the processes for the evaluation of the psychological state of pilots.

World Commercial Airline Fatal Accidents and Fatalities 2006 to 2015




Source: Flightglobal, IATA

### Security

One Stop Security (OSS) is a bilateral agreement between countries which recognises the security standards and level of each other as equal. As a result, passengers arriving from one of the countries to transfer in the other towards their final destination do not need to be security screened an additional time. EC Regulation 2015/1998 introduces these standards and consolidates all amendments to its predecessor. It provides for the signing of future OSS agreements and regulates the process of auditing countries which apply for their security level to be recognised as equal to the one of the EU.

Another example of other countries seeking EU expertise is the ACI-Europe initiated a programme named "Airport Twinning". Under this programme an EU Member State will pair with a non-EU Member European State by seconding airport security staff to the partner country's airports. The aim is to improve the security measures and prepare the non-EU Member State for the audit of the EC, which will determine whether its security standards will be accepted as being equal to those of the EU. IATA also ran a series of training activities in Africa which aimed at promoting and standardising aviation security practices and educating personnel across the continent.

## Consumer Rights – Air Passengers

Regulation (EC) No 261/2004 is considered as central legislation on air passenger rights. Since its enactment in 2005, the Regulation has been subject to continuous scrutiny by the European Court.

The EC adopted guidelines on 10 June 2016 which aimed to improve the clarity of the passenger rights rules, ensure a better application and consistent enforcement by carriers and Member States and finally achieve a fairer market. This aim was also incorporated into the Aviation Strategy for Europe.

In addition, ICAO adopted its core principles on air passenger protection in 2015. These should serve ICAO member states as guidance when developing air passenger legislation. ICAO's core principles comprise fundamental recommendations and rights before, during and after travelling, including the provision of information at the airport, the communication in the event of disruptions and complaint handling.

# 1. Air Traffic Trends

## 1.1. Introduction

Preliminary figures released by the International Civil Aviation Organization (ICAO) indicated that the total number of passengers carried on scheduled services reached 3.7 billion in 2016, a 6.0 per cent increase over 2015. Global traffic, expressed in terms of total scheduled revenue passenger-kilometers (RPKs), posted an increase of 6.3%, while (GDP) growth in 2016 was expected to be at around 2.4%[1].

For the global aviation industry, 2015 was an exceptional year in terms of traffic growth and improved industry performance indicators. Despite differences in economic growth across the globe, overall the airline industry performance was greatly assisted by a 20% reduction in fuel costs, as fuel prices were on average 50% lower than in 2014.

Airline passenger traffic (measured in RPKs) grew at +7.4% in 2015[2], compared with global GDP growth of +3.1%. The International Air Transport Association (IATA) reported that airlines sustained record load factors exceeding 80% on average, as capacity grew only by +6.7% year on year[3]. Demand growth outpaced capacity in all major world regions except for the Middle East, where double-digit traffic growth was surpassed by even higher capacity additions.

For 2015, global passenger **airport throughput** was +6.4% higher than in 2014. From a regional perspective passenger growth in 2015 accelerated in regions such as Asia-Pacific and North America with growth of +8.6% and +5.3% respectively. However, the "sluggish" economic growth and the topical safety and security concerns have contributed to a slowdown of growth in Europe (+5.2%), Latin America (+5.3%) and especially Africa (+0.6%). Finally, the Middle East grew at a similar rate (+9.6%) in 2015 as in 2014, as strong growth rates were witnessed at the major long-haul hubs in the region.

2015 was another challenging year for air cargo, as subdued growth of emerging markets, paired with a slowdown of Chinese imports, exports and manufacturing activity resulted in a +2.6% growth of total cargo volumes for the year. Middle East was the only region to avoid this slowdown in cargo volumes (+9.9% up year-on-year (YoY)), while the Brazilian recession has contributed to a decline in cargo volumes for Latin America (-1.3%).

Finally, 2015 has noted a small decrease in flight activity of business aviation in Europe and a slow growth of the sector in the US market, with both trends set to continue in 2016, according to preliminary market indicators. While healthcare flight operations have shown a growth in recent years, industries such as manufacturing, construction and power & energy are the key contributors to the decline in average flight hours.

The purpose of the first section of this report is to:

- Examine the performance of the global and regional commercial aviation activity for the year 2015
- Identify the key drivers of air traffic growth historically, focusing on the past year

[1] http://www.icao.int/Newsroom/Pages/traffic-growth-and-airline-profitability-were-highlights-of-air-transport-in-2016.aspx

[2] IATA

[3] Boeing Current Market Outlook 2016-2035

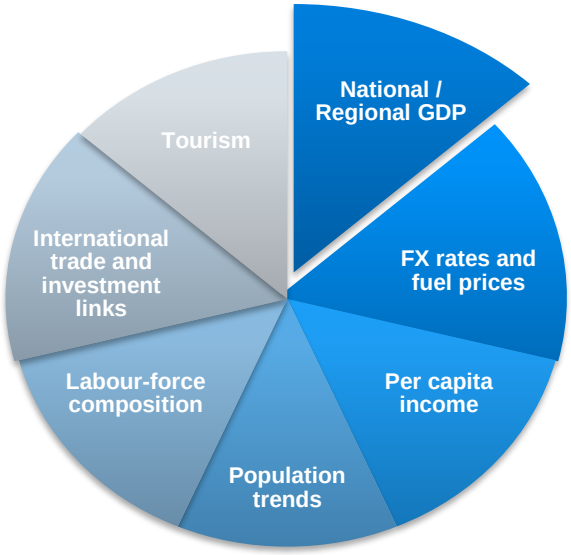
- Summarise the projections for air transport growth at a regional and global level, as well as its implications
- Analyse the performance of airlines, airports and manufacturers over the past year.

## 1.2. Air Traffic Drivers

According to Boeing, in their 2016 Current Market Outlook, the various influences on a region's air-travel growth can be grouped into three categories: economic activity, ease of travel, and local market factors. These groups explain both the demand and supply impact on air travel. Some factors of market demand, such as GDP, are easy to quantify, but others (for example, liberalization) are more difficult to assess but can have a significant effect on market performance[4].

Economic activity is the most easily understood and quantified key factor in traffic flows. Figure 1 highlights key metrics included in this category.

Figure 1 - Economic Activity Components that Affect Air Travel Demand




Source: Mott MacDonald

A second important driver of air traffic is ease of travel. Ease of travel is a factor that can experience improvements in many ways. Some of the more common examples include more open air services agreements between countries, such as the 2015 revised US-Mexico agreement; Liberalized domestic-market regulations; Emerging technology such as new airplanes enabling new routes; Business-model innovation as found in the low cost airline model; Airline-network improvements in nonstop city pair connectivity or the launch of a new base by a low cost carrier.

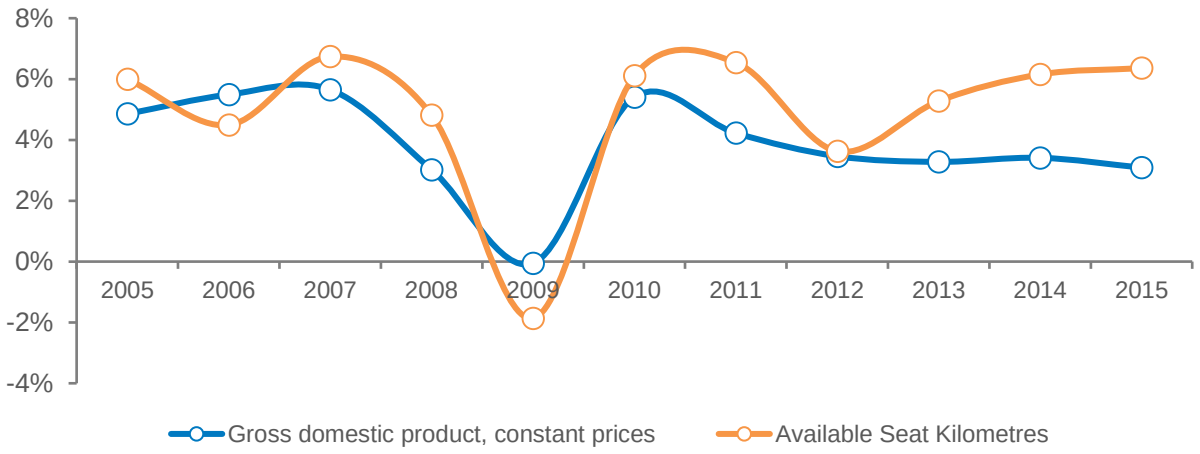
Local markets as a factor in forecasting air travel flows is not directly related to either macroeconomic trends or ease of travel, but its impact on air travel growth can be considerable. Examples of the latter can be found in the US domestic market airline consolidation or in congestion at specific airports that impedes additional growth.

[4] Boeing Current Market Outlook 2016-2035

## Relationship of GDP Growth to Air Travel

Amongst the drivers of air traffic demand, economic growth is the primary driver of demand, both as it largely explains past performance and it forms the basis of forecast continued growth. Figure 2 shows the correlation of Gross Domestic Product (GDP) and air traffic growth, measured in Available Seat Kilometre (ASKs) flown. In recent years, air travel has grown significantly more rapidly than growth in GDP.

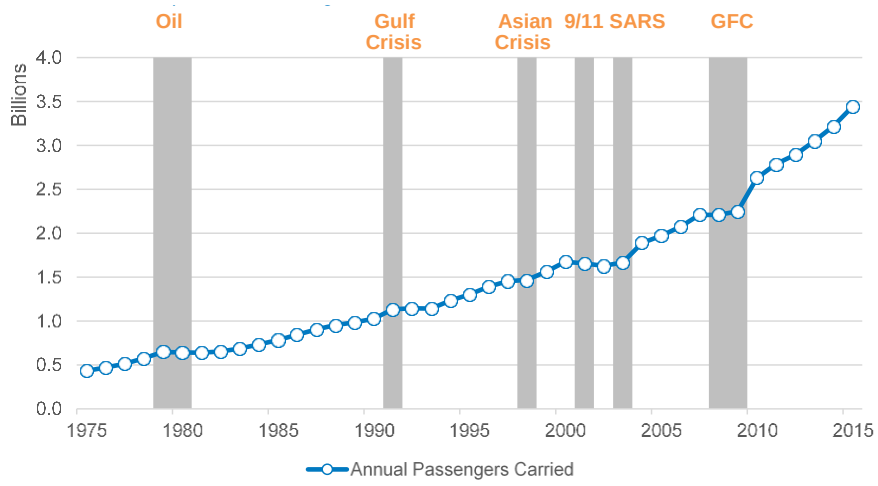
Figure 2 - Relationship of Real GDP and Air Travel




Source: IMF and SRS Analyser, 2016

However, there is a risk of overstating economic activity as a driving force to air traffic growth, especially during a downturn, as Figure 3 illustrates below. Although the air transport industry is subject to occasional market shocks, the industry's demand is resilient; services are often seen as essential, and spending on discretionary trips for vacations or family events is frequently high priority. Over the past 30 years, the aviation industry has experienced recessions, oil-price shocks, near pandemics, wars, and security threats, yet traffic has continued to grow on average at 5 percent annually.

Figure 3 - World Annual Traffic Expressed in Passengers carried




Source: Airbus, ICAO

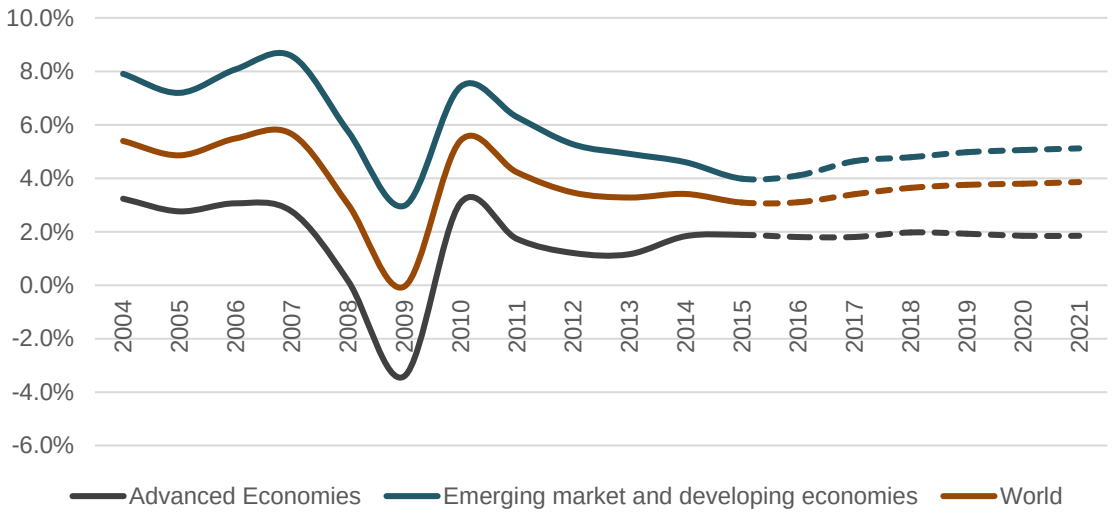
## GDP Projections – Short and Medium Term

Global economic expansion is expected to continue, with regional challenges that will contribute to an overall modest growth. In the past, emerging markets have driven economic growth, but there are now some regional divergences from this trend. In the short term, the outcome of the UK vote to leave the EU (also widely referred to as Brexit), which appeared to surprise global financial markets, implies the materialization of an important downside risk for the world economy.

As a result, according to the International Monetary Fund (IMF), the global outlook for 2016-2017 has worsened, despite the better-than-expected performance in early 2016[5]. This deterioration reflects the expected macroeconomic consequences of uncertainty, including on the political front. This uncertainty is projected to affect business confidence and investment, as well as have repercussions on financial conditions and market sentiment in general.

Regarding Brexit, the initial financial market reaction was severe but generally as projected by most economists. As of mid-July 2016, the GB pound has weakened by about 10%, despite some rebound after the initial shock, while equity prices in some sectors and yields on safe assets have both declined.

Figure 4 - Real GDP Growth of Emerging and Advanced Economies




Source: IMF, 2016

Brexit-related downwards revisions are concentrated in advanced European economies, with minimal impact elsewhere, including the United States and China. Pending further clarity on the exit process, the IMF's latest baseline update reflects a gradual reduction in uncertainty going forward, with arrangements between the European Union and the United Kingdom to avoid a large increase in economic barriers and major financial market disruptions.

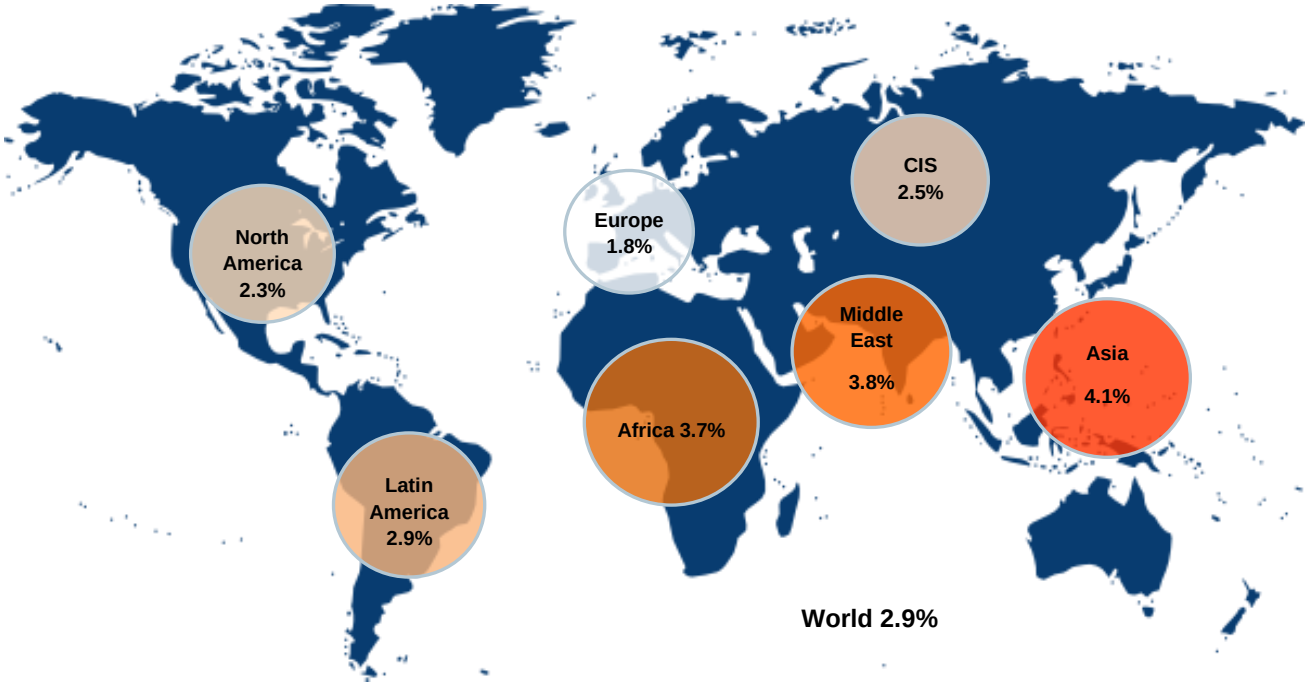
## GDP Projections – Long Term

For the long term economic outlook at a global and regional level, recent forecasts agree that structural transformation and policy reforms are the key drivers that will allow for the necessary industrial capacity and global trade that will ensure a sustained economic growth in the long term. IHS Economics (which forms the

[5] IMF World Economic Outlook July 2016 Update

basis for the Boeing, Airbus, Bombardier and Embraer long term forecasts) and the Japan Aircraft Development Corporation (JADC) in their Worldwide Market Forecast both project global economic growth of 2.9% per annum for the period of 2016-2035 (Figure 5).

Figure 5 - IHS Economics Projections of Real GDP Annual Growth by Region for 2016-35

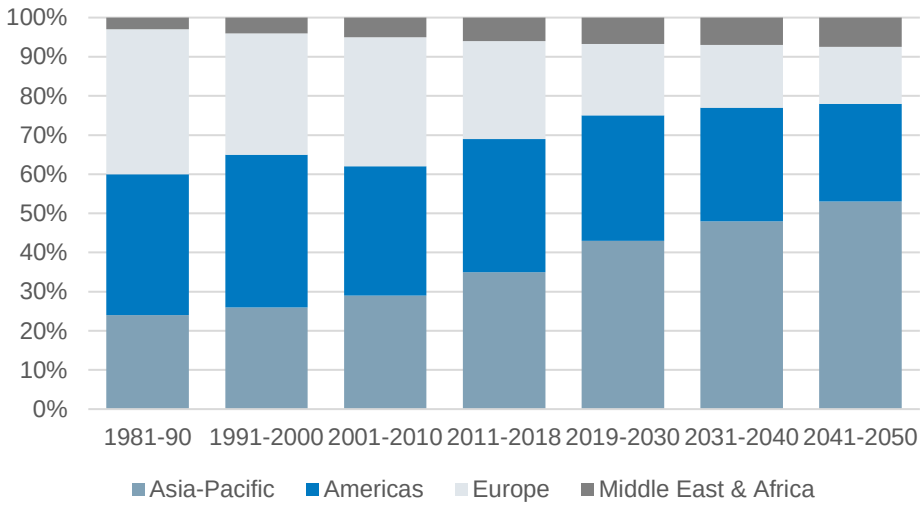



Source: IHS Economics for Boeing CMO 2016-2035

The Economist Intelligence Unit kept its estimations on the global economic long-term outlook during 2015 and stays with its assumption about the continuing economic prosperity across the Asian Pacific region, which is expected to account for over 50% of global GDP by 2050. Further growth is also projected in Africa, almost reaching a 10% share in global GDP by 2050. In light of this expansion, the share of Europe and America decline, Figure 6. Overall, worldwide GDP is projected to grow at an average rate of around 2.5% between 2020 and 2030. However, this is forecasted to decrease to 2.1% between 2030 and 2040, while another slowdown is expected until 2050, assuming an average growth rate of 1.8%[6].

[6] EIU Global Forecasting 2050 – Long-term key trends

Figure 6 - Regional Share of Global GDP




Source: Economist Intelligence Unit, 2016

## GDP per Capita

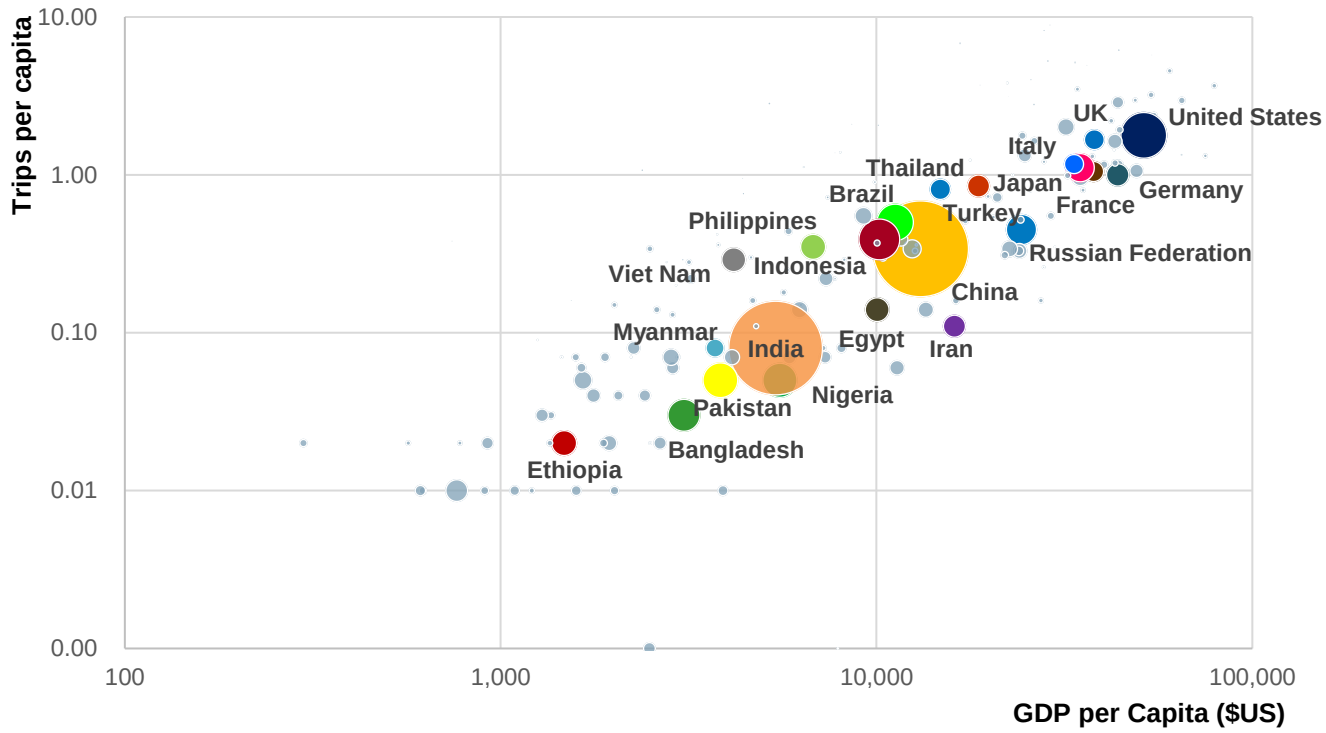
Another useful economic indicator for air travel demand is per capita income, which is a measure of disposable income and correlates strongly with a country population's propensity to fly. Within a given region, propensity to fly as measured in number of trips or in revenue passenger kilometres (RPK) that generally increase with per-capita income.

Generally, markets that are more open are more responsive to changes in per capita income because airlines are freer to add routes, frequencies, and seats to capture demand. In a more regulated environment, demand may increase with GDP per capita, but lower service quality and higher pricing may restrain travel growth. Geography may also influence travel within a region, with islands or poorly connected land masses necessitating more air travel. Emerging countries are developing large new middle class populations through increased GDP per capita and wider distribution of wealth. This means that more people in developing countries are reaching the threshold of wealth where discretionary air travel becomes possible.

Demand for air travel continues to increase rapidly when GDP per capita reaches about $5,000 to $10,000[7] per annum. Figure 7 shows the relationship of trips per capita to the GDP per capita by country, with bubble size proportionate to the country's population.

[7] JADC Worldwide Market Forecast 2016-2035

Figure 7 - Propensity to Fly in 2015 (logarithmic scale)




Source: Sabre, WBG, IHS, Airbus, 2016

## Fuel Price

For air travel, lower fuel costs lead to increased airline profitability and reduced air fares. The recent drop in oil prices has, therefore, helped to stimulate growth in air travel and is likely to create a net positive impact for the global economy. Although effects differ from country to country, lower oil prices represent a net gain for global economic growth as resources are shifted to more efficient economies on average, and consumer spending is stimulated in the world's largest oil importing economies[8].

Spot prices of Brent Crude Oil dropped 73% (from $111.80/barrel in June 2014 to USD30.7/barrel in January 2016[9]), and the price of jet fuel (USA, spot price) also dropped by 68% (from USD2.88/gallon in June of 2014 to USD0.93/gallon in January of 2016[10]). In 2015 the average annual price was USD1.53/gallon or 43% lower than the USD2.70/gallon in the previous year, so airlines have reduced or abolished their fuel surcharges. These price falls are due to a combination of the following factors:

- economic growth deceleration of China and decreased demand for crude oil in emerging countries;
- the US government lifting the ban on exports of crude oil following industrialization of shale oil;
- Iran restarting exports of oil after it was released from economic sanctions;
- increased production of crude oil in non-OPEC countries; and,
- OPEC has postponed coordinated production cuts.

[8] Boeing Current Market Outlook 2016-2035

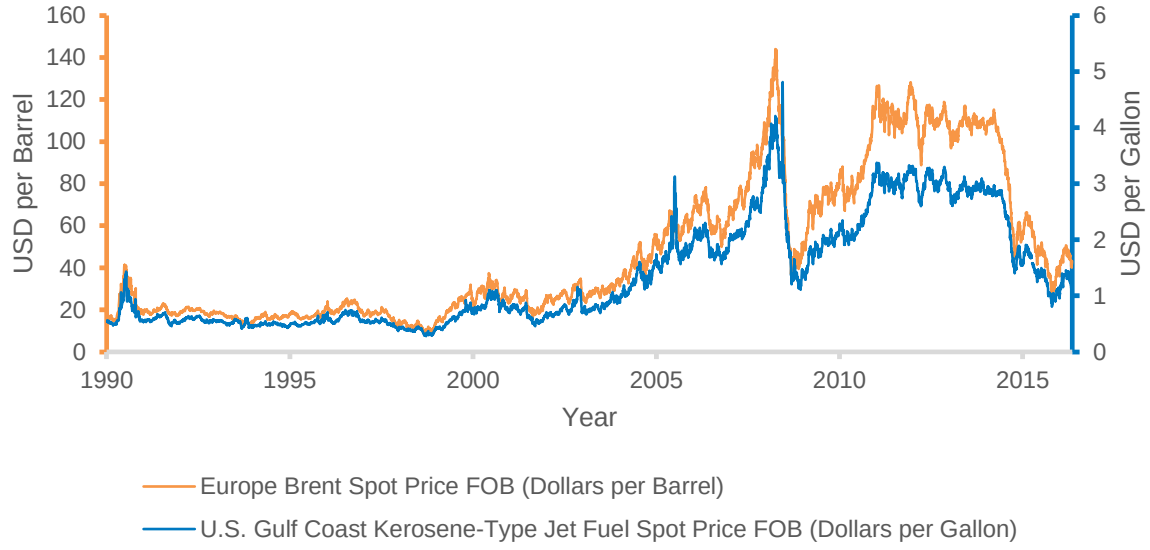
[9] JADC Worldwide Market Forecast 2016-2035

[10] JADC Worldwide Market Forecast 2016-2035

Most advanced economies, such as those of the United States and the European Union, benefit from the lower cost of commodity imports and see their economies driven by strong consumer spending. The same applies to China and other emerging economies with growing middle classes, where consumption remains strong and supportive of air travel growth.

On the other hand, many emerging markets that are more dependent on export revenue from natural resource extraction are seeing increased economic pressure. In many cases, declining export revenue goes hand in hand with slower GDP growth, increased capital outflow, and depreciated exchange rates. In several countries, political uncertainties exacerbate the fragile economic situation and further reduce near-term growth prospects by lowering investment incentives.

Figure 8 - Historic Relationship of Brent Crude Oil Price and Aviation Jet Fuel Price




Source: U.S. Energy Information Administration

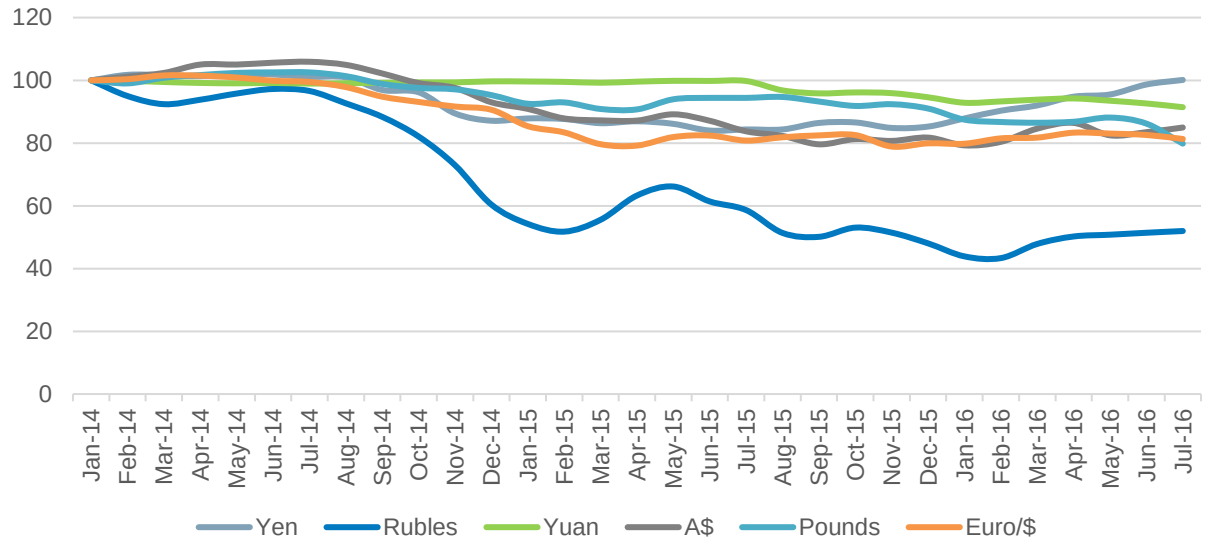
It is difficult to predict the trajectory of fuel prices in the future. However, the past year of sustained low prices, despite prolonged and substantial political upheaval in 2015, will give added confidence for that trend to continue for the medium term.

## Market Exchange Rates

There have been significant exchange rate changes in the past year, with most notable the recent sharp decline of the British pound, following the decision of the UK to exit the European Union. The impact that this would have on air travel is more clear-cut than the economic effects. The weaker pound has immediately made outbound trips for UK inhabitants more expensive (because a given amount of GBP will now buy less goods and services overseas). At the same time, for overseas visitors to the UK, their local-currency earnings will now stretch further than they did previously.

Consequently, the Euro also weakened against the US Dollar while the general economic conditions and impact of lower oil prices has kept the Russian Ruble depressed. In some regions, this currency volatility tempers the near-term benefit of lower fuel prices on consumer spending, as the cost of visiting destinations with a stronger currency are increased. At the same time, passengers on the opposite travel flow will benefit from this change.

Figure 9 - Exchange Rate Indices of Key Currencies to USD




Source: OANDA.com, 2016

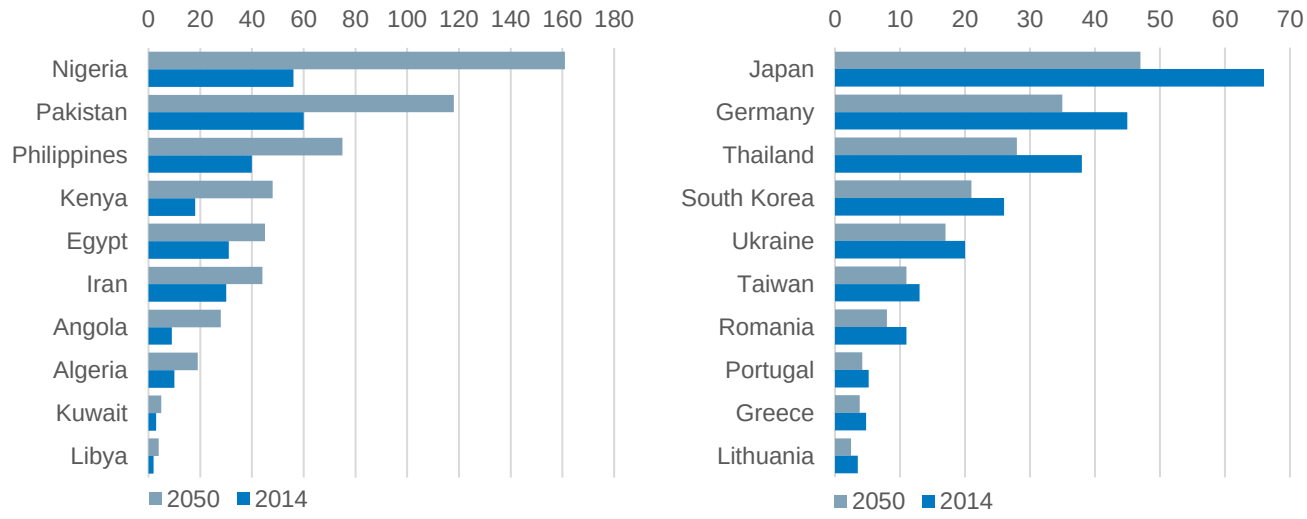
## Demographics

The Economist Intelligence Unit projects that populations will grow at a gradually decreasing rate through to 2050[11]. The decreasing growth rate is more pronounced for working-age populations, reflecting a global trend towards aging populations as already seen in Europe and Japan.

These changes in working age populations are shown in

Figure 10 for the top 10 countries with the largest increases, left graph, and decreases, right graph, in projected labour force between 2014 and 2050. These demographic changes affect both the overall GDP growth rates and growth in demand for air travel.

Figure 10 - Top 10 Largest Projected Increase and Decrease in Labour Force (in Billion)

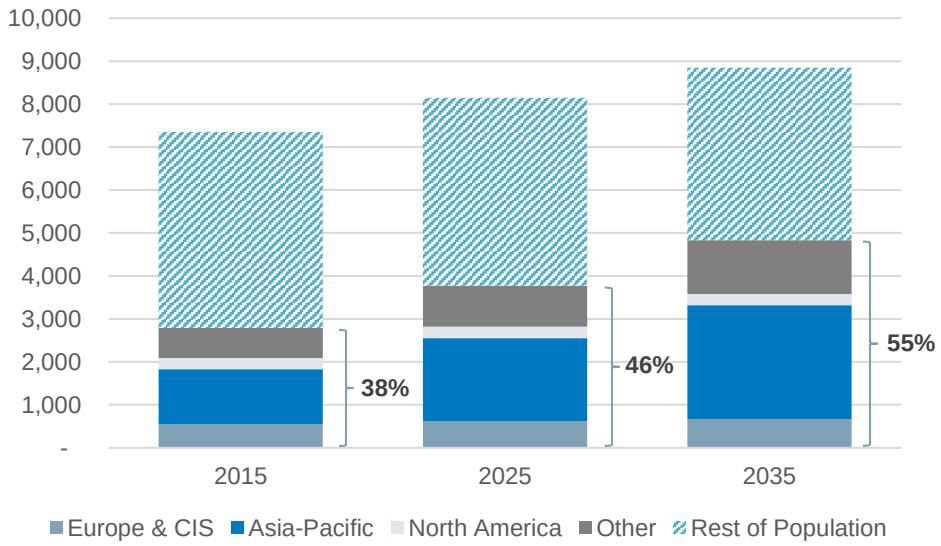



[11] EIU Global Forecasting 2050 – Long-term key trends[11]

Source: Economist Intelligence Unit

The growth of working age population is expected to have a major impact on the expansion of the middle class population of emerging economies, as is identified by Airbus and Oxford Economics on Figure 11.

Figure 11 - Middle Class Population's Regional Breakdown (millions) and Share of World Population – Present and Forecast




Source: Oxford Economics, Airbus GMF 2015

## Tourism

According to the UN World Tourism Organisation (UNWTO), tourism has grown almost uninterrupted over time, despite occasional shocks, demonstrating the sector's strength and resilience. The number of international tourist arrivals (overnight visitors) in 2015 increased by 4.6% to reach a total of 1.186 million worldwide, an increase of 52 million over the previous year[12]. It was the sixth consecutive year of above-average growth in international tourism following the 2009 global economic crisis.

In 2015, slightly over 50% of overnight visitors travelled to their destination by air, while the remainder travelled by surface transport, predominantly by car. The trend over time has been for air transport to grow at a slightly faster pace than surface transport. Travel for holidays, recreation and other forms of leisure accounted for just over half of all international tourist arrivals in 2015 (53% or 632 million).

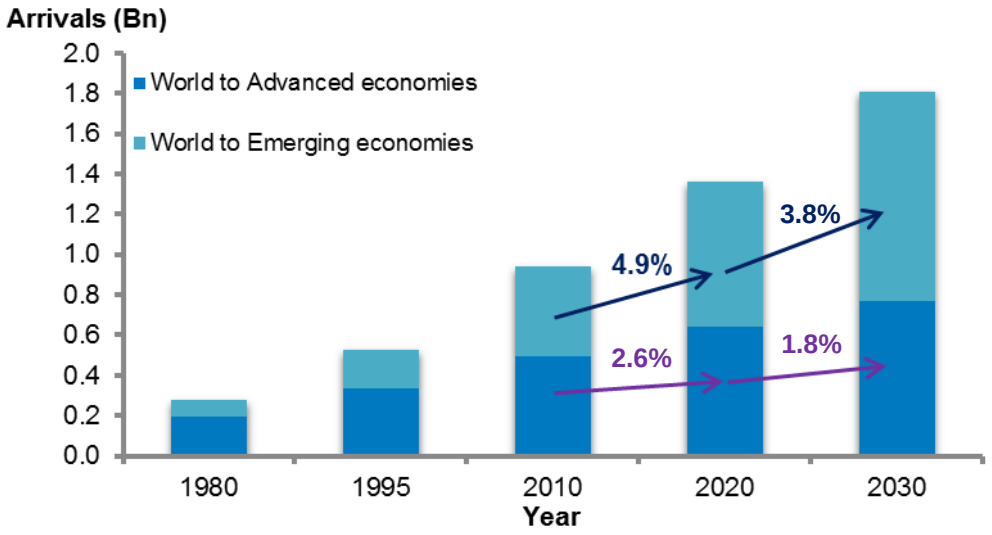
France, the United States, Spain and China continued to top the rankings in both international arrivals and receipts. In receipts, China continues to lead global outbound travel, after registering double-digit growth in tourism expenditure every year since 2004, benefitting Asian destinations such as Japan and Thailand as well as the United States and various European destinations. Spending by Chinese travellers increased by 26% in 2015 to reach USD292 billion, as the total number of outbound travellers rose by 10% to 128 million[12].

In their Tourism Highlights 2016 Edition, the UNWTO has not drastically revised its long-term projections on international tourist arrivals. Overall, international tourist arrivals are assumed to grow at an annual rate of 3.3% between 2010 and 2030, reaching 1.8 billion tourists. As illustrated in Figure 12, the majority of growth

[12] UNWTO Tourism Highlights 2016 Edition

is still expected to occur in emerging economies, which are estimated to record a 2.2% annual growth in international tourist arrivals between 2010 and 2030, reaching 1 billion tourists. This would be equal to 57% of global international tourist arrivals[12].

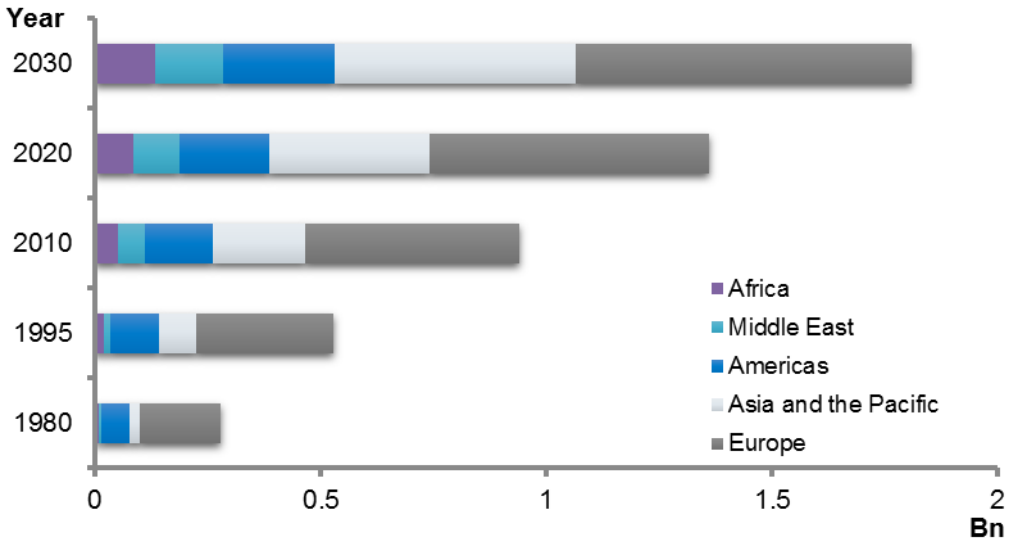
Figure 12 - History and Projections for International Tourist Arrivals to Advanced and Emerging Economies




Source: UNWTO, 2016

Across the regions, the Americas and Asia/Pacific both recorded close to 6% growth in international tourist arrivals, with Europe, the world's most visited region, recording 5% growth. Arrivals in the Middle East increased by 2%, while in Africa they declined by 3%, mostly due to weak results in North Africa. Prospects for 2015 are strongest for the Asia/Pacific and the Americas (both +4% to +5%), followed by Europe (+3.5% to +4.5%). In Africa and the Middle East (both +2% to +5%), prospects are positive but more uncertain and volatile. The same growth trends are expected in the medium to longer term, as the Asia/Pacific and the Americas are forecast to attract passengers at a stronger rate, increasing their individual market shares, while Europe will continue to be the market leader in overall international visitor arrivals.

Figure 13 - International Tourist Arrivals History and Projections by Region of Destination




Source: UNWTO, 2016

## 1.3. Passenger Traffic Trends

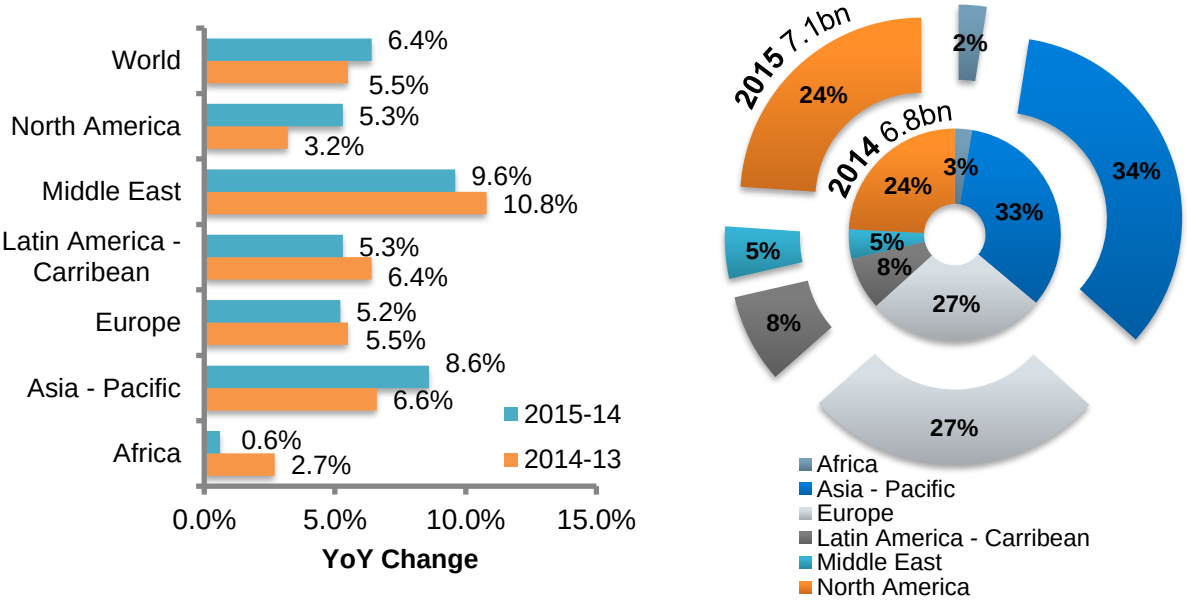
### Global Passenger Performance

### Airport Statistics

For 2015, global passenger airport throughput was +6.4% higher than in 2014, with annual passengers surpassing 7 billion, as opposed to 6.8 billion in 2014. This is the highest annual growth rate since 2010, the year following the global recession of 2008-09. Meanwhile, total aircraft movements grew by +2% year on year to 88 million in 2015[13].

From a regional perspective, the Middle East grew fastest at +9.6% as the three Gulf super-connectors further expand their capacity worldwide (Figure 14). European traffic grew at +5.2% in 2015, almost the same as in 2014, far outpacing economic growth in the region, helped by the lower fuel prices and the strong growth of international tourist arrivals. Relatively modest growth of +5.3% was witnessed in North America's mature market, aided by low fuel costs, while mostly due to geopolitical and security challenges in North Africa, overall the African region registered a slow +0.9% passenger growth in 2015.

Figure 14 - Passenger Growth Rate and Traffic Share by Region




Source: ACI World Airport Traffic Database, 2016

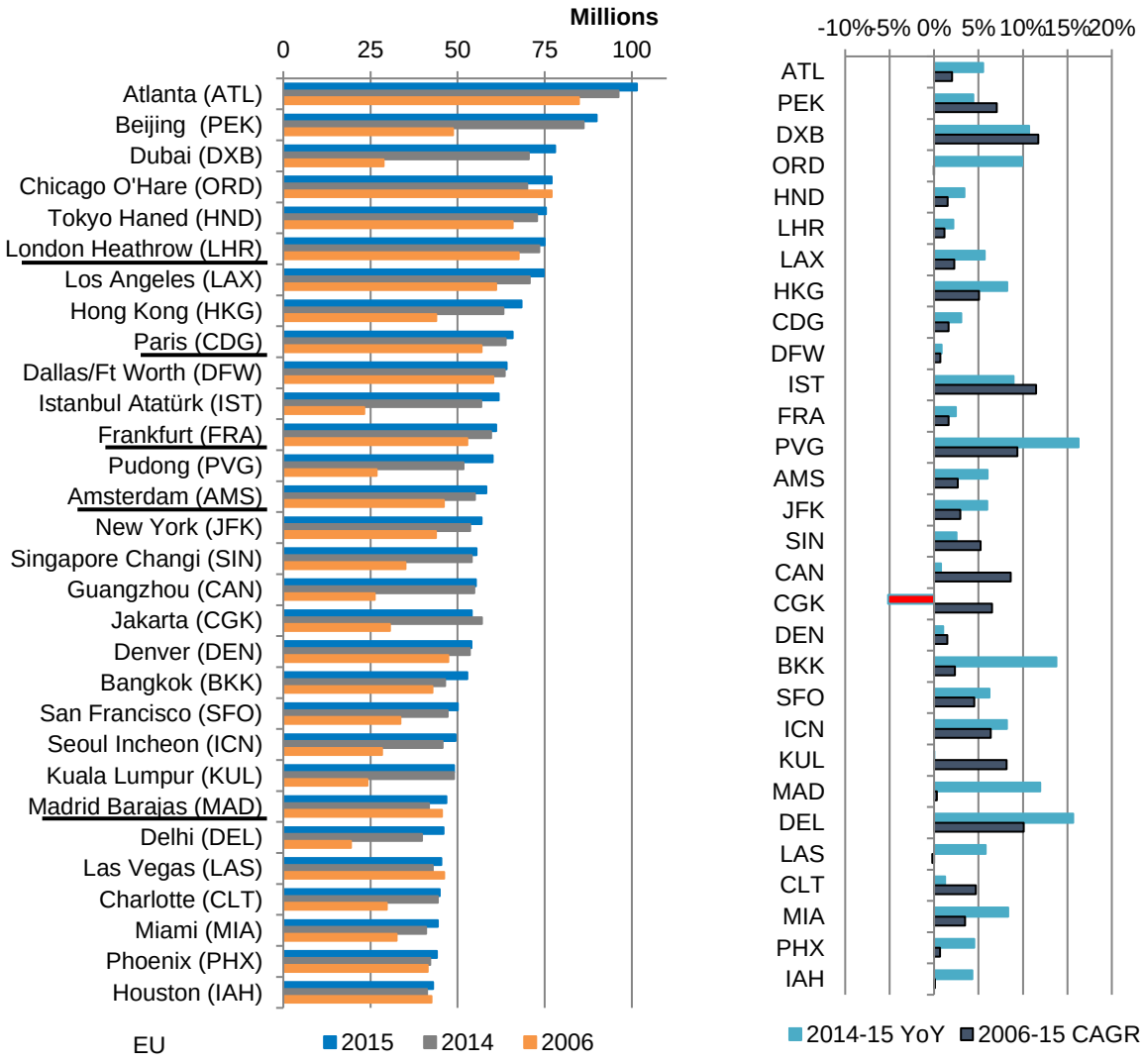
Delving deeper to a more granular level, the passenger performance of the top 30 airports worldwide is shown in Figure 15. Despite the regional fluctuation in traffic performance described above, the world's largest airports have generally been growing strongly in the last 10 years.

The most rapidly growing airports over the past 10 years (2006 to 2015) were: Delhi International (+10.1% pa), Istanbul-Ataturk (+11.5% pa) and Dubai International (+11.7% pa), as well as the Chinese airports of Guangzhou (+8.6% pa) and Shanghai-Pudong (+9.4% pa). This reflects sustained strong growth rates in developing aviation markets, such as China and India, as well as the continued expansion of the connecting hubs in Middle East and Turkey regions.

[13] 2015 ACI Annual World Airport Traffic Report

US airports represent 13 airports of the top 30 airports globally, while 11 airports are located in the Asia Pacific region. The only airport in the top 30 that registered a passenger decline in 2015 was Jakarta International, while Delhi International airport made the list for the first time this year, as the focus hub of Indian aviation domestic air travel.

Figure 15 - Top 30 Airports in 2015 by Passenger Traffic Worldwide




Source: ACI World Traffic Reports, 2015

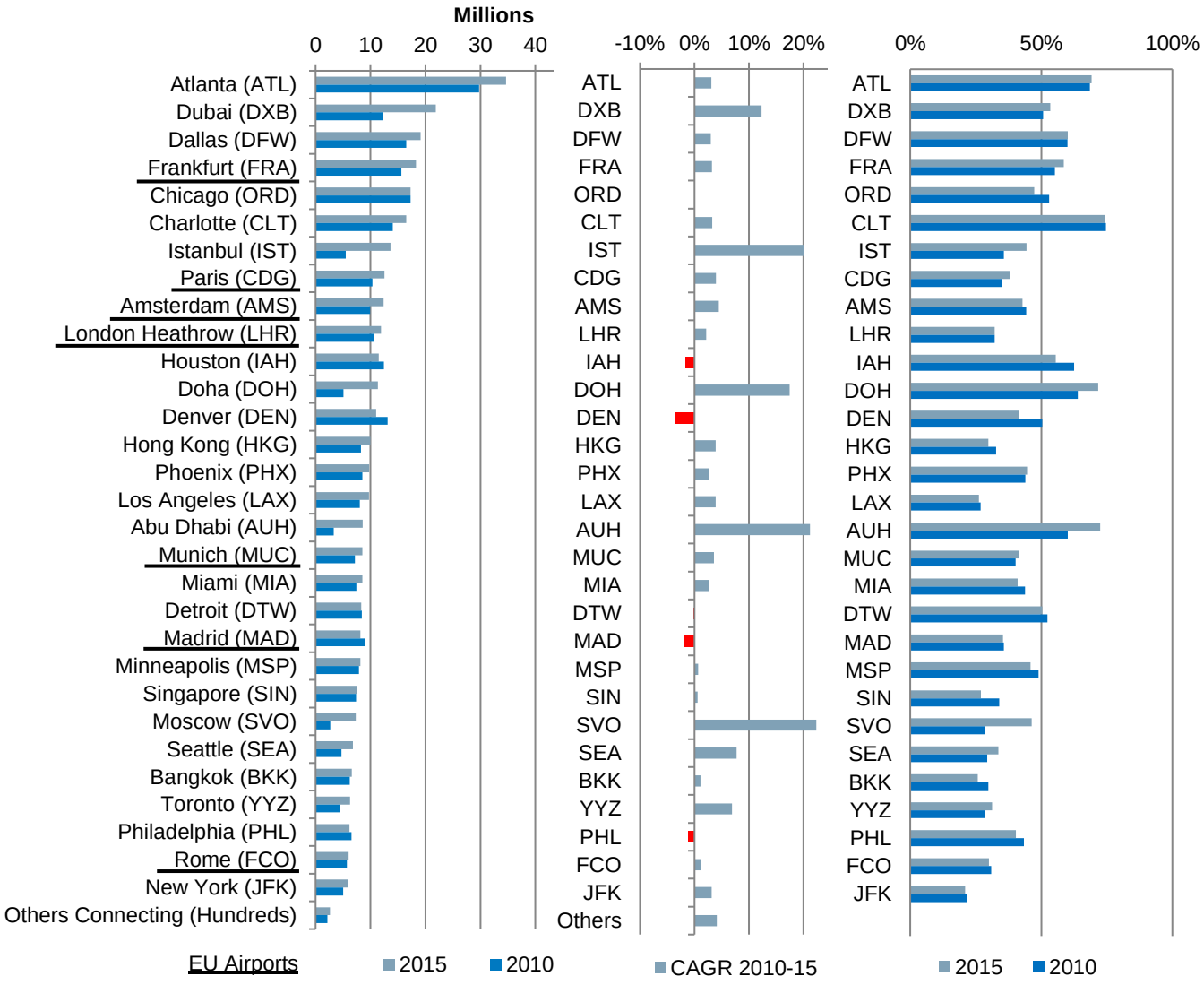
Regarding European airports, five airports are within the top 30 in passengers carried: London Heathrow, Paris Charles de Gaulle, Frankfurt Main and Amsterdam Schiphol and Madrid Barajas airport. Similar to US airports, growth since 2006 has been low at European airports. However, as the Eurozone economies picked up in 2015, all five airports recorded a higher year on year growth for 2015 compared to their 10-year average annual growth rates. Statistical Annex A provides an overview on global passenger and air transport movements.

## Airport Connectivity

One of the themes that are trending in the last five years in air transport is the strengthening of international and domestic hub airports around the world. This phenomenon has been mostly attributed to the consolidation in the airline industry, as witnessed lately in the US domestic market; it also highlights the emergence of the super connector airline model, as the Big 3 Gulf carriers demonstrate. As airlines merge to form powerful groups, they are able to consolidate their operations within their main airport hubs. This allows them to offer increased services from those hubs and increase their profitability and their yields when operating within those airport "fortresses".

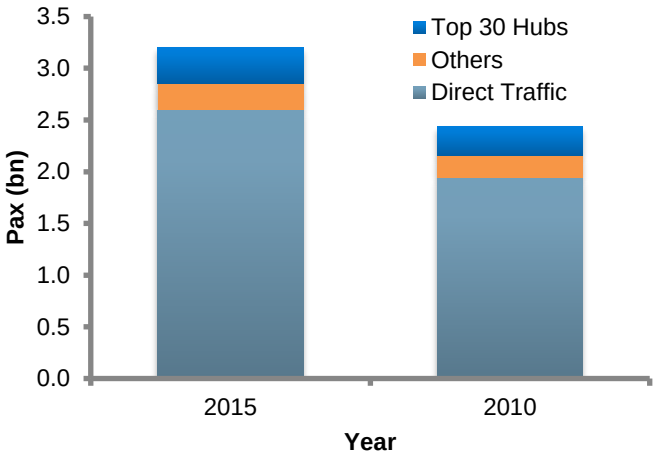
As a result, the significance of connecting passengers has been growing, as airlines and airports target services to passengers choosing the hub as a stopover. The airports with the highest share of connecting passengers for 2015 and the change since 2010 are depicted on Figure 16.

Figure 16 - Top 30 Hub Airports by Connecting Passengers 2015, YoY Performance and Connecting Passenger Share




Source : Sabre ADI

Figure 17 - Direct & Connecting Passenger Splits (One-Way)




Source : Sabre ADI

In the past 5 years: an overall growth in direct air services over connecting flights has been observed, with direct passengers growing at a rate of +6.0% pa between 2010 and 2015, while connecting passengers grew at a rate of +4.0% pa during the same period. Connecting passenger growth was evenly split between the top 30 and the remaining connecting airports.

This trend reflects both increased use of 'hub bypass' aircraft types, such as the Boeing 787, and growth of the mega hubs in the Middle East and other markets.

The strong growth of Istanbul Airport and Middle Eastern hubs have changed the travel behaviours of transfer passengers in recent years and also affected the share of transfer passengers at European hub airports. Due to their beneficial geographical location between Europe and Asia and notable governmental support, Turkish and Middle Eastern carriers such as Emirates, Qatar Airways, Etihad Airways and Turkish Airlines have managed to gradually attract an increasing number of transfer passengers travelling from Europe and North America to Australia, Far East and South East Asia.

The tables below illustrate the travel behaviour of transfer passengers at Istanbul Airport and Middle Eastern hubs. The top row shows the share of the particular transfer flow in the airport's total transfer traffic. The second row displays the % change of this particular transfer flow between 2010 and 2015. As seen in Table 1, connecting between Europe and the Near & Middle East and other European airports accounted for the main transfer flows at Istanbul Airport. Notable shares could also be observed for flows ending in Africa. Transfer traffic between Europe and the Far East & Australasia, as well as between Near & Middle Eastern countries continue to present the most important markets for the Middle Eastern hubs. Connections between Europe and the Near & Middle East, as well as from the Near & Middle East to North America also presented considerable shares. Especially the latter market has not been among the largest transfer flows in 2014.

Statistical Annex B provides an overview on the top 30 hub airports worldwide.

Table 1 - Istanbul Airport (IST) Transfer Flow Shares (% Change 2015 vs 2010)

| Region (Origin / Destination) | Africa | Europe | Far East & Australasia | Latin & Central America | North America | Near & Middle East | Grand Total |
|---|---|---|---|---|---|---|---|
| Africa | 0.36% | 5.30% | 0.23% | 0.04% | 0.56% | 1.93% | **8.42%** |
| | 292% | 301% | 103% | 58% | 281% | 69% | **196%** |
| Europe | 5.10% | 8.65% | 4.58% | 0.22% | 2.20% | **23.32%** | **44.07%** |
| | 288% | 472% | 265% | 451% | 677% | **90%** | **164%** |
| Far East & Australasia | 0.23% | 4.53% | 0.00% | 0.08% | 0.08% | 0.97% | **5.88%** |
| | 79% | 252% | 174% | 804% | 610% | 55% | **186%** |
| Latin & Central America | 0.04% | 0.19% | 0.08% | 0.00% | 0.00% | 0.29% | **0.60%** |
| | 41% | 371% | 1141% | -40% | -48% | 158% | **222%** |
| North America | 0.53% | 2.19% | 0.08% | 0.00% | 0.01% | 3.15% | **5.97%** |
| | 330% | 686% | 749% | -23% | 59% | 256% | **357%** |
| Near & Middle East | 1.86% | **23.78%** | 0.92% | 0.29% | 3.23% | 4.97% | **35.05%** |
| | 77% | **93%** | 150% | 165% | 268% | 62% | **97%** |

| Region (Origin / Destination) | Africa | Europe | Far East & Australasia | Latin & Central America | North America | Near & Middle East | Grand Total |
|---|---|---|---|---|---|---|---|
| **Total %** | **8.13%** | **44.64%** | **5.89%** | **0.63%** | **6.08%** | **34.63%** | **100.00%** |
| | **197%** | **166%** | **236%** | **242%** | **358%** | **91%** | **145%** |
| Total Pax 2015 (000s) | 1,705 | 5,905 | 780 | **83** | 804 | 4,581 | 13,228 |

**Key:** **1st Largest Flow** / 2Nd Largest Flow / 3Rd Largest Flow Source: Sabre ADI

Table 2 - Doha Airport (DOH) Transfer Flow Shares (% Change 2015 vs 2010)

| Region (Origin / Destination) | Africa | Europe | Far East & Australasia | Latin & Central America | North America | Near & Middle East | Grand Total |
|---|---|---|---|---|---|---|---|
| Africa | 0.28% | 1.43% | 1.61% | 0.02% | 0.62% | 4.99% | **8.94%** |
| | 177% | 139% | 45% | 83% | 489% | 96% | **100%** |
| Europe | 1.40% | 0.01% | 11.55% | 0.02% | 0.03% | 11.38% | **24.38%** |
| | 173% | 528% | 197% | 36% | 2355% | 98% | **140%** |
| Far East & Australasia | 1.62% | 11.56% | 0.00% | 0.19% | 0.69% | 4.33% | **18.38%** |
| | 51% | 193% | 589% | 2% | 373% | 86% | **139%** |
| Latin & Central America | 0.02% | 0.02% | 0.34% | 0.00% | 0.00% | 0.36% | **0.74%** |
| | 134% | 34% | 110% | - | -100% | 116% | **111%** |
| North America | 0.43% | 0.01% | 0.61% | 0.00% | 0.00% | 4.56% | **5.61%** |
| | 450% | 639% | 227% | - | 44% | 124% | **143%** |
| Near & Middle East | 5.18% | **12.13%** | 4.55% | 0.32% | 5.12% | **14.65%** | **41.94%** |
| | 99% | **105%** | 69% | 65% | 124% | **114%** | **104%** |
| **Total** | **8.92%** | **25.16%** | **18.67%** | **0.55%** | **6.44%** | **40.26%** | **100.00%** |
| | **104%** | **140%** | **132%** | **36%** | **154%** | **105%** | **120%** |
| Total Pax 2015 (000s) | 988 | 2,788 | 2,068 | 61 | 714 | 4,462 | 11,081 |

**Key:** **1st Largest Flow** / 2Nd Largest Flow / 3Rd Largest Flow Source: Sabre ADI

Table 3 - Abu Dhabi Airport (AUH) Transfer Flow Shares (% Change 2015 vs 2010)

| Region (Origin / Destination) | Africa | Europe | Far East & Australasia | Latin & Central America | North America | Near & Middle East | Grand Total |
|---|---|---|---|---|---|---|---|
| Africa | 0.06% | 1.41% | 1.17% | 0.02% | 0.27% | 2.59% | **5.51%** |
| | 119% | 191% | 248% | 7767% | 693% | 248% | **238%** |
| Europe | 1.32% | 0.03% | **13.13%** | 0.01% | 0.07% | 9.54% | **24.09%** |
| | 176% | 509% | **178%** | 25318% | 7346% | 170% | **176%** |
| Far East & Australasia | 1.13% | **13.59%** | 0.01% | 0.49% | 0.46% | 5.52% | **21.20%** |
| | 241% | **182%** | 1068% | 3077% | 517% | 50% | **138%** |
| Latin & Central America | 0.01% | 0.01% | 0.49% | 0.00% | 0.00% | 0.38% | **0.89%** |
| | 1341% | 3562% | 6612% | - | - | 2518% | **3795%** |
| North America | 0.22% | 0.06% | 0.33% | 0.00% | 0.00% | 6.11% | **6.72%** |
| | 530% | 13837% | 476% | - | 213% | 168% | **183%** |
| Near & Middle East | 2.59% | 9.96% | 5.45% | 0.37% | 6.99% | **16.22%** | **41.58%** |
| | 206% | 181% | 30% | 1974% | 184% | **198%** | **152%** |
| **Total** | **5.35%** | **25.05%** | **20.58%** | **0.89%** | **7.78%** | **40.35%** | **100.00%** |
| | **210%** | **183%** | **121%** | **2553%** | **203%** | **157%** | **162%** |
| Total Pax 2015 (000s) | 455 | 2,134 | 1,753 | 76 | 663 | 3,437 | 8,518 |

**Key:** **1st Largest Flow** / 2Nd Largest Flow / 3Rd Largest Flow Source: Sabre ADI

Table 4 - Dubai Airport (DXB) Transfer Flow Shares (% Change 2015 vs 2010)

| Region (Origin / Destination) | Africa | Europe | Far East & Australasia | Latin & Central America | North America | Near & Middle East | Grand Total |
|---|---|---|---|---|---|---|---|
| Africa | 0.43% | 4.09% | 1.56% | 0.06% | 0.96% | 3.81% | **10.90%** |
| | 81% | 147% | 23% | 171% | 264% | 41% | **78%** |
| Europe | 3.86% | 0.02% | **13.09%** | 0.03% | 0.02% | 9.58% | **26.60%** |
| | 132% | 109% | **114%** | 1332% | 476% | 60% | **93%** |
| Far East & Australasia | 1.49% | **13.10%** | 0.01% | 0.46% | 0.56% | 3.18% | **18.80%** |
| | 16% | **115%** | 26% | 181% | 356% | 13% | **79%** |

| Region (Origin / Destination) | Africa | Europe | Far East & Australasia | Latin & Central America | North America | Near & Middle East | Grand Total |
|---|---|---|---|---|---|---|---|
| Latin & Central America | 0.06% | 0.03% | 0.44% | 0.00% | 0.00% | 0.41% | **0.94%** |
| | 154% | 1278% | 217% | - | 134% | 107% | **160%** |
| North America | 0.78% | 0.01% | 0.51% | 0.00% | 0.00% | 5.12% | **6.43%** |
| | 245% | 318% | 432% | 940% | 172% | 139% | **160%** |
| Near & Middle East | 3.65% | 9.65% | 3.40% | 0.38% | 5.38% | **13.89%** | **36.34%** |
| | 35% | 58% | 9% | 95% | 144% | **59%** | **58%** |
| **Total** | **10.27%** | **26.90%** | **19.01%** | **0.93%** | **6.91%** | **35.99%** | **100.00%** |
| | **67%** | **94%** | **77%** | **143%** | **167%** | **59%** | **78%** |
| Total Pax 2015 (000s) | 2,233 | 5,849 | 4,133 | 202 | 1,503 | 7,826 | 21,746 |

**Key:** **1st Largest Flow** / 2Nd Largest Flow / 3Rd Largest Flow Source: Sabre ADI

## Airline Statistics

Airline passenger traffic (measured in RPKs) grew at +6.7% in 2015, compared with global GDP growth of +3.1%. The International Civil Aviation Organisation (ICAO) reported that airlines carried 3.5 billion passengers in 2015, a +6.8% increase on 2014[14]. For 2016, global traffic was expected to grow 6.3% over 2015, with annual passengers surpassing 3.7 billion and with approximately 7,015 billion RPKs performed[1]. The global airline industry has grown at or above the long-term growth rate for five consecutive years, while productivity continued to increase on historically high aircraft utilization and passenger load factors. Specifically, load factors in 2015 remained at about 80%, showing that airlines are matching demand without oversupplying capacity[15].

Table 5 - Top 150 Airline Key Traffic Figures by Region

| Region | Passenger traffic (million RPK & YoY Growth) | | Load Factors (% and YoY Growth) | | Passenger Numbers (Actual in millions & YoY) | |
|---|---|---|---|---|---|---|
| **Africa** | 92,818 | 2.7% | 68.2 | 0.2% | 34 | 3.5% |
| **Asia Pacific** | 1,954,254 | 8.9% | 79.6 | 1.5% | 1,035 | 8.4% |
| **Europe** | 1,714,827 | 4.9% | 83.2 | 0.8% | 868 | 6.2% |
| **Latin America** | 273,305 | 7.8% | 80.0 | 0.4% | 181 | 4.3% |
| **Middle East** | 598,380 | 10.9% | 77.1 | -1.8% | 173 | 9.9% |
| **North America** | 1,669,165 | 4.8% | 83.7 | 0.3% | 924 | 4.7% |
| **Grand Total** | **6,302,749** | **6.7%** | **81.2** | **0.5%** | **3,215** | **6.5%** |

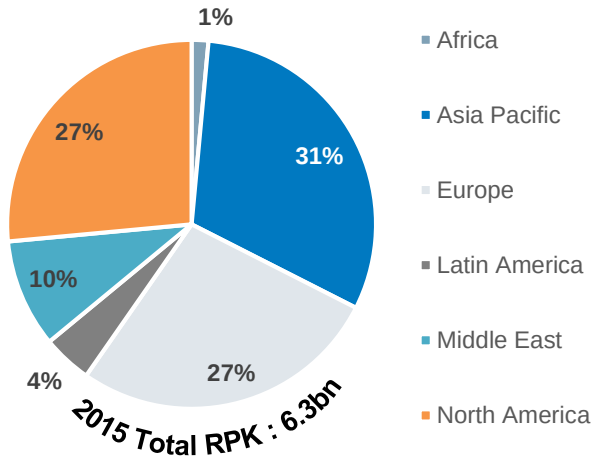
Comparing traffic performance on a region by region basis, Middle East and Asia Pacific once again led all regions with high year on year traffic growth. European passenger volumes grew at +6.2% in 2015, outpacing economic growth, while North America traffic grew at +4.7%, helped by a solid domestic market performance. Carriers in Africa and Latin America saw slower growth in 2015 due to softer commodity prices that had an impact on economic performance, as well as increased political challenges.

Source: FlightGlobal, World Airline Rankings, 2015

[14] http://www.icao.int/annual-report-2015/Documents/Appendix_1_en.pdf

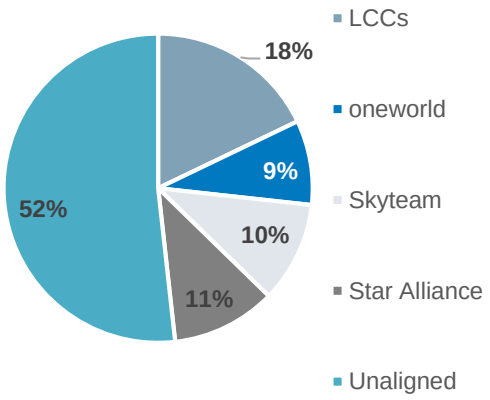
[15] Boeing Current Market Outlook 2016-2035

Figure 18 - Top 200 Passenger Airlines Traffic by Region (RPK)




Source: FlightGlobal, World Airline Rankings, 2015

Figure 19 - Traffic Shares for Main Airline Groups 2015




Source: FlightGlobal, Star Alliance/SkyTeam/oneworld factsheets

When measured in RPKs, Asia Pacific airlines outgrew the traffic share of North American and European carriers (31% share vs 27% and 27% respectively). Middle Eastern airlines captured 10% of global traffic in 2015 and increased their share in total RPK through double digit growth rates for 2015.

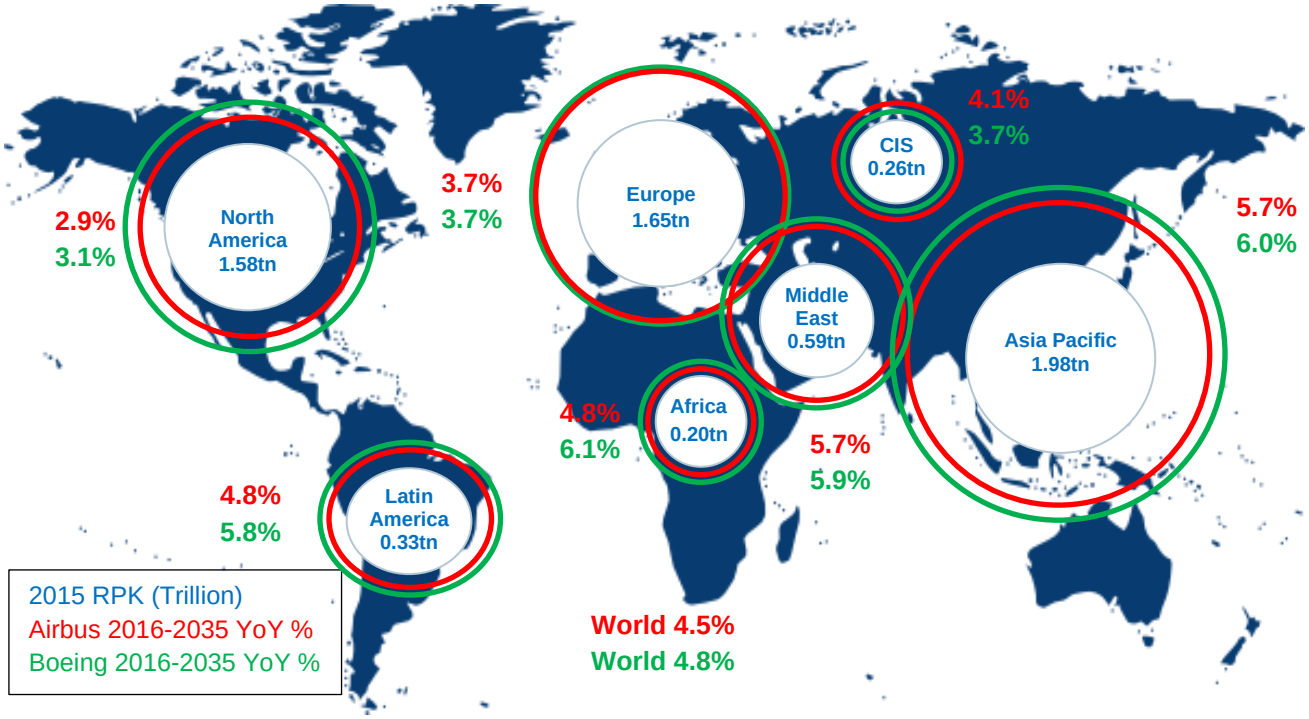
Regarding business models, it is becoming increasingly difficult to discern between full service/mainline and low cost carries, at least on short haul flights where many of the features of the low cost business model have been emulated by full service operators and vice versa. However, using FlightGlobal groupings, 77% of RPKs were flown by mainline airlines in 2015, which, combined with the lower fuel prices explains the improved profitability of a considerable number of full service carriers.

Low cost carriers captured less than 20% of the total 2015 passenger volumes, but compared to 2014, this presented a 3% growth. The three main airline alliances handled 30% of total passenger traffic, which was 2% above 2014 levels. While Skyteam's share remained constant, both oneworld and Star Alliance noted a 1% increase each. Just over 50% of 2015 passenger volume was carried by unaligned airlines, which was 5% less than 2014 and particularly driven by the strong growth of LCC.

## Long Term Global Outlook

Every year, and as part of their long term strategic planning, aircraft manufacturers Airbus and Boeing publish their forecasts of air travel demand for the next 20 years. Their long-term predictions updated in 2016 remained largely unchanged against to last year's projections (2015 to 2034 publication).

Figure 20 - Air Traffic Growth Projections by Region for 2016-2035




Source: Airbus/Boeing, 2016

Figure 20 shows that Airbus assumes that global RPK grow at an annual average rate of 4.5% between 2016 and 2035, which is only 0.1% below Airbus' last year projections published for the period between 2015 and 2034. Similarly, Boeing expects an annual average increase of 4.8% between 2016 and 2035, which is again in the region of 0.1% less than its forecast for the period between 2015 and 2034. Although both manufacturers appear to have similar assumptions on the future development of global RPK, it also emerges that their regional expectations vary. Africa shows the largest differences. While Airbus projects an annual growth rate of 4.8%, Boeing forecasts an increase a higher increase of 6.1%. While Airbus seems to be less optimistic compared to Boeing in most regions, its expectations for the CIS countries are 0.4% above the projections of Airbus. Further information on worldwide intra and inter regional flows history and expectations are provided in Annex E.

The Japanese Aircraft Development Corporation (JADC) expects an annual increase of 4.7% in worldwide RPKs between 2016 and 2035, which is in line with the long-term projections of Boeing and Airbus[16].

**Passenger Performance by Region: Europe**

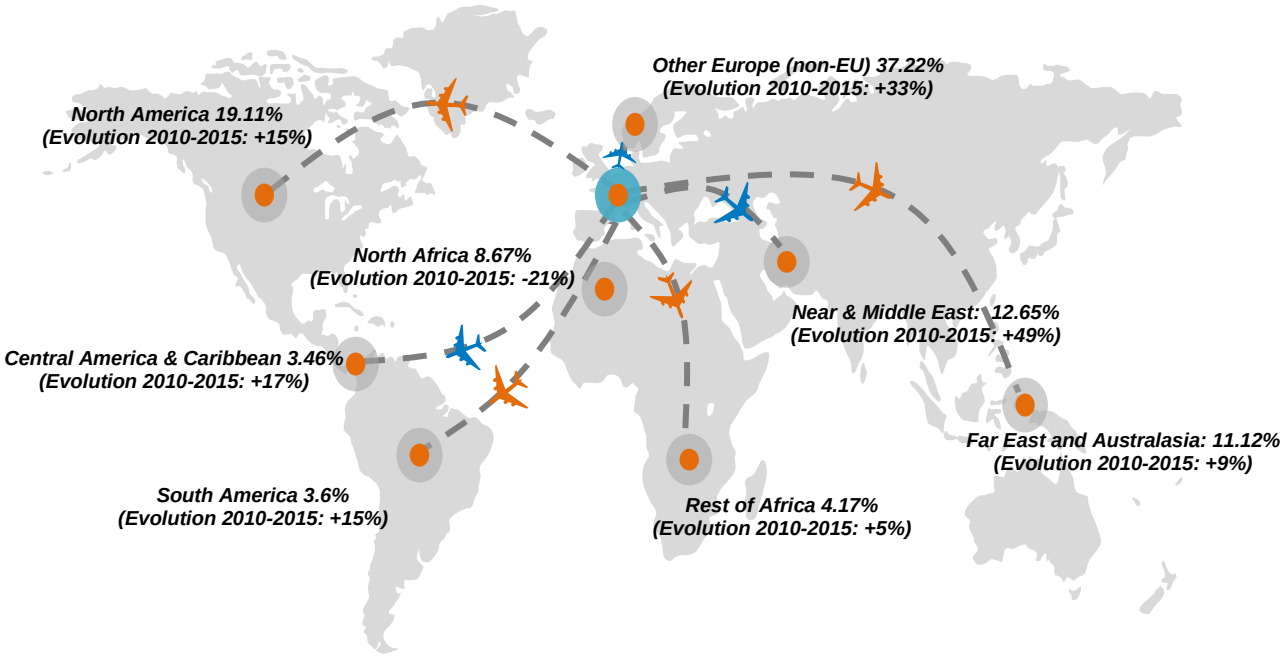
## Introduction

Europe's air travel market remained strong in 2015 despite significant economic uncertainties. Europe's GDP grew by 1.9% in 2015 and is forecast to grow by 1.8% annually through 2035. As illustrated in Figure 21, the key Extra-EU air passenger flows for 2015 were between EU and other European (non-EU) countries, accounting for 37% of the traffic, which was 3% less than in 2014. Along with the trend observed in recent years, especially low-cost carriers continued to expand their route networks between EU and non-EU European countries, which strongly supported the dominance of this flow sector and the 33% rise since 2010. Similar to 2014, connections between North America and EU accounted for the second highest share.

[16] JADC Worldwide Market Forecast 2016-2035

Routes between the two continents are traditionally one of the most profitable ones, thus, it is unsurprising that air passenger flows grew by 15% between 2010 and 2015. However, the highest growth rate since 2010 was observed in passenger flows between Europe and the Near & Middle East (+49%) due to the strong expansion of Middle Eastern carriers. In contrast, North Africa's share in passenger flows decreased by 21% during 2010-2015, after a 7% decline was already recorded between 2008 and 2014. A series of multiple terrorist attacks and political instability in many North African countries have largely driven this negative development.

Figure 21 - Air Passenger Flows 2015 Share and Historic Evolution From/To Europe (EU28)




Source: Eurostat

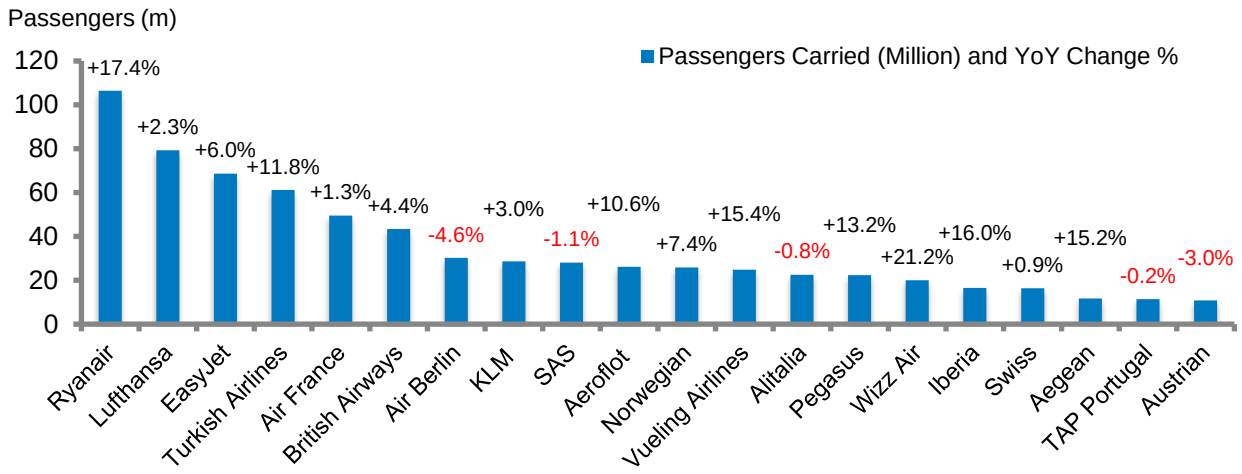
## Airline Outlook

The Association of European Airlines reports that member airlines carried 311 million passengers in 2015, which was a 4% growth over 2014, while the average load factor remained constant at 81%17. Members of the European Low Fares Airline Association reported a strong 37% increase in passengers between July 2014 and June 201518. Overall, European airlines experience strong growth in passenger traffic for 2015, with Wizz Air, Aeroflot, Aegean, Turkish Airlines, Pegasus, Vueling, Iberia and Ryanair achieving double digit growth rates. Air Berlin, with its continuous restructuring, recorded the only significant year on year passenger decline in 2015, while minor traffic losses were also reported by SAS, Alitalia, TAP Portugal and Austrian.

[17] http://www.aea.be/statistics.html

[18] http://www.elfaa.com/151007_ELFAA_PressRelease_Statistics_Jul14_Jun15.pdf

Figure 22 - Top 20 Airlines in Passengers Carried in 2015 - Europe

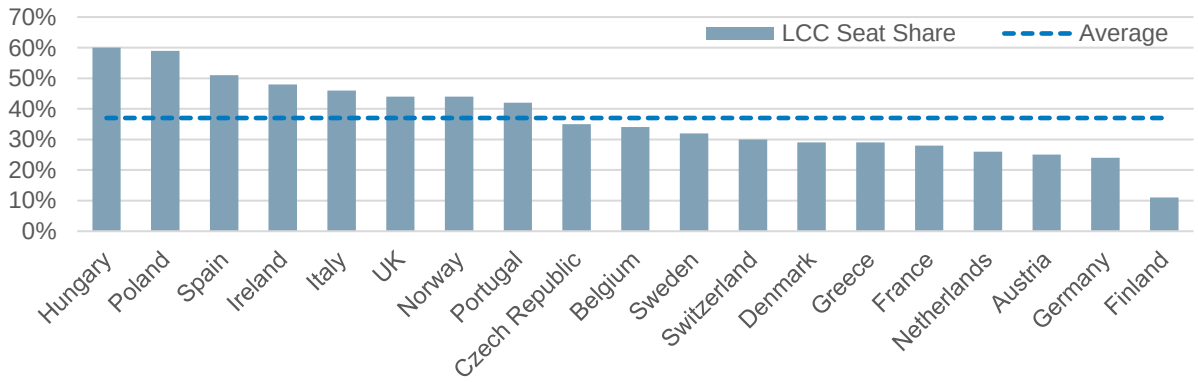



Source: Airline Business, 2016

Airline operations in Europe continue to evolve with the launch of new ventures, routes, and business models. Norwegian Air Shuttle continues to expand their long-haul low-cost carrier operations, while Lufthansa has launched a long-haul LCC subsidiary to compete for leisure passengers. European operators have been on the forefront of this trend, with 96 long-haul routes introduced since 2012—the most of any region[19]. The introduction of more efficient aircraft has helped European carriers both to improve their load factors, but also to increase their RPKs and ASKs as they fly routes of longer length.

LCCs continued to play a major role in European air traffic market during 2015 and saw some of the highest increases in passenger traffic, such as Ryanair (17%), EasyJet (6%), Vueling (15%) and Wizz Air (21%). As illustrated in Figure 23, average low-cost capacity across Europe was 40% in 2015, while especially the large LCC's home countries ranked above the average low-cost capacity share. Hungarian carrier Wizz Air continued its expansion in Eastern-European countries, Ryanair (Ireland) pushed its growth across European markets, including Spain and Portugal. In contrast, low-cost capacity in countries such as France, the Netherlands and Germany was below the average, partly driven by the strong presence of large full-service carriers such as Air France, KLM and Lufthansa.

Figure 23 - LCC Capacity Share of Selected European Countries

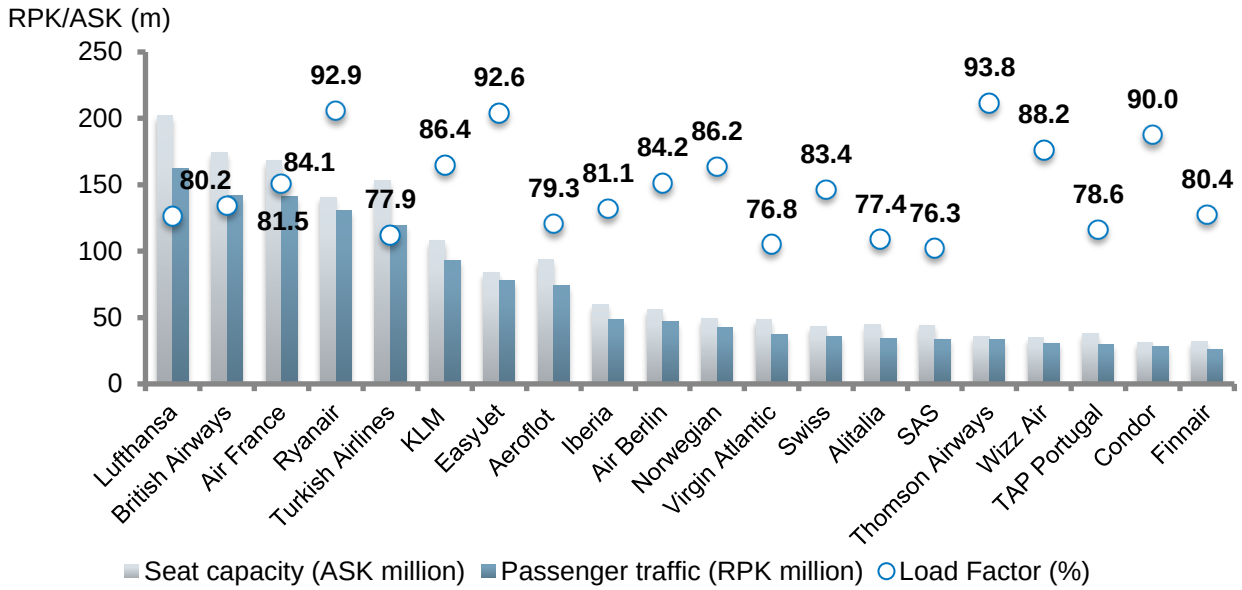



Source: CAPA Centre for Aviation, OAG, 2016

[19] Boeing Current Market Outlook 2016-2035

During 2015 European airlines continued the development observed in 2014 by managing to match demand with capacity efficiently and achieving on average high load factors. Similar to 2014, Thomson Airways recorded the highest load factor of 94%, which was close to 1% above the previous year level. Despite an increase of almost 1%, EasyJet lost its second place to Ryanair, which noted a load factor of almost 93%. SAS ranked last with a load factor of just above 76%.

Figure 24 - Top 20 Passenger Airlines in RPKs for 2015 - Europe




Source: Airline Business

There are more airline groups operating in Europe than in any other region in the world (this includes operators based on other regions that fly to/from each region). According to schedules data from OAG for the week of 30 May 2016, there are 237 airline groups operating in Europe[20].This could suggest that Europe has too many airline groups for the size of the market when compared with North America.

