MAY 2022

# COMMERCIAL AIRCRAFT MARKET FORECAST

## AERO ADVISORY SERVICES

MHIRJ | AERO ADVISORY SERVICES

MOVE THE WORLD FORWARD MITSUBISHI HEAVY INDUSTRIES GROUP

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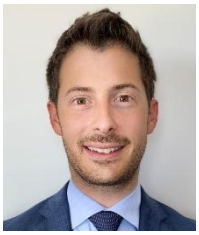
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# 1. TABLE OF CONTENTS

1. INTRODUCTION ..... 3
2. EXECUTIVE SUMMARY ..... 4
3. METHODOLOGY ..... 5
4. WORLD TRENDS ..... 8
5. AMERICAS ..... 20
5.1. NORTH AMERICA – Turning to external growth ..... 20
5.2. LATIN AMERICA – An increasingly dense network ..... 24
6. ASIA & PACIFIC ..... 26
6.1. CHINA – The future largest domestic market in the world ..... 26
6.2. ASIA & PACIFIC – The world's largest market ..... 29
7. EUROPE/RUSSIA/CIS ..... 32
7.1. WESTERN EUROPE – Where narrowbodies are kings ..... 34
7.2. EASTERN EUROPE incl. RUSSIA/CIS – LCCs are taking over ..... 36
8. MIDDLE EAST & AFRICA ..... 38
8.1. MENA – The world's hub ..... 38
8.2. SUB-SAHARAN AFRICA – Land of opportunity ..... 40
9. FACTORS IMPACTING A FORECAST ..... 43
10. HOW WE CAN HELP ..... 45
11. APPENDIX ..... 47

# 1. INTRODUCTION

Aviation is facing unprecedented challenges as it emerges from the COVID-19 pandemic and adjusts to ongoing supply chain disruptions and the existential threat of climate change. Passengers are being forced to re-evaluate the way they travel, businesses to restructure how work is organized and airlines to reimagine their business model and operations. To navigate this new reality and anticipate the needs of future travelers, reliable forecasts have never been more important than they are today.

Mitsubishi Heavy Industries is a key player in the aerospace industry, involved in many commercial aircraft programs, both on the airframe and engine side, with a 360-degree view from design to aircraft financing, from production to in-service support, a unique perspective that we, at MHIRJ, are willing to leverage.

Many aviation stakeholders have adopted the ambitious goal of achieving net zero carbon emissions for commercial aviation by 2050. This is a key milestone for our industry and sets the timeframe to anticipate future requirements.

Our market forecast is unique in terms of its approach and timespan: it starts with a behavioral passenger demand model from which we generate a fleet and delivery forecast that covers the next 30 years.

We made the choice to not simply adapt messages from the past as we did not want to be influenced by what was produced before the current crises. Instead, we made a conscious decision to use new techniques and take a fresh look at a new world**.**

This report represents only a small fraction of the vast amount of detailed data used to generate the forecast. It is possible to provide specific analyses which extract greater granularity by country or to city-pair level and over any time horizon.

OUR VIEW

***A UNIQUE APPROACH WITH A UNIQUE PERSPECTIVE***

*Not only does this market forecast leverage innovative methodologies and tools to assess future commercial aircraft needs, but it also extends to a new timeline, aligned with the Paris Agreement's goal for global warming to not exceed 1.5°C. Our unique 30-year forecast provides a view of the traffic and fleet developments through 2050, an emblematic date that has been set as the target to achieve net zero carbon in the aviation industry.*

# 2. EXECUTIVE SUMMARY

### POST-COVID RECOVERY

- Passenger demand will be driven primarily by leisure traffic
- **Passenger traffic will be affected by changes in GDP**, but not oil price
- The pre-COVID 2019 passenger demand projection curve will not be reached until 2030

### THE WORLD COMMERCIAL FLEET…

- Will consist of 38,794 commercial aircraft in 2040, and 45,222 by 2050
- Requiring a total of **33,808 new aircraft deliveries in the next 20 years**… and 54,334 in the next 30 years.
- 54% of the deliveries by 2050 will be for large narrowbodies
- Over 8,500 new small narrowbodies will be required by 2050
- The widebody fleet will double in the next 30 years, requiring over 9,700 deliveries
- 35% of the deliveries will be to support future growth

### A SHIFT IN AIRCRAFT OWNERSHIP…

Lessors own a growing share of the active commercial fleet worldwide, representing **almost 60% of the current fleet**. This will continue to impact the industry at many levels, from shorter economic lifetimes for aircraft to OEM backlog structures.

### … AND A SHIFT IN BUSINESS MODELS

LCC & ULCC business models will **continue challenging established legacy and leisure carriers** and will be a major contributor to growth in Europe, the Americas and Asia

### AIRLINE CONCENTRATION & FLEET OPTIMIZATION

- Today there are **15% fewer airlines than 10 years ago**. Airlines will continue to consolidate.
- **Right-sizing in all aircraft segments**: larger narrowbodies are expanding into the widebody market and smaller narrowbodies into both the large narrowbody and regional segments.
- The need for regional aircraft will remain strong with close to 7,000 deliveries required over the next 30 years. This segment should be the first to benefit from the implementation of new fuel technologies, which should create further fleet and network opportunities.

# 3. METHODOLOGY

Our Market Forecast is based on the following key pillars:

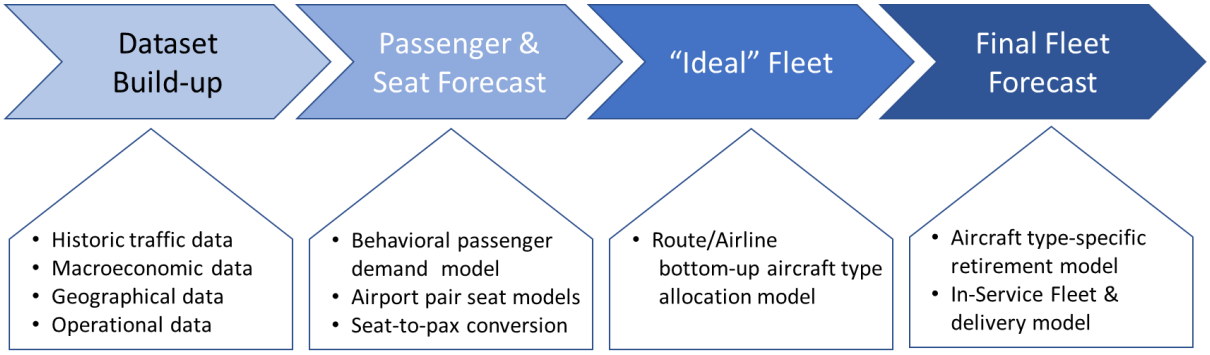
- A **passenger demand model** following a **behavioral approach,** which takes into account the distribution of incomes within a population together with the propensity and likelihood to travel.
- A **traffic flow analysis** that goes beyond the intra-regional levels shown in this document, down to the **country-pair and city-pair levels,** and which accounts for departure and arrival times for each route.
- A unique **new route opportunity model,** allowing the forecast to include prospective routes that do not exist today.
- An **aircraft type-specific retirement model** for current and future fleet retirements.

Unlike traditional approaches to market forecasting which rely on econometric models often based on GDP, fares and population size, our approach uses the origins of demand, the "mechanical" principles that govern decision-making, for both passengers as well as airlines.

Our methodology uses very few correlations or statistics which can be misleading if not well understood.

As a result, the output of our methodology delivers a higher level of reliability and robustness.

## A 4-step process




The reference year for our forecast is 2019, the last "normal" year of air traffic activity before the COVID-19 pandemic hit in early 2020. In addition, the new "post-COVID" market perspectives, coupled with recent technological developments and government concerns on the long-term evolution of the air transport sector, has led us to extend the forecast horizon to 2050, a year that has become symbolic for our industry, but which is not yet part of other comparable forecasts.

## Data sets build-up.

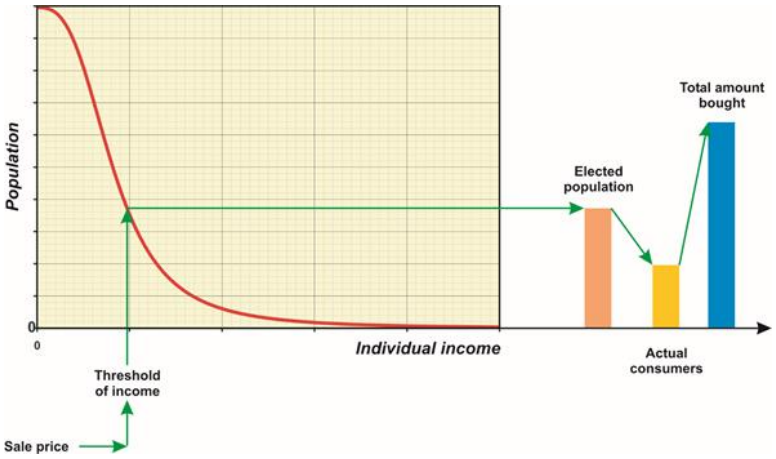
A very large number of data sets, such as detailed historical traffic data, GDP, population, airline fleets, geographical coordinates, catchment area populations, etc. are used to build the base. To be able to quantify the evolution of the passenger demand throughout the day for each route, a frequency and schedule attractiveness model taking into consideration departure and arrival times, is also included.

Also, unlike other market forecasts, commercial aircraft which have been parked for more than 3 years as of 2019, before the COVID crisis, have been considered as permanently retired and are not included in our 2019 reference fleet.

## Passenger/seat forecast.

The core of our forecast is an innovative behavioral passenger demand methodology. Our model determines the number of potential trips for a given route by estimating the average ticket price for that route and the affordability among the population by applying a minimum threshold to their individual annual income.

Only that part of the population that can afford the trip will fly. Using the population income distribution method, it is not only possible to determine the size of the population that can afford air travel, but also the frequency of travel per year. Ultimately, this result is transformed into passenger demand and its potential future development. This method applies to both leisure travel (VFR traffic and holidays) and business travel, since individual income also represents a good approximation of people likely to travel for business purposes.




Our top-down approach starts from a passenger/seat forecast per country pair and assigns the demand at the granularity of existing airport-to-airport pairs. It even considers future potential airport pairs. New routes obviously play a very important role in projecting future growth and the aircraft type for these routes is key for airlines. This is modelled by using a unique database, developed based on the current and future population of the catchment area for each airport in the world.

## "Ideal" fleet in operation forecast.

We use a bottom-up approach to determine the future number of aircraft as well as the future number of flights for each route (existing and new) operated by each airline. To allocate the "ideal" fleet, the model makes it possible to identify among all the possible fleet scenarios the one that best meets a certain number of predefined criteria and constraints such as the distance between airports, the minimum and maximum load factor acceptable, the minimum and maximum acceptable number of weekly flights evolving over time and the rules for selecting airlines/aircraft types.

## Aircraft deliveries and retirements to define future fleet demand

The previous step in the forecasting process defines the ideal number of operating aircraft over time. Unfortunately, airlines do not have the flexibility to instantly adjust their fleet structure to apply the ideal solution on a daily basis.

This last important step in the process takes into account the inertia that exists in the replacement of a fleet. If the previous step makes it possible to evaluate the ideal fleet at a given moment, it is now necessary to consider the aircraft types that remain in service and which cannot be retired immediately, as well as the need for stability in delivery projections by aircraft manufacturers. This step will not only anticipate the future retirements of aircraft in the existing fleet, but also the retirements of future deliveries.

In a nutshell, our model makes it possible to forecast the "ideal fleet" which remains the long-term objective that the market strives to achieve, while considering the natural inertia that occurs with the constant adjustment of the fleet structure.

## Everything but a black box.

While market forecasts remain a complex exercise, seeking to use rigorous methodologies to explain potential future scenarios, sometimes they look more like crystal balls with regard to the assumptions and models used. We pride ourselves on being able to explain every step of our process. We are aware that it is never easy to summarize all the models and assumptions used during this exercise, but we can easily explain the influence of each of the parameters that are introduced. We believe that we have made the most accurate assumptions based on many years of data, but the market forecast is not meant to be a black box and we would be happy to go into more detail if you wish. Please do not hesitate to contact us.

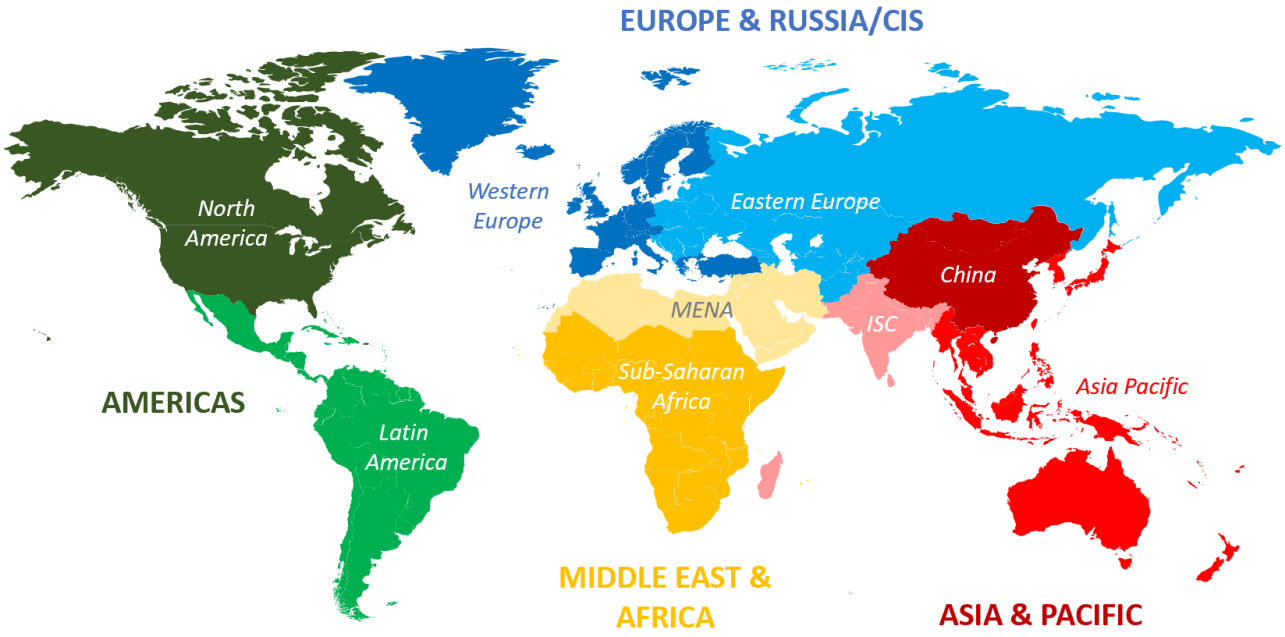
Aircraft OEMs may influence their customers by offering aircraft types that do not necessarily correspond to their ideal need. Similarly, airlines may make fleet choices that are not always tied to simple passenger demand. In the end, our market study does not aim to anticipate what manufacturers or customers are likely to choose or favor in the future, but to show the demand potential that exists for each of the aircraft segments.

OUR VIEW

***MULTIPLE TIMELINES FOR A BETTER UNDERSTANDING OF TRENDS***

*We show three different timelines in our forecast results: 2030, 2040 and 2050. This provides a view of how traffic flows and fleets will evolve over time, as this evolution will certainly not be linear over such a long-time span. Our forecast contains extensive detailed data to thoroughly identify future market dynamics and requirements for any time horizon. Contact us if you require more information or customized studies.*

# 4. WORLD TRENDS




*Regions and sub-regions of the forecast*

Even though new strains of the COVID-19 virus continue to spread around the globe, vaccination programs together with a better understanding of the virus itself and improved treatments have all led to the belief, even amongst cautious commentators, that the worst of the pandemic is behind us. Strong passenger numbers on domestic services in some of the world's largest countries including China, the USA and Russia, suggest that the crisis within the air transport sector is less about demand and more about barriers. It is clear from numerous examples that when the constraints and barriers are removed, passengers will fly again.

## Leisure traffic is helping the recovery.

Summer 2021 clearly demonstrated the importance of this market segment as leisure traffic bounced back more quickly than business travel. Legacy carriers are increasingly focused on this segment, not only to support the short-term recovery, but also to offer their loyal customers a variety of choices for their most precious weeks of the year. Demand within some sub-segments of business travel is likely to remain at a reduced level for several years, replaced by on-line virtual meetings. However, when taking a longer-term view, we expect global economies to grow steadily over the coming years, leading to increased air transport demand for both leisure and business travelers.

## LCCs continue their growth worldwide.

Low-cost carriers and ultra-low-cost carriers in particular, are continuing to grow worldwide. Of the top 100 airlines worldwide, 35 belong to the LCC segment, representing 30% of the capacity share. Ten years ago, there were only 29 LCC carriers with 25% of the capacity share among the top 100 airlines. The European ULCC Wizz Air grew at an astonishing rate of 25% during the pandemic. Together with its counterparts around the globe, such as Ryanair, easyJet, Southwest, Spirit, Frontier, Azul, Volaris, AirAsia, Lionair and Indigo, airlines employing an LCC business model will continue challenging established legacy and leisure carriers, contributing significant growth in Europe, the Americas and Asia.

## Consolidation and Concentration.

This trend will continue, especially in Europe and the Americas. Several airline bankruptcies, mergers and acquisitions have taken place in recent years and will continue with the growth of important airline groups on the one hand and challenging market conditions on the other. Two high level views clearly illustrate these trends: today the top 100 airlines account for 82% of the capacity share in the market while ten years ago it was less than 80%. The number of regular passenger operators worldwide has dropped 14% over the last 10 years from 700 to 600.

## Right Sizing.

The right sizing trend will impact all aircraft segments with major drivers being the increased capabilities and unbeatable seat-costs of modern narrowbodies. The concentration of the narrowbody segment has a knock-on effect on all other segments. Larger narrowbodies are expanding into the widebody market and smaller narrowbodies into the regional segment. They offer good economical alternatives, however both segments will retain their importance in their key markets and usage.

Both the widebody and narrowbody segment will also contribute necessary feedstock for cargo conversions, giving them a second life. The importance of conversions is underlined by the fact that today 52% of the commercial in-service freighter fleet is made of converted aircraft. The need for freighters is not only driven by replacement needs for aging freighters, but also by market needs as long-term outlooks for the cargo segment remain positive especially as the e-commerce segment continues to grow strongly worldwide.

## Lessor Ownership.

The influence of lessors on the order books of the OEMs and their major aircraft programs suggests that their impact on the market will continue to grow. Today almost 60% of the active commercial fleet worldwide (Airbus, ATR, Boeing, De Haviland, Embraer, MHIRJ) is owned by lessors or financiers and not by the operator itself. Lessors have long been a key enabler for growth, helping new airlines to launch operations and supporting fleet growth with established carriers. The fact that a growing share of the world fleet is owned by lessors will continue to have an impact on the industry at many levels: more standardized aircraft specifications, fate of aircraft programs, certain commercial competition between OEMs and lessors, less financial institutions directly involved in aircraft financing, fleet ownership shift toward new countries such as China, etc.
The future outlook is positive for lessors who will continue to play a key role and will likely expand their influence as fleet growth develops worldwide. As we see a shift of money from the west to the east, Chinese banks and conglomerates have, in recent years, set up their own leasing companies or acquired shareholdings in established western lessors. In addition, the segment has seen considerable consolidation including the recently completed acquisition of GECAS by AerCap. We expect further consolidation in the near and mid-term.

As a separate note, it will be interesting to see if the growing influence of Chinese financiers may provide increased opportunities for local products, such as the C919, in markets outside of China.

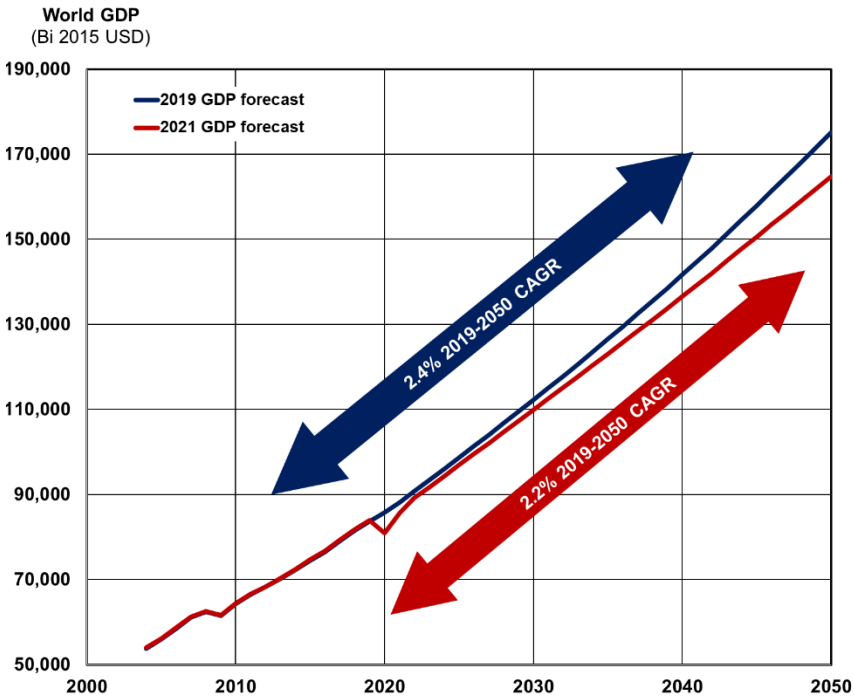
## A move towards sustainable aviation and net zero carbon.

The industry is committed to an ambitious plan to achieve net zero carbon by 2050. The rapid ramp-up of SAF production and fleet renewals with more efficient models will be the most effective solutions in the medium term, while investment and research on alternative fuels such as electric & hydrogen continues. Regional airlines operating from regional airports will be the first to receive greener aircraft, as the new fuel technologies will be adopted first on smaller aircraft.

Decarbonizing air transport will continue to require substantial investments with aviation being one of the most expensive sectors to decarbonize (it costs more than 5 times as much to reduce 1 ton of $CO_2$ than in the energy production or agriculture sectors). But decarbonization is not optional. It represents a huge challenge, but also a fantastic opportunity and calls for the mobilization of all those involved: airlines, aircraft and engine manufacturers, fuel suppliers, public authorities, as well as passengers.

You can find more details on the various approaches to address sustainability, specifically the roll-out of new technologies and how they will impact the composition of the commercial aircraft fleet as well as key industry stakeholders in our ***Sustainable Aviation Roadmap*** position paper.

## 4.1. Economic developments post-COVID




In 2020, the global COVID crisis set the world economy back by more than two years. Global GDP was equal to the 12-month cumulative world GDP level of September 2017. For 2022 the lag is reduced to a 7-month shift, as viewed by Oxford Economics which reflects a rapid recovery of the world economy. However, the 2021 GDP forecast is slightly less optimistic, causing the slope to diverge from the 2019 forecast.

The dynamics for China and India will have a major impact on the air traffic demand forecast going forward: China's GDP will overtake North America's by 2040 with Western Europe in third place. The Indian subcontinent will follow a similar pattern to China, climbing from the 7th position up to 5th by 2040. As expected, the entire Asian region will grow its GDP share from 35% in 2019 to 45% in 2050. In other words, almost half of the world's GDP will be produced by Asian countries by 2050, whereas today this portion belongs to North America and Western Europe combined. The last decade of the forecast period will see China strengthening its leadership role, generating nearly one quarter of the world's GDP, while the Indian Subcontinent will continue growing its significance worldwide.

