FAA Aerospace Forecasts
Fiscal Years 2024-2044

Economic Environment

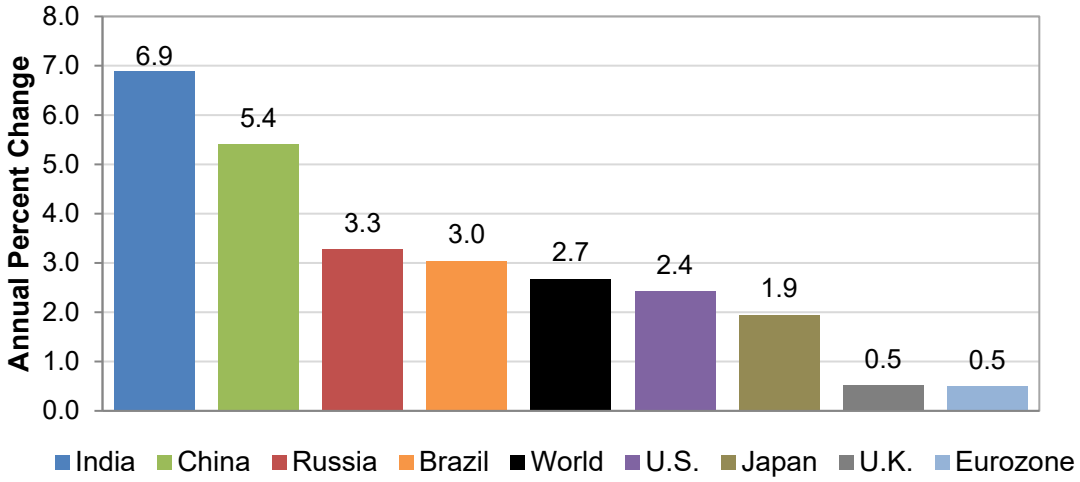
In 2023, global real GDP expanded but continued its gradual deceleration from the spike in the second year of the pandemic. GDP surged by 6.1 percent in 2021, slowed to 3.1 percent in 2022 and then slowed further in 2023, to 2.7 percent, a few tenths slower than the average over the decade prior to the pandemic. During the pandemic, inflation spiked, and government deficits swelled, conditions that monetary and fiscal authorities have worked to combat with higher interest rates and reduced spending – efforts that have restrained economic growth. GDP is expected to ease further in 2024 due to still-elevated interest rates, before edging up to its trend rate thereafter.

In the U.S., real GDP growth slows from 2.4 percent in 2023 to 1.4 percent in 2024 as COVID-19 relief measures wear off, consumer spending normalizes and higher interest rates slow activity. High interest rates continue to suppress growth in 2025 at 1.4 percent and with that slower growth, unemployment rates rise from 3.6 percent in 2023 to 4.3 percent in 2024 and 4.7 percent in 2025. By restraining demand, the central bank achieves its goal of lowering inflation to 2.0 percent in 2025 after being 4.1 percent in 2023. Interest rates are brought down and in the long-term, GDP growth averages 1.7 percent per year and the unemployment rate stabilizes at 4.3 percent. As with other advanced economies, GDP growth is hindered by an aging population that slows labor force growth and contributes to the decline in the participation rate. Compared to the U.S., real GDP growth in the European Union plus U.K. is considerably weaker in 2023 at 0.5 percent and again at 0.6 percent in 2024. Aggressive deficit reduction efforts, high energy costs and interest rates all dampen growth in the near-term and combine with the area's lower trend rate resulting from slowing demographic and productivity trends. In Japan, tourism, capital investments and expansionary fiscal policies contribute to produce real GDP growth of 1.9 percent in 2023 but high prices and weak exports dampen growth slowing it to 0.8 percent in 2024. Trend growth rates of under one percent continue in the second half of the decade as the country's persistent problems of weak consumer spending and slowing population and demographic trends remain. After bouncing back from a low 3.0 percent rate in 2022 due to its zero-COVID policy, China's GDP growth picked up to 5.4 percent in 2023 before resuming its long-term gradual slowdown, averaging about 4.5 percent in the second half of the decade. Growth is expected to be weighed down by the downturn in property markets, stalled economic and banking-sector reforms, and high rates of household savings.

Among large emerging markets, Brazil's considerable fiscal stimulus supported growth again in 2023, coming in at 3.0 percent before dropping to 1.8 percent in 2024 as stimulus is withdrawn. Longer term, Brazil's economy benefits from its large domestic market and abundant natural resources but is restrained by high interest rates and large fiscal deficits. Russian growth recovered to 3.3 percent in 2023 after its sanctions-induced decline in 2022 as the country found ways to sidestep sanctions and has boosted military spending. Growth eases steadily to end the decade at 1.5 percent as the emigration of skilled professionals and military age people adds to downward demographic trends. Productivity losses from the withdrawal of

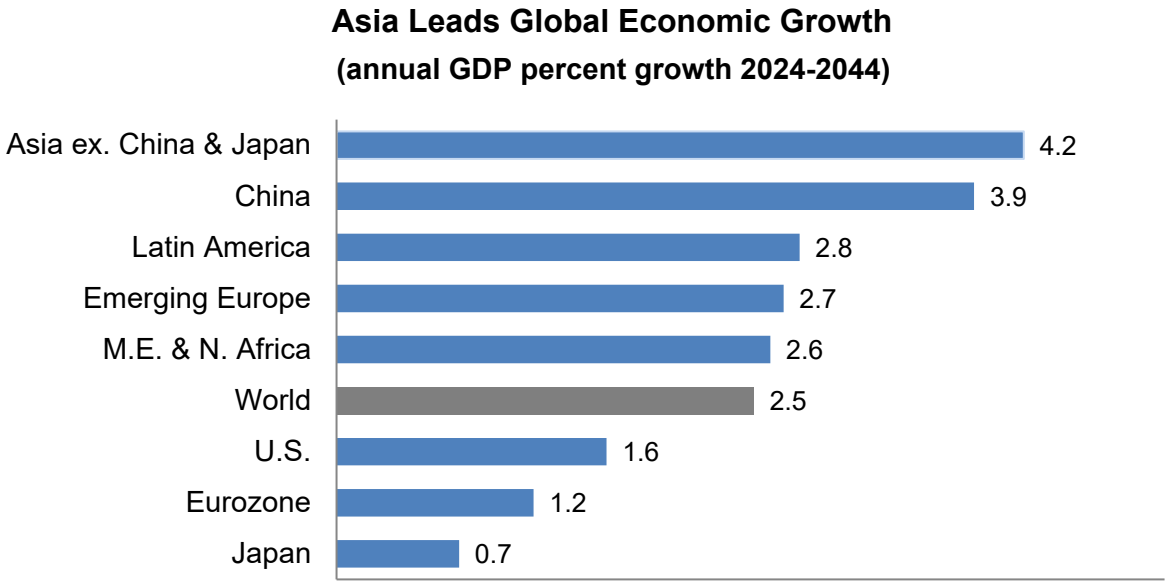
foreign companies and investment also contribute to the slowdown. Finally, India has seen strong expansion in both the manufacturing and services sectors, resulting in growth of 6.9 percent in 2023, easing through the second half of the decade. In the medium-term its growth will be driven by favorable demographics including strong consumer spending from growing middle-income households, increasing contributions from the service sectors, and undeveloped natural resources.

World Economic Growth in 2023



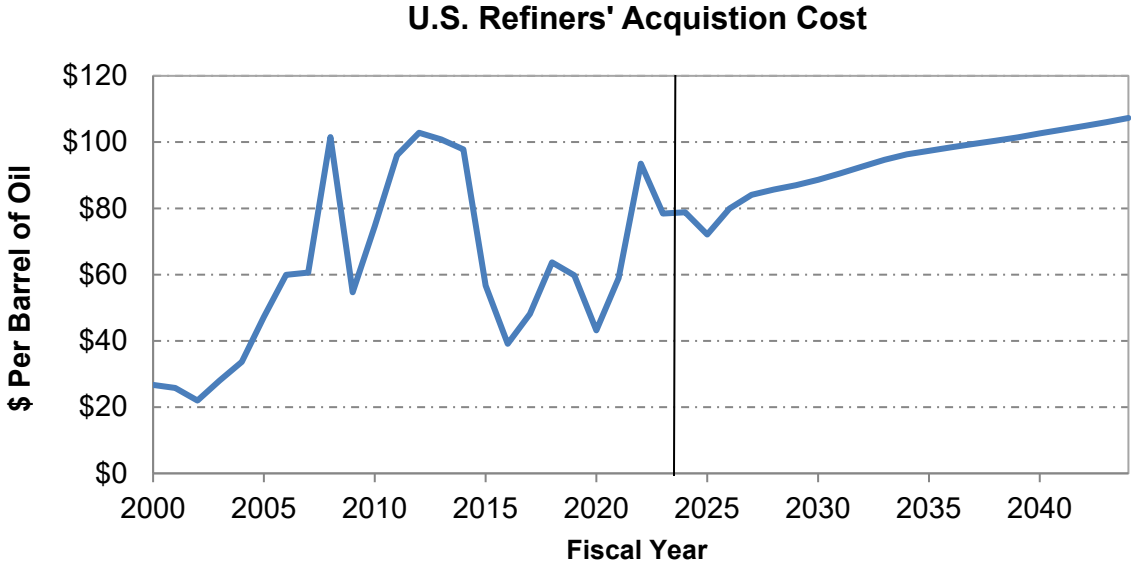
Source: S&P Global

S&P Global forecasts world real GDP to grow at 2.5 percent a year between 2024 and 2044. Emerging markets, at 3.7 percent a year, are forecast to grow faster than the global average but at lower rates than in the early 2000's. Asia (excluding Japan), led by India and China, is projected to have the fastest growth followed by Latin America, Eastern Europe, and Africa and Middle East. Growth in the more mature economies (1.4 percent a year) will be lower than the global trend with the fastest rates in the U.S. followed by Europe. Growth in Japan is forecast to be very slow at 0.7 percent a year reflecting deep structural issues associated with a shrinking and aging population.



Source: S&P Global, Jan 2024 Comparative World Overview

Oil spiked to $93 per barrel in 2022 in the wake of Russia's invasion of Ukraine. After pulling back in 2023 and again in 2025, prices begin to climb as economic activity accelerates. Over the long-run, S&P Global expects the price of oil to increase due to growing global demand and higher costs of extraction. S&P Global forecasts U.S. refiner's acquisition cost of crude to rise to $107 per barrel at the end of the forecast horizon.



Source: S&P Global

U.S. Airlines

Domestic Market

Mainline and regional carriers[1] offer domestic and international passenger service between the U.S. and foreign destinations, although regional carrier international service is confined to the border markets in Canada, Mexico, and the Caribbean.

