Market Forecast
Dear Reader,

Bombardier Commercial Aircraft is excited by the state of today's aviation industry. We are equally enthusiastic about the industry's future, given the prospective dynamism of the markets that we serve. Indeed, the aerospace sector continues to grow profitably and evolve in order to manage the increasing demand for air travel. As the world leader of aircraft solutions in the 60- to 150-seat segment, Bombardier Commercial Aircraft is uniquely positioned to capitalize on the opportunities in this market.

Our Market Forecast provides an industry outlook over a 20-year period by determining the long-term effect of key market drivers. These elements are influencing factors in our growth, retirement and migration models. The final output is segmented by region and aircraft seating capacity in order to better understand regional dynamics and gauging requirements respectively. The Market Forecast highlights our business confidence, influences product development, drives our strategic planning and underscores our unique position in today's marketplace.

In addition to showing general market dynamics, our forecast focuses on how airlines are changing the way that assets are evaluated. Airlines are shifting their primary metric for network and fleet optimization strategies from 'cost' to 'profit'. With this thinking at the forefront, more airlines are investing in right-sized aircraft that maximize their profits. Lower oil prices may permit airlines to delay the replacement or retirement of less efficient aircraft, but in the long-term, fuel efficiency and environmental footprint will remain key drivers of airline fleet decisions.

The long-term outlook for our markets is strong. With our leading portfolio of products we are confident in the prospects of our business. Bombardier Commercial Aircraft is the only manufacturer that has a solution for any type of business model in the 60- to 150-seat segment and we are well positioned to capture the value from the exciting opportunities outlined in this Market Forecast.

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Fred Cromer
President
Bombardier Commercial Aircraft
Executive Overview
The 60- to 150-seat segment in-service fleet is at a record high with 6,900 aircraft.

Intra-Regional routes will remain the core of the market. Intra-regional traffic to grow at 5% CAGR. Intra-regional routes account for around 80% of global traffic.

Airline fleet decisions are evolving from capacity-driven to profit-driven. Falling yields are driving increased profit focus. Airlines will observe capacity discipline to achieve higher profits per passenger. Right-sizing will be a critical component in profit optimization.

The Small Regional Aircraft segment erosion will have a ripple upgauging effect. Almost all regional jets in the small regional aircraft segment will upgauge due to lack of options and regional pilot shortages. In mature markets, direct replacement with small narrowbodies will occur. By 2036, less than 400 aircraft will remain in this segment in the global fleet.

The Large Regional Aircraft segment will continue to penetrate short-haul routes. Mature markets effectively utilize large regional aircraft to optimize profits on high-yield routes. Turboprop productivity and fleet utilization has increased over the past decade. Regional jets remain critical to hub-and-spoke networks and will replace a sizeable portion of smaller regional jets.

The Small Single-Aisle Aircraft segment will facilitate airline network optimization. This segment will increase point-to-point flying on short- to medium-haul routes. 86% of the current fleet in this segment will retire by 2036. New and thin routes will be profitable using aircraft in this segment.
Bombardier Commercial Aircraft forecasts 12,550 deliveries in the 60- to 150-seat segment over the 2017-2036 time frame. The total market is valued at US$820 billion with the small single-aisle segment responsible for around 70% of revenues.

Revenue from large regional aircraft is forecast at US$240 billion with 5,750 deliveries globally. Small single-aisle aircraft deliveries are forecast at 6,800 units over the next 20 years, accounting for US$580 billion in revenues.

The demand will be driven by:
- replacement of aging fleet
- opportunity to further optimize airline networks
- opening of new routes globally

<table>
<thead>
<tr>
<th>Segment</th>
<th>Deliveries</th>
<th>Revenue (billions of $)</th>
<th>Revenue share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large regional aircraft</td>
<td>5,750</td>
<td>240</td>
<td>30%</td>
</tr>
<tr>
<td>Small single-aisle aircraft</td>
<td>6,800</td>
<td>580</td>
<td>70%</td>
</tr>
</tbody>
</table>

Revenue estimates are based on 2017 list prices.
Deliveries by Region

With an established fleet, North America will account for 27% of the delivery share, with 3,500 units in the 60- to 150-seat segment, and Europe will secure 18% of the deliveries. Emerging markets like Greater China, South Asia and East Asia & Oceania will be responsible for over 4,000 unit deliveries.

Mature markets will account for around 50% of deliveries.

Asia Pacific will account for one-third of delivery share.

<table>
<thead>
<tr>
<th>Region</th>
<th>Deliveries</th>
<th>Delivery Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>3,400</td>
<td>27%</td>
</tr>
<tr>
<td>Europe</td>
<td>2,200</td>
<td>18%</td>
</tr>
<tr>
<td>Greater China</td>
<td>2,150</td>
<td>17%</td>
</tr>
<tr>
<td>East Asia &amp; Oceania</td>
<td>1,550</td>
<td>12%</td>
</tr>
<tr>
<td>Latin America</td>
<td>1,050</td>
<td>8%</td>
</tr>
<tr>
<td>Russia &amp; CIS</td>
<td>700</td>
<td>6%</td>
</tr>
<tr>
<td>Africa</td>
<td>550</td>
<td>4%</td>
</tr>
<tr>
<td>South Asia</td>
<td>500</td>
<td>4%</td>
</tr>
<tr>
<td>Middle East</td>
<td>450</td>
<td>4%</td>
</tr>
</tbody>
</table>

Source: Flightglobal Fleets Analyzer, Bombardier Market Forecast 2017-2036
Asia Pacific Includes Greater China, South Asia and East Asia & Oceania
Demand for transportation has evolved steadily through the decades, growing at 3.3% CAGR since 1990. This has made travel more accessible and increased transportation choices. Air transportation has grown at the fastest rate since 1990, at around 5% CAGR. Air travel still remains the safest mode of transportation.

Based on data for 54 countries, covering all global regions. CAGR = compound annual growth rate.

Source: OECD, Oxford Economics, IATA WATS, Oliver Wyman analysis.
Econometric modelling of the historic relationship between GDP, population, passenger demand and fleet growth is used to forecast the demand for aircraft deliveries.

Key quantitative inputs include in-service fleet data, passenger traffic and third-party forecasts for GDP, population and fuel prices. Qualitative inputs include labour contracts (e.g. scope clauses), market liberalization, infrastructure development and environmental policies.

Our market drivers suggest a positive outlook for commercial aircraft.

**Key Market Drivers**

- **Economic growth**: Airlines have settled into a financially-driven culture.
- **Oil price & volatility**: The market is highly replacement-driven.
- **Emerging markets**: Lower oil prices support airline profitability and fleet solutions.
- **Pilot scope clauses**: Labour contracts will influence demand for the regional and mainline fleet.
- **More efficient aircraft**: Emerging markets require new aircraft to meet the fast-growing traffic demand.
- **Technological obsolescence & environmental regulations & fees**: Environmental regulations will influence aircraft demand.

Emerging markets require new aircraft to meet the fast-growing traffic demand.
Bombardier regional penetration curves show a strong relationship between macroeconomics and air travel demand.

In order to understand the relationship between air travel and macroeconomics, Bombardier uses Regional Penetration Curves. All regions, whether economically mature or developing, follow a typical growth path. As the economic strength of a region improves (due to GDP, middle-class growth, etc.), air travel demand increases.

Source: Oxford Economics, Diio Mi, Bombardier Analysis
Mature economies like North America and Europe are expected to maintain their strong positions whilst growing at 1.7% and 1.4% CAGR respectively. South Asia and Greater China are expected to lead global growth with 5.7% and 4.6% CAGR respectively.

East Asia & Oceania comprises of several fast-growing economies and many slowly emerging markets; hence, the overall growth rate is 2.0% CAGR for the region.

Africa and the Middle East are forecast to grow at a healthy rate, above the global average. Conversely, the recovering economies of Latin America and Russia & CIS will face a slower than average growth rate as they recuperate and stabilize.

Source: Oxford Economics; CAGR = Compound annual growth rate
Macroeconomics

By 2050, China and India are expected to increase their middle-class spending power. As a result, they will capture more than 50% of global consumption.

Source: OECD
There is broad consensus about the long-term oil price outlook. Current forecasts by the U.S. Energy Information Agency (EIA), OPEC and the World Bank indicate that the price of oil could bounce back to US$80 to $100 per barrel. Higher oil prices influence airline decisions to replace or retire less-efficient aircraft types. As oil price volatility surges, the demand for more fuel-efficient and segment-optimized aircraft will increase.

Source: Oxford Economics, OPEC, EIA
As air travel grows, so does the workforce in the industry and the demand for more specialized personnel. Pilots, mechanics, cabin crew and dispatchers are examples of personnel that directly impact daily operations of an airline fleet. The workforce supply affects long-term demand for aircraft, as well as the size and purpose of aircraft.