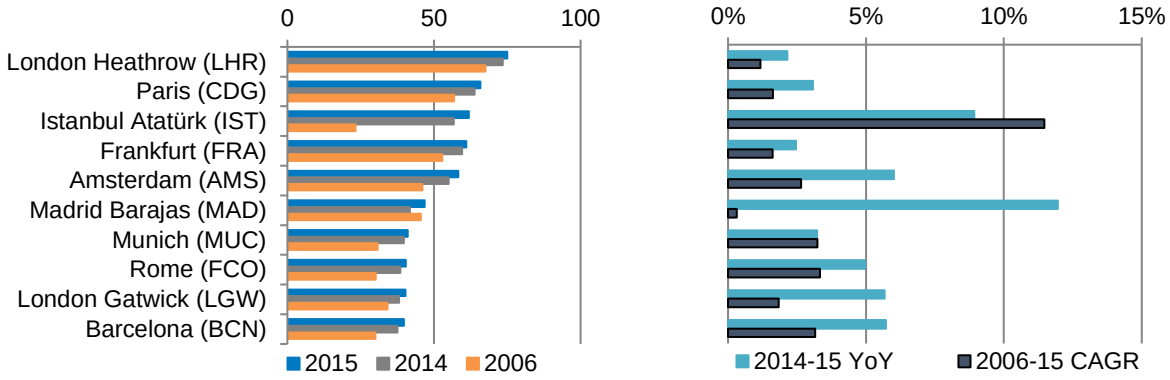
Table 6 - Indicators of Market Concentration based on Seat Share by Region

| | Share of Seats of Top 5 groups | Number of groups to reach cumulative share indicated | | |
|---|---|---|---|---|
| | | 25% | 50% | 90% |
| **N America** | 72% | 2 | 3 | 16 |
| **Middle East** | 57% | 2 | 4 | 30 |
| **Lat America** | 51% | 2 | 5 | 25 |
| **Europe** | 43% | 3 | 7 | 47 |
| **Africa** | 36% | 3 | 9 | 47 |
| **Asia Pacific** | 33% | 4 | 11 | 49 |

Source: CAPA, 2016

[20] http://centreforaviation.com/analysis/european-airline-consolidation-and-profitability-part-1-top-5-airline-groups-have-only-43-share-275322

Figure 25 - Top 10 Airports in 2015 by Passenger Traffic (m) - Europe



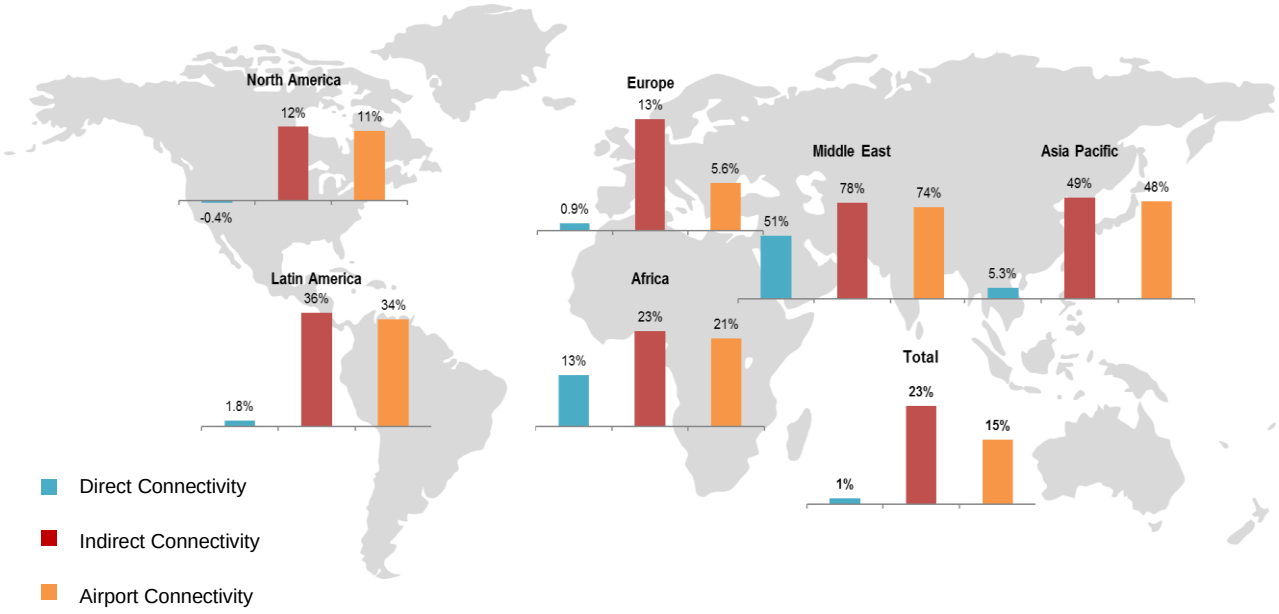

Source: ACI World Traffic Reports, 2016

The improved macroeconomic performance of many countries of the Eurozone, combined with the impact of a full year of reduced oil prices on consumer purchasing power has resulted in a strong traffic performance across European airports. Namely, all the airports in the Top 10 traffic performance table experienced passenger growth in 2015. Geopolitical uncertainties drove European tourists back to Southern European countries and away from many North African and Turkish resorts.

Figure 26 illustrates the performance of direct, indirect and airport connectivity from EU airports to world regions in 2016 compared to 2008, the year of the global financial crisis. The results are based on the ACI Europe Airport Connectivity Report 2016[21]. Indirect and airport connectivity continued to grow in 2016 and thus followed the positive trend which was already observed in 2015. Direct connectivity from European airports to world regions, which still recorded a negative development between 2008 and 2015, achieved a turnaround in 2016 and noted a 1% increase. This was largely caused by the growth of direct connectivity between EU airports, which benefitted from the continuous expansion of LCC. While in 2015 this was 4.2% below 2008 levels, it lay 0.9% above 2008 results in 2016. Similarly, direct connectivity from EU airports to Latin America outperformed 2008 levels for the first time in 2016. Direct connectivity from EU airports to North America was still less than during the global financial crisis, but recorded a considerable improvement from -3.1% in 2015 to -0.4% in 2016. These positive developments in direct connectivity were strongly driven by airlines adding capacity in light of lower oil price levels and continuous demand[21].

[21] ACI EUROPE Airport Industry Connectivity Report 2016

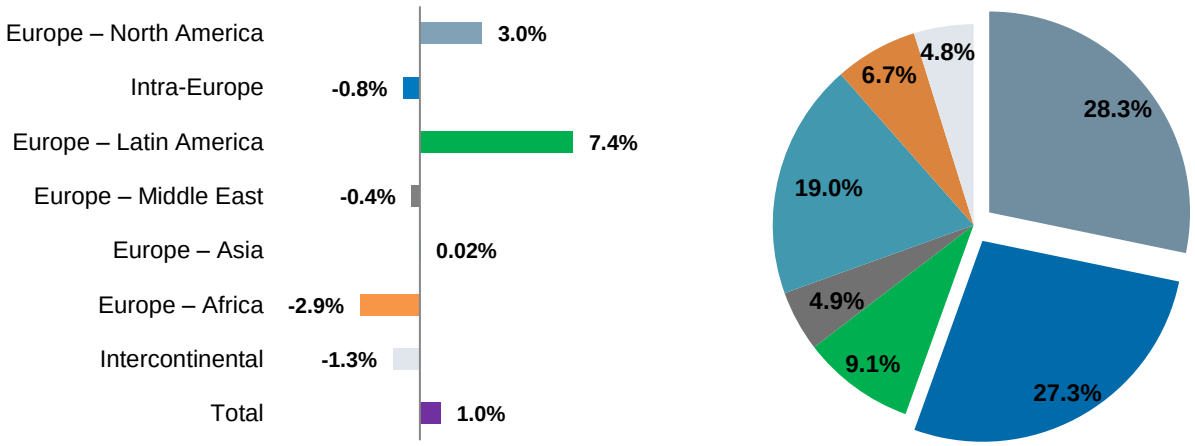
Figure 26 - Direct, Indirect & Airport Connectivity from EU Airports by World Region (2016 vs 2008)




Source: ACI EUROPE Airport Industry Connectivity Report 2016

Figure 27 shows the hub connectivity between Europe and World Regions in 2016, the market split and the performance compared to 2015. Hub connectivity refers to the ability of European airports to facilitate connecting to airports in the various world regions. Similar to the results above, these findings were published by the ACI Europe Airport Connectivity Report 2016[21]. While total hub connectivity between Europe and world regions experienced a 5.5% growth in 2015, it only increased by 1% in 2016. This has been primarily due to considerable restructuring efforts undertaken by the major European full-service carriers, which also affected their presence at Europe's hub airports and hence the connection possibilities for passengers. Solely hub connectivity between Europe and North America, as well as Europe and Latin America continued its positive development in 2016, whereas all other markets experienced stagnation or declines. Hub connectivity between Europe and Africa recorded the highest loss, strongly affected by the ongoing tense political situation across many African countries. The 2016 market split remained largely unchanged compared to 2015, with intra-European and North American hub connectivity presenting the largest shares. The most notable increase in market share was observed for hub connectivity to Latin America, which grew from 8.5% to 9.1% between 2015 and 2016.

Figure 27 - Hub Connectivity between Europe and World Regions - 2015/16 Growth and 2016 Share




Source: ACI EUROPE Airport Industry Connectivity Report 2016

Table 7 - New and cancelled scheduled routes from/to the EU in 2015 and 2016 by region and by country (20 most active countries)

| Destination Continent | Cancelled | | Started | |
|---|---|---|---|---|
| | 2015 | 2016 | 2015 | 2016 |
| Africa | 117 | 141 | 88 | 80 |
| Asia | 46 | 39 | 39 | 56 |
| North America | 23 | 10 | 32 | 52 |
| Middle East | 42 | 37 | 43 | 55 |
| South America | 7 | 7 | 6 | 5 |
| Central America | 1 | 0 | 1 | 3 |

| Destination Country | Cancelled | | Started | |
|---|---|---|---|---|
| | 2015 | 2016 | 2015 | 2016 |
| Egypt | 32 | 23 | 29 | 9 |
| Tunisia | 23 | 84 | 21 | 7 |
| Morocco | 24 | 17 | 15 | 26 |
| United States | 17 | 4 | 24 | 36 |
| Israel | 16 | 14 | 14 | 16 |
| Cape Verde | 13 | 2 | 4 | 9 |
| United Arab Emirates | 7 | 3 | 8 | 8 |
| Russia | 19 | 12 | 2 | 5 |
| Lebanon | 7 | 2 | 3 | 9 |
| Algeria | 3 | 1 | 4 | 11 |
| China | 3 | 4 | 11 | 14 |
| Canada | 4 | 4 | 6 | 10 |
| Hong Kong | 0 | 1 | 3 | 3 |
| Qatar | 1 | 0 | 1 | 4 |
| Brazil | 4 | 0 | 0 | 2 |
| Thailand | 1 | 1 | 3 | 2 |
| Mexico | 2 | 2 | 2 | 5 |
| Japan | 2 | 2 | 1 | 3 |
| India | 2 | 0 | 0 | 3 |
| Saudi Arabia | 2 | 0 | 1 | 4 |

Source: SRS Analyser

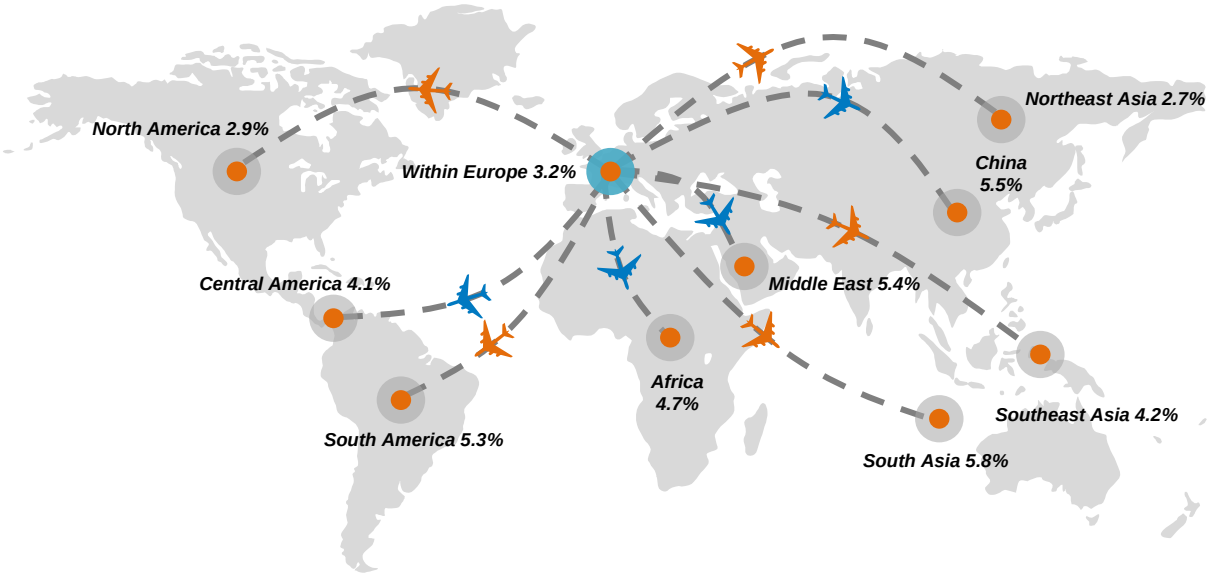
Table 7 further highlights the observations made above. It illustrates the new and cancelled scheduled routes from/to the EU. Along with the continuing instable political situation in North Africa, the continent has seen another substantial reduction in routes during 2016, especially in Egypt and Tunisia. Although Morocco mainly followed this trend, the country also recorded a noteworthy number of new services. A positive development was also observed in Algeria and Cape Verde. While few routes were cancelled in 2016, considerable additional services were launched in both countries during this time. Moreover, routes between Europe and Asian countries such as China, as well as between Europe and the Middle East, including the UAE, Lebanon, Israel, continued to grow in 2016. While the latter was partly due to the further expansion of Middle Eastern carriers across Europe, it was also driven by national airlines. Israeli carriers such as El Al, Arkia and Israir have been gradually developing their presence in Europe since Israel and the EU signed an Open Skies agreement in 2013. Notable additional services were also started between Europe and North America, which includes Mexico. As the country is increasingly developing into a popular holiday destination, European charter and leisure carriers such as TUIfly, Thomas Cook and Thomson Airways strongly expanded their air services. In contrast, the additional flights between the US and Europe were driven by carriers on both sides, American and European airlines.

## Long Term Outlook

The long-term projections for RPK development in Europe between 2016 and 2035 did not change considerably from the outlook for the period between 2015 and 2034. The European aviation market, which noted 1.7 trillion RPKs in 2015, is forecasted to grow at an annual rate of 3.7% from 2016 to 2035. However, looking at a regional level, it emerges that there are notable differences in growth projections of air traffic flows from and to Europe (additional information provided in Statistical Annex E).

Compared to the regional projections for 2015 to 2034, a slide decline in growth rates was recorded across all markets. Air traffic flows between Europe and South Asia experienced the largest decrease. While they were expected to rise by 6.5% between 2015 and 2034, this rate dropped to 5.8% for the period from 2016 to 2035. Nevertheless, the market remains the strongest growing. Overall, intercontinental traffic is further impacted by the general tendency of network airlines to focus less on short-haul point-to-point traffic, while increasing hub operation. In this context, South and South East Asian destinations are expected to benefit from Middle Eastern airlines, which are expanding their transfer traffic from European airports, via Middle Eastern hubs to these markets. European network carriers in contrast, largely focus on long-haul operations to North, Central and South American regions.

Figure 28 - Air Traffic Flows From/To Europe Growth Projections for 2016-2035




Source: Boeing, 2016

Air traffic flows within Europe are projected to increase by 3.2% between 2016 and 2035, which remained almost stable to the growth assumption for the period from 2015 to 2034. Intra-European traffic development is particularly driven by the continuous expansion of short-haul low-cost point-to-point traffic. This is expected to result in fiercer competition for network and charter airlines, which also explains why long-term projections for intra-European flows are among the lowest compared to traffic development from/to other regions.

## Market Developments

Moving to the **internal European market**, a kick to the foundations of the European Union took place on 23 June 2016, when the UK voted in favour of a British exit from the EU.

From an economic point of view, Brexit is likely to have a negative impact on air traffic volumes in three ways:

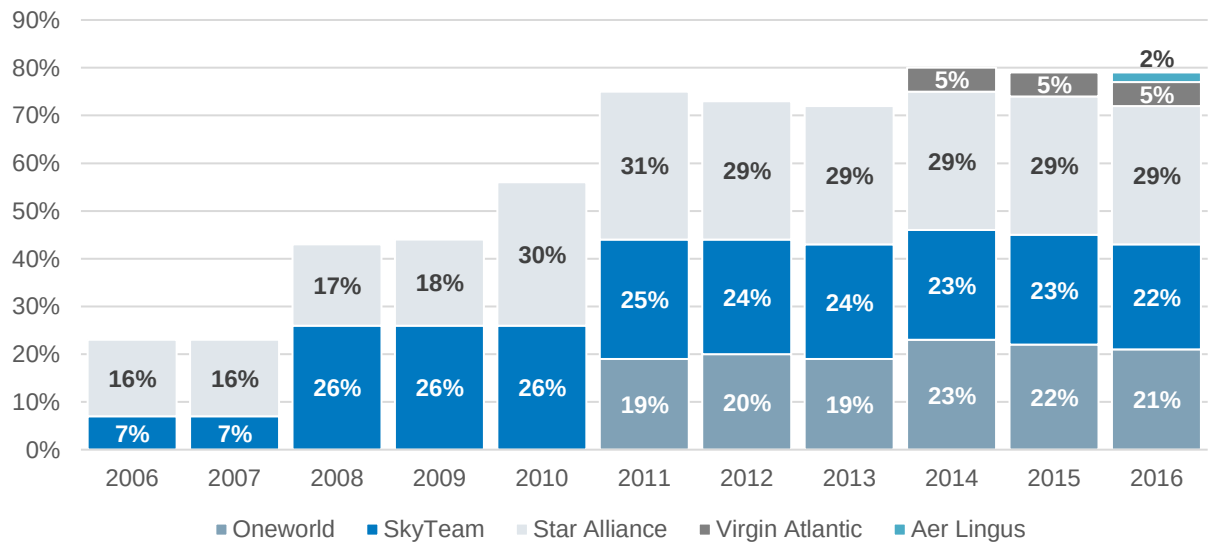
- Due to the relationship between GDP growth and growth in passenger traffic, a reduction in economic growth in the UK (and/or the rest of the EU) will negatively affect air travel demand.
- The fall in GBP versus other currencies, EUR in particular that has followed the referendum is effectively a price change for UK airlines' air fares.
- Air cargo volumes are closely related to levels of international trade, which are themselves affected by economic growth and trading agreements between nations.

The UK air market is dominated by outbound traffic, with such traffic accounting for just over two-thirds of total flows (in 2015 there were 53.9 million visits overseas by air by UK residents, compared to 26.2 million visits to the UK by overseas residents) [22].

The shape of the **transatlantic market** and its stakeholders on both sides of the ocean is another area of focus for this section. Following the regulators' approval of the immunised joint ventures (JVs), there have been some improvements in capacity and frequency coordination, as well as a convergence of product and service quality towards that provided by the superior partner.

Consequently, a strong market concentration has been observed, with 77% of all ASKs between North America and Europe being controlled by joint ventures with antitrust immunity during summer 2016 (the three JVs within the three global alliances plus the Delta-Virgin Atlantic JV)[23].

Figure 29 - Share of Europe-North America ASKs Operated within all joint ventures* with antitrust immunity, summer schedule 2006 to 2016




[22] IATA - The impact of 'BREXIT' on UK Air Transport – June 2016

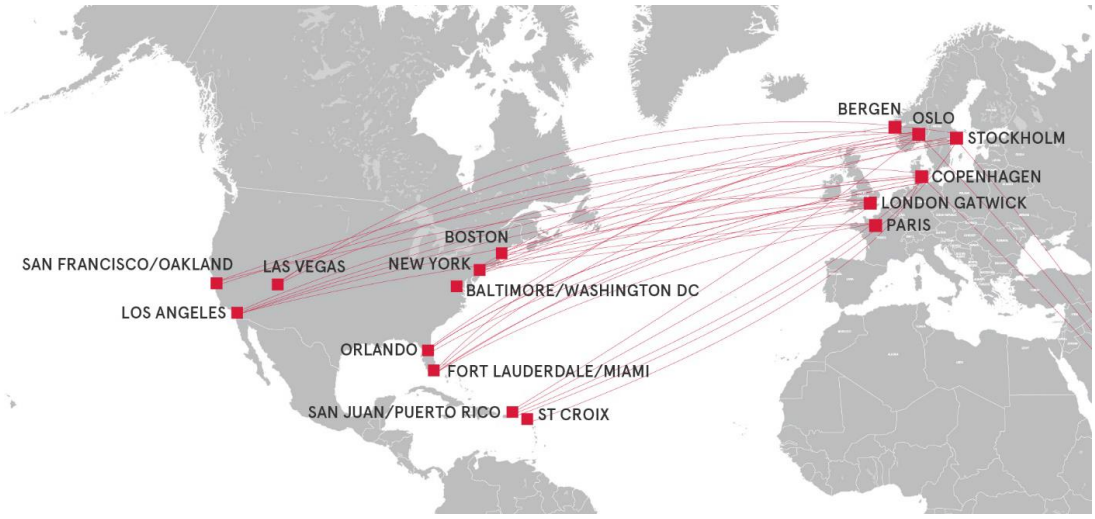
[23] http://centreforaviation.com/analysis/north-atlantic-airline-market-closed-jvs-to-have-78-of-asks-in-2016-weighing-the-benefits-272815

*Note that capacity share shown for the three global alliances relates only to ASKs in the joint ventures that operate within the alliances, and not to all alliance capacity on the North Atlantic; assumes that Aer Lingus joins the oneworld JV in summer 2016.
Source: CAPA, OAG Schedule Analyser, 2016

This will increase to 78% if Aer Lingus joins the oneworld JV, based on summer 2016 capacity (although Aer Lingus is not expected to join until 2017). The share on US-EU routes would be even higher, as all three US major global network airlines have highlighted oversupply in the trans-Atlantic during the 2016 peak summer travel period.

In contrast, LCCs captured just 3.0% of total ASKs on North America-Europe routes in summer 2016, growing 1.6% from summer 2015. This growth was primarily expressed by Norwegian Air Shuttle amidst strong opposition by the US big three airlines and heavy scrutiny by US regulators. With a tentative approval for its Irish subsidiary secured in April 2015, the transatlantic network of the airline is shown below.

Figure 30 - Norwegian's Transatlantic Network Summer 2016




Source: Norwegian Air Shuttle 1Q2016 results presentation 21-Apr-2016

In addition to LCCs, other operators also grew rapidly on the North Atlantic. Turkish Airlines had 3.7% of total ASKs in summer 2016, more than all the LCCs combined, and grew by 36% compared to summer 2015 [24]. Its summer 2016 North Atlantic ASKs almost doubled the summer 2013 level.

The combined scheduled ASKs of two large European leisure groups, Thomas Cook Group and TUI Group, grew by 40% in summer 2016, being almost 80% higher than in summer 2013. The leisure groups' combined 2.1% ASK share is not far behind that of the LCCs (if charter capacity was included, it might even be higher) [24].

**Passenger Performance by Region: North America**

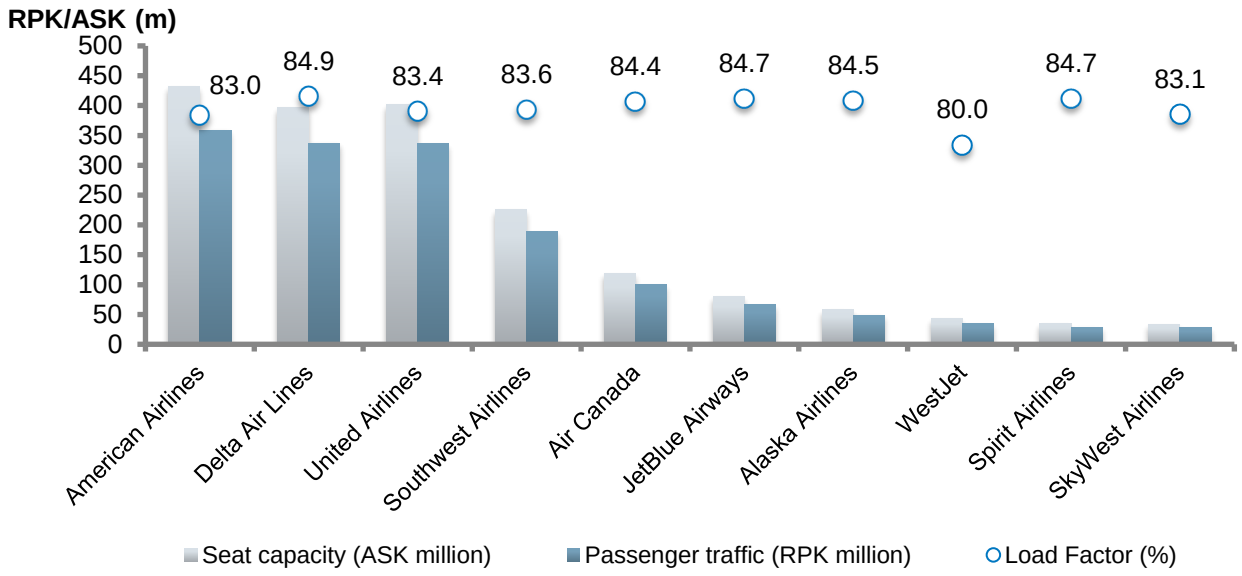
## Airline Outlook

Despite economic and political uncertainty in various regions across the globe, the North American airline industry grew strongly in both passenger traffic and capacity terms in 2015. Domestic services in the United

[24] http://centreforaviation.com/analysis/north-atlantic-airline-market-closed-jvs-to-have-78-of-asks-in-2016-weighing-the-benefits-272815

States recorded the highest growth rates across all airline business segments. The Big three network carriers (American, Delta and United Airlines) managed to grow domestic load factors to about 86 % in 2015 as demand outpaced supply, with a 3.5% YoY traffic growth, while capacity grew by only 3% during the same period.

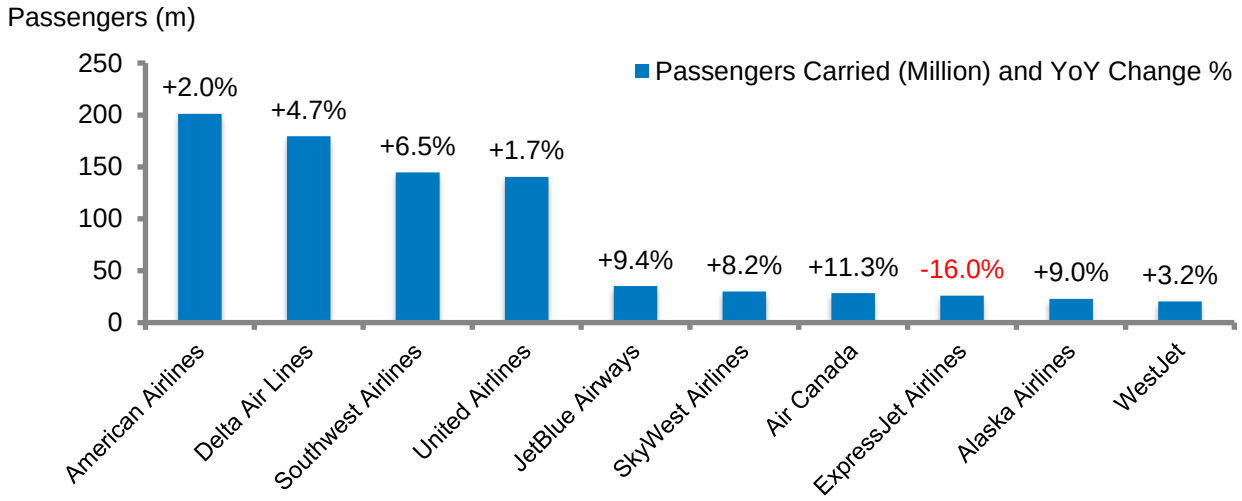
Figure 31 - Top 10 Airlines in RPKs for 2015 – North America




Source: Airline Business, 2016

North American airlines can now be categorised into four business models – full service airlines; low cost, high value airlines; ultra-low cost airlines. While Southwest keeps true to its original low cost paradigm it is jetBlue who has pushed the boundaries of low cost product evolution with its successful Mint experiment, featuring a fully lie-flat business seat. This has helped the airline record almost double digit YoY growth. Canada's flag carrier, Air Canada also saw the highest growth in traffic in 2015.

Figure 32 - Top 10 Airlines in Passengers Carried in 2015 – North America



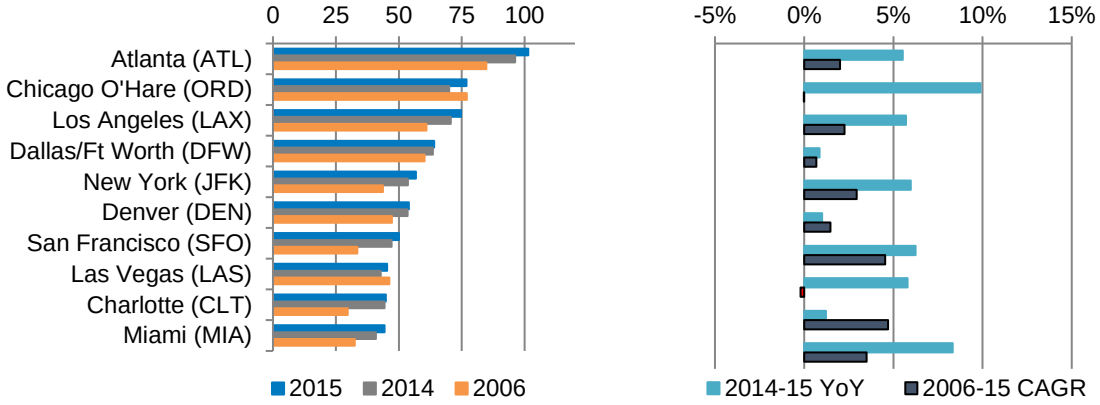

Source: Airline Business, 2016

The expectation is that over time, the industry will further consolidate, with the LCCs and smaller network carriers becoming potential consolidation targets. Due to new expanded air-service agreements with Mexico and Cuba, which will be furthered discussed later on, traffic between North and Central America is expected to grow stronger than previously forecast. Also, once ratified by Brazil's National Congress, the long-waited open skies between US and Brazil would remove air service limitations between these countries. Further expectations for a liberalized air-services agreement between the United States and China in the near future, is also expected to further boost travel and trade between the two countries.

## Airport Outlook

Atlanta International airport has in 2015 served once again the most passengers in North America as well as globally. The major hub of Delta Airlines and one of the main hubs of Southwest Airlines has been growing steadily in the past ten years, focusing on the domestic market. Chicago O'Hare surpassed Los Angeles International airport to regain the second spot, with a 10% year on year passenger growth. Overall, the consolidation of operations of the major three US carriers has emphasised the importance of their major airport hubs as central pieces of their route rationalisation. This can be seen in the growing traffic at those airports year after year, and is expected to continue during 2016 and onwards.

Figure 33 - Top 10 Airports in 2015 by Passenger Traffic (m) – North America




Source: ACI World Traffic Reports, 2016

## Market Developments

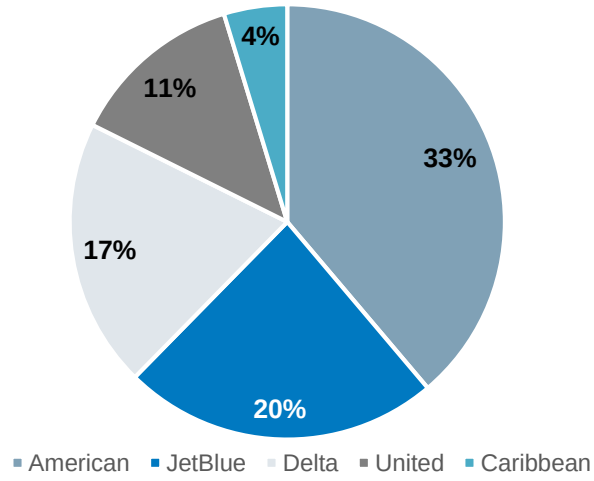
Starting with the US Big 3 vs Gulf 3, in early 2015 American, Delta and United Airlines delivered a white paper claiming that Emirates, Etihad and Qatar had received USD42 billion in illegal subsidies. The US government has not yet held talks with the UAE and Qatar regarding their open skies policies, but the recent decision to grant Norwegian Air tentative approval for its new service suggests that the government may avoid slipping into a protectionist mind-set[25]. Recently American and Delta have suggested they have no plans to relent in their efforts to convince the US government that Emirates, Etihad and Qatar are unfairly subsidised.

Arguably, the 3 Gulf carriers pose little threat directly to the US airlines, mostly due to geographical limitations. In fact, their respective networks are highly complementary. However, there is a clear impact on their European hub partners and the routing of traffic volumes over their own hubs and onto the closed JVs

[25] http://centreforaviation.com/analysis/iata-after-the-white-paper-time-for-the-us-major-airlines-and-gulf-carriers-to-kiss-and-make-up-282419

of the North Atlantic. At the moment, the advantages to be gained by forging closer links to one or more of the Gulf 3 are capitalised only by the smaller US airlines on their Gulf airline traffic feed[25].

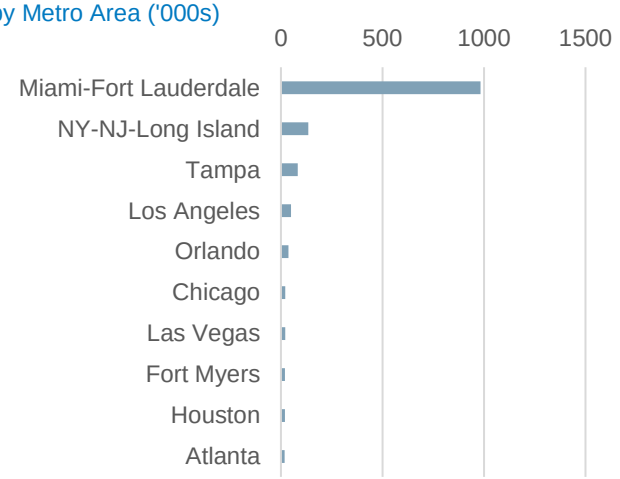
Figure 34 - Top 5 Airlines Operating between the US & Caribbean (% of seats per week, one-way, between 9 March 2015 and 7 Mar 2016)




Source: CAPA, 2016

During 2015 Cuba and the US reached a deal to start liberalising scheduled flights between the two countries, the last of which occurred close to 56 years ago. The agreement between the two countries prohibits tourist travel and instead requires that passengers must fall into 12 opaque categories, ranging from family visits to educational activities. Now that Cuba and the US have finalised an agreement that liberalises some, but not all, air travel between the countries, a number of US airlines has applied to launch services to Cuba. The three large US global network airlines are among the contenders for new services, each one offerings different reasoning for the merits of their prospective routes. One of the important discussion points in air services between Cuba and the US is the potential lack of infrastructure in Cuba to handle an influx of visitors from the US. There could be serious capacity issues at Cuban airports and limited hotel accommodation. However, an increasing investment and expansion of tourism infrastructure is expected in the long run. The Cuban government already announced over 50 projects which are supposed to support managing the strong rise in visitor arrivals[26]. This would also benefit European tourists. Besides Canada, the UK, France and Germany are among Cuba's largest source markets, but in light of the expected influx of US travellers, these markets had already raised concerns about capacity issues and rising price levels[27].

Figure 37 - Top 10 Cuban - American Populations in the US by Metro Area ('000s)




Source: Delta Airlines, 2016

[26] http://www.travelindustrytoday.com/2015-06-05-fitcuba-2015::21798

[27] http://www.travelpulse.com/news/tour-operators/cuba-the-capacity-issue.html

The Havana route award proceedings were a rare case in which both large global network airlines, Low Cost and Ultra Low Cost Carriers all had the opportunity to compete for approval to operate to Cuba's capital.

With the tentative awards the US Department of Transport (DoT) can be credited for creating a level playing field on flights to Havana. Aside from the closely watched contest to win services to Havana, the US DoT also awarded service rights to nine other secondary Cuban cities with South Florida featuring prominently in those route assignments. With a 50-plus year absence of scheduled airline flights between the US and Cuba, there is no up-to-date data from which to measure demand patterns. The full list of the tentative awards can be found in the following page.

Table 8 - US Airline Route Awards to Cuba

| Secondary cities | | Havana | |
|---|---|---|---|
| **Airline** | **Route/Frequency** | **Airline** | **Route/Frequency** |
| **American** | Once daily from Miami to Camaguey and Cienfuegos<br>Twice daily from Miami to Holguin, Santa Clara and Varadero | American | Miami, four times daily<br>Charlotte, once daily |
| **Frontier** | Once daily from Chicago O'Hare to Santiago<br>Four times weekly from Philadelphia to Camaguey<br>Three times weekly from Philadelphia to Santa Clara<br>Saturday service from Chicago O'Hare to Varadero<br>Saturday service from Philadelphia to Varadero | jetBlue | Fort Lauderdale, once daily (except for Saturday)<br>New York JFK, once daily<br>Orlando, once daily |
| **jetBlue** | Once daily from Fort Lauderdale to Camaguey, Holguin and Santa Clara | Frontier | Miami, once daily |
| **Silver Airways** | All service is from Fort Lauderdale:<br>Five weekly flights to Camaguey<br>Three weekly flights to Cayo Coco<br>Saturday service to Cayo Largo<br>Two weekly flights to Cienfuegos<br>Once daily to Holguin<br>Three weekly flights to Manzanillo<br>Four weekly flights to Varadero<br>One daily flight to Santa Clara<br>One daily flight to Santiago | Delta | New York JFK, once daily<br>Atlanta, once daily<br>Miami, once daily |
| **Southwest Airlines** | Twice daily from Fort Lauderdale to Varadero<br>Once daily from Fort Lauderdale to Santa Clara | United | Newark, once daily<br>Houston Intercontinental, once weekly |
| **Sun Country** | Saturday service from Minneapolis to Varadero<br>Sunday service form Minneapolis to Santa Clara | Southwest Airlines | Fort Lauderdale, twice daily<br>Tampa, once daily |
| | | Spirit | Fort Lauderdale, twice daily |
| | | Alaska | Los Angeles, once daily |

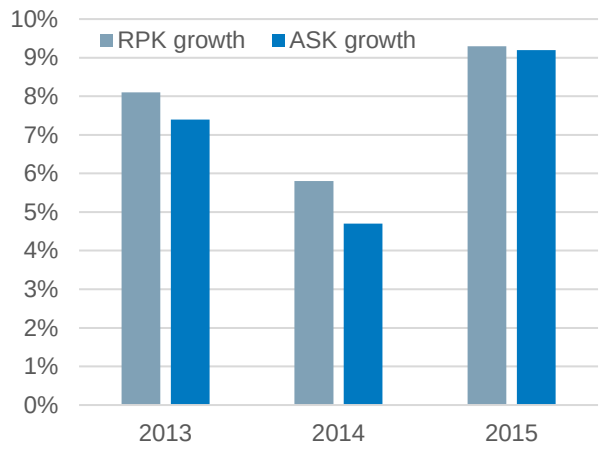
Source: DoT, 2016

**Passenger Performance by Region: Latin America**

## Market Developments

The Latin American region has a history of cyclical ups and downs, but the fundamental drivers for future expansion remain in place: the middle class is growing, income levels are expected to rise, and the commodities and resources that have enabled growth during previous periods still remain. Several countries in the region are working through near-term economic challenges. The Brazilian and Venezuelan economies are contracting, and Argentina is on the edge, although the new government is taking positive actions for improvement. Conversely, the economies of many other nations, including Mexico, Panama, Peru, and Colombia, are performing well and are positioned for continued expansion. Chile is still growing, although affected by the commodities slump, and Cuba is gradually opening its borders[28].

Figure 35 - Latin America International Traffic and Capacity Growth between 2013 and 2015




Source: IATA, 2016

Overall, while the near-term economic outlook is challenging, long-term prospects for the region as a whole are promising. Even with the formidable challenges that Venezuela and Brazil are creating for Latin American aviation, data from IATA show international traffic and capacity growth of 9% for the region in 2015, which is higher than the industry's performance in both 2014 and 2013. The numbers reflect the overarching belief in Latin America's stance as one of the largest growth markets in the future.[29]

A pending open skies agreement with Brazil, a new bilateral with Mexico and the recently concluded agreement to resume scheduled flights between the US and Cuba have created new opportunities for US airlines to broaden their reach in Latin America and the Caribbean. As Venezuela continues to shut itself off from the international aviation industry, other governments in Latin America are moving towards a more liberalised stance.

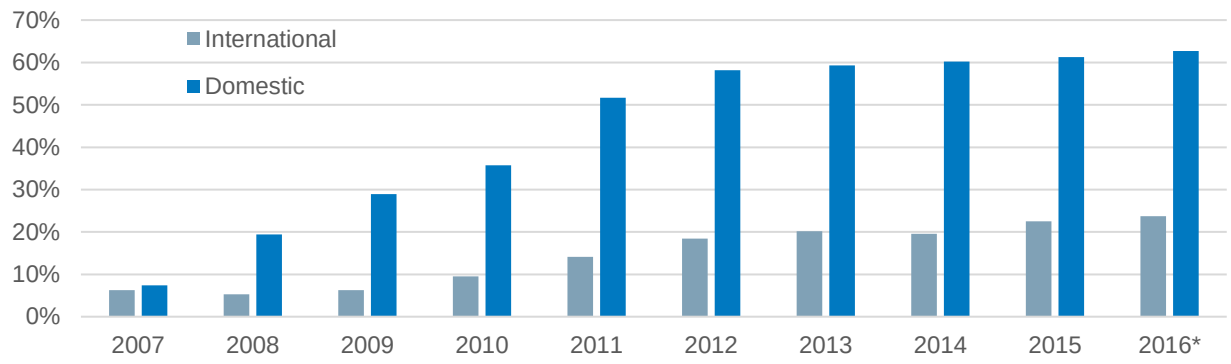
Low cost airline representation is less pronounced in South and Latin America and varies by market. Brazil's second largest airline Gol is a low cost airline, but for the moment is mired in Brazil's economic woes. At the moment Gol is not undertaking any growth; it is working to revise its fleet and debt, as access to credit by Brazilian companies remains a challenge.

Mexico has Latin America's highest concentration of low cost airlines. In the mid-2000s three Mexican low cost airlines emerged, gaining further opportunity in 2010 with the demise of the full service airline Mexicana. In 1Q2016 Volaris, VivaAerobus and Interjet combined represented 63% of Mexico's domestic market, and Aeromexico remained the market leader with a 32% share.

[28] Boeing Current Market Outlook 2016-2035

[29] http://centreforaviation.com/analysis/capa-americas-summit-latin-america-remains-promising-as-open-skies-drives-us-international-growth-276493

Figure 37 - Mexico LCC Capacity Share (%) of Total Seats: 2007 to 2016 Jan-May




Source: CAPA, 2016 *Year to month indicated

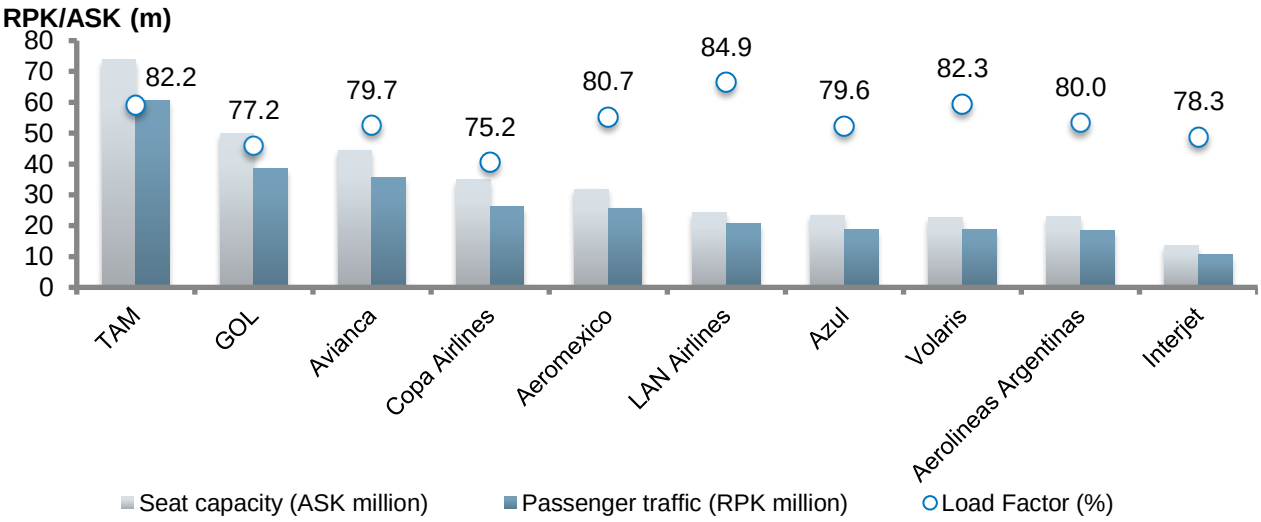
In late 2014 the US and Mexico agreed to a revised bilateral air agreement that lifted restrictions on the number of airlines allowed to operate on routes between the two countries. Due to the lack of specified fifth freedom rights in the agreement, it is not a full open skies agreement.

Meanwhile, in March 2015 SkyTeam partners Aeromexico and Delta revealed plans to establish a cross-border joint venture in the context of the revised agreement. The joint venture has all the requisite approvals but has yet to be formally finalised. Combined, those two airlines represent 25% of the seats deployed between the US and Mexico for the week of 18-Jul-2016, surpassing the market leaders American and United – each having a 20% share.

## Airline Outlook

Airlines are adjusting capacity and rationalizing their fleets as needed to deal with the current situations and to position themselves for growth. Challenges provide incentive for change. Brazil is proposing to raise the maximum-permitted level of foreign ownership of Brazilian airlines to 49%, and airlines and airline-related entities are calling for reforms on taxes, policies, and regulations that constrain growth [30].

Figure 38 - Top 10 Airlines in RPKs for 2015 – Latin America

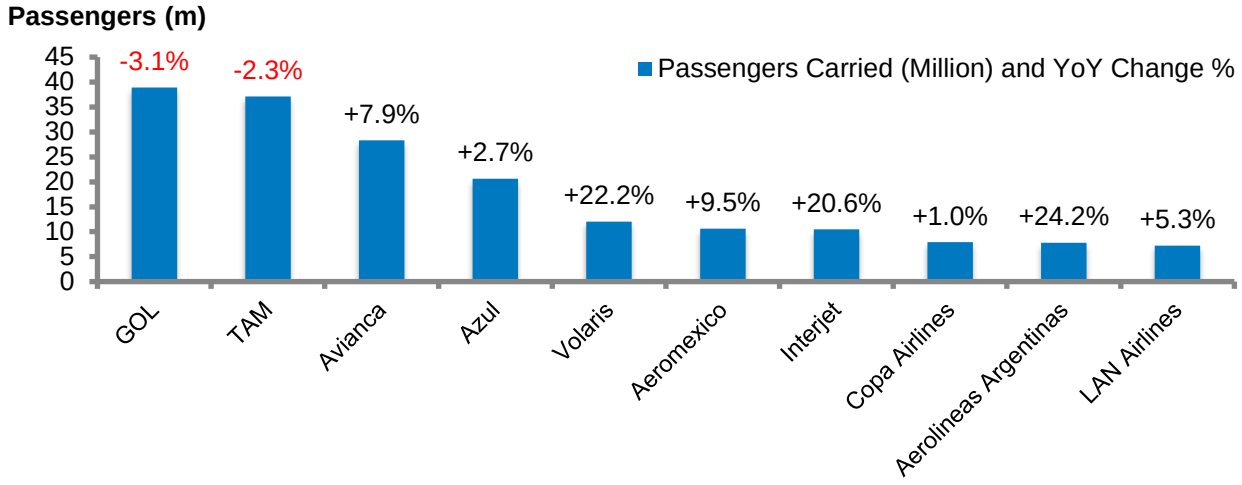



Source: Airline Business, 2016

[30] Boeing Current Market Outlook 2016-2035

Looking at Figure 39 the challenges of the Brazilian economy and political scene have taken a toll on airline passenger performance with GOL and TAM traffic volumes declining by 3.1% and 2.3% YoY respectively. Of note are also the growth rates of the three Mexican airlines in the Top 10 ranking Aeromexico, Volaris and Interjet, indicating the strong growth of the Mexican aviation industry. Finally, the impressive growth of Aerolineas Argentinas signals a path to recovery for Argentinian aviation following the recently elected more liberal government.

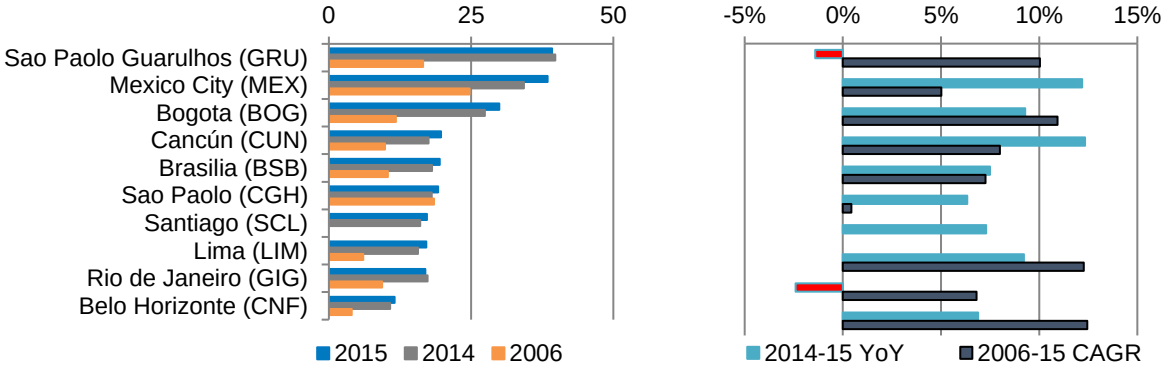
Figure 39 - Top 10 Airlines in Passengers Carried in 2015 – Latin America




Source: Airline Business

Despite a struggle for profitability observed in many airlines operating in the region, airport traffic performance in Latin America has been mixed, with four airports on Figure 40 achieving year on year growth of between 8-10%. Furthermore, the anaemic performance of Brazilian aviation is apparent on the figure as four of the top ten airports in passengers are located in Brazil and have been affected by the country developments.

Figure 40 - Top 10 Airports in 2015 by Passenger Traffic (m) – Latin America




Source: ACI World Traffic Reports

## Passenger Performance by Region: Middle East

Located at the crossroads between Asia, Africa, and Europe, airlines in the Middle East are well positioned to compete for traffic connecting these regions. About 80% of the world's population lives within an eight-

hour flight of the Gulf, allowing carriers in the Middle East to aggregate traffic at their hubs and offer one-stop service between many city pairs that would not otherwise enjoy such direct itineraries.

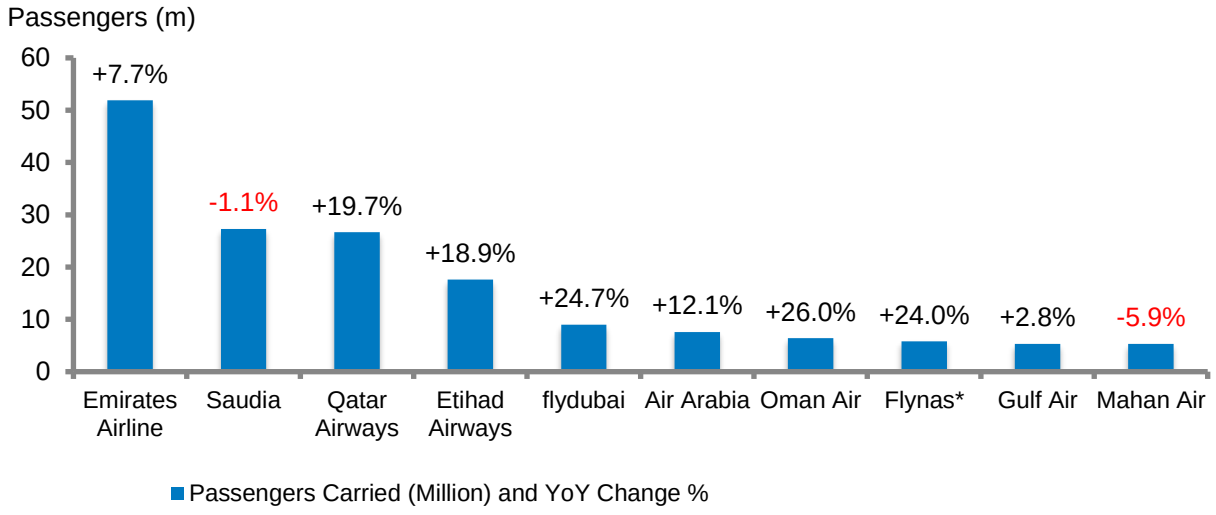
Lower oil prices challenged many Middle East economies in 2015 and 2016. Although not every country in the region has oil, many of its governments often use oil revenues in place of VATs, income taxes, or taxes on corporate profits to finance their operations. The 2016 Iran nuclear deal represents an impressive opportunity for the region which will be further analysed below.

## Airline Outlook

Middle Eastern carriers continue to form various partnerships with international airlines to sustain future growth. These range from code sharing and buying equity stakes, to expanding the commitment in airline alliances. This results in numerous growth opportunities, especially considering that Middle Eastern carriers still face considerable access limitations in many international markets.

In this context, low-cost carriers such as flydubai and Flynas are strengthening their position by a continuous development of their business model and the expansion into new markets. Besides gradually reducing air fares and customer experience and service improvements, they are also establishing cross-border subsidiaries and enlarge networks into previously underserved areas, such as the Commonwealth of Independent States.

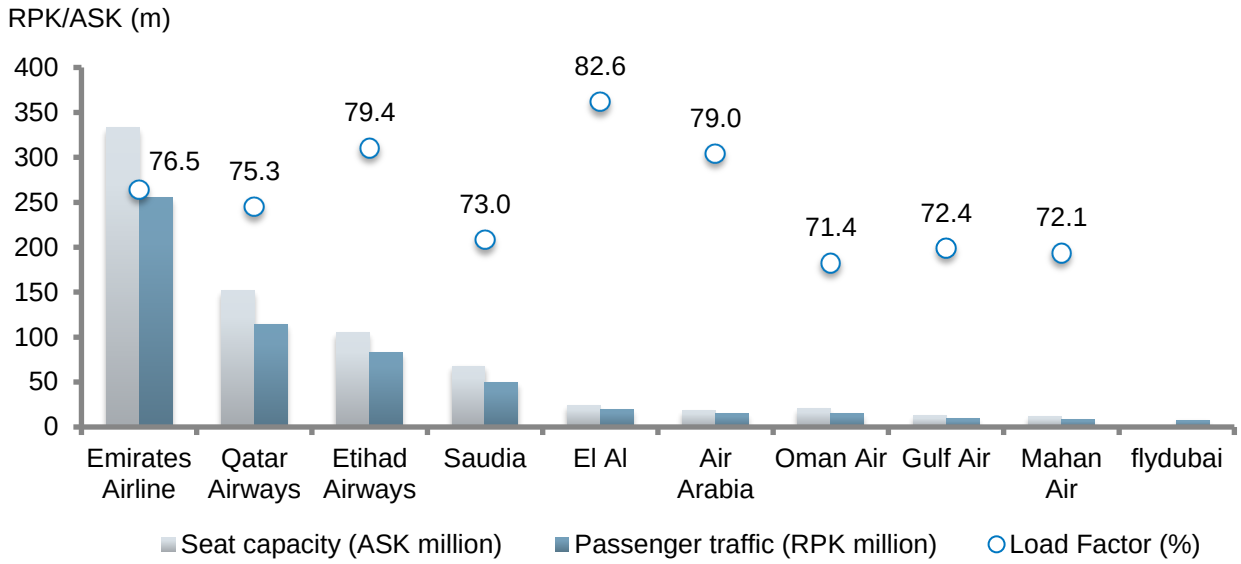
Figure 41 - Top 10 Airlines in Passengers Carried in 2015 – Middle East




Source: Airline Business

All the above have resulted in is yet another year of strong growth for Middle Eastern airlines, with double digit year on year growth for half of the carriers on Figure 41. Load factors for Middle Eastern airlines ranged from 71% (Oman Air) to 83 % (El Al) (Figure 42).

Figure 42 - Top 10 Airlines in RPKs for 2015 – Middle East

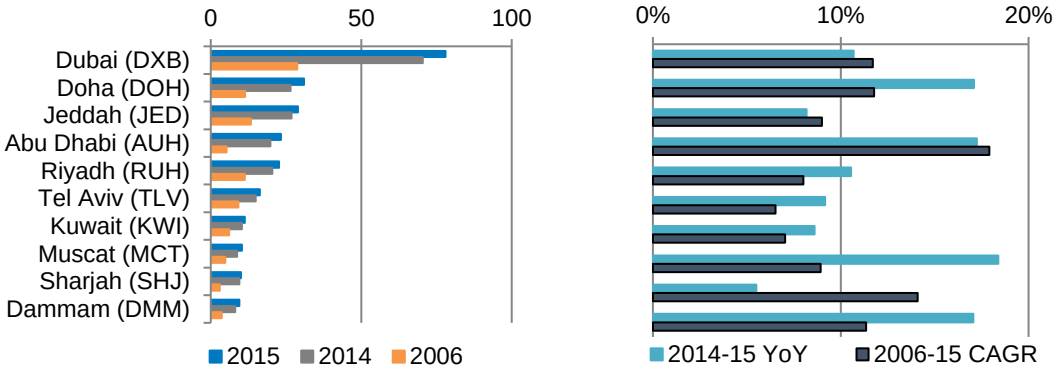



Source: Airline Business Note: Information on flydubai's load-factor was not available

## Airport Outlook

Middle East hub airports have been upheld as examples of integrated planning and successful execution that boost economies. In a fast-growth region like the Middle East breaking records is the norm. Unsurprisingly, the region's three hub airports – Dubai International, Doha and Abu Dhabi – posted record traffic in 2015. Abu Dhabi posted an additional 3.4 million passengers (+17%) and Doha 4.6 million (+17%). Although Abu Dhabi and Doha are collectively 68% the size of Dubai, together they added more passengers (8 million) than Dubai (7.5 million, +11%).

Figure 43 - Top 10 Airports in 2015 by Passenger Traffic (m) – Middle East



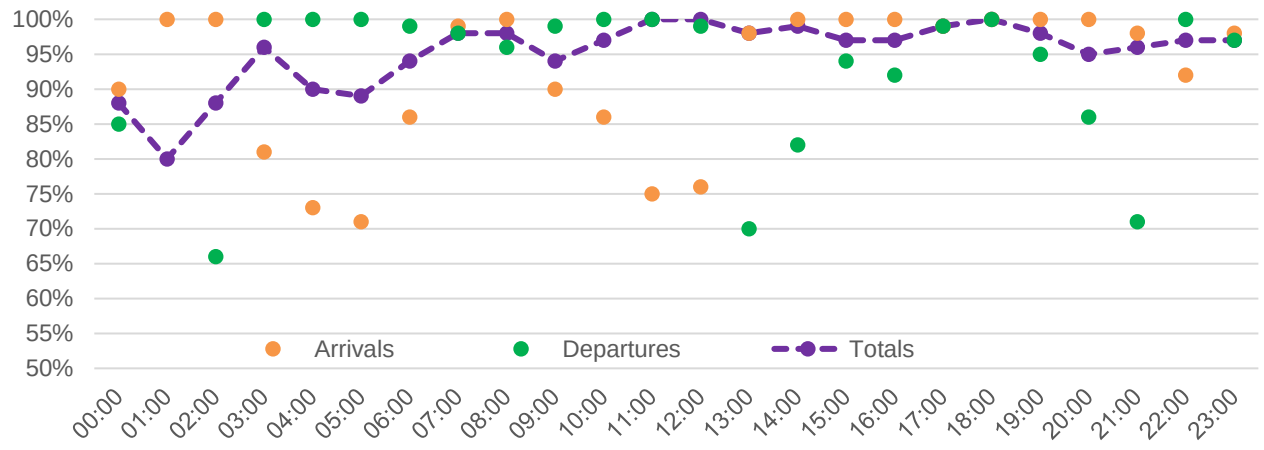

Source: ACI World Traffic Reports

Now the region has the challenge of maintaining growth despite increasing taxes and fees. On 30-Mar-2016 Dubai announced a new AED35 (USD9.53) departure fee[31]. It will be the only fee currently imposed on transfer passengers and Dubai could generate significant millions of dollars from it in 2016. This is especially a concern since the increase does not appear to be associated with any increased cost of operation – six months prior, Dubai wrote off any increase. Capacity constraints at Dubai may mean there is little risk of

[31] http://centreforaviation.com/analysis/dubai-doha-and-abu-dhabi-airports-win-record-traffic-unhelpful-taxes-could-challenge-growth-274542

losing passengers to alternative hubs. Abu Dhabi and Doha remain tax free for transfer passengers. Oman has doubled passenger fees over two years, while Bahrain is considering increases as well.

Figure 44 - Dubai International slot usage: northern summer 2015




Source: ACL

## Market Developments

Following the lifting of nuclear-related sanctions against Iran in January 2016 a potentially significant global aviation market was once again reopened to the world, after almost four decades of isolation. Iran has huge pent-up demand and potential after almost 40 years of isolation from the international community. Despite the isolation, Iran's economy approaches those of Turkey and Spain, which are 15-20% larger than Iran's, but their fleet sizes are 100-200% greater.

Table 9 - Comparison of Iran's Economy and Aviation Sector with Selected Markets

| | GDP (PPP) 2015 | Fleet Size | Domestic Seats per Capita |
|---|---|---|---|
| **Spain** | USD1.62 trillion | 369 | 0.83 |
| **Turkey** | USD1.59 trillion | 465 | 0.63 |
| **Iran** | USD1.37 trillion | 160* | 0.25 |

Source; CAPA, IMF, OAG

Soon after sanctions were removed Iran Air placed firm orders for 118 Airbus aircraft and 20 ATRs, with options for a further 20 ATRs. Private airlines are estimated to have an interest in entering into commitments for a further 100 aircraft over the next twelve months[32].

The country has a young population with a median age of 28 years, with strong aspirations to travel and engage with the rest of the world. Geographically, Iran enjoys almost the same aviation advantages as the Gulf states. Decades of sanctions have had a significant negative impact on Iran's aviation sector, which is underdeveloped relative to comparable markets[33]. At the moment, Iran's aviation could be compared with Indian aviation a decade ago. If it were to follow a similar path of development as India post sanctions, there are clearly significant opportunities for Iranian aviation and for the international aviation community.

[32] http://centreforaviation.com/analysis/iran-airs-fleet-order-signals-serious-intent-for-the-iranian-aviation-industry-266339

[33] http://centreforaviation.com/analysis/iata-iran-with-an-educated-populace-of-80-million-becomes-a-potentially-major-aviation-force-282989

Table 10 - Comparison of Iran's Economy and Aviation Sector with India

| | India FY2004 | Iran FY2016 | India FY2016 |
|---|---|---|---|
| **GDP (PPP)** | USD1.1 trillion | USD1.4 trillion | USD2.3 trillion |
| **Airport pax** | 48 million | 48 million | 224 million |
| **Domestic share of pax** | 74% | 74% | 76% |
| **Fleet size** | 158 | 160 | 4,200 |
| **LCC share of domestic** | 1% | 0% | 60% |

Source: CAPA, IMF, Airports Authority of India, Iran Airports Company, Directorate General of Civil Aviation India

### Passenger Performance by Region: Asia Pacific

Asia is gaining prominence in global aviation and is expected to become the world's leading travel market. Airlines and airports in this region are growing strongly, with many of them ranked among the largest in the world. This evolution has been due largely to regional economic growth; liberalization and deregulation; new, efficient airplanes, and new business models. Over the past decade, both the number of the airlines and their jet fleets have almost doubled, while the capacity they provide grows by 7% on average each year.

Demand in commercial aviation is also coming from the continuing expansion of the middle class in Asia, where a greater sector of the population is reaching income levels that make flying more affordable. Despite the presence of geopolitical conflict and currency fluctuation, liberalization and robust economic growth are primarily responsible for the significant expansion in Asia's aviation industry. Changes, such as open skies, enable the air-travel market in the region to expand beyond national boundaries and support airlines in implementing new low-cost carrier (LCC) business models, which is a viable and growing option for this emerging market.

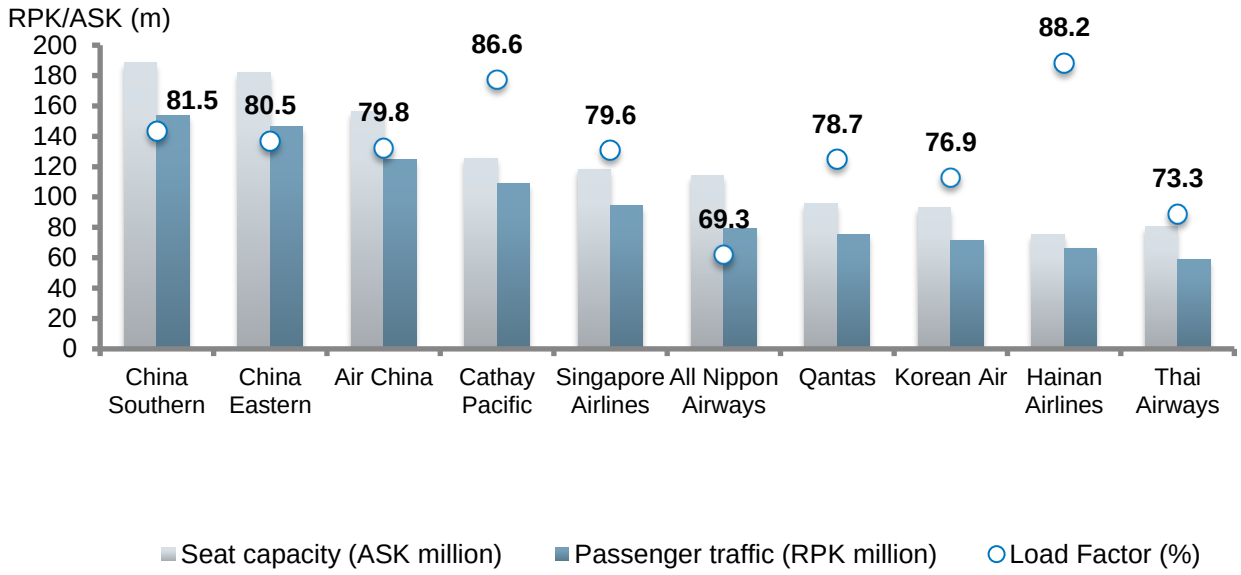
Total air traffic for the region is forecast to grow at an average of 6.0% as airlines, airport capacity, and passenger traffic all expand in the next 20 years. Driven by the region's strong economic development, highly effective industry structure, and increasing accessibility of air transport services, more than 100 million new passengers are projected to enter the market annually.

However, it is also essential to note that the Asian Pacific aviation market has experienced a series of unfortunate events involving Asian airlines during 2014 and 2015, including the loss of two Malaysian Airlines aircraft, the TransAsia Airways accident in Taiwan or Air Asia crash into the Java Sea. These raised concerns about the level of safety in the industry.

## Traffic Outlook

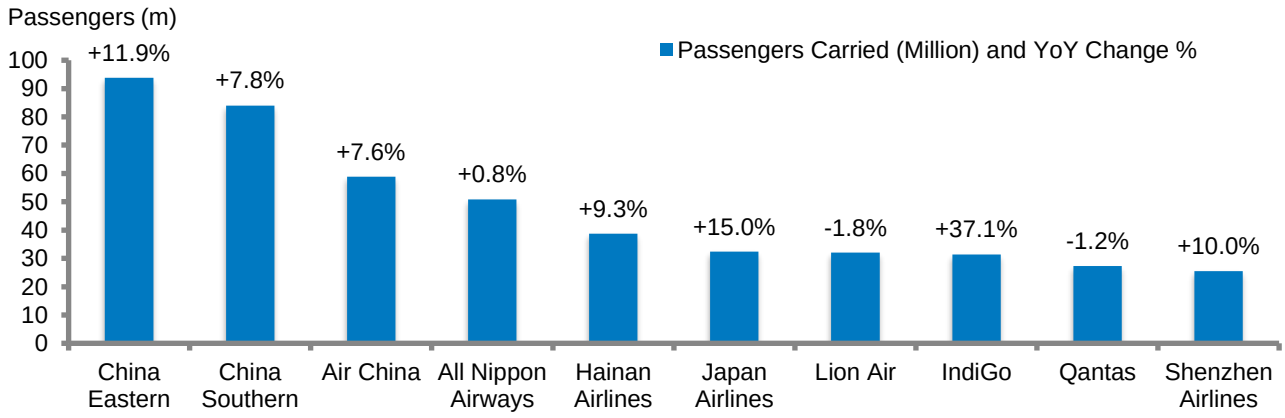
Asia Pacific continued in 2015 to be dominated by three Chinese airlines, China Southern, Eastern and Air China, having the highest RPK and ASK in the market, see Figure 45. However, from a load factor perspective, it is Hainan Airlines and Cathay Pacific which lead the ranking, with 88% and 86% respectively. These two carriers achieved higher load factors compared to those of the remaining carriers. Nevertheless, with most of the load factors being around 80%, Asian Pacific airlines appear to benefit from the growing air travel demand in the region. it should however be noted that the dominance of the Chinese airlines has largely been the result of their vast domestic route networks, while Cathay Pacific and Singapore Airlines mainly focused on international operation.

Figure 45 - Top 10 Airlines in RPKs for 2015 – Asia Pacific




Source: Airline Business

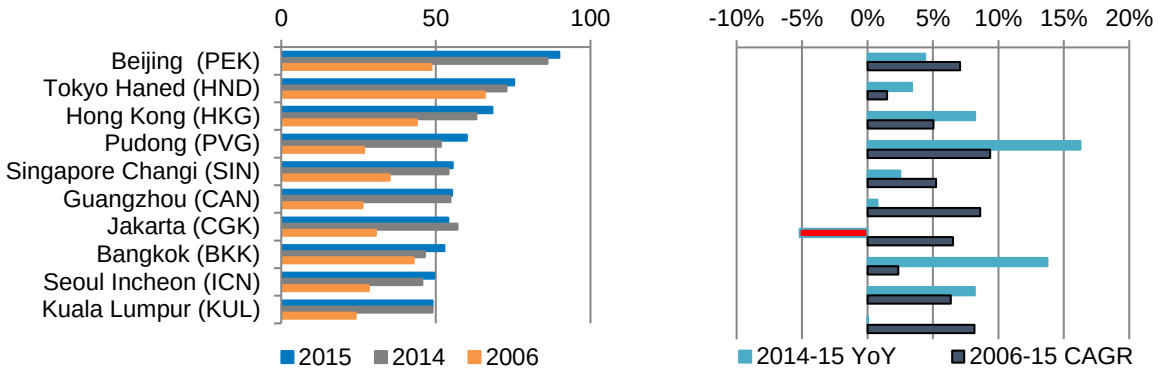
Figure 46 - Top 10 Airlines in Passengers Carried in 2015 – Asia Pacific




Source: Airline Business

In terms of passengers carried, Japan Airlines is continuing its growing trend since its restructuring, with traffic growing 15% year on year in 2015, following a 17.2% in 2014. Half of these top 10 airlines in terms of passengers carried are Chinese, while the impressive growth of 37.1% of IndiGo is a sign for the promising Indian aviation prospect.

Figure 47 - Top 10 Airports in 2015 by Passenger Traffic (m) – Asia Pacific




Source: ACI World Traffic Reports

Figure 47 illustrates the top 10 airports in Asia Pacific and their passenger traffic volumes since 2006. In line with the developments described above, the majority of the airports recorded a considerable increase in passenger traffic during this time. While Beijing handled the largest amount of passengers in 2015, Pudong recorded the highest growth compared to 2014 (16%), followed by Bangkok (14%). Solely Jakarta experienced a decline in passenger volume during 2014 (-5%). This has been partly due to the growing competition of another airport in Jakarta, Halim Perdanakusuma (HLP), which gradually expands its passenger numbers since operational restrictions were lifted in early 2014[34]. The strongest development since 2006 was observed at Pudong, Guangzhou and Kuala Lumpur airports, whose passenger volumes grew at CAGR's of 9.4%, 8.6% and 8.2% respectively. Interestingly, Kuala Lumpur's passenger traffic in 2015 almost remained on 2014 levels. As the airport is a hub of Malaysian Airlines, its traffic had been considerably affected by the extensive restructuring and route cuts of Malaysian Airlines following its two accidents during 2014[35]. Besides this, it also emerges that four of the top 10 airports in the region are in China. Similarly to Chinese airlines, they have not only been benefitting from large domestic route networks, but also a strong rise in Chinese air travel demand and the country's growing economy.

## Market Developments

### China

China has continued its development into the world's largest air transport system during 2015. 440 million passengers were served by around 206 airports, eight of these even handled passenger volumes of over 30 million. By 2020, annual passenger traffic is expected to have surpassed the 700 million mark and by 2024, China is estimated to be the largest air passenger market in the world[36]. The rates at which Chinese carriers were growing in 2015 reflected this strong performance. In the first eight months alone, their total passenger volume noted a 37% rise compared to the previous-year period. This is equal to the total amount of passenger traffic Chinese airlines gained between 2010 and 2014. This growth has been largely driven by a steady increase in air travel demand across China, which came along with economic prosperity and a growing middle class. In 2015, Chinese outbound tourism strengthened its position as largest in the world[37], totalling at 133 million travellers, which was 20% above 2014 levels[38]. Besides Hong Kong and Macau,

[34] http://www.anna.aero/2016/08/23/jakarta-soekarno-hatta-international-handled-52-million-passengers-in-2015/

[35] http://www.thestar.com.my/business/business-news/2015/12/10/lower-passenger-traffic-in-malaysian-airports-last-month/

[36] http://www.icao.int/Meetings/a39/Documents/WP/wp_304_en.pdf

[37] http://www.e-unwto.org/doi/pdf/10.18111/9789284418145

[38] http://www.forbes.com/sites/profdrwolfganggarlt/2015/12/30/2015-year-of-resilient-growth-and-further-segmentation-of-chinas-outbound-tourism/#52a4fc9b1d46

Australia is among the most popular destinations[39]. The number of Chinese tourist arrivals crossed the one million mark for the first time in 2015 and the country developed into China's second largest long haul market outside Asia, only the USA ranked ahead. It is expected that by 2016, China and Australia will be connected by flights on 21 city pairs. For comparison, there are 22 city pairs between Australia and New Zealand, which is Australia's biggest incoming market[40]. Besides the flourishing outbound travel demand, China also recorded the fourth highest international tourist arrivals in 2015, highlighting its importance as leading global business and leisure destination[37]. In addition, the country is experiencing a gradual liberalisation of its air traffic. The Chinese government increasingly values the industry as a decisive factor for economic development and thus has made significant efforts to facilitate its expansion, including international negotiations on visa requirements and air service agreements[41].

However, along with its growth, China's air transport system is also facing an increasing number of challenges, ranging from a lack of specialists such as pilots and mechanics, to limited air traffic management capabilities and financial bottlenecks of regional airports and several Chinese airlines. In addition, the rapid expansion of the China's high-speed rail system is considered to present a considerable competition for domestic air services[42].

### Japan

International tourist arrivals to Japan noted an exceptional growth of 47% to 19.7 million between 2014 and 2015, making it the fifth largest market across the Asia and Pacific region[37]. Originally, the country was expected to surpass the 20 million mark in 2020, but in light of 11 million incoming tourists gained since 2010, this target is likely to be achieved earlier than planned and an ambitious new goal of 40 million annual tourists has already been set for 2020[43]. A gradual deregulation in Japan's airline sector, as well as the facilitation of visa procedures for large source markets such as China, Malaysia and Thailand, have strongly supported the development of Japan's tourism industry in recent years[44]. Unsurprisingly, this has also triggered considerable growth in Japanese air passenger volume, which grew by 5% between 2014 and 2015. The vast majority of incoming tourists in 2015 came from surrounding Asian regions (84%)[44], with China being the largest source market, accounting for a quarter of total tourist arrivals[45]. This is also reflected in Japanese air traffic. Between 2014 and 2015 alone, four Chinese carriers started serving Japan and the number of Chinese airports offering flights to Japan rose to 34, which was almost twice as high as in 2010, while scheduled seat capacity reached an all-time high[46]. The USA presented the biggest market outside Asia, accounting for 5% of total incoming tourists in 2015[47] and the fourth largest scheduled seat capacity[48].

To date, low-cost carriers have only played a minor role in Japan compared to other large air transport markets, handling about 10% of total passenger traffic[49]. However, along with the increasing liberalisation of Japanese air traffic, an increasing expansion of domestic and international low-cost carriers could be

[39] http://www.goldmansachs.com/our-thinking/pages/macroeconomic-insights-folder/chinese-tourist-boom/report.pdf

[40] http://centreforaviation.com/analysis/china-australia-aviation-one-million-visitors-flights-on-21-city-pairs-from-12-chinese-cities-261773

[41] http://centreforaviation.com/analysis/chinas-secondary-airlines-plan-long-haul-growth-10-airlines-to-have-widebody-aircraft-part-1-253336

[42] http://www.nextor.org/Conferences/201502_NEXTOR_Workshop/Zhang%20&%20Zhao-Asilomar-2015.pdf

[43] http://centreforaviation.com/analysis/japan-tourism-targets-doubled-despite-airline-capacity-decreases-long-haul-focus-275209

[44] McKinsey&Company (October 2016): "The Future of Japan's tourism: Path for sustainable growth towards 2020"

[45] http://www.eastasiaforum.org/2016/06/25/making-the-most-of-japans-tourism-boom/

[46] http://centreforaviation.com/analysis/china-japan-market-grows-with-doubling-of-tourism-four-new-airlines-and-greater-city-pairs-242946

[47] http://www.tourism.jp/en/tourism-database/stats/inbound/#country

[48] http://centreforaviation.com/profiles/countries/japan

[49] http://www.thenational.ae/business/aviation/japans-airline-sector-steady-but-requires-lift

observed. While the share of low-cost in total domestic seat capacity grew from 6% in 2009 to 18% in 2015, the share of low-cost in total international seat capacity climbed from 1% to 12% during the same time[50].

Notable capacity limitations in Japans' infrastructure could present considerable challenges to the country's ambitious targets in tourist arrivals. Almost half of the incoming tourist volume remains in the country's largest cities Osaka, Tokyo and Kyoto, which will increase the pressure on accommodation and transport facilities. It is estimated that in 2020, Tokyo's Haneda and Narita Airports may be short of 30% capacity. This is also the year where they city will host the Olympic Games[44]. Moreover, Japan's incoming tourist volumes strongly rely on the Chinese market and potential downturns in demand from this region could already have a considerably negative impact on incoming tourist arrivals in Japan[44]. In order to decrease this dependency, Japan plans to further liberalise visa requirements for visitors from the Philippines, India, Russia and Vietnam, which is also expected to positively affect air traffic demand from these countries[51].

### India

India became the fastest growing aviation market in the world during 2015. While passenger volume in China and the USA rose by 10% and 5% respectively compared to 2014, India recorded an extraordinary increase of 20% to over 80 million passengers. This strong development was largely driven by a drop in fuel prices, which reached a five-year low, a remarkable domestic air travel demand, as well as higher income levels and a booming economy[52].

According to IATA, domestic Indian air traffic alone grew by 25% between 2014 and 2015, which was not only the highest rate recorded worldwide, but also far above the global average of 5%[53]. International passenger volumes recorded a notably smaller growth of 8%. This has largely been the result of the still strongly regulated Indian air traffic market, which does not only limit the accessibility for foreign airlines, but also the international operation of domestic carriers. Although over 70 foreign airlines offer international connections to the country compared to five Indian carriers[54], the latter handled around 1/4 of international passenger volume in 2015[55].

Indian airlines were growing along with the country's air travel demand during 2015, while especially the decreasing fuel price improved their profitability. CAPA expects that in 2016, combined industry losses will fall by 75%[54]. Low-cost carrier IndiGo and Jet Airways were the largest domestic airlines in 2015, serving 37% and 19% respectively of total domestic passengers. The latter was also the dominating carrier in international traffic, handling 10% of international passenger volume in Q42015, followed by Air India (8%). Emirates and Etihad were the largest foreign airlines with an 8% and 4% share in international passenger traffic[55].

India's future domestic and international air travel is expected to benefit from a gradual liberalisation and public investment into the sector. In 2015, India expanded its air service agreements with several countries, including Finland, Kazakhstan, Kenya, Sweden, Norway, Denmark, Oman and Ethiopia. In addition, the Indian government continued to work on its new aviation policy, which will promote the international operation

[50] http://centreforaviation.com/analysis/china-japan-aviation-lccs-peach-jetstar-japan-gain-traffic-rights-raising-overcapacity-concerns-296147

[51] http://www.forbes.com/sites/profdrwolfganggarlt/2015/12/30/2015-year-of-resilient-growth-and-further-segmentation-of-chinas-outbound-tourism/#52a4fc9b1d46

[52] http://www.telegraph.co.uk/finance/economics/12077311/India-crowned-worlds-fastest-growing-aviation-market-in-2015-as-economy-takes-off.html

[53] http://www.iata.org/pressroom/pr/Pages/2016-02-04-01.aspx

[54] http://centreforaviation.com/analysis/iata-indias-aviation-market-surges-20-on-economic-growth-and-low-fuel-prices-283494

[55] http://dgca.gov.in/reports/rep-ind.htm

of domestic airlines, the registration of foreign aircraft, airport construction and expansion, as well as bureaucracy reduction and administrative improvements regarding licensing and training[59].

India's air travel was also strongly driven by the growing tourism sector. In 2015, the country ranked among the top destinations in South Asia, recording 8 million international tourist arrivals, which presented a 5% increase over 2014. Since 2010, international tourist arrivals grew at a CAGR of 7%[37]. The liberalisation of visa requirements, such as the introduction of a medical visa, as well as considerable financial investments and tax reduction by the Indian government strongly supported the development of the sector. In 2015, tourism was the country's third largest foreign exchange earner[56].

Growing foreign investment into India's aviation industry is expected to further sustain the sector's growth. Aircraft manufacturers Boeing and Airbus are increasingly cooperating with Indian companies regarding production, maintenance and training[59]. Both also share the optimistic view on India's future air travel growth. Over the next 20 years, Boeing expects India to account for 5% of worldwide demand for new airplanes[57], while Airbus estimates that the country's passenger traffic will grow at 8% annually[58]. By 2020. India aims at becoming the third-largest air travel market in the world[59].

### Myanmar

Myanmar has long been isolated from global trade, which also limited its aviation sector, but along with a removal of economic sanctions in 2012, both sectors have since experienced strong growth. While the country only handled 0.8 million international air passengers in 2008, these climbed to 2 million in 2012. By 2015, Myanmar recorded 3.4 million passengers, which presented a 7.5% increase over 2014. Nevertheless, this was below the CAGR of 23% at which international passenger volume has grown since 2008[60]. Domestic passenger traffic is slightly smaller in volume, at 2.3 million passengers in 2015. This was 4% higher than in 2014, but considerably less than the 14% CAGR at which it had grown since 2010[61].

It appears that Myanmar's air traffic market started to experience a slowdown in 2015. While 12 international airlines started operations Myanmar between 2012 and 2013, only two new carriers launched routes between 2014 and 2015[62]. Moreover, considering that the country is served by 24 foreign airlines, Burmese carriers face difficulties gaining market shares in international traffic. Four Asian airlines handled 50% of Myanmar's international passenger volume in 2015. Air Asia was the largest carrier (17%), followed by Thai Airways (13%), Bangkok Airways (10%) and Singapore Airlines (10%). Myanmar Airways (9%), which ranks fifth, is the largest Burmese carrier handling international traffic[60].

At the same time, 10 airlines compete in Myanmar's domestic market despite its small size, which results in notable overcapacity, fierce competition, fragmentation and unprofitability. Despite this, Myanmar National Airlines, Air KBZ and Mann Yadanarpon were the largest domestic carriers, operating over 60% of total domestic seat capacity[63]. In addition to rivalry completion, domestic airlines also face notable challenges from high taxes on fuel, on aircraft and parts[66]. With many of the domestic carriers operate less than five

[56] http://www.ibef.org/industry/indian-tourism-and-hospitality-industry-analysis-presentation

[57] http://www.boeing.co.in/news-and-media-room/news-releases/2016/july/boeing-forecasts-demand-for-1850-new-airplanes-in-india.page

[58] https://www.flightglobal.com/news/articles/india-to-require-1600-new-aircraft-by-2034-airbus-423226/

[59] http://www.ibef.org/industry/indian-aviation.aspx

[60] http://centreforaviation.com/analysis/myanmar-aviation-part-1-rapid-international-growth-but-challenging-conditions-as-emirates-enters-274760

[61] https://centreforaviation.com/analysis/draft-myanmar-aviation-part-3-domestic-growth-slows-but-consolidation-remains-elusive-275215

[62] http://www.ainonline.com/aviation-news/air-transport/2016-02-12/myanmar-boom-wanes-overcapacity-bites

[63] http://centreforaviation.com/profiles/countries/myanmar

aircraft, some experts have request the introduction of a minimum fleet size or consolidation to improve the market environment[62].

Along with the gradual opening of the country, Myanmar welcomed a record level of 4.7 million total international tourist arrivals in 2015[37] and the industry has already developed in one of the most essential economic sectors of the country[64], accounting for 4% of total GDP[65]. Although it is one of the smallest tourism markets in South-East Asia, this presented an exceptional 52% growth over 2015, which was far above the regional average of 8%[37]. The World Travel and Tourism Council estimates that Myanmar will be among the strongest growing tourism markets in the next 10 years[65], while the country itself expects to reach 7.5 million by 2020[60]. The strong tourism development is also reflected in air traffic development. While almost one third of incoming tourists in 2015 arrived by air, Emirates and Qatar Airlines announced to considerably increase their existing capacity between Myanmar and their hub airports in the Middle East during 2016[60]. This would provide valuable European source markets such as France or Germany with additional travel opportunities[66]. However, in order to successfully accommodate the expected increasing number of international passengers, current airport infrastructure will require continuous investment and expansion. In addition, ongoing security issues and instability might present affect future international tourist arrivals[64], while it should be noted, that the strong growth rates achieved in the past were driven by the opening of the country to international visitors and it remains to be seen whether the country is able to overcome its status as one-time destination[67].

### Cambodia

Air passenger traffic in Cambodia rose to 6.5 million in 2015, which is 13% above 2014 levels. Since the economic crisis in 2009, passenger volumes had been growing at a CAGR of 15%, which makes it one of the fastest growing air traffic markets in Asia[68].

Since over 85% of Cambodian air traffic is international, this development has been strongly driven by the increase in foreign tourist arrivals. These have almost doubled since 2010 and reached 4.8 million in 2015, 6% more than in 2014[37]. A stronger performance was only prohibited by the global fear of terrorist attacks, the MERS outbreak and the economic crisis in Russia[69]. China contributed in particular to this performance, as Chinese tourists appreciate the geographic proximity, close cultural links and affordability[70]. China is the second largest source market and accounted for 15% of international tourist arrivals in 2015, only Vietnam ranked ahead, presenting a 20% share[72]. However, in contrast to Chinese tourists, most Vietnamese arrivals occur by road due to the geographical proximity[68]. While Cambodia welcomed 128K Chinese tourists in 2009[68], it aims to attract 2 million tourists from China alone by 2020[71]. The USA was the largest source market outside Asia (5%) and the UK the largest European one (4%)[72]. Tourist arrivals from non-Asian markets reduced considerably with the economic crisis in 2009 and although a gradual recovery has been overserved since then, tourism representatives pointed out that a lack of flight capacity is responsible for the small share of non-Asian markets. In addition to the continuous investment into the tourism sector,

[64] https://www.tourism-watch.de/en/content/run-myanmar

[65] http://www.oxfordbusinessgroup.com/news/myanmar%E2%80%99s-tourism-industry-set-rapidly-expand

[66] http://www.mmtimes.com/index.php/business/19504-myanmar-s-airlines-face-pressure-at-home-and-abroad.html

[67] https://centreforaviation.com/analysis/myanmar-international-airline-market-starts-to-see-much-slower-growth-has-the-bubble-burst-233458

[68] http://centreforaviation.com/analysis/cambodia-part-1-china-thailand-drive-double-digit-passenger-growth-for-sixth-consecutive-year-266343

[69] http://www.ttrweekly.com/site/2015/07/cambodia-finalises-tourism-strategy/

[70] http://centreforaviation.com/analysis/cambodia-aviation-part-1-china-visitor-surge-makes-cambodia-the-fastest-growth-market-in-se-asia-207130

[71] https://www.cambodiadaily.com/news/cambodias-airport-passenger-figures-display-robust-growth-104662/

[72] http://centreforaviation.com/profiles/countries/cambodia

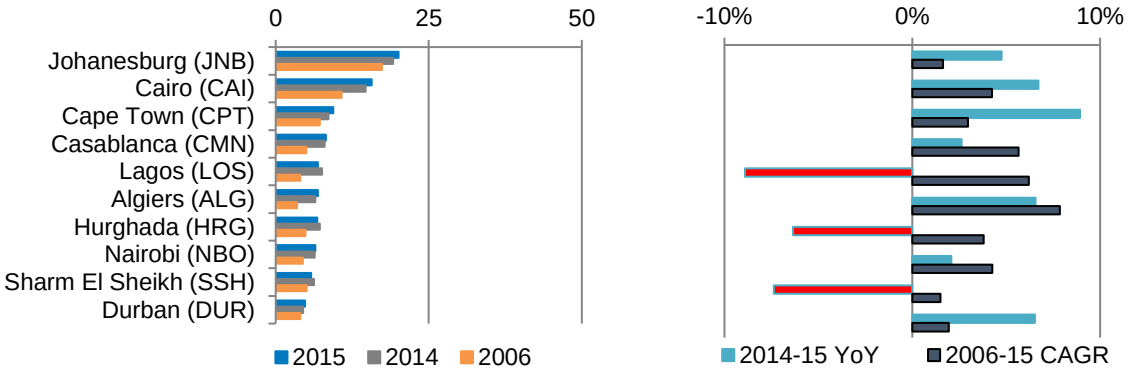
Cambodia's future air passenger volume will also strongly depend on a stable inner security[73], considering that the country has been facing recurring political protests and terrorist attacks in recent years[74].

### Passenger Performance by Region: Africa

Africa is a region of huge opportunity - as has been observed for decades - but even bigger challenges. Africa's airlines continue to struggle and collectively remain in the red while airlines in every other region in today's favourable environment are profitable. A shift in external conditions with lower commodity prices, a slowdown in major trading partners, changes in foreign exchange rates and tightening borrowing conditions caused Africa's economic activity to slow from 3.4% in 2014 to 3.0% in 2015.

The recent downturn in commodity pricing has hurt the African economy though GDP decline is projected to slow in 2016, as prices stabilize and supply constraints ease. The region has an immensely improved business and macroeconomic environment, supporting higher investment through improved policies. Population projections for Africa indicate an annual growth of 3.1% over the next 25 years, with urban growth outpacing the growth of the rural population[75]. Structural changes and a new mind-set from African governments are desperately needed. Political interference and government meddling in airlines is a common problem, as well as protectionism and unnecessarily high taxation.

