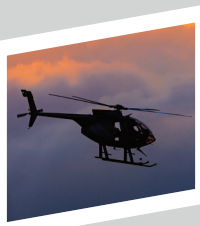
Federal Aviation Administration



FY2024-2044

FAA AEROSPACE FORECAST

Table of Contents

Forecast Highlights (2024–2044) 1
Review of 2023 6
Glossary of Acronyms 8
Acknowledgements 10
FAA Aerospace Forecasts 11
Economic Environment 12
U.S. Airlines 15
Domestic Market 15
International Market 19
System 25
Cargo 26
General Aviation 28
FAA Operations 34
U.S. Commercial Aircraft Fleet 37
Commercial Space 39
Regulatory Safety Oversight Activities of FAA 40
FAA's Launch and Reentry Operations Forecast 42
Additional Factors Affecting Forecast Accuracy 43
Emerging Aviation Entrants: Unmanned Aircraft System and Advanced Air Mobility 46
New Entrants: Analysis and Forecasts 46
Small Recreational UAS 47
Commercial/Non-Model Aircraft 49
Remote Pilots 52
Large UAS 52
Advanced Air Mobility 54
Forecast Uncertainties 59
Appendix A: Alternative Forecast Scenarios 64
Scenario Assumptions 64
Alternative Forecasts 68
Enplanements 68
Revenue Passenger Miles 69
Available Seat Miles 69
Load Factor 70
Yield 71
Appendix B: Forecast Tables 76

Forecast Highlights (2024–2044)

The U.S. commercial air carrier industry experienced a decade of relative stability, unprecedented in modern times, that extended from the end of the great recession in 2009 up to 2020 when COVID-19 emerged. During that period, U.S. airlines revamped their business models to minimize losses by lowering operating costs, eliminating unprofitable routes, and grounding older, less fuel-efficient aircraft. To increase operating revenues, carriers initiated new services that customers were willing to purchase and started charging separately for services that were historically bundled in the price of a ticket. The results of these efforts were impressive: 2019 marked the eleventh consecutive year of profitability for the U.S. airline industry.

The outbreak of the COVID-19 pandemic in 2020, however, brought a rapid and cataclysmic end to those boom years. Airline activity and profitability tumbled almost overnight and without the financial and competitive strength built up during the boom, airlines would have faced even greater challenges. As it was, they were able to slash capacity and costs, and then, relying on their balance sheets, credit ratings and value inherent in their brands, to raise capital through borrowing and restructuring fleets allowing them to withstand the period of losses. Although several small regional carriers ceased operations in 2020, no mainline carriers did. Cargo activity was one of few bright spots as it surged, boosted by consumers purchasing goods to enhance time spent at home as necessitated by the pandemic, and by surface transportation disruptions caused by worker shortages due to COVID-19 illnesses.

In 2022, each passenger carrier across the industry continued to face generally similar headwinds and tailwinds as the others. Demand for travel to leisure destinations domestically and in the Latin region surged. Carriers were caught off guard and struggled to bring aircraft back into service, open new routes and hire staff to meet the demand. Just as all carriers were impacted by the challenges, they also generally all benefitted from the resurgent desire to travel and the two-year string of quarterly losses for the industry was halted.

Then in 2023 the landscape changed again. As a wider array of accessible destinations opened up, travelers responded by seeking flights across the Atlantic and to some Pacific markets. Domestic and Latin activity remained solid, but it didn't match the increases of those other regions or of its own growth the year before. Besides that regional shift, passengers also began to embrace premium offerings and loyalty programs more fully. Increasingly, passengers were willing to pay for some additional comfort and valued the ability to convert everyday credit card purchases into airline miles. These shifts and greater demand for product differentiation meant that most LCCs, with single-class service and domestic-heavy networks, were unable to capture demand to the extent the mainline carriers could. Furthermore, after being unprepared for the surge in demand in the previous year, all carriers hired and added capacity aggressively in 2023 in efforts to avoid a repeat. This saw flight crews migrating up the chain to mainline carriers and the added capacity put downward pressure on fares in many domestic markets, both of which

added to the strains some, but not all, carriers faced. Aircraft delivery delays and manufacturing missteps also worked asymmetrically to dampen productivity of some airlines but not others.

Even as carriers worked to accurately assess shifting preferences and fine tune the supply response, the overall level of demand was strong and supportive of the industry's aggregate results. Consumer demand for experiences over goods continued to fuel the desire for leisure trips and a willingness to pay higher fares that exceeded their 2019 levels. Meanwhile, business travel (but not fares) remained depressed relative to 2019. For the year, business demand was roughly ten to twenty percent below its pre-pandemic level. The strong overall demand led to positive aggregate financial results but with losses at some carriers. For all of CY2023, the top eight U.S. passenger carriers posted operating profits of $12.7 billion and net profits of $8.0 billion, including losses at three of the eight.

The business modifications necessitated by the downturn will shape the industry for years to come, long after the recovery is complete. Primarily, airlines will be smaller having retired aircraft and encouraged voluntary employee separations. Fleets, however, become younger and more fuel-efficient as retirements targeted the oldest and the least efficient aircraft.