CAE forecasts a need for over 250,000 pilots over the next 10 years.

- **290K Active pilots** in 2017
- **105K Retiring pilots**
- **255K Additional pilots for growth**
- **440K Active pilots** in 2027

Source: CAE 2017-2027 Pilot Market Forecast
Incremental improvements in technology are more frequent than clean-sheet designs. The IATA Technology Roadmap suggests that there will be several incremental improvements in the airframe and engine manufacturing domains.
Although incremental improvements happen frequently and have an impact on aircraft efficiency, the introduction of clean-sheet airframe designs has the biggest impact on the industry. Clean-sheet designs do not occur often, but when they do, they gain a stronghold and disrupt the marketplace due to the gigantic leap in innovation.
Airline Business Environment
The International Air Transport Association (IATA) forecasts further growth in capacity in 2017 along with operating profits of around $55 billion. However, since 2010, there has been a steady decline in airline yields.

Fueled by high passenger load factors, the global airline market achieved record profits in 2016. Continued declining yields undermine the sustainability of this capacity-driven profitability. To achieve sustainable profits, airlines must focus on optimizing revenue and cost simultaneously, with a great deal of flexibility. Profit per passenger will become a new metric of focus. Only airlines with a robust yield-demand-capacity optimization business model will become true market leaders.

As airlines are moving into a financially-driven corporate culture, there is an increased focus on profit.
The industry will remain profitable, but profits are forecast to decline in 2017.

Airline Business Environment

Annual trend of airline operating profits globally

Operating Profit, US$ Billions


Source: IATA (June 2017) E = Estimate F = Forecast
Airlines are winning the load factor race at the cost of profit spillage. Key performance metrics such as demand, capacity, yield and unit costs have a direct impact on profitability. Since 2005, there has been a 67% increase in passenger numbers. Comparatively, capacity has increased by 56% since 2005, which has brought load factors to record levels. In 2016, the average global load factor was 80.5%.

In addition, oil prices have decreased significantly, contributing to low unit costs. Yields, on the other hand, have decreased steadily, with a 33% drop in the average fare since 2005.

Source: IATA
Consumer Preferences

Consumer price sensitivity has driven cost reduction, which has impacted passenger comfort.

What influences consumer ticket purchases?

- Price: 43%
- Schedule and convenient flight time: 21%
- Frequent flyer program: 13%
- Other: 23%

Consumer preferences have evolved along with the growth in the industry. Price has become the most influential factor in customer decision-making during ticket purchases. Since 2000, sensitivity towards pricing has increased at the expense of schedule and travel flexibility. Unfortunately, airlines' need to decrease fares has impacted the in-flight comfort of the passenger. The average seat width and seat pitch have decreased over the past three decades. More seats are being fit into aircraft at the expense of passenger comfort.

Source: IATA Global Passenger Survey 2015

<table>
<thead>
<tr>
<th>Year</th>
<th>Seat Pitch</th>
<th>Seat Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>32 in</td>
<td>18.5 in</td>
</tr>
<tr>
<td>2016</td>
<td>31.25 in</td>
<td>17.5 in</td>
</tr>
</tbody>
</table>

Economy class seat averages, inches
Current airline strategy considers fleet planning and revenue management as separate functions for meeting optimization goals.

Airlines are shifting towards a profit-driven optimization.

From the fleet-planning perspective, the objective has always been to fulfill this requirement at the lowest possible cost, i.e. minimizing cost per passenger. Furthermore, the revenue management function aims to use available assets and maximize revenue, i.e. maximizing revenue per trip.

The individualized optimization of these steps does not maximize their confluence. One way to augment the entire process is to ensure that the right amount of capacity is used for the demand. Optimizing one key metric, profit per passenger, maximizes profitability across all segments of the business. In order to achieve this, a shift towards a profit-centric optimization cycle is required.
Having a rigid capacity-driven planning process has negatively impacted yields. As a result, airlines have been forced to consider larger aircraft with lower unit costs per seat. This has created an over-capacity situation in many regions. The direct repercussion of flying over-capacity aircraft on routes is a decline in yield. The vicious cycle of lower yields has been a consequence of this capacity-driven cycle, resulting in around 4,000 intra-regional routes being dropped in 2016. Not all markets can sustain increased capacity, resulting in fewer new routes being opened annually.

Using right-sized aircraft breaks the vicious circle of capacity and lower yields.

Industry trends have seen many airlines following the common practice of selecting aircraft with the lowest cost per seat. In order to penetrate into smaller high yield markets, several market considerations help define the “right size” of aircraft to utilize on a route. With the right-sized aircraft new markets can be explored and thinner routes can be operated. This enables the operation of markets with lower passengers and lower trip costs, which maximizes profits.
Right-Sizing:

- Maximizes profitability in fluctuating demand conditions
- Avoids spillage
- Optimizes profitable market capture
Market Dynamics
Current Fleet

Growing at 2.4% CAGR in the past 10 years, the in-service fleet is at a record high with 6,900 aircraft.

44% of the in-service fleet is leased.

Approximately 60% of the in-service fleet is located in North America and Europe.

Regional distribution of in-service fleet

Source: Flightglobal Fleets Analyzer; does not include stored fleet
The current fleet of large regional aircraft is fairly young and is replaced consistently; hence, the average age of the fleet is close to 8 years. The small single-aisle aircraft segment, however, has a much older fleet due to the unavailability of efficient aircraft in the segment for several years. The average age for the fleet of small single-aisle aircraft is around 17 years, which makes it the oldest fleet segment in the world.

Most airlines make long-term fleet replacement decisions as their fleet approaches 15-20 years in service.
Large Regional Aircraft

Turboprops and regional jets have been sharing the market evenly.

In-service fleet share (turboprops and regional jets)

Source: Flightglobal Fleets Analyzer; does not include stored fleet
The small single-aisle aircraft segment has finally been rejuvenated with a new product offering, after a long period of being served by sub-optimized and ageing products. The segment has played an important role in growing regional markets and short- to medium-haul mainline markets. Since 2006, the number of routes flown by aircraft around the world in this seat segment has increased by 20%.

Aircraft in this segment connect over 7,000 city pairs as an integral part of airline networks globally. As mature markets look for increased penetration, the small single-aisle aircraft segment will be the ideal solution to satisfy the requirement. Similarly, as emerging markets look to grow, many airlines will require aircraft in the small single-aisle aircraft segment to launch new routes and operate thin routes profitably.
Small Single-Aisle Segment

The number of city pairs served by small single-aisle aircraft has increased sharply.

Source: City pair data based on Innovata schedule
There are strong upgauging and downgauging drivers that are impacting segment growth.

The 60- to 150-seat segment will grow organically due to flourishing economies and market penetration. Additionally, the upgauging trend from the small regional aircraft segment will drive further growth. The lower-seat segment will require larger aircraft to cater to market growth and combat regional pilot shortages. Moreover, there will be a lack of replacement options in the small regional aircraft segment, as most manufacturers are exiting the segment. There will also be a substantial amount of downsizing from the large single-aisle segment. Many airlines will aspire to capitalize on profitability on a per-route basis. Several regions will also require right-sized aircraft to complement their existing fleet and increase market penetration. A combination of the above factors will propel the 60- to 150-seat segment to 14,250 units by 2036.
Demand & Fleet Forecast
Air travel is closely linked to macroeconomics. Factors like gross domestic product (GDP), consumer spending power and middle-class population percentage have a direct impact on domestic and international travel. Bombardier uses regional penetration modeling to determine these relationships for each region.

Global GDP is projected to increase at a 2.5% compound annual growth rate (CAGR), with North America and Europe remaining the world's biggest economies. In terms of rate of growth, South Asia and Greater China will be the fastest-growing economies, with 5.7% CAGR and 4.6% CAGR respectively.

Focusing on markets where Bombardier Commercial Aircraft products typically operate, intra-regional traffic is forecast to grow by 5% CAGR. This will propel the growth of the 60- to 150-seat segment.

The following table shows the projected growth in GDP, revenue passenger kilometers (RPKs), enplanements, and fleet over the period from 2016 to 2036.

<table>
<thead>
<tr>
<th>Category</th>
<th>2016</th>
<th>2036</th>
<th>CAGR</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP</td>
<td>77T</td>
<td>126T</td>
<td>2.5%</td>
</tr>
<tr>
<td>RPKs</td>
<td>6.3T</td>
<td>16.1T</td>
<td>4.8%</td>
</tr>
<tr>
<td>Enplanements</td>
<td>3.7B</td>
<td>9.0B</td>
<td>4.7%</td>
</tr>
<tr>
<td>Intra-regional enplanements</td>
<td>2.9B</td>
<td>7.4B</td>
<td>5.0%</td>
</tr>
<tr>
<td>Fleet (60 to 150 segment)</td>
<td>6,900</td>
<td>14,250</td>
<td>3.7%</td>
</tr>
</tbody>
</table>

Intra-regional traffic to grow at 5% CAGR

RPK = revenue passenger kilometers  T = trillion  B = billion

[1] World GDP Growth Forecast at 2.5% CAGR
In 2016, over 80% of all passenger enplanements were intra-regional.