Figure 48 - Top 10 Airports in 2015 by Passenger Traffic (m) – Africa




Source: ACI World Traffic Reports

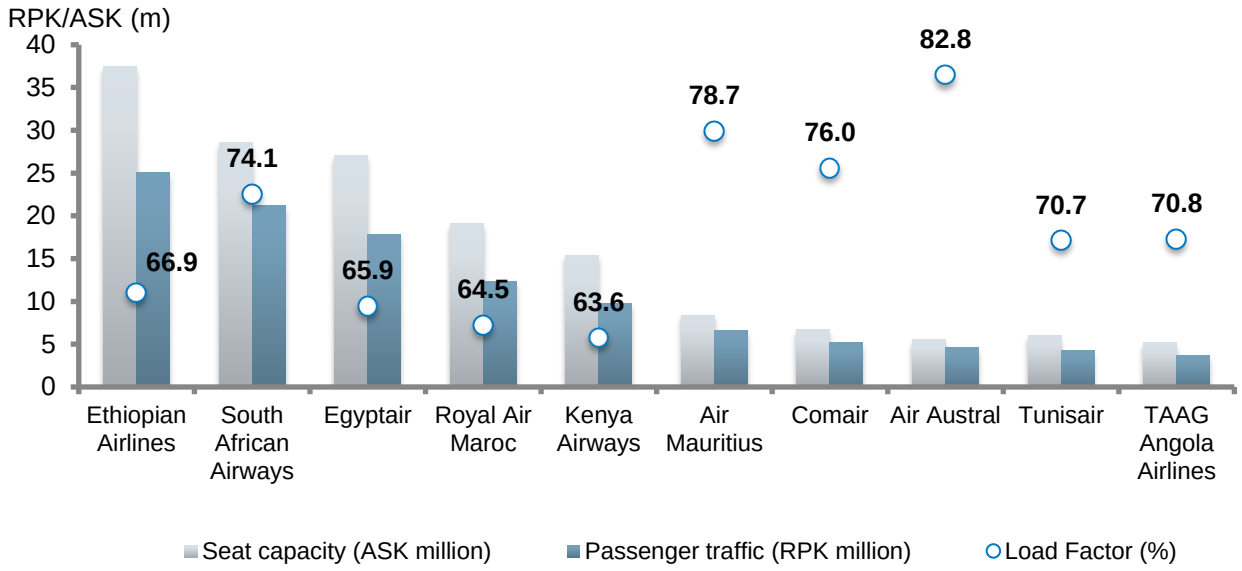
Regarding airport traffic, the geopolitical shocks that took place in Africa in 2015, in the form of terrorist attacks and military conflicts, are obvious. From the three airports that recorded year on year declines in traffic in 2015, two are located in Egypt, namely Hurghada and Sharm El Sheikh. Traffic decline is attributed almost exclusively to the reduction of inbound tourist flows, following the downing of a Russian aircraft in the Sinai region. Its impact will be further analysed below. The last poor performing airport is Lagos in Nigeria, which could be attributed to the sentiment of insecurity and uncertainty in the north part of the country.

[73] https://www.cambodiadaily.com/business/travel-industry-downplays-bombing-fallout-116660/

[74] http://www.phnompenhpost.com/national/political-deadlock-broken

[75] Boeing Current Market Outlook 2016-2035

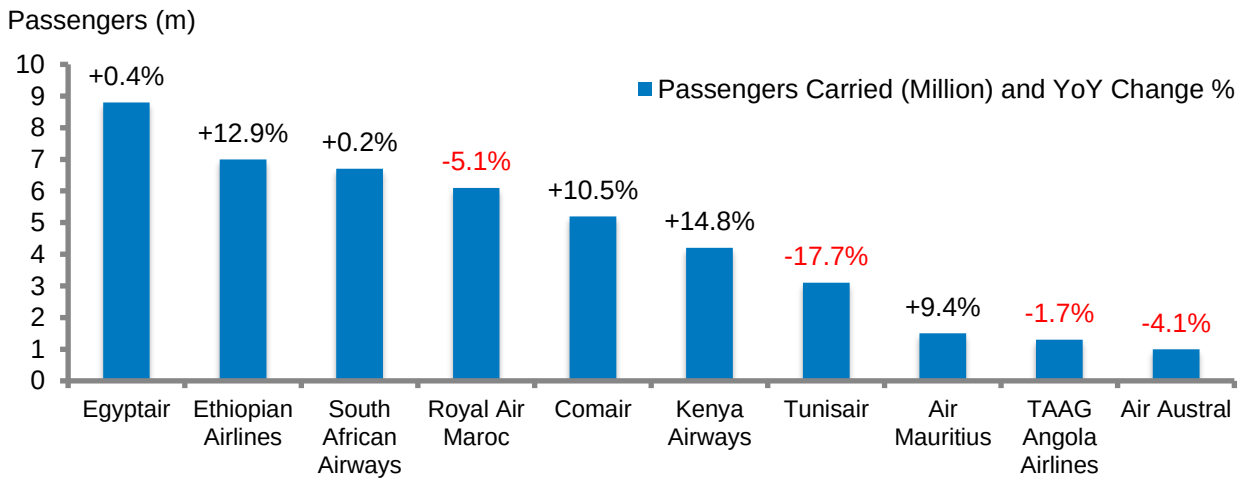
Figure 49 - Top 10 Airlines in RPKs for 2015 - Africa




Source: Airline Business

South African Airways, once the major healthy airline of the African region, now faces a prolonged restructuring period that could enable the carrier to grow once more. As a result, the airline has lost its first spot in RPKs and ASKs flown to Ethiopian Airlines, currently the success story of the continent, despite the below 70% average load factors. With LCCs penetration still quite low, it is no wonder that the average load factor of the market is in the region of 70% for 2015. In terms of passengers carried, Egyptair remained in the top for 2015, marginally growing their passenger volumes, while Ethiopian and Kenya Airways experienced the highest year on year passenger growth, 12.9% and 14.8% respectively. In contrast, Tunisair lost a notable 18% in passenger volume, partly as a result of Tunisia's political instability and the associated decline in tourist arrivals. Similar reasons in Morocco also contributed to the 5% drop in passengers carried by Royal Air Maroc.

Figure 50 - Top 10 Airlines in Passengers Carried in 2015 - Africa



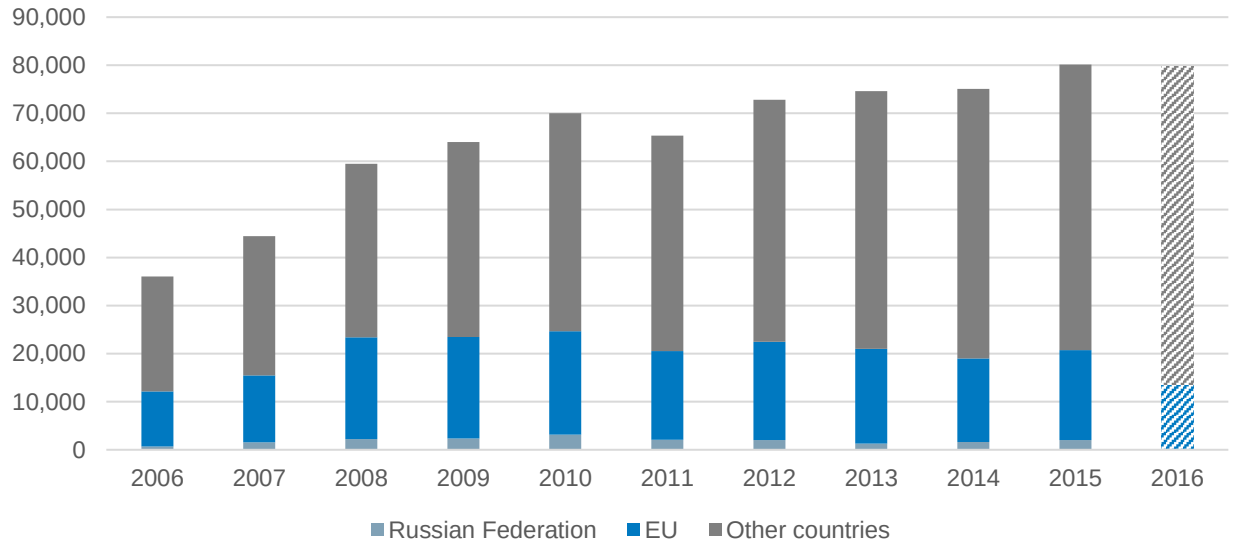

Source: Airline Business

## Market Developments

Air travel to Egypt continues to be very susceptible to geopolitical events. The fall-out from the Russian airline Metrojet incident at the end of October 2015 continued to be felt during the summer 2016. All flights between Russia and Egypt were suspended, as well many flights from the EU. Additionally, the March 2016 hijacking of an Egyptair domestic flight, causing its diversion to Larnaca, further threw the spotlight on security concerns in Egyptian aviation.

International seat capacity to Egypt enjoyed a number of years of double-digit growth (+15% pa) before this was interrupted by the Arab Spring of 2011. There followed a period of virtually stagnant capacity. International capacity returned to growth in 2015 (+10% YoY), before being interrupted once more by these more recent events. According to OAG data, international seat numbers will fall by 4% in summer 2016.

Figure 51 - One-way Scheduled Flights to Egypt between 2006 and 2016




Source: SRS Analyser

Russian and UK airlines were the biggest contributors to the fall in capacity the summer 2016, while Egyptian airlines and many from other countries in the Middle East are set to grow on international routes to Egypt. The Egypt tourism market has in the past demonstrated its powers of recovery and is likely to do so again. A slightly more reliable view can be taken of the summer 2016 schedule, rather than calendar 2016 data. According to OAG, international scheduled seats to Egypt were 4% lower in summer 2016 versus summer 2015. Among the 18 airlines that no longer planned scheduled flights to Egypt in summer 2016, the most significant withdrawal was from the now bankrupt Russian airline Transaero, which was the third largest Russian operator of international seats in summer 2015[76]. Egypt has recovered from geopolitical demand softness in the past and will continue to work hard to do so again. As is often and understandably the case in such matters, perception is all important and can lag reality.

Looking at sub-Sahara market developments, South African Airways (SAA) is again looking at opportunities for new partnerships and network expansion. SAA is now re-engaging with Etihad following an unsuccessful initial partnership and is keen to launch new routes after the delivery of its first two A330-300s in 4Q2016.

[76] http://centreforaviation.com/analysis/egypt-air-travels-sensitivity-to-geopolitical-events-shows-in-falling-international-seat-numbers-274771

Any growth, however, is unlikely to be profitable until SAA addresses its longstanding challenges. The airline has still not fully implemented its previous turnaround plan and urgently needs yet another capital injection. A full and deep restructuring is required but seems impossible in the current political environment. Exploring fifth freedom opportunities from other faster growing African countries is logical, given the relatively limited opportunities and challenges in SAA's home market. However, SAA needs to focus first on resolving internal issues and improving its position in South Africa.

An even bigger setback with implementing the recovery plan occurred in mid-2015 when SAA board approval for a new partnership with Emirates was revoked at the last moment. Emirates and SAA management had agreed to a comprehensive codeshare, and for SAA to operate alongside Emirates on the Johannesburg-Dubai route, with a rare revenue guarantee from Emirates. The Emirates partnership was to replace a much more limited partnership with Etihad and it was critical for SAA's long-term sustainability. Unfortunately, politics intervened and this opportunity was lost[77].

A contrast is however emerging in Angola. The strategy being implemented by TAAG Angola following its partnership with Emirates represents a model that perhaps can be emulated by other ailing airlines in Africa. The Emirates partnership gives TAAG a much brighter long term outlook. A codeshare is now in the process of being implemented, which will extend TAAG's network globally. Having dropped services to Dubai in 2015, TAAG is using the partnership to learn from Emirates, as Emirates took over management of TAAG in October 2015. TAAG is also now looking at expanding in China, which is currently served with two weekly Beijing flights and is its only other long haul market. The new business plan being implemented with the help of Emirates also envisages turning Luanda into a hub[78].

Mauritius also has an ambitious plan to develop a new hub and expand its flag carrier with a new focus on transit traffic. Air Mauritius has historically been focused on point-to-point traffic including inbound visitors, but is eager to tap into rapid growth in traffic between Asia and continental Africa. Air Mauritius already has a strong network in Asia but is relatively weak regionally. In May2016 the airline launched services to Maputo in Mozambique and Dar es Salaam in Tanzania, which are its first destinations in continental Africa outside South Africa and Kenya. Air Mauritius now serves six cities in continental Africa along with three destinations in neighbouring islands, giving it nine regional international destinations. It has a larger Asian network, which currently consist of 11 destinations[78].

As for Ethiopian, the airline has expanded rapidly in Asia over the last several years, as well as regionally within Africa, recognising the huge opportunities in the Africa-Asia market. Ethiopian now has almost 50 regional international destinations and almost 70 when its West African affiliate ASKY is included. Ethiopian currently serves 11 destinations in Asia-Pacific but has nearly three times as much nonstop capacity to Asia as Air Mauritius.

Addis Ababa has emerged as the biggest hub in Africa and Ethiopian has emerged as Africa's largest and by far the most profitable African airline group. Ethiopian has doubled in size in the past five years, with Asia-Africa transit traffic driving a majority of the growth. During the same five years, traffic at Africa's other four main airline groups has been flat, or only grown modestly, and three of these groups have been highly unprofitable.

[77] http://centreforaviation.com/analysis/south-african-airways-seeks-regional-growth-and-new-partnerships-but-outlook-remains-bleak-285650

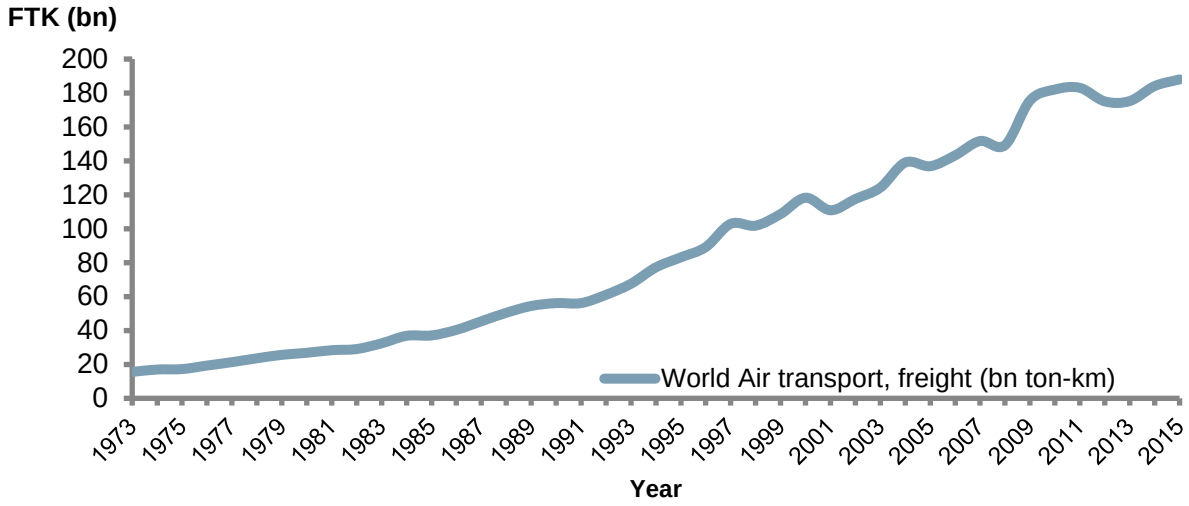
[78] http://centreforaviation.com/analysis/africa-outlook-ethiopian-airlines-and-air-mauritius-grow-but-others-face-strong-headwinds-282282

## 1.4. Air Cargo Traffic

### Air Cargo Traffic Outlook

Despite a strong start to the year, 2015 was a year of many challenges for air cargo. Global trade stalled towards the middle of the year amid uncertainty emanating from Chinese manufacturing and globally weak industrial production. Lower production of goods worldwide meant less trade. However, throughout the second half of the year, the global trade picture has been modestly improving. International trade is picking up speed throughout 2016. Trade will allow productivity increases in global-production chains and expand availability and variety of products to consumers around the world. The many benefits of a global and open economy have motivated policy makers to advance free-trade initiatives of historic proportions. Statistical Annex A provides an overview on worldwide cargo volume development.

Figure 52 - Global Air Freight Historic Volumes (FTK bn)



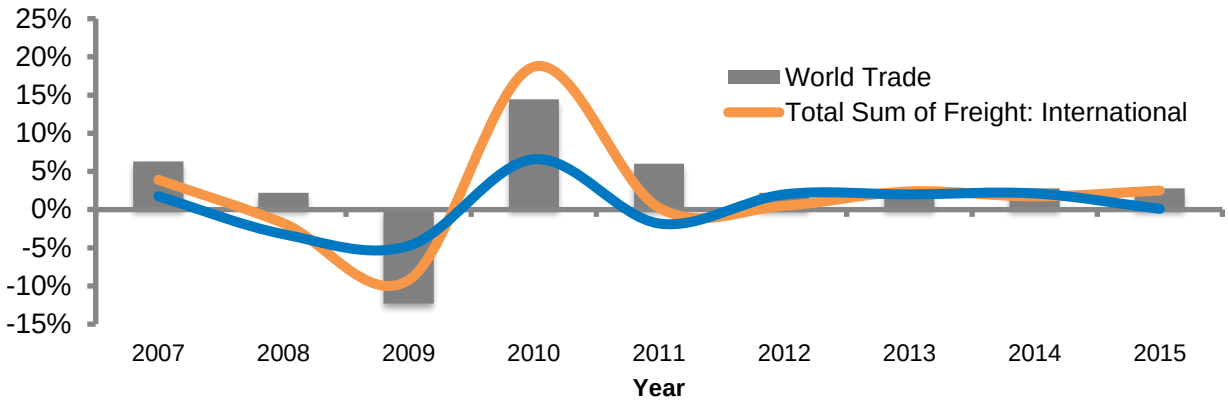

Source: World Development Indicators

World air-cargo volume, in spite of exogenous shocks arising from economic and political events and natural disasters, grew at an average of 5.2 % per year over the last three decades. After a period of stagnation that followed the global economic slowdown, air cargo traffic started to recover in late 2013. This recovery continued through 2014 and, with the aid of the US West Coast port labour dispute that extended into the first quarter of 2015, world air-cargo volume grew about 5% by year-end. In the second quarter of 2015, global trade and industrial production slumped. As a result, air-cargo growth slowed with world air-cargo volume growing about 2 % for the full year.

However, there is continued demand for the speed and reliability benefits that air freight offers. Industries that require transport of time-sensitive and high-value commodities such as perishables, consumer electronics, high-fashion apparel, pharmaceuticals, industrial machinery, and automobile components recognize the value of air freight, and this value will continue to play a significant role in their shipping decisions. The restructuring of logistics chains to serve the rapidly growing e-commerce industry also requires the unique capabilities that air cargo provides and offers a new area of growth[79].

[79] Boeing Current Market Outlook 2016-2035

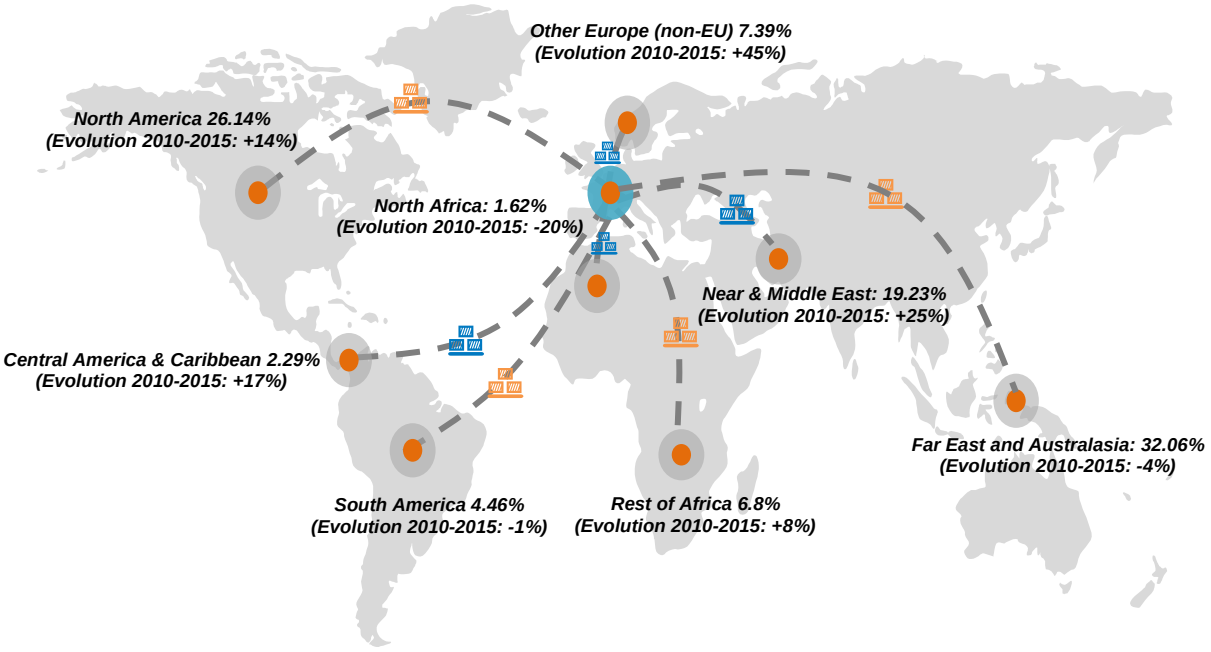
Figure 53 - Relationship of Global Trade to International and Domestic Air Freight




Source: ACI World Traffic Reports, CPB World Trade Monitor, WTO

As illustrated in Figure 54, over 50% of total air cargo volumes from/to the European Union were transported to/from North America (26%) or Far East and Australasia (32%). However, in comparison to 2014, the latter market lost 1% in market share, while the former gained 1%. This development becomes even clearer when looking at the performance since 2010, showing that the North American flow grew by 14%, whereas the share of the Far Eastern and Australasian market dropped by 4% during the same time. Total cargo volume between EU and other European (non-EU) countries recorded the highest increase since 2010 (+45%), however, this market only held a comparatively small share of 7% in total cargo volumes. A strong expansion between 2010 and 2015 was also observed to/from the Near and Middle East (+25%) and to/from Central America and the Caribbean (+17%). Besides this, one positive and one negative turnaround in growth rates could be observed in two markets when comparing their development between 2008 and 2014 to the change between 2010 and 2015. While air cargo volumes to/from the Rest of Africa declined by 9% in the former, they recorded an 8% in the latter period. The opposite development occurred in air cargo volumes between Europe and South America. These had increased by 13% between 2008 and 2014, but dropped by 1% between 2010 and 2015, largely due to the recent economic downturn in several South American countries such as Brazil.

Figure 54- Air Freight and Mail 2015 Market Share and Historic Evolution from/to Europe (EU28)




Source: Eurostat

## Air Cargo Airlines and Airports Performance

Despite the recent weak performance of air freight traffic, there are many airlines that, helped by the improved capabilities of passenger aircrafts in providing belly hold cargo capacity, have continued to account air freight as an important segment of their operations. Nevertheless, the sector faces a growing issue of overcapacity, forcing carriers to create additional strategies in order to boost their freight revenues. While Emirates raised their cargo price levels, Cathay Pacific reintroduced a fuel surcharge, which previously had been gradually abolished by cargo airlines. Lufthansa has been increasingly focussing on the development of its cargo e-commerce and express services[80]. This included the introduction of a Lufthansa Cargo eServices app, which enables customers to manage and track their shipment[81], as well as targeting a cooperation with large online retailers such as Amazon[82].

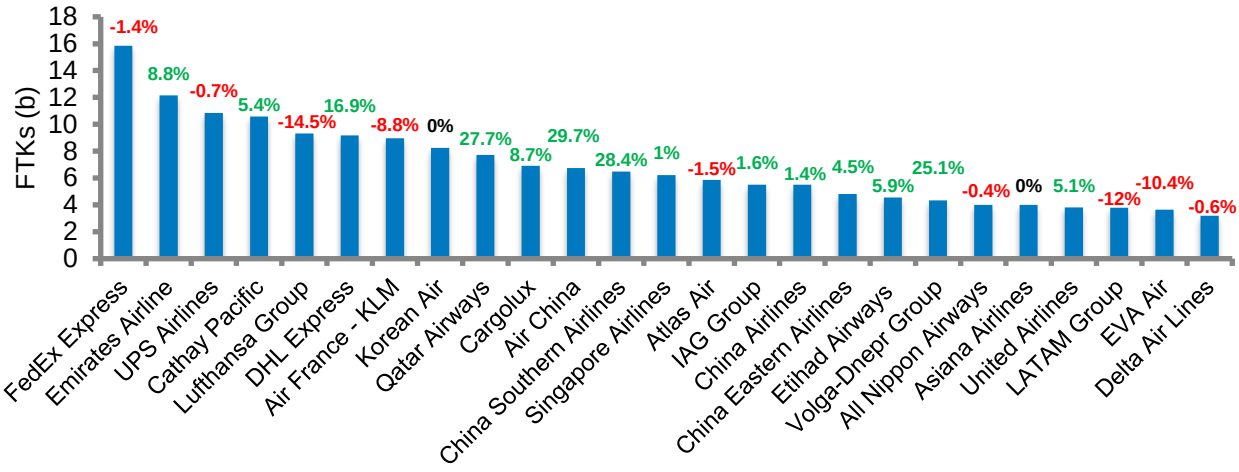
The figure below shows the performance of the top 25 Airline by FTKs during 2015. Overall there was little movement across the ranking compared to the previous year and airlines largely kept their positions. It emerges that especially Middle Eastern and Chinese carriers recorded growth, while European airlines Lufthansa and Air France – KLM, as well as the South American LATAM Group noted considerable declines. FedEx Express remained the dominant courier delivery services company worldwide despite a 1% drop in FTKs. It is followed by Emirates Airlines, which rose its cargo capacity by 9% and thus strengthened its second place. Cathay Pacific experienced a strong growth of 5%, surpassing Lufthansa and catching up with UPS. Nevertheless, the latter was able to defended its 3rd place although its FTKs fell by 1%. Lufthansa and Air France-KLM saw considerable declines of 15% and 9% respectively. DHL Express recorded one of the strongest growth rates compared to 2014 (+17%) and hence became the sixth largest cargo airline in 2015.

[80] http://aircargoworld.com/the-freight-50-top-carriers-vie-for-answers-to-overcapacity/

[81] https://lufthansa-cargo.com/eservices-app

[82] http://www.lloydsloadinglist.com/freight-directory/news/Lufthansa-Cargo-talking-to-Amazon-Alibaba-on-possible-co-operation/66903.htm#.WC9Ln2dvhjo

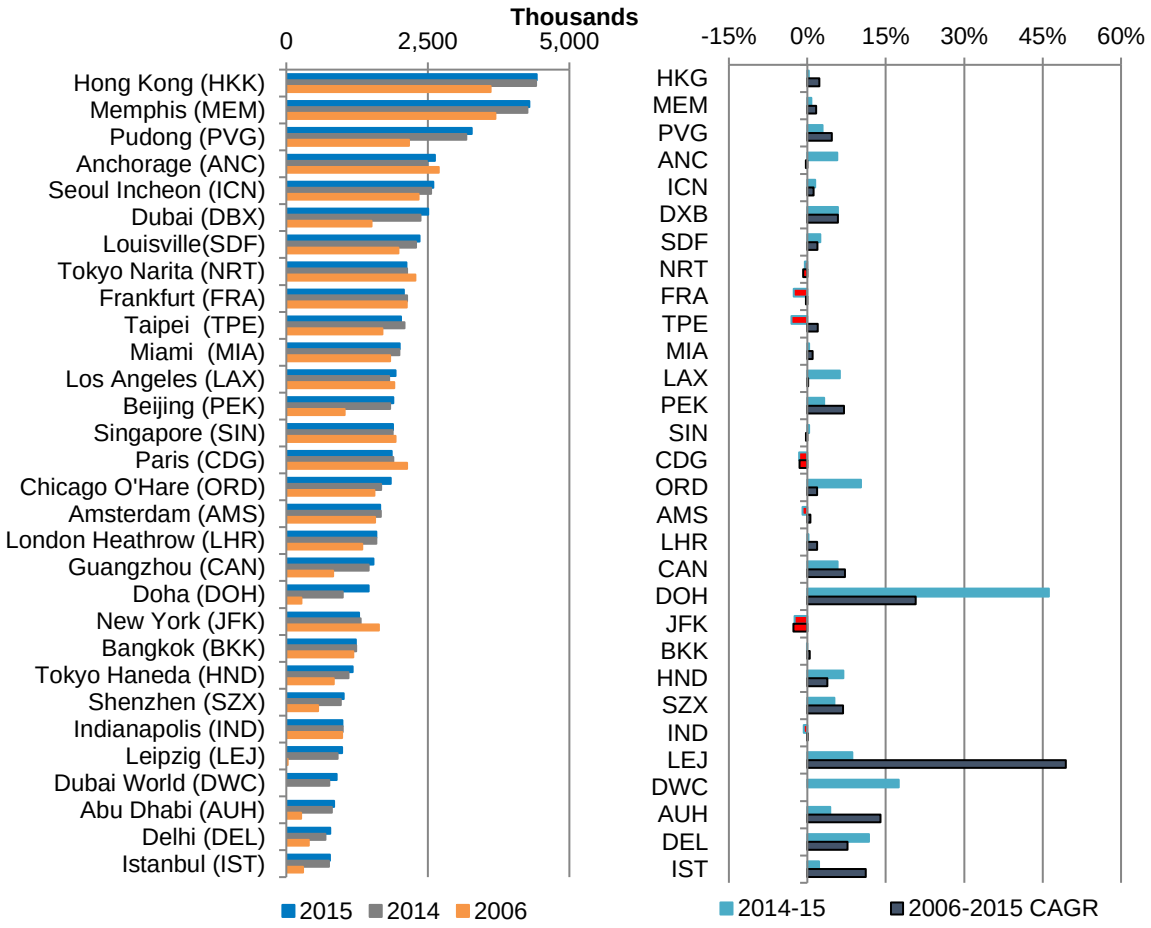
Figure 55 - Top 25 Airline Groups in Cargo (billion FTKs) Worldwide in 2015 and YoY Growth




Source: Air Cargo World August 2016[80]

Looking at the top 30 airports in terms of air freight, North American and Asian airports are dominating the rankings helped by the large domestic markets of individual countries in the regions. However, the major hubs of Europe and Middle East, such as Frankfurt, Paris or Dubai and Doha, do make it to the rankings, as they provide access to a large market of end point customers for goods flown by air freight. Statistical Annex A provides an overview on global airport cargo volumes.

Figure 56 - Top 30 Airports Worldwide in Cargo (Tons) for 2015



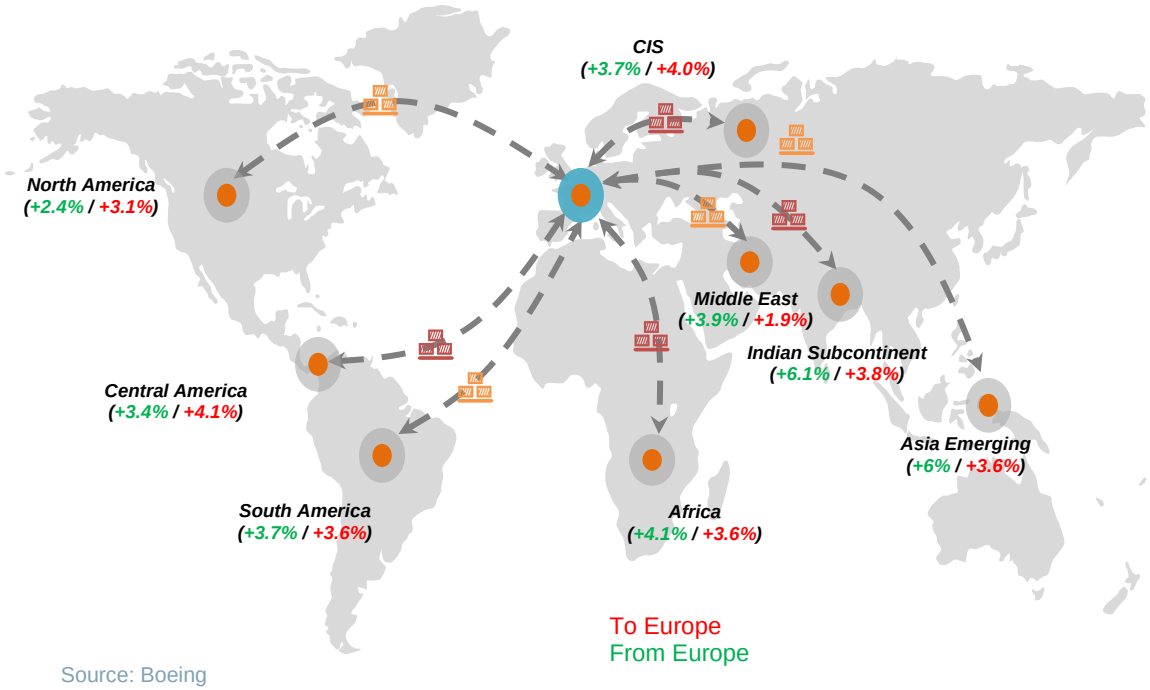

Source: ACI World Traffic Reports

## Air Cargo Long Term Projections

The world economy and industrial production, which are primary leading indicators of air cargo traffic, are forecast to recover and return to long-term trend growth rates in 2017. As global GDP and world-trade growth accelerate, air cargo traffic, as measured in revenue tonne-kilometres, is projected to grow an average 4.2% per year over the next 20 years. In turn, air-cargo traffic will grow, and sustained growth should lead to improvements in capacity balance and yields.

For Europe freight flows in particular, the following figure helps with illustrating what are the anticipated growth rates of air cargo volumes between Europe and its major trading partners. For European exports carried by air, the Indian subcontinent and the various Asian emerging economies will be the key growth end markets, with 6.1% and 6% pa respectively. For imports, the flows from Central America and again the Indian subcontinent, emphasizing the importance of this partner to Europe, will show the highest growth rates, with 4.1% and 3.8% pa.

Figure 57 - Air Freight Flows From/To Europe Growth Projections for 2016-2035




Source: Boeing

## 1.5. Business Aviation Traffic

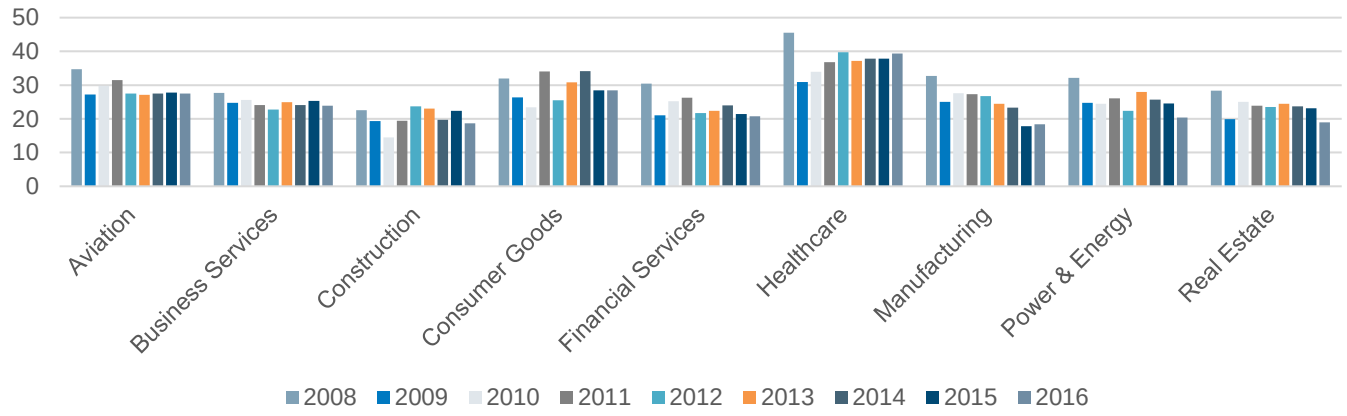
Business aviation is defined as the use of any general aviation aircraft for business aviation purposes[83]. The main indicators that measure the performance of this industry are the business jet transaction prices and sales activity, as well as the hours or segments flown by business jets. The present section will focus on the later metric of traffic performance, while a brief overview of the business jet transaction activity and demand forecast can be found in the MRO section.

According to the Jet Support Services Inc. (JSSI), the average utilization of the aircraft in our report has maintained a steady decline since its brief bounce back in 2010. Despite the fact that markets have returned to the pre-financial crisis levels, flight hours and the underlying use of business aircraft have yet to illustrate the same recovery on a global scale[84].

[83] National Business Aviation Association (NBAA), www.nbaa.org/business-aviation

[84] JSSI Business Aviation Index Q1 2016

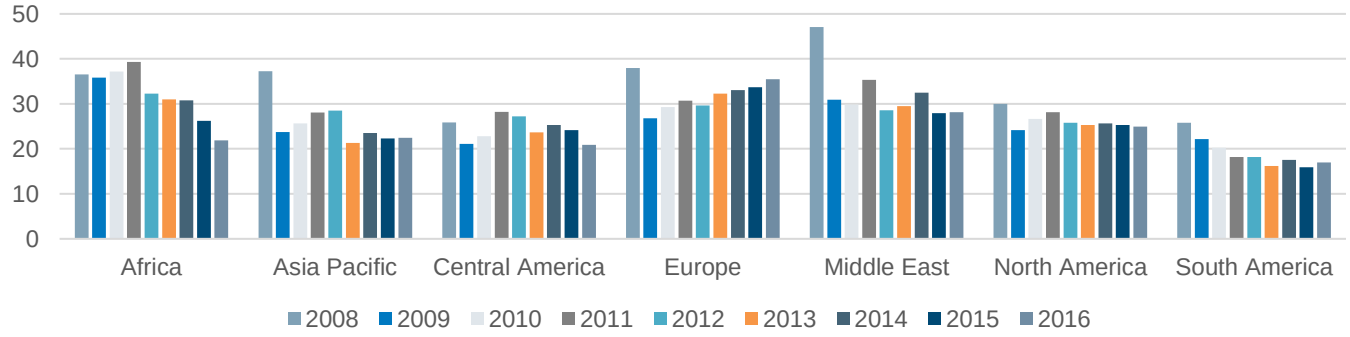
Figure 58 - Flight Hour Activity (Average flight hours) by Industry (years 2008 to 2016)




Source: JSSI Business Aviation Index Q2 2016

Additionally, business aviation performance varied between the industries, with healthcare being the main industry that have experienced a steady growth of flight activity, while the manufacturing and construction industries saw declines directly related to the fragile state those industries were in during the year and the significant reduction in orders from China that impacts the construction industry (Figure 59)[85]. Since 2010 only three sectors have shown an overall upward trend in utilization: Construction, Consumer Goods and Health Care. Aviation and Business Services have maintained close to level numbers since 2010 while the other sectors have seen a significant decrease. The power and energy sector also saw a decrease in flight hours, as many energy companies have taken cost reduction measures to manage the significant decline in the price of oil over the last two years[86].

Figure 59 - Quarterly Flight Hour Activity (Average flight hours) by Region (years 2008 to 2016)




Source: JSSI Business Aviation Index Q2 2016

Analysis of the quarterly flight hour activity by aircraft, Figure 59, shows that the majority of regions have seen some stabilization over the past few years. With only slight changes since 2013 in the South American, Asia-Pacific, North American, and European markets, utilization has become less volatile per annum. On the contrary, Africa continues to see a steady decline in utilization since reaching highs in 2011, with five consecutive years of decreasing average flight hours the African market is showing little signs of recovery[87].

[85] JSSI, http://www.jetsupport.com/jssiglobal-business-indicator-business-aviation-picks-up-in-2014/

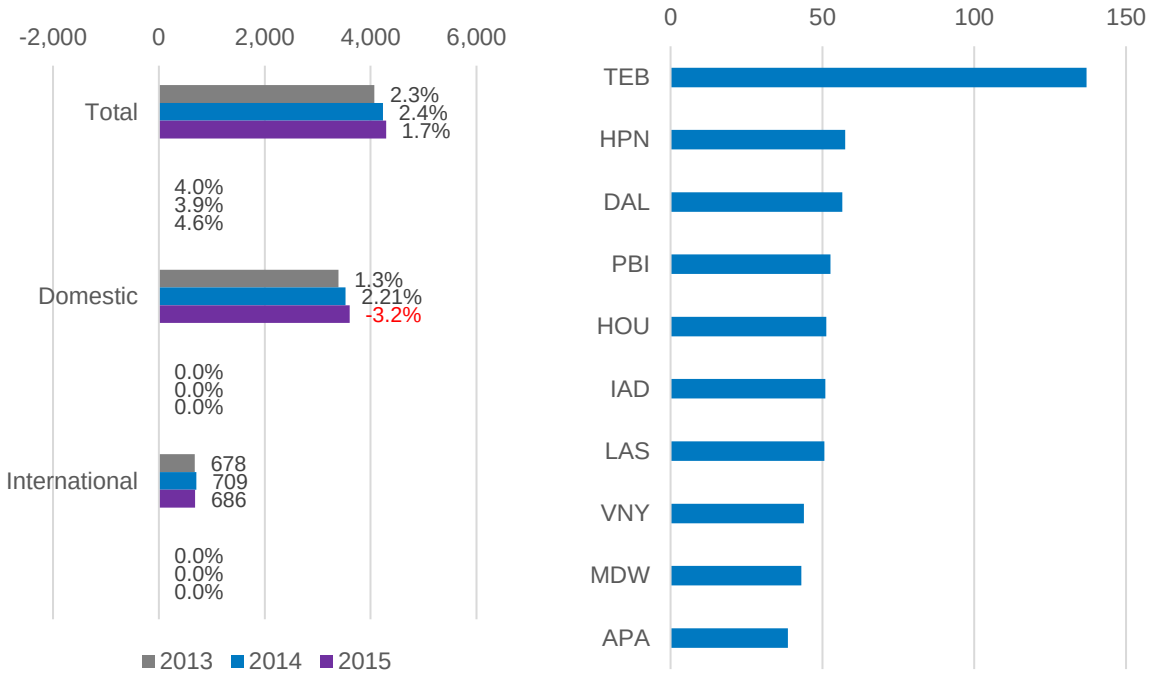
[86] http://www.jetsupport.com/jssi-index-business-aviation-enters-new-normal-in-2016/

[87] http://www.jetsupport.com/jssi-index-business-aviation-enters-new-normal-in-2016/

The two most important markets for business aviation are the United States and Europe. The North American region has stabilized and is experiencing subtle growth, while Europe, as the second largest business aviation market, has recovered within 9% of its all-time high in 2008, but is still experiencing utilization volatility. The same holds true for the Central American region, which was on par with North America in 2008 but has yet to recover to the same levels. While all other regions have illustrated some recovery from their low points, Middle East and Africa are two regions that are still down 42% and 50% respectively.

Regarding individual airport performance, the two airports serving New York City hold the first two spots of domestic flights, signifying the importance of the city for business activity.

Figure 60 - FAA Annual Jet Operations by Traffic Segment ('000s and %YoY) and 2015 domestic flights for the Top 10 Airports ('000s)

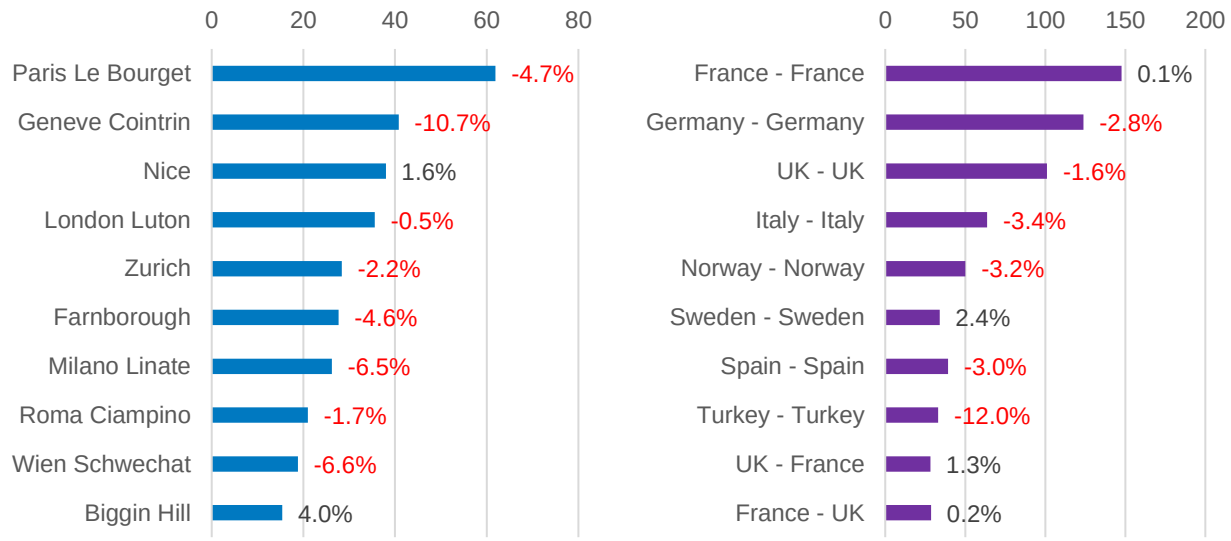



Source: Federal Aviation Administration - Business Jet Report: January 2016 Issue

European business aviation activity has been "sluggish" in 2015 with a sharp decline in departures and arrivals of -5.9% year on year[88]. Overall 2015 performance was below 2014 by -1.7% year on year for the sector. Furthermore, individual airport performance is highlighted below, where it is obvious that most airports had a weaker performance when compared to 2014 (Figure 61). At a market level, Sweden domestic operations witnessed the highest growth year on year, while the UK-France market remained the largest intra-Europe market segment, recording 1.3% growth in average daily flights year on year.

[88] European Business Aviation Association (EBAA), December 2015 Traffic Tracker Europe

Figure 61 - Top 10 European Airports and Country Pairs in Average Daily Flights and YoY Change for 2015




Source: European Business Aviation Association (EBAA), December 2015 Traffic Tracker Europe

First indicators for 2016 suggest weaker business aviation flight activity, with average flight hours in Q1 and Q2 for 2016 compared to 2015[89]. However, Bombardier, a leading manufacturer of business jets, in their 2016 market forecast are expecting a promising future for business aviation in the years ahead. Within the next two years, as the collective world economy gradually returns to stronger growth rates, emerging markets such as Latin America, China and Russia will once again be the key drivers of future growth for business aviation, once their current challenges subside[90].

[89] JSSI Business Aviation Index Q2 2016

[90] 2016-2025 Bombardier Business Aircraft Market Forecast

# 2. Airlines

## 2.1. Introduction

This chapter provides an overview of performance of the airline industry in 2015 (with key developments during the second half of the year) and the first half of 2016. The chapter highlights the most important global trends (such as economic drivers and revenue sources), analyses the airline industry financial metrics and summarises regional performance of the airline industry. For further details, the data presented on this chapter is presented in Tables of the Statistical Annex.

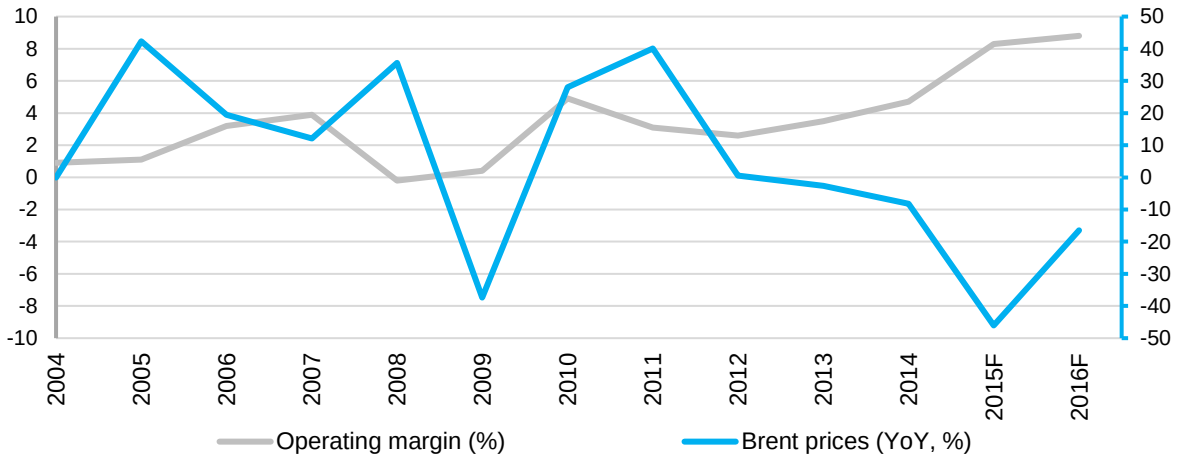
## 2.2. Global Trends

### Economic Drivers

The worldwide airline industry continued growing rapidly in 2015. Operating margins in 2015 peaked at a new record since 2000, according to IATA. Global demand increased despite the weaker global economy during 2015.

Lower air fares (on average, 5% lower in 2015 vs 2014[91]), driven by continuously low fuel jet prices, boosted passenger traffic in 2015, 6.5% above 2014 levels. At the same time, much of the industry also benefited from a period of relative capacity discipline. Airlines reacted to demand growth by cautiously adding capacity. Between 2014 and 2015, global market capacity increased by 5.6%.

Figure 62 – Airline Worldwide industry, Operating margin (%) and variation on crude oil prices, Brent (YoY %)




*Source: IATA Industry Forecast, June 2016*

In fact, during 2015, the global economy strengthened at a modest level of passenger traffic growth. The UK and the USA experienced the strongest growth of the world's most developed economies while Japan and Italy continue to underperform. Developing markets saw the Indian economy outpace China and Russia while Brazil was mired in recession. IMF estimated global growth to be 3.1% in 2015, slightly lower than in 2014 (3.4%). For 2016, IMF predicts global growth to be 3.4%.

[91] IATA, Air Passenger Market Analysis – December 2015

Early results in 2016 indicate a continuing robust performance for the industry. However, in July 2016, IMF revised its global economic forecast due to the substantial increase in economic, political, institutional uncertainty caused by the Brexit vote, which was projected to have negative macroeconomic consequences, especially in advanced European economies. The previous 2017 global passenger traffic forecast was cut by 0.1%.

In general, the economic drivers have been favourable to the global airline industry since mid-2014. However, for the second half of 2016 and 2017, there are emerging challenges. The biggest challenge for the airline industry will be to try to sustain the operational margin levels.

### Airline Performance

American carriers have reported the highest global profit levels in 2015 with an increasing number of airlines profiting from operational improvements. In fact, American Airlines, Delta Air Lines and United Continental Holdings are the top performers in all global rankings: revenue, operating profit, RPK and passengers. The dominance of consolidated US major carriers has occurred not only in domestic markets but also globally.

Worldwide, the operating profit reported by airlines has been increasing steadily in the past 5 years, with 18[92] airlines worldwide recording operating profit of more than $1bn during 2015.

European carriers had a successful 2015. Despite low economic growth in the region (+1.6% GDP growth in the Euro zone in 2015 compared to 2014), European carriers surpassed 2014's operating profits: $7.4 billion in 2015 compared to $1 billion in the previous year.

Table 63 – Top Airlines by Airline Groups and Airlines by Operating Revenue, Operating Net Profit, RPKs and Passengers in 2015

| Top 10 groups by revenue | |
|---|---|
| American Airlines Group | $41.0bn |
| Delta Air Lines | $40.7bn |
| United Continental Holdings | $37.9bn |
| Lufthansa Group | $35.4bn |
| Air France - KLM Group | $28.7bn |
| FedEx | $26.5bn |
| Emirates Group | $25.3bn |
| IAG | $25.2bn |
| Southwest Airlines | $19.8bn |
| China Southern Air Holding | $17.8bn |

| Top 10 groups by net profit | |
|---|---|
| American Airlines Group | $7.6bn |
| United Continental Holdings | $7.3bn |
| Delta Air Lines | $4.5bn |
| Emirates Group | $2.2bn |
| Southwest Airlines | $2.2bn |
| Lufthansa Group | $1.9bn |
| Ryanair | $1.7bn |
| IAG | $1.7bn |
| Japan Airlines | $1.5bn |
| Air China | $1.2bn |

| Top 10 Airlines by RPK | |
|---|---|
| American Airlines | 358,823m |
| Delta Air Lines | 337,264m |
| United Airlines | 335,728m |
| Emirates Airline | 255,176m |
| Southwest Airlines | 189,057m |
| Lufthansa | 162,173m |
| China Southern Airlines | 153,749m |
| China Eastern Airlines | 146,291m |
| British Airways | 142,016m |
| Air France | 141,207m |

| Top 10 airlines by passengers | |
|---|---|
| American Airlines | 201.2m |
| Delta Air Lines | 179.4m |
| Southwest Airlines | 144.6m |
| United Airlines | 140.4m |
| Ryanair | 106.4m |
| China Eastern Airlines | 93.8m |
| China Southern Airlines | 84.0m |
| Lufthansa | 79.3m |
| EasyJet | 68.6m |
| Turkish Airlines | 61.2m |

*Source: Mott MacDonald analysis of ATW*

In 2015, Europe's top three airlines for profitability were Lufthansa, Ryanair and IAG, the first and the latter Full Service Carriers (FSC), while Ryanair operates as a Low Cost Carrier (LCC).

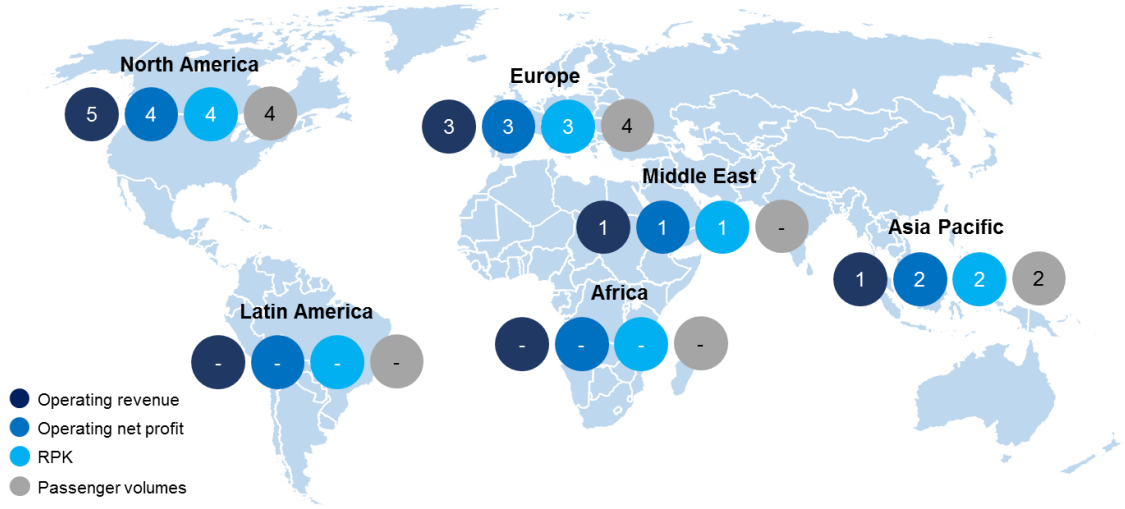
[92] FlightGlobal, World Airline Rankings 2016

In terms of total revenues, the three big European airline groups (Lufthansa Group, Air France-KLM and IAG) were in the lead. In terms of passenger volumes, Ryanair was the top European carrier in 2015, followed by Lufthansa and EasyJet. Turkish Airlines was the 4th largest European carrier by passenger volume in 2015 and 10th largest worldwide.

Outside Europe and North America, Chinese carriers continued their upward momentum with Air China, China Eastern and China Southern increasing their positions in the rankings in terms of RPKs and total passengers carried. In Middle East, Emirates was the only airline keeping a place among the top 10 most profitable airlines in 2015.

Overall, the North American market retained its position as the most profitable worldwide, with operating profits among leading North American carriers almost doubling in 2015. European carriers also produced solid results despite economic challenges. The distribution of the top Airline Groups and Airlines by key KPIs is presented in the following figure.

Figure 64 - Distribution of Top-10 Airline Groups and Airlines by Operating Revenue, Operating Net Profit RPKs and Passenger Volumes in 2015




*Source: Mott MacDonald analysis of ATW*

2016 started with the global outlook for airline collective profit as positive. IATA revised its 2016 financial outlook for the industry upwards, projecting revenues of $39.4 bn in 2016 from $36.3 bn in 2015.

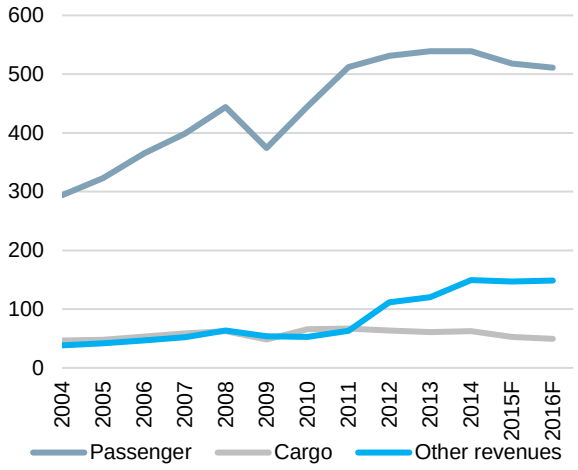
Since then the outlook has changed considerably, particularly in Europe. A number of terrorist-related events took place in Belgium, France, Germany and Turkey. But, more likely, the uncertainty brought by the UK decision to leave the European Union (Brexit) has generated higher uncertainties and the precise detail of the exit could take two or more years to define. IATA expects that “prolonged uncertainty will influence both the magnitude and persistence of the economic impacts” with initial estimates suggesting that the number of UK air passengers could be 3-5% lower by 2020, driven by “the expected downturn in economic activity and the fall in the sterling exchange rate”.

## Revenue – boosted by ancillaries

Favourable economic drivers, capacity discipline and low jet fuel prices were not the only reasons airlines achieved excellent 2015 results. During the first half of 2015, margins were still increasing on the back of airlines improving long term hedging contracts. Margins continued to improve in the second half of the year, partially due to ancillary revenues.

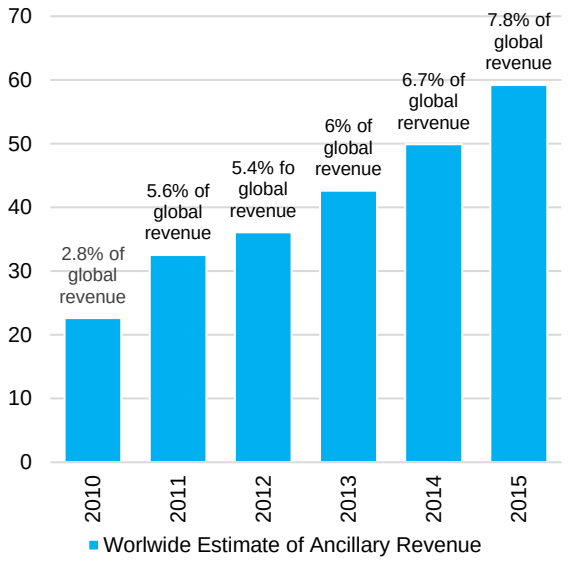
According to IATA, between 2004 and 2016, airline revenues excluding cargo and passenger-related charges are projected to increase from $38.4 billion in 2004 to an estimated $148.4 billion in 2016. This equates to an increase from 10% of total revenues in 2004 to 21% in 2016. Other revenue sources consist of all other activity carried out by airlines, including MRO, catering, ancillary revenue, and other non-aeronautical services.

Figure 65 – Airline Worldwide Industry, Revenue by Category ($ billion)




*Source: IATA Industry Forecast, June 2016*

Figure 66 – Worldwide Estimate of Ancillary Revenues ($ bn)




*Source: IdeaWorks/Cartrawler, for Ancillary Revenue, 2016*

Ancillary revenues have become a major revenue source for airlines. Airlines are continuously looking for more ways to earn revenue from all aspects of the customer experience. For example, the number of full-service carriers which have implemented separate charges for seat allocation and checked luggage has risen sharply, or the increasing number of airlines using portable Wi-Fi network for inflight entertainment, but charging a fee to connect to the service.

Ancillary revenues are generated by activities and services that provide revenue for airlines beyond the sale of tickets, which may be generated by direct sales to passengers, or indirectly as a part of the travel experience, such as sales commissions from hotel accommodation or car rentals.

The increase in percentage of total ancillary revenue has been significant in recent years and seems to be a good indicator for the airline industry in finding new and diverse sources of revenues aside from the more traditional passenger and cargo elements.

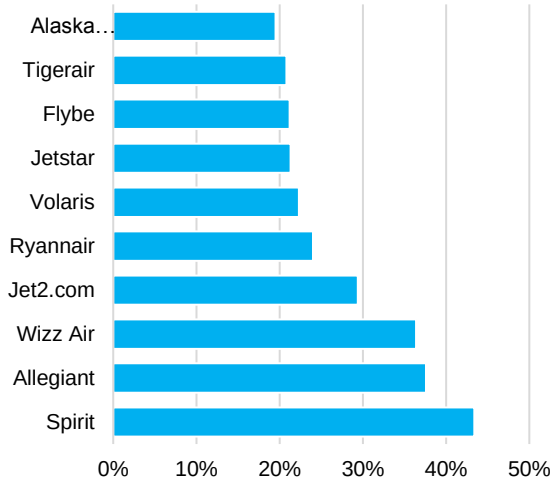
It is hardly surprising that within the list of 135 airlines analysed in a 2015 Top 10 Ancillary Revenue Rankings report, prepared by IdeaWorksCompany, that airlines with higher ancillary revenues are those with lower average fares, in most instances, low cost carriers.

The US carriers are responsible for the biggest share of the global ancillary revenue worldwide, where, collectively their estimated total ancillary revenue during 2015 was of $22.0 billion compared to $13.3 billion in the whole of Europe.

There are different sources of ancillary revenue for airlines and this is closely associated with the different carrier groupings. For example, the so-called traditional airlines (full service carriers), that represent the largest group of carriers, have fees associated with excess or heavy bags, or extra legroom. Low Cost Carriers, the second largest group, rely more upon a mix of a la carte charges to generate good levels of ancillary revenue, thus dropping their base tickets prices.

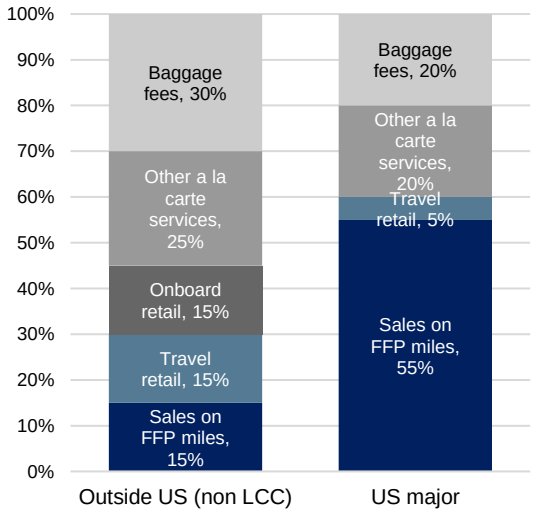
There is no doubt this trend will continue in the future. Tickets no longer guarantee free checked bags, seat assignment or a meal. But the necessity of lowering ticket prices and allowing passengers to choose their most desired combination of services "a la carte" will enable low fares to coexist with airline operating profit, provided by ancillary revenues. And it will only be a matter of time before airlines that have not adopted this practice, start to do so.

Figure 67 – Top 10 Airlines – Ancillary Revenue as a % of Total Revenue in 2015




*Source: IdeaWorks, 2015 Top Ancillary Revenue by Airline*

Figure 68 – Estimated sources of Ancillary Revenue for US Major Airlines and outside US




*Source: IdeaWorks, 2015 Top Ancillary Revenue by Airline*

## Costs – Sensitive Labour Relations

Labour was the second-largest operating expense for airlines after fuel during 2015.

Table 11 - Labour

| Worldwide Airline Industry | 2014 | 2015 | 2016F |
|---|---|---|---|
| Labour costs, $ billion | 143 | 144 | 153 |
| % change over year | 4.8% | 0.6% | 6.4% |
| Employment, million | 2.47 | 2.54 | 2.61 |
| % change over year | 2.9% | 2.8% | 2.8% |
| Productivity, atk/employee | 463,996 | 479,745 | 495,912 |
| % change over year | 2.4% | 3.4% | 3.4% |
| Unit labour cost, $/ATK | 0.125 | 0.118 | 0.118 |
| % change over year | -0.5% | -5.4% | 0.1% |
| GVA/employee, $ | 95,646 | 95,143 | 100,186 |
| % change over year | 4.2% | -0.5% | 5.3% |

*Source: IATA Economic Performance of the Airline Industry, June 2016*

Airlines have generally been effective in holding down labour costs and improving productivity in 2015, aided by underlying growth in traffic.
IATA estimates total employment by airlines reached 2.5 million in 2015, a gain of almost 3% compared to 2014. Productivity, measured in ATK/employee, was also higher in 2015, increasing by 3% in contrast to 2014. The average employee generated close to 480,000 ATKs in 2015. Wages and jobs also rose as employees shared the benefits of improved performance.

But labour relations between airlines and employees were neither simple nor easy, with several strikes taking place during the last year, in particular in Europe.

Lufthansa saw its cabin crew and pilots taking part in several strikes during 2015, protesting against pension arrangements and Lufthansa's growing use of its LCC subsidiary Germanwings and its lower-cost LCC Eurowings. Also Air France-KLM, despite experiencing a big improvement on its strike-hit 2014, failed to reach agreement with its pilots over restructuring plans and, in particular, the planned expansion of the LCC subsidiary Transavia France.

In 2016 the airline industry continues having its labour force engaging in action against decisions made by their employers. One of the most publicised cases took place during June 2016, with a rare strike involving EasyJet. EasyJet pilots, members of the Dutch Pilot Association, carrying out an eight-hour strike at Amsterdam Schiphol.

## 2.3. Airline Financial Report

Compared to 2014, the financial performance of airlines in 2015 reported a record year in operating profit and margins, despite a decrease in revenues. This decrease was largely offset by a reduction in operating expenses, hence the record numbers reported, as noted in Table 12.

As indicated in Table 12, worldwide industry net profits of $35.3 billion were 158% higher than in 2014, amounting to $21.6 billion, with net profit per passenger more than double 2014 figures, increasing from $4.1 to $9.9. Revenues decreased by 4.4% while expenses decreased by 8%, particularly driven by continuing reduction in fuel costs. Operating profit was up 70% to $59.5 billion, generating an operational margin of 8.3%. Also the expected return on invested capital (9.3%) was for the second year in a row, and only for the second time in the airline industry's history, in excess of its cost of capital (estimated at 6.8%)[93].

The outlook for 2016 is also positive. IATA projects revenues are estimated to drop by1.3%, however expenses are anticipated to decrease by 1.9% that could lead to improve net profits by 5.6% and break a new record ($39.4 billion). Net profit by passenger is expected to exceed $10. 2016 is anticipated to be the fifth consecutive year of improving aggregate industry profits.

Table 12 - Economic Performance of Airline Industry

| Worldwide airline Industry | 2010 | 2011 | 2012 | 2013 | 2014 | 2015F | 2016F |
|---|---|---|---|---|---|---|---|
| **REVENUES, $ billion** | 564 | 642 | 706 | 720 | 751 | 718 | 709 |
| % change | 18.4 | 14 | 9.8 | 2.1 | 4.3 | -4.4 | -1.3 |
| Passenger, $ billion | 445 | 512 | 531 | 539 | 539 | 518 | 511 |
| Cargo, $ billion | 66.1 | 66.9 | 63.5 | 60.7 | 62.5 | 52.8 | 49.6 |
| Traffic volumes | | | | | | | |
| Passenger growth, rpk, % | 8 | 6.3 | 5.3 | 5.2 | 5.7 | 7.4 | 6.2 |
| Sched passenger numbers, millions | 2700 | 2864 | 2999 | 3152 | 3328 | 3568 | 3783 |
| Cargo growth, ftk+mtk, % | 19.4 | 0.4 | -0.9 | 0.6 | 5 | 2.3 | 2.1 |
| Freight tonnes, millions | 49.1 | 49.3 | 48.8 | 49.5 | 51.5 | 52.2 | 53.2 |
| World economic growth, % | 4.1 | 2.9 | 2.4 | 2.5 | 2.6 | 2.4 | 2.3 |
| Passenger yield, % | 9.5 | 7.5 | -1.4 | -3.9 | -5.5 | -10.7 | -7 |
| Cargo yield % | 14.4 | 0.8 | -4.2 | -4.9 | -2 | -17.4 | -8 |
| | | | | | | | |
| **EXPENSES, $ billion** | 536 | 623 | 687 | 695 | 716 | 659 | 647 |
| % change | 13.1 | 16.2 | 10.4 | 1.1 | 3.1 | -8 | -1.9 |
| Fuel, $ billion | 152 | 191 | 228 | 230 | 226 | 181 | 127 |
| % of expenses | 28.3 | 30.8 | 33.1 | 33.1 | 31.6 | 27.5 | 19.7 |
| Crude oil price, Brent, $/b | 79.4 | 111.2 | 111.8 | 108.8 | 99.9 | 53.9 | 45 |
| Jet kerosene price, $/b | 91.4 | 127.5 | 129.6 | 124.5 | 114.8 | 66.7 | 55.4 |
| Fuel consumption, billion gallons | 70 | 72 | 73 | 74 | 78 | 82 | 86 |
| CO2 emissions, million tonnes | 665 | 685 | 693 | 709 | 739 | 781 | 817 |

[93] IATA, Industry Profitability Improves, June 2016

| Worldwide airline Industry | 2010 | 2011 | 2012 | 2013 | 2014 | 2015F | 2016F |
|---|---|---|---|---|---|---|---|
| Non-fuel, $ billion | 384 | 431 | 460 | 465 | 490 | 478 | 519 |
| cents per atk (non-fuel unit cost) | 40 | 42.3 | 43.8 | 42.7 | 42.7 | 39.2 | 40.1 |
| % change | 9.1 | 5.8 | 3.5 | -2.5 | 0.1 | -8.3 | 2.2 |
| Capacity growth, atk, % | 3.7 | 6 | 3 | 3.7 | 5.4 | 6.3 | 6.3 |
| Flights, million | 27.8 | 30.1 | 31.2 | 32 | 33 | 34.8 | 36.8 |
| Break-even weight load factor, % | 63.5 | 64.1 | 64.7 | 64.5 | 63.9 | 61.3 | 60.4 |
| Weight load factor achieved, % | 66.8 | 66.1 | 66.4 | 66.8 | 67 | 66.9 | 66.2 |
| Passenger load factor achieved, % | 78.7 | 78.5 | 79.4 | 79.7 | 79.9 | 80.4 | 80 |
| | | | | | | | |
| **OPERATING PROFIT, $ billion** | 27.6 | 19.8 | 18.4 | 25.3 | 35.1 | 59.5 | 62.2 |
| % margin | 4.9 | 3.1 | 2.6 | 3.5 | 4.7 | 8.3 | 8.8 |
| | | | | | | | |
| **NET PROFIT, $ billion** | 17.3 | 8.3 | 9.2 | 10.7 | 13.7 | 35.3 | 39.4 |
| % margin | 3.1 | 1.3 | 1.3 | 1.5 | 1.8 | 4.9 | 5.6 |
| per departing passenger, $ | 6.4 | 2.9 | 3.1 | 3.4 | 4.1 | 9.9 | 10.4 |
| | | | | | | | |
| **RETURN ON INVESTED CAPITAL, %** | 6.2 | 4.7 | 4.6 | 4.8 | 5.9 | 9.3 | 9.8 |

*Source: IATA Industry Forecast, June 2016*

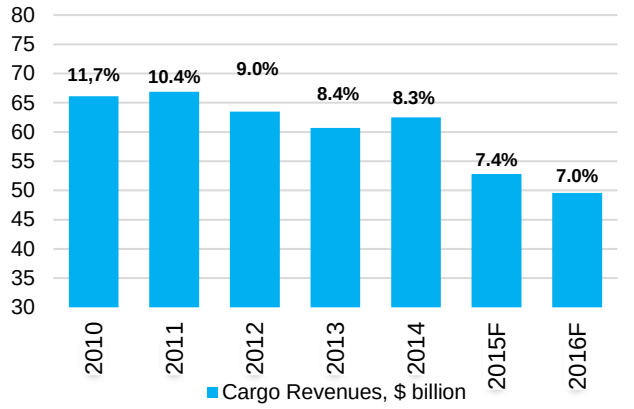
Globally, airline operational efficiencies are improving. Traffic, represented by revenue passenger kilometres (RPKs), kept growing at a faster pace than capacity, considering available seat capacity (ASKs). This led to a worldwide improvement in load factor from 79.9% in 2014 to 80.4% in 2015, consequently improving operating margins. Breakeven load factors decreased to 61.3% in 2015, and are anticipated to drop further to 60.4% in 2016, highlighting the improvements in operating margins.

Table 13 – System-wide Global Commercial Airlines

| | Passenger traffic (RPK) % change over year | | | | Passenger capacity (ASK) % change over year | | | |
|---|---|---|---|---|---|---|---|---|
| | 2013 | 2014 | 2015 | 2016F | 2013 | 2014 | 2015 | 2016F |
| **Global** | 5.2 | 5.7 | 7.4 | 6.2 | 5.2 | 5.7 | 7.4 | 6.2 |
| Regions | | | | | | | | |
| North America | 2.3 | 2.7 | 5.3 | 4.0 | 2.3 | 2.7 | 5.3 | 4.0 |
| Europe | 3.9 | 5.7 | 6.0 | 4.9 | 3.9 | 5.7 | 6.0 | 4.9 |
| Asia-Pacific | 7.2 | 6.9 | 10.1 | 8.5 | 7.2 | 6.9 | 10.1 | 8.5 |
| Middle East | 11.6 | 12.1 | 10.4 | 11.2 | 11.6 | 12.1 | 10.4 | 11.2 |
| Latin America | 6.3 | 7.0 | 7.6 | 4.2 | 6.3 | 7.0 | 7.6 | 4.2 |
| Africa | 4.6 | 0.3 | 0.0 | 4.5 | 4.6 | 0.3 | 0.0 | 4.5 |

*Source: IATA Industry Forecast, June 2016*

Figure 69 – Worldwide Estimate of Cargo Revenues in the Airline Industry ($ bn) and % of total revenues




*Source: IATA Industry Forecast, June 2016*

With regards to cargo, revenues decreased by 16% between 2014 and 2015 from $62.5 billion to $52.8 billion. The global economy softened towards the end of 2015 leading to weaker air cargo demand.

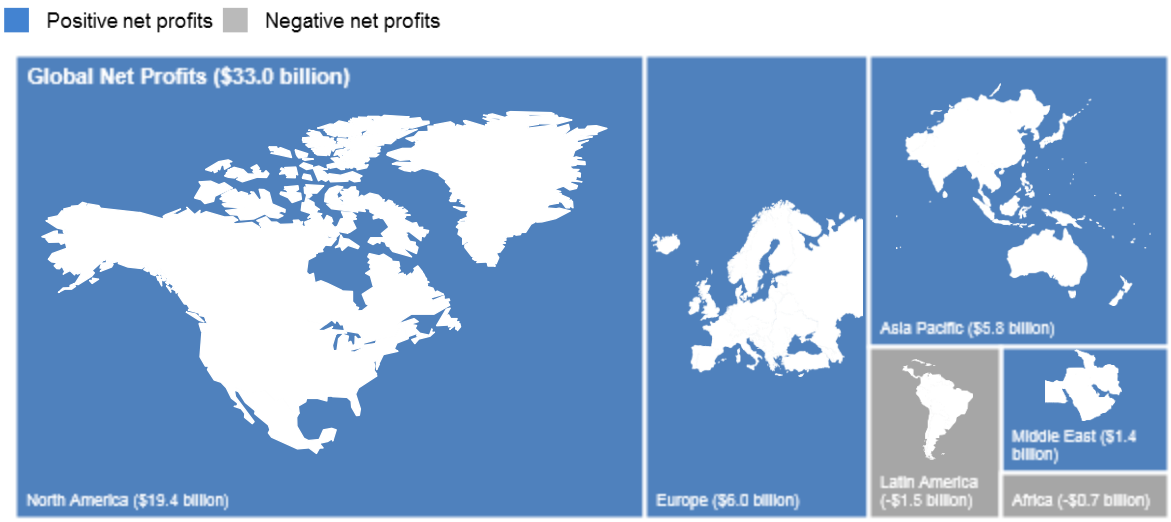
In contrast to the commercial passenger side of the business, the airline industry freight load factor average was below the industry average for the first time since 2004. A combination of soft demand and significant capacity increases, particularly in belly cargo, contributed to the drop in load factor. Low freight loads directly impact yields and revenues.

Although the overall performance was very positive, mainly in improved profitability in 2015, there were regional differences. More than half of global cargo net profits were generated in North America.

North American carriers' efficiency led the industry's performance and generated close to 60% of industry total profits in 2015, improving from $11.2 billion in 2014 to $21.5 billion in 2015. These resulted from a strong economy, a better performing currency (US dollar) and efficiency improvements from the majority of airlines.

On the other hand, both Latin America and Africa reported losses. In Latin America, the performance was weak on the back of the deepening economic crisis in Brazil, weak commodity prices and adverse currency fluctuations. The region reported $1.5 billion in losses in 2015, but is expected to recover in 2016. African carriers also presented losses in 2015 and are expected to remain in the red throughout 2016. The African region suffers from weaker operating airlines as well as higher political instability impacting important tourism markets in the North of the continent.

Figure 70 – Net Profits by Region, 2015 Estimates

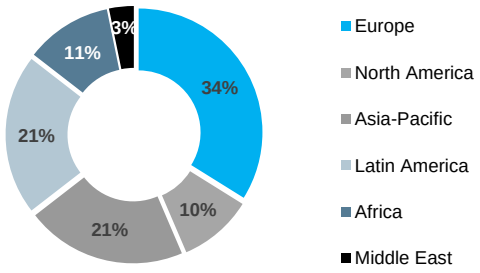



*Source: IATA Industry Forecast, June 2016*

## 2.4. Partnerships, Market Entrances and Exits

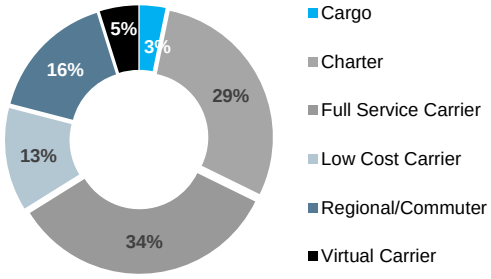
CAPA reported 62 new start-ups worldwide since August 2015. At a regional level, Europe led with 21 new airlines commencing operations followed by Latin America and Asia-Pacific, each with 13 new airlines. Full-service (21) and charter (18) services were the preferred business models for the start-up carriers.

Figure 71 – Recently launched start-ups by Region, Aug 2015-Aug 2016



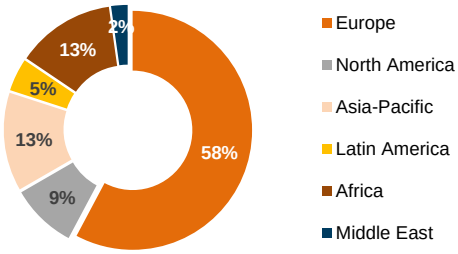

Source : CAPA – Centre for Aviation

Figure 72 – Recently launched start-ups by Business Model




Source: CAPA News – Centre for Aviation

Figure 73 – Recently launched start-ups by region, Aug 2015-Aug 2016




Source: CAPA – Centre for Aviation

During the same period, 45 airlines ceased operations.

Europe was the region where most airlines ceasing operations took place, with 26 airlines grounding their operations. Of these, most (12) were regional/commuter services. Asia-Pacific and Africa were the other regions where more airlines ceased operations with six carriers in each region.

In Europe, probably the most notable exit was made by Cyprus Airways, after years of poor financial results as the Commission ordered Cyprus Airways to repay EUR65M in aid deemed to have been granted unlawfully. Estonian Air and Air Lituanica, two Baltic carriers, also ceased operation in 2015. Further details on these cases can be found in Section 6.3 (Competition Issues) of this Report.

At the same time other European carriers sought private investment. Some carriers were successful while others are still looking for the best option. AirBaltic and Croatia Airlines were two positive examples. Air Baltic appear to have secured investment by a German investor with EUR52 million for a 20% stake of the Latvian airline, with the government agreeing to invest a further EUR80 million. For the Croatian carrier, the government continues to seek an investor with Aegean Airlines, Lufthansa and Turkish Airlines all reported to have expressed an interest.

However, IAG was responsible for the biggest transaction in the European market. 2015 saw a conclusion to the takeover of Aer Lingus. The British Airways, Iberia and Vueling owner agreed to pay EUR1.36 bn for the Irish state-owned airline.

TAP Portugal saw a new shareholder purchase a stake in the company. Atlantic Gateway Consortium, which includes David Neelman, Chairman of Brazilian Azul, acquired a 61% stake in TAP in November 2015. The stake was subsequently scaled back to 45% with the Portuguese government retaining a 50% share and 5% was made available for the carriers' employees.

In 2016 Lufthansa moved a step closer to complete the takeover of Brussels Airlines. Lufthansa's board approved the exercise of its call option to buy the remaining 55% of SN Airholding, the parent company of Brussels Airline. Lufthansa acquired 45% of the company in 2009 and negotiated the option to buy the balance of the shares for no more than EUR250million. The deal is expected to close in early 2017.

A high-profile airline grounding occurred in Russia. The market, still impacted by the combined effects of the Ruble devaluation, an economic slowdown linked to falling oil prices, and sanctions following the Crimean crisis, witnessed Transaero suspend services in October 2015 following a decision by the Russian Federal Air Transport Agency to revoke its Air Operators Certificate (AOC).

In April 2016, North American full-service Seattle-based carrier Alaska Airlines announced that their board of directors unanimously approved a merger agreement with San Francisco-based Virgin America with Alaska Air Group acquiring Virgin America for $57.0 per share. This price included existing Virgin America indebtedness and capitalised aircraft operation leases. The aggregate transaction value is estimated to be approximately $4.0 billion. The merger is still subject to approval by the Department of Justice (DOJ), focused on competition, service and price for passenger sand satisfaction of other customary closing conditions. The companies expect to complete the transaction with regulators' approval in the 4th quarter of 2016. The merger will present Alaska with hub-sized operations at all four top west-coast airports.

In Asia partnerships are playing an important role. In 2015 Qantas has received the authorisation from the Australian Competition and Consumer Commission for its planned joint-venture with China Eastern Airlines. In Southeast Asia, airlines struggled to find profitability in long haul markets. Singapore Airlines therefore undertook a joint venture with Lufthansa while Malaysia Airlines took a similar approach with Emirates. Both agreements were confirmed in first half of 2016. Also during 2016,Virgin Australia announced its board approval for the $159million investment of HNA Group, parent of China-based Hainan Airlines, for a 19% stake of the Australian airline,

Another development in Asia was the U-FLY Alliance, an alliance of independent low-cost carriers founded in 2016 by HK Express, Lucky Air, Urumqi Air and West Air with the vision of stablishing a low-cost network, and deliver flexible, affordable services to passengers. U-FLY is the world first LCC alliance. All four founding airlines are affiliated with HNA Group.

In Latin America partnerships are also paying an important role. HNA Group invested $450 million for a 23.7% stake in Azul Brazilian Airlines. HNA followed United Airlines as an investor in Azul after United, earlier in 2015, agreed to acquire a 5% stake in Azul for $100 million. Delta also expanded its investment in GOL in July 2015, and in November expressed its intention to increase its holding in Aeromexico to as much as 49%. In July 2016, Qatar Airways confirmed a 10% stake acquisition of LATAM for USD613million. Despite the regional difficulties, some non-Latin American airlines see this as the opportunistic time to gain a foothold in the market.

## 2.5. Airline Performance by Region

### Europe

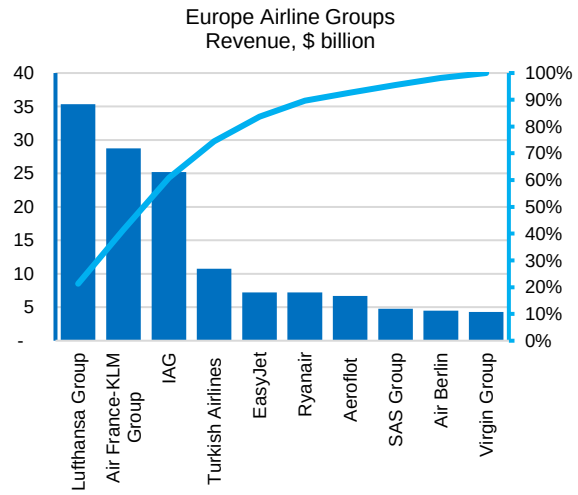
During 2015 European carriers experienced a strong increase in profitability. However, issues like softening economies, the impact of terrorist attacks against air travel and continuing uncertainties surrounding Brexit are challenging this trend in the future.

Table 14 – Europe Airline Industry

| Airline Industry | 2014 | 2015 | 2016F |
|---|---|---|---|
| Net post-tax profit, $billion | 1.0 | 7.4 | 7.5 |
| Per passenger, $ | 1.15 | 8.03 | 7.83 |
| % revenue | 0.5% | 3.8% | 4.0% |
| RPK growth, % | 5.7% | 6.0% | 4.9% |
| ASK growth, % | 5.1% | 4.8% | 5.8% |
| Load factor, % ATK | 67.2% | 67.4% | 66.6% |
| Breakeven load factor, % ATK | 65.8% | 63.8% | 62.9% |

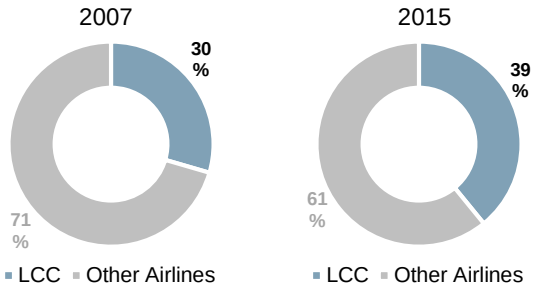
*Source: IATA Economic Performance of the Airline Industry, June 2016*

Figure 74 – Top 10 Europe Airlines by Revenue




*Source: World Airline Rankings 2016, Flightglobal*

Figure 75 – LCC Capacity Share (%) of Total Seats within Europe (2007 vs 2015)




*Source: CAPA with data provided by OAG*

European airlines experienced a strong increase in profitability in 2015, driven by the decrease in oil prices. This despite breakeven load factor being higher compared to other world markets due to the competitive open aviation market and the relatively high costs. Net profits went up from $1 billion in 2014 to $7.4 billion in 2015. Net profits are projected to rise to $7.5 billion in 2016.

Net profit per passenger improved from $1.15 to $8.03 between 2014 and 2015. Operating margins improved year on year compared with previous periods, increasing from 0.5% in 3.8% in 2015.

The vast majority of European carriers were profitable during 2015. The first months of 2016 initially projected even higher profits for 2016, but the UK vote to leave the EU in June 2016 has added uncertainty to the region.

The big three European groups (IAG, Air France-KLM and Lufthansa group) experienced growth in operating revenue between 2014 and 2015, representing over 60% of the total operating revenue among the top 10 European Airlines.

With respect to operating profits, IAG reported the highest growth in Europe at $2.5 billion, with all its airline units being profitable. Lufthansa was second with $1.8 billion.

European Low Cost Carries continue to perform well. Ryanair and EasyJet were third and fourth with high operating profits compared with other European airlines. Both carriers achieved higher operating margins, 22.3% and 14.7% respectively, compared to those presented by IAG and Lufthansa, 10.1% and 5.2% respectively.

Low Cost capacity, within the Europe remained flat between 2014 and 2015. Ryanair and EasyJet are by far the two larger carriers in this market, being responsible for 50% of total capacity offered in the market.

## North America

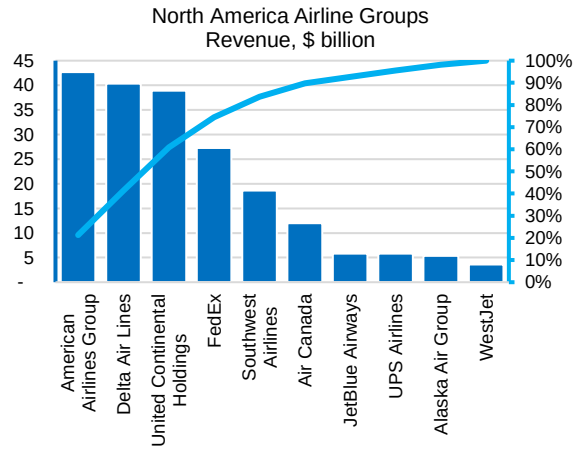
An increasing number of North American carriers are profiting financially from their operations. At the same time, lower fuel cost created interesting dynamics within the market. These are explained below.

Table 15 – North American Airline Industry Performance

| Airline Industry | 2014 | 2015 | 2016F |
|---|---|---|---|
| Net post-tax profit, $billion | 11.2 | 21.5 | 22.9 |
| Per passenger, $ | 13.30 | 24.48 | 25.34 |
| % revenue | 5.1% | 9.8% | 10.8% |
| RPK growth, % | 2.7% | 5.3% | 4.0% |
| ASK growth, % | 2.5% | 5.0% | 4.3% |
| Load factor, % ATK | 65.1% | 64.3% | 64.0% |
| Breakeven load factor, % ATK | 57.9% | 54.8% | 54.2% |

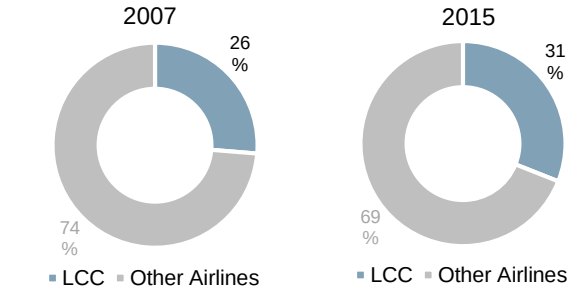
*Source: IATA Economic Performance of the Airline Industry, June 2016*

Figure 76 - Top 10 N. American Airlines by Revenues




*Source: World Airline Rankings 2016, Flightglobal*

Figure 77 – LCC capacity share (%) of total seats within North America (2007 vs 2015)




*Source: CAPA with data provided by OAG*

In 2015, North American carriers reported the strongest financial performance in the world. Net profits were $21.9 billion in 2015, a net profit of $24.48 per passenger. This produced net margins of almost 10%.

Combined with lower fuel costs, the consolidation experienced in the market and ancillary revenues helped raise load factors to 64% pushing breakeven load factors down to 55.5% in 2015. Results are projected to be even better in 2016.

Operating profits among leading North American carriers almost doubled to $32.8 billion in 2015, with total reported revenues of $218.3 billion.

The big three North American groups (American Airlines, Delta and United) were responsible for almost 60% of total operating revenue among top 10 North American carriers.

