

AVIATION WEEK  
**Fleet&MRO**  
FORECASTS

# 2024 MARKET SUMMARY REPORT

BUSINESS

AVIATION WEEK  
NETWORK

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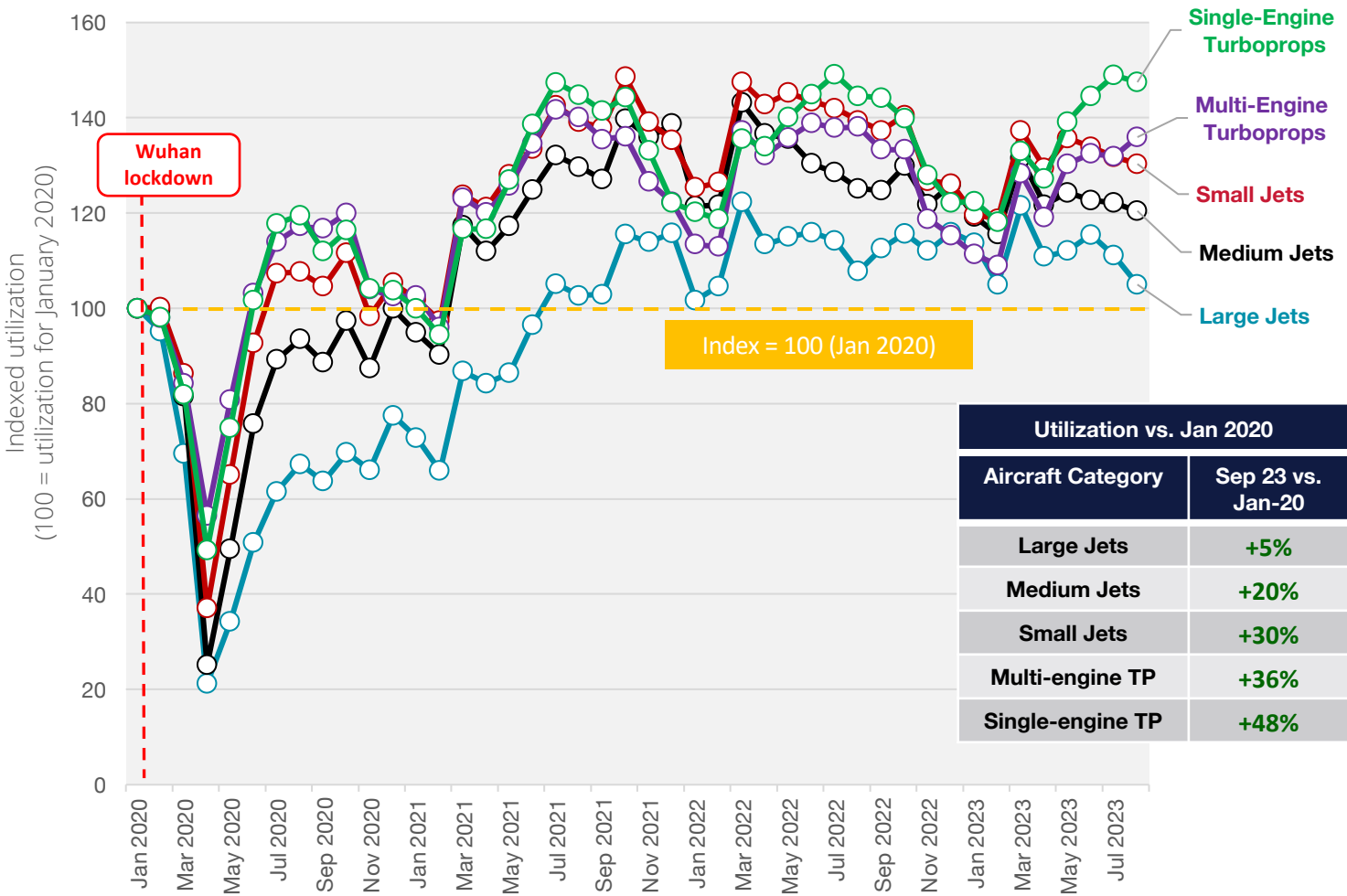
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# Foreword: Business Aviation Climbing

Brian Kough, Senior Director, Forecasts & Aerospace Insights | Intelligence & Data, Aviation Week Network

Utilization change since January 2020



The recent trend history of business aircraft utilization speaks for itself. All categories of aircraft post-pandemic have seen strong, global, and more importantly, persistent recovery. Despite some recent retrenchment in the 3rd quarter, business utilization is up to 48% higher in the case of single-engine turboprops and 5% for large jets based on aggregate hours flown.

With nearly all international borders now open for business after the last parts of the Asia Pacific now take part in the freedom of movement, the new normal seems firmly in place. The “stickiness” of private aviation for new users appears on solid foundations as we look ahead toward our future.

New aircraft deliveries have accelerated meeting the requirements of individual, charter, and fractional operators. For the Jan-Sept period, unit deliveries are up over 180 aircraft compared to 2020. Primarily driven by small jet and single-engine turboprop category aircraft recently, the expectations for 4<sup>th</sup> quarter are high. We feel the delivery market will stabilize on the high side of recent “normal” activity seen over the previous decade at ~900 jets and ~230 turboprops per year on average. Last year’s signs of unsustainable exuberance in the new and used markets appear on track to stabilize with sales transactions taking on what we would call more normal activity and transaction precautions.

# Foreword: Business Aviation Climbing

Brian Kough, Senior Director, Forecasts & Aerospace Insights | Intelligence & Data, Aviation Week Network

Aircraft Bluebook reports used aircraft valuations have ceased their stellar climbs from 2022, and except for turboprops, have seen slight price decreases as of the 3rd quarter amounting to -3% decrease overall.

GDP estimates for the major world regions remain positive according to economic prognosticators with Asia Pacific seeing the highest forecasted growth and Europe seeing the lowest. Jet fuel prices are a concern as supply constraints are pushing prices higher – on an inflation adjusted basis, we are near November 2014 prices. While higher prices are good for the oil & gas operators, higher fuel prices are generally a detractor.

Concerning factors remain this year. Interest rates have risen, and fuel prices have been susceptible to shocks as the world's supply chain remains vulnerable. War in the Ukraine persists, a new outbreak occurred in Israel-Gaza, and flash points in Asia Pacific have not subsided. Labor pressures are manifesting at OEMs, suppliers, and with MROs servicing aircraft as well as the security of supply chains themselves - all reasons for caution and monitoring the market dynamics. However, the market's strong signals cannot be mistaken, our predictions are favorable for continued fleet and MRO growth.



Credit: Brian Kough, Aviation Week Network



Credit: Brian Kough, Aviation Week Network



Credit: Nigel Prevett, Aviation Week Network

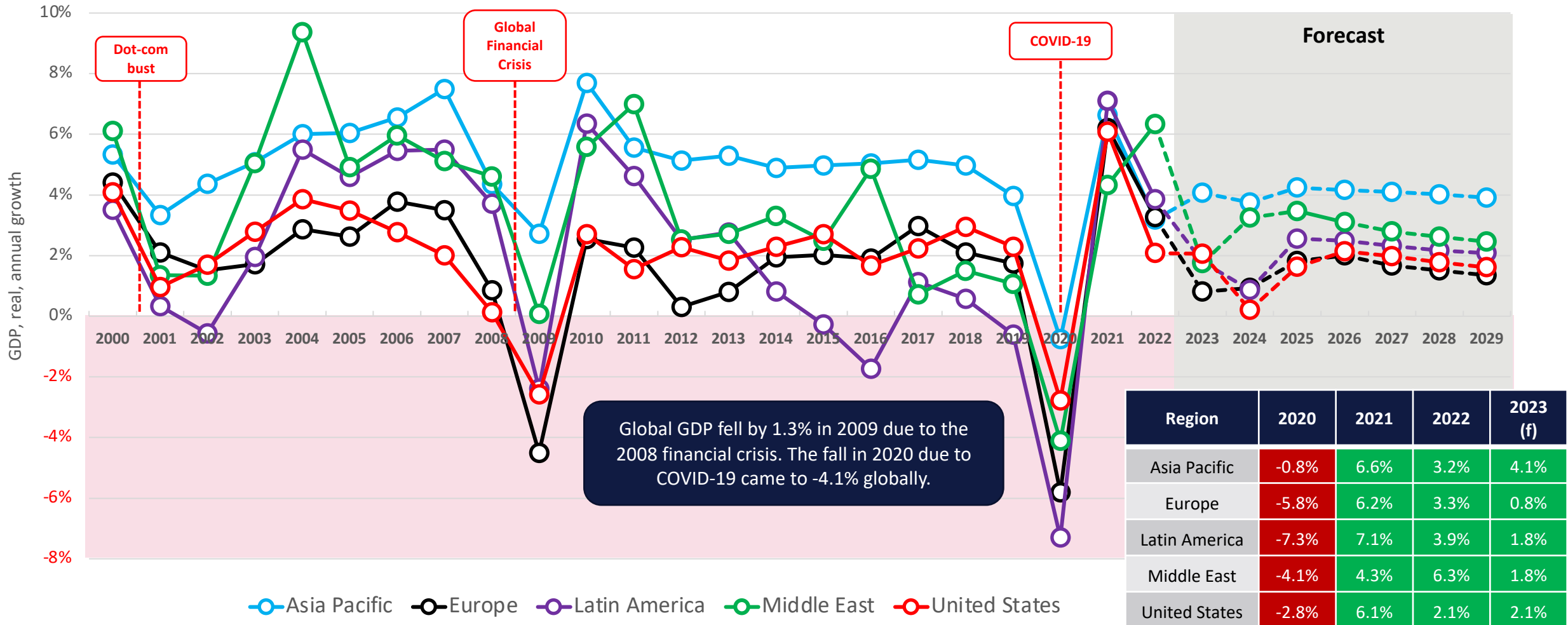


Credit: Brian Kough, Aviation Week Network

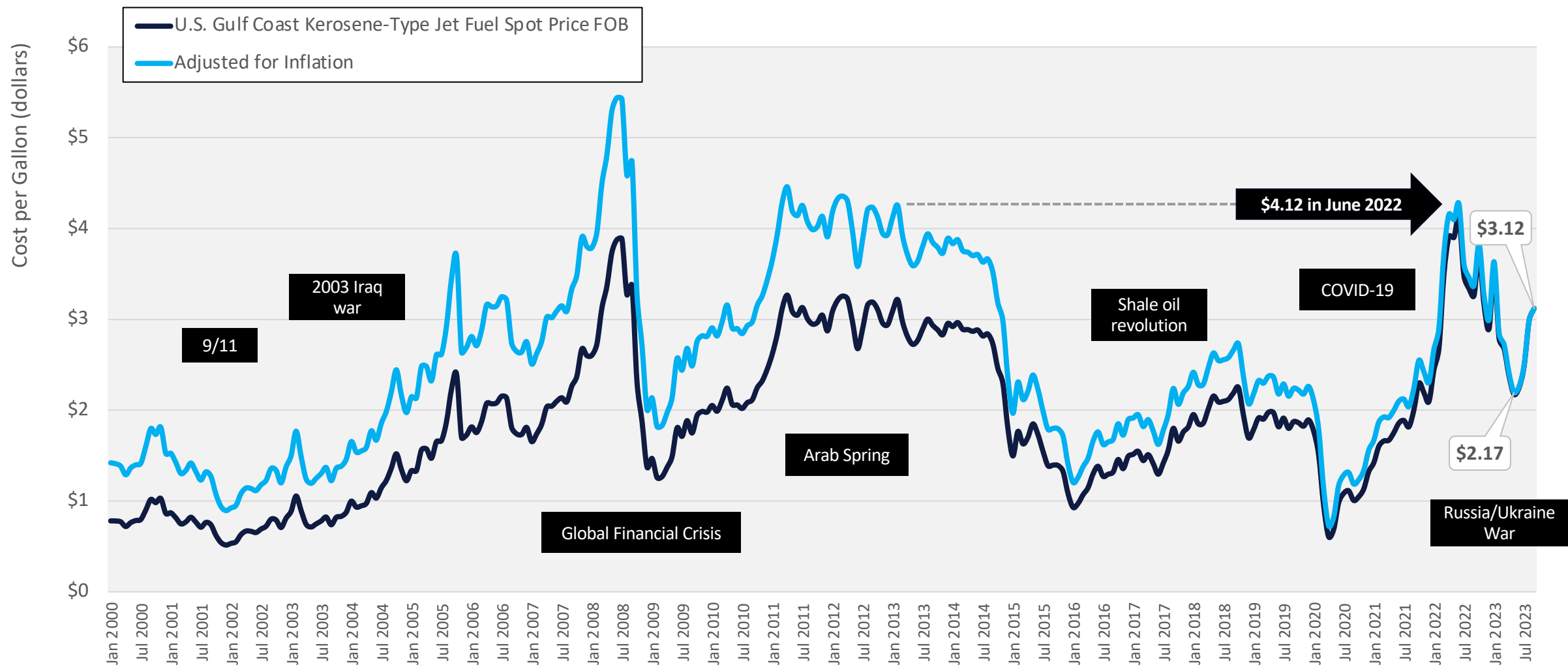


Credit: Brian Kough, Aviation Week Network

# Foreword: GDP, Recent Economic Shocks & Forecast



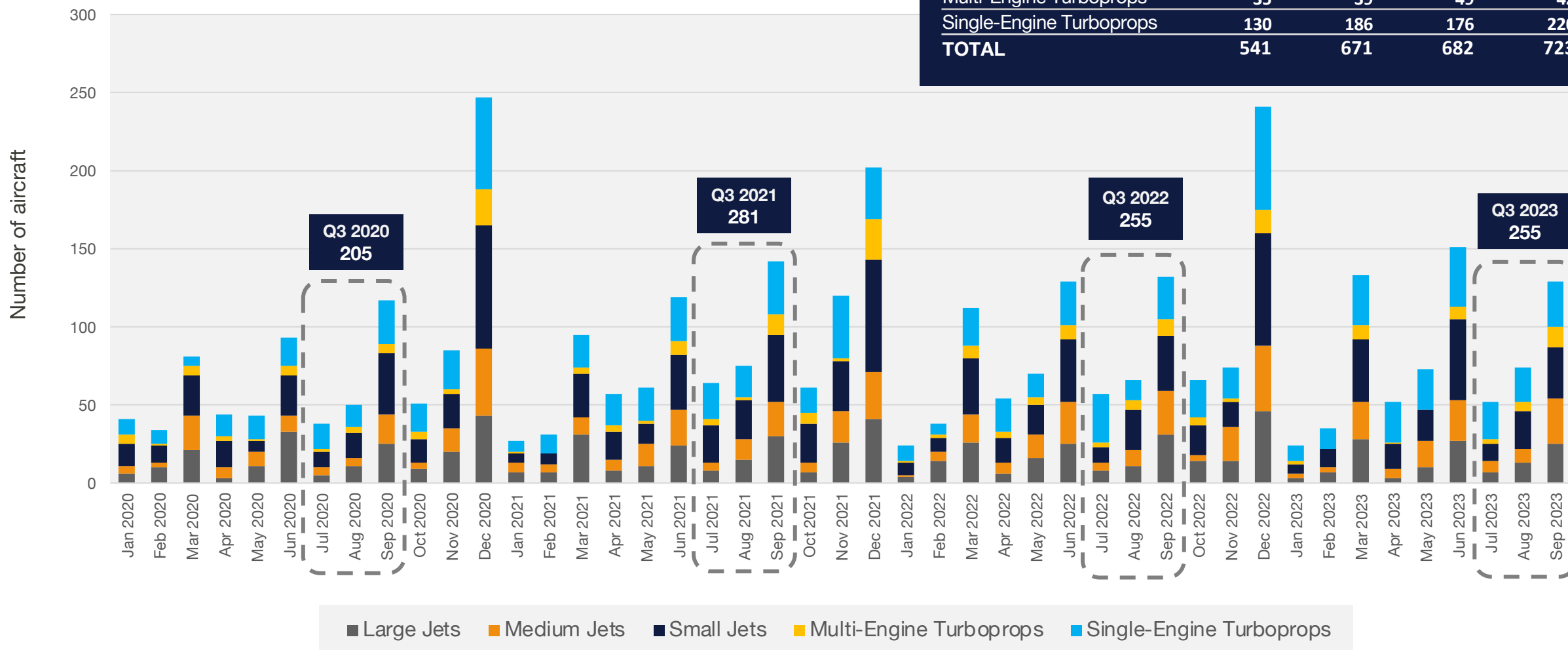
# Recent Historical Economic Shocks & Jet Fuel Prices



# Foreword: Recent Aircraft Deliveries

## Monthly business aircraft deliveries by category

| Q1-Q3 Delivery Totals by Aircraft Category |            |            |            |            |
|--------------------------------------------|------------|------------|------------|------------|
|                                            | 2020       | 2021       | 2022       | 2023       |
| Large Jets                                 | 125        | 141        | 141        | 123        |
| Medium Jets                                | 85         | 106        | 117        | 124        |
| Small Jets                                 | 166        | 199        | 199        | 214        |
| Multi-Engine Turboprops                    | 35         | 39         | 49         | 42         |
| Single-Engine Turboprops                   | 130        | 186        | 176        | 220        |
| <b>TOTAL</b>                               | <b>541</b> | <b>671</b> | <b>682</b> | <b>723</b> |



# What's New?

# What's New This Year?

## Engine Type Certificate Holder (TCH) – See slide #38.

- The engine TCH is the current owner of the relevant certification authority's Type Certificate or loosely speaking the brand. Similar to an aircraft Type Certificate, the owner holds the legal rights to the design and is held responsible for its upkeep.
- A type certificate is issued by the authorities of a nation state mandating the airworthiness standard for the aircraft type, model, engine or propeller. Thus, the technology, engineering designs, intellectual property is held by this entity.
- The impact is that the TCH may license the technical manuals, technical software, as well as procedures to establish airworthiness standards for maintenance, i.e. maintenance intervals, tooling, technics, etc.

## Engine Taxonomy

- The engine naming and hierarchy has been revised to follow common usage/recognition patterns more closely. Engines powering the aircraft in the forecast and historical entries will have an entry at the highest level, called family, and the next lower level of detail called model. Each has had revisions so use caution when matching up to previous forecasts.
- Example of hierarchy - the FJ44 *family* of engines which powers multiple aircraft like Citations, PC-24 and the new HondaJet Echelon (2600) have multiple engine *models* such as: FJ44-1A, FJ44-4A-QPM, and FJ44-4.



# Market Outlook

# Market Outlook

Molly McMillin, Editor-in-Chief | The Weekly of Business Aviation, Aviation Week Network



First-time buyers who entered business aviation during the coronavirus pandemic are staying, although the rate of new entrants has returned to normal.

Some new entrants purchased small business aircraft, while others jumped headfirst into a larger jet.

“Wealth did that; COVID didn’t do that,” Michael Amalfitano, Embraer Executive Jets president and CEO, based in Melbourne, Florida, said during a panel discussion at a recent Summit. “You have to focus on why they bought the aircraft—because they had the money to do so. And they always had the interest to do so. And now COVID gave them the reason to do so.”

The reason the customers are sticking is because they can afford to, Amalfitano says. The big question today, however, is whether they bought the right aircraft for their needs.

“That is a different question,” he says.

The number of first-time buyers spiked from the typical rate of 10-12% of buyers to 30%, Amalfitano says.

Today, “we’re back to normal growth of first-time buyers,” he says. When they change or exit an aircraft, it’s because they made the wrong buy and not because they do not want to fly private aircraft. They also are realizing that business aviation is more than the initial cost of an aircraft, including maintenance and the cost of pilots.

The corporate market, which had been in a wait-and-see mode, has returned. They are now in a replacement cycle process for aircraft and planning their fleets.

The charter and fractional ownership market received a boost as well.

Demand for NetJets’ fractional ownership services hit record levels during the pandemic, and while it has moderated, demand continues to remain higher than pre-pandemic levels, says Patrick Gallagher, NetJets president of sales, marketing and service. In September, NetJets entered a record-breaking deal with Textron Aviation for options to buy up to 1,500 Citation Latitude, Longitude and Ascend business jets over the next 15 years.

“We see an insatiable appetite for growth from customers and to be able to tee up these long-range supply agreements with our OEM partners is just really, really important to us,” Gallagher says.

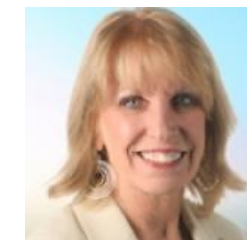
Manufacturers’ backlogs for new aircraft are high. The big five business jet manufacturers—Gulfstream, Textron Aviation, Dassault, Embraer and Bombardier, have \$50.3 billion in order backlogs on the books – representing about 18-24 months of backlog, according to JetNet data. Book-to-bill, the number of orders compared to deliveries, have declined from 2-to-1 in 2022 to about 1-to-1 in 2023.

Bombardier, for example, has built a two-year backlog with plans to increase production. Today, “the market supports a book-to-bill of 1,” says Eric Martel, Bombardier president and CEO. “If we’re selling 138 and more airplanes (a year), it means we’re maintaining that two years of backlog. It gives us predictability for the next two years, which is amazing.”

For Bombardier, North America remains a strong market, while the company sees “good momentum” in the Asia-Pacific and Middle East markets. The market in Europe, however, is more neutral, Martel says.

# Market Outlook

Molly McMillin, Editor-in-Chief | The Weekly of Business Aviation, Aviation Week Network



The used business aircraft markets, meanwhile, are stabilizing, with analysts noting a decline in transactions in 2022 compared to the robustness of 2021 and inventory for sale increasing, although not dramatically. Deals are taking a little longer, brokers say.

Aviation Week's Business Aviation Fleet & MRO 10-year forecast predicts deliveries of 11,836 business aircraft from 2024 through 2033. That includes 9,047 business jets, including the Cirrus Vision light jet, and 2,789 turboprops valued at \$299 billion over the decade.

Of the total breakdown, light jets are projected to reflect 21% of the total, followed by ultra-long-range jets at 19%, super midsize jets at 13% with very large jets, large jets and midsize jets each representing less than 10%. Single-engine turboprops are expected to take 19% of the share with multi-engine turboprops at 4%.

"While new aircraft deliveries and used aircraft sales are seeing unusually high demand and price increases lately, we feel that the delivery market will stabilize on the high side of normal activity we've seen over the previous decade," says Brian Kough, Aviation Week senior director of forecasts and aerospace insights. "Business jets will see the biggest gains, while business turboprops will see more of the same, but with single-engine turbos replacing multi-engines at a quicker pace."

Supply chain issues continue to pressure production and the industry, although the situation is improving, manufacturers say.

There's always things that we're working through," says Ron Draper, Textron Aviation president and CEO. "The capacity of the aerospace supply chain needs to grow—raw materials on up. We're working through that with our suppliers."

At the same time, the industry is facing a shortage of skilled labor.

To adjust, manufacturers are taking a number of steps to attract and retain employees, including increasing pay, benefits and adding additional perks.

"That's good for workers," Draper says. "That will push wages up, and we will go out and compete. We've got great people. We have great processes, but we're going to have to keep hiring."

Textron Aviation's goal is to hire 2,000 employees in 2023. "We'll be doing that every year and training lots of folks."

Piper Aircraft, for example, opened a health care center at its Vero Beach, Florida, headquarters in July, offering employees and their families no-cost preventative care, sick care, chronic condition management, health coaching and lab services.

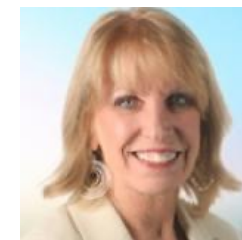
Textron Aviation opened similar on-site clinics along with on-site cafes and learning centers for skill development and training.

While supply chain and workforce shortages are challenges, they also present advantages.