In the medium-term, airlines will strive to determine which shifts in demand that occurred following the pandemic will be long-lasting and which will fade as impacts of the pandemic recede. For example, the surge in demand for travel to Florida and Caribbean leisure destinations seems to be waning and reverting to pre-pandemic levels. Similarly, the changes to travel patterns – both day-of-week and time-of-day – due to fewer business trips and more hybrid business and leisure trips have been partially unwound but may not fully revert. On the other hand, many carriers are investing in premium cabins with the expectation that customers will continue to be willing to pay for upgraded experiences. Although that willingness has been very evident during the past two years, it is not certain to continue. Furthermore, trade tensions that emerged during the pandemic have weighed on some international traffic, particularly to China and other parts of Asia. This will likely continue to lag activity in other regions, but the duration is unknown.

In the long run, many of the strengths and capabilities developed over during decade between the end of the great recession and the onset of COVID-19 will become evident again. There is confidence that the U.S. airline industry as a whole has finally transformed from a capital intensive, highly cyclical industry to an industry that can generate solid returns on capital and sustained profits.

Fundamentally, over the long-term, aviation demand is driven by economic activity, and a growing U.S. and world economy provides the basis for aviation to grow. The 2024 FAA forecast calls for U.S. carrier domestic passenger growth over the next 20 years to average 2.5 percent per year. This average, however, includes robust growth in 2024, as activity returns to pre-pandemic levels. Following the recovery period, trend rates resume with average growth through the end of the forecast of 2.3 percent. Annual domestic passengers in 2024 are forecast to exceed 2019 levels by 6 percent.

After averaging $55 per barrel over the five years ending in 2021, oil prices surged to $93 per barrel with the Russian invasion of Ukraine in 2022 but then moderated to $78

dollars per barrel in 2023. Prices are forecast to remain at about that level for a few years before climbing slowly to reach $107 per barrel at the end of the forecast period.

Just as U.S. economic activity drives domestic demand for air transport, foreign economic activity affects international travel demand. In 2021, global real GDP rose above 6 percent, driven by worldwide pandemic relief programs. As central banks raised interest rates to restrain inflation caused by demand imbalances, growth moderated to 2.7 percent in 2023. The forecast for growth in 2024 is for a continued slight slowing to 2.3 percent. The U.S. and the Latin America region slow somewhat below that level but Europe experiences much slower growth with some individual countries seeing outright declines. The Asia region, however, supports the global figure with growth over 4 percent. Beginning in 2025, global growth returns close to trend rates although some individual countries take longer.

System traffic in revenue passenger miles (RPMs) is projected to increase by 2.7 percent a year between 2024 and 2044. Domestic RPMs are forecast to grow 2.6 percent a year while International RPMs are forecast to grow slightly faster at 2.8 percent a year, as international RPMs have almost fully recovered to pre-COVID (2019) levels in FY2023. Thus, unlike prior forecasts, these figures will not be boosted by several years of high growth rates coming off the low levels of 2021 and 2022. System capacity as measured by available seat miles (ASMs) is forecast to grow somewhat slower than RPM during the recovery period as airlines seek to restore load factors but, subsequently, ASM grow in line with the increases in demand.

After U.S. carriers posted profits in FY 2023, the FAA expects U.S. carriers to remain profitable over the next few years as rising demand -- despite higher fares -- more than offsets higher costs for labor and fuel. As carriers return to levels of capacity consistent with their fixed costs, shed excess debt, and yields stabilize, consistent profitability should continue. Over the long term, we see a competitive and profitable aviation industry characterized by increasing demand for air travel and airfares growing more slowly than overall inflation, reflecting growing U.S. and global economies.

Recovery of the general aviation (GA) sector from the impact of the COVID-19 crisis was faster than the airlines. Private aviation had become an attractive substitute for wealthier individuals who could afford to pay during the heaviest times of the pandemic. Some reversal in this trend has been observed among the turbojet users offering rides to extended family and friends, even though many of these newcomers continue to fly privately. At the lower end of the general aviation use, mostly by single engine piston powered aircraft, we see highest numbers in the past three decades attracted to flying and becoming student pilots, and highest numbers among them since 1995 earning their private pilot certificates. Other pilots contributing to GA activity more than ever included private pilots earning their commercial pilot certificates and commercial pilots becoming Air Transport Pilots (ATP) as the new pilot certifications in these two categories reached new peaks in 2023. The long-term outlook for general aviation thus is promising, as growth at the higher-end offsets continuing retirements at the traditional low end, mostly piston-powered part of the sector. The active GA fleet is forecast to increase by 9.0 percent between 2024 and 2044. The turbine aircraft fleet, including rotorcraft, did not show a decline

between 2019 and 2022, and in fact, experienced a fast growth of 3.6 percent from 2021 to 2022. This fleet is projected to have an average growth rate of 2.0 percent per year during the forecast period. The total piston fleet (single and multi-engine pistons, light-sport aircraft, and piston rotorcraft) declined by 2.7 percent between 2019 and 2022 and is estimated to have shrunk by an additional 0.4 percent in 2023. The average annual growth rate of the piston fleet between 2023 and 2044 is forecast to be -0.1 percent. Including experimental aircraft, the majority of which are pistons, the growth rate of the combined fleet is flat over the forecast period, with a total growth of less than one percent in 21 years. While steady growth in both GDP and corporate profits results in continued growth of the turbine and rotorcraft fleets, the largest segment of the fleet – fixed wing piston aircraft will continue to shrink over the forecast period, just to be offset by the growing experimental aircraft fleet. Any additional growth in the GA fleet is expected to occur in turbine aircraft. Despite average annual growth of the active GA fleet between 2022 and 2044 of 0.4 percent, the number of GA hours flown is projected to increase by 17.4 percent during this period (an average of 0.7 percent per year), as growth in turbine, rotorcraft, and experimental hours more than offset declines in fixed wing piston hours.