The growth of the 60- to 150-seat segment complements the evolution of intra-regional traffic globally. The demand for intra-regional traffic will continue to dominate air travel and increase rapidly by 2036. Additionally, the largest traffic flows and passenger volumes will continue to be dominated by intra-regional city pairs.

Source: Diio Mi, Bombardier Market Forecast 2017-2036
By 2036, the East Asia & Oceania intra-regional market will overtake Europe and North America in number of enplanements.

Top 20 traffic flows by enplanements

- East Asia & Oceania to East Asia & Oceania
- Europe to Europe
- Greater China to Greater China
- North America to North America
- Middle East to Middle East
- Latin America to Latin America
- South Asia to South Asia
- Middle East to Europe
- Russia & CIS to Russia & CIS
- East Asia & Oceania to Greater China
- Greater China to East Asia & Oceania
- Middle East to South Asia
- North America to Latin America
- Africa to Africa
- South Asia to Middle East
- Latin America to North America
- Europe to Middle East
- Middle East to Africa
- Europe to North America
- Middle East to East Asia & Oceania
- North America to Latin America

Source: Flightglobal Fleets Analyzer, Bombardier Market Forecast 2017-2036
Bombardier uses retirement modeling by seat segment to determine the replacement demand for the forecast. Around 75% of the current global fleet in the 60- to 150-seat segment will retire by 2036. The small single-aisle segment will be the key driver for the retirements with approximately 86% of the fleet to retire.

Since the large regional aircraft segment is comparatively younger, around 64% of the fleet will be replaced. However, over 2,000 aircraft from the lower seat segment will be retiring by 2036 and will require replacement. This could have a ripple effect in all the other seat segments.

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### Global Retirement Forecast

**60- to 150-seat segment**

<table>
<thead>
<tr>
<th>Region</th>
<th>Retirements</th>
<th>% of fleet to retire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>500</td>
<td>76%</td>
</tr>
<tr>
<td>East Asia &amp; Oceania</td>
<td>700</td>
<td>72%</td>
</tr>
<tr>
<td>Europe</td>
<td>1,400</td>
<td>77%</td>
</tr>
<tr>
<td>Greater China</td>
<td>300</td>
<td>55%</td>
</tr>
<tr>
<td>Latin America</td>
<td>600</td>
<td>68%</td>
</tr>
<tr>
<td>Middle East</td>
<td>170</td>
<td>88%</td>
</tr>
<tr>
<td>North America</td>
<td>3,200</td>
<td>81%</td>
</tr>
<tr>
<td>Russia &amp; CIS</td>
<td>340</td>
<td>66%</td>
</tr>
<tr>
<td>South Asia</td>
<td>130</td>
<td>91%</td>
</tr>
</tbody>
</table>

*Includes small regional aircraft segment retirements*
Percentage of Global Fleet to Retire by 2036

<table>
<thead>
<tr>
<th>Aircraft Type</th>
<th>Percentage</th>
<th>Aircraft to Retire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large regional aircraft</td>
<td>64%</td>
<td>2,100</td>
</tr>
<tr>
<td>Small single-aisle aircraft</td>
<td>86%</td>
<td>3,100</td>
</tr>
<tr>
<td>Small regional aircraft</td>
<td>89%</td>
<td>2,200 (fleet renewal with larger regional aircraft)</td>
</tr>
</tbody>
</table>
The 60- to 150-seat segment is forecast to double by 2036.

<table>
<thead>
<tr>
<th></th>
<th>2016 fleet</th>
<th>Deliveries</th>
<th>Retirements</th>
<th>2036 fleet</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total: 60- to 150-seat segment</strong></td>
<td>6,900</td>
<td>14,250</td>
<td>5,200</td>
<td>12,550</td>
</tr>
<tr>
<td><strong>Small single-aisle aircraft</strong></td>
<td>3,600</td>
<td>6,800</td>
<td>3,400</td>
<td>7,300</td>
</tr>
<tr>
<td><strong>Large regional aircraft</strong></td>
<td>3,300</td>
<td>5,750</td>
<td>2,300</td>
<td>6,950</td>
</tr>
</tbody>
</table>
The erosion of the small regional aircraft segment will boost growth in the upper seat categories. Upgauging will have a ripple effect on the small single-aisle segment.

By 2036, there will be fewer than 400 aircraft in the small regional aircraft segment.

Source: Flightglobal Fleets Analyzer, Bombardier Market Forecast 2017-2036
By 2036, Greater China will have the second largest fleet in the 60- to 150-seat segment. North America will still have the largest fleet in 2036. But many regions such as Greater China and East Asia & Oceania will grow their fleet expeditiously to close to 2,000 in-service aircraft. The fleet in South Asia will grow to more than five times its current size as the region grows at a breathtaking pace. In most other regions, fleets are poised to increase to 2 to 3 times their current sizes.

Source: Flightglobal Fleets Analyzer, Bombardier Commercial Aircraft Market Forecast 2017-2036
Regional Forecasts
Routes under 600 NM dominate the intra-regional market.
The number of regional aircraft has grown rapidly in Africa.
For routes between 600 NM and 2,000 NM, declining yields will drive airlines to right size with more efficient aircraft.
The small single-aisle segment will facilitate the opening of new routes.
Intra-regional traffic will grow at 4.6% CAGR.
A majority of aircraft will continue to have dual-class cabins.
550 deliveries in total (4% of global delivery share)
Stabilizing and Expanding

Economic Trends
In 2016, the region's GDP growth slowed as oil-exporting countries were deeply impacted by the fall in commodity prices. It is a strong indication that the economy needs to be more balanced. Aid led by the World Bank and various countries, as well as continuous foreign investment in agriculture and manufacturing, have paved the way to transform the economy into a more globally integrated one.
Overall, the region's GDP is forecast to grow from $2.3 trillion in 2016 to $4.9 trillion in 2036, an average annual growth of 4.1% over next 20 years.

Market Dynamics
Air travel remains the most efficient transportation mode in Africa. Although international markets to and from Africa are mostly liberalized, intra-regional markets are still largely subject to restrictive bilateral agreements that create pent-up demand yet to be fully realized.
Without full-scale air liberalization, airlines are conditioned to address domestic networks and link capital cities intra- and inter-regionally. As a result of connecting networks, turboprop aircraft become a very critical tool to develop domestic networks.

<table>
<thead>
<tr>
<th>GDP growth</th>
<th>RPK growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1% CAGR</td>
<td>4.2% CAGR</td>
</tr>
</tbody>
</table>

Intra-Regional Traffic Growth

60- to 150- seat segment
550 forecast deliveries
4% of global delivery share
Fleet to grow by 2.4X
76% of fleet to retire
Breakdown of Traffic in Africa (2016)

In 2016, more than 50% of traffic flew on intra-African routes. Out of all the new routes launched in 2016, 60% were on intra-regional city pairs.

Distribution of intra-regional flights by stage length
(as of 31 Dec 2016)

- 77% Less than 600 NM
- 23% More than 600 NM

Routes with regional aircraft have grown rapidly.

- 2006: 850 city pairs
- 2016: 1,260 city pairs

Turboprops have a significant capacity share of the short-haul routes in the region in order to facilitate the demand for connectivity. The turboprop fleet in Africa is at a record high, having grown at a rate of 13% CAGR (2010-2016).

Large turboprops in Africa
(in-service fleet; large regional aircraft segment)

Source: Diio
Source: Flight Fleets Analyzer
Small single-aisle aircraft will open more new intra-regional routes in Africa.

Demand for Multiple-Class Services

Another top priority for the airline industry is to modernize fleet and proactive network planning in order to return the industry to profitability after a decade of underperformance. In order to keep pace with the growing number of intercontinental flights to and from Africa, most of the regional network now comprises multiple-class cabins. Seamless services are demanded by air travelers who connect from a widebody jet on the international leg to a turboprop aircraft to reach the final destination.

Distribution of intra-regional seats by cabin class
(as of 31 Dec 2016)

90% of intra-regional seats are operated in a dual-class cabin connecting over 70% of city pairs

Source: Diio
Aircraft Demand

Intra-regional traffic is forecast to grow 4.6% annually over the next 20 years. The 60- to 150-seat aircraft fleet will grow by 2.4 times in order to meet the growing traffic demand. A total of 550 new aircraft are needed, of which 300 aircraft will be delivered in the large regional aircraft category and 250 aircraft will be delivered in the small single-aisle category.