# Market Outlook

Molly McMillin, Editor-in-Chief | The Weekly of Business Aviation, Aviation Week Network

THE WEEKLY OF  
**BusinessAviation**



“Those constraints are both a curse and a blessing,” says Ron Gunnarson, Piper Aircraft president of sales, marketing and customer support. “We are an industry that follows the market like no other industry with the ups and downs,”

When times are good, the industry has a tendency to overproduce aircraft.

“You are going full tilt, full throttle all the time, and you get yourself out onto a ledge,” Gunnarson says. “No one can overbuild like general aviation OEMs.”

That overbuilding presents difficulties in times of a downturn.

Today’s supply chain and workforce difficulties, however, are “keeping us in the real world,” he says, with a healthy backlog of aircraft orders.

“It’s a very good and special place to be,” Gunnarson says.



**Embraer Praetor 600**

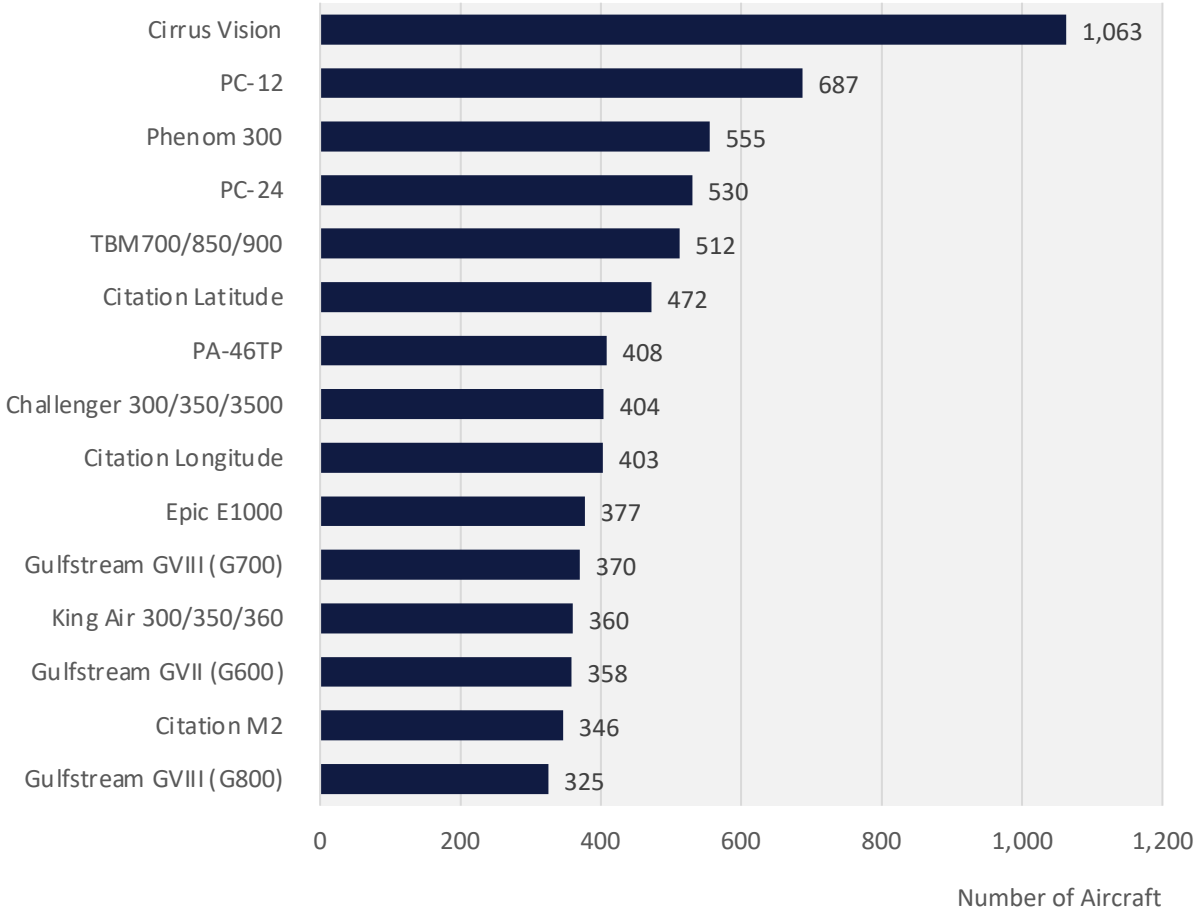


**Bombardier Global 7500**

# Fleet Forecast & Trends

# Forecast Aircraft Deliveries

By Aircraft Group



**Highlights**

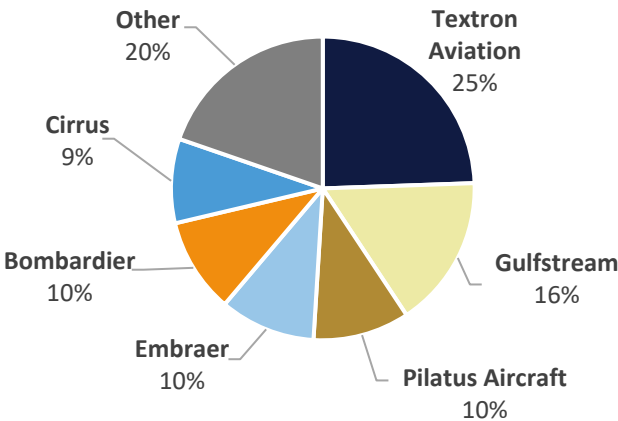
- 11,836 total deliveries over 10 years; 9,047 business jets / 2,789 turboprops.
- \$299 billion retail delivery value over 10 years.

The Cirrus Vision Jet, Pilatus PC-12 and Phenom 300 are expected to see the highest number of unit deliveries of new build aircraft in the forecast period. The Citation product line alone will account for 2,106, or 18% of the total. All models of Gulfstream’s line up will account for 1,729 (15%), while Cirrus’ lone, single-engine turbofan type, the Vision SF50, will account for 1,063 (9%). The vast majority of both unit-counts and delivery values will occur in North America, with Western Europe trailing in a distant second place, \$180 billion vs. \$57 billion, respectively.

By manufacturer, Textron continues its leading product line-up position and is expected to deliver the most aircraft over the period at 2,893 aircraft, or 24% of total deliveries with leading programs of the Citation Latitude/Longitude/Ascend as well as the King Airs.

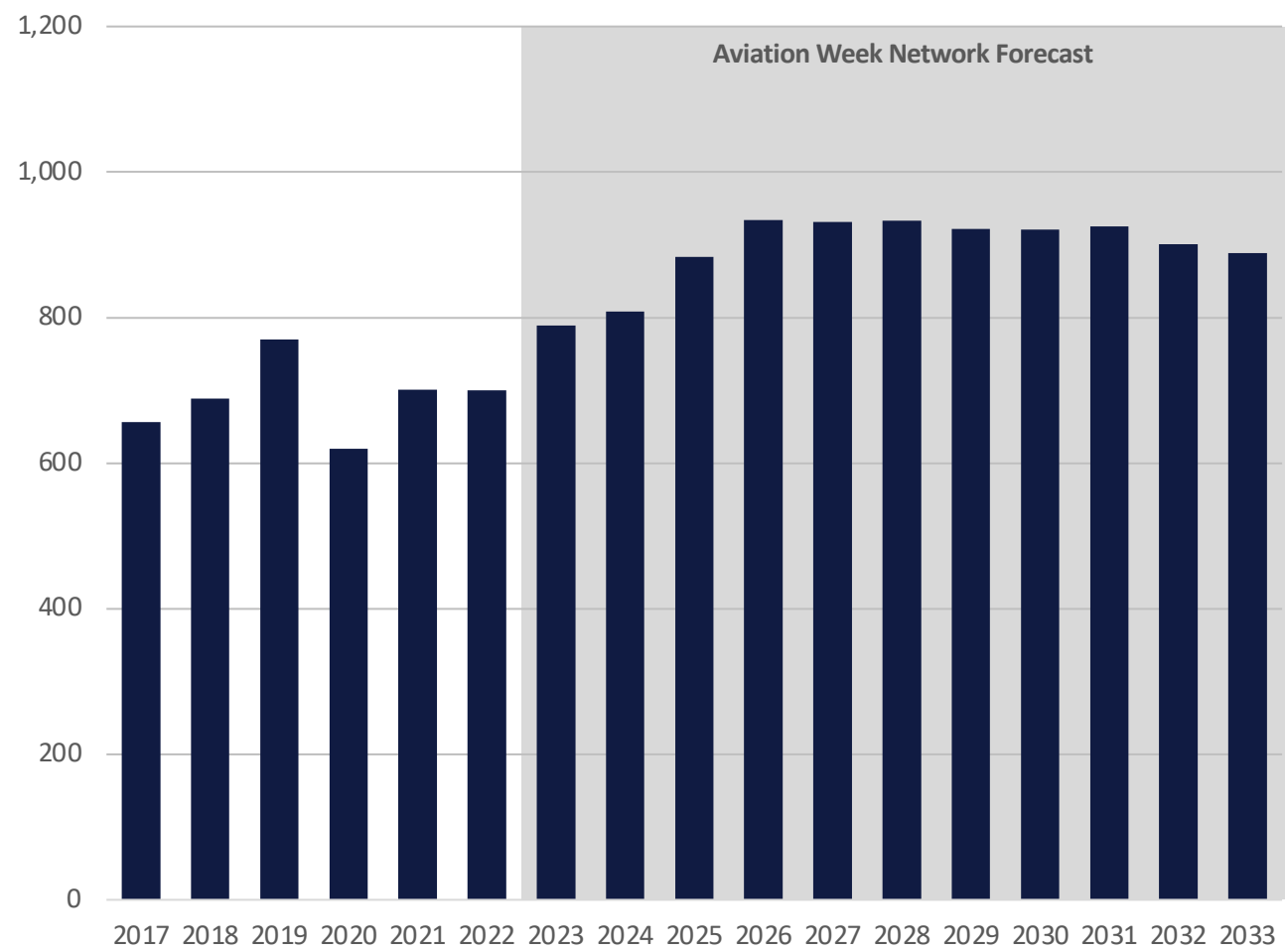
Gulfstream (1,924), Pilatus (1,217), Embraer (1,208), Bombardier (1,198), and Cirrus (1,063) are the other leading manufactures with a share of 9% or greater of overall deliveries.

Deliveries By Manufacturer



# Historical & Forecast Aircraft Deliveries – Jets

Business Jet Deliveries



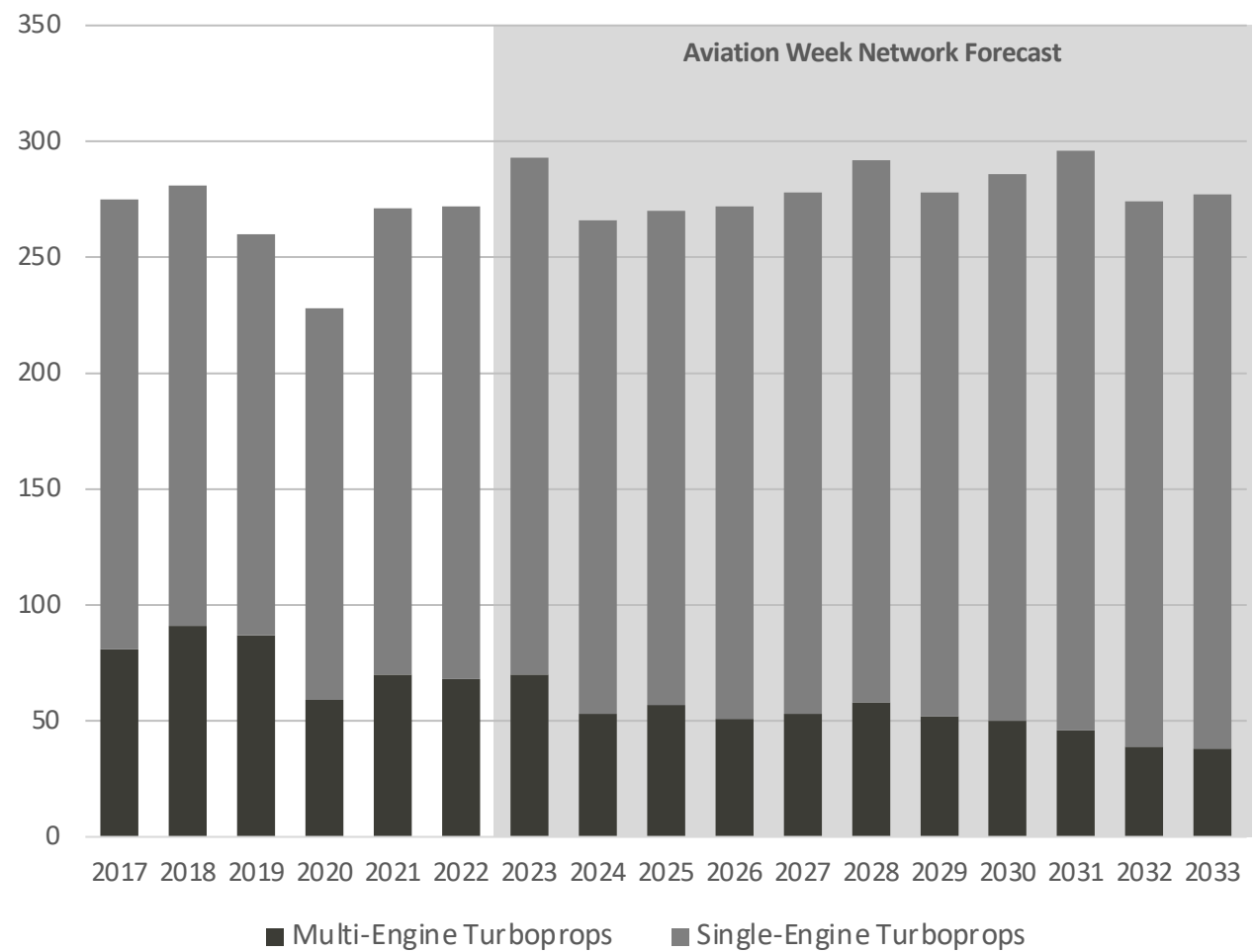
## Highlights

- 9,047 business jet (turbofan) deliveries over the 2024-33 period.
- 76% of all business aircraft deliveries will be turbofan powered during the 10-year period, with small jets accounting for most units delivered.
- 900-unit annual average for business jet deliveries for next 10 years predicted to come to just over.



# Historical & Forecast Aircraft Deliveries – Turboprops

Business Turboprop Deliveries



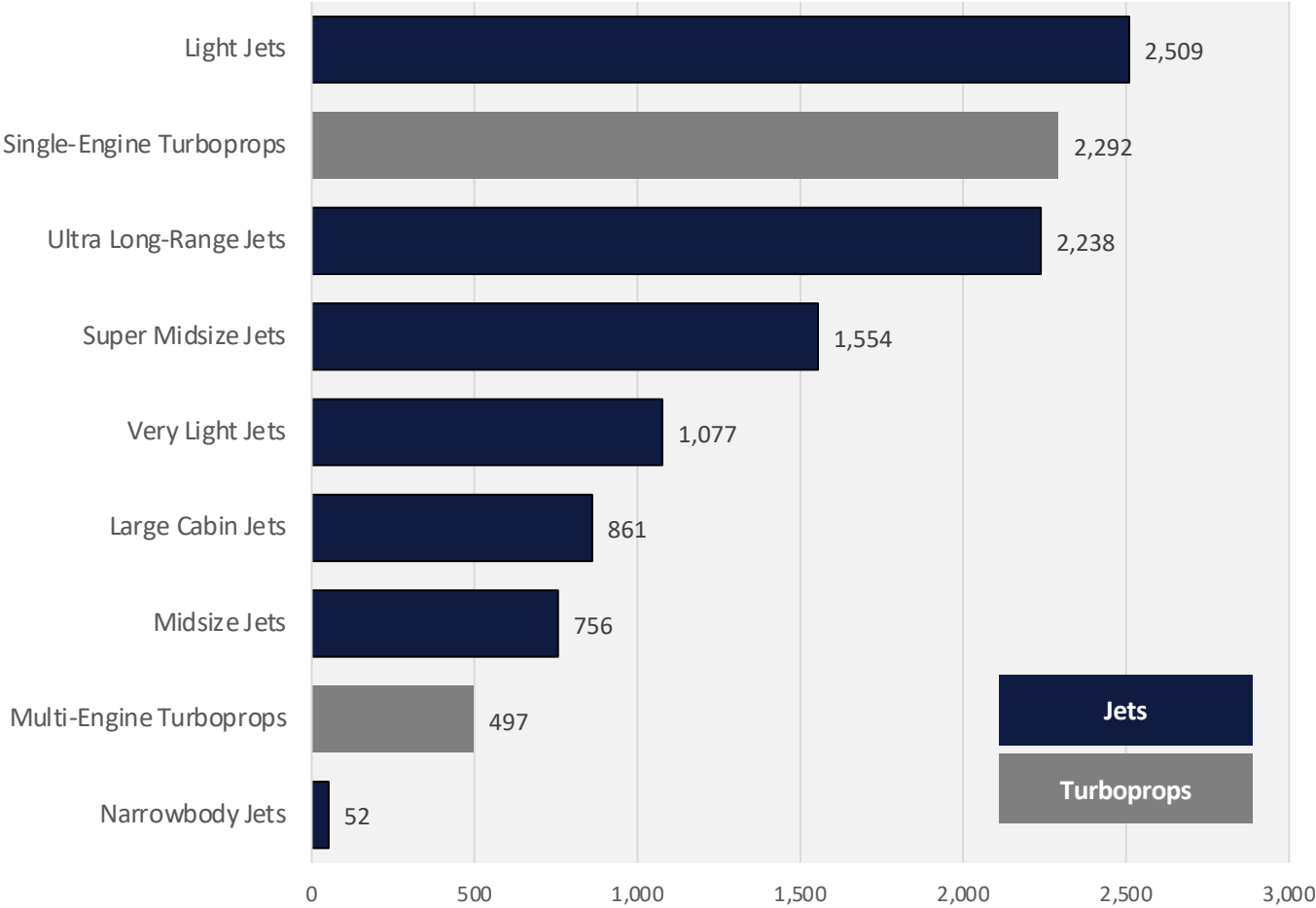
## Highlights

- 2,783 turboprop deliveries over period .
- 2,292 single-engine (SE) turboprop deliveries over 2024-33 period.
- 24% - Turboprops share of all business aircraft deliveries.
- ~230 yearly average units for SE business turboprop deliveries for next 10 years.
- Single-engine in-service fleet grows at above average 4.3% CAGR replacing multi-engine configured aircraft shares.



# Forecast Deliveries – Size Category & Propulsion

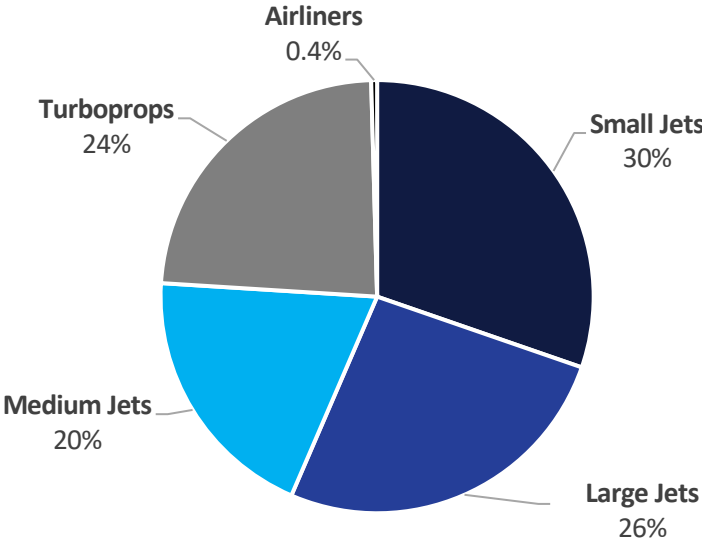
2024-33 Unit Deliveries by Size Category



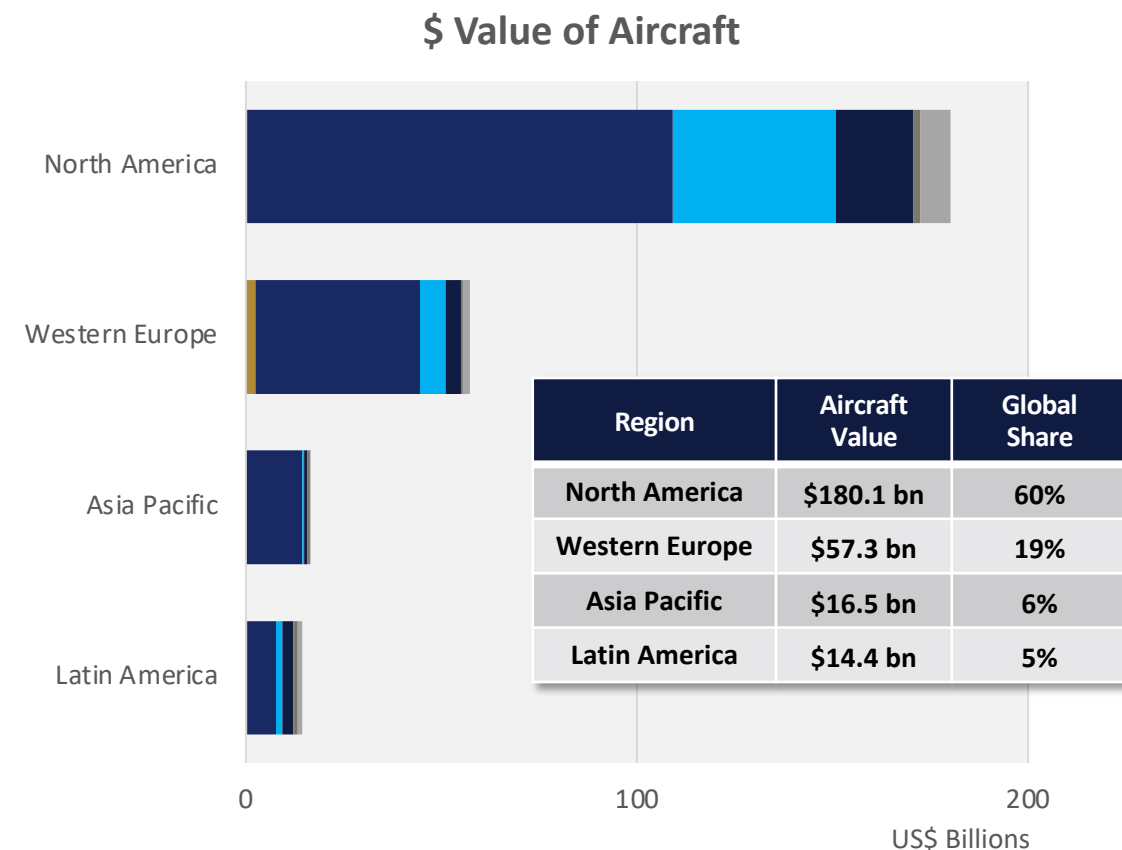
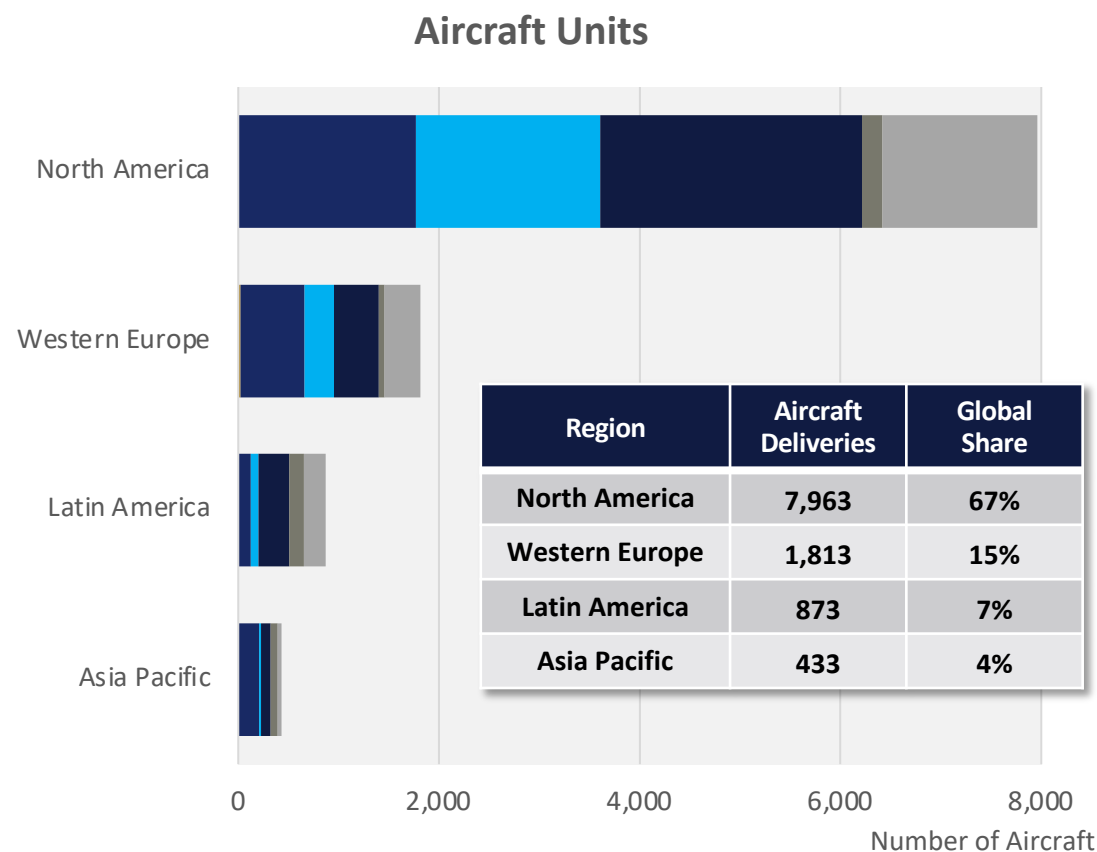
In terms of business aircraft size, light jets and single-engine turboprops are expected to see the largest number of deliveries between 2024 and 2033 with these two categories alone accounting for 4,801 deliveries, equivalent to 41% of the total over the forecast.