Over the coming years, the commercial air carrier industry will be focused on managing through the aftereffects of the pandemic. Although demand has by most measures returned to 2019 levels, the progress has been unsteady and uneven across segments making it difficult to plan and manage capacity. Furthermore, carriers face numerous factors constraining their ability to add capacity back into networks – factors that will take years to resolve. A significant constraint will continue to be aircraft delivery delays carriers face having ordered hundreds of new aircraft whether for fleet renewal, replacement of aircraft retired during the pandemic, or to take advantage of lower unit operating costs. These new aircraft will add to debt burdens but as predictability returns and balance sheets strengthen, carriers will be better positioned to pay down this debt plus that accumulated during the pandemic. With stronger balance sheets, carriers will be able to transition to more traditional long-term business strategies.

While some aspects of demand were more predictable in 2023 than in the previous years, its strength and characteristics were still not the same as in the pre-pandemic environment and it may be years before it returns to that previous normal. Leisure traveler demand is expected to continue as the main driver while business trips remain somewhat below prior levels and are growing only slowly. And although leisure travelers are demonstrating confidence by booking further out from departure, the day-of-week and seasonal patterns have been shifted by an increase in blended leisure and business trips. By geographic region, the altered balance between leisure and business has shifted demand towards medium-sized and sunbelt cities, and away from transcontinental routes and coastal destinations.

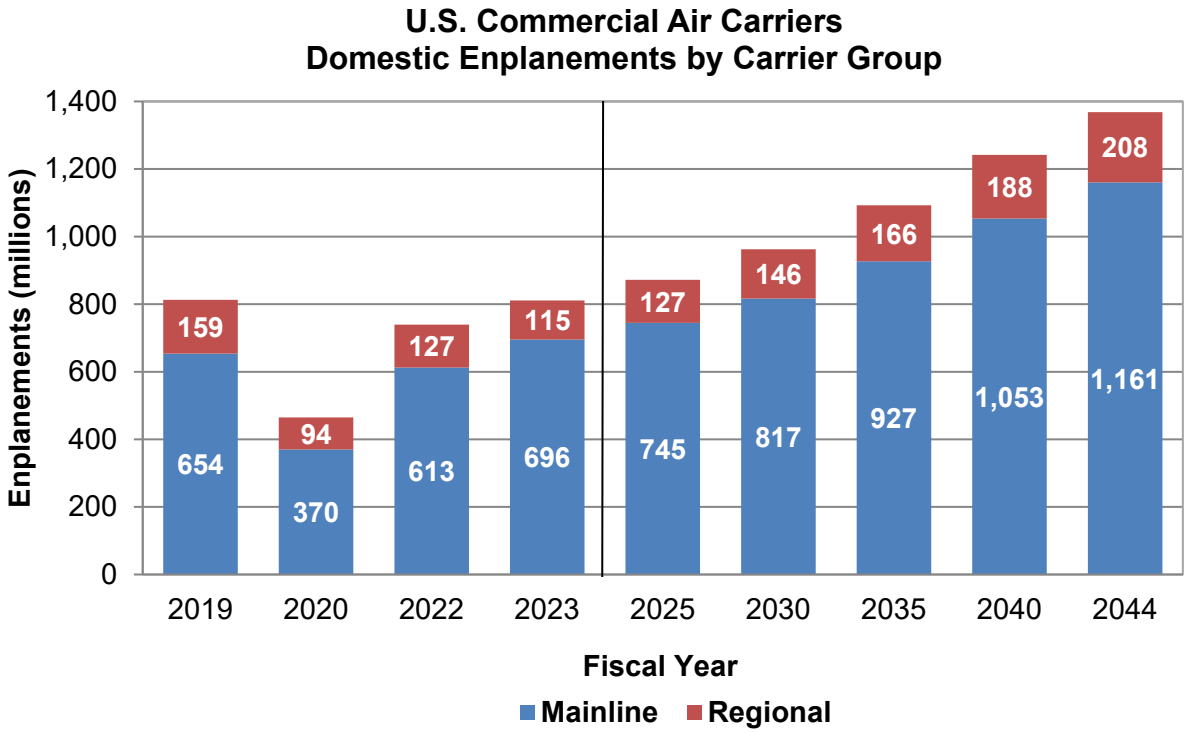
Air carriers' ability to manage capacity is further complicated by constraints that arose during the pandemic and that will take years to unwind. Hiring and training bottlenecks only began to be resolved in 2023 and have left carriers, regionals especially, short staffed for pilots as well as maintenance crews. And even where staffing levels are above where they were in 2019, such as for gate and ramp agents, the large proportion of new hires has lowered productivity. The effects of supply chain disruptions linger, and combined with similar staffing issues, are hampering manufacturers' ability to deliver new aircraft creating years-long backlogs. Finally, under-staffing at a few ATC facilities is limiting the number of aircraft that can be handled in those places. These issues will all be slow to reverse and weigh on the forecast

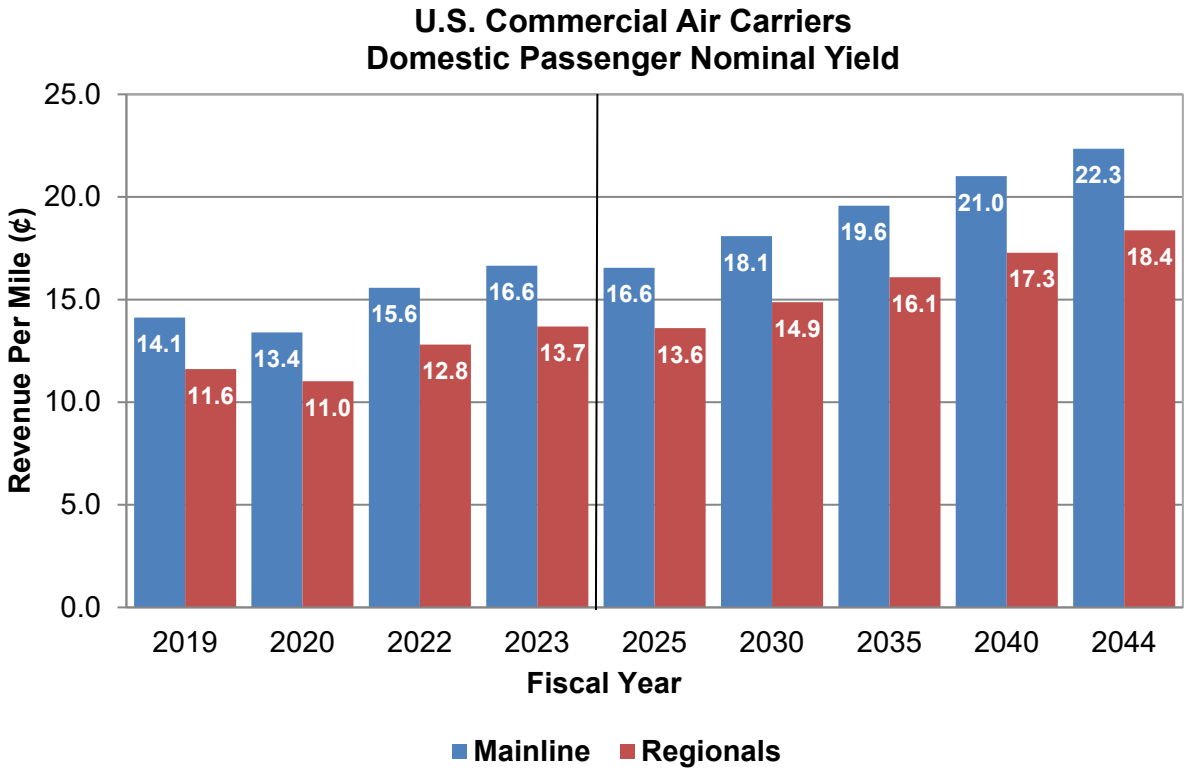
[1] Mainline carriers are defined as those providing service primarily via aircraft with 90 or more seats. Regionals are defined as those providing service primarily via aircraft with 89 or fewer seats and whose routes serve mainly as feeders to the mainline carriers.

of capacity production for the next three to five years, or possibly longer.

Higher airfares have already resulted from increased labor expenses necessary to attract and retain workers and this elevated spending is expected to be permanent. Labor unions representing pilots and flight attendants have found considerable leverage in this environment, making cost increases, and therefore fare increases, an industry-wide phenomenon. Passengers have been largely undeterred, allowing some carriers to add on additional fare or fee increases that are helping to begin paying down debt incurred during the pandemic. Until debt returns to more typical levels, it will act as an additional restraint on investment and expansion.

During the first years of the pandemic, regional carriers suffered very similar consequences of COVID-19 as did the mainline group. However, in 2023, regionals provided 7.2 percent of domestic capacity, down from 11.1 percent in 2019, a result of both the shift in demand and difficulty supplying capacity as flight crews moved up to higher paying mainline jobs. In terms of traffic, regionals saw similar declines, dropping to 6.9 percent of RPM in 2023 compared to 10.4 percent in 2019. The deviations in 2023 are expected to revert over time as travel patterns and airline operations continue the slow recovery to more normal conditions.





The regionals have less leverage with the mainline carriers than they have had in the past as the mainline carriers have negotiated contracts that are more favorable for their operational and financial bottom lines. And as mainline carriers cut service to smaller cities since the pandemic, it was the regional partners that were most affected. Furthermore, mainline carriers successfully reduced costs by offering voluntary retirements to flight crews but as activity rebounded, they drew replacements from the ranks of the regionals, exacerbating their pre-pandemic pilot shortages. As regional carriers recover and activity returns to 2019 levels, service to smaller cities is expected to return. Regional pilot shortages, however, are likely to persist through next year due to the time required for training and recruitment.

A trend for regionals that was largely unaffected by the pandemic is the longstanding increase in the number of seats per aircraft. This measure rose by more than 55 percent over the decade from 1997 to 2007 and although it slowed more recently to an increase of 17 percent in the ten years ending in 2019, it is a trend that is expected to continue into the future. A consequence of this drive to replace 50 seat regional jets with more fuel-efficient 70 seat jets is that capital costs have increased. The move to the larger aircraft will prove beneficial in coming years, however, since their unit costs are lower.