The combination of large turboprops and small single-aisle aircraft will optimize intra-African connectivity on short-haul and medium-haul routes.
53% of annual passengers are flown on routes under 500 NM.

More than 50% of O&D traffic has demand for less than 100 passengers per day.

Huge potential for LCCs and new route opening in the region due to under-developed connectivity.

The largest turboprop market in the world, contributing to the overall growth of the 60- to 150-seat segment.

Around 45% of the current 60- to 150-seat segment is more than 15 years old.

Tier 1 airport congestion will drive growth at Tier 2 and Tier 3 airports.

Intra-regional traffic to grow at 6.0% CAGR

1,650 deliveries in total (12% of global delivery share)

Fleet to triple by 2036
A Diverse Region with a Strong Demand for Aircraft

East Asia and Oceania is a diverse region that has a wide spectrum of economies, cultures and political systems. Overall, this region's GDP will grow at 2.0% annually over the next 20 years.

Whilst Japan has the fourth-largest economy (PPP basis) in the world, its sluggish economy coupled with an ageing population will see below-average growth over the next 20 years.

Indonesia will lead the ASEAN region with an above-average growth over next 20 years. This region continues to drive for a Single Aviation Market policy (ASEAN-SAM) that would support economic development.

Led by Australia, Oceania will drive an above-average GDP growth over the next 20 years.

In 2016, a Trans-Pacific Partnership Agreement was finalized by 12 countries on both sides of the Pacific Ocean. This agreement will promote not only trade but environmental protection, labour standards, intellectual property, etc.
Market Dynamics

Global Routes in 2016 by Distance
(all departures from East Asia & Oceania)

- Less than 600 NM: 58%
- 600 - 2,000 NM: 12%
- More than 2,000 NM: 30%

88% of current global city pairs that originate from airports in the region are less than 2,000 NM apart.

Short-haul routes are still the backbone of the region.

A majority of intra-regional demand is in short-haul routes.

Approximately 53% of all passengers fly less than 500 NM. These demand sizes require more short-haul aircraft and higher frequencies to cater to the growing demand. Moreover, the passenger demand in East Asia & Oceania is greater on shorter routes. Around 50% of O&D traffic in the region have less than 100 passengers per day.

Percentage of Intra-Regional Passengers Flown vs. Range

53%
Domestic passengers per year flying < 500 NM
Demand already exists to boost thin regional routes and short-haul point-to-point markets.

Around 50% of intra-regional O&D traffic has < 100 Passengers Per Day
Aircraft Demand

The growth in this region will mainly come from ASEAN countries. The overall RPK is forecast to grow 5.6% annually, and intra-regional traffic is forecast to grow 6.0% annually over the next 20 years. The 60- to 150-seat aircraft fleet will grow by 3 times in order to meet the growing traffic demand. A total of 1,650 new aircraft will be needed. Of these, 900 aircraft will be delivered in the large regional aircraft category, whereas 750 aircraft will be delivered in the small single-aisle category.

With close to 700 aircraft retiring in the regional and small-single aisle segments, East Asia & Oceania will have the third-largest replacement opportunity in the world.

<table>
<thead>
<tr>
<th>2016 fleet</th>
<th>Deliveries</th>
<th>Retirements</th>
<th>Net migration</th>
<th>2036 fleet</th>
</tr>
</thead>
<tbody>
<tr>
<td>650</td>
<td>1,550</td>
<td>470</td>
<td>150</td>
<td>1,880</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Large regional aircraft segment</th>
<th>650</th>
<th>1,550</th>
<th>470</th>
<th>190</th>
<th>1,150</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016 fleet</td>
<td>Deliveries</td>
<td>Retirements</td>
<td>Net migration</td>
<td>2036 fleet</td>
<td></td>
</tr>
<tr>
<td>460</td>
<td>900</td>
<td>280</td>
<td>70</td>
<td>1,150</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Small single-aisle aircraft segment</th>
<th>190</th>
<th>650</th>
<th>190</th>
<th>80</th>
<th>730</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016 fleet</td>
<td>Deliveries</td>
<td>Retirements</td>
<td>Net migration</td>
<td>2036 fleet</td>
<td></td>
</tr>
<tr>
<td>190</td>
<td>650</td>
<td>190</td>
<td>80</td>
<td>730</td>
<td></td>
</tr>
</tbody>
</table>
Europe

Most intra-regional routes are within 2,000 NM and are growing fast.

Average seats per departure on intra-European routes still favour the 60- to 150-seat segment.

European market focus continues to be on shorter, thinner routes.

As many markets near saturation, smaller aircraft will facilitate new route openings.

Intra-regional traffic to grow at 3.9% CAGR

2,200 deliveries in total (18% of global delivery share)

One of the largest fleet replacement markets in the world in the 20- to 150-seat segment, with over 1,400 aircraft to be replaced by 2036.
Post-Brexit Stability

Europe has the largest and most mature economy in the world. Its GDP is forecast to grow annually at 1.4% over the next 20 years. The whole economy will grow from $20.5 trillion in 2016 to $26.9 trillion in 2036. Whilst there is variation in country-level economies, most countries in Europe have a per-capita GDP above the world average. This is reflected in the lowest regional GDP growth rate as compared to other regions.

The outcome of the “Brexit” referendum has raised concerns regarding the impact on the UK, Europe and the rest of the world. Over the short term, a decline in tourism-driven passenger traffic is expected. The long-term effect on the economy and trade is still yet to be fully understood and realized. Eastern European countries generally have average GDP growth for the region.

GDP growth

1.4% CAGR

Intra-regional traffic growth

3.9% CAGR

60- to 150- seat segment

2,200 forecast deliveries
18% of global delivery share
Fleet to grow by 1.3X
77% of the fleet to retire
Most of the European intra-regional routes in 2016 were within 2,000 NM in distance. The 600 NM to 2,000 NM sector has been the fastest growing sector with many airlines adding more point-to-point routes over the stage length.

Intra-European market focus continues to be on shorter routes.

Average O&D weekly flights

Only 5% of the routes are flown 7 or more times a week. Hence, tremendous potential exists for higher frequencies on short- to medium-haul routes.
Approximately 1,400 aircraft are to be replaced in the region by 2036.

Around 40% of the fleet in the 20- to 150-seat segment is over 15 years of age, making Europe one of the largest replacement markets in the world.

Age profile
(20- to 150-seat segment in Europe)

Cost pressure and low yields are the driving upgauging trend.

Fleet segment evolution
In the regional segment, small regional aircraft are being replaced gradually by more efficient large regional aircraft. Both types are utilized in their respective networks to provide optimal solutions for profitability.

In-service fleet in Europe

The large regional aircraft segment is growing at a fairly even rate for turboprops and regional jets.

Source: Flight Fleets Analyzer
Aircraft Demand

The overall RPK is forecast to grow 3.7% annually and intra-regional traffic is forecast to grow 3.9% annually over the next 20 years. The 60- to 150-seat aircraft fleet will grow by 1.3 times in order to meet the growing traffic demand. A total of 2,200 aircraft will be delivered in the 60- to 150-seat aircraft segment. 1,000 aircraft will be delivered in the large regional aircraft category, whereas 1,200 aircraft will be delivered in the small single-aisle category.

<table>
<thead>
<tr>
<th></th>
<th>2016 fleet</th>
<th>Deliveries</th>
<th>Retirements</th>
<th>Net migration</th>
<th>2036 fleet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>1,490</td>
<td>2,200</td>
<td>1,140</td>
<td>(620)</td>
<td>1,930</td>
</tr>
<tr>
<td>Large regional</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>aircraft segment</td>
<td>690</td>
<td>1,000</td>
<td>500</td>
<td>430</td>
<td>760</td>
</tr>
<tr>
<td>Small single-aisle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>aircraft segment</td>
<td>800</td>
<td>1,200</td>
<td>640</td>
<td>190</td>
<td>1,170</td>
</tr>
</tbody>
</table>

Cost pressure and low yields are driving upgauging trend to large regional aircraft and small single-aisle aircraft.
The network operated by regional aircraft has grown rapidly in the region since 2006.

The fleet in China still lags behind the numbers seen globally, especially for turboprops and regional jets.

A majority of intra-regional demand has less than 100 passengers daily.

One-third of domestic passengers fly less than 500 NM, with most flying on larger single-aisle aircraft.

Several startup airlines are emerging to capture growth and will require a large number of regional aircraft.

