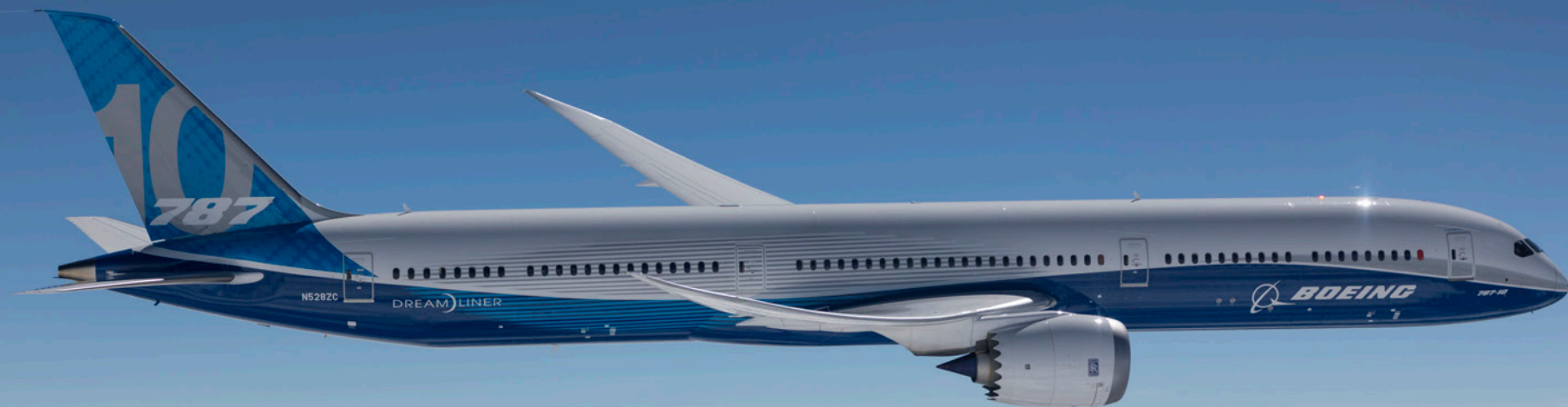




CURRENT MARKET OUTLOOK

2017-2036







FOREWORD

Thanks to aviation, our world is getting smaller every day. I certainly never imagined we'd see a nonstop flight from London to Austin. But it's one of the more than 140 new routes opened up by the 787 Dreamliner in just a few short years. That's how fast this industry changes.

To help us all prepare for changes still to come, the Boeing Current Market Outlook (CMO) is dedicated to forecasting new airplane demand over the next 20 years. In many ways, it paints a picture of the future of flight.

Just as we adapt our product lineup to meet the changing business needs of customers, our CMO is also adapting to a dynamic market. In this year's CMO, you'll find more color and context around the numbers—and find out why we see things the way we do.

We also decided to look back at some of the big changes over the past 10 years, providing insight into the structural changes to the industry as opposed to the short-term blips.

As air travel continues to become more a part of our daily lives—connecting us with family, friends, and business colleagues—it's more important than ever that the aviation industry be fully prepared for the growth coming our way. And that's exactly why we do the CMO.

Randy Tinseth

Vice President – Marketing
Commercial Airplanes

EXECUTIVE SUMMARY

GLOBAL FORECAST

 **41,030**
DELIVERIES

 **6.1**
TRILLION MARKET
VALUE

 **4.7%**
TRAFFIC GROWTH

 **3.5%**
FLEET GROWTH

DELIVERIES BY CATEGORY

Regional Jet

2,370
new airplanes
\$110B

Single Aisle

29,530
new airplanes
\$3,180B

Small Widebody

5,050
new airplanes
\$1,340B

Medium/Large Widebody

3,160
new airplanes
\$1,160B

Freighters

920
new airplanes
\$260B

DELIVERIES BY REGION



Table Of Contents

Long-Term Market Outlook	6
Environment	10
Airline Business Strategy Drivers	14
Global Passenger & Market Overview	18
Africa	24
Asia-Pacific	28
CIS	32
Europe	36
Latin America	40
Middle East	44
North America	48
Air Cargo	52
Methodology	54
Appendix	58



LONG-TERM MARKET OUTLOOK



FORECASTING AIRPLANE DEMAND IN A DYNAMIC MARKET ENVIRONMENT

Commercial aviation is a dynamic industry that continuously adapts to various market forces. Forecasting long-term demand for airplanes requires assumptions and predictions about the macro trends and drivers that will shape the airline industry far into the future. A multitude of factors are at play, and they often vary from market to market. However, we can broadly categorize three key dimensions of the macro environment that drive airplane demand forecasts:

- The underlying demand for air travel.
- The regulatory, infrastructure, and technology environment.
- The strategies and products airlines offer in the marketplace.

We update our forecast annually to adjust for the effects of current business conditions and developments into our analysis of the long-term industry drivers. Over the last year, all three of these categories have seen significant developments that influence the forecast.

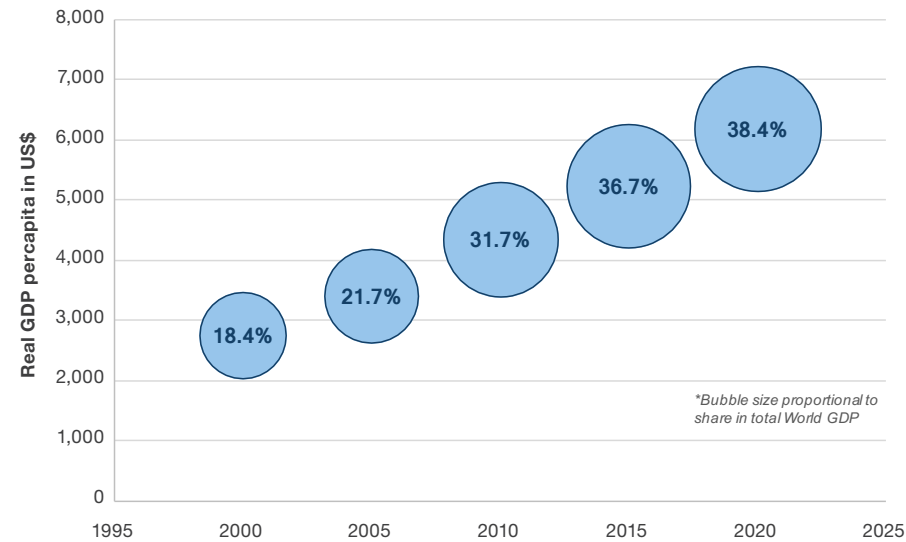
STRONG CONSUMER ECONOMY IS DRIVING GROWTH, SUPPORTING AIR TRAVEL DEMAND

Worldwide air travel has grown at a historically brisk pace. Year-over-year passenger travel growth for the past five years has averaged 6.2 percent. Low air fares, higher living standards with a growing middle class in large emerging markets, and the growth of tourism and travel relative to total consumer spending in major economies are all driving strength in the demand for air travel.

ECONOMIC AND INCOME GROWTH ARE KEY DRIVERS

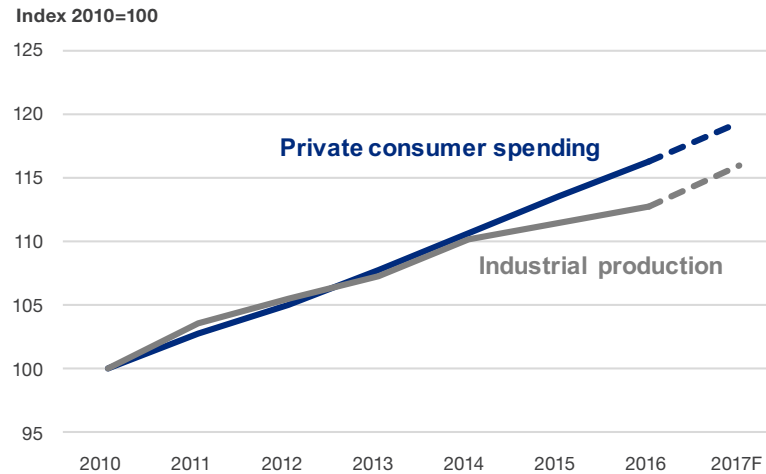
Economic and income growth in large emerging markets such as China and India have been a primary driver of global GDP growth and also demand for air

Emerging Markets GDP per capita



Source: IHS Markit Economics

Consumption and industrial production



Source: IHS Markit Economics

travel. China has contributed significantly to world traffic growth for several years, as its passenger growth has increased at an average rate of more than 10 percent per year. India's emergence as a high-growth economy has produced more than 20 percent passenger traffic growth per year in its domestic market. India is expected to become the third largest commercial aviation market by the early 2020s. The middle class in China and India grew from 80 million in 2000 to 135 million in 2016, an increase of nearly 70 percent.

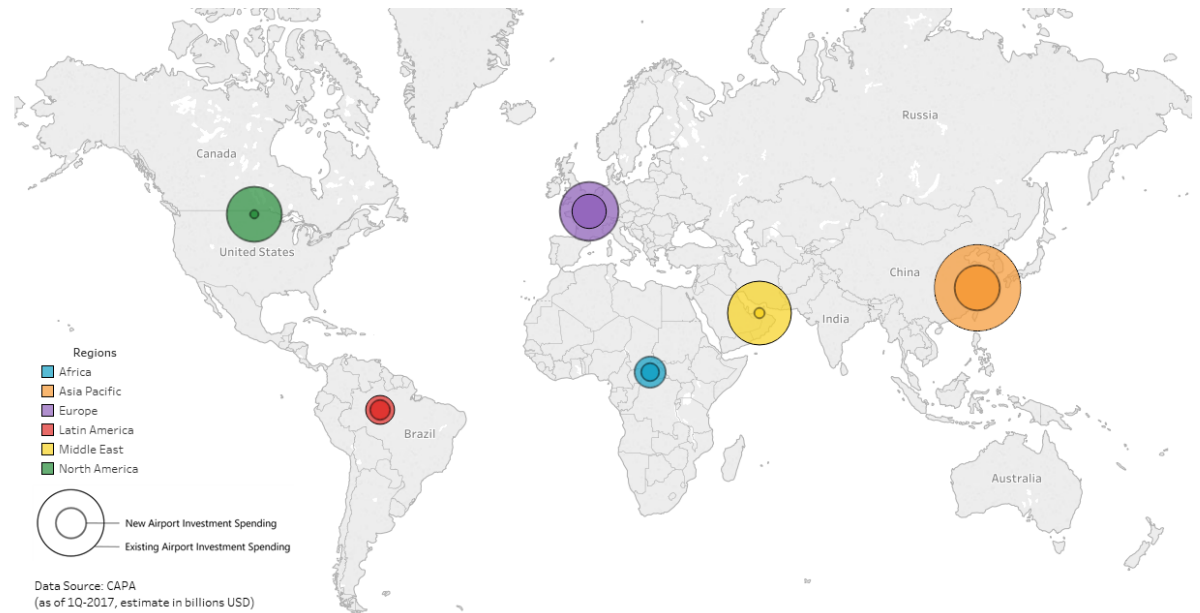
STRONG CONSUMER SPENDING AND SERVICES GROWTH BOLSTERING AIR TRAVEL DEMAND

While global economic growth has lagged the long-term average in recent years, the composition of the growth supports increasing air travel demand. However, consumer spending remains robust in developed economies such as the United States, Europe, and Australia. In addition, emerging market economies like China are transitioning to a more service-based economy supporting sustained air travel demand into the future. This trend is projected to continue in global economic outlooks.

TRAVEL AND TOURISM IS A GROWING PART OF CONSUMER SPENDING

Within the services sector of the global economy, consumer spending on travel and tourism continues to grow. According to the World Tourism Organization, international tourist arrivals grew 3.9 percent in 2016, faster than overall GDP growth. Like air passenger traffic, overall tourism has grown sustainably since the financial crisis, with 300 million more international tourists in 2016 compared to the pre-crisis record set in 2008. This trend is projected to continue with the direct contribution of tourism and travel to global GDP expected to grow 4 percent per year in real terms over the next 10 years, according to the World Tourism and Travel Council. Recent regional trends seen in air travel

Regional new and existing airport investment



markets reflect broader travel and tourism developments. In 2016, the strongest regional growth was recorded in Asia Pacific, while growth in North America was solid and Europe posted positive numbers despite a challenging geopolitical year. The outlook for strong air travel demand is consistent with broad consumer demand trends and travel and tourism outlooks.

REGULATORY AND INFRASTRUCTURE DRIVERS

In addition to air travel demand fundamentals, regulatory environment, infrastructure requirements, and technology development also shape airplane demand. Several key elements in this arena are market liberalization, airport infrastructure development, and environmental regulations. These market forces, among others, are incorporated into our long-term forecast.

AIRLINE MARKET LIBERALIZATION—REDUCING FARES AND IMPROVING SERVICE

A key factor in strong passenger travel growth over the past 35 years is increasingly liberalized markets. Dating back to the deregulation of the commercial airline industry in the United States in 1978, market liberalization has been critical to the substantial growth of commercial aviation in all regions of the world. Liberalization has allowed entrepreneurs to use people's creativity to generate new ways to meet market demands and fill market niches that previously were restricted by government regulations.

Liberalization has encouraged significant traffic growth by removing constraints on route entry, pricing, service capacity, and airline cooperative arrangements. As airline competition and operating efficiency have grown, pricing has decreased in real terms while flight

frequencies and product choices have increased for passengers worldwide. In addition, improved air services often directly and indirectly stimulate economic growth, creating a virtuous circle that leads to further air transport growth, which in turn leads to added economic growth.

Prominent industry liberalization examples include the development of low-cost carriers (LCC) and Open Skies agreements. The LCC business model would not have flourished without relaxation of government-regulated airline ticket pricing and heavy new market entrant regulation. Recent strong growth of LCC operators in countries such as Japan and Mexico illustrate the high impact of these kinds of market liberalization, as new entrants into these markets have reduced fares and increased new services.

Open Skies agreements have also promoted strong growth in the commercial airline industry, extending liberalization and higher levels of competition to international and long-haul markets. For example, the Open Skies agreement by ASEAN (Association of Southeastern Asian Nations) was fully ratified last year following implementation that began in 2009. The agreement supports increased competition and connectivity within the region, providing passengers the benefits of lower fares and greater itinerary and service-level choices. The increasingly liberal market environment has led to airlines exploring new ways to differentiate from their competitors with new products and services including added point-to-point connections.

The continuation of airline regulatory liberalization worldwide is critical for the continued, strong health and growth of passenger travel. The expectation is that this trend will continue since consumers have come to expect more choices and low prices for airline travel.

AIRPORT INFRASTRUCTURE INVESTMENT CONTINUES TO GROW

Airport investment projects have proceeded at a brisk pace supporting air travel growth that has occurred—and is expected to continue—over the next 20 years. Predictably, the fast-growing Asia Pacific region has dominated growth in airport expansion and new airport construction. However, there has been significant airport investment in most regions of the world. For example, between now and the end of 2021, nearly \$1 trillion will be invested in new and existing airports worldwide, with Asia Pacific accounting for about 40 percent of that investment.

This global airport investment is a mix of improvements at existing facilities and spending on new airports. Improvements to existing facilities are more prevalent in mature aviation markets, while new airports garner a larger share of spending in emerging markets. Estimates show that at least \$2 trillion will be invested in airport infrastructure in a combination of these ways through 2030.

Due to the long-term nature of airport design and construction, along with large financing requirements, airport investment levels reflect government and key stakeholder support for aviation development and future growth. Investment in airport development supports global market access; air travel is essential in the modern business world and the connection of countries to global value chains. It is also a key metric in foreign direct investment location decisions. Indicators of the quality of air transport infrastructure closely correlate with the availability of recent technologies.

In addition to airport investment, airlines address potential airport constraints through business and network strategies. As airlines seek competitive advantage in passengers' preference for shortest trip times, networks continue to gravitate toward

more point-to-point air travel. This strategy is helped by the availability of new technology airplanes like the 787, which can economically serve secondary cities directly and thus reduce routings through congested airports. This market dynamic is expected to continue developing over the next 20 years.

ENVIRONMENT



SUSTAINABLE GROWTH: AVIATION COMMITS TO ENHANCED ENVIRONMENTAL TARGETS

Aviation currently contributes about 2 percent of global man-made carbon dioxide (CO₂) emissions. The United Nations' Intergovernmental Panel on Climate Change reports that this figure may increase to 3 percent by 2050 without further action. Industry members have committed to a set of three ambitious goals to ensure aviation's sustainable future.

SUPPORTING A GLOBAL REGULATORY FRAMEWORK

The International Civil Aviation Organization (ICAO) is the United Nations' agency that governs international aviation. State regulators, such as the US Federal Aviation Administration (FAA) and the European Aviation Safety Agency (EASA), participate in this organization and seek to align domestic regulations with ICAO, to ensure clarity and effectiveness of aviation regulations worldwide. ICAO recently achieved two major milestones in regulating CO₂ emissions from commercial airplanes.

The Committee on Aviation Environmental Protection (CAEP) approved an airplane fuel efficiency standard in February 2016, which was adopted by the ICAO Council in March 2017. This standard represents more than six years of work by a group of international experts from ICAO member states, industry, and nongovernmental organizations. The new standard is ambitious and will become part of the certification process applied to every airplane before delivery, starting in 2020 for new-type cert applications and by 2028 for all in-production airplanes.

Industry CO₂ Emissions Goals

<p>GOAL 1</p> <p>1.5% AVERAGE ANNUAL FLEET FUEL EFFICIENCY IMPROVEMENT FROM 2009 TO 2020</p> <p>PROGRESS</p> <p>Currently tracking well above goal, although figure expected to normalize</p> <p>HOW IS INDUSTRY ACHIEVING THIS?</p> <ul style="list-style-type: none"> ✓ New airplane and engine technologies ✓ More efficient operations by airlines ✓ Better use of air traffic management infrastructure 	<p>GOAL 2</p> <p>STABILIZE NET AVIATION CO₂ EMISSIONS AT 2020 LEVELS THROUGH CARBON-NEUTRAL GROWTH</p> <p>PROGRESS</p> <p>Industry is actively supporting global actions at an intergovernmental level</p> <p>HOW IS INDUSTRY ACHIEVING THIS?</p> <ul style="list-style-type: none"> ✓ All actions for Goal 1 ✓ Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) at the International Civil Aviation Organization (ICAO) 	<p>GOAL 3</p> <p>REDUCE AVIATION NET CO₂ EMISSIONS TO 50% OF WHAT THEY WERE IN 2005, BY 2050</p> <p>PROGRESS</p> <p>Significant research and innovation efforts underway</p> <p>HOW IS INDUSTRY ACHIEVING THIS?</p> <ul style="list-style-type: none"> ✓ All actions for Goal 1 & 2 ✓ Development of sustainable alternative aviation fuels ✓ Research into future design concepts by airplane and engine manufacturers
---	---	---

Source: <http://aviationbenefits.org/environmental-efficiency/aviation-climate-solutions/>

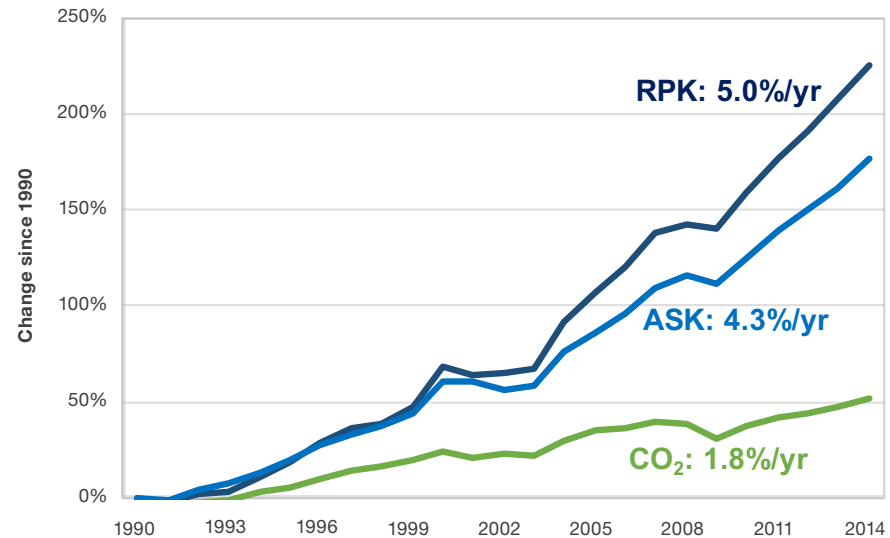
In October 2016, the ICAO Assembly agreed on a framework for a new global market-based measure to control CO₂ emissions from international aviation. The Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) is designed to complement mitigation measures the air transport community is already pursuing to reach its goals of capping CO₂ emissions at 2020 levels. The current plan for implementation of the CORSIA will begin with a pilot phase from 2021 through 2023, followed by a first phase from 2024 through 2026. Participation in both of these early stages will be voluntary; the next phase, from 2027 to 2035, is mandatory for all member states on board.