Delta Air Lines profits of nearly $8 billion led the way in the industry for 2015. American Airlines and United followed with $6.2 billion and $5.2 billion respectively. Southwest also had a stellar year, with $4.1 billion in operation profits. The top 4 most profitable North American carriers were also the most profitable worldwide.

In fact, Southwest is the original and largest LCC within the North American market, being responsible for approximately 55% of capacity offered within this carrier group. Between 2014 and 2015 the LCC share of seat capacity within the North American market remained flat.
In the meanwhile, it was the ultra-low-cost segment with carriers such as Frontier and Spirit that experienced the biggest challenges in the market during 2015, with the low unit costs allowing price matching by major US airlines.

## Asia-Pacific

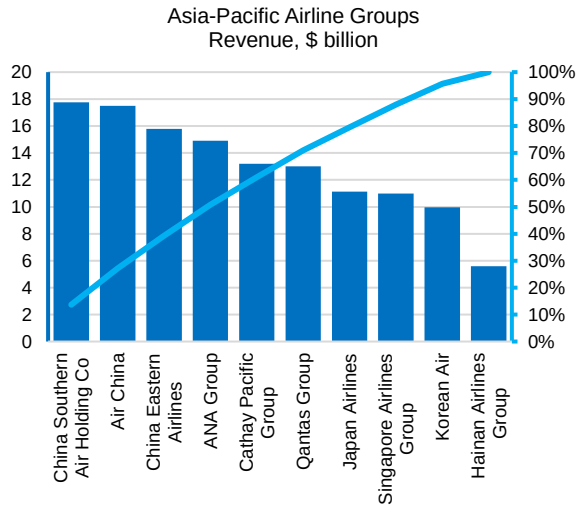
Chinese carriers led the way during the most profitable year in recent times.

Table 16 – Asia-Pacific Airline Industry Performance

| Airline Industry | 2014 | 2015 | 2016F |
|---|---|---|---|
| Net post-tax profit, $billion | 1.8 | 7.2 | 7.8 |
| Per passenger, $ | 1.63 | 5.95 | 5.94 |
| % revenue | 0.9% | 3.6% | 3.9% |
| RPK growth, % | 6.9% | 10.1% | 8.5% |
| ASK growth, % | 7.4% | 8.4% | 9.1% |
| Load factor, % ATK | 66.9% | 67.3% | 66.7% |
| Breakeven load factor, % ATK | 65.2% | 61.5% | 60.5% |

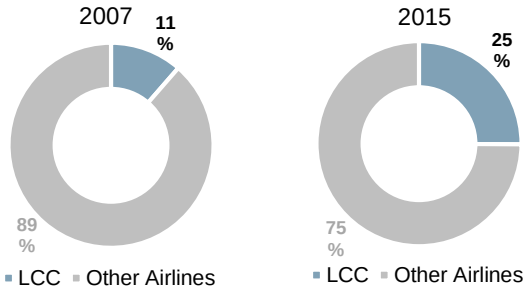
*Source: IATA Economic Performance of the Airline Industry, June 2016*

Figure 78 – Top 10 Asia-Pacific airlines by revenues




*Source: World Airline Rankings 2016, Flightglobal*

Figure 79 – LCC capacity share (%) of total seats within Asia-Pacific (2007 vs 2015)




*Source: CAPA with data provided by OAG*

Net profits in the Asian-Pacific increased from $1.8 billion in 2014 to $7.2 billion in 2015. This performance has been driven by lower fuel costs. Breakeven load factor decreased from 65.2% to 61.5% between 2014 and 2015 while passenger load factor increased from 66.9% to 67.3%.

Net profit per passenger improved from $1.63 to $5.95 between 2014 and 2015. Operating profits among main airlines in the region was of $15.8 billion in 2015 with total reported revenues of $200.1 billion.

The competitiveness of the Asian-Pacific market is demonstrated when assessing the well-balanced spread of revenues among the top 10 airlines, with 9 out of 10 reporting revenues between $18 and $10 billion.

The big three Chinese carriers: Air China, China Southern and China Eastern Airlines all posted operating profits in excess of $2 billion during 2015. The two main Japanese carriers, Japan Airlines and ANA, completed the top-5 ranking of most profitable airlines by operation result, with profits exceeding $1 billion.

Across the entire region, the LCC share of capacity remained flat in 2015. However, within the region there were large variations. For instance, LCCs represented 60% of seat capacity within the Southeast Asia while in the Northeast region LCCs were only responsible for 12% of seat capacity. LCCs have been growing strongly in the past 8 years in the Asia Pacific region.

The key development in the Asia-Pacific LCC market during 2015 was due to eight that formed a new standards-based collaborative marketing group. The group, Value Alliance, covers more than 160 destinations in the region with a combined fleet of 176 aircraft.

## Middle East

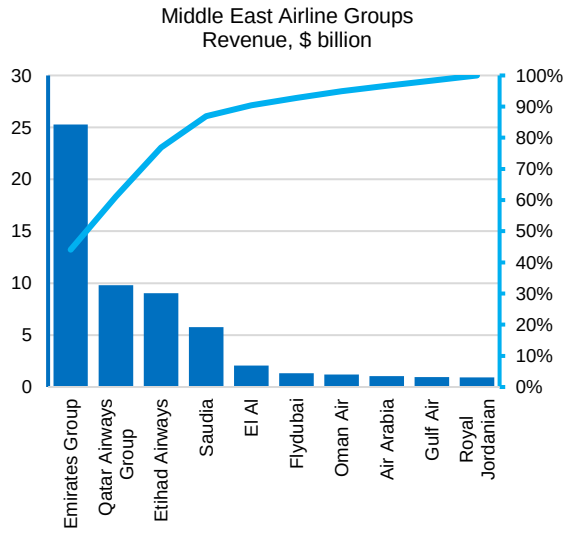
Despite conflicts in the region and a slump in oil prices, Middle Eastern carriers reported healthy growth in 2015. Lifting of sanctions on Iran was an additional good indicator for a profitable year during 2016.

Table 17 – Middle East Airline Industry Performance

| Airline Industry | 2014 | 2015 | 2016F |
|---|---|---|---|
| Net post-tax profit, $billion | 0.4 | 1.4 | 1.6 |
| Per passenger, $ | 2.44 | 7.56 | 7.83 |
| % revenue | 0.7% | 2.3% | 2.5% |
| RPK growth, % | 12.1% | 10.4% | 11.2% |
| ASK growth, % | 10.9% | 12.9% | 12.2% |
| Load factor, % ATK | 61.0% | 60.1% | 58.8% |
| Breakeven load factor, % ATK | 60.3% | 58.6% | 57.2% |

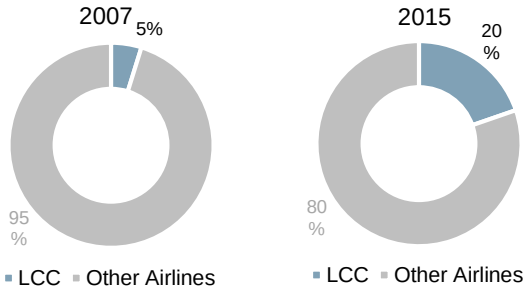
*Source: IATA Economic Performance of the Airline Industry, June 2016*

Figure 80 – Top 10 M. East Airlines by Revenues




*Source: World Airline Rankings 2016, Flighglobal*

Figure 81 – LCC capacity share (%) of total seats within Middle East (2007 vs 2015)




*Source: CAPA with data provided by OAG*

Driven by its low unit costs, Middle Eastern airlines continued being profitable despite the region reporting one of the lowest load factor levels in the world. The market presented net profits of $1.4 billion in 2015, $1 billion higher than in 2014, as Table 17 indicates.

Local carriers achieved a profit of $7.56 per passenger (vs $2.44 in 2014) and margins increased from 0.7% to 2.3%. As in all other markets, 2016 is projected to be even stronger than in 2015.

During 2015, Emirates' momentum continued, with operating revenues reaching $25 billion and respective operation profit of $2.6 billion.

The other two big Gulf Carriers (Qatar and Etihad) followed in second and third place with far more modest revenues. The "Big 3" were responsible for 77% of total revenues in the region during 2015. The three carriers kept profiting from rapid investment and growth.

Worldwide, the airlines' influence expanded with Qatar Airways increasing its shareholding in IAG, from an initial 10% to 20%. It also has planned to invest in Italy's Meridiana and Morocco's Royal Air Maroc.

Looking at the region's smaller players, Iran and Saudi Arabia were once considered the main carriers in the region but that might be about to change, with Tehran vowing to become sixth-freedom hub after the lifting of nuclear sanctions.

The LCC share of seating capacity offered within the market increased to 20%. Flydubai, responsible for 60% of scheduled LCC seats within Middle East led the expansion, with additional 28% capacity seats allocated to the market between 2014 and 2015.

## Latin America

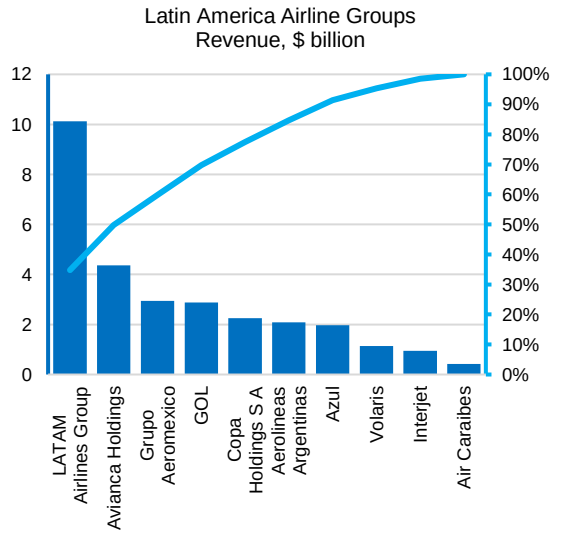
Brazil's economy dragged down the region's growth in 2015, this despite a positive report from Mexico. Economic uncertainty in the region is driving a slow recovery projection for 2016.

Table 18 – Latin America Airline Industry Performance

| Airline Industry | 2014 | 2015 | 2016F |
|---|---|---|---|
| Net post-tax profit, $billion | 0.0 | -1.5 | 0.1 |
| Per passenger, $ | 0.08 | -5.47 | 0.38 |
| % revenue | 0.1% | -4.7% | 0.4% |
| RPK growth, % | 6.3% | 7.6% | 4.2% |
| ASK growth, % | 4.1% | 6.9% | 3.7% |
| Load factor, % ATK | 62.6% | 62.1% | 62.5% |
| Breakeven load factor, % ATK | 61.3% | 60.9% | 60.9% |

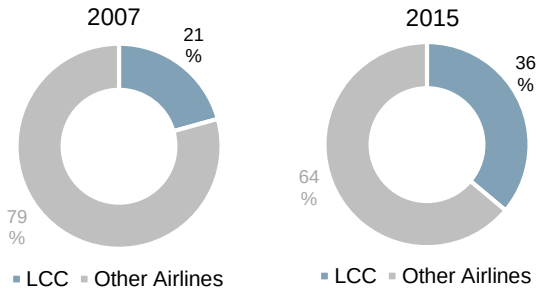
*Source: IATA Economic Performance of the Airline Industry, June 2016*

Figure 82 – Top 10 Latin America Airlines by Revenues




*Source: World Airline Rankings 2016, Flightglobal*

Figure 83 – LCC Capacity Share (%) of Total Seats within Latin America (2007 vs 2015)




*Source: CAPA with data provided by OAG*

Latin American airlines faced challenges in 2015. It can be seen on the financial performance reports, where the net losses in 2015 were $1.5 billion. This was a result of weak home markets and currencies, despite a degree of airline consolidation and limited long-haul success.

For 2016, the market is expected to recover slightly, with projected net profits of $0.1 billion and revenue per passenger of $0.38.

The Latin American market was challenging for carriers in 2015. In particular Brazil, once a fast rising economy and Latin America's largest market is mired in a corruption scandal, hurting from consecutive quarters of currency depreciation and facing the need to cut capacity. As a result, foreign airlines' response at large has been to reduce operations to the country as demand plummeted whilst some have recently announced plans to pull some of the Brazilian flights.

During 2015, LATAM Airlines Group reported the highest revenue in the region ($10 billion) but this represented a 19% decrease compared to 2014. LATAM Airlines Group reported $514 million of operational profit.

Across the market, Mexican carriers were among the most profitable in the region during 2015.

Following Europe, Latin America is the second largest market in terms of proportionate capacity for LCCs. Despite this fact, Latin America has a relatively low number of LCCs and all operate in only three countries. This represents a significantly underpenetrated market with opportunity to expand.

Between 2014 and 2015 LCCs share of capacity within the market remained flat at 36%.

## Africa

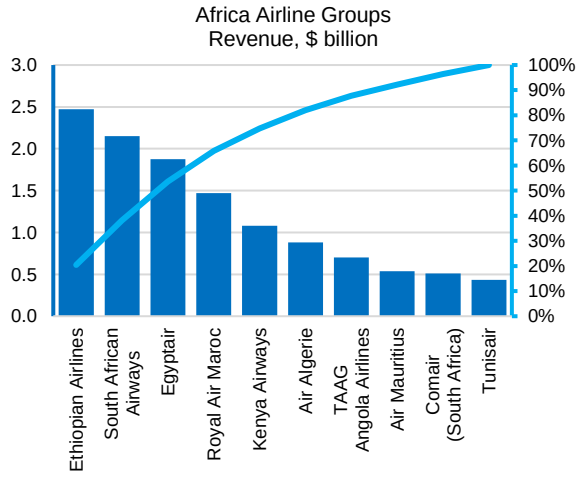
Despite good performances, i.e. Ethiopian Airlines, most African carriers continued to struggle in 2015. Air traffic liberalisation in the continent is very much needed for air traffic to develop to its full potential.

Table 19 – Africa Airline Industry Performance

| Airline Industry | 2014 | 2015 | 2016F |
|---|---|---|---|
| Net post-tax profit, $billion | -0.8 | -0.7 | -0.5 |
| Per passenger, $ | -9.81 | -8.60 | -5.64 |
| % revenue | -4.8% | -4.7% | -3.3% |
| RPK growth, % | 0.3% | 0.0% | 4.5% |
| ASK growth, % | 2.5% | -0.2% | 5.3% |
| Load factor, % ATK | 56.1 % | 55.5 % | 54.6 % |
| Breakeven load factor, % ATK | 57.3 % | 56.9 % | 55.3 % |

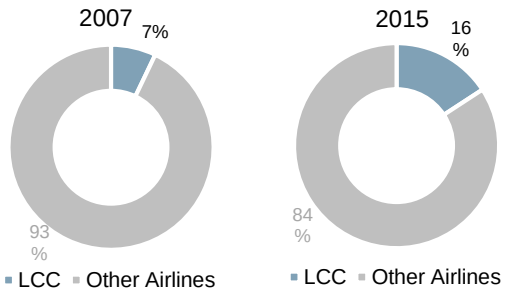
*Source: IATA Economic Performance of the Airline Industry, June 2016*

Figure 84 – Top 10 Africa airlines by revenues




*Source: World Airline Rankings 2016, Flightglobal*

Figure 85 – LCC Capacity Share (%) of Total Seats within Africa (2007 vs 2015)




*Source: CAPA with data provided by OAG*

Africa also experienced a challenging year in 2015. Low commodity prices, weak markets and regional conflicts drove losses of $0.7 billion in 2015. Angola and Nigeria, Africa's two largest oil exporters, have been hit particularly hard by the downturn.

As presented on Table 19, average breakeven load factor is relatively low, as yields are a little higher than global average and costs are lower. However, load factors are the lowest globally.

For 2016, projections are set to improve, however still anticipated to result in losses for the airlines.

During 2015, Ethiopian Airlines continued on its positive track. The airline, which took delivery of its first Airbus 350-900, reported revenues of $2.5 billion and margins of almost 10% (-USD198 million).

For other carriers in the region the challenges were significant. The other two sub-Saharan big carriers, Kenya Airways and South African Airways, are still working on restructuring projects - while the North African markets were hit by terrorist attacks.

LCC penetration is the lowest within any global region. LCC share of capacity within the market remained flat during the last 3 years. But there are hopes that this might change with the long awaited opening of the intra-African markets to free competition, expected to happen in the near future.

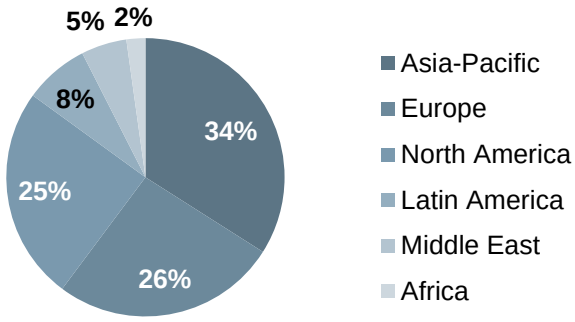
Mango Airlines, a South African low-cost airline and subsidiary of South African Airways is the main LCC in the market, offering almost 50% of scheduled seat capacity.

# 3. Airport Business & Investments

## 3.1. Introduction

In 2015, 3.6bn passengers travelled on scheduled services representing an increase of 7.2% over 2014 (IATA) which led to strong airport passenger performance during the year vs 2014. This growth was principally driven by an increase in the Asia-Pacific Region (+10%) and the Middle East (+8.1%) passenger traffic market. The Asia- Pacific region now accounts for 34% of total passenger traffic shown by Figure 86.

Figure 86 - 2015 Distribution of Passenger Traffic




Source: IATA Press Release 5th July 2016

On the back of this strong performance, the world's largest airports recorded the following passenger traffic numbers in 2015:

Table 20 - Global Top 20 Airports – Passenger Traffic 2015

| Rank 2015 | Rank 2014 | Country | Airport / Code | Total Passengers | 2014-2015 YoY Growth % |
|---|---|---|---|---|---|
| 1 | -1 | USA | Atlanta (ATL) | 101,491,106 | 5.5 |
| 2 | -2 | China | Beijing (PEK) | 89,938,628 | 4.4 |
| 3 | -6 | UAE | Dubai (DXB) | 78,010,265 | 10.7 |
| 4 | -7 | USA | Chicago (ORD) | 76,949,504 | 9.8 |
| 5 | -4 | Japan | Tokyo (HND) | 75,316,718 | 3.4 |
| **6** | **-3** | **UK** | **London (LHR)** | **74,989,795** | **2.2** |
| 7 | -5 | USA | Los Angeles (LAX) | 74,937,004 | 6.1 |
| 8 | -10 | Hong Kong | Hong Kong (HKG) | 68,283,407 | 8.2 |
| **9** | **-8** | **France** | **Paris (CDG)** | **65,766,986** | **3.1** |
| 10 | -9 | USA | Dallas Fort Worth (DFW) | 64,072,468 | 0.9 |
| 11 | -13 | Turkey | Istanbul (IST) | 61,836,781 | 9.2 |
| **12** | **-11** | **Germany** | **Frankfurt (FRA)** | **61,032,022** | **2.5** |
| 13 | -19 | China | Shanghai (PVG) | 60,053,387 | 16.3 |

| Rank 2015 | Rank 2014 | Country | Airport / Code | Total Passengers | 2014-2015 YoY Growth % |
|---|---|---|---|---|---|
| **14** | **-14** | **Netherlands** | **Amsterdam (AMS)** | **58,284,864** | **6** |
| 15 | -18 | USA | New York (JFK) | 56,827,154 | 6.8 |
| 16 | -16 | Singapore | Singapore (SIN) | 55,449,000 | 2.5 |
| 17 | -15 | China | Guangzhou (CAN) | 55,201,915 | 0.8 |
| 18 | -12 | Indonesia | Jakarta (CGK) | 54,053,905 | -5.5 |
| 19 | -17 | USA | Denver (DEN) | 54,014,502 | 1 |
| 20 | -22 | Thailand | Bangkok (BKK) | 52,902,110 | 14 |

Though Atlanta and Beijing Airports held their positions, growth was most evident at Dubai (+10.7%), Hong Kong (+8.2%), Istanbul (+9.2%), Shanghai (+16.3%) and Bangkok (+14%). However, one of Asia's largest airports' – Jakarta Airport (CGK), recorded a decline in passenger volumes compared to 2014. This was a result of the lifting of operational restrictions at Jakarta's second airport - Halim Perdanakusuma (HLP) airport that increased its passengers by 86% (from circa 1.6mppa to 3.1mppa)[94].

The increasing demand in these regions through growing populations and rising incomes is changing the composition of the top 20 busiest airports with a shift from the West to the East.

This growth in passenger traffic demand is bringing additional challenges to airports across the world, most notably in high growth areas – Asia Pacific for example, that require significant investment, expansion, and rehabilitation programs to meet future demand.

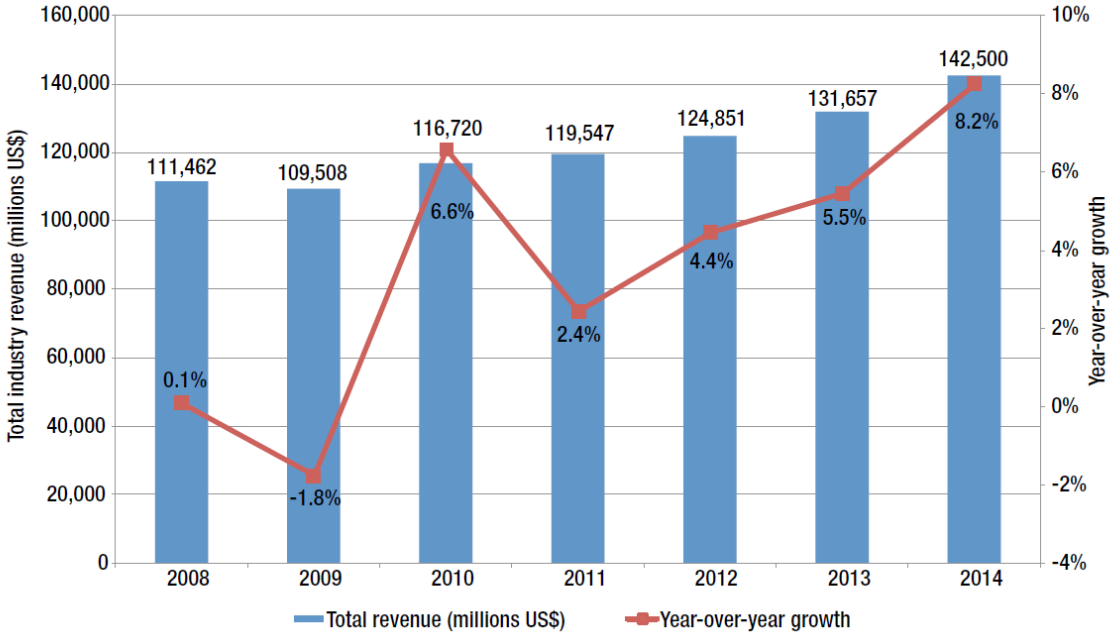
In many circumstances, government owners/operators of airports do not have the required capital or expertise to provide the required expansion and seek private sector involvement to deliver new infrastructure. The following section provides an overview of the key airport infrastructure challenges faced by emerging markets.

## 3.2. Airport Financial Performance

Airport financial data is available for the 2014 period due to the time delays in assembling the information across the ACI airports. Nevertheless, the airport industry continued to report strong growth in revenues on the back of strong traffic in 2014. Figure 87 shows the development in total revenue between 2008 and 2014.

[94] Directorate General of Civil Aviation – Ministry of Transportation Republic of Indonesia, Air Transport Traffic Database

Figure 87 ACI Airports – Evolution of total revenue 2008-2014




Source: ACI Airports Economic Survey (2015)

Worldwide revenues reached $142bn representing a YoY increase of 8.2% on the back of strong growth in scheduled passenger traffic of 7.2%.

Airport revenues are principally generated through aeronautical (aircraft and passenger charges) and non-aeronautical methods (terminal and landside concessions). Table 21 shows the trend of non-aeronautical revenues constituting a growing share of total revenues as airports seek to diversify their revenues streams.

Table 21 Airport Revenue 2014 (USD m)

| Region | Total Revenue in 2014 | Growth vs 2013 | % Aero Revenue | % Non-Aero Revenue | Aero Rev Growth YoY | Non-Aero Growth YoY |
|---|---|---|---|---|---|---|
| Africa | 3,000 | 17.0% | 70% | 30% | 0% | 13% |
| Asia - Pacific | 41,800 | 8.3% | 49% | 51% | 10% | 16% |
| Europe | 50,800 | 7.0% | 59% | 41% | 0% | 5% |
| Latin America/Caribbean | 8,100 | 25.9% | 59% | 41% | 9% | 27% |
| Middle East | 10,900 | 13.0% | 48% | 52% | 18% | 33% |
| North America | 27,900 | 4.8% | 52% | 48% | 4% | 16% |
| **World** | **142,500** | **8.2%** | **54%** | **46%** | **5%** | **14%** |

As demonstrated in Table 21 Airport Revenue 2014 (USD m), airport revenues recorded strong growth across all regions with Latin America and Caribbean recording a 25.9% increase in revenues against 2013 followed by Africa (1%) and the Middle East (13%). Worldwide revenues reached a total of $142bn representing a YoY increase of 8.2% which is expected, considering the growth in scheduled passenger traffic by 7.2%.

Revenue from aeronautical streams still constituted the largest revenue source for airports compared with non-aeronautical revenues. However, revenues from non-aeronautical streams grew at a faster rate when

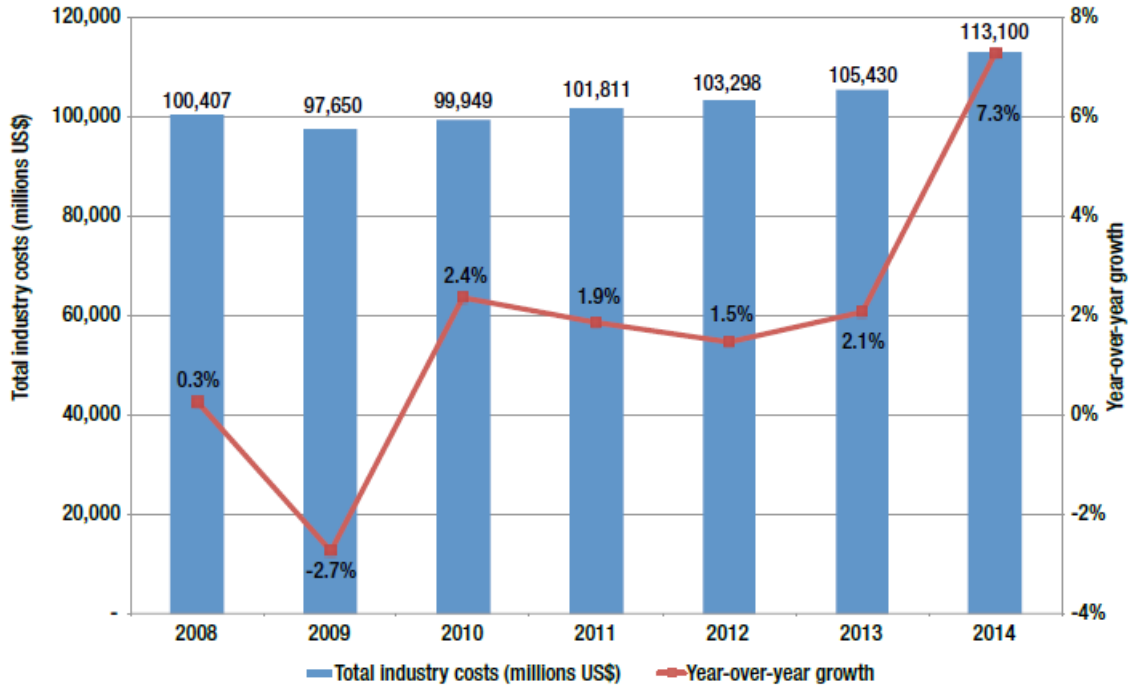
compared against 2013. Airports across the world are seeking new opportunities to maximise revenues from commercial opportunities within the terminals and from the wider airport boundary.

Airports are facing increasing pressure on yields from aeronautical activities such as passenger fees, landing charges and aircraft services charges. ICAO states that airports seek to offer competitive charging levels to airlines to attract and retain traffic to secure future growth[95]. Therefore, non-aeronautical revenue generation becomes a priority for airports. This revenue helps the airport to reduce capital needs in a dual till regulatory environment (keeping aeronautical and non-aeronautical revenues separate) with profits from non-aeronautical revenues being reinvested into airport infrastructure.

### Airport Operating Costs

Operating costs continued to increase for airports across the world, increasing by +7.3% vs 2013. This was principally driven by higher concession/lease fees, higher maintenance costs and higher staff salary costs. The evolution of operating costs between 2008 and 2014 is shown by Figure 88.

Figure 88 ACI Airports – Evolution of total costs 2008-2014




Source: ACI Airports Economic Survey (2015)

Staff salary costs constituted the largest proportion of an airport's operating costs at 22%, followed by contracted services (15%), capital costs and general costs (7%) and utilities/communications (5%).

Though as a whole, the airport sector performed well in 2015, there are airports groupings that have not performed so well and continue to face financial pressures with smaller airports facing these challenges. These smaller airports do not benefit from economies of scale through critical mass of passenger traffic or exploit to the full non-aeronautical revenues development or commercial opportunities. ACI highlight in their research that airports with fewer than 1mmpa often have negative margins due to higher total costs as they are spread over fewer passengers[96].

[95] ICAO Working Paper – "Worldwide Air Transport Conference, 6th Meeting, Montreal 18-22 March 2013 -Economics of Airports

[96] 2015 ACI Economics Report

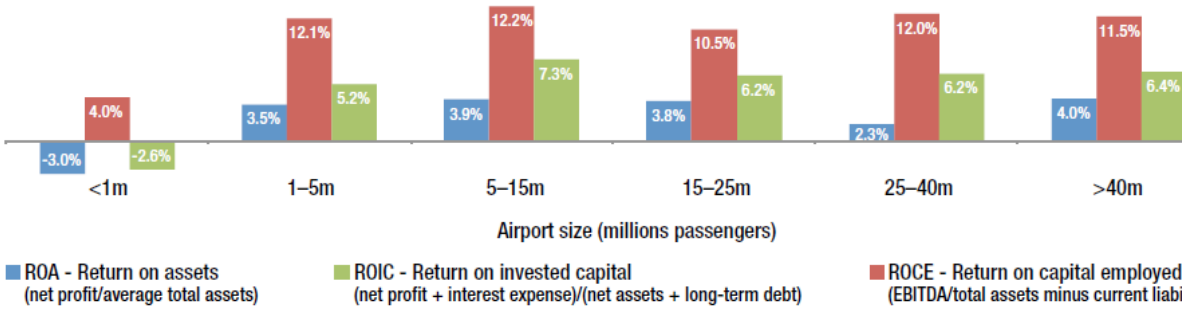
## Return on Invested Capital (ROIC)

The return on invested capital (ROIC) is a measure used to assess profitability of airports which considers all invested capital – both debt and equity. The following section uses the most recent available data from ACI which is for the year 2014.

In 2014, ROIC reached 6.3% for the industry as a whole. However there were considerable variations depending on the region and size of the airports.

Airports in emerging economies and those airports handling over 1mmpa had higher ROIC vs advanced economies and smaller (<1mppa) airports. This is shown by Figure 89 and Figure 90.

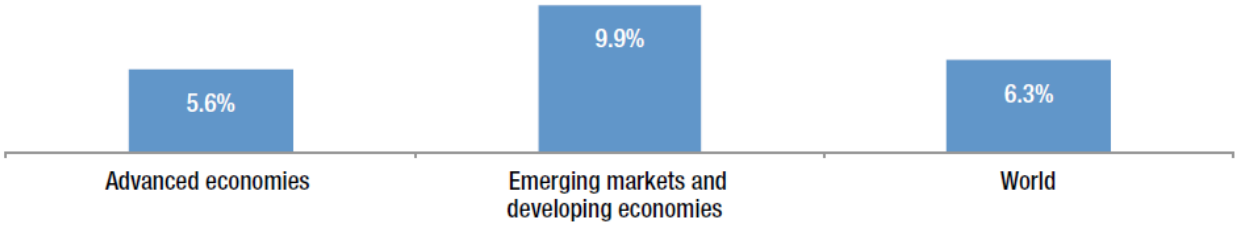
Figure 89: Airport Returns and Size Comparison




Source: ACI 2015 Economics Survey

Figure 89 indicates that the larger the airport, the greater economies of scale it delivered through spreading the capital costs across the higher throughout. Smaller airports experienced a negative ROA and ROIC due to the low traffic volumes to drive down costs adequately.

Figure 90: Airport Return on Invested Capital (ROIC)




Source: ACI 2015 Economics Survey

Emerging markets demonstrated the largest ROIC vs advanced economies at 9.9% or 77% higher than advanced economies.

The 2015 ACI Report highlights that the ROIC is a sound measure of profitability, and that the weighted average cost of capital (WACC) should also be considered as it demonstrates the opportunity cost of capital. The ACI Report notes that studies have shown the cost WACC to be in the region of 6-8%. Based on this metric, the results from the industry show that in 2014 many airports were only breaking even and real

economic losses were experienced. The WACC can be higher at larger airports due to financing instruments used to fund large scale investments with higher financing costs (interest).

## 3.3. Airport Infrastructure – Emerging Markets

Airports in high aviation growth areas are facing significant challenges in providing the infrastructure to meet the high levels of traffic growth.

This is prevalent in the Asia and Pacific region. Rising middle classes and incomes in these high population countries (Thailand, Philippines, Indonesia, and India etc.) are expected to significantly increase the propensity to fly of these populations in the future. Major airports in these countries have inadequate capacity and there is considerable pressure on the existing infrastructure and to meet future demand. This section provides a high level overview of major Asia Pacific countries that faced these challenges in 2015.

### Thailand

The state owned Bangkok Suvarnabhumi Airport, the country's main international airport, handled over 52m passengers in 2015 but has a designed terminal capacity to handle 45 million passengers (IATA, 2016). In addition, the airport was handling over 800 flights per day vs the 600 flight capacity. The airport has struggled to provide capacity to meet the double digit passenger growth over recent years. Numerous expansion plans have been delayed for the airport with cost estimates in billions (€) due to scrutiny over the plans from the Government on high cost projects (reported to be on projects >$31m).

### Indonesia

Indonesia's capital city and gateway airport to the country, Jakarta Soekarno-Hatta International Airport, handled 54 million passengers in 2015 - though the existing infrastructure has a capacity of 38mppa. In addition, the airfield, terminal and airspace management is operating beyond capacity.

The airport is state owned and operated but has limited budget resources to finance the scale of investment required not only at Jakarta Airport (CKG) but across the islands[97]. However, the newly constructed Terminal 3 is expected to open in 2016 and to relieve terminal capacity. However, this would bring total capacity in line with current throughput by adding 25 mppa to the existing 38 (total 63mppa). At the time of publication, there has been no private investment in Indonesia airport projects.

### India

Indian Terminal Capacity is currently 250mmpa with 190mppa currently being utilised. However, 10 of these airports' capacity are already saturated. Research undertaken by the Centre for Asia Pacific Aviation (CAPA) expects that the main airports of Bangalore, Hyderabad, Delhi, Kolkata and Chennai will be saturated by 2026[98]. This presents a significant challenge for India as it expects to become one of the world's largest aviation markets as its populations surpasses the 1bn mark.

[97] PWC Report: Indonesia's airports sector expects investments of up to US$25bn in 10 years, double the present level due to 4.8% expected increased air traffic growth

[98] CAPA "India's Airport Capacity Crises" 27th January 2017

### Philippines

Philippine airports are facing current and short term capacity constraints with Manila airport operating at capacity after years of high single digit passenger growth (2015 - 37mmpa). The second largest airport in the country – Mactan Cebu airport handled over 7.5mppa in 2015 but operated within a terminal infrastructure designed for circa 4.5mppa[99]. However, the Indian company GMR, have commenced construction on a new terminal to provide additional capacity to 12.5mppa.

The above examples show the capacity issues surrounding major South East Asia airports. The infrastructure required is large scale and the high levels of expertise and resources required are often limited in government owned/operated airport infrastructure. Many of the above countries are seeking private involvement in airport development and this will be explored further in the following section.

## 3.4. Financing and Public Private Partnerships

In 2015, momentum continued in the growing trend of private sector involvement in the financing and operation of airport infrastructure across the globe as the markets had liquidity with relatively cheap cost of capital, investor appetite for long term assets and governments still were recovering from the 2008 financial crises with limited financial budgets.

The scale of investment required to meet demands is large and private finance will be required to fund part of the total capital requirements.

It is estimated that in ASEAN alone (Association of South East Asian Nations[100]) over $33bn dollars of airport investment is required in the next 5 years to meet demand[101]. This is a considerable sum considering many of these member states of ASEAN are developing countries with limited government budgets.

The Indian Government has announced that they will be investing over $120bn in airport infrastructure in a combination of existing expansion and new green-field airports as the country looks to become the 3rd largest aviation market in the world by 2020[102]. The Indian Government is seeking private investment to provide capital and expertise that it does not have in order provide additional capacity. Approximately 50% of traffic in India is handled through 4 PPP airports (Delhi, Mumbai, Bangalore and Hyderabad). The initial Delhi investment was over $1bn, Bangalore airport has invested over $400m[103], Hyderabad airport construction was expected to be circa $370m and the new Mumbai Terminal 2 when completed is expected to cost over $1.5bn[104]. These projects were all funded through private investment.

Major airport privatisations (or PPP's) that commenced in 2015 are summarised below.

[99] Mott MacDonald

[100] ASEAN countries consist of Brunei, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam.

[101] ASEAN-UNCTAD, Part One – FDI and MNEs 'Development in ASEAN

[102] KPMG- FICCI Report. 5th International Exhibition & Conference on Civil Aviation: India Aviation 2016, March 16-20 2016, Begumpet Airport, Hyderabad, India.

[103] Airport Technology Project Database – Bangalore Airport

[104] CSIA Press Release – Geodesic Techniques

Table 22 - Major Airport Transactions and Deals 2015

| Airport | Type | Structure | Details |
|---|---|---|---|
| Navi Mumbai Airport | Greenfield | PPP | June: Shortlist of Private Operators for the development of the new Mumbai airport |
| 14 Greek Regional Airports | Brownfield | PPP | December: Signed Agreement with Greek Government for 40 Concession for 14 regional airports (Deal value - €1.2bn) |
| 6 Philippines Airports | Brownfield | PPP | 5 private bidders pre-qualify for the two bundles of airports – 2 in Bundle 1 and 3 in Bundle 2. 30-year concession to operate, maintain and expand the airports. |
| Brazil 4 Regional Airports | Brownfield | | Infraero launch data room to allow private investors to undertake feasibility studies on the following airports;<br>Salvador, Porte Alegre, Florianopolis, Fortaleza |
| Japan – Kansai and Osaka Airports | Brownfield | PPP | December: Private consortium (Vinci Concessions and Orix Corporation) signed agreement with Kansai Airports for the 44 concession rights to operate and maintain the airports including expanding the facilities (Value of deal - $18bn) |
| Madagascar Airports – Ivato and NosyBe | Brownfield | PPP | Preferred Proponent (Consortium of ADP, Bouygues, Colas, Meridiam) reached for the concession of NosyBe and Ivato airports for the operation, maintenance, and expansion (Ivato) - ~28 years' concession. |
| Istanbul Airport | Greenfield | BOT | Achieved Financial Close in November 2015. 6 runways 150 mppa airport for 25-year concession length (Value of deal €28bn) |

Source: Multiple Sources: InfraNews, CAPA

The theme of private investment in airport infrastructure is evident in the major transaction list for 2015. Both Japanese airports listed in Table 22 had accumulated large government debt circa $14.7bn[105] and the Greek Regionals[106], Brazil 4[107] regional airports and the Madagascar airports all required large investment to modernise and expand the facilities with the Governments facing fiscal pressures and turning to the private sector to provide the expertise and necessary investment.

## 3.5. Customer Service Awards

Airports Council International (ACI) is an industry body representing nearly 2,000 airports worldwide that advances the interests of airports and promotes professional excellence amongst its members. Each year ACI presents awards to the airports that have achieved high customer satisfaction through their Air Service Quality (ASQ) benchmarking studies. This survey allows passengers to rate an airport performance through 34 key service areas covering 8 major categories such as check-in, security, airport facilities and commercial offering.

In 2015, over 600,000 passengers were surveyed to obtain feedback. This allows airports – through benchmarking analysis to set or monitor KPIs, as well as optimise investments and initiatives to improve passenger satisfaction levels and make strategic decisions on where to focus financial and human resources. In addition, it allows best practice to be shared amongst the airport community through initiatives that have worked well and highlighting key development and changes in passenger satisfaction trends.

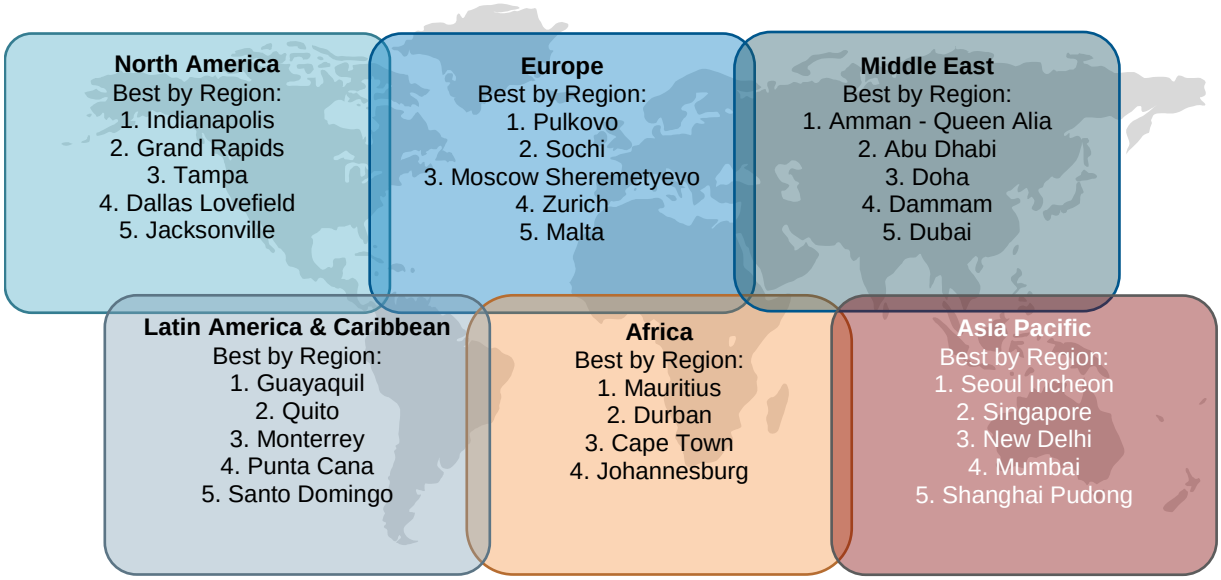
[105] Clifford Chance – "Fasten Seat Belts – Japan Infra to take off"

[106] These include Aktion, Chania, Corfu, Kavala, Kefalonia, Kos, Lesvos, Mykonos, Rhodes, Samos, Santorini, Thessaloniki, Zakynthos.

[107] The Brazilian regional airports include Fortaleza, Florianopolis, Porte Algre and Salvador

The following airports were the major ASQ award winners for 2015, classified by region and by size of airport.

Figure 91: ASQ Award Winners 2015 (airports over 2mppa – top 5)




Source: ACI ASQ

The result for the best performing airports in the world showed a mixed number of airport sizes and types receiving the awards. In the Middle East and in the Asia Pacific region, some of the largest airports in these regions achieved the highest rankings.

The airport winners were principally new airports or airports that have had significant new infrastructure added having being built within the last 15 years. These include;

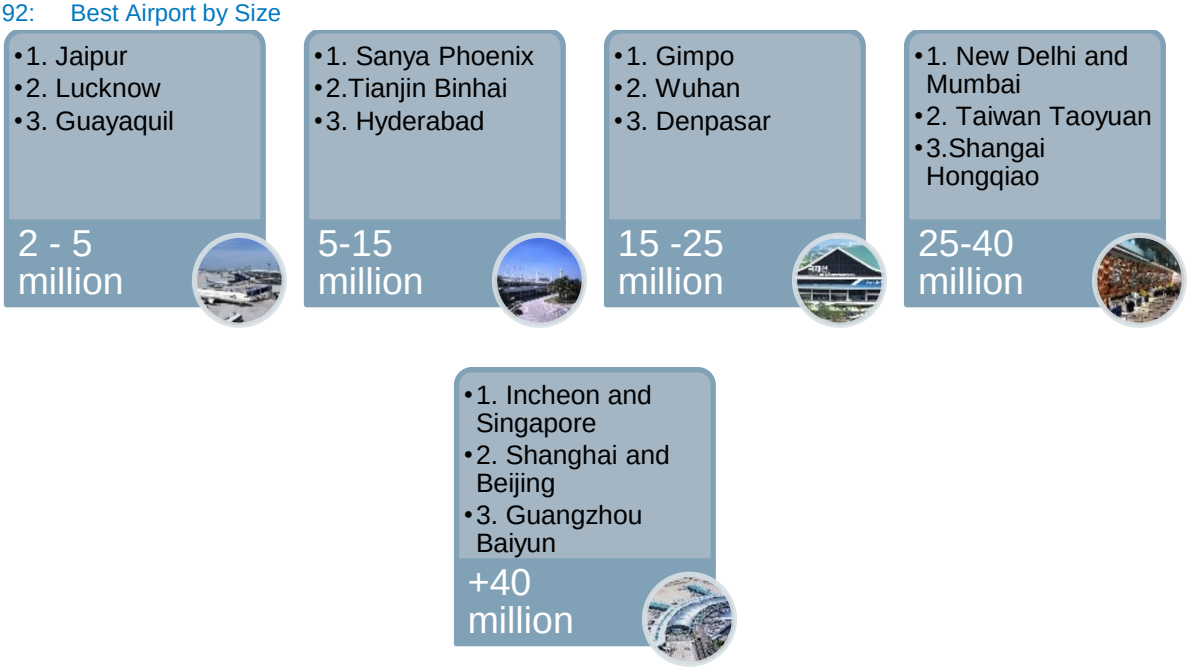
- Amman Airport – opened in 2013
- Doha Airport – opened in 2014
- Abu Dhabi Airport – major terminal and airfield developments in the 2000's
- Dubai Airport – major terminal and airfield development in the 2000's
- Seoul Incheon Airport – opened in 2001
- Singapore Airport – Terminal 3 opened in 2008
- New Delhi – Terminal 3 opened in 2010

In North America and Europe, smaller airports were recognised as the top performers with Russian airports considered high performers; the North Americas airports that were ranked highest all handled under 10mppa.

ACI North America highlights that North American gateway airports lack sufficient funds to invest in the rehabilitation and expansion of airports[108]. Old and capacity constrained facilities –a common feature at some of America's largest airport – will impact customer's satisfaction and therefore reflected in absence of these large airports in the ASQ winners.

[108] Airline Leader, Issue 27 citing ACI North America research

Figure 92: Best Airport by Size




Source: ACI ASQ

The highest ranking airports in the ASQ survey across all sizes are principally located in the Asia-Pacific region with no airports in Europe appearing in the highest rankings.

# 4. Aircraft Manufacturers & MRO

## 4.1. Introduction

This chapter provides an overview of performance of civil aircraft manufacturing and Maintenance, Repair and Overhaul (MRO) industries in 2015 and the first half of 2016. The chapter highlights the most important global trends, analyses the composition of the current global fleet, aircraft orders and projections from the main manufacturers and summarises regional performance of the industry.

## 4.2. Global Trends

The worldwide airline industry continued to present a positive financial performance in 2015, largely driven by favourable oil prices. While profitability has returned, operators continue to seek opportunities to reduce costs. With labour (i.e. salaries, wages, and benefits) and fuel costs being more challenging to control, airlines focus significant attention on their fleets and, in particular, in maintenance.

The spend in MRO activities in 2015 ($64.3B) was 3.5% higher compared to 2014 ($62.1B)[109], with the North American region claiming the largest share of the global market regions expenditure. One of the key discussions emerging in 2015 was on how technology advances are expected to impact the MRO industry. As presented ahead, the entrance of new generation airliners in replacement of older aircraft will drive significant changes in maintenance frequencies as well as in maintenance methodologies[110].

Consolidation in the MRO segment was robust in 2015 with scale and global presence becoming increasingly important. This trend is expected to continue as the aviation industry anticipates healthy growth in the next decade with the number of new aircraft deliveries (more than 1,600 in 2015 and aircraft orders growing year after year[111]) accelerating the process. The majority of these aircraft orders (623) were delivered in Asia-Pacific, primarily to serve the regional market.

In total, there were 2,660 new commercial aircraft net orders in 2015, reflecting a 30% decline against the 2014 peak. But while orders failed to match the highs of recent years, they remain above pre-economic crisis levels[112].

In 2015 the aviation industry continued to cement its role as a source of considerable economic activity. The global air transport industry supported nearly 63 million jobs worldwide and is estimated to contribute $ 2.7 trillion (3.5%) to Global GDP[113].

[109] ICF MRO Industry Outlook, April 2016

[110] Oliver Wyman, MRO Big Data – A Lion or a Lamb, Innovation and adoption in aviation MRO, MRO Survey, 2016

[111] Flight International, World Aurliner Census, 2016

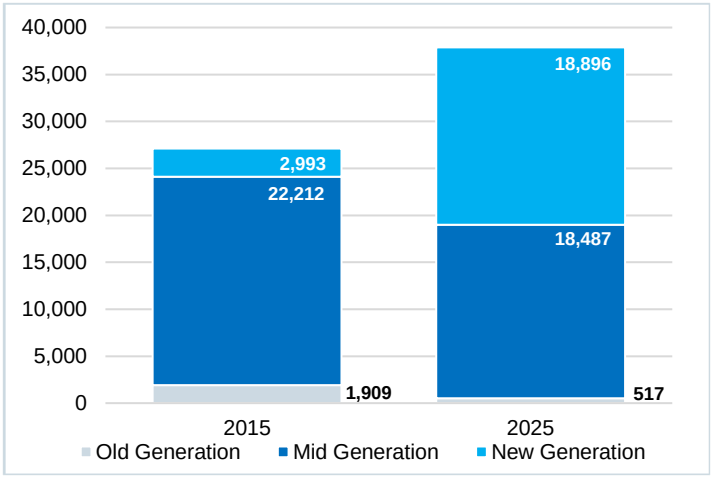
[112] Flightglobal, Fleet Watch 2016, A review of commercial aircraft orders and deliveries for 2015, 2016

[113] ATAG, Aviation Benefits Beyond Borders, July 2016

## New Generation Aircraft

The aviation industry is entering an era of new technology that will bring a new generation of intelligent aircraft in the market. The new generation of airliners will allow longer maintenance intervals and repair changes as well as better health monitoring and prognostics of maintenance needs.

Figure 93 – 10 Year Fleet Forecast by Aircraft Generation Category




*Old Gen: B727, B737 Classic, B747 Classic, DC10, L1011 and A300;*
*Mid Gen: B757, B767, B747-400, A320 Family, A330/A340,B 737NG, ERJ, CRJ;*
*New Gen: B777X, B787, A350, A330neo, A380, E170/175/190/195, CRJ-7/9/1000, B737MAX and A320neo*

Source: ICF, 2016 MRO Forecast and Market Trends

The entry into service of the A350, with its first commercial flight in January 2015 by Qatar Airways, has been the latest milestone of the arrivals of new generation aircraft. Together with the A380, B747-8, B787-9, and soon the A320neo and the B737max, these new aircraft types will replace ageing and maintenance intensive aircraft types.

ICF International, in its 2016 MRO Forecast and Market Trends report[114], projects an increase of 531% of new generation aircraft between 2015 and 2025. Old generation aircraft in operation by 2025 are expected to be 73% less than 2015 figures.

The systematic replacement of old gen aircraft will drive significant change in the business for MRO providers. Less maintenance will be required as it will be replaced by more sophisticated monitoring of aircraft performance and predictive maintenance tools. This will reduce the overall time-on-tool requirements for individual checks with fewer repairs, and thus drive a need for change from an MRO provider perspective.

## Global MRO Activity

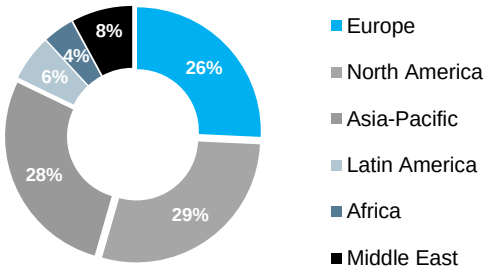
The global civil MRO spend in 2015 was $ 64.3 billion, up by 3.5% compared to the $ 62.1 billion spent in 2014. The strongest driver for these values was the engines segment that represents 40% of the total MRO market, accordingly to ICF International. With the continuing growth of aircraft deliveries and the possibility of deferring older aircraft retirements (at least until low fuel prices keep reducing the economic benefits of using only new aircrafts and engines[115]), the medium term prospect for this activity is also positive.

Looking at the MRO global market share by region, North America claimed the largest share in MRO activity (29%), with Asia-Pacific (28%) and Europe (26%) following close. Based on current aircraft orders, the Asia-Pacific share of the global MRO market is expected to increase and potentially become the largest global region for MRO activity in the coming years.

[114] ICF MRO Industry Outlook, April 2016

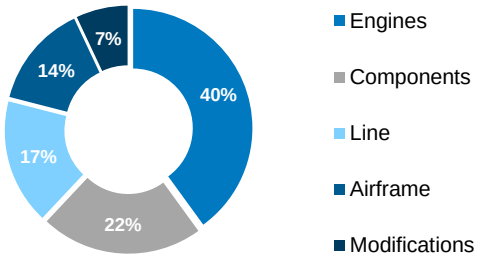
[115] Oliver Wyman, As Oil Prices Fall, New Aircraft Lose Competitive Edge, 2015

Figure 94 – 2015 MRO Demand by Global Region (%)




Source: ICF, 2016 MRO Forecast and Market Trends

Figure 95 – 2015 MRO Demand by Segment (%)




Source: ICF, 2016 MRO Forecast and Market Trends

## Aerospace Industry Merges and Acquisitions

Despite that the aerospace and defence industry reported lower revenues in 2015 compared to 2014, see Table 23 below, the results still reflect a record of revenues and operating profits for five consecutive years.[116]

Aggregated reported revenues for the top 20 aerospace companies indicated a 1.5% decline between 2014 and 2015. Revenues for the top 20 global defence companies reported a 3.2% decrease to $ 177.8 billion in 2015 while the commercial aerospace subsector continued to report growth, with the top 20 global companies reporting 0.3% increase in revenues.

In 2016, the global commercial aerospace sector is expected to grow driven by strong passenger traffic and continued demand for commercial aircraft from growing economies. The global military MRO expenditure is also expected to recover on account of growing tensions and instability in the Middle East.

Table 23 – Top 20 Global and U.S. Aerospace and defence companies – Commercial Aerospace versus defence Subsector Financial Performance (2015 and 2014*)

| Top global aerospace and defence companies | | 9 months ending September 2015 | 9 months ending September 2014 | Percentage change |
|---|---|---|---|---|
| **Revenues (US$ billion)** | | | | |
| Top 20 global aerospace and defence companies | Commercial aerospace | $175.5 | $174.9 | -0.3% |
| | Defence | $177.8 | $183.7 | -3.2% |
| **Operating earnings (US$ billion)** | | | | |
| Top 20 global aerospace and defence companies | Commercial aerospace | $18.7 | $18.4 | 1.6% |
| | Defence | $20.0 | $19.2 | 4.2% |

*Note: Years reflect nine months ending September 2015 and September 2014*

Source: 2016 Global Aerospace and Defence Industry Outlook, Deloitte

2015 was a record year for Mergers and Acquisitions (M&A) activity, with a total value of $ 62.8 billion in deals, which was approximately 50% higher than the previous record. The year was highlighted by the largest deal recorded in the Aerospace & Defence industry, with Berkshire Hathaway's (American multination conglomerate holding company) $ 32 billion acquisition of Precision Castparts (American industrial goods

[116] Deloitte, Global Aerospace and Defence Industry Outlook, 2016

and metal fabrication company), twice the value of the previous record deal, which was UTC's (American aerospace and defence product supplier) acquisition of Goodrich (American aerospace manufacturing company). The year also included Lockheed Martin's (American global aerospace, defence, security and advanced technologies company) $ 9 billion acquisition of Sikorsky (American aircraft manufacturer), the industry's sixth largest deal ever[117].

Table 24 - Megadeals in 2015 (disclosed value of at least US$ 1 billion)

| Target | Acquirer | Status | Value of transaction in US$ billion | Category |
|---|---|---|---|---|
| Precision Castparts Corp. | Berkshire Hathaway Inc. | Completed | 31,595 | Other |
| Sikorsky Aircraft Corp. | Lockheed Martin Corp. | Completed | 9,000 | Aircrafts & Parts |
| ExelisInc. | Harris Corp. | Completed | 4,561 | Other |
| Landmark Aviation | BBA Aviation PLC | Completed | 2,065 | Other |
| Websense Inc. | Raytheon Co. | Completed | 1,900 | Other |
| ShifangMingriYuhangIndustry Co. Ltd. | Xinjiang Machinery Research Institute Co. Ltd. | Completed | 1,804 | Aircraft & Parts |

Source: Aerospace and Defence – 2015 year in review and 2016 forecast, PWC

## 4.3. Aviation, a Global Industry

Before further analysing the Manufacturers and MRO performance, in this section we explore the importance of the Aviation Industry to work and GDP around the world.

Aviation is the only worldwide transportation network making it an essential contributor to global business and tourism. It thus plays a vital role in facilitating economic growth. Air transport facilitates world trade; it is indispensable for tourism across the globe and it offers connectivity that indirectly contributes to improved productivity and is closely linked with investment and innovation. Aviation's global economic impact (direct, indirect, induced and tourism catalytic) is estimated at $ 2.7 trillion, equivalent to 3.5% of the world GDP in 2014[118].

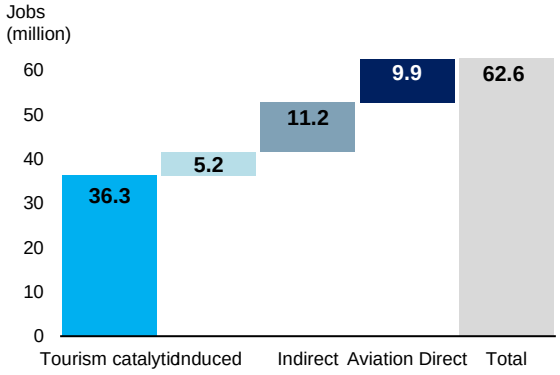
At the same time, air transport is a major global employer. The Air Transport Action Group (ATAG) reports that the air transport industry indirectly generates more than 62 million jobs globally.

Directly, the industry employs over 450,000 people working for airport operators, over 5.5 million working for other on-airport business (such as retail, car rental, freight services, etc.); close to 2.7 million are employed by airlines and over 1.1 million are working in civil aerospace for air navigation service providers.

[117] PWC, Aerospace and Defence – 2015 year in review and 2016 forecast, 2016

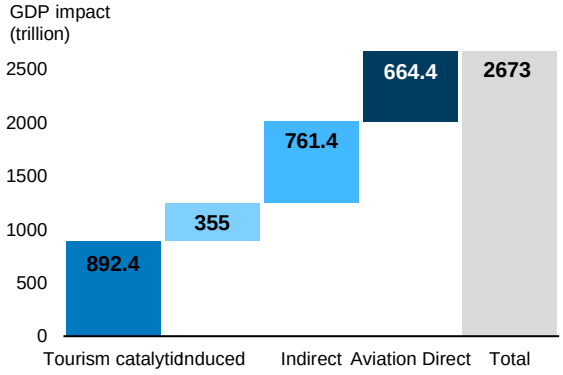
[118] ATAG, Aviation Beyond Borders, 2016; All figures for 2014

Figure 96 - Aviation Global Employment Impact, 2014 (latest report)




Source: Aviation Benefits Beyond Boarders, ATAG

Figure 97 - Aviation Global GDP Impact, 2014 (latest report)



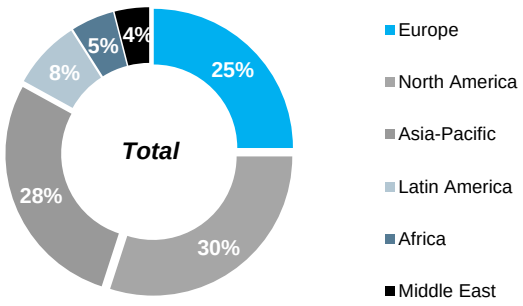

Source: Aviation Benefits Beyond Boarders, ATAG

## 4.4. Global Fleet Trends in 2015

### Global Fleet

During 2015 commercial operators took delivery of almost 1,400 aircraft from both Boeing and Airbus, 3% more aircraft than those delivered in 2014, with the worlds' two largest airliners producers raising the production benchmark to a new high. The regional aircraft market also experienced much activity, with 274 new unit deliveries occurring in 2015. Combined with aircraft removals and other additions to the global fleet (e.g. removal from storage), global in-service fleet experienced a 3.2% annual growth rate.

Figure 98 - 2016 Global Airline Fleet Distribution (July 2016)




Source: Flight Fleets Analyser 2016, Flightglobal

North America remained the largest aviation region as its market share accounted for 30% of total number of commercial units in service around the world. However, this represented a 1% decrease compared to previous year.

It was the Asia Pacific region which gained in total market share, being responsible for 28% of commercial airline fleets globally during 2015.

Europe's share of commercial airlines also increased, to 25%, representing the third largest aviation global region. Last year the region's share was 24%. This has been driven by a combination of both old gen aircraft replacements as well as new orders as airlines expand their operations.

Table 25 and Table 26 below present the top 10 fleet per aircraft category in 2015 and 2016 to July 2016. With regards to mainline aircraft, the number of current generation A320s and B737s in service rose respectively 7.8% and 8.8% compared to the previous year. In 2016 there were more than 6,500 Airbus

320 family jets in service and more than 5,500 Boeing B737s in operation. Boeing had good news about the 787, with 135 units having entered the market between 2015 and 2016.

The small-airliner sector had also a positive year. The total number of Embraer 170/175/190/195 and ATR 42/72 in service went up by 4.0% and 6.2% respectively between 2015 and 2016. Nonetheless, note the 9% reduction in the active Embraer ERJ 135/140/145 fleet to 553 units.

Table 25 – Top 10 Fleet in Service – Mainline Aircraft

| Manufacturer & aircraft family | Fleet in service in 2016 | Fleet in service in 2015 | YoY Change |
|---|---|---|---|
| Airbus A320 family | 6,510 | 6,041 | 7.8% |
| Boeing 737-600/ 700/800/900 | 5,567 | 5,115 | 8.8% |
| Boeing 777 | 1,324 | 1,258 | 5.2% |
| Airbus A330 | 1,154 | 1,093 | 5.6% |
| Boeing 737-200/300/400/500 | 945 | 1,006 | -6.1% |
| Boeing 767 | 742 | 762 | -2.6% |
| Boeing 757 | 688 | 737 | -6.6% |
| Boeing 717/MD-80/ MD-90/DC-9 | 655 | 668 | -1.9% |
| Boeing 747 | 515 | 558 | -7.7% |
| Boeing 787 | 423 | 288 | 46.9% |

Source: Flight Fleets Analyser 2016, Flightglobal

Table 26 – Top 10 Fleet in Service – Regional Aircraft

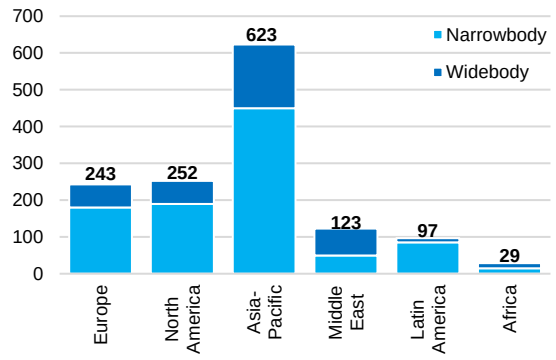
| Manufacturer & aircraft family | Fleet in service in 2015 | Fleet in service in 2016 | YoY Change |
|---|---|---|---|
| Embraer 170/175/190/195 | 1,146 | 1,102 | 4.0% |
| ATR 42/72 | 941 | 886 | 6.2% |
| Bombardier CRJ700/900/1000 | 751 | 696 | 7.9% |
| Bombardier CRJ100/200 | 560 | 558 | 0.4% |
| Embraer ERJ-135/140/145 | 553 | 606 | -8.7% |
| Bombardier Dash 8 Q400 | 468 | 451 | 3.8% |
| Bombardier Dash 8-100/200/300 | 393 | 424 | -7.3% |
| Beechcraft 1900 | 334 | 347 | -3.7% |
| De Havilland Canada Twin Otter | 281 | 268 | 4.9% |
| Saab 340 | 232 | 228 | 1.8% |

Source: Flight Fleets Analyser 2016, Flightglobal

## Global Deliveries in 2015

In 2015 over 1,600 new aircraft were delivered worldwide. Boeing led the increase, shipping over 100 more units than its European rival Airbus. Boeing delivered 739 new airliners, which presents a 5% increase compared to 2014, while Airbus deliveries remained almost flat, with 628 airliners shipped in 2015, only 1% above 2014 figures.

Figure 99 – Airbus/Boeing 2015 Delieveries by Category & split by Region



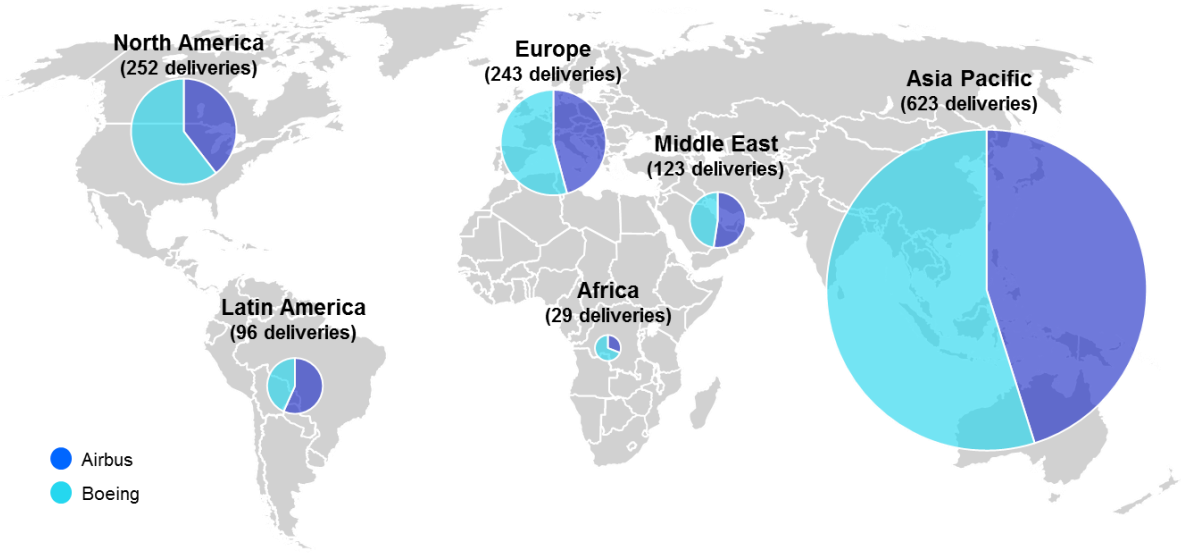

Source: Flight Fleets Analyser 2016, Flightglobal

Mainline aircraft deliveries rose by 3% in 2015, reaching 1,367. Asia-Pacific contributed most with 623 new units entering the market. Irrespective of regions, it is worth noting that local airlines accounted for almost half of all single aisle aircraft delivered worldwide in 2015. The value of these deliveries represented over two-fifths of the industry's entire investment in new aircrafts.

Deliveries in North America raised by 10% to 252 aircraft, 9 more than those delivered in Europe. Despite this fact, Europe's airlines were the second biggest spenders with their deliveries valuing at almost $ 18 billion[119].

In terms of unit deliveries, the market share between Airbus and Boeing was fairly even in most of the markets, apart from North America and Africa. In terms of total sales, Airbus delivered the equivalent of $ 31,693 million while Boeing shipped $ 59,075 million in aircraft. Grand total value of deliveries of Boeing and Airbus airliners across the world exceeded $ 100,758 million in 2015.

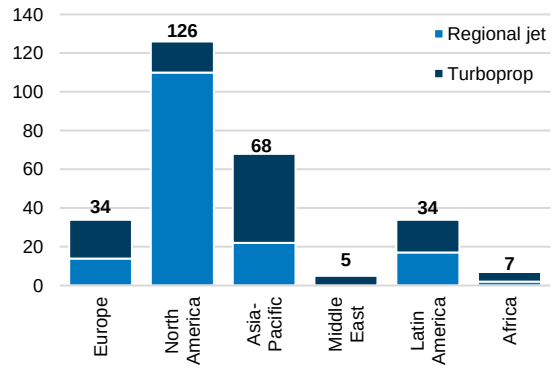
Figure 100 – Airbus and Boeing Deliveries by Region (aircraft units) in 2015




Source: Aircraft & Engines 2016, Airline Business

[119] Airline Business, Mainline Aircraft Statistics 2015, 2016

Figure 101 – Regional Aircraft Deliveries in 2015




Source: Flight Fleets Analyser 2016, Flightglobal

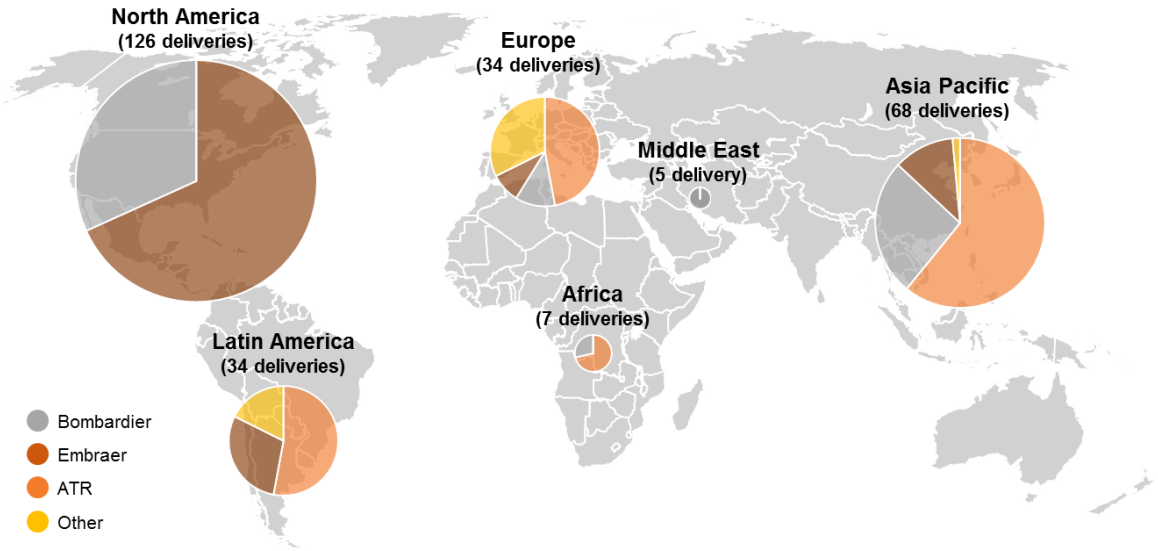
For the regional and turboprop market, the number of new deliveries remained relatively flat between 2014 and 2015.

Embraer, ATR and Bombardier were the biggest manufacturers in 2015, with the Brazilian company (Embraer) delivering 101 new aircraft (additional 10 compared to 2014), ATR 81 (additional 3 against 2014) and Bombardier 72 (less 6 units than the ones delivered during 2014).

Sukhoi and Comac, the two new regional jet manufacturers, were responsible for 19 and 1 unit deliveries during 2015, respectively.

Globally, and as Figure 101 shows, North America was the market with the highest number of new regional aircraft units delivered in 2015, 126 in total. Asia-Pacific followed in second place with new 68 regional aircrafts delivered. Europe and Latin America, with 34 new units, were the third largest markets for this aircraft models.

Figure 102 – Regional Aircraft Deliveries by Region (aircraft units) in 2015

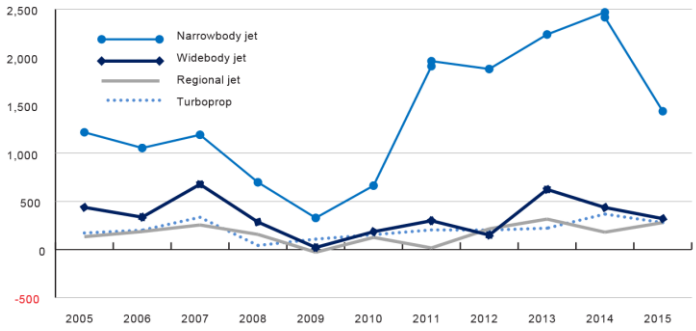



Source: Aircraft & Engines 2016, Airline Business

## 2015 Orders by Aircraft Manufacture

Flightglobal reported 2,684 commercial aircraft ordered during the year[120]. Taking into account the 310 cancellations and 123 swaps, net orders for the year closed at 2,375. This represented a 30% decrease on the orders reported in 2014.

Figure 103 – Airliner Orders 2005-2015




Source: Fleet Watch 2016, Flightglobal

Airbus, the European manufacturer, received 1,100 new orders in 2015. This reflects a 37% decline compared to 2014 when over 1,700 orders were placed.

Boeing on the other hand secured 840 new orders during 2015, a 45% reduction compared to 2014 (1,527orders).

Narrowbody airliners represented close to two-thirds of total orders. Airbus secured 900 of these requests, mainly for the A320neo, while Boeing recorded 550 orders, most of them for its new 737 Max.

Table 27 – Top 10 Commercial Aircraft Orders in 2015

| Customer | Country | Aircraft family | Orders |
|---|---|---|---|
| IndiGo | India | A320neo family | 250 |
| Wizz Air | Hungary | A320neo family | 110 |
| AerCap | Netherlands | B737 Max | 100 |
| Avianca | Colombia | A320neo family | 98 |
| Copa Airlines | Panama | B737Max | 50 |
| FedEx | USA | B767 | 46 |
| GECAS | Ireland/USA | A320neo family | 43 |
| Smile Air | Ghana | MA700 | 40 |
| Japan Airlines | Japan | RJ90 | 32 |

Source: Fleet Watch 2016, Flightglobal

With regards to widebodies, both Boeing and Airbus received orders in the same range, 179 and 137 respectively.

Regional jets and turboprops recorded an identical number of orders. Regional jets secured 281 new orders and one less for turboprops. But while this level of demand marked a decline in turboprop orders, it represented a 55% increase in regional jet orders.

As Table 27 shows, the fast-growing Indian low-cost carrier Indigo placed the largest order in 2015, committing for 250 A320neo airliners. Wizz Air, another low-cost carrier, also ranked high in the orders list, with 110 A320neo orders in 2015.

It is worth stating here that the biggest cancellation in 2015 came from the Russian market, amid the challenging economic and currency environment. VEB Leasing, a provider of leasing deals for new and used civil aircraft, freight planes, and business aircraft, cancelled a total of 24 Sukhoi Superjet 100s. Moreover, the collapse of the Russian carrier Transaero resulted in a further 6 Superjet 100 cancellations.

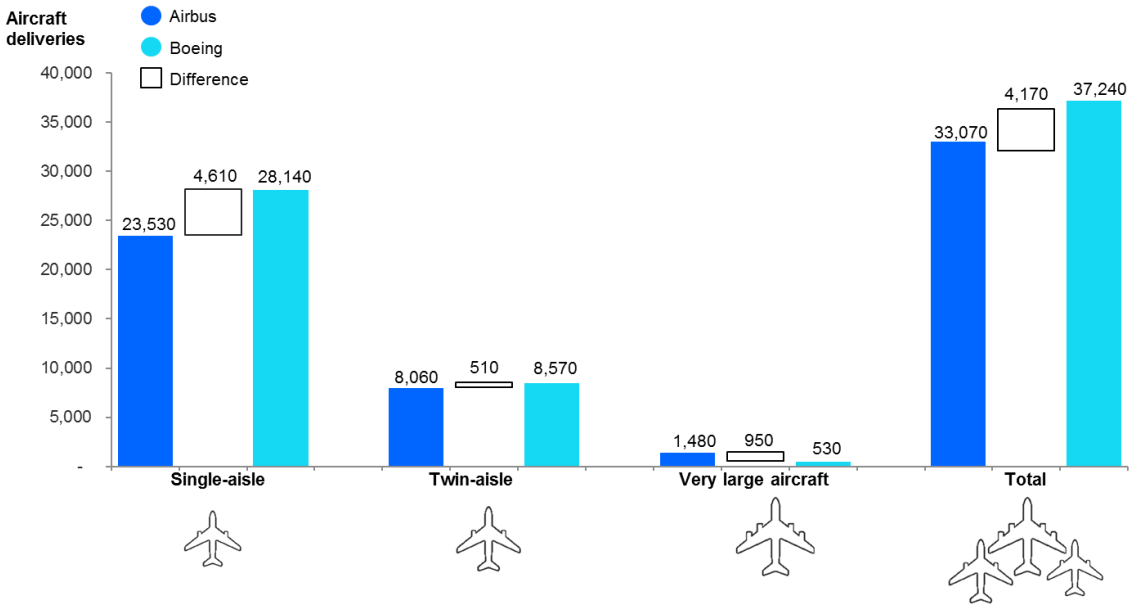
[120] Flightglobal, Fleet Watch 2016, A review of commercial aircraft orders and deliveries for 2015, 2016

## Aircraft Manufacture Projections

Demand for commercial airliners is growing. In emerging markets, demand for air travel is growing driven by prosperous macroeconomic factors such as GDP and an expanding middle class. In case oil prices remain in low levels for some time, this may drive airlines to delay the replacement or retirement of less efficient aircraft types, which will have a knock on effect on airline fleet decisions driven by aircraft fuel efficiency. At the same time, technological obsolesce is also expected to drive aircraft retirements and make the number of aircraft deliveries increase year over year. In this section we look at aircraft manufacturer projections.

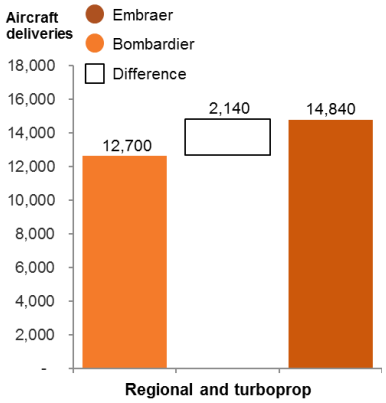
In their 2016-2035 Market Forecast and Current Market Outlook, Airbus and Boeing continue to present somewhat different long term projections. Boeing expects 37,420 new units (excluding regional jets) to be delivered between 2016 and 2035, compared with 33,070 expected by Airbus. The two manufactures have similar forecast of twin aisle aircraft but Boeing forecasts 4,610 more single-aisle deliveries over the period, and only one-third of the number of very large aircraft.

Figure 104 - Airbus and Boeing 2016-2035 Forecast Comparison




Source: Mott MacDonald analysis of Airbus Global Market Forecast 2016-2035 and Boeing's Current Market Outlook 2016

Figure 105 – Embraer and Bombardier Regional and Turboprop Jet Forecasts




Source: Mott MacDonald analysis of Bombardier's Market Forecast 2014-2033 and Embraer's Market Outlook 2015-2034

With respect to regional and turboprop jet aircraft, Figure 105 reflects Embraer and Bombardier manufacturer's projections.

The Brazilian manufacturer Embraer expects to deliver 14,750 aircrafts during the next 20 years, whilst the latest available market forecast by Bombardier projects 12,700 deliveries for the same aircraft types.

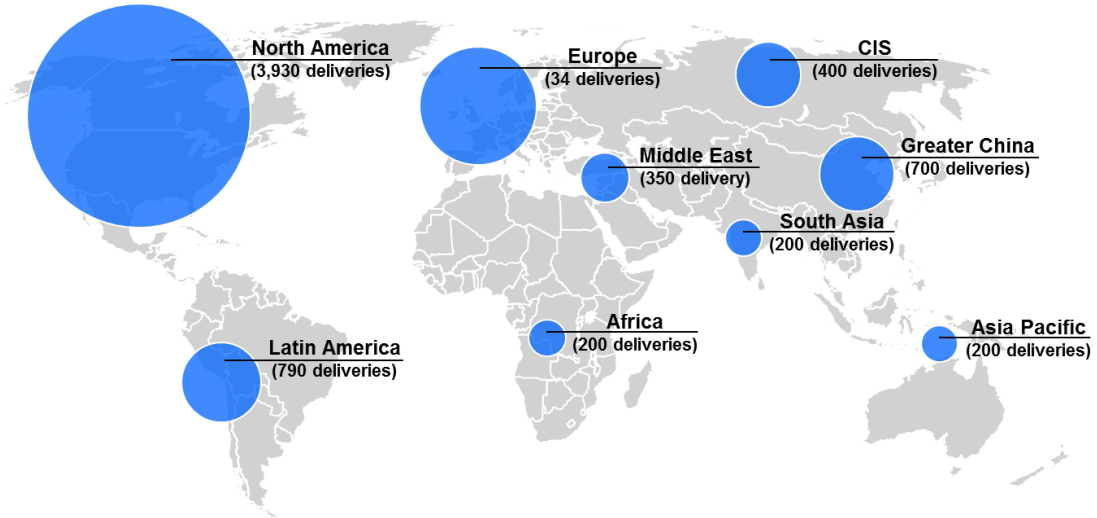
For both manufacturers, Asia-Pacific and North America are the regions showing the largest growth opportunity and where they expect the main number of orders to come.

## General Aviation

In 2015, general aviation deliveries were down by 5% compared to 2014, according to the General Aviation Manufacturers Association (GAMA)[121]. There were 2,331 new units entering in service in 2015, against 2,454 in 2014. The 2015 results were impacted by economic uncertainty and currency fluctuation in key general aviation markets such as Brazil and Europe, as well as in emerging markets like China. On the other hand, the North America market and in particular Unites States provided stronger delivery numbers.

With regards to business jets, GAMA reports 718 new deliveries in 2015, a flat number compared to 2014 (722 new units). Bombardier projects in its 2016-2025 Business Aircraft Market Forecast that 8,300 new units will enter in service during the next 10 years, with North America, Europe, Latin America and Greater China anticipated to be the largest markets for business aircraft.

Figure 106 – Bombardier's business jets 2016-2025 forecast deliveries




Source: Bombardier's Business Aircraft Market Forecast 2016-2025

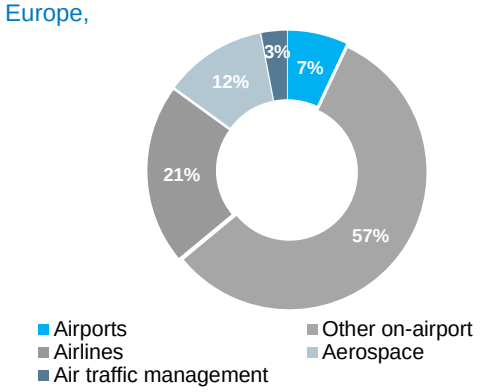
[121] GAMA, 2015 General Aviation Statistical Databook & 2016 Industry Outlook, 2016

## 4.5. Air Transport Industry Performance by Geographical Region

### Europe

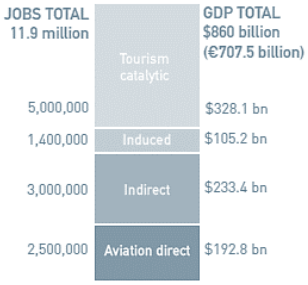
It is estimated that the air transport industry in Europe directly generated 2.5 million jobs in 2014[122]. This number was mainly constituted by on-site jobs at the airport (airport management, security, retail and hotels) 64% of the total, and 21% employed by airlines or handling agents. In total and indirectly, the industry supported 11.9 million jobs and made an $ 860 billion contribution to GDP in Europe. Worldwide, the air transport industry accounted for 19% of total jobs and 32% of the GDP.

Figure 107 – Direct Jobs Generated by Air Transport in Europe, 2014




Source: Aviation Benefits Beyond Boarders, ATAG

Figure 108 – Total Jobs and GDP Generated by Air Transport in Europe, 2014




Source: Aviation Benefits Beyond Boarders, ATAG

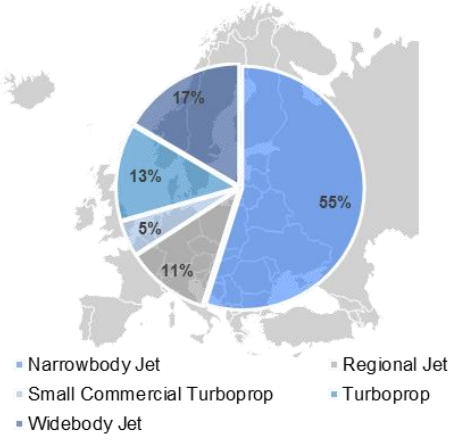
[122] ATAG, Aviation Beyond Borders, 2016; All figures for 2014

Table 28 – 2015 Deliveries: Top 5 European Airlines by Value

| Rank | Airline | Value ($m) | Units |
|---|---|---|---|
| 1 | Turkish Airlines (THY) | 2,838 | 33 |
| 2 | Lufthansa | 1,420 | 13 |
| 3 | British Airways | 1,155 | 7 |
| 4 | Ryanair | 1,118 | 24 |
| 5 | EasyJet | 1,067 | 23 |

Source: Aircraft & Engines 2016, Airline Business

Figure 109- European Fleet: Units in Service by Aircraft Segment




Source: Mott MacDonald analysis of CAPA Fleet Analytics

During 2015, over 240 new mainline airliners entered in service and operated by European commercial operators, with a value of over $ 17.8 billion. Turkish Airlines and Lufthansa had the largest fleet acquisition in 2015 by value ($ 2.8 million and $ 1.4 million, respectively).

Turkish Airlines also acquired the highest number of total aircraft in 2015 (33 units), followed by the low-cost carriers Ryanair (24) and EasyJet (23).

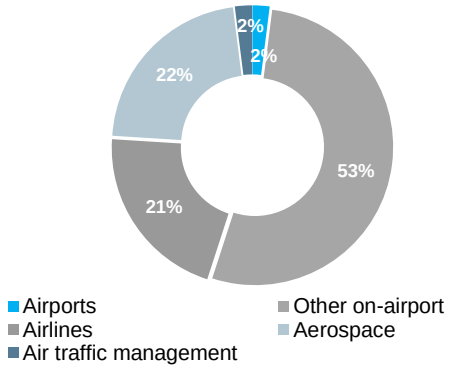
Europe maintained the third place as the largest world region in terms of aircraft in service, with 25% of the total fleet distribution (also 25% of global market in 2014).

More than half of the world's aircraft in service are narrowbody jets. This is also true for Europe. The region's fleet is mainly made from narrowbody jets (55%) followed by widebodies (17%).

The dominance of single-aisle aircraft types in the region will increase in the short-term, as close to 74% of the confirmed orders are for this aircraft segment. Turboprop aircraft have a declining share and make up to only 1% of aircraft orders.

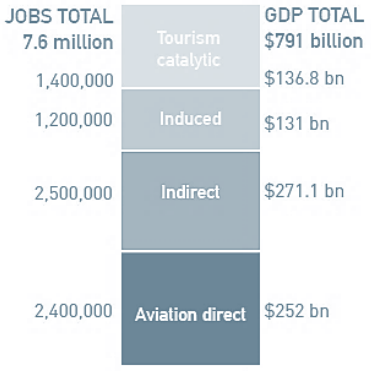
## North America

Figure 110 – Direct Jobs Generated by Air Transport in North America, 2014




Source: Aviation Benefits Beyond Boarders, ATAG

Figure 111 – Total Jobs and GDP Generated by Air Transport in Europe, 2014



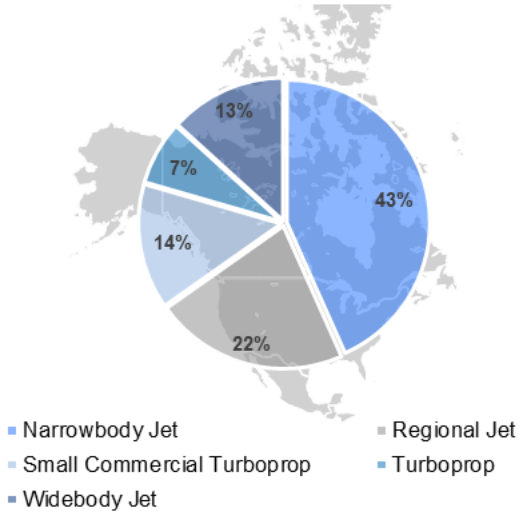

Source: Aviation Benefits Beyond Boarders, ATAG

Table 29 – 2015 Deliveries: Top 5 North American Airlines by Value

| Rank | Airline | Value ($m) | Units |
|---|---|---|---|
| 1 | American Airlines | 4,474 | 70 |
| 2 | United Airlines | 2,675 | 34 |
| 3 | FedEx | 1,597 | 18 |
| 4 | Delta Air Lines | 1,355 | 23 |
| 5 | Southwest Airlines | 885 | 19 |

Source: Aircraft & Engines 2016, Airline Business

Figure 112- North America fleet: units in service by aircraft segment




Source: Mott MacDonald analysis of CAPA Fleet Analytics

During 2015, 252 new mainline airliners entered in service with commercial operators within North America. This was worth over $16,369 million.

American Airlines and United Airlines had the largest fleet acquisitions by value in 2015. American spent over $4,474 million in 70 new aircraft while United spent $2,675 million adding 34 new units to its fleet. American was also the world's top airline by number of units delivered during the year.

North America leads as major aviation region by number of aircraft in service. The region was responsible for 30% of the total airline fleet in 2015.

43% of North-American fleet is made of narrowbodies, while widebodies make up 13% of the total number of units in the market. Regional jets represent 22% of the market, the highest share for this segment from all the major aviation regions

According to CAPA[123] there were 2,172 confirmed orders for commercial airlines in North America in 2015. From these, 61% were for narrowbodies, 15% for widebodies and 23% for regional jets.

The air transport industry in North America directly generated an estimated 2.4 million jobs in 2014[124]. This number was mainly driven by on-site jobs across the various airports in the region (55%) and employed in the manufacture of civil aircraft, including systems, components, airframes and engines (22%). The air transport sector supported 6.2 million jobs and contributed to $ 654 billion to GDP in North America.