Intra-regional traffic to grow at 5.2% CAGR

2,150 deliveries in total (17% of global delivery share)

Fleet to quadruple by 2036
The Fastest-Growing Market

Led by China, this region will continue to chart stellar economic growth with a forecast 4.6% annual GDP growth rate over the next 20 years. The GDP will more than double from $10.3 trillion in 2016 to $24.1 trillion in 2036.

Whilst China has the largest economy and the largest population in the world, its per capita GDP (PPP basis) was still below world average in 2016, presenting a tremendous growth opportunity. The Chinese government has taken a highly regulated approach to control its socio-economic development, in order to ensure stability and prosperity. 2016, marked the first year of the country’s 13th five-year plan, which outlined the importance of continuous economic reform to drive increased domestic consumption and innovation. It is essential to rebalance its reliance on exports and foreign investments, which are dependent on its trading partners’ own economic cycles. Conglomerates are rising to the world stage and are determined to lead business innovation domestically and globally.

In contrast, Hong Kong, Macau and Taiwan play a seemingly less-important role in Greater China’s growth. Nonetheless, they serve as international gateways for China.
Market Dynamics

The regional network has grown rapidly in the last 10 years.

(Number of routes)

Source: Diio Mi

The number of routes operated by regional aircraft in China has grown at a very fast pace. The passenger demand in Greater China is higher on shorter routes. More than 50% of O&D traffic in the region has less than 100 passengers per day. Moreover, approximately 34% of all passengers fly less than 500 NM per year. These market characteristics require more short-haul aircraft and higher frequencies to cater to the growing demand.

Daily intra-regional O&D passengers

Current market demands require more regional aircraft to boost connectivity.

More than 50% of intra-regional O&D traffic has < 100 passengers per day
Tier 2 and Tier 3 Airports are Underserved in the Region.

New route potential
(China domestic market)

<table>
<thead>
<tr>
<th>Market types</th>
<th>Potential routes</th>
<th>Currently served</th>
<th>Daily flights</th>
<th>Competition on route</th>
<th>YOY growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tier 1 – Tier 1</td>
<td>171</td>
<td>91%</td>
<td>&gt;10</td>
<td>Extreme</td>
<td>9%</td>
</tr>
<tr>
<td>Tier 1 – Tier 2</td>
<td>969</td>
<td>68%</td>
<td>&gt;3</td>
<td>High</td>
<td>9%</td>
</tr>
<tr>
<td>Tier 1 – Tier 3</td>
<td>2,584</td>
<td>22%</td>
<td>1</td>
<td>Moderate</td>
<td>16%</td>
</tr>
<tr>
<td>Tier 2 – Tier 2</td>
<td>1,275</td>
<td>26%</td>
<td>1</td>
<td>Moderate</td>
<td>14%</td>
</tr>
<tr>
<td>Tier 2 – Tier 3</td>
<td>6,936</td>
<td>5%</td>
<td>1</td>
<td>Low</td>
<td>33%</td>
</tr>
<tr>
<td>Tier 3 – Tier 3</td>
<td>9,180</td>
<td>0.3%</td>
<td>0.3</td>
<td>Very low</td>
<td>43%</td>
</tr>
<tr>
<td>Total</td>
<td>21,115</td>
<td>10%</td>
<td>2</td>
<td>-</td>
<td>11%</td>
</tr>
</tbody>
</table>

Highest growth is seen in Tier 2 & Tier 3 cities.

China’s civil aviation is tightly regulated by the Civil Aviation Administration of China (CAAC). Although it is the world’s most populous country, China has a relatively low number of airports. In 2016, there were only 217 airports with recorded passenger data. As a result, airport congestion has already constrained growth at Tier 1 airports (over 15 million annual passenger throughput). Major carriers based at these hub airports have acquired larger aircraft in order to maximize utilization of available slots.

Tier 1 routes have lower growth and high competition, leading to pricing pressure.

In contrast, growth at Tier 2 and Tier 3 airports is in the double digits. Hence, there is tremendous penetration potential at these airports, which will require aircraft in the 60- to 150-seat segment.

Source: IATA Schedules, Pax15S, BCA Analysis (all data as of 31st Dec 2016)
Growth at Tier 2 & Tier 3 cities will be encouraged by airport expansion.

Number Of Chinese airports

Source: IATA, CAAC and Bombardier Analysis

64 new airports by 2020
High Single-Aisle Fleet Share Driven by Historical Focus on Tier 1 Cities

The Chinese fleet still lags behind fleets globally.

An imbalance of aircraft application is observed in the China market. Strong reliance of single-aisle aircraft is driven by historical focus on developing top tier markets. The mismatch between capacity and demand is so evident that a large amount of routes are designed with multiple stops between origin and destination.

As the industry continues to mature, an influx of smaller single-aisle and regional aircraft are necessary to realign supply, demand and service frequency. It will also increase the yield and enhance the overall profitability of the industry.

Global aircraft split on routes <500 NM

- Single-aisle: 26%
- Turboprop: 2%
- Regional jet: 13%
- Widebody: 59%

Aircraft split on domestic routes in China <500 NM

- Single-aisle: 95%
- Turboprop: 2%
- Regional jet: 1%
- Widebody: 2%
Aircraft Demand

In 2016, the CAAC issued a new directive to mandate new start-up carriers to build up a fleet of 25 regional aircraft and achieve a monthly fleet utilization of 3,000 hours before it can consider allowing the acquisition of larger aircraft. This new directive opens new opportunities for more regional networks and the development of secondary hubs to alleviate the congestion at Tier 1 and 2 airports.

Intra-regional traffic is forecast to grow at 5.2% annually over the next 20 years. The 60- to 150-seat aircraft fleet will grow by 3.9 times in order to meet the growing traffic demand. A total of 2,150 aircraft will be delivered in the 60- to 150-seat aircraft segment. 900 aircraft will be delivered in the large regional aircraft category, whereas 1,250 aircraft will be delivered in the small single-aisle category.

Tier 2 and Tier 3 airports are underserved in the region and are growing fast.
Latin America

The economy is recovering with high passenger demand. However, yields are declining.

There is huge potential for increased point-to-point routes in the region.

Routes under 1,000 NM dominate the intra-regional market and are growing fast.

Large replacement market with continuing trend of growth in the 60- to 150-seat segment.

Intra-regional traffic to grow at 5.6% CAGR.

1,050 deliveries in total (8% of global delivery share).

Fleet to double by 2036.

There is a large dispersion of cities with low populations in the region.
In a Phase of Economic Recovery

There is a cyclicality of different economies within the Latin America and Caribbean region. The downward economic trend is further overshadowed by the recessions in Brazil and Venezuela. Whilst Brazil’s economy contracted again in 2016, it is expected that its GDP growth will reach the break-even point in 2017.

Mexico—the second-largest economy in the region—Chile, Columbia and Panama all performed well above the regional average in 2016.

Over recent years, commodity-based currencies have been devalued substantially due to falling prices and an appreciating US dollar.

Worsening inflation has put pressure on further monetary control in certain countries.

The long-term economic outlook of the region will be just below the world average, at 2.4% over the next 20 years.

GDP growth

2.4% 5.1%

Intra-regional traffic growth

5.6%

60- to 150-seat segment

1,050 forecast deliveries
8% of global delivery share
Fleet to grow by 2.0X
68% of the fleet to retire
Market Dynamics

Sluggish economic growth and weakening currencies have impacted revenue and yields. Although the economy is underperforming, air traffic growth continued in Latin America & Caribbean in 2016. This was largely at the expense of falling yields and led to a drop in airline revenue. Like other regions, network developments have been focused on linking major metro cities. The top 15 airports accounted for more than half of all capacity in the region. Tier 2 and Tier 3 airports will grow at a faster rate and cater to future demand through point-to-point routes.

Although there has been intake of new aircraft in the region, the average age of the fleet is still relatively high. Over 25% of aircraft of 150 seats or less are over 20 years of age.
There is significant potential for LCCs to grow in the region.

Intra-regional connectivity with small cities can be covered by modern regional aircraft. Connectivity to the US, the most important international market, requires aircraft with exceptional range and performance capability.

New generation small single-aisle aircraft open up new point-to-point non-stop opportunities to access secondary US cities profitably.

Since capacity increase will be the primary focus for LCCs, right-sizing of fleets will be critical.

LCC share of departing seats

Source: ALTA, Innovata schedules
In 2016, around 90% of all intra-regional flights were below 1,000 NM in stage length. With its dispersed population (most cities have less than 100,000 inhabitants), application of smaller-gauge aircraft is a necessity in order to develop well-connected networks around the region. This is evidenced by the 10-fold increase in large regional aircraft fleet size over the past 10 years.

Future network optimization will rely on regional aircraft for growth and small single-aisle aircraft for point-to-point connectivity.