ACHIEVING RESULTS

As our industry plans for the future, it's also helpful to measure the past results of our strategies. Since 1990, the commercial aviation industry has decoupled its economic growth from its CO₂ emissions growth. Airline passenger traffic, as measured by revenue passenger kilometers (RPKs), averaged a 5 percent annual growth rate while CO₂ emissions grew less than 2 percent over the same time.

More than 2 percent of this growth gap can be attributed to the entry of new airplane and propulsion technologies into the fleet as well as increased efficiencies in global air traffic management systems. The remaining gap (difference in RPK and ASK rates) shows the contribution of increased cabin utilization strategies by airlines. The CO₂ emissions amounts are derived from data from the International Energy Agency and do include some noncommercial airplane fuel use. Although it isn't possible to separate this additional aviation activity, it is believed to be a small proportion of the total reported value and serves to add conservatism to the calculations.

CO₂ emissions growing much slower than traffic



Source: http://www.boeing.com/resources/boeingdotcom/principles/environment/pdf/Eco_Brochure.pdf

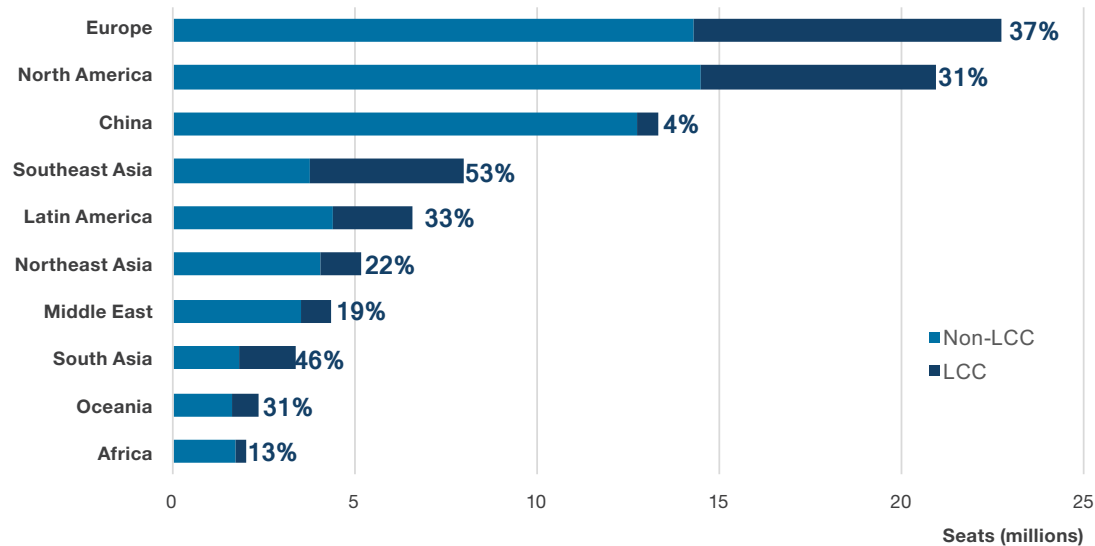




AIRLINE BUSINESS STRATEGY DRIVERS



LCC share of total seats by region



Source: Innovata 2017 FEB

AIRLINE BUSINESS STRATEGY DRIVERS

Evolving airline business strategies and product offerings are bringing more value to travelers in a range of ways. A wider array of service offerings better match airlines' products with customer values. These developments include lowering fares, unbundling product offerings allowing customers to pay for only the services they want, and broadening airline networks to increase connectivity and points served.

LOWER FARES BOOST DEMAND

Average airfares have declined in the past 10 years at an average of 0.9 percent per year. The worldwide spread of low-cost carriers (LCC) and ultra-low-cost carriers (ULCC) has been instrumental in enabling this trend. Additionally, the increase in point-to-point flights and flight frequencies has encouraged the stimulation of passenger demand.

Since the original concept was first introduced in the 1970s, LCCs have rapidly become a prominent global airline business model. As the innovative business model has expanded in different parts of the world, several unique business strategies optimized for LCC operations have been developed with a common value proposition: maximize profitability through cost reduction particularly in the short-haul segment. To accomplish this goal, LCCs have executed some of the following characteristic strategies:

- Short-haul, point-to-point flights, often with secondary airport operation.
- Single-aisle fleet standardization preference.
- Single-class, higher-density airplane preference.
- Higher utilization and quick turnaround.
- Lower yield but higher volume concept.
- Basic services and more ancillary revenue.

- Limited lower-cost distribution outlets (now primarily Internet).

More than four decades later, the LCC business model's success for short-haul routes is evident in the current aviation market. Supported by earlier adoption of deregulation policy, North American and European LCC operators currently provide more than 30 percent of seat capacity in each region's short-haul market segment. In Asia, rapid expansion of LCCs has been a key driver of overall growth in the short-haul market since the early 2000s. As a result, the LCC penetration rate in some Asian regions is now more than 50 percent of their home markets, and other regions have been progressively growing LCC capacity at double-digit annual rates over the past decade.

Like the LCCs before them, a new breed of even lower-cost carriers—ULCCs—has expanded the total number of passengers by attracting flyers willing to travel because the price is now low enough for flying to become more attractive and affordable. While established network carriers continue responding to aggressive competition posed by the low-cost business models, our current backlog and forecast project that LCCs will penetrate further into the short-haul market and increase regional connectivity.

More than 90 percent of the current LCC capacity resides in the short-haul segment. However, as market structures become more complex and consumer behaviors continue to evolve, hybrid and low-cost long-haul (LCLH) business models are emerging. LCCs are meeting passenger demands by extending more affordable travel to long-haul markets, while network carriers are responding with their own low-cost subsidiaries.

Establishing the low-cost business model for long-haul service is more challenging than it is for short haul. Capital

Top 20 airports with the most weekly seats in 1996



Top 20 airports with the most weekly seats in 2016



Source: August OAG 1996 and 2016

costs for long-haul airplanes and network support are higher. Operational complexity is greater, with additional regulatory compliance requirements as well as the need to establish a feeder network. One of the key short-haul LCC cost advantages is higher airplane utilization rates stemming from shorter turn times. The longer stage lengths of a long-haul operation mean that turn time occupies a much smaller proportion of the total aircraft day, so the cost advantage for LCLH from this factor is reduced. Typically, LCLH service also offers relatively few premium seats, compared to traditional long-haul competitors, reducing the revenue potential of the service, especially on routes with significant demand for premium service.

Despite these disadvantages, recent years have seen a substantial increase in LCLH offerings from both short-haul LCCs and LCC subsidiaries of network carriers. While still too early for a definitive judgment

of the long-term success of the LCLH model, growth in the segment indicates that many price-sensitive passengers are eager for this type of offering.

NETWORK AIRLINES OFFER UNRIVALED CONNECTIVITY AND RANGE OF SERVICE CHOICES

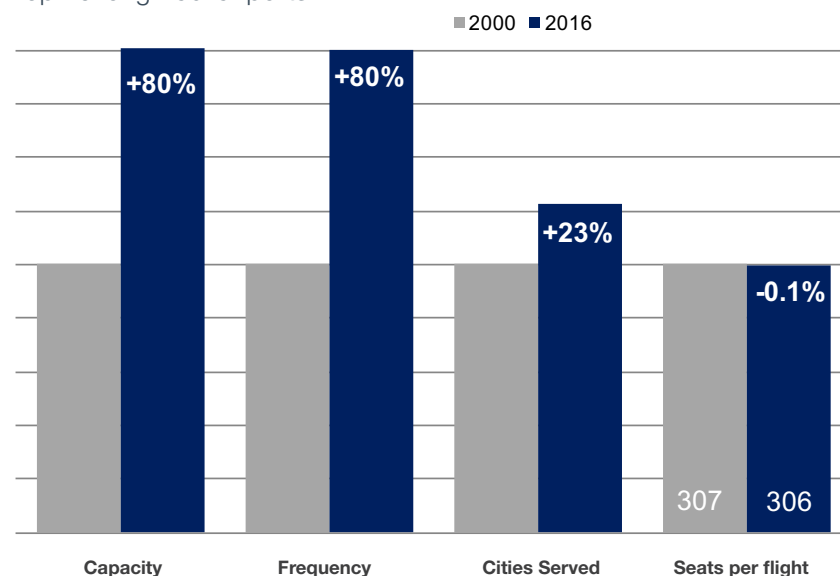
As the LCC business model develops across the globe, network carriers are adapting their business strategies to boost competitiveness. Over the past decade, as consolidation and network restructuring has occurred, most notably in the United States but also in other regions, balance sheets have strengthened and many network carriers are better financially positioned to withstand the increasingly competitive environment. Global airline networks are well positioned for future growth at their hub locations due to extensive regional and domestic services that feed their long-haul markets. Other amenities that enhance the value proposition of the global network carriers versus LCCs

include differentiated cabin offerings and upgrades, extensive frequent flier programs, and expanded route networks through alliance partnerships. In addition, network carriers have countered with their own low-cost, no-frills ticket options on selected competing routes with limited seats. This is adding a new dimension to the ever-changing competitive landscape of the network carriers versus the growing LCC market segment.

Airline network hubs serve as the portals to any region in the world, and the new generation of widebody aircraft is contributing to the fragmentation of international networks by opening new markets or time-of-day windows that are not financially viable with older-generation aircraft. The 787 continues as a prime vehicle in opening new nonstop markets, including the recently announced Perth–London

Fragmentation, not airplane size, driving growth at large hubs

Top 20 long-haul airports



Source: OAG & Innovata Flight Schedules

service, San Francisco–Chengdu, and Melbourne–Vancouver, and this trend will only continue. The network hub has become a more global phenomenon over the last 20 years. The maps (page 16) illustrate the location and size of the top 20 hubs by passenger volume in 1996 and in 2016. In 1996, the hubs were centered on North America and Western Europe, with 17 of the top 20 hubs located there. By 2016, the map is more geographically balanced, with 12 of the top 20 hubs located outside these areas. This broadening of the network hub model points to the increasing geographic diversity of demand for air travel.

Global “super-connector” carriers are a subcategory of the network carrier business model. These carriers, based in or near the Middle East, focus on providing connecting opportunities between markets to the west of their hubs and markets to the east. This “one stop to anywhere” business model has become increasingly

popular with passengers looking for efficient ways to traverse these long routes. Growth of this business model has been enabled in the past decade by the introduction of then-new technology airplanes with improved range sufficient to travel nonstop to destinations as far-flung from the Middle East as the US west coast and Australia.

Network carriers continue to grow long-haul services from their large hubs. Overall long-haul capacity and frequency from the 20 largest hub airports increased over 80 percent between 2000 and 2016, while the number of cities served from these hubs increased over 20 percent. Airplane size on these routes has remained fairly constant, actually dropping by just 1 percent over the same period. Fears of capacity constraints at large hub airports leading to concentrations of very large airplanes there have not materialized, and growth, even at the largest of hub airports, continues to follow the fragmentation pattern of the industry at large.

Our long-term outlook shows the network carriers leading the growth in new aircraft demand. Network carriers are projected to add over 18,000 new aircraft, with the vast majority of demand—11,000 units—in the single-aisle category. Widebody passenger aircraft at network airlines are forecast to increase by 6,500 units, with 54 percent in the small widebody category, which will continue to fragment and grow the number of markets served by the global network carriers. About half of our forecast deliveries to large network carriers will be for growth, both to open new markets and to add frequencies in existing markets, while the remaining half will replace retiring airplanes.



GLOBAL PASSENGER & MARKET OVERVIEW

WORLD

2.8%
GDP

4.7%
TRAFFIC

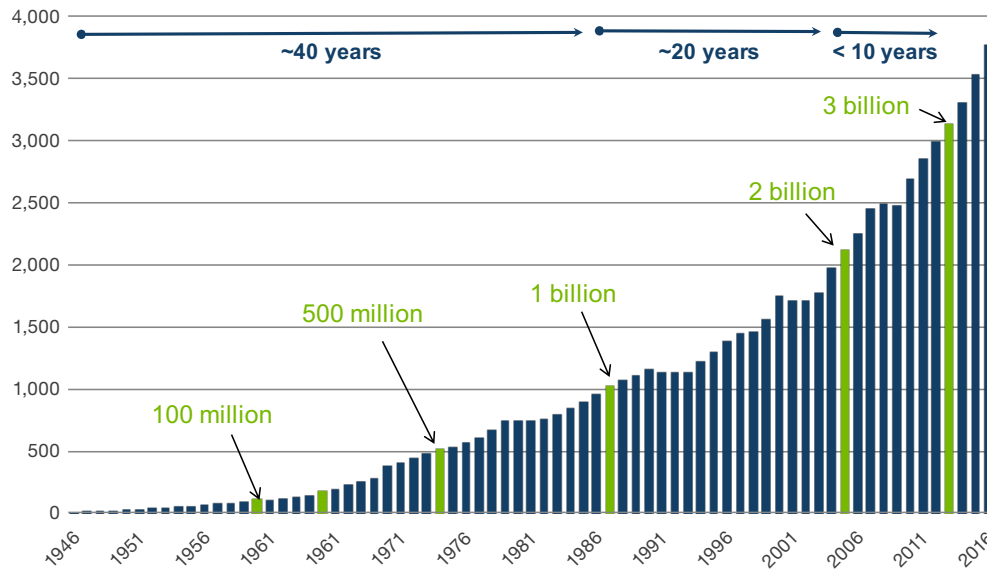
3.5%
FLEET

41,030
DELIVERIES

\$6.1T
MARKET VALUE

Over 3.7 billion passengers in 2016, essential to modern life

Annual passengers (millions)



Source: ICAO/IATA

TRAFFIC AND MARKET OUTLOOK

LONG-TERM PASSENGER TRAFFIC RESILIENT

Air travel has proven to be a resilient market, and robust growth is expected to continue in the future. As the industry has evolved from its infancy in the 1940s through the dawn of the jet age, the number of passengers traveling annually has grown from about 100 million in 1960 to just over 1 billion in 1987. It took 18 years to double to 2 billion passengers, and only 7 more years to grow to 3 billion. The upward trajectory is expected to continue, especially in regions such as China, India, and Southeast Asia as these economies expand and more people choose air travel.

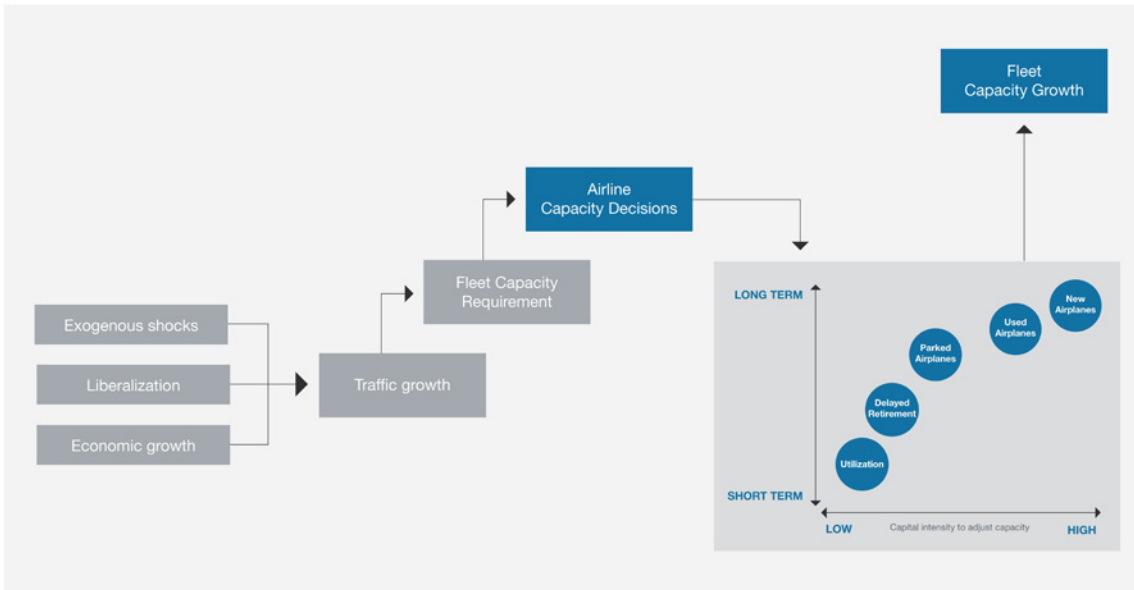
OUTLOOK FOR 4.7 PERCENT AVERAGE ANNUAL PASSENGER TRAFFIC GROWTH OVER THE NEXT 20 YEARS

We continue to see robust long-term demand with an average revenue passenger kilometer growth rate of 4.7 percent per year over 20 years. Like the global economy, world traffic varies by market. Over the next two decades, fast growth in China's domestic market will make it the largest domestic market in the world, and traffic within Asia is set to become the largest travel market. The central location of the airlines in the Middle East allows them to link many parts of the world with one-stop flights, which will help drive higher-than-average growth on those routes. In the more mature aviation markets, such as North America and Europe, domestic growth rates are below the global average; increasing connections to emerging markets provide more opportunities for growth. These differing growth profiles result in an increasingly diverse global air travel market. Twenty years ago, the majority of passengers traveled on airlines based in Europe or North America, but today that number has declined to 48 percent, and by 2036, it will be 36 percent.

Traffic Flows



Underlying dynamics of the aviation industry



percent today, and this represents average systemwide load factors that include seasonal fluctuations, time-of-day and day-of-week variations, and differences in regional travel demand characteristics. Many factors have enabled this trend, including improved scheduling and yield management systems as well as information technologies that make travel simpler and more transparent for passengers. While there is opportunity to further improve load factors, achieving and consistently sustaining ever-increasing levels will be challenging.

Capacity growth—making more seats and more seat-kilometers available in the industry—can happen in a number of ways. Short term, capacity can be increased by improved utilization of existing assets (flying more hours or increasing airplane seat capacity), by delaying aircraft retirements, and potentially by reinstating parked airplanes or acquiring additional capacity from other operators and leasing entities. But longer term, the aviation industry will require new airplanes in order to provide the capacity needed to keep up with travel demand.

GROWING IN-SERVICE FLEET DRIVES DEMAND FOR AIRPLANE REPLACEMENT

Airplanes are durable assets and typically remain in service for two to three decades or longer. As airplanes approach the end of their useful lives, they must be replaced. Airplanes are retired when they reach the end of their economic life; that is, the cost to retain and operate the airplane exceeds profits generated. Replacement includes a number of considerations, including age, the number of flight hours and pressurization cycles the airplane has undergone, and increased maintenance requirements. New-generation equipment can provide improved range and payload capability, allowing airlines to serve markets not possible with older equipment. And newer airplanes provide better fuel economy

NEW AIRPLANE DEMAND TOPS 41,000 DELIVERIES THROUGH 2036

Demand in the commercial market is forecast to more than double over the next two decades. To meet this demand, we forecast the number of jet airplanes will nearly double to almost 47,000, at an average annual growth rate of 3.3 percent. To support this fleet growth, Boeing forecasts a need for more than 41,000 new deliveries, valued at over US\$6 trillion, for growth and replacement over the next 20 years.