## Asia-Pacific

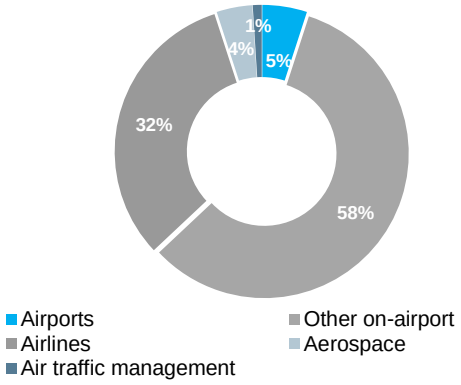
The air transport industry in Asia-Pacific directly generated an estimated 3.3 million jobs in 2014[125]. This number was mainly driven by on-site jobs at airports (63%) and from airline or handling agent jobs (32%). The air transport sector supported over 8.9 million jobs and contributed $ 364 billion to the GDP in the Asia-Pacific region.

[123] CAPA, Centre for Aviation Fleet database, 2016

[124] ATAG, Aviation Beyond Borders, 2016; All figures for 2014

[125] ATAG, Aviation Beyond Borders, 2016; All figures for 2014

Figure 113 – Direct Jobs Generated by Air Transport in Asia Pacific, 2014




Source: Aviation Benefits Beyond Boarders, ATAG

Figure 114 – Total Jobs and GDP Generated by Air Transport in Asia-Pacific, 2014

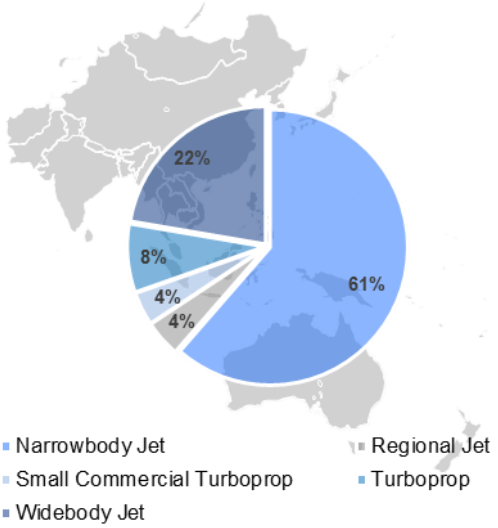

Source: Aviation Benefits Beyond Boarders, ATAG

Table 30 – 2015 Deliveries: Top 5 Asia Pacific Airlines by Value

| Rank | Airline | Value ($m) | Units |
|---|---|---|---|
| 1 | China Eastern Airlines | 3,884 | 65 |
| 2 | China Southern Airlines | 2,552 | 34 |
| 3 | Korean Air | 2,255 | 15 |
| 4 | Air China | 2,230 | 36 |
| 5 | ANA - All Nippon Airways | 1,948 | 16 |

Source: Aircraft & Engines 2016, Airline Business

Figure 115- Asia-Pacific fleet: units in service by aircraft segment




Source: Mott MacDonald analysis of CAPA Fleet Analytics

During 2015, 623 new airliners entered in service with commercial operators in Asia-Pacific. This was equivalent to over $ 43 billion in value.

China Eastern Airlines was the top regional airline by both value and number of aircraft delivered (65 new units valued at $ 3,884 million). China Southern Airlines and Korean Air both made it to the top three with $ 2,552 million and $ 2,255 million spent in new aircraft respectively.

Asia-Pacific remained the second largest aviation world region in 2015 by number of aircraft in service. During 2015, the region was also responsible for 28% of the global airliner fleet.

61% of the region's fleet is made of narrow-body jets, the largest share of this aircraft segment among all other major aviation regions. This share is expected to increase as 70% of existing orders for the market are made for narrow-body units. Widebodies account for 22% of the region's fleet.

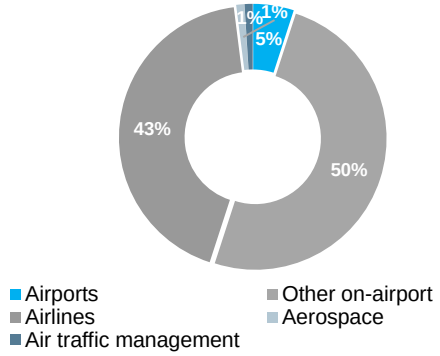
The share of regional aircraft accounts only for 16% of the existing fleet and this share is expected to decrease in the medium term as only 12% of existing regional requests are made for this aircraft unit[126].

[126] CAPA, Centre for Aviation Fleet database, 2016

## Middle East

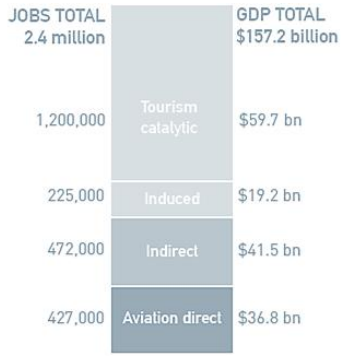
The air transport industry in the Middle East directly generated an estimated 427,000 jobs in 2014[127]. This number was mainly driven by on-site jobs at airports (55%) and airline or handling agent jobs (43%). The air transport industry supported over 1.2 million jobs and contributed $ 60 billion to the region's GDP in 2014.

Figure 116 – Direct Jobs Generated by Air Transport in the Middle East, 2014




Source: Aviation Benefits Beyond Boarders, ATAG

Figure 117 – Total Jobs and GDP Generated by Air Transport in the Middle East, 2014



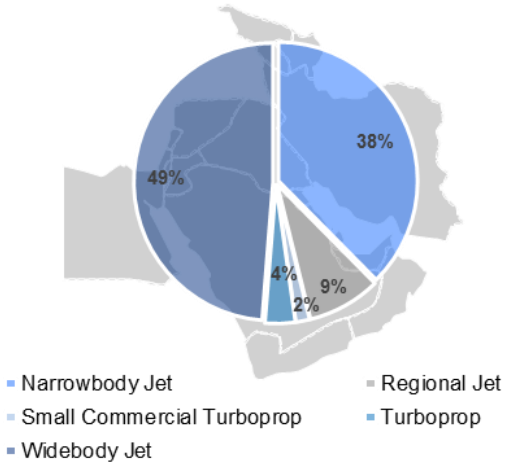

Source: Aviation Benefits Beyond Boarders, ATAG

Table 31 – 2015 Deliveries: Top 5 ME Airlines by Value

| Rank | Airline | Value ($m) | Units |
|---|---|---|---|
| 1 | Emirates Airline | 5,129 | 26 |
| 2 | Qatar Airways | 3,025 | 21 |
| 3 | Etihad Airways | 1,820 | 15 |
| 4 | Saudia | 1,463 | 9 |
| 5 | Kuwait Airways | 716 | 10 |

Source: Aircraft & Engines 2016, Airline Business

Figure 118- Middle East fleet: units in service by aircraft segment




Source: Mott MacDonald analysis of CAPA Fleet Analytics

During 2015, 123 new airliners entered in service on commercial operators in the Middle East. Emirates was the leader in aircraft deliveries by both unit and value. The Dubai-based airline added 26 units to its fleet, which represented over $ 5,129 million in order value. This was the highest value of aircraft deliveries of any airline worldwide.

Qatar Airways was the second largest Middle East airline by aircraft orders, 21 new aircraft delivered, followed by Etihad with 15 new units added to its fleet.

The region fleet has a strong presence of widebody jets (49%) which is by far the biggest share for a major aviation region (Asia-Pacific, the second largest region by widebody market share, widebodies account for 22% of the units in service). This market share is expected to increase as 64% of the existing 1,051 orders are widebody aircraft.

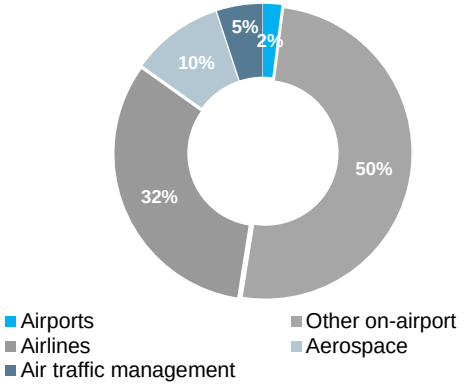
The share of regional jets is the smallest of all major aviation regions, representing 15% of the aircraft fleet in service and accounting for 5% of existing orders.

[127] ATAG, Aviation Beyond Borders, 2016; All figures for 2014

## Latin-America

The air transport industry in Latin America directly generated an estimated 606,000 jobs in 2014, mainly driven by on-site jobs (52%) and airline or handling agent jobs (32%)[128]. The total impacts mean the air transport sector supported over 2.2 million jobs and contributed $ 107 billion to the market's GDP.

Figure 119 – Direct Jobs Generated by Air Transport in Latin America, 2014




Source: Aviation Benefits Beyond Boarders, ATAG

Figure 120 – Total Jobs and GDP Generated by Air Transport in Latin America, 2014


Source: Aviation Benefits Beyond Boarders, ATAG

Table 32 – 2015 Deliveries: Top 5 Latin American Airlines by Value

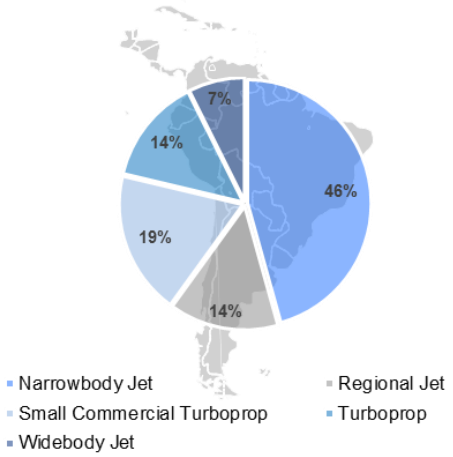
| Rank | Airline | Value ($m) | Units |
|---|---|---|---|
| 1 | LAN Airlines | 1,290 | 13 |
| 2 | Avianca Brazil | 843 | 16 |
| 3 | Avianca | 639 | 9 |
| 4 | Aeromexico | 635 | 9 |
| 5 | TAM Linhas Aereas | 611 | 10 |

Source: Aircraft & Engines 2016, Airline Business

During 2015, 97 new airliners entered in service with commercial operators in the Latin-America. It represented the second lowest number of unit deliveries by major aviation regions.

LAN Airlines, with 13 new airliners delivered, was the only airline exceeding $ 1 billion in business value. Avianca Brazil and Avianca completed the top three deliveries by value with respectively $ 843 and $ 639 million spent in new aircraft deliveries.

Figure 121- North America fleet: units in service by aircraft segment




Source: Mott MacDonald analysis of CAPA Fleet Analytics

The Latin America fleet has a strong presence of regional and turboprop aircraft in service. Combined this segment represented 47% of total units in service in the region during 2015. Narrow-body jets, responsible for 46% of total airliners in service are the only segment that exceeds the regional aircraft share.

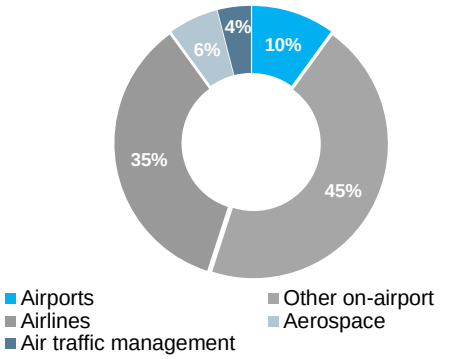
The important share of regional aircraft is expected to decrease; from the 780 orders registered in 2015, only 8% are for this aircraft segment. The biggest share (82%) is made for narrow-body jets while the remaining 10% are for widebodies expected to be delivered in the next years.

[128] ATAG, Aviation Beyond Borders, 2016; All figures for 2014

## Africa

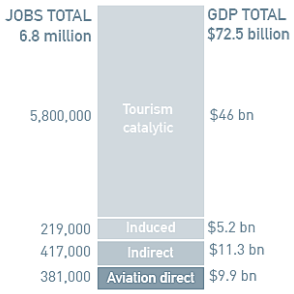
The transport industry in Africa directly generated an estimated 381,000 jobs in 2014[129]. This number was mainly driven by on-site airport jobs (55%) and jobs with airlines or handling agents (35%). The air transport sector supported over 1 million jobs and contributed $26.5 billion to Africa's GDP.

Figure 122 – Direct Jobs Generated by Air Transport in Africa, 2014




Source: Aviation Benefits Beyond Boarders, ATAG

Figure 123 – Total Jobs and GDP Generated by Air Transport in Africa, 2014



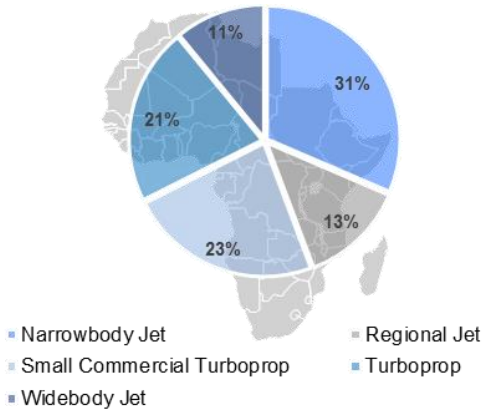

Source: Aviation Benefits Beyond Boarders, ATAG

Table 33 – 2015 Deliveries: Top 5 African Airlines by Value

| Rank | Airline | Value ($m) | Units |
|---|---|---|---|
| 1 | Ethiopian Airlines | 1,149 | 10 |
| 2 | Kenya Airways | 496 | 6 |
| 3 | Air Algerie | 384 | 5 |
| 4 | Tunisair | 194 | 2 |
| 5 | Royal Air Maroc | 119 | 1 |

Source: Aircraft & Engines 2016, Airline Business

Figure 124- Africa fleet: units in service by aircraft segment




Source: Mott MacDonald analysis of CAPA Fleet Analytics

Africa was the region responsible for the lowest number of aircraft deliveries in 2015. In total only 29 new airliners were delivered. This generated $2.623 million for aircraft manufacturers.

Ethiopian and Kenya Airways were responsible for more than 50% of the region's total acquisitions, with 10 and 6 units added respectively to their fleets in 2015.

African airlines account for 5% of total aircraft in service worldwide. The region's fleet presents a very diverse fleet mix, where regional aircraft represent the biggest share of units in service, 58% of the total fleet, which also represent the highest presence of the segment among all the major aviation regions. Narrowbodies and widebodies account for 31% and 11% of the existing fleet respectively.

The number of orders is the lowest across all regions, with only 171 units expected to be delivered in the short term.

There are 113 narrow-body and 71 widebodies ordered. The importance of regional aircraft is expected to decrease as only 7% of total orders are made for this aircraft segment.

[129] ATAG, Aviation Beyond Borders, 2016; All figures for 2014

# 5. Air Traffic Management

## 5.1. Introduction

As global air traffic grew back to record levels during the northern summer of 2016, air navigation service providers in many parts of the world are facing contrasting issues concerning not only the deployment of new air traffic management (ATM) technology but also more traditional problems related to the air traffic controller workforce, overall resource numbers, industrial relations and wider societal problems. Most regions of the world are gaining from an accelerating trend in the deployment of new ATM technology; but what is becoming apparent as 2016 progresses is that ATM enhancement is being enabled by the incremental deployment of individual technologies rather than that resulting from large scale implementation of the multi-dimensional programmes such NEXTGEN in the US and SESAR in Europe.

While these programmes continue to be refined and acquire additional national and supra-national funding, they are evolving in line with the development of several key enabling technologies which are also being deployed in other regions. This process, along with moves to improve harmonisation of the new systems across the globe, is greatly enhancing the seamless management of air traffic flows. This will set the scene for the next update of the over-arching ICAO Global Air Navigation Plan (GANP) due following the 39th assembly in autumn 2016. This review focuses on the latest developments in several of these key enabling technologies and relates them to regional strategies and the move to a truly global and harmonised ATM system.

## 5.2. Social/Industrial Context

In both 2015 and 2016, there have been various statements by air traffic controller groups in both Europe and the US that at a time of technological change and implementation of new systems, controllers are being encouraged to stay on beyond retirement age. There are different drivers for this; in the US, the wave of young controllers hired after President Reagan fired striking controllers in 1981 are now reaching retirement age. In the fragmented European system, many states are imposing cost reductions following on from national austerity measures and requirements of the European Single Sky cost regime for RP2 2015-2019. This has had the effect of reducing hiring, overtime and training, placing additional burden on existing controllers and the need in some cases, to extend working for some controllers beyond the existing retirement age.[130]

In December 2015, the trade association of the largest US scheduled airlines, A4A, stated that the majority (with the notable exception of Delta Airlines), wished for a speed up in the modernisation of the US air traffic management system, highlighting the present inefficiencies and making the case for a not–for-profit organisation, free from the constraints of the US Federal budget process which exists at present with the Federal Aviation Administration (FAA).[131] By February 2016, draft legislation, which would have created such an entity, had been drafted. Known as the AIRR, Aviation Innovation, Reform, and Reauthorisation Act, it set out a vision for a not-for-profit version of the Air Traffic Organisation (ATO), modelled on NavCanada. This was presented to the House Transportation and Infrastructure Committee in February but met opposition from the large general aviation community. By April 2016, the US Senate moved to re-authorise FAA funding into 2017 with a bill which required FAA to invest in enhanced surveillance of drones, monitor

[130] Press release IFACTA European Regional Meeting Tallinn Estonia October 2015

[131] Press release A4A National Media Call on the Need for Modernization and Reform of Nation's Air Traffic Control December 2015

cockpit automation, cyber security and provide greater clarity on the economic benefit to airspace users of investment in new ATM systems.

The Senate Appropriations Committee stated that "attempts to remove the air traffic control system from the FAA is fraught with risk, could lead to uncontrollable cost increases to consumers and could ultimately harm users and operators in the system".[132] It was also suggested that any putative separation of the ATO needed a degree of union reform, echoing the continuing impact of strike action on European air traffic in both 2015 and 2016. The summer 2016 FAA re-authorisation bill also included language requiring FAA to amend its hiring and training requirements for new controllers to offset the shortage, which was reported as reaching crisis levels in for peak summer 2016. In the context of NEXTGEN, it is interesting that August 2016 saw FAA advertising to recruit up to 1,500 new controllers.

In Europe, spring 2016 was marked by yet more industrial action, with French ATC striking on several occasions, together with Italian counterparts and others. This action gave focus to the analogous European airline industry lobby group, Airlines for Europe, A4E, who are demanding action to improve European ATM by:

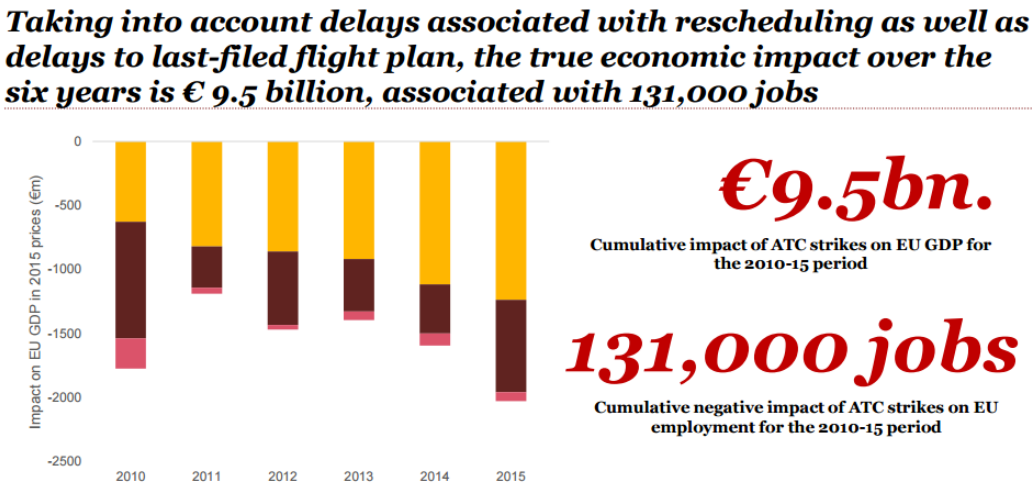
- delivering reliable and efficient airspace
- reducing the cost of ATC provision
- completion of the Single European Sky
- better economic regulation of ATM at EU level;
- minimising disruption by ATC strikes
- using new technology to make efficiency savings; and,
- using SESAR funding to drive compliance with the Single Sky framework.

A4E commissioned Price Waterhouse Coopers (PwC)[133] to study the costs and dis-benefits that years of industrial disputes have had on the European economy. Not surprisingly, European ATC unions criticised this report, accusing it of overstating the impacts and suggesting it was deliberately designed to mislead the public. Figure 125 below illustrates how these dis-benefits could have approached EUR10bn over the last six years if the costs of rescheduling are included and delays calculated on the basis of the last filed flight plan. This approach is somewhat questionable, given that increasingly, airlines, particularly short haul, take a strategic view to minimise uncertainty and cancel a large number of daily flights in the face of extended strike action which has been the regrettable case on many occasions in the last few years. The travelling public then incur a huge amount of personal disruption.

[132] Senate Appropriations Committee April 21 2016 S. 2844: Transportation, Housing and Urban Development, and Related Agencies Appropriations Act, 2017

[133] PwC (2016) The economic impact of ATC strikes in Europe Report for A4E 2016

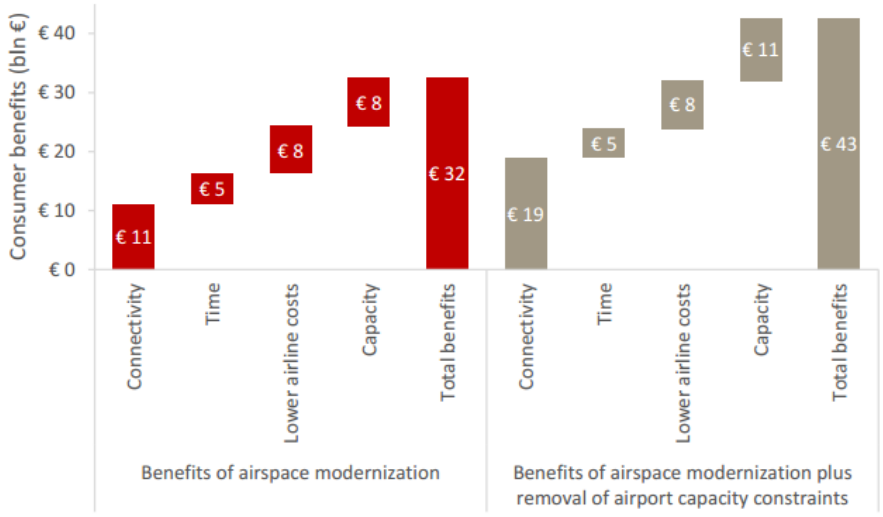
Figure 125: Estimate of overall economic impact of European ANSP strike action over six years




Source: PwC, 2015

At the same time, IATA commissioned SEO Amsterdam Economics to produce a study[134] on the economic benefits of European airspace modernisation. Emphasising the importance of connective-ness across the continent, the study then seeks to quantify the welfare benefits to consumers of airspace modernisation and removal of airport capacity constraints in the years out to 2035. The large increases in GDP that would also accrue are discussed. The study relies heavily on Eurocontrol Network Management, Performance Review and STATFOR data to define the present situation on route inefficiency and airport capacity constraints and applies a generalised cost model to estimate the economic benefits that would occur with increased traffic flows which would be generated with a more efficient European airspace route structure and greater airport capacity costs as shown in Figure 126 with an overview infographic at Figure 127.

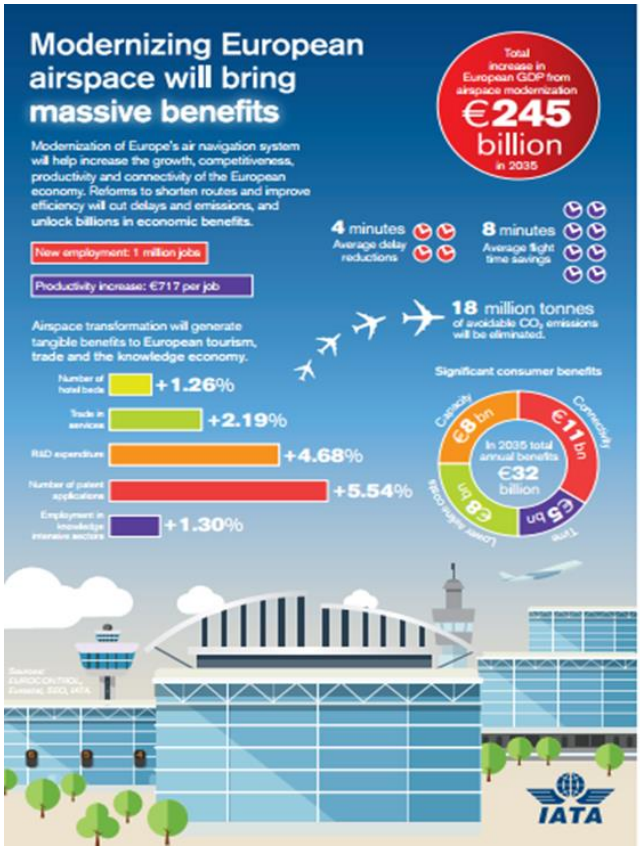
Figure 126: Consumer Benefits of Airspace Modernization and Airspace Modernization plus




Source: SEO, 2016

[134] SEO (2016): Economic benefits of European airspace modernization Amsterdam, February 2016, Commissioned By IATA

Figure 127: Overview of Benefits to 2035 of Modernising European Airspace




Source: SEO, 2016

Staffing and resource issues in the context of the deployment of new technology in ATM have not just been confined to Europe and the US. Airservices Australia has commenced its ambitious Onesky program to update ATM infrastructure and combine civil and military air traffic control. Ahead of this, the Australian ANS services provider announced in early summer 2016 that it was looking to lose some 600 staff in a bid to reduce operating costs and improve profitability.

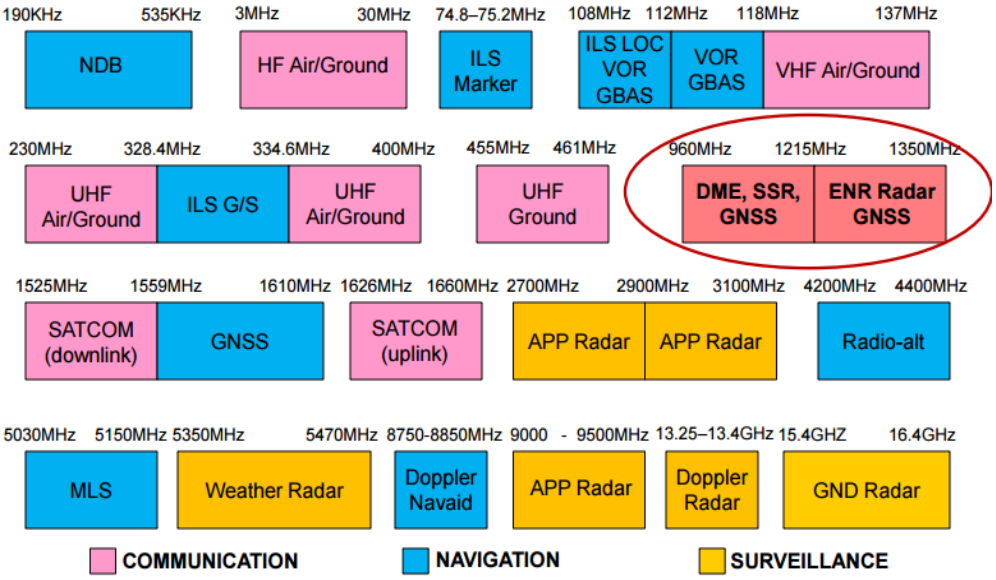
## 5.3. Global Issues - Flight Tracking

Although ICAO and IATA led the frenetic level of discussion over potential regulatory standards and solutions in 2014 and 2015 following the disappearance of Malaysian flight MH370, ICAO itself failed to adopt the 15 minute tracking mandate that emerged out of discussions in September 2015. At about the same time, trials carried out in the Asia-Pacific region by Qantas and other carriers showed that they could achieve a 14 minute tracking interval using existing autonomous dependent surveillance-contract (ADS-C) technology which was less than half that obtained in existing operation in the Future Air Navigation System (FANS-1) environment which has been the cornerstone of Pacific region oceanic operation for the last two decades.

An ICAO committee, Normal Tracking Implementation Initiative (NATII) recommended the cautious ICAO approach, allowing airlines voluntary implementation and time to develop stakeholder awareness. However, two other developments late in 2015 made the future path for flight-tracking more clear. Firstly, following significant lobbying from Europe and other regions, in November 2015, the World Radio Conference (WRC) endorsed the use of a particular band of the radio frequency spectrum for earth to satellite communication using ADS-B, Figure 128. This paves the way for aircraft to utilise satellite communication and therefore the broadcast of aircraft positions worldwide and, in particular, over ocean and remote areas not presently covered by line-of-sight communication. Secondly, because many individual ANSPs are now requiring airspace users to have ADS-B communication capability and the fact that ADS-B is the basis of the proposed

satellite surveillance system being developed by Aireon for operation by 2018, the proposed ICAO flight tracking standard will actually be achieved by the investment in aircraft equipage to meet other requirements.

Figure 128: Use of the Radio Spectrum for Air Navigation and Surveillance




Source: Eurocontrol presentation at ICNS conference, 2016

### Conflict Zones

Within Europe, the High Level Task Force on Conflict Zones completed its final report[135] in March 2016, recommending a common European risk assessment of conflict zones and a quick alert mechanism to notify the aviation community of impending threats which would impact flight planning. It emphasised cooperation within Europe on information sharing and threat identification. It also identified measures needed at national and European levels to limit the risks to civil aviation from such conflict zones.

## 5.4. Key ATM Technology Enablers

It became ever more clear in 2016 that air traffic management is becoming increasingly dependent on the digital exploitation of data with the level of automation on aircraft, both conventional 'manned' but increasingly 'unmanned' or remotely piloted and that of the ground and satellite systems that are being developed. The exploitation of digital technology and an increasingly virtualised infrastructure offers huge savings in hardware and maintenance costs but it is also likely to create vulnerabilities particularly in the area of cybersecurity, witness recent comments by EASA in Europe and the language in the latest US FAA re-authorisation bill.

The move to 'big data' is also evident in the industrialisation of new products and consolidation of vendors. In Europe, Airbus had greatly enlarged the capability of its Prosky subsidiary with the purchase of Navtech to drive the expansion of digital services. The first half of 2016 saw multiple announcements of new products and adoption by ANSPs, e.g. UK NATS signing up SNOWFLAKE for advanced data handling, Frequentis and Thales announced advanced network and decision tools. Similarly, in the US in June 2016, the US Department of Transportation and NASA announced an initiative using big data to reduce congestion at major airports, a key driver of the performance of the future air transportation system.

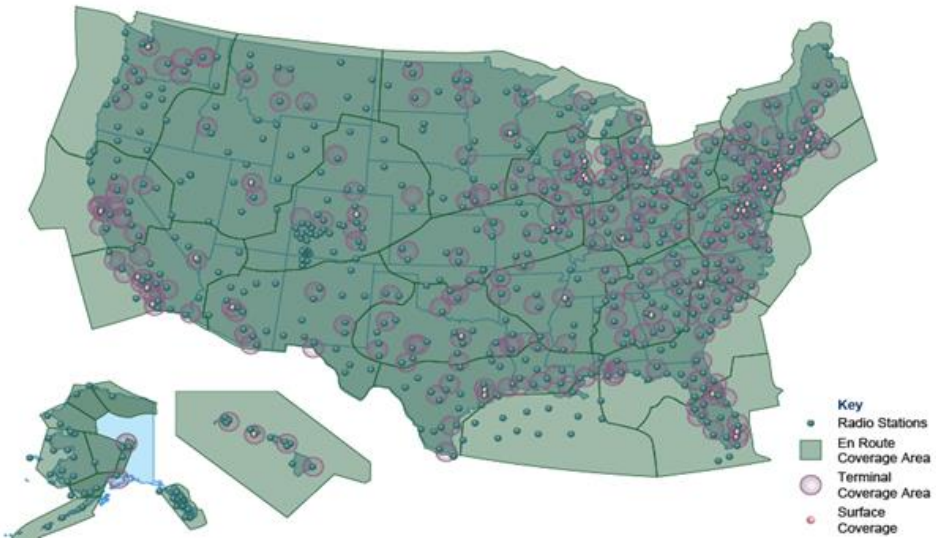
[135] European Aviation Safety Agency EASA European High Level Task Force on Conflict Zones March 2016

The next section presents a review of the latest developments in some of the most important enablers that are driving change in the management of air traffic.

## ADS-B: Autonomous Dependent Surveillance-Broadcast

ADS-B is proving to be the key technology for providing a step change in global surveillance. Following on from its adoption in Australia, the mandate for aircraft flying in controlled airspace by 2020 in the US together with the completion of a US continental wide system of terrestrial receivers, see Figure 129,. is allowing the technology to be one of the early wins of the NEXTGEN programme. ADS-B surveillance data from this network is now being processed at all the US en-route centres by the advanced en-route automation modernisation (ERAM) technology, giving controllers a layer of surveillance of equipped aircraft in addition to radar. This capability is driving the FAA move to encourage business and general aviation who fly in controlled airspace to adopt the new technology and gain the safety benefits.

Figure 129: US Network of Ground ADS-B Receivers and Coverage




Source: FAA, 2016

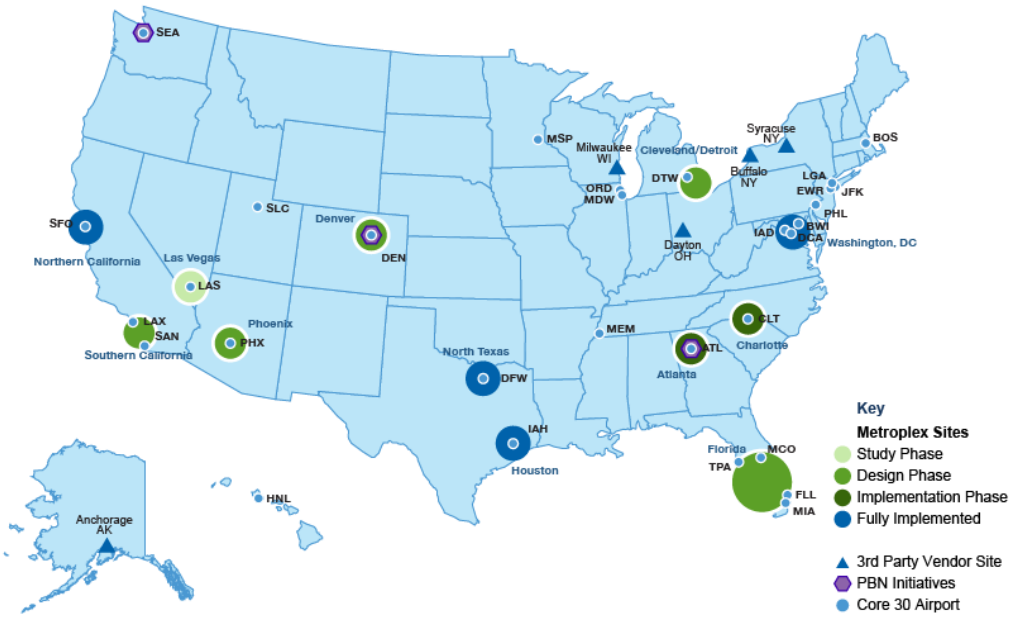
The larger prize for ADS-B is as the basis of satellite surveillance. This provides a way for many regions and countries to take a major leap in the provision of modern and comprehensive surveillance facilities at much less cost than conventional ground facilities. The latest developments in the Aireon project are discussed in a later section.

## PBN: Performance-based Navigation

The exploitation of performance based navigation (PBN) techniques is proving to be a major agent of change for arrival and departures at many airports around the world, in line with its position as an early win in the ICAO Block upgrade programme. While the benefits to airports and airspace users of closely defined arrival and departure routes in terms of predictability and consequent potential capacity increases are clear, the impact on local populations is less favourable. The concentrative effect of aircraft movement on new routes close to airports following the trial or permanent introduction of PBN routes has had significant community pushback in California and Arizona, in particular, in the US as FAA deploys PBN as part of NEXTGEN as illustrated in Figure 6.

Similarly in the UK, residents in ex-urban and rural areas close to Heathrow, Gatwick and Birmingham airports have reacted badly to PBN routes, disrupting the UK's Future Airspace Strategy (FAS) deployment, designed to meet SESAR and, ultimately, ICAO requirements. Lawyers and politicians have not been slow to back communities in emphasising the externalities of change.

Figure 130: Roll out of PBN Procedures at Major US Airports




Source: FAA, 2016

## DATALINK

2016 has seen a continuation of the struggle within Europe to develop a mission capable datalink system that will drive future 4D trajectory management. The first half of the year saw the commissioning of the Enhance Large Scale ATN deployment consortium (ELSA) study by the SESAR JU to address the shortcomings in the existing system that had been flagged up by EASA. This study[136] reported in July 2016. The focus is on finding solutions to multi frequency deployments and improvements to VHF data link mode 2 (VDL2). There have been issues between EASA, SESAR JU and Eurocontrol which illustrate the difficulties that occur in European decision making as a long term solution for datalink is one of the centralised services envisaged by Eurocontrol as a way of reducing fragmentation in European service provision. This, is turn, has to be consistent with the European ATM Master Plan which sets out the requirement for datalink infrastructure over a longer time period and with greater capacity and performance than that might be achieved by multi-frequency VDL2. In October 2016, and based on the results of the ELSA study, the European Commission mandated the SESAR Deployment manager to develop and implement, as project manager, a recovery plan to implement the necessary technological upgrades that will ensure a stable and reliable ATN/VDL mode 2 technology in Europe.

## SWIM

2016 provides more evidence that system wide information management (SWIM) techniques are moving from disparate concepts for handling data into a harmonised and increasingly global infrastructure that is going to bring the efficiencies to ATM and analytics that are characteristic of 'big data' in other industries. SWIM techniques have been part of FAA management of US airspace since to 2010 and underpin their collaborative decision making loop with the now relatively small number of major airline airspace users and provides the model of how the basic constituents of aeronautical information data, flight planning information, airport and weather data translate into a core body of operational information that can be shared with ANSP, airports and airspace users to greatly increase efficient operation of the air traffic system, in contrast to one where each actor operates within their own silo of data.

[136] VDL Mode 2 Measurement, analysis and simulation campaign Final report of the ELSA consortium to the SESAR JU July 2016

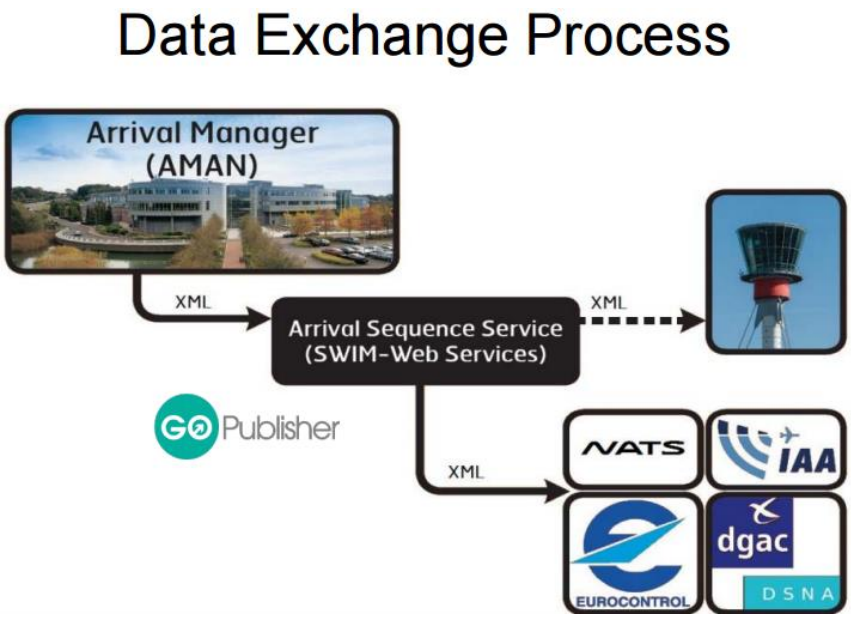
SWIM is a key and well developed component of both the SESAR and NEXTGEN programmes. SESAR held a key demonstration day in June 2016 illustrating a large variety of specific operational contexts how SWIM techniques can aid operational techniques. As SWIM initiatives bring a large increase in the amount of data available, there is increasingly a realisation[137] that this creates an environment where airspace users may be able to operate with their own decision support system based on new technology and information which is more independent of ANSPs in their present form with deployment of concepts such as user driven prioritisation process (UDPP) and selective flight protection (SFP).

In the US, formal SWIM designation is given to the SWIM Terminal Data Distribution System (STDDS), converting surface data from airport towers into accessible information that is distributed to terminal area control (TRACON) centres; similarly, the Surface Visualization Tool (SVT) is becoming a key SWIM enabler by displaying a common picture of airport movements and congestion to the TRACON controllers and is a platform that will enable the Terminal Flight Data Manager (TDFM) programme to be deployed. In addition, SWIM Flight Data Publication Service (SFDPS) is providing the aeronautical, flight and weather data in common format to all FAA and airspace user operational sites.

### XMAN

Following a trial in 2015, XMAN techniques for handling the arrival flow into London Heathrow entered operational service in 2016, with the benefits of reduced holding and consequent reductions in carbon dioxide emissions from a reduction in extended flight paths on approach. This project involved coordination across the UK-Irish FABs, with ANSPs NATS and IAA, and Functional Airspace Block Europe Central (FABEC) with French ANSP DSNA. The key enabler is vastly superior handling of flight planning and surveillance data that allows controllers to issue instructions to aircraft on speed and height to allow essentially 4D trajectories to arrive in the London TMA in such a way as to minimise time in the holds. This has involved the use of advanced data handling using open standard service orientated architecture and exploitation of SWIM standard flight and data messaging as illustrated in Figure 131.

Figure 131: Heathrow XMAN Data-Flow




Source: Snowflake, 2016

[137] Presentation to ICNS conference May 2016, Steve Bradford Chief Technologist FAA NextGEN, Philippe Merlo Director ATM Eurocontrol

These data techniques are also likely to be enablers following trials of advanced arrival techniques such as iSTREAM which follows on from the FAIRSTREAM trial for arrivals at Paris and Zurich using target time of arrival (TTA) techniques. Munich is also extending its arrival management capability with XMAN developments with neighbouring area control centres.

## 5.5. Strategy/Technology Programmes

All world regions continue to evolve established programmes to update, develop and harmonise their air traffic management infrastructure. However, as the infographic presented at Figure 132 illustrates, it is the contribution that SESAR and NEXTGEN, together with the support of large CARATS programme in Japan, that will allow the fulfilment of the ICAO Block upgrade programme to modernise global ATM over the next 10 years.

Figure 132: Overall Schema of Global ATM Development Programmes


Source: SESAR, 2016

### EUROPE SES/SESAR

In Europe, 2015 into 2016 saw an important evolution relevant to the SESAR project itself and also the wider aviation context with the publication by the European Commission of a finalised version of a long awaited aviation strategy which lays great emphasis on the completion of the Single European Sky and recognises the importance of the delivery of SESAR and the importance to the European economy of the industrialisation of that research. The research programme SESAR 1 ends in 2016, with a continuation and funding for a SESAR 2020 research programme through 2024. The SESAR Joint Undertaking issued a revised version of the European ATM Master Plan late in 2015. The SESAR Deployment Manager produced a Deployment Programme in 2015 and a revised draft for the 2016 edition became available in June 2016.

Following the limited progress made in 2015, 2016 was meant to be the year that SES II legislation in Europe is completed to enable the efficiencies and increased competitiveness that follow to be unlocked. A common theme in both the European strategy and SES II is that of the importance of airports to increasing the capacity of the European aviation system. It is also becoming clearer that timely industrialisation of the results emerging directly from SESAR R&D activities under the SESAR Joint Undertaking and now being rolled out by the SESAR Deployment Manager with funding from the Connecting Europe Facility (CEF), is going to be the biggest agent of change to modernise ATM.

In fact, some of the structures embodied in the SES legislation, in particular Functional Airspace Blocks (FABs), are increasingly being seen[138] as additional layer of responsibility which act as an obstacle to decision making, leading to more fragmentation, blurring accountability and therefore increasing costs of

[138] PRB white paper RP3 Performance Objectives Peter Griffiths June 2016

operating and developing European ATM. That said, the revised geometry that some FABs provides is assisting the deployment of free route airspace (e.g. Borealis initiative in northern Europe) and will provide wider platforms for the deployment of new advanced trajectory management systems (e.g. ITEC).

The closer cooperation of air navigation service providers (e.g. A6, Borealis, Coopans) in developing and deploying new systems is also likely to be key in enabling a more rapid delivery of change to the ATM system in conjunction with the SESAR Deployment Manager. This highlights the importance of the Summer 2016 stakeholder consultation by the Deployment Manager on the Deployment Programme to ensure not only it is consistent with European ATM Master-Plan, the requirements of the Pilot Common Project (PCP) but also deliverable by industry to ANSPs. The July 2016 announcement of funding from the CEF provides a secure platform to underwrite the Deployment Programme.

## USA NEXTGEN

In the United States, the annual update to the NEXTGEN programme was published in June 2016, highlighting the significant progress in deployment of key strands of enabling technology that are having measurable positive impacts on the performance of the National Airspace System (NAS). The emphasis on positive outcome follows the negative criticism of the NEXTGEN Advisory Committee in 2014, a further report [139]from US DoT Office of the Inspector General in January 2016 relating more generally to FAA organisation and perhaps, more crucially, the ongoing debate in the US in the first half of 2016 relating to the discussion on the benefits of separate funding for the ATO. The 2016 update highlights the progress made on the key strands of ERAM, ADS-B, DATA-COMM, PBN, airport runway and surface operations together with improvements to data sharing in the context of SWIM developments.

It is significant that elements of the NEXTGEN programme related to airports and terminal areas, such as:

- DATA-COMM, as discussed above;
- the continued rollout of PBN arrival/departure procedures at additional major metropolitan airports such as Charlotte;
- further deployment of the standard terminal automation system (STARS); and,
- the announcement in July 2016 of the development and implementation of terminal flight data manager (TDFM) introducing the benefits of electronic flight strips.

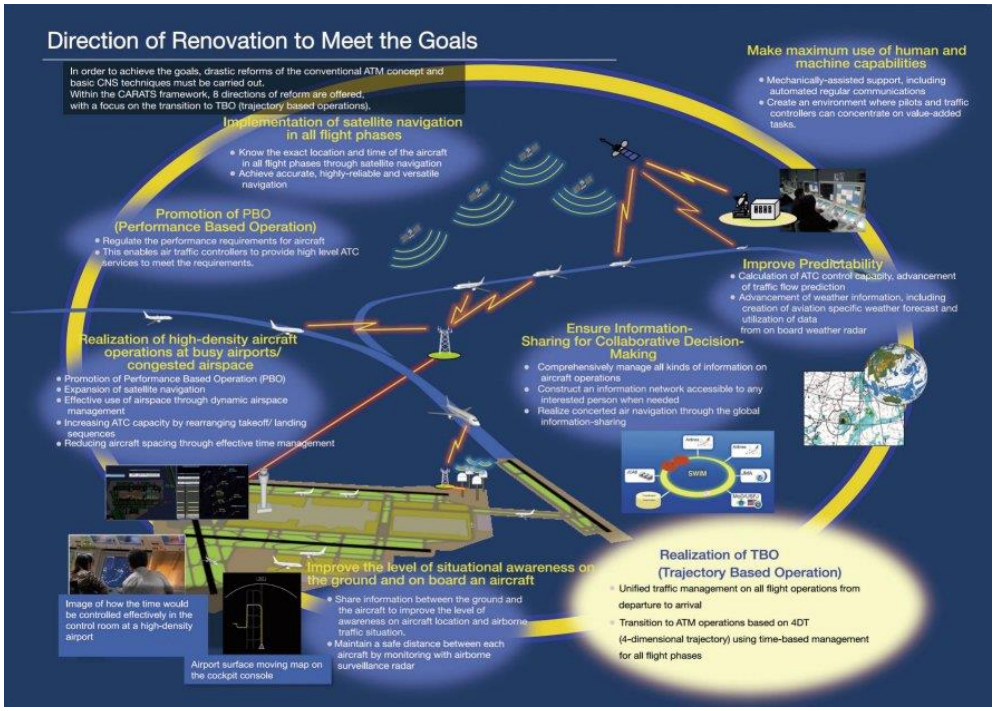
…are achieving prominence, highlighting the importance of unlocking capacity at congested airports and terminal airspace.

## Japan CARATS

In Japan, work continues on Collaborative Actions for Renovation of Air Traffic Systems (CARATS), particularly to align some of the previously envisaged programmes with what is emerging with NEXTGEN and SESAR and compliance with the ICAO GANP. The modernisation of Japan air traffic management system is crucial not only to meet these aims but to allow for the predicted rapid growth in air traffic with no increase in controllers, reaping the gains of better information and managing the move towards trajectory based operations, integration of satellite surveillance and SWIM data architecture, as shown in Figure 133. It was announced in March 2016 that Japan and Singapore are going to collaborate on ATM modernisation and research on ATM concepts and technologies.

[139] Office of Inspector General Audit Report FAA reforms have not achieved expected cost, efficiency and modernisation outcomes January 2016

Figure 133: Overview of Japan ATM Modernisation




Source: Civil Aviation Bureau of Japan (JCAB), 2016

## Australia ONESKY

Airservices Australia continues to make progress in the development of a combined civil and military air traffic management system for completion in 2021. This will bring safety and efficiency gains and provide the platform for conversion to ADS-B surveillance. It will also allow 4D trajectory management along with other similar enablers that are being employed within SESAR and NEXTGEN. In February 2016, Airservices announced the signing of a contract with Thales for the supply of advanced software that will underpin the new system. Highlighting the moves already made from ground based navigational infrastructure, Airservices announced the withdrawal of a significant number of VORs and related equipment from summer 2016.

## Canada

NavCanada published the latest version of its air navigation system plan in September 2015.[140] This highlights both short and medium term deployments of new ATM technology grouped around initiatives in PBN, communications, surveillance, aeronautical information and weather. It also describes the mapping of these activities to the ICAO block upgrade programme. Given the importance of the joint venture between NavCanada and Iridium in the development of space based ADS-B, it is not surprising that the deployment of this technology first on the North Atlantic in 2018 and then with the potential to replace conventional secondary radar over the land areas of the nation by 2022 is a prominent goal of the plan. Related to this is enhancements to air traffic management, particularly reductions on lateral separation on the North Atlantic but which are dependent on advances in required navigation performance (RNP4), controller pilot downlink communication (CPDLC) and enhancements to ADS-B and ADS-C.

## Middle East

[140] Charting the future The Air Navigation System Plan NavCanada September 2015

2016 has seen continued focus on better cooperation between states, particularly in the Gulf region, to try and provide for greater capacity to meet the aspirations of fast growing airlines in the region. Following the announcement of both Airbus and Helios studies in late 2015 to improve planning[141], coordination of airspace change together with the provision of roadmaps for implementation and harmonisation of the latest ATM solutions, real gains in capacity are yet to materialise across the region. This was also highlighted in an Oxford Economics report[142] which set out some potential gains that could be achieved if the amount of airspace was increased and fragmentation reduced. Collaboration on implementation is seen as the key with such a large number of fast growing airlines at large airports that are not situated that apart.

### India

Airports Authority of India continues to provide civilian air traffic management across the country and is adopting many of the technology upgrades adopted in other regions including ADS-B, PBN, airport CDM and upper airspace harmonisation together with RNP routes. However, the flagship GAGAN project to deploy a satellite based surveillance augmentation system has proved controversial.

### China

Thales announced in late 2015 that they have been awarded a contract to upgrade the Shanghai airspace and management systems at Pudong and Hongqiao airports which are facing significant traffic growth.[143] This is part of a wider plan to upgrade the six large air traffic control centres to meet the relentless growth in air traffic, with Beijing, Shanghai and Guangzhou to be completed by 2022. More generally, lower altitude airspace in China will be able for more general use by civilian aircraft which will provide for a much needed capacity increase and be an enabler for the potential use by general and business aviation.

### Asia Pacific

Countries within the Asia-Pacific region continue to lead with innovating ATM projects, including cooperation on flight tracking standards, trialling of environmentally favourable ATM techniques on ocean flights e.g. the Asia and Pacific Initiative to Reduce Emissions ASPIRE programme and joint ventures to study the implications of deploying space based surveillance. Japan, CAAS Singapore, Airservices Australia and Airways New Zealand are at the forefront of deploying systems to meet ICAO block upgrade plans, in particular ADS-B, Required Navigation Performance (RNP) and PBN.

## 5.6. Airports

### Capacity

As discussed above in the context of the United States, there is an increased realisation that airports are likely to become the main focus of capacity constraints across the air transport system in future years as the technology enablers unlock significant capacity increases in the en-route and terminal airspace. The political and environmental agenda is such in most developed countries that new runways are not going to be easy to construct and existing infrastructure must be used to its maximum potential.

### Remote Towers

The most immediate new technology that has achieved the highest profile in 2015 and 2016 is that of remote tower services (RTS) where the convergence in remote surveillance and communication makes the concept

[141] Press release Airbus ProSky/METRON Arab Civil Aviation Commission (ACAC) sign a MOC Sep 6, 2015;also https://www.askhelios.com/projects/seamless-airspace-study-for-gcc

[142] Oxford Economics/NATS Economic benefits of improvements to Middle East Air Traffic Control August 2015

[143] Press release Thales to modernise ATM automation in Shanghai ATC Global Dubai, 5th October 2015

a potentially attractive solution to drive cost reduction and efficiency. Swedish ANSP LFV has made the most progress with the concept, making the case for the safe deployment and operation of a remote tower system. A study, in conjunction with the airports operator Swedavia, is looking at the deployment of remote towers at five airports across the country, Malmo, Visby, Ostersund, Umea and Kiruna, which would be controlled centrally from Stockholm to establish a large scale reliable and safe remote system. Demonstrating the scale-ability of the concept, CAAS Singapore announced a project to identify a potential concept of operation and business case for a remote tower associated with the new Changi East development containing Runway 3 and Terminal 5 with a study of the potential risks, mitigations and stakeholder engagement.

## A-CDM

The European deployment of airport collaborative decision making (A-CDM) continues with Milan Linate being the 20th airport, see Figure 134. A full review of the rollout and discussion of the benefits to ATM has been published in a Eurocontrol impact assessment report[144]. With the threshold of 50% departures across Europe about to be reached, the information flows, particularly departure planning information (DPI) is having an increasingly positive impact on network performance.

Figure 134: European A-CDM Airports

| Implementation Status | AIRPORT (IATA CODE) | % of departures in 2015 (%) |
|---|---|---|
| Implemented | Barcelona (BCN), Berlin-Schönefeld (SXF), Brussels (BRU), Dusseldorf (DUS), Frankfurt (FRA), Helsinki (HEL), London (LGW), London (LHR), Madrid (MAD), Milan (MXP), Munich (MUC), Oslo (OSL), Paris (CDG), Prague (PRG), Rome (FCO), Stuttgart (STR), Venice (VCE), Zurich (ZRH) | 27.0% |
| On-going | Athens (ATH), Lisbon (LIS), Manchester (MAN) | 2.9% |
| Implementation planned in 2016 | Amsterdam (AMS), Bergen (BGO), Copenhagen (CPH), Dublin (DUB), Geneva (GVA), Hamburg (HAM), Istanbul Ataturk (IST), Lyon (LYS), Milan (LIN), Naples (NAP), Palma (PMI), Paris Orly (ORY), Stavanger (SVG), Stockholm (ARN), Trondheim (TRD), Vienna (VIE) | 17.7% |
| Initial contact | Nice (NCE), Bucharest (OTP) | 1.3% |
| | All other European airports | 51.1% |

Source: Eurocontrol Performance Review Report, 2015

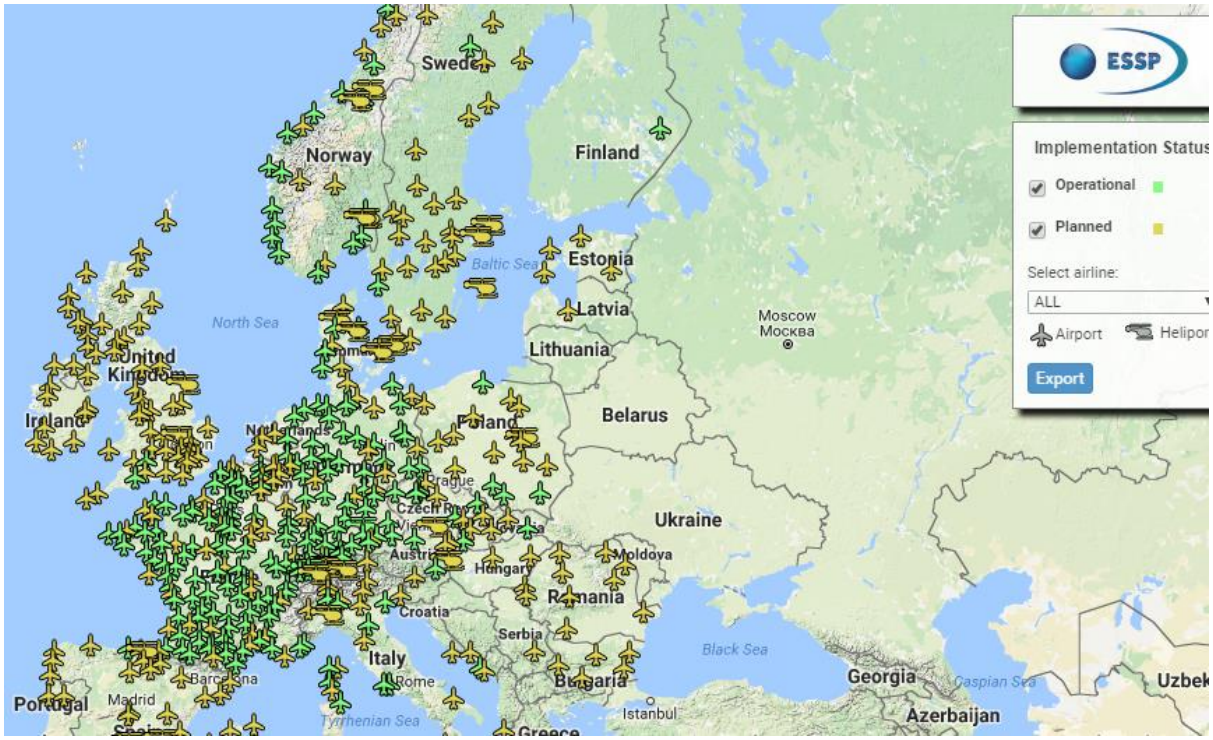
As the pressure on airport capacity increases, particular at the larger airports; smaller incremental increases in overall capacity are going to be achieved through the deployment of advanced technology. Three examples of this are presented below.

## GBAS

Safety and efficiency of aircraft during the air-to-air transition of an aircraft through an airport i.e. approach/landing/take-off will be enhanced using satellite based navigation techniques (SBAS). Ground Based Augmentation Systems (GBAS) that allow a larger number of approach and departure routes to be flown more accurately are being deployed across Europe, United States and Canada. Figure 135 illustrates the spread of such capability across Europe using augmentation from the European Geostationary Navigation Overlay Service (EGNOS) system.

[144] A-CDM Impact Assessment Final Report Eurocontrol March 2016

Figure 135: Implementation of European SBAS




Source: EGNOS, 2016

## LPV-200

The implementation of the localizer performance with vertical guidance (LPV) approach route using EGNOS satellite at Paris Charles de Gaulle airport in May 2016 points the way to allowing for demanding PBN approaches at European airports and a cost effective way of replacing ageing ground navigational infrastructure. [145]The procedure allows for lateral and angular vertical guidance during final approach without visual contact down to 200 feet above the runway.

Significant capacity benefits at the busiest airports should become available from the adoption of such procedures.

## TBS: Time Based Separation

Following trials at London Heathrow airport during 2015, involving NATS and Eurocontrol, the deployment of a time based separation tool has now become fully operational, allowing much greater capacity resilience to high winds on approach. The key feature of this system is the downlinking of actual winds from Mode S on board aircraft on approach which provides the tool and controllers with a very accurate picture of wind conditions and therefore the spacing to avoid vortex effects. Deployment of this tool is changing the concept of operation for arrivals at this most heavily utilised airport operating at 99% of capacity and reducing the amount of capacity reduction and holding in poor weather conditions.

Development of this tool in conjunction with Lockheed Martin is enabling the airport to meet revised wake vortex Re-categorisation (RECAT) standards and innovate in the way groups or pairs of aircraft are set up

[145] Press release 12 May 2016 European Global Navigation Systems Agency First EGNOS LPV-200 approach implemented at Charles de Gaulle Airport

on approach to minimise gaps and potentially increase capacity, important not only because of the potential weather impacts but also with the increasing number (20/day) of A380 aircraft arriving at the airport.

## 5.7. Unmanned / Remotely Piloted Aerial Systems UAS/RPAS/Drones

The extremely rapid growth in small remotely piloted aircraft or drones in many countries is presenting regulatory authorities and air navigation service providers with the dilemma of balancing the paramount requirement for safety in the airspace with that of maximising the economic opportunities that will result from developments in a very innovative industry. The Director General of IATA described drones as “a real and growing threat to commercial aviation”. This balance has come into sharp focus during the summer of 2016 with some important developments. The review in this section focuses on the operational aspects of these developments, particularly in the United States and Europe. A review of some of the safety issues related to drone development is presented in Chapter 3, Safety of this report.

In the United States, June 2016 saw the publication of new regulations[146] for the operation of small drones (under 55 pounds weight) for commercial use in civilian airspace. These come into force in August 2016. The rules contained in the Part 107 document are aimed at minimising risk to other aircraft flying in airspace, people and property on the ground by allowing line of sight (VLOS) operations during the daytime and twilight. There are other operational restrictions and points the way to further rollbacks in the regulation which would ultimately allow operations at night and beyond line of sight. These are key requirements of commercial operators, most notable and publicised being Amazon who are seeking a major relaxation of the rules to allow the development of a package delivery service by small drones. It was significant that only a few weeks after the publication of the rules in the US, Amazon announced a cooperation agreement with the UK Civil Aviation Authority for the testing of small drone operation in the UK.

This action followed much preparatory action over the last year. Perhaps the most significant from an administrative perspective, was the introduction in the US of a drone registration scheme for drones between 0.5 and 55 pounds. This database has grown extremely rapidly during the first half of 2016, recording a registration and basic personal data relating to the operator.

The issue of operation standards for the key drone technologies has also been a very significant precursor to the wider deployment of drones within the airspace, particularly with regard to detect and avoid (DAA) and command and control (C2) technologies which are key to drone operation to fulfil the ‘see and avoid’ basis of flying. Although drones can fly autonomously using sensors, the technologies depend on radio links which may fail so operations must build in procedural solutions to maintain separation of the unmanned aircraft from other aircraft in the airspace. This is particularly important around airports and in terminal manoeuvring areas. Studies like the TEMPAERIS initiative in Europe show that the operation of unmanned aircraft in terminal airspace is broadly similar to the operation of small general aviation aircraft in such an environment.[147] More broadly, unmanned aircraft systems must provide a safe way of operating beyond visual line of sight and have procedures in the event of failure of even high reliability links.

Airservices Australia also published in June an operational concept for RPAS in controlled airspace which would allow integration with conventional operation. The framework envisaged and approach used is seen as gradual, proportionate, evolutionary and inclusive.

[146] FAA Office of Secretary of Transportation Final Rule Operation and Certification of Small Unmanned Aircraft Systems June 2016

[147] Deliverable D02 - TEMPAERIS Final Report SESAR JU October 2015

Figure 136: The Commercial Opportunity

Source: AirMap, 2016

The more pressing and immediate problem that has emerged as amateur and hobbyists fly drones, together with potential criminal and terrorist use, is that of drone flying close to airports and the collision risk with conventional aircraft. Initiatives in this area require collaboration not only between aviation authorities but also security and law enforcement agencies. This has been illustrated by an exercise carried out at New York Kennedy airport, identify and deploying counter measures against test rotary and fixed wing unmanned aircraft.

More widely, FAA is continuing research to detect unmanned vehicles close to airports. This has been formalised specifically in the language contained in the latest FAA re-authorisation act, requiring the maintenance of safe and efficient airport environment for both manned and unmanned air traffic operations. In May, FAA announced that it had signed three research and development agreements to evaluate procedures and technologies that can identify unauthorised drone operations in and around airports. In the UK, trials have been carried out at several of the London airports in conjunction with the police and control authorities on ways of detecting and disabling unmanned vehicles close to airports. This was brought into sharp focus with an unsubstantiated claim that a drone was detected close to an arriving aircraft at Heathrow in April 2016 and a subsequent near miss at Newquay in August 2016.

Figure 137: The Nuisance/Security Hazard


Source: as seen on Dorset Jurassic coast UK, 2016

In Europe, July 2016 saw the SESAR JU issued a call within the SESAR 2020 program for exploratory research into the integration of drones into civil airspace. Again, this comes with the realisation that the

economic and business opportunities that follow from drone use will only be fully realised if they can operate safely in all areas of airspace. A key focus of the research is therefore in the very low level (VLL) and beyond visual line of sight (B-VLOS) environment. The specifications were established in collaboration with the European Aviation Safety Agency (EASA). This follows the development and consultation, during late 2015 and early 2016, on Europe-wide rules on drone usage. These specified three types of operation; open, specified and certified. This is based on an assessment and classification of low, medium and higher risks of drone operation. EASA had also created a drone collision task force in May 2016 to specifically look at the risk of collision between drones and aircraft, together with the detailed vulnerability of aircraft structures from such a collision. The results of this study were due to emerge at the end of July 2016.

May 2016 also saw the first meeting of a new group with ambitious aims to create worldwide standards for unmanned aircraft systems air traffic management (UTM). This would ultimately lead to standardisation across the globe for the integration of the operation of drones into controlled airspace. The US National Aeronautics and Space Administration (NASA) is also devoting considerable resources to UTM research with the aim of handover to FAA by 2019. This is based on four capability levels, with increased complexity ranging from rural line of site operations up to applications in high density urban areas.

With the latest forecasts indicating that there are already 700,000 drones in US airspace and a forecast, in April 2016, of 2.7M commercial drones in the US by 2020, it was not surprising that the FAA further extended oversight through an advisory committee in May 2016 to "identify and prioritise" integration of UAS and drive safety innovation. They also stated that it was difficult to establish an airspace structure that could safely manage UAS together with other traffic and stating there was no current plan to reclassify low-altitude airspace to accommodate small drones. The fact that 02 Aug 2016 was 'drone day' by FAA in Washington, marked by testimony[148] by officials to house representatives illustrates how the FAA is now focused on the importance of UAS to the national airspace system, highlighting the balance between safety requirements and commercial opportunity and the rapid pace of change.

Technology providers such as Harris are leading the way with the deployment of ADS-B solutions that will allow UAS operators and airspace managers to enhance safety with views of the occupants of the airspace below 500ft. Similarly innovative companies like AirMAP are bringing together aeronautical and local weather information together on portable electronic devices to help drone operators fulfil the emerging FAA rules and procedures for drone operation.

In May 2016, Price Waterhouse Coopers (PwC) produced a significant report [149]on the potential value of the world drone market together with a discussion of the potential disruptive effects on transportation and distribution. A summary table at Table 34indicates the scale of the opportunity.

Table 34: Predicted Value of Drone-Powered Solutions in Key Industries - Global View

| List of Key Industries | Global predicted value ($ billion) |
|---|---|
| Infrastructure | 45.2 |
| Agriculture | 32.4 |
| Transport | 13 |
| Security | 10 |
| Media & Entertainment | 8.8 |
| Insurance | 6.8 |
| Telecommunication | 6.3 |
| **Mining** | 4.4 |
| **Total:** | **127.3** |

Source: PwC, 2016

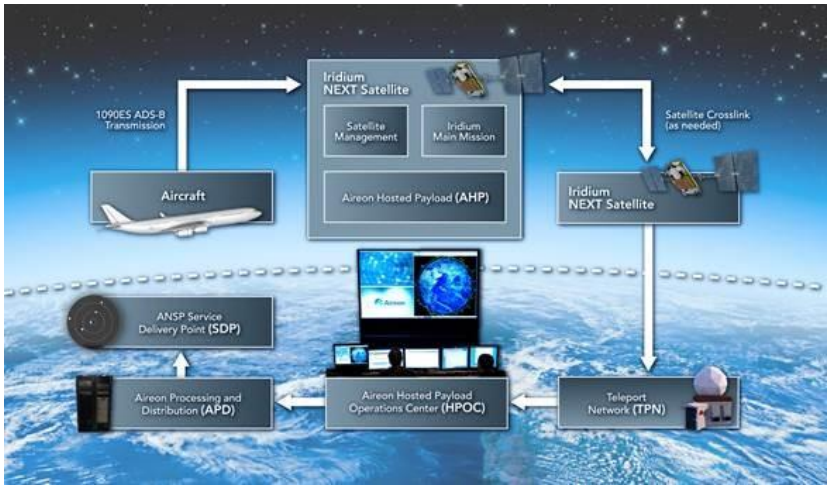
[148] Testimony of Michael Huerta FAA Administrator Washington August 2 2016

[149] "Clarity from above" Global report on commercial applications of drone technology PwC May 2016

## 5.8. Aireon

The Aireon initiative which aims to deliver a space based global ADS-B satellite surveillance system gathered further momentum in 2016. Aireon is a joint venture between the Iridium Corporation, NAVCanada and several other partners including ENAV of Italy. September 2016 sees the launch of the first batch of the Iridium NEXT satellites, which incorporate some 81 ADS-B payloads that will form the basis of the independent global surveillance system as shown in Figure 125.

Figure 138: Satellite Architecture for Deployment of Space-Based ADS-B




Source: Aireon, 2016

Several additional ANSPs announced that they would be using the Aireon solution for surveillance, including South African ATNS, where the Johannesburg FIR and Cape Town FIR and surrounding area account for % of world airspace. Given the earlier announcement of Aireon collaboration with the ASECNA group of ANSPs and a more recent commercial agreement with the Southern African Development Community, this will further enhance surveillance across Africa where existing radar provision has always been fragmented.

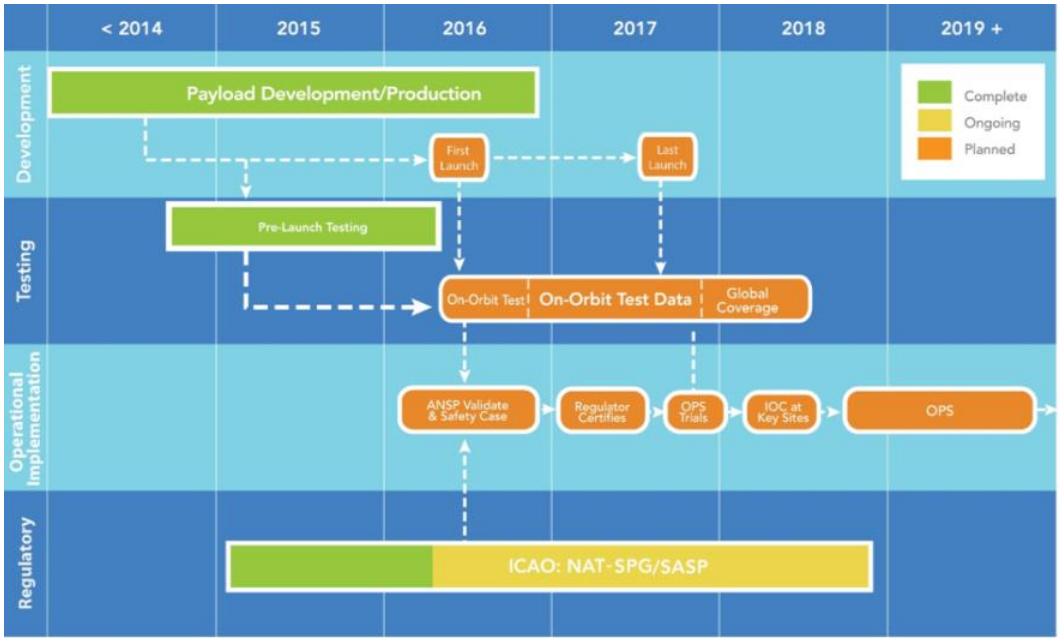
Similarly, Singapore CAAS has also announced a 12-year agreement with Aireon to provide surveillance for the Singapore FIR, which allows the potential for further sharing of ADS-B data with surrounding airspace in the Asia Pacific. In July 2016, it was announced that the Myanmar DCA were evaluating the Aireon satellite system as a way of modernising their surveillance capability for the Burmese FIR without the need for the construction of expensive ground facilities. NAVIAR of Denmark have also announced a strategy for the deployment of Aireon ADS-B as an additional layer of surveillance to provide redundancy against the failure of the radar network and provide additional capability in the Greenland and North Sea areas.

Ahead of the ADS-B satellite network deployment, Iridium is also offering alternative and augmented GPS technology to aid navigation and announced in May 2016 the Aircraft Locating and Emergency Response and Tracking service (ALERT), the free global emergency and tracking service that is being operated by the Irish Aviation Authority (IAA).

The Aireon project was boosted by the World Radio Conference (WRC) decision to allocate ADS-B communication a dedicated tranche of spectrum. Although there are potentially two competitors to Aireon, Globestar has already demonstrated ADS-B signal capture from aircraft and SES Techcom announced plans to develop a rival system, neither seem viable in the new frequency environment or can be available ahead of the 2018 Aireon timeline when space based ADS-B surveillance is due to be initiated by founding partner

NAVCANADA and NATS on the North Atlantic Gander and Shanwick areas. It is widely expected that this move to ADS-B surveillance from the existing procedural environment will allow a significant reduction in longitudinal separation on the track system with immediate capacity benefits. As already noted, the Aireon satellite deployment will also allow NAVCanada to change its mode of operation for surveillance and potentially reduce lateral separation both in polar Canada and oceanic track systems. The overall timeline for the satellite ADS-B rollout is shown in Figure 139. It is significant that initial live surveillance data from the satellite constellation may be available late 2016.

Figure 139: Aireon Satellite ADS-B Deployment




Source: Aireon, 2016

Aireon will also provide ICAO with a ready-made solution to its aircraft tracking requirements as ADS-B satellite surveillance will provide 1 minute updates on global aircraft positions, although ICAO is then faced with the prospect of Aireon as a monopoly supplier. Different sub-optimal concepts are emerging in other areas. For example, in India, airlines are resisting the introduction of GPS Aided Geo Augmented Navigation (GAGAN) as it imposes the costs of additional equipment together with retrofits, training and certification.

Aireon are now also in discussion with two key elements of the Russian federation air traffic control system, AZIMUT who provide enabling communication, navigation and surveillance (CNS) support to the State Air Traffic Management Corporation and INFOCOM-via who provide aviation information services. The prize for Aireon and the ANSP here is huge as the Russian Federation is one of the largest airspace in the world, containing remote, polar and oceanic areas where the Aireon concept will provide a cost effective solution to surveillance over a large area.

In June 2016, the Flight Safety Foundation (FSF) released a comprehensive report [150] on the safety benefits of space based ADS-B surveillance as of now and in the short and medium term as ANSPs reap the rewards of near real time 100% global coverage. Specifically, the report points to:

- real time surveillance will allow reduced oceanic separation;
- position errors at flight information regions (FIR) should be eliminated;
- 8sec updates will eliminate off-track errors;

[150] Benefits Analysis of Space-Based ADS-B Flight Safety Foundation Washington DC June 2016

- controller and pilot workloads should be reduced with better planning and constant real time airspace picture;
- better strategic planning and contingency management e.g. in conflict and ash cloud zones; and,
- assistance in collection of black box type data in aircraft incidents and accidents.

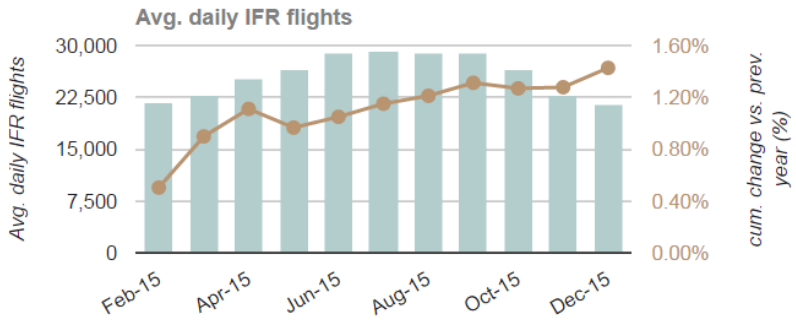
The report highlights the need for equipage mandates and system integrity standards to be met together with the widespread adoption by ANSPs to give the desired global interdependency.

## 5.9. Demand/Capacity/Performance

### Europe

All the detail related to the performance of the European air traffic management system in 2015 and into 2016 is contained in three documents.[151] [152][153] 2015 saw an overall 1.5% increase in flights in Europe over 2014. A slightly higher year on year outturn increase is expected in 2016 which will take annual flight volumes back close to the previous pre-economic downturn totals in 2007 and 2008. As shown in Figure 140, Figure 141 and Figure 142 , the *average* number of daily instrument flight rule (IFR) flights is below 30,000 in the peak summer months in 2015 but there were several peak days ahead of 30,000. In 2016, there have been many more in the first months of the summer as airline schedules increased with a better economic situation.

Figure 140: 2015 European Traffic Growth



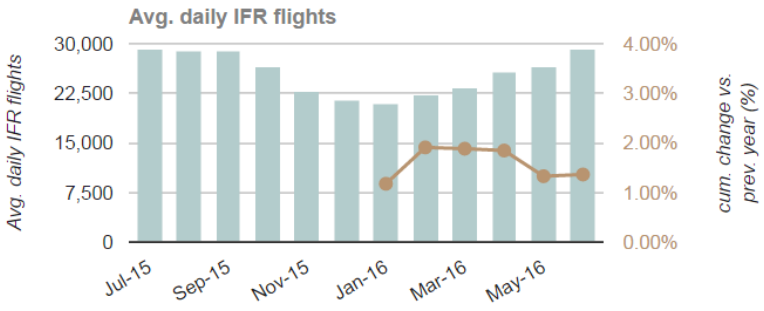

Source: Performance Review Body (PRB) dashboard, 2015

[151] Performance Review Report (PRR) 2015 Eurocontrol June 2016

[152] Network Manager Annual Report 2015 Eurocontrol June 2016

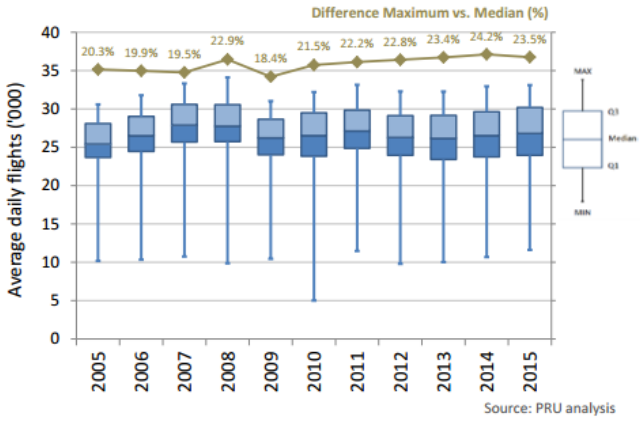
[153] Performance Review Body dashboard http://www.eurocontrol.int/prudata/dashboard/rp2_2015.html
http://www.eurocontrol.int/prudata/dashboard/rp2_2016.html

Figure 141: 2016 European Traffic Growth




Source: Performance Review Body (PRB) dashboard, 2016

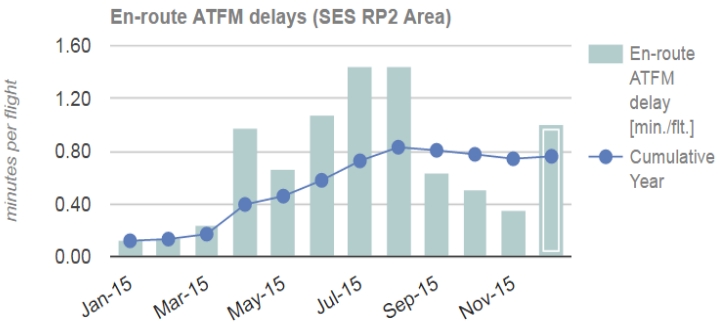
Figure 142: Variability of Average Daily Flights in Europe 2005-2015




Source: Eurocontrol PRU, 2015

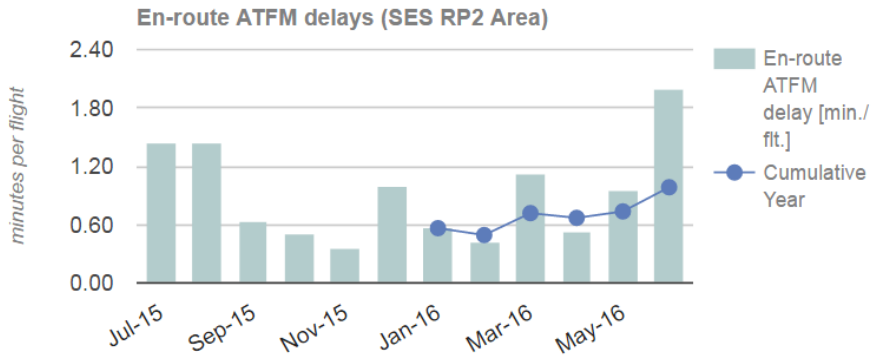
Reviewing the published delay performance, the overview shown on the PRB dashboard in Figure 143 and Figure 144 confirms that the Reference Period 2 (RP2) target of 0.5min/flight was not met in 2015 and is unlikely to be met in 2016, given the level of delay. The details of delay cause are analysed in both the Performance Review and Network management documents but the headline cause in both years is delays caused by strike action. While ATC capacity and capacity (staffing shortages) contribute to the total and there are specific issues in several centres and states which are clearly documented, it is clear that the industrial action discussed earlier is the prime reason for the delay target being so significantly overshot.

Figure 143 Evolution of en-route ATFM Delay 2015




Source: PRB dashboard, 2015

Figure 144: Evolution of en-route ATFM Delay YTD 2016

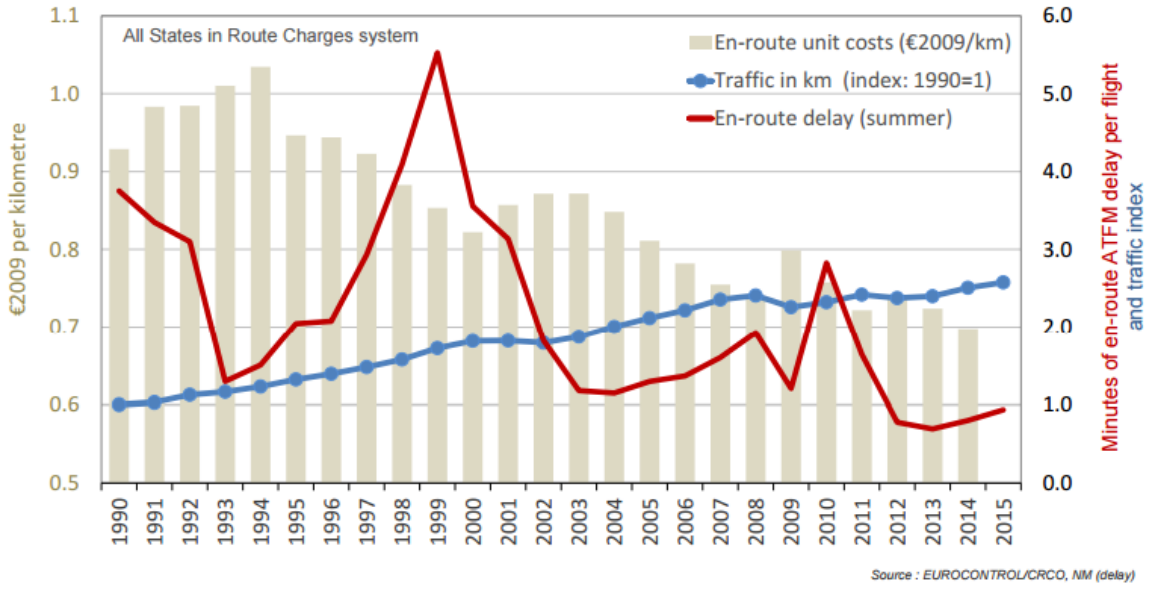



Source: PRB dashboard, 2016

The documentation also presents analysis of airport ATFM delays where there is a general increase and specific issues at certain airports. Notably, there is also a pause in the improvement in horizontal flight efficiency, both for flight planned and flown, indicating that the scope for improvement through the existing route improvement programme may be ending. The additional RP2 performance indicator relating to additional arrival time in terminal areas confirms the expected picture at the busier airports around Europe. Comparing 2015 and 2016 does not reveal any great deterioration, indicating that ATFM measures and network management is improving performance as traffic increases.

The documentation also analyses the remaining performance scheme parameters and provides an analysis of a continuing view that the air traffic management system is safe but opaqueness in safety performance remains. The picture on costs is complicated with the adoption of the determined cost methodology but Figure 145 presents a moderately positive picture of the strategic relationship between cost, traffic and delay, especially when the main driver for delay in recent years has been the industrial action by controllers in several countries.

Figure 145: High level view of Trends in Costs, Traffic and Delay in European ATM



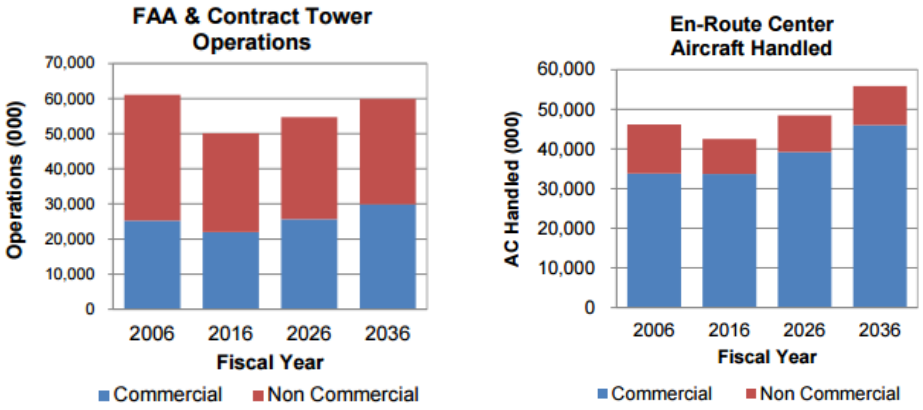

Source: Eurocontrol PRR, 2015

## United States

Activity forecasts for the US ATM system in terms of tower movements handled and en-route activity is provided in aggregate in the annual FAA forecasts document[154]. Detailed historical data is provided via the OPSNET databases.

The overall level of activity presented in Figure 146 below is very interesting in the context of the debate over the ownership, organisation and modernisation of the US air traffic management system as it illustrates that the impact of the 2008 onwards downturn is forecast to have a much longer impact on flight volumes than that in Europe. At a time when, as discussed earlier, there is great pressure on controller numbers, the changing nature and distribution of demand in the US provides a challenging backdrop to the deployment of new ATM technology and management of what appears a scarce controller resource.

Figure 146: US FAA System Activity Forecasts




Source: FAA Annual Aerospace Forecasts, 2016

[154] FAA Annual Aerospace Forecasts 2016-2036

# 6. Market & Competition Issues

## 6.1. Introduction

Whereas in previous editions of this Report, the focus had been on summarizing past developments of the year covered, this edition seeks to include ongoing developments. When reviewing aviation policy unfold in a continuum from past to current, three major factors affecting European aviation surfaced:

First, the Commission's Aviation Strategy document[155], adopted end 2015, has provided cornerstones against which to evaluate the impact of regulatory measures. Thus the external aviation policy, as depicted in the Strategy document, outlines objectives and priorities and therefore places the measures in a context. Given the holistic approach pursued by the Commission, the issue is no longer merely whether new agreements have been concluded with third countries, but whether the European aviation sector has gained competitiveness globally and is contributing more to connectivity.

Second, in light of the encompassing Aviation Strategy, the State Aid decision must be seen in a broader context. First of all, the decisions of DG COMP have been evaluated with regard to how the Guidelines on State aid to airports and airlines[156] ("the Aviation Guidelines") have been implemented. But it is becoming increasingly clear that DG COMP should be seen as an integral element of the Aviation Strategy: the manner in which state aids are reviewed in the EU must be seen against aids granted by non-EU states to their national airlines if the Commission is to succeed in achieving its stated objective of securing fair competition internationally.

Third, the Brexit decision will be the single most important market issue as of 2017. It is as yet premature to assess its implications for aviation, but it is a possible game changer for market dynamics within the EU, and international negotiations on traffic rights.

This Report thus seeks in this chapter to cover the first two abovementioned issues, but also to analyse as concisely as possible the implications of the regulatory developments for decision makers.

## 6.2. EU External Aviation Policy

### The Communication 2015/598: An Aviation Strategy for Europe

On 7 December 2015, the Commission adopted a new Aviation Strategy for Europe, presented as "a milestone initiative to boost Europe's economy, strengthen its industrial base and contribute to the EU global leadership"[157].

[155] Communication from the Commission – An Aviation Strategy for Europe, COM/2015/0598 final, http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52015DC0598&from=EN

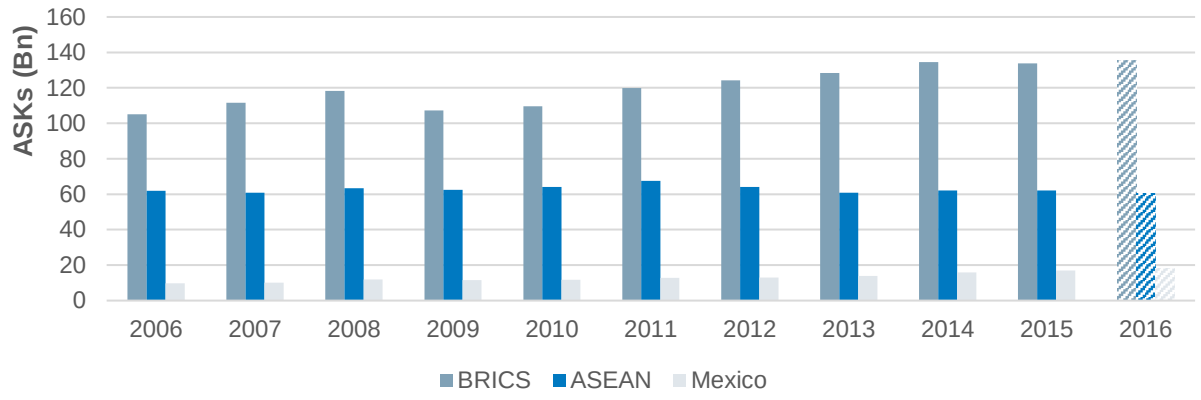
[156] Communication from the Commission - Guidelines on State aid to airports and airlines, OJ C 99, 4.4.2014, p. 3–34, http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014XC0404(01)&from=EN.