**Market share of the world GDP**

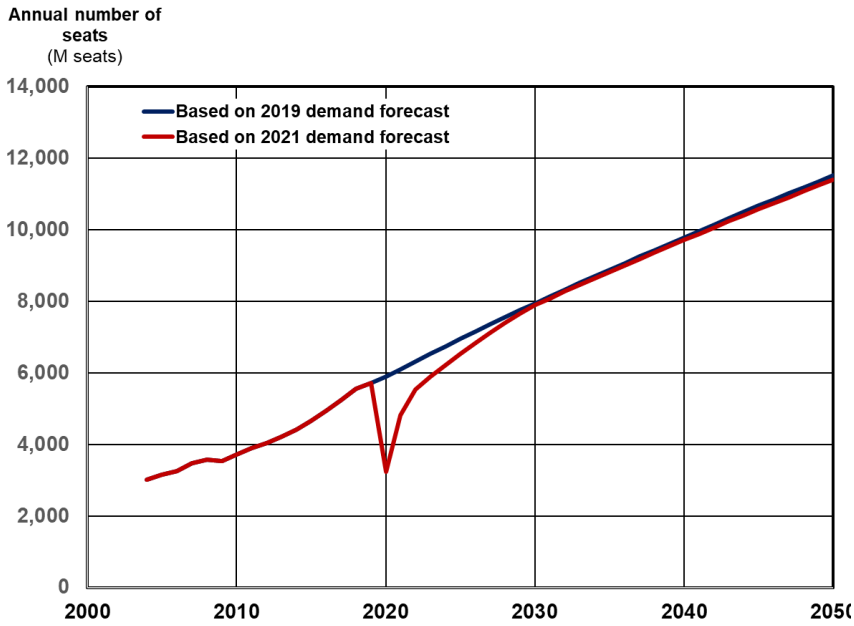
| 2019 | | 2030 | | 2040 | | 2050 | |
|---|---|---|---|---|---|---|---|
| North America | 25.8% | North America | 23.7% | China | 23.0% | China | 23.6% |
| Western Europe | 22.1% | China | 21.3% | North America | 22.7% | North America | 22.1% |
| China | 17.0% | Western Europe | 19.2% | Western Europe | 17.2% | Western Europe | 16.0% |
| Asia/Pacific | 14.1% | Asia/Pacific | 13.6% | Asia/Pacific | 13.0% | Asia/Pacific | 12.6% |
| Latin America | 6.5% | Latin America | 6.1% | Indian subcontinent | 7.7% | Indian subcontinent | 9.2% |
| Eastern Europe | 4.4% | Indian subcontinent | 5.9% | Latin America | 5.9% | Latin America | 5.6% |
| Indian subcontinent | 4.1% | Eastern Europe | 4.2% | Eastern Europe | 4.3% | Eastern Europe | 4.3% |
| Middle-East / North Africa | 4.0% | Middle-East / North Africa | 3.9% | Middle-East / North Africa | 4.0% | Middle-East / North Africa | 3.9% |
| Sub-Saharan Africa | 2.0% | Sub-Saharan Africa | 2.1% | Sub-Saharan Africa | 2.4% | Sub-Saharan Africa | 2.7% |

OUR VIEW

***GDP ASSUMPTIONS BASED ON OXFORD ECONOMICS***

*With a team made of 250 economists and analysts, Oxford Economics is a leader in global forecasting (oxfordeconomics.com). This is our source for GDP growth rates. Similar industry market forecasts often use higher GDP growth rate assumptions, sometimes up to 1% more globally.*

## 4.2. Demand forecast - Back to the pre-COVID trend by 2030

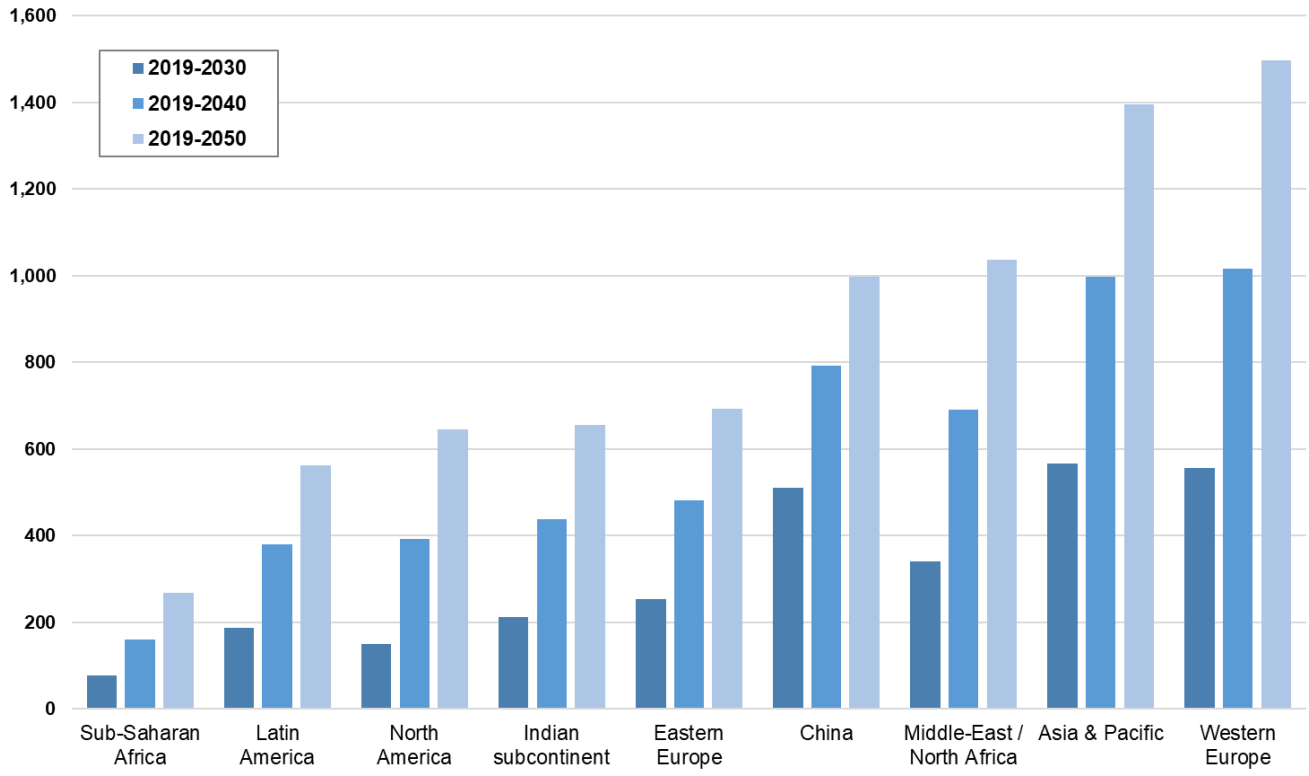



With the lingering effects of travel restrictions around the world, especially on international and long-haul routes, a return to 2019 traffic levels is not anticipated before 2023. However, for demand to catch up and get back to the 2019 forecast trend, it will take much longer and will not be achieved until 2030.

Seats and ASK growth rates are the key indicators to measure the dynamics of the overall demand. But the incremental number of annual seats does not necessarily reflect the growth potential of the regions as this will depend on the volume of the current demand. In North America for example, even minimal growth can represent a significant volume of seats compared to other regions.

| Total number of seats CAGR over the period | 2019-2030 | 2030-2040 | 2040-2050 | 2019-2050 |
|---|---|---|---|---|
| Asia/Pacific - China | 4.8% | 3.4% | 2.7% | **3.7%** |
| Asia/Pacific - Indian subcontinent | 5.7% | 4.5% | 3.4% | **4.6%** |
| Asia/Pacific - Latin America | 6.5% | 3.4% | 2.5% | **4.2%** |
| Asia/Pacific - Middle-East / North Africa | 6.4% | 3.9% | 2.6% | **4.4%** |
| China - Eastern Europe | 5.9% | 3.8% | 2.8% | **4.2%** |
| China - Indian subcontinent | 7.3% | 4.6% | 3.4% | **5.1%** |
| China - Latin America | 7.1% | 4.8% | 3.9% | **5.3%** |
| China - North America | 7.2% | 4.2% | 3.0% | **4.8%** |
| China - Sub-Saharan africa | 6.1% | 4.4% | 3.6% | **4.7%** |
| Eastern Europe - Indian subcontinent | 7.2% | 5.2% | 4.4% | **5.7%** |
| Eastern Europe - Latin America | 6.2% | 4.0% | 2.7% | **4.4%** |
| Eastern Europe - Middle-East / North Africa | 5.8% | 4.6% | 2.8% | **4.5%** |
| Eastern Europe - Sub-Saharan africa | 5.7% | 4.0% | 2.7% | **4.2%** |
| Indian subcontinent - Middle-East / North Africa | 6.2% | 4.9% | 3.6% | **4.9%** |
| Indian subcontinent - North America | 6.1% | 4.3% | 3.5% | **4.7%** |
| Indian subcontinent - Sub-Saharan africa | 6.0% | 4.9% | 4.2% | **5.0%** |
| Latin America - Sub-Saharan africa | 8.4% | 2.8% | 2.0% | **4.5%** |
| Middle-East / North Africa - Middle-East / North Africa | 4.7% | 3.4% | 2.1% | **3.4%** |
| Middle-East / North Africa - Sub-Saharan africa | 5.0% | 3.4% | 2.5% | **3.7%** |
| Sub-Saharan africa - Sub-Saharan africa | 4.6% | 3.9% | 3.8% | **4.1%** |

Western Europe together with Asia & Pacific, China and the Middle East will be the key world regions that will fuel traffic growth in the next 30 years.

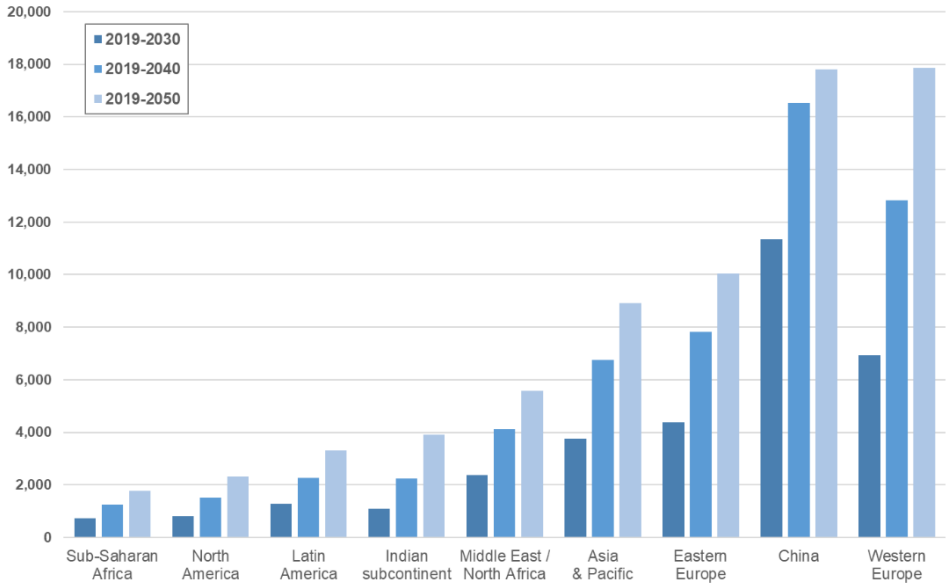



*Incremental Number of annual seats (millions of seats)*

| 2005 | 2019 | 2050 |
|---|---|---|
| United States (939M) | United States (1,004M) | China (1,272M) |
| China (190M) | China (734M) | United States (1,211M) |
| Japan (134M) | India (174M) | India (375M) |
| Brazil (61M) | Japan (148M) | Indonesia (351M) |
| Spain (57M) | Indonesia (138M) | Russia (187M) |
| Australia (54M) | Brazil (120M) | Japan (183M) |
| Canada (46M) | Australia (80M) | Mexico (150M) |
| United Kingdom (38M) | Russia (79M) | Turkey (145M) |
| Mexico (36M) | Mexico (67M) | Brazil (135M) |
| Italy (36M) | Canada (64M) | Canada (112M) |
| Germany (34M) | Turkey (58M) | Vietnam (99M) |
| France (33M) | Spain (52M) | Australia (98M) |
| India (32M) | Thailand (47M) | Philippines (80M) |
| Indonesia (27M) | Vietnam (43M) | Spain (79M) |
| South Korea (24M) | Italy (40M) | Thailand (74M) |

*Top 15 Domestic Markets (millions of seats)*

## 4.3. Network developments - New routes thriving in Western Europe and China




*Net additional number of airport-pairs since 2019*

While North America is already a very mature aviation market with limited opportunities left for network development (blank spots), Western Europe together with China, and to a lesser extent Eastern Europe, Asia & Pacific and MENA, will generate the most route openings and network expansion. For Sub-Saharan Africa and the Indian subcontinent, despite having fairly populated areas, the unequal income distribution and the lack of a sufficiently large middle class, makes it less obvious for airlines to invest in new routes.

90% of new route openings between 2019 and 2040 will come from the top 10 region-pairs in terms of traffic. Domestic China, domestic Western Europe and Western Europe-Eastern Europe will lead route openings until 2040 driven by the dynamic and growing European economies of Poland, Spain and Turkey. Growth is expected to slow down post-2040, however the top 10 region-pairs will still contribute more than 80% of the new route openings until 2050.

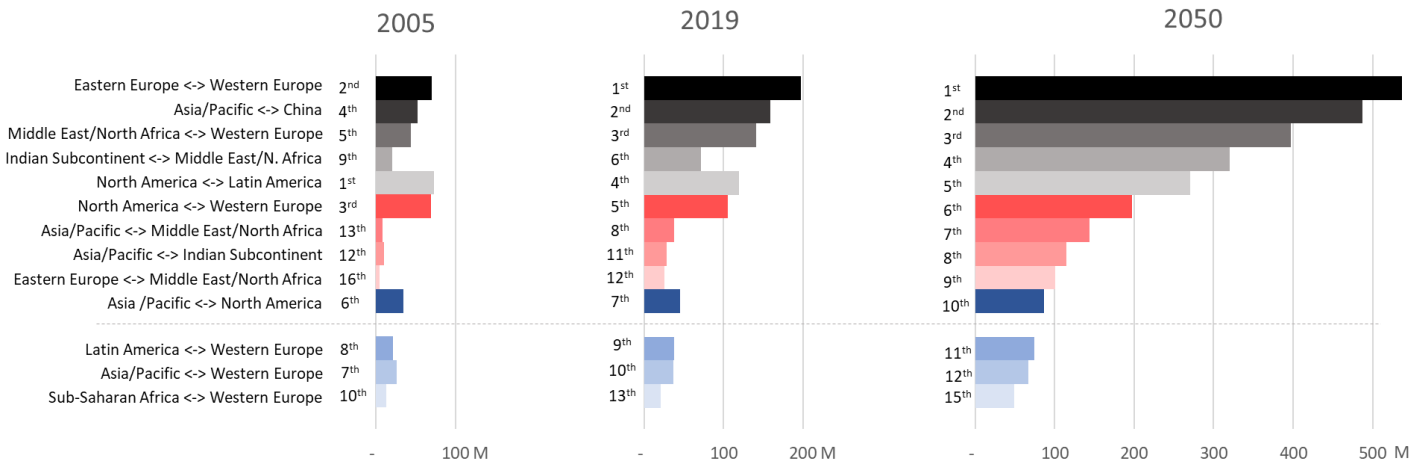
OUR VIEW

***A MARKET INCREASINGLY CENTERED AROUND ASIA***

*The China-Thailand cross-border market will grow from only 3 million seats in 2005 and ranked 55th in the world, to become the largest market by 2050. Similarly, the India-UAE cross-border market represented just over 7 million seats 15 years ago and will exceed 100 million within 30 years. This illustrates a world increasingly focused on Asia.*

| 2005 | 2019 | 2050 |
|---|---|---|
| Canada ⇔ USA (31M) | Spain ⇔ UK (49M) | China ⇔ Thailand (141M) |
| Spain ⇔ UK (26M) | Canada ⇔ USA (40M) | India ⇔ UAE (100M) |
| Mexico ⇔ USA (25M) | Mexico ⇔ USA (37M) | Spain ⇔ UK (93M) |
| Germany ⇔ Spain (25M) | Germany ⇔ Spain (33M) | Mexico ⇔ USA (89M) |
| UK ⇔ USA (23M) | UK ⇔ USA (27M) | Canada ⇔ USA (63M) |
| Japan ⇔ USA (17M) | China ⇔ Thailand (26M) | Indonesia ⇔ Malaysia (57M) |
| Germany ⇔ UK (16M) | Japan ⇔ South Korea (24M) | China ⇔ Japan (48M) |
| Ireland ⇔ UK (16M) | China ⇔ Japan (24M) | Germany ⇔ Spain (45M) |
| France ⇔ UK (14M) | China ⇔ South Korea (23M) | China ⇔ USA (44M) |
| Germany ⇔ Italy (14M) | India ⇔ UAE (22M) | Italy ⇔ UK (41M) |

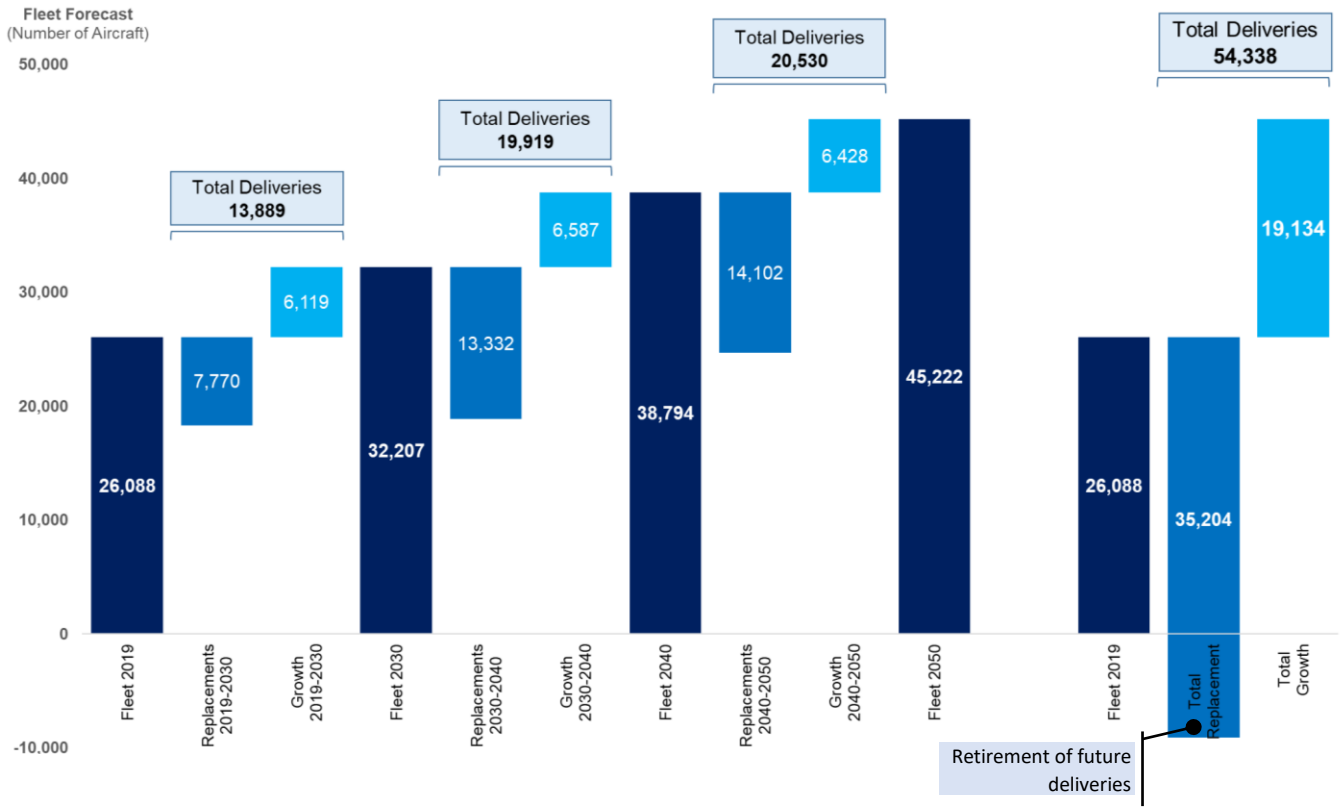
*Top 10 Cross-Border Markets (millions of seats)*




*Top 10 Inter-Regional Markets (millions of seats)*

## 4.4. Fleets and deliveries - All of today's aircraft will be replaced by 2050

Because the time span of our market forecast goes beyond the usual economic life of an aircraft, it includes a unique model reflecting retirements of future deliveries. The total number of aircraft delivered between 2019 and 2050 will exceed the total number of aircraft in service in 2050. The size of the world fleet in service will almost double in the next 30 years. All aircraft in operation today will be replaced by 2050, however not necessarily by aircraft of the same size category.



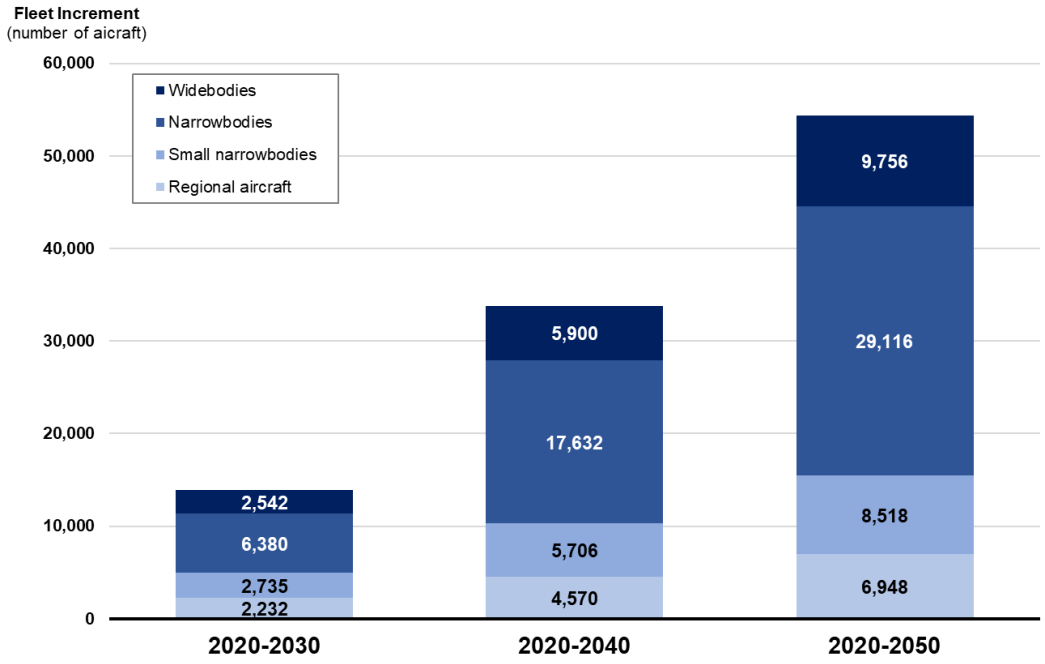

**China:** The market will require more small narrowbodies and regional aircraft to densify the network and support future economic growth. Large narrowbody share will shrink from 73% of the current fleet to 63% by 2050, approaching the fleet mix of other mature markets.

**North America:** The widebody fleet will increase from 10% to 17% of the market by 2050, as two thirds of the future growth will come from inter-regional traffic.