With robust air travel demand growth in 2024 and steady growth thereafter, we expect increased activity growth that has the potential to increase controller workload. The continuing recovery in U.S. airline activity from the COVID downturn is the primary driver. The U.S. commercial aviation sector was hit by the pandemic much harder than the non-commercial sector. Operations at FAA and Contract Towers returned to pre-COVID levels in 2023 and are forecast to grow from these levels, led by strong growth in commercial operations. Large and medium hubs will continue to see faster increases than small and non-hub airports, largely due to the commercial nature of their operations. Over the entire forecast period, operations at FAA and contract towers are forecast to grow 1.1 percent a year with commercial activity growing at approximately four times the rate of non-commercial (general aviation and military) activity.

Commercial Space launch activity has been steadily growing over the past 5 years. FY2023 actuals were the highest in U.S. history at 113, accounting for 16.7% of the activity since 1989. FAA is forecasting launch and re-entry activity to increase from a low-high range of 134-156 in FY2024 to a low-high range of 195-338 by FY2028. Much of this increase is attributable to the lineup of reusable vehicles and the expectation for increased human space exploration and space tourism.

Drones have been experiencing healthy growth in the United States and around the world over the past decade. The last few years have been no exception despite the profound impact of COVID-19 on the overall economy. The introduction of drones in the NAS has opened numerous possibilities, especially from a commercial perspective. That introduction has also brought operational challenges including safe and secure integration of drones into the NAS. Despite these challenges, the drone sector holds enormous promise; potential uses range from individuals flying solely for recreational purposes to individual businesses carrying out focused missions to large companies delivering commercial packages and delivering medical supplies. Public service uses, such as conducting search and rescue support missions

following natural disasters, are proving to be promising as well. The FAA forecasts that the recreational small drone fleet will likely (i.e., base scenario) attain its peak over the next 5 years, from the present 1.78 million units to approximately 1.88 million units by 2028, thus attaining cumulative annual growth rate of 1.2% during 2023-2028. Based on registration data, the size of the commercial drone fleet (> 0.5 lbs. and up to 55 lbs.) totaled approximately 842,000 aircraft by the end of 2023. As the base (i.e., the cumulative total) increases, the FAA anticipates the growth rate of the sector to slow over time, and forecasts the commercial drone fleet to (i.e., base scenario) be about 1.12 million by 2028.

Another sector showing promise is Advanced Air Mobility (AAM). Based on research performed by others, the FAA believes that AAM will likely enter into service (EIS) in the 2025-2027 timeframe. Starting from limited services to initial launch cities, services will be experimental, slow, and likely gain a gradual trajectory of growth until 2030. We expect that initial 5 years or so will be required to resolve many outstanding issues including establishing solid AAM business cases. Depending upon the sector's resolving the outstanding issues, this will be followed by a moderate service trajectory during 2030-2040. Beyond that period, we anticipate a sustainable, mature sector on a longer-term growth trajectory.

Review of 2023

Three years after the start of the COVID-19 pandemic, its repercussions continued to be felt across the industry in 2023. Consumer spending continued to rebalance out of goods and into services, supporting demand for travel. Geographically, however, the reopening of countries across the Atlantic meant that demand surged there instead of in domestic markets as had happened the previous year. Although the Pacific region did not experience the same surge, it did see gradually increasing traffic. Another post-pandemic shift that continued was greater consumer preference for seats towards the front of the aircraft. Customers displayed a willingness to pay higher fares for these premium seats, whether preferred seating, premium economy, business or first class. On the capacity supply side, supply chain disruptions had still not dissipated, restraining the manufacture and delivery of new aircraft. In addition, some new headwinds emerged such as manufacturing missteps that impeded deliveries and operations. Nevertheless, carriers added capacity aggressively and by the end of the year, in many cases, found that excess capacity was suppressing yields and the ranks of new employees were depressing productivity. Demand for air travel was sufficiently strong, however, to boost industry profitability and that of individual carriers that could satisfy the evolving customer preferences.

Air cargo activity pulled back from the boost it received during the pandemic, consistent with the normalization of consumer spending from goods back into services. The general aviation segment saw growth in aircraft deliveries, although total flight hours were little changed from the year before. UAS activity grew solidly, and commercial space launches surged in 2023, both of which had expanded in 2022.

U.S. commercial passenger activity started the year within 5 percent of 2019 levels and by spring had achieved parity with 2019 levels. TSA checkpoint throughput increased from about 5 percent below 2019's level to about 3 percent above by the end of the year. The main source of strength throughout the year was from leisure travelers, with a surge in the summer driven by a pick-up in the Atlantic region, adding it to the domestic and Latin destinations that by the end of the year, exceeded 2019 levels. In the business segment, activity increased as many employees began to return to the office on a more regular basis and in-person meetings, conferences and trainings resumed.