Mainline carriers have also been increasing the seats per aircraft flown although, unlike that for the regionals, the trend had been accelerating up until 2019. From 2009-2019, the measure grew by an average of 1.5 percent per year. Then during the pandemic, seats per aircraft jumped around, ranging from an increase of 5.0 percent in 2021 to a 0.6 percent decrease in 2022 as carriers first

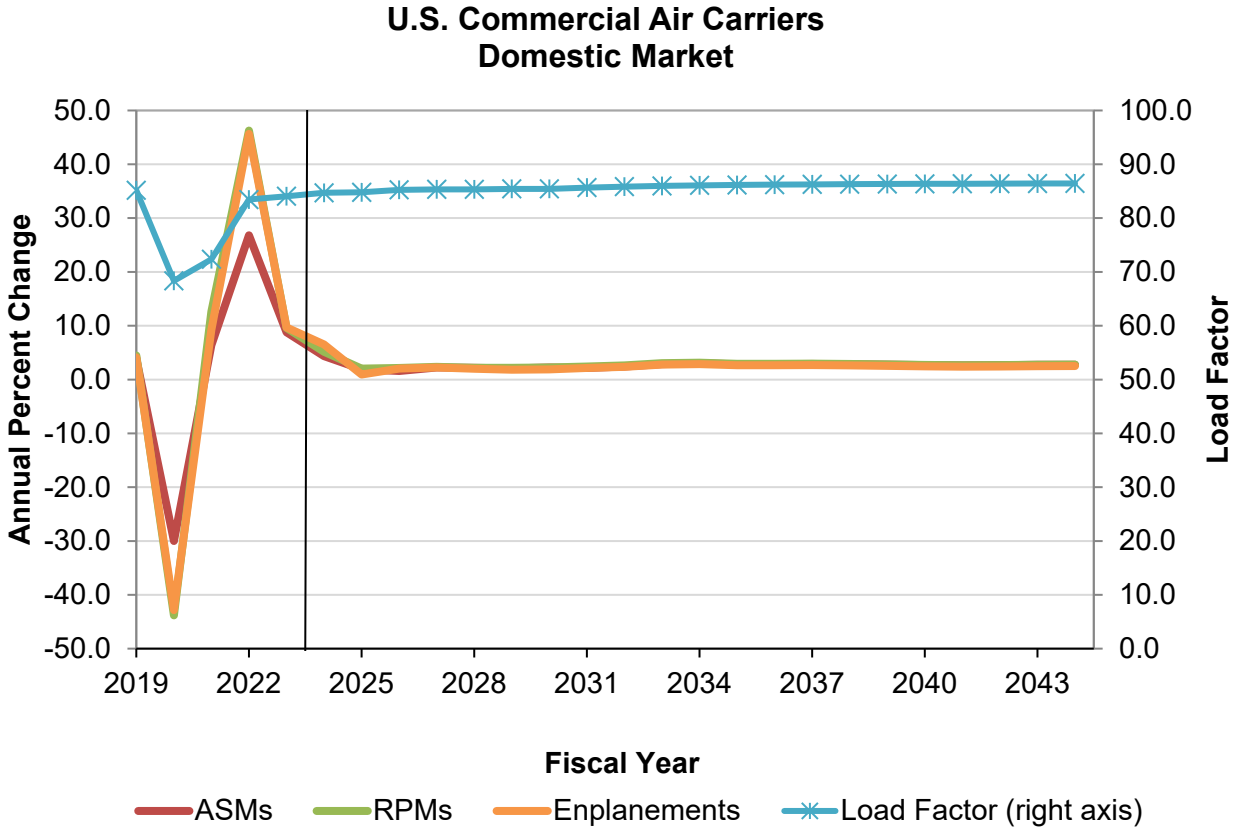
flew some of their idle long-haul international aircraft on domestic routes and then reallocated them to more typical markets. That aircraft positioning seemed to normalize in 2023 when seats per aircraft grew 1.1 percent.

Another continuing trend is that of ancillary revenues. Carriers generate ancillary revenues by selling products and services beyond that of an airplane ticket to customers. This includes the un-bundling of services previously included in the ticket price such as checked bags, on-board meals, and seat selection, and by adding new services such as boarding priority and internet access. After posting record net profits in 2015, U.S. passenger carrier profits declined subsequently on rising fuel and labor costs, and flat yields, but were supported by ancillary revenues. Even in 2020 when profits turned to staggering losses, this remained a meaningful source of revenue for carriers.

On the other hand, revenue management systems that have grown increasingly sophisticated in recent years became almost worthless during the pandemic years. These systems enable carriers to price fares optimally for each day and time of flight, and to minimize foregone revenue. But, because they rely on historical data to make price and schedule predictions, the unprecedented nature of the collapse in 2020 meant they could provide little guidance and carriers were forced to assess market conditions without the benefit or precision of that quantitative analysis.

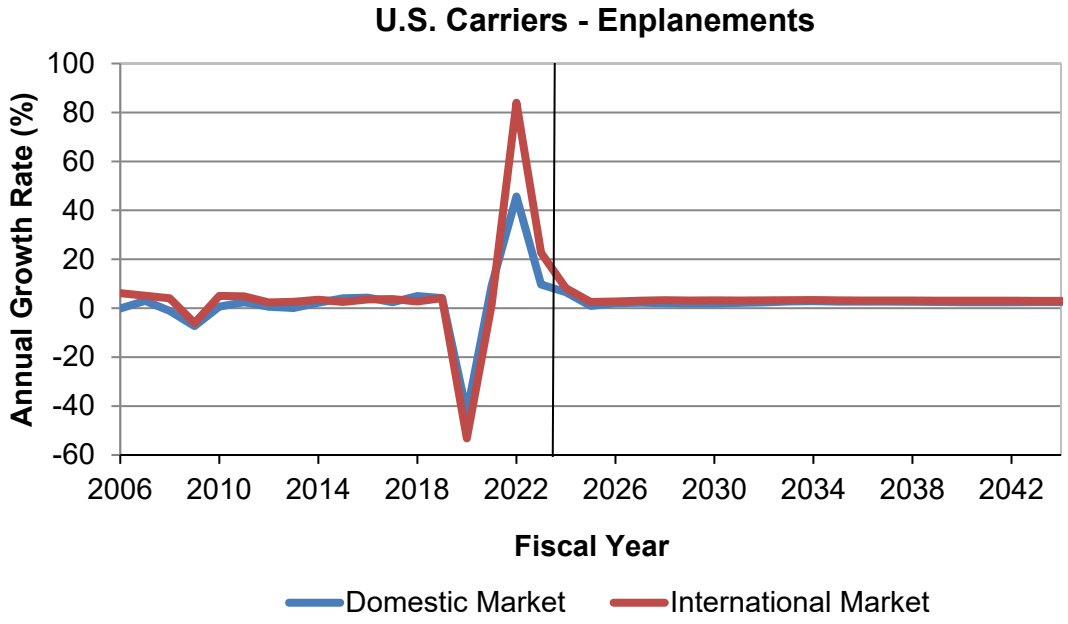
While revenue management systems will regain their important role once travel demand returns to more normal rhythms, one source of ancillary revenue, change fees, was broadly scrapped in 2020. As traveler plans were forced to change due to COVID-19-related restrictions, airlines began dropping fees for itinerary changes in many ticket classes. As a share of total passenger revenue, cancellation fees dropped from about 2 percent in FY2019 and the years prior to under 1 percent in FY2023. Some airlines have stated that the elimination of change fees is a permanent move and won't be reversed with the end of the pandemic. In contrast, baggage fees seem unlikely to be rescinded as their share remained at about 4.0 percent in FY2023.

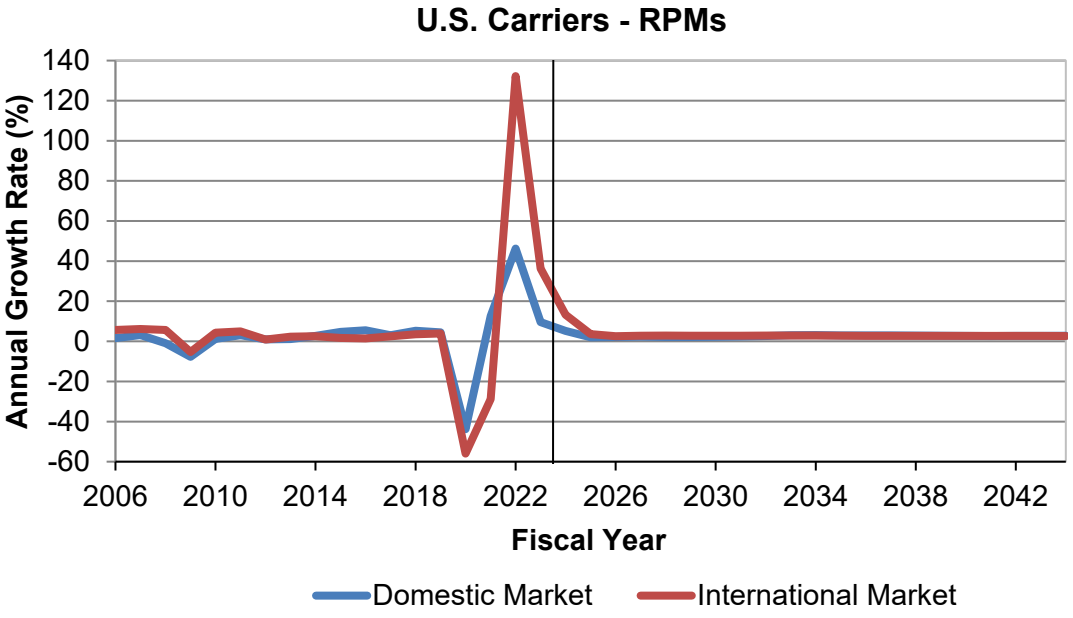
Other methods of segmenting passengers into more discreet cost categories based on comfort amenities like seat pitch, leg room, and access to social media and power outlets were unaffected by the pandemic. The offering of Basic Economy fares has been part of an effort by network carriers to protect market share in response to the rapid growth low-cost carriers (LCC) have achieved in recent years. In 2019, mainline enplanements had increased almost 23 percent since 2007 but low-cost carrier enplanements grew by 39 percent. RPM over the same period show a similar pattern with mainline RPMs up almost 27 percent and LCC RPM fully 48 percent higher. These longer-term trends were interrupted in 2020 with enplanements and RPM dropping across both mainline and LCC carriers to just over half of 2019's levels. However, by 2023 the strength of LCC's became apparent again as their enplanements and RPM had recovered to about 7 percent above 2019 levels while mainline traffic lagged slightly at about 5 percent above pre-pandemic levels.