At the next higher, market segment level, small jets account for one-in-three of all business aircraft deliveries over the period, with Large Jets accounting for a further 26%. This means that these two categories account for 56% of deliveries in the forecast, despite accounting for just 46% of the 2024 in service fleet.

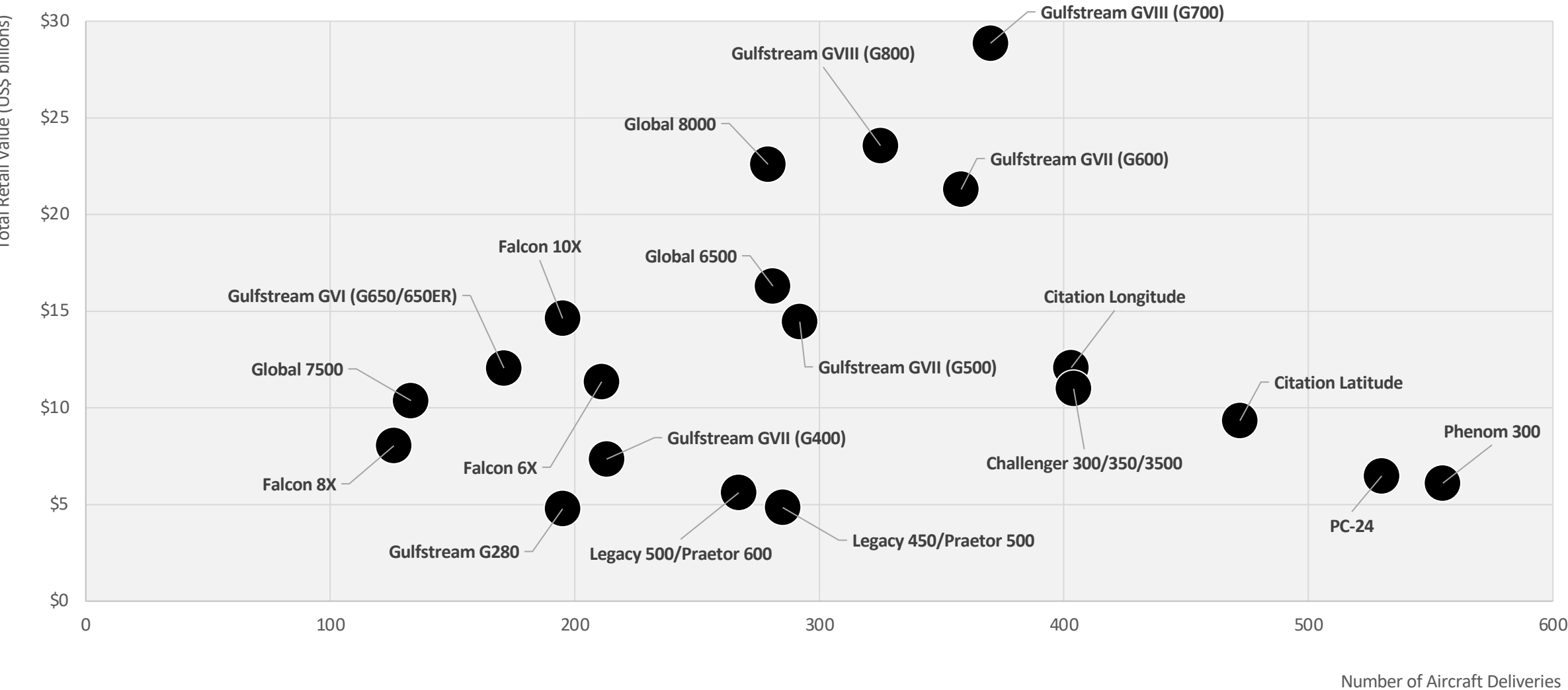
Deliveries By Market Segment



# Aircraft Deliveries and Value by Region

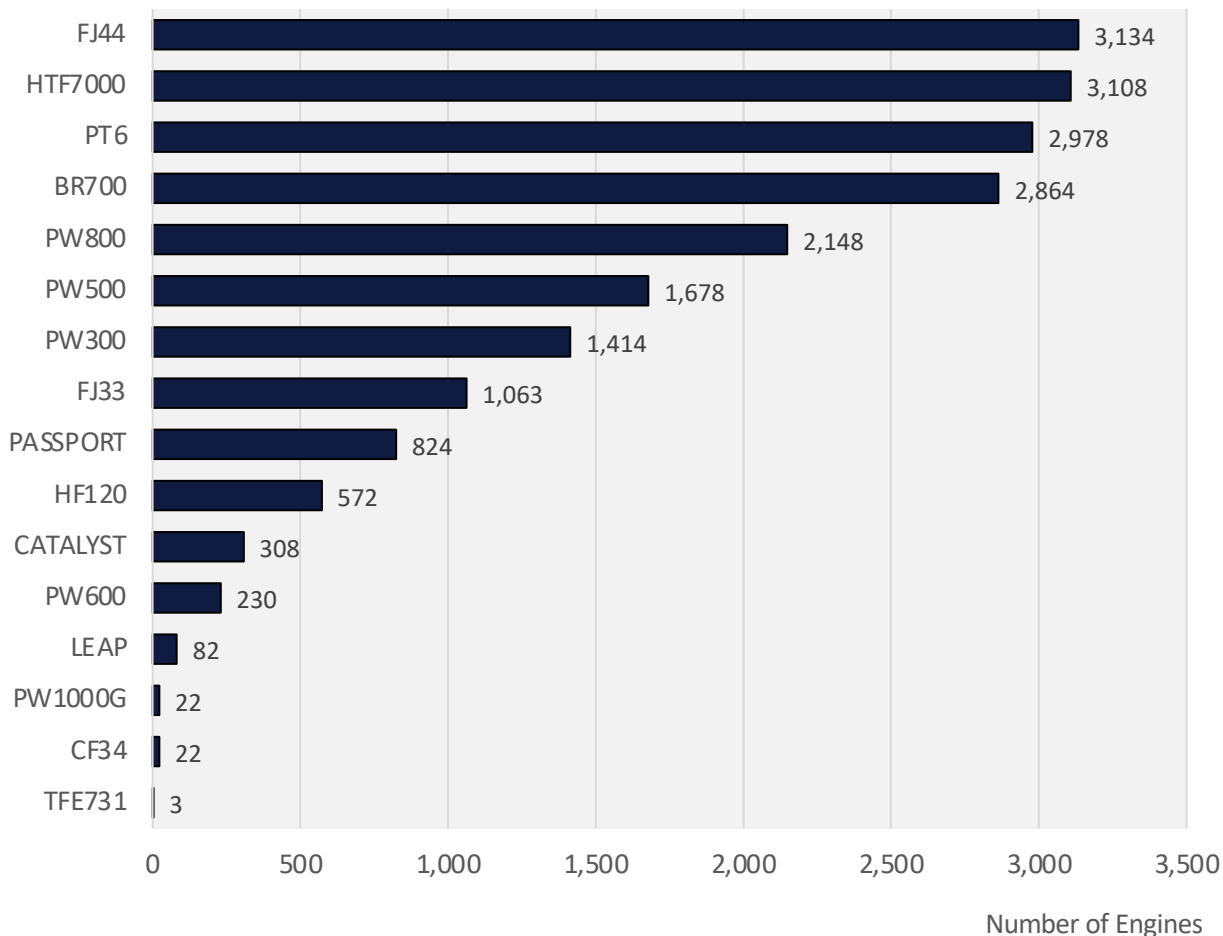


# Aircraft Deliveries – 20 Highest Program Values



# Forecast Engine Deliveries

By Engine Family

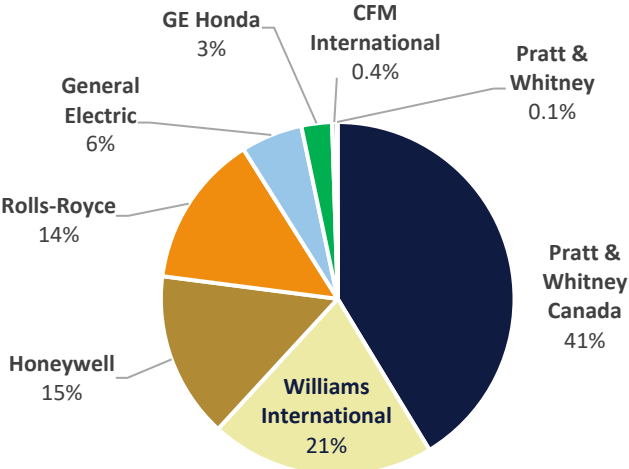


The Williams International FJ44, Honeywell HTF7000 and Pratt & Whitney Canada PT6 series of engines are expected to lead deliveries over the forecast period, with these three engine families each taking an equal 15% share, accounting for 45% of all business engine deliveries between 2024 and 2033. Deliveries of the Rolls-Royce BR700 series are expected to account for a further 14%.

Turbofans will dominate the market with 17,164 deliveries over the period, equivalent to 84% of the total. By comparison, a total of 3,286 turboprop engines will be delivered over the course of the forecast.

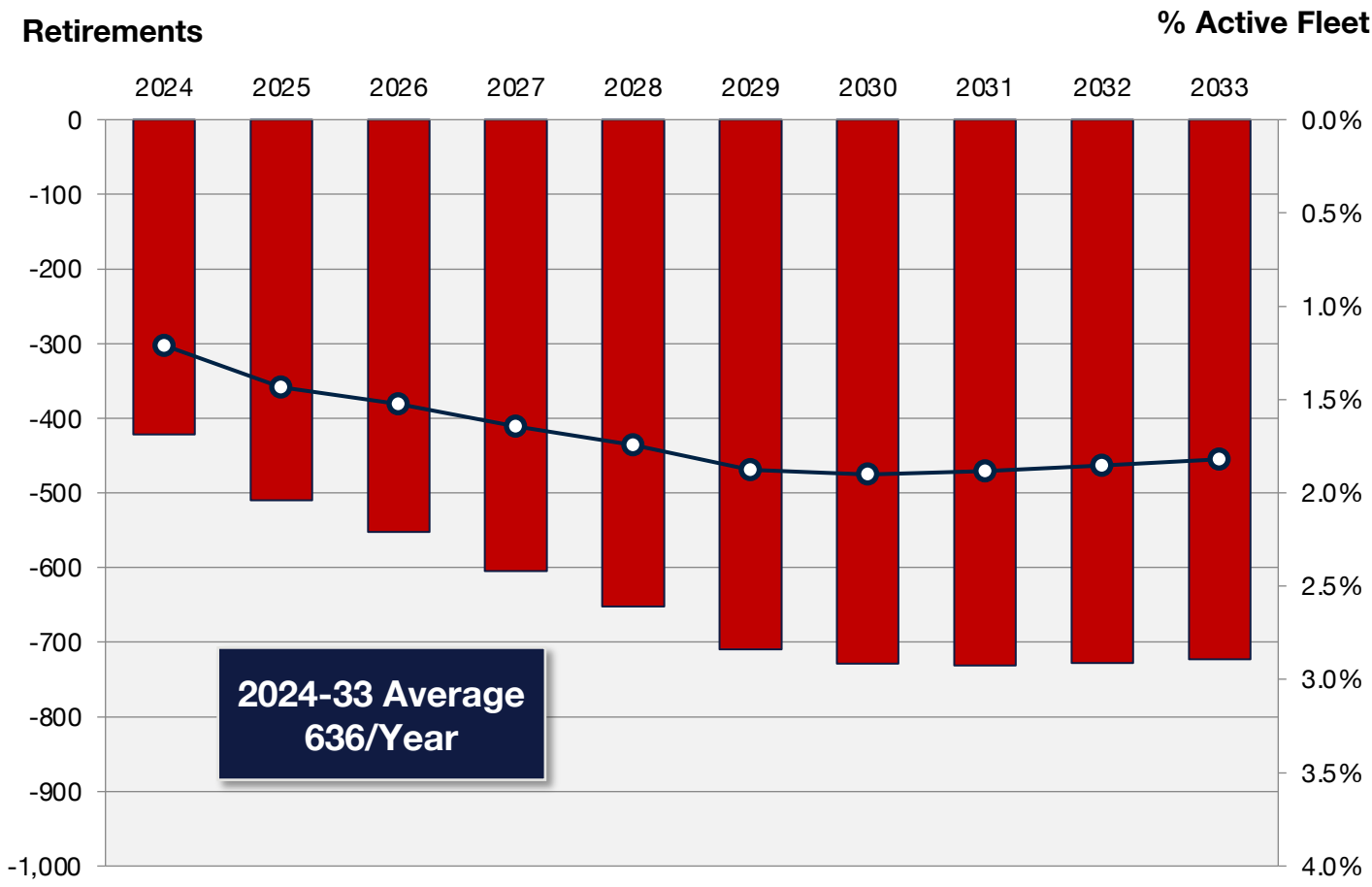
The strong performance of the PW800 and PT6 engine families mean that Pratt & Whitney Canada will account for the largest share of deliveries over the forecast, at 41% of the total. Williams International will account for a further 21%, Honeywell 15% and Rolls-Royce 14%.

By Manufacturer



# Aircraft Retirements - Trends

Annual forecasted aircraft retirements and % of active fleet



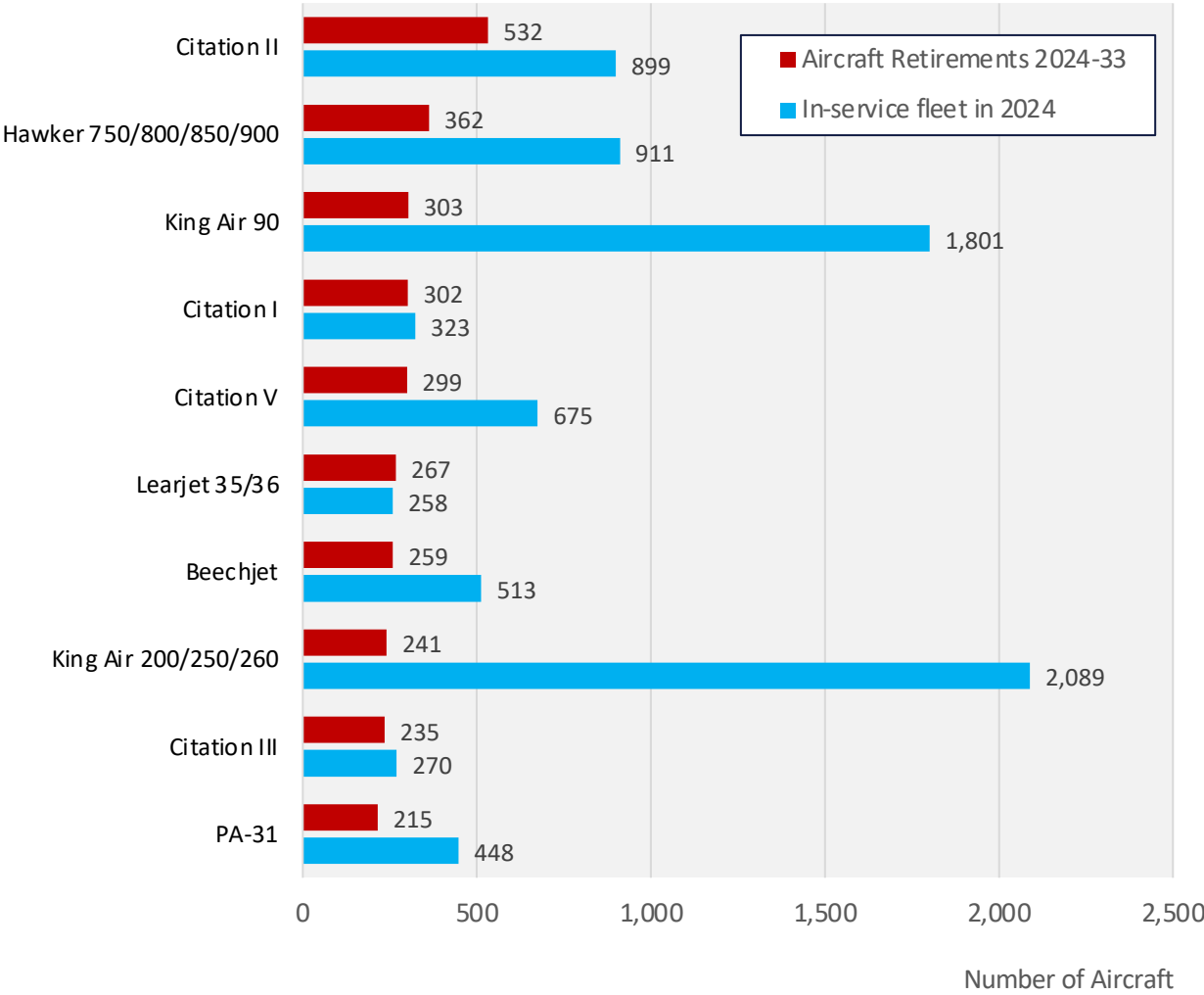
**Highlights**

- Retirements peak in 2031 at 731.
- Historic rise of percentage of fleet rates dominate the decade.
- Top retirees include Cessna Citations, Learjet (31, 35, 60, etc.), King Air 90s.
- Age-based retirements.



~6,300 aircraft retirements over the 10-year forecast

# Aircraft Retirements – Analysis



At the group level, the Citation II is expected to see the highest number of retirements at 532, followed by the Hawker 750/800/850/900 at 362 aircraft. At the wider family level, Citation aircraft account for 1,730 units and 27% of total retirements in the forecast.

Nevertheless, despite the large number of aircraft leaving service, the number of retirements represents just 23% of the total Citation line in service in the year 2024.

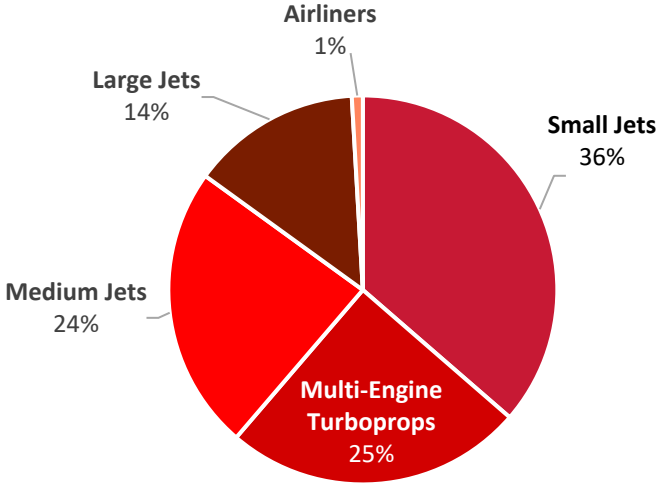
Considerable numbers of King Air 90 (303), Citation I (302), Citation V (299) and Learjet 35/36 (267) aircraft will also be withdrawn from service.

Substantial fleets which are expected to see almost complete withdrawal from service over the decade include the Citation I and the Learjet 35/36.

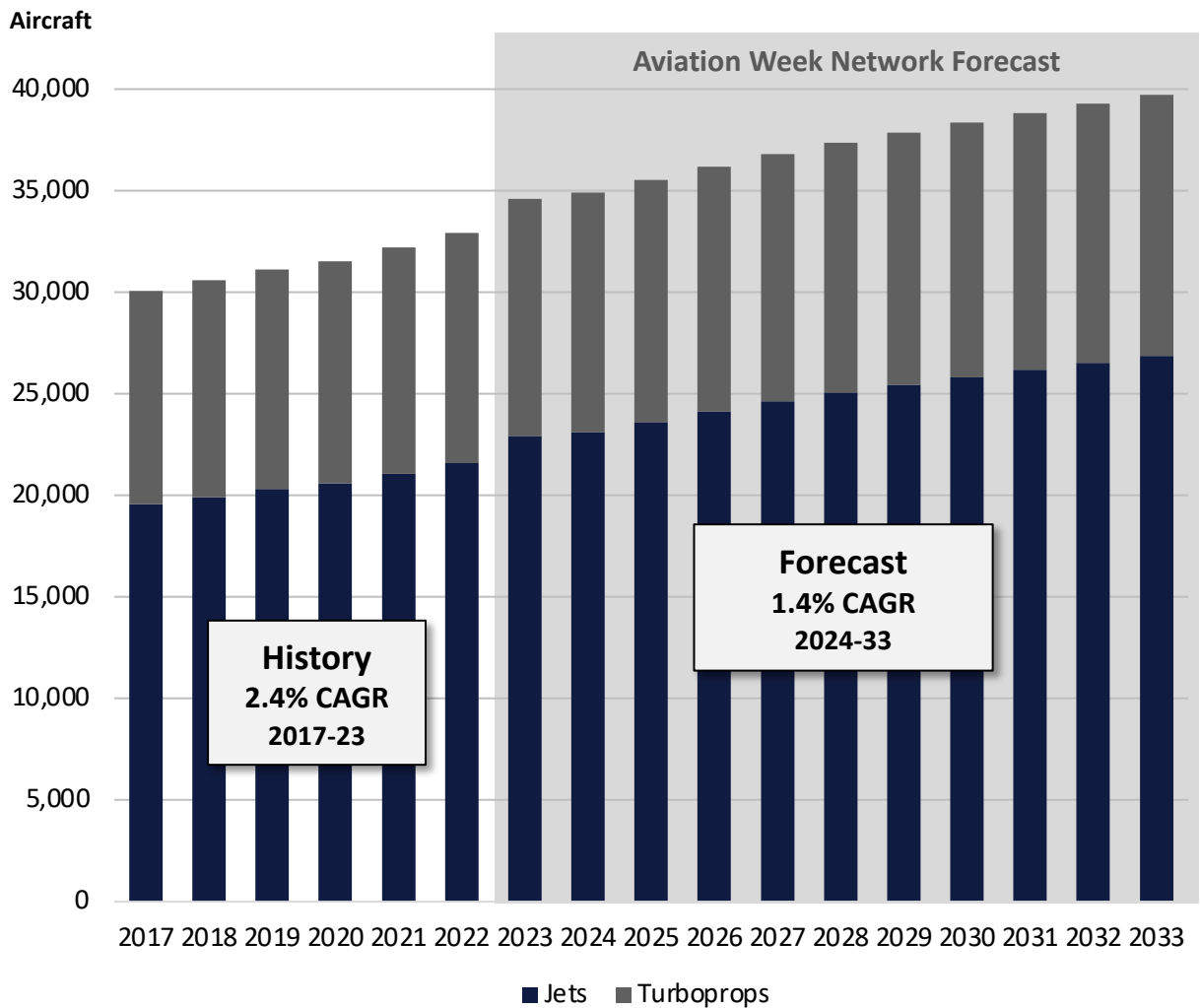
At the market segment level, retirements are dominated by Small Jets which account for 36% of all retirements in the period.