After strong employment gains in 2022 that averaged nearly 5,000 per month as airlines rushed to accommodate the surge in demand that year, 2023 saw more muted growth in air travel and with it, slower employment gains. According to the Bureau of Transportation Statistics (BTS), airline employment rose during the year with average increase of about 1,000 jobs per month. At year end, employment was 47,000 higher than in December 2019 and most mainline carriers were adequately staffed. While regional carriers continued to have difficulty retaining and hiring pilots, both attrition and availability improved towards the end of the year. Across the industry, productivity continued to be hampered by onboarding and training requirements of the large number of new employees brought on

in the past three years. While the FAA met its hiring goal of 1,500 air traffic controllers in FY2023, shortages at some facilities remained and contributed to some operational restrictions.

In FY2023, system traffic as measured by revenue passenger miles (RPMs) grew 15.8 percent from the previous year while system enplanements rose 11.1 percent. Domestic RPMs were 9.6 percent higher while enplanements were up 9.7 percent. International RPMs increased by 36.3 percent after more than doubling in 2022, while enplanements rose by 22.6 percent – the relative difference due to the pickup in long-haul Atlantic markets. Despite being hampered by constraints, system ASM expanded by 12.9 percent with domestic ASM growing 8.8 percent and international up 25.3 percent. The disparate growth rates pushed the system-wide load factor up 2.1 percentage points to 83.7 percent.

System nominal yields continued to rise in 2023, up 8.0 percent after jumping up 31.0 percent in 2022. Several factors contributed, including on the supply side, a spike in labor costs and continued high oil prices, as well as constrained production. On the demand side, consumers were eager to travel and, in aggregate, tolerated the fare increases.

With the surge in activity during the year, financial results improved as well. Data for FY2023 shows that the reporting passenger carriers had a combined operating profit of $14.7 billion – a number approaching the average profit over the five years ending in FY2019 of $22.1 billion, but not beginning to recover the $58 billion in combined losses in 2020 and 2021. As with operations, profitability was uneven throughout the year as combined profits were just $26 million during the March quarter. On the other hand, strong activity during the June quarter generated profits of $7.7 billion that rivalled pre-pandemic highs.

The general aviation industry continued its growth in 2023 with an increase of 7.7 percent in deliveries of U.S. manufactured aircraft between 2022 and 2023 (18.8 above 2019 levels), with pistons up by 10.7 percent and turbines up by 4.3 percent. Global billings increased by 2.2 percent to $23.4 billion (0.6 percent below 2019 levels – statistics for U.S. billings were not available as of the publication date of this report).

Total operations in 2023 at FAA and contract towers increased by 3.7 percent compared to 2022 and exceed pre-COVID (2019) levels by 2.3 percent. Air carrier activity increased by 6.7 percent, while air taxi operations fell 1.0 percent. General aviation activity increased by 4.1 percent (the only segment with activity levels higher than 2019) and military activity was down by 8.6 percent. Activity at large and medium hubs rose by 3.9 percent and 0.7 percent, respectively, while small and non-hub airport activity rose by 4.0 percent in 2023 compared to the prior year.

Glossary of Acronyms

Acronym	Term
AAM	Advanced Air Mobility
ANG	FAA Office of NextGen
ARP	FAA Office of Airports
ASMs	Available Seat Miles
AST	FAA Office of Commercial Space Transportation
ATO	FAA Air Traffic Organization
ATP	Air Transport Pilot
AUVSI	Association for Unmanned Vehicle Systems International
BVLOS	Beyond Visual Line of Sight
CAPS	COA Application Processing System
CBP	Customs and Border Patrol
CFR	Code of Federal Regulations
COAs	Certification of Authorizations
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
CRS	Commercial Resupply Services
CY	Calendar Year
DARPA	Defense Advanced Research Projects Agency
DHS	Department of Homeland Security
DoD	Department of Defense
DoE	Department of Energy
DoI	Department of Interior
EIS	Entry Into Service
EMS	Emergency Medical Services
eVTOL	Electric Vertical Take-off and Landing
FAA	Federal Aviation Administration
FY	Fiscal Year
GA	General Aviation
GAMA	General Aviation Manufacturers Association
GC	Grand Challenge
GDP	Gross Domestic Product
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
IMF	International Monetary Fund
ISS	International Space Station
LAANC	Low Altitude Authorization and Notification Capability
LCC	Low-Cost Carriers
LSA	Light Sport Aircraft
lUAS	Large Unmanned Aircraft System(s)
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NDAA	National Defense Authorization Act
NOTAM	Notices to Airmen
NPRM	Notice of Public Proposed Rulemaking
PCE	Personal Consumption Expenditure
PDARS	Performance Data Analysis and Reporting Systems
RAC	Refiners' Acquisition Cost

RLV	Reusable Launch Vehicle
RP	Remote Pilot
RPA	Remote Pilot Authorization
RPMs	Revenue Passenger Miles
RTMs	Revenue Ton Miles
sUAS	Small Unmanned Aircraft System(s)
SpaceX	Space Exploration Technologies Corp.
TRACON	Terminal Radar Approach Control
TRB	Transportation Research Board
TSA	Transportation Security Administration
UAM	Urban Air Mobility
UAS	Unmanned Aircraft System(s)
UASFM	UAS facility maps
USD	United States Dollar
VFR	Visual Flight Rules

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FAA Aerospace Forecasts
Fiscal Years 2024-2044