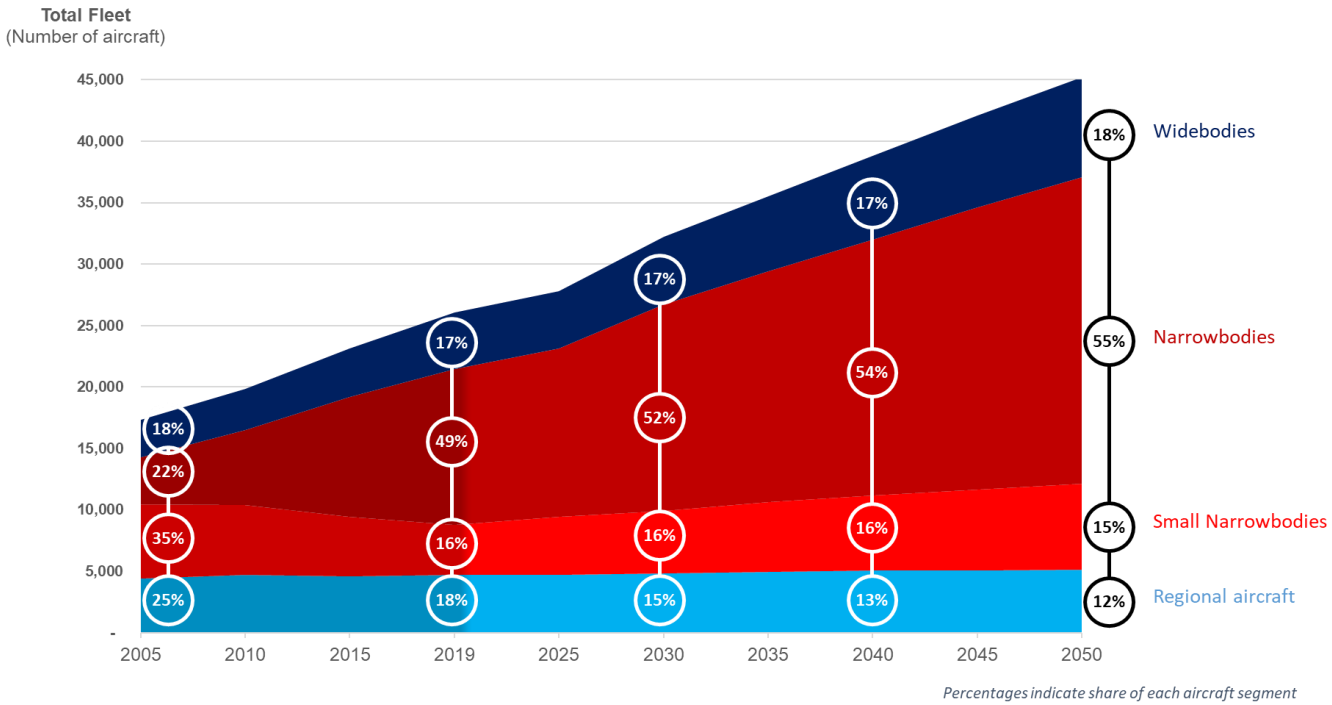
**Middle-East & North Africa:** The share of the widebody fleet will shrink relative to the rest of the fleet as future growth will be driven by regional expansion.

**Europe, Latin America, and to some extent Asia-Pacific:** These regions already have a balanced fleet mix to address future market opportunities. Few changes are expected between aircraft size categories for these regions. Each aircraft size category will grow proportionally.

**Sub-Saharan Africa:** The only region where the narrowbody fleet will grow significantly, from only 15% of the overall fleet mix today to 35% by 2050. The market has limited infrastructure today but a growing middle-class will accelerate growth in the coming years.

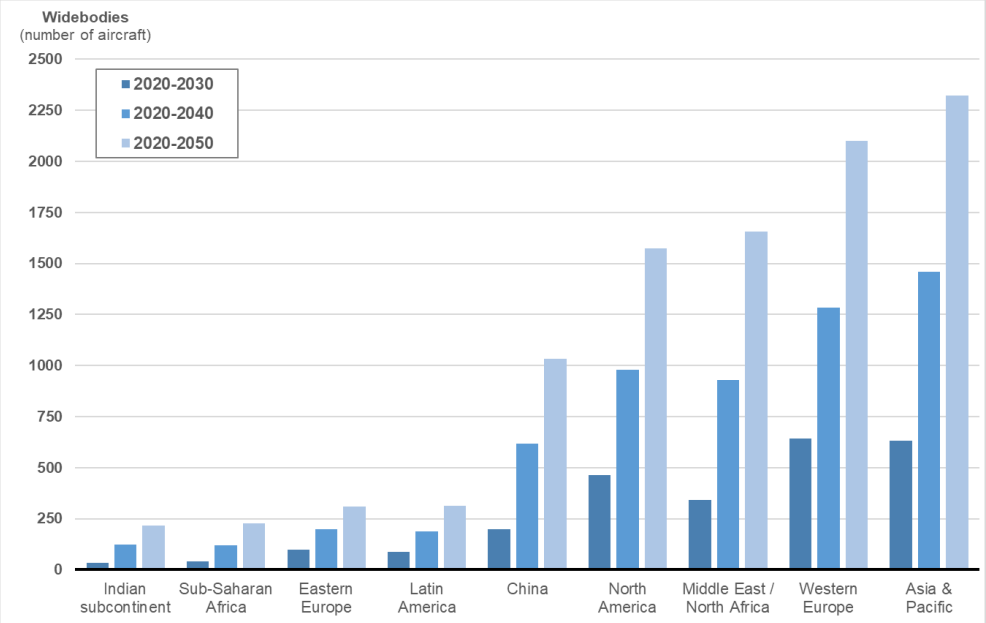



*Total deliveries by aircraft type*




*World fleet mix: 2005-2050*

## 4.5. Widebody aircraft (225-seats and more)

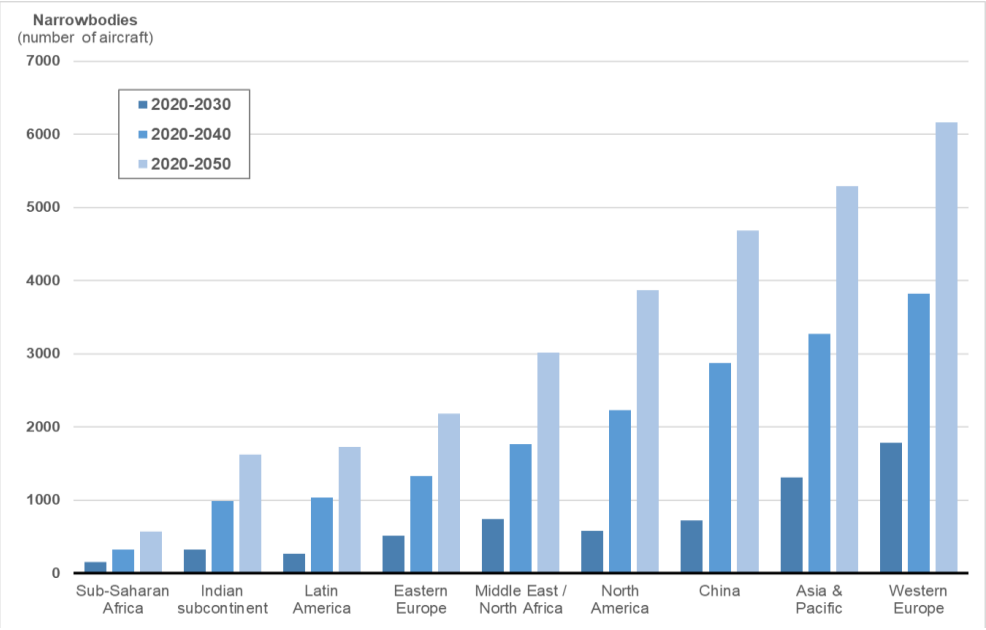



*Widebody aircraft deliveries*

With more than 700 million international tourists visiting in 2019, Western Europe is by far the most visited region. It will remain the world leader and will keep driving the demand for widebody aircraft. Among developed countries, Europeans also enjoy more vacation days to travel abroad. In China and Japan, the tourism effect is augmented by the need to use widebodies on short and medium intra-regional and domestic routes with high demand, driving the need for widebodies in these regions.

## 4.6. Narrowbody aircraft (150 to 225 seats)

The popularity of narrowbody aircraft will continue and even strengthen in the future.




*Narrowbody aircraft deliveries*

The need is driven by two major factors: domestic or regional population size and geography. For obvious reasons, the greater the domestic or regional population, the greater the need for narrowbodies.

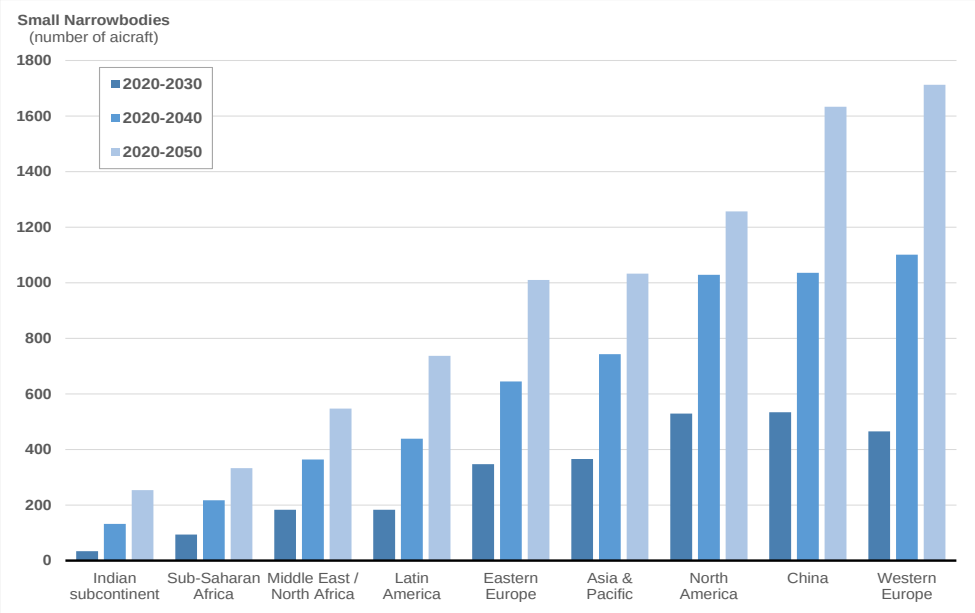
Geography or rather being located at the right place, i.e. between populated or connected regions, also plays a key role. This explains the success of some airlines like Copa in Panama, linking North America and South America with narrowbodies.

It also explains the significant need for narrowbodies in Middle East and North Africa, these two sub-regions are perfectly located between India, Africa, and Europe.

With increased capabilities and range, modern narrowbodies represent a viable alternative to widebody aircraft for some long-haul operations. This segment has started to gain traction with North American and European carriers wishing to fly transatlantic or long-haul north-south routes to secondary destinations. Yet, the core of the operations will remain intra-regional and domestic flights.

With almost 20% of the additional seats and ASKs over the forecast period, Turkey is the main engine propelling future narrowbody deliveries in Western Europe ahead of North America, Asia & Pacific and China. Given its strategic geographic location between Asia, Europe and Middle East and Africa, Turkey is expected to remain a key player in the aviation market going forward.

## 4.7. Small narrowbody aircraft (100 to 150 seats)



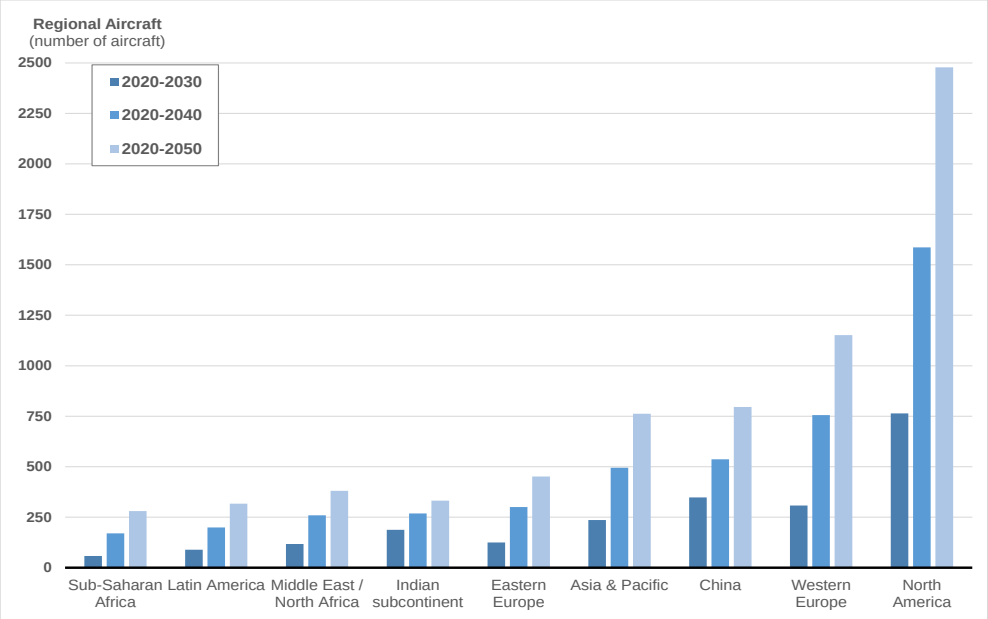

*Small narrowbody aircraft deliveries*

The small narrowbody fleet was a popular segment in the early 2000s representing more than 25% of the narrowbody deliveries, but the segment had been in decline for several years and some had even envisioned its end when it reached less than 5% of the deliveries in 2015.

However, new technology and new developments, coupled with interest from some key airlines, has led to a revival of this size category. This segment is roughly three times smaller than the larger narrowbody segment but will bounce back and represent more than 15% of the future narrowbody fleet in the next 20 years.

Because of the large potential for new route developments and the topology of routes in Western Europe and China, these regions will require the largest fleets of small narrowbody aircraft. North America will remain a key market for this segment, despite the limited potential for new route and frequency increases.

## 4.8. Regional aircraft (50 to 100 seats)




*Regional aircraft deliveries*

We anticipate a significant need for regional turboprops and jets in the 50- to 90-seat category in the next 30 years.

North America and Western Europe will remain the primary markets for regional aircraft, absorbing respectively 35% and 16% of the worldwide deliveries by 2050.

Although the regional fleet in North America is expected to contract, our model still anticipates a large number of deliveries for the region, almost 1,600 units by 2040 and 2,500 units by 2050. This will be fueled by replacements, with limited requirement for new market development.

The picture in Western Europe is quite different as a substantial portion of the regional aircraft fleet is used on newly created routes. By 2050, almost half of the regional aircraft in service in Western Europe will be serving routes which did not exist in 2019.

Asia & Pacific will also require a significant number of regional aircraft to feed hubs and ensure territorial connectivity in large archipelagos such as Indonesia and the Philippines. Finally, in China, the busiest airports are still far from reaching the number of passengers and movements seen today in North America, with an average aircraft size of around 140 seats compared to 100 in North America. A hub-and-spoke model with a much larger regional aircraft fleet will be the only way for China to unlock its enormous domestic traffic potential. Connecting second tier and third tier cities with higher frequency service will be essential to support China's future economic growth.

| TOP 5 US Airports | | Passengers (millions) | Aircraft Movements |
|---|---|---|---|
| 1 | Atlanta (ATL) | 110.5 | 904,301 |
| 2 | Los Angeles (LAX) | 88.1 | 691,257 |
| 3 | Chicago (ORD) | 84.6 | 919,704 |
| 4 | Dallas (DFW) | 75.1 | 720,007 |
| 5 | Denver (DEN) | 69.0 | 640,098 |
| **TOP 5 Chinese Airports** | | | |
| 1 | Beijing (PEK) | 100.0 | 594,329 |
| 2 | Shanghai (PVG) | 76.2 | 511,846 |
| 3 | Guangzhou (CAN) | 73.4 | 491,249 |
| 4 | Chengdu (CTU) | 55.9 | 366,887 |
| 5 | Shenzhen (SZX) | 52.9 | 370,180 |

*Traffic and movement comparisons between top US and Chinese airports (2019)*

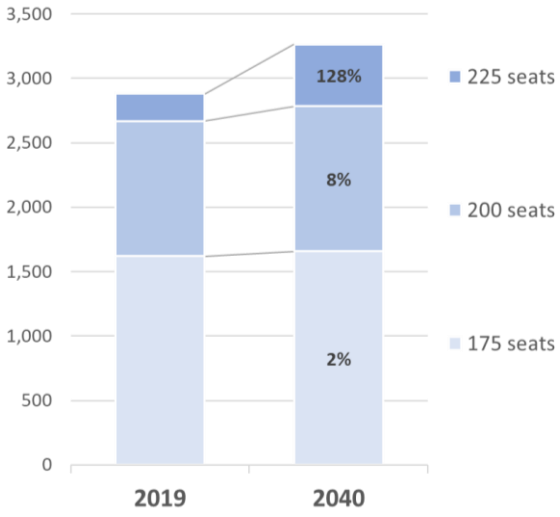

# 5. AMERICAS

## 5.1. NORTH AMERICA - Turning to external growth

### Major Regional Trends

1. **Two thirds of the growth will come from inter-regional traffic.** The US domestic aviation market is very mature, consequently North American domestic traffic will grow moderately. Transatlantic traffic will also enjoy moderate growth of around 2% per year while less developed markets, such as Asia and India, will grow faster. Expanding economies from these regions and a rapidly increasing middle class will generate more business and leisure traffic to the US. Overall, the North American region will grow from 1.4 billion seats flown pre-pandemic to 1.8 billion seats in 2040 with inter-regional capacity increasing from 1.1B to 1.26B seats. In other words, two thirds of the growth will come from inter-regional travel.

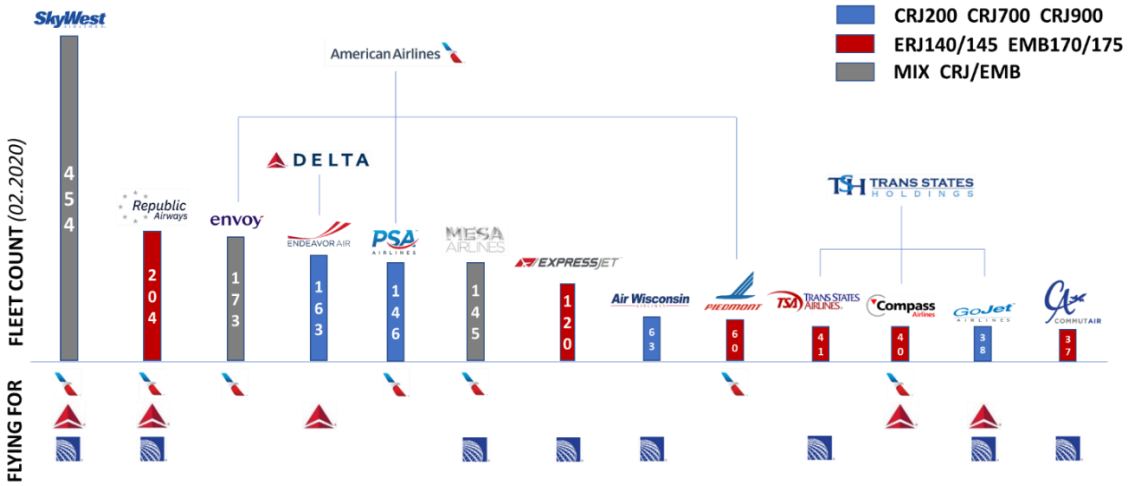
2. **The rise of the large narrowbodies.** During the last decade, North American carriers have gradually ordered and operated larger and larger narrowbody aircraft, such as the 737-900 and the A321. This trend toward large narrowbodies will continue at both Majors and LCCs alike. With greater range performance, new generation aircraft such as the A321XLR, will continue to fragment the transatlantic market, by-passing the saturated hubs on both sides of the ocean. This will further reinforce the need for large narrowbodies in North America.



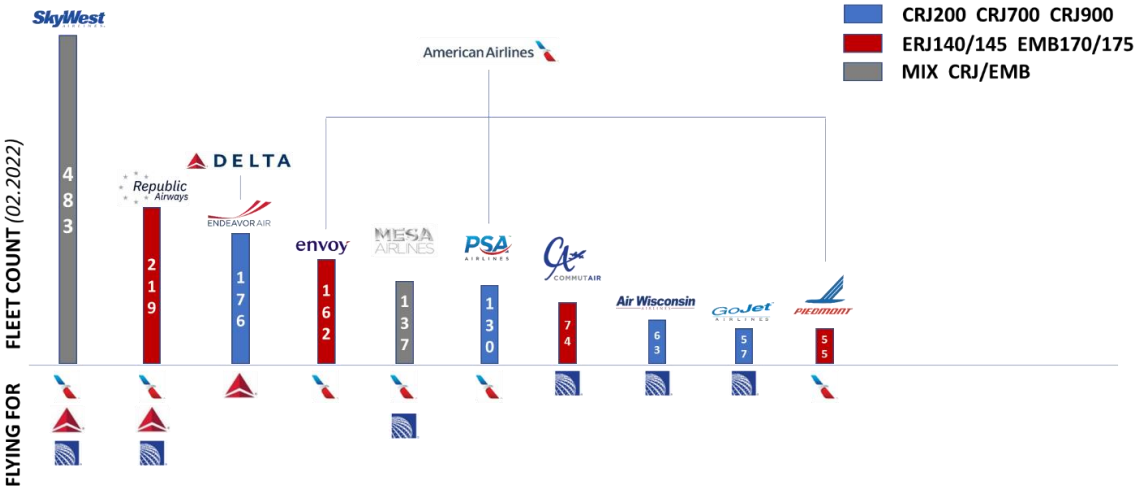

*Narrowbody Fleet Mix*

3. **High yields despite successive crises.** With a limited rail infrastructure compared to Europe, American carriers will continue to benefit from unique market characteristics such as a huge market size, a large middle class, a vast territory, and relatively less market competition. The established geographical distribution of each player persists, preserving dominance at their main bases and maintaining high yields compared to what is observed in Europe. New entrants, such as Breeze and Avelo, have no choice but to develop new networks out of secondary or abandoned routes. Finally, the market share of LCCs is much less than in Europe, with many LCCs having adopted hybrid models, leading to less differentiation and maintaining higher yields.

4. **The number one market for regional aviation.** About 1,400 regional aircraft will be in service in North America by 2040, maintaining its position as the world's largest regional market. Smaller regional jets (50- to 76-seaters) will remain a critical element of the US domestic network, providing crucial feed to domestic and long-haul flights.




*US CPA landscape prior to the pandemic*




*US CPA landscape post-pandemic*

Scope clauses remain the fundamental cornerstone of the regional fleet structure in the US. However, the pandemic has led to recent adjustments of the regional landscape. Prior to the COVID-19 crisis, thirteen regional carriers operated for the three US majors with different fleet sizes, ownership structures and individual offerings.

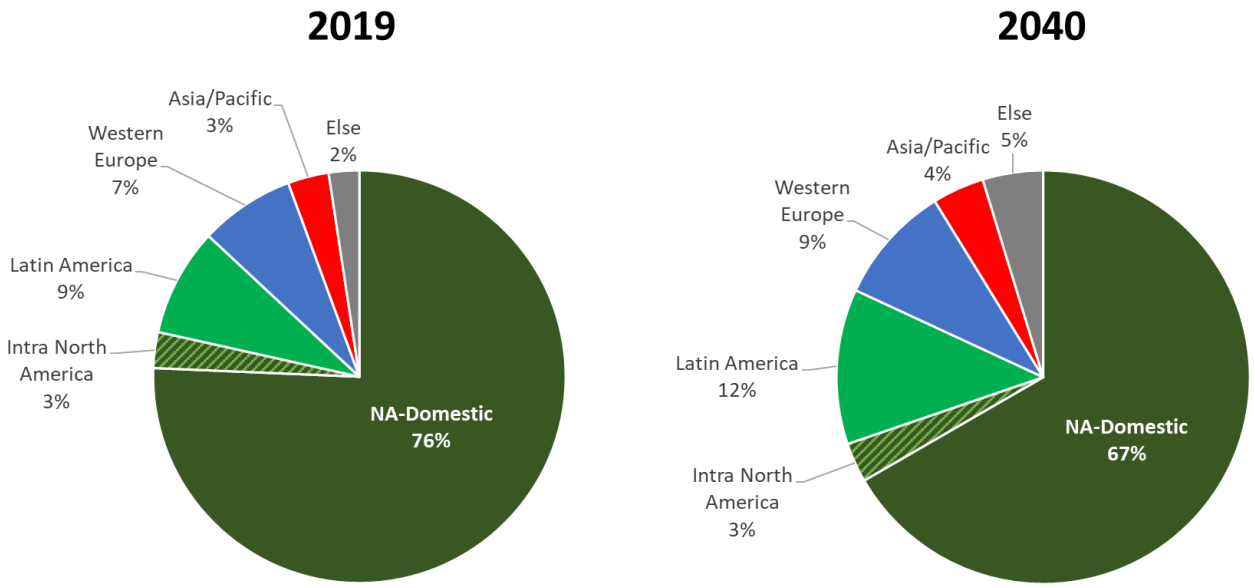
The pandemic has resulted in greater concentration of the regional players. Achieving economies of scale is a key prerequisite for today's regional airlines to address new challenges such as the pilot shortage, while smaller regional operators will face increasing pressure in the future. Three regional carriers exited the business during 2020 and their fleets were re-distributed to other operators. Only the largest independent regional operators continue to offer their services to more than one US Major, with a mix of CRJ, ERJ and E-Jet aircraft. The remaining operators, either owned by a Major or independent, have streamlined their operation and specialized by aircraft type and customer as a strategy to tackle future challenges.