[157] European Commission - Press release, Brussels, 7 December 2015, Commission presents a new Aviation Strategy for Europe, http://europa.eu/rapid/press-release_IP-15-6144_en.htm

This Aviation Strategy is the result of a public consultation[158] and of an extensive dialogue between the Commission and EU Member States, the European Parliament, the European Economic and Social Committee, and stakeholders.

With respect to international developments, this Aviation Strategy highlights the importance of tapping into growth markets by improving services, market access and investment opportunities with third countries, whilst guaranteeing a level playing field. The Aviation Strategy supports European air connectivity, the Single European Sky and liberalised aviation agreements with the BRICs and ASEAN[159].

Figure 147 - One-way Capacity (ASKs) between the EEA and BRICS, ASEAN and Mexico



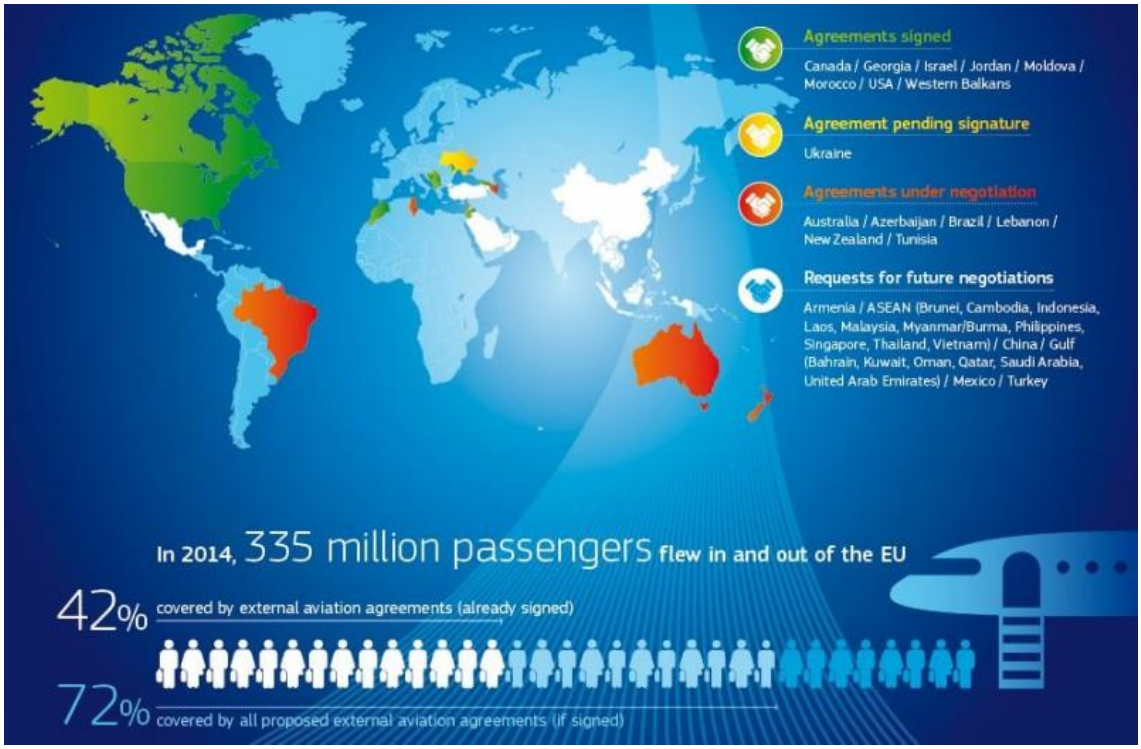

Source: SRS Analyser, 2016

Additionally, the Commission recommends the negotiation of new comprehensive EU-level air transport agreements with China, Turkey, Saudi Arabia, Bahrain, UAE (United Arab Emirates), Kuwait, Qatar, Oman, Mexico and Armenia. Furthermore, new aviation dialogues should be sought with key aviation partners such as India.

[158] http://ec.europa.eu/transport/modes/air/consultations/doc/2015-aviation-package/synopsis-report.pdf

[159] http://centreforaviation.com/analysis/european-parliament-on-aviation-build-a-single-sky-promote-liberalisation---and-protectionism-244496

Figure 148 - EU-wide Air Transport Agreements Dec-2015




Source: European Commission, 2016

### Improve Market Access

Today, Europe's share in worldwide scheduled passenger traffic is 27%[160].

This situation is expected to change in the coming years, given the fast economic development of the Asian region. With growth forecasts at annual average growth rate of 6%, the passenger transport market in the Asia Pacific region should represent 40% of the worldwide traffic in 2034. In this context, China should become the largest market in the world, overtaking the United States in terms of number of transported passengers from 2023[161].

In view of their geographic location, the Gulf States, as well as Turkey, already benefit from the shift of the centre of gravity of economic growth towards the East.

In order to allow European airlines to take part in the development of these emerging markets, the Commission recommended negotiating comprehensive EU-level air transport agreements with the following countries and regions: China, ASEAN, Turkey, Saudi Arabia, Bahrein, UAE, Kuwait, Qatar, Oman, Mexico and Armenia.

[160] Flying by numbers 2015-2034, Global Market Forecast of Airbus, p. 10.

[161] Commission Staff Working Document, accompanying the document "Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of Regions : An Aviation Strategy for Europe, COM(2015) 598, http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52015SC0261&from=EN

On 7 June 2016, the Council adopted mandates that allow the Commission to start negotiations on comprehensive EU-level air transport agreements with ASEAN, Qatar, UAE and Turkey[162].

## ASEAN

The agreement with ASEAN is expected to become the first EU bloc-to-bloc aviation agreement. Already in February 2014, at the end of an EU-ASEAN Aviation Summit, the European Commission and the Association of Southeast Asian Nations (ASEAN) proposed to take aviation cooperation to a new level by negotiating a comprehensive air transport agreement[163].

The strategic and economic importance of a comprehensive air transport agreement between EU and ASEAN is obvious:

- Air traffic between the two regions nearly doubled over the last 15 years to reach more than 10M passengers in 2012;
- Passenger air traffic between EU and ASEAN is expected to grow by an average rate of 5% per year over the next 20 years164;
- Currently a significant amount of this traffic is flown by airlines from third countries, especially Emirates, Etihad, Qatar Airways and Turkish Airlines, via hubs in the Gulf (Dubai, Doha and Abu Dhabi).

## Gulf: Qatar, UAE

In 2015, some European carriers, notably Lufthansa and Air France KLM, as well as major U.S. airlines (American Airlines, Delta Air Lines, and United Airlines), accused Gulf carriers of receiving unfair state subsidies, allegations these disputed.

In a newly released 55-page white paper to the U.S. government, the three major U.S. airlines claim that the Gulf carriers have received $ 42bn in subsidies since 2004, which distort the competitive market in direct violation of U.S. Open Skies policy[165].

In response to requests of European carriers, the Commission seeks strict limits on state subsidies to airlines and the possibility of revoking their traffic rights in the context of new commercial air services agreements (further explored in the ATM section of this Report).

## Improve Investments Opportunities

The consolidation of the European and global markets for transport of passengers creates a need for operators to benefit from a better access to foreign capital, from a greater freedom to invest in foreign markets and from a reduction of barriers to joint venture and merger operations.

In its Aviation Strategy concept, the Commission addressed the obstacles facing European airlines in overcoming the current hurdles. In order to reduce legal uncertainties, the Commission proposed:

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[162] EC Press Release, 07.06.2016, Comprehensive EU air transport agreements: Council adopts mandates, http://www.consilium.europa.eu/press-releases-pdf/2016/6/47244641972_en.pdf

[163] EC Press Release, 12.02.2014, Aviation: EU-ASEAN Aviation Summit proposes open skies agreement, http://europa.eu/rapid/press-release_IP-14-133_en.htm

[164] EC Memo, 10.02.2014, EU–ASEAN Aviation Summit – Towards stronger relations in aviation, http://europa.eu/rapid/press-release_MEMO-14-95_en.htm

[165] Restoring Open Skies : The need to address subsidized competition from state-owned airlines in Qatar and the UAE, January 28, 2015, http://www.openandfairskies.com/wp-content/themes/custom/media/White.Paper.pdf

- to pursue the relaxation of ownership and control rules on the basis of effective reciprocity through bilateral air services and trade agreements "with the longer term objective to do so at multilateral level"; and,
- to publish interpretative guidelines on the application of Regulation 1008/2008 with respect to the provisions on the ownership and control.

These initiatives undoubtedly constitute means to reduce barriers and uncertainties; however, they will require deeper analysis in the context of the following:

- The continued pursuit by Member States and third States of their national strategic and economic interests. Facilitating effective control by foreign investors into EU holding companies and/or airlines could be perceived by Member States as undermining the desired impact of investments into infrastructure or indeed the competitiveness of their respective national economies. To offset the interest of a non-EU strategic investor to redirect traffic flows via its hub to international third country destinations, thought should be given to providing Member States with the means to improve connectivity by enhancing PSO options and facilitating regional consolidation as a means of safeguarding access to and from European regions;
- Means should be elaborated to encourage investments by EU strategic and financial investors into European infrastructure and airlines and airline groups;
- Further analysis will be required to ensure the issue of reciprocity, which the Commission has identified, as being key. European strategic and financial investors should benefit from ease of access to invest into growth markets in Asia, i.e. in growth markets also outside the EU. An investor into an EU airline or airline group will not only seek assurances that his investment is protected against unfair competition (explored below), but also benefits from growth opportunities by acquiring or establishing competitors in global growth markets.

## Guaranteeing a Level-Playing Field

In its new Aviation Strategy, the Commission not only addresses the goal of further improving market access opportunities, but also the manner in which the market players will compete within the market.

As already discussed above, several American and European airlines have complained about alleged subsidies and public aid granted by Gulf States to their national companies (Etihad, Emirates and Qatar Airways) which are denied to their non-national competitors.

Regulation 868/2004 on the protection against subsidies and unfair pricing practices[166] is a regulatory tool to address such complaints, but has been applied insofar as airlines consider that its enforcement is complicated and inappropriate to resolve the issue.

This complexity results in particular from:
- The definition of active legitimacy for bringing a complaint;
- The difficulty of determining the existence of unfair pricing;
- The difficulty of determining "non-commercial advantage";
- The difficulty in proving "injury";
- The difficulty in identifying financial transactions in the relationship between a government and an airline of a third country.

[166] Regulation (EC) 868/2004 of the European Parliament and of the Council concerning protection against subsidisation and unfair pricing practices causing injury to Community air carriers in the supply of air services from countries not members of the European Community. *Official Journal of the European Union, L162*, 1–7.

In its communication, the Commission announced that it considers proposing in 2016 new measures to address unfair practices; those new measures should differ from the framework of Regulation 868/2004.

The Commission equally considers negotiating effective fair competition provisions in the context of the negotiation of EU comprehensive air transport agreement.

A "fair competition clause", could:

- list the forms of public support that could be considered unfair, such as protection from bankruptcy, provision of capital, tax relief and cross-subsidisation; and,
- set up a consultation period in cases of disputes over unfair subsidies to an airline, after which, should talks fail, the complaining country would be able to suspend or revoke the airline's air traffic rights and impose fines.

Gulf companies, such as Emirates, have already taken a firm stand[167] against the inclusion of such clauses in an Air Service Agreements stating that the clauses in force and Regulation 868/2004 are sufficient tools to ensure fair and equal competition.

## 6.3. EU Competition Issues

### DG COMP Decision Trends on State Aid to Airports

## Principles set by the Aviation Guidelines

The underlying objective of the Aviation Guidelines is to ensure that any public investment is used to finance the construction of viable airports meeting the demand of airlines and passengers.

In particular, duplication of unprofitable airports in the same catchment area and creation of additional unused capacity should be avoided.

Moreover, granting of operating aid to airports should be phased out after a 10-year transitional period, leaving in place only airports being able to finance their operations from their own resources

At the same time, the Aviation Guidelines aim at taking account of certain considerations such as the poor accessibility of certain regions, the need for local development or the fact that smaller airports need greater public financing.

On that basis, the Commission will accept investment aid to airports which meet certain conditions. By the same token, operating aid to airports will also be accepted at certain conditions, until April 2024. The Commission will reassess the situation of airports with annual passenger traffic of up to 700 000 by 2018 in order to decide whether and for how long they may receive further operating aid.

[167] Emirates, Airline and subsidy : our position, http://www.emirates.com/english/images/Airlines%20and%20subsidy%20-%20our%20position%20new_tcm233-845771.pdf

# Key DG COMP Decisions on State Aid to Airports

Table 35 Procedures for state aid to airports processed in 2015

| Case | Country | Parties | Opening | Closing | Decision |
|---|---|---|---|---|---|
| SA.35388 | Poland | Setting up the Gdynia-Kosakowo Airport | 02/07/2013 | 26/02/2015 | NDR |
| SA.38936 | France | Régime d'aide à l'exploitation des petits et moyens aéroports français | 20/06/2014 | 08/04/2015 | NRO |
| SA.38937 | France | Régime d'aide à l'investissement des petits et moyens aéroports français | 20/06/2014 | 12/06/2015 | NRO |
| SA.39757 | Ireland | Ireland support scheme for aid for regional airports | 05/11/2014 | 31/07/2015 | NRO |
| SA.39315 | Estonia | Tallinn Airport airside area development project | 06/08/2014 | 10/11/2015 | NRO |
| SA.40433 | Austria | Investitionsprogramm Flughafen Klagenfurt | 01/01/2015 | 06/11/2015 | NRO |
| SA.33769 | Romania | Târgu Mureş Airport, Wizz Air and Ryanair | 31/07/2015 | On-going | |
| SA.32963 | Romania | Cluj-Napoca Airport: Aid to Wizz Air | 31/07/2015 | On-going | |
| SA.29064 | Ireland | Unlawful State aid by Ireland to Aer Lingus, Aer Arann and Dublin Airport Authority | 28/09/2015 | On-going | |

*NDR = Negative Decision with recovery - NRO = Decision not to raise objections*

Source: EC Decision

## Poland: Setting up the Gdynia-Kosakowo Airport (SA.35388)[168]

In February 2014, the Commission concluded that the public funding aimed at setting up Gdynia Kosakowo Airport, a new airport, around 25 km from Gdansk airport (north Poland), provided by the city of Gdynia and the municipality of Kosakowo constituted incompatible State aid. The Commission ordered Poland to recover PLN 91.7 million (around EUR. 21.8 million) illegally granted by the municipalities. Following arguments presented by Poland in the Court proceedings, on 26 February 2015, the Commission readopted the final decision on Gdynia-Kosakowo Airport excluding from the recovery amount a part of public financing that had been spent on activities related to public policy remit (fire brigade, security, police etc.).

An action for annulment of the decision brought by the municipalities of Gdynia and Kosakovo and by the airport operator is currently pending in front of the General Court[169].

[168] Commission decision of 26 February 2015 on the measure SA.35388 (2013/C) (ex 2013/NN and ex 2012/N) – Poland - Setting up the Gdynia-Kosakowo airport, C (2015) 1281 final, http://ec.europa.eu/competition/state_aid/cases/249231/249231_1654141_224_2.pdf.

[169] Action brought on 15 May 2015 — Gmina Miasto Gdynia and Port Lotniczy Gdynia Kosakowo v Commission, OJ C 254 from 03.08.2015, p.16, http://curia.europa.eu/juris/document/document.jsf?text=&docid=166264&pageIndex=0&doclang=EN&mode=lst&dir=&occ=first&part=1&cid=569496.

France : Régimes d'aide à l'exploitation des petits et moyens aéroports français et d'aide à l'investissement des Aéroports Français (SA.38936[170]; SA.38937[171])

On 8 April 2015, the Commission approved two aid schemes notified by France concerned investment aid and operating aid to airports. The schemes were notified on 20 June 2014.

The investment and operating aid schemes concern all French airports of less than 3 million passengers annually. In 2012, there were 77 such airports in France, of which 67 served less than 1 million passengers a year. No aid can be granted where there are other airports in the same catchment area, meaning at less than 100km or 60 minutes travelling time by car, bus, train or high-speed train.[172]

The amount of operating aid for airports with up to 700,000 passengers per annum will be 80% of the initial operating funding gap. For other airports, the maximum permissible aid amount will be limited to 50% of the initial funding gap for a period of 10 years.

The schemes, which have been approved for a period of 10 years, enable France to grant individual aid that complies with the criteria laid down in the Aviation Guidelines without further intervention by the Commission. In order to ensure that France complies fully with the Aviation Guidelines, monitoring arrangements, in a form of annual reports on the application of the schemes, were put in place.

Ireland: Support scheme for operating and investment aid for regional airports (SA.39757)[173]

On 15 April 2015, the Irish authorities notified to the Commission two aid schemes which aim to provide support for regional airports in Ireland. The two notified schemes form part of Ireland's "Regional Airports Programme 2015 - 2019".

Four Irish airports are eligible for the notified aid schemes: Donegal, Waterford, Kerry and Ireland West Airport Knock ("IWAK"). The four airports are spread out geographically. Each airport is situated at least 100km and 1-hour drive from another Irish airport. The biggest airport, IWAK, served 665,400 passengers in 2013, 703,700 passengers in 2014 and 684,700 in 2015, while the smallest one, Waterford, served 28,200 passengers in 2013, 35,200 passengers in 2014 and 36.300 in 2015[174]. Ireland considers that these airports play an important role for the connectivity of its citizens with the rest of Europe. Currently, they are focused on bringing in tourism and ensuring international connectivity.

The Commission has decided that the notified schemes fulfil the conditions set in points 83 to 137 of the Guidelines[175] and that they are compatible with the internal market pursuant to Article 107(3)(c) TFEU. Now that the schemes have been approved, the funds can be allocated across the eligible airports.

[170] Commission decision of 8 April 2015 on the measure SA.38936 (2014/N) – France - Régime d'aide à l'exploitation des aéroports français, C (2015) 2267 final, http://ec.europa.eu/competition/state_aid/cases/253205/253205_1659696_111_2.pdf

[171] Commission decision of 8 April 2015 on the measure SA.38937 (2014/N) – France - Régime d'aide à l'investissement des aéroports français, C (2015) 2270 final, http://ec.europa.eu/competition/state_aid/cases/253206/253206_1659697_128_2.pdf

[172] Commission decision of 8 April 2015 on the measure SA.38936 (2014/N), *op.cit*., para. 6-23 and Commission decision of 8 April 2015 on the measure SA.38937 (2014/N), *op.cit*., para. 6-21.

[173] State aid SA.39757 (2015/N) –Ireland –Regional Airports Programme 2015 –2019, C (2015) 5311 final, http://ec.europa.eu/competition/state_aid/cases/258116/258116_1676549_114_2.pdf.

[174] ACI World Monthly Traffic Reports, Sabre ADI, Central Statistics Office (CSO) of Ireland

[175] Communication from the Commission - Guidelines on State aid to airports and airlines, OJ C 99, 4.4.2014, *op.cit*., para. 83 to 137.

### Estonia: Airside Infrastructure Tallinn Airport (SA.39315)[176]

On 26 June 2015, the Estonian authorities notified a measure concerning the modernisation of the Tallinn airport's infrastructure

Tallinn airport is Estonia's busiest airport and the only airport with regular international air traffic. In 2013, it served around 2 million passengers. In 2014, 15 airlines operate at Tallinn airport, flying to 20 international destinations[177].

On 10 November 2015, the Commission has decided that the aid scheme to finance the modernisation of infrastructure at Tallinn airport fulfils the conditions set in point 79 of the Guidelines[178] and is compatible with the internal market pursuant to Article 107(3)(c) TFEU.

### Austria: Investitionsprogramm Flughafen Klagenfurt (SA.40433)[179]

On 14 April 2015, the Austrian authorities notified to the Commission planned public financing for the modernisation of Kärnten Airport in the Austrian Land Carinthia.

Kärnten airport is located in Carinthia, a mountainous region in the south of Austria, next to Klagenfurt, Carinthia's capital. The closest airport is that of Ljubljana in Slovenia, which is situated at 71km but more than 1-hour drive, due to the mountainous roads. The airport offers connections to major international airports, namely Vienna, Berlin, Hamburg and Cologne airports. In 2013-2014, the airport served around 200,000 passengers.[180]

The Commission has decided that the aid to finance the modernisation of infrastructure and equipment at Kärnten airport fulfils the conditions set in point 79 of the Guidelines[181] and is compatible with the internal market pursuant to Article 107(3)(c) TFEU.

### Romania: Cluj-Napoca Airport: Aid to Wizz Air (SA.32963)[182]

On 4 May 2011, the Commission received a complaint concerning the potential granting of illegal State aid to Wizz Air at Cluj - Napoca Airport. On 31 July 2015, the Commission decided to initiate a formal investigation procedure[183], which is still on-going.

The measures subject to the investigation concern:

- agreements between Cluj-Napoca airport and Wizz Air concluded between 2007 and 2010, which grant Wizz Air remuneration for providing advertising services to the Cluj region, subject to various conditions related to the presence and scale of operations of Wizz Air at Cluj airport, and which set terms for ground handling services provided by the airport to Wizz Air;

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[176] State aid SA.39315 (2015/N) – Estonia Investment in airside infrastructure at Tallinn airport, C (2015) 7700 final, http://ec.europa.eu/competition/state_aid/cases/259256/259256_1706255_53_2.pdf.

[177] *Ibid*., para. 3-13.

[178] Communication from the Commission - Guidelines on State aid to airports and airlines, OJ C 99, 4.4.2014, *op.cit*., para. 79.

[179] State aid SA.40433 (2015/N) – Austria. Investment Programme Kärnten Airport, Klagenfurt, C( 2015) 7569 final, http://ec.europa.eu/competition/state_aid/cases/258091/258091_1710939_186_2.pdf.

[180] *Ibid*., para. 4-33.

[181] Communication from the Commission - Guidelines on State aid to airports and airlines, OJ C 99, 4.4.2014, *op.cit*., para. 79.

[182] State aid SA.32963 (2012/NN) (ex 2011/CP) –Romania State aid to Wizz Air and Cluj-Napoca Airport, C (2015) 5346 final, http://ec.europa.eu/competition/state_aid/cases/260004/260004_1733089_51_2.pdf.

[183] State aid SA.32963 (2012/NN) (ex 2011/CP) –Romania State aid to Wizz Air and Cluj-Napoca Airport, C (2015) 5346 final, http://ec.europa.eu/competition/state_aid/cases/260004/260004_1733089_51_2.pdf.

- various subsidies from local authorities over the period 2010 – 2014 to Cluj-Napoca airport to cover capital and operating costs[184].

#### Romania: Târgu Mureş Airport, Wizz Air and Ryanair (SA.33769)[185]

On 13 October 2011, the Commission received a complaint concerning the potential granting of illegal State aid to Wizz Air at Târgu Mureş airport. On 31 July 2016, the Commission decided to initiate a formal investigation procedure[186], which is still on-going.

The measures subject to the investigation concern:

- airport charges at Târgu Mureş airport that seem abnormally low and involve significant discounts linked to traffic level, mainly benefitting Wizz Air but also Ryanair and other airlines operating at that airport;
- various subsidies received by the airport from local authorities since 2011, in the form of an incorrect entrustment of the SGEI duties to the airport used to finance the loss created by low airport charges, and of the financing of ground handling equipment, and car parking facilities[187].

### Ireland: Unlawful State aid by Ireland to Aer Lingus, Aer Arann and Dublin Airport Authority (SA.29064)[188]

On 30 March 2009, Ireland introduced a tax to be paid by airlines for each departing passenger. Ryanair lodged a complaint regarding the alleged unlawful and illegal State aid through five measures connected with the air travel tax. After a preliminary investigation, the Commission found that four of the alleged aid measures, including the non-application of the air travel tax to transfer and transit passengers, did not constitute State aid. The decision was adopted on 13 July 2011 and it was challenged before the General Court by Ryanair.

In 2014, the General Court annulled the decision on purely procedural grounds, with respect to the exemption for transit and transfer passengers[189]. The Court found the duration of the preliminary investigation too long and concluded that a formal investigation procedure should have been opened.

In order to comply with the judgment in Case T-512/11, the Commission opened the formal investigation procedure on the exemption for transfer and transit passengers on 28 September 2015. The investigation is still on-going.

### Analysis in light of the Aviation Guidelines Principles regarding Aid to Airports

In accordance with the Aviation Guidelines, the Commission analyses each case in light of the list of criteria contained in points 79 (all aid measures), 83 to 111 (investment aid) and 112 to 137 (operating aid) of the Guidelines.

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[184] *Ibid*., para. 21-47; European Commission - Press release, Brussels, 31 July 2015, State aid: Commission opens in-depth investigations into Romanian measures in favour of two airports and airlines, http://europa.eu/rapid/press-release_IP-15-5458_en.htm.

[185] State aid SA.33769 (2015/NN) (ex-2011/CP) –Romania –Alleged aid to Târgu Mureş Transilvania Airport, Wizz Air, Ryanair and other airlines, C (2015) 5347 Final, http://ec.europa.eu/competition/state_aid/cases/260005/260005_1733087_31_2.pdf.

[186] State aid SA.32963 (2012/NN) (ex 2011/CP) –Romania State aid to Wizz Air and Cluj-Napoca Airport, C (2015) 5346 final, http://ec.europa.eu/competition/state_aid/cases/260004/260004_1733089_51_2.pdf.

[187] *Ibid*., para. 30-72; European Commission - Press release, Brussels, 31 July 2015, State aid: Commission opens in-depth investigations into Romanian measures in favour of two airports and airlines, http://europa.eu/rapid/press-release_IP-15-5458_en.htm.

[188] State aid SA.29064 (2015/C) (ex 2011/NN) — Air Transport — Exemption from air passenger tax http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52016XC0617%2804%29&from=EN

[189] Case T-512/11 *Ryanair v Commission* ECLI:EU:T:2014:989.

Consequently, each criterion has been applied by the Commission as follows.

### The aid/scheme contributes to a well-defined objective of common interest

In accordance with the Aviation Guidelines, investment and operating aid to airports will be considered to contribute to the achievement of an objective of common interest where it:

- increases the mobility of Union citizens and the connectivity of the regions by establishing access points for intra-Union flights; or
- combats air traffic congestion at major Union hub airports; or
- facilitates regional development190.

In addition as regards investment aid, when the investment aid aims at creating a new airport capacity, the new infrastructure must, in the medium-term, meet the forecasted demand of the airlines, passengers and freight forwarders in the catchment area of the airport, without diminishing the medium-term prospects for use of existing infrastructure in the catchment area[191].

Moreover as regards operating aid, where an airport is located in the same catchment area as another airport with spare capacity the Commission will have doubts as to the prospects for the first airport to achieve full operating cost coverage at the end of the transitional period. To avoid any unnecessary duplication, the business plan, based on sound passenger and freight traffic forecasts, must identify the likely effect on the traffic of the other airport located in that catchment area.

In applying this criterion, the Commission has accepted that an aid contributes to a well-defined objective of common interest for the following grounds put forward by Member States:

- the aid will improve the accessibility of the region in a sustainable way, since the airport plays an important role in the country's transportation system and economy192;
- there are no other airports located in the same catchment area or the airports serve different markets193;
- without the investment, the airport risks closure, while it is essential for the economy of the province in which it is situated194;
- the aid schemes aim at optimising the country's airport network, fighting saturation of the big national airports, developing European transregional air connections and regional economy.195

### The need for State Intervention

In accordance with the Aviation Guidelines, State intervention to finance infrastructure investments will be considered needed where the annual passenger traffic is less than 3 million passengers and, where the annual passenger traffic is above 3 and up to 5 million, only under certain case-specific circumstances[196].

As regards operating aid, State intervention will be considered need where the annual traffic of the airport does not exceed 3 million passengers[197].

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[190] Communication from the Commission - Guidelines on State aid to airports and airlines, OJ C 99, 4.4.2014, *op.cit.*, para. 84.

[191] *Ibid.*, para. 85.

[192] SA.39315 Estonia, airside infrastructure Tallinn airport, *op.cit.*, para. 46-48.

[193] SA.39757 Ireland, Regional airports programme 2015-2019, *op.cit.*, para. 54-62 and 96-101.

[194] SA.40433 Austria, Investitionsprogramm Flughafen Klagenfurt, *op.cit.*, para. 53-58.

[195] SA.38937 – France, Régime d'aide à l'investissement des aéroports français, *op.cit.*, para.33-40 and SA.38936 – France, Régime d'aide à l'exploitation des aéroports français, *op.cit.*, para. 35-42.

[196] Communication from the Commission - Guidelines on State aid to airports and airlines, OJ C 99, 4.4.2014, *op.cit.*, para. 89.

[197] *Ibid.*, para. 119.

The Commission has found a need for State intervention where:

- the aid will bring about a material improvement for the investment project that the market itself does not deliver given the high funding gap[198];
- the airports at stake would risk closure without the aid, while the aid aims at developing the airports to a viable size, allowing them to cover their own operational costs199;
- in absence of the aid, no financial institution or other investor would invest in the project200;
- the investment aid scheme corresponds to a real need201;

### Appropriateness of the Aid Measure

In accordance with the Aviation Guidelines, this criterion means that an aid measure will not be considered compatible with the internal market if other less distortive policy instruments or aid instruments allow the same objective to be reached[202].

For investment aid, where a Member State has considered other policy options and the use of a selective instrument, such as a direct grant, has been compared with less distortive forms of aid (such as loans, guarantees or repayable advances), the measures concerned are considered to constitute an appropriate instrument[203].

For operating aid to be considered appropriate, Member States are required to establish the aid amount *ex ante* as a fixed sum covering the expected operating funding gap (determined on the basis of an *ex ante* business plan) during a transitional period of 10 years, while no ex post increase of the aid amount should be possible. In exceptional circumstances the maximum amount of compatible operating aid can be granted (calculated on the basis of the initial operating funding gap)[204].

The Commission has considered aid measures to be appropriate where:

- subsidised interest rates, a loan at reduced interest rates or credit guarantees would not be sufficient for the implementation of the project since the revenue generated by the latter will not be sufficient even to cover the principal loan amount or would be too burdensome205;
- the amount of operating aid scheme is established ex ante by a fixed amount for each airport without it being possible to increase the aid ex post206;
- the French authorities committed to evaluate the possibility to use an instrument less selective than a direct subsidy, such as loans, guarantees or repayable advances, and to choose the less distortive form of aid207.

### Incentive Effect

In accordance with the Aviation Guidelines, this criterion is only fulfilled as regards investment aid where works on an individual investment can start only after an application has been submitted to the granting

[198] SA.39315 Estonia, airside infrastructure Tallinn airport, *op.cit*., para. 49-52.

[199] SA.39757 Ireland, Regional airports programme 2015-2019, *op.cit*., para. 102-106.

[200] SA.40433 Austria, Investitionsprogramm Flughafen Klagenfurt, *op.cit*., para. 59-64.

[201] SA.38937 – France, Régime d'aide à l'investissement des aéroports français, *op.cit*., para. 41-42.

[202] Communication from the Commission - Guidelines on State aid to airports and airlines, OJ C 99, 4.4.2014, *op.cit*., para. 90 and 120.

[203] *Ibid*., para. 91.

[204] *Ibid*., para. 120-122.

[205] SA.39315 Estonia, airside infrastructure Tallinn airport, *op.cit*., para. 53-55; SA.40433 Austria, Investitionsprogramm Flughafen Klagenfurt, *op.cit*., para. 65-67; SA.39757 Ireland, Regional airports programme 2015-2019, *op.cit*., para. 107-109.

[206] SA.39757 Ireland, Regional airports programme 2015-2019, *op.cit*., para. 67-73.

[207] SA.38937 – France, Régime d'aide à l'investissement des aéroports français, *op.cit*., para.43-46 and SA.38936 – France, Régime d'aide à l'exploitation des aéroports français, *op.cit*., para. 46-49.

authority and where the investment would not have been undertaken or would not have been undertaken to the same extent without any State aid[208].

As regards operating aid, this criterion is fulfilled if it is likely that, in the absence of the operating aid, the level of economic activity of the airport concerned would be significantly reduced[209].

The Commission has considered that there is an incentive effect where:

- a profit-driven airport operator would not finance EUR70 million investment in airside infrastructure without aid210 or the airport operator would not undertake the modernisation of the airport in the absence of the aid in question211;
- in the absence of operating aid, the level of economic activity of the airport would be seriously endangered212;
- for projects to be funded under an investment aid scheme, work can begin only after obtaining permission for payment of aid to the competent authority213, all the more so if a counterfactual analysis is foreseen in the business plan and the aid is restricted to the cases of creation of new infrastructure or the improvement of existing airport capacity214;
- the public authority guarantees that the requirements regarding the incentive effect of operating aid are fulfilled215.

### Proportionality of the Aid Amount

In accordance with the Aviation Guidelines, the maximum permissible amount of investment aid is expressed as a percentage of the eligible costs as follows:

- Up to 75% for airports with less than 1 million average passenger traffic, with average traffic determined on the basis of the inbound and outbound passenger traffic during the two financial years preceding that in which the aid is notified or granted in the case of non-notified aid;
- Up to 50% for airports with 1 million to 3 million average passenger traffic;
- Up to 25% for airports with more than 3 million to 5 million average passenger traffic216.

Those numbers can be increased by 20% for airports located in remote regions, irrespective of their size[217].

As regards operating aid, the maximum permissible aid amount during the whole transitional period will be limited to 50% of the initial funding gap for a period of 10 years starting from 4 April 2014, except for airports with average passenger traffic of less than 700.000 passengers, in which case the maximum permissible aid amount will be 80% of the initial operating funding gap for a period of five years, after which the need for a specific treatment will be reassessed by the Commission for the 5 remaining years[218].

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[208] Communication from the Commission - Guidelines on State aid to airports and airlines, OJ C 99, 4.4.2014, *op.cit*., para. 93-94.

[209] *Ibid*., para. 124.

[210] SA.39315 Estonia, airside infrastructure Tallinn airport, *op.cit*., para. 56-60.

[211] SA.40433 Austria, Investitionsprogramm Flughafen Klagenfurt, *op.cit*., para. 68-75.

[212] SA.39757 Ireland, Regional airports programme 2015-2019, *op.cit*., para. 74-77.

[213] *Ibid*., para. 110-113.

[214] SA.38937 – France, Régime d'aide à l'investissement des aéroports français, *op.cit*., para. 47-49.

[215] SA.38936 – France, Régime d'aide à l'exploitation des aéroports français, *op.cit*., para. 50-52.

[216] Communication from the Commission - Guidelines on State aid to airports and airlines, OJ C 99, 4.4.2014, *op.cit*., para. 97-101.

[217] *Ibid*., para. 102-103.

[218] *Ibid*., para. 127-129.

The Commission has considered proportional the following aid scheme amounts:

- 50% of the total investment amount where the aid amount does not exceed the general funding gap of the total investments in airport infrastructure219;
- 80% of the initial funding gap and then 50% of the initial operating funding gap, with the obligation for the airports to submit annual reports of the evidence of progress towards being viable without operating support220;
- amounts allowing operating costs to be fully covered without State aid at the end of the transitional period for airports of more than 700,000 passengers a year as demonstrated by a business plan, while for airports of less than 700,000 passengers the Commission will reassess the future prospects for full operating cost coverage for this category of airports221.

### Absence of undue negative effects on competition and trade between Member States

In accordance with the Aviation Guidelines, in order for this criterion to be fulfilled, the airport must not be located in the same catchment area as another airport with spare capacity[222].

However, as regards operating aid, the aid for an airport in the same catchment area can be considered compatible with the internal market only when the Member State demonstrates that all airports in the same catchment area will be able to achieve full operating cost coverage at the end of the transitional period[223].

Additionally, both for investment and operating aid, the airport must be open to all potential users and must not be dedicated to one specific user[224].

The Commission has found that undue negative effects on competition and trade are absent where:

- the airport is relatively small a significant competitive threat to other airports being therefore unlikely[225];
- the airports subject to the scheme are located at least 100km or 60 minutes' drive from another commercial airport, and are open to all potential users without discrimination[226];
- the airport is open to all potential users without discrimination[227] and no aid will be granted in the areas where there are no prospects for development or where there is a significant negative impact for the airports in the same catchment area[228].

[219] SA.39315 Estonia, airside infrastructure Tallinn airport, *op.cit*., para. 61-71; SA.40433 Austria, Investitionsprogramm Flughafen Klagenfurt, *op.cit*., para. 76-84.

[220] SA.39757 Ireland, Regional airports programme 2015-2019, *op.cit*., para. 78-85.

[221] SA.38936 – France, Régime d'aide à l'exploitation des aéroports français, *op.cit*., para. 53-57.

[222] Communication from the Commission - Guidelines on State aid to airports and airlines, OJ C 99, 4.4.2014, *op.cit*., para. 106 and 131.

[223] Communication from the Commission - Guidelines on State aid to airports and airlines, OJ C 99, 4.4.2014, *op.cit*., para. 132.

[224] *Ibid*., para. 108 and 133.

[225] SA.39315 Estonia, airside infrastructure Tallinn airport, *op.cit*., para. 72-81.

[226] SA.39757 Ireland, Regional airports programme 2015-2019, *op.cit*., para. 86-89 and 117-121.

[227] SA.40433 Austria, Investitionsprogramm Flughafen Klagenfurt, *op.cit*., para. 85-90.

[228] SA.38937 – France, Régime d'aide à l'investissement des aéroports français, *op.cit*., para. 52-57 and SA.38936 – France, Régime d'aide à l'exploitation des aéroports français, *op.cit*., para. 58-64.

# DG Comp Decision Trends on Start-up Aid to Airlines

## Principles set by the Aviation Guidelines Regarding Start-up Aid to Airlines

In line with the policy objective regarding airports, the underlying objective of the Aviation Guidelines regarding start-up aid to airlines is to ensure that the allocation of airport capacity to airlines gradually becomes more efficient, i.e. demand-oriented.

Start-up aid may be granted where it increases the mobility of Union citizens and the connectivity of the regions by opening new routes; or facilitates regional development of remote regions.

However, the grant of start-up aid is subject to the conditions set out in points 141-155 of the Aviation Guidelines.

## Key DG COMP Decisions on Start-up Aid to Airlines

Table 36 Procedures for start-up aid processed in 2015

| Case | Country | Parties | Notif. | Closing | Dec. |
|---|---|---|---|---|---|
| SA.38938 | France | Régime d'aide au démarrage des compagnies aériennes | 20/06/2014 | 08/04/2015 | NRO |
| SA.39466 | UK | Start-up aid to airlines operating in the United Kingdom | 05/09/2014 | 31/07/2015 | NRO |
| SA.40744 | Italy | Trapani airport start-up aid | 29/01/2015 | 12/10/2015 | NRO |
| SA.40605 | Lithuania | Start-up aid for flights from regional airport | 20/01/2015 | 22/04/2016 | NRO |
| SA.41815 | Italy | Start-up aid for new routes from/to the airport of Comiso | 08/05/2015 | 23/03/2016 | NRO |
| | | *NRO = Decision not to raise objections* | | | |

Source: EC Decision

### France: Regime d'aide au Démarrage des Companies Aériennes (SA.38938)[229]

On 20 June 2014, the French authorities notified to the Commission a start-up aid scheme for new routes.

The aid scheme amounts to a total of EUR135 million for a period of 9 years, designed to cover 50% of airport charges over a three-year period, the intensity being possibly variable (for instance: 75% the first year, 50% the second year and 25% the third year). The aid can only be granted for new routes serving airports of less than 3 million passengers per annum which do not enter in competition with routes from existing airports in the same catchment area[230].

The Commission has decided that the notified scheme fulfils the conditions set out in points 138 to 155 of the Aviation Guidelines[231] and is therefore compatible with the internal market based on Article 107 (3)(c) TFEU, on the condition that the French authorities communicate to the Commission an annual report on the application of the scheme.

[229] SA.39938 – France, Régime au démarrage de nouvelles lignes aériennes au départ des aéroports français, C (2015) 2271 final, http://ec.europa.eu/competition/state_aid/cases/253207/253207_1659698_124_2.pdf.

[230] *Ibid.*, para. 3-21.

[231] Communication from the Commission - Guidelines on State aid to airports and airlines, OJ C 99, 4.4.2014, *op.cit.*, para. 83 to 137.

### UK: Start-up Aid to Airlines Operating in the UK (SA.39466)[232]

On 10 April 2015, the UK authorities notified to the Commission an aid scheme aiming at providing support for the opening of new air passenger transport services connecting certain UK airports to other airports in the Common European Aviation Area (CEAA).

The start-up aid scheme will cover up to 50% of airport charges incurred in operating the new route, from 1 September 2015 to 31 March 2019, for new routes between UK airports with less than 3 million passengers a year and airports located in the CEAA[233].

The Commission has decided not to raise objections against that aid scheme since it is compatible with the internal market based on Article 107 (3)(c) TFEU.

### Italy: Start-up Aid to Airlines from Trapani Airport (SA.40744)[234]

On 29 January 2015, the Italian authorities notified to the Commission an aid measure aiming at providing support for the opening of new air passenger transport services connecting Trapani-Birgi Airport in Sicily with national destinations and other airports in the Union.

The start-up aid concerns new routes from Trapani airport to destinations which have to fulfil certain criteria, without any geographical limit. The average annual traffic at the airport is below 2 million passengers. The aid will cover up to 50% of airport charges incurred in operating the new route, for a 3 year period.[235]

The Commission has decided that the notified scheme fulfils the conditions set in points 138 to 155 of the Guidelines[236] and is therefore compatible with the internal market based on Article 107 (3)(c) TFEU.

### Lithuania: Start-up aid for flights from regional airports (SA.40605)[237]

On 15 December 2015, the Lithuanian authorities notified to the Commission an aid scheme aiming to provide support for the opening of new air passenger transport services connecting Lithuanian airports to other airports in the CEAA.

The start-up aid concerns new routes from 3 airports: Vilnius, Kaunas and Palanga. The average annual traffic at all three airports is below 3M passengers. The aid is granted for a maximum period of 3 years for new routes to airports located in the CEAA. The aid will cover up to 50% of airport charges incurred on a specific route for a 3-year period.[238]

The Commission has decided that the notified scheme fulfils the conditions set in points 138 to 155 of the Guidelines[239] and is therefore compatible with the internal market based on Article 107 (3)(c) TFEU.

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[232] State aid SA.39466 (2015/N) –United Kingdom –Start-up aid to airlines operating in the United Kingdom, C (2015) 5254 final, http://ec.europa.eu/competition/state_aid/cases/258034/258034_1678164_84_3.pdf.

[233] *Ibid*., para. 3-40.

[234] State Aid SA.40744 (2015/N) – Italy Start-up aid to airlines operating from Trapani airport, C (2015), http://ec.europa.eu/competition/state_aid/cases/256645/256645_1745683_124_2.pdf.

[235] *Ibid*., para. 4-29.

[236] Communication from the Commission - Guidelines on State aid to airports and airlines, OJ C 99, 4.4.2014, *op.cit*., para. 83 to 137.

[237] State aid SA.40605 (2015/N) – Lithuania – Start-up aid for flights from regional airports, C (2016) 2314 final, http://ec.europa.eu/competition/state_aid/cases/261836/261836_1764438_62_2.pdf.

[238] *Ibid*., para. 3-37.

[239] Communication from the Commission - Guidelines on State aid to airports and airlines, OJ C 99, 4.4.2014, *op.cit*., para. 83 to 137.

### Italy: Start-up Aid for New Routes from/to the Airport of Comiso (SA.41815)[240]

On 8 May 2015, the Italian authorities notified the Commission an aid scheme aiming to provide support for the opening of new air passenger transport services from the airport 'Pio La Torre' in Comiso, Sicily.

The start-up aid concerns new routes from Comiso airport to Spain, Germany, France and the UK. The average annual traffic at the airport is below 400,000 passengers. The aid will cover up to 50% of airport charges incurred in operating the new route, for a 2-year period.[241]

The Commission has decided that the notified scheme fulfils the conditions set in points 138 to 155 of the Guidelines[242] and is therefore compatible with the internal market based on Article 107 (3)(c) TFEU.

#### Analysis in light of the Aviation Guidelines

##### Principles regarding Start-up Aid

In accordance with the Aviation Guidelines, the Commission analyses each case in light of the list of criteria set out in points 138-155 of the Aviation Guidelines.

Consequently, each criterion has been applied by the Commission as follows.

##### The Aid/Scheme Contributes to a well-defined Objective of Common Interest

In accordance with the Aviation Guidelines, start-up aid to airlines will be considered to contribute to a well-defined objective of common interest where:

- it increases the mobility of Union citizens and the connectivity of the regions by opening new routes; or
- it facilitates regional development; and
- the new route is not already operated by a high-speed rail service or from another airport in the same catchment area under comparable conditions[243].

In applying this criterion, the Commission has accepted that start-up aid contributes to a well-defined objective of common interest when:

- the aid encourages airlines to launch new routes from airports with fewer than 3 million passengers, while it will not duplicate high-speed rail services or an existing air service in the same catchment area[244];
- the objectives of the start-up aid are to improve the connectivity of the region, in particular a remote region, within the meaning of the Aviation Guidelines, and to facilitate its economic development, while there will be no duplication of high-speed rail services or an existing air service in the same catchment area[245].

##### The need for State Intervention

[240] State aid SA.41815 (2015/N) – Italy Start-up aid for new routes from/to the airport of Comiso (city), C (2016) 1680, http://ec.europa.eu/competition/state_aid/cases/258485/258485_1747696_117_2.pdf.

[241] State aid SA.41815 (2015/N) – Italy Start-up aid for new routes from/to the airport of Comiso (city), *op. cit.*, para. 3-24.

[242] Communication from the Commission - Guidelines on State aid to airports and airlines, OJ C 99, 4.4.2014, *op.cit.*, para. 83 to 137.

[243] Communication from the Commission - Guidelines on State aid to airports and airlines, OJ C 99, 4.4.2014, *op.cit.*, para. 139-140.

[244] State aid SA.39466 (2015/N) –United Kingdom –Start-up aid to airlines operating in the United Kingdom, *op.cit.*, para. 48-51; State aid SA.40605 (2015/N) – Lithuania – Start-up aid for flights from regional airports, *op.cit.*, para. 46-49.

[245] State aid SA.41815 (2015/N) – Italy Start-up aid for new routes from/to the airport of Comiso (city), *op. cit.*, para. 34-45; State Aid SA.40744 (2015/N) – Italy Start-up aid to airlines operating from Trapani airport, *op. cit.*, para. 41-45.

In accordance with the Aviation Guidelines, start-up aid will only fulfil this criterion for routes linking an airport with less than 3 million passengers per annum to another airport within the CEAA, except for routes linking an airport located in a remote region to another airport (within or outside the CEAA), which will be compatible irrespective of the size of the airports concerned[246].

In 2015 the Commission has approved five start-up aids. All the airports have less than 3 million passengers per annum[247].

### Appropriateness of State Aid as Policy Instrument

In accordance with the Aviation Guidelines, the fulfilment of this criterion requires that there are no less distortive policy instruments or aid instruments allowing the same objective to be reached. In addition, an *ex ante* business plan must be prepared by the airline, establishing that the route receiving the aid has prospects of becoming profitable for the airline without public funding after 3 years or, alternatively, the airlines must provide an irrevocable commitment to the airport to operate the route for a period at least equal to the period during which it received start-up aid[248].

The Commission has considered start-up aid to airlines to be appropriate where:

- the State opted for this support method after the failure of a previously approved start-up aid scheme under the old Guidelines, as the requirements of the latter were too strict to incentivise airlines to bid[249];
- the State opted for start-up aid after analysing various alternative ways to achieve the same objective[250] or where it explained that "*start-up aid is the most adequate means to encourage airlines to take the risk of operating new routes in the current market environment*"[251];
- the airport in question experienced a loss of commercial traffic a couple of years before[252];
- the start-up aid consists in reducing airport charges[253].

Finally, in all five decisions, the Commission also approved the proposed start-up aid because airlines are required to submit an *ex ante* business plan proving that the route has prospects of becoming profitable for the airline without public funding after 3 years [254].

### Existence of Incentive Effect

The Aviation Guidelines state that start-up aid has an incentive effect if it is likely that, in the absence of the aid, the level of economic activity of the airline at the airport concerned would not be expanded. The

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[246] Communication from the Commission - Guidelines on State aid to airports and airlines, OJ C 99, 4.4.2014, *op.cit*., para. 142-143.

[247] SA.39938 – France, Régime au démarrage de nouvelles lignes aériennes au départ des aéroports français, *op.cit*., para. 37-38 ; State aid SA.39466 (2015/N) –United Kingdom –Start-up aid to airlines operating in the United Kingdom, *op.cit*., para. 52; State aid SA.40605 (2015/N) – Lithuania – Start-up aid for flights from regional airports, *op.cit*., para. 50-51; State aid SA.41815 (2015/N) – Italy Start-up aid for new routes from/to the airport of Comiso (city), *op. cit*., para. 46-48; State Aid SA.40744 (2015/N) – Italy Start-up aid to airlines operating from Trapani airport, *op. cit.*, para. 46-48.

[248] Communication from the Commission - Guidelines on State aid to airports and airlines, OJ C 99, 4.4.2014, *op.cit*., para. 146-147.

[249] State aid SA.40605 (2015/N) – Lithuania – Start-up aid for flights from regional airports, *op.cit*., para. 52-55.

[250] State aid SA.39466 (2015/N) –United Kingdom –Start-up aid to airlines operating in the United Kingdom, *op.cit*., para. 53-54.

[251] State aid SA.41815 (2015/N) – Italy Start-up aid for new routes from/to the airport of Comiso (city), *op. cit.*, para. 49-52.

[252] State Aid SA.40744 (2015/N) – Italy Start-up aid to airlines operating from Trapani airport, *op. cit.*, para. 49-52.

[253] SA.39938 – France, Régime au démarrage de nouvelles lignes aériennes au départ des aéroports français, *op.cit*., para. 39-42.

[254] State aid SA.40605 (2015/N) – Lithuania – Start-up aid for flights from regional airports, *op.cit*., para. 52-55; State aid SA.39466 (2015/N) –United Kingdom –Start-up aid to airlines operating in the United Kingdom, *op.cit*., para. 53-54; State aid SA.41815 (2015/N) – Italy Start-up aid for new routes from/to the airport of Comiso (city), *op. cit*., para. 49-52; State Aid SA.40744 (2015/N) – Italy Start-up aid to airlines operating from Trapani airport, *op. cit.*, para. 49-52; SA.39938 – France, Régime au démarrage de nouvelles lignes aériennes au départ des aéroports français, *op.cit*., para. 39-42.

criterion can only be fulfilled if the new route has started after the application for aid has been submitted to the granting authority.[255]

Taking this into account, the Commission has concluded in four decisions to the existence of incentive effect based on the ground that the routes subject to the aid are not currently operated and are not planned by any airline, while they will only be launched following to the submission of the application for aid by the airline[256].

In one case (France), the Commission found it is sufficient for the State to guarantee that this criterion will be respected[257].

### Proportionality of the Aid Amount

Under the Aviation Guidelines, fulfilment of this criterion requires that the start-up aid covers a maximum of 50% of the airport charges in respect of the new route, those charges being the only eligible costs for aid, for a maximum period of three years[258].

In accordance with the Aviation Guidelines, the Commission has concluded to the respect of that criterion, in all five cases, based on the fact that the aid amount is limited to 50% of the airport charges for a maximum period of three years[259].

### Avoidance of Undue Negative Effects on Competition and Trade

In accordance with the Aviation Guidelines, undue negative effects on competition and trade will be avoided where three conditions are met:

- the new route is not already operated by a high-speed rail service or by another airport in the same catchment area under comparable conditions;
- adequate publicity in due time should be ensured by public authorities for the new route, in order to enable all interested airlines to offer their services;
- the aid must not be combined with any other type of State aid granted for the operation of a route[260].

The Commission concluded in all five decisions that the criterion is fulfilled on the grounds that the new routes will not result in a transfer of passengers from an existing route, the State has put into place adequate publicity of the call for tender, and the start-up aid will not be combined with other types of State aid granted for the operation of the same route[261].

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[255] Communication from the Commission - Guidelines on State aid to airports and airlines, OJ C 99, 4.4.2014, *op.cit.*, para. 148-149.

[256] State aid SA.40605 (2015/N) – Lithuania – Start-up aid for flights from regional airports, *op.cit.*, para. 56-60; State aid SA.39466 (2015/N) –United Kingdom –Start-up aid to airlines operating in the United Kingdom, *op.cit.*, para. 55-59; State aid SA.41815 (2015/N) – Italy Start-up aid for new routes from/to the airport of Comiso (city), *op. cit.*, para. 53-55; State Aid SA.40744 (2015/N) – Italy Start-up aid to airlines operating from Trapani airport, *op. cit.*, para. 53-57.

[257] SA.39938 – France, Régime au démarrage de nouvelles lignes aériennes au départ des aéroports français, *op.cit.*, para. 43-44.

[258] Communication from the Commission - Guidelines on State aid to airports and airlines, OJ C 99, 4.4.2014, *op.cit.*, para. 150.

[259] SA.39938 – France, Régime au démarrage de nouvelles lignes aériennes au départ des aéroports français, *op.cit.*, para. 45-46 ; State aid SA.40605 (2015/N) – Lithuania – Start-up aid for flights from regional airports, *op.cit.*, para. 61; State aid SA.39466 (2015/N) –United Kingdom –Start-up aid to airlines operating in the United Kingdom, *op.cit.*, para. 60; State aid SA.41815 (2015/N) – Italy Start-up aid for new routes from/to the airport of Comiso (city), *op. cit.*, para. 57-59; State Aid SA.40744 (2015/N) – Italy Start-up aid to airlines operating from Trapani airport, *op. cit.*, para. 58-60.

[260] Communication from the Commission - Guidelines on State aid to airports and airlines, OJ C 99, 4.4.2014, *op.cit.*, para. 151-155.

[261] SA.39938 – France, Régime au démarrage de nouvelles lignes aériennes au départ des aéroports français, *op.cit.*, para. 47-53; State aid SA.40605 (2015/N) – Lithuania – Start-up aid for flights from regional airports, *op.cit.*, para. 62-67; State aid SA.39466 (2015/N) –United Kingdom – Start-up aid to airlines operating in the United Kingdom, *op.cit.*, para. 61-66; State aid SA.41815 (2015/N) – Italy Start-up aid for new routes from/to the airport of Comiso (city), *op. cit.*, para. 60-64; State Aid SA.40744 (2015/N) – Italy Start-up aid to airlines operating from Trapani airport, *op. cit.*, para. 61-67.

## Key DG COMP Decisions on State Aid to Airlines

Table 37 DG COMP in-depth Investigation

| | Opening date | Closing date |
|---|---|---|
| Cyprus Airways | 06.03.13 | 09.01.15 |
| Estonian Air | 20.02.13 | 06.11.15 |

Source: EC Decision

### Cyprus Airways

On 9 January 2015, the Commission closed two in-depth investigations[262] into a number of public support measures provided by Cyprus in favour of Cyprus Airways, mainly by concluding[263] that the State aid granted to Cyprus Airways in 2012 violated the "one time last time" principle, insofar as the Cypriot state had already granted EUR95 million in restructuring aid to Cyprus Airways[264] in 2007.

According to recital 73 of the 2004 R&R Guidelines and recital 71 of the 2014 R&R Guidelines:

"*where less than 10 years have elapsed since the aid was granted or the restructuring period came to an end or implementation of the restructuring plan was halted (whichever occurred the latest), the Commission will not allow further aid pursuant to these guidelines*"[265].

This principle aims to avoid situations where firms are artificially kept alive only through repeated State interventions.

Further, the Commission also found that also other conditions for granting restructuring aid were not fulfilled. The proposed restructuring plan was based on unrealistic assumptions and did not restore the long-term viability of Cyprus Airways within a reasonable timescale. In addition, the plan did not limit the aid to the minimum since it did not include a sufficiently high, real and actual own contribution to the restructuring costs of Cyprus Airways.

Consequently, the Commission ordered Cyprus Airways to repay EUR65 million in aid deemed to have been granted unlawfully.

On 10 January 2015, Cyprus Airways announced it was ceasing operations.

[262] State aid SA.35888 (2013/C) (2013/NN) – Cyprus – Rescue aid for Cyprus Airways (Public) Ltd, C (2013)1163 final, http://ec.europa.eu/competition/state_aid/cases/247909/247909_1418834_24_2.pdf ; State aid SA.37220 (2014/C) (ex 2013/NN) – Cyprus – Restructuring aid for Cyprus Airways (Public) Ltd and SA.38225 (2014/C) (ex 2014/NN) Training aid for Cyprus Airways (Public) Ltd, C(2014) 470 final, http://ec.europa.eu/competition/state_aid/cases/251734/251734_1523566_55_2.pdf

[263] Commission Decision of 09.01.2015 on the state aid SA.35888 (2013/C) (ex 2013/NN)- SA.37220 (2014/C) (ex 2013/NN)- SA.38225 (2014/C) (ex 2013/NN) implemented by Cyprus for Cyprus Airways (Public) Ltd, C(2014) 9362 final, http://ec.europa.eu/competition/state_aid/cases/251734/251734_1631242_230_2.pdf

[264] Commission Decision of 7 March 2007, State aid C 10/06 (ex N555/05), Cyprus Airways Public Ltd — Restructuring plan, **http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2008.049.01.0025.01.ENG**

[265] Communication from the Commission – Community Guidelines on State aid for rescuing and restructuring firms in difficulty, *op. cit.*, para. 3.3; Communication from the Commission - Guidelines on State aid for rescuing and restructuring non-financial undertakings in difficulty, *op. cit.*, para. 70.

## Estonian Air

On 20 February 2013, the European Commission opened an in-depth investigation[266] to verify whether Estonia's plan to grant a rescue loan of EUR8.3 million to Estonian Air, is in line with EU state aid rules.

On 4 February 2014, the Commission opened a second in-depth investigation[267] to verify whether the plan of Estonia (notified in June 2013) to grant EUR40.7 million State aid for the restructuring of Estonian Air is in line with EU state aid rules.

On 6 November 2015, the Commission adopted one final decision closing both these in-depth investigations.

### Estonia: Measures Implemented in favour of Estonian Air (SA.35956)[268]

The first in-depth investigation concerned five measures implemented in favour of Estonian Air between 2009 and 2014. The first two measures (a capital increase by the State of EUR2.48 million in February 2009 and a sale of ground-handling section of Estonian Air to the State-owned Tallinn Airport for EUR2.4 million in June 2009) were found to be conducted in line with market conditions and thus not involving State aid. The three remaining measures constituted State aid in the total amount of EUR84.9M.

The first measure is a State capital injection of EUR17.9 million on 10 November 2010. The capital was used for pre-payments of Bombardier CRJ900 aircraft as well as to partly cover a total net loss in 2011 of EUR17.3 million.

The second measure is capital increase of Estonia's participation in the airline for a total amount of EUR30 million. The capital injection took place on 20 December 2011 for EUR15 million and on 6 March 2012 for the same amount. As a consequence, the stake of Estonia in Estonia air rose to 97.34%. The objective of the measure was to improve the airline's competitiveness through a bigger network and more frequencies.

The third measure concerns a rescue loan facility of a total amount of EUR37 million. A first tranche of EUR8.3 million was provided by Estonia between 20 December 2012 and 11 February 2013. On 5 March 2013, a rescue loan increase led to granting an additional EUR16.6 million to Estonian Air, as well as a last tranche of EUR12.1 million on 28 November 2014. The objective of that measure was to cover the losses of Estonian Air. Those losses amounted to EUR14.9 million in mid-2012, while liquidity problems continued in 2013 and 2014.

Those measures were all notified by Estonia to the Commission on 3 December 2012. On 4 March 2013, Estonia as well informed the Commission of its decision to increase the amount of the rescue loan facility. Since the Commission only took its decision on 6 November 2015, the standstill obligation has not been respected for those three measures.

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[266] State aid SA.35956 (2013/C) (ex 2013/NN) (ex 2012/N) – Estonia - Rescue aid to Estonian Air, C (2013) 775 final, http://ec.europa.eu/competition/state_aid/cases/247780/247780_1426512_104_2.pdf

[267] State aid SA.36868 (2014/C)(ex 2013/N) – Estonia - Restructuring aid to Estonian Air, C (2014) 459 final, http://ec.europa.eu/competition/state_aid/cases/251732/251732_1535769_42_2.pdf

[268] Commission decision of 6.11.2015 on the measures SA.35956 (2013/C) (ex 2013/NN) (ex 2012/N) implemented by Estonia for AS Estonian Air and on the measures SA.36868 (2014/C)(ex 2013/N) which Estonia is planning to implement for AS Estonian Air, C (2015) 7470 final, **http://ec.europa.eu/competition/state_aid/cases/247780/247780_1730087_223_2.pdf**.

### Estonia: Measures Planned in favour of Estonian Air (SA. 36868)[269]

The second in-depth investigation concerned a planned restructuring aid of EUR40.7 million in the form of a State capital increase, based on a restructuring plan for a five-year period, from 2013 to 2017.

This plan was aiming at a return to viability by 2016 through measures such as decrease of fleet size, route network, and staff, implementation of new pricing model and reorganisation of the senior management team. The plan was also foreseeing compensatory measures.

On 31 October 2014, Estonia substantially modified the restructuring plan, among others by planning acquisition of Estonian Air by a private investor and by extending the restructuring period and moving it backwards from November 2010 to November 2016, thereby aiming to capture as restructuring aid also the aid measures of case SA.35956. However, the Commission did not accept the modified restructuring plan as a basis for assessing all the measures as part of a single restructuring package. The backward extension of the restructuring period brought about by the modified plan would effectively mean that three distinct and even opposing business strategies would be combined into a single restructuring period. In line with decision-making practice of the Commission[270], the measures covered thus could not be considered as part of a restructuring continuum to be assessed as one restructuring operation.

#### Legal Considerations

The Commission analyses all the measures in light of the 2004 Guidelines on State aid for rescuing and restructuring firms in difficulty ("the 2004 R&R Guidelines")[271], except for the third measure of case SA.35956 (rescue loan facility of a total amount of EUR37 million), which is analysed in accordance with the New Guidelines on State aid for rescuing and restructuring non-financial undertakings in difficulty ("the 2014 R&R Guidelines")[272].

Measure one of case SA.35956 (State capital injection of EUR17.9 million) is considered illegal and incompatible State aid since the conditions for granting rescue or restructuring aid to Estonian Air as a firm in difficulty are not fulfilled. As regards rescue aid, the conditions of point 25 of the 2004 R&R Guidelines are clearly not met. As regards conditions for restructuring aid, the measure was granted without a credible restructuring plan ensuring long-term viability of the company and it lacked any compensatory measures and own contribution to the restructuring costs required by the 2004 R&R Guidelines.

The Commission has considered all subsequent measures as being incompatible State aid, in particular on the ground of violation of the "one time, last time" principle, absence of a credible restructuring plan ensuring return to long-term viability of the company and insufficient compensatory measures. Further, with the exception of the planned restructuring aid, the measures were provided in breach of the standstill obligation and thus constituted illegal aid that has to be recovered from the beneficiary.

[269] Commission decision of 6.11.2015 on the measures SA.35956 (2013/C) (ex 2013/NN) (ex 2012/N) implemented by Estonia for AS Estonian Air and on the measures **SA.36868 (2014/C)(ex 2013/N)** which Estonia is planning to implement for AS Estonian Air, C (2015) 7470 final, http://ec.europa.eu/competition/state_aid/cases/247780/247780_1730087_223_2.pdf.

[270] See e.g. Commission decision of 14.10.2010 on the State aid **C 8/10 – Varvaressos S.A.**, or Commission decision of 9.7.2014 on the State aid SA.34191 (2012/C) – A/S Air Baltic Corporation.

[271] Communication from the Commission – Community Guidelines on State aid for rescuing and restructuring firms in difficulty, 2004/C 244/02, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2004:244:0002:0017:EN:PDF.

[272] Communication from the Commission - Guidelines on State aid for rescuing and restructuring non-financial undertakings in difficulty, 2014/C 249/01, http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014XC0731(01)&from=EN.

### Impact on Passenger Traffic Levels

Pursuant to the negative decision of the Commission, Estonian Air declared bankruptcy on 29 December 2015. At the same time, Estonian authorities created a new airline called Nordic Aviation Group, which was rebranded to Nordica on 30 March 2016[273].

The new airline was reported to have carried 27,172 passengers in April 2016, almost 60% of the total passengers (46,089) carried by Estonian Air in April 2015[274].

To be able to face competition, Nordica established a partnership with Adria Airways, gaining access to advantages such as a Lufthansa code-share for its most popular route Tallinn-Munich[275].

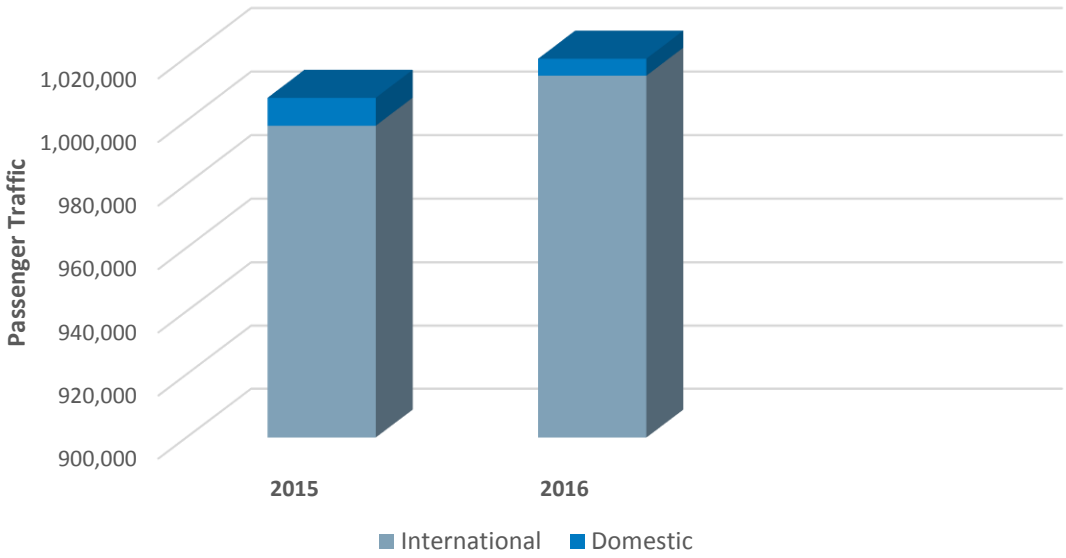
However, this situation did not have a negative impact on passenger traffic at Tallinn airport. The bankruptcy of Estonian air seems to have led to healthy competition between the newly created Nordica and airBaltic, leading to traffic at Tallinn airport of 1.02 million passengers for the first half of 2016, 94.8% of which was international traffic and the remaining 5.2% (5340) was domestic traffic.

This represents a 1.2% increase year on year largely attributed to increase in international passengers compared to the same period last year.

The conclusion is therefore that the bankruptcy of Estonian Air did not have a negative impact on Tallinn airport passenger traffic overall, except for domestic traffic which was reduced after the national carrier's bankruptcy.

It is possible to imagine that this reduction in domestic traffic results from the cancellation of certain domestic routes which were considered unviable.

Figure 149 Tallinn Airport Passenger Traffic (1st half year)




Source: Tallinn Airport, Airport Traffic Trends 2016/15

[273] http://www.anna.aero/2016/03/16/airbaltic-leads-ryanair-and-wizz-air-in-baltic-region/

[274] http://www.baltic-course.com/eng/transport/?doc=120457

[275] http://ftnnews.com/aviation/29880-nordica-enters-cooperation-with-lufthansa-via-adria-airways.html

## Airline Mergers and Acquisitions

Table 38 Procedure for Airline Mergers and Acquisitions handled in 2015-2016

| Case | Parties | Notif. | Dec. Date | Decision |
|---|---|---|---|---|
| M.7541 | IAG / AER LINGUS | 27/05/2015 | 14/07/2015 | With conditions |
| M.7630 | FEDEX / TNT EXPRESS | 26/06/2015 | 08/01/2016 | Unconditional clearance |

Source: EC Decisions

### FedEx – TNT Express

On 8 January 2016, the European Commission approved the acquisition of TNT Express by FedEx without conditions.[276]

The Commission is of the opinion that the merger will not give rise to competition concerns, because FedEx and TNT are not particularly close competitors and the merged entity will continue to face sufficient competition in all markets concerned. Therefore, the Commission decided that the merger of the two companies would not significantly impede effective competition in the EEA or any substantial part of it.

This approval comes after the Commission declared on 30 January 2013 a proposed merger of TNT with UPS, one of the two main competitors of FedEx globally, incompatible with the internal market[277].

## 6.4. International Developments

### USA

## New International Agreements

The United States concluded six open sky agreements during the period concerned.

Table 39 Open Skies Agreements concluded by the US (2015-2016)

| Partners | Signature Date | Entry into force |
|---|---|---|
| US - Togo | 07/04/2015 | Pending |
| US - Serbia | 29/05/2015 | Pending |

[276] European Commission - Press release, Brussels, 8 January 2016, Mergers: Commission approves acquisition of small package delivery services provider TNT Express by FedEx, http://europa.eu/rapid/press-release_IP-16-28_en.htm.

[277] Summary of Commission Decision of 30 January 2013 declaring a concentration incompatible with the internal market and the functioning of the EEA Agreement (Case COMP/M.6570 — UPS/TNT Express), 2014/C 137/05, http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:C:2014:137:FULL&from=EN.

| Partners | Signature Date | Entry into force |
|---|---|---|
| US - Ukraine | 14/07/2015 | Pending |
| US - Seychelles | 07/12/2015 | Pending |
| US - Mexico | 18/12/2015 | Pending |
| US - Azerbaijan | 06/04/2016 | 14/06/2016 |

Source: US Department of States

### The Norwegian Air International Case

In 2014, Norwegian Air International (NAI), an airline company established in Ireland, has applied in the US to operate services between the EU and US under the EU-US Open Skies agreement.

More than two years later, the US Department of Transportation has only granted a tentative decision in April 2016, submitting the issue for public comment by interested parties[278].

The latest concerns about granting authorisation to operate to NAI are labour-related concerns raised by American trade unions, based on allegations that NAI would use underpaid foreign flight crews. From a legal prospective, the question rose as to whether article 17*bis* of the US-EU Air Transport Agreement of April 30, 2007 [279], the so-called "Social Clause", would be violated. Those concerns were nevertheless rejected by an opinion from the Department of Justice's Office of Legal Counsel, which concludes that Article 17*bis* does not provide an independent basis upon which the United States may deny a permit to a carrier such as Norwegian[280].

In spite of this, the US has taken no final decision so far[281]. Therefore, the EU has sent a letter to the US Department of Transportation informing that the EU will invoke the arbitration clause of the US-EU Air Transport Agreement. The formal arbitration procedure will however only start in autumn 2016 and would take several months[282].

## The Middle East

The civil aviation authorities of Qatar and the United Arab Emirates have conducted numerous negotiations to conclude agreements, or increase the flight frequency under agreements that have already been concluded.

During the 2015-2016 period concerned, these negotiations resulted in the following agreements:

[278] Department of Transportation, https://www.transportation.gov/briefing-room/us-dot-issues-proposed-order-norwegian-order-international

[279] Protocol to amend Air Transport Agreement between the US and the EU signed on 25 and 30 April 2007, http://www.state.gov/documents/organization/143930.pdf

[280] Interpretation of Article 17 Bis of the US-EU Air Transport Agreement, https://www.justice.gov/sites/default/files/olc/opinions/attachments/2016/04/21/2016-04-14-ata-article-17.pdf

[281] http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+WQ+E-2016-005753+0+DOC+XML+V0//EN&language=en

[282] Reuters, http://www.reuters.com/article/us-norwegian-air-eu-usa-idUSKCN10628B?il=0

## Qatar

Table 40 Air Services Agreements concluded by Qatar in the period 2015-2016

| Date | Parties | Objective |
|---|---|---|
| 27/01/2015 | Qatar - Guinea | Open skies agreement |
| 04/03/2015 | Qatar - Kyrgyz Republic | Open skies agreement |
| 17/03/2015 | Qatar - Irak | Increase the number of passenger and cargo flights |
| 22/03/2015 | Qatar - UK | Air Transport Memorandum of Understanding: open the skies |
| 01/06/2015 | Qatar - Philippines | Increase traffic rights Doha-Manila, open skies between Doha and the remaining cities. |
| 09/09/2015 | Qatar - New Zealand | Open skies agreement |
| 08/11/2015 | Qatar - Lithuania | Open skies agreement |
| 26/06/2016 | Qatar - UAE | |

Source: Qatar Civil Aviation Authority

## United Arab Emirates

Table 41 Air Services Agreements concluded by UAE in the period 2015-2016

| Date | Parties | Objective |
|---|---|---|
| 15/01/2015 | UAE - Iran | Agreement to strengthen air transport and aviation safety |
| 07/03/2015 | UAE - Burkina Faso | Open skies agreement |
| 18/06/2015 | UAE - South Sudan | Open skies agreement |
| 26/08/2015 | UAE - Gabon | Open skies agreement |
| 19/11/2015 | UAE - Slovakia | Open skies agreement |
| 28/01/2016 | UAE - Bulgaria | Air transport services agreement |
| 01/06/2016 | UAE - Congo | Air transport services agreement |
| 26/06/2016 | UAE - Qatar | Air transport services agreement |
| 30/06/2016 | UAE - Macedonia | Open skies agreement |

Source: UAEinteract

## China

At the end of 2015, overall air passenger traffic in China was 436.18M passengers, a growth by 11.3% compared to the end of 2014. International passenger traffic was of 42.07 million passengers, representing a 33.3% increase year-on-year, while domestic traffic increased by 9.4% to 394.11 million passengers. Those increases are however in contrast with the number of new air services agreements signed in 2015, namely 2[283]. A further air service agreement (ASA) was signed by China with an African nation, and a further ASA in the Oceana region. [284]

At the same time, the number of airlines in China grew to 55 (from 39 airlines 5 years ago), forcing China to recruit pilots from abroad[285].

Earlier in 2016, the European Commission obtained a mandate from the Council to launch negotiations with China for a new bilateral aviation safety agreements (BASA) in the aviation industry sector[286], while the EU-funded EU-China Aviation Partnership Project (APP), a 5-year and EUR 10 million project managed by the European Aviation Safety Agency (EASA) has been officially launched on 24 February 2016.

[283] Civil Aviation Industry Statistics Report 2015, http://www.caac.gov.cn/XXGK/XXGK/TJSJ/201605/P020160531575434538041.pdf, p. 2 and 7.

[284] Comparison of statistical figures of the Statistical Bulletin of the Civil Aviation Industry Development in 2015 vs 2014.

[285] Bloomberg, http://www.bloomberg.com/news/articles/2016-08-17/chinese-airlines-lure-expat-pilots-with-lucrative-pay-perks

[286] European Commission – Press release, Brussels, 8 March 2016, http://europa.eu/rapid/press-release_IP-16-661_en.htm

# 7. Environment & Sustainable Development

## 7.1. Introduction

Aviation delivers social and economic benefits to European citizens and to citizens across the world. However, these benefits come at an environmental cost. Improvements in technology have mitigated some of aviation's environmental impacts. Yet demand for aviation has continued to increase, and is forecast to do so in the future. Consequently, aviation has exerted an increasing pressure on the environment. Public awareness of environmental issues has also increased and the aviation sector has responded to environmental issues and there are numerous initiatives globally examining a range of issues. The success of these initiatives, will allow for aviation to continue delivering benefits for citizens into the future.

This chapter provides an overview of the main environmental and sustainability issues faced by the sector, namely; climate change mitigation, climate change adaptation, air quality, noise, and health. The chapter examines how these issues are being addressed through initiatives and technologies.[287]

## 7.2. Institutions, Initiatives and Programs

### International Civil Aviation Organisation

The International Civil Aviation Organisation (ICAO) is a United Nations (UN) specialised agency, which manages the administration and governance of the Convention on International Civil Aviation. As such the ICAO works with the member states of the convention to implement and develop standard practices and policies across the aviation sector, including environmental issues.

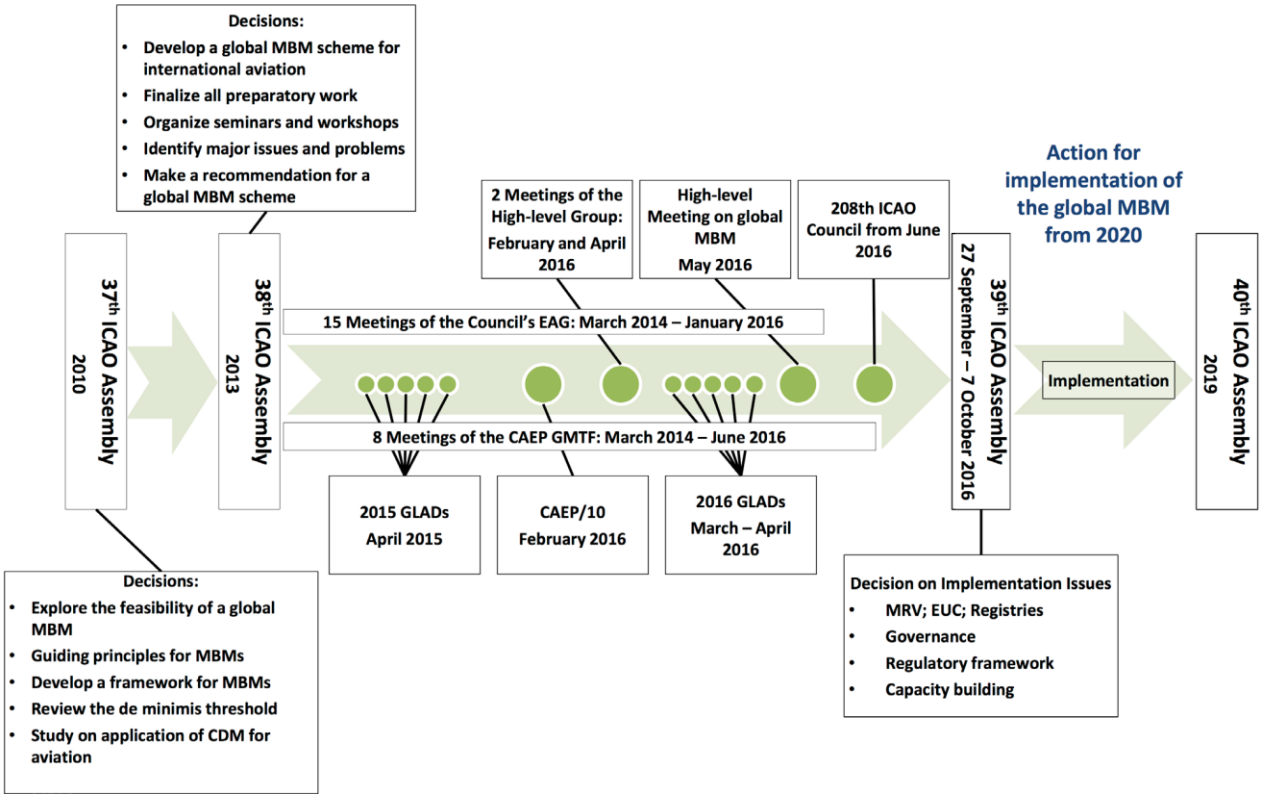
The ICAO has been developing a global Market-Based-Mechanism (MBM), for managing carbon emissions since the 37th ICAO assembly in 2010 (see Figure 150 below). The development of the MBM was overseen by the Environmental Advisory Group (EAG), which met 15 times between March 2014 and January 2016. The EAG worked with the Committee on Aviation Environmental Protection's (CAEP) Global MBM Technical Task Force (GMTF), to develop technical elements of the MBM. To promote the engagement of ICAO member states in the processes of developing the MBM, two rounds of five Global Aviation Dialogues (GLADs) were held. The first round was attended by 79 states and 29 international organisations, and the second round was attended by 60 states and 20 international organisations. The GLADs were held in Lima, Nairobi, Cairo, Singapore and Madrid[288] . In early 2016 the ICAO began discussing a draft assembly resolution on the MBM. The ICAO set up a high level group on the MBM in early 2016 to work on the draft assembly resolution text. This text will form the basis for discussions on the MBM at the 39th ICAO Assembly, which is to be held between the 27 of September and the 7th of October 2016, where a final decision on the design and implementation of the MBM was agreed in resolution A39-3[289] .

[287] Additional information from the Europe Commission regarding the environmental impact of aviation in Europe can be found in the European Aviation Environmental Report (https://www.easa.europa.eu/eaer/). This covers technologies, alternative fuels, air traffic management, airports, market based mechanisms as a response to climate change and climate adaptation.

[288] ICAO, 2015 Global Aviation Dialogues (GLADs), 2016, http://www.icao.int/meetings/GLADs-2015/Pages/default.aspx

[289] ICAO, http://www.icao.int/environmental-protection/Documents/Resolution_A39_3.pdf

Figure 150: ICAO MBM Development Timetable




Source: ICAO Environmental Report 2016

The proposed text identifies the MBM as a Carbon Offsetting Scheme for International Aviation (COSIA). The scheme aims to cap emissions from international aviation at 2020 levels. This would be achieved through an offsetting mechanism, whereby emissions growth beyond 2020 levels would be apportioned to individual operators. The mechanisms for assessing offsets and trading are still under development by CAEP. The implementation of the COSIA will be phased depending on the level of development of each member. A pilot phase applies from 2021 through 2023, a first phase from 20124 through 2026 and a second phase from 2027 through 2035. All states are encouraged to volunteer to participate in the pilot phase and the first phase, noting that developed States would likely join earlier and Least Developed Countries later[290][291].

The 10th meeting of the Committee on Aviation Environmental Protection (CAEP/10) was held in February 2016. As well as discussions on the MBM the CAEP/10 meeting also resulted in agreement of two new standards. The first is an airplane level $CO_2$ standard that will come into force for new designs in 2020 and in production designs in 2023. Any aircraft that does not meet the standard cannot be produced past 2028. The second standard covers non-volatile particulate matter. This standard is at engine level and comes into force in 2020[292].

[290] ICAO, ICAO High-level Meeting on a Global Market-Based Measure (MBM) Scheme; Overview of ICAO's work on a global MBM scheme, 2016.

[291] ICAO, ICAO High-level Meeting on a Global Market-Based Measure (MBM) Scheme; Introduction to the Draft Assembly Resolution Text, 2016.

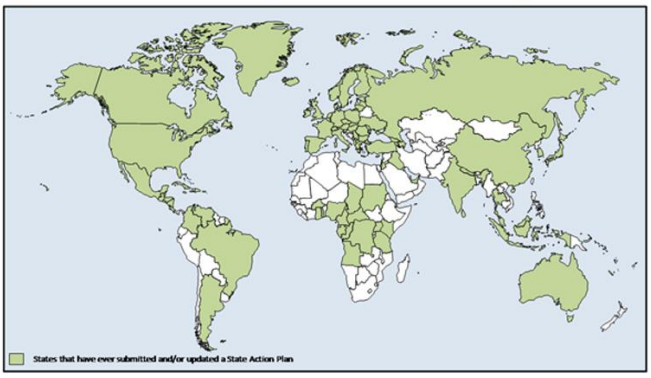
[292] ICAO, Environmental Report, 2016.

## State Action Plans

State action plans allow states that are members of the ICAO to report their activities that address Greenhouse Gas emissions (GHG) from aviation. Action plans contain the information on baseline emissions, a list of measures to reduce emissions, the expected results of these and information on any required financial assistance. The process of developing an action plan requires involvement of numerous stakeholders within a member state. This fosters collaboration and provides a focus for action. During 2015, 13 member states submitted action plans to the ICAO, bringing the total number of states involved to 95[293]. The new member states were:

- Fiji
- Gambia
- Togo
- Cameroon
- Chad
- Israel
- Sudan
- Ghana
- Bahrain
- Lithuania
- Switzerland
- Nigeria
- India

Figure 1.2: All states that have submitted a state action plan




Source: ICAO, 2016

## The Atlantic Interoperability Initiative to Reduce Emissions

The Atlantic Interoperability Initiative to Reduce Emissions (AIRE) is collaboration between the European Commission and the United States. The aim of the AIRE initiative is to reduce GHG emissions from improvements in aircraft design and through changes in operating procedures. On the European side AIRE projects are delivered by Single European Sky Air Traffic Management (SESAR). The SESAR program is part of the Single Europe Sky (SES) initiative. The SES initiative was set up by the European Commission to restructure European air traffic management, to increase capacity and improve efficiency. SESAR contributes research and development to the SES initiative[294][295].

The Third Cycle of AIRE project was completed in 2014 and the results of seven of the projects were published in 2015[296]. These projects were used to assess safety and environmental issues associated with air traffic control. A summary of these projects is presented in Table 42 below.

[293] ICAO, "State Action Plans," 2016. [Online]. Available: http://www.icao.int/environmental-protection/pages/action-plan.aspx

[294] European Comissions, "AIRE – Atlantic Interoperability Initiative to Reduce Emissions," 2015. [Online]. Available: http://ec.europa.eu/transport/modes/air/environment/aire_en.htm.

[295] SESAR, "SESAR," 2016. [Online]. Available: http://www.sesarju.eu/.

[296] SESAR, "R&D Library," 2015. [Online]. Available: http://www.sesarju.eu/r-d-library?shs_term_node_tid_depth=1141&field_stakeholder_category_tid=All&field_solution_term_tid=All&field_benefit_term_tid=All&populate=AIRE.

Table 42 - Summary of AIRE Projects

| Project | Summary |
|---|---|
| ENGAGE 2 | The project was the same as ENGAGE 1 but covered a larger airspace. It allowed pilots to vary their flight level and Mach over the Atlantic within certain limits to reduce fuel consumption. |
| WE-FREE | The project allows pilots to fly their preferred trajectories without the need to adhere to a predefined route structure departing Paris for Italy at weekends to reduce fuel consumption. |
| OPTA-IN | The project was designed to provide efficiency in flight by enabling Air Traffic Control to deliver optimised descent approaches, through the use of specific speed control based tables, in medium density traffic. |
| REACT PLUS | The project implemented Continuous Descent Operations (CDO) and Continuous Climb Operations (CCO) at Budapest airport. |
| SATISFIED | The project examined the potential fuel savings from free routing in the South Atlantic region. |
| AMBER | The project designed and tested approaches to Riga airport with reference to fuel consumption and noise impacts. |
| CANARIAS | The project designed and tested approaches to Lanzarote airport with reference to fuel consumption and noise impacts. |

Source: SESAR, 2015

The detailed output from each of these projects is reported on the SESAR website[297].

### European Initiatives

This section examines European environmental and sustainability initiatives. However, SESAR initiatives have been discussed in Section 0 due to their relationship to AIRE, and are therefore not examined here.

The Advisory Council for Aeronautics Research in Europe (ACARE) is an advisory body coordinating aviation research across Europe. It represents 40 members including the EC, as well as airlines, airports, regulators and research establishments. ACARE's environmental research is driven by five goals to be achieved by 2050. These are:

- $CO_2$ emissions per passenger kilometre have been reduced by 75%, NOx emissions by 90% and perceived noise by 65%, all relative to the year 2000.
- Aircraft movements are emission-free when taxiing.
- Air vehicles are designed and manufactured to be recyclable.
- Europe is established as a centre of excellence on sustainable alternative fuels, including those for aviation, based on a strong European energy policy.
- Europe is at the forefront of atmospheric research and takes the lead in formulating a prioritised environmental action plan and establishes global environmental standards.

[297] http://www.sesarju.eu/r-d-library?shs_term_node_tid_depth=1141&field_stakeholder_category_tid=All&field_solution_term_tid=All&field_benefit_term_tid=All&populate=AIRE <http://www.sesarju.eu/r-d-library?shs_term_node_tid_depth=1141&field_stakeholder_category_tid=All&field_solution_term_tid=All&field_benefit_term_tid=All&populate=AIRE>

ACARE runs three research projects to achieve these goals; X-Noise EV, which relates to aviation noise research, Forum AE, which relates to emissions research, and Core-JetFuel, which relates to alternative aviation fuels. In 2015 ACARE published a 2014/2015 activity update[298]. This update reports on the progress of each of these projects including an assessment of performance against ACARE's goals. The report concludes that noise research is on track to meet its target, that significant work is required to meet the emissions targets, specifically technology maturation, and that a quantitative target is required at European level for alternative fuels.

## 7.3. Aviation Emissions

Aviation emissions are produced by aircraft, support vehicles and ground transportation. The emissions from these sources fall into two categories: emissions that cause deterioration in local air quality, and emissions that cause climate change. Emissions that cause climate change from aviation also fall into two categories. The first category is GHGs, which are gases that cause climate change by trapping heat in the atmosphere. These emissions are produced when fossil fuels are combusted. Secondly, emissions from aircraft can alter radioactively active substances, trigger the formation of aerosols and lead to changes in clouds. Together these effects are known as radiative forcing.

Local air quality issues are caused be Nitrogen Oxides ($NO_x$), Sulphur Oxides ($SO_x$) and Particulate Matter ($PM_{10}$ and $PM_{2.5}$). In high concentrations these pollutants have been shown to cause and exacerbate a range of cardiovascular diseases including; chronic obstructive pulmonary disease (an umbrella term for lung diseases including chronic bronchitis), heart disease, lung cancer and asthma[299].

In aviation, the highest concentrations of these pollutants can be found close to airports where ground transport and aviation take place in close proximity.

### Climate Change

In 2015 aviation produced 781 $MTCO_2$, of which approximately 2% are a result of anthropogenic carbon emissions[300][301]. Demand for aviation is expected to increase in the future, and emissions are also expected to grow although not as quickly as demand[302]. This means that the aviation sector is anticipated to increase its carbon efficiency. There are three main ways in which the aviation industry can reduce its climate change impact; increased efficiency due to Air Traffic Management (ATM), technological and design improvement, and through the use of alternative fuel. The rest of this section will examine improvements in ATM and technological and design improvements during 2015. Developments in alternative fuels during 2015 are presented in section 7.7.