Source: Diio as of 31st Dec 2016 / Flight Fleets Analyzer
With a moderate economic forecast, the overall RPK is forecast to grow 5.1% annually and intra-regional traffic to grow 5.6% annually over the next 20 years. The 60- to 150-seat aircraft fleet will grow by 2 times in order to meet the growing traffic demand. A total of 1,050 aircraft will be delivered in the 60- to 150-seat segment. 500 aircraft will be delivered in the large regional aircraft category, whereas 550 aircraft will be delivered in the small single-aisle category.

The 60- to 150-seat segment is well placed in the region to capture future growth.
Capacity management is essential for restoring profit growth.

The Middle East lags behind the global market in terms of regional market penetration.

Intra-regional traffic to grow at over 8% CAGR

450 deliveries in total (4% of global delivery share)

A majority of intra-regional routes are flown on larger single-aisle aircraft or widebodies.
Re-Evaluating Strategy

Economic development in the Middle East is countered by a continued cycle of conflict in the region. Geopolitics will heavily influence the course of the economy in the region.

In 2016, non-oil economic activities remained strong in the region, but the oil sector suffered from the reduced crude production orchestrated by the Organization of the Petroleum Exporting Countries (OPEC).

As the world’s crude inventory remains at record levels and other non-OPEC oil-producing countries continue to ramp up production, Middle Eastern countries will need to adapt for long-term prosperity. Nonetheless, the oil sector will remain the driver for the regional economy. The overall GDP is forecast to grow above the world average at 3.1% annually for the next 20 years.

<table>
<thead>
<tr>
<th>GDP growth</th>
<th>RPK growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1% CAGR</td>
<td>8.1% CAGR</td>
</tr>
</tbody>
</table>

Intra-regional traffic growth

60- to 150- seat segment

- 450 forecast deliveries
- 4% of global delivery share
- Fleet to grow by 3.4X
- 88% of the fleet to retire
Market Dynamics

Capacity management is essential to restore profit growth

While profitability was still recorded by the Middle East airlines in 2016, it is on a downward trend. Double-digit capacity growth in the past two years was achieved at the expense of decreasing yields due to emergence of low-cost carriers in the region. The widebody-driven business model has been put under pressure, in light of a series of attempts by the US to curb air travel between some Middle East countries and the US. A slowdown in widebody aircraft deliveries is expected for the major carriers in the region. This presents a great opportunity for fleet planners to re-examine and re-balance the fleet mix in order to develop intra-regional connectivity, which has been largely bypassed in favour of inter-regional networks, to fit demand to capacity.

Source: IATA
Segmentation of intra-regional routes with sector length of 600-2,000 NM (% of flights)

- Small single-aisle aircraft segment: 7%
- Large single-aisle aircraft segment: 14%
- Regional jets: 36%
- Widebodies: 43%

Airlines adding capacity to gain market share have caused yields to fall.

The increase in seats per flight signals a demand-capacity imbalance.

Source: Flight Fleets Analyzer

Source: Diio
Regional Fleet Lags Behind Global Trend

24% of the global fleet is comprised of turboprops and regional jets. However, regional aircraft make up only 5% of the fleet in the Middle East. Fleets in the 60- to 150-seat segment will need to grow to match 8.8% CAGR intra-regional passenger growth. Right-sizing of the fleet will lead to higher market penetration and improve yields.

The difference is most pronounced for turboprops and regional jets.

Segmentation of in-service aircraft

Source: Flight Fleets Analyzer
With an above-average economic growth forecast, the overall RPK is expected to grow 8.1% annually, and intra-regional traffic is forecast to grow 8.8% annually over the next 20 years.

The 60- to 150-seat aircraft fleet will grow by 3.4 times in order to meet the growing traffic demand. A total of 450 aircraft will be delivered in the 60- to 150-seat segment.

200 aircraft will be delivered in the large regional aircraft category, whereas 250 aircraft will be delivered in the small single-aisle category.

Right-sizing of the fleet will lead to market penetration and profitability.
North America will remain the largest fleet in the world with over 4,000 aircraft.

3,400 deliveries in total (28% global delivery share)

1,130 aircraft retiring in the small regional aircraft segment will be replaced with larger-gauge aircraft.

A large increase in the number of 70-seaters is expected.

Average numbers of onboard passengers per domestic departure will remain within the small single-aisle seat range.

75% of the current fleet will retire by 2036.
Well-Positioned for Continuous Optimization

The new US administration is heading in a direction that is generally regarded as favouring domestic business and the economy. The risk of protectionism, however, casts a shadow over the aviation market. A travel ban from certain countries could possibly slow down international traffic to and from the US.

Increasing oil inventory in the US is gradually influencing world oil prices and supply, effectively weakening the decades-long control of the oil market by the OPEC countries. Oil is strongly linked to economic growth in the US and the rest of the world.

While the Canadian economy is closely linked to the US economy, it has a relatively stringent regulatory framework governing its development, as demonstrated during the financial crisis of 2008. As the current majority government continues to carry out its mandate, more stable economic development is expected in the medium term. However, there are potential risks to the economy as a result of the pending renegotiation of NAFTA, which may present longer-term economic impacts.

Over the forecast period, the GDP of North America will grow from $18.8T in 2016 to $25.5T in 2036, an annual growth rate of 1.7%. It will be the second-largest economy, with 20.4% of world total GDP by 2036.

Intra-regional traffic growth

- 1.7% GDP growth (CAGR)
- 2.1% RPK growth (CAGR)

60- to 150-seat segment

- 3,400 forecast deliveries
- 27% of global delivery share
- Fleet to grow by 1.5X
- 81% of the fleet to retire
The North American airline industry is expected to record another profitable year in 2016, totaling 7 consecutive years of profitability since 2010. This is a direct result of the industry consolidation in the last decade.

One of the main reasons for the continuous profitability of North American carriers is their focus on high-yield intra-regional markets. However, in 2016 the year-over-year capacity (ASK) growth of 3.7% has finally outpaced the demand (RPK) of 3.2%, reducing the passenger load factor from the peak level of 84.0% in 2015 to 83.5% in 2016.

Domestic yields remain strong.

Source: U.S. DOT T100 Database (date shown for Oct 2015)
Entering a new era of small single-aisle aircraft

Attrition in the small regional aircraft segment has increased the average seats per flight. Upgauging trends are already evident.

Average seats per domestic departure

% of seats per domestic departure

Source: A4A, Diio Mi published schedules as of Jan 27, 2017
U.S. Pilot Shortage and Scope Clause

In an attempt to improve aviation safety, the FAA implemented a rule in 2013 to raise the prerequisite to 1,500 hours to acquire the Airline Transport Pilot certificate, which is now required for all airline First Officers entering their flying career.

The adverse impact of the pilot shortage has begun to show in the market. The regional pilot training class fill rate has dropped from 75% in 2013 to 65% in 2015. The 1500-hour rule has discouraged young pilots from entering the airline industry.

The number of new regional pilot recruits who meet the 1,500-hour rule and who passed the safety assessment meet less than 2/3 of the industry’s requirements.

The adverse impact of the pilot shortage has also impacted small communities. Since 2013, over 100 airports have lost services. The social and economic impacts of this phenomenon are significant.
Scope clauses are contentious items during contract negotiation between airline management and pilot unions. They are something that unions do not want to give away easily because they are directly linked to mainline pilot jobs, while airline management would prefer to do without them in order to streamline operations and increase efficiency. In previous down cycles, airlines were able to open up scope to allow more, bigger and heavier regional jets into the system, within the bankruptcy restructuring mandates. In the current up cycle however, unions are able to gain wage hikes and more benefits as well as continuing to restrict the scope of regional flying.

After 20 years of change, scope is currently limited to 76 seats and 86,000 lb MTOW for all major carriers that utilize regional aircraft in their network. This has effectively created a gap, as a large number of large regional jets are replacing the older smaller regional jets (30-60 seats). From 2006 to 2016, the fleet of larger regional jets has grown by 2.5 times.

The prospect of further scope relief is bleak, even though most major carriers have reached the limit for expanding their large regional jet fleets. Pilot unions have suggested that they are not interested in increasing the MTOW limit to allow current regional jets under development to be considered in the negotiation, and with the current pilot shortage, pilot unions hold serious leverage.

Source: Flightglobal Fleets Analyzer
The current scope clause is designed around regional jets such as CRJ700/900. They are undoubtedly the most suitable aircraft type today and for the foreseeable future. There is a need for more large regional jets to drive efficiency, but the ability to add more units is largely constrained by the current scope. Due to the pilot shortage, replacing small regional jets will make expanding the large regional jet fleet vital.

As a result of small-regional jet early retirements, the average seats per departure has increased in the US from 105.5 in 2010 to 116.7 in 2016.