## North America is a very mature market

North American GDP is expected to grow at a moderate rate of 1.7% per year to reach almost $31,000B by 2040 the second largest after China. During the same period, its population is expected to grow by 0.54% per year to 410 million inhabitants, below the world average (+2.4% per year GDP growth and +0.86% population growth). North America has a high GDP per capita, resulting in a very high propensity to travel. Despite the moderate growth rates, the large size of the North American market will continue to fuel one of the largest traffic volumes worldwide.

## Increasing international traffic

Although the North American domestic market will continue to grow, international traffic will grow even faster. The additional range capabilities of new-generation aircraft which will provide access to more direct long-haul destinations, coupled with a growing interest among Americans to travel abroad, will result in a shift in travel patterns. In the next 20 years, the share of inter-regional traffic will increase to 30% from 20% today.




*Traffic breakdown to/from North America (number of seats deployed)*

## The North American route portfolio is mature and resilient

Approximately 6,500 routes were operated in North America in 2019. Due to a very resilient US domestic market, the number of routes cancelled during the pandemic was limited and comparable to the impact of the 2009 economic crisis. From 2022 onward, the market will resume the steady growth pattern of the last 15 years, with a constant rate of about 1% net additional routes per year.

## Replacement opportunity for narrowbody deliveries and growth for widebodies

Narrowbody aircraft will constitute the majority of North American deliveries, with four out of five aircraft replacing aging aircraft. North American airlines typically operate their narrowbody fleet much longer than those in Western Europe and some parts of developed Asia, such as Japan. The region will require over 3,250 new narrowbody aircraft, including small narrowbodies, progressively renewing the large existing fleets of the US Majors and LCCs. The region is home to the largest network carriers in the world (American, United, Delta) and many of the world's largest LCCs.

The development of inter-regional traffic to Latin America, Europe and Asia will drive growth of the widebody fleet, requiring 1,000 new aircraft deliveries over the next 20 years. Contrary to other large widebody markets such as Europe or Asia, the North American widebody aircraft have always been concentrated at a few carriers operating large fleets. Almost 75% of today's North American widebody fleet is with the "big three", United, Delta and American.

The US regional fleet is expected to contract somewhat by 2040. A large portion of the small regional aircraft sub-segment (50- to 65- seaters) is due for replacement in the next ten years which will absorb many of the 1,600 new regional aircraft that will be delivered in the next 20 years. North America is and will remain the largest regional aircraft market in the world.

| 2020-2040 delivery split North America | Total aircraft | Large widebodies | Widebodies | Narrowbodies | Small narrowbodies | Regional aircraft |
|---|---|---|---|---|---|---|
| **2019 in-service fleet** | **7,107** | 0 | 700 | 2,746 | 1,382 | 2,279 |
| **2020-2040 deliveries** | **5,824** | 0 | 980 | 2,229 | 1,029 | 1,586 |
| Growth | 155 | 0 | 498 | 385 | -254 | -474 |
| Replacement | 4,941 | 0 | 482 | 1,844 | 1,029 | 1,586 |
| **2040 in-service fleet** | **7,262** | 0 | 1,198 | 3,131 | 1,128 | 1,805 |
| *Fleet Growth* | *+2%* | *0%* | *+71%* | *+14%* | *-18.%* | *-21.%* |

*For any other horizon up to 2050 please consult MHIRJ Aero Advisory Services*

## 5.2. LATIN AMERICA – An increasingly dense network

### Major Regional Trends

1. **Competition is growing.** Aggressive promotions by LCC operators in the region are stimulating passenger demand and encouraging many new airlines to launch operations, despite limited government support and a burdensome tax system.

2. **Large potential for new air traffic to be stimulated out of today's non-flying population.** Today the propensity to travel in the region is low, the outlook for future GDP growth and its impact on middle-class mobility offers very exciting prospects for growth of air transport in the region.

3. **Consolidations and partnerships will continue between North American Majors and Latin American airlines.** Strong VFR and tourism traffic between North America and Latin America is well established and will continue to grow. Consolidations and partnerships between North American majors and Latin American airlines will provide more seamless point-to-point services and a wider portfolio of destinations. The clear objective is to capture a growing VFR traveler population, generate additional foreign feed and add network density. We have already seen cooperation between Delta and LATAM, American and Gol, and United and Avianca. This trend is expected to continue as any Latin American airline reaching a critical size will require a North American partner to fully address the north-south traffic flows. These flows are expected to represent 25% of the seats departing from Latin America by 2040.

4. **Today's low network density among Latin American airlines will become an opportunity for route development.** Continuous growth in all traffic flows, domestic, intra-regional and inter-continental, will drive network developments in the next decades with the number of direct routes in the region expected to double by 2050.

### The anticipated economic boom for Latin America

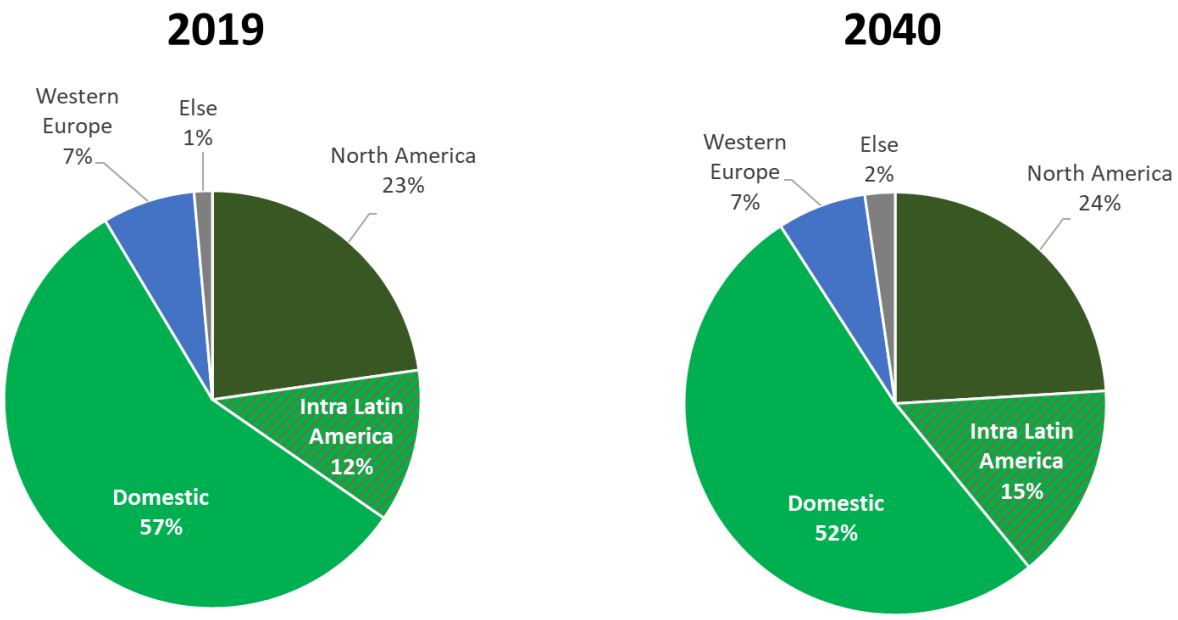
Latin America is expected to enjoy robust GDP growth of 2.1% per year to reach $5,130B by 2040. During the same period, the population is expected to grow by 0.55% per year to reach 482 million people by 2040. The increased GDP per capita and the associated expanding middle class will stimulate air transport demand over the next 20 years.

### Latin America's primary international market will remain North America

The primary traffic flows in Latin America will remain domestic and intra-regional travel, representing close to 70% of the total. Brazil has the largest share of the region's traffic at 29% followed by Mexico with 24%, together they are the region's powerhouse accounting for more than half the total traffic.

North America will remain the most important destination outside the region by far, with 24% of the traffic share by 2040, followed by Western Europe.

Traffic flows to Asia, Africa and Eastern Europe are expected to grow at rates twice the world average. However, in absolute terms, these traffic flows will remain relatively small. The long-term volatility in exchange rates could play a significant role in reorienting the regional leisure traffic toward more international destinations.




*Traffic breakdown to/from Latin America (number of seats deployed)*

## The number of direct routes will double by 2050

There is a huge potential for expanding networks in Latin America with many city-pairs simply not served today. The region had about 3,200 direct routes in operation prior to the pandemic, compared with only 2,000 routes in 2005. In 2022, the number of direct routes operated should recover to pre-pandemic levels and will grow from there at an impressive rate of 2.8% net additional routes per year reaching 5,500 routes by 2040.

## Single aisle will remain the platform for growth

The sharp increase in the number of direct routes will drive the requirement for more aircraft, but many of these routes will be beyond the maximum range of regional aircraft. This will result in a much stronger demand for both the narrowbody and small narrowbody segments, with 1,500 new aircraft required in the next 20 years. Regional aircraft will still play a niche role in selected domestic markets for regional connectivity and long-haul feed, supporting a requirement for 190 new aircraft in this category.

The widebody market is currently under-represented in Latin America with less than ten operators. LATAM is by far the largest widebody operator in the region, however we expect competition to intensify leading to a 50% increase in the widebody fleet over the next 20 years.

| 2020-2040 delivery split Latin America | Total aircraft | Large widebodies | Widebodies | Narrowbodies | Small narrowbodies | Regional aircraft |
|---|---|---|---|---|---|---|
| **2019 in-service fleet** | **1,641** | 0 | 154 | 823 | 411 | 253 |
| **2020-2040 deliveries** | **1,859** | 0 | 188 | 1,033 | 439 | 199 |
| Growth | 883 | 0 | 74 | 549 | 219 | 41 |
| Replacement | 976 | 0 | 114 | 484 | 220 | 158 |
| **2040 in-service fleet** | **2,524** | 0 | 228 | 1,372 | 630 | 294 |
| *Fleet Growth* | *+54%* | *0%* | *+48%* | *+67%* | *+53%* | *+16%* |

*For any other horizon up to 2050 please consult MHIRJ Aero Advisory Services*

# 6. ASIA & PACIFIC


## 6.1. CHINA - The future largest domestic market in the world

### Major Regional Trends

1. **New Airport infrastructure development.** According to plans released in 2021, China is aiming to have 400 civilian airports by the end of 2035, which means an increase of 150 airports compared to today's figures. The massive investment in new airport infrastructure, particularly in second-tier cities will substantially boost Chinese domestic traffic, as well as open the possibility of new domestic, regional and intercontinental route development.

2. **The Western China strategy.** China's development strategy to increase foreign investments in the still under-developed western provinces has not fully materialized yet. A successful implementation of this strategy would lead to greater economic growth in western provinces compared to the well-developed coastal regions, thus increasing passenger demand at a faster rate than in Chinese megacities.

3. **Traffic congestion in large cities.** Chinese megacity airports are reaching their capacity limits. With Beijing's third airport project complete, a third airport under consideration in Shanghai and a second under study in Guangzhou, there is very limited room left to add additional airport capacity in these major urban centers. The ensuing air traffic congestion surrounding these megacities will push aircraft size up on domestic and regional routes between large cities and incentivize airlines to operate point-to-point routes between second- and third-tier cities, bypassing hubs. Prior to the pandemic, the ten largest Chinese airports handled almost half of the country's passengers.

| | City / Airport | 2019 passengers (millions) |
|---|---|---|
| 1 | Beijing Capital | 100.01 |
| 2 | Shanghai Pudong | 76.15 |
| 3 | Guangzhou Baiyun | 73.38 |
| 4 | Chengdu Shuangliu | 55.86 |
| 5 | Shenzhen Bao'an | 52.93 |
| 6 | Kunming Changshui | 48.08 |
| 7 | Xi'an Xianyang | 47.22 |
| 8 | Shanghai Hongqiao | 45.64 |
| 9 | Chongqing Jiangbei | 44.79 |
| 10 | Hangzhou Xiaoshan | 40.11 |

*Largest Chinese airports by passenger numbers as of 2019 (arriving & departing). Source: CAAC*

4. **Narrowbodies dominate the domestic market.** With a domestic market characterized by high-price elasticity and high volumes, new route openings between second-tier cities, bypassing major hubs, will significantly increase the utilization of narrowbody aircraft. Changing market dynamics fueled by new locally-made aircraft, such as the C919, will further promote this trend.

5. **New provincial carriers enable expansion.** The fast-growing Chinese domestic market is stimulating the creation of provincial airlines. Often created as subsidiaries of larger national carriers, these provincial airlines will continue to play an important role in the development of domestic connectivity. Over the last ten years, almost 30 new airlines have been established, which is more than anywhere else in the world. 12 of these operators belong to the HNA conglomerate, three to the China Southern Group and two to the Air China Group. Prior to the pandemic, these newcomers operated 12% of the commercial Chinese fleet.


*New commercial operators in China over the last ten years, year of first operation*

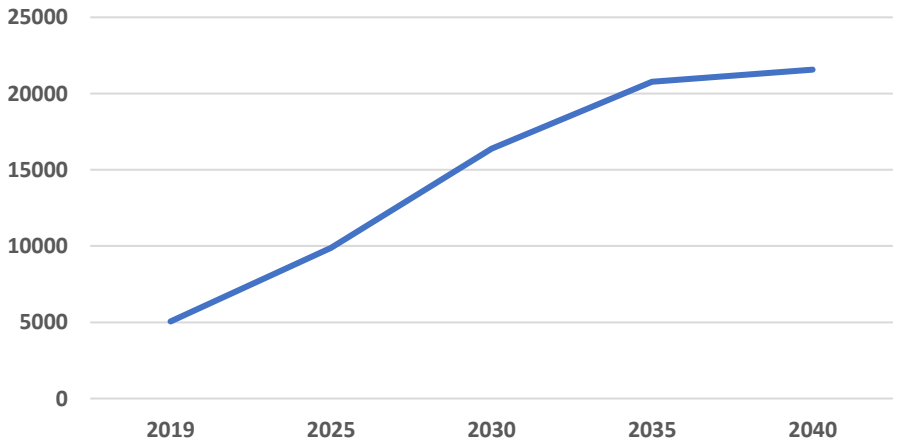
## Rising individual wealth

Although China's future economic growth is expected to slow down, it remains well above the growth of western economies at 3.9%. The GDP level is expected to expand to $31,434B by 2040. The Chinese population will remain stable, growing at only 0.04% to reach 1.48 billion people by 2040. The increasing economic output per capita of a wealthy ever-growing middle-class will boost demand for air travel and will further impact the preferences of travellers and the business models of Chinese airlines.

## A booming domestic market to fuel route developments

Today, China has the largest domestic market in the world. It is expected to continue to grow by 2.5% annually to reach 1.24 billion passengers by 2040.

Route development in China is expected to grow explosively over the next 20 years, catalyzed by the opening of more than 13,000 new domestic routes, the most in the world, and supported by various key drivers such as the new airport infrastructure development, the Western China strategy, the traffic congestion in megacities and the creation of new provincial airlines.




*Number of routes to/from China*

## One of the world's key narrowbody markets

We foresee strong growth of the narrowbody segment, fueled by route developments and aircraft replacements. A total of over 3,900 new narrowbodies, small and large, will be required in the next 20 years. An even stronger boom is expected in the smaller narrowbody and regional segments, for which fleets will be multiplied by a factor of 2.5 and 5 respectively! Small regional aircraft will play a more important role going forward due to the domestic market dynamics described above. New route developments will be central to growth, powered by Chinese-made aircraft programs such as the C919, ARJ21 and MA700. Historically, local rules and legislation created challenges for the certification of foreign regional aircraft and their introduction into Chinese fleets, explaining today's small fleet.

At the upper end, the large widebodies will see the end of their operation. It remains a curiosity that the A380 which was designed for markets like China, did not prove to be successful in the country, with just a single Chinese operator, China Southern. However, the widebody segment has great potential, with almost 640 new aircraft required over the period. Traffic between megacities and expanding international/intercontinental flying of a huge Chinese middle-class will drive the demand.

| 2020-2040 delivery split China | Total aircraft | Large widebodies | Widebodies | Narrowbodies | Small narrowbodies | Regional aircraft |
|---|---|---|---|---|---|---|
| **2019 in-service fleet** | **3,530** | 5 | 437 | 2,586 | 395 | 107 |
| **2020-2040 deliveries** | **5,066** | 0 | 617 | 2,876 | 1,036 | 537 |
| Growth | 2,158 | -5 | 264 | 919 | 554 | 426 |
| Replacement | 2,903 | 0 | 353 | 1,957 | 482 | 111 |
| **2040 in-service fleet** | **5,688** | 0 | 701 | 3,505 | 949 | 533 |
| *Fleet Growth* | *+61%* | *-100%* | *+60%* | *+36%* | *+140%* | *+398%* |

*For any other horizon up to 2050 please consult MHIRJ Aero Advisory Services*

## 6.2. ASIA & PACIFIC – The world's largest market

(Asia & Pacific in our forecast excludes China, detailed separately)

### Major Regional Trends

1. **The Asia & Pacific region is on track to become the largest air travel market in the world.** By 2023, the region will account for 21% of the world's traffic and 22% of the world's aircraft deliveries, making it the largest air travel market in the world. The region's projected passenger growth rate of 2.9% per year is above the world average of 2.5% per year and will be one of the main engines for air traffic growth.
2. **High price elasticity continues to propel low-cost carrier growth.** With a third of the world population by 2040, a growing middle class, and a very price-elastic demand, the LCC business model seems set to thrive in the region. Already the dominant business model on short- and medium-haul routes in Southeast Asia, the LCC business model has also been successfully implemented on long-haul routes. This is unique! The geographical size of the region and the growing potential of the leisure markets are also contributing factors to the continued success of the long-haul low-cost business model in the region.
3. **Growing number of start-ups, despite stabilized (restructured) national carriers.** Despite Asia & Pacific's slower traffic recovery after the pandemic compared to other regions, most airlines have managed to avoid bankruptcy and national airlines have seized the opportunity to restructure. Furthermore, strong macroeconomic tailwinds continue to drive the long-term demand growth and create a fertile environment for airline start-up creation.
4. **India's Regional Connectivity Scheme.** The implementation of the government's Regional Connectivity aviation policy (UDAN) has the potential to radically transform the Indian domestic market. Investments in infrastructure including the development of new airports in secondary cities, as well as the implementation of fare caps on flights under one hour will stimulate demand for domestic flights.

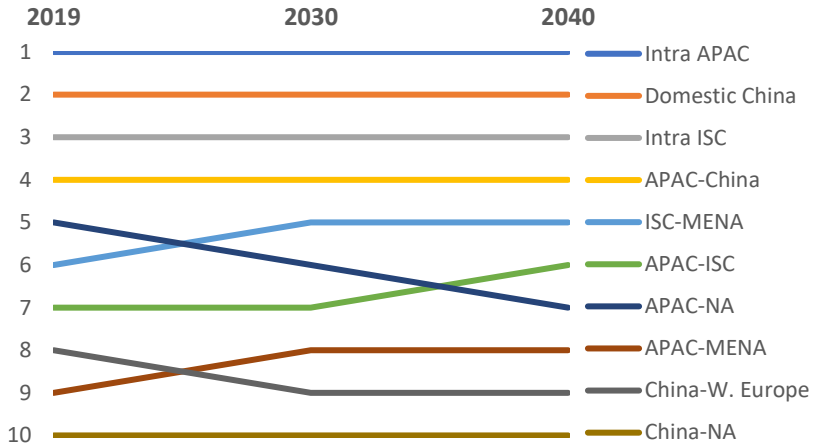
### Rising purchasing power of the middle class

At a rate of 3.8% growth per annum, Southeast Asia's economic output is expected to equal North Asia's by 2040. Over the same period, the population is expected to grow moderately by 0.74% to 814 million people. India's economy is expected to grow at an even faster rate of 6% per year, well above its population annual growth of 0.8%. India's GDP should reach $8,400B by 2040. This opens incredible opportunities for air traffic growth.

For the Pacific region, strong GDP and population growth of 2.6% and 1.25% per year respectively, are expected over the next two decades. The Asia & Pacific region combines the perfect ingredients for growth in air travel: a large and growing population, with an emerging middle class that is very eager to travel thanks to more disposable income.

## Booming regional connectivity

Intra-regional traffic flows are expected to grow at the fastest rate over the next 20 years, surpassing demand in North America and Western Europe. Traffic in Asia & Pacific is expected to grow by 2.9% per year. On its own, the Indian Sub-Continent (ISC) traffic will flourish at a very high 4.15% per annum.

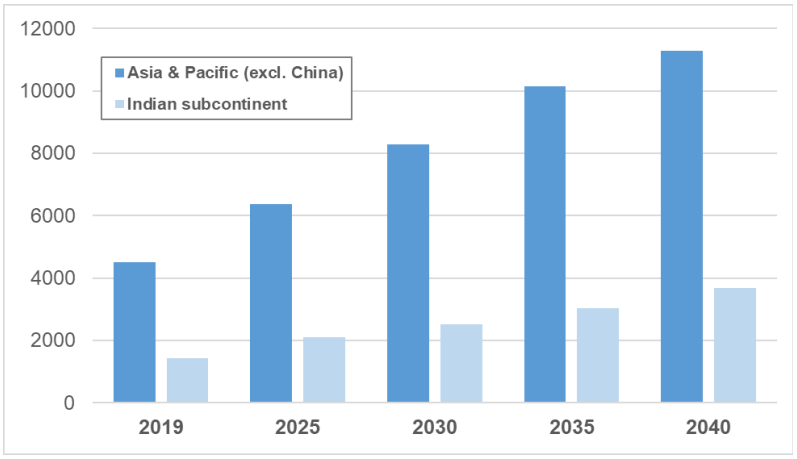



*Top 10 Asia & Pacific traffic flows (passengers)*

## An exploding route network expansion

The number of direct routes connecting Asia-Pacific (excl. China) and the Indian Sub-Continent is expected to proliferate at a rate of 4.5% annually, surpassing by far the passenger growth rate (2.9%). This should be a gold mine for airlines and in particular LCCs. Both sub-regions already host some of the world's largest LCC groups, AirAsia and Lion Air with their multiple subsidiaries, but also Indigo, SpiceJet and Go First in India.

While historically Asia & Pacific has been very much driven by its long-haul traffic, LCCs have boosted domestic traffic in the past 20 years, we expect the connecting traffic to become the next phase of growth.




*Number of routes to/from Asia & Pacific (excl. China)*

## Just another large narrowbody market

The rapid expansion of the Asia & Pacific regional route networks, combined with strong traffic growth, will create a solid demand for narrowbody aircraft. Over 3,200 new narrowbodies and another 750 small narrowbodies, primarily used as route openers, will be needed in the next 20 years. The well-established regional fleet will be almost completely replaced over the next two decades but will not see any significant growth as the geography of the region will mostly require aircraft with longer range.

The increasing traffic density between large metro areas will create opportunities for widebodies on intra-regional routes. At the upper end, the large widebody fleet will decrease significantly.

Traditionally, Asia has always been a key market for widebody aircraft and will remain the largest widebody market in the world, with over 1400 new deliveries expected in the next 20 years.

| 2020-2040 delivery split Asia & Pacific | Total aircraft | Large widebodies | Widebodies | Narrowbodies | Small narrowbodies | Regional aircraft |
|---|---|---|---|---|---|---|
| **2019 in-service fleet** | **4,005** | 60 | 1,207 | 1,915 | 223 | 600 |
| **2020-2040 deliveries** | **5,969** | 0 | 1,459 | 3,272 | 743 | 495 |
| Growth | 2,468 | -45 | 507 | 1,525 | 457 | 24 |
| Replacement | 3,456 | 0 | 952 | 1,747 | 286 | 471 |
| **2040 in-service fleet** | **6,473** | 15 | 1,714 | 3,440 | 680 | 624 |
| *Fleet Growth* | *+62%* | *-75%* | *+42%* | *+80%* | *+205%* | *+4%* |

*For any other horizon up to 2050 please consult MHIRJ Aero Advisory Services*

The Indian Subcontinent will see a significant overall fleet increase, surfing the tremendous domestic market growth and the progressive increase in its population's propensity to travel. All segments will see a significant increase, with explicit opportunities for small narrowbody fleets that are anticipated to grow almost five-fold by 2040, followed by narrowbody fleets that will double. The widebody market will grow over 50% and regional aircraft will continue to play an important role serving small communities.