Single-aisle airplanes command the largest share of new deliveries at more than 70 percent, with airlines needing more than 29,500 over the next 20 years. These new airplanes will continue to stimulate growth for low-cost carriers and will provide required replacements for older, less-efficient airplanes. In addition, more than 9,100 new widebody airplanes will be delivered, which

will allow airlines to serve new markets—passenger and cargo—more efficiently than in the past.

Consistent with air travel demand growth trends, we forecast that by 2036, approximately 40 percent of all new airplanes will be delivered to airlines based in the Asia region. An additional 40 percent will be delivered to airlines in Europe and North America combined, with the remaining 20 percent delivered to the Middle East, Latin America, CIS, and Africa.

AIR TRAVEL DEMAND GROWTH DRIVES NEED FOR NEW AIRPLANE DELIVERIES

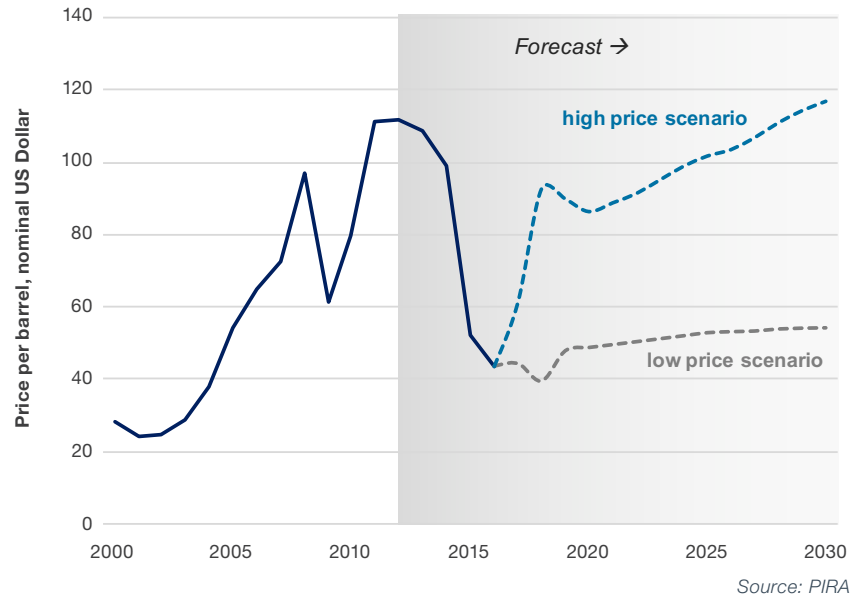
Air travel growth can be accommodated in two primary ways: increasing passenger load factors (capacity utilization) and increasing overall capacity. Airlines have been remarkably effective at increasing load factors over time. The average load factor of 65 percent in the early 1990s has steadily increased to levels at or exceeding 80

than the airplanes they replace, sometimes providing significant cost savings compared to older equipment.

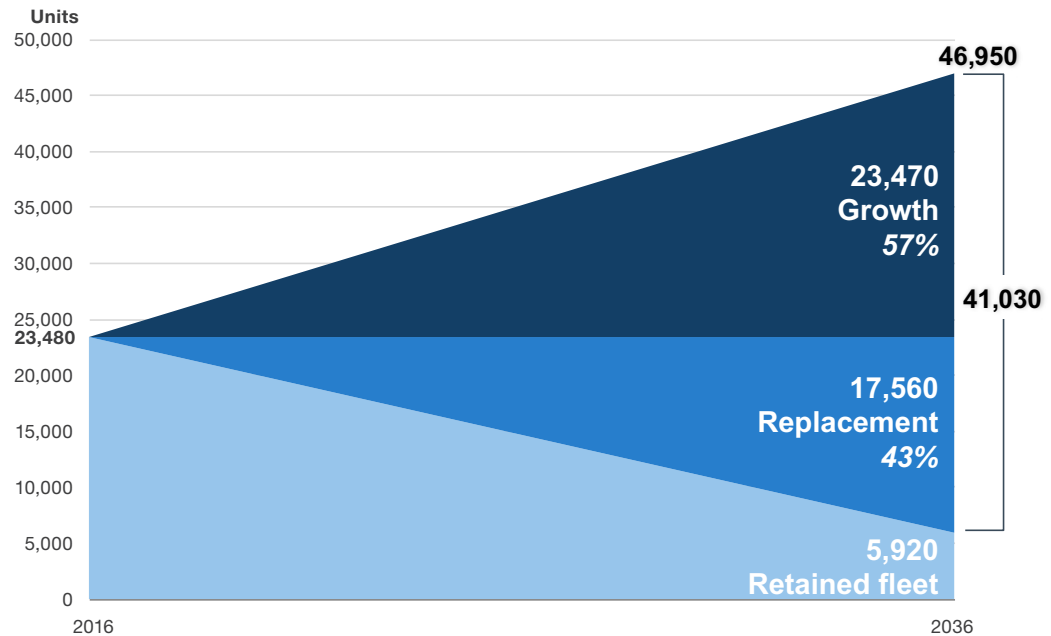
Replacement demand remains important despite fuel prices that have moderated over the last few years. While the fuel cost advantage of a new-generation airplane is reduced somewhat relative to the post-financial crisis period, it is important to consider other factors.

- **Historically high oil prices.** Thus far in 2017, oil prices have averaged over \$50 per barrel. In the early 2000s, the price of oil was in the \$30 to \$40 per barrel range in today’s dollars. In that environment, the 787 was initially developed and the business case for replacing older airplane models with the 787 was more compelling.
- **Oil price volatility.** Fuel is a large share (20 to 30 percent or more) of an airline’s operating costs, and volatility in such a major cost component creates uncertainty in the airline’s profitability outlook. By reducing the requirement for fuel, newer, more efficient airplanes can act as an effective operating hedge on the airline’s profits.
- **Continued fleet growth.** More than 23,000 jets are in service today, which means more are reaching retirement age every year. Satisfying the replacement demand requires an increasing number of new airplanes. While replacement varies year to year due to cyclical conditions, average long-term replacement is about 3 percent of the fleet per year, which means close to 18,000 retirements over the next 20 years. Our long-term view of global market replacement demand is that airplane replacement will comprise 43 percent of demand during the next 20 years.
- **Low utilization for out-of-production models.** We have seen that when airlines retain older, less-fuel-efficient models, they tend to use them at lower rates. These older airplanes can provide inexpensive “surge capacity” for

Long-term oil price outlook marked by uncertainty



More efficient, newer generation airplanes will replace aging aircraft



airlines that retain them, flying relatively few hours in peak season to provide extra lift when oil prices are sufficiently low. The presence of these older models does not reduce the need for core fleet replacement; it provides a way to make a bit of extra profit in high season.

- **Competitive market.** When airlines compete head to head in a market, the airline with the lowest unit cost can set the price. If the cost differential is large enough, the price set by the lowest-cost competitor may be insufficient to yield a profit for the higher-cost competitor. When one airline begins operating a newer, lower-unit-cost airplane on a route, its competitors risk facing prices that are unsustainable in the long term and thus have an incentive to also upgrade to the lower-unit-cost equipment.

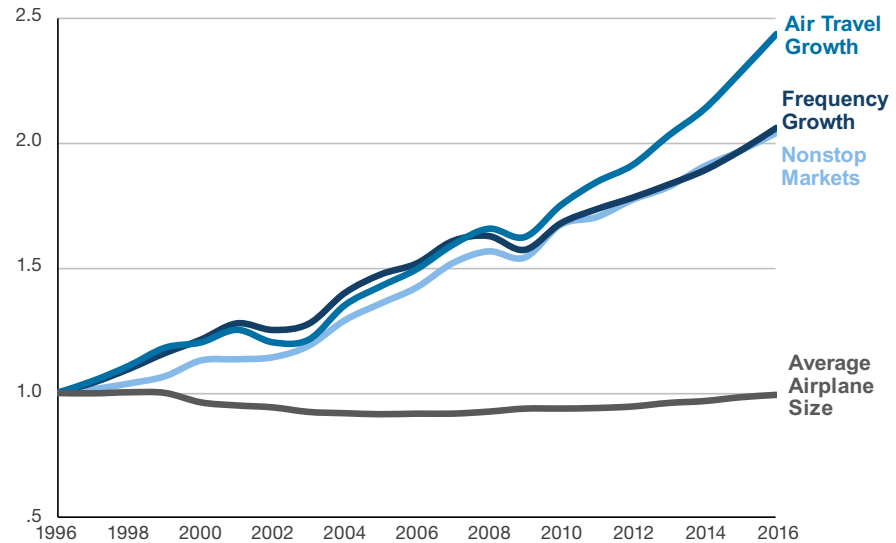
Replacing an airline's fleet is not a short-term decision driven by oil price fluctuations but rather a long-term investment based on multiple factors. While lower oil prices make the short-term economics of fleet renewal somewhat less compelling, the long-term dynamics of fleet management make a strong case for airlines to continue replacing older airplanes.

SINGLE-AISLE AIRPLANES MAKE UP THE MAJORITY OF THE GLOBAL MARKET

Today, 64 percent of the world jet fleet is single-aisle airplanes. Over the next 20 years, this share will increase to account for about 69 percent of the global fleet, more than 32,000 passenger airplanes in 2036.

A number of factors drive the robust global demand for new single-aisle airplanes. First, single-aisle airplanes are the backbone of the low-cost business model strategy that is growing around the world. In addition, strong replacement needs in more mature aviation markets and robust overall growth in emerging markets are driving increased demand for single-aisle airplanes. Asia

Air travel growth has been met by increased frequencies and nonstops



Source: August 2016 OAG/Innovata (Index 1996 = 1.00)

Pacific, Europe, and North America are the three largest market regions for new single-aisle airplanes, and they represent nearly 80 percent of all single-aisle demand.

Low-cost carriers' expansion is anticipated to increase their fleet share in the single-aisle category from roughly one-quarter to one-third of the globe, representing approximately 11,000 single-aisle jets in the commercial fleet over the next 20 years. Yet network carriers will continue to drive more than 60 percent of new passenger airplane demand, representing more than 20,000 airplanes in the fleet in 2036.

NEW TECHNOLOGY, MORE FRAGMENTATION IN THE WIDEBODY MARKET

As air travel continues to grow, airlines have a choice about how they want to grow their businesses. They can accommodate that growth with increases in airplane capacity and size, or they can add more frequencies and nonstop markets to their networks. Passengers prefer

the latter because of the increased flexibility and more efficient itineraries they offer. This trend is reflected in the profile of the widebody fleet and delivery forecasts.

As airlines continue to focus on versatility, we have seen airlines increasingly move from large to medium and small widebody passenger airplanes. In 1996, the large-size passenger widebody airplanes accounted for 32 percent of the in-service fleet. Today, that number has declined to 11 percent. By 2036, we anticipate the large segment will be less than 5 percent of the passenger widebody fleet.

Today, the global widebody passenger fleet stands at roughly 4,100 airplanes. The forecast shows the need for approximately 8,200 new widebody deliveries for passenger service over the next 20 years. Sixty percent of these passenger widebody deliveries are in the small category and will contribute to the growth of the small widebody segment from 55 percent of all passenger widebody airplanes today to 63 percent by 2036.





AFRICA

3.5%
GDP

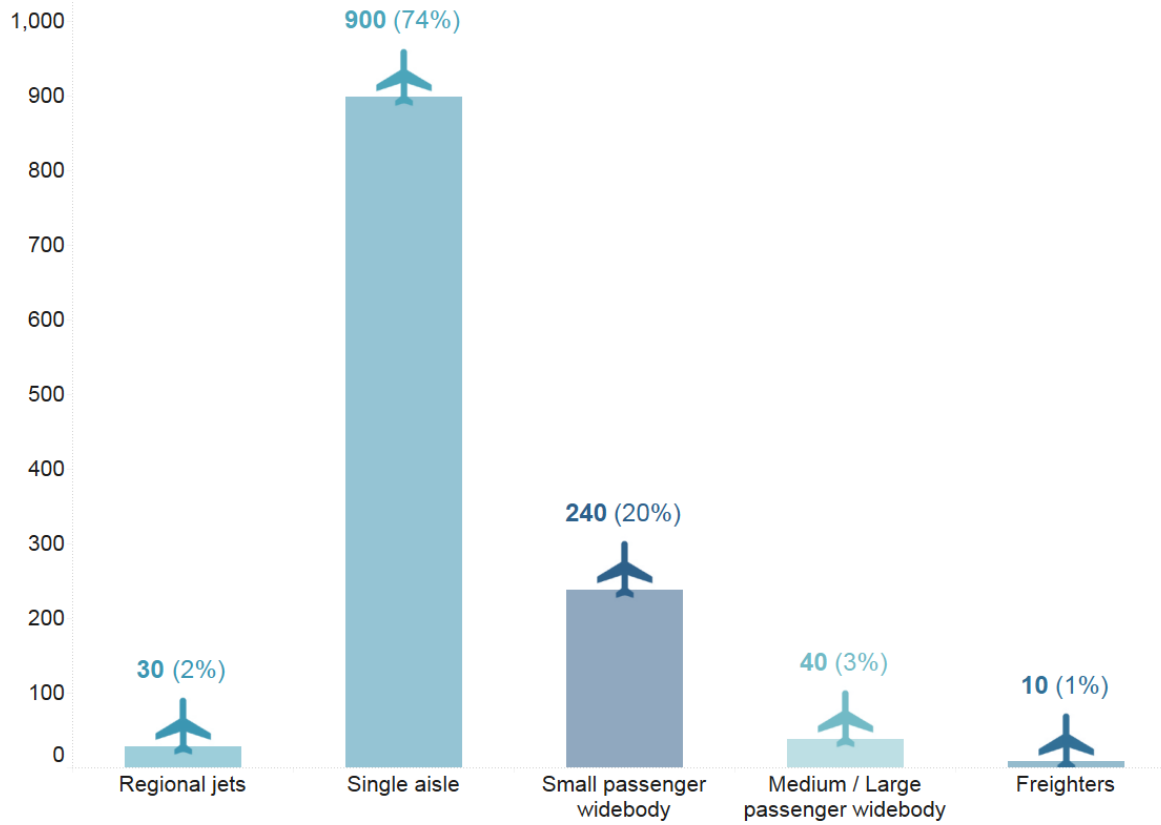
5.9%
TRAFFIC

4.1%
FLEET

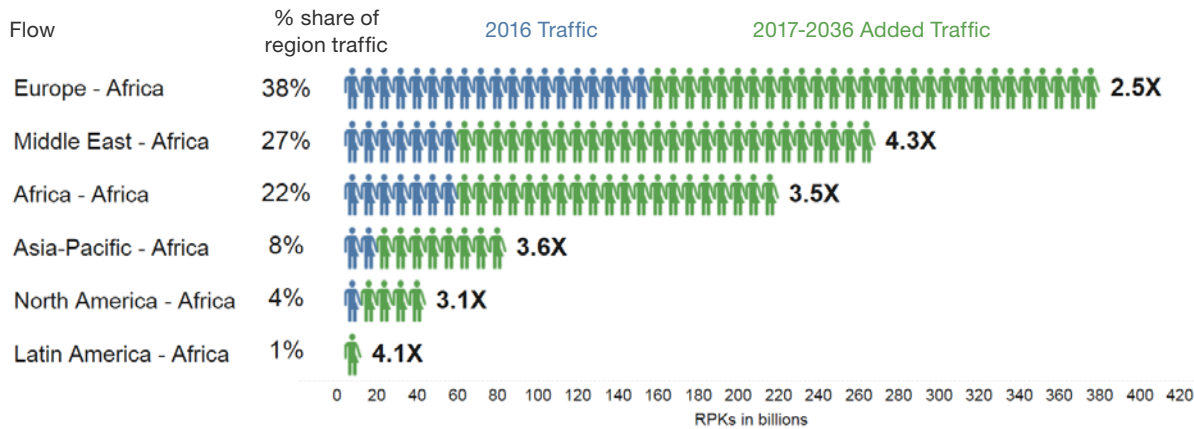
1,220
DELIVERIES

\$180B
MARKET VALUE

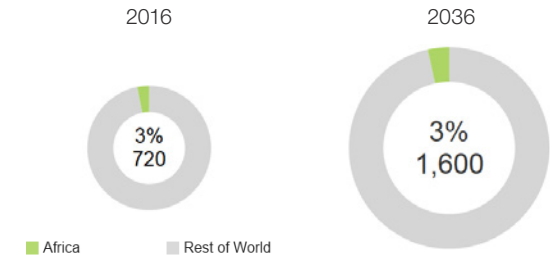
DELIVERY 2017-2036



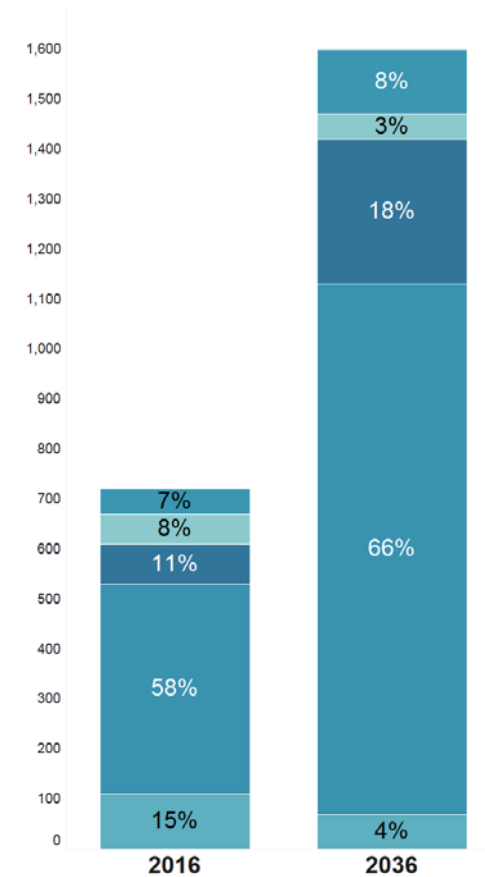
TRAFFIC FLOW



SHARE OF WORLD FLEET

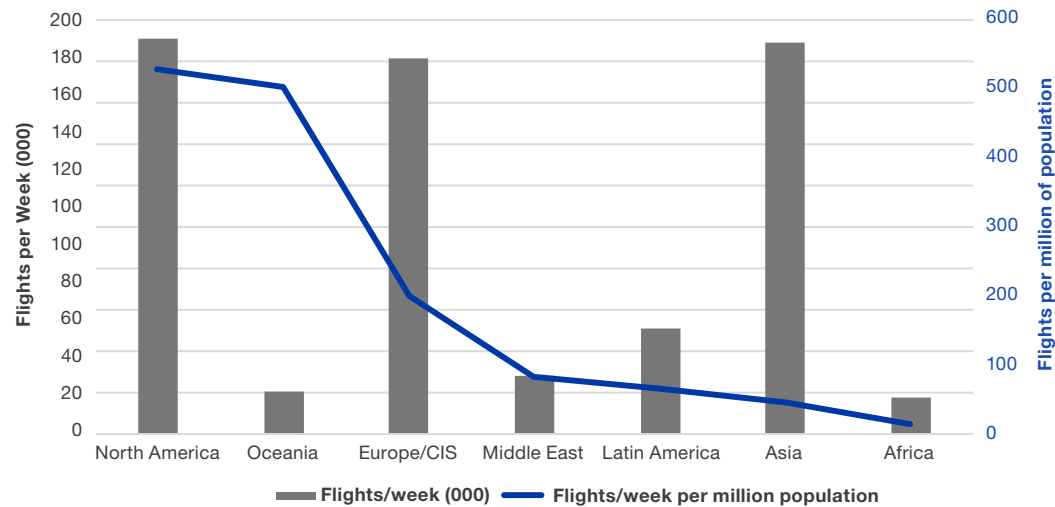


FLEET COMPOSITION



- Freighters
- Medium / Large passenger widebody
- Small passenger widebody
- Single aisle
- Regional jets

Africa is underserved compared to other regions of the world



Sources: Innovata August 2016, IHS Markit

With 20 percent of the world’s total land mass and about 16 percent of the global population, Africa is a vast, diverse continent that hosts a variety of climates, cultures, and geopolitical systems. Africa has an abundance of natural resources including metals, minerals, and oil; centers of agriculture and commerce that stimulate economic development, trade, and business travel; as well as resort beaches, cultural centers, wildlife, and natural attractions that promote leisure travel. Africa’s population is the youngest among all the continents, with large numbers of people ready to enter the workforce during the coming years. Literacy rates are improving, and Africa is becoming highly urbanized; the United Nations predicted that 56 percent of Africans will live in urban areas by 2050, up from 40 percent today.