The limit of 76 seats has created an opportunity for the new generation jet in the small single-aisle segment to bridge the fleet “gap” and provide mainline carriers with the ability to right-size capacity to market demand. This was not possible with previous small single-aisle products due to their sub-optimized design and resulting high unit cost. Only optimized aircraft in this segment are able to provide the cost efficiency and profitability needed. This allows airlines to open up new market opportunities.

Many airlines will add aircraft in the small single-aisle segment, signaling the end of scope creep and the beginning of a new era in this market.

Scope requirements will result in an increase in 70-seater aircraft in service by 2036.

The regional upgauging trend is already evident in North America.
Over the next two decades, more than 3,000 aircraft will need to be replaced in North America.

Over 1,000 aircraft are set to retire by 2036 in the small regional aircraft segment.

Around 2,100 aircraft are set to retire by 2036 in the 60-150-seat segment.

Age profile of in-service fleet (20- to 150-seat segments)

- 25+ years
- 15-24 years
- 0-14 years

60% 31% 9%
Aircraft Demand

With robust economic trends, the overall revenue (RPK) is forecast to grow 2.1% annually. Intra-regional traffic is forecast to grow 2.1% annually over the next 20 years. The 60- to 150-seat aircraft fleet will grow by 1.5 times in order to meet the growing traffic demand. Coupled with the requirement to replace an ageing fleet, a total of 3,400 new aircraft will be required. In the regional segment, the large regional aircraft fleet will continue to grow and replace ageing smaller-gauge regional aircraft.

North America is the largest replacement market in the world.

<table>
<thead>
<tr>
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<th>Deliveries</th>
<th>Retirements</th>
<th>Net migration</th>
<th>2036 fleet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>2,610</td>
<td>3,400</td>
<td>2,120</td>
<td>60</td>
</tr>
</tbody>
</table>

### Large regional aircraft segment
- 2016 fleet: 1,240
- Deliveries: 1,400
- Retirements: 820
- Net migration: 240
- 2036 fleet: 2,060

### Small single-aisle aircraft segment
- 2016 fleet: 1,370
- Deliveries: 2,000
- Net migration: 130
- 2036 fleet: 1,890
Replacement demand is high, with two-thirds of the fleet in the 20- to 150-seat segment over 15 years of age.

Intra-regional routes require many thin routes to be operated, which require right-sized aircraft.

Economic recovery will be the catalyst for increased connectivity in the region, requiring aircraft in the 60- to 150-seat segment.

Intra-regional traffic to grow at 7.6% CAGR

700 deliveries in total (6% of global delivery share)
Recovering at a Steady Pace

After a deep deterioration in 2015, the economy of the CIS countries just barely recorded growth in GDP in 2016. Continued easing of the recession in Russia and the upward trend of commodity prices are strong indicators for increased trade activities and gradual economic recovery in 2017. Ukraine and Kazakhstan, the next two largest economies, both recorded economic growth above the regional average in 2016. Thanks to significant investment in infrastructure development, Ukraine in particular recovered from a -9.9% contraction in 2015 to 2.2% growth in 2016.

In 2016, Russian carriers reduced domestic capacity, anticipating a year of continued recession. Despite that decision, RPK grew by 2.5% in 2016. This growth pushed the passenger load factor up to 80.4%. As Russia is expected to return to growth, the overall economy of the region will trend positively.

Over the long term, the GDP of the region is expected to grow at 2.1% annually for the next 20 years.

Russia has unique demographics. Its most populous cities are widely dispersed with lots of smaller cities over a vast landmass. To provide profitable connectivity, airlines must operate small-size aircraft with high range capacity. As the economy stabilizes and grows, the number of short-haul routes will increase in frequency and new medium-haul routes will emerge within the region.

<table>
<thead>
<tr>
<th>GDP growth</th>
<th>RPK growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1% CAGR</td>
<td>7.2% CAGR</td>
</tr>
</tbody>
</table>

Intra-regional traffic growth

| 7.6% CAGR |

60- to 150-seat segment

700 forecast deliveries
6% of global delivery share
Fleet to grow by 2.7X
66% of the fleet to retire
Market Dynamics

Only 30 routes are flown 7 or more times a week.

A dispersed population and large distances require right-sized aircraft to further boost connectivity.

Economic growth will be the catalyst for increased intra-Russia connectivity.

Average O&D weekly flights

Source: Diio

Source: Diio Mi; F=Forecast
Replacement demand is high, with around two-thirds of the fleet over 15 years of age.

**Over 110 aircraft**

to retire by 2036 in the small regional aircraft segment.

**Around 230 aircraft**

to retire by 2036 in the small regional aircraft segment.

Replacement demand is high, with around two-thirds of the fleet over 15 years of age.

**Based on market needs, the fleet has converged towards the 60- to 150-seat segment.**

**Segmentation dynamics**

(% of in-service fleet)

**Fleet evolution by seat segment**

(in-service aircraft only)

**Fleet evolution by seat segment**

(in-service aircraft only)

**Number of aircraft**

<table>
<thead>
<tr>
<th>2006</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>395</td>
<td>420</td>
</tr>
<tr>
<td>180</td>
<td>210</td>
</tr>
<tr>
<td>95</td>
<td>105</td>
</tr>
</tbody>
</table>

**Source:** Flightglobal Fleets Analyzer
With moderate economic growth forecast, the overall RPK is forecast to grow 5.1% annually, and intra-regional traffic is forecast to grow 5.6% annually over the next 20 years. The 60- to 150-seat aircraft fleet will grow by 2 times in order to meet the growing traffic demand.

A total of 1,050 aircraft will be delivered in the 60- to 150-seat aircraft category. 500 aircraft will be delivered in the large regional aircraft category, whereas 550 aircraft will be delivered in the small single-aisle category.

Opportunities exist to boost frequencies on current short-haul routes and add new medium-haul routes across the region.
South Asia

India is the fastest-growing air travel market in the world, propelling the South Asia region.

The majority of routes in the region are under 600 NM and growing fast.

More than 100 turboprops are operating in the region. This number has doubled since 2006.

The small single-aisle segment will facilitate the opening of new routes.

India’s Ministry of Civil Aviation has several initiatives in place to support the growth of domestic connectivity.

500 deliveries in total (4% of global delivery share)

60- to 150-seat segment to quadruple by 2036
A Fast-Growing Market Focused on Regional Connectivity

The economy of South Asia is forecast to grow to nearly 3 times its current size over the next 20 years. It is the highest growth region in the world, driven by a young population and a growing middle-class.

In addition to inherent demographic characteristics, the success of the region is also dependent on its domestic economic reform and increasing integration into the world economy.

Like its economy, India dominates the aviation market in the region. The Indian aviation market has been hyper-active again in recent years. In 2016, it recorded year-over-year domestic traffic growth of 23.3% and a passenger load factor of 83.8%. A significant portion of this growth was from low-cost carriers, which have concentrated networks around the metro cities. Other South Asian countries such as Bangladesh, Maldives, Bhutan, Nepal, and Sri Lanka are relatively small in land mass, with plenty of underdeveloped airfields that will not be upgraded in the near future. Their requirements often prioritize domestic connectivity and the linking of several international gateways. Therefore, turboprop and longer-range single aisle aircraft make up their main aircraft fleet.

### GDP growth and RPK growth

<table>
<thead>
<tr>
<th>GDP growth</th>
<th>RPK growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.7%</td>
<td>7.2%</td>
</tr>
</tbody>
</table>

### Intra-regional traffic growth

8.0%

### 60- to 150-seat segment

- 500 forecasted deliveries
- 4% of global delivery share
- Fleet to grow by 4.6X
- 91% of the fleet to retire
Market Dynamics

India is the world’s fastest-growing economy and air travel market. The rapid growth in the 60- to 150-seat segment will facilitate new routes being opened and more cities being connected.

Domestic traffic in India grew by 23% in 2016.

In 2016, around 71% of all intra-regional flights were operated on routes under 600 NM in stage length. In the past decade, the number of new routes under 600 NM has grown faster than routes over 600 NM.
RCS will increase market penetration, further boosting intra-regional connectivity.

The Ministry of Civil Aviation in India has several initiatives in place to enhance regional connectivity and infrastructure development. The aviation policy has mostly been successful in promoting air services to small communities, including through lower fuel tax on turboprop aircraft and discounted landing fees for aircraft with a capacity of less than 80 seats. In 2016, the aviation authority rolled out the new Regional Connectivity Scheme (RCS). It contains a series of measures to lower airline operating costs to Tier 2 and Tier 3 airports, as well as capping fares to affordable levels to the general public.

As the country’s average sector distance is only around 350 NM, turboprop aircraft are particularly suitable for linking Tier 2/3 cities to the rest of the country. A more comprehensive and modern fleet is needed to develop various business models to suit different needs in the South Asia region.