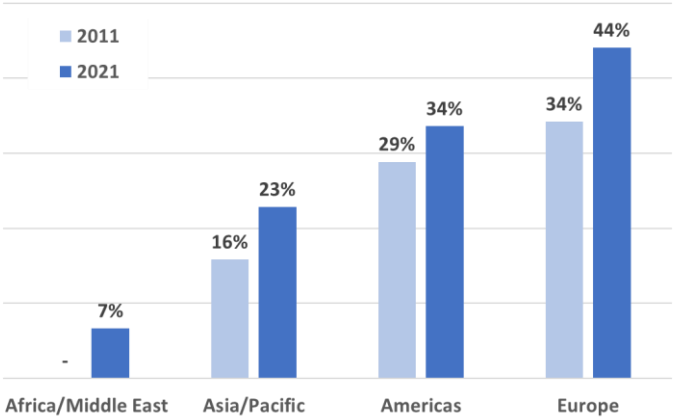
| 2020-2040 delivery split Indian Subcontinent | Total aircraft | Large widebodies | Widebodies | Narrowbodies | Small narrowbodies | Regional aircraft |
|---|---|---|---|---|---|---|
| **2019 in-service fleet** | **852** | 0 | 97 | 557 | 29 | 169 |
| **2020-2040 deliveries** | **1,512** | 0 | 123 | 989 | 132 | 268 |
| Growth | 862 | 0 | 54 | 653 | 105 | 50 |
| Replacement | 650 | 0 | 69 | 336 | 27 | 218 |
| **2040 in-service fleet** | **1,714** | 0 | 151 | 1,210 | 134 | 219 |
| *Fleet Growth* | *+101%* | *0%* | *+56%* | *+117%* | *+362%* | *+30%* |

*For any other horizon up to 2050 please consult MHIRJ Aero Advisory Services*

# 7. EUROPE/RUSSIA/CIS

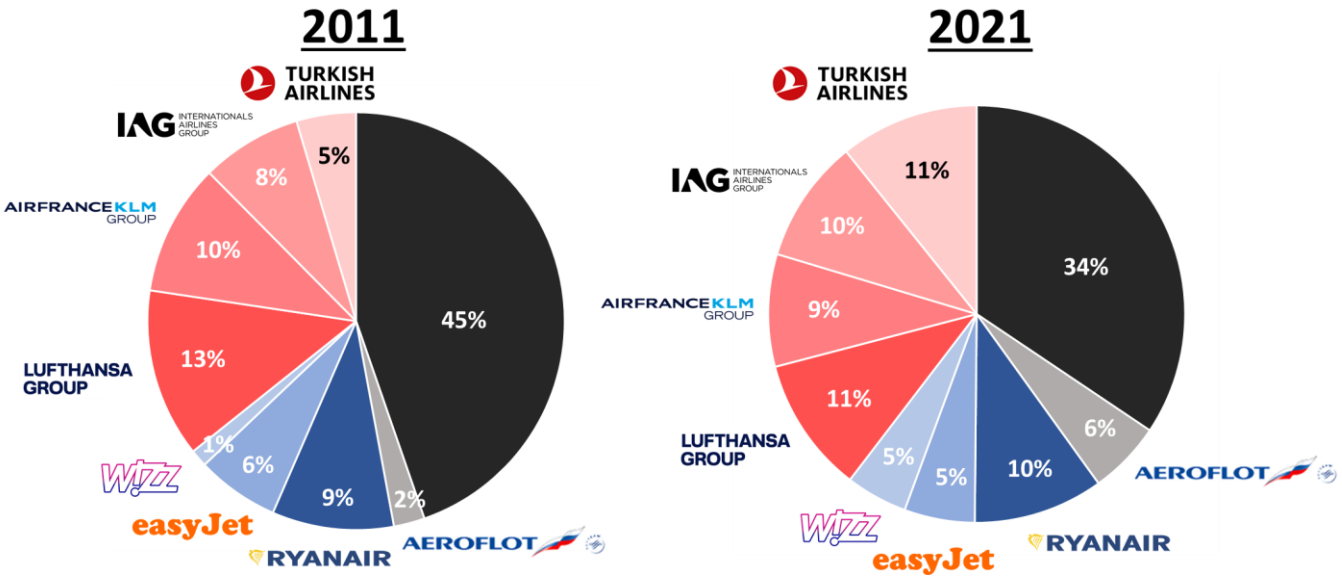

## Major Regional Trends

1. **Continuous LCC expansion and growth throughout the continent.** While the capacity share of LCCs has increased by 5-6% over the last 10 years in most regions, it has grown by 10% in Europe. Among the top ten largest European airlines by total passengers, 4 are now LCCs, including the largest one, Ryanair. We expect this progression of LCCs to continue, at the expense of other airlines. We also note a rapid growth of LCCs in Russia, but also more recently in Kazakhstan and Uzbekistan. A significant number of these LCCs are connected to network carriers.




*LCC capacity share among the top 100 airlines*

2. **Consolidation around key players.** On the one side, the big LCCs with **Ryanair, Wizz, easyJet** and on the other, the big aviation groups (network carriers with their in-house LCCs and regionals) - **Lufthansa Group** (with Austrian, Swiss, Brussels, Eurowings, Eurowings Discover, Lufthansa Cityline, Air Dolomiti), **IAG – International Airline Group** (British Airways, Iberia, Aer Lingus, Vueling), the **Air France – KLM** group (with Transavia, Cityhopper and Hop!), **Turkish Airlines** and the **Aeroflot group**.




*Capacity share development of European airlines*

The major European airline groups have managed to consolidate and expand their market dominance, leaving limited room for the remaining players. The share of the smaller unaligned network carriers, stand-alone regionals, leisure carriers and smaller niche carriers, has decreased from 45% to 33% over the last ten years.

Big groups tend to either fully own their regional operations or completely outsource it. The increased cost pressure and the greater focus on mainline operations push more and more groups to favor subcontracting regional operations to dedicated, outside regional specialists. However, most current ACMI contracts in Europe are typically of opportunistic and short-term nature, limiting the capacity for the regional specialists to invest and expand appropriately. Some of these players, such as Cityjet or Air Nostrum, have managed to secure longer term engagements and have reached a critical size to be able to leverage economies of scale and expertise. But most other players have difficulties reaching those necessary critical sizes, while the in-house regional subsidiaries of major airlines continue to struggle to exist, bearing high overhead costs (Lufthansa Cityline, Hop!). A viable solution would be the emergence of large, dedicated regional carriers, serving major airlines through long-term contracts and bringing the required expertise and cost levels, similar to what exists in North America.

3. **Increasing capacity of narrowbody aircraft.** The highly competitive European environment and the growing pressure from LCCs is creating a rush to the lowest fares, forcing airlines to pursue the lowest unit costs. The larger narrowbody aircraft deliver lower unit costs which has resulted in a 15% increase in the average narrowbody capacity in Europe between 2005 and 2019. This race to low costs and low fares can severely impact margins, especially at times of lower growth or crises.

4. **Congestion at airports and congestion in airspace.** Implementing infrastructure projects, especially those involving airport expansion, are lengthy processes, subject to political and societal priorities. The massive delay of the Berlin Brandenburg airport and the on-going discussions about London Heathrow's third runway are examples of much-needed infrastructure which is not available when required. Delays lead to workarounds and alternative solutions which are often less than ideal, and which negatively impact the efficiency of the aviation system. The inability to achieve a single European sky, despite a decade of discussions, also means that individual national airspace restrictions continue to apply. With the projected growth for the next decades combined with the inability to move quickly, there is a risk that air traffic growth in Europe could be limited by the cumulative effect of the various system inefficiencies.

5. **Leading the decarbonization revolution.** Despite some unfair criticisms such as the "flygskam" movement in the Scandinavian countries, Europe remains at the forefront of the environmental revolution in aviation. There is strong political, societal and financial will in Europe to achieve net zero carbon. The rapid ramp-up of SAF and fleet renewals will be the most effective solutions in the medium term, while investment and research in alternative fuels (electric & hydrogen) continues. The preferred approach to tackle the transition will be a model based on incentives rather than fiscal constraints. The introduction of new fuel technologies will be gradually deployed on smaller commuter or regional aircraft, so regional airports and regional airlines will be the first to operate such aircraft.

   You can find more in our ***Sustainable Aviation Roadmap*** position paper.

   The current switch to high-speed trains in some markets such as Spain, France or Germany is an intermediate step that will push aviation to react. With the gradual decarbonization of commercial aviation, a rebalancing should take place. There remains a need for decarbonized and efficient aviation on regional routes that bypass hubs and that cannot be efficiently served by the ground transportation.

## 7.1. WESTERN EUROPE - Where narrowbodies are kings

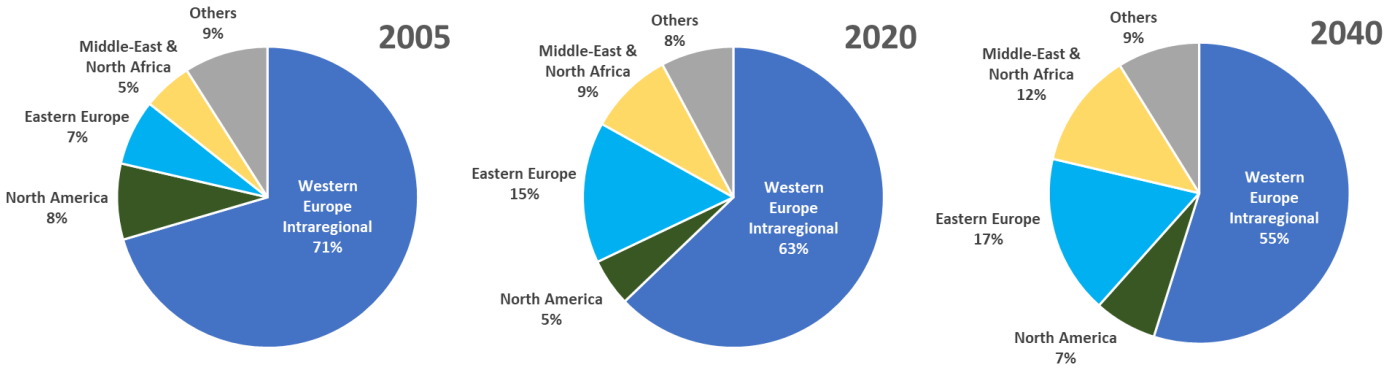
### Region with the third highest GDP level maintains solid growth

Western European GDP is expected to grow moderately from $18,061B to $23,514B by 2040 at a yearly rate of 1.5%. For the same period, its population is expected to grow slightly by 0.21% per year to 533 million inhabitants. Traffic growth will therefore be fueled by the increase in GDP, not by the stagnant population.

### Solid market demand in a mature aviation market

Western Europe is a mature aviation market with traffic to other mature markets, such as North America, expected to grow at a moderate 2.4% annually. Higher growth rates are expected to developing markets, such as Middle East & North Africa (~5%), China (~5%) and Eastern Europe (~4%). Apart from solid business traffic, Western Europe remains by far the most visited region in the world with 700 million international visitors in 2019. There is also strong demand for migrant labor and the resulting VFR traffic to those regions of the world.

| Traffic flow from Western Europe to | ASK CAGR 2019-2030 | ASK CAGR 2019-2040 | ASK CAGR 2019-2050 |
|---|---|---|---|
| Asia/Pacific | 2.4% | 2.0% | 1.9% |
| China | 4.6% | 4.0% | 3.5% |
| Eastern Europe | 4.9% | 4.0% | 3.5% |
| Indian subcontinent | 3.1% | 2.9% | 2.9% |
| Latin America | 2.9% | 2.4% | 2.2% |
| Middle-East / North Africa | 4.6% | 3.8% | 3.3% |
| North America | 2.3% | 2.3% | 2.1% |
| Sub-Saharan Africa | 3.8% | 3.0% | 2.8% |
| Western Europe | 2.8% | 2.3% | 2.1% |
| **World** | **3.4%** | **3.0%** | **2.7%** |




*Market Demand to/from Western Europe*

## More route openings to come

One of the key indicators of air service quality and growth dynamics is the number of direct routes. For Western Europe, about 12,000 routes were operated in 2019. The pandemic led to the cancellation of around 300 direct routes. By 2022 the pre-pandemic levels will be surpassed and continued dynamic growth of 3% annually is foreseen, mainly fueled by expanding LCC capacity. The number of direct routes will double to 24,800 by 2040 second only to China with 16,500 new routes by 2040.

## Strong narrowbody demand

Much like in the past 20 years, we foresee a strong demand for narrowbodies, large and small, representing 4,820 deliveries over the next 20 years: Western Europe will be the leading region in terms of narrowbody deliveries worldwide. The smaller narrowbody fleet will grow at a more moderate pace (+40%), a little higher than the regional fleet (+28%). At the upper end, large widebodies will see the end of their operation, benefiting the widebody segment which will require 1,190 new aircraft by 2040.

| 2020-2040 delivery split Western Europe | Total aircraft | Large widebodies | Widebodies | Narrowbodies | Small narrowbodies | Regional aircraft |
|---|---|---|---|---|---|---|
| **2019 in-service fleet** | **4,843** | 37 | 924 | 2,504 | 826 | 552 |
| **2020-2040 deliveries** | **6,697** | 0 | 1,190 | 3,790 | 1,034 | 683 |
| Growth | 2,798 | -37 | 571 | 1,776 | 333 | 155 |
| Replacement | 4,125 | 0 | 714 | 2,042 | 768 | 601 |
| **2040 in-service fleet** | **7,641** | 0 | 1,495 | 4,280 | 1,159 | 707 |
| *Fleet Growth* | *+58%* | *-100%* | *+62%* | *+71%* | *+40%* | *+28%* |

*For any other horizon up to 2050, please consult MHIRJ Aero Advisory Services*

## 7.2. EASTERN EUROPE incl. RUSSIA/CIS - LCCs are taking over

This forecast does not consider any potential long-term implications of the conflict between Russia and Ukraine as it is too early to foresee how this will affect future growth and requirements in those countries.

### Despite solid growth, GDP levels remain behind the west

GDP in Eastern Europe will grow faster than in Western Europe at a rate of 1.9% per annum, from $3,219B in 2021 to $4,562B by 2040. During the same timeframe, the population is expected to remain stable, shrinking slightly by -0.34% to 299 million inhabitants by 2040. The growing middle class in Eastern Europe will be the primary driver for traffic growth.

### Good demand for long-haul and VFR traffic

Eastern European traffic numbers and growth projections reflect a maturing aviation market. Moderate growth is expected between Eastern Europe and other developed markets such as North America (up to 2.4% per year). Higher growth rates are expected to developing and growing markets such the Middle East (5%), China (5%) and India (6%).

The primary market will remain to Western Europe, which continues to grow based on solid business traffic and the strong connections established through regional labor shifts. The early surge of Eastern European citizens seeking to find employment in Western Europe has stabilized and the result of the migrations since 2004 is a sizeable community of citizens of Eastern European origins now settled in most major cities in Western Europe. This in turn has resulted in a steady flow of workers and families within the European Union. The major European LCCs tapped into this market from an early stage and their growth strategies have reflected the movement of people around the EU. On the business side, many companies have set up operations in Eastern Europe, taking advantage of attractive investment conditions.

| Traffic flow from Eastern Europe to | ASK CAGR 2019-2030 | ASK CAGR 2019-2040 | ASK CAGR 2019-2050 |
|---|---|---|---|
| Asia/Pacific | 4.5% | 3.7% | 3.2% |
| China | 5.6% | 4.8% | 4.2% |
| Eastern Europe | 5.1% | 4.2% | 3.5% |
| Indian subcontinent | 6.4% | 5.7% | 5.2% |
| Latin America | 6.2% | 5.1% | 4.3% |
| Middle-East / North Africa | 5.6% | 5.1% | 4.3% |
| North America | 1.9% | 2.4% | 2.4% |
| Sub-Saharan Africa | 6.2% | 5.2% | 4.4% |
| Western Europe | 4.9% | 4.0% | 3.5% |
| **World** | **3.4%** | **3.0%** | **2.7%** |

Traffic patterns are now more balanced in terms of origin compared to the past. Many Eastern Europeans maintain some family, cultural and business links with Russia and the CIS, and these traffic flows will continue.

The flow of workers to Russia remains the main source of passenger demand in Central Asia and Caucasus (CIS). There are other notable traffic flows from Central Asia – for example to China, the Middle East and Turkey, but Russia will remain the main destination for traffic from this region. Demographic trends suggest Russia may well need more workers in the future and the CIS is the obvious source of such labor.

Citizens of Russia and the CIS are regular visitors to the EU for leisure and business. Yet, the volume of Western European citizens visiting Russia and the CIS is relatively small, but with substantial growth potential.

OUR VIEW

***THE IMPACT OF THE FLOW OF WORKERS FROM THE CIS TO RUSSIA***

*A UN report stated that in 2016/2017, almost 2 million foreign citizens received work permits and patents to work in Russia and along with several hundred thousand who were entitled to work without a special permit each year. The majority of these workers came from Uzbekistan, Kyrgyzstan and Tajikistan. The exact figures are difficult to estimate due to time limited, seasonal, and even illegal work, or changes in citizenship over time. However, another way of assessing the importance and the volume of foreign workers in Russia, is by quantifying the amount of annual remittance returned to the home countries by these workers and its share of the country's GDP. For instance, Kyrgyz citizens working abroad sent back $2,450M in 2021, representing some 30% of the country's GDP, of which 83% came from those working in Russia.*
*See the table below for more details.*

| Country | Remittance (M USD) - 2019 | Remittance (M USD) - 2021 | Share of the home country's GDP | Share from Russia |
|---|---|---|---|---|
| **Kyrgyzstan** | 2,411 | 2,450 | 30% | 83% |
| **Azerbaijan** | 1,275 | 1,500 | 3% | 62% |
| **Armenia** | 1,527 | 1,228 | 9% | 59% |
| **Tajikistan** | 2,321 | 2,250 | 28% | 58% |
| **Uzbekistan** | 8,545 | 7,600 | 12% | 55% |
| **Kazakhstan** | 506 | 390 | 20% | 51% |
| **Georgia** | 2,258 | 2,200 | 12% | 18% |

## More direct routes

Approximately 5,400 routes were operated in 2019 from Eastern Europe, 55% less than in Western Europe. The pandemic led to the cancellation of around 300 direct routes. In 2021, pre-pandemic levels were already reached and expanding LCCs are expected to fuel dynamic growth of 3.5% annually going forward. The number of direct routes from Eastern Europe will double by 2033, and by 2040, some 13,200 direct routes will be flown.

## Strong demand for narrowbodies

We foresee strong growth of the narrowbody and small narrowbody fleets which will almost double, requiring nearly 2,000 new aircraft deliveries combined. Around half of these deliveries will be dedicated to the Russian market. A more moderate evolution is expected in the regional and widebody fleets, increasing respectively by 19% and 31%.

| 2020-2040 delivery split Eastern Europe | Total aircraft | Large widebodies | Widebodies | Narrowbodies | Small narrowbodies | Regional aircraft |
|---|---|---|---|---|---|---|
| **2019 in-service fleet** | **1,730** | 0 | 159 | 809 | 462 | 300 |
| **2020-2040 deliveries** | **2,466** | 0 | 198 | 1,323 | 645 | 300 |
| Growth | 1,083 | 0 | 50 | 622 | 354 | 57 |
| Replacement | 1,383 | 0 | 148 | 701 | 291 | 243 |
| **2040 in-service fleet** | **2,813** | 0 | 209 | 1,431 | 816 | 357 |
| *Fleet Growth* | *+63%* | *0%* | *+31%* | *+77%* | *+77%* | *+19%* |

*For any other horizon up to 2050 please consult MHIRJ Aero Advisory Services*

# 8. MIDDLE EAST & AFRICA


## 8.1. MENA – The world's hub

### Major Regional Trends

1. **Continued growth of LCC carriers in the MENA region.** The Middle East and North Africa region have seen a remarkable increase in capacity from low-cost carriers. European LCCs are increasing their presence in North Africa and the GCC, but the regional budget carriers are also expanding their activities across the region and into Europe. The increasing attractiveness of the MENA region as a leisure destination is expected to sustain the growth of LCCs in the region.
2. **Long-haul to long-haul connections are expected to remain the dominant business model.** The large network carriers of the GCC (Emirates, Etihad and Qatar) have captured a significant portion of long-haul East to West travel flows with their geographical advantage, large widebody fleets, and deep pockets. The long-haul-to-long-haul connectivity model that these airlines operate will remain significant in the GCC, further driving widebody aircraft requirements.
3. **North African traffic mainly from Europe.** Passengers travelling for leisure and visiting friends and family will make up most of the traffic to the North African region. With most passengers originating from Europe, this will further boost the LCC growth and the utilization of high-density narrowbody aircraft.
4. **Regional connectivity plan in Saudi Arabia.** The GCC's largest domestic market, Saudi Arabia, is expected to benefit substantially from the implementation of the domestic connectivity scheme over the next 20 years. This plan should further boost the traffic growth, which we expect to be at 1% annual for domestic and 4.7% for international passengers.

### Steady economic growth and individual wealth.

Middle Eastern GDP will grow from $2,872B to $4,707B by 2040 at a rate of 2.6% per annum. For the same period, its population is expected to grow by 1.4% per year to 485 M inhabitants. The GCC region will continue to boast the highest GDP per capita in the region, sustaining long-term air travel growth and demand.

North African GDP is expected to grow strongly from $380B to $692B by 2040 at an annual rate of 3.2% and its population is expected to grow by 1.05% per year to 129 M inhabitants during the same period.

### Reinforced status for regional aviation powerhouses

The vast majority of MENA's air travel will remain concentrated in the GCC region, with the long-haul connectivity model expected to remain the key driver of air travel to the region. Other countries in the region, such as Egypt and Israel have significant potential and will triple their seat capacity over the next two decades.

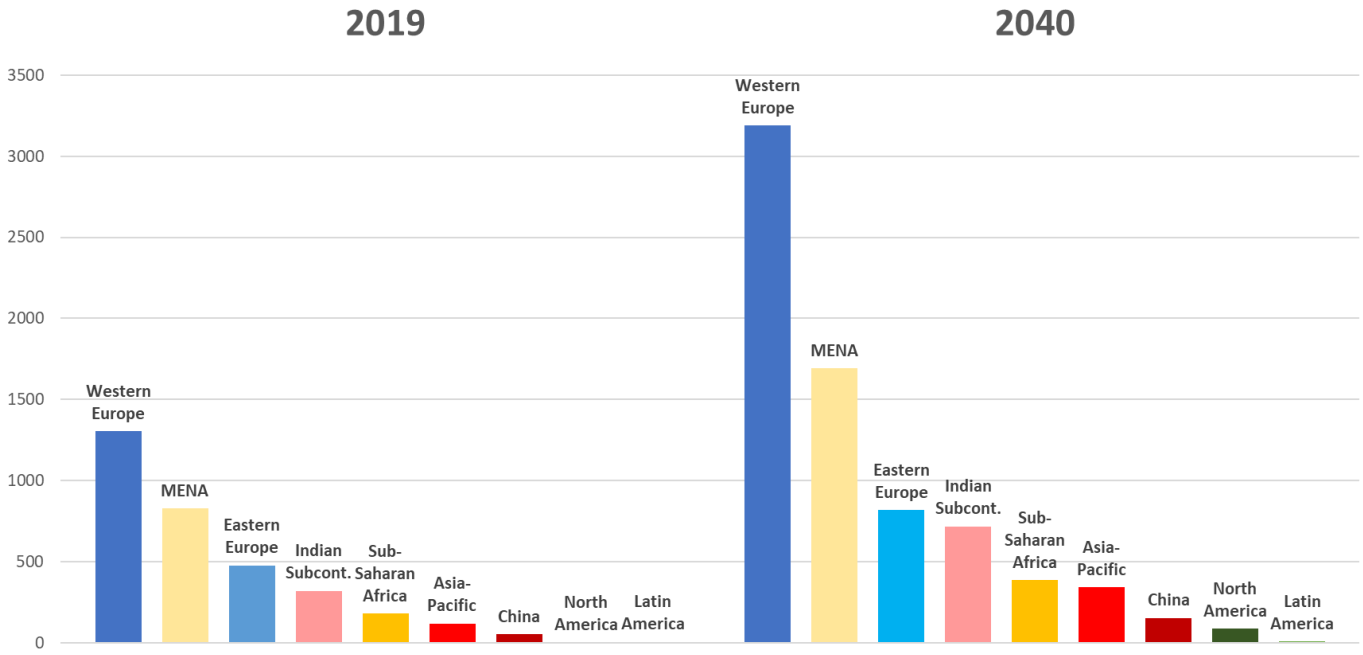
| 2019 Rank | Country | Seat Capacity (millions) |
|---|---|---|
| 1 | UAE | 152.9 |
| 2 | Saudi Arabia | 94.8 |
| 3 | Qatar | 54.3 |
| 4 | Egypt | 37.3 |
| 5 | Morocco | 30.2 |

| 2040 Rank | Country | Seat Capacity (millions) |
|---|---|---|
| 1 | UAE | 338.4 |
| 2 | Qatar | 224.1 |
| 3 | Saudi Arabia | 202.4 |
| 4 | Egypt | 100.9 |
| 5 | Israel | 76.9 |

## Capitalizing on the leisure segment

The massive leisure market potential in North Africa will prompt significant growth in the number of routes, especially from Western Europe and intra-regional. Liberalized air service agreements have accelerated growth and the dynamics are expected to continue.