Economic Environment

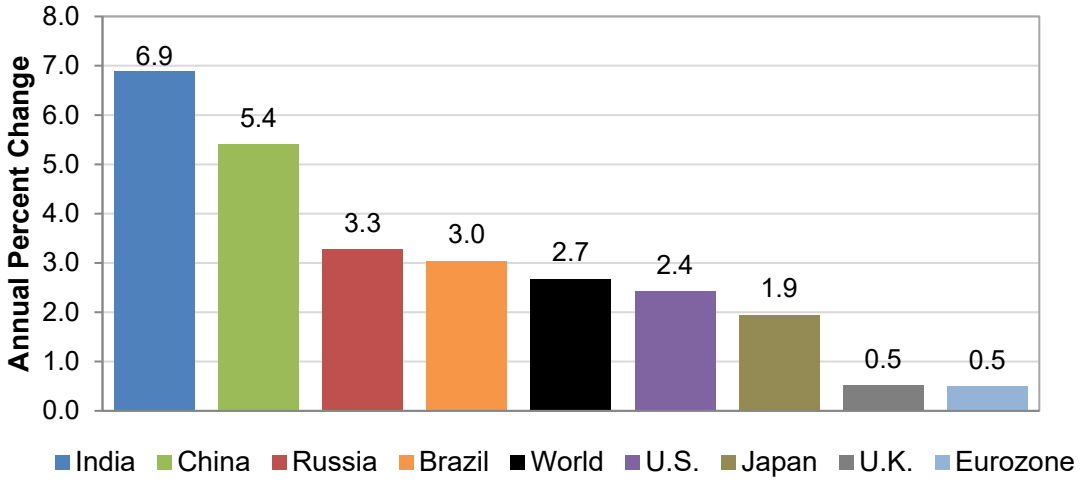
In 2023, global real GDP expanded but continued its gradual deceleration from the spike in the second year of the pandemic. GDP surged by 6.1 percent in 2021, slowed to 3.1 percent in 2022 and then slowed further in 2023, to 2.7 percent, a few tenths slower than the average over the decade prior to the 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

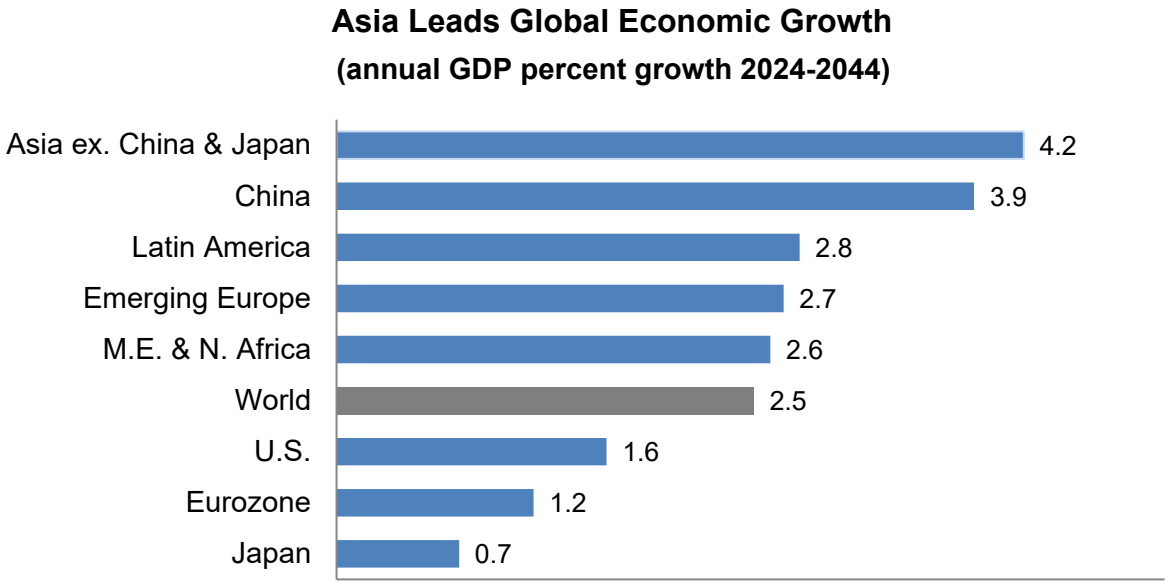
foreign companies and investment also contribute to the slowdown. Finally, India has seen strong expansion in both the manufacturing and services sectors, resulting in growth of 6.9 percent in 2023, easing through the second half of the decade. In the medium-term its growth will be driven by favorable 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