Regional aircraft have been successfully used to try new routes and increase market penetration in South Asia. As these markets mature, larger regional aircraft will be required, as well as single-aisle aircraft, especially in the 60- to 150-seat segment.

95 new intra-regional city pairs were launched with regional aircraft in 2016.

Source: Flightglobal Fleets Analyzer
With an optimistic economic trend, the overall RPK is forecast to grow 7.8% annually and intra-regional traffic is forecast to grow 8.0% annually over the next 20 years. The 60- to 150-seat aircraft fleet will grow by 5.1 times in order to meet the growing traffic demand. A total of 500 new aircraft are needed.

### Intra-regional traffic to grow at 8.0% CAGR

**2016 fleet**
- Large regional aircraft segment: 70
- Small single-aisle aircraft segment: 40

**Deliveries**
- Large regional aircraft segment: 150
- Small single-aisle aircraft segment: 350

**Retirements**
- Large regional aircraft segment: 60
- Small single-aisle aircraft segment: 40

**Net migration**
- Large regional aircraft segment: 10
- Small single-aisle aircraft segment: 10

**2036 fleet**
- Total: 510
Conclusion
The 60- to 150-seat segment will be a key catalyst to further growth, market penetration and airline profitability.

Intra-regional traffic to grow at 5% per year

By observing capacity discipline and investing in right-sized aircraft, airlines will further boost profit per seat.

The large regional aircraft segment will continue to penetrate short-haul markets.

The 20- to 60-seat segment erosion will have a ripple effect into the higher seat segments.

The small single-aisle aircraft segment will usher in a new narrowbody era in air transportation.
Deliveries

**Large regional aircraft segment**
- Deliveries: 5,750
- Revenue (US $): $240B
- Strong delivery demand from Asia Pacific owing to growth; renewal in demand driven by North America and Europe

**Small single-aisle segment**
- Deliveries: 6,800
- Revenue (US $): $580B
- Delivery demand driven by North America, Europe & Greater China

Source: Flightglobal Fleets Analyzer, Bombardier Commercial Aircraft Market Forecast 2017-2036
Methodology

Current fleet

Market dynamics
- Historical market analysis
- Industry drivers
- Airline business environment

Future fleet

Delivery outlook
- Business model
- Evolution
- Network optimization
- Gauging
- Aircraft utilization

RETIREMENTS
- Operating cost
- Retirement profile
- Fleet utilization

MIGRATIONS
- Leasing market
- Oil prices
- Aircraft availability

GROWTH
- Demand forecast
- Macroeconomics
- Regional penetration curves
This presentation includes forward-looking statements. Forward-looking statements generally can be identified by the use of forward-looking terminology such as “may,” “will,” “expect,” “intend,” “anticipate,” “plan,” “foresee,” “believe” or “continue” or the negatives of these terms or variations thereon or similar terminology. By their nature, forward-looking statements require BOMBARDIER to make assumptions and are subject to important known and unknown risks and uncertainties, which may cause BOMBARDIER’s actual results in future periods to differ materially from forecast results. While BOMBARDIER considers its assumptions to be reasonable and appropriate based on information currently available, there is a risk that they may not be accurate. For additional information with respect to the assumptions underlying the forward-looking statements herein, please refer to the sections on BOMBARDIER’s aerospace segment and BOMBARDIER’s transportation segment in the Management’s Discussion and Analysis of BOMBARDIER’s Annual Report.

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All monetary amounts are expressed in 2017 US dollars, unless otherwise stated.
## Regional Segmentation

### Africa
- Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo (Republic), Cote D'Ivoire, Democratic Republic of Congo, Egypt, Equatorial Guinea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Kenya, Lesotho, Libya, Madagascar, Malawi, Mali, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Reunion, Rwanda, Sao Tome & Principe, Senegal, Seychelles, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Togo, Tunisia, Uganda, Zambia, Zimbabwe

### East Asia & Oceania
- Australia, Brunei, Cambodia, East Timor, Fiji, Indonesia, Japan, Kiribati, Laos, Malaysia, Mongolia, Myanmar, New Zealand, North Korea, Papua New Guinea, Philippines, Singapore, Solomon Islands, South Korea, Thailand, Timor, Tonga, Vanuatu, Vietnam

### Greater China
- China, Hong Kong, Macau, Taiwan

### Russia & CIS
- Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan

### Europe
- Albania, Austria, Belgium, Bosnia & Herzegovina, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Kosovo, Latvia, Lithuania, Luxembourg, Macedonia, Malta, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom

### Latin America
- Anguilla, Antigua and Barbuda, Argentina, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Brazil, Cayman Islands, Chile, Colombia, Costa Rica, Cuba, Curacao, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guadeloupe, Guatemala, Guyana, Haiti, Honduras, Jamaica, Martinique, Mexico, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, St Kitts and Nevis, St Vincent and the Grenadines, St. Lucia, Suriname, The Bahamas, Trinidad & Tobago, UK Virgin Islands, Uruguay, US Virgin Islands, Venezuela, Virgin Islands (US)

### Middle East
- Bahrain, Cyprus, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, Turkey, UAE, Yemen

### North America
- Canada, USA

### South Asia
- Afghanistan, Bangladesh, India, Maldives, Nepal, Pakistan, Sri Lanka
Fleet Segmentation

| Large regional aircraft | ATR-72, Q400, MA70, An-148, An-158, Avro RJ-100, Avro RJ-85, BAE-146, CRJ700, CRJ900, CRJ1000, ARJ-21, E170, E175, E190, F-70, F-28, MRJ-90, SSJ-100, Tu-134 |
| Small single-aisle | A319ceo/ne, DC-9, MD-80, B717, B737 (-300/ -500/ -600/ -700), CS100, CS300, E190-E2, E195/E195-E2, F-100, Yak-42 |

Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AACO</td>
<td>Arab Air Carriers Organization</td>
</tr>
<tr>
<td>AFRAA</td>
<td>African Airlines Association</td>
</tr>
<tr>
<td>ALTA</td>
<td>Latin America &amp; Caribbean Air Transport Association</td>
</tr>
<tr>
<td>ASK</td>
<td>Available seat kilometres</td>
</tr>
<tr>
<td>A4A</td>
<td>Airlines for America</td>
</tr>
<tr>
<td>CAAC</td>
<td>Civil Aviation Administration of China</td>
</tr>
<tr>
<td>CAGR</td>
<td>Compound annual growth rate</td>
</tr>
<tr>
<td>CIS</td>
<td>Commonwealth of Independent States</td>
</tr>
<tr>
<td>DGCA</td>
<td>Directorate General of Civil Aviation</td>
</tr>
<tr>
<td>DOT</td>
<td>US Department of Transportation</td>
</tr>
<tr>
<td>EIA</td>
<td>US Energy Information Administration</td>
</tr>
<tr>
<td>EIS</td>
<td>Entry into service</td>
</tr>
<tr>
<td>ERAA</td>
<td>European Regional Airline Association</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross domestic product</td>
</tr>
<tr>
<td>IATA</td>
<td>International Air Transport Association</td>
</tr>
<tr>
<td>OECD</td>
<td>Organization for Economic Cooperation and Development</td>
</tr>
<tr>
<td>OPEC</td>
<td>Organization of the Petroleum Exporting Countries</td>
</tr>
<tr>
<td>O&amp;D</td>
<td>Origin and Destination</td>
</tr>
<tr>
<td>RAA</td>
<td>Regional airline association</td>
</tr>
<tr>
<td>RJ</td>
<td>Regional jet</td>
</tr>
<tr>
<td>ROIC</td>
<td>Return on invested capital</td>
</tr>
<tr>
<td>RPK</td>
<td>Revenue passenger kilometre</td>
</tr>
<tr>
<td>TP</td>
<td>Turboprop</td>
</tr>
</tbody>
</table>

Resources

- African Airlines Association (AFRAA)
- Airlines for America (A4A)
- Arab Air Carriers Organization (AACO)
- CAE
- Civil Aviation Administration of China (CAAC)
- Consumers’ Union
- Oxford Economics
- Diio Mi
- European Regional Airline Association (ERAA)
- Flightglobal Fleets Analyzer
- Frost & Sullivan
- Indian Directorate General of Civil Aviation (DGCA)
- Innovata
- International Air Transport Association (IATA)
- Latin America & Caribbean Air Transport Association (ALTA)
- Organization of the Petroleum Exporting Countries (OPEC)
- Organization for Economic Cooperation and Development (OECD)
- Oliver Wyman
- Regional Airline Association (RAA)
- US Department of Transportation (DOT)
- US Energy Information Administration (EIA)
The Bombardier Commercial Aircraft Market Forecast 2017-2036 is available at:
news.commercialaircraft.bombardier.com/forecast

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