Today there are few existing direct services, however improved travel policies and rapid economic growth will result in a doubling of intra-regional routes.




*Number of routes to/from MENA*

## Future fleet growth in Middle East regional market

The growth of LCC carriers in MENA will continue to drive the need for narrowbodies with a requirement for more than 1,750 new narrowbody aircraft by 2040, 90% of them being dedicated to airlines based in the Middle East. Widebody aircraft will remain essential tools for the “big three” Gulf carriers to sustain their long-haul connectivity model and continued growth. The lack of large widebodies will further reinforce that need, leading to a widebody fleet expected to grow by 90% in the next 20 years, primarily dedicated to the Middle East market.

Even if marginal, this region will retain the world’s largest in-service fleet of large widebodies.

Regional aircraft have traditionally played a minor role in this part of the world. However, new regional connectivity plans in countries such as Saudi Arabia and the emergence of larger domestic markets in the region, will boost regional aircraft fleets which are expected to almost double by 2040.

| 2020-2040 delivery split MENA | Total aircraft | Large widebodies | Widebodies | Narrowbodies | Small narrowbodies | Regional aircraft |
|---|---|---|---|---|---|---|
| **2019 in-service fleet** | **1,681** | 135 | 631 | 612 | 176 | 127 |
| **2020-2040 deliveries** | **3,320** | 0 | 930 | 1,767 | 364 | 259 |
| Growth | 1,937 | -64 | 576 | 1,142 | 178 | 105 |
| Replacement | 1,319 | 0 | 354 | 625 | 186 | 154 |
| **2040 in-service fleet** | **3,618** | 71 | 1,207 | 1,754 | 354 | 232 |
| *Fleet Growth* | *+115%* | *-47%* | *+91%* | *+187%* | *+101%* | *+83%* |

*For any other horizon up to 2050 please consult MHIRJ Aero Advisory Services*

## 8.2. SUB-SAHARAN AFRICA – Land of opportunity

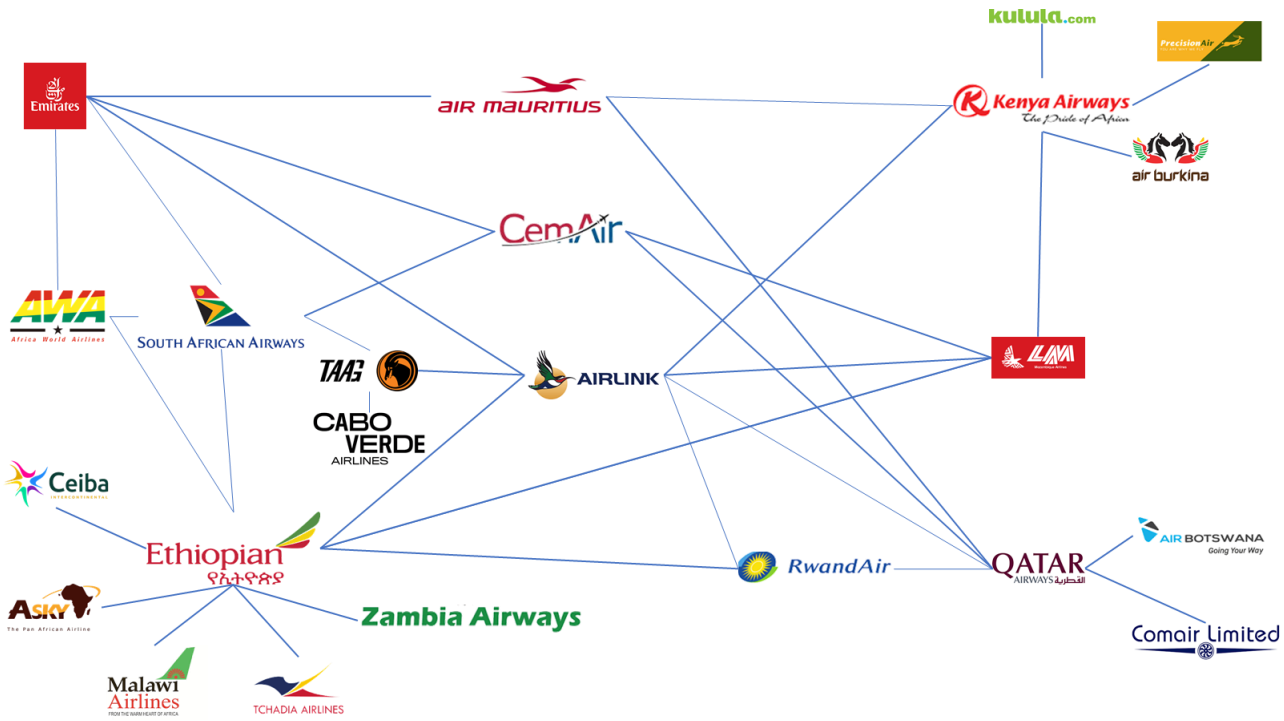
### Major Regional Trends

1. **Profitability remains difficult to achieve.** The lack of profits has been a key challenge and the main deterrent for sustainable growth amongst African airlines. The region's inter-continental and intra-continental connectivity remains under-developed. Following a trend toward smaller, right-sized and more economical aircraft that started in 2017, the African airline industry is on the path to achieving profitability and realizing the continent's air travel potential.

2. **Regional connectivity between West and Southern Africa will be a key development vector.** Some significant efforts have been put in place to restore connectivity between Western and Southern Africa to avoid highly circuitous journeys through Eastern Africa or even Europe or the Middle East. This new network development is not only expected to drive intra-regional traffic but will also boost traffic between Northern and Southern Africa.

3. **Intra-Africa free trade union and single East Africa passport will boost traffic.** The syndication of African subregions through trade unions and simpler travel facilities, such as ECOWAS and the single Eastern African passport, will have a beneficial effect on intra-regional traffic and will drive more regional and transcontinental flights.

4. **Growing number of alliances between African carriers and key players from the Middle East.** The increasing number of partnerships, ownership stakes and alliances between regional African airlines and foreign long-haul specialists from the Gulf region, will accelerate the growth of passenger demand in smaller markets. Consolidation at the intra-African level will also enhance the airlines' ability to generate profits and consequently drive passenger growth.



5. **Revival of national carriers.** Unlike many other regions of the world, national airlines are making a comeback in Africa. Governments throughout the continent are recognizing the importance of controlling the inflows of traffic and ensuring connectivity with the world. Significant investments from governments in the development of the aviation sector, including airlines, infrastructure, and tourism will ultimately be the catalysts for traffic growth. However privately owned airlines do exist alongside the national carriers in a few African countries with Kenya, Nigeria and South Africa each having an extensive private airline sector in sub-Saharan Africa.


*Airline ownership landscape in Sub-Saharan Africa*

## A changing demographic landscape

Sub-Saharan Africa is expected to see the world's highest population growth over the next 20 years reaching 1.76 billion people at a rate of 2.36% annually. This will make Sub-Saharan Africa the most populated region worldwide after the Indian Sub-Continent. The shifting demographic trends will positively influence the propensity to travel in Sub-Saharan Africa, further fueled by an impressive 3.5% annual GDP growth, reaching $3,217B by 2040.

## A similar podium at the top

South Africa is expected to remain the largest air transport market until 2040 followed by Ethiopia. The booming Nigerian and Kenyan domestic markets will generate momentum in regional air traffic going forward, with seat capacity more than doubling at the country level over the period. Sudan will break into the top 5 by 2040, jumping ahead of Ghana and Tanzania.

| 2019 Rank | Country | Seat Capacity (millions) |
|---|---|---|
| 1 | South Africa | 38.8 |
| 2 | Ethiopia | 18.5 |
| 3 | Nigeria | 13.5 |
| 4 | Kenya | 12.8 |
| 5 | Tanzania | 6.1 |

| 2040 Rank | Country | Seat Capacity (millions) |
|---|---|---|
| 1 | South Africa | 61.0 |
| 2 | Ethiopia | 54.7 |
| 3 | Nigeria | 35.4 |
| 4 | Kenya | 30.2 |
| 5 | Sudan | 14.6 |

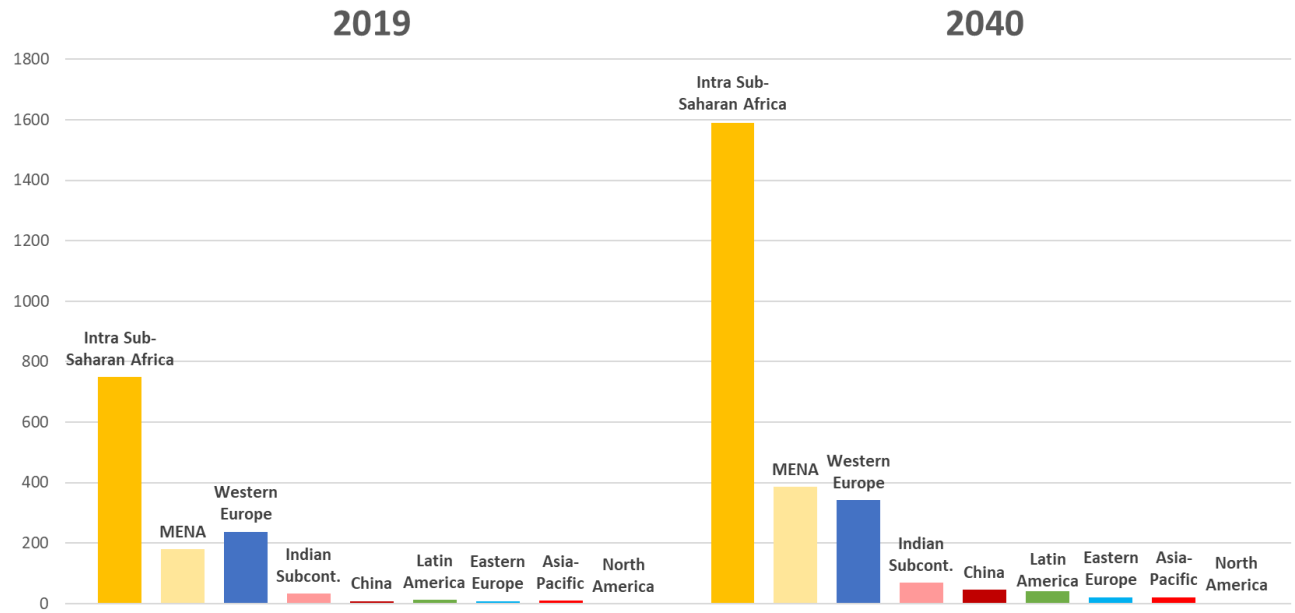
## Untapped opportunity

New intra-regional routes will double and will offer the biggest future growth potential by far. The significant route development within Africa will be further catalyzed by the implementation of a single air transport market (SATAM). The west-south African corridor, particularly the Nigeria-South Africa market, presents an attractive route development opportunity that will contribute to a significant number of new routes. Traditional connections to Western Europe and Middle East North Africa will remain strong, with the number of direct routes multiplied by 1.4 times and 2.2 times respectively.

## Sub-Saharan narrowbody fleet to triple by 2040

The region will require over 1,000 new aircraft in the next 20 years with the narrowbody fleet expected to triple in size. Demand for small narrowbodies will increase by 50%, benefiting from the growing traffic and new route opportunities. A cascading upshift in aircraft size should take place with Regional aircraft being up-gauged to small narrowbodies, which in turn will be up-gauged to large narrowbodies.

The very fragmented airline market on the continent, with smaller widebody fleets on average and less than ten widebody operators, limits the future demand for widebodies to just 190 aircraft. As of today, the only sizeable widebody operation in Sub-Saharan Africa is with Ethiopian Airlines.




*Number of routes to/from Sub-Saharan Africa*

| 2020-2040 delivery split Sub-Saharan Africa | Total aircraft | Large widebodies | Widebodies | Narrowbodies | Small narrowbodies | Regional aircraft |
|---|---|---|---|---|---|---|
| **2019 in-service fleet** | **699** | 0 | 113 | 108 | 170 | 308 |
| **2020-2040 deliveries** | **832** | 0 | 120 | 325 | 217 | 170 |
| Growth | 362 | 0 | 75 | 218 | 90 | -21 |
| Replacement | 449 | 0 | 45 | 107 | 127 | 170 |
| **2040 in-service fleet** | **1,061** | 0 | 188 | 326 | 260 | 287 |
| *Fleet Growth* | *+52%* | *0%* | *+66%* | *+202%* | *+53%* | *-7%* |

*For any other horizon up to 2050 please consult MHIRJ Aero Advisory Services*

# 9. FACTORS IMPACTING A FORECAST

Air travel development is intimately linked to economic growth, especially increasing income levels, buying power, and demographic growth. In other words, the size and spending capability of the middle-class drive traffic growth.

There are, however, other factors which can further accelerate or, to the contrary, slow down air traffic development. Some new enablers have also appeared in recent years which should create turning points for commercial aviation over the upcoming decades.

These effects are not factored into the forecasting methodologies but are important to consider in order to put the forecast results into perspective.

## Market liberalization

Passengers, as consumers, prefer competition because it drives better products, better connectivity, and lower fares. Removing strict bilateral agreements, creating open skies and deregulating markets increases access to new entrants and stimulates competition. It is not a coincidence that the world's largest air travel markets are those that deregulated the earliest.

Similarly, heavy taxation of air services limits traffic growth. Aviation is still too often seen as a cash cow that can be milked endlessly without damage. Air service taxation constrains economic growth, and that applies from the country down to the airport level. A balance must always be sought between economic development and taxation required to maintain and renew the necessary infrastructure.

## Technology

Technology plays a huge role in aviation. Constant improvements allow more economical operations, lower-cost services and improved productivity, which all lead to lower fares and more traffic.

As we have seen with the introduction of the A320neo and the 737 MAX, the arrival of a new generation of aircraft can lead to a market rush to secure delivery slots, impacting the delivery forecast. This also happened in the small narrowbody segment with the A220 and the Embraer E2. The entry-into-service of these aircraft revived interest from airlines wishing to right-size some of their fleets.

Another example is how improved range capability has systematically led to the creation of new markets, generating additional traffic. The introduction of the 787 has led to the fragmentation of long-haul markets, a trend that has just started. We expect a similar phenomenon will happen with the A321XLR.

The arrival of new-generation or more capable products can artificially accelerate deliveries in some aircraft segments although there is usually a rebalancing which takes place in the long run.

## Sustainability

The aviation industry has embarked on a transformational path to reach net zero carbon by 2050 and that will certainly impact any forecast results.

The team at MHIRJ Aero Advisory Services recently published a position paper on the Sustainable Aviation Roadmap. The study examines various approaches to address sustainability and how they will impact the composition of the commercial aircraft fleet as well as key industry stakeholders such as airlines, airports, manufacturers, etc.

One of the key take-aways is that, aside from the deployment and wider use of SAF across the industry, the new sustainable technologies will be implemented on smaller commuter and regional aircraft first, before migrating to the larger aircraft segments. This could revolutionize regional flying in many ways. Not only would it generate immediate interest from many airlines and accelerate anticipated regional aircraft deliveries, it would also create new route opportunities in certain regions such as Europe, where regulators and lawmakers have given priority to the railway system for environmental reasons.

On the other hand, some of these technologies, such as hydrogen, will require significant investment and structural changes, which could negatively impact air travel growth if all the transformation costs are passed on to the passengers. A smarter approach will need to be developed, preserving growth by spreading the burden across all stakeholders.

## Oil price

Many consider the rising price of oil as an influencing and limiting factor to air travel growth. However, we believe this is underestimating the ability of the entire aviation ecosystem to adapt. It is true that if the price of oil increases quickly, airlines will not be able to absorb the shock in the short term and this will lead to increased ticket prices, resulting in reduced passenger traffic. However, if the price of oil rises gradually over a longer period of time, the industry has proven it can adapt and compensate without any noticeable impact on traffic growth.

So, the impact of the price of oil on the forecast depends on the extent and scale of its volatility.

## Pilots

Short-term and sudden shortages will definitely impact air traffic as airlines find themselves with no manpower to fly or maintain their aircraft, as has been recurrently observed in the last few years. In other words, what is not flown results in lost traffic!

But these recurrent pilot shortages could pale compared to what would happen if the world suddenly needed thousands of additional pilots to fly eVTOLs or air taxis. Until they are flown remotely or become autonomous, these new vehicles will require certified pilots and the huge buzz they are creating could quickly turn into a battle to secure piloting resources. We believe that pay scales will play favorably toward commercial airlines and newly certified pilots would naturally prefer larger aircraft to air taxis.

These are just some of the exogenous factors that could impact the outcome of the forecast.

# 10. HOW WE CAN HELP

In an environment where making long-term strategic and capital-intensive decisions is “routine”, understanding future market opportunities requirements, global and regional trends, down to route-by-routes opportunities, is essential.

## Airlines – Fleet & Network Strategy:

Key to every airline’s success and profitability is its network strategy. From developing entirely new networks to optimizing existing ones, understanding the short and medium / long term demands and market developments, at country or airport level, for specific or more global markets is at the forefront of defining or refining a carrier’s network strategy. This forms the basis for many other critical strategic decisions, including fleet planning, mergers/acquisitions, restructuring and strategic partnerships.

## Airlines – Revenue Strategy:

It is not just about finding new markets or optimizing existing ones. Driving greater economic efficiencies requires assessing route profitability and identifying the right-size aircraft to generate maximum revenue and profit. And it all starts with understanding market dynamics, competitive positionings, underlying market sizes and traffic flows, to deliver short-term and longer-term cost and revenue improvements as well as comprehensive multi-year revenue forecasts.

## Banks & Lessors – Fleet and Market Strategy:

Understand and forecast future trends is central to de-risking aircraft acquisitions and disposals. By forecasting global passenger demand and aircraft market trends, regional traffic trends and aircraft segment changes, down to the changing passenger behaviors, one can anticipate aircraft program requirements and future aircraft developments.

## Airports – Air Service Development Strategy:

Whether for defining and sizing the infrastructure requirements (master planning), or anticipating future fleet mixes, or developing sound business plans to attract airlines and passengers, a solid grasp of the market potential, at different levels of granularity, of the passenger flows and the route dependencies, is key to any air service development analysis.

## OEM and Aviation Vendors – Product and Market Strategy:

To say that launching a new aircraft program or a derivative is a complicated and costly endeavour is an understatement. These types of decisions are critical and will have a lasting impact up and down the value chain. It all starts with the market, the sizing, the trending, the impact of crises and upturns, the identification of market challenges and opportunities, and the market potentials linked to fleet developments, at macro and micro levels, in the medium and long terms. All of which are essential to achieve a market-matched product or service offering.

## MHIRJ Aero Advisory Services

As part of the world's leading industrial firm, our team of aviation professionals combines a vast experience in both aircraft development and aircraft operations. This unique industry position and unmatched perspective enable us to understand how aircraft OEMs develop products and services, how airlines grow fleets and networks, and how the aviation market must evolve to meet the needs of an ever-changing world.

Our team is comprised of ex-senior executives of aircraft manufacturers and former executives from well-regarded airlines and lessors. Their depth of knowledge and past experience enable them to understand the complex interactions between network and fleet planning, and quickly assess the potential implications of various fleet strategies such as the introduction of new or replacement aircraft types.

In summary:

- A 15-member strong team of experts coming from OEMs, airlines, and lessors:
  - allowing a 360º view on the business, with access to hundreds of senior executives at airlines, lessors, manufacturers, service providers, etc.
  - combining almost 400 years of experience in commercial aviation, both from the "buy side" and the "sell side", allowing a greater ability to assess risks and opportunities.

- A deep industry knowledge in aircraft & engine technology, airline network strategy, airline fleet & product strategy, airline cost & revenue optimization, passenger traffic, airline business models and aircraft transactions.