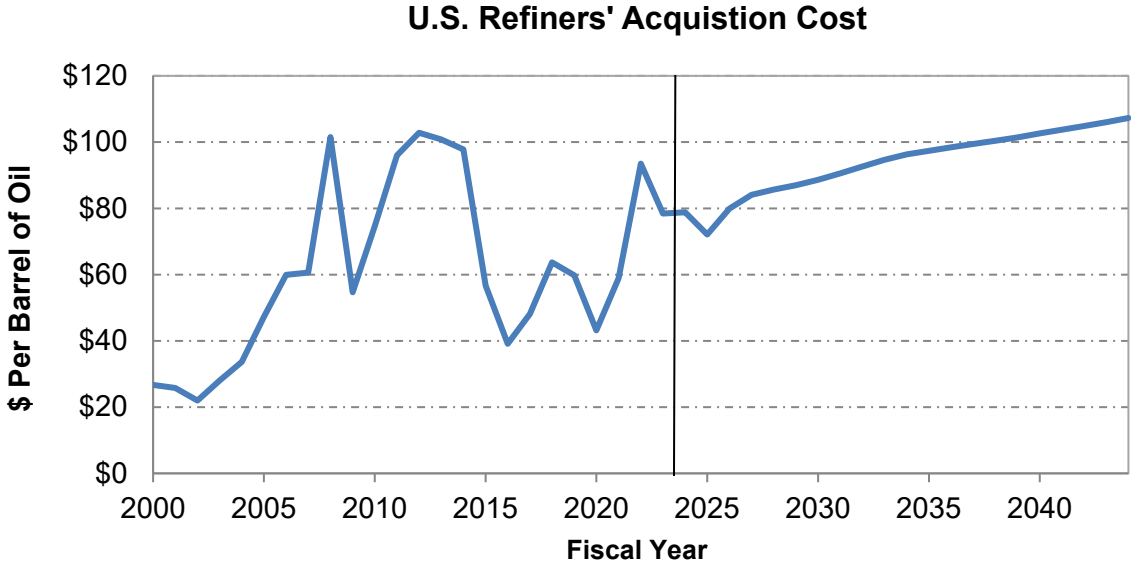
Source: S&P Global

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.

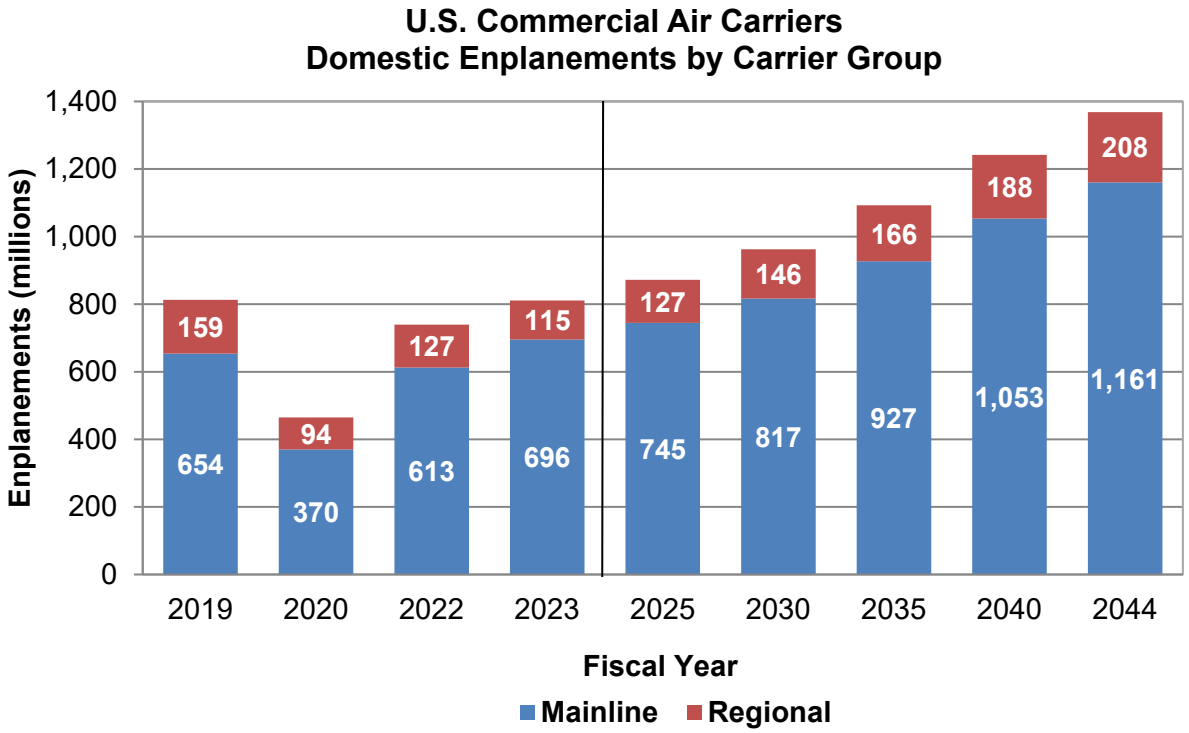
Air carriers' ability to manage capacity is further complicated by constraints that arose during the pandemic and that will take years to unwind. Hiring and training bottlenecks only began to be resolved in 2023 and have left carriers, regionals especially, short staffed for pilots as well as maintenance 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