STRONG REGIONAL GROWTH

Air traffic for Africa’s carriers is forecast to grow 5.9 percent annually over the next 20 years, which is above world average and is driven by overall economic

growth and increasing numbers of travelers from, to, and within the region. Most of this growth is projected to occur in the second half of the forecast period.

Air travel within Africa has been resilient over the last decade and represents about 20 percent of total African service. Between 2006 and 2016, intra-Africa scheduled capacity has increased an average of 5.5 percent per year. The distances and geographic challenges involved in travel within the continent, lack of good roads and railways, increasing levels of trade and commerce, and a growing middle class who can now afford to fly all contribute to growth in air travel. Within Africa, single aisle airplanes are dominant, accounting for about 75 percent of total intra-Africa available seat-kilometers. Inter-regional travel service (from or to other regions in the world) constitutes 80 percent of total Africa air travel, with an average capacity growth rate of 4.6 percent per year over the last decade. To and from Europe is and will continue to be the largest market. In addition to

commerce-related activities, Africa offers a spectrum of tourist opportunities and cultural interests that contribute to the demand for air travel. North Africa, especially, is increasing in popularity as a European leisure destination. Nearly 60 percent of Africa’s international service is to and from Europe, followed by service to and from the Middle East at 20 percent. Scheduled capacity between Africa and China, which now represents about 4 percent of Africa’s international air travel, has grown at double-digit rates over the last 10 years. About 70 percent of Africa’s international capacity is served via widebody airplanes. Air cargo is also an important component of Africa air service both within Africa and between regions. Europe is the major air trade partner, along with the Middle East and North America, and trade ties between African nations and China are increasing.

Single aisle jets expand from 58% to 66% of fleet

FUTURE FOR AFRICAN AVIATION

Positive developments within the aviation industry in Africa are underway, but further progress needs to be made. Efforts must continue to promote progressive aviation policies, including liberalization of the African aviation market; improved aviation infrastructure; relaxation of visa policies; harmonization of legislation; licensing and technical standards across the African continent; and efficient implementation of a safe, secure, and sound air traffic navigation system across Africa.

The aviation industry will play an important role in the region's continuing development by linking African cities and countries with each other and with the rest of the world. African airlines will need 1,220 new airplanes over the next 20 years to accommodate this growth. 74 percent of the deliveries to African airlines between 2017 and 2036 will be single-aisle airplanes, while 23 percent of the deliveries will be widebody airplanes. Regional jet deliveries will total less than 3 percent. In dollar terms, Africa will invest almost \$180 billion in new airplanes, split evenly between widebody and single-aisle segments.





ASIA -PACIFIC

3.9%
GDP

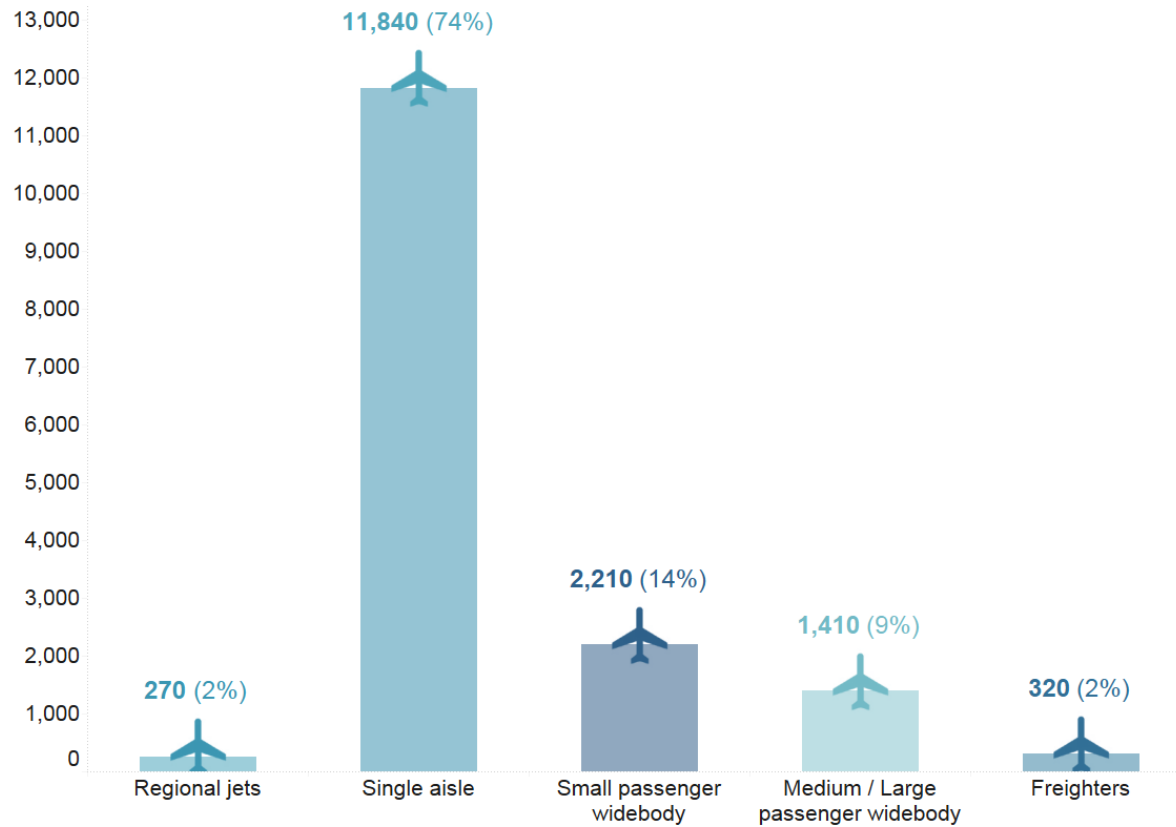
5.7%
TRAFFIC

4.8%
FLEET

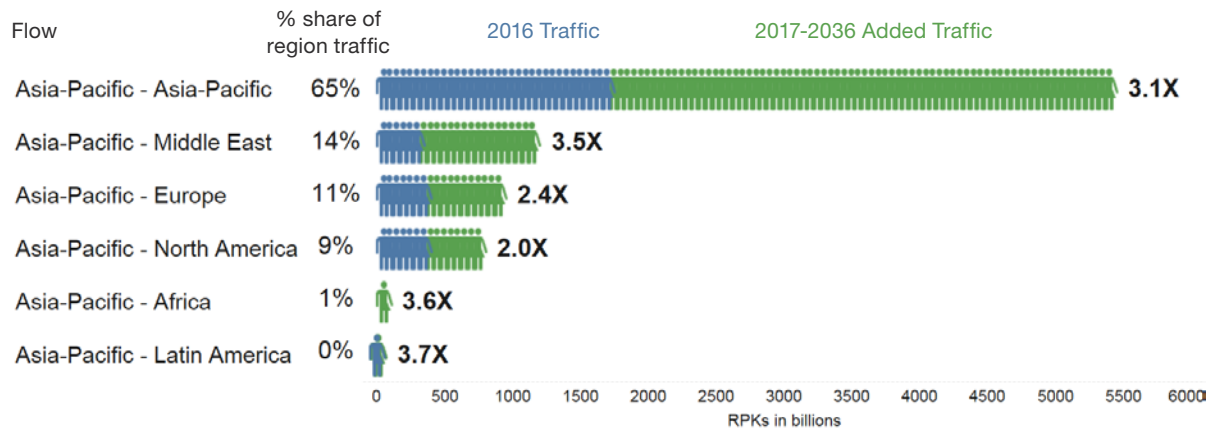
16,050
DELIVERIES

\$2,500B
MARKET VALUE

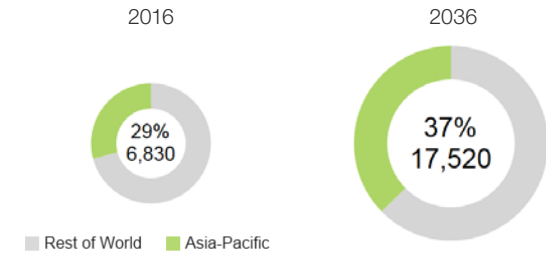
DELIVERY 2017-2036



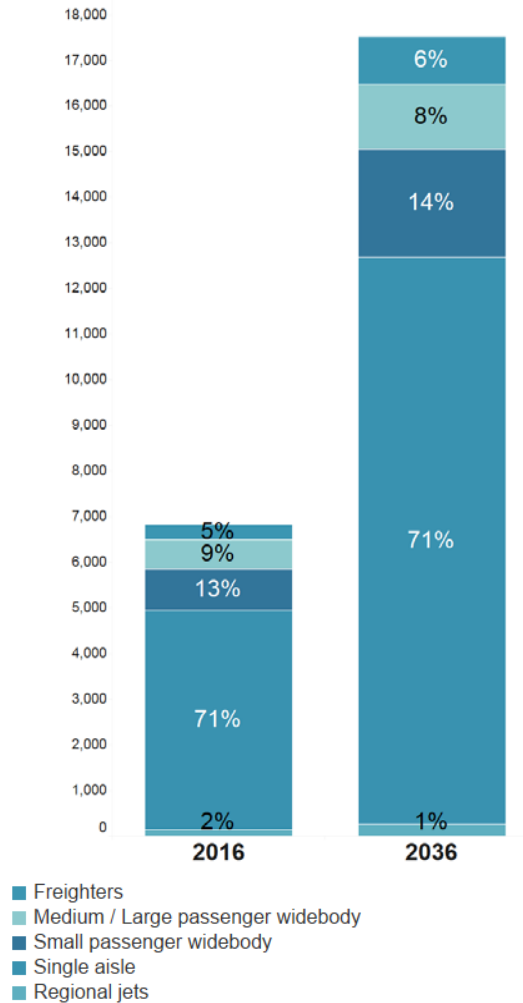
TRAFFIC FLOW



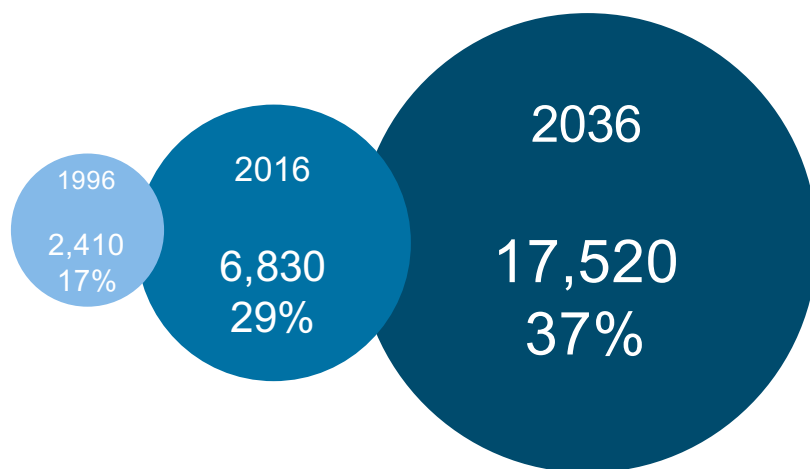
SHARE OF WORLD FLEET



FLEET COMPOSITION



Asia-Pacific share of global jet fleet continues expanding



Source: CMO 2017, Flight Global Ascend Online Data

BRIGHT MARKET OUTLOOK CONTINUES

The Asia-Pacific region has become one of the biggest aviation markets in the world. China, India, and other emerging markets in the region are the main engines of growth. The significant increase has been due largely to regional economic growth, market liberalization, new technology-enhanced airplanes expanding furthermarket opportunities, and successful evolution of new business models.

Over the past decade, jet fleets of Asian airlines have nearly doubled, from 3,600 to 7,000. The number of Asian airlines with jet fleets has grown from 200 to 250, while airplane orders by these airlines have increased from 1,940 to 4,400. The capacity that these airlines provide has grown on average by almost 10 percent annually. Seat capacity provided by the low-cost-carrier (LCC) business model has grown on

average by 22 percent annually, currently providing the most number of seats in the global LCC market.

DYNAMIC INDUSTRY STRUCTURES RESHAPE MARKET

In addition to strong economic growth in the region, liberalization is responsible for significant expansion in the Asian aviation industry. For example, ASEAN open skies has enabled the air-travel market in the region to expand beyond national boundaries and supported airlines in implementing new business models. Easing of visa policy has also allowed passengers to travel more broadly in and out of Asia.

Different business models and airline strategies are starting to reshape the aviation industry in Asia. Historically, the LCC business model adopted a strategy focused on operating at secondary airports, flying single-aisle airplanes with a single-class product, achieving high airplane utilization, and minimizing

airport and cabin services. Now that the LCC model has gained success in Asia, especially in Southeast Asia and South Asia, airlines are extending the model to long-haul routes. While limited in the region today, this new model is increasingly capturing the attention of many airline operators and investors as they start becoming profitable and more strategically viable to effectively compete with the traditional network carriers.

*Asia-Pacific
airlines comprise
nearly 40%
of worldwide
deliveries*

Ten years ago, Asian LCCs essentially had no widebody jets flying in the medium- to long-haul market segments. Today, LCC groups based in Asia are flying almost 100 widebody jets, with many more in the backlog, and continue to widen the average LCC stage length. As these new business models in Asia are progressively implementing new strategies, some of the major participants in these business segments are now connected through alliance partnerships and looking for even more opportunities to continue strengthening their positions in Asia. At the other end of spectrum, while their competition in Asia are some of the largest, oldest, and most well-regarded network carriers in the world, the evolution of new business models will continue to emerge as a trend in the Asian market.

REGION RESPONSIBLE FOR ALMOST 40 PERCENT OF FUTURE AIRPLANE DEMAND

Asia is forecast to be the biggest travel market in the world, growing at 5.7 percent annually, and by 2036 passenger traffic throughout Asia will constitute nearly 40 percent of global passenger traffic. One factor in this growth is the region's economic development; average Asian GDP is expected to grow by 3.9 percent annually over the next 20 years. As a result, the region's share of world GDP is projected to rise from 33 percent today to 40 percent by 2036. Although that growth will be mixed due to the region's current composition of mature, developing, and emerging markets, Asian GDP and passenger traffic will drive an estimated need for 16,050 new airplanes valued at \$2.5 trillion. The LCC market, for example, is helping grow the need for 11,840 new single-aisle airplanes, with the majority in the 737 MAX 8 seat-size category.

Meanwhile, widebody airplanes provide the needed range and economics to continue opening new markets that were not reachable or profitable in the past. In China, international growth continues to accelerate at above 20 percent per year. Small widebody airplanes like the 787 have been key to opening new routes from smaller, secondary markets, while larger widebody airplanes have been instrumental in opening routes from larger hubs to North America. These market dynamics will lead to a regional need for 3,620 new widebody airplanes by 2036.

Air cargo also plays a crucial role in Asia. The region transports vast amounts of goods over difficult terrain and large stretches of ocean. Many of the world's biggest and most efficient cargo operators are located in the region, where the air cargo market is expected to grow by 4.7 percent per year. As a result, carriers in the region are expected to need 320 new production freighters and 630 converted freighters in the years ahead.