For more information:

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# 11. APPENDIX

## 11.1. Reference tables

### 11.1.1. GDP and population

| | GDP CAGR (2015 USD based) | | | | Population CAGR | | | |
|---|---|---|---|---|---|---|---|---|
| | 2019-2030 | 2030-2040 | 2040-2050 | 2019-2050 | 2019-2030 | 2030-2040 | 2040-2050 | 2019-2050 |
| Asia/Pacific | 2.1% | 1.8% | 1.6% | 1.8% | 0.6% | 0.4% | 0.2% | 0.4% |
| China | 4.6% | 3.0% | 2.1% | 3.3% | 0.2% | -0.1% | -0.3% | -0.1% |
| Eastern Europe | 2.1% | 2.3% | 1.8% | 2.1% | 0.2% | 0.1% | 0.1% | 0.2% |
| Indian subcontinent | 5.8% | 5.0% | 3.8% | 4.9% | 1.0% | 0.7% | 0.4% | 0.7% |
| Latin America | 1.8% | 1.8% | 1.5% | 1.7% | 0.8% | 0.5% | 0.3% | 0.5% |
| Middle-East / North Africa | 2.4% | 2.3% | 1.8% | 2.2% | 1.5% | 1.2% | 0.9% | 1.2% |
| North America | 1.7% | 1.8% | 1.7% | 1.7% | 0.5% | 0.5% | 0.4% | 0.5% |
| Sub-Saharan Africa | 3.1% | 3.3% | 3.1% | 3.2% | 2.5% | 2.2% | 1.9% | 2.2% |
| Western Europe | 1.2% | 1.1% | 1.2% | 1.1% | 0.3% | 0.2% | 0.1% | 0.2% |
| **World** | **2.5%** | **2.2%** | **1.9%** | **2.2%** | **0.9%** | **0.7%** | **0.6%** | **0.8%** |

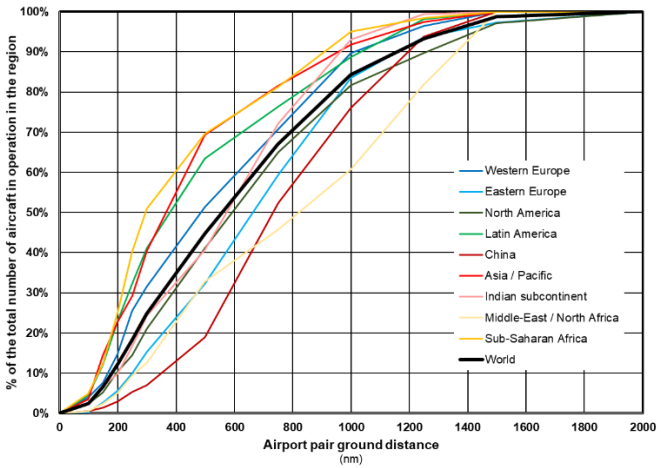
*Source: Oxford Economics*

### 11.1.2. Operated Routes

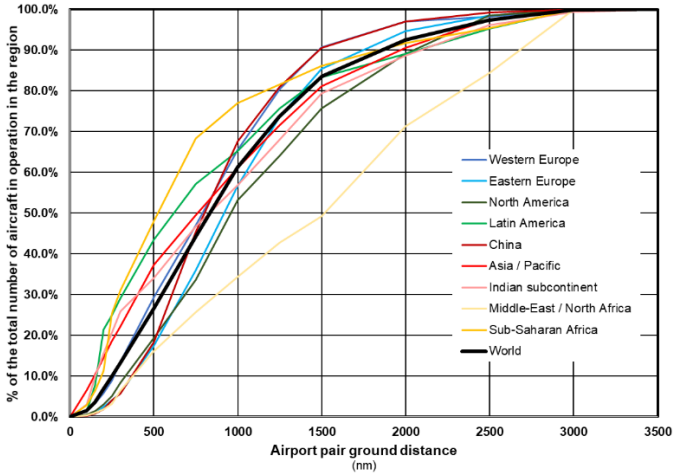
| | Market share of the number of operated | | | | Number of operated routes | | |
|---|---|---|---|---|---|---|---|
| | 2019 | 2030 | 2040 | 2050 | 2019-2030 | 2030-2040 | 2040-2050 |
| Asia/Pacific - Asia/Pacific | 8.1% | 7.8% | 7.9% | 7.8% | 5.0% | 3.9% | 3.1% |
| Asia/Pacific - Indian subcontinent | 0.4% | 0.4% | 0.5% | 0.6% | 5.9% | 5.1% | 4.5% |
| Asia/Pacific - Middle-East / North Africa | 0.4% | 0.4% | 0.5% | 0.5% | 7.3% | 5.2% | 4.4% |
| Asia/Pacific - Sub-Saharan Africa | 0.0% | 0.0% | 0.0% | 0.0% | 6.1% | 3.1% | 2.3% |
| China - Asia/Pacific | 3.4% | 4.5% | 5.0% | 5.5% | 7.9% | 5.9% | 4.7% |
| China - China | 10.8% | 22.5% | 22.4% | 19.5% | 12.6% | 7.7% | 5.2% |
| China - Indian subcontinent | 0.1% | 0.1% | 0.2% | 0.2% | 6.6% | 6.1% | 5.5% |
| China - Middle-East / North Africa | 0.2% | 0.2% | 0.2% | 0.2% | 8.3% | 5.1% | 4.5% |
| China - Sub-Saharan Africa | 0.0% | 0.1% | 0.1% | 0.1% | 15.2% | 8.6% | 6.4% |
| Eastern Europe - Asia/Pacific | 0.7% | 0.4% | 0.3% | 0.3% | -0.5% | 0.5% | 0.8% |
| Eastern Europe - China | 0.5% | 0.3% | 0.3% | 0.3% | 1.4% | 1.4% | 1.5% |
| Eastern Europe - Eastern Europe | 5.3% | 5.5% | 6.2% | 6.1% | 5.7% | 4.8% | 3.6% |
| Eastern Europe - Indian subcontinent | 0.1% | 0.1% | 0.1% | 0.1% | 4.3% | 3.7% | 3.7% |
| Eastern Europe - Latin America | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% | -0.2% | 0.4% |
| Eastern Europe - Middle-East / North Africa | 1.4% | 1.1% | 1.1% | 1.1% | 2.9% | 2.6% | 2.2% |
| Eastern Europe - North America | 0.1% | 0.1% | 0.0% | 0.0% | -0.6% | -0.5% | -0.3% |
| Eastern Europe - Sub-Saharan Africa | 0.0% | 0.0% | 0.0% | 0.0% | 8.7% | 4.7% | 3.3% |
| Indian subcontinent - Indian subcontinent | 2.2% | 2.3% | 2.8% | 3.9% | 5.7% | 5.1% | 5.1% |
| Indian subcontinent - Middle-East / North Africa | 1.0% | 0.9% | 0.9% | 0.9% | 5.2% | 3.9% | 3.0% |
| Indian subcontinent - Sub-Saharan Africa | 0.1% | 0.1% | 0.1% | 0.1% | 6.7% | 3.7% | 2.9% |
| Latin America - Asia/Pacific | 0.0% | 0.0% | 0.0% | 0.0% | 3.8% | 3.0% | 2.7% |
| Latin America - China | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| Latin America - Latin America | 5.6% | 4.7% | 4.5% | 4.7% | 3.6% | 2.9% | 2.6% |
| Latin America - Middle-East / North Africa | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 1.7% | 1.8% |
| Latin America - Sub-Saharan Africa | 0.0% | 0.0% | 0.0% | 0.0% | 5.6% | 4.0% | 3.1% |
| Middle-East / North Africa - Middle-East / North Africa | 2.5% | 2.3% | 2.2% | 2.3% | 4.7% | 3.4% | 2.9% |
| Middle-East / North Africa - Sub-Saharan Africa | 0.5% | 0.5% | 0.5% | 0.5% | 5.0% | 3.7% | 2.9% |
| North America - Asia/Pacific | 0.4% | 0.3% | 0.3% | 0.3% | 2.5% | 2.0% | 2.1% |
| North America - China | 0.2% | 0.1% | 0.1% | 0.2% | 0.9% | 1.5% | 2.3% |
| North America - Indian subcontinent | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.4% | 0.2% |
| North America - Latin America | 3.1% | 2.3% | 2.1% | 2.2% | 2.6% | 2.3% | 2.2% |
| North America - Middle-East / North Africa | 0.2% | 0.2% | 0.2% | 0.2% | 5.5% | 3.9% | 3.2% |
| North America - North America | 14.0% | 8.3% | 6.6% | 5.9% | 0.5% | 0.4% | 0.4% |
| North America - Sub-Saharan Africa | 0.1% | 0.0% | 0.0% | 0.0% | -0.4% | 0.0% | -0.1% |
| Sub-Saharan Africa - Sub-Saharan Africa | 2.3% | 2.0% | 2.1% | 2.3% | 4.3% | 3.6% | 3.2% |
| Western Europe - Asia/Pacific | 0.5% | 0.4% | 0.3% | 0.3% | 3.3% | 2.1% | 1.8% |
| Western Europe - China | 0.3% | 0.2% | 0.2% | 0.2% | 1.2% | 1.0% | 1.0% |
| Western Europe - Eastern Europe | 7.9% | 9.1% | 9.2% | 9.5% | 6.6% | 4.8% | 3.8% |
| Western Europe - Indian subcontinent | 0.4% | 0.2% | 0.2% | 0.2% | 1.2% | 0.8% | 0.9% |
| Western Europe - Latin America | 0.8% | 0.6% | 0.5% | 0.4% | 1.9% | 1.4% | 1.1% |
| Western Europe - Middle-East / North Africa | 3.9% | 3.9% | 4.2% | 4.5% | 5.3% | 4.4% | 3.6% |
| Western Europe - North America | 1.4% | 1.0% | 1.0% | 1.1% | 2.2% | 2.5% | 2.4% |
| Western Europe - Sub-Saharan Africa | 0.7% | 0.5% | 0.4% | 0.5% | 2.3% | 1.7% | 1.7% |
| Western Europe - Western Europe | 20.0% | 16.1% | 16.4% | 17.2% | 3.3% | 3.1% | 2.7% |
| **World** | **100%** | **100%** | **100%** | **100%** | **5.3%** | **4.0%** | **3.2%** |

## 11.1.3. Distance Distribution

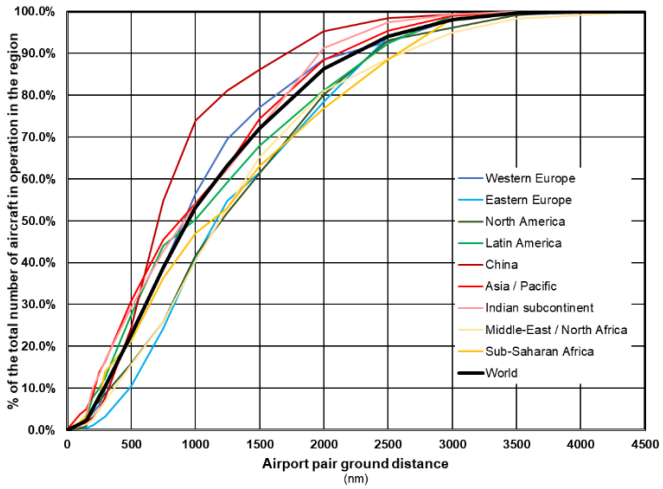
***Regional Aircraft***



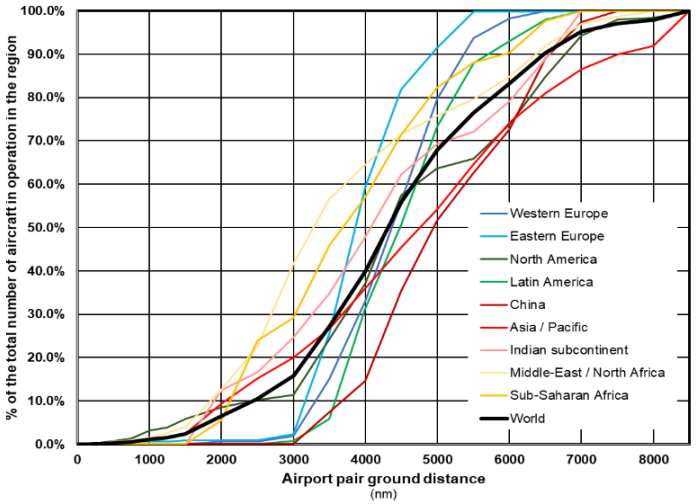

***Small Narrowbodies***




***Narrowbodies***




***Widebodies***



## 11.1.4. Seats and ASK

| Traffic flow | Seats market share | | | | ASK market share | | | | Seats CAGR | | | ASK CAGR | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2019 | 2030 | 2040 | 2050 | 2019 | 2030 | 2040 | 2050 | 2019-2030 | 2019-2040 | 2019-2050 | 2019-2030 | 2019-2040 | 2019-2050 |
| Asia/Pacific - Asia/Pacific | 15.6% | 16.0% | 15.4% | 14.7% | 11.2% | 10.5% | 9.8% | 9.9% | 3.2% | 2.5% | 2.1% | 2.7% | 2.3% | 2.0% |
| Asia/Pacific - China | 2.8% | 3.4% | 3.8% | 4.3% | 3.2% | 4.4% | 5.1% | 4.7% | 4.8% | 4.1% | 3.7% | 6.3% | 5.2% | 4.5% |
| Asia/Pacific - Eastern Europe | 0.2% | 0.2% | 0.2% | 0.2% | 0.5% | 0.5% | 0.5% | 0.5% | 3.3% | 3.0% | 2.7% | 4.5% | 3.7% | 3.2% |
| Asia/Pacific - Indian subcontinent | 0.5% | 0.7% | 0.8% | 1.0% | 0.9% | 1.1% | 1.4% | 1.3% | 5.7% | 5.1% | 4.6% | 5.6% | 5.1% | 4.5% |
| Asia/Pacific - Latin America | 0.0% | 0.0% | 0.0% | 0.0% | 0.1% | 0.2% | 0.2% | 0.2% | 6.5% | 5.0% | 4.2% | 6.7% | 5.1% | 4.3% |
| Asia/Pacific - Middle-East / North Africa | 0.7% | 1.0% | 1.1% | 1.3% | 2.7% | 3.9% | 4.5% | 4.0% | 6.4% | 5.2% | 4.4% | 6.9% | 5.5% | 4.6% |
| Asia/Pacific - North America | 0.8% | 0.8% | 0.9% | 0.9% | 4.0% | 4.6% | 4.7% | 4.7% | 3.6% | 2.9% | 2.7% | 4.6% | 3.7% | 3.3% |
| Asia/Pacific - Sub-Saharan Africa | 0.0% | 0.0% | 0.0% | 0.0% | 0.2% | 0.1% | 0.1% | 0.1% | 0.1% | 0.0% | 0.1% | -0.1% | -0.1% | 0.0% |
| Asia/Pacific - Western Europe | 0.6% | 0.6% | 0.6% | 0.6% | 3.3% | 3.0% | 2.7% | 2.9% | 2.5% | 2.1% | 1.9% | 2.4% | 2.0% | 1.9% |
| China - China | 12.9% | 14.0% | 12.7% | 11.3% | 8.5% | 8.3% | 7.2% | 6.9% | 3.7% | 2.5% | 1.8% | 3.2% | 2.2% | 1.6% |
| China - Eastern Europe | 0.1% | 0.2% | 0.2% | 0.2% | 0.3% | 0.4% | 0.5% | 0.4% | 5.9% | 4.9% | 4.2% | 5.6% | 4.8% | 4.2% |
| China - Indian subcontinent | 0.1% | 0.1% | 0.1% | 0.2% | 0.1% | 0.2% | 0.2% | 0.2% | 7.3% | 6.0% | 5.1% | 7.8% | 6.2% | 5.3% |
| China - Latin America | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 7.1% | 6.0% | 5.3% | 6.6% | 5.7% | 5.1% |
| China - Middle-East / North Africa | 0.1% | 0.1% | 0.1% | 0.2% | 0.4% | 0.4% | 0.4% | 0.4% | 4.7% | 3.8% | 3.3% | 4.5% | 3.7% | 3.3% |
| China - North America | 0.2% | 0.4% | 0.5% | 0.5% | 1.4% | 2.3% | 2.6% | 2.3% | 7.2% | 5.7% | 4.8% | 8.3% | 6.2% | 5.1% |
| China - Sub-Saharan Africa | 0.0% | 0.0% | 0.0% | 0.0% | 0.1% | 0.1% | 0.1% | 0.1% | 6.1% | 5.3% | 4.7% | 6.2% | 5.3% | 4.8% |
| China - Western Europe | 0.3% | 0.3% | 0.4% | 0.4% | 1.3% | 1.5% | 1.6% | 1.5% | 4.5% | 3.9% | 3.4% | 4.6% | 4.0% | 3.5% |
| Eastern Europe - Eastern Europe | 2.5% | 3.0% | 3.3% | 3.3% | 2.1% | 2.5% | 2.7% | 2.5% | 4.7% | 3.9% | 3.2% | 5.1% | 4.2% | 3.5% |
| Eastern Europe - Indian subcontinent | 0.0% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 7.2% | 6.3% | 5.7% | 6.4% | 5.7% | 5.2% |
| Eastern Europe - Latin America | 0.0% | 0.0% | 0.0% | 0.0% | 0.1% | 0.1% | 0.1% | 0.1% | 6.2% | 5.2% | 4.4% | 6.2% | 5.1% | 4.3% |
| Eastern Europe - Middle-East / North Africa | 0.5% | 0.6% | 0.8% | 0.9% | 0.7% | 0.9% | 1.0% | 1.0% | 5.8% | 5.2% | 4.5% | 5.6% | 5.1% | 4.3% |
| Eastern Europe - North America | 0.1% | 0.1% | 0.1% | 0.1% | 0.3% | 0.2% | 0.2% | 0.2% | 2.1% | 2.5% | 2.5% | 1.9% | 2.4% | 2.4% |
| Eastern Europe - Sub-Saharan Africa | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 5.7% | 4.9% | 4.2% | 6.2% | 5.2% | 4.4% |
| Eastern Europe - Western Europe | 3.4% | 4.1% | 4.4% | 4.7% | 2.8% | 3.3% | 3.4% | 3.4% | 4.6% | 3.7% | 3.3% | 4.9% | 4.0% | 3.5% |
| Indian subcontinent - Indian subcontinent | 3.5% | 3.8% | 4.1% | 4.0% | 1.7% | 1.6% | 1.7% | 1.7% | 3.9% | 3.3% | 2.7% | 2.6% | 2.8% | 2.5% |
| Indian subcontinent - Middle-East / North Africa | 1.2% | 1.8% | 2.3% | 2.8% | 1.9% | 2.6% | 3.3% | 3.1% | 6.2% | 5.6% | 4.9% | 6.3% | 5.6% | 5.0% |
| Indian subcontinent - North America | 0.0% | 0.0% | 0.1% | 0.1% | 0.2% | 0.3% | 0.4% | 0.4% | 6.1% | 5.2% | 4.7% | 6.2% | 5.2% | 4.7% |
| Indian subcontinent - Sub-Saharan Africa | 0.0% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 6.0% | 5.4% | 5.0% | 6.2% | 5.6% | 5.2% |
| Indian subcontinent - Western Europe | 0.3% | 0.3% | 0.3% | 0.3% | 1.0% | 1.0% | 1.0% | 1.1% | 3.3% | 3.1% | 3.1% | 3.1% | 2.9% | 2.9% |
| Latin America - Latin America | 6.3% | 6.1% | 6.3% | 6.4% | 3.7% | 3.3% | 3.3% | 3.5% | 2.6% | 2.5% | 2.3% | 2.3% | 2.5% | 2.3% |
| Latin America - Middle-East / North Africa | 0.0% | 0.0% | 0.0% | 0.0% | 0.1% | 0.1% | 0.1% | 0.1% | 4.8% | 4.0% | 3.3% | 4.6% | 3.9% | 3.2% |
| Latin America - North America | 2.1% | 2.1% | 2.3% | 2.4% | 3.1% | 3.2% | 3.3% | 3.4% | 3.1% | 2.9% | 2.7% | 3.4% | 3.2% | 2.9% |
| Latin America - Sub-Saharan Africa | 0.0% | 0.0% | 0.0% | 0.0% | 0.1% | 0.1% | 0.1% | 0.1% | 8.4% | 5.7% | 4.5% | 9.0% | 6.1% | 4.8% |
| Latin America - Western Europe | 0.7% | 0.7% | 0.6% | 0.7% | 3.1% | 2.9% | 2.7% | 2.8% | 3.0% | 2.4% | 2.2% | 2.9% | 2.4% | 2.2% |
| Middle-East / North Africa - Middle-East / North Africa | 2.6% | 3.1% | 3.5% | 3.7% | 1.5% | 1.7% | 1.9% | 1.8% | 4.7% | 4.1% | 3.4% | 4.5% | 4.0% | 3.5% |
| Middle-East / North Africa - North America | 0.2% | 0.2% | 0.3% | 0.3% | 1.3% | 1.4% | 1.5% | 1.6% | 3.4% | 3.5% | 3.3% | 3.5% | 3.5% | 3.3% |
| Middle-East / North Africa - Sub-Saharan Africa | 0.3% | 0.4% | 0.5% | 0.5% | 0.7% | 0.8% | 0.8% | 0.8% | 5.0% | 4.2% | 3.7% | 4.4% | 3.9% | 3.4% |
| Middle-East / North Africa - Western Europe | 2.5% | 2.9% | 3.2% | 3.5% | 4.1% | 4.7% | 4.9% | 4.8% | 4.7% | 3.9% | 3.4% | 4.6% | 3.8% | 3.3% |
| North America - North America | 19.3% | 14.4% | 12.9% | 12.2% | 15.1% | 10.6% | 9.1% | 10.1% | 0.3% | 0.6% | 0.7% | 0.1% | 0.5% | 0.6% |
| North America - Sub-Saharan Africa | 0.0% | 0.0% | 0.0% | 0.0% | 0.2% | 0.1% | 0.1% | 0.2% | 2.8% | 2.7% | 2.7% | 2.7% | 2.7% | 2.7% |
| North America - Western Europe | 1.8% | 1.7% | 1.7% | 1.7% | 6.9% | 6.1% | 6.0% | 6.2% | 2.3% | 2.3% | 2.1% | 2.3% | 2.3% | 2.1% |
| Sub-Saharan Africa - Sub-Saharan Africa | 1.3% | 1.5% | 1.8% | 2.2% | 0.7% | 0.9% | 1.0% | 1.1% | 4.6% | 4.3% | 4.1% | 5.2% | 4.7% | 4.5% |
| Sub-Saharan Africa - Western Europe | 0.4% | 0.4% | 0.4% | 0.4% | 1.2% | 1.2% | 1.2% | 1.2% | 4.0% | 3.1% | 2.8% | 3.8% | 3.0% | 2.8% |
| Western Europe - Western Europe | 16.0% | 14.8% | 14.1% | 13.8% | 9.3% | 8.8% | 8.2% | 8.4% | 2.3% | 1.9% | 1.8% | 2.8% | 2.3% | 2.1% |
| **World** | **100.0%** | **100.0%** | **100.0%** | **100.0%** | **100.0%** | **100.0%** | **100.0%** | **100.0%** | **3.0%** | **2.6%** | **2.3%** | **3.4%** | **3.0%** | **1.7%** |

## 11.1.5. Aircraft generic types and categories

| Aircraft Segment | Manufacturer | Aicraft type designation | Generic aircraft type |
|---|---|---|---|
| Regional aircraft | Aerospatiale/Alenia | ATR 42-300 / 320 | 50 seats regional aircraft |
| Regional aircraft | Aerospatiale/Alenia | ATR 42-400 | 50 seats regional aircraft |
| Regional aircraft | Aerospatiale/Alenia | ATR 42-500 | 50 seats regional aircraft |
| Regional aircraft | Aerospatiale/Alenia | ATR 72 | 75 seats regional aircraft |
| Regional aircraft | Antonov | AN-140 | 50 seats regional aircraft |
| Regional aircraft | Antonov | AN-24 | 50 seats regional aircraft |
| Regional aircraft | Antonov | AN-32 | 50 seats regional aircraft |
| Regional aircraft | Antonov | AN-148-100 | 75 seats regional aircraft |
| Regional aircraft | Antonov | AN-12 | 90 seats regional aircraft |
| Regional aircraft | Avro | RJ70 Avroliner | 75 seats regional aircraft |
| Regional aircraft | Avro | RJ85 Avroliner | 90 seats regional aircraft |
| Regional aircraft | Avro | RJX85 | 90 seats regional aircraft |
| Regional aircraft | BAe | 146-100 | 75 seats regional aircraft |
| Regional aircraft | BAe | 146-200 | 75 seats regional aircraft |
| Regional aircraft | British Aerospace | ATP | 75 seats regional aircraft |
| Regional aircraft | British Aerospace | One Eleven 200 | 75 seats regional aircraft |
| Regional aircraft | British Aerospace | One Eleven 300 | 75 seats regional aircraft |
| Regional aircraft | British Aerospace | One Eleven 400/475 | 75 seats regional aircraft |
| Regional aircraft | CASA / IPTN | CN-235 | 50 seats regional aircraft |
| Regional aircraft | COMAC | ARJ-21-700 | 90 seats regional aircraft |
| Regional aircraft | Convair | CV-240 | 50 seats regional aircraft |
| Regional aircraft | Convair | CV-240 / 440 / 580 / 600 / 640 | 50 seats regional aircraft |
| Regional aircraft | Convair | CV-440 Metropolitan | 50 seats regional aircraft |
| Regional aircraft | Convair | CV-580 | 50 seats regional aircraft |
| Regional aircraft | De Havilland Canada | DHC-8-100 | 50 seats regional aircraft |
| Regional aircraft | De Havilland Canada | DHC-8-200 | 50 seats regional aircraft |
| Regional aircraft | De Havilland Canada | DHC-8-300 | 50 seats regional aircraft |
| Regional aircraft | De Havilland Canada | DHC-8-400 | 75 seats regional aircraft |
| Regional aircraft | Douglas | DC-4 | 50 seats regional aircraft |
| Regional aircraft | Douglas | DC6A/B | 50 seats regional aircraft |
| Regional aircraft | Douglas | DC-9-10 | 90 seats regional aircraft |
| Regional aircraft | Douglas | DC-9-20 | 90 seats regional aircraft |
| Regional aircraft | Embraer | ERJ140 | 50 seats regional aircraft |
| Regional aircraft | Embraer | ERJ145 | 50 seats regional aircraft |
| Regional aircraft | Embraer | E170-E1 | 75 seats regional aircraft |
| Regional aircraft | Embraer | E175-E1 | 90 seats regional aircraft |
| Regional aircraft | Embraer | E175-E2 | 90 seats regional aircraft |
| Regional aircraft | Fairchild | FH.227 | 50 seats regional aircraft |
| Regional aircraft | Fairchild Dornier | 728JET | 90 seats regional aircraft |
| Regional aircraft | Fokker | F.27 Friendship / Fairchild F.27 | 50 seats regional aircraft |
| Regional aircraft | Fokker | F.28 Fellowship | 75 seats regional aircraft |
| Regional aircraft | Fokker | F.28 Fellowship 1000 | 75 seats regional aircraft |
| Regional aircraft | Fokker | F.28 Fellowship 2000 | 75 seats regional aircraft |
| Regional aircraft | Fokker | F.28 Fellowship 3000 | 75 seats regional aircraft |
| Regional aircraft | Fokker | F.28 Fellowship 4000 | 90 seats regional aircraft |
| Regional aircraft | Fokker | Fokker 50 | 50 seats regional aircraft |
| Regional aircraft | Fokker | Fokker 70 | 75 seats regional aircraft |
| Regional aircraft | Hawker Siddeley | HS.748 | 50 seats regional aircraft |
| Regional aircraft | Ilyushin | IL114 | 50 seats regional aircraft |
| Regional aircraft | MHIRJ | CRJ-100 | 50 seats regional aircraft |
| Regional aircraft | MHIRJ | CRJ-200 | 50 seats regional aircraft |
| Regional aircraft | MHIRJ | CRJ-550 | 50 seats regional aircraft |
| Regional aircraft | MHIRJ | CRJ-700 | 75 seats regional aircraft |
| Regional aircraft | MHIRJ | CRJ-705 | 90 seats regional aircraft |
| Regional aircraft | MHIRJ | CRJ-900 | 90 seats regional aircraft |
| Regional aircraft | NAMC | YS-11 | 75 seats regional aircraft |
| Regional aircraft | Saab | SAAB 2000 | 50 seats regional aircraft |
| Regional aircraft | Shorts | SD.360 | 50 seats regional aircraft |
| Regional aircraft | Sukhoi | Superjet 100-75 | 75 seats regional aircraft |
| Regional aircraft | Tupolev | Tu134 | 75 seats regional aircraft |
| Regional aircraft | Vickers | Viscount | 75 seats regional aircraft |
| Regional aircraft | Xi'an Aircraft Industrial Corporation | Yunshuji Y7 | 50 seats regional aircraft |
| Regional aircraft | Xi'an Aircraft Industrial Corporation | Yunshuji MA-60 | 50 seats regional aircraft |