[298] ACARE, "Activity Summary 2014-2015," 2015.

[299] World Health Organisation, "Ambient (outdoor) air quality and health," 2014. [Online]. Available: http://www.who.int/mediacentre/factsheets/fs313/en/.

[300] Air Transport Action Group, "Facts and Figures," 2016. [Online]. Available: http://www.atag.org/facts-and-figures.html.

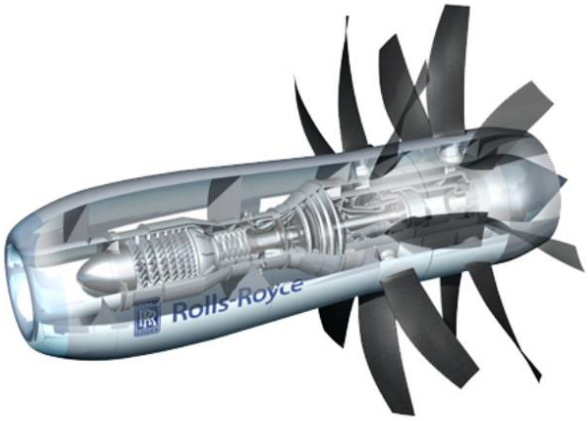
[301] IATA, "Fact Sheet Climate Change," 2016.

[302] EEA; EASA; Eurocontrol, "European Aviation Environmental Report," 2016.

As discussed in section 0, the SES and its research program SESAR, are responsible for delivering improvements in efficiency, and therefore reductions in carbon emissions in European airspace. EUROCONTROL publishes annual performance review reports that detail the performance of ATM in Europe. During 2015 flight efficiency decreased compared to 2014 due to Air Traffic Control (ATC) capacity issues. This will have resulted in higher emissions. Improvements in ATM in the US are managed under the Federal Aviation Administration's (FAA) NextGen program, which aims to improve the efficiency of aviation within the US. In 2015 the FAA released the NextGen Implementation Plan 2015[303]. This report detailed progress made and future activities.

During 2015 there have been a number activities related to technological and design improvements across aerodynamics, propulsion and weight savings[304]. In Europe much of the aviation's sector's technological research is undertaken by the Clean Sky research program. Clean Sky released an annual activity report for 2015[305], which reported on progress of it research initiatives during 2015. Two of the most important achievements were the critical design reviews of the Breakthrough Laminar Aircraft Demonstrator in Europe (BLADE), and the Open Rotor Ground Demonstrator. BLADE is a carbon fibre leading edge and wing cover, deigned to reduce drag by promoting laminar flow and therefore increase fuel efficiency. The Open Rotor Ground Demonstrator is a test engine based on an open rotor design (see Figure 151 below). The design may allow for an increase in efficiency of up to 30% over high bypass turbo fan engines.

Figure 151: Open Rotor Design




Source: Rolls-Royce, 2016[306]

[303] FAA, "NextGen Implementation Plan 2015," 2015.

[304] EEA; EASA; Eurocontrol, "European Aviation Environmental Report," 2016.

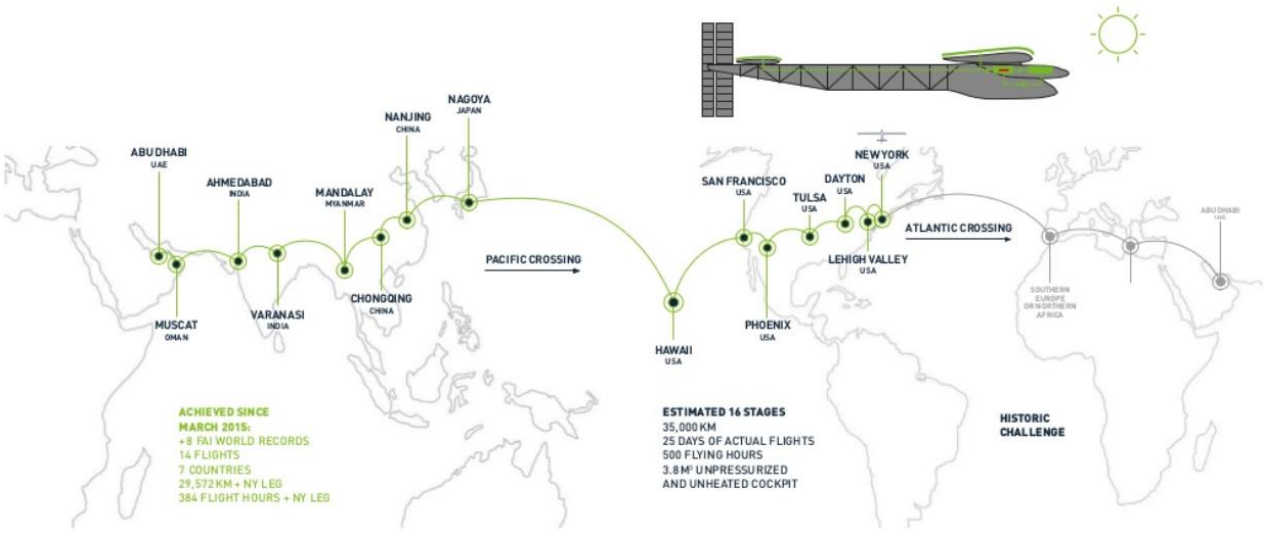
[305] Clean Sky, "Final Annual Activity Report," 2015.

[306] Rolls-Royce, "Sustainable and Green Engine (SAGE) ITD," 2016. [Online]. Available: http://www.rolls-royce.com/about/our-technology/research/research-programmes/sustainable-and-green-engine-sage-itd.aspx#open-rotor-technology

Airbus has continued to develop new efficient aircraft. The new A350-1000 has been under construction during 2015. It will be the largest and most efficient of the A350 family, typically seating 366, and like the other A350 aircraft variants is constructed from a carbon-fibre reinforced polymer, which reduces weight and therefore increases efficiency and reduces emissions[307]. Airbus also delivered its first A320Neo to Lufthansa in January 2016. The new design is expected to be approximately 15% more efficient than its predecessor[308]. Boeing has also continued to develop more fuel efficient aircraft during 2015. Boeing completed the detailed design of the B787-1000 series during 2015. It will be the largest of the 787 family with a seat capacity of 330 and will have efficiency approximately 25% better than the aircraft it replaces[309]. Boeing also runs an eco-demonstrator program, which is a test bed for noise and fuel consumption reduction technologies. The B757 aircraft was added to the program in 2015 to add to the research and development of green technologies[310].

During 2015 there were also significant milestones in emissions-free flights. On the 10th July 2015 Airbus flew its electric aircraft, the E-fan demonstrator, across the English channel[311]. On the 9th March 2015 Solar impulse 2, a solar powered plane, started it's around the world journey (see Figure 152). The historic circumnavigation was successfully completed on the 23rd July 2016. The longest leg of the journey took place on the 28th June 2015. This leg of the flight was between Nagoya in Japan and Killaloe in Hawaii. The distance covered was 8,924 km, which took 117.5 hours[312].

Figure 152: Solar Impulse Route Map




Source: Solar Impulse, 2016

GHG emissions are also produced by ground transportation associated with the aviation sector. This includes support vehicles and vehicles used to transport passengers and freight to airports. There are a number of schemes to reduce the emissions from support vehicles including ACARE's target for emissions-free taxing.

[307] Airbus, "A350-1000," 2016. [Online]. Available: http://www.airbus.com/aircraftfamilies/passengeraircraft/a350xwbfamily/a350-1000/

[308] Airbus, "A320Neo," 2016. [Online]. Available: http://www.airbus.com/aircraftfamilies/passengeraircraft/a320family/spotlight-on-a320neo/

[309] Boeing, "787 Dreamliner Familiy," 2016. [Online]. Available: http://www.boeing.com/commercial/787/

[310] Airbus, "History is made, and the future of electric aircraft is opened with E-Fan's English Channel crossing," 2015. [Online]. Available: http://www.airbusgroup.com/int/en/corporate-social-responsibility/latest-news/History-is-made--and-the-future-of-electric-aircraft-is-opened-with-E-Fan-s-English-Channel-crossing.html

[311] Airbus, "History is made, and the future of electric aircraft is opened with E-Fan's English Channel crossing," 2015. [Online]. Available: http://www.airbusgroup.com/int/en/corporate-social-responsibility/latest-news/History-is-made--and-the-future-of-electric-aircraft-is-opened-with-E-Fan-s-English-Channel-crossing.html.

[312] Solar Impulse, "Exploration to Change the World," 2016. [Online]. Available: http://www.solarimpulse.com/.

Airports are also involved in promoting modal shift away from road transportation these and other measures are discussed further in section 7.6.

### Air Quality

As discussed in section 7.3, deteriorations in air quality due to aviation are centred on airports. As with GHG emissions, emissions that cause poor air quality are associated with combustion. Therefore one of the most effective ways of managing air quality is to reduce combustion. The improvements in aircraft efficiency discussed in section 0, as well as leading to reductions in GHG emissions, will also lead to reductions in pollutants that cause poor air quality. However, it is anticipated that due to the anticipated increased demand for aviation in the future, aviation related air quality concerns will remain an issue.

The impact of pollutants that cause poor air quality is related to the concentration of the pollutant and exposure to the pollutants. This means that air quality issues and airport planning are closely linked. During 2015, the debate over airport expansion in the south east of the UK has continued. The UK's Airport Commission was set up by the British government to examine the issue recommending expansion of Heathrow in July 2015. In December 2015 the British Government deferred the decision until 2016. Air quality concerns have continued to play a major role in the debate[313].

Alternative aviation fuels have the potential to reduce $SO_x$ emissions as well as GHG emissions. This is because biofuels, unlike fossil fuels, do not contain sulphur. A further discussion around developments in aviation biofuels can be found in section 7.7. Reducing combustion of fuels in support vehicles is another potential method for improving air quality and reducing GHG emissions. Air quality improvements and emissions reductions can also be achieved by promoting model shift. Both of these methods of improving air quality are discussed in section 7.6.

## 7.4. Climate Change (Adaptation and Resilience)

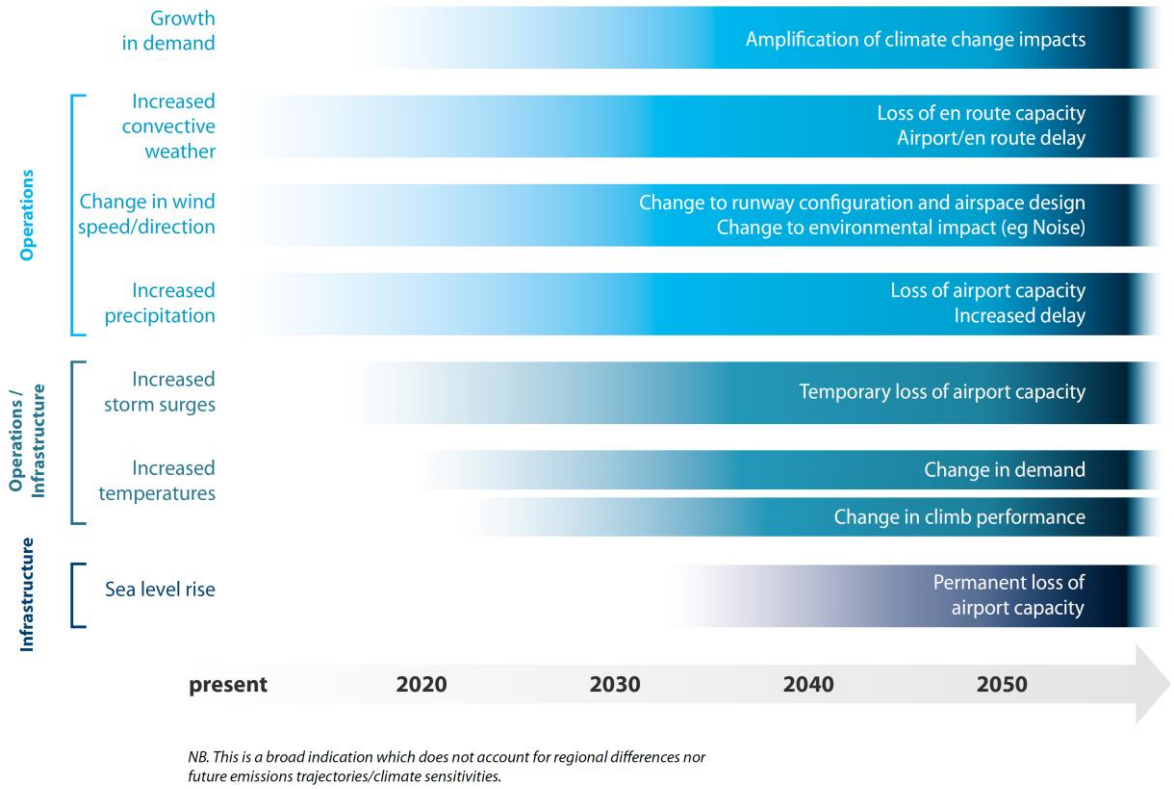
In April 2014, a research paper titled *Adapting European airports to a changing climate* was published by Transportation Research Procedia[314]. This paper updated the findings of EUROCONTROL's 2013 report *Challenges of Growth 2013: Task 8 climate change risk and resilience*[315]. The analysis presents the key impacts to airport and these can be found in Figure 153 below.

[313] Airports Commission, "Airports Commission: Final Report," 2015.

[314] Rachel Burbidge, "Adapting European airports to a changing climate," Transport Research Procidia, vol. 14, pp. 14-23, 2016.

[315] EUROCONTROL, "Challenges of Growth 2013: Task 8: Climate Change Risk and Resilience," EUROCONTROL, 2013.

Figure 153: Key Aviation Climate Change Impacts




Source: Rachel Burbidge (EUROCONTROL), 2016

The analysis details the mechanisms through which climate change may impact upon the aviation sector.

- Changes in precipitation may require increased aircraft separation, which may reduce airport capacity and cause delays. Furthermore, changes in precipitation may also result in airport flooding.
- Increases in convective weather[316] may require increased diversion and associated delay, additionally diversionary airports may be affected and increased flight planning may be required.
- Changes in wind patterns may result in runways experiencing increased cross winds, this may result in airspace redesign and noise redistribution.
- Sea level rise and storm surge may reduce capacity and delay and lead to the total loss of capacity through inundation.
- Increases in temperatures may cause physical infrastructure damage. Additionally, the increase in temperatures may place additional demands on cooling services. The increased temperatures may also lead to demand changes and this is likely in the Mediterranean region.

The rest of the analysis looks at barriers to adaptation and examines the key priorities for building aviation climate change resilience. These are presented in Figure 154 below.

[316] Convective weather is a storm or developing storm

Figure 154: Key priorities for building aviation climate resilience


Source: Rachel Burbidge (EUROCONTROL), 2016

- Understanding the problem relates to identifying the impacts for each stakeholder and identifying research priorities;
- Assessing the problem refers to undertaking a climate change risk assessment;
- Actions to adapt entail identifying methods to build resilience;
- communication and collaboration is identified as key for awareness raising and for disseminating best practice.

The UK's Civil Aviation Authority (CAA) produced a Climate Change Adaptation Report in 2015[317], which is an update of the CAA's 2011 Climate Change Adaptation Report. The report identifies aviation as particularly susceptible to climate change. The report details the risks climate change poses to the CAA, and the wider aviation industry. It then goes onto discuss how these risks will be addressed. The majority of the risks identified were expected to impact upon the operation of the CAA, for example weather event making staff unavailable. However, it was noted that an increase in convective weather may result in changes to routing and airspace management.

## 7.5. Aircraft Noise

At the end of 2015, the EC launched a consultation on the evaluation of the Environmental Noise Directive (END) (2002/49/EC). Along with Regulation (EU) No 598/2014 on noise-related operating restrictions at airports within a 'Balanced Approach' to aircraft noise management[318], the END represents the European legislative framework that controls aircraft noise at airports, following on from the World Health Organization community noise guidelines (1999[319]) which highlighted the effects on health of noise from industry and transport sources).

The END came into force in 2002 with the aim aims to avoid, prevent, or reduce the harmful effects of noise on human health from road, railways, airports and industrial installations. Specifically:

(1) a common approach to the management of noise in Member States by requiring Member States to map noise in agglomerations and around major roads, railways, airports and industrial installations, and to draw up respective action plans, which need to be publicly consulted.

[317] CAA, "Climate Change Adaptation Report," 2015.

[318] http://www.icao.int/environmental-protection/pages/noise.aspx

[319] http://www.who.int/docstore/peh/noise/guidelines2.html

(2) a basis for developing EU measures to reduce noise at source (e.g. noise resulting from road traffic, airports, railways, as well as from outdoor and industrial equipment), as the strategic noise maps inform the Union on the acoustic environment quality in the EU.

The consultation[320] invited stakeholders to comment on the effectiveness and efficiency of the END. This includes consideration of progress by Member States in achieving the objectives, barriers to achieving objectives, extent to which a common approach has been reached in the EU, and reactions from the stakeholders. The consultation also solicited views on how the Directive can contribute to ensuring 'that by 2020 noise pollution in the Union has significantly decreased, moving closer to WHO recommended levels' as stated in the 7th Environment Action Programme[321].

The END has resulted in individual airports setting out actions plans to control noise and publicly disclosing these documents. Mapping of environmental noise has also been widely undertaken, but the END did not specify how these maps should be produced (i.e. the metrics that should be used).

It is expected that the feedback from the consultation exercise will lead to the Directive being updated. This process will need to be undertaken in the context of a growing bank of scientific evidence relating to the health effects of noise and calls for the application of noise limits at sources.


Early in 2015 the EC's Science for Environment Policy322 published a document capturing the latest research on 'Noise impacts on health'. This covered key issues that are relevant to the aviation industry including, the potential effects of aircraft noise at night on cardiovascular disease, the importance of preserving quiet areas (in urban and rural locations), and that the health of vulnerable people exposed to noise is under-researched.

## 7.6. Airports

European airports have undertaken a range of initiatives to improve their environmental performance during this reporting period. These cover GHG emissions, air quality pollution, noise, water and biodiversity[323][324][325]. A selection of these initiatives has been listed below:

- Electric vehicles
- Promotion of carpools, active travel and public transport.
- renewable energy generation
- Green tariff electricity
- Electrified airport stands
- LED Lights
- Rainwater harvesting

### Airport $CO_2$ Accreditation

[320] http://ec.europa.eu/environment/consultations/noise_2015_en.htm

[321] http://ec.europa.eu/environment/action-programme/

[322] http://ec.europa.eu/environment/integration/research/newsalert/pdf/47si.pdf

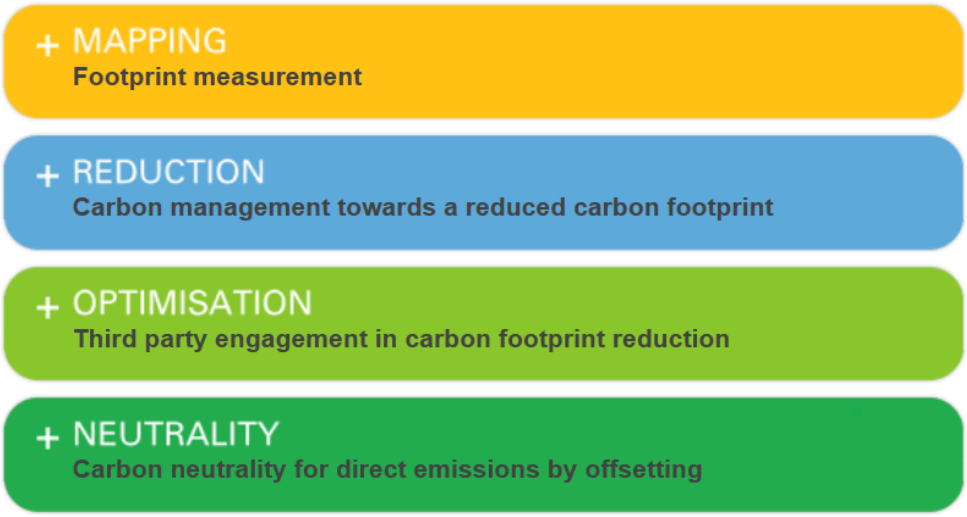
[323] Schiphol Group, "Annual Report," 2015.

[324] Groupe ADP, "Corporate Social Responsibility," 2015.

[325] Athens Airport, "Corporate Responsibility Report," 2015.

Airports Council International (ACI) ran its Airport Carbon Accreditation program (ACA) for the sixth year in 2014/15[326]. The program aims to "*reduce carbon and increase airport sustainability*"[327]. This aim is achieved through an accreditation scheme that incentivises carbon management activities based on the operational and public relations benefits of being accredited. Airports seeking to be accredited to the scheme can choose from four different levels that reflect their maturity (see Figure 155 below). Level 1 refers to mapping, level 2 refers to reduction, level 3 refers to optimisation, and level 3+ refers to neutrality.

Figure 155: ACA Certification Levels




Source: ACA, 2016

During 2014/15 seven airports in Europe entered the scheme. These were:

- Level 1: Bergamo-Orio al Serio (Italy); Marseilles - Provence and Cannes-Mandelieu (France); Bristol (UK) and Tel Aviv-Ben Gurion (Israel)
- Level 2: Newquay Cornwall Airport (UK), and Stavanger International (Sweden)
- Level 3: London Gatwick (re-joined the programme since withdrawing in Year 5)

During the same period 17 airports upgraded as follows:

- To Level 2: Treviso (Italy); Toulouse-Blagnac (France); Madeira, Faro, Ponta Delgada and Band E ANA (Horta, Santa Maria, Flores and Porto Santo airports) (Portugal); Tirana (Albania); Budapest (Hungary);
- To Level 3: Nice (France); Istanbul (Turkey);
- To Level 3+: Rome-Fiumicino and Venice-Marco Polo (Italy); Ankara and Antalya (Turkey).

In Europe, the airports in the scheme represent approximately 64% of air passenger traffic. Furthermore, 77% of the airports involved actively managing their carbon emissions, rather than just measuring them. Figure 156 below summarises the GHG emissions from airports covered by the scheme in 2013/14 and 2014/15 in Europe. The carbon footprint per passenger has continued to fall and is now 1.89kg$CO_2$ for Scope 1 and 2 emissions[328], this is a 27% reduction compared to year 1 of the scheme (2009/10) where emissions were 2.6 kg$CO_2$ per passenger[329]. Additionally emissions reductions and offsets have also increased. This indicates that European airports are increasingly managing their GHG emissions.

[326] Airport Carbon Accreditation, "Annual Report 2014-15," 2015.

[327] [327] Airport Carbon Accreditation, "Airport carbon accreditation," 2016. [Online]. Available: http://www.airportcarbonaccreditation.org/.

[328] Scopes are a method of apportioning emissions by level of responsibility. Scope 1 emissions are direct emissions, for example emissions from fuel combustion in an airport vehicle. Scope 2 emissions are for purchased electricity, and scope 3 emissions are indirect emissions for example emissions from travel in a vehicle owned or operated by another organisation (WBCFSD and WRI, "The Greenhouse Gas Protocol," 2004).

[329] Airport Carbon Accreditation, "Annual Report 2010-11," 2011.

Figure 156: Summary of European emissions covered by the program comparing 2013/14 (year 5) with 2014/15 (year 6)

| Variable | 2013-2014 | | 2014-2015 | |
|---|---|---|---|---|
| | Emissions | Number of airports | Emissions | Number of airports |
| **TOTAL SCOPE 1 & 2 EMISSIONS** | | | | |
| Aggregate carbon footprint for 'Year 0'[1] for emissions under airports' direct control (all airports) | 2,044,683 $tCO_2$ | 85 | 2,089,358 $tCO_2$ | 92 |
| Carbon footprint per passenger | 2.01 $kgCO_2$ | | 1.89 $kgCO_2$ | |
| Carbon footprint per traffic unit | 1.78 $kgCO_2$ | | 1.79 $kgCO_2$ | |
| **SCOPE 1 & 2 EMISSIONS REDUCTION[2]** | | | | |
| Aggregate reduction in emissions from sources under airports' direct control (Level 2 and above) | 87,449 $tCO_2$ | 56 | 139,022 $tCO_2$ | 71 |
| Carbon footprint reduction per passenger | 0.11 $kgCO_2$ | | 0.15 $kgCO_2$ | |
| Carbon footprint reduction per traffic unit | 0.09 $kgCO_2$ | | 0.14 $kgCO_2$ | |
| **TOTAL SCOPE 3 EMISSIONS[3]** | | | | |
| Total carbon footprint for 'Year 0' for emissions sources which an airport may guide or influence (Level 3 and above) | 12,777,994 $tCO_2$ | 31 | 14,037,537 $tCO_2$ | 36 |
| **SCOPE 3 EMISSIONS REDUCTION** | | | | |
| Aggregate reductions from emissions sources which an airport may guide or influence | 223,905 $tCO_2$ | 31 | 550,884 $tCO_2$ | 36 |
| **TOTAL EMISSIONS OFFSET** | | | | |
| Total emissions offset (Level 3+) | 181,496 $tCO_2$ | 16 | 294,385 $tCO_2$ | 20 |

Source: ACA, 2015

The scheme has also expanded in the rest of the world between 2013/14 and 2014/15. In the Asia-pacific region nine new airports have joined the scheme, In North America five airports have joined the scheme and in the Latin America and Caribbean Region one airport has joined the scheme. The number of airports in the scheme in Africa has stayed the same. In total the Scheme now covers 125 airports representing 28% of global air passengers[330].

[330] Airport Carbon Accreditation, "Annual Report 2014-15," 2015.

## 7.7. Alternative Fuels

As discussed in section 7.3 alternative aviation fuels have the potential to reduce GHG emissions and improve air quality. During 2015 there has been technological progress in the development of alternative aviation fuels and progress towards making their use commercially viable. More than 2,000 flights have now occurred using alternative fuels, and the sector is moving from one off demonstration flights to investing in alternative aviation fuels. However, the economic conditions for alternative aviation fuels have remained difficult due to the low oil price during 2015. This has meant that effective policy remains crucial to the sector[331].

The SOLAR-JET Project[332] produced kerosene from water, $CO_2$, and solar energy for the first time in 2015. This was achieved by using a two-step solar thermal chemical cycle and a Fischer–Tropsch reaction. This technology has the potential to produce alternative aviation fuel without displacing food production. There have also been studies of the potential to produce kerosene from bio-methane and cross condensation of alcohols to ketones[333].

There has also been progress on the commercial side of alternative aviation fuel development during 2015. A number of off-take agreements were signed between produces as airlines during 2015. This included an off-take agreement between Fulcrum Bioenergy and United Airlines. United Airlines also took a $30 million USD equity investment in Fulcrum Bioenergy. This is the single largest investment by an airline in alternative aviation fuel. Fulcrum Bioenergy's process converts municipal solid waste into alternative aviation fuel[334]. Additionally, from January 2016 Oslo airport made alternative aviation fuel available to all airlines refuelling from the airport's main fuel farm.

[331] IATA, "IATA 2015 Report on Alternative Fuels," 2016.

[332] SOLAR-JET, "Solar chemical reactor demonstration and Optimization for Long-term Availability of Renewable JET fuel," 2015. [Online]. Available: http://www.solar-jet.aero/.

[333] IATA, "IATA 2015 Report on Alternative Fuels," 2016.

[334] ICAO, Environmental Report, 2016.

# 8. Safety & Security

## 8.1. Introduction

This report discusses the topics of Safety and Security in the context of 2015. The Safety section first reviews the safety record for the calendar year and then delves into relevant topics, namely pilots' psychological health, updates on Open Skies in the Asia Pacific and the potential challenges faced from the upsurge in the use of drones. It is then followed by the Security section which introduces the foundations of Aviation Security discussing the more recent developments in this area.

## 8.2. Safety

Commercial flights growth in 2015 increased 2% year on year. At the same time, for the second consecutive year, 2015 was the safest year in aviation history. There were zero fatalities from jet aircraft operations and fatalities from turboprop aircraft were 186. The latter was an increase from the previous year.

Nevertheless, there were several high profile accidents. These included the Germanwings flight 9525 that was brought down by the co-pilot and the MetroJet flight 9268 which exploded mid-air during departure from Sharm-el-Sheikh International Airport in Egypt. Earlier in the year, TransAsia experienced another hull loss for a second year as flight 235 crashed during take-off.

These aviation accidents have revealed challenges to the regulatory bodies across the world. Following the Germanwings accident, the "2-persons-in-the-cockpit" rule was revisited and reconfirmed by the EASA assembled task force. However, questions arose with regards to the adequacy of the processes for the evaluation of the psychological state of pilots.

Following these incidents, the FAA conducted appropriate research and issued recommendations in the area of evaluating the psychological fitness of pilots.

The situation in the Asia Pacific region has not changed – traffic continues to increase at a strong pace, while infrastructure and safety standards fail to cope. This chapter also looks into aviation safety in the Asia Pacific region. It is expected that the introduction of the ASEAN Open Skies Agreement will have a positive effect on the safety records in the region. Finally, in this chapter we examine how the North American regulators have responded to the challenge to establish rules and regulations for registration, certification and operation of unmanned aircraft vehicles, also known as drones.

### 2015 Safety Review

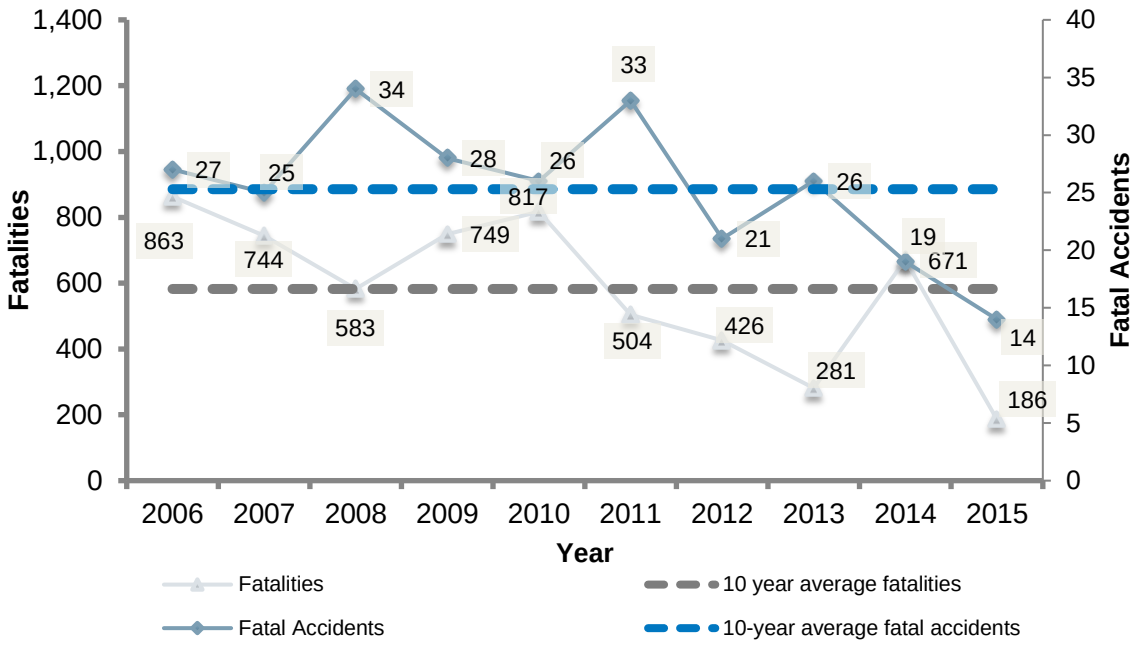
### 2015 Safety Performance

A study by Boeing[335] confirms that in 2015 there were zero fatal jet accidents. This is so because the statistics exclude the Germanwings and the MetroJet aircraft accidents as they both were the result of "fatal and non-fatal self-inflicted injuries or injuries inflicted by other persons" which were the case in two of the three high profile accidents discussed in the next section. Furthermore, there were a total of 186 fatalities from 14 aircraft hull-loss accidents. This makes the case for improved global aviation safety even stronger

[335] Statistical Summary of Commercial Jet Airplane Accidents (Worldwide Operations 1959-2015), Boeing, 2015

Figure 157 which follows shows historical commercial airliner passenger fatalities from 2006 to 2015. The trend is positive and optimistic. The ten-year average for both fatalities and fatal accidents decreased when compared to 2014th ten-year average. Since 2011, and excluding 2014, fatalities have been below the 10-year average of 582. Similarly, since 2012, fatal accidents have been below the 10-year average of 25 fatal accidents with one exception – the 26 fatal accidents in 2013.

Figure 157: World Commercial Airline Fatal Accidents and Fatalities 2006 to 2015




Source: Flightglobal, IATA

## 2015 Fatal Accidents

2015 was the safest year in aviation history both in terms of fatalities and fatal accidents. This can be stated, as the amount of flight accidents per year has been diminishing and as the amount of flights performed per year continued to rise at a global pace of 2%[336].

Table 43 and Table 44 provide further detail to the fatal accidents (passenger and non-passenger flights) which occurred in 2015[337]. The accident with the most fatalities was an ATR-42 domestic flight operated in Indonesia with 54 fatalities following a controlled flight into terrain[338,339]. Most of the 2015 accidents listed below happened while en-route except three which happened during the initial climb phase of the flight plus one which happened during final approach. Out of the 14 fatal accidents, three incurred fatalities of more than 10 people. The Antonov 12BK of Allied Services Limited was the cause for 41 fatalities after the aircraft crashed during initial climb. According to the ASN safety database the cargo flight's pilot had radioed air traffic control that there were 12 people on board which following the accident was proven wrong. The TransAsia accident (43 fatalities) in Taiwan is later discussed in this chapter. Trigana Air Service Flight 267

[336] 2015 ACI Annual World Airport Traffic Report

[337] Aviation Safety Network (ASN) safety database, 2015

[338] SKYbrary, "Controlled Flight Into Terrain", 2014

[339] National Transportation Safety Committee (NTSC) – Indonesia, Report KNKT.15.08.17.04 published 3.October 2015

incurred the most fatalities (54); however, due to lack of sufficient information[340] in the public domain, this accident is not discussed in the report.

Table 43: Fatal Accidents 2015 – Passenger Flights

| Date | Operation | Operator | A/c Type | Location | Fatalities | Phase |
|---|---|---|---|---|---|---|
| **04-Feb** | S.P | TransAsia Airways | ATR 72 | Taiwan | 43 | C |
| **25-Jun** | R&C | Promech Air | DHC-3 Otter | USA | 9 | ER |
| **16-Aug** | S.P | Trigana Air Service | ATR 42 | Indonesia | 54 | ER |
| **15-Sep** | R&C | Rainbow King Lodge | DHC-3 Otter | USA | 3 | C |
| **02-Oct** | S.P | Aviastar Mandiri | DHC-3 Otter | Indonesia | 10 | ER |
| **S.P= Scheduled Pax R&C= Regional and Commuter** | | | | | | |
| **ER= En-route L= Landing C= Climb RA= Runway/Final Approach** | | | | | | |

Source: Aviation Safety Network database, 2015

Table 44: Fatal Accidents 2015 – Non-Passenger Flights

| Date | Operation | Operator | A/c Type | Location | Fatalities | Phase |
|---|---|---|---|---|---|---|
| **11-Feb** | N.P | Aeropanamericano | Beechcraft 1900C | USA | 4 | C |
| **13-Apr** | N.P | Carson Air | Swearingen SA226 | Canada | 2 | ER |
| **09-May** | N.P | Airbus Industrie | Airbus A400M | Spain | 4 | RA |
| **02-Jun** | N.P | Aeronaves TSM | Swearingen SA226 | Mexico | 5 | ER |
| **20-Aug** | N.P | Dubnica Air | Let L-410MA | Slovakia | 3 | ER |
| **20-Aug** | N.P | Dubnica Air | Let L-410MA | Slovakia | 4 | ER |
| **14-Oct** | N.P | Microsurvey Aerogeofisica e Consultoria Cientifica | Cessna 208B Grand Caravan | Colombia | 3 | ER |
| **04-Nov** | N.P | Allied Services Limited | Antonov 12BK | South Sudan | 41 | C |
| **11-Dec** | N.P | Wasaya Airways | Cessna 208B | Canada | 1 | ER |
| **N.P= Non Passenger** | | | | | | |
| **ER= En-route L= Landing C= Climb RA= Runway/Final Approach** | | | | | | |

Source: Aviation Safety Network database, 2015

[340] Aircraft Accident Investigation Report KNKT.15.08.17.04

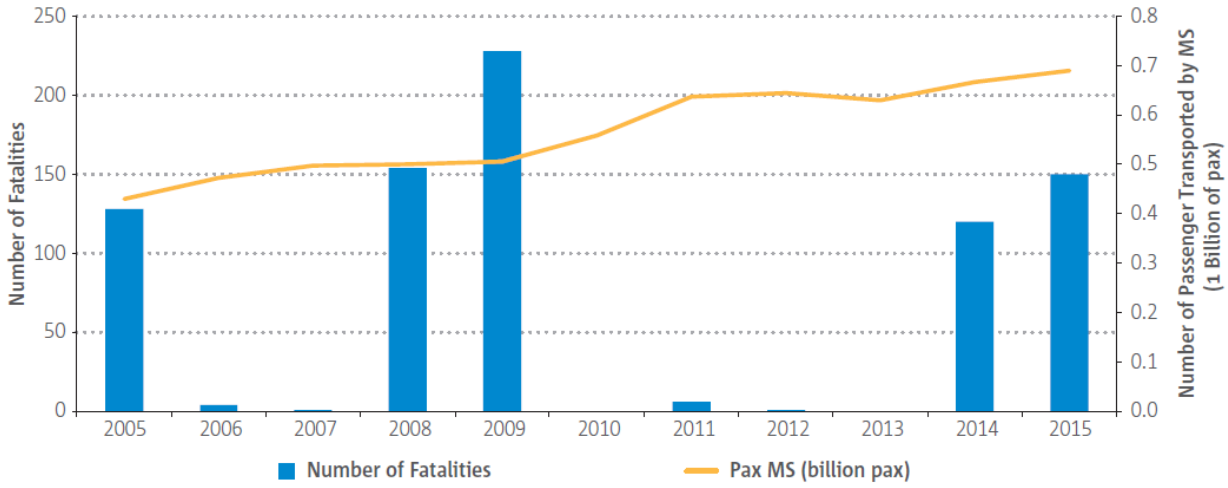
## 2015 Safety Review – Focus on Europe

### EASA

The European Aviation Safety Agency (EASA) 2016 annual report on aviation safety, published in July 2016[341], identifies commercial flights as the domain with the highest number of fatalities. The top 5 aircraft types in terms of the number of fatalities in 2015 vs the annual average for the past 10 years are: commercial and non-commercial aeroplanes, gliders and sailplanes, aerial work/part SPO aeroplanes and non-commercial helicopters.

Before presenting the findings of the EASA annual report, it should be noted that the EASA report classifies the Germanwings Flight 9525 incident as a safety occurrence, hence the statistics do not match those found in the IATA Fatality Risk report. IATA considers that the Germanwings incident meets the exclusion rule for "fatal and non-fatal self-inflicted injuries or injuries inflicted by other persons", as per the definition provided in Regulation (EU) 996/2010[342]. However, EASA counts this as a safety occurrence and includes it in their statistics, however, no explanation is provided on why it is considered as a safety occurrence and not a security incident.

Figure 158. Commercial aircraft fatalities per billion passengers transported 2005-2015




Source: EASA Safety Review 2016

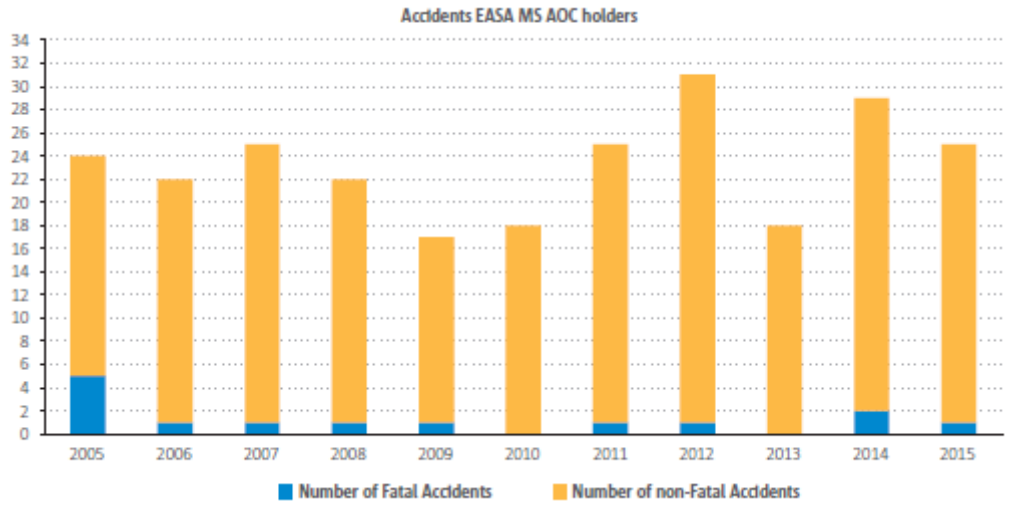
Figure 158 presents a 10-year trend in fatalities against total passengers transported in EASA Member States. Similar to the IATA Report, a negative correlation is found between passenger growth and the number of fatalities per annum. Notable findings include (1) the 24% drop in the number of serious incidents over the period, to 58 in 2015, and (2) the sharp decline in fatal accidents over the last 5-year period of non-EASA MC AOC Holders (from 3.5 per million departures in 2010 to 1 in 2015). EASA MC AOC Holders have a consistently low rate of fatal accidents per one million departures of less than 0.5 fatal accident per million departures.

The Report analyses non-fatal against fatal accidents, and confirms that there is no relationship between the two (e.g. an increase in non-fatal accidents will not necessarily result in an increase of fatal accidents).

[341] EASA Annual Safety Review 2016: https://www.easa.europa.eu/newsroom-and-events/news/easa-annual-safety-review-2016

[342] Regulation (EU) No 996/2010 of the European Parliament and of the Council of 20 October 2010: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:295:0035:0050:EN:PDF

Figure 159. Commercial Air Traffic Aeroplane Accidents by EASA MS AOC Holders




Source: EASA Safety Review 2016

Take-Off, Approach and Landing are the en-route phases when most accidents take place, and passenger aircraft have significantly more accidents than any of the other categories – cargo, military, pleasure or unknown, driven also by the volume of flights by passenger aircraft. Aircraft propelled by turbofan and turboprop engine top the accidents and serious incidents rankings. Turbofan aircraft are impacted by en-route turbulence (causing more passenger and crew injuries) due to the cruising altitude.

EASA identifies eight key risk areas and the respective actions (part of the European Plan for Aviation Safety, EPAS) undertaken to mitigate the respective risks which cover:

- Loss of Control while in flight
- Aircraft System Failure
- Ground Collisions and Ground Handling
- Controlled Flight into Terrain (CFIT) – Terrain Conflict
- Runway Incursions
- Abnormal Runway Contact and Excursions
- Airborne Conflict
- Fire

Top key risks areas are grouped as follows:

- **Operational Safety Issues:** Detection, recognition and recovery from loss of control; Operation in adverse weather conditions; Calculation and entry of take-off and landing parameters into aircraft systems; Handling and operation of the aircraft following a technical failure; Maintaining adequate separation with aircraft (both in the air and on the ground); Ground handling operations; Prevention and resolution of conflict with aircraft not fitted with transponders.
- **Human Factors Safety Issues:** Personal readiness and crew impairment; Flight crew perception and awareness; Crew resource management and communication.
- **Organisational Safety Issues:** Implementation of reporting systems and safety management systems; Oversight of organisations.

In addition the above, the Report also focuses upon risk from conflict zones, with reference to the disintegration of Malaysian Airlines Flight 17 from impact with a Buk surface-to-air missile[343]. Following this tragic accident ICAO set up a central repository where states can voluntarily supply information about risk from conflict zones. In addition, a European High Level Task Force on conflict zones was set up, and in March 2016 it published a report[344] about its activities, aiming to bring together EU countries to share intelligence information about emerging conflict zones so that a risk assessment can be produced per conflict zone that will be issued in the form of Information Bulletin to all Member States and Operator.

Cyber Security also tops EASA's interests on safety matters. The Agency has a roadmap of identified "strategic objectives, enablers in the domains of regulation and standards, research and cybersecurity promotion initiatives" and is in the process of establishing an Aviation Computer Emergency Response Team (AV-CERT).

The vehicle for EASA to promote and drive aviation safety among EASA MS is the European Plan for Aviation Safety (EPAS). This Plan is supported by a common Safety Risk Management (SRM) process that consists of five general steps and engages a number of collaborative groups and advisory bodies. According to the SRM process, a safety issue needs to be (1) identified, and (2) assessed. Then (3) safety actions are defined and programmed, before (4) they are implemented. Finally, the safety performance is measured. The process engages Collaborative Analysis Groups, the Network of Analysts and the Safety Promotion Network. The Stakeholder Technical Bodies are responsible for reviewing and committing to concrete actions that address the specific safety issues at Domain level; the Stakeholder and Member State Advisory Bodies review and discuss the strategic safety activities in the Rulemaking Plan and the EPAS. The Rulemaking Groups and the Safety Task Groups support EASA in implementing the specific safety actions.

To summarise, aviation safety in Europe has the best track record worldwide for the past 10 years. EASA achieves this by continuously following recent industry developments and learning from aircraft accidents both among its Member States but also worldwide.

## EU Air Safety List

Following Regulation (EC) No 2111/2005, the European Commission established a list of airlines which are not allowed to fly in European airspace[345] (those banned from operating in Europe, and those restricted from operating under certain conditions in Europe). The list is maintained publicly on the Commission's website and it contains EU operational bans to individual airlines and countries. On a country level, all airlines issued with an Air Operator's Certificate from that country are subject to the ban, even if not named explicitly in the list.

Airlines are added on a case by case basis. Either the EC or a Member State (via its Civil Aviation Authority) may propose an airline to be either added to or removed from the list, using the following air safety criteria[346]:

- results of aircraft ramp checks carried out in European airports;
- the use of poorly maintained, antiquated or obsolete aircraft;

[343] Final Report from Dutch Safety Board on the MH17 Crash: https://www.onderzoeksraad.nl/uploads/phase-docs/1006/debcd724fe7breport-mh17-crash.pdf

[344] European High Level Task Force on Conflict Zones, 17.03.2016; https://www.easa.europa.eu/system/files/dfu/208599_EASA_CONFLICT_ZONE_CHAIRMAN_REPORT_no_B_update.pdf

[345] The EU Air Safety List – further information: http://ec.europa.eu/transport/modes/air/safety/air-ban/furtherinfo_en

[346] Q&A on the list of air carriers subject to an operating ban in the EU (the "blacklist"): http://europa.eu/rapid/press-release_MEMO-09-162_en.htm?locale=en

- the inability of the airlines involved to rectify the shortcomings identified during the inspections (evidenced by a repetition of the same deficiencies over a period of time); and,
- the inability of the authority responsible for overseeing the airline to perform this task and to ensure that the international safety standards are adhered to at all times.

Citizens of the European Union are encouraged to avoid travel with the airlines present on the "blacklist" when travelling abroad[347].

## ENCASIA

The European Network of Civil Aviation Safety Investigation Authorities (ENCASIA) was established in 2010[348] to group the air safety investigation authorities (SIAs) of the EU Member States in a single representative body. Its role is to advise other institutions within the EU on matters in relation to safety investigations and the prevention of accidents and incidents. One example from 2015 was an Opinion published by ENCASIA on the approach for investigations of accidents and serious incidents involving drones.

ENCASIA has six active working groups (WG)[349].

- WG 1 "Network Communication and Internet Presence" which focuses on how the Network's activities are communicated across the EU;
- WG 2 "Inventory of best practices of investigation in Europe" that collects observed good practices from Safety Investigation Authorities (which ENCASIA consists of). In 2015 its focus was on protecting the content from Cockpit Voice Recorders (CVRs). Some countries would delete the content prior to returning the CVR to its owner. However, in other countries this would be unlawful and therefore the CVR must be safeguarded as it is an "evidence that can incriminate or exonerate";
- WG 3 "Procedures for asking and providing help" and WG 4 "Training of investigators". These WGs hosted in 2015 a 4-day training event in Portugal which covered all aspects of an investigation. The event focused on the Safety Recommendations Information System (SRIS) database and the collection of best practices. The objective of this WG is to ensure that the Safety Investigation Agencies of individual EU Member States are prepared to manage a major investigation and capable to pool resources from fellow Member States;
- WG 5 "Peer Reviews" facilitates the reviews of selected SIAs through peer review panels of three individuals from other SIAs. In 2015, Iceland, Germany, Norway, Portugal, Denmark and Romania were reviewed. The results showed that collectively the SIAs have the expertise to manage both small and large aircraft accidents and advised Romanian and Portuguese SIAs to make arrangements with other SIAs to formalise potential collaborations. Additionally, the UK Air Accidents Investigation Branch (AAIB) was invited by its Singaporean peer (also called AAIB) via the ICAO Continuous Monitoring Approach external audit scheme to conduct a peer review and to share European good practices; and,
- WG 6 "Safety Recommendations". The objective of this WG is to further develop the European SRIS[350] by improving the analysis of its content. SRIS contains all safety recommendations (SRs) concluded from every SIA investigation. In this way, for example, the safety recommendations following the investigation of an accident in Slovakia can potentially prevent a similar accident in Bulgaria. Since its launch in 2012, a total of 1,810 safety recommendations have been recorded,

[347] List of Air Carriers Which Are Banned From Operating Within The Union http://ec.europa.eu/transport/modes/air/safety/air-ban_en

[348] European Network of Civil Aviation Safety Investigation Authorities (ENCASIA): https://ec.europa.eu/transport/modes/air/encasia_en

[349] ENCASIA Annual Report 2015: https://ec.europa.eu/transport/sites/transport/files/2015-encasia-report.pdf

[350] European Central Repository for Safety Recommendations in Aviation: https://ec.europa.eu/jrc/en/scientific-tool/sris-european-central-repository-safety-recommendations-aviation

375 of which were safety recommendations from 2015. This represented a drop in the average for 2012-2014 of 478 SRs which should be considered a good sign that either the total number of accidents being investigated is dropping and/or the amount of safety regulation imperfections is being reduced.

ENCASIA went one step further with the register of SRs by grouping them and identifying Safety Recommendations of Union wide Relevance (SRURs). These consisted in the areas of Parachute Jumping, Pilot Licensing, Ballistic Parachute Recovery Systems, Training for Pilots, Lithium Ion Batteries in Aircraft Equipment and others. Furthermore, SIAs would conduct their own studies which would output further SRs. Examples are from France (review of the certification of Thielert engines which were associated with multiple events of engine malfunction), Italy (review of air show organisation following accidents on shows worldwide) and the UK (review of airworthiness of aircraft registered overseas and resident in the UK).

An analysis of the SRs collected in 2015 shows that half of them relate to Procedures and Regulation and a quarter of them – to Aircraft, Equipment, or Facilities. The latter mainly consist of Aircraft Equipment, Aircraft Systems, Aerodrome Equipment or Facilities and Aircraft Documentation. 21% of the 375 SRs relate to Aircraft Operations (Procedures). The other major groups of SRs in the Procedures and Regulation category are Aircraft Certification and Aircraft Maintenance and Inspection.

## TCO

In 2014 EASA published the Third Country Operator (TCO) Regulation[351]. It applies to all air carriers who would like to perform commercial flights to any EU destination. Under this regulation, EASA would issue air carriers, with an AOC issued outside the EU, with a safety authorisation should they meet the ICAO safety standards. The TCO authorisation covers all EU Member States, the 4 European Free Trade Association (EFTA) States and all additional territories covered by Regulation (EC) No 216/2008.

It should be noted that the TCO only accounts for the safety-related part of the assessment of the air carrier[352]. Member States will continue to issue the required operational permit. Both the TCO and the European Air Safety List are maintained in a coordinated way. This means that if an air carrier from the list is given a TCO authorisation, it will be subsequently removed from the "blacklist".

Exception to the TCO regulation can only be made for air ambulawence or ferry flights and for non-scheduled flights "to overcome an unforeseen, immediate and urgent operational need".

### 2015 Safety Review – Worldwide Focus

## Fatality Risk

In its 2015 safety report, IATA introduced a new measure of air traffic safety called "fatality risk". This measure seeks to quantify the exposure of a passenger or crew to a fatal injury through dividing the number of "hull loss equivalents" by the total number of flights or sectors. A hull-loss equivalent is the division of all fatalities by the total number of passengers and crew carried by the aircraft that have taken part in fatal accidents. As this is a new measure, it was retroactively applied to the 2010-14 period.

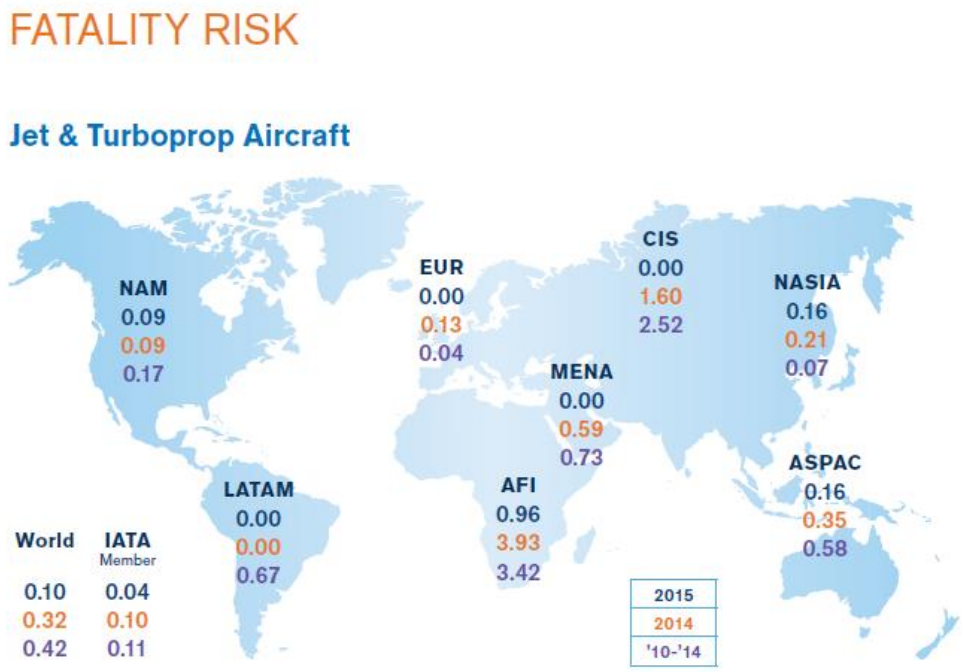
Figure 160 below presents a map indicating the fatality risk per geographical region and providing statistics for 2015, 2014 and the 5-year average for the period 2010-2014; the 2014 and 5-year average figures were calculated retroactively based on available data.

[351] EASA: Third Country Operators: https://www.easa.europa.eu/easa-and-you/air-operations/tco-third-country-operators

[352] EASA FAQ on Third Country Operators: https://www.easa.europa.eu/the-agency/faqs/third-country-operators

Despite the few data points, the fatality risk statistics indicate a trend of global improvement in aviation safety over the past few years. However, this needs to be verified as more data becomes available.

Figure 160: Total Jet & Turboprop Aircraft Fatality Risk

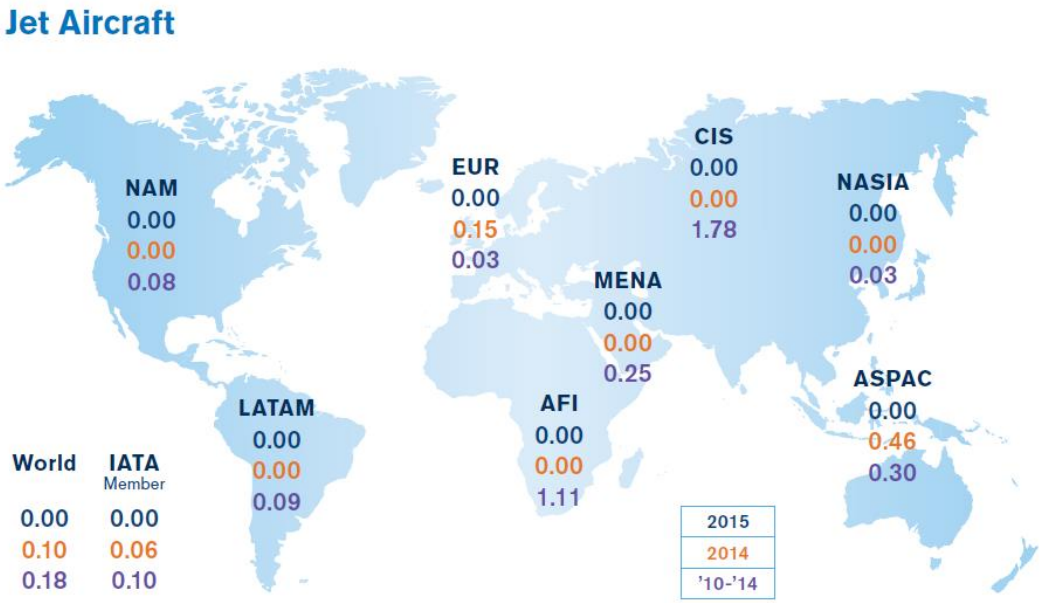



Source: IATA Safety Report 2015

Nevertheless, even though there were zero jet aircraft fatalities in 2015, the risk from a fatal injury in an accident with a turboprop aircraft remains significant, as evident from Figure 161 and Figure 162 presented below.

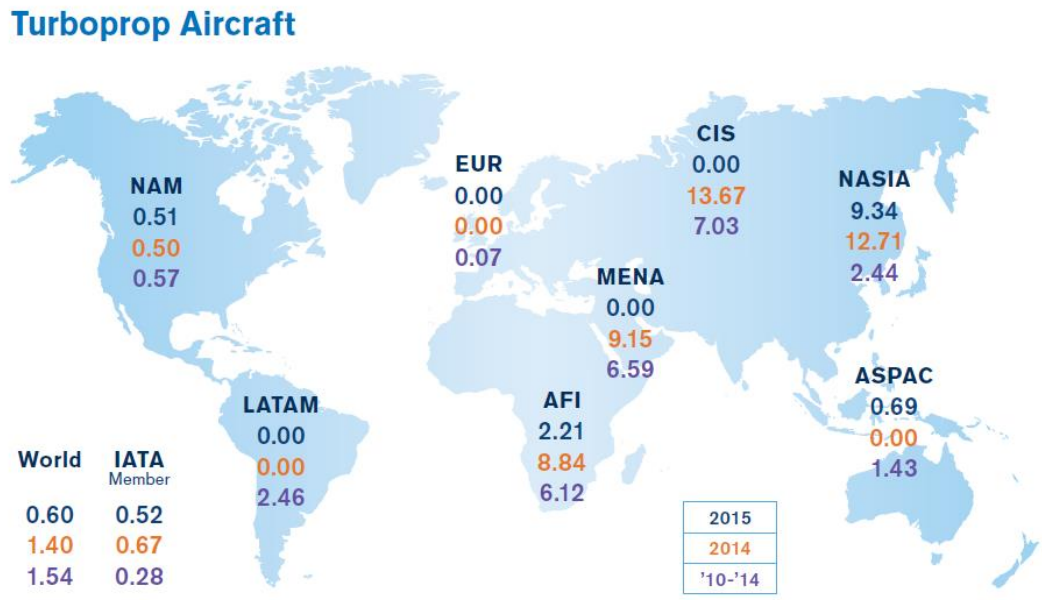
In overall, two points can be made from the information in the two figures. First, more fatal accidents are taking place on turboprop aircraft and, second, there is a general trend of improvement in aircraft fatalities. From a geographical point of view, Asia remains high in the risk map.

Figure 161: Total Jet Aircraft Fatality Risk




Source: IATA Safety Report 2015

Figure 162: Total Turboprop Aircraft Fatality Risk




Source: IATA Safety Report 2015

Although the African region appears in the overall map to have the highest fatality risk – primarily driven by turboprop aircraft fatalities - North Asia experienced the most fatalities per turboprop flight in 2015.

The World vs IATA member average statistics displayed in the figures above indicate a better safety culture of IATA member airlines. In order to become a member of IATA an airline needs to go through the IATA Operational Safety Audit which is internationally accepted to evaluate the operational management and control systems of the respective airline[353]. Nevertheless, the world fatality risk in 2015 indicates an improved safety performance across both IATA and non-IATA members.

### High Profile Accidents

This section of the Safety and Security chapter explores in some detail some of the fatal accidents that occurred in 2015: Germanwings Flight 9525, MetroJet Flight 9268 and TransAsia Flight 235. The former two are categorised as criminal activities and are therefore not present in the safety statistics of the aviation industry. The latter is the accident with second most fatalities in 2015.

## Germanwings Flight 9525

On 24th March 2015 a Germanwings aircraft operating from Barcelona, Spain, to Dusseldorf, Germany, crashed in the French Alps following a deliberate action by the co-pilot. The Airbus A320-200 was carrying in total 144 passengers plus 6 crew members on board, all of whom died. While en-route, the pilot left the cockpit leaving the co-pilot alone in the cabin. The latter then reprogrammed the autopilot to descent the aircraft into the ground. The pilot tried to re-enter the cabin and to gain contact with the co-pilot, however, due to the security design specifications of the cockpit door system this was not possible. Consequently, the aircraft crash landed into the mountains in southern France[354].

Following the 9/11 terrorist attacks security of the cockpit was significantly enhanced.

- Firstly, cockpit doors were “designed to resist penetration by small arms fire and grenade shrapnel and to resist forcible intrusions by unauthorized persons”[355].
- Secondly, a system was put in place to allow the pilot in the cabin to deny access to anyone trying to enter the emergency entry code for the cockpit door. The only scenario when the door can be unlocked from the outside without the consent of the people within the cockpit is when the latter are incapacitated (e.g. Helios Flight 522[356]). Flight crew can input an emergency cockpit entry code to request access to the pilot cabin. If nobody in the pilot cabin reacts to the buzzer, the door would unlock for a few seconds and thus granting entry from the outside.
- Moreover, airlines (mostly American) adopted the “2-persons-in-the-cockpit” rule. It emphasises on the importance that at all times at least 2 people should be in the cockpit one of whom is certified to fly the aircraft[357]. Canadian and European airlines adopted this rule on a wider scale only after the 2015 Germanwings crash. Lufthansa Group, Germania, Wizz Air, Thomas Cook, easyJet and Norwegian Air Shuttle were the first airlines which adopted the rule in the aftermath of the accident. Since then, and on 21st July 2016, the European Aviation Safety Agency (EASA) issued a formal recommendation that all EU-based airlines should adopt it as well[358].

[353] IATA Membership Application Procedure and Fees, January 2016

[354] Aviation Safety Network (ASN) safety database, 2015

[355] EASA regulation November 1, 2003

[356] ASN safety database, 2005

[357] Cabin Safety Subject Index, FAA, 07th April 2015

[358] EASA Safety Information Bulletin issued 21st July 2016

EASA assembled a task force which "delivered a set of 6 evidence-based recommendations to the European Commission on 16 July 2015"[359]. The cockpit door system was not seen as the main issue for this accident, but the primary topic of concern was the psychological evaluation of pilot crews, as little attention was paid to this area prior to the Germanwings accident. The report assesses the current system within which there is no specialised psychological evaluation, however such evaluation is part of the generic regular medical examination of pilot crews. The system expects that pilots would self-check-in when they feel psychologically unstable, which may result in them being grounded. Therefore, it can be deemed counter-intuitive that anyone would report themselves and thus risk losing their job.

The six EASA recommendations are listed below.

Table 45: EASA Task Force Recommendations on Measures Following the Germanwings Accident

| EASA Task Force Recommendation | |
|---|---|
| **Recommendation 1:** | 2-persons-in-the-cockpit recommendation is maintained. |
| **Recommendation 2:** | All airline pilots should undergo psychological evaluation as part of training or before entering service. |
| **Recommendation 3:** | Mandate drugs and alcohol testing as part of a random programme of testing by the operator. |
| **Recommendation 4:** | Establishment of robust oversight programme over the performance of aero-medical examiners including the practical application of their knowledge. |
| **Recommendation 5:** | National regulations ensure that an appropriate balance is found between patient confidentiality and the protection of public safety. |
| **Recommendation 6:** | Implementation of pilot support and reporting systems, linked to the employer Safety Management System within the framework of a non-punitive work environment and without compromising Just Culture principles. |

Source: EASA Task Force Report

In addition to the six recommendations presented above, EASA also makes a general recommendation for the creation of a European aeromedical data repository as a first step to facilitate the sharing of aeromedical information and tackle the issue of pilot non-declaration. EASA will lead the project to deliver the necessary software tool.

As indicated in the table above, five of the six EASA recommendations focus on the procedures for medical and psychological examinations of pilots and the balance between public safety and patient confidentiality. Patient confidentiality is a major issue in such situations. Doctors depend on the patient sharing the truth about their state and they can fail to make the correct diagnosis if the patient cannot trust in the confidentiality of their doctor-patient relationship and share everything relevant. On the other hand, there is the matter of national security and the respective pilot presenting a threat to the safety and security of multiple people.

[359] Task Force on Measures Following the Accident of Germanwings Flight 9525, EASA, 16th July 2015

## MetroJet Flight 9268

On 31st October 2015 an Airbus 321-200 operated by Russian airline MetroJet and carrying 217 passengers plus 7 crew members on board disintegrated mid-air in the North Sinai province of Egypt. Initial findings indicate that a bomb was detonated on board mid-flight[360].

The black box (Flight Data Recorder, FDR) of the aircraft revealed that the FDR had suddenly stopped recording during the climb phase of the flight. There were no indications of a bird strike, mechanical failure or any other malfunction of the aircraft and its systems. There have also been no distress calls or mayday announcements from the pilots. Despite that the wreckage of the aircraft found on the ground was 13km in length, the forward fuselage and wings were found at the same place (destroyed upon impact with terrain), whilst the rest of the aircraft was scattered across the wider area of the wreckage. Based on this information, investigators have assumed that the aircraft disintegrated mid-air[361].

This accident is still under investigation. However, officials from both Russia and Egypt have acknowledged that the most probable cause for the accident is the explosion of an estimated 1.5kg of TNT explosive on board of the aircraft. Investigators from the US and the UK have not challenged this conclusion, as it is not common for aircraft to disintegrate mid-air due to mechanical failure. The statement by the Russian Federal Security Service (FSB) further reads that there had been traces of bomb residue in the aircraft wreckage.[362]

One theory explaining how a bomb has come on board is that an airport employee smuggled the bomb into the aircraft's baggage hold or that they assisted those who did. In November 2015, media reported that two employees of the airport have been detained for questioning[363]. If this is true, it can pose wider questions for the security screening of staff working in the security cleared zones at airports.

## TransAsia Flight 235

On 4th February 2015, a turbo-prop aircraft crashed in Keelung River in Taipei shortly after taking off from the Taiwan capital airport. Investigations concluded that pilot error was the cause for the crash. There were 15 survivors (1 of who crew member) out of the 58 people on board.[364]

The analysis of the black box revealed that the automatic take-off power control system (ATPCS) wasn't enabled during take-off. Despite that, the pilots didn't abort the take-off nor did the airline have a standard operating procedure (SOP) in place to dictate such actions, contrary to common practice. Consequently, the right engine shut down during initial climb and entered auto feather mode[365]. The pilots didn't follow the existing SOP to identify the malfunctioning engine and reduced the power to the other, left, engine. Following these, the pilots didn't have enough time to restart any of the two engines, so the aircraft stalled over a highway viaduct and fell into the Keelung River. Only 1 crew member and 14 passengers survived this accident.[366]

In June 2016, the Aviation Safety Council in Taipei, Taiwan, published the Aviation Occurrence Report which investigates the crash with the objective of prevention future accidents and incidents. Its findings listed the following probable causes for the TransAsia incident:

[360] ASN safety database, 2015

[361] Investigation by Interstate Aviation Committee

[362] Announcement by the FSB (Federal Security Bureau, Russia)

[363] Reuters: "Egypt detains two airport staff over Russian air crash - security sources". 17.November 2015

[364] ASN safety database, 2015

[365] SKYbrary: "AP4ATCO – Turboprop Engine"

[366] Aviation Occurrence Report, Aviation Safety Council (Taipei, Taiwan), June 2016

- power plant issue with the auto feather unit (AFU);
- lack of TransAsia SOP to abort take-off in case the ATPCS doesn't arm;
- failure of the crew to shut down the engine, the master warning of which had sounded, as well as failure to follow the airline's procedures for identifying the fault in the aircraft system;
- The flight crew didn't coordinate, communicate or manage the threats and errors in an efficient manner and lost control of the aircraft in a crucial situation.

This was the second fatal accident for TransAsia in two consecutive years following the crash of Flight 222 upon approach caused by adverse weather and failure of the crew to comply with the approach procedures[362]. This reiterates the need for the airline to improve its safety culture. Further identifies lessons learnt and actions taken as a result of the 2016 accident:

- improvement of pilot training;
- need for thorough airline procedures and for flight crews to follow these;
- engine modification release that better tackles issues with the ATPCS and AFUs.

As the main theme arising from the Germanwings high profile accident relates to pilots' psychological health, the next section takes a look at this in a bit more detail along with the proposed recommendations in relation to rulemaking.

### Pilots' Psychological Health

As discussed earlier in this chapter, Germanwings Flight 9525 crashed in the French Alps in October 2015 killing 144 passengers. The most probable cause of the accident was the suicidal psychological state of the co-pilot who found himself alone in the cockpit after the pilot left the cabin. There is a general understanding in the aviation community that the enhanced security of the cockpit doors, implemented after the 9/11 terrorist attacks in the USA, are adequate and it was unfortunate that they played an antagonistic role in this accident.

It is general practice following an aircraft fatal accident that the stakeholder countries set up a task force to investigate the respective accident. In the event of the Germanwings Flight 9525 accident the relevant task force focused on the evaluation of the psychological state of pilots[359]. It recognised that the current system depends on doctors identifying psychological issues either during regular generic medical examinations or from the pilots coming forward themselves. Independent of EASA's task force, the FAA set up an Aviation Rulemaking Committee (ARC) to look into the topic of pilot fitness[367]. As a result, the Committee conducted research and produced a comprehensive report that drew from 15 academic sources within the field of mental health research.

The report synthesises studies on human societies to point out that even though people are becoming more aware of psychological illnesses, they are not capable of recognising one. In the same time, people who doubt themselves whether they have such an illness would be more inclined to seek professional advice and treatment after someone close to them suggests it as well. As noted in the report, this makes it very hard for psychological illness to be identified in the first place. Should a pilot visit a psychologist, the airline's management must be notified who may or may not then act by either suspending the pilot from flying duty or monitor them more closely.

It should be noted that in the Germanwings accident case the potential route cause was not the discovery of the mental illness, but the communication between different authorities with regards to identifying the illness and sharing it, and subsequently working together to resolve this, which relates to patient confidentiality. The

[367] FAA: "Pilot Fitness Aviation Rulemaking Committee Report"; 18th November 2015

ARC report[367] concludes that "a risk mitigation process built on SMS (Safety Management Systems[368]) principles should be used by air carriers and pilot representative organisations to create an environment where early reporting, appropriate treatment and rapid return to the flightdeck are the expectation". So, identification of the illness is challenging, but even when an issue is identified, there must be an efficient system in place to safeguard pilots as well as the community; the pilot from losing their job because a mental illness poses a threat to the community and the community from future aircraft accidents due to pilots with psychological illness flying the aircraft.

The ARC research continues with looking into the pilot community. Although there is no data to assess the presence of similar trends – whether pilots are aware of the nature of mental illnesses – the report ascertains that all pilots undergo numerous medical examinations during their training to become commercial airline pilots.

The ARC report indicates three stages in the context of pilot recruiting, when a psychological illness can be developed: prior to hiring, during training and while on the job. It is interesting to note that hiring practices have not changed for over 20 years and are largely similar across the various airlines and pilot associations. This indicates that the industry wouldn't have taken advantage of any available research on how to better identify psychological issues. In addition, new hire pilots are "closely scrutinized during their initial training and qualification period, as well as during their first year or probationary period". This pushes trainees to their limits and exposes their weaknesses, so should they be suffering from psychological issues, those would surface up. In spite of this "scrutiny" failure rates for new pilots amongst all major airlines are relatively low (12.4%)[367].

The final part of the ARC research focused on the scenario where the pilots develop mental illness after they've been hired. Aviation Medical Examiners (AME) conduct regular examinations during which they may find a reason to believe the pilot is mentally unfit to operate an aircraft and would subsequently produce a report. It is then the management's decision whether to remove the respective pilot from flying status. If a pilot is unsure and visits a medical or mental health professional, this also results into a report based on which the management of the airline may decide to remove them from flying duty. Therefore, self-reporting can be perceived by pilots as a high risk scenario.

In addition, the ARC report identified a number of disincentives to a pilot self-reporting. These are listed below:

- Negative impact on career opportunities, or even a career ending possibility;
- Financial instability, due to a halt of flying and increased medical costs;
- Lack a trust in the system;
- Disapproval of people diagnosed with mental illness among the general population, colleagues, friends and family;
- The individual may not recognise the symptoms of present mental illness; and,
- The individual does not believe that the treatment would "do any good".

Thus the following eight-topic recommendations were drawn:

Table 46: ARC Report Recommendations

| Topics | ARC Recommendations |
|---|---|
| **1. Enhance AME Training** | Doctors' training to focus mostly on physical medicine and less on psychological.<br>This recommendation suggests that either the doctors are better trained to identify psychological issues with patients, or that the AME system is restructured to include psychiatrists among the people actively and routinely examining the pilot community. |

[368] SKYbrary, "Safety Management System", 2016

| Topics | ARC Recommendations |
|---|---|
| **2. Psychological Testing** | The ARC does not recommend formal testing as part of the pilot's hiring process or during routine FAA routine medical examinations beyond what is currently in place as no evidence was found to indicate that such testing of pilots would enhance the ability to assess mental fitness. |
| **3. Pilot Assistance Programmes** | Pilots who report mental issues to receive temporary relief from flight duties, professional support and encouragement to go back to flying as soon as possible. This may encourage pilot willingness to report such issues when present.<br>However, for this to be possible, the process must be confidential, non-stigmatised and provide a safe environment. Patients must be able to trust the system and the cure. |
| **4. Air Carrier Education** | Airlines should spread awareness of mental illness across their staff and promote acceptance for employees/colleagues experiencing such illnesses.<br>As a result, it can be expected that self-reporting would increase and therefore chances of successful treatment would also increase. |
| **5. Informational Material on Pilot Support Programmes** | The FAA should collect and prepare an information bulletin on pilot support programmes which may assist airlines in preparing their own info bulletin.<br>Sharing best practice should help bring trust to the system and treatment of mental illness. |
| **6. Medical Professional Reporting** | The development of a national policy on mandatory reporting of pilots who are unfit to fly an aircraft due to mental illness.<br>Currently, the reporting responsibilities of doctors in this context are unclear. |
| **7. Two Persons on Flightdeck and Flightdeck Access** | The current practice in the US of always maintaining two people in the cockpit should remain unchanged and should also be promoted to airlines of foreign heritage.<br>It should be noted that this policy allows other crew members access to the cockpit and might present a separate threat because cabin crew members undergo different hiring and medical examination procedures than pilot crew members. Thus an alignment of the two should be considered. |
| **8. Aircraft Design Standards** | The ARC didn't find any new aircraft designs or technologies that would improve aviation safety in the context of pilot crew mental fitness. |

Source: ARC Report

## Open Skies in the Asia Pacific

In 2015 TransAsia experienced a hull loss fatal accident for a consecutive year. Even though Indonesia is part of ASEAN, safety continues to be a concern with the rate of fatal accidents and fatalities still one of the highest among the world regions and the majority of its commercial airlines still on the EU blacklist. Simultaneously, ASEAN's Open Skies policy which came into effect on 1st January 2015[369] has the potential of improving the safety culture in the region.

Asia Pacific had the most accidents per million sectors after Africa and CIS[370]. Passengers carried by airlines of the Association of Asia Pacific Airlines (AAPA) doubled from 2003 to 2012[371]. According to CAPA[372], the total seat capacity of ASEAN airlines grew with double digit figures for the period 2009-2013. Growth in the

[369] ASEAN Briefing: "The State of ASEAN Aviation in 2016"

[370] IATA Safety Report, 2015

[371] Association of Asia Pacific Airlines (AAPA), Industry Overview and Regulatory Challenges, Presentation by Andrew Herdman, Director General of AAPA

[372] CAPA – Centre for Aviation: "Asian carriers post solid traffic & load factor increases in 2012 but cargo remains a headache: AAPA"

region is expected to continue to grow from 4.8 trillion Revenue Passenger Kilometres (RPKs) in 2010 to 12.3 trillion RPKs in 2030, representing a third of worldwide RPKs[371]. The region is the world's largest aviation market with 37% of all orders for aircraft for the period 2014-2033[373]. In summary, the region has been entertaining a sustained growth over the past decade. Such a rapid expansion creates safety concerns if other sectors of the industry such as airport capacity, air traffic management, pilot training and certification fail to cope. The TransAsia Flight 235 accident backs up the statistics that a reoccurring reason for accidents in the area is the lack of introduced or enforced standard operating procedures. This is what the Open Skies policy can improve.

A single aviation market, or Open Skies, is a market which allows airlines from the signatory countries of that market to fly with granted freedoms of the air – airline from Country A can operate a route between Country B and Country C. Currently this is only possible under bilateral agreements. In order to make Open Skies possible, the countries involved need to standardise their safety and security regulations and air traffic management practices.

ASEAN Single Aviation Market came into effect on 1st January 2015 by removing any present restrictions on third, fourth and fifth freedoms of the air, as defined per ICAO regulation[374], for airlines based in ASEAN member states. First, it must be noted that ASEAN is established as an association to bring together the countries members as communities[375]. Unifying the aviation markets is part of the association's agenda. The main struggle in attaining this Single Aviation Market, however, is the alignment of the regulatory frameworks of the respective countries. ASEAN achieves this via the Mutual Recognition of Aviation Related Certification Agreement[376]. This is based on the establishment of minimum standards and capabilities and refers to air operator certification, aircraft airworthiness and licensing of flight crew and engineers. There isn't an up-to-date report in the public domain for the progress of ASEAN's member states in aligning these standards among each other.

### Challenges from the Upsurge in Drones

Drones are also known as unmanned aircraft vehicles (UAVs)[377]. Their main attribute is that there is no pilot on board but can be controlled either remotely by an operator or through the use of software. Initially they were developed for military purposes (surveillance and/or fighting); however, in the current decade their use by the wider public is becoming increasingly popular. The most common UAVs can be of any size – from a few centimetres to a few meters per dimension. They can be powered either by a mix of rotors powered by lithium-polymer batteries, or by turbo propellers depending on the intended use. Conventional jet engines are not deployed[378].

Due to their benefits over conventional aircraft, ownership and usage of UAVs is increasing in both commercial and non-commercial applications. This presents a health and safety risk to commercial aviation, as regulation is yet to be introduced. Due to the lack of regulation drones are operated in parks, in cities and near airports. The latter has caught the attention of aircraft pilots and airport operators as near-misses of UAVs with departing or approaching passenger aircraft have increased drastically in the last year[379]. The

[373] Boeing, Current Market Outlook 2014-2033

[374] ICAO Freedoms of the Air

[375] 2010 ASEAN Multilateral Agreement on the Full Liberalisation of Passenger Air Services

[376] ASEAN, "Building the ASEAN Community: ASEAN Single Aviation Market; One Sky, One Region"

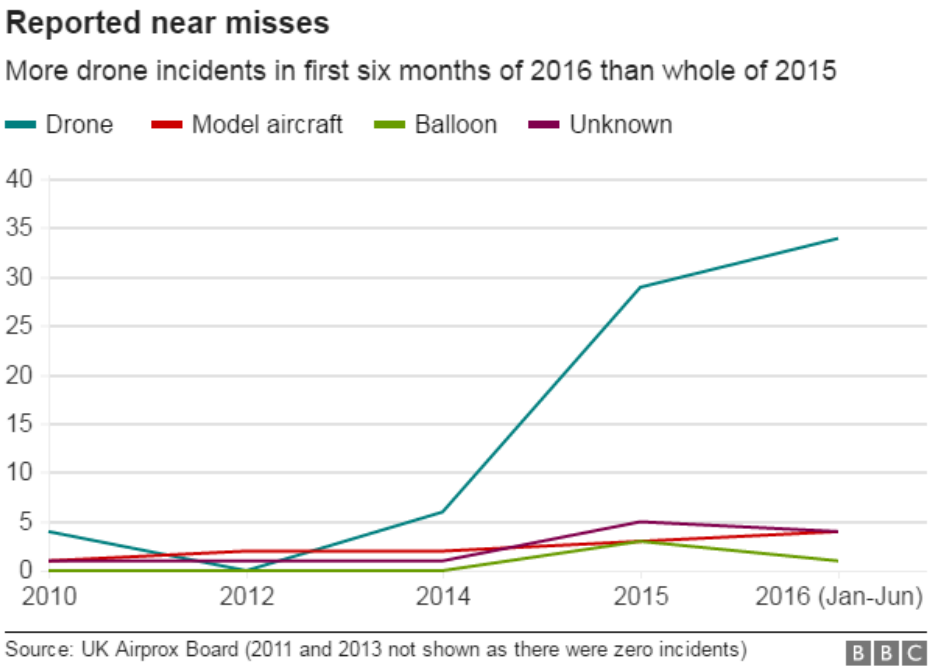
[377] CAA: Flying drones

[378] ICAO: Unmanned Aircraft Systems (UAS)

[379] "Structuring the safety case for unmanned aircraft system operations in non-segregated airspace", R. Clothier, B. Williams, N. Fulton, Safety Science journal, Vol. 79, Nov-2015, p.213-228

danger is not only that the impact is compared to a bird strike, but most importantly that UAVs are highly explosive because of the batteries that power them.

Figure 163: Reported Near Misses




Source: BBC, 2016

The UK Airprox Board collects statistical information for every "situation in which, in the opinion of a pilot or air traffic services personnel, the distance between aircraft as well as their relative positions and speed have been such that the safety of the aircraft involved may have been compromised"[380]. From January to June 2016 alone there were 34 reported near misses between general aviation aircraft and UAVs, compared to 29 across 2015[381]. For comparison, in the US there were 764 drone sightings near airplanes in 2015[382]. Even though drones should fly at a maximum height of 400ft, the highest near miss, recorded over Heathrow in February 2015, was 12,500ft[383].

## Regulation

To mitigate these risks, the North American governments have started introducing regulations for the use of UAVs. These regulations divide them in categories based on their weight and type of usage to apply limits on the height and speed they can operate within. Mexico was the first to introduce such a regulation – on 8th April 2015[384].

The Transport Minister of Canada introduced a "No Drone Zone" sign to remind UAV operators of areas where they shouldn't be flying, such as airports[385]. The government informs the public about the potential

[380] UK Airprox Board Website

[381] BBC: "Drones and planes in mid-air near misses increase"

[382] Washington Post: "How airports and the drone industry are teaming up to protect planes"

[383] BBC: "'Drone' hits British Airways plane approaching Heathrow Airport"

[384] Direccion General de Aeronautica Civil, Mexico: Establishing Requirements for operating unmanned aircraft systems

[385] CAPA Centre for Aviation: "Canadian Transport Minister inaugurates drone safety campaign, confirms regulations will be proposed"

dangers of drones through a dedicated website. The website outlines the "Do's and Don'ts" and the legal requirements for obtaining a permission to fly an UAV. The latter depend on the usage of the UAV – if used for "fun of flying only" and weight of the device is below 35kg, no permission is required; but in any other case the UAV owner must apply for a "Special Flight Operations Certificate" (SFOC). According to the ministry website, the Government has issued 5,679 SFOCs between 2010 and 2015[386]. However, a full regulation solely dedicated to UAV is still in the making and a proposal is yet to be published.

Similar rules to those of Canada but applying to drone operators in the USA (albeit with different terminology) are published on the FAA website as well[387]. However, a full regulation is not yet in place.

## Applications

UAVs have many applications. The regulations in North America tackle unpredictable range of applications such as "fun of flying" as well as the commercial usage of drones. Many businesses find new generation solutions via the usage of drones, including businesses in the aviation industry. One example is the airport operator of Houston airports who is working with a local drone operator to perform airport perimeter security[388]. As Texas law permits civilians to carry guns including into the airport terminal building, the utilisation of UAVs for security purposes is very welcome. Another example is Airbus' new software for inspection of aircraft prior to shipment to customers[389]. Usually a visual inspection requires two inspectors, a telescopic handler and an average of two hours. In comparison, the drone inspection would take 10 to 15 minutes and upon discovery of any potential non-quality the software produces a 3D image to send to the engineering department for analysis and correction in real time. This decreases significantly the risk of mechanical failure of the aircraft during a test flight and after it's been shipped to the client.

Another innovation in the industry is Airmap[390]. Over 75 American airports already use Digital Notice and Awareness System (D-NAS) which enables air navigation for UAVs. Via this application drone operators can monitor other UAVs in proximity to their own and can also request flight clearance from ATC should one be required. Reportedly, the FAA would also consider using software of similar function to impose the no fly zones for UAVs with the aim of minimising the airprox events.

British architects Foster+Partners and the Swiss Federal Institute of Technology have designed in partnership a "droneport" – an airport solely for UAVs[391]. This airport will be located in Rwanda and its purpose will be to coordinate the deliveries of medicine cargo to remote locations comprising 44% of the country. The construction is expected to finish by 2020 when deliveries would commence. It can be assumed that drones might be handed their own airspace – something that has been proposed for other similar projects[392].

All these diverse drone applications drive the growth in UAV development, construction and usage. This brings challenges to regulators to bring all drone operations under the same regulatory framework. The North American governments have initiated the process, but there is a lot more to be done yet in order to tackle safety from airprox events.

[386] Transport Canada: "Drone Safety: Getting permission to fly your drone"

[387] FAA, Unmanned Aircraft Systems

[388] CAPA Centre for Aviation: "CAPA Airport Innovation Summit explores opportunities to pursue new technology in Australia & beyond"

[389] Airbus: "Airbus demonstrates aircraft inspection by drone at Farnborough"

[390] Airmap Inc.

[391] Foster and Partners: "Norman Foster's Droneport Prototype goes on show at the Venice Biennale 2016"

[392] BBC: "Amazon suggests a separate airspace for delivery drones"

## 8.3. Security

Aviation Security largely relates to the personal identification of the air travelers, as well as the scanning of cargo and luggage for forbidden items. The standards and regulations in airport security are set out in Annex 17 of the Chicago Convention. As the threat of acts of unlawful interference increases with time, ICAO continues to amend these standards to tackle more issues. ICAO learns from investigations, but also conducts its own research by employing working groups on a global scale.

Nevertheless, some issues extend beyond aviation. In order to battle cybercrime and terrorism, ICAO works with the UN Security Council Counter-Terrorism Committee. The implementation of ePassports and ICAO's Public Key Directory (PKD) has had a tangible effect on the decreased ability of criminals to cross borders. The PKD enables the efficient validation of ePassports.

While ICAO and the UN focus on this increased security level, countries identify another field for improvement. One Stop Security (OSS) is a bilateral agreement between countries which recognise the security standards and level of each other as equal. As a result, passengers arriving from one of the countries to transfer in the other towards their final destination do not need to be security screened an additional time. This is of a great benefit for both passengers and airport hubs, however of a less benefit to small airports which need to spend resources in order to meet these new standards without gaining much in return.

EC Regulation 2015/1998 introduces these standards and consolidates all amendments to its predecessor. It provides for the signing of future OSS agreements and regulates the process of auditing countries which apply for their security level to be recognised as equal to the one of the EU. Another example of other countries seeking EU expertise is the employment of European professionals by IATA to conduct a series of security trainings in Africa.

### Legal Foundations for Security

Annex 17 (Security) and Annex 9 (Facilitation) to the Chicago Convention, ICAO's founding charter, introduce the standard and recommended practices in terms of security and how to integrate these within the Standard Operating Procedures (SOPs) of airports, airlines and other operators in the aviation industry. ICAO utilises three main mediums to ensure that the industry in the area of aviation security universally and uniformly implement these practises across the industry [393]:

1) Policy Initiatives
2) Audits of Member States
3) Assistance to States that lack the infrastructure and/or the resources to keep up with the international aviation security standards

ICAO implements amendments to the Annexes as an outcome of research conducted by different working groups from various regions. The latest amendment to Annex 14 was published in 2014, however, since then work has already started on the next, 15th amendment, which should put more focus on landside security (airport access, airport roads and car parking, public areas in the terminal buildings)[394]. The AFCAC Aviation Security working group met in 2015 and discussed three working papers relating to potential aviation security amendments:

- On-entry screening to the terminal building as a means of mitigating acts of unlawful interference
- Guidance material for the utilisation of K-9 screening method

[393] ICAO, Security: http://www.icao.int/Security/Pages/default.aspx?p=9

[394] AFCAC Air Transport Committee: http://www.afcac.org/en/documents/2015/meeting/May/ATCM/13ATCM/13wp10_avsecp_en.pdf

- Implementation support and development-security programme (Risk management assistance to Africa)

One of the practices is already applied at numerous airport locations worldwide (e.g. Turkey and Pakistan) and it is to also become a standard for the African continent. The K-9 screening method refers to the use of trained police dogs to sniff bombs, drugs and other prohibited material in passenger bags, whilst the third working paper emphasises on the need of African nations to receive training and support in managing risk and build up their capacity and capabilities in this aspect.

### Issues that "extend beyond Aviation"

There are some security-related issues which "extend beyond aviation", according to ICAO. Such issue is cyber security. The threat and impact of cyber-attack stretches to all industries and has the capacity to impact both financial and a personal data. In 2015 cyber-criminals gained access to the servers of a cyber security company and on a separate occasion the personal email account of the CIA Director. These occurrences give a fair presentation of what the threat from cyber-crime consists of. Due to the large volume of information sharing in the aviation industry, i.e. personal information such as identification documents, bank account information, other air traveller personal details, as well as flight details, industry bodies such as ICAO and IATA are working together with governments towards agreeing on a framework to mitigate against the inherent risks of cyber-crime, such as a legal framework or set of norms or principles in order to potentially govern cyber security in aviation. The CANSO-ICAO quarterly update informs the reader that both the industry and the governments are working together to assess and mitigate the risk and vulnerability from cyber-attacks.