CIS

2.0%
GDP

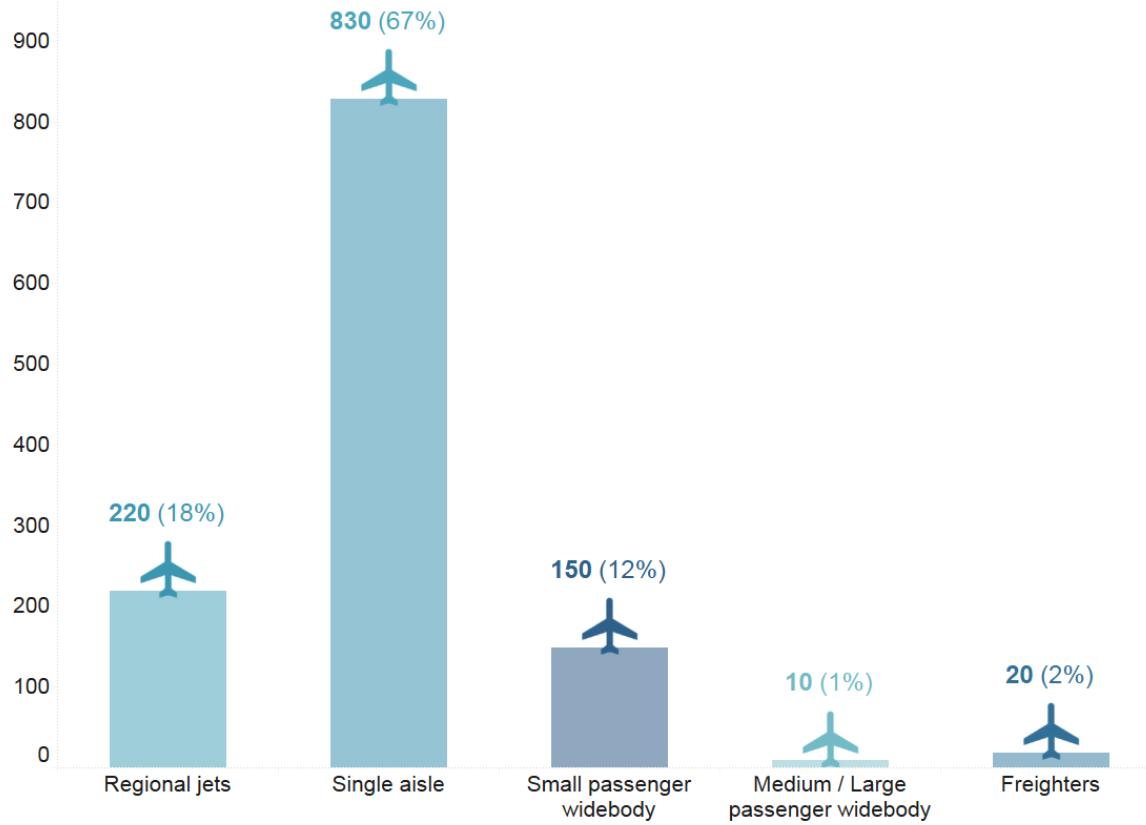
4.3%
TRAFFIC

3.0%
FLEET

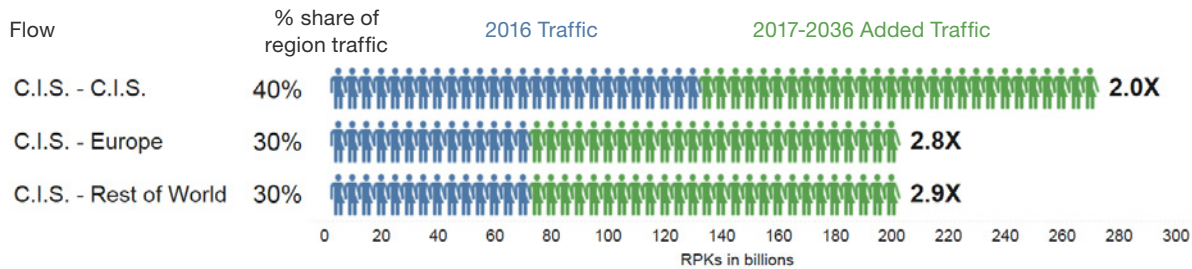
1,230
DELIVERIES

\$140B
MARKET VALUE

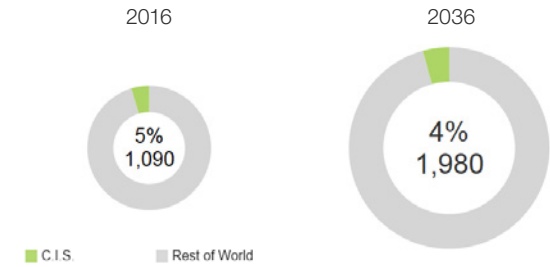
DELIVERY 2017-2036



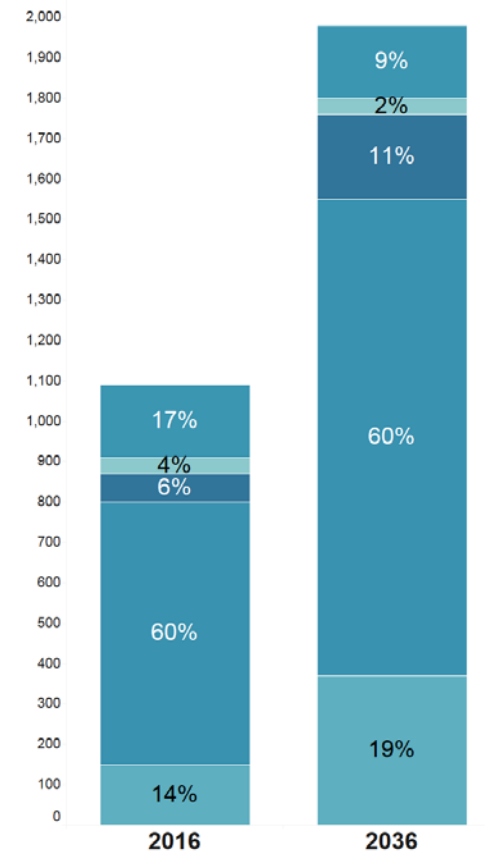
TRAFFIC FLOW



SHARE OF WORLD FLEET

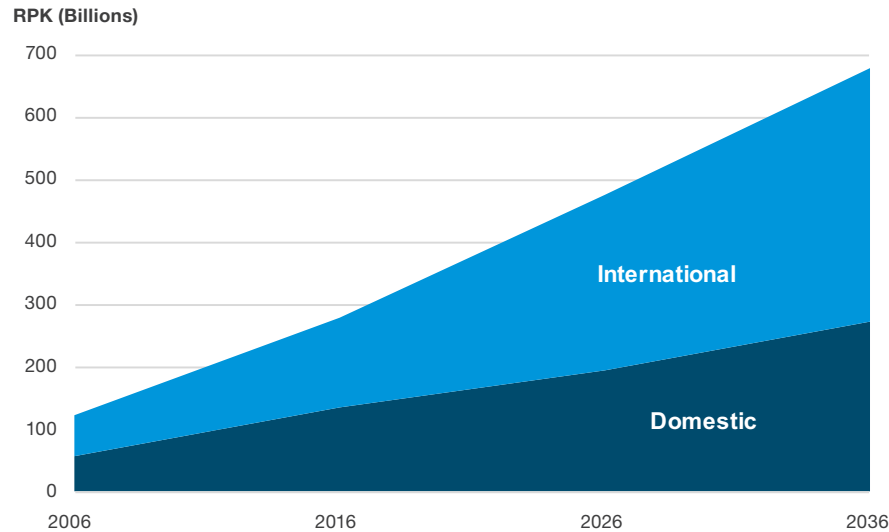


FLEET COMPOSITION



- Freighters
- Medium / Large passenger widebody
- Small passenger widebody
- Single aisle
- Regional jets

Expansion of traffic in both domestic and international markets



IMPROVING ECONOMIC OUTLOOK

After several years of economic uncertainty and geopolitical unrest, Russia and the Commonwealth of Independent States (CIS) are in the midst of a modest recovery. Following the sharp drop in oil prices in 2014 and the related collapse of the Russian ruble, CIS economies saw a 3.2 percent decline in GDP between 2014 and 2016.

While still weak against the US dollar, the ruble is up 44 percent from its lowest point in early 2016. As oil prices rebound, the Russian economy shows signs of recovery. Year-over-year GDP growth is forecast to return to positive growth in 2017 with a long-term outlook for 2 percent annual average growth.

These improvements are contributing to an improvement in the aviation outlook. Air travel in the region is showing marked improvement in demand for both business

and leisure travel. Domestic CIS travel was up 16.6 percent year over year for the first quarter of 2017.

Geopolitical uncertainty is impacting travel demand for Russians and other citizens of commonwealth countries, which are constrained by more than a weak ruble. Internationally, economic sanctions imposed against Russia and route restrictions to popular tourist destinations in Egypt and Turkey due to terrorist actions continue to limit foreign travel. Other leisure markets in Southeast Asia have not yet fully filled the void from a downturn in Russian vacation travel. Travel to popular vacation destination Turkey, however, was reopened in August 2016.

As a consequence of the economic and political challenges regionally and internationally, CIS aviation demand is projected to grow below long-term average in the near-to-mid-term. While the ruble remains weak

against the US dollar and the euro, Russians and other CIS citizens are more likely to spend larger shares of their discretionary income in domestic markets for travel.

International traffic expected to grow 5.3% annually

LONG-TERM OUTLOOK

As the political and economic situation improves, international travel is expected to rebound. Over the next 20 years, international traffic is expected to grow at an annual rate of 5.3 percent driving a requirement in the region for more widebody airplanes. Concurrently, the development of low-cost carriers within the CIS market space is forecast to spur demand for single-aisle airplanes. CIS airlines are forecast to need 830 single-aisle and 160 widebody airplanes to meet the increased demand for air travel. In addition to growth demand, there is also demand to replace an aging fleet of Russian and western-built airplanes. A little more than one quarter of the new deliveries to the region's airlines are forecast to be used to replace existing stock. An estimated 220 regional jets, both western and Russian built, will be required over the next 20 years, driven by air travel demand growth in the intra-CIS region.





EUROPE

1.7%
GDP

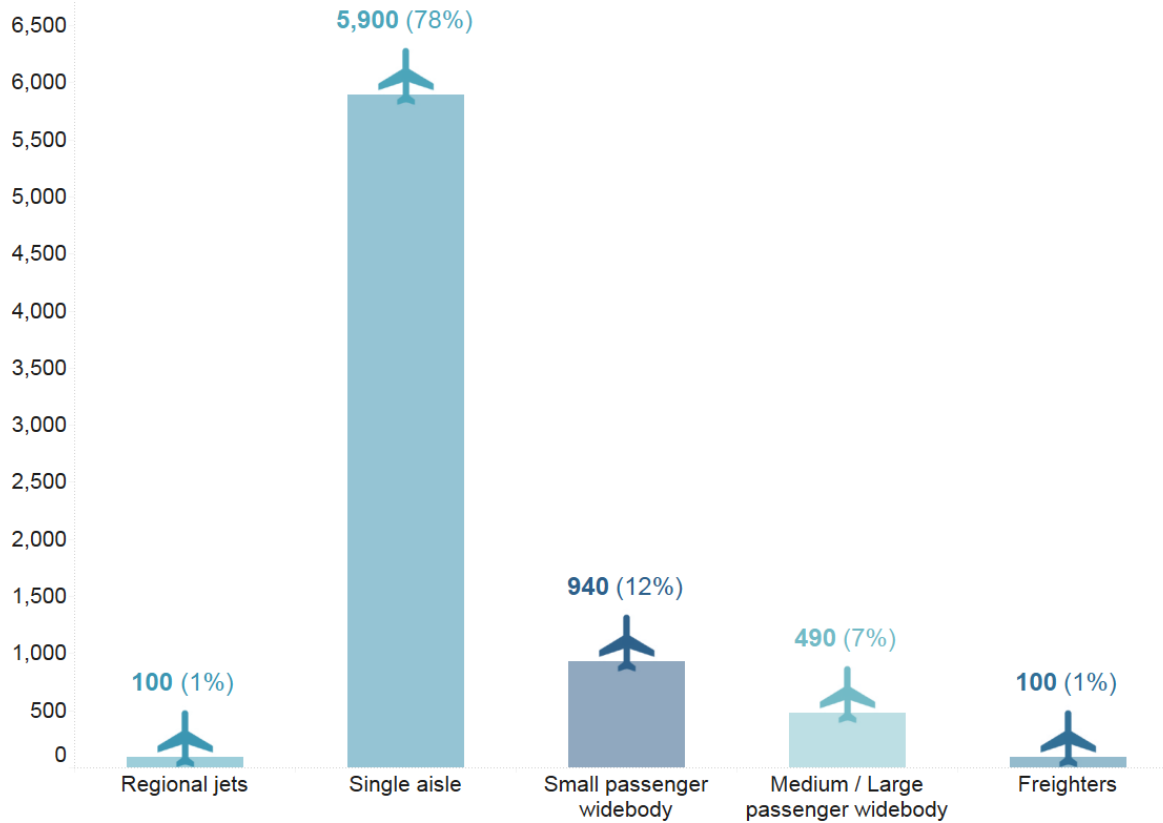
3.7%
TRAFFIC

2.7%
FLEET

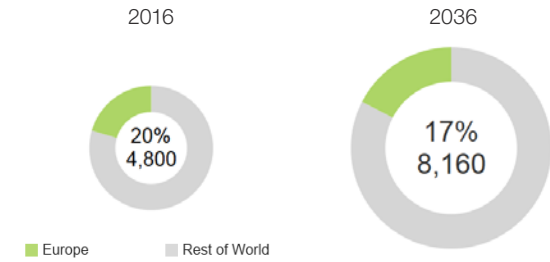
7,530
DELIVERIES

\$1,110B
MARKET VALUE

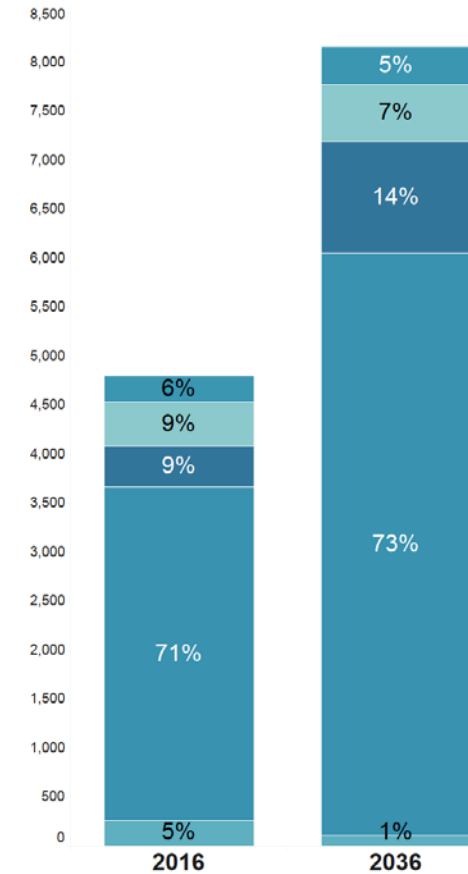
DELIVERY 2017-2036



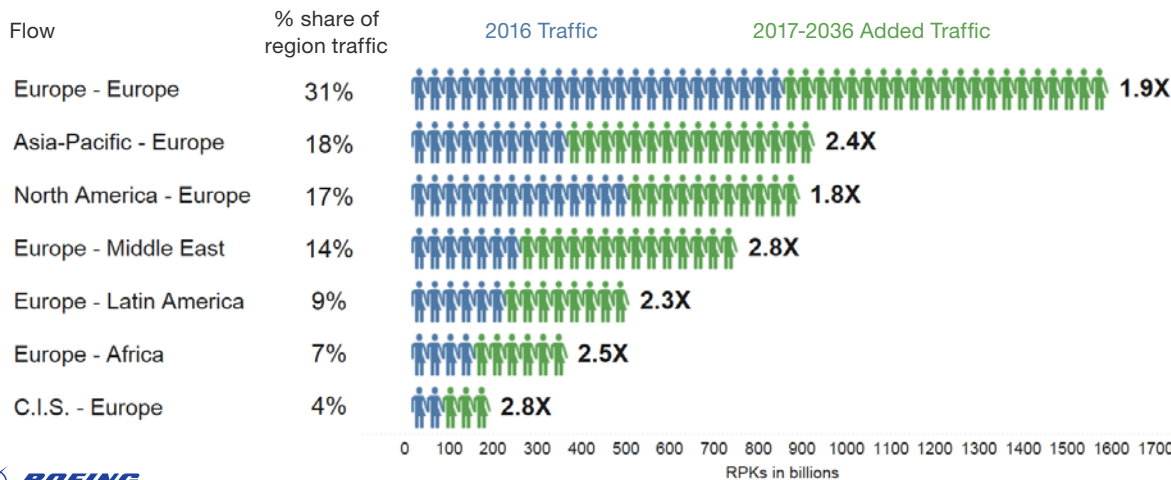
SHARE OF WORLD FLEET



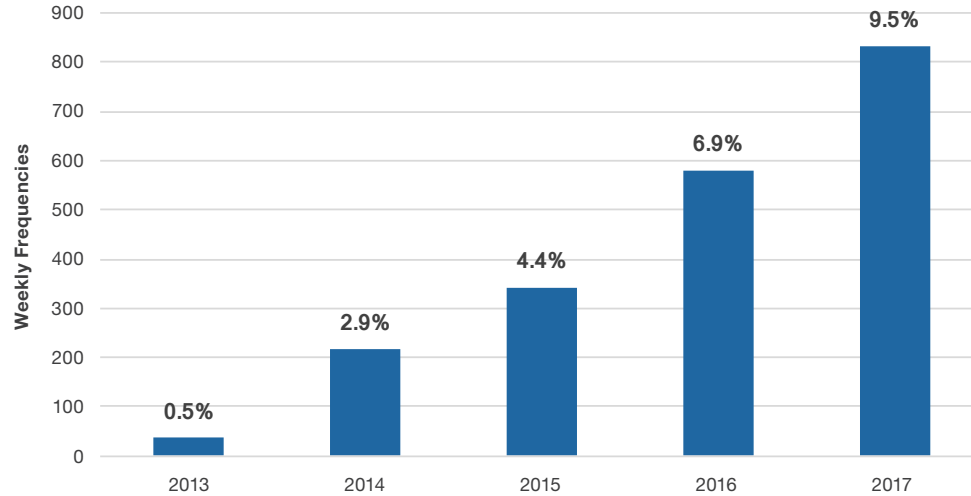
FLEET COMPOSITION



TRAFFIC FLOW



Low-cost long-haul increasing share of frequencies on Europe-North American flow



Source: Diio/Innovata/OAG

operations this June, and Air France-KLM's Boost has announced plans to initiate LCLH operations next year.

The North Atlantic has been a primary flow for LCLH service additions to and from Europe, with Norwegian, Eurowings, Level, Iceland-based LCC Wow air, Canadian LCC WestJet, and Air Canada LCC subsidiary Rouge increasing their LCLH service between Europe and North America by over 250 peak operations per week for summer 2017.

LCCs provide over 48% of capacity

STRONG GROWTH DESPITE UNCERTAINTY

Europe's aviation market remained strong in 2016 despite lackluster economic performance, political uncertainties such as Brexit, and security and terrorism concerns. Network airlines carried 4.3 percent more passenger traffic than in 2015, while the largest low-cost carriers (LCC) in Europe reported an increase in short-haul passenger traffic of 12.4 percent. These strong traffic increases came in the face of GDP growth in Europe of only 1.8 percent, indicating that GDP growth is only one element driving traffic growth in the region. European airlines acquired more than 390 new airplanes in 2016, of which 78 percent were single aisle.

The European aviation market is expected to grow during the next 20 years, with airlines forecast to acquire more than 7,500 new airplanes valued at over \$1.1 trillion. Single-aisle airplanes will comprise the majority of deliveries, representing a 78 percent share

of total deliveries. Although European aviation growth is slower than aviation growth in emerging economies, the region's large installed base of more than 4,800 airplanes supports substantial demand for replacement airplanes. Replacement demand will account for 55 percent of Europe's total new airplane market.

EMERGENCE OF LOW-COST LONG-HAUL

Perhaps the most striking strategic development in Europe in 2016 has been the rapid rise of the low-cost long-haul (LCLH) business model. Norwegian continues to expand its long-haul operations, adding bases in Paris and Barcelona for service to North America and recently initiating the first low-cost service from London to Singapore. Network airlines are responding with LCLH operations in their LCC subsidiaries. Lufthansa subsidiary Eurowings is expanding the LCLH operations it initiated last year, Level from International Airlines Group begins

CONTINUED STRATEGIC EVOLUTION

Airline operations in Europe continue to evolve with the launch of new ventures, routes, and business models beyond LCLH. LCCs continue to grow short-haul markets, providing over 48 percent of intra-Europe capacity in 2016. The largest LCCs continue to make inroads into both Germany and France—places where LCC penetration had been relatively low. Ryanair is building short-haul capacity in Germany and is now second only to Lufthansa there. EasyJet is adding capacity in France and is now the second largest short-haul carrier not only in France, but also at Charles de Gaulle airport, where LCCs had previously been reluctant to fly.

LCCs are also showing a willingness to move beyond the traditional LCC model in pursuit of additional growth. Recently announced codeshare agreements

between Ryanair and Air Europa and between TUI and KLM are transforming what it means to be an LCC or inclusive tour operator today. These new agreements indicate that the lines separating disparate business models are indeed blurring in the face of the current competitive marketplace.

Network airlines are challenged to compete with LCCs in short-haul markets, and in response they are increasingly utilizing their short-haul mainline operations to flow long-haul passengers through their hubs on connecting itineraries. At the same time, the network carriers are shifting increasing amounts of short-haul, point-to-point flying to their LCC subsidiaries to compete more effectively with stand-alone LCCs.

Network carriers have also been challenged by competition from large Middle East airlines in some long-haul markets. The Middle East carriers have captured significant share by providing one-stop service from Europe to destinations such as India, Australia, and Southeast Asia, where the geographic advantage of Middle East carriers is the greatest.

This wide variety of business models that airlines are experimenting with is leading to airlines providing more flights at lower prices. Passengers are taking advantage of lower fares and additional service choices by flying more, increasing demand for airplanes.