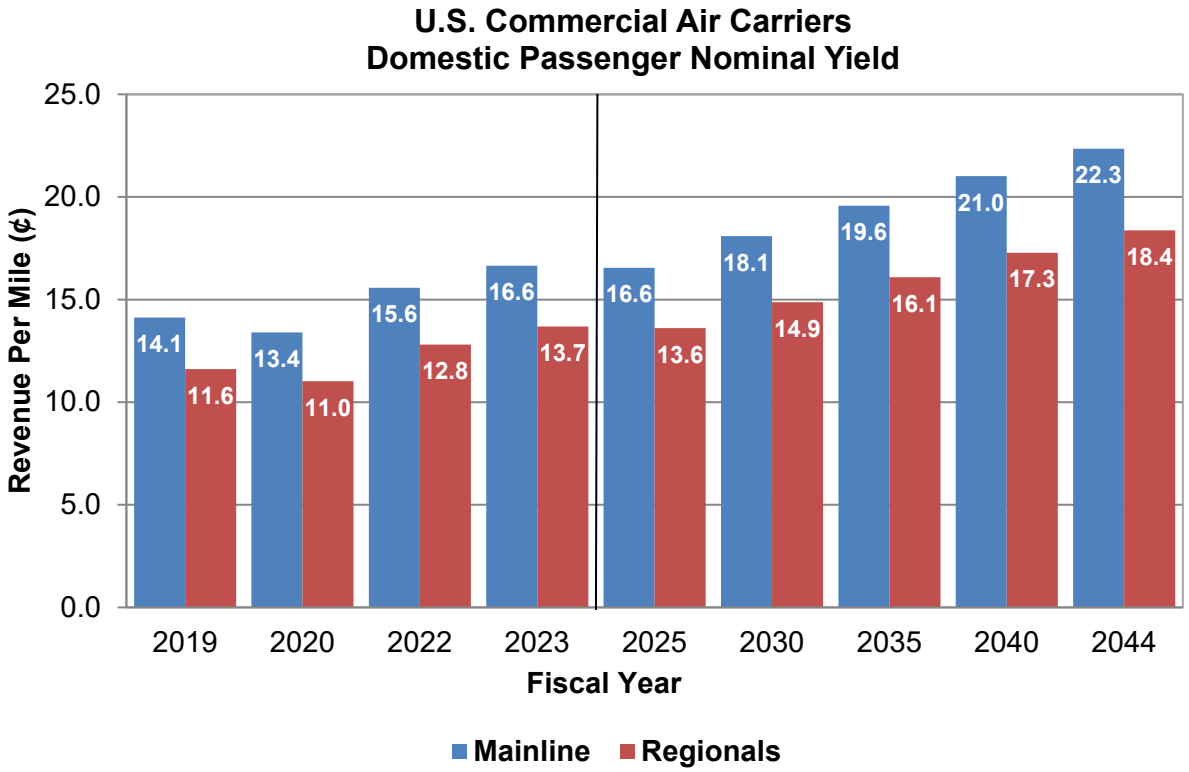
[1] Mainline carriers are defined as those providing service primarily via aircraft with 90 or more seats. Regionals are defined as those providing service primarily via aircraft with 89 or fewer seats and whose routes serve mainly as feeders to the mainline carriers.

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

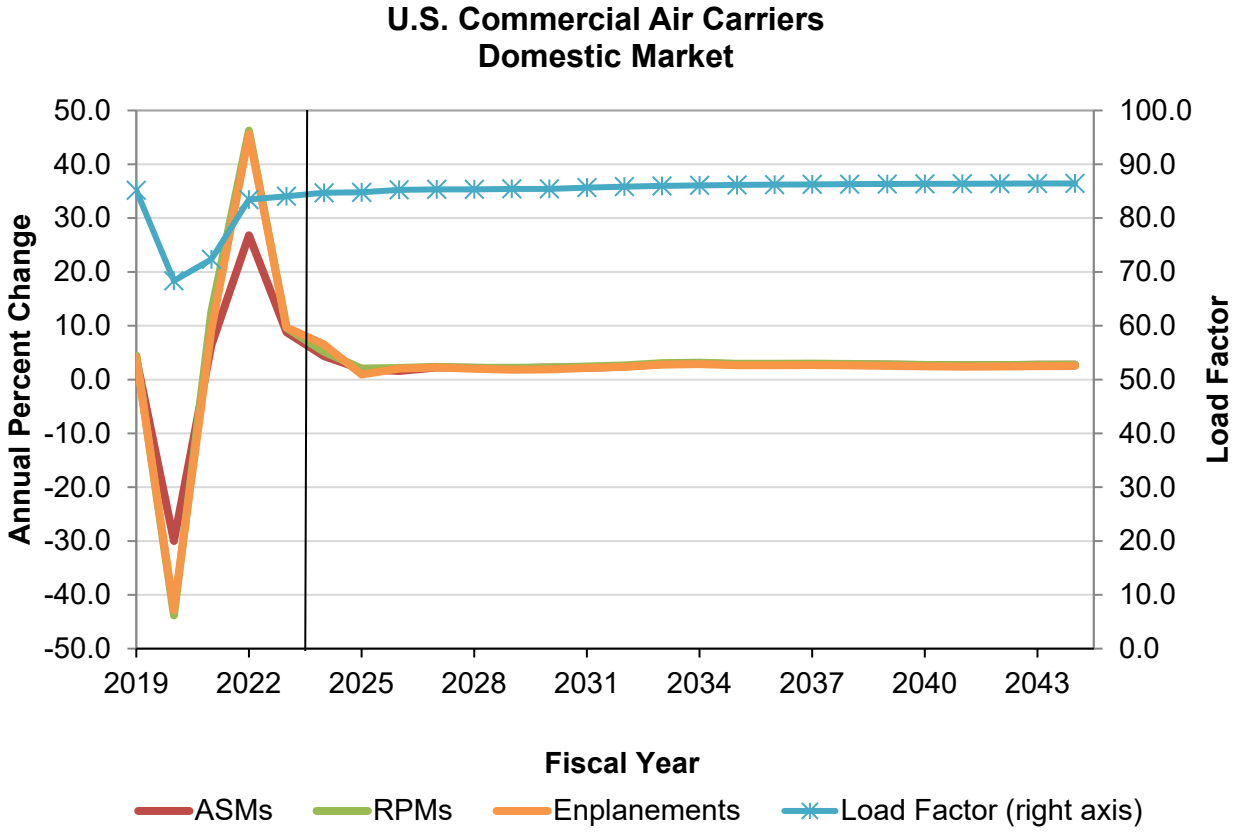
flew some of their idle long-haul international aircraft on domestic routes and then reallocated them to more typical markets. That aircraft positioning seemed to normalize in 2023 when seats per aircraft grew 1.1 percent.