ICAO also collaborates with the UN Counter-Terrorism Committee (UNCTC). ICAO welcomes the usage of new technologies and simultaneously appreciates the risk that these bring. With Member States implementing the ePassports, the UN directly benefits from the active limitation of the movement of terrorists around the world. Through their collaboration, ICAO and the UN aim to consolidate partnership between the numerous organisations and working groups. ICAO aims to increase its assistance and technical cooperation capacity as well as the PKD membership. PKD is a database server which holds personal identity information. Its role is to allow governments to efficiently share this type of information between each other in order for border control to be able to validate passengers and their ePassports. The benefit from the PKD is that governments don't need to maintain dozens of bilateral exchanges of information, as they only need a single one – with the PKD. The savings are in the form of network resources and speed of service.

### Single Security Standard

## One Stop Security

The Germanwings and MetroJet accidents (discussed in the High Profile Accidents sub-section of this chapter) have reminded the industry that in parallel to safety, security must also be held at high standards. Airport security is a complex process and one that adds stress to a passenger's journey, which consists of two stages – the verification of the passenger's identity and the security screening of the passenger's belongings upon boarding the aircraft.

However, standards vary between countries. Passengers flying to the USA must be screened at the airport in which their US-bound flight departs from[395]. If the destination country does not consider security practice

[395] US Department of Homeland Security: "Written testimony of TSA Administrator John Pistole for a House Committee on Appropriations, Subcommittee on Homeland Security budget hearing titled "Resources for Risk-Based Security""

is adequate at the passenger's first point of origin (in the context of a trip consisting of multiple transfers), the passenger may be required to be security screened at the penultimate airport one additional time. A fitting example of the threat this rule aims to prevent is the crash of transit flight from Manila to Tokyo Narita via Cebu in 1994[396]. In this example security at the first leg of the passenger journey failed to detect the bomb materials in the passenger's belongings, which is what the rule outlined above aims to avoid.

Nevertheless, this creates space and facility requirements in airport operation practices, may be the cause of congestion in terminal buildings and increases the risk for flight delays. As One Stop Security (OSS) would have a positive effect on a passenger's journey (less congestion in terminals, less flight delays), OSS agreements have been on the agenda for airline lobbyists, like IATA and AEA[397]. One Stop Security aims to standardise security practices among participating countries and airports to ensure the same level of screening. Currently, the EU has One Stop Security agreements in place with Canada, the USA, Montenegro and the following islands – Greenland, Faroe, Guernsey, Jersey and Isle of Man[398]. The agreement with Canada was announced in 2015 and came into effect in March 2016[399]. This means that passengers on a flight from Canada to an EU airport where they would transfer onto their next destination will no longer be required to go through security checks at the European airport. However, this is not a reciprocal rule – passengers travelling from EU airports and transferring in Canada will not benefit from One Stop Security process, until such an agreement is signed by the Canadian Government – something that happened in 2016.

Furthermore, the issue persists not only for international but also for domestic flights. As reported in 2014[400], a passenger from Manchester Airport transferring at Heathrow on an US-bound flight needed to undergo a second security search according to the FAA rule for a compulsory security check at the last point of departure airport. Another example of this practice was a Memorandum of Understanding between Guyana and Trinidad and Tobago from December 2015, which allowed One Stop Screening for passengers from Guyana transferring in Trinidad and Tobago onto US-bound flights. The Transportation Security Administration (TSA) suspended the Memorandum several months later via an Emergency Amendment. This was for the exact same reason of a compulsory check at the last point of departure airport.

The process of One Stop Security depends on uniformity among all airports participating in the scheme. It benefits big airport hubs, as they require less facility space for security operations, and benefits transferring passengers, as they don't need to be security screened. However, it does little to benefit small size and especially domestic only airports. Iceland provides good solution to this issue – the country has decided to opt out of this EU rule. Only the airport in Reykjavik – the only international airport on the island, has retained an OSS agreement with the rest of the EU. Regional airports in Norway are making their case for the same exclusion[401].

## The Introduction of EC Regulation 2015/1998

In order to standardise the provision of Airport Security across its Member States, the European Commission adopted Regulation (EU) No 2015/1998 which lays down detailed measures for the implementation of these security standards. It repeals a previous regulation (Regulation (EU) No 185/2010) which had been amended more than 20 times and adheres to Regulation (EC) No 300/2008 which lays does the common rules in the

[396] ASN safety database

[397] Association of European Airlines: "AEA welcomes long-waited One Stop Security agreement with Canada"

[398] European Commission, One Stop Security

[399] Government of Canada: "New airport security option made available to speed up connections for air travellers"

[400] IFSEC Global: "What is Stopping One Stop Aviation Security?"

[401] ScienceNordic: "Are we overdoing aviation security"

field of civil aviation security[402]. To name a few of the obligations set out in this regulation, countries are responsible for designating a single authority competent for aviation security and for the respective quality control programme monitoring said authority. Airports and airlines are responsible for implementing the security programme and for ensuring internal quality control.

In order for the One Stop Security programme to be successful between an EU and non-EU country, the EU must first recognise the said country's security standards as equivalent to EU standards. For this to be achieved, the EC conducts an audit of the respective national authority supervising the security services in the country, and of the operational standards in respect to security at the airports and airlines in the country. If passed, the audit proclaims that the country follows the same standards framework as its EU peers. In order to ensure the continuity of the programme, the audit is followed by inspections.

## Exchange of Experience

At the time of writing this report, ACI-Europe initiated a programme named "Airport Twinning"[403]. Under this programme an EU Member State will pair with a non-EU Member European State by seconding airport security staff to the partner country's airports. The aim is to improve the security measures and prepare the non-EU Member State for the audit of the EC, which will determine whether its security standards will be accepted as being equal to those of the EU.

Another good example of acts of harmonisation is the IATA security training offered in African countries. In 2014-2015 IATA ran a series of training activities in Africa which aimed at promoting and standardising aviation security practices and educating personnel across the continent. The locations included Mauritius, Cameroon and Namibia with future training dates also planned for Senegal, Morocco, Nigeria, Southern Africa and Mali. These training courses focus on aviation security for senior management; bomb threat assessment; security risk and crisis management; aviation security quality control and cargo security among others. The common characteristic between ACI's Airport Twinning programme and IATA's security trainings is that both utilise experienced European professionals to share their expertise and experience with third parties.

Coming back to ICAO's three mediums ensuring that aviation universally and uniformly implements these security practises across the industry, the two examples of collaboration noted above illustrate the third medium of "Assistance to States".

[402] EU-wide rules on Civil Aviation Scurity: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3Atr0028

[403] ACI-Europe: Airport Twinning: http://www.airport-business.com/2016/06/airport-twinning-new-aci-europe-security-project-initiative/

# 9. Consumer Issues

## 9.1. Introduction

This chapter discusses the recent developments in air passenger rights and consumer issues during 2015 and the first half of 2016. It thereby reflects on updates within EU regulation and it also covers current issues and trends in various countries across the world.

Firstly, the chapter highlights recent policy changes and trends in European air passenger legislation and presents related industry responses. It thereby focuses in particular on Regulation (EC) No 261/2004. Following this it presents and analysis of the latest statistics and regulatory differences in two Member States (UK and Germany) and Switzerland, highlighting key trends across the markets.

The chapter then focusses on the regulation of air passenger rights and complaint handling in non-EU countries, where information was available. These include India, Malaysia, Australia, South Africa, Nigeria, Tanzania, the US, Brazil and Saudi Arabia.

Finally, results relating to international punctuality research are presented, including the Eurocontrol CODA Digest 2015 and the OAG 2015 Punctuality Report, which monitor airline and airport performance across the world.

## 9.2. Key Legislation and Recent Developments in the European Union

Overall, the EU legislation on air passenger rights is among the most detailed worldwide, securing consumer's rights towards a variety of parties, including airlines, airports and tour operators. Table 47 specifies the three main EU regulations on air passenger rights from an airline perspective. These apply to all passengers departing from an airport located in the territory of a Member State to which the Treaty applies and to passengers departing from an airport located in a third country to an airport situated in the territory of a Member State to which the Treaty applies if the operating air carrier is an EU carrier. This regulation also applies to Iceland, Switzerland and Norway.

Table 47: Main Regulations on Air Passenger Rights in the EU

| EC Regulation | Scope |
|---|---|
| **Regulation (EC) No 261/2004** | Common rules on the compensation and assistance to passengers in the event of denied boarding and of cancellation or long delay of flights. |
| **Regulation (EC) No 1107/2006** | Common rules on the rights of disabled persons and persons with reduced mobility when travelling by air. |
| **Regulation (EC) No 2027/97** | Common rules on the liability of air carriers for damage sustained by a passenger or a passenger's baggage in the event of accidents. It aligns the EC regulation with the international rules set out in the Montreal Convention and is valid irrespective of whether the route is domestic, between EC countries or international. |

| EC Regulation | Scope |
|---|---|
| **Regulation (EC) No 1008/2008** | Common rules for the operation of air transport services in the EU, including the licensing of EU air carriers and price transparency. |

Source: European Commission

## Regulation (EC) 261/2004

Regulation (EC) No 261/2004 is considered as central legislation on air passenger rights. Since its enactment in 2005, the Regulation has been subject to continuous scrutiny by the European Court.

The Commission highlighted in 2011 that ensuring the benefits of the Regulation requires "a uniform interpretation of EU law on passenger rights and a harmonised and effective enforcement"[404]. To address the identified gaps, the EC proposed a revision of the regulation in March 2013. The European Parliament voted on the proposal on 5 February 2014 (1st reading). Similar to other aviation files, negotiations are currently blocked in Council.

Along with the publication of the new Aviation Strategy for Europe in December 2015, the EC called for the resume of the discussions in the Council and informed about its intention to publish interpretative guidelines on Regulation (EC) No 261/2004. These guidelines were adopted on 10 June 2016[405]. By publishing those guidelines, the EC has aimed to improve the clarity of the rules, ensure a better application and consistent enforcement by carriers and Member States and finally achieve a fairer market[405]. This aim was also incorporated into the Aviation Strategy for Europe.

These guidelines do not create additional rules, but present the position of the Commission on the existing rules laid down in the Regulation and the current jurisprudence of the European Court of Justice. Following the observations made in the practical implementation of the Regulation and feedback gathered from various industry stakeholders, it emerged that there were uncertainties and discrepancies regarding the correct application of the Regulation.

Though comprehensive, the practical implementation of the Regulation revealed gaps in the content and case law has often been used to seek clarification. However, national case law is based on judgements of national courts and thus, decisions and rulings varied across EU Member States. Even if clarification was provided by the EU Court of Justice, it did not necessarily lead to a common enforcement in all EU countries. Thus, the need for interpretative guidelines on the Regulation became evident to secure the overall aim of establishing a common set of rules on air passenger rights across the EU Member States.

In addition to this, ICAO adopted its core principles on air passenger protection in 2015. These should serve ICAO member states as guidance when developing air passenger legislation. ICAO's core principles comprise fundamental recommendations and rights before, during and after travelling, including the provision of information at the airport, the communication in the event of disruptions and complaint handling[406]. Table 48 provides a detailed description of the principles.

[404] The Commission's White Paper on Transport, adopted on 28 March 2011; Roadmap to a Single European Transport Area — Towards a competitive and resource efficient transport system COM(2011) 144 final, p 23: http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0144:FIN:EN:PDF

[405] European Commission (10th June 2016): "Air Passenger Rights: European Commission wants better enforcement of rules ahead of summer holidays", http://ec.europa.eu/transport/themes/passengers/news/2016-06-10-better-enforcement-pax-rights_en.htm

[406] ICAO press release 9th July 2015: "ICAO council adopts core principles on consumer protection and new long-term vision for air transport liberalization"; http://www.icao.int/Newsroom/Pages/ICAO-Council-Adopts-Core-Principles-on-Consumer-Protection-and-New-Long-Term-Vision-for-Air-Transport-Liberalization.aspx

Table 48: ICAO Core Principles on Air Transport Consumer Protection

| Core Principle | Scope |
|---|---|
| **Prior to travel** | Passengers should benefit from sufficient levels of advance information and customer guidance, given the wide variety of air transport products in the market and associated legal and other protections which may apply. Product and price transparency is also recommended as a basic customer right. |
| **During travel** | Passengers are to be provided regular updates on any special circumstances or service disruptions which arise, as well as due attention in cases of a service disruption. The core principles also call on airlines and other stakeholders to have planning in place for situations of massive disruptions, and reiterate the fundamental right to fair access for persons with disabilities. |
| **After travel** | Efficient complaint handling procedures should be established and clearly communicated to customers. |

Source: ICAO, 2015

## Industry Reactions

The proposed revision of the Regulation (EC) No 261/2004, as well as the publication of the interpretative guidelines on this Regulation triggered a wide range of industry reactions. The latter was overall highly welcomed due to the additional clarity and uniformity they provide. Nevertheless, it was also stressed that the need for a revision of the Regulation (EC) No 261/2004 still remains[407] and that air passenger rights around the world still differ significantly[408]. The International Air Transport Association (IATA) pointed out that a lack of harmonisation continues to create confusion and dissatisfaction among customers and called for the development of a unified international solution[409].

Similarly to the reactions on the publication of the interpretative guidelines, the proposed revision of the Regulation (EC) No 261/2004 received overall positive reactions[410]. The European Consumers Centres Network (ECC-NET), which provides consumers across all EU Member States as well as Iceland and Norway with information on their rights, welcomed the improved level of clarity provided by the proposed revision, especially on the definition of extraordinary circumstances and Passengers with Reduced Mobility (PRM)[410]. This view was also echoed by providers of legal support to air passengers across Europe[411]. While a largely positive response was also received from airport associations such as the ACI, these highlighted at the same time that it will become essential to have local airline representatives at each airport in order to provide the best assistance and guidance to passengers[410]. IATA pointed out that a revision of the Regulation "would help to provide a better balance between passenger rights and airline obligations"[407].

The following part presents how passenger complaints are handled in the UK, Germany and Switzerland, as well as the latest research, recent regulatory changes, differences and trends in this context.

[407] G. Dunn (10th June 2016): "EC adopts guidelines to clarify existing passenger rights rules", Flightglobal, http://dashboard.flightglobal.com/app/#/articles/426244?context=federated

[408] IATA press release 10th June 2016: "Industry Welcomes Clarity on EU Passenger Rights", http://www.iata.org/pressroom/pr/Pages/2016-06-10-01.aspx

[409] CAPA (21st October 2015): "IATA: New approach needed for aviation consumer protection legislation", http://centreforaviation.com/news/iata-new-approach-needed-for-aviation-consumer-protection-legislation-491912

[410] European Parliament (May 2015): "Strengthening air passenger rights in the EU", http://www.europarl.europa.eu/RegData/etudes/BRIE/2015/556983/EPRS_BRI(2015)556983_EN.pdf

[411] EU Claim (26th February 2016): "EU strengthens passenger rights", http://www.euclaim.de/ueber/presse/meldungen/currentpage/1

## 9.3. Passenger Complaints across EU & non-EU Countries

### United Kingdom

The Civil Aviation Authority (CAA) is the national enforcement body of the Regulation (EC) 261/2004 in the UK. Amongst other duties, its role is to protect air passenger rights contained within the Regulation and ensure compliance with the legislation by all parties. In this context, the CAA can also take legal action in case of violation or breach of any rule set out in the Regulation.

In the course of 2015, the CAA launched action against several airlines, including Wizz Air, Ryanair, Aer Lingus and Jet2, as they were providing insufficient passenger service in the event of flight disruptions and did not fully comply with compensation obligations[412]. In addition, the CAA initiated investigations about a potential lack of pricing transparency of the online travel agents Opodo and eDreams[413].

## CAA Aviation Ombudsman Scheme

Amongst other tasks, one of CAA's role has to date been the handling of passenger complaints and dispute settlement between airlines and passengers. However, in April 2015, the CAA announced to transfer this role to an aviation ombudsman. The CAA lacks legal powers to enforce financial or non-financial compensation claims against airlines. In contrast, the aviation ombudsman would be an independent provider, who would not only be able to make legally binding claims, but also able to process passenger complaints faster than the CAA. This approach is also called Alternative Dispute Resolution (ADR) scheme. ADR schemes have already proven successful in other sectors such as energy or telecommunication. Despite transferring its active role as complaint handler, the CAA pointed out that it remains an essential factor in this process. The CAA will still be responsible for approving all ADR providers and for ensuring their reliability and independency. However, while ADR providers are legally allowed to charge for their work, the CAA strongly advocates for ADR schemes to be for free, similarly to their own passenger complaint handling services[414].

Industry reactions on the CAA's aviation ombudsman scheme have been positive. The next steps aim at obtaining the full voluntary commitment of airlines to join this complaint handling approach, whereby the CAA targets all those carriers serving at least 50% of UK passenger traffic. However, if airlines refrain from joining by the end of 2016, the CAA plans to make participation to this scheme compulsory.

## Consumer Research 2015

### Passenger Complaints 2015

The following section presents the results of the 2015 CAA Passenger Complaint Survey and their development in comparison to 2014[415].

The CAA registered around 6.6K passenger complaints in the UK in 2015. This is in light of 251M annual passengers across all UK airports. Compared to 2014, the number of passenger complaints declined by

[412] CAA (19th August 2015): "CAA action leads to airlines changing policies and means passengers will get better support in the future"

[413] CAA (17th December 2015): "CAA launches investigation into the pricing practices of Opodo and eDreams"

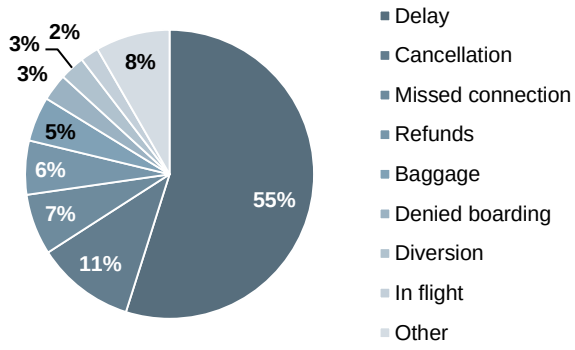
[414] CAA (15th April 2015): "CAA confirms plans for creation of aviation ombudsman", https://www.caa.co.uk/News/CAA-confirms-plans-for-creation-of-aviation-ombudsman/

[415] Sourced from CAA website on 21st of July 2016

83%. Until 2014, passenger complaints have been increasing as a result of greater public awareness of consumer rights and the constant development of air passenger legislation. A considerable jump in complaints was noted after the EU Court of Justice clarified the entitlement of passengers to compensation in the event of flight delays over three hours at the end of 2009.

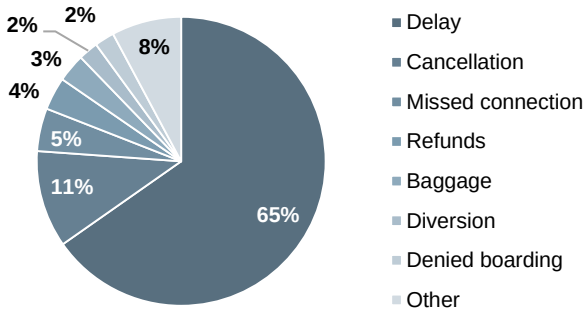
As illustrated in Figure 164, delays were the most frequent reason for filing a complaint with an airline in 2015 (55% of total complaints). Moreover, flight cancellations (11%), missed connections (7%) and issues about refunds (6%) and baggage (5%) accounted for over a quarter of complaints in 2015. Although delays also ranked number one in 2014, Figure 165, their share dropped by 10%pts in 2015. This could have been caused by improved airport operations, better weather conditions or fewer strike actions. Complaints due to flight cancellations stayed constant, while missed connections climbed by 2%pts in 2015. It also emerges that whereas complaints related to in flight issues did not present a notable share in 2014, they accounted for 2% in 2015.

Figure 164: Reasons for Passenger Complaints 2015




Source: CAA, 2016

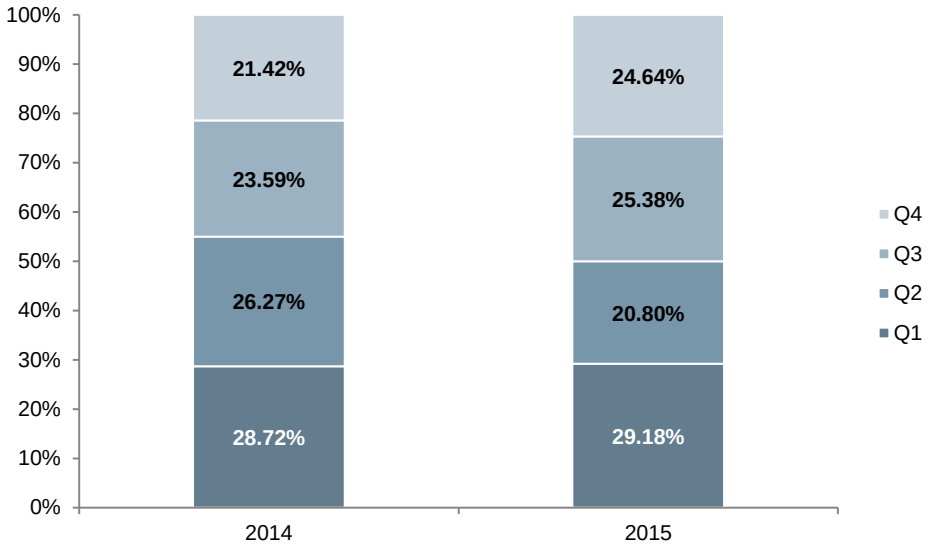
Figure 165: Reasons for Passenger Complaints 2014




Source: CAA, 2016

With 29% of total complaints, the first quarter of 2015 recorded the majority of complaints (14.5K). The third (12.6K) and fourth quarter (12.3K) were almost equal, noting 25% each, while the second quarter lied further behind (21%, 10.3K). Similar to 2015, quarter one also accounted for the majority of complaints in 2014 (29%, 27.8K), as indicated in Figure 166. However, it also emerges, that the second quarter in 2014 showed the second highest number of complaints during that year (26%, 25.5K). The variances between 2014 and 2015 could have been the result of different weather conditions or industrial action.

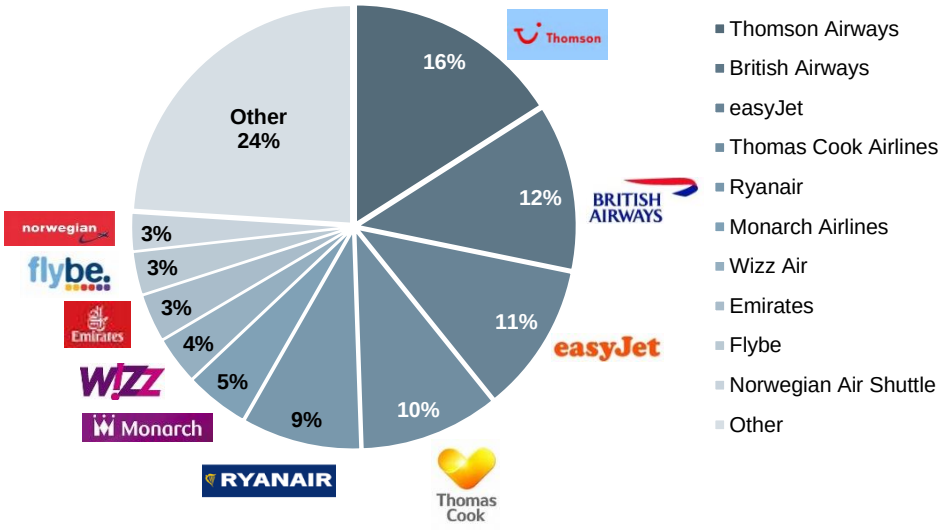
Figure 166: Quarterly Distribution of Passenger Complaints in 2014 and 2015




Source: CAA, 2016

The CAA also publishes complaints information broken down by carrier. Thomson Airways (16%), British Airways (12%) and easyJet (11%) received most out of the 16.6K passenger complaints in 2015, Figure 167. Thomson Airways and British Airways continue to receive the most complaints amongst all participating airlines receiving since 2014, with similarly high shares of 17% and 11% respectively. Thomas Cook, in contrast, accounted for 23% of total passenger complaints in 2014, but dropped to 10% in 2015. Ryanair and easyJet, which only presented 4% and 7% respectively in 2014, recorded higher shares in 2015.

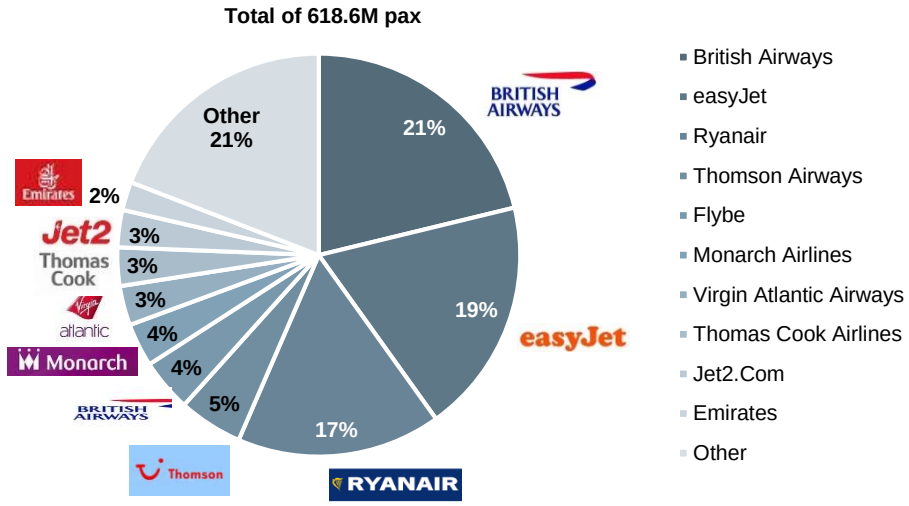
Figure 167: Top 10 Airlines with most Passenger Complaints 2015




Source: CAA, 2016

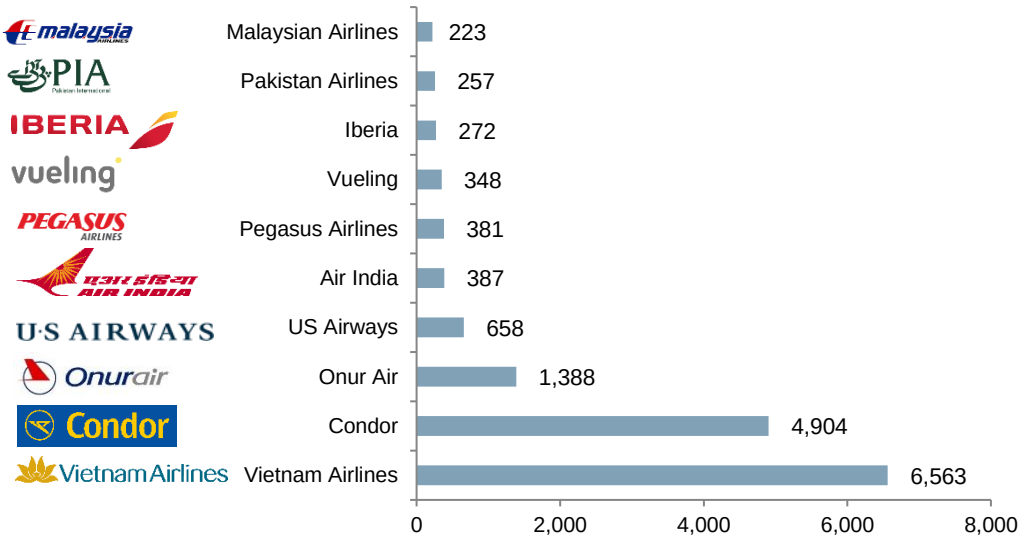
However, the airlines named above also serve the largest shares in passenger traffic to and from UK airports, as presented in Figure 168. Handling more passengers also increases the likelihood of complaints.

Figure 168: Top 10 Airlines by Share in Passenger Traffic at UK Airports 2015




Therefore, it is unsurprising that when looking at complaints per million passengers, Figure 169 a different picture is shown. Vietnam Airlines and Condor noted by far the highest number of complaints, with 6.5K and 4.9K per one million passengers respectively. Onurair also recorded above 1,000 complaints per million passengers, while the remaining carriers are below the 1,000 threshold. It should be noted that all airlines listed in the figure below only handled 0.05% each of total passengers at UK airports in 2015.

Figure 169: Airlines with most Complaints per Million Passengers in the UK 2015




Source: CAA, 2016

## Passenger Satisfaction 2015

Alongside to passenger complaints, the CAA also conducts annual research on customer satisfaction. The 2015 survey revealed that UK air passengers have an overall high level of satisfaction, with 84% of respondents very satisfied or satisfied with their air travel experience. Disabled passengers and those with mobility restrictions (PRM) indicated a similarly high overall satisfaction regarding travel assistance provided by airlines and airports, with an average score of more than 4 out of 5. Nevertheless, the results also showed that PRM passengers faced a considerable level of uncertainty prior to their trip about whether their requirements would be met, noting an average informed score of 3.6 out of 5[416].

Interestingly, the survey also revealed that 10% of the survey respondents experienced a disruption during their most recent flight. 90% of these disruptions were caused by delays. However, and most importantly, most passengers were satisfied with the handling of the disruption by the airline, as shown in Table 49.

Table 49: Passenger Satisfaction with Handling of Disruption

| How satisfied or dissatisfied were you with the following aspects of how this was handled? | | |
|---|---|---|
| | **Information and updates provided to passengers (%)** | **Arrangements made to assist passengers, such as food, accommodation etc. (%)** |
| 5 Very satisfied | 25 | 22 |
| 4 | 30 | 31 |
| 3 | 25 | 20 |
| 2 | 10 | 12 |
| 1 Very dissatisfied | 10 | 15 |
| **Mean score** | **3.52** | **3.31** |

Source: CAA (2015): "Consumer research for the UK aviation sector – final report", p.51

In a second report published by the CAA in 2015, the authority benchmarked airline compliance with a set of passenger rights from Regulation (EC) No 261/2004[417]. A particular focus was laid on the provision of information to passengers in the event of denied boarding, cancellation or long delays (Recital 20 and Article 14 of the Regulation). The results are illustrated in Table 50.

Table 50: Results of Airline Compliance with Recital 20 and Article 14 of the Regulation (EC) No 261/2004

| Very Good | Good | Taking steps to improve compliance | Below compliance standard |
|---|---|---|---|
| easyJet | Air France KLM | British Airways | Aer Lingus |
| Ryanair | flybe | Emirates | Jet2 |
| Wizz Air | Thomas Cook | Lufthansa | |

[416] CAA (2015): "Consumer research for the UK aviation sector – final report", https://publicapps.caa.co.uk/docs/33/CAP1303ConsumerresearchfortheUKaviationsectorfinalreport.pdf

[417] CAA (2015): "A right to know – Compliance report", http://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=6679

| Very Good | Good | Taking steps to improve compliance | Below compliance standard |
|---|---|---|---|
| | United | | |
| | Thomson Airways | | |
| | Virgin | | |
| | Monarch | | |

Source: CAA (2015): "A right to know – Compliance report ", p.10

Airlines meeting the requirements set out in Recital 20 and Article 14 of the Regulation were classified as "Good". This included proactively informing passengers affected by a disruption about their exact rights at the right time either by giving out hard copies such as leaflets or contacting passengers via phone or email. Moreover, this classification suggests that the airline ensured that their own, as well as airport and ground handling staff, was sufficiently trained to handle these situations. Finally, that the carrier had a comprehensive strategy in place, which monitored its compliance with passenger rights and also revealed improvement potential.

Where an airline was ranked as "Very Good", it did not only meet the above named requirements, but its measures taken in the event of disruptions provided passengers with an even greater level of assurance. Carriers "taking steps to improve compliance" are in the process of strengthening their customer service in the event of disruptions, whereby they are actively supported by the CAA. Lastly, airlines ranked "below the compliance standard" failed to proactively contact passengers affected by a disruption. In addition, these carriers did not have a comprehensive strategy on compliance with passenger rights.

## CAA Strategic Plan 2016-2021

One of the main goals contained in the CAA 2016 to 2021 Strategic Plan is the empowerment of air passengers through information provision to consumers and the enforcement of their rights[418]. In this context, the CAA particularly aims at increasing awareness and understanding among air passengers about their options and ensuring they have access to the correct information when needed. This also includes ensuring that disabled passengers and passengers with reduced mobility are provided with sufficient information and assistance when travelling.

The CAA aims to improve the empowerment of air passengers with the following measures. Firstly, the authority will continue to monitor and report on airline and airport compliance with EU air passenger rights, particularly Regulation (EC) No 261/2004 and No 1107/2006. In this context, the CAA also intends to reinforce its action against noncompliance with the rules laid down in this legislation and to publish the results of research on punctuality, cancellation and customer service. Furthermore, the CAA plans to further develop the process of passenger complaint handling by promoting the implementation of the ADR scheme illustrated above, as well as harmonizing the cooperation between airlines, airports, travel agents and tour operators and raising awareness among air passengers about their rights.

### Germany

The Luftfahrt-Bundesamt (LBA) is the Federal Aviation Office of Germany and the national enforcement body of these Regulations in the country. However, unlike its UK counterpart CAA, the LBA is not responsible for passenger complaints. While airlines are usually the first point of contact for passenger complaints in

[418] CAA (2015): "The CAA's Strategic Plan 2016-2021 – Making Aviation Better: Our Key Strategies", http://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=7074

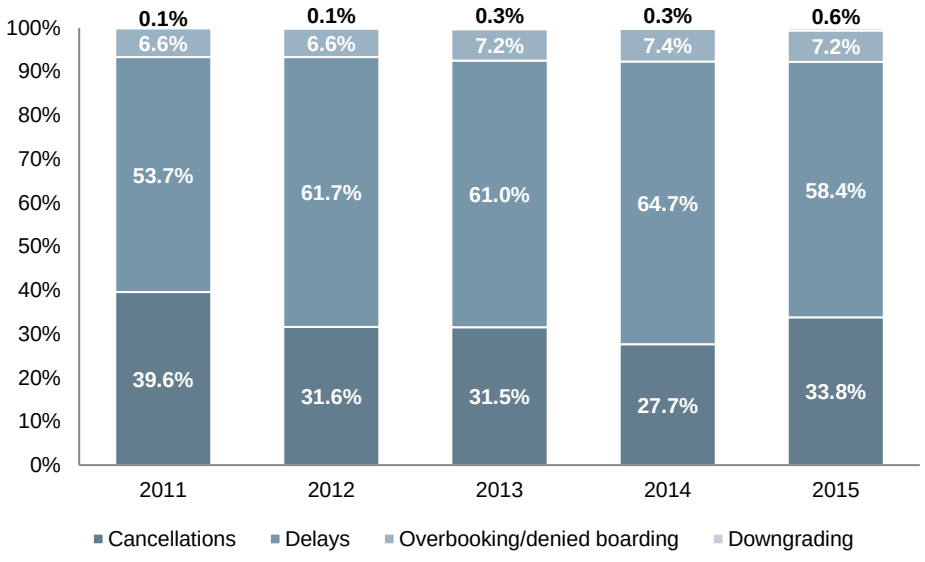
Germany, air passengers also have the option to contact an Alternative Dispute Resolution (ADR) provider since 2013. The Conciliation Body for Public Transport (söp) mediates between airlines and passengers if both parties cannot reach a satisfactory solution themselves. This process has received positive feedback by airlines and consumer associations[419]. As illustrated earlier, the CAA is still in the process of developing such an ADR scheme.

In order to make use of the ADR in Germany, both parties, the complainant and the airline, have to participate in the process. All major national and international carriers operating to and from German airports are member of the söp board of trustees and thus, usually agree to collaborate. The söp acts as an independent and neutral entity and follows a precise legal examination in each case. It finally provides both parties with a report detailing its recommendations for an amicable settlement. However, this is only legally binding if it is accepted by both, the passenger and the airline. Besides, both parties are also able to take legal actions at any time of conciliation process. While the carrier covers all arising costs of the German ADR scheme, it is free of charge for the complainant, who is solely required to bear its own expenses, such as postage. This is similar to what the CAA envisages for the UK ADR scheme. In 2015, the söp successfully completed 90% of their conciliation procedures. When recommendations were rejected, it was in 80% of the cases due to the airline not accepting the settlement. With an increasing level of awareness of the German ADR scheme among air passengers, the number of conciliation requests rose considerably since 2014, noting 8.7K in 2015 (+81%pts).

## Consumer Research 2015

Research published by the LBA revealed that passenger complaints in Germany regarding Regulation (EC) No 261/2004 grew by 4%pts to 2.8K in 2015[420]. Despite this increase, the total number of complaints is still considerably lower compared to previous years, Figure 170, and also considered small in light of the 216M annual air passengers handled at German airports in 2015.

Figure 170: Air Passenger Complaints in Germany on the basis of Regulation (EC) No 261/2004




Source: LBA, 2016[421]

[419] söp (2nd March 2016): "Annual report 2015", https://www.soep-online.de/assets/files/sop_Jahresbericht_2015_vom_02.03.2016.pdf

[420] LBA (15th January 2016): "Statistics on air passenger rights according to Regulation (EC) No 261/2004", http://www.lba.de/DE/Presse/Statistiken/Statistik_Fluggastrechte.html?nn=700678

[421] LBA (15th January 2016): "Statistics on air passenger rights according to Regulation (EC) No 261/2004", http://www.lba.de/DE/Presse/Statistiken/Statistik_Fluggastrechte.html?nn=700678

Figure 170 illustrates that delays accounted for the vast majority of complaints in 2015 (58.4%), which is similar to the UK (55%), while cancellations presented 33.8% and overbooking/denied boarding 7.2%. However, compared to 2014, the share of delays declined by 6.2%pts from 64.7%, while the share of cancellations gained this percentage in 2015. In this context, the German ADR entity söp points out that 68% of their conciliation cases in 2015 were involving delays or cancellations, which is 8%pts less than in 2014.

The LBA also revealed that 55% of complaints in 2015 were directed towards German airlines, 29% towards European carriers, whereas Non-European airlines were subject of 16% of complaints. This is a similar distribution as in 2014. However, compared to 2013, German carriers were able to reduce their share by 8%pts, while other European airlines recorded an increasing number of complaints. This could have been driven by the growing presence of the latter in the German market.

The German Aviation Association (BDL) presents airlines, airports, air traffic control and aviation service providers in Germany. Their annual consumer report analyses the satisfaction among passengers at German airports. The latest 2015 research revealed that over 90% of respondents were satisfied or very satisfied with their last flight and did not face any issues finding their way around the airport. This is similar to the 2014 results[422].

### Switzerland

Although Switzerland is not an EU Member State, it has adopted the EU legislation on air passenger rights in 2006. Between 2014 and 2015, the Swiss Federal Office of Civil Aviation (FOCA) noted an increase of 10%pts in passenger complaints from 3.5K to 3.9K[423]. Compared to the results presented for the UK and Germany, this can be considered as high in light of 49M annual passengers at Swiss airports in 2015. Similarly to other EU countries, Switzerland also has a dedicated authority handling air passenger complaints. The FOCA formally acts as a mediator in the event of disputes between passengers and airlines. However, filing complaints with the FOCA has been criticised as a slow and tedious process by several consumer associations across the EU[424] [425]. In addition, the FOCA has no legal power to enforce compensation claims against airlines. In fact, passengers are required to file an independent lawsuit if the complaint with the FOCA remains unsuccessful.

The following part focuses on latest trends in passenger rights and complaint handling in countries outside the EU, on which information was available. These include India, Malaysia, Australia, South Africa, Nigeria, Tanzania, the US, Brazil and Saudi Arabia.

### United States of America

The Department of Transportation (DOT) is responsible for the execution and the enforcement of air passenger rights in the US. Although these are based on general consumer legislation established by the Congress, the DOT regularly releases regulations which expand legal rights and protection of aviation consumers. The most recent included the extension of air passenger rights in the event of overbooking, cancellations and delays, as well the requirement for airlines to present customers with the full cost of a flight ticket, including taxes and fees at the time of booking[426]. The DOT's Aviation Consumer Protection Division

[422] BDL (2016): "Consumer report 2015"

[423] http://www.aargauerzeitung.ch/wirtschaft/ein-passagier-kaempft-gegen-easyjet-wegen-flugverspaetung-veraendert-flug-ezy-4922-alles-130269769

[424] http://www.tagesanzeiger.ch/wirtschaft/sozial-und-sicher/flugreisenden-entgehen-millionen/story/14124134?track

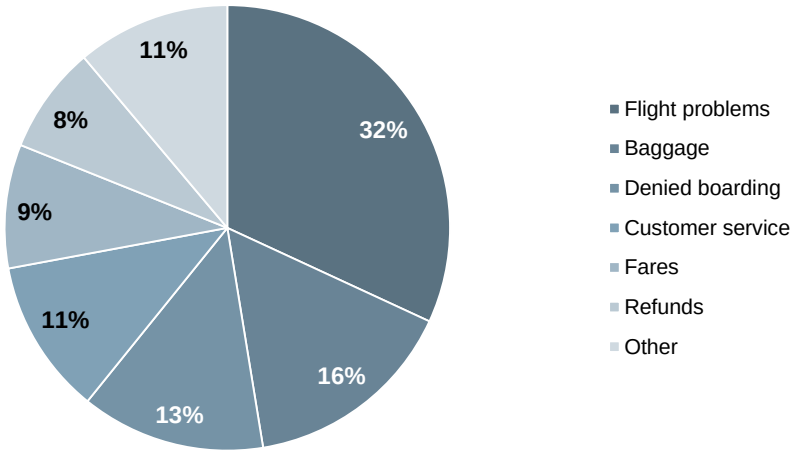
[425] http://www.aargauerzeitung.ch/wirtschaft/ein-passagier-kaempft-gegen-easyjet-wegen-flugverspaetung-veraendert-flug-ezy-4922-alles-130269769

[426] R. Y. Tang (17th August 2016): Airline Passenger Rights: The Federal Role in Aviation Consumer Protection",

observes the compliance of airlines with passenger rights and evaluates the efficiency of the existing legislation and makes suggestions on further development. Moreover, the Division also handles passenger complaints if the passenger and the carrier are unable to settle the dispute themselves. The work of the Division is supported by the Advisory Committee for Aviation Consumer Protection (ACACP). The Committee evaluates the Division's work and meets on a regular basis to discuss latest consumer issues in aviation and to provide recommendations for improvement[427].

In 2015, the Division recorded 20,170 passenger complaints, which is 30%pts higher than 2014[428]. Figure 171 illustrates that issues related to flights, such as cancellations, delays or missed connections, accounted for the majority of reasons for passenger complaints in 2015 (32%). It is followed by problems with baggage and denied boarding, presenting 16% and 13% respectively. This reflects the results observed in the UK and Germany. The overall split was similar in 2014, solely issues related to denied boarding declined by 2%pts, while fare related problems grew by 3%pts. However, the Division also revealed that airlines could significantly improve the on-time arrival and cancellation rate of scheduled domestic services in 2015. While the former grew from 76% to 80%, the latter dropped by 0.7%pts to 1.5%.

Figure 171: Reasons for Passenger Complaints 2015




Source: DOT, 2016

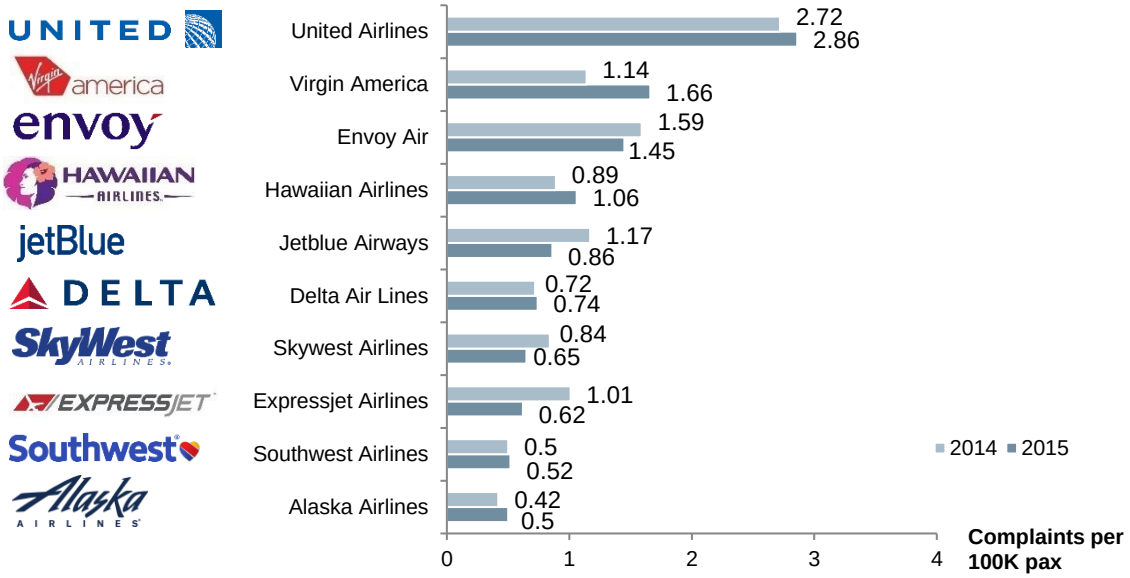
Figure 172 compares complaints per 100K passengers of US airlines in 2015 and 2014. United Airlines recorded by far the most complaints (2.85), followed by Virgin America (1.66) and Envoy Air (1.45). In contrast, Alaska Airlines and Southwest Airlines performed best, noting only 0.5 and 0.52 complaints per 100K passengers respectively. However, both carriers recorded better results in 2014, with 0.42 complaints for Alaska Airlines and 0.5 complaints for Southwest Airlines. Similarly, United Airlines and Virgin America had fewer complaints in 2014. Solely three out of the ten carriers improved their performance in 2015.

https://www.hsdl.org/?view&did=794917

[427] https://www.transportation.gov/airconsumer/about-us

[428] DOT (February 2016): "Air Travel Consumer Report", https://www.transportation.gov/airconsumer/air-travel-consumer-reports

Figure 172: Top 10 US Airlines with most Complaints per 100,000 Passengers in 2015 vs 2014




Source: DOT, 2016

**Brazil**

Similar to other countries, airlines are the first point of contact for passenger complaints in Brazil. However, the Brazilian National Civil Aviation Agency (ANAC) assists passengers in settling the dispute if they cannot reach an agreement with the carrier themselves. Although ANAC can implement punitive measures to airlines for non-compliance with passenger rights, the authority is unable to legally enforce compensation payments. In this case, passengers are required to seek support from the Brazilian Consumers Protection and Defence Authorities or file a lawsuit[429].

EU and Brazilian air passenger rights differ in some respects, including payment of compensation. While the Regulation (EC) No 261/2004 entitles passengers to financial remuneration for delays from three hours, the Brazilian legislation only provides for compensation payments from more than four hours of delays.

Research conducted by ANAC revealed that 91.9% of flights departing from Brazil's 15 largest airports between December 2015 and January 2016 were on time. This was the best performance recorded since 2007 and lies well above the national target of 85%. The period was chosen as it usually is the busiest period of the year at Brazilian airports[430].

Brazilian airports perform well in the OAG 2015 Punctuality report[431], which evaluates on-time performance (OTP) of around 4,000 airports across the world. In the category of small airports (less than 10M seats), two Brazilian airports ranked among the Top 20, Porto Alegre (POA) and Curitiba (CWB). However, although 87.7% and 87.4% of flights departed and arrived within 15 minutes of their scheduled time, both airports were below the average of 89.8% recorded in this category. Three Brazilian airports were within the Top 20 of medium airports (between 10M and 20M seats), but only São Paulo Congonhas (CGH) outperformed the average OTP of 86.2%, scoring of 87.8%. Brasilia (BSB, 85.5%) and Rio de Janeiro (GIG, 83.5%) lied below this percentage.

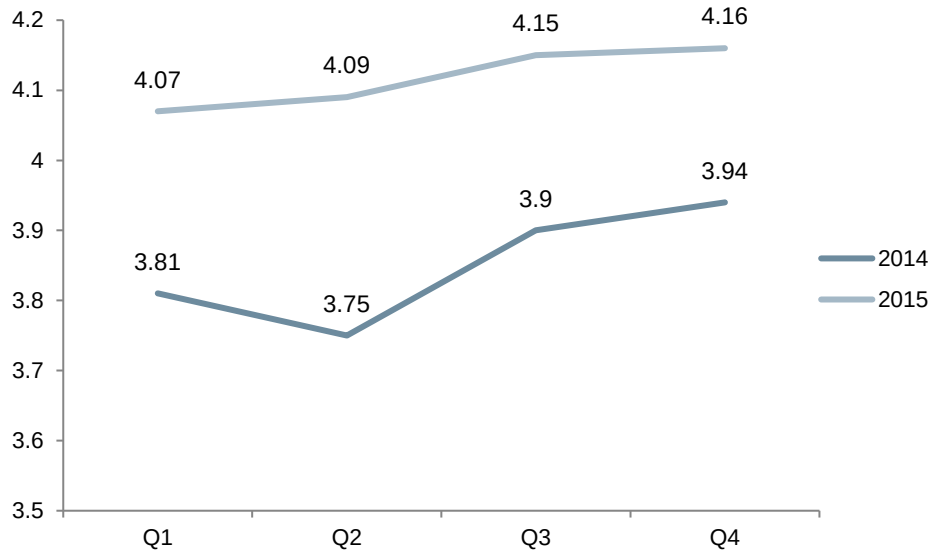
[429] ANAC (2015): "Passenger guide – Information for foreign passengers in Brazil"

[430] http://agenciabrasil.ebc.com.br/geral/noticia/2016-01/fim-de-ano-teve-menor-indice-de-voos-atrasados-dos-ultimos-nove-anos

[431] OAG (January 2016): "On-time performance results for airlines and airports"

Research on passenger satisfaction at Brazilian airports reflected the performance in the OAG Punctuality Report[432]. Figure 173 compares the level of satisfaction between 2014 and 2015, with 5 being the maximum attainable mark (= very good) and 1 being the lowest attainable mark (= very poor). 2015 results strongly outperformed 2014 levels. This was largely driven by major construction and development works carried out at numerous airports prior to the 2014 Football World Cup in Brazil, which negatively impacted passenger experience.

Figure 173: Passenger Satisfaction at Airports in Brazil 2014 vs 2015




Source: SAC, 2015

Across 2015, check-in processes at all airports achieved the highest satisfaction levels among passengers, with queuing times, as well as friendliness and efficiency of staff all scoring around 4.5 points and thus, securing the first three places in the ranking. In contrast, passengers were most unsatisfied with the cost of parking (2.6 out of 5), as well as the value of the commercial offer (2.7) and gastronomic range (2.5). These results do not differ significantly from 2014. Marginal improvement with the quality of internet connection was also recorded, reaching 3.1 out of 5 in 2015 compared to 2.9 in 2014.

### South Africa

Following the adoption of the South African Consumer Protection Act in 2008, the Airlines Association of Southern Africa (AASA), the Board of Airlines Representatives South Africa (BARSA) and the South African National Consumer Commission (NCC) have started to develop an industry code on consumer rights of air passengers. Until the finalisation of this document, air passengers continue to file complaints with airlines directly and seek support from the AASA and BARSA if they are unable to settle the dispute alone[433].

Table 51 shows on-time departure performance at major airports in South Africa in August 2015. Approximately 10% of the flights departed each of the airports with a delay greater than 15 minutes. This is considerably lower than the average of 32% recorded across 26 major African and Middle Eastern airports. Although the average delay time at Cape Town (44.3 minutes) and Durban (57.1 minutes) was above the regional average (43.1minutes), the three South African airports claimed the first three places in the ranking.

[432] http://www.aviacao.gov.br/assuntos/pesquisa-satisfacao/2015

[433] https://www.aasa.za.net/policies-and-regulations/

Table 51: On-time Departure Performance at Major Airports in South Africa August 2015

| City | Airport Code | Flights | On-time | Delayed (>= 15min) | Avg. Delay (min) |
|---|---|---|---|---|---|
| **Cape Town** | CPT | 3,338 | 91.5% | 8.5% | 44.3 |
| **Johannesburg** | JNB | 8,449 | 88.7% | 11.3% | 38.2 |
| **Durban** | DUR | 1,825 | 87.9% | 12% | 57.1 |
| **Average at airports in Middle East and Africa** | | **113,694** | **68.1%** | **31.9%** | **43.1** |

Source: FlightStats, 2016

## Nigeria

Air passenger rights in Nigeria are governed by the Nigerian Consumer Protection Regulations and amongst others, cover the minimum rights and obligations of passengers and carriers in the event of overbooking, denied boarding, delays, cancellations and damaged or lost baggage[434]. The legislation is enforced by the Nigerian Civil Aviation Authority (NCAA), which is also responsible for passenger complaints. In this context, the Authority asked all air service providers to establish a Customer Affairs Unit (CAU) in order to handle customer complaints. Although passengers can file a complaint against an airport or airline with the NCAA, they are advised to contact the CAU of the airline or airport first. However, if both parties are unable to reach an agreement, passengers can contact the NCAA Consumer Protection Department for support, which is similar to the processes presented in other countries before. In early 2016, the NCAA pointed out that the large majority of air passengers in Nigeria are still unaware of their rights and the compensation they are entitled to in case of delays, cancellations or lost baggage[435].

Out of the 7,328 passenger complaints recorded by the NCAA in 2015, 99% concerned international flights. However, almost 60% of these complaints were settled successfully and resulted in compensation payments to passengers[436]. Delays, lost baggage and overbooking were the main reasons for complaints[437]. Throughout 2015, 40% of flights operated by international airlines were delayed, while domestic carriers recorded delays on 49% of their services. In addition, domestic airlines cancelled 24% of their flights. In contrast, only 1% of services operated by international carriers were cancelled[438]. Comparable data for 2014 was not available.

Due to increasing passenger complaints and non-compliance with passenger rights, the NCAA suspended the operator certificate of the Nigerian carrier DiscoveryAir. Following this, the airline announced in early 2015 to cooperate with the NCAA to solve the problem[439]. In June 2016, the NCAA pointed out that the ongoing aviation fuel shortage in Nigeria could result in an increasing number of cancellations. In order to affect as little passengers as possible, the Authority advised airlines to lower their ticket sales and to aim at keeping cancelations to a minimum[440].

[434] http://www.ncaa.gov.ng/directorates/consumer-protection/passenger-rights-legislation/

[435] http://thenewsnigeria.com.ng/2016/05/why-nigerian-air-passengers-cannot-claim-their-rights/

[436] http://theeagleonline.com.ng/turkish-airlines-air-france-top-list-of-nigerian-passengers-complaints-in-2015/

[437] http://centreforaviation.com/news/ncaa-received-more-than-3000-passenger-complaints-in-1h2015-479664

[438] http://www.ncaa.gov.ng/summary-of-complaints-handled-in-2015/

[439] http://centreforaviation.com/news/discoveryair-cooperating-with-ncaa-engaging-with-passengers-after-receiving-complaints-report-410174

[440] http://centreforaviation.com/news/ncaa-warns-airlines-over-increase-in-flight-cancellations-555619

## Tanzania

According to the Civil Aviation Act of Tanzania, air passengers do not only have the possibility to file complaints with airlines, but also contact the Civil Aviation Authority if the passenger and the carrier are unable to find a satisfactory solution themselves. If the Authority is unable to settle the dispute within 60 days, the complainant has the right to demand a decision from a Committee of the Authority.

The Civil Aviation Act of Tanzania also provides that the Civil Aviation Authority establishes an entity which receives and follows up on air passenger complaints. In line with this, the government of Tanzania has implemented a Civil Aviation Authority Consumer Consultative Council (TCAA CCC) in June 2015. The entity is supposed to monitor and protect consumer issues and rights in the aviation sector. This includes establishing local and regional consumer committees, raising awareness about air passenger rights across the industry and promoting a fair competitive environment to ensure consumer welfare[441].

## Saudi Arabia

Air passenger rights in Saudi Arabia are specifically governed by the Consumer Protection Regulation since 2005. At the beginning of 2016, Saudi Arabia's General Authority of Civil Aviation (GACA) modified this legislation, establishing new regulations on the entitlement of passengers to financial and non-financial compensation in the event of lost baggage, cancellations, delays and overbooking[442]. The revision followed the evaluation of passenger complaints and industry opinions. Saudi Arabia is one of the first countries in the Middle East that established specific legislation on air passenger rights.

The Consumer Protection Department is the responsible authority for handling air passenger complaints in Saudi Arabia, as well as monitoring the compliance of carriers with the existing legislation. In 2015, the GACA recorded an increase of 252%pts in passenger complaints. Delays were the most frequent reason (28%), followed by lost baggage (14%) and cancellations (12%). It is worth noting that 97% of passengers were satisfied with the complaint resolution. In order to further refine the process of complaint handling, the GACA is currently developing an online complaint submission system. In addition, the Authority is planning to launch a passenger rights campaign across the country's airports to increase the awareness among consumers about their protection and responsibilities[443].

## India

Air passenger rights in India are regulated by the Civil Aviation Requirements of the Directorate General of Civil Aviation (DGCA). This legislation also details the financial and non-financial compensation passengers are entitled to in the event of cancellations, delays and denied boarding. Nevertheless, critics argue that the process of filing a complaint with airlines in India still lacks transparency, while a large share of passengers remain unclear about their rights[444]. In addition, the Air Passenger Association of India (APAI) also points out that the current legislation on passenger compensation still lacks clarity on what is within and what is beyond airline control. However, the APAI highlights that this is essential as it decides whether passengers are entitled to compensation[445].

APAI is an independent entity which represents air passenger rights and monitors their compliance across the Indian aviation sector. It also aims at educating air passengers about their legal entitlements and at

[441] http://tcaa.go.tz/news_detail.php?news=1973

[442] CAPA (1st July 2016): "GACA issues new consumer protection regulations"

[443] CAPA (7th April 2016): "Saudi Arabia's GACA reports 1394 passenger complaints in 2015"

[444] https://www.refund.me/press-releases/refund-launches-flight-compensation-app-air-passengers-india/

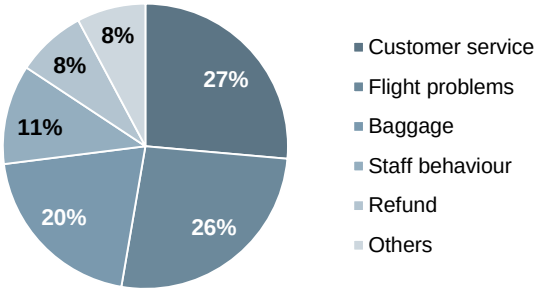
[445] CAPA (19th July 2016): "APAI president raises issues with DGCA passenger compensation norms"

further promoting the adaption of Indian air passenger rights to global standards. In this context, the Indian parliament has passed an amendment to existing air passenger legislation in December 2015 to gradually align its regulations with international levels. The amendment increased compensation payments to passengers in case of death, injury, lost baggage or delays[446].

In addition, the Indian Civil Aviation Ministry decided in early 2016 to increase the punitive power of the DGCA. While the DGCA is currently able to suspend an airline's or airport's operation, the new act will also allow the Authority to impose fines and penalties for non-compliance with regulations[447].

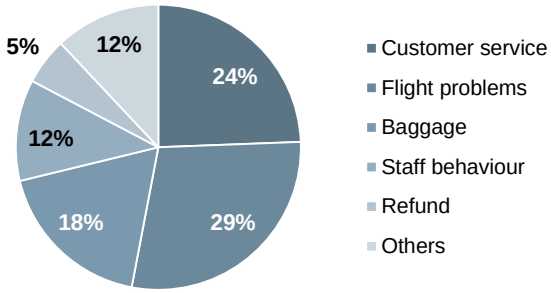
In July 2015, the DGCA registered 802 passenger complaints on scheduled domestic flights, which was 39% higher than in the previous-year period. However, the number of complaints per 10,000 passengers only rose from 1.1 to 1.2. Figure 174 highlights that over 50% of complaints alone were due to customer service issues or flight problems. Although this was similar to July 2014, Figure 175, complaints related to customer service were 3%pts below 2015 levels, while flight problems accounted for 3%pts more. In addition, there is also a notable growth of complaints on refunds, which gained 3%pts in 2015. This could have partly been driven by the growing awareness among passengers about their rights and the amendment of India's air passenger legislation in December 2015, which awards higher compensation payments to passengers.

Figure 174: Reasons for Passenger Complaints in India July 2015




Source: DGCA, 2015[448]

Figure 175: Reasons for Passenger Complaints in India July 2014




Source: DGCA, 2014[449]

[446] http://indiatoday.intoday.in/story/cheers-for-air-travellers-parliament-gives-nod-to-carriage-by-air-amendment-bill/1/618313.html

[447] CAPA (23rd June 2016): "India's DGCA to get more punitive powers: report"

[448] http://dgca.nic.in/reports/Traffic_reports/Traffic_Rep0315.pdf

[449] http://dgca.nic.in/reports/Traffic_reports/Traffic_Rep0814.pdf

## Malaysia

Malaysia has taken major steps in consumer protection of air passengers during 2015 and the beginning of 2016. This included the establishment of the Malaysian Aviation Commission (MAVCOM) as part of the Malaysian Aviation Commission Act 2015. Amongst other tasks, MAVCOM is responsible for the enforcement of air passenger rights and protection and also acts as a passenger complaint handler[450]. In this context, MAVCOM enacted the Malaysian Aviation Consumer Protection Code in the beginning of 2016. It is the country's first legislation which specifically regulates the relationship between air passengers, carriers, airports and other aviation service providers such as foreign airlines. The Code significantly improved air passenger rights in Malaysia by increasing protection and transparency, as well as by providing clarification on responsibilities. All aviation service providers in Malaysia are obliged to comply with the regulations laid down in this legislation. The Code requires carriers and airports to resolve passenger complaints within 30 days and entitles passengers to financial and non-financial compensation for delays exceeding two hours, cancellations and lost or damaged baggage. In addition, MAVCOM also launched a consumer management system in May 2016, which supports air passengers in settling disputes with airlines and airports[451].

In terms of punctuality, Malaysia's largest airport Kuala Lumpur (KUL) ranks 14th best of 34 major airports in the Asia-Pacific region. While 75.36% of its flights in August 2015 departed within 15 minutes of schedule, the average delay was 36.2 minutes. These results clearly outperform the regional average of 61.57% on-time departures and average delay of 64.2 minutes[452].

## Australia

Unlike the EU, Australia does not have a specific legislation on air passenger rights in the event of delays, cancellations or denied boarding. While the EU regulations define the entitlement of passengers to financial reimbursement in such events, compensation payments in case of overbooking, delayed or cancelled flights are at the discretion of the airline in Australia. The Australian Department of Infrastructure and Regional Development argues that a different regulation would be likely to increase the level of airfares. Nevertheless, similar to other countries, air passengers in Australia firstly file a complaint with the carrier. If the parties cannot reach an agreement, passengers can seek support from the Airline Customer Advocate (ACA). This entity was founded by five Australian airlines in 2012, including Qantas, Virgin Australia, Jetstar, Tiger and Regional Express, to improve the settlement of passenger complaints. However, research published in May 2015 revealed that the body is unable to settle 40% of its cases, while the average processing period rose from 15 to 18 days within one year[453]. Critics argue that the reliance of the body on funding from airlines negatively affects the effectiveness of its work. Moreover, airlines are not legally bound by ACA decisions.

The Australian Department of Infrastructure and Regional Development published a report on punctuality of Australian airlines in 2015, including Qantas, Regional Express, Tigerair, Jetstar and Virgin Australia. 86% of arriving and 87% of departing flights were on-time, i.e. within 15 minutes of schedule. This is a slight improvement compared to 2014, where punctuality of arrivals was 84% and of departures 86%. 1.6% of scheduled flights had to be cancelled, which is 0.1%pts higher than in the previous year.

Figure 176 presents on-time performance of airlines in Australia in 2015. Virgin Australia is the only carrier outperforming both, the average punctuality of departing and arriving flights. Regarding the latter, Qantas also notes better results than its competitors. Regional Express and Tigerair record below average cancellations, whereas Jetstar lies above the regional percentage.

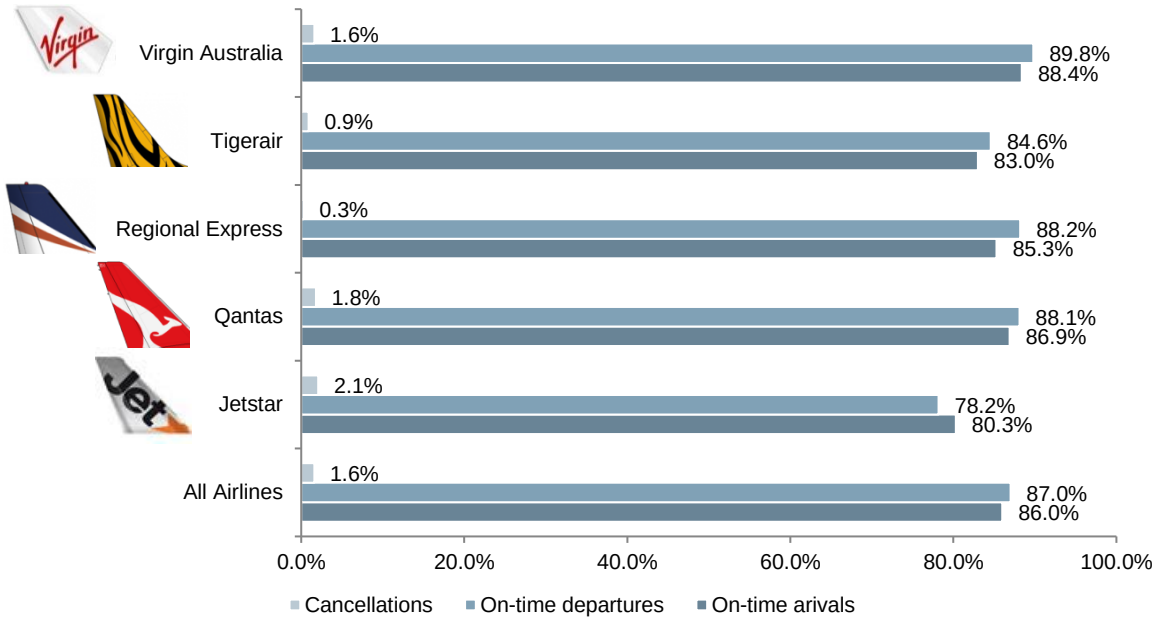
[450] http://www.mavcom.my/en/who-we-are/

[451] CAPA (19th July 2016): "MAVCOM implements Malaysia's first aviation consumer protection code"

[452] Flightstats.com (Accessed 10th August 2016)

[453] https://www.choice.com.au/travel/on-holidays/airlines/articles/airline-advocate-weak-on-complaint-resolution-220515

Figure 176: On-time Performance and Cancellation of Australian Airlines 2015




Source: Department of Infrastructure and Regional Development Australia, 2016

Table 52 illustrates the punctuality of Australia's five largest airports in 2016, showing that punctuality of arriving flight ranges from 84.8% at Sydney and Melbourne, to 89.6% at Adelaide. On-time departure performance also lay within a 5% scale, whereby Adelaide scored again the highest results, Sydney and Melbourne ranked at the other end of the table.

Table 52: On-time Performance at Major Airports in Australia 2015

| City | Airport Code | On-time arrivals | On-time departures |
|---|---|---|---|
| Sydney | SYD | 84.8% | 85.8% |
| Melbourne | MEL | 84.8% | 85.7% |
| Brisbane | BNE | 86.3% | 89.1% |
| Perth | PER | 88.7% | 90.6% |
| Adelaide | ADL | 89.6% | 90.8% |

Source: Department of Infrastructure and Regional Development Australia, 2016

## 9.4. International Punctuality Research

The previous sections have shown that delays and cancellations account for the majority of passenger complaints and customer dissatisfaction across all markets. Consequently, the following part presents the results of the Eurocontrol CODA Digest 2015 and the OAG 2015 Punctuality Report, which monitor airline and airport performance across the world. A particular focus is placed on the countries and regions analysed in the course of this chapter.

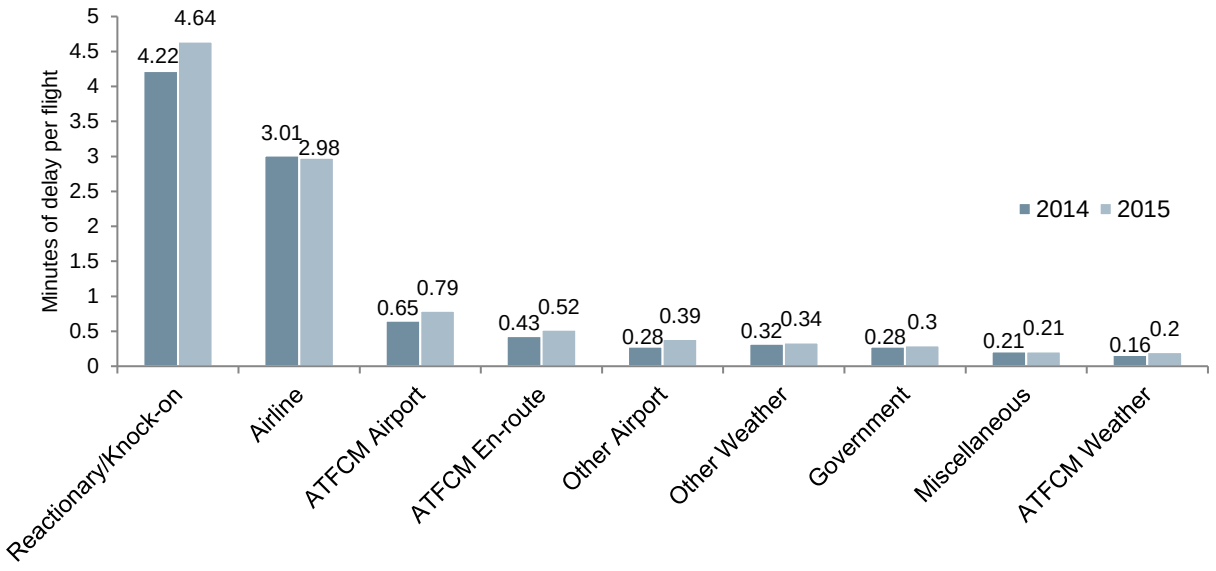
## CODA Digest 2015

The Eurocontrol Central Office for Delay Analysis (CODA) monitors airline delays and cancellations across Europe and is based on data received directly from the carriers.

2015 on-time performance and cancellations across European air traffic was strongly affected by adverse weather conditions and industrial action of airline staff and air traffic controllers. The average delay per flight in 2015 grew by 8% to 10.4 minutes compared to 2014. Figure 177 illustrates the composition of this delay, showing that reactionary or knock-on delays accounted for the largest share in average delay, followed by Airline and ATFCM Airport (Air Traffic Flow and Capacity Management) related issues. Reactionary or knock-on delays describe disruptions occurring from a late arriving aircraft which then impacts the departure time of the aircraft's subsequent flight.

In comparison to 2014, reactionary or knock-on delays recorded a considerable increase from 4.22 to 4.64 minutes per flight (+10%pts). Larger growth was even noted by airport related delays, where Other Airport delays rose from 0.28 to 0.39 minutes per flight (+39%pts) and ATFCM Airport delays from 0.65 to 0.79 minutes per flight (+22%pts). In contrast, airline related delays remained constant.

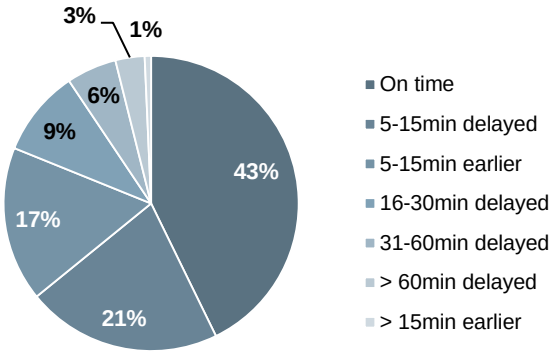
Figure 177: Delays Causes 2015 vs 2014




Source: Eurocontrol, 2016

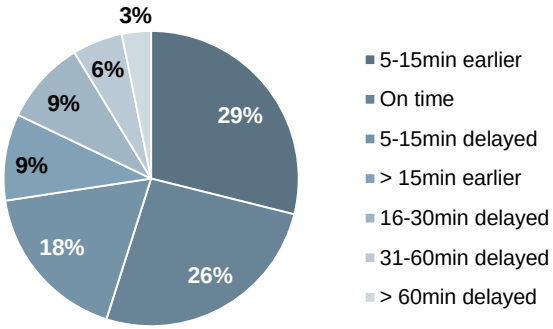
Although the majority of flights in 2015 departed on time or earlier (60.5%), it was 2%pts less than in 2014 (Figure 178). 8.7% of flights in 2015 left the airport with a delay greater than 31 minutes, which was 1%pt above 2014 levels. Similar results are also observed for 2015 arrival punctuality (Figure 179), where 64.4% of flights arrived on time or earlier than scheduled, which was 1%pt less than in 2014. At the same time, the share of flights arriving with more than 31 minutes delay rose from 7.7% to 8.7%. Although most arrivals and departures in 2015 were on time or earlier than scheduled, it is noteworthy that a quarter of flights still departs or arrives with a delay between 5 and 30 minutes. This reflects the capacity constraint challenges faced by a number of airports across the EU.

Figure 178: Departure Punctuality 2015




Source: Eurocontrol, 2016

Figure 179: Arrival Punctuality 2015




Source: Eurocontrol, 2016

## OAG 2015 Punctuality Report

The following section presents the findings of the OAG 2015 Punctuality Report[454], which is prepared by the British air travel intelligence company on an annual basis and ranks the on-time performance of 50M flights worldwide. Results are split into various categories, including small, medium and large airports, as well as full-service airlines and low-cost carriers.

Table 53 illustrates the on-time performance of arriving and departing flights at selected airports worldwide with less than 10M annual seats, while particularly focussing on the countries analysed in the course of this chapter. Overall average on-time performance was 89.8%, which remained largely unchanged vs. 2014. Besides the top three airports, the table shows that six of the top 20 airports were either in Australia or Germany.

Table 53: On-time Performance at Selected Small Airports in 2015 (<10m Annual Seats)

| Rank | Airport | Average on-time performance 2015 |
|---|---|---|
| **1** | **Osaka, ITM (Japan)** | **93.9%** |
| **2** | **Brussels South Charleroi, CRL (Belgium)** | **93.6%** |
| **3** | **Panama City, PTY (Panama)** | **92.6%** |
| 4 | Stavanger (Norway) | 91.2% |
| 5 | Bergen, BGO (Norway) | 90.9% |
| 6 | Cologne Bonn, CGN (Germany) | 90.4% |
| 7 | Adelaide, ADL (Australia) | 90.2% |
| 8 | Warsaw, WAW (Poland) | 89.9% |
| 9 | Bristol, BRS (UK) | 88.6% |
| 10 | Hannover, HAJ (Germany) | 88.6% |
| 11 | Perth, PER (Australia) | 88.6% |
| 13 | Cairns, CNS (Australia) | 88.4% |
| 14 | Berlin Schoenefeld, SXF (Germany) | 88.3% |
| 15 | Christchurch, CHC (New Zealand) | 88.1% |
| 16 | Nagoya, NKM (Japan) | 88.1% |
| 17 | Porto Alegre, POA (Brazil) | 87.7% |
| 18 | Cali, CLO (Colombia) | 87.6% |
| 19 | Milan Linate, LIN (Italy) | 87.5% |

[454] OAG (January 2016): "On-time performance results for airlines and airports"

| Rank | Airport | Average on-time performance 2015 |
|---|---|---|
| 20 | Curitiba, CWB (Brazil) | 87.4% |

Source: OAG, 2016

Table 54 presents on-time performance of arriving and departing flights at selected airports worldwide with 10 to 20M annual seats. Overall average on-time performance was 86.2%, in similar levels to 2014. In contrast to the small airport category, no medium airport recorded an on-time performance over 90%. This has partly been the result of capacity constraints and hub operations at many of these airports. Besides, it emerges, that nine of the top 20 medium airports are located in Australia, Germany or the US.

Table 54: On-time Performance at Selected Medium Airports in 2015 (10-20M Annual Seats)

| Rank | Airport | Average on-time performance 2015 |
|---|---|---|
| **1** | **Copenhagen, CPH (Denmark)** | **88.5%** |
| **2** | **Moscow Sheremetyevo, SVO (Russia)** | **88.5%** |
| **3** | **Helsinki, HEL (Finland)** | **88.4%** |
| 4 | Brisbane, BNE (Australia) | 88.3% |
| 5 | Salt Lake City, SLC (USA) | 87.9% |
| 6 | São Paulo-Congonhas, CGH (Brazil) | 87.8% |
| 7 | Athens, ATH (Greece) | 87.8% |
| 8 | Honolulu, HNL (USA) | 87.4% |
| 9 | Auckland, AKL (New Zealand) | 86.7% |
| 10 | Hamburg, HAM (Germany) | 85.9% |
| 11 | Berlin Tegel, TXL (Germany) | 85.6% |
| 12 | Oslo, OSL (Norway) | 85.5% |
| 13 | Brasilia, BSB (Brazil) | 85.5% |
| 14 | Vancouver, YVR (Canada) | 85.2% |
| 15 | Vienna, VIE (Austria) | 85.1% |
| 16 | Detroit, DTW (USA) | 84.6% |
| 17 | Stockholm, ARN (Sweden) | 84.2% |
| 18 | Bogota, BOG (Colombia) | 83.8% |
| 19 | Santiago, SCL (Chile) | 83.7% |

| Rank | Airport | Average on-time performance 2015 |
|---|---|---|
| 20 | Rio de Janeiro, GIG (Brazil) | 83.5% |

Source: OAG, 2016

Table 55 illustrates the on-time performance of arriving and departing flights at selected airports worldwide with more than 20m annual seats. Overall average on-time performance was 83.3%, which slightly higher than in 2014 (82.9%). Unlike in the small airport category, only one airport (Tokyo Haneda) recorded an on-time performance over 90%. This stresses again that smaller airports seem to benefit from less congestion and traffic volume and thus tend to have a higher on-time performance. It also emerges, that over half of the airports in the top 20 are in the US. In contrast, some of the largest airports in the world such as London Heathrow (LHR), Beijing (PEK) and Hong Kong (HKG) could not be found in the first 20. Similarly, no large Middle Eastern airports ranked among the top 20 either.

Table 55: On-time Performance at Selected Large Airports in 2015 (>20M Annual Seats)

| Rank | Airport | Average on-time performance 2015 |
|---|---|---|
| **1** | **Tokyo Haneda, HND (Japan)** | **91.3%** |
| **2** | **Munich, MUC (Germany)** | **87.7%** |
| **3** | **São Paulo Guarulhos, GRU (Brazil)** | **87.5%** |
| 4 | Minneapolis, MSP (USA) | 85.3% |
| 5 | Sydney, SYD (Australia) | 85.2% |
| 6 | Melbourne, MEL (Australia) | 85.1% |
| 7 | Singapore Changi, SIN (Singapore) | 84.8% |
| 8 | Atlanta, ATL (USA) | 84.4% |
| 9 | Frankfurt, FRA (Germany) | 84.1% |
| 10 | Seattle, SEA (USA) | 83.6% |
| 11 | Phoenix, PHX (USA) | 83.5% |
| 12 | Madrid, MAD (Spain) | 82.6% |
| 13 | Charlotte, CLT (USA) | 81.4% |
| 14 | Las Vegas LAS, (USA) | 81.4% |
| 15 | Amsterdam, AMS (Netherlands) | 81.2% |
| 16 | Orlando, MCO (USA) | 80.8% |
| 17 | Boston, BOS (USA) | 80.7% |

| Rank | Airport | Average on-time performance 2015 |
|---|---|---|
| 18 | Houston, IAH (USA) | 80.1% |
| 19 | Miami, MIA (USA) | 80.1% |
| 20 | Dallas/Fort Worth, DFW (USA) | 79.9% |

Source: OAG, 2016

Table 56 illustrates top 20 airlines worldwide with the best on-time performance of arriving flights in 2015. Overall average on-time performance was 88.9%, 1.1%pts above 2014 levels. Although only four airlines recorded on-time performance of over 90%, this signifies an improvement against 2014. It also emerges, that except for Azul and Norwegian, all other airlines are full-service carriers. This is largely due to the high aircraft utilisation of low-cost carriers, which can negatively impact on-time performance.

Table 56: On-time Performance of Airlines Worldwide 2015

| Rank | Airline | Average on-time performance 2015 |
|---|---|---|
| 1 | airBaltic (BT) | 94.4% |
| 2 | Copa Airlines (CM) | 91.7% |
| 3 | Azul (AD) | 91.0% |
| 4 | Japan Airlines (JL) | 90.4% |
| 5 | All Nippon Airways (NH) | 89.7% |
| 6 | Finnair (AY) | 89.5% |
| 7 | TAM (JJ) | 89.5% |
| 8 | Austrian Airlines (OS) | 89.3% |
| 9 | Hawaiian Airlines (HA) | 89.1% |
| 10 | LOT Polish Airlines (LO) | 88.9% |
| 11 | Virgin Australia (VA) | 88.6% |
| 12 | KLM (KLM) | 88.5% |
| 13 | SAS (SK) | 88.2% |
| 14 | Monarch Airlines (ZB) | 88.2% |
| 15 | Qantas Airways (QF) | 88.1% |
| 16 | Iberia (IB) | 87.5% |
| 17 | Flybe (BE) | 87.5% |

| Rank | Airline | Average on-time performance 2015 |
|---|---|---|
| 18 | Air New Zealand (NZ) | 87.3% |
| 19 | Qatar Airways (QR) | 87.1% |
| 20 | Norwegian Air Shuttle (DY) | 86.7% |

Source: OAG, 2016

Overall, the OAG Punctuality Report 2015 finds that although the continuous growth in passenger and flight volume across the world pressurises on-time performance, overall punctuality is increasing, benefitting from new technologies, revised operating procedures and constant improvement efforts of airlines and airports. Asia, especially Japan, dominates almost all segments, with Osaka and Tokyo Haneda leading the small and the large airports ranking and Japan Airlines and All Nippon Airways being among the top 5 in the airline category. Similarly, US, Australian and Brazilian airports and carriers recorded excellent results. In contrast, UK airports and airlines are rarely among the top 20, which has been mainly the result of the capacity bottlenecks in the UK air space.

# Glossary

| | |
|---|---|
| **AAIB** | The UK Air Accidents Investigation Branch |
| **AAPA** | Association of Asia Pacific Airlines |
| **AASA** | Airlines Association of Southern Africa |
| **ACA** | Airline Customer Advocate Australia |
| **ACA** | Airport Carbon Accreditation |
| **ACACP** | US Advisory Committee for Aviation Consumer Protection |
| **ACARE** | Advisory Council for Aeronautics Research in Europe |
| **A-CDM** | Airport Collaborative Decision Making |
| **ACI** | Airports Council International |
| **ADR** | Alternative Dispute Resolution |
| **ADS-C** | Autonomous Dependent Surveillance-Contract |
| **AEA** | Association of European Airlines |
| **AFU** | Auto Feather Unit |
| **AIRE** | Atlantic Interoperability Initiative to Reduce Emissions |
| **ALERT** | Aircraft Locating and Emergency Response and Tracking |
| **AME** | Aviation Medical Examiners |
| **ANAC** | Brazilian National Civil Aviation Agency |
| **ANSP** | Air Navigation Services Provider |
| **AOC** | Air Operators Certificate |
| **APAI** | Air Passenger Association of India |
| **ARC** | Aviation Rulemaking Committee |
| **ASA** | Air Service Agreement(s) |
| **ASEAN** | Association of South East Asian Nations |
| **ASECNA** | Agency for Aerial Navigation Safety (in Africa and Madagascar) |
| **ASN** | Aviation Safety Network |
| **ASQ** | Air Service Quality |
| **ATC** | Air Traffic Control |
| **ATFCM** | Air Traffic Flow and Capacity Management |
| **ATK** | Available Tonne Kilometres |
| **ATM** | Air Traffic Management |
| **ATO** | Air Traffic Organisation |
| **ATPCS** | Automatic Take-Off Power Control System |
| **ATR** | Aerei da Trasporto Regionale / Avions de Transport Régional |
| **AV-CERT** | Aviation Computer Emergency Response Team |
| **BARSA** | Board of Airlines Representatives South Africa |
| **BBC** | British Broadcasting Corporation |
| **BDL** | German Aviation Association |
| **BLADE** | Breakthrough Laminar Aircraft Demonstrator in Europe |
| **BOT** | Build-Operate-Transfer |
| **B-VLOS** | Beyond Visual Line of Sight |
| **CAA** | Civil Aviation Authority |

| | |
|---|---|
| **CAEP** | Committee on Aviation Environmental Protection |
| **CAEP/10** | The 10th meeting of the Committee on Aviation Environmental Protection |
| **CAPA** | Centre for Asia Pacific Aviation |
| **CARATS** | Collaborative Actions for Renovation of Air Traffic Systems |
| **CAU** | Customer Affairs Unit Nigeria |
| **CEF** | Connecting Europe Facility |
| **CFIT** | Controlled Flight into Terrain |
| **CIS** | Commonwealth of Independent States |
| **CODA** | Eurocontrol Central Office for Delay Analysis |
| **COSIA** | Carbon Offsetting Scheme for International Aviation |
| **CPDLC** | Controller Pilot Downlink Communication |
| **CVR** | Cockpit Voice Recorders |
| **DAA** | Detect and Avoid |
| **DGCA** | Directorate General of Civil Aviation India |
| **DOT** | US Department of Transportation |
| **EAG** | Environmental Advisory Group |
| **EASA** | European Aviation Safety Agency |
| **EC** | European Commission |
| **ECAA** | European Common Aviation Area |
| **EEA** | European Economic Area |
| **EFTA** | European Free Trade Association |
| **ELSA** | Enhance Large Scale ATN |
| **ENCASIA** | Civil Aviation Safety Investigation Authorities |
| **END** | Environmental Noise Directive |
| **EPAS** | European Plan for Aviation Safety |
| **ERAM** | En-route Automation Modernisation |
| **EU** | European Union |
| **FAA** | Federal Aviation Administration |
| **FABEC** | Functional Airspace Block Europe Central |
| **FABs** | Functional Airspace Blocks |
| **FANS-1** | Future Air Navigation System |
| **FAS** | Future Airspace Strategy |
| **FDR** | Flight Data Recorder |
| **FIR** | Flight Information Regions |
| **FOCA** | Swiss Federal Office of Civil Aviation |
| **FSB** | Federal Security Service (Russian) |
| **FSC** | Full Service Carriers |
| **FSF** | Flight Safety Foundation |
| **FTK** | Freight Tonne Kilometres |
| **GACA** | General Authority of Civil Aviation Saudi Arabia |
| **GAGAN** | GPS Aided Geo Augmented Navigation |
| **GANP** | Global Air Navigation Plan |
| **GDP** | Gross Domestic Product |
| **GHG** | Greenhouse Gas emissions |
| **GLADs** | Global Aviation Dialogues |
| **GMTF** | Global MBM Technical Task Force |

| | |
|---|---|
| **IAA** | Irish Aviation Authority |
| **IATA** | International Air Transport Association |
| **ICAO** | International Civil Aviation Organisation |
| **IMF** | International Monetary Fund |
| **KPIs** | Key Performance Indicators |
| **LBA** | Federal Aviation Office of Germany |
| **LCC** | Low Cost Carrier |
| **LPV** | Localizer performance with Vertical Guidance |
| **M&A** | Mergers and Acquisitions |
| **MAVCOM** | Malaysian Aviation Commission |
| **MBM** | Market-Based-Mechanism |
| **MPPA** | Million Passengers per Annum |
| **MRO** | Maintenance, Repair and Overhaul |
| **NAS** | National Airspace System |
| **NASA** | National Aeronautics and Space Administration |
| **NATII** | Normal Tracking Implementation Initiative |
| **NCAA** | Nigerian Civil Aviation Authority |
| **NCC** | South African National Consumer Commission |
| **OSS** | One Stop Security |
| **OTP** | On-time performance |
| **PBN** | Performance Based Navigation |
| **PCP** | Pilot Common Project |
| **PPP** | Public Private Partnerships |
| **PRM** | Passengers with Reduced Mobility |
| **RNP** | Required Navigation Performance |
| **RNP4** | Required Navigation Performance |
| **ROA** | Return on Assets |
| **ROCE** | Return on Capital Employed |
| **ROIC** | Return on Invested Capital |
| **RP2** | Reference Period 2 |
| **RPK** | Revenue Passenger Kilometres |
| **RTS** | Remote Tower Services |
| **SBAS** | Satellite Based Navigation Techniques |
| **SDM** | SESAR Deployment Manager |
| **SES** | Single Europe Sky |
| **SESAR** | Single European Sky Air Traffic Management |
| **SFDPS** | SWIM Flight Data Publication Service |
| **SFOC** | Special Flight Operations Certificate |
| **SFP** | Selective Flight Protection |
| **SMS** | Safety Management System |
| **SOP** | Standard Operating Procedure |
| **söp** | German Conciliation Body for Public Transport |
| **SR** | Safety Recommendations |
| **SRIS** | Safety Recommendations Information System |
| **SRM** | Safety Risk Management |
| **SRUR** | Safety Recommendations of Union wide Relevance |

| | |
|---|---|
| **STARS** | Standard Terminal Automation System |
| **STDDS** | SWIM Terminal Data Distribution System |
| **SVT** | Surface Visualization Tool |
| **SWIM** | System Wide Information Management |
| **TCAA CCC** | Civil Aviation Authority Consumer Consultative Council Tanzania |
| **TCO** | Third Country Operator Regulation |
| **TDFM** | Terminal Flight Data Manager |
| **TEU** | Treaty on European Union (TEU; Maastricht Treaty, effective since 1993) |
| **TFEU** | Treaty on the Functioning of the European Union (TFEU; Treaty of Rome, effective since 1958) |
| **TNT** | Tri-Nitro-Toluene |
| **TSA** | Transportation Security Administration |
| **TTA** | Target Time of Arrival |
| **UAE** | United Arab Emirates |
| **UAV** | Unmanned Aircraft Vehicle |
| **UDPP** | User Driven Prioritisation Process |
| **UK** | United Kingdom |
| **UN** | United Nations |
| **US / USA** | United States / United States of America |
| **UTM** | Unmanned Air Traffic Management |
| **VDL2** | VHF Data Link Mode 2 |
| **VLL** | Very Low Level |
| **VLOS** | Visual Line of Sight |
| **WACC** | Weighted Average Cost of Capital |
| **WHO** | World Health Organisation |
| **WRC** | World Radio Conference |