LATIN AMERICA

3.0%
GDP

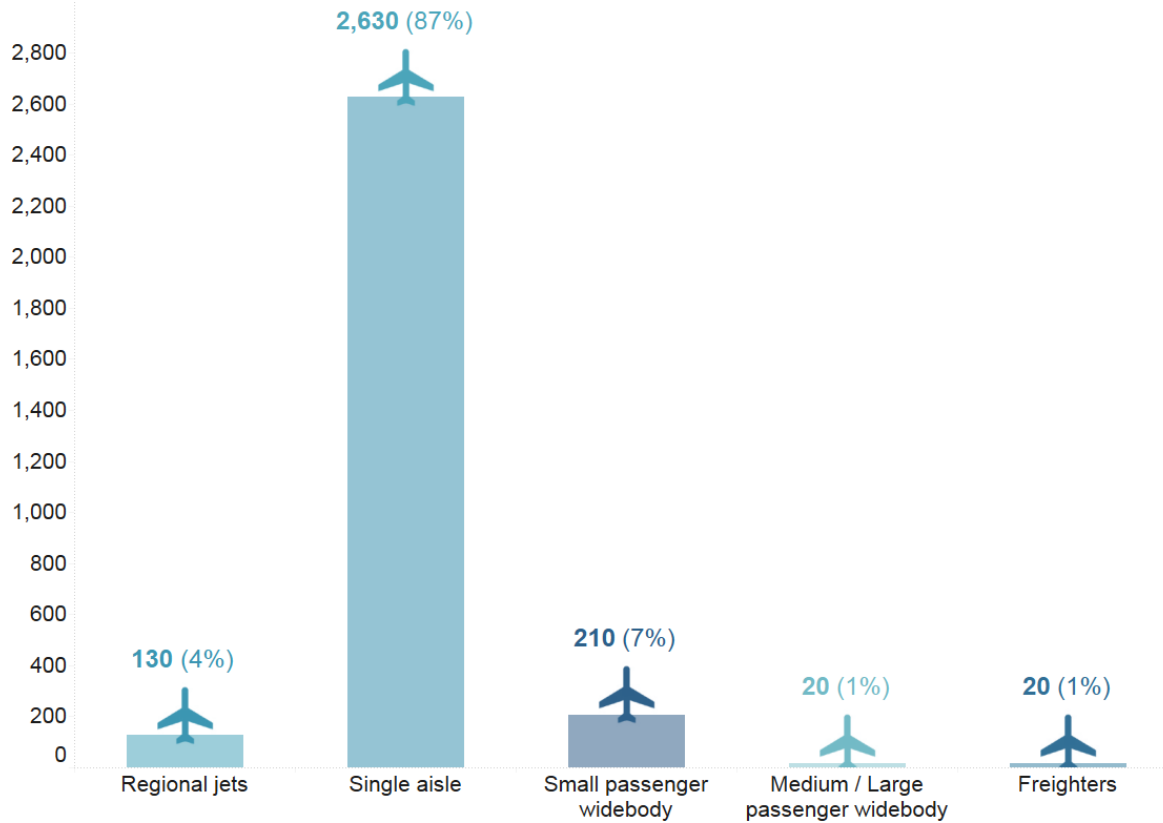
6.1%
TRAFFIC

4.4%
FLEET

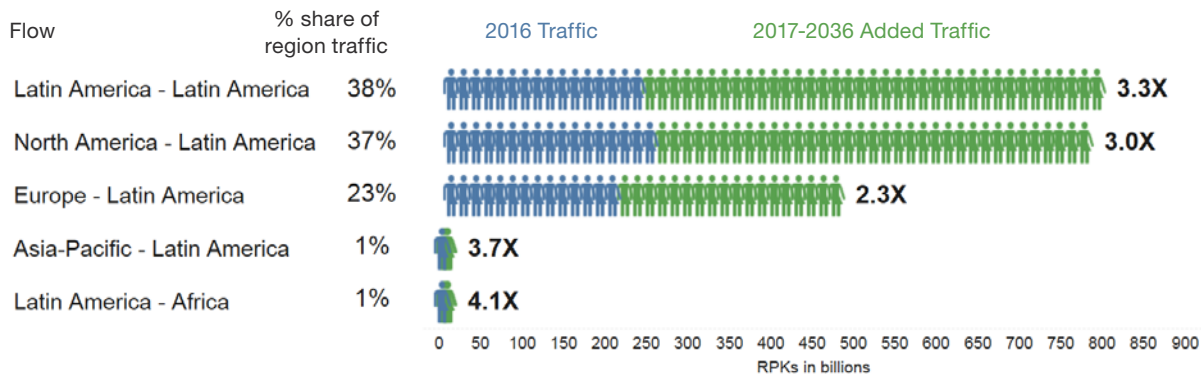
3,010
DELIVERIES

\$350B
MARKET VALUE

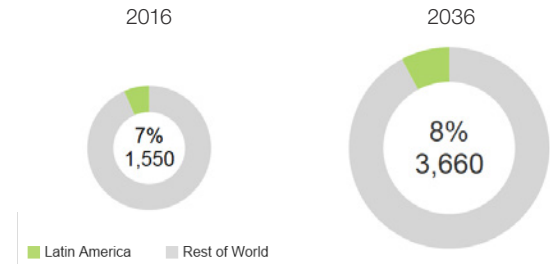
DELIVERY 2017-2036



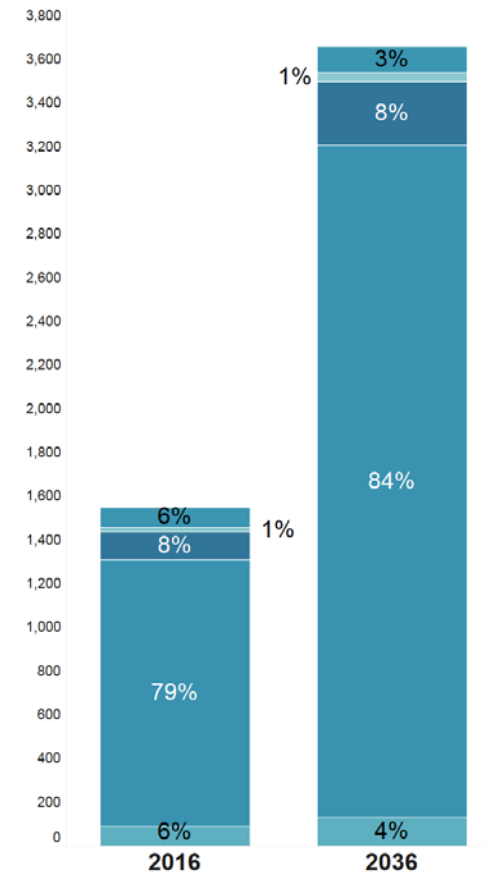
TRAFFIC FLOW



SHARE OF WORLD FLEET

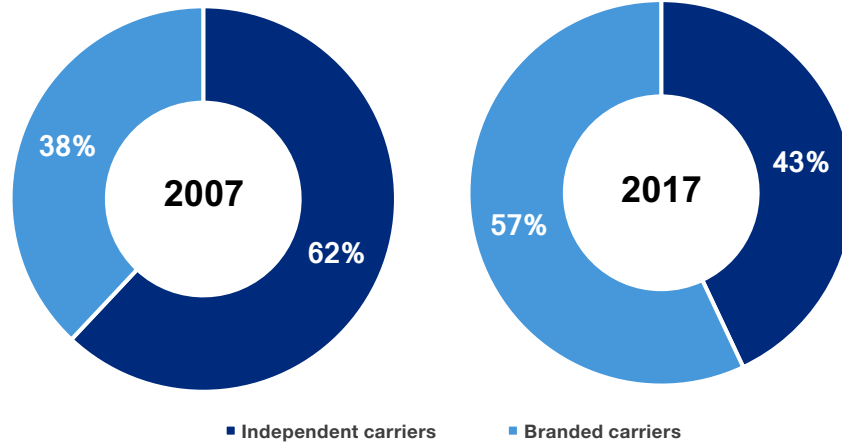


FLEET COMPOSITION



- Freighters
- Medium / Large passenger widebody
- Small passenger widebody
- Single aisle
- Regional jets

Intra-Latin America capacity market share



Source: OAG/Innovata Schedules May 2007 & 2017

Economic reforms, notably in Argentina and Brazil, are expected to stimulate domestic economies and improve outlook for the region with a GDP growth rate of 3 percent. The Pacific countries of Chile, Colombia and Peru are expected to grow at a higher-than-average GDP rate due to pro-business environments, while Mexico, the largest economy in Central America, is forecast to grow at the average regional average rate over the long-term.

FREE MARKET APPROACH CHANGING THE LANDSCAPE

In addition to regional economic growth, new airline competition is increasing across the region and stimulating passenger traffic growth. In particular, the free market approach of the Pacific countries is reshaping the Latin American airline industry with the emergence of pan-regional brands due to liberalized agreements on cross border ownership and consolidation. A growing and concentrated grouping of these branded airline groups, both

network and low-cost carriers are boosting service levels, and as a result, passenger demand. Branded carriers are expected to increase their intra-Latin American market share to over 60 percent of total capacity in the long-term. As a result of the economic reforms and competitive landscape, the Latin American aviation market is expected to grow at a higher-than-global average annual rate of 6 percent over the next 20 years.

The Big 3 global airline alliances are also battling for market share and access in the region. Several equity investments in Latin American airlines have occurred or are expected to expand as the region's aviation market continues to grow. Airlines in the United States, China and the Middle East have made financial investments that are expected to further improve the financial health of the Latin American airline industry, funding expansion and new aircraft purchases.

INFRASTRUCTURE INVESTMENTS ON THE HORIZON

New airport projects are expected to alleviate the potential congestion issues in major metropolitan areas to accommodate anticipated future air travel growth. For example, the New Mexico City International Airport is slated to open in 2020. Expansion at São Paulo's Viracopos International Airport, located 60 miles from the city center, will serve as a third airport alternative in the region.

*Branded carriers
intra-Latin
American market
share to over
60% of capacity*

Due to the steady growth in traffic, the region's demand for new aircraft is forecasted at 3,000 units. Single aisle jets make up the majority of new aircraft growth, with 85 percent, or 2,600 units forecasted. Branded carriers expanding beyond national borders are forecast to figure prominently in this growth benefitting from movement towards an open-skies policy in the Latin America aviation market. Widebody demand is also expected to increase, with at least 200 new jets. The total in-service fleet is expected to more than double over the next 20 years, growing from 1,550 jet aircraft to 3,660.





MIDDLE EAST

3.5%
GDP

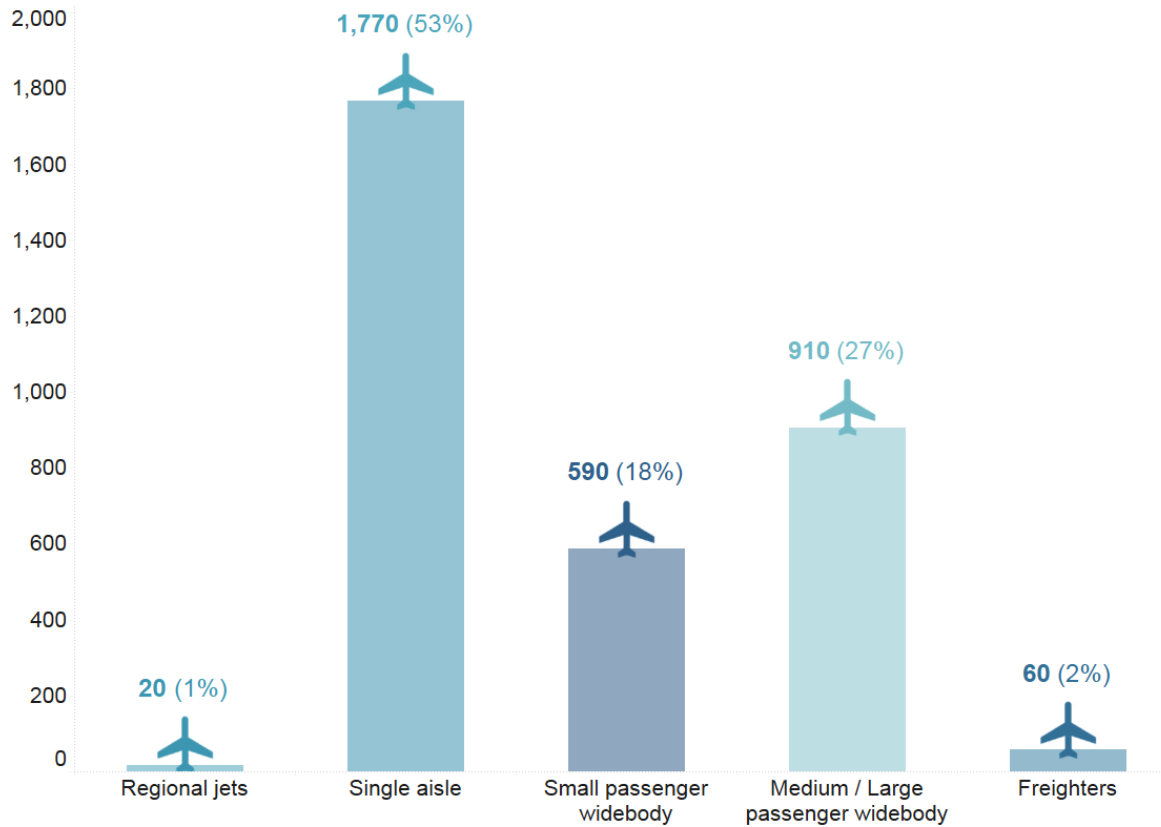
5.6%
TRAFFIC

5.1%
FLEET

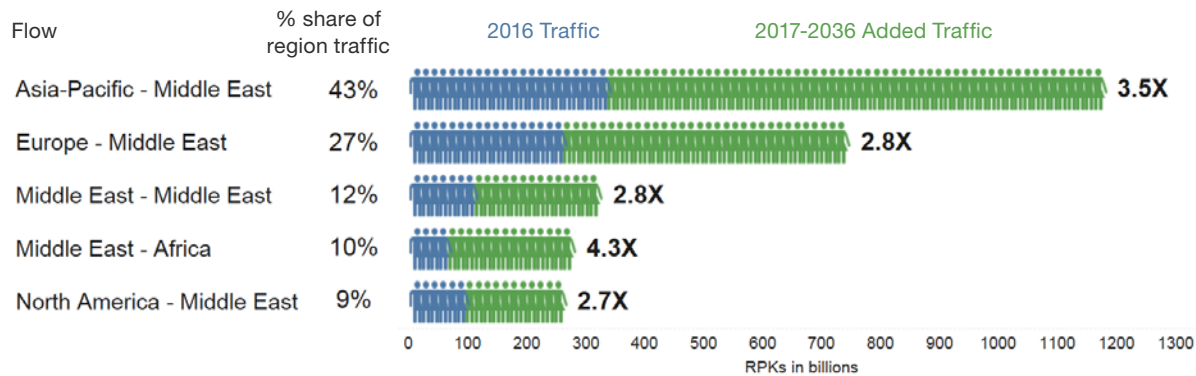
3,350
DELIVERIES

\$730B
MARKET VALUE

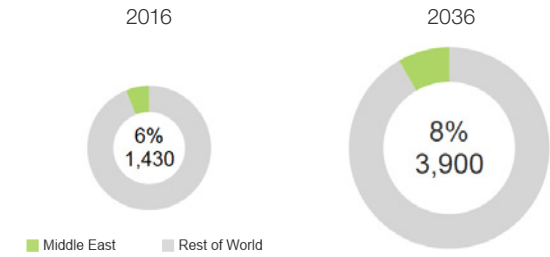
DELIVERY 2017-2036



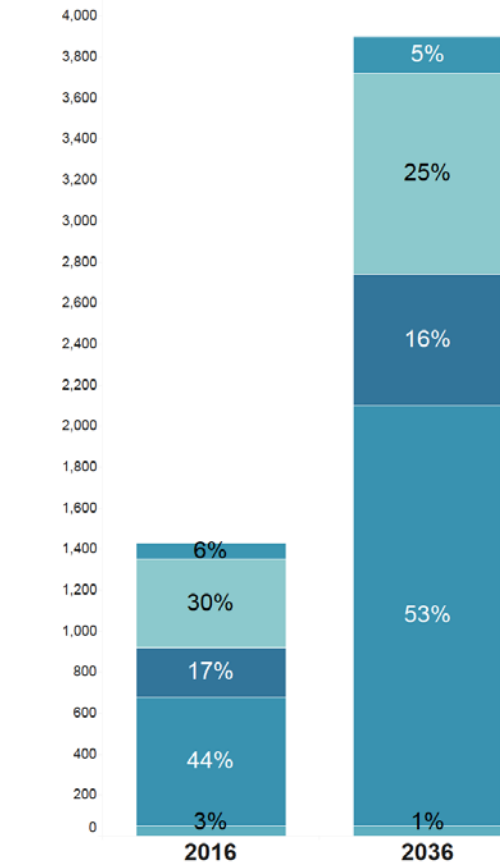
TRAFFIC FLOW



SHARE OF WORLD FLEET

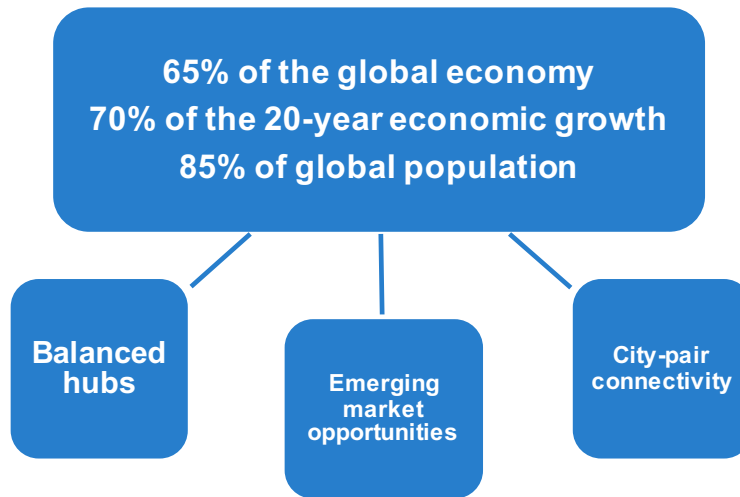


FLEET COMPOSITION



- Freighters
- Medium / Large passenger widebody
- Small passenger widebody
- Single aisle
- Regional jets

The region is in the "middle" of massive potential



serve yet realized industry-leading growth regardless. But recent developments in the United States, United Kingdom, and elsewhere suggest that a return to more protectionist policies is possible. While economic and trade interests weigh against a sustained outcome in this direction, it does remain a risk, one that is a contributing driver of equity investments, strategic partnerships, and alliance membership strategies recently pursued by the region's airlines.

More than 45% of deliveries forecast to be widebodies

MARKET FUNDAMENTALS SUPPORT A BUOYANT FORECAST

Operating at the crossroads between Asia, Africa, and Europe, airlines in the Middle East are well positioned to compete for traffic connecting those regions. About 80 percent of the world's population lives within an eight-hour flight of the Persian Gulf, allowing carriers in the Middle East to aggregate traffic at their hubs and offer one-stop service between many cities that would not otherwise enjoy such direct itineraries. Growth prospects for these connecting markets are strong. For example, South Asia has 1.8 billion people, and propensity to travel—driven by expected improvements in regional GDP per capita—is set to grow by a factor of five over the next 20 years. Less dramatic but similarly robust growth is projected for other emerging markets near the Middle East, notably Southeast Asia and Africa. Increasing demand for travel to and from these

regions is a key factor supporting Boeing's forecast for the region—3,350 airplane deliveries over 20 years.

OIL PRICES IMPACT SHORT-TERM OUTLOOK

Lower oil prices challenged many of the region's economies in 2015 and 2016, resulting in government budget shortfalls, deferred infrastructure investment, and lower foreign investment and economic activity within the region, all leading to lower business-travel demand for the region's airlines. Energy analyst forecasts call for recovery of oil prices to levels at which some of the region's problems will be alleviated, supporting both long-haul routes to and from the Middle East, as well as short-haul travel within the region.