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.

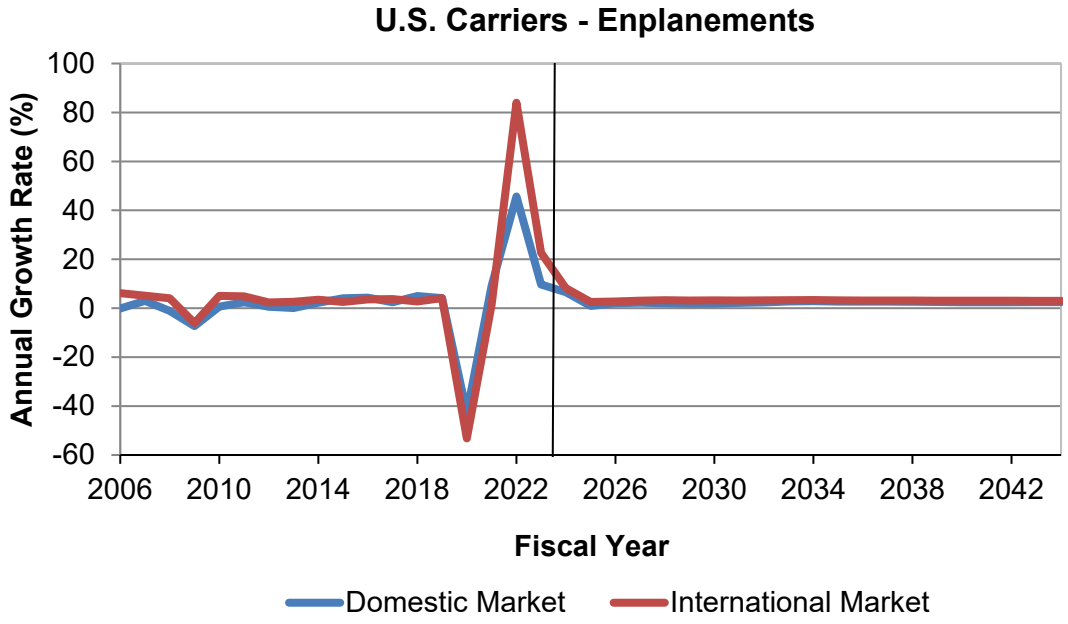
While revenue management systems will regain their important role once travel demand returns to more normal rhythms, one source of ancillary revenue, change fees, was broadly scrapped in 2020. As traveler plans were forced to change due to COVID-19-related restrictions, airlines began dropping fees for 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.

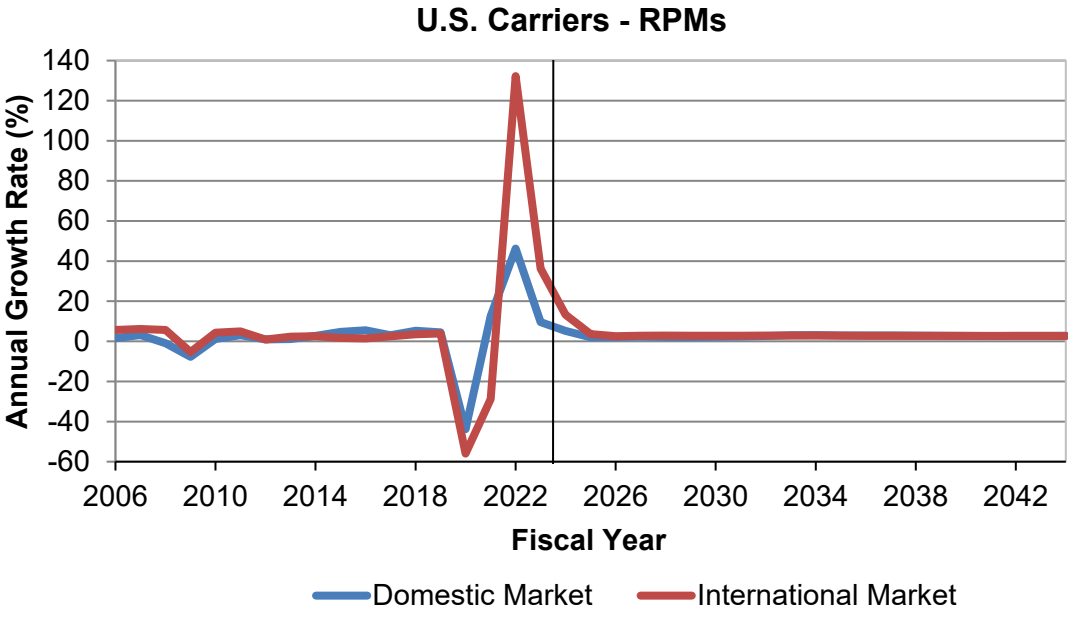
Other methods of segmenting passengers into more discreet cost categories based on comfort amenities like seat pitch, leg room, and access to social media and power outlets were unaffected by the pandemic. The offering of Basic Economy fares has been part of an effort by network carriers to protect market 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
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