Multi-Engine Turboprops account for the next largest share at 25%, closely followed by Medium Jets at 24%.

Retirements by Market Segment



# In-Service Aircraft Fleet

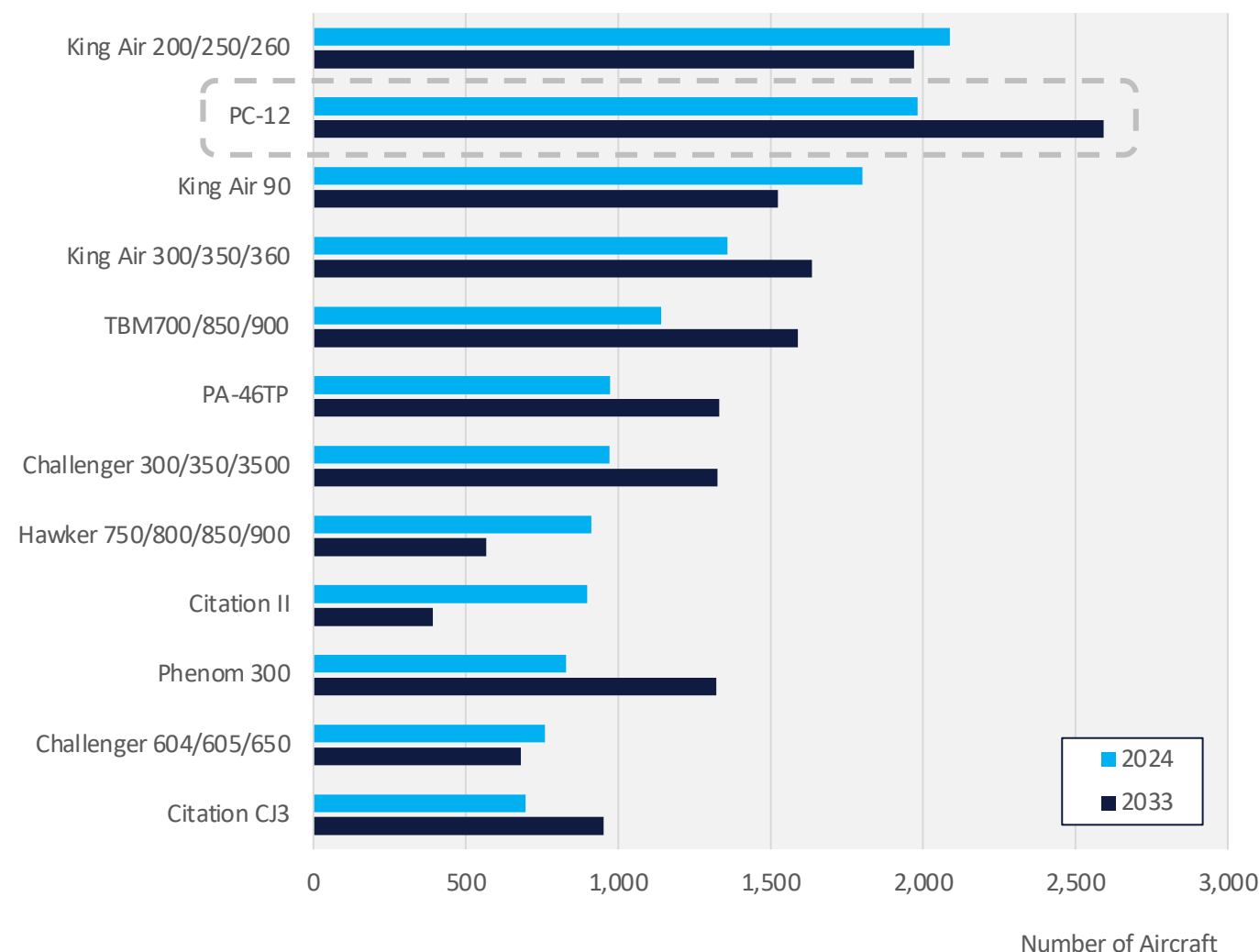


## Highlights

- 1.4% future CAGR expected after 2.4% historical CAGR fleet growth.
- 39,719 global business aircraft fleet by the end of 2033.
- 1.7% CAGR for turbofan-powered aircraft;
- 1.0% CAGR for turboprop-powered aircraft.
- Large Jets gain the most share overall, while single-engine turboprops gain market share at the expense of multi-engine turboprops.



# In-Service Fleet – Aircraft Share Over Time



The resultant shifts in the active, in-service fleet from new deliveries and retirements, plays out at various levels of analysis.

At the aircraft group level, depicted at left, the PC-12 fleet is expected to move from being the second largest in-service fleet in 2024 to the largest by 2033. The multi-engine turboprop King Air 200/250/260 group is expected to slip to the second largest fleet. The King Air 90 aircraft group declines as well, going from third place in 2024 to sixth on the last year of the forecast.

The Citation family, all Citation lines, retains its position as the largest in-service *family* over the decade with more than 7,000 aircraft expected to be in operation throughout the 10 years of the forecast. The reduction in the older Citation I (-84%) and II (-57%), will be offset by growth in the Citation Longitude (+251%), Latitude (+99%) and Ascend models.

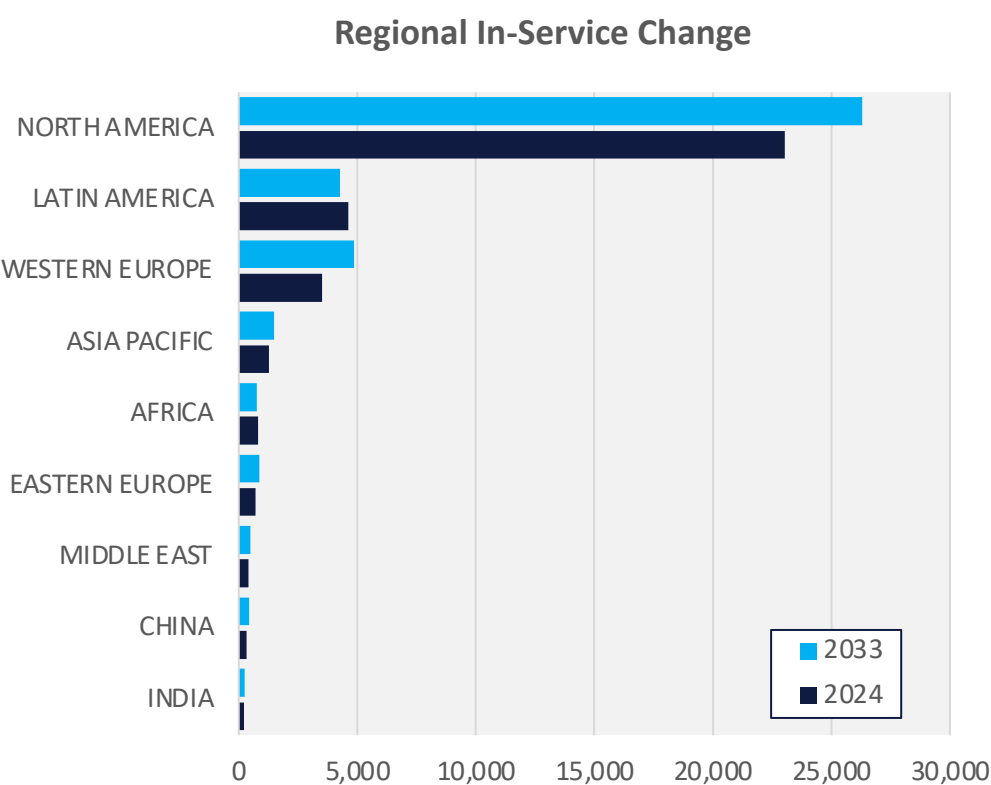
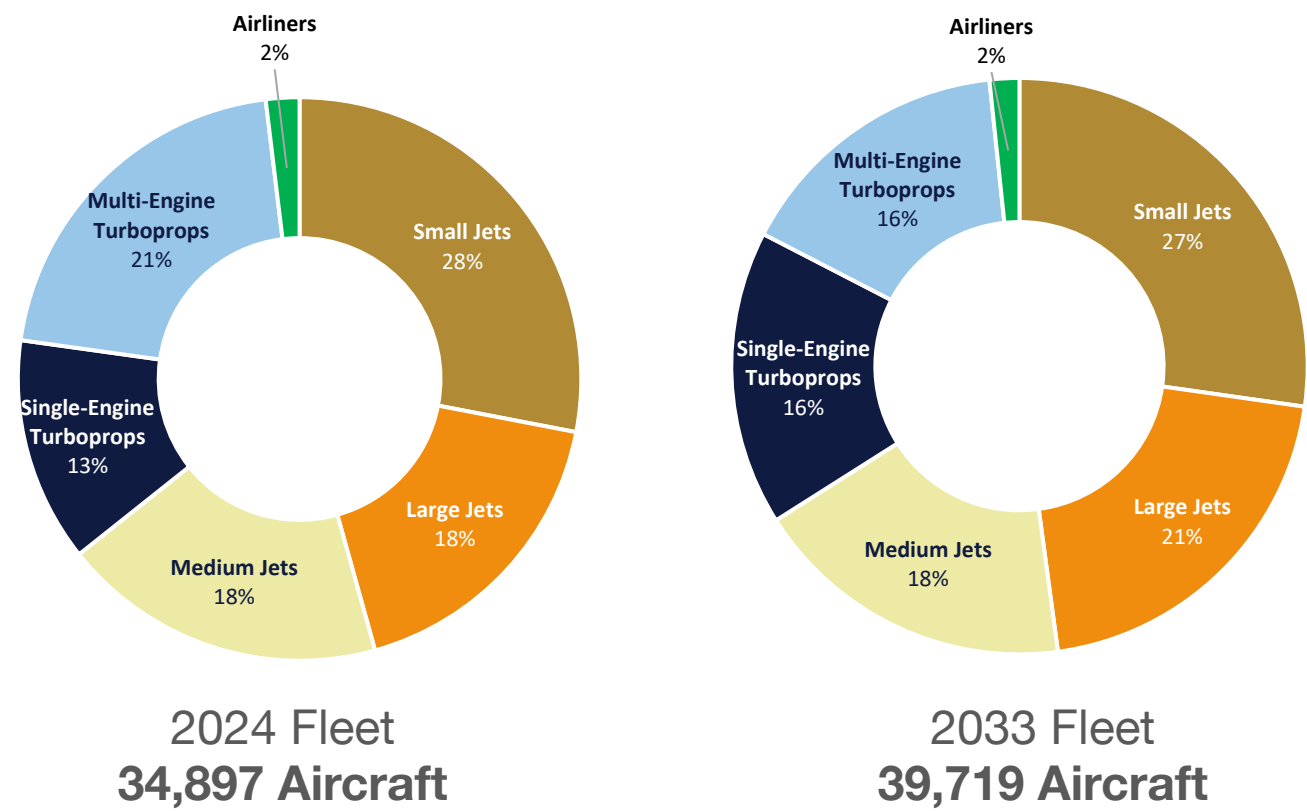
At the category level, Ultra Long-Range Jets (+77%), Very Light Jets (+68%), and Single-Engine Turboprops (+46%) are expected to see the greatest growth of in-service fleets. The numbers of Multi-Engine Turboprops (-14%) and Midsize Jets (-11%) in service globally are projected to fall significantly over the course of the forecast.

Aircraft fleets that are expected to see rapid growth over the course of the forecast include the Pilatus PC-24 (+173%), Cirrus Vision SF50 (+156%) and HondaJet (+93%).

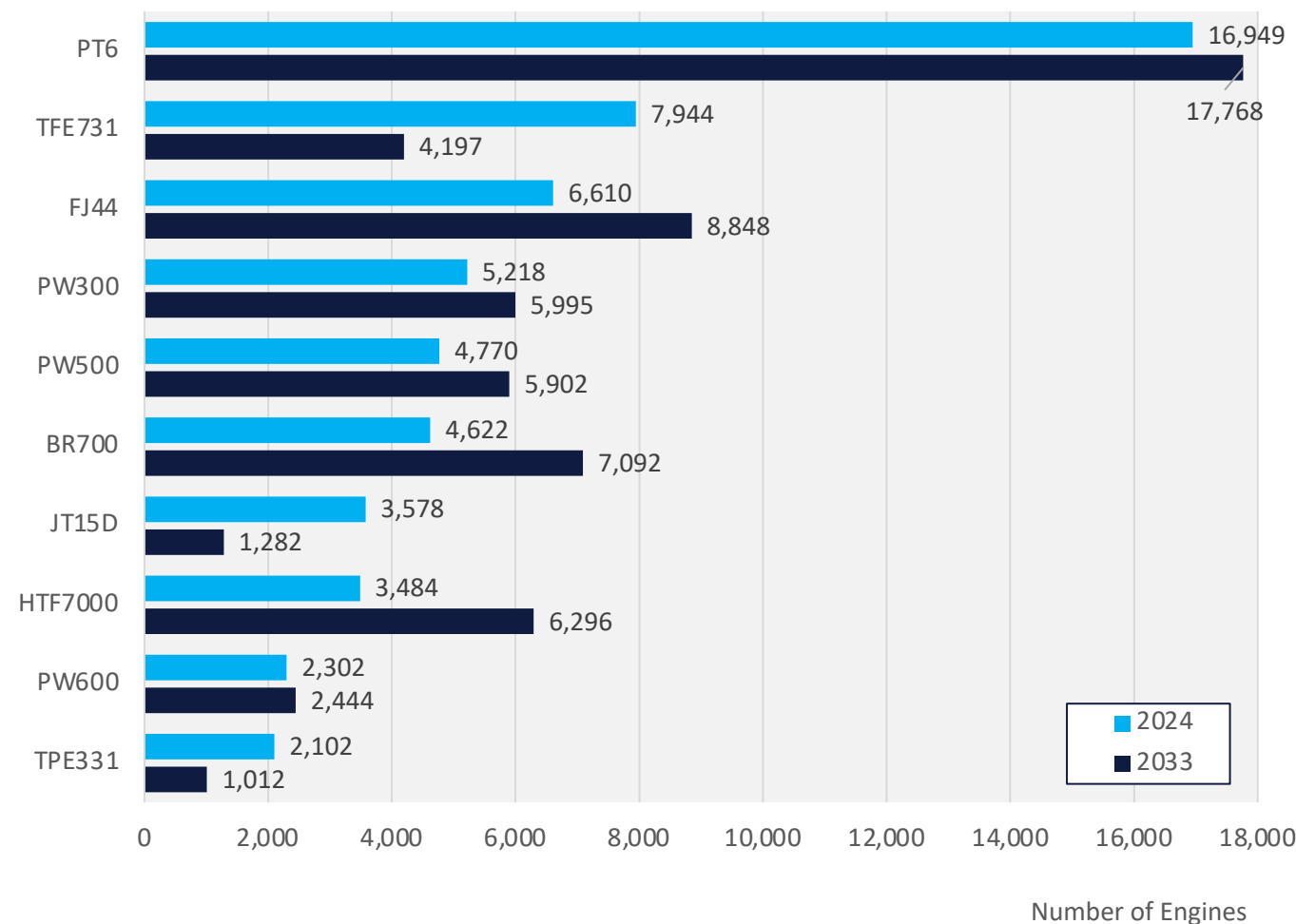
Those expected to experience a significant decline in fleet strength include the Learjet 35/36 (-93%), King Air 100 (-74%) and Falcon 50 (-72%).

# In-Service Fleet Share

Fleet expands 14% 2024-33; grows at 1.4% CAGR over 10 years



# In-Service Fleet – Engine Family Share Over Time



The number of turbofan and turboprop engines in service globally is forecast to grow at 1.1% CAGR, from 65,660 units in 2024 to 72,263 by 2033. With 14 original engine manufacturers and 23 engine family types, the business engine fleet is a highly segmented market.

The Pratt & Whitney Canada PT6 engine family dominates the forecast in terms of the fleet. As of 2024, the number of PT6 engines in operation globally and powering single-engine and multi-engine turboprop aircraft comes to 16,949 units, the largest number of any powerplant representing 26% of the total. The PT6 family's end strength will grow but its fleet share will drop by a percentage point of the total engine count by 2033.

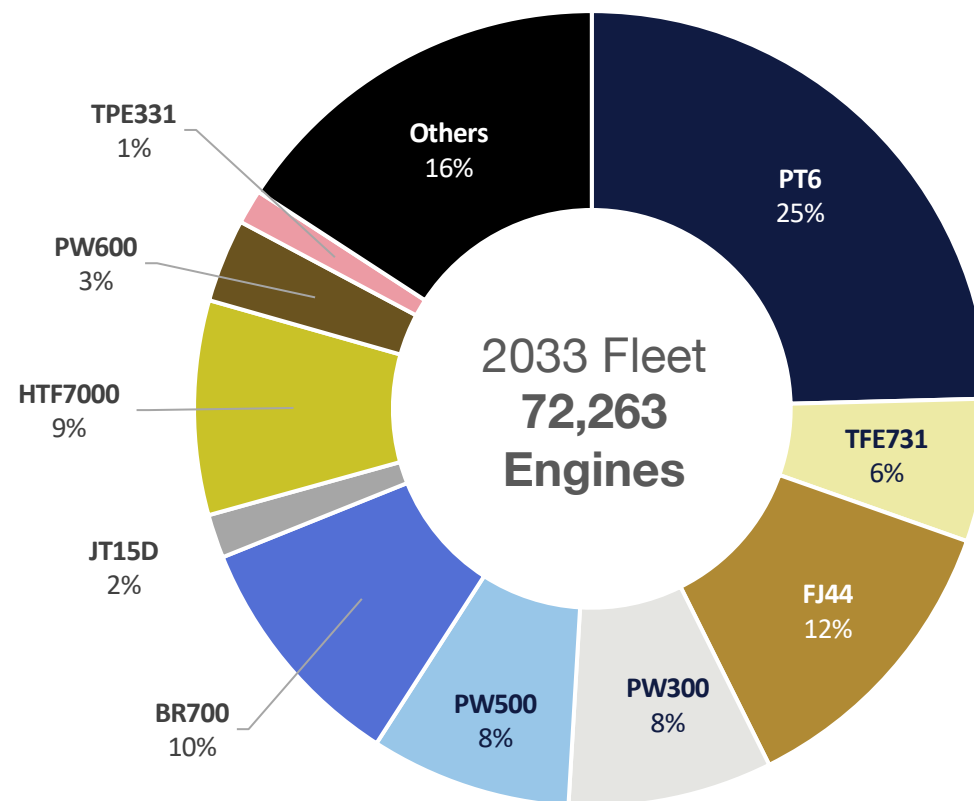
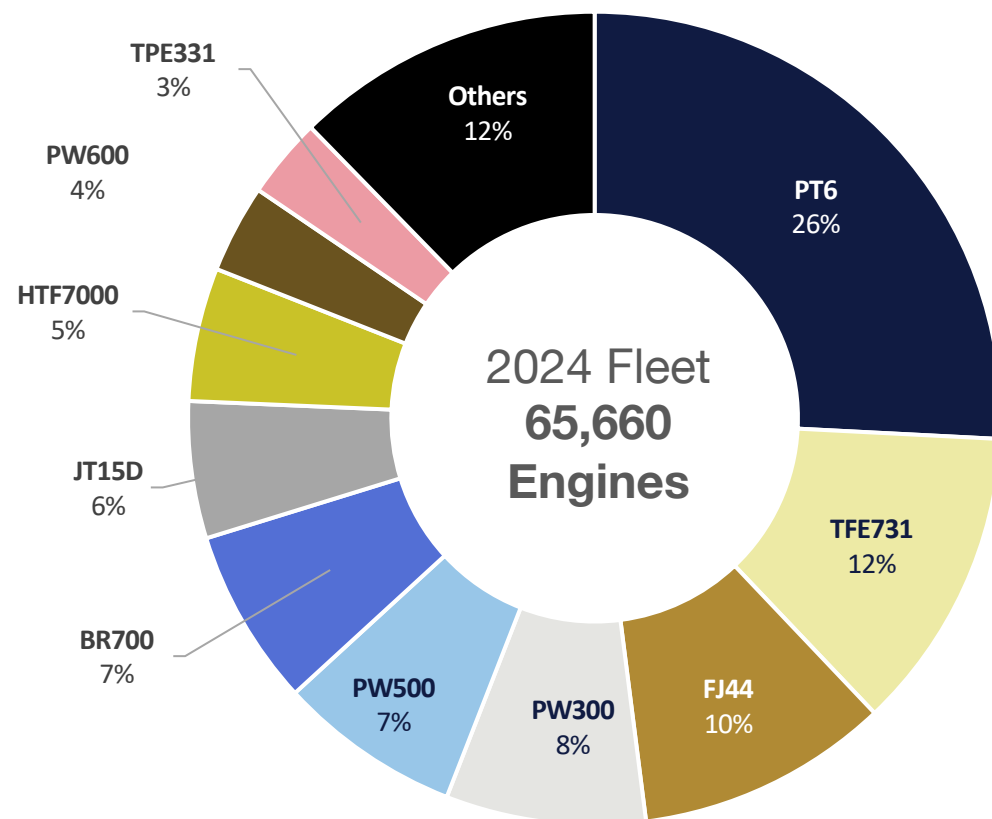
The current, second most popular engine family, the Honeywell TFE731 powering Hawkers, Learjets, and Falcon 900s will see a declining fleet as these aircraft and their engines are replaced with newer generation engines in the future. The TFE731 numbers projected to decline by 47% over the decade, falling from 7,944 engines in 2024 to 4,197 by 2033.

The FJ44 engine family, the third most popular engine with a long history of powering early Cessna Citations, will be given a breath of life by powering newer aircraft, namely the Pilatus PC-24 and the HondaJet Echelon (2600).

The fastest growing in service fleets of engines over the period will include the PW800 (+309%), Passport (+170%), FJ33 (+156%), HF120 (+93%) and the HTF7000 series (+81%).

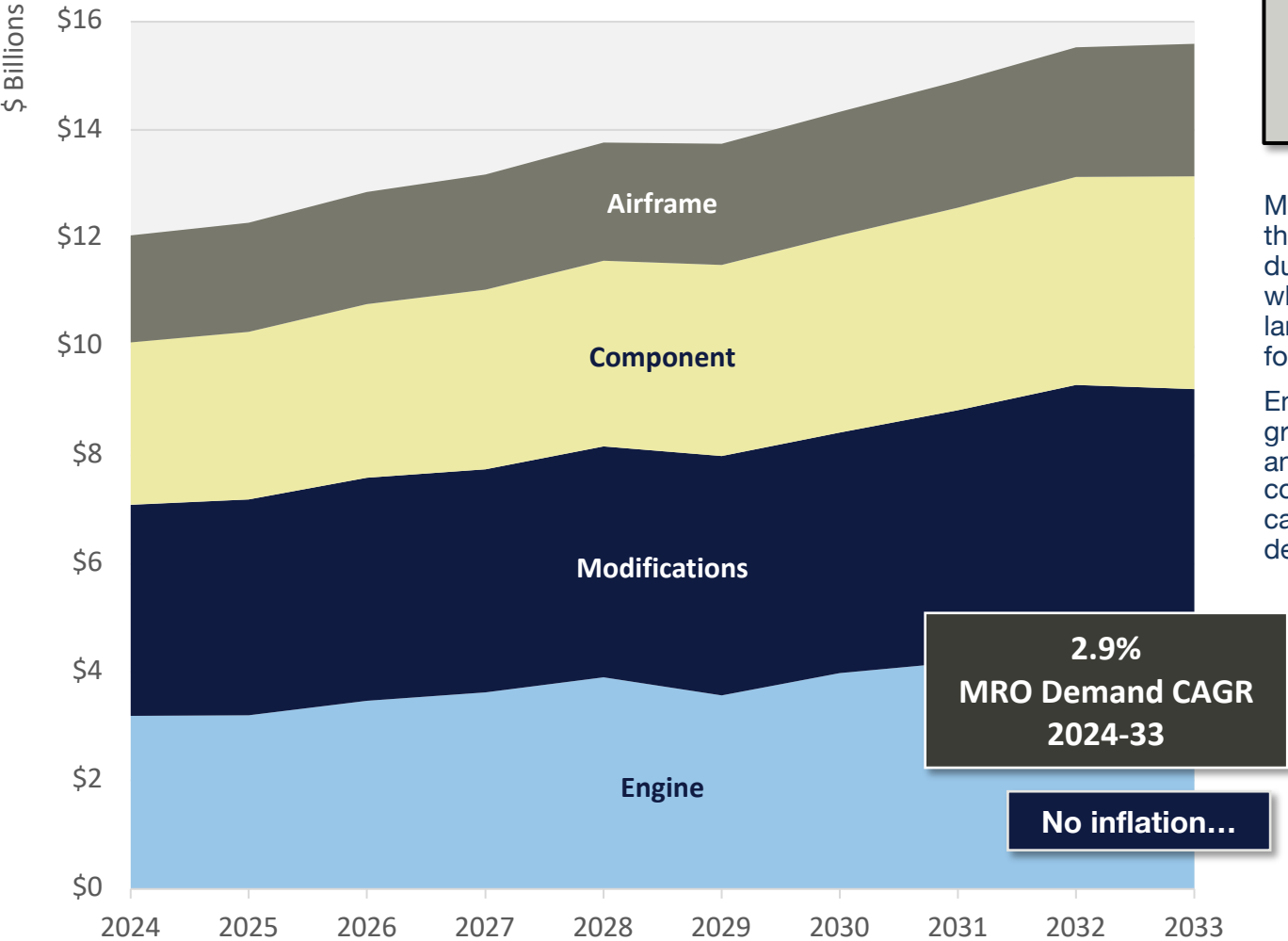
Among the engine fleets that are expected to see the biggest decline over the forecast are the JT15D (-64%) and TPE331 (-52%).

# Engines – In-Service Fleet Trends



# MRO Demand Forecast & Trends

# MRO Demand - Forecast

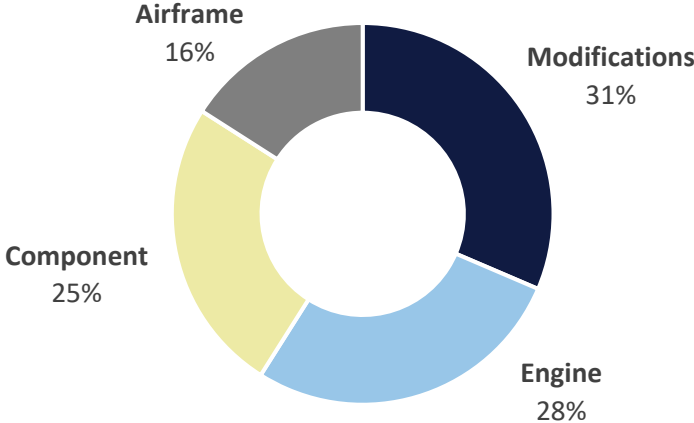


## Highlights

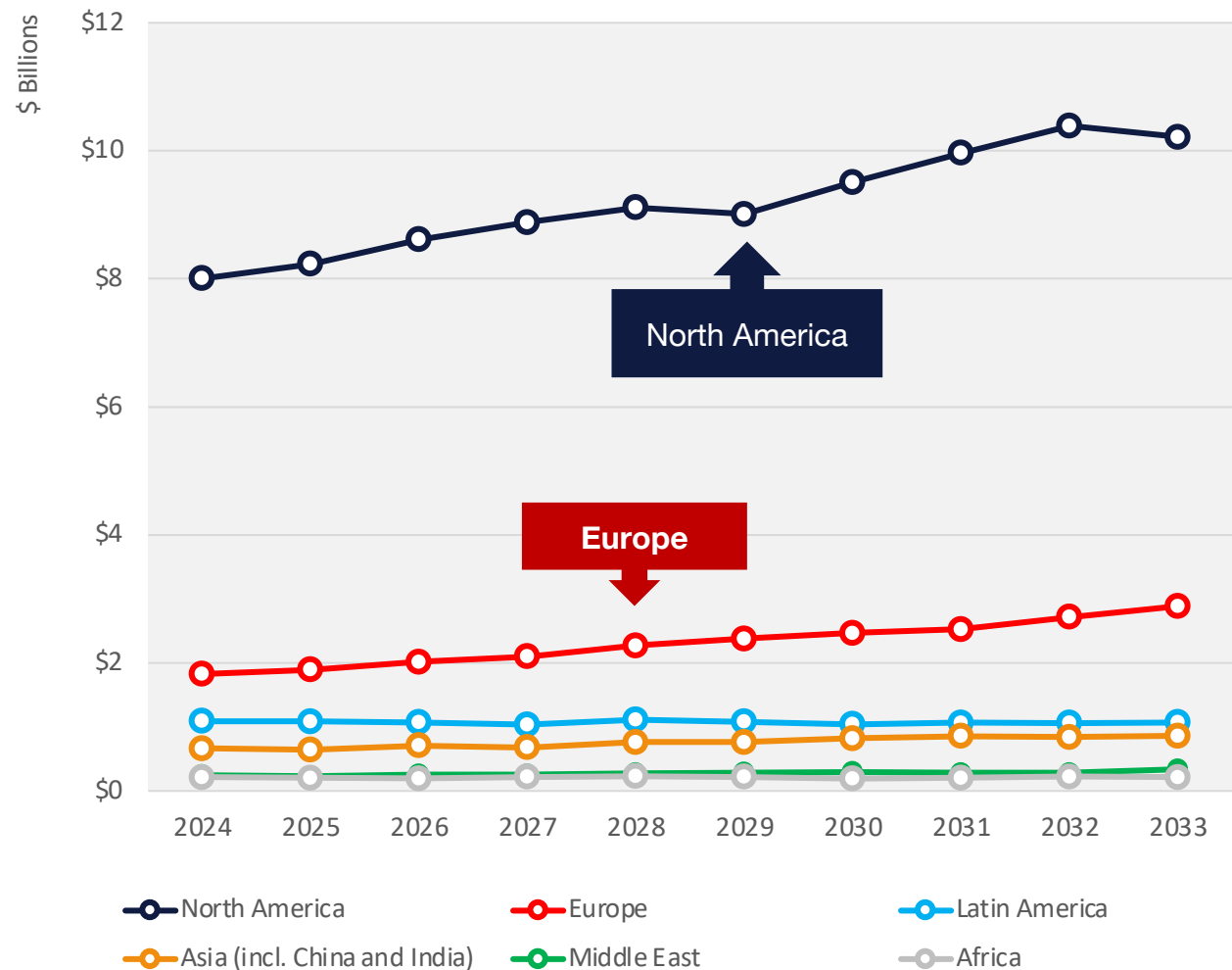
- \$138 billion in aftermarket requirements over the decade.
- \$43.5 billion in modifications demand, the largest MRO category grows at 2.3% CAGR.
- \$38 billion in engine MRO demand grows the fastest at 3.7% CAGR.
- + 53k major engine MRO events expected on 23 engine family types.

MRO Demand is expected to increase in line with both projected utilization and the size of the in-service fleet. Just over \$138 billion in requirements is expected during the 10-year period, growing at a 2.9% CAGR. Modifications maintenance which includes paint, cabin upgrades and avionics, is expected to generate the largest amount of demand at \$43.5 billion, or 31% of total MRO demand in the forecast.

Engine maintenance will account for a further \$38.1B or 28% of demand and will grow the fastest. Components, which includes APUs, landing gear, and wheels and brakes, tallies to \$34.7B or 25% of the total while airframe maintenance composes the remaining \$22.1 billion or 16% over the decade. At the size category level, Large Cabin Jets will account for the biggest share of MRO demand at 20% share, despite their smaller unit values.



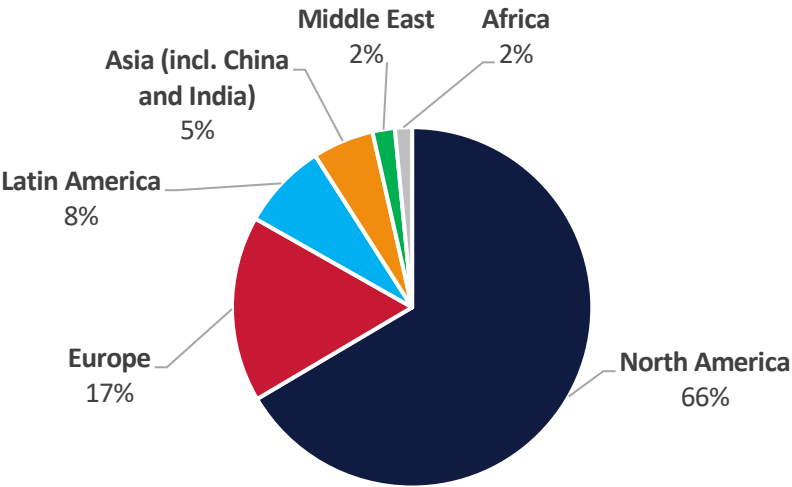
# MRO Demand – Regions



Operators in North America continue to generate by far the largest amount of MRO demand throughout the forecast period given its fleet strength. Just over two thirds of all MRO expenses are generated here alone with demand continuing to increase at a healthy 2.7% CAGR over the decade.

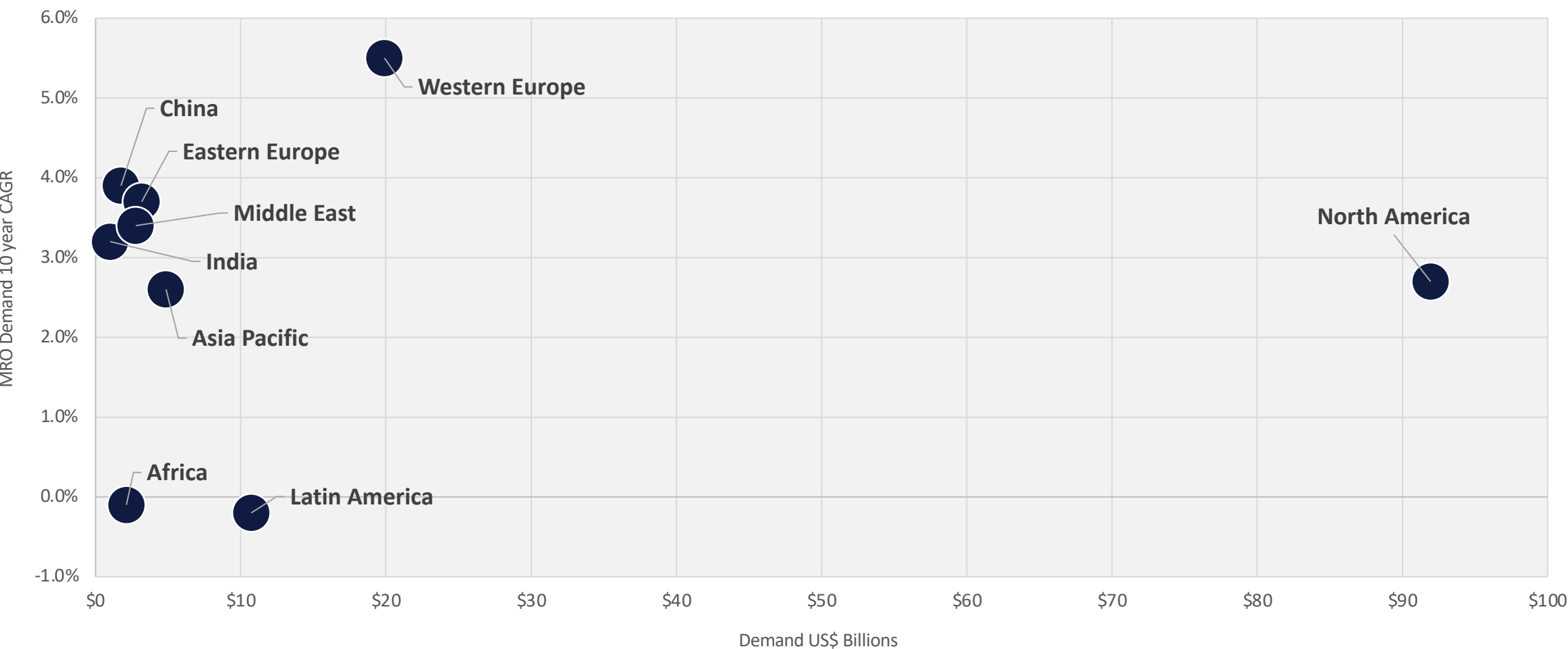
Eastern and Western Europe combined generates \$23.1 billion in demand over the period, accounting for 17% of total MRO. Combined European demand also increases at a robust 5.2% 10-year CAGR – the highest of any region.

Demand in Asia (including Asia Pacific, China and India) will experience significant growth, albeit from a low base. In China alone, MRO spend increases by 42% over the decade. However, even with this growth, demand in China will remain limited to around \$200 million in 2033. The Asia-Pacific region sees growth of 26% over the period, with demand reaching \$500 million by 2033.



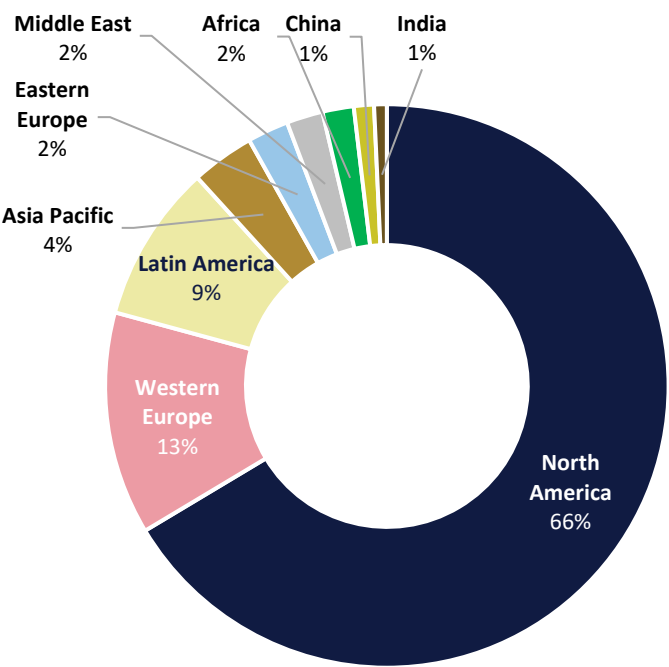
# MRO Demand – Regional Trends

North America continues to dominate MRO demand accounting for 66% of global maintenance requirements

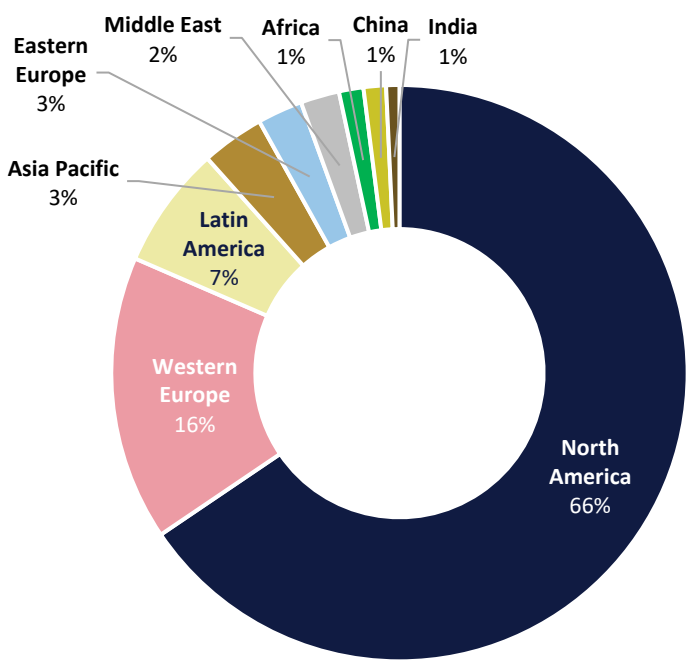


# MRO Share by Region

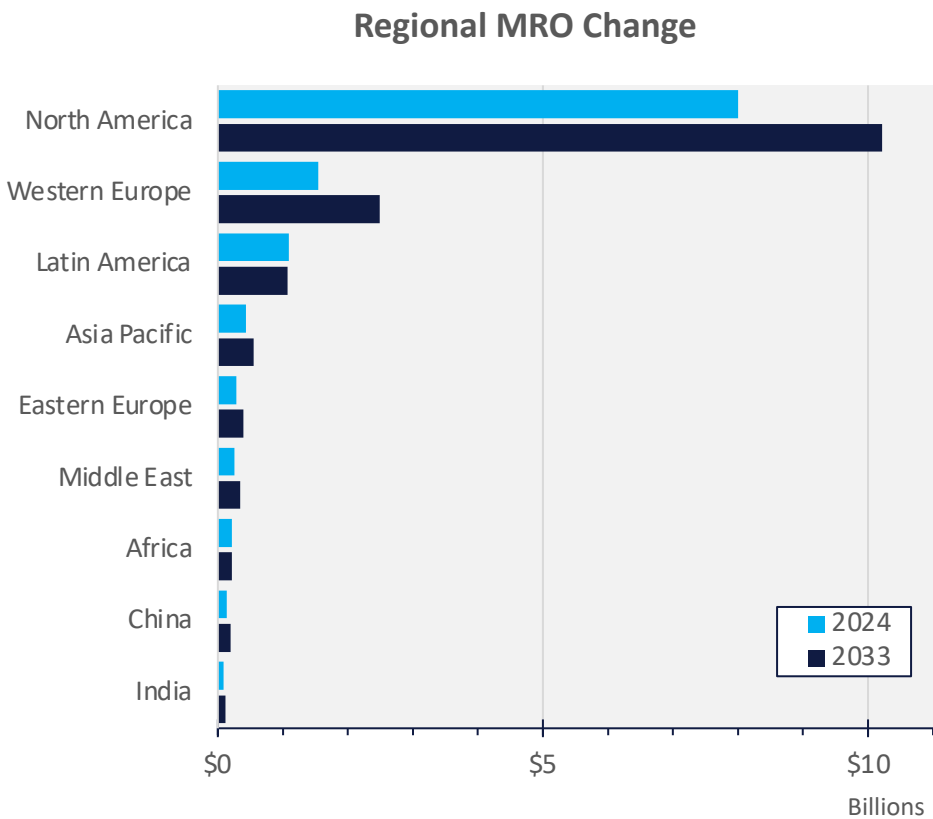
MRO increases 29% 2024-33; grows at 2.9% CAGR over 10 years



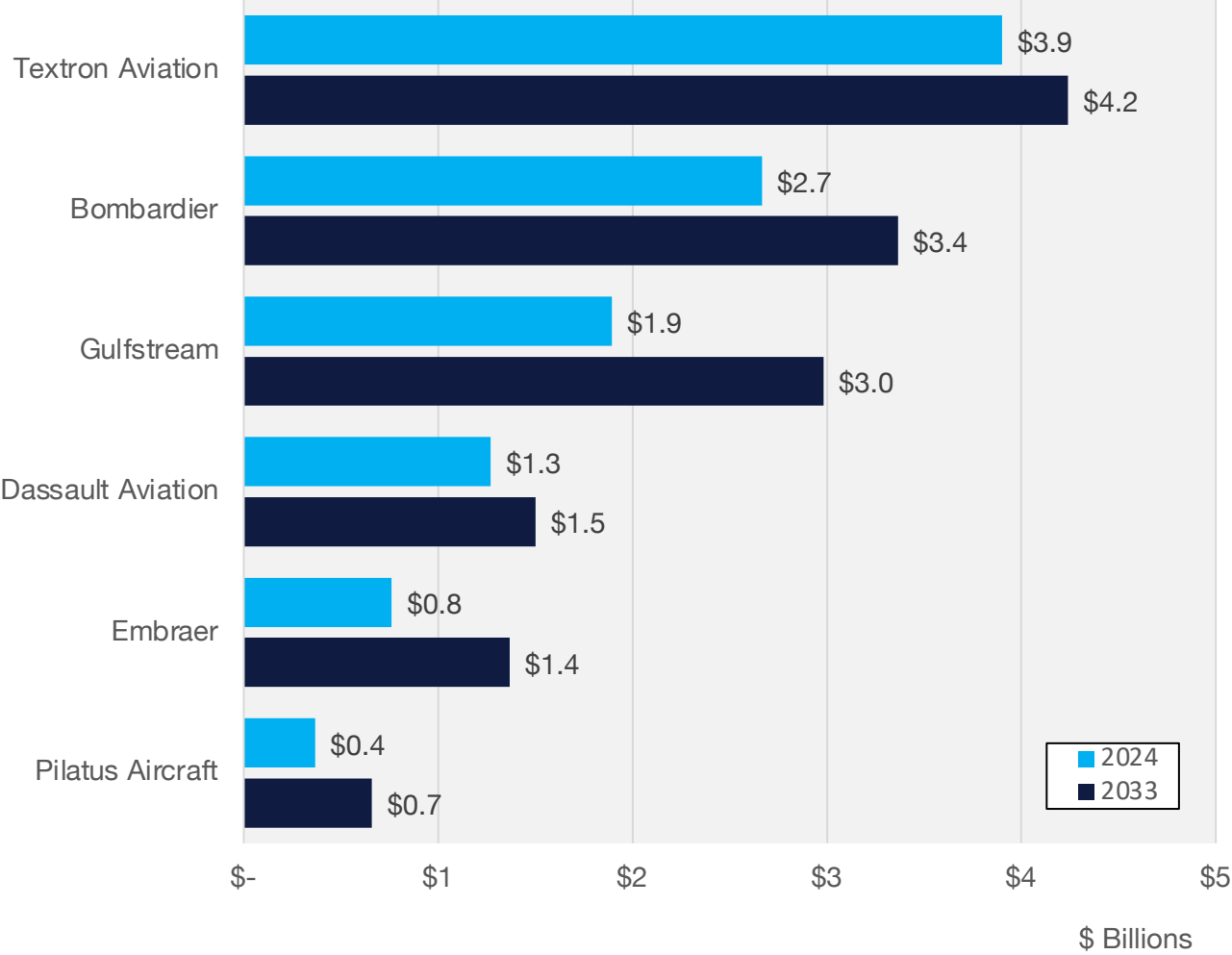
**\$12 Billion**  
2024 MRO  
Demand



**\$15.6 Billion**  
2033 MRO  
Demand



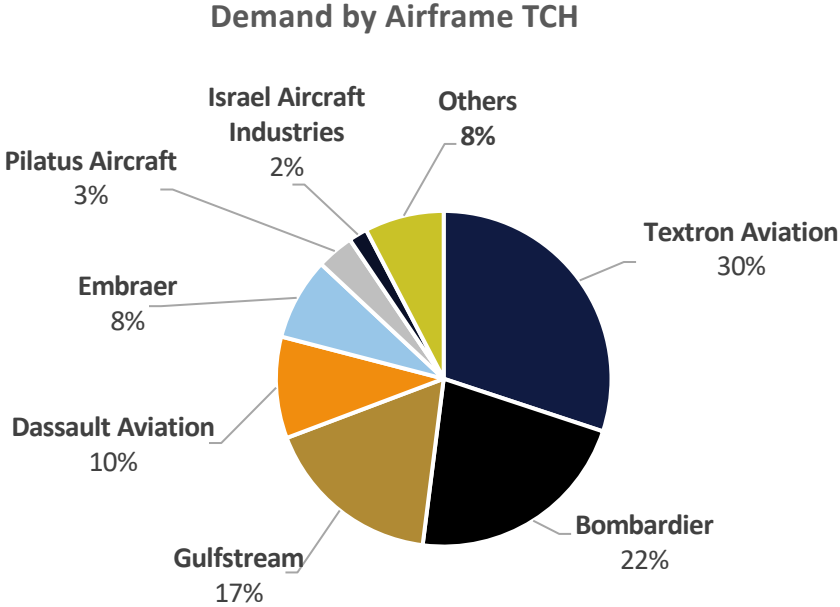
# MRO Demand Change – Aircraft Type Certificate Holders



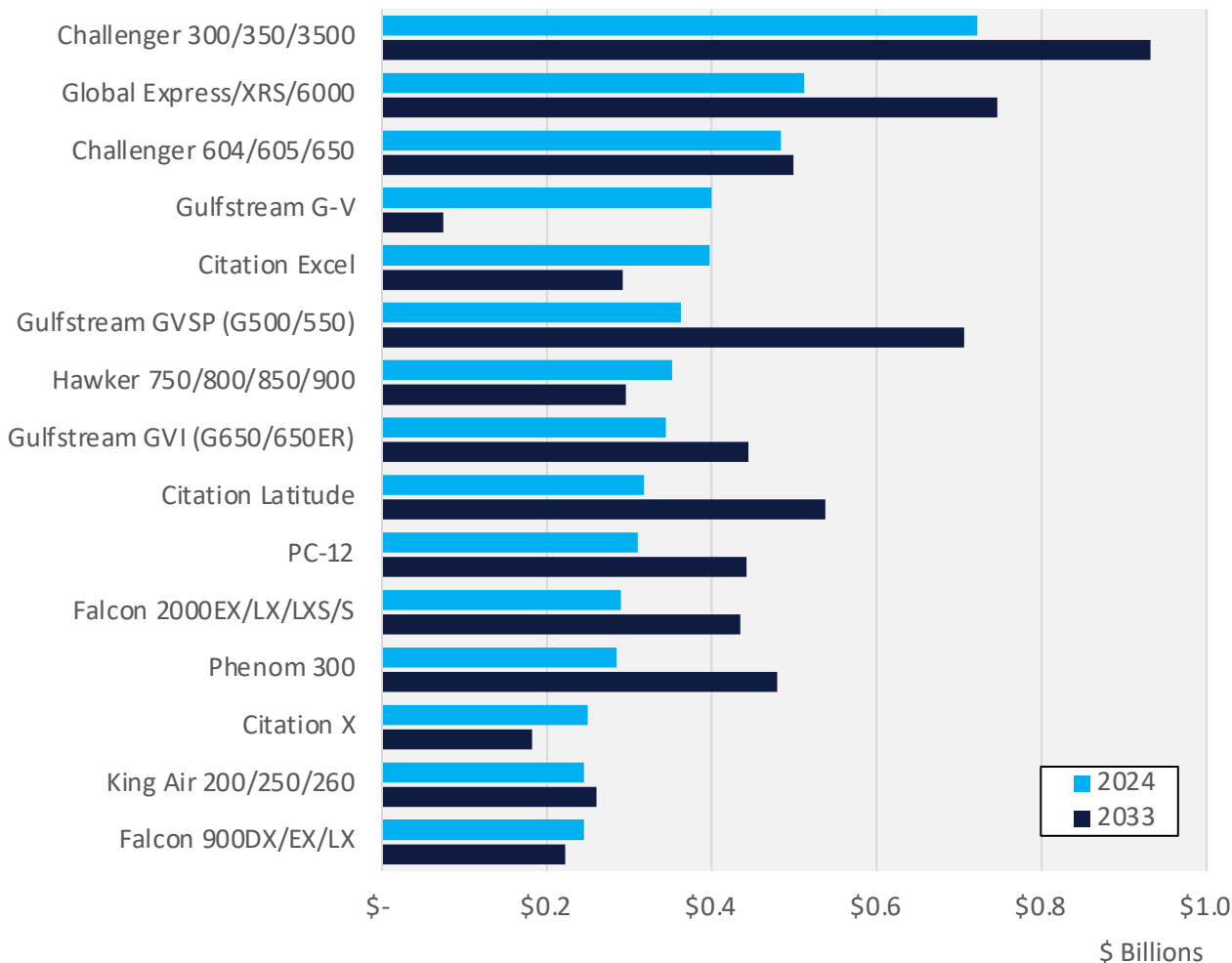
Textron aircraft account for the largest share of MRO Demand during the forecast period, with 30% or a value exceeding \$40 billion over 10-years. The Citation family of aircraft will account for nearly 70% of Textron’s MRO expenditures. Over the forecast period, Textron will show a .93% CAGR over the forecast period.

Bombardier and Gulfstream follow with shares of 22% and 17% respectively. In 2033 alone, MRO Demand for Bombardier will account for \$3.4 billion while Gulfstream will account for over \$3 billion.

Pilatus Aircraft and Embraer will both experience a growth of 80% and 6.7% CAGR – the largest increase for any of the leading aircraft type certificate holders.



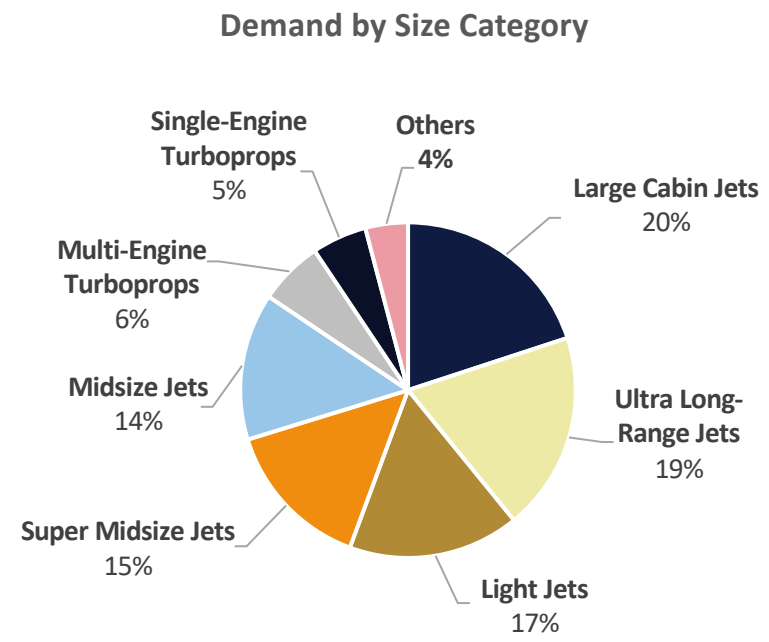
# MRO Demand Change – Aircraft Programs



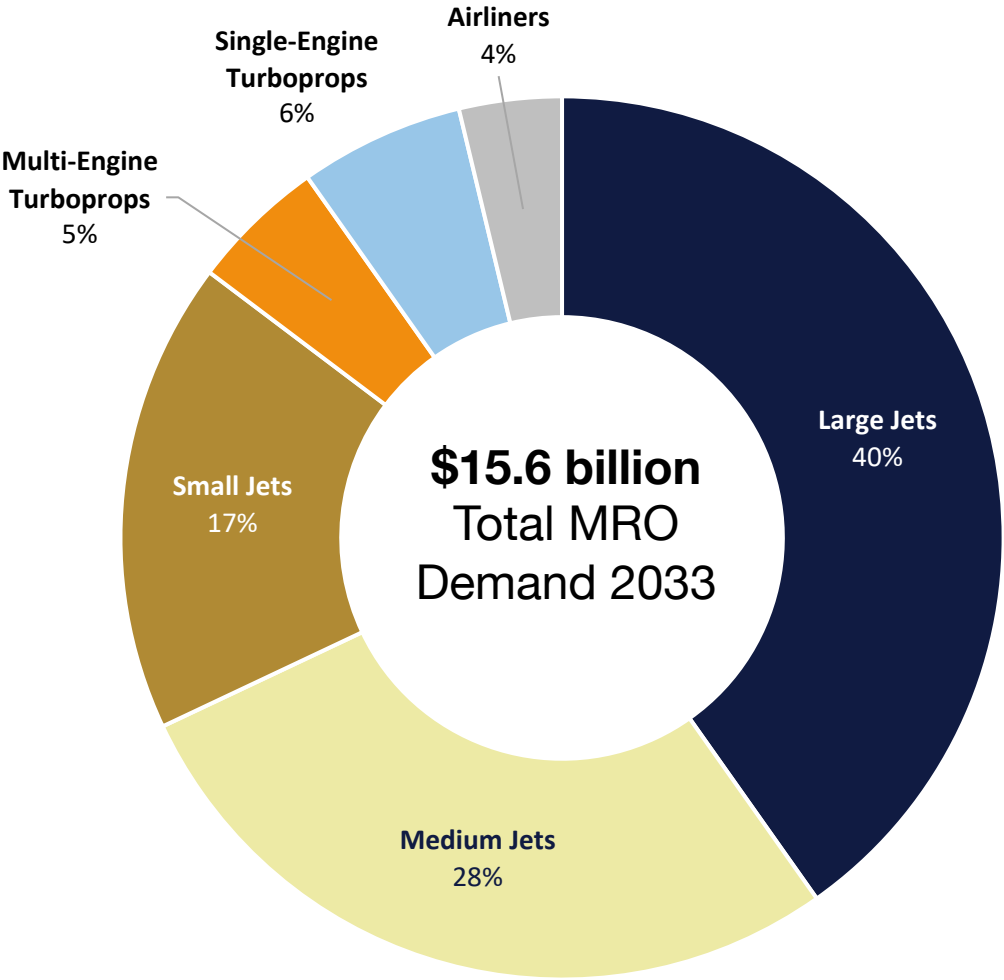
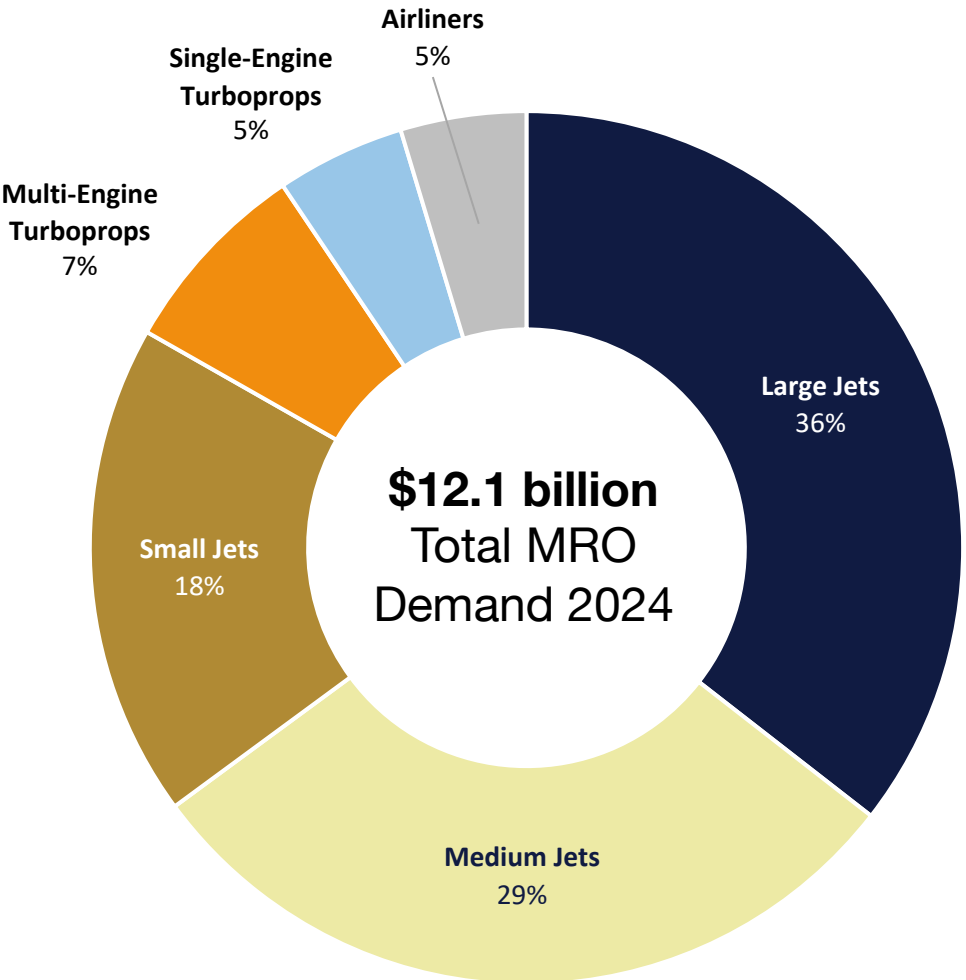
Bombardier aircraft lead all other manufacturers in generating MRO demand over the forecast with over \$30 billion in dollar demand. Beginning in 2024, the Bombardier Challenger 300/350/3500 lineup and Global Express/XRS/6000 groups represent the two leading programs in terms of dollar demand generated at the aircraft group level. This share/position trend continues over the course of the decade. Ranking third initially, the Challenger 604/605/650 series [\$484 million in 2024] loses its place to the Gulfstream GVSP (G500/550) [\$707 million in 2033].

At the lowest size segmentation level, Large Cabin Jets account for the largest share of MRO demand at 20%. Along with the Ultra Long-Range, the two categories account for nearly 40% of all demand generated, while representing about 20% of the global in-service fleet.

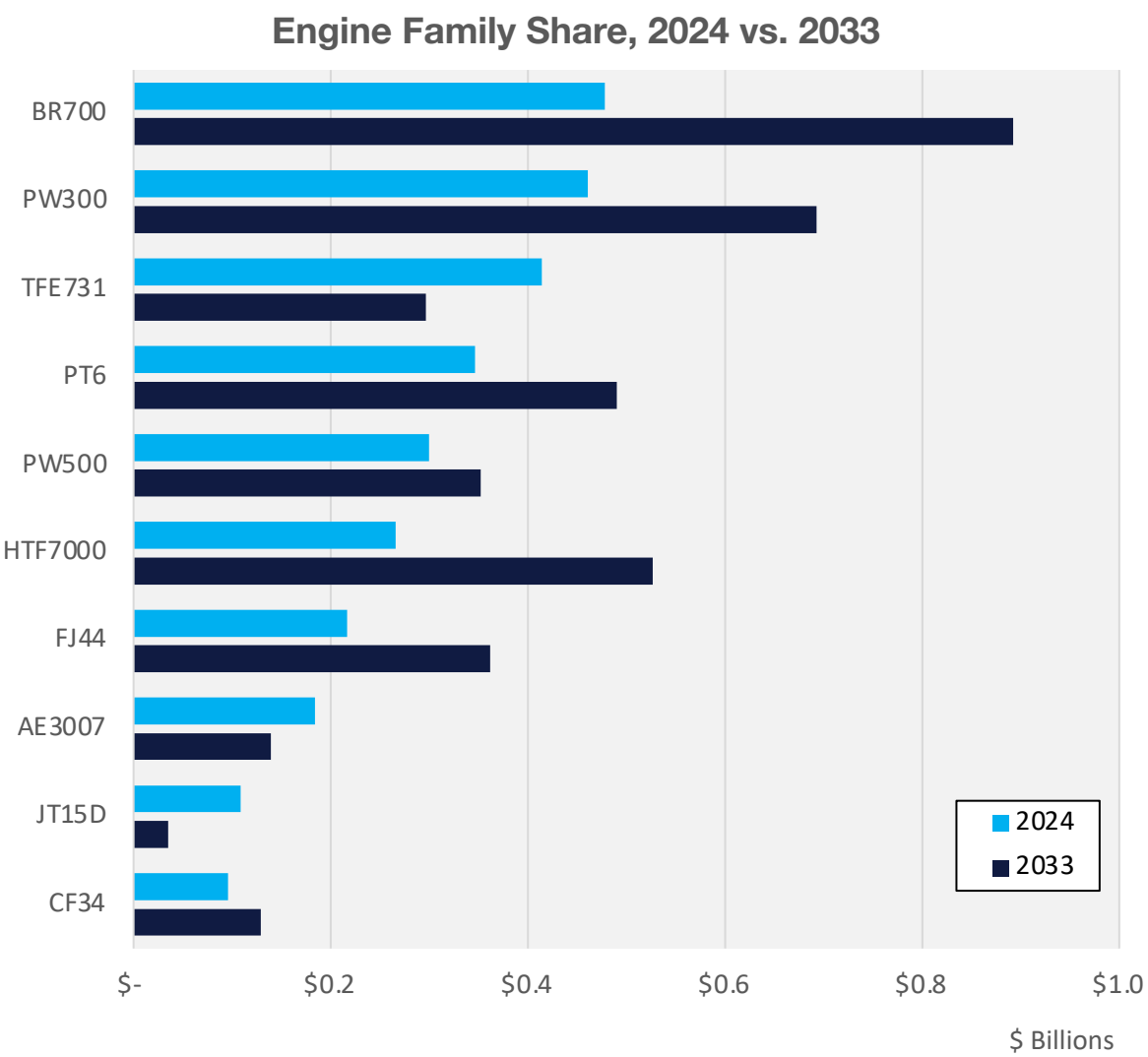
The vast Citation series is expected to generate \$28.9 billion in demand, equivalent to 21% of all MRO activity over the decade. While the popular Gulfstream lineup is expected to generate \$21.9 billion, representing a further 16% of the total.



# MRO Demand – Aircraft Size Segment Share 2024 vs. 2033



# MRO Demand Change – Engines



Engine maintenance generates \$38.1B in MRO dollar demand over the decade, equivalent to 28% of overall maintenance. Growth in engine MRO demand outpaces other maintenance categories achieving a 3.7% CAGR over the decade.

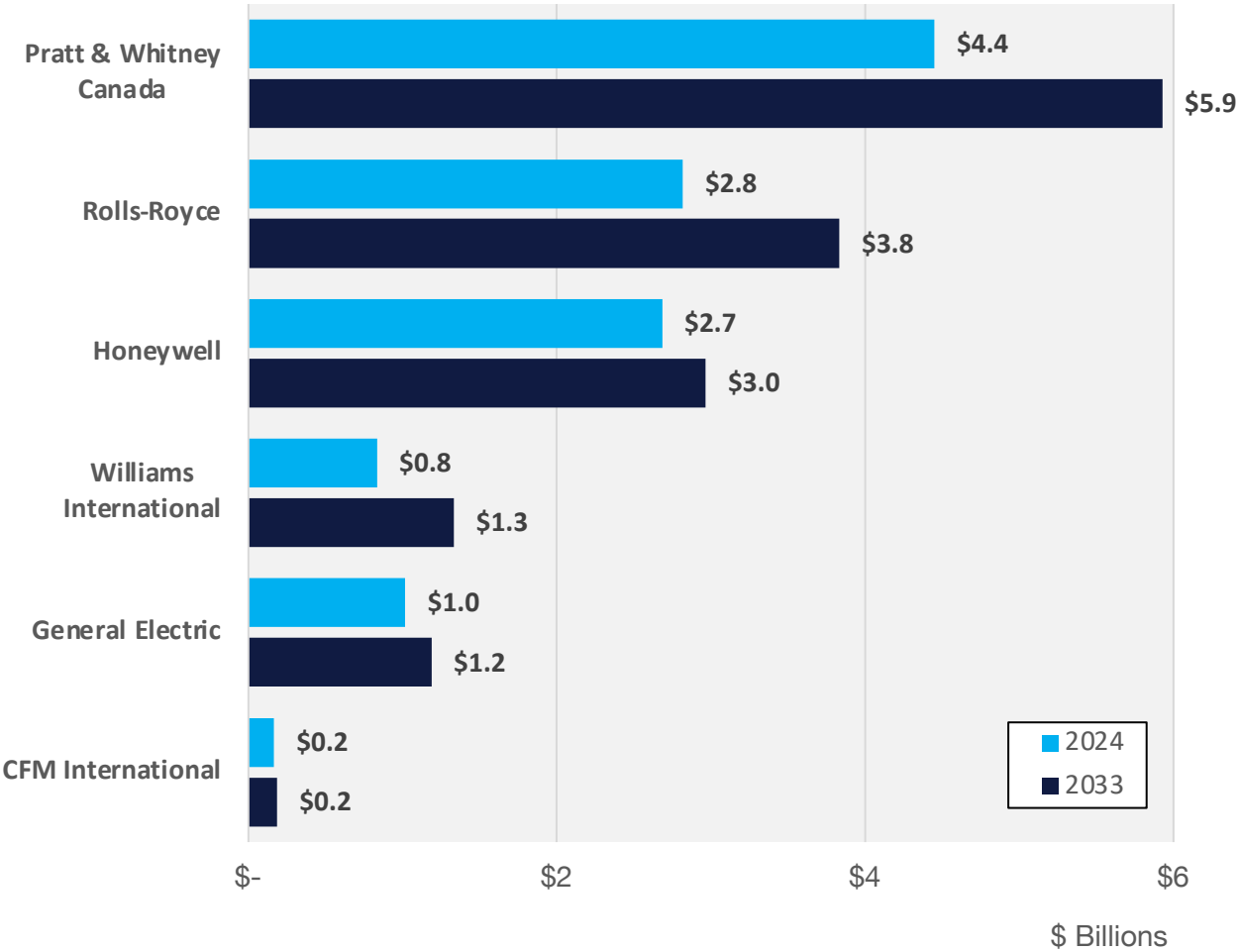
Turbofans generate \$33.6 billion in MRO spend accounting for 88% of the total after growing at a 4.0% CAGR over the decade. Turboprops generate \$4.5 billion in engine maintenance requirements and after a 1.9% CAGR.

Rolls Royce BR700 engines accelerate their lead in the top position over the forecast. Powering Gulfstream, Bombardier, and Dassault aircraft, and with new entrants including the Pearl 15 and Pearl 700 models, they generate the largest annual MRO demand of any family. Projected growth in the forecast of 7.2% CAGR arrives at \$890 million in 2033 alone. The Pratt & Whitney Canada PW300 series powering Dassault, Cessna, and Bombardier aircraft account for \$693 million in demand in 2033, equivalent to 18% of the total global engine maintenance spend that year. Aside from the BR700 and PW300 rapid growth, the PT6’s MRO demand is expected to increase at a 3.9% CAGR over the decade, reaching \$490 million in 2033.

Meanwhile, the TFE731 is the only engine family in the top five to show a decrease in demand, with a -3.6% CAGR



# MRO Demand Change – Engine Type Certificate Holders

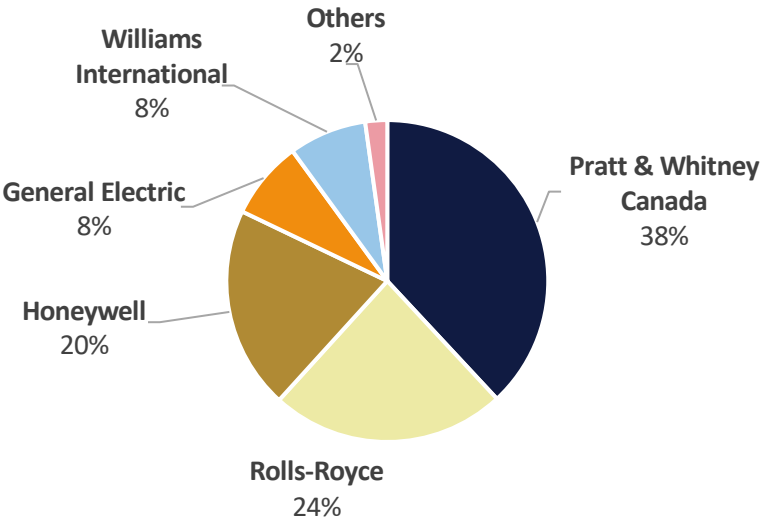


Pratt & Whitney Canada engines account for the largest share of MRO demand, at 38% during the 2024-33 period. Rolls-Royce at 24% and Honeywell at 20% follow.

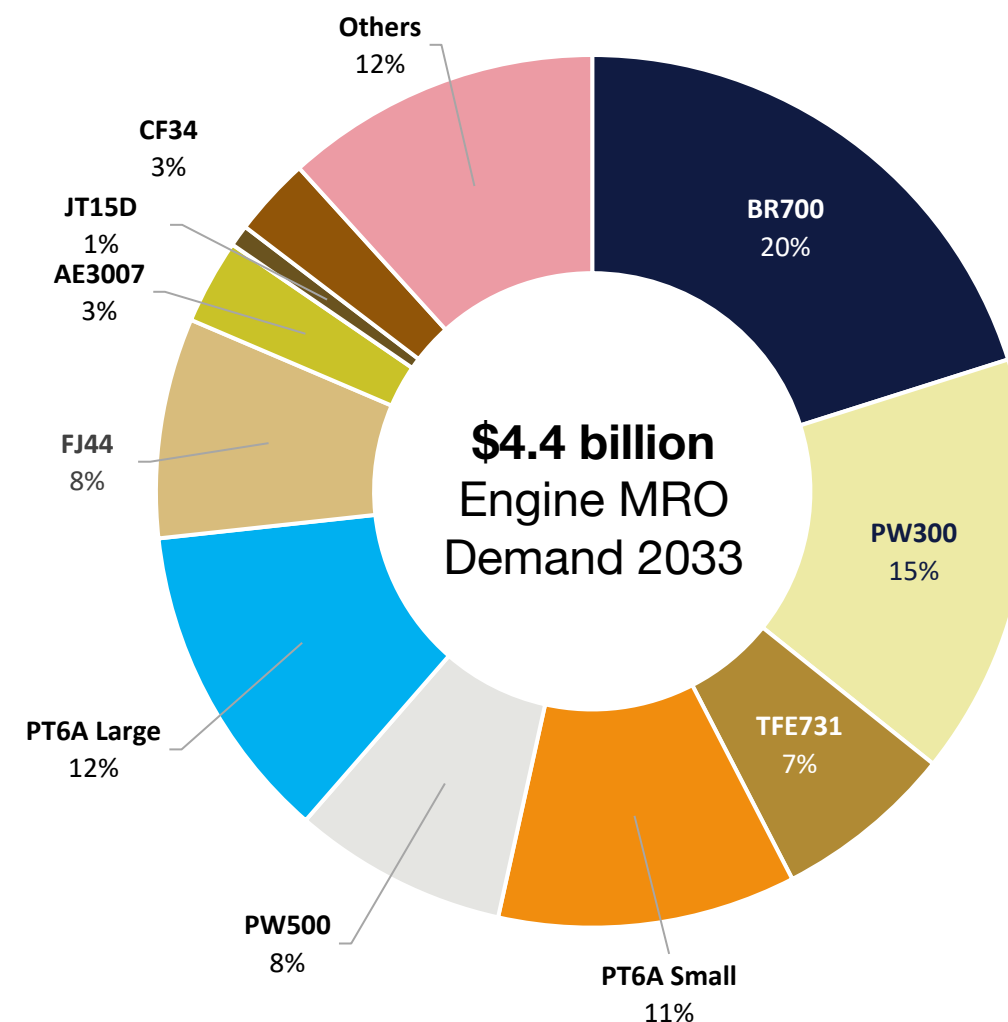
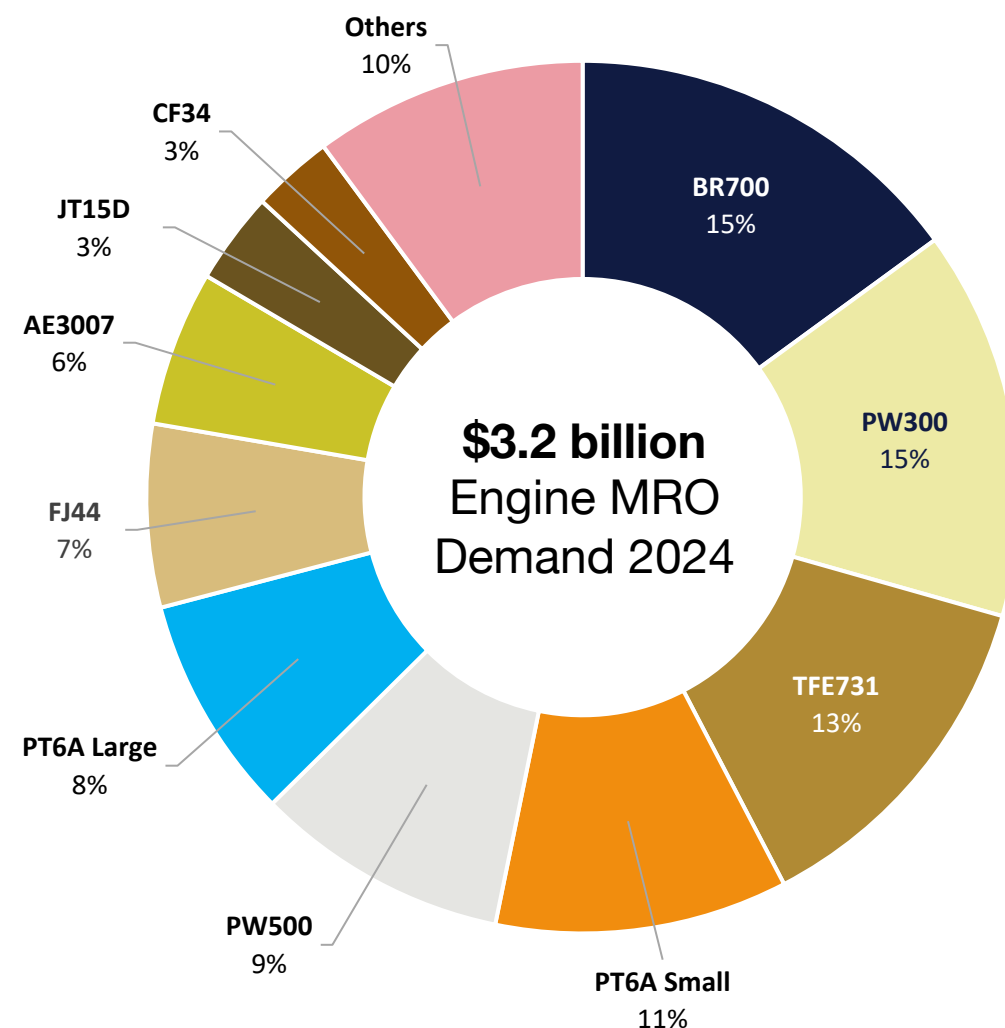
Rolls Royce engines on the Gulfstream family of aircraft make up the largest individual percentage of MRO expenditure. However, the number Pratt and Whitney Canada engines and associated MRO expenditures on the Citation, Phenom, Falcon and additional aircraft families place Pratt and Whitney Canada as the largest engine TCH by MRO expenditure.

By 2033, the leading three type certificate holders generating the most demand will remain Pratt & Whitney Canada (\$5.9bn), Rolls-Royce (\$3.8bn) and Honeywell (\$3.0bn).

Demand by Engine TCH

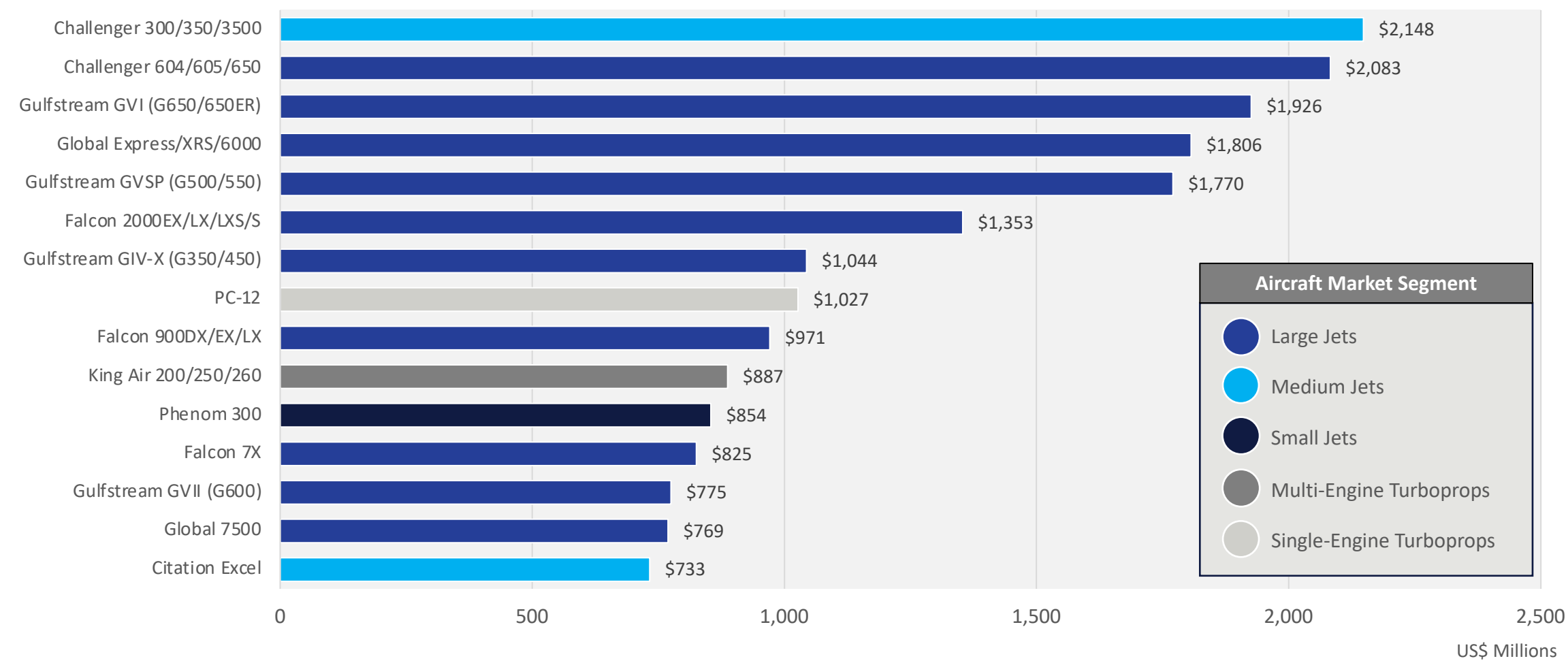


# MRO Demand Change – Engine Family Share 2024 vs. 2033



# Modification MRO Demand – 2024-33

Large Jets account for 44% of all modifications



# Methodology

- Scope
- Modeling
- Assumptions

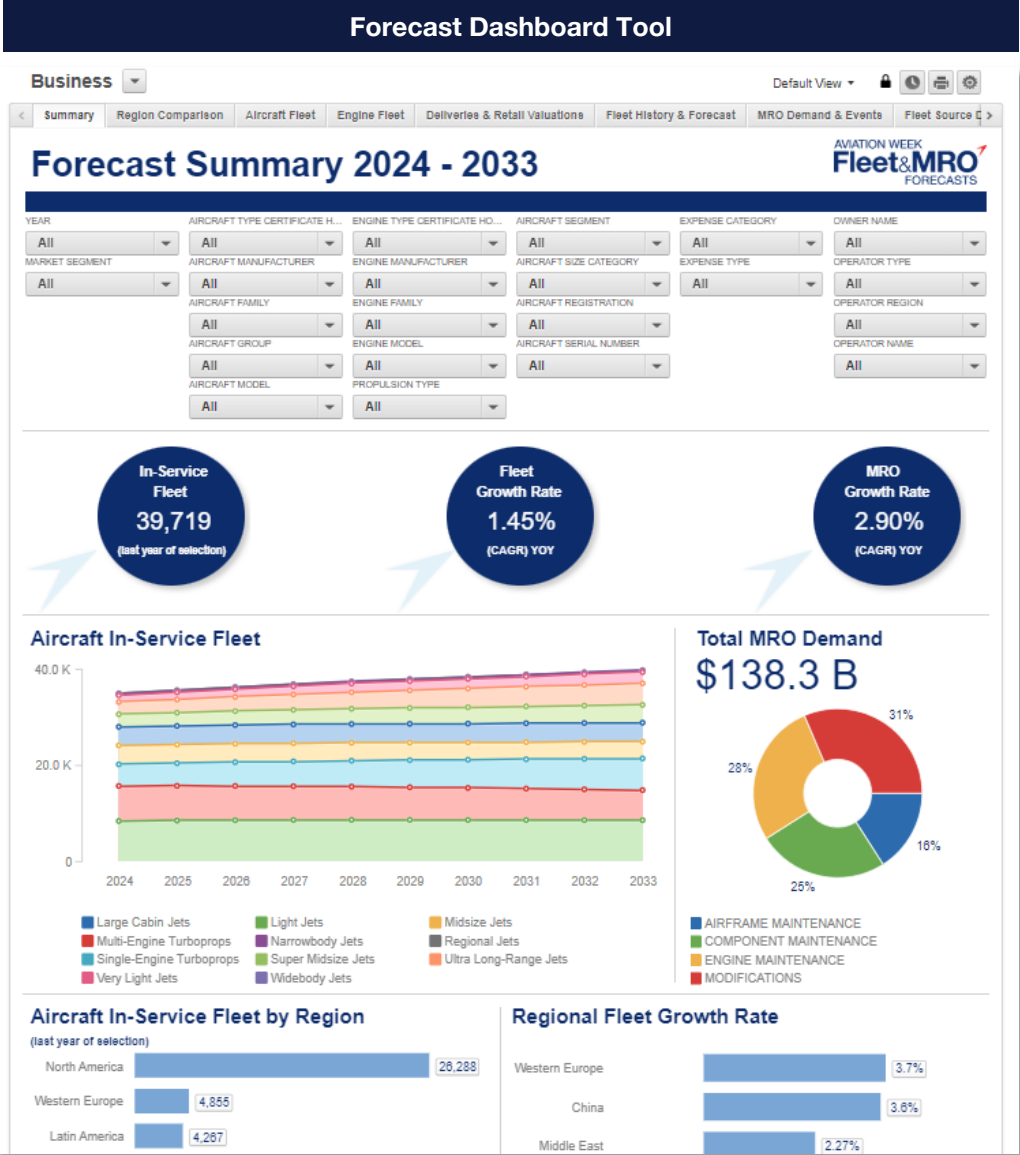
# Methodology & Assumptions

## Overview

The comprehensive forecast dataset is available via an online business-information (BI) tool interface. The summation of an extensive dataset of fleet and MRO information is compiled in-house by Aviation Week Network, Intelligence & Data Services Department. Users may customize the tool by filtering through aircraft and various categories—aircraft family/group/model/category, geographic regions, OEMs, engines and operators, as well as MRO expense categories or expense types—to yield customized data, graphs and table displays for any segment of the fleet and MRO projections. Information contained in the dedicated summary, regional, fleet, engine and MRO tabs provides users with the most sought-after data for strategic planning.

Projections by the Aviation Week Fleet & MRO Forecast business-aviation segment are predicated on data for estimated aircraft production, deliveries, retirements and resultant in-service fleets, as well as projections for maintenance requirements based on trends, aircraft operating economics, regional variations and ownership types.

This independent industry effort combines Aviation Week’s fleet database information with projected utilization rates and OEM hour-and-cycle MRO intervals along with cost assumptions at an aircraft-group/operator type level to develop an MRO forecast for strategic decisionmakers and analysts. Its dedicated research team, with more than 160 combined years’ industry experience, acquires first-hand information and developments from industry surveys and OEM data feeds, as well as guidance from advisory board contributors representing top-tier OEMs, MRO providers, consultants and independent analysts.



# Methodology & Assumptions

## Scope

The forecast examines the projected 10-year, 2024-33, market for business aircraft and allocates new deliveries and retirements across nine geographic regions (see Appendices). The in-service aircraft, aftermarket cost assumptions and utilization projections are combined to create a model of potential MRO demand at the aircraft, engine, operator, country, regional, and other levels.

Business aircraft in this study are defined broadly as civil turboprop- and turbofan-powered, Western-built units whose original designs were for the business and/or executive market, plus other aircraft operated in an executive/business role. Included are aircraft operated under Part 91 or similar international standards for owner-operators, under Part 135 or similar international standards for charter/on-demand and freight certificates, fractional arrangements, corporate flight departments and some civil government operations.

Government-operated aircraft have roles for executive transport or flight-inspection services, particularly those whose airframes share a common, civil business-aircraft heritage. (In-scope aircraft family listings are found in the Appendices).

Nine world geographic regions are represented and are used to associate both future aircraft fleets and future MRO demand. Countries are allocated to regions where common market characteristics are represented and may not conform to popular associations.

## Forecast World Regions – See also Appendices



| Hierarchies/Typology                                          |                                         |
|---------------------------------------------------------------|-----------------------------------------|
| Aircraft Hierarchy<br>(Arranged from highest to lowest level) | MRO<br>Major Categories & Expense Types |
| Family                                                        | See Appendices                          |
| Group                                                         |                                         |
| Type (unused)                                                 |                                         |
| Model                                                         |                                         |

# Methodology & Assumptions

## Fleet Forecast, Models & Assumptions

The forecast begins with an initial extract from Fleet Discovery, Aviation Week's in-house database where aircraft are tracked at the serial-number level from manufacture, ownership, storage, and disposal.

The fleet elements are updated continuously with specific operator, owner and registration information throughout the preceding years and months. The effects on fleet totals of parked, stored or destroyed aircraft are calculated to determine annual active in-service fleet values until extracted for use in the forecast. The total in-service fleet (ISF) is calculated for each forecast year by factoring in annual retirements and deliveries. The basic in-service fleet formula used is:

ISF Year 2 =  
ISF Year 1 + Year 2 deliveries  
- Year 2 retirements

ISF Year 3 =  
ISF Year 2 + Year 3 deliveries  
- Year 3 retirements

(The formula continues  
for the forecast years.)

Legend: ISF = in-service fleet

## Deliveries

Forecast delivery projections are based on an analysis combining macroeconomic conditions, regional economic factors, historical averages, production capacity and known orders. Annual delivery estimates are created for a period beginning with the first entry into service either announced by OEMs or assessed by analysts—by year and model. Expected deliveries are estimated given anticipated economic conditions, projected economics-driven demand trends and production capacity evaluated by analyst assessments. The expected deliveries are then allocated to regions, operator types, and engine types, but not to individual operators or countries unless known at the time of the forecast.

## Retirements

Initial retirement assumptions are assigned, based on age of the airframe, to project retirements. Since retirements are based on individual decisions and most are not announced or even officially recorded, they are notoriously difficult to predict. Projections initially are assigned among candidates in a specified age/airframe category, then evaluated by group/model and holistically by industry experts for consensus and final adjustments. Retirement curves are recalibrated throughout the analytical process enabling the forecast to incorporate the latest retirement data. These retirement trends are applied to the various target fleet segments once the selection criteria have been finalised.

# Methodology & Assumptions

## MRO Model

The model’s predictive algorithms use a life-cycle analysis to model aircraft MRO aftermarket demand based on groups/models, size categories, engine families and operator types; and evaluate each model by age, region and projected average annual utilization during the forecast period. Average MRO expenses by group/model are modelled across the projected in-service fleets.

The goal is to derive a potential MRO demand across each aircraft model for its unique situation (operator type/region/age). Data outputs include projected dollar demand for airframe, engine, component and modification categories. Expense categories are further assigned within a number of related categories such as OEM, type certificate holder, operator type (fractionals, corporate, charters, etc.) and region. Further, 20 individual *expense types* are calculated as subcategories such as avionics, landing gear, flight controls, hard and soft goods. (See the Appendices for a complete table listing.)



## Retail Price-based Valuations

In the online dashboard, Aviation Week examines the value of new deliveries over the 10-year period in constant 2023 U.S. dollars. The study uses Aircraft Bluebook advertised, averaged equipped retail prices but does not adjust for discounts that a manufacturer may provide for multiple purchases or other contract concessions. The examination includes regional distribution by year, aircraft-size classes, aircraft families, manufacturers and roles, etc. to predict new delivery market trends by value. The range of filterable elements are hosted in the online tool.



# Methodology & Assumptions

## Engine Methodology

### Engine Service Event Scope

Major maintenance service events (overhauls and hot section inspections) usually occur at engine repair facilities. It is assumed engines will be overhauled to manufacturers' type-certificate specifications. On-condition and life-limited component parts are inspected and/or replaced as necessary and accounted for in overhaul cost assumptions..

The business model assumes engines have events/costs at set cycle intervals for each of two major events: overhauls and hot-section inspections, with unique costs for each. An engine-unique hourly "unscheduled maintenance" rate factor also is applied and allocated based on projected utilization rates. Tech inserts, unscheduled engine removals, airworthiness-directive (AD)/service-bulletin (SB) compliance and dilution rates for spare engines are not assumed as unique events, but compliance costs for ADs and SBs are incorporated into major service events.



Credit: Antoine Fafard, Aviation Week Network

### Engine Service Event Modeling

Engine events are forecast based upon the following parameters:

- Current aircraft utilization (flight cycles accumulated).
- Projected utilization (flight cycles per forecast year).
- Engine service intervals (average engine cycle intervals derived from surveys of OEMs and MROs) triggered for each powerplant by projected utilization.

The servicing algorithm connects engines continuously to aircraft within the forecast model. Roughly speaking, the algorithms make the following calculations: Engine utilization history + projected utilization in Year 1 + projected utilization in Year 2 = total utilization for year 2. The algorithms then follow the formula for subsequent years. Utilization event-trigger algorithms are used to note when an event should occur, a service event is counted, and the corresponding expense is recorded. Utilization is informed by in-house flight tracking sources.

By nature of the modelling and the online dashboard, costs are associated with the operator, aircraft types, aircraft categories, country, region, OEM, type-certificate holder and multiple other connections. No factors are applied for a particular operator's harsh environmental conditions or for proprietary engine maintenance practices/schedules assumed under their certification authority.

### Engine Count Modeling

Aircraft deliveries and retirements provide a collective proxy for engine counts in the forecasts. For example, when an Embraer Phenom 300 is delivered, the model adds two Pratt & Whitney Canada PW535E engines to the engine in-service count. The utilization rate starts accruing for the aircraft/engine combinations and anticipated MRO spending builds on event triggers; turboprop engines now follow the same modeling as turbofans – cycle-based intervals for overhaul determination. An engine hourly rate factor is applied. As an aircraft is retired, so are the corresponding engines. The forecast does not account for spare engines.

# Methodology & Assumptions

## MARKET SITUATION

The pandemic aftermath is the overarching influence of this market. Its ramifications were abrupt and severe but the new normal is characterized by continuing tail winds in utilization and new orders, especially in North America and in Europe. The welcome newfound demands being placed on the business aviation market to fulfil high-end commercial passenger's demands, as well as robust business travel rebounds, gives reasons for optimism in this market. What we've seen is that swings may occur in this market, but passenger demand seems abundant with new users enjoying the benefits of business aviation.

Economic, manufacturing and financial factors influenced this forecast. Debt levels and inflation is high in the Americas and Europe. Fuel costs are relatively high impacting corporate margins. Capital costs are rapidly increasing, while the US dollar lower, but still near all time highs. Manufacturing issues include supply chain problems and labor shortages/costs. The potential for continued economic softening in many regions, including inflation and recessions, could all potentially conspire to impact the market negatively.

## GENERAL ASSUMPTIONS

OEM production estimates are derived from corporate announcements, one-on-one discussions, internal staff research, and are evaluated against external and internal sources during the buildup to the forecast release. GDP predictions from major sources are used to estimate overall economic conditions over the forecast period and shape the end results.

Model assumptions reflect internal projections for utilization rates that influence service intervals as well as average costs at the airframe, engine, modification, and component-maintenance levels, which are based on survey data and other primary research. The forecast does not model characteristics of individual operators nor their unique maintenance

programs; however, it provides valuable trend information for strategic investment, planning, and decisions.

Constant U.S. 2023 dollars, without further adjustments for future inflation or escalation, are used in all cost figures. Additionally, material costs and regional labor rates are not escalated in MRO assumptions, but costs are adjusted for inflation in each annual release of the forecast.

Future global, regional recessions and/or major geopolitical economic shocks cannot be predicted and are not accounted for in the forecast; however, current global risks and trends are accounted for to shape the forecast results.



# Appendices - Scope

- MRO Expense Categories/Expense Types
- Region-Country Assignments
- Aircraft Type Certificate Holder/Group/Size Category

# Appendix 1 - MRO Expense Categories/Expense Types

| Expense Category      | Expense Type                      |
|-----------------------|-----------------------------------|
| AIRFRAME HEAVY        | AIRFRAME                          |
| COMPONENT MAINTENANCE | APU                               |
|                       | CABIN SYSTEMS                     |
|                       | COCKPIT AVIONICS                  |
|                       | ELECTRICAL                        |
|                       | FLIGHT CONTROLS                   |
|                       | FUEL SYSTEMS                      |
|                       | HYDRAULIC POWER & UTILITY SYSTEMS |
|                       | LANDING GEAR                      |
|                       | OTHER CATEGORIES                  |
|                       | THRUST REVERSERS                  |
|                       | WHEELS & BRAKES                   |
| ENGINE MAINTENANCE    | HOT SECTION INSPECTION (HSI)      |
|                       | OVERHAUL (OH)                     |
|                       | UNSCHEDULED ENGINE                |
| MODIFICATIONS         | AVIONICS                          |
|                       | CABIN ELECTRONICS                 |
|                       | HARD GOODS                        |
|                       | PAINT                             |
|                       | SOFT GOODS                        |

# Appendix 2 – Region-Country Assignments



| Region | Country                     |
|--------|-----------------------------|
| Africa | Algeria                     |
| Africa | Angola                      |
| Africa | Botswana                    |
| Africa | Burkina Faso                |
| Africa | Burundi                     |
| Africa | Cameroon                    |
| Africa | Central African Republic    |
| Africa | Chad                        |
| Africa | Congo (Brazzaville)         |
| Africa | Congo (Democratic Republic) |
| Africa | Djibouti                    |
| Africa | Egypt                       |
| Africa | Equatorial Guinea           |
| Africa | Ethiopia                    |
| Africa | Gabon                       |
| Africa | Gambia                      |
| Africa | Ghana                       |

| Region | Country     |
|--------|-------------|
| Africa | Guinea      |
| Africa | Ivory Coast |
| Africa | Kenya       |
| Africa | Lesotho     |
| Africa | Libya       |
| Africa | Madagascar  |
| Africa | Malawi      |
| Africa | Mali        |
| Africa | Mauritania  |
| Africa | Mauritius   |
| Africa | Morocco     |
| Africa | Mozambique  |
| Africa | Namibia     |
| Africa | Niger       |
| Africa | Nigeria     |
| Africa | Reunion     |
| Africa | Senegal     |

| Region       | Country          |
|--------------|------------------|
| Africa       | Seychelles       |
| Africa       | Somalia          |
| Africa       | South Africa     |
| Africa       | Sudan            |
| Africa       | Tanzania         |
| Africa       | Togo             |
| Africa       | Tunisia          |
| Africa       | Uganda           |
| Africa       | Zambia           |
| Africa       | Zimbabwe         |
| Asia Pacific | Australia        |
| Asia Pacific | Bangladesh       |
| Asia Pacific | Brunei           |
| Asia Pacific | Cook Islands     |
| Asia Pacific | Fiji             |
| Asia Pacific | French Polynesia |
| Asia Pacific | Hong Kong        |

| Region       | Country          |
|--------------|------------------|
| Asia Pacific | Indonesia        |
| Asia Pacific | Japan            |
| Asia Pacific | Kiribati         |
| Asia Pacific | Laos             |
| Asia Pacific | Macau            |
| Asia Pacific | Malaysia         |
| Asia Pacific | Marshall Islands |
| Asia Pacific | New Caledonia    |
| Asia Pacific | New Zealand      |
| Asia Pacific | Pakistan         |
| Asia Pacific | Papua New Guinea |
| Asia Pacific | Philippines      |
| Asia Pacific | Samoa            |
| Asia Pacific | Singapore        |
| Asia Pacific | South Korea      |
| Asia Pacific | Taiwan           |
| Asia Pacific | Thailand         |

# Appendix 2 – Region-Country Assignments, *cont.*



| Region         | Country              |
|----------------|----------------------|
| Asia Pacific   | Tuvalu               |
| Asia Pacific   | Vanuatu              |
| Asia Pacific   | Vietnam              |
| China          | China                |
| Eastern Europe | Albania              |
| Eastern Europe | Armenia              |
| Eastern Europe | Azerbaijan           |
| Eastern Europe | Belarus              |
| Eastern Europe | Bosnia & Herzegovina |
| Eastern Europe | Bulgaria             |
| Eastern Europe | Croatia              |
| Eastern Europe | Czech Republic       |
| Eastern Europe | Estonia              |
| Eastern Europe | Georgia              |
| Eastern Europe | Hungary              |
| Eastern Europe | Kazakhstan           |
| Eastern Europe | Kyrgyzstan           |

| Region         | Country         |
|----------------|-----------------|
| Eastern Europe | Latvia          |
| Eastern Europe | Lithuania       |
| Eastern Europe | Moldova         |
| Eastern Europe | Montenegro      |
| Eastern Europe | North Macedonia |
| Eastern Europe | Poland          |
| Eastern Europe | Romania         |
| Eastern Europe | Russia          |
| Eastern Europe | Serbia          |
| Eastern Europe | Slovakia        |
| Eastern Europe | Slovenia        |
| Eastern Europe | Tajikistan      |
| Eastern Europe | Turkmenistan    |
| Eastern Europe | Ukraine         |
| Eastern Europe | Uzbekistan      |
| India          | India           |
| Latin America  | Anguilla        |

| Region        | Country                |
|---------------|------------------------|
| Latin America | Argentina              |
| Latin America | Aruba                  |
| Latin America | Bahamas                |
| Latin America | Barbados               |
| Latin America | Belize                 |
| Latin America | Bermuda                |
| Latin America | Bolivia                |
| Latin America | Brazil                 |
| Latin America | British Virgin Islands |
| Latin America | Cayman Islands         |
| Latin America | Chile                  |
| Latin America | Colombia               |
| Latin America | Costa Rica             |
| Latin America | Curacao                |
| Latin America | Dominican Republic     |
| Latin America | Ecuador                |
| Latin America | El Salvador            |

| Region        | Country                      |
|---------------|------------------------------|
| Latin America | Guadeloupe                   |
| Latin America | Guatemala                    |
| Latin America | Haiti                        |
| Latin America | Honduras                     |
| Latin America | Jamaica                      |
| Latin America | Mexico                       |
| Latin America | Panama                       |
| Latin America | Paraguay                     |
| Latin America | Peru                         |
| Latin America | St. Barthelemy               |
| Latin America | St. Kitts & Nevis            |
| Latin America | St. Lucia                    |
| Latin America | St. Maarten                  |
| Latin America | St. Vincent & The Grenadines |
| Latin America | Suriname                     |
| Latin America | Trinidad & Tobago            |
| Latin America | Turks & Caicos               |

# Appendix 2 – Region-Country Assignments, *cont.*



| Region        | Country              |
|---------------|----------------------|
| Latin America | Uruguay              |
| Latin America | Venezuela            |
| Middle East   | Bahrain              |
| Middle East   | Iran                 |
| Middle East   | Iraq                 |
| Middle East   | Israel               |
| Middle East   | Jordan               |
| Middle East   | Kuwait               |
| Middle East   | Lebanon              |
| Middle East   | Oman                 |
| Middle East   | Qatar                |
| Middle East   | Saudi Arabia         |
| Middle East   | Syria                |
| Middle East   | United Arab Emirates |
| North America | Canada               |
| North America | Guam                 |
| North America | USA                  |

| Region         | Country       |
|----------------|---------------|
| Western Europe | Austria       |
| Western Europe | Belgium       |
| Western Europe | Cyprus        |
| Western Europe | Denmark       |
| Western Europe | Finland       |
| Western Europe | France        |
| Western Europe | Germany       |
| Western Europe | Greece        |
| Western Europe | Greenland     |
| Western Europe | Guernsey      |
| Western Europe | Iceland       |
| Western Europe | Ireland       |
| Western Europe | Isle Of Man   |
| Western Europe | Italy         |
| Western Europe | Jersey        |
| Western Europe | Liechtenstein |
| Western Europe | Luxembourg    |

| Region         | Country     |
|----------------|-------------|
| Western Europe | Malta       |
| Western Europe | Monaco      |
| Western Europe | Netherlands |
| Western Europe | Norway      |
| Western Europe | Portugal    |
| Western Europe | San Marino  |

| Region         | Country        |
|----------------|----------------|
| Western Europe | Spain          |
| Western Europe | Sweden         |
| Western Europe | Switzerland    |
| Western Europe | Turkey         |
| Western Europe | United Kingdom |



Credit: Antoine Fafard, Aviation Week Network

# Appendix 3 – Aircraft Type Certificate Holder/Group/Size Category



| Type Certificate Holder | Aircraft Group | Aircraft Size Category | Aircraft Size Segment |
|-------------------------|----------------|------------------------|-----------------------|
| 328 Support Services    | Dornier 328Jet | Regional Jets          | Airliners             |
| Airbus                  | A310           | Widebody Jets          | Airliners             |
| Airbus                  | A319           | Narrowbody Jets        | Airliners             |
| Airbus                  | A320           | Narrowbody Jets        | Airliners             |
| Airbus                  | A330           | Widebody Jets          | Airliners             |
| Airbus                  | A340           | Widebody Jets          | Airliners             |
| Airbus                  | ACJ220         | Narrowbody Jets        | Airliners             |
| Airbus                  | ACJ318         | Narrowbody Jets        | Airliners             |
| Airbus                  | ACJ319         | Narrowbody Jets        | Airliners             |
| Airbus                  | ACJ319neo      | Narrowbody Jets        | Airliners             |
| Airbus                  | ACJ320         | Narrowbody Jets        | Airliners             |
| Airbus                  | ACJ320neo      | Narrowbody Jets        | Airliners             |
| Airbus                  | ACJ321         | Narrowbody Jets        | Airliners             |
| Airbus                  | ACJ330         | Widebody Jets          | Airliners             |
| Airbus                  | ACJ340         | Widebody Jets          | Airliners             |
| Airbus                  | ACJ350         | Widebody Jets          | Airliners             |
| Boeing                  | 727            | Narrowbody Jets        | Airliners             |

| Type Certificate Holder | Aircraft Group          | Aircraft Size Category | Aircraft Size Segment |
|-------------------------|-------------------------|------------------------|-----------------------|
| Boeing                  | 737 Classic             | Narrowbody Jets        | Airliners             |
| Boeing                  | 737-200                 | Narrowbody Jets        | Airliners             |
| Boeing                  | 737MAX / BBJ            | Narrowbody Jets        | Airliners             |
| Boeing                  | 737NG / BBJ             | Narrowbody Jets        | Airliners             |
| Boeing                  | 747 Classic             | Widebody Jets          | Airliners             |
| Boeing                  | 747-400                 | Widebody Jets          | Airliners             |
| Boeing                  | 747-8                   | Widebody Jets          | Airliners             |
| Boeing                  | 757                     | Narrowbody Jets        | Airliners             |
| Boeing                  | 767                     | Widebody Jets          | Airliners             |
| Boeing                  | 777                     | Widebody Jets          | Airliners             |
| Boeing                  | 787                     | Widebody Jets          | Airliners             |
| Bombardier              | Challenger 300/350/3500 | Super Midsize Jets     | Medium Jets           |
| Bombardier              | Challenger 600          | Large Cabin Jets       | Large Jets            |
| Bombardier              | Challenger 601          | Large Cabin Jets       | Large Jets            |
| Bombardier              | Challenger 604/605/650  | Large Cabin Jets       | Large Jets            |
| Bombardier              | Global 5000             | Large Cabin Jets       | Large Jets            |
| Bombardier              | Global 5500             | Large Cabin Jets       | Large Jets            |

# Appendix 3 – Aircraft Type Certificate Holder/Group/Size Category, *cont.*



| Type Certificate Holder | Aircraft Group          | Aircraft Size Category   | Aircraft Size Segment    |
|-------------------------|-------------------------|--------------------------|--------------------------|
| Bombardier              | Global 6500             | Ultra Long-Range Jets    | Large Jets               |
| Bombardier              | Global 7500             | Ultra Long-Range Jets    | Large Jets               |
| Bombardier              | Global 8000             | Ultra Long-Range Jets    | Large Jets               |
| Bombardier              | Global Express/XRS/6000 | Ultra Long-Range Jets    | Large Jets               |
| Bombardier              | Learjet 23-29           | Light Jets               | Small Jets               |
| Bombardier              | Learjet 31              | Light Jets               | Small Jets               |
| Bombardier              | Learjet 35/36           | Light Jets               | Small Jets               |
| Bombardier              | Learjet 40/45           | Light Jets               | Small Jets               |
| Bombardier              | Learjet 55              | Midsize Jets             | Small Jets               |
| Bombardier              | Learjet 60              | Midsize Jets             | Medium Jets              |
| Bombardier              | Learjet 70/75           | Light Jets               | Small Jets               |
| Cirrus                  | Cirrus Vision           | Very Light Jets          | Small Jets               |
| COMAC                   | ARJ21                   | Regional Jets            | Airliners                |
| Daher                   | Kodiak                  | Single-Engine Turboprops | Single-Engine Turboprops |
| Daher                   | TBM700/850/900          | Single-Engine Turboprops | Single-Engine Turboprops |
| Dassault Aviation       | Falcon 10/100           | Light Jets               | Small Jets               |
| Dassault Aviation       | Falcon 10X              | Ultra Long-Range Jets    | Large Jets               |

| Type Certificate Holder | Aircraft Group         | Aircraft Size Category   | Aircraft Size Segment    |
|-------------------------|------------------------|--------------------------|--------------------------|
| Dassault Aviation       | Falcon 20/200          | Midsize Jets             | Medium Jets              |
| Dassault Aviation       | Falcon 2000            | Large Cabin Jets         | Large Jets               |
| Dassault Aviation       | Falcon 2000EX/LX/LXS/S | Large Cabin Jets         | Large Jets               |
| Dassault Aviation       | Falcon 50              | Super Midsize Jets       | Medium Jets              |
| Dassault Aviation       | Falcon 6X              | Large Cabin Jets         | Large Jets               |
| Dassault Aviation       | Falcon 7X              | Large Cabin Jets         | Large Jets               |
| Dassault Aviation       | Falcon 8X              | Ultra Long-Range Jets    | Large Jets               |
| Dassault Aviation       | Falcon 900             | Large Cabin Jets         | Large Jets               |
| Dassault Aviation       | Falcon 900DX/EX/LX     | Large Cabin Jets         | Large Jets               |
| Eclipse Aerospace       | Eclipse 500/550        | Very Light Jets          | Small Jets               |
| Embraer                 | Legacy 450/Praetor 500 | Super Midsize Jets       | Medium Jets              |
| Embraer                 | Legacy 500/Praetor 600 | Super Midsize Jets       | Medium Jets              |
| Embraer                 | Legacy 600/650         | Large Cabin Jets         | Airliners                |
| Embraer                 | Lineage 1000           | Regional Jets            | Airliners                |
| Embraer                 | Phenom 100             | Light Jets               | Small Jets               |
| Embraer                 | Phenom 300             | Light Jets               | Small Jets               |
| Epic                    | Epic E1000             | Single-Engine Turboprops | Single-Engine Turboprops |

# Appendix 3 – Aircraft Type Certificate Holder/Group/Size Category, *cont.*



| Type Certificate Holder | Aircraft Group              | Aircraft Size Category  | Aircraft Size Segment   |
|-------------------------|-----------------------------|-------------------------|-------------------------|
| Epic                    | Epic Jet                    | Very Light Jets         | Small Jets              |
| Fokker                  | F28                         | Regional Jets           | Airliners               |
| Gulfstream              | Gulfstream G-I              | Multi-Engine Turboprops | Multi-Engine Turboprops |
| Gulfstream              | Gulfstream G-II             | Large Cabin Jets        | Large Jets              |
| Gulfstream              | Gulfstream G-III            | Large Cabin Jets        | Large Jets              |
| Gulfstream              | Gulfstream G-IV             | Large Cabin Jets        | Large Jets              |
| Gulfstream              | Gulfstream G-IV (G300/400)  | Large Cabin Jets        | Large Jets              |
| Gulfstream              | Gulfstream G-V              | Ultra Long-Range Jets   | Large Jets              |
| Gulfstream              | Gulfstream G280             | Super Midsize Jets      | Medium Jets             |
| Gulfstream              | Gulfstream GIV-X (G350/450) | Large Cabin Jets        | Large Jets              |
| Gulfstream              | Gulfstream GVI (G650/650ER) | Ultra Long-Range Jets   | Large Jets              |
| Gulfstream              | Gulfstream GVII (G400)      | Large Cabin Jets        | Large Jets              |
| Gulfstream              | Gulfstream GVII (G500)      | Large Cabin Jets        | Large Jets              |
| Gulfstream              | Gulfstream GVII (G600)      | Ultra Long-Range Jets   | Large Jets              |
| Gulfstream              | Gulfstream GVIII (G700)     | Ultra Long-Range Jets   | Large Jets              |
| Gulfstream              | Gulfstream GVIII (G800)     | Ultra Long-Range Jets   | Large Jets              |
| Gulfstream              | Gulfstream GVSP (G500/550)  | Ultra Long-Range Jets   | Large Jets              |

| Type Certificate Holder           | Aircraft Group           | Aircraft Size Category   | Aircraft Size Segment    |
|-----------------------------------|--------------------------|--------------------------|--------------------------|
| Honda Aircraft Company            | HondaJet                 | Light Jets               | Small Jets               |
| Honda Aircraft Company            | HondaJet 2600            | Light Jets               | Small Jets               |
| Israel Aircraft Industries        | Gulfstream G100          | Midsize Jets             | Medium Jets              |
| Israel Aircraft Industries        | Gulfstream G150          | Midsize Jets             | Medium Jets              |
| Israel Aircraft Industries        | Gulfstream G200          | Super Midsize Jets       | Medium Jets              |
| Israel Aircraft Industries        | Westwind                 | Midsize Jets             | Medium Jets              |
| Mitsubishi                        | Challenger 850/Execliner | Regional Jets            | Airliners                |
| Mitsubishi                        | CRJ700/900/1000          | Regional Jets            | Airliners                |
| Mitsubishi                        | Mu-2                     | Multi-Engine Turboprops  | Multi-Engine Turboprops  |
| Ontic Engineering & Manufacturing | Merlin                   | Multi-Engine Turboprops  | Multi-Engine Turboprops  |
| Piaggio Aerospace                 | P.180 Avanti             | Multi-Engine Turboprops  | Multi-Engine Turboprops  |
| Pilatus Aircraft                  | PC-12                    | Single-Engine Turboprops | Single-Engine Turboprops |
| Pilatus Aircraft                  | PC-24                    | Light Jets               | Small Jets               |
| Piper                             | PA-31                    | Multi-Engine Turboprops  | Multi-Engine Turboprops  |
| Piper                             | PA-42                    | Multi-Engine Turboprops  | Multi-Engine Turboprops  |
| Piper                             | PA-46TP                  | Single-Engine Turboprops | Single-Engine Turboprops |
| Sabreliner Aviation               | Sabre                    | Midsize Jets             | Medium Jets              |

# Appendix 3 – Aircraft Type Certificate Holder/Group/Size Category, *cont.*



| Type Certificate Holder | Aircraft Group     | Aircraft Size Category   | Aircraft Size Segment    |
|-------------------------|--------------------|--------------------------|--------------------------|
| Syberjet Aircraft       | SJ30               | Light Jets               | Small Jets               |
| Textron Aviation        | Beech 2000         | Multi-Engine Turboprops  | Multi-Engine Turboprops  |
| Textron Aviation        | Beechjet           | Light Jets               | Small Jets               |
| Textron Aviation        | Caravan            | Single-Engine Turboprops | Single-Engine Turboprops |
| Textron Aviation        | Citation CJ1       | Light Jets               | Small Jets               |
| Textron Aviation        | Citation CJ2       | Light Jets               | Small Jets               |
| Textron Aviation        | Citation CJ3       | Light Jets               | Small Jets               |
| Textron Aviation        | Citation CJ4       | Light Jets               | Small Jets               |
| Textron Aviation        | Citation Excel     | Midsize Jets             | Medium Jets              |
| Textron Aviation        | Citation I         | Light Jets               | Small Jets               |
| Textron Aviation        | Citation II        | Light Jets               | Small Jets               |
| Textron Aviation        | Citation III       | Midsize Jets             | Medium Jets              |
| Textron Aviation        | Citation Latitude  | Midsize Jets             | Medium Jets              |
| Textron Aviation        | Citation Longitude | Super Midsize Jets       | Medium Jets              |
| Textron Aviation        | Citation M2        | Light Jets               | Small Jets               |
| Textron Aviation        | Citation Mustang   | Very Light Jets          | Small Jets               |
| Textron Aviation        | Citation Sovereign | Midsize Jets             | Medium Jets              |

| Type Certificate Holder | Aircraft Group            | Aircraft Size Category   | Aircraft Size Segment    |
|-------------------------|---------------------------|--------------------------|--------------------------|
| Textron Aviation        | Citation V                | Light Jets               | Small Jets               |
| Textron Aviation        | Citation X                | Super Midsize Jets       | Medium Jets              |
| Textron Aviation        | Citation XLS Ascend       | Midsize Jets             | Medium Jets              |
| Textron Aviation        | Citation XLS+/Gen2        | Midsize Jets             | Medium Jets              |
| Textron Aviation        | Conquest1                 | Multi-Engine Turboprops  | Multi-Engine Turboprops  |
| Textron Aviation        | Conquest2                 | Multi-Engine Turboprops  | Multi-Engine Turboprops  |
| Textron Aviation        | Denali                    | Single-Engine Turboprops | Single-Engine Turboprops |
| Textron Aviation        | Hawker 4000               | Super Midsize Jets       | Medium Jets              |
| Textron Aviation        | Hawker<br>750/800/850/900 | Midsize Jets             | Medium Jets              |
| Textron Aviation        | HS125                     | Midsize Jets             | Medium Jets              |
| Textron Aviation        | King Air 100              | Multi-Engine Turboprops  | Multi-Engine Turboprops  |
| Textron Aviation        | King Air 200/250/260      | Multi-Engine Turboprops  | Multi-Engine Turboprops  |
| Textron Aviation        | King Air 300/350/360      | Multi-Engine Turboprops  | Multi-Engine Turboprops  |
| Textron Aviation        | King Air 90               | Multi-Engine Turboprops  | Multi-Engine Turboprops  |
| Textron Aviation        | Mu300                     | Light Jets               | Small Jets               |
| Textron Aviation        | Premier I/IA              | Light Jets               | Small Jets               |
| Twin Commander Aircraft | Turbo Commander           | Multi-Engine Turboprops  | Multi-Engine Turboprops  |

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