THE CHALLENGE OF MARKET ACCESS

The challenge of market access is nothing new: Middle Eastern carriers have faced significant resistance from incumbent carriers in many of the countries they





NORTH AMERICA

2.1%
GDP

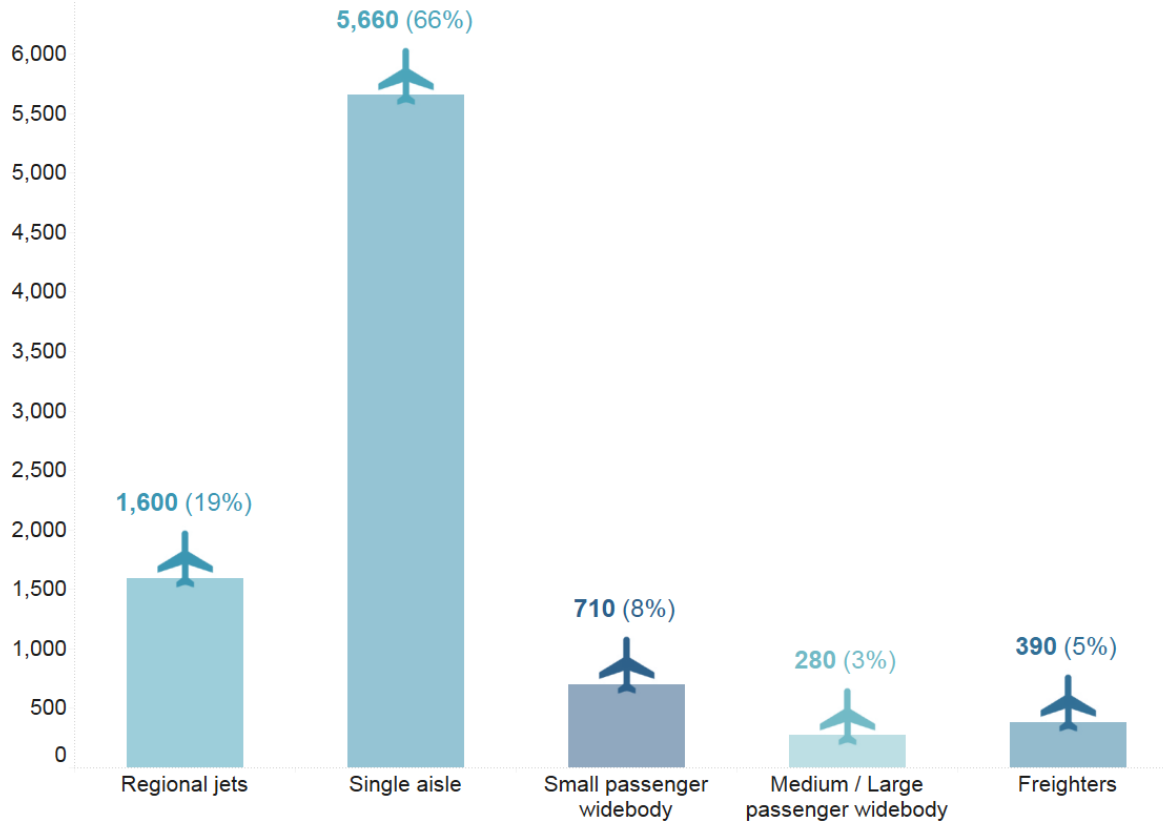
3.0%
TRAFFIC

1.8%
FLEET

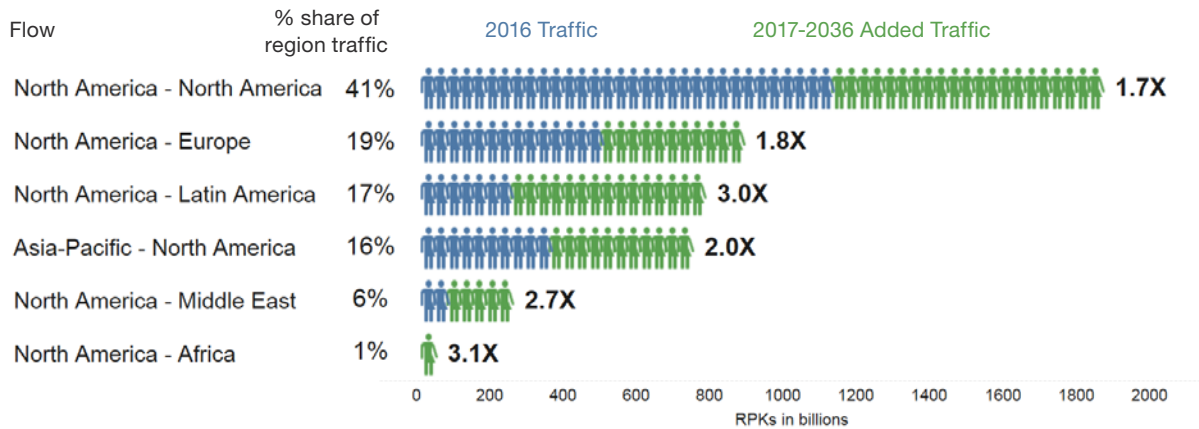
8,640
DELIVERIES

\$1,040B
MARKET VALUE

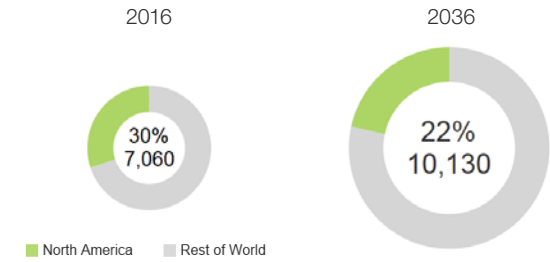
DELIVERY 2017-2036



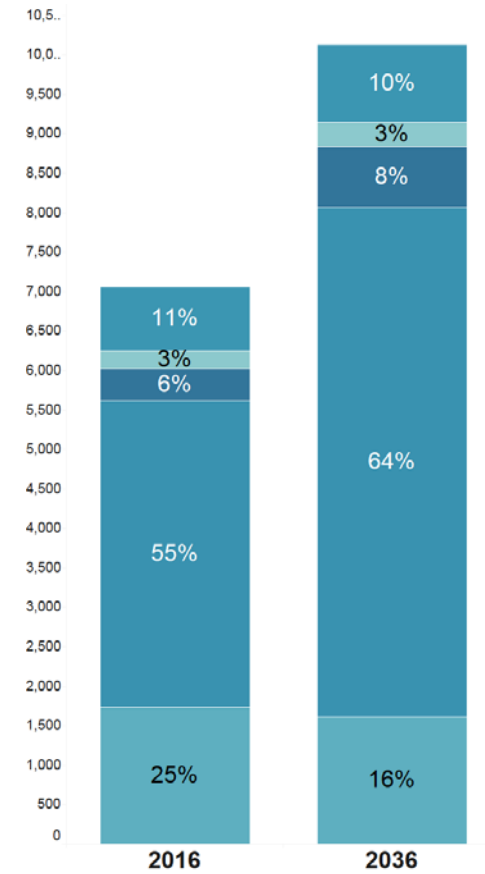
TRAFFIC FLOW



SHARE OF WORLD FLEET

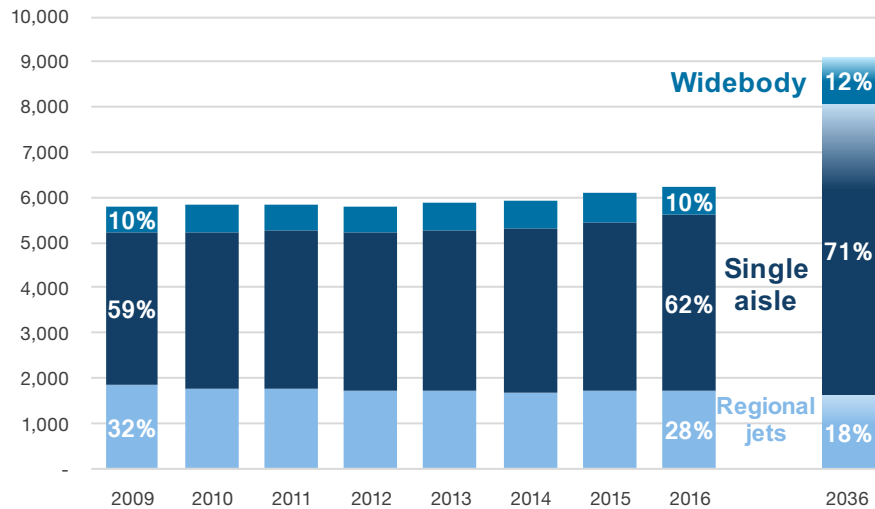


FLEET COMPOSITION



- Freighters
- Medium / Large passenger widebody
- Small passenger widebody
- Single aisle
- Regional jets

Single aisle expanding share of passenger jets



Source: Ascend May 2017, CMO 2017

markets. Small widebody planes, projected to account for 72 percent of total widebody passenger deliveries over the next 20 years, offer the ability for North American airlines to operate additional nonstop flights profitably from hubs as well as secondary markets as they take advantage of these market opportunities.

SINGLE-AISLE AIRPLANES AN INCREASING SHARE OF THE FLEET

With load factors remaining at or near historical levels and traffic growing above historical norms, the fleet has expanded recently at a faster rate to provide needed capacity. This trend is expected to continue, with traffic for the region projected to grow 3 percent per year for the next 20 years, outpacing the 1.8 percent annual fleet growth.

Single-aisle passenger share to comprise 71% of fleet in 2036

The single-aisle share of the North American fleet has edged up in recent years and is poised to continue this trend, expanding more rapidly to comprise 71 percent of the passenger fleet in 20 years compared to 62 percent today. Conversely, the regional jet fleet has been contracting since reaching its peak in 2008, ceding share to the single aisle segment. Medium single-aisle airplanes such as the 737 MAX 8 remaining the most popular size for network and low-cost carrier operators and comprising the majority of the 5,660 new single-aisle deliveries.

RETURNING TO GROWTH AFTER A DECADE SHAPED BY RESTRUCTURING AND CONSOLIDATION

North America is composed of two substantial and mature economies that both have established aviation markets. The region also ranks highest among all regions in the forecast for both GDP per capita and trips per capita. Following several large bankruptcies in the last decade and a series of subsequent mergers, the North American fleet has begun to grow again, up 6 percent over the last two years and eclipsing its former 2007 high point. The period of restructuring has greatly improved airline productivity in the region. Load factors have risen from 72 percent to 83 percent since 2000, and airlines in the region are also improving airplane utilization. While the single-aisle fleet size is essentially unchanged compared to 2007, capacity growth of 14 percent has been achieved via a combination of upgauging and cabin densification. The financial results have been extremely positive with the

region accounting for more than half of global airline industry profitability since 2013. The strong finances of airlines in the region position them well for expanding and refreshing their fleet over the next 20 years.

SOLID GROWTH IN TODAY'S LARGEST INTRA-REGIONAL MARKET, AND STRONG OPPORTUNITIES IN INTERNATIONAL MARKETS

Intra-North America is the largest intra-regional market, accounting for 16 percent of global passenger traffic in 2016. Although the 2.6 percent long-term traffic growth rate forecast for intra-North American is below world average, the size of the intra-North American market provides strong support for single aisle airplane demand growth in the region.

Long term, the forecast shows international traffic growing faster than intra-North America, roughly 4 percent per year, driven by opportunities in emerging

North America accounts for 30 percent of all commercial jets in service in the world today. This large current fleet of over 7,000 airplanes represents a significant market for replacement over the forecast period. The region will require 8,640 new airplanes over the next 20 years, and 65 percent of these will be needed to replace airplanes in the existing fleet.





AIR CARGO

AIR CARGO REMAINS IMPORTANT PART OF AIRLINE STRATEGIES

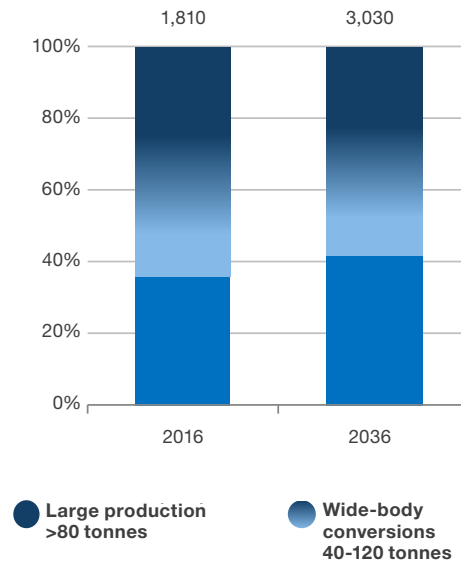
While growth has been inconsistent in recent years, overall global air cargo traffic has been increasing. Improving world industrial production and global trade has driven demand for air cargo services. Growth in 2016 was 3.6 percent and marked the fourth consecutive year of positive growth. This trend has accelerated in 2017. The pricing differential between containership and air has returned to historic norms, making air cargo a more attractive option for shippers.

Demand continues 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.

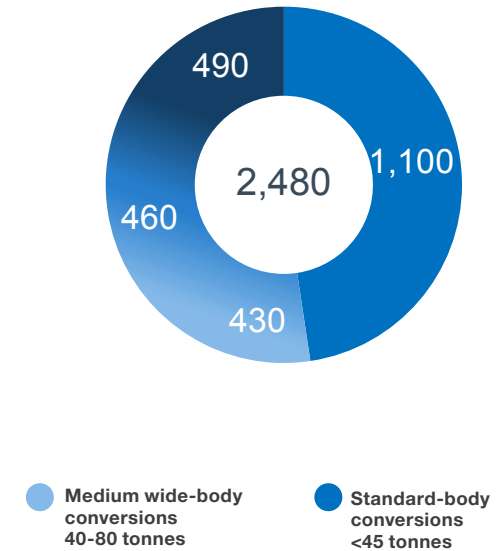
Passenger airplanes and dedicated freighters both carry air cargo. Lower-hold cargo capacity on passenger flights has been expanding as airlines deploy new jetliners with excellent cargo capability, such as the 777-300ER. However, dedicated freight services offer shippers a combination of reliability, predictability, and control over timing and routing that is often superior to that of passenger operators. As a result, freighters are expected to continue carrying more than half of global air cargo to satisfy the demanding requirements of that market.

As global GDP and world trade growth continues, air cargo traffic, as measured in revenue tonne-kilometers, is projected to grow an average 4.2 percent per year over the next 20 years. World air cargo volume, in spite of external shocks arising from economic and political

Share of freighter fleet



Freighter deliveries 2017–2036



events and natural disasters, grew an average of 5.2 percent per year over the last three and a half decades. Replacement of aging airplanes, plus the industry’s growth requirements, will create a demand for 2,480 freighter deliveries over the next 20 years. Of these, 1,560 will be passenger airplane conversions. The remaining 920 airplanes, valued at \$260 billion, will be new. The overall freighter fleet will increase by more than half—from 1,810 airplanes in 2016 to 3,030 by 2036.

METHODOLOGY



OVERVIEW

Boeing publishes the Current Market Outlook (CMO) on an annual basis to measure the effect of new or significant trends that are developing in the aviation industry and their resulting impact on future aircraft demand. The CMO forecast has both top-down and bottom-up components matching passenger and cargo traffic demand with a corresponding level of capacity. The CMO produces a long-range fleet forecast of at least 180 global airlines, including all passenger jet aircraft in commercial service that have more than 30 seats.

AIR TRAVEL DEMAND

The CMO is a long-term, noncyclical forecast that looks beyond short-term shocks to address underlying trends in the aviation industry.

Travel demand is forecast for 63 intraregional and interregional traffic flows. Different flows have different drivers and are therefore modeled differently. For example, some flows may emphasize development GDP per capita (economic activity) while others may be influenced by local market factors such as industry consolidation.

Many factors can influence air travel growth in a market. Generally, these factors can be grouped into one of three categories: economic activity, ease of travel, and local market factors. Some factors that drive demand, such as GDP, are easy to quantify. Other factors are more difficult to quantify but can have an even greater effect on market performance. When such factors are present, other information sources (e.g., expert opinion or analogies to other markets) must be harnessed to create a meaningful forecast.

Economic activity is easily understood and quantified. Key influencers include

- Country and regional GDP development.

- Population and per-capita income trends.
- Labor-force composition.
- International trade, economic, and investment links.

While economic indicators have strong explanatory power in some markets, there is a risk that regression of traffic on economic variables can overstate the importance of economic drivers, because in these markets another set of factors is changing at the same time. In many cases, these influencers are related to ease of travel.

Ease of travel can improve in many ways. Some of the more common examples include:

- More open air services agreements between countries.
- Liberalized domestic market regulation.
- Emerging technology (e.g., new airplanes enable new routes).
- Business-model innovation (e.g., low-cost airlines driving down fares).
- Airline network improvements (e.g., new nonstop city pairs, greater frequencies).

Finally, in some markets influencing factors exist that are not related to macroeconomic trends or related directly to ease of travel. These are the local market factors, and their impact on a market can be considerable. One notable example: From 2009 to 2015, the US domestic market saw essentially no airline capacity growth. Given that load factors were already high, very little headroom was left for traffic growth. Therefore, traffic growth during that period was anemic, while the economy as a whole grew by 13 percent. Consolidation of the US airline industry during that time contributed to the disconnect, as did the reluctance of US airlines to increase capacity in a time of high fuel prices. Those factors were not replicated in a similar combination anywhere else in the world.

Demand changes as countries develop economically. Emerging markets throughout the world show that air travel is one of the first discretionary expenditures added as consumers join the global middle class. As emerging market demand starts to develop, it may take the form of nonscheduled services to leisure destinations. Later, the same demand may migrate to scheduled services of low-fare carriers or to network airlines.

In developed markets, demand for essential travel has been met, so growth comes from discretionary travel. In these markets, GDP per capita matters less than other factors such as the availability of vacation days earned and the funds needed to travel, consumer confidence, service pricing, and service quality (e.g., the availability of nonstop flights).

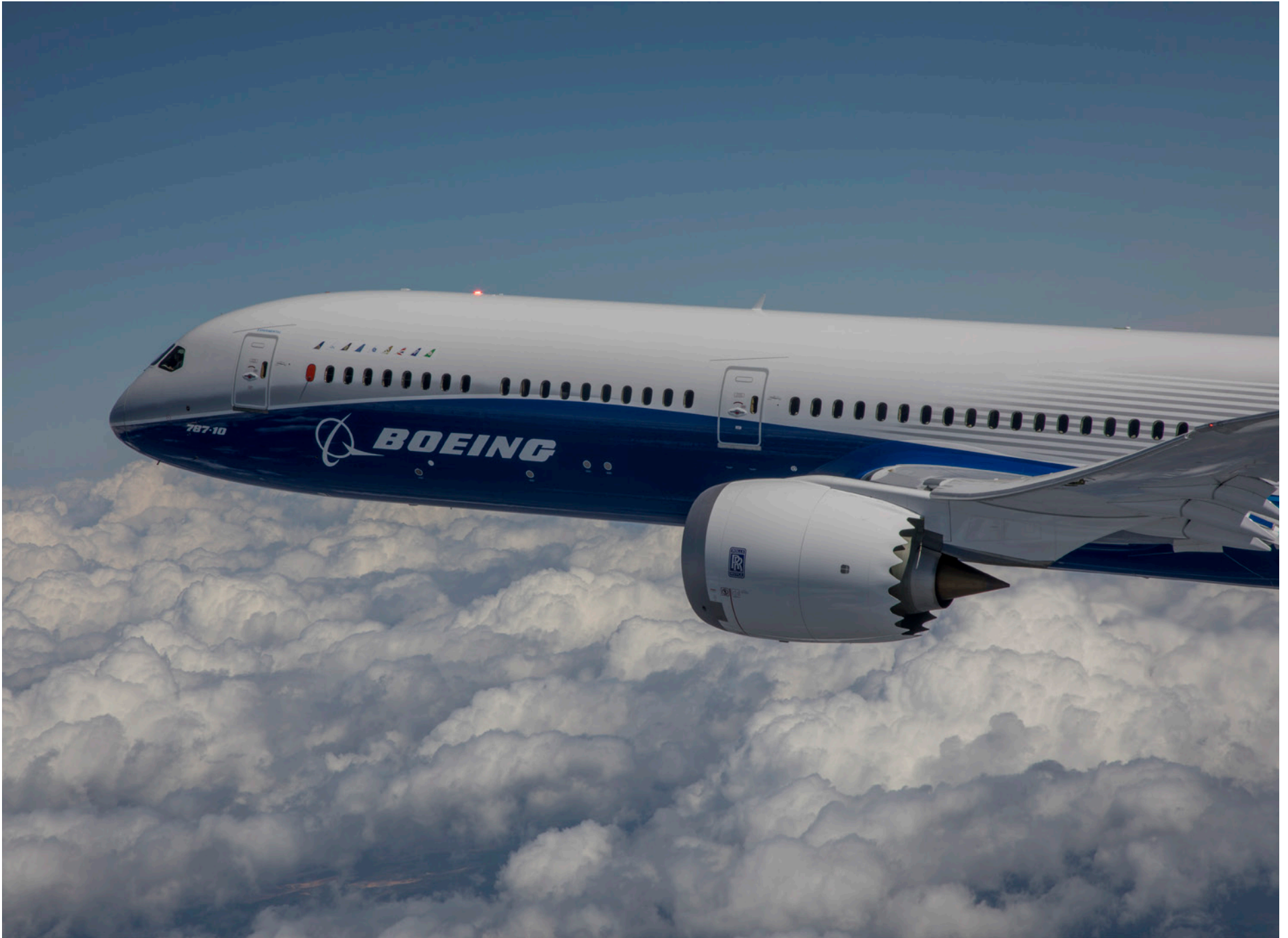
Within a given region, propensity to travel, measured in trips or in revenue passenger-kilometers, generally increases with per capita income. The rate of increase varies considerably. Generally, markets that are more open are more responsive to changes in per capita income because airlines are freer 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 island geographies or poorly connected land masses necessitating more air travel than might otherwise be the case.