| Aircraft Segment | Manufacturer | Aicraft type designation | Generic aircraft type |
|---|---|---|---|
| Small narrowbody | Aerospatiale | Caravelle | 125 seats narrowbody |
| Small narrowbody | Airbus | A220-100 | 125 seats narrowbody |
| Small narrowbody | Airbus | A220-300 | 150 seats narrowbody |
| Small narrowbody | Airbus | A318 | 125 seats narrowbody |
| Small narrowbody | Airbus | A318 (Sharkelts) | 125 seats narrowbody |
| Small narrowbody | Airbus | A319 Ceo | 150 seats narrowbody |
| Small narrowbody | Airbus | A319 Ceo (Sharklets) | 150 seats narrowbody |
| Small narrowbody | Airbus | A319 Neo | 150 seats narrowbody |
| Small narrowbody | Antonov | An-158 | 100 seats narrowbody |
| Small narrowbody | Avro | RJX100 | 100 seats narrowbody |
| Small narrowbody | Avro | RJX85 / RJX100 | 100 seats narrowbody |
| Small narrowbody | Avro | RJ100 Avroliner | 125 seats narrowbody |
| Small narrowbody | BAe | 146-300 | 100 seats narrowbody |
| Small narrowbody | Boeing | 717-200 | 125 seats narrowbody |
| Small narrowbody | Boeing | 720B | 150 seats narrowbody |
| Small narrowbody | Boeing | 727-100 | 125 seats narrowbody |
| Small narrowbody | Boeing | 727-100 Mixed Configuration | 125 seats narrowbody |
| Small narrowbody | Boeing | 727-200 | 150 seats narrowbody |
| Small narrowbody | Boeing | 727-200 (winglets) | 150 seats narrowbody |
| Small narrowbody | Boeing | 727-200 Advanced | 150 seats narrowbody |
| Small narrowbody | Boeing | 727-200 Mixed Configuration | 150 seats narrowbody |
| Small narrowbody | Boeing | 727 Combi | 150 seats narrowbody |
| Small narrowbody | Boeing | 737-100 | 125 seats narrowbody |
| Small narrowbody | Boeing | 737-200 | 125 seats narrowbody |
| Small narrowbody | Boeing | 737-200 Combi | 125 seats narrowbody |
| Small narrowbody | Boeing | 737-500 | 125 seats narrowbody |
| Small narrowbody | Boeing | 737-500 (winglets) | 125 seats narrowbody |
| Small narrowbody | Boeing | 737 Combi | 150 seats narrowbody |
| Small narrowbody | Boeing | 737 MAX 7 | 150 seats narrowbody |
| Small narrowbody | Boeing | 737-300 | 150 seats narrowbody |
| Small narrowbody | Boeing | 737-300 (winglets) | 150 seats narrowbody |
| Small narrowbody | Boeing | 737-300 Mixed Configurations | 150 seats narrowbody |
| Small narrowbody | Boeing | 737-400 | 150 seats narrowbody |
| Small narrowbody | Boeing | 737-400 Combi | 150 seats narrowbody |
| Small narrowbody | Boeing | 737-600 | 150 seats narrowbody |
| Small narrowbody | Boeing | 737-700 | 150 seats narrowbody |
| Small narrowbody | Boeing | 737-700 (winglets) | 150 seats narrowbody |
| Small narrowbody | Boeing | 737-700 Combi | 150 seats narrowbody |
| Small narrowbody | British Aerospace | One Eleven / RomBAC One Eleven | 125 seats narrowbody |
| Small narrowbody | British Aerospace | One Eleven 500 / RomBAC One Eleven | 125 seats narrowbody |
| Small narrowbody | COMAC | ARJ-21-900 | 100 seats narrowbody |
| Small narrowbody | Douglas | DC-9-30 | 125 seats narrowbody |
| Small narrowbody | Douglas | DC-9-40 | 125 seats narrowbody |
| Small narrowbody | Douglas | DC-9-50 | 125 seats narrowbody |
| Small narrowbody | Embraer | E190-E1 | 100 seats narrowbody |
| Small narrowbody | Embraer | E190-E2 | 100 seats narrowbody |
| Small narrowbody | Embraer | E195-E1 | 125 seats narrowbody |
| Small narrowbody | Embraer | E195-E2 | 125 seats narrowbody |
| Small narrowbody | Fokker | Fokker 100 | 100 seats narrowbody |
| Small narrowbody | Ilyushin | IL18 | 125 seats narrowbody |
| Small narrowbody | Ilyushin | IL76 | 150 seats narrowbody |
| Small narrowbody | Lockheed | L-1049 Super Constellation | 100 seats narrowbody |
| Small narrowbody | Lockheed | L-188 Electra Mixed Configuration | 100 seats narrowbody |
| Small narrowbody | Lockheed | L-188 Electra pax | 100 seats narrowbody |
| Small narrowbody | Lockheed | L-182 / 282 / 382 (L-100) Hercules | 125 seats narrowbody |
| Small narrowbody | McDonnell Douglas | MD87 | 125 seats narrowbody |
| Small narrowbody | McDonnell Douglas | MD90 | 125 seats narrowbody |
| Small narrowbody | McDonnell Douglas | MD80 | 150 seats narrowbody |
| Small narrowbody | McDonnell Douglas | MD81 | 150 seats narrowbody |
| Small narrowbody | McDonnell Douglas | MD82 | 150 seats narrowbody |
| Small narrowbody | McDonnell Douglas | MD83 | 150 seats narrowbody |
| Small narrowbody | MHIRJ | CRJ-1000 | 100 seats narrowbody |
| Small narrowbody | Sukhoi | Superjet 100-95 | 100 seats narrowbody |
| Small narrowbody | Tupolev | Tu-204 / Tu-214 | 150 seats narrowbody |
| Small narrowbody | Yakovlev | Yak 42 | 125 seats narrowbody |

| Aircraft Segment | Manufacturer | Aicraft type designation | Generic aircraft type |
|---|---|---|---|
| Narrowbody | Airbus | A320-100/200 Ceo | 175 seats narrowbody |
| Narrowbody | Airbus | A320-200 Ceo (Sharklets) | 175 seats narrowbody |
| Narrowbody | Airbus | A320-200 Neo | 175 seats narrowbody |
| Narrowbody | Airbus | A321 | 200 seats aircraft |
| Narrowbody | Airbus | A321-100/200 Ceo | 200 seats aircraft |
| Narrowbody | Airbus | A321-200 Neo | 225 seats aircraft |
| Narrowbody | Boeing | 737 MAX 8 | 175 seats narrowbody |
| Narrowbody | Boeing | 737 MAX 9 | 175 seats narrowbody |
| Narrowbody | Boeing | 737-800 | 175 seats narrowbody |
| Narrowbody | Boeing | 737-800 | 175 seats narrowbody |
| Narrowbody | Boeing | 737-800 (winglets) | 175 seats narrowbody |
| Narrowbody | Boeing | 707 Combi | 200 seats aircraft |
| Narrowbody | Boeing | 707/720 | 200 seats aircraft |
| Narrowbody | Boeing | 707-300 | 200 seats aircraft |
| Narrowbody | Boeing | 737 MAX 10 | 200 seats aircraft |
| Narrowbody | Boeing | 737-900 | 200 seats aircraft |
| Narrowbody | Boeing | 737-900 (winglets) | 200 seats aircraft |
| Narrowbody | Boeing | 757 Mixed Configuration | 200 seats aircraft |
| Narrowbody | Boeing | 757-200 | 200 seats aircraft |
| Narrowbody | Boeing | 757-200 (winglets) | 200 seats aircraft |
| Narrowbody | Boeing | 757-300 | 225 seats aircraft |
| Narrowbody | Boeing | 757-300 | 225 seats aircraft |
| Narrowbody | Canadair | CL-44 | 175 seats narrowbody |
| Narrowbody | Douglas | DC-8-62 | 200 seats aircraft |
| Narrowbody | Douglas | DC-8-72 | 200 seats aircraft |
| Narrowbody | Ilyushin | IL62 | 175 seats narrowbody |
| Narrowbody | McDonnell Douglas | MD88 | 175 seats narrowbody |
| Narrowbody | Shorts | SC-5 Belfast | 175 seats narrowbody |
| Narrowbody | Tupolev | Tu154 | 175 seats narrowbody |

| Aircraft Segment | Manufacturer | Aicraft type designation | Generic aircraft type |
|---|---|---|---|
| Widebody | Airbus | A310 all models | 200 seats aircraft |
| Widebody | Airbus | A310-200 | 200 seats aircraft |
| Widebody | Airbus | A310-300 | 200 seats aircraft |
| Widebody | Airbus | A330-200 | 225 seats aircraft |
| Widebody | Airbus | A300-600 | 250 seats widebody |
| Widebody | Airbus | A330-800 Neo | 250 seats widebody |
| Widebody | Airbus | A300 | 275 seats widebody |
| Widebody | Airbus | A300B2/B4/C4 | 275 seats widebody |
| Widebody | Airbus | A330-300 | 275 seats widebody |
| Widebody | Airbus | A340-200 | 225 seats aircraft |
| Widebody | Airbus | A340-300 | 275 seats widebody |
| Widebody | Airbus | A340-500 | 225 seats aircraft |
| Widebody | Airbus | A330-900 Neo | 300 seats widebody |
| Widebody | Airbus | A340-600 | 300 seats widebody |
| Widebody | Airbus | A350 | 300 seats widebody |
| Widebody | Airbus | A350-900 | 300 seats widebody |
| Widebody | Airbus | A350-1000 | 350 seats widebody |
| Widebody | Airbus | A380-800 | 500 seats widebody |
| Widebody | Boeing | 747SP | 225 seats aircraft |
| Widebody | Boeing | 767-200 | 225 seats aircraft |
| Widebody | Boeing | 767-300 | 225 seats aircraft |
| Widebody | Boeing | 767-300 (winglets) | 225 seats aircraft |
| Widebody | Boeing | 767-400 | 225 seats aircraft |
| Widebody | Boeing | 787-8 | 225 seats aircraft |
| Widebody | Boeing | 787-9 | 275 seats widebody |
| Widebody | Boeing | 777-200/200ER | 275 seats widebody |
| Widebody | Boeing | 777-200LR | 275 seats widebody |
| Widebody | Boeing | 747-100 | 300 seats widebody |
| Widebody | Boeing | 747-200 | 300 seats widebody |
| Widebody | Boeing | 747-200 Combi | 300 seats widebody |
| Widebody | Boeing | 787-10 | 300 seats widebody |
| Widebody | Boeing | 747 all Combi models | 350 seats widebody |
| Widebody | Boeing | 747-300 | 350 seats widebody |
| Widebody | Boeing | 747-300 Combi | 350 seats widebody |
| Widebody | Boeing | 747-400 | 350 seats widebody |
| Widebody | Boeing | 747-400 (Domestic) | 350 seats widebody |
| Widebody | Boeing | 747-400 Combi | 350 seats widebody |
| Widebody | Boeing | 747-8 | 350 seats widebody |
| Widebody | Boeing | 747-8 | 350 seats widebody |
| Widebody | Boeing | 747SR | 350 seats widebody |
| Widebody | Boeing | 777-300 | 350 seats widebody |
| Widebody | Boeing | 777-300ER | 350 seats widebody |
| Widebody | Boeing | 777-8 | 350 seats widebody |
| Widebody | Boeing | 777-9 | 350 seats widebody |
| Widebody | Douglas | DC-10 | 275 seats widebody |
| Widebody | Douglas | DC-10 all Combi models | 275 seats widebody |
| Widebody | Douglas | DC-10-10/15 | 275 seats widebody |
| Widebody | Douglas | DC-10-30/40 | 275 seats widebody |
| Widebody | Ilyushin | IL96 | 225 seats aircraft |
| Widebody | Ilyushin | IL96-300 | 225 seats aircraft |
| Widebody | Ilyushin | IL86 | 250 seats widebody |
| Widebody | Lockheed | L-1011 1 / 50 / 100 / 150 / 200 / 250 Tristar | 250 seats widebody |
| Widebody | Lockheed | L-1011 500 Tristar | 250 seats widebody |
| Widebody | Lockheed | L-1011 Tristar | 250 seats widebody |
| Widebody | McDonnell Douglas | MD11 | 300 seats widebody |
| Widebody | McDonnell Douglas | MD11 Mixed Configuration | 300 seats widebody |

## 11.1.6. Regions and Countries

| Country | Region |
|---|---|
| Afghanistan | Eastern Europe |
| Albania | Eastern Europe |
| Algeria | Middle-East / North Africa |
| Andorra | Western Europe |
| Angola | Sub-Saharan Africa |
| Anguilla | Latin America |
| Antigua and Barbuda | Latin America |
| Argentina | Latin America |
| Armenia | Eastern Europe |
| Aruba | Latin America |
| Australia | Asia/Pacific |
| Austria | Western Europe |
| Azerbaijan | Eastern Europe |
| Bahamas, The | Latin America |
| Bahrain | Middle-East / North Africa |
| Bangladesh | Indian subcontinent |
| Barbados | Latin America |
| Belarus | Eastern Europe |
| Belgium | Western Europe |
| Belize | Latin America |
| Benin | Sub-Saharan Africa |
| Bermuda | Latin America |
| Bhutan | Indian subcontinent |
| Bolivia | Latin America |
| Bonaire, Sint Eustatius and Saba | Latin America |
| Bosnia and Herzegovina | Eastern Europe |
| Botswana | Sub-Saharan Africa |
| Brazil | Latin America |
| Brunei | Asia/Pacific |
| Bulgaria | Eastern Europe |
| Burkina Faso | Sub-Saharan Africa |
| Burundi | Sub-Saharan Africa |
| Cambodia | Asia/Pacific |
| Cameroon | Sub-Saharan Africa |
| Canada | North America |
| Cape Verde | Sub-Saharan Africa |
| Cayman Islands | Latin America |
| Central African Republic | Sub-Saharan Africa |
| Chad | Sub-Saharan Africa |
| Chile | Latin America |
| China | China |
| Christmas Island | Indian subcontinent |
| Cocos Keeling Islands | Indian subcontinent |
| Colombia | Latin America |
| Comoros | Indian subcontinent |
| Congo, Dem. Rep. | Sub-Saharan Africa |
| Congo, Rep. | Sub-Saharan Africa |
| Cook Islands | Asia/Pacific |
| Costa Rica | Latin America |
| Cote d'Ivoire | Sub-Saharan Africa |
| Croatia | Eastern Europe |
| Cuba | Latin America |
| Curacao | Latin America |
| Cyprus | Western Europe |
| Czech Republic | Eastern Europe |
| Denmark | Western Europe |
| Djibouti | Sub-Saharan Africa |
| Dominica | Latin America |
| Dominican Republic | Latin America |
| East Timor | Asia/Pacific |
| Ecuador | Latin America |
| Egypt | Middle-East / North Africa |
| El Salvador | Latin America |
| Equatorial Guinea | Sub-Saharan Africa |
| Eritrea | Sub-Saharan Africa |
| Estonia | Eastern Europe |
| eSwatini / Swatziland | Sub-Saharan Africa |
| Ethiopia | Sub-Saharan Africa |
| Falkland Islands | Latin America |
| Federated States of Micronesia | Asia/Pacific |
| Fiji | Asia/Pacific |
| Finland | Western Europe |
| France | Western Europe |
| French Guiana | Latin America |
| French Polynesia | Asia/Pacific |
| Gabon | Sub-Saharan Africa |
| Gambia, The | Sub-Saharan Africa |
| Georgia | Eastern Europe |
| Germany | Western Europe |
| Ghana | Sub-Saharan Africa |
| Gibraltar | Western Europe |
| Greece | Western Europe |
| Greenland | Western Europe |
| Grenada | Latin America |
| Guadeloupe | Latin America |
| Guatemala | Latin America |
| Guinea | Sub-Saharan Africa |
| Guinea-Bissau | Sub-Saharan Africa |
| Guyana | Latin America |
| Haiti | Latin America |
| Honduras | Latin America |
| Hong Kong, China | Asia/Pacific |
| Hungary | Eastern Europe |
| Iceland | Western Europe |
| India | Indian subcontinent |
| Indonesia | Asia/Pacific |
| Iran, Islamic Rep. | Middle-East / North Africa |
| Iraq | Middle-East / North Africa |
| Ireland | Western Europe |
| Israel | Middle-East / North Africa |
| Italy | Western Europe |
| Jamaica | Latin America |
| Japan | Asia/Pacific |
| Jordan | Middle-East / North Africa |
| Kazakhstan | Eastern Europe |
| Kenya | Sub-Saharan Africa |
| Kiribati | Asia/Pacific |
| Kosovo | Eastern Europe |
| Kuwait | Middle-East / North Africa |
| Kyrgyzstan | Eastern Europe |
| Lao PDR | Asia/Pacific |
| Latvia | Eastern Europe |
| Lebanon | Middle-East / North Africa |
| Lesotho | Sub-Saharan Africa |
| Liberia | Sub-Saharan Africa |
| Libya | Middle-East / North Africa |
| Lithuania | Eastern Europe |
| Luxembourg | Western Europe |
| Macao, China | China |
| Madagascar | Indian subcontinent |
| Malawi | Sub-Saharan Africa |
| Malaysia | Asia/Pacific |
| Maldives | Indian subcontinent |
| Mali | Sub-Saharan Africa |
| Malta | Western Europe |
| Marshall Islands | Asia/Pacific |
| Martinique | Latin America |
| Mauritania | Middle-East / North Africa |
| Mauritius | Indian subcontinent |
| Mayotte | Indian subcontinent |
| Mexico | Latin America |
| Moldova | Eastern Europe |
| Mongolia | China |
| Montenegro | Eastern Europe |
| Montserrat | Latin America |
| Morocco | Middle-East / North Africa |
| Mozambique | Sub-Saharan Africa |
| Myanmar | Asia/Pacific |
| Namibia | Sub-Saharan Africa |
| Nauru | Asia/Pacific |
| Nepal | Indian subcontinent |
| Netherlands | Western Europe |
| New Caledonia | Asia/Pacific |
| New Zealand | Asia/Pacific |
| Nicaragua | Latin America |
| Niger | Sub-Saharan Africa |
| Nigeria | Sub-Saharan Africa |
| Niue | Asia/Pacific |
| Norfolk Island | Indian subcontinent |
| North Korea | China |
| North Macedonia | Eastern Europe |
| Norway | Western Europe |
| Oman | Middle-East / North Africa |
| Pakistan | Indian subcontinent |
| Palau | Asia/Pacific |
| Panama | Latin America |
| Papua New Guinea | Asia/Pacific |
| Paraguay | Latin America |
| Peru | Latin America |
| Philippines | Asia/Pacific |
| Poland | Eastern Europe |
| Portugal | Western Europe |
| Puerto Rico | Latin America |
| Qatar | Middle-East / North Africa |
| Reunion | Indian subcontinent |
| Romania | Eastern Europe |
| Russia | Eastern Europe |
| Rwanda | Sub-Saharan Africa |
| Saint Barthelemy | Latin America |
| Saint Helena | Sub-Saharan Africa |
| Saint Martin | Latin America |
| Saint Pierre et Miquelon | North America |
| Samoa | Asia/Pacific |
| Sao Tome and Principe | Sub-Saharan Africa |
| Saudi Arabia | Middle-East / North Africa |
| Senegal | Sub-Saharan Africa |
| Serbia | Eastern Europe |
| Seychelles | Indian subcontinent |
| Sierra Leone | Sub-Saharan Africa |
| Singapore | Asia/Pacific |
| Sint Maarten | Latin America |
| Slovak Republic | Eastern Europe |
| Slovenia | Eastern Europe |
| Solomon Islands | Asia/Pacific |
| Somalia | Sub-Saharan Africa |
| South Africa | Sub-Saharan Africa |
| South Korea | Asia/Pacific |
| South Sudan | Sub-Saharan Africa |
| Spain | Western Europe |
| Sri Lanka | Indian subcontinent |
| St. Kitts and Nevis | Latin America |
| St. Lucia | Latin America |
| St. Vincent / Grenadines | Latin America |
| Sudan | Sub-Saharan Africa |
| Suriname | Latin America |
| Sweden | Western Europe |
| Switzerland | Western Europe |
| Syrian Arab Republic | Middle-East / North Africa |
| Taiwan | Asia/Pacific |
| Tajikistan | Eastern Europe |
| Tanzania | Sub-Saharan Africa |
| Thailand | Asia/Pacific |
| Togo | Sub-Saharan Africa |
| Tonga | Asia/Pacific |
| Trinidad and Tobago | Latin America |
| Tunisia | Middle-East / North Africa |
| Turkey | Western Europe |
| Turkmenistan | Eastern Europe |
| Turks and Caicos Islands | Latin America |
| Tuvalu | Asia/Pacific |
| Uganda | Sub-Saharan Africa |
| Ukraine | Eastern Europe |
| United Arab Emirates | Middle-East / North Africa |
| United Kingdom | Western Europe |
| United States | North America |
| Uruguay | Latin America |
| Uzbekistan | Eastern Europe |
| Vanuatu | Asia/Pacific |
| Venezuela, RB | Latin America |
| Vietnam | Asia/Pacific |
| Virgin Islands (U.S.) | Latin America |
| Virgin Islands (UK) | Latin America |
| Wallis and Futuna | Asia/Pacific |
| West Bank & Gaza | Middle-East / North Africa |
| Western Sahara | Middle-East / North Africa |
| Yemen, Rep | Middle-East / North Africa |
| Zambia | Sub-Saharan Africa |
| Zimbabwe | Sub-Saharan Africa |

## 11.2. List of Acronyms

| | | |
|---|---|---|
| ACMI | : | Aircraft, Crew, Maintenance, Insurance |
| ASK | : | Available Seat Kilometer |
| B | : | Billion |
| CAAC | : | Civil Aviation Administration of China |
| CAGR | : | Compound Annual Growth Rate |
| CIS | : | Commonwealth of Independent States |
| CPA | : | Capacity Purchase Agreement |
| ECOWAS | : | Economic Community of West African States |
| ERJ | : | Embraer Regional Jet |
| EU | : | European Union |
| FAA | : | US Federal Aviation Administration |
| GCC | : | Gulf Cooperation Council |
| GDP | : | Gross Domestic Product |
| ISC | : | Indian Sub-Continent |
| LCC | : | Low-Cost Carrier |
| M | : | Million |
| MENA | : | Middle East & North Africa |
| OEM | : | Original Equipment Manufacturer |
| SAF | : | Sustainable Aviation Fuel |
| UAE | : | United Arab Emirates |
| ULCC | : | Ultra-Low-Cost Carrier |
| UN | : | United Nations |
| US | : | United States of America |
| USD | : | US Dollar |
| VFR | : | Visiting Friends and Relative |