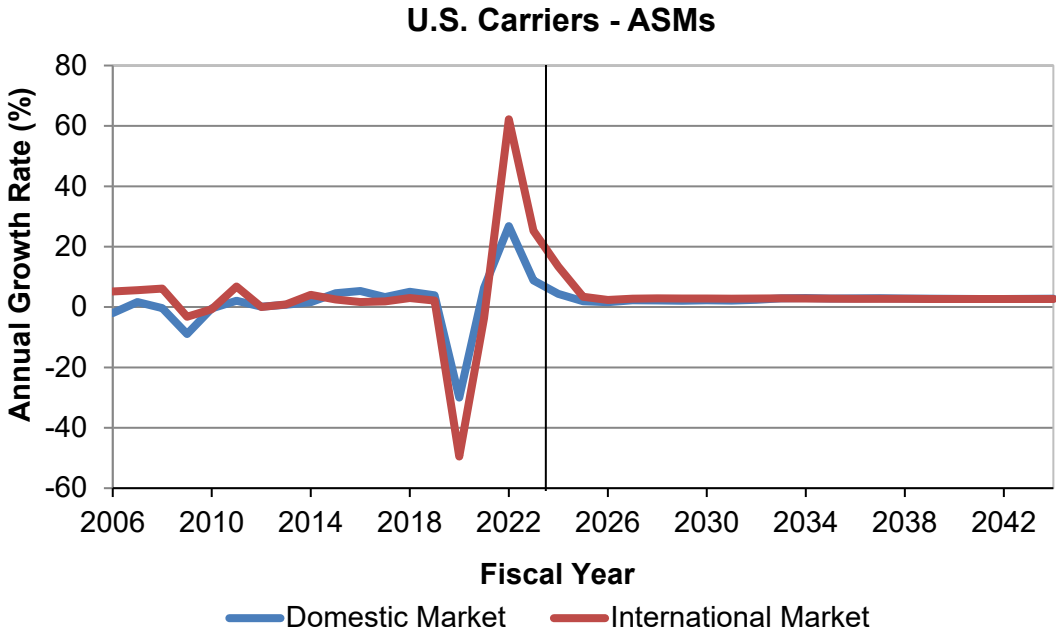


International Market

Over most of the past decade, the international market has been the growth segment for U.S. carriers when compared to the mature and much larger U.S. domestic market. For the ten years ending in 2023, international enplanements grew by 31 percent while domestic enplanements grew 24 percent. However, during the downturn in 2020 and first years of the recovery, domestic activity fell less and recovered faster. Then in 2023, domestic enplanements were virtually even with 2019's level after being at 91 percent a year earlier, while international enplanements showed even stronger improvement, reaching 107 percent, compared to 87 percent in the previous year. International travel had been particularly impacted by border closings, quarantine requirements and other travel restrictions, as well as the uncertainty of when requirements might change but as restrictions lifted, activity rebounded sharply. On the domestic side, the fall off in business travel contributed to the decline and slower recovery, even as leisure travel surged. International travel is expected to show further gains in 2024 as some markets continue to experience recovery-fueled growth.


U.S. Carriers - Enplanements
Annual Growth Rate (%)
100
80
60
40
20
0
-20
-40
-60
2006
2010
2014
2018
2022
2026
2030
2034
2038
2042
Fiscal Year
Domestic Market
International Market

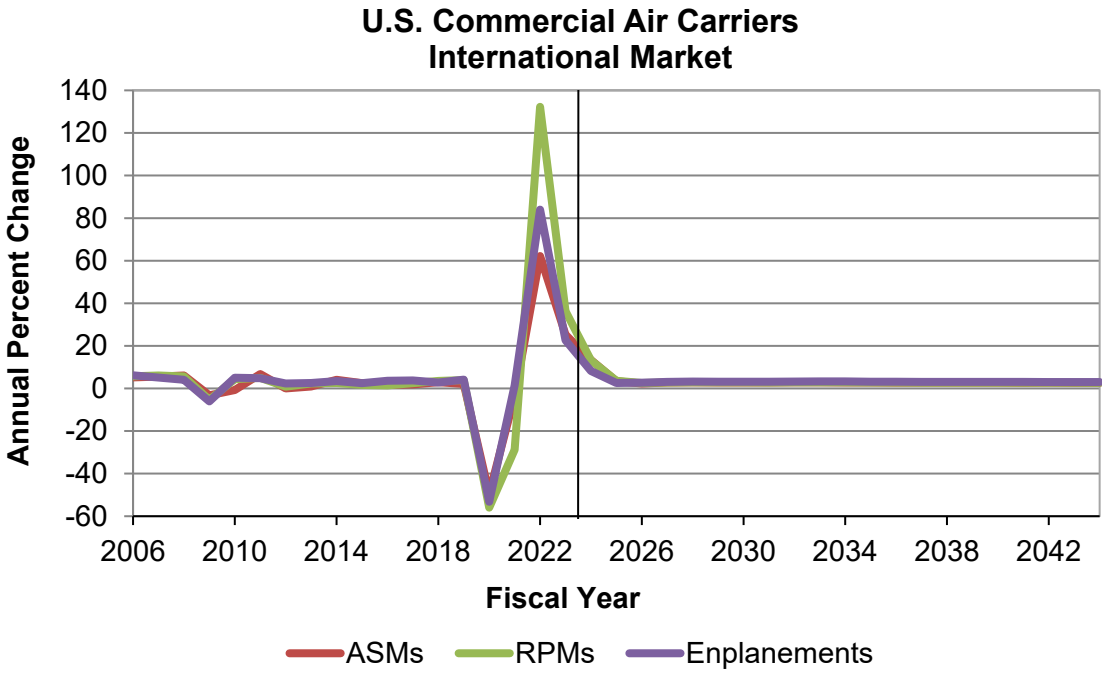

U.S. Carriers - RPMs
Annual Growth Rate (%)
140
120
100
80
60
40
20
0
-20
-40
-60
2006
2010
2014
2018
2022
2026
2030
2034
2038
2042
Fiscal Year
Domestic Market
International Market



International capacity and demand will see another year of strong growth in 2024 as the recovery continues but rates will return to more typical values in 2025 and 2026. For FY2024 the average annual growth rates for international ASM and RPM are forecast at 13 percent, and enplanements at 8 percent as aggregate trip lengths grow due to increasing Atlantic and Pacific activity. From FY2025-2044, annual growth for ASM and RPM are forecast to both grow at 2.8 percent, while enplanements will grow at a rate of 3.1 percent. Taking these two periods as a whole gives annual growth from FY 2023-2044 for ASM, RPM and enplanements of 3.3 percent (after rounding).

Load factors recovered sharply again in 2023, reaching 83 percent, above the 77 percent in the previous year and about the same as 2019's level. Load factors are projected to rise only slightly throughout the remainder of the decade to reach 84 percent at the end of the forecast.

In the long-run, growth of major global economies will slow from the above-trend rates of recent, pre-pandemic years. Several moderating factors are at work, including high inflation and interest rates, reduced global trade, and political stresses. The European and Japanese economies are generally seeing slow but positive growth, in part due to weak trade with Asia, mainly China. Overall, global conditions appear set to return to a stable path once the economic environment improves with looser financial conditions, diminished risk of recession, and improved government fiscal positions. Rising oil prices, however, will create some drag on this otherwise supportive environment for air travel demand.



The impact of COVID-19 on travel by region has varied considerably, as will the recovery paths. Factors affecting the responses by market are similar to those affecting travel as a whole: COVID-19 case counts, governmental restrictions, predominant traveler segments, and macroeconomic conditions. As a result, enplanements to Latin America had fully recovered in 2022, and to the Atlantic region in 2023. The Pacific region is forecast to be recovered in 2027 though it will be within 3 percent the year before.

For U.S. carriers, Latin America remains the largest international destination with more than twice the enplanements of Atlantic, the next largest in a typical year, due to its proximity to the U.S., strong trade ties, and popular visitor destinations. In 2023, Latin America enplanements rose by 10 percent while RPMs rose 9 percent. Much of the strength was again driven by leisure traffic heading to warm weather destinations and by the relatively low number of COVID-19 cases and travel restrictions. Enplanements and RPM growth are expected to slow further in 2024, returning to long-term trend rates, as other regions become viable to leisure travelers. Over the twenty-year period of 2024-2044, Latin America enplanements are forecast to increase at an average rate of 3.7 percent a year while RPMs grow 3.9 percent a year.

Switching to the Pacific region, it is the smallest in terms of enplanements despite region's emerging markets' economic growth and potential for air travel. Enplanements bottomed out at just 5.8 percent of 2019's level in 2021 as many countries enforced stringent travel restrictions, especially China, a very large market in the region. RPM also collapsed by similar amounts. In 2022, enplanements and RPM came off the bottom and had recovered to about 56 percent of 2019 levels in 2023. In 2024, those measures of activity are expected to continue expanding to above 85 percent. With comparatively slow trend growth, the region's enplanements take time to fully recover to 2019's level but are within 5

percent by 2026 while RPM are fully recovered in that year. From FY2026 through the end of the forecast, Pacific enplanements and RPM are forecast to grow at average rates of 2.4 percent. Although the region is forecast to have the strongest economic growth of any region over the next 20 years, led by China and India, enplanements and RPMs over the period are restrained in part because of generally low incomes and relatively small middle classes. Consequently, demand centers on wealthier countries such as Japan and Korea, rather than the faster growing economies.

The Atlantic region ranks in the middle between the other two, with pre-pandemic enplanements roughly twice those in the Pacific region and half those in the Latin region. After contracting in 2015 and 2016, Atlantic enplanement growth began rising to reach 7.0 percent in 2019. This growth was supported by U.S. demand as well as growth of Middle East and African markets, even as the European economies slowed in 2019. In 2020, like the other regions, Atlantic enplanements tumbled and bottomed out in 2021 at 21 percent of 2019's level. Subsequent percentage gains were large, returning enplanements to 114 percent of 2019 levels in 2023. Although Western Europe is a mature area with moderate economic growth, the economically smaller Middle East and Africa areas are expanding rapidly with GDP growth rates more than twice that of Europe. As a result, a growing share of the forecast aviation demand in the Atlantic region is linked to those two areas, particularly in the second half of the forecast period. Over the forecast horizon from 2024 to 2044, enplanements and RPM in the Atlantic region are expected to grow at average annual rates of 1.9 percent and 2.1 percent, respectively.

Total Passengers to/from the U.S. on American and Foreign Flag Carriers

Key factors that may influence international air travel include globalization, incomes, technological improvements, and migration patterns. Total passengers (including passengers flown on Foreign Flag carriers) between the United States and the Atlantic, Latin America, Pacific, and Canada Transborder regions grew 25 percent during 2023 to total 244.2 million. It is the third consecutive year of double-digit percentage growth for passengers as the post-pandemic rebound continues.

Passenger levels for the combined regions have been steadily increasing since the 73.4 percent drop posted in 2020 but have yet to return to pre-pandemic levels. The percentage growth in passengers for each of the years going from 2021 to 2023 was 47.4 percent, 97.3 percent, and 25.0 percent, respectively. While the overall percentage growth in international passengers is forecast to slow to 6.8 percent in 2024, it is strong enough to surpass the peak of 252.9 million passengers posted in 2019.

While combined international passengers total is forecast to return to pre-pandemic levels this year, not all regions are recovering at the same pace. The Latin region has already returned to 2019 levels, surpassing pre-pandemic levels in 2023 with year-over-year growth of 13.2 percent. The level of passengers during the same year totaled 99.6 million for an increase of almost 11 million passengers beyond 2019 levels. The Atlantic region is forecast to return to pre-pandemic levels in 2024. Passenger growth in this region is forecast to be 6.7 percent during 2024, for a total of 92.6 million passengers, surpassing 2019 levels by approximately 4 million.

Passenger growth in the Transborder Canada region is forecast to be 12.0 percent in 2024, almost two times greater than the growth in the Atlantic region. Passenger levels in 2024 are forecast to be 31.8 million and remain shy of pre-pandemic levels. The Transborder Canada region is forecast to surpass pre-pandemic levels in 2025.

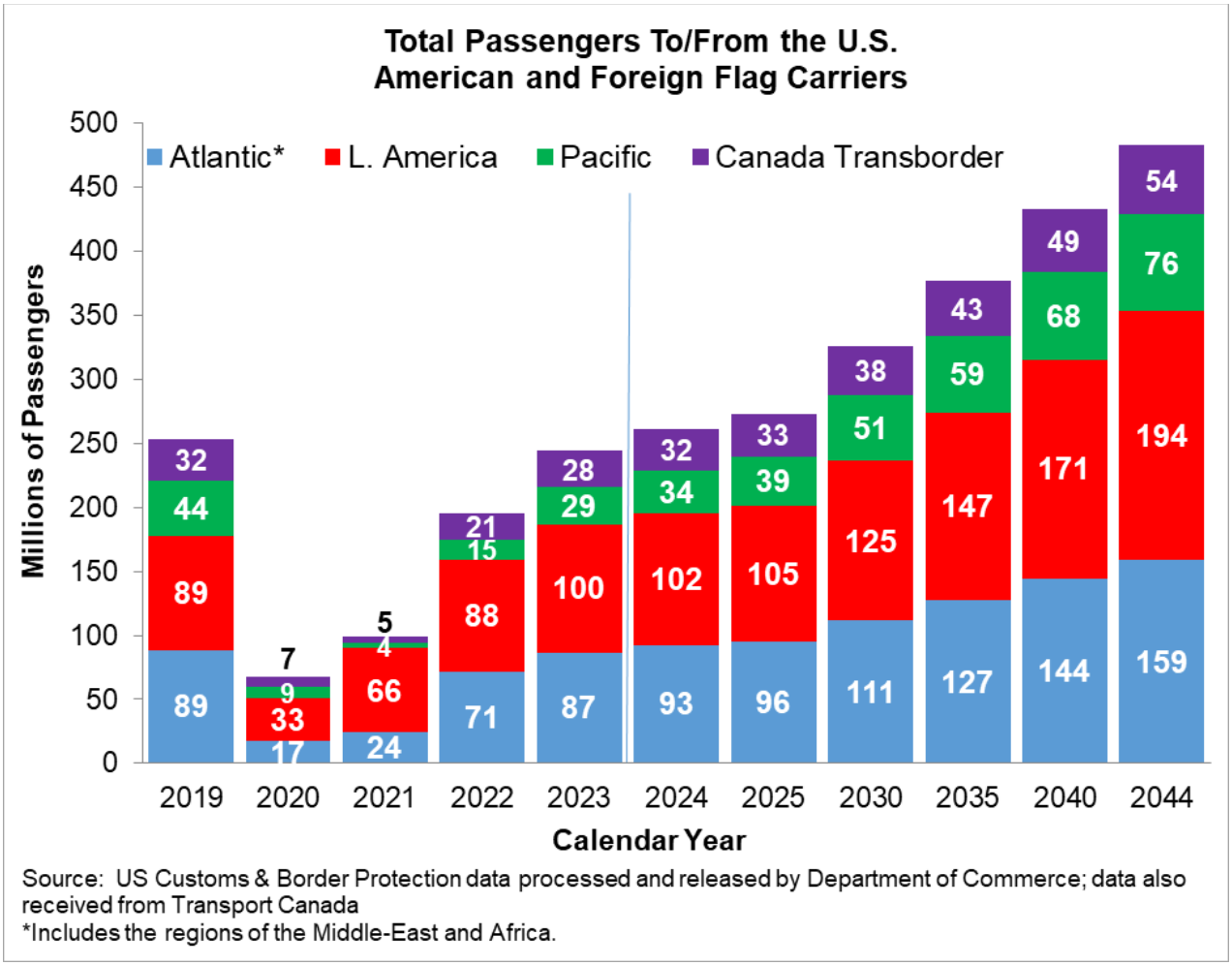
Pacific region passengers posted the strongest year-over-year growth of the four regions during 2023 (93.0 percent), but continue to fall short of the 43.8 million passengers in 2019. Passenger levels for this region are forecast to exceed pre-pandemic levels in 2027. During the first four years of the forecast period, the percentage growth in passengers is expected to taper from 15.6 percent in 2024 to 7.1 percent in 2027, and the passenger levels are forecast to exceed pre-pandemic levels by approximately 3.5 million in the same year.

Over the 20-year forecast horizon, combined international passengers are forecast to grow an average of 3.3 percent annually, from a level of 244 million in 2023 to 483 million in 2044. During the first five years of the forecast period passenger growth averages 4.7 percent annually and is more than two times greater than the average annual growth for the remaining forecast period (2.2 percent). The accelerated growth during the early forecast years reflects the ongoing recovery of Pacific region passengers to pre-pandemic levels.

A comparison of passenger share by region shows the Latin share of total international passengers increasing from 35.1 percent in 2019 to 40.2 percent in 2044. The percentage share of passengers in the Atlantic, Pacific and Canda Transborder regions by 2044 is forecast to be 33.2 percent, 15.8 percent, and 10.6 percent, respectively. Between 2019 and 2044, the Pacific region passenger share decreases 1.5 percentage points, the Atlantic region share decreases 1.8 percentage points, and the Canada Transborder passenger share decreases 2.0 percentage points.

The two countries forecast to have the highest passenger levels at the end of the forecast horizon by world region are Mexico (71.6 million) and Dominican Republic (26.0 million) in the Latin America region; United Kingdom (32.8 million) and Germany (17.7 million) in the Atlantic region; and China (17.5 million) and South Korea (14.7 million) in the Pacific region. Correspondingly, for countries that are forecast individually, those with the highest average annual percentage growth over the forecast period by world region are the Dominican Republic (4.5 percent) and Brazil (4.4 percent) for the Latin region; France (2.7 percent) and Netherlands (2.6 percent) for the Atlantic region; and China (16.7 percent) and Hong Kong (6.5 percent) for the Pacific region.[2] The fast growth in the Pacific region reflects a continuation of recovery to pre-pandemic levels.

[2] Only select countries within each world region are forecast individually and are primarily those countries posting the highest passenger levels. The rest of the countries within a region are not forecast individually, but rather as a whole. Those countries identified as having the highest average annual percentage passenger growth within each region is based solely on those countries that are forecast individually. It is plausible that countries within a world region have a higher percentage growth in passengers than those identified, however the growth would be on a considerably smaller passenger base.



Source: US Customs & Border Protection data processed and released by Department of Commerce; data also received from Transport Canada
*Includes the regions of the Middle-East and Africa.

System

System (the sum of domestic plus international) capacity contracted 36 percent to 789 billion ASMs in 2020 while RPMs plummeted 47 percent to 548 billion. During the same period, system-wide enplanements fell 44 percent to 509 million. After a tentative beginning towards recovery in 2021, activity surged in 2022 and had recovered to 2019 levels in 2023. Prior to the pandemic, U.S. carriers had prioritized the domestic over the international market in terms of allocating capacity as the U.S. saw stronger economic growth than many regions around the world. Then during the pandemic and recovery years, the split continued as domestic capacity rose 3 percent above 2019's level in 2023 while international capacity remained 1 percent below. However, as international markets continue their recoveries, capacity growth rates in those regions will outpace domestic. Subsequent years through 2044 see slightly faster capacity expansion in international markets compared to domestic driven in part by somewhat stronger economic growth in some Latin and Asian countries.

U.S. mainline carrier enplanement growth in the combined domestic and international

markets was 15 percent in 2023 while regional carriers saw a decline of 9 percent of passengers carried. The difference resulted from strong growth in international markets where regional carriers have little exposure as well as capacity constraints from pilot shortages that more severely impacted regional carriers.

In the domestic market in 2019, mainline enplanements marked their ninth consecutive year of increases, a trend that was abruptly halted in 2020 with a decline of 44 percent but followed by two years of strong growth in 2022 and 2023. Similarly, international mainline passengers had posted a tenth consecutive year of growth in 2019, a trend that was also broken in 2020 with a 53 percent decline but then fully reversed in 2023 after two years of strong increases. Mainline enplanements exceeded their 2019 levels in 2023 by 6 percent in domestic markets and 9 percent in international. Domestic mainline enplanement growth is forecast to slow in 2024, rising 6 percent as the recovery winds down. With the recovery complete, domestic enplanements resume growth driven by economic fundamentals and average 2.3 percent over the remainder of the forecast. International mainline enplanements follow a similar path with strong growth in 2024 and trend-like growth through the end of the forecast averaging 3.1 percent.

Although carriers cut capacity aggressively in 2020, the drop in traffic was even greater and system load factor fell from 84.5 percent in 2019 to a low of 68.5 in 2021 – a combined drop that far exceeded those following both 9/11 and the Great Recession. Load factor recovered sharply in 2022 and rose modestly in 2023, reaching 83.9 percent. Through the forecast, load factor edges gradually higher, culminating at 85.7 percent in 2044.

Cargo

Air cargo traffic includes both domestic and international freight/express and mail. The demand for air cargo is a derived demand resulting from economic activity. Cargo moves in the bellies of passenger aircraft and in dedicated all-cargo aircraft on both scheduled and nonscheduled service. Cargo carriers face price competition from alternative shipping modes such as trucks, container ships, and rail cars, as well as from other air carriers.

Historically, air cargo activity tracks with GDP. Other factors that affect air cargo growth are fuel price volatility, movement of real yields, globalization, and trade. The forecasts of revenue ton miles rely on several assumptions specific to the cargo industry. First, security restrictions on air cargo transportation will remain in place. Second, most of the shift from air to ground transportation has occurred. Finally, long-term cargo activity depends heavily on economic growth.

The forecasts of RTMs derive from models that link cargo activity to GDP. Forecasts of domestic cargo RTMs use real U.S. GDP as the primary driver of activity. Projections of international cargo RTMs depend on growth in world and regional GDP, adjusted for inflation. FAA forecasts the distribution of RTMs between passenger and all-cargo carriers based on an analysis of historic trends in shares, changes in industry structure, and market assumptions.

U.S. carrier international air cargo traffic spans four regions consisting of Atlantic, Latin, Pacific, and 'Other International.'

U.S. air carriers flew 47.3 billion revenue ton miles (RTMs) in 2023, a step down from 51.5 billion in 2022. During the pandemic, households made huge changes in spending patterns, shifting out of services and into goods, goods that were often shipped by air. As a result, RTMs surged to 20 percent above 2019's level by 2022. Consumer spending then began to revert in 2023, bringing system RTMs down to 10 percent above 2019's level. Domestic cargo RTMs dropped 11.3 percent to 17.6 billion in 2023 while international RTMs declined 6.4 percent to 29.7 billion. Air cargo RTMs flown by all-cargo carriers averaged 78.7 percent of the total in the years leading up to 2020 but then spiked to 88.0 percent in 2020 and 2021, with passenger carriers flying the remainder. With the return of passenger flights and their belly-hold capacity, that ratio dropped to 85.7 percent in 2023. Total RTMs flown by the all-cargo carriers fell 8.8 percent in 2023 while total RTMs flown by passenger carriers fell 4.7 percent.

After falling by 8.3 percent in 2023, total RTMs are expected to grow 4.3 percent in 2024 as the normalization of consumer demand for goods versus services concludes and air cargo is again governed by economic activity. Because of steady U.S. and world economic growth in the long term, FAA projects total RTMs to increase at an average annual rate of 3.0 percent over the forecast period (from 2024 to 2044).

Domestic cargo RTMs from 2024 to 2044 are forecast to increase at an average annual rate of 2.0 percent. In 2023, all-cargo carriers carried 93.1 percent of domestic cargo RTMs. The all-cargo share is forecast to remain roughly flat in the medium-term as passenger flights return to the system. In the long-term, the all-cargo share rises only slightly to 94.3 percent by 2044 based on increases in capacity for all-cargo carriers.

International cargo RTMs also declined in 2023 with the normalization of spending and as international passenger flights returned, RTM shifted away from all-cargo carriers. With the post-pandemic return of passenger flights, international RTM on passenger aircraft is expected to grow rapidly, increasing about 13 percent in 2024 and 10 percent in 2025. Over the same years, all-cargo RTMs will grow by about 3 percent per year as some tonnage is lost to passenger carriers. The share of international cargo RTMs flown by all-cargo carriers was 81.4 percent in 2023 and is forecast to decline in the medium term before gradually increasing in line with historical trends and ending at 83.7 percent in 2044.

Following the period of recovery and readjustment, growth for both types of carriers returns to long-run trend rates. For the forecast period (2024-2044), international cargo RTMs are expected to increase an average of 3.6 percent a year based on projected growth in world GDP with the Other International region having the fastest RTM growth (4.9 percent), followed by Pacific (3.3 percent), Atlantic (2.6 percent), and Latin America region (2.0 percent).

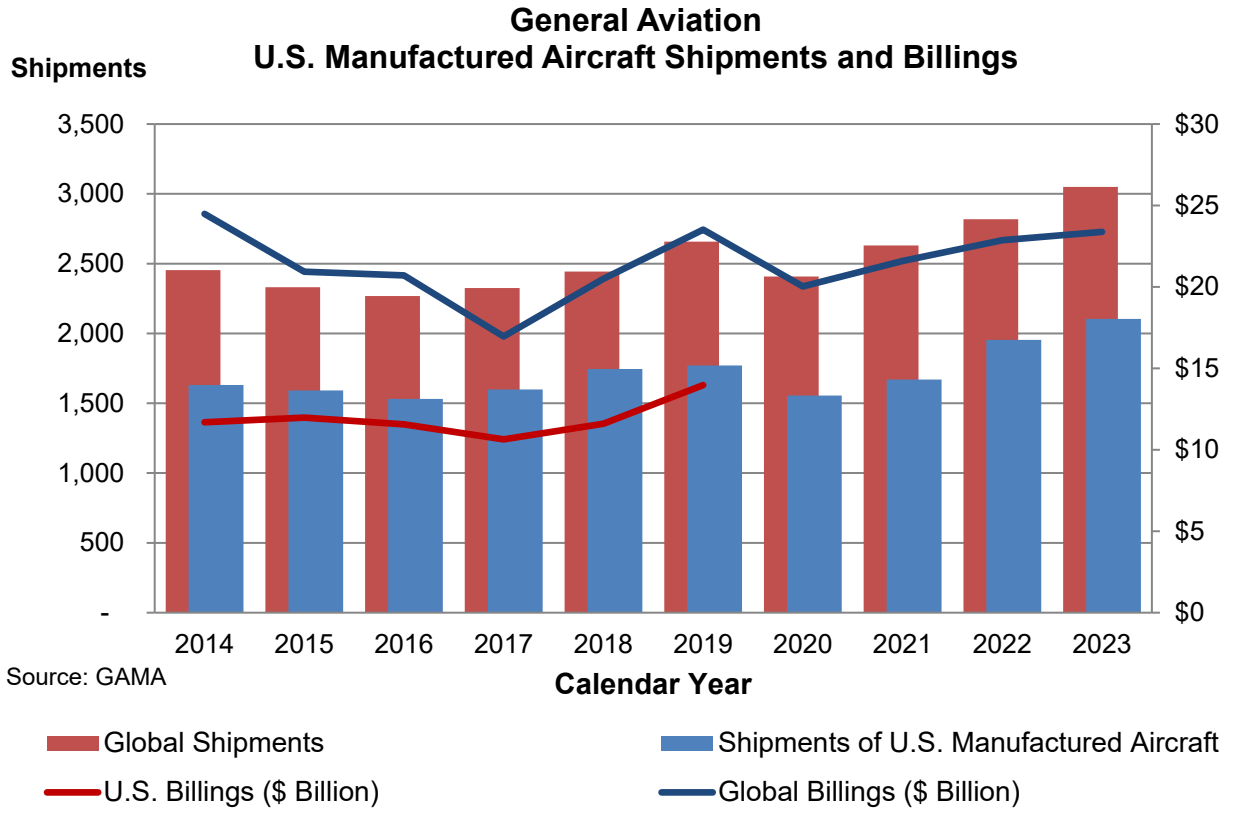
General Aviation

The FAA uses estimates of fleet size, hours flown, and utilization rates from the General Aviation and Part 135 Activity Survey (GA Survey) as baseline figures to forecast the GA fleet and activity. Since the survey is conducted on a calendar year (CY) base and the records are collected by CY, the GA forecast is done by CY. Forecasts of new aircraft deliveries, which use the data from General Aviation Manufacturers Association (GAMA), together with assumptions of retirement rates, generate growth rates of the fleet by aircraft categories, which are applied to the GA Survey fleet estimates. The forecasts are carried out for "active aircraft,"[3] not total aircraft. The FAA's general aviation forecasts also rely on discussions with the industry experts conducted at industry meetings, including Transportation Research Board (TRB) meetings of Business Aviation and Civil Helicopter Subcommittees conducted twice a year in January and May or June.

The results of the 2022 GA Survey, the latest available, were consistent with the results of surveys conducted since 2004 improvements to the survey methodology. The active GA fleet was estimated to be 209,540 aircraft in 2022 (0.2 percent increase from 2021). Small declines (less than one percent) in piston aircraft categories, including rotorcraft were more than offset by increases in the turboprop and turbojet fleets (up 4.6 percent) with additional increases in experimental and lighter than air aircraft (total of two fleets, 1.3 percent up). Total hours flown were estimated to be 27.0 million in 2022, up 1.9 percent from the previous year, 5.4 percent above where they were in 2019 and at their highest level since the historical peak of 2007. Increases were observed in the hours by turbojet (7.6 percent up), turboprop (4.6 percent up), turbine rotorcraft (2.8 percent up), and single-engine piston (1.5 percent up) aircraft; while hours by experimental aircraft (down 8.2 percent), piston rotorcraft (down 7.1 percent), multi-engine piston (down 4.2 percent) and much smaller categories of light-sport aircraft (LSA; down 5.7 percent), and gliders and lighter than air aircraft (together forming the other category, down 2.3 percent) declined.

In 2023, deliveries of the general aviation aircraft manufactured in the U.S. increased to 2,104 -- 7.7 percent higher than in CY 2022 and 18.8 percent higher than their 2019 level. Deliveries of single-engine piston aircraft were up 10.7 percent, while the much smaller segment of multi-engine piston deliveries were up by 9.5 percent (summing to a 10.7 percent increase in the fixed engine piston deliveries). Business jet deliveries increased by 1.0 percent and turboprop deliveries were up 8.0 percent, amounting for a 4.3 percent increase in fixed wing turbine shipments. While the GAMA statistics for factory net billings were not available yet for the U.S. manufactured GA aircraft, global billings increased in 2023 by 2.2 percent to $23.4 billion.

[3] An active aircraft is one that flies at least one hour during the year.



GAMA also reported the rotorcraft deliveries increased at a global level in 2023 in both piston and turbine segments by 7.7 percent and 10.4 percent, respectively.

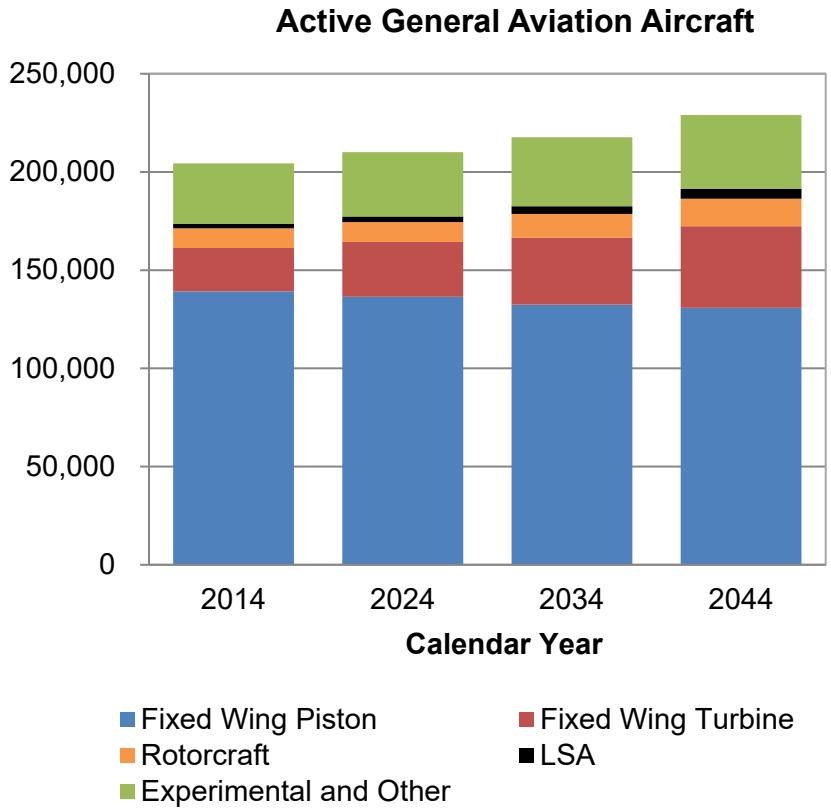
These current conditions indicate the GA sector, which had a much quicker recovery from the impacts of the pandemic than the airlines, surpassed the activity level of 2019. The active fleet in 2022 was only 0.7 percent below the 2019 level, with the fixed-wing turbine, experimental and other (gliders and lighter than air vehicles) aircraft categories above their 2019 levels. The long-term outlook for general aviation, driven by turbine aircraft activity, remains stable. The active general aviation fleet, which showed an increase of 0.2 percent between 2021 and 2022, is forecast to increase from its 2022 level of 209,540 aircraft to 228,975 by 2044, as the declines in the fixed-wing piston fleet are offset by increases in turbine, rotorcraft, experimental, and light sport fleets. Total active general aviation fleet grows by a small increase of 0.4 percent annually.

The more expensive and sophisticated turbine-powered fleet (including rotorcraft) is projected to grow by 18,480 aircraft between 2022 and 2044 to total 52,340 in 2044, an average growth rate of 2.0 percent a year during this period, with the turbojet fleet increasing 2.6 percent a year. When measured from the 2019 levels, the growth rate for the turbine-powered fleet is 2.0 percent per year, a total growth of 62.3 percent. The growth in U.S. GDP and corporate profits are catalysts for the growth in the turbine fleet.

The largest segment of the fleet, fixed wing piston aircraft, is predicted to shrink by 6,945

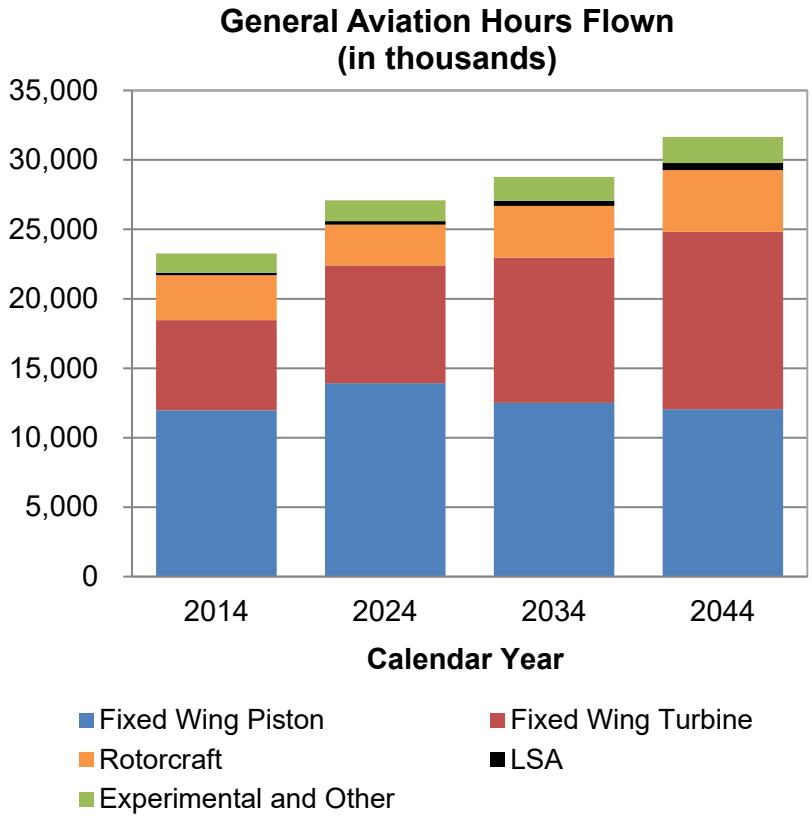
aircraft between 2022 and 2044, with an average annual growth rate of -0.2 percent. Unfavorable pilot demographics, overall increasing cost of aircraft ownership, availability of much lower cost alternatives for recreational usage, coupled with new aircraft deliveries not keeping pace with retirements of the aging fleet are the drivers of the decline.

On the other hand, the smallest category, light-sport-aircraft (created in 2005), is forecast to grow by 3.0 percent annually, adding about 2,439 new aircraft by 2044, nearly doubling its 2022 fleet size of 2,666.



Although the total active general aviation fleet is projected to marginally increase, the number of general aviation hours flown is forecast to increase an average of 0.7 percent per year through 2044; amounting to a total growth of 17.4 percent, from 27.0 million in 2022 to 31.6 million, as the newer aircraft fly more hours each year. Fixed wing piston hours are forecast to decrease at a slightly faster rate than the fleet, an average of 0.8 percent a year, because most of the fleet, 61.1 percent, is expected to be 60 years of age or older by 2044 when we apply average attrition rates by age groups from the GA surveys of past 14 years (in 2022, 22.5 percent of the fixed wing piston aircraft were 60 years or older). Countering this trend, hours flown by turbine aircraft (including rotorcraft) are forecast to increase 2.1 percent yearly between 2022 and 2044. Jet aircraft account for most of the increase, with hours flown increasing at an average

annual rate of 2.5 percent during this period. The large increases in jet hours result mainly from the increasing size of the business jet fleet.



Rotorcraft activity, positively impacted by increases in oil prices, associated oil exploration and increasing additional and replacement demand through growing passenger transfer and Emergency Medical Services (EMS) sectors helped rotorcraft deliveries improve in 2022. Potential effects of Advanced Air Mobility (including electric vertical take-off and landing-- eVTOLs) in the later years of the forecast period are too uncertain yet to include in the forecast. The active fleet of rotorcraft is projected to grow at a slightly faster rate compared to the previous year's forecast, 1.7 percent a year, driven by higher growth in the turbine segment, going from a total of (piston and turbine together) 9,769 in 2022 to 14,025 in 2044. Rotorcraft hours are projected to grow by 2.2 percent annually during this period.

Lastly, the light sport aircraft category is forecasted to see an increase of 3.6 percent a year in hours flown, primarily driven by growth in the fleet.

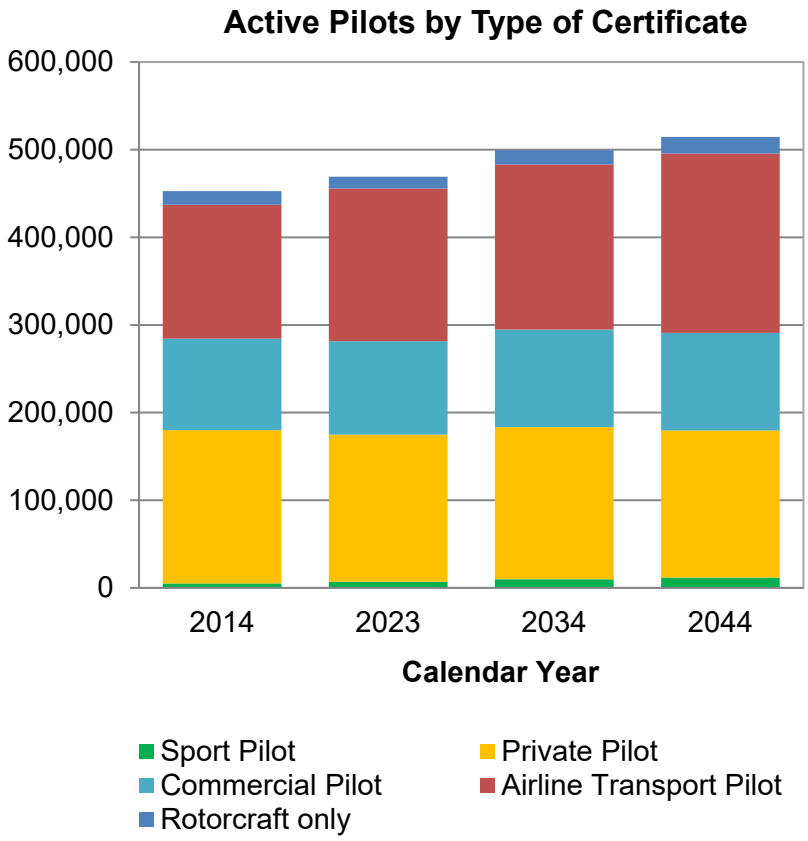
The FAA also conducts a forecast of pilots by certification categories, using the data compiled by the Administration's Mike Monroney Aeronautical Center. There were 806,940 active pilots certificated by FAA at the end of 2023. The number of certificates in most pilot categories continued to increase, while there was an expected decline in the recreational pilot certificate that only 71 pilots carry. The

FAA suspended the student pilot forecast since 2018. The number of student pilot certificates has been affected by a regulatory change that went into effect in April 2016 and removed the expiration date on the new student pilot certificates. The number of student pilots jumped from 128,501 at the end of 2016 to 149,121 by the end of 2017, and to 316,470 at the end of 2023. The 2016 rule change generates a cumulative increase in the certificate numbers and breaks the link between student pilot and advanced certificate levels of private pilot or higher. There is no sufficient data to perform a reliable forecast for the student pilots.

Commercial and air transport pilot (ATP) certificates have been impacted by a legislative change as well. The Airline Safety and Federal Aviation Administration Extension Act of 2010 mandated that all Part 121 (scheduled airline) flight crew members would hold an ATP certificate by August 2013. Airline pilots holding a commercial pilot certificate and mostly serving at Second in Command positions at the regional airlines could no longer operate with only a commercial pilot certificate after that date, and the FAA data initially showed a faster decline in commercial pilot numbers, accompanied by a higher rate of increase in ATP certificates. The number of commercial pilot certificates started to increase since 2017 and with an increase of 2.1 percent reached 106,711 in 2023. While the ATP certificate holders increased every year since 2011, significantly reduced number of flights and a large number of parked aircraft due to the pandemic generated an overcapacity for the ATPs employed by the airlines, despite government support to the aviation sector. Consequently, the number of pilots holding an ATP certificate declined in 2020 and 2021 but started to rise again in 2022 and reached to 174,113 in 2023, a 4.4 percent increase from the previous year (5.6 percent higher than their 2019 level). New commercial pilot and ATP certificates earned in 2023 were at their highest level ever.

Private pilots had stabilized their decline since 2016 at around 162,000 by 2020 and continued their increase in 2023 by 2.2 percent, from 164,090 in the previous year to 167,711. Sport pilot certificates, created in 2005, kept their steady increase since their inception to reach 7,144 by December 31, 2023. Rotorcraft pilots reversed their decline since 2016, scoring a growth rate of 1.9 percent to end up with 13,428 by the end of 2023.

The number of active general aviation pilots (excluding students and ATPs) is projected to increase slightly between 2023 and 2044 from 316,357 to 334,290 (0.3 percent annually). The ATP category is forecast to increase by 30,590 (up 0.8 percent annually). The much smaller category of sport pilots is predicted to increase by 2.5 percent annually over the forecast period. Private pilot certificates are projected to remain flat between 2023 and 2044, while commercial pilot certificates are projected to increase at an average annual rate of 0.2 percent over the forecast horizon.


Active Pilots by Type of Certificate
600,000
500,000
400,000
300,000
200,000
100,000
0
2014
2023
2034
2044
Calendar Year
Sport Pilot
Private Pilot
Commercial Pilot
Airline Transport Pilot
Rotorcraft only

FAA Operations

The traffic at FAA facilities underwent drastic changes during the period of 2019 and 2020 from the COVID-19 impact. There was 16.7 percent decline in traffic from 53.3 million in 2019 to 44.4 million in 2020. Activity increased 3.4 percent in 2023, completing the recovery from the COVID-19 downturn. Airport operations at FAA and contract towers totaled 54.5 million, exceeding the 2019 total of 53.7 million. While domestic markets led the way for the recovery from 2020 to 2021, international markets began to pick up steam in 2022 and continued their strong recovery in 2023. By September 2023, both domestic and international passenger volumes on U.S. airlines had exceeded 100% of the pre-COVID-19 level.

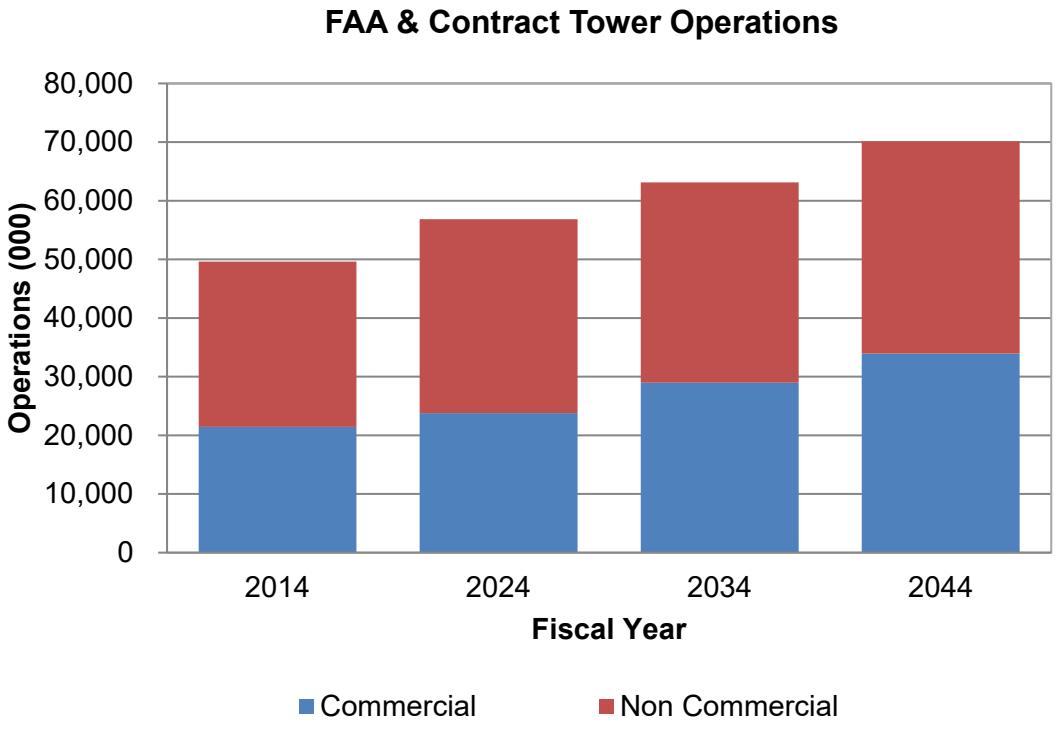
In the long run, economic the growth in air travel demand and the business aviation fleet will drive the long-term growth in operations at FAA facilities over the rest of the forecast period. Activity at FAA towers and contract towers is projected to increase at an average rate of 1.1 percent a year through 2044 from 56.8 million in 2024 to 70.1 million in 2044. The 1.1 percent annual growth forecast is similar to the 1.2 percent forecast for 2023-2043 last year. Commercial operations[4] at these facilities are forecast to increase 1.8 percent a year, approximately four times faster than non-commercial operations. The growth in commercial operations is less than the growth in U.S. airline passengers (1.8 percent versus 2.6 percent) over the forecast period due primarily to larger aircraft (seats per aircraft mile) and higher load factors. Both trends allow U.S. airlines to accommodate more passengers without increasing the number of flights.

General aviation operations are forecast to increase an average of 0.5 percent a year as increases in turbine powered activity more than offset declines in piston activity. General aviation operations accounted for 55 percent of total operations in 2023. This is slightly higher than pre-COVID share of 51 percent in 2019. The decline of general aviation traffic was relatively mild during the early years of the pandemic where recovery speed was swift.

The growth in operations at towered airports is not uniform. Most of the activity at large and medium hubs[5] is commercial in nature, as these are the airports where the vast majority (about 89 percent in 2023) of the passenger enplanements in the U.S. occur.

[4] Commercial operations include air carrier and commuter/air taxi operations.

[5] A large hub is defined to have 1 percent or more of total U.S. revenue passenger enplanements in FY 2022. A medium hub is defined to have at least 0.25 percent but less than 1 percent of total U.S. revenue passenger enplanements. In the 2022 TAF there were 30 large hub airports and 34 medium hub airports.



Given the growth in airline demand and most of that demand is at large and medium hubs, activity at the large and medium hubs is forecast to grow substantially faster than smaller airports including small FAA towers[6] and FAA contract towers[7]. The forecasted annual growth in operations is 2.0 percent at large hubs, 1.6 percent at medium hubs, 0.9 percent at small FAA towers, and 0.5 percent at FAA contract towers between 2024 and 2044.

Among the 31 large hubs, the airports with the fastest long-term annual growth forecast are those located along the coastal sections of the country where most large cities are located. Large cities have historically generated robust economic activity, which in turn drives up the airline demand. On the other hand, many of the large hub airports located in the middle of the country are forecast to have slower long-term annual growth. In terms of COVID-19 recovery, the airports with mostly domestic traffic and located at popular leisure destinations have had stronger recoveries.

FAA Tracon (Terminal Radar Approach Control) Operations[8] are forecast to grow slightly faster than at towered facilities. This is in part a reflection of the different mix of activity at

[6] Small FAA towers are defined as towered airports that are neither large or medium hubs nor FAA contract towers.

[7] FAA contract towers are air traffic control towers providing air traffic control services under contract with FAA, staffed by contracted air traffic control specialists.

[8] Tracon operations consist of itinerant Instrument Flight Rules (IFR) and Visual Flight Rules (VFR) arrivals and departures at all airports in the domain of the Tracon as well as IFR and VFR overflights.

Tracons. Tracon operations are forecast to increase an average of 1.3 percent a year between 2024 and 2044. Commercial operations accounted for approximately 57 percent of Tracon operations in 2023 and are projected to grow 1.8 percent a year over the forecast period. General aviation activity at these facilities is projected to grow only 0.4 percent a year over the forecast.

The number of IFR aircraft handled is the measure of FAA En-Route Center activity. Growth in airline traffic is expected to lead to increases in activity at En-Route centers. Over the forecast period, aircraft handled at En-Route centers are forecast to increase at an average rate of 1.9 percent a year from 2024 to 2044, with commercial activity growing at the rate of 2.1 percent annually. Activity at En-Route centers is forecast to grow faster than activity at towered airports and FAA Tracons because more of the activity at En-Route centers is from the faster growing commercial sector and high-end (mainly turbine) general aviation flying.[9] In 2023, the share of commercial IFR aircraft handled at FAA En-Route centers is about 81 percent, which is greater than the 57 percent share at Tracons or the 41 percent share at FAA and Contract Towers.

[9] Much of the general aviation activity at towered airports, which is growing more slowly, is local in nature, and does not impact the centers.

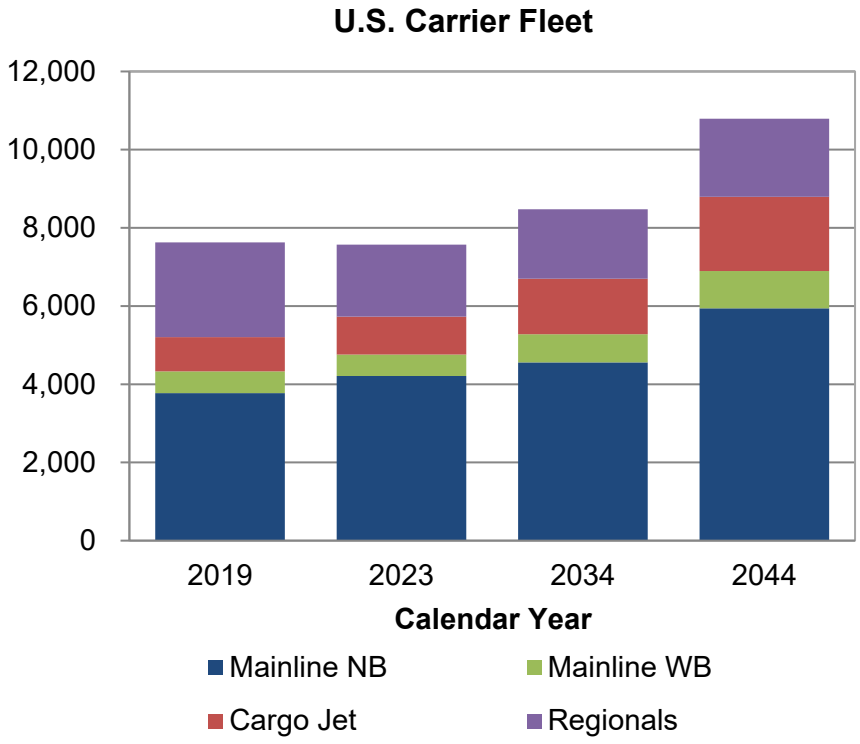
U.S. Commercial Aircraft Fleet

Boosted by the continuing recovery in demand for air travel and cargo, the number of aircraft in the U.S. commercial fleet grew by 11 percent in 2022-23 (an increase of 720 aircraft). The total number of commercial aircraft is forecast to increase from 7,572 in 2023 to 10,793 in 2044, an average annual growth rate of 1.7 percent a year. The continued recovery in demand from the COVID-19 downturn along with long-term post-COVID increases in demand for air travel and growth in air cargo is expected to fuel increases in both the passenger and cargo fleets.

Between 2023 and 2044 the number of jets in the U.S. mainline carrier fleet is forecast to grow from 4,832 to 6,894, a net average of 98 aircraft a year as carriers continue to remove older, less fuel-efficient narrow body aircraft. As the industry continues its recovery from the COVID-19 downturn, increasing utilization rates, production issues and continuing supply chain constraints are all hampering near term growth. These factors result in slight declines in the narrowbody fleet (including E-series aircraft as well as A220-series at JetBlue and A220-series at Delta) into the second half of the decade. Into the 2030s, the fleet sees solid increases averaging 138 aircraft per year as carriers replace current technology 737 and A320 family aircraft with the next generation MAX and Neo families. The wide-body fleet grows by an average of 19 aircraft a year as carriers add 777-8/9, 787's, A350's to the fleet while retiring 767-300/400, A330-200/300 and 777-200 aircraft. In total the U.S. passenger carrier wide-body fleet increases by 2.6 percent a year over the forecast period.

The regional carrier fleet is forecast to increase from 1,772 aircraft in 2023 to 2,000 in 2044 as the fleet expands by 0.6 percent a year (11 aircraft) over that period. Carriers remove 50 seat regional jets and retire older small turboprop and piston aircraft, while adding 70-90 seat jets, especially the E-2 family in the 2030s. By 2044, the number of jets in the regional carrier fleet totals 1,813, up from 1,436 in 2023. The turboprop/piston fleet is forecast to shrink by 44% from 336 in 2023 to 187 by 2044. These aircraft account for 9.3 percent of the regional fleet in 2044, down from 19.0 percent in 2023.

The cargo carrier large jet aircraft fleet is forecast to increase from 968 aircraft in 2023 to 1,899 aircraft in 2044 driven by the growth in freight RTMs. The narrow-body cargo jet fleet is projected to increase on net by just 3 aircraft a year as 737-800/900MAX's are converted from passenger use to cargo service as older 757-200's are retired. The wide body cargo fleet is forecast to increase 42 aircraft a year as new 777-8 and converted 767-300 aircraft are added to the fleet, replacing older MD-11, A300, and 747-400 freighters.


U.S. Carrier Fleet
12,000
10,000
8,000
6,000
4,000
2,000
0
2019
2023
2034
2044
Calendar Year
Mainline NB
Mainline WB
Cargo Jet
Regionals