AIRPLANE DEMAND

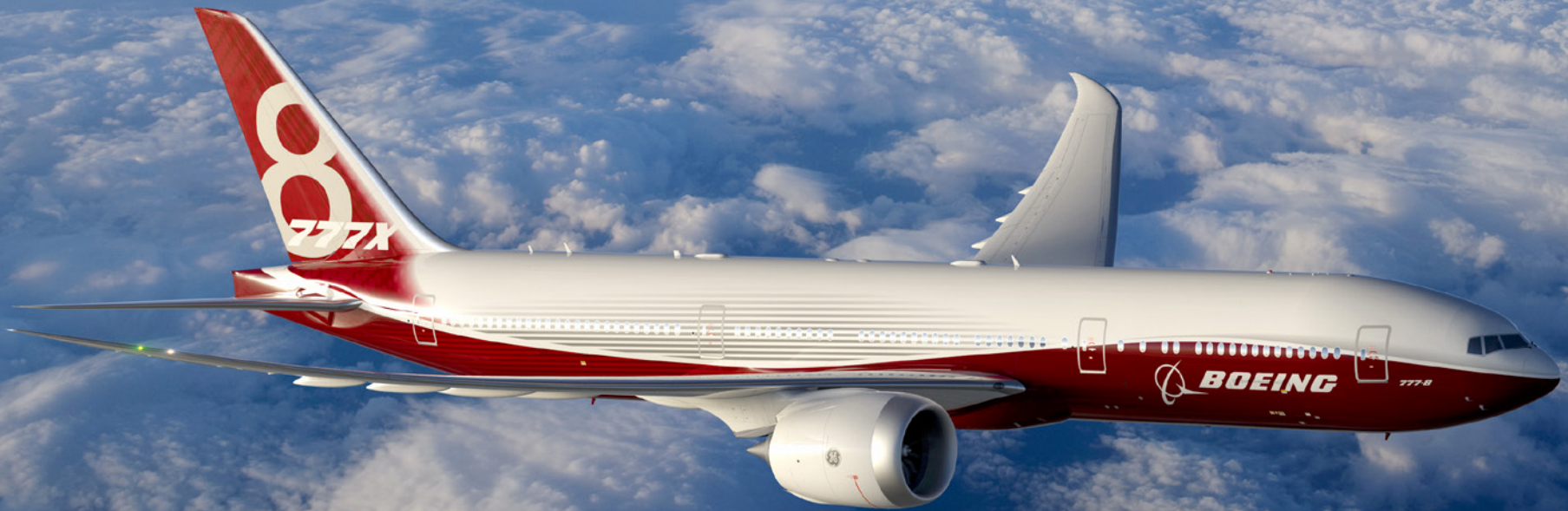
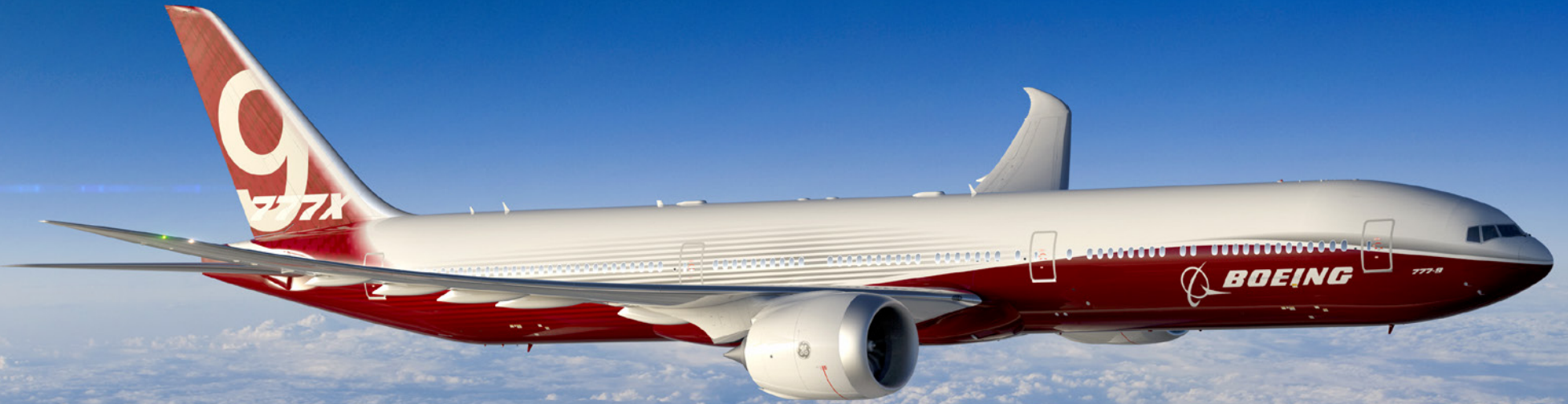
The airplane demand forecast phase is the final step of the process. With detailed knowledge of the industry's current fleet and short-term fleet plans, inclusive of seating configurations, aircraft utilization, fleet retirement schedules, and a backlog of sold aircraft, a base is established to assign current production or future aircraft products to an airline's long-term fleet. Many things are considered during this phase, including an

airline's strategy and brand as well as its current and future route network, and matching those with the appropriate aircraft product that maximizes profitability and capability. The capacity of the incoming and existing fleets must equal the total capacity targets for each participating regional flow and time period.





APPENDIX



FORECAST ON A PAGE

	Asia-Pacific	North America	Europe	Middle East	Latin America	C.I.S.	Africa	World
Economic growth (GDP) %	3.9%	2.1%	1.7%	3.5%	3.0%	2.0%	3.5%	2.8%
Airline traffic (RPK) %	5.7%	3.0%	3.7%	5.6%	6.1%	4.3%	5.9%	4.7%
Airplane fleet (%)	4.8%	1.8%	2.7%	5.1%	4.4%	3.0%	4.1%	3.5%

Market Size

Deliveries	16,050	8,640	7,530	3,350	3,010	1,230	1,220	41,030
Market value (\$B)	2,500	1,040	1,110	730	350	140	180	6,050
Average value (\$M)	160	120	150	220	120	110	150	150
Unit share	39%	21%	18%	8%	7%	3%	3%	100%
Value share	41%	17%	18%	12%	6%	2%	3%	100%

Deliveries

Regional jets	270	1,600	100	20	130	220	30	2,370
Single aisle	11,840	5,660	5,900	1,770	2,630	830	900	29,530
Small passenger widebody	2,210	710	940	590	210	150	240	5,050
Medium / Large passenger widebody	1,410	280	490	910	20	10	40	3,160
Freighters	320	390	100	60	20	20	10	920
Total	16,050	8,640	7,530	3,350	3,010	1,230	1,220	41,030

Market Value (\$B)

Regional jets	10	70	10	<5	10	10	<5	110
Single aisle	1,290	600	640	190	280	90	90	3,180
Small passenger widebody	600	180	250	160	50	30	70	1,340
Medium / Large passenger widebody	490	100	180	360	10	>5	20	1,160
Freighters	110	90	30	20	<5	10	<5	260
Total	2,500	1,040	1,110	730	350	140	180	6,050

2016 Fleet

Regional jets	140	1,740	260	50	90	150	110	2,540
Single aisle	4,820	3,880	3,410	630	1,220	650	420	15,030
Small passenger widebody	900	410	410	240	130	70	80	2,240
Medium / Large passenger widebody	640	220	450	430	20	40	60	1,860
Freighters	330	810	270	80	90	180	50	1,810
Total	6,830	7,060	4,800	1,430	1,550	1,090	720	23,480

2036 Fleet

Regional jets	260	1,610	110	50	130	370	70	2,600
Single aisle	12,420	6,460	5,940	2,050	3,080	1,180	1,060	32,190
Small passenger widebody	2,370	770	1,140	640	290	210	290	5,710
Medium / Large passenger widebody	1,430	300	580	980	40	40	50	3,420
Freighters	1,040	990	390	180	120	180	130	3,030
Total	17,520	10,130	8,160	3,900	3,660	1,980	1,600	46,950

MAJOR TRAFFIC FLOWS

2016 PASSENGER TRAFFIC

RPKs in billions	Africa	Latin America	Middle East	Europe	North America	Asia-Pacific
Asia-Pacific	22.2	4.0	337.2	381.4	366.1	1738.1
North America	13.4	263.7	98.8	499.7	1120.1	
Europe	153.8	212.2	260.1	859.4		
Middle East	62.5	-	116.1			
Latin America	3.1	241.0				
Africa	62.9					

2036 PASSENGER TRAFFIC

RPKs in billions	Africa	Latin America	Middle East	Europe	North America	Asia-Pacific
Asia-Pacific	80.7	14.9	1176.7	923.4	750.5	5444.1
North America	42.0	780.9	262.4	880.5	1884.2	
Europe	383.0	491.2	735.4	1601.2		
Middle East	270.7	-	321.8			
Latin America	12.6	800.0				
Africa	222.9					

AIRLINE PASSENGER GROWTH RATES 2016–2037

RPKs	Africa	Latin America	Middle East	Europe	North America	Asia-Pacific
Asia-Pacific	6.7%	6.7%	6.4%	4.5%	3.7%	5.9%
North America	5.9%	5.6%	5.0%	2.9%	2.6%	
Europe	4.7%	4.3%	5.3%	3.2%		
Middle East	7.6%	-	5.2%			
Latin America	7.2%	6.2%				
Africa	6.5%					

TRAFFIC DISTRIBUTION

2016 TRAFFIC MARKET SHARE

RPKs	Africa	Latin America	Middle East	Europe	North America	Asia-Pacific
Asia-Pacific	7%	1%	38%	16%	15%	60%
North America	4%	36%	11%	20%	47%	13%
Europe	48%	29%	29%	35%	21%	14%
Middle East	20%	-	13%	11%	4%	12%
Latin America	1%	33%	-	9%	11%	0%
Africa	20%	0%	7%	6%	1%	1%
All traffic to/from region	100%	100%	100%	100%	100%	100%

2036 TRAFFIC MARKET SHARE

RPKs	Africa	Latin America	Middle East	Europe	North America	Asia-Pacific
Asia-Pacific	8%	1%	42%	18%	16%	64%
North America	4%	37%	9%	17%	41%	9%
Europe	38%	23%	26%	31%	19%	11%
Middle East	27%	-	11%	14%	6%	14%
Latin America	1%	38%	-	9%	17%	0%
Africa	22%	1%	10%	7%	1%	1%
All traffic to/from region	100%	100%	100%	100%	100%	100%

Bold: Share within region.

How to read the tables:

Read down the selected column; for example:

In 2016, traffic within North America accounted for 47% of all the total traffic to, from and within North America.

In 2036, traffic within North America will account for 41% of all the total traffic to, from and within North America.

PASSENGER TRAFFIC

REGIONAL FLOW RPKS IN BILLIONS	2009	2010	2011	2012	2013	2014	2015	2016	2036	2016- 2036 ANNUAL GROWTH
Africa -Africa	43.9	48.7	53.7	51.1	54.5	56.6	59.2	62.9	222.9	6.5%
Africa - Europe	128.2	135.5	140.4	134.1	140.4	146.5	153.2	153.8	383.0	4.7%
Africa - Middle East	32.9	36.4	50.8	39.4	48.6	53.7	59.5	62.5	270.7	7.6%
Africa - North America	8.8	11.3	12.2	11.4	12.6	12.5	12.7	13.4	42.0	5.9%
Africa - Southeast Asia	4.1	5.6	4.2	5.9	4.6	3.7	3.7	3.8	11.5	5.7%
Central America - Central America	29.8	31.3	36.5	32.2	33.8	38.7	42.5	48.7	93.3	3.3%
Central America - Europe	77.1	73.8	82.1	73.7	78.3	87.4	95.3	104.8	227.9	4.0%
Central America - North America	104.7	112.7	138.3	114.5	132.0	153.0	170.1	180.5	516.4	5.4%
Central America - South America	14.0	18.3	28.5	19.2	23.2	30.8	34.2	35.5	115.2	6.1%
China - China	287.4	335.4	460.8	380.1	411.3	509.2	564.7	629.8	2058.5	6.1%
China - Europe	77.3	82.1	96.9	94.2	96.7	105.2	121.1	132.9	396.9	5.6%
China - North America	60.9	71.4	89.5	85.4	87.1	98.1	107.5	119.1	342.3	5.4%
China - Northeast Asia	43.2	51.8	60.7	51.5	60.9	66.2	73.0	81.0	164.4	3.6%
China - Oceania	22.8	27.4	35.0	31.4	34.1	37.7	44.3	55.4	165.4	5.6%
China - Southeast Asia	45.3	54.7	82.5	63.0	73.8	89.4	109.9	127.0	434.1	6.3%
CIS Region - CIS Region	76.9	87.6	118.3	103.1	107.1	125.3	138.1	134.9	272.9	3.6%
CIS Region - International	83.6	101.6	157.9	124.1	139.4	164.9	151.9	144.2	405.4	5.3%
Europe - Europe	624.9	640.2	714.0	659.5	676.6	760.3	796.8	859.4	1601.2	3.2%
Europe - Middle East	131.2	143.8	196.8	153.3	178.0	210.9	242.5	260.1	735.4	5.3%
Europe - North America	405.4	418.6	441.8	430.2	432.9	462.7	475.0	499.7	880.5	2.9%
Europe - Northeast Asia	59.4	64.3	74.3	63.8	75.9	77.8	81.3	78.4	127.2	2.4%
Europe - South America	79.3	82.9	102.4	89.8	99.6	102.1	104.4	107.4	263.3	4.6%
Europe - South Asia	51.3	53.8	56.4	54.1	53.9	57.2	57.5	58.3	176.7	5.7%
Europe - Southeast Asia	95.9	97.1	105.3	100.4	106.6	108.0	111.3	111.8	222.5	3.5%
Middle East - Middle East	68.6	77.9	86.3	82.4	76.5	91.7	102.2	116.1	321.8	5.2%
Middle East - North America	41.6	45.7	63.2	50.3	57.1	73.7	88.3	98.8	262.4	5.0%
Middle East - South Asia	64.8	75.1	95.1	83.0	87.3	100.5	114.4	129.8	493.1	6.9%
Middle East - Southeast Asia	46.7	56.3	79.0	61.3	66.4	89.4	97.6	109.0	310.0	5.4%
North America - North America	915.1	946.3	998.4	976.3	984.7	1029.9	1077.7	1120.1	1884.2	2.6%
North America - Northeast Asia	120.2	128.4	150.4	135.4	149.0	154.0	160.5	168.2	222.0	1.4%
North America - Oceania	34.8	34.9	43.1	38.3	40.3	43.3	48.3	53.4	103.1	3.3%
North America - South America	56.9	60.9	79.2	66.7	72.0	82.7	86.9	83.2	264.5	6.0%
North America - Southeast Asia	10.3	10.3	9.8	11.3	10.7	9.6	10.8	12.9	36.0	5.3%
Northeast Asia - Northeast Asia	81.9	84.6	103.9	81.9	92.6	107.6	112.5	116.8	149.5	1.2%
Northeast Asia - Oceania	15.1	18.1	15.9	16.6	17.1	15.9	17.2	19.5	28.4	1.9%
Northeast Asia - Southeast Asia	74.3	79.6	113.3	92.3	104.9	124.2	134.6	143.9	318.4	4.1%
Oceania - Oceania	73.3	78.4	99.0	83.8	92.0	100.0	102.8	105.3	238.1	4.2%
Oceania - Southeast Asia	54.7	61.1	77.8	66.9	71.5	83.2	80.0	83.5	199.2	4.4%
South America - South America	86.9	115.8	147.4	134.4	141.9	155.7	159.1	156.8	591.5	6.9%
South Asia - South Asia	43.8	49.5	68.1	58.6	63.8	71.4	79.2	97.0	515.0	8.7%
Southeast Asia - South Asia	21.9	28.5	36.2	29.2	34.0	38.4	40.4	44.6	229.6	8.5%
Southeast Asia - Southeast Asia	96.0	113.1	166.6	130.7	145.1	176.9	194.0	212.3	859.4	7.2%
Rest of World	69.3	87.9	126.1	97.4	116.0	140.0	148.2	167.9	637.6	6.9%
GRAND TOTAL	4564.2	4938.7	5898.0	5262.2	5585.0	6246.0	6664.5	7104.3	17793.5	4.7%

AIRPLANE MARKET SECTOR DEFINITIONS

SINGLE AISLE PASSENGER AIRPLANES

Single Aisle	Single Aisle	Regional Jets	Medium/Large	Small
Boeing 707, 757	BAe 146-300, Avro RJ100	Antonov An-148, -158	Boeing 747-8	Boeing 767, 787-8, -9
Boeing 717, 727	Bombardier CRJ-1000	AVIC ARJ-700	Boeing 747-100 through -400	Boeing/MDC DC-10
Boeing 737-100 through -600	Bombardier CS100, CS300	Avro RJ70, RJ85	Airbus A380	Airbus A300, A310
Boeing 737-700, -800, -900ER	Embraer 190, 195	BAe 146-100, -200	Boeing 777, 777X	Airbus A330-200, -300, -800, -900
Boeing 737-MAX7, MAX8, MAX9, MAX10	Embraer 190E2, 195E2	Bombardier CRJ	Boeing 787-10	Airbus A350-900
Airbus A318, A319, A320, A321	COMAC C919	Dornier 328JET	Boeing/MDC MD-11	Lockheed L-1011
Airbus A319neo, A320neo, A321neo	Fokker 100	Embraer 170, 175, 175E2	Airbus A340	Ilyushin IL-96
Boeing/MDC DC-9, MD-80, -90	UAC MS 21-200/300	Embraer ERJ-135/140/145	Airbus A350-1000	
	Ilyushin IL-62	Fokker 70, F28	Ilyushin IL-86	
	Tupolev TU-154, TU-2014, TU-214	Mitsubishi MRJ		
	Yakovlev Yak-42	Sukhoi Superjet 100		
		Yakovlev Yak-40		

Bold: airplanes in production or launched.

FREIGHTER AIRPLANES

LARGE WIDEBODY <i>More than 80 tonnes</i>	MEDIUM WIDEBODY <i>40 to 80 tonnes</i>	STANDARD BODY <i>Less than 45 tonnes</i>
Boeing/ MDC MD-11	Lockheed L-1011SF	BAe 146
Boeing 747-100 through -400	Boeing /MDC DC-10	Boeing/MDC DC-8/9
Boeing 777	Boeing 787	Boeing 737
Airbus A350	Airbus A300	Boeing 727
Ilyushin IL-96T	Airbus A330	Bombardier CRJ
Antonov An-124	Ilyushin IL-76TD	Tupolev Tu-204
747-8F	Ilyushin IL-76TD	Boeing 707
		Boeing/MDC MD-80
		Boeing 757-200
		Airbus A320, A321

Production and conversion (SF) models assumed for each type unless otherwise specified



WEBSITE

www.boeing.com/cmo

ADDRESS

Boeing Commercial Airplanes
Market Analysis
P.O. Box 3707, MC 21-28
Seattle, WA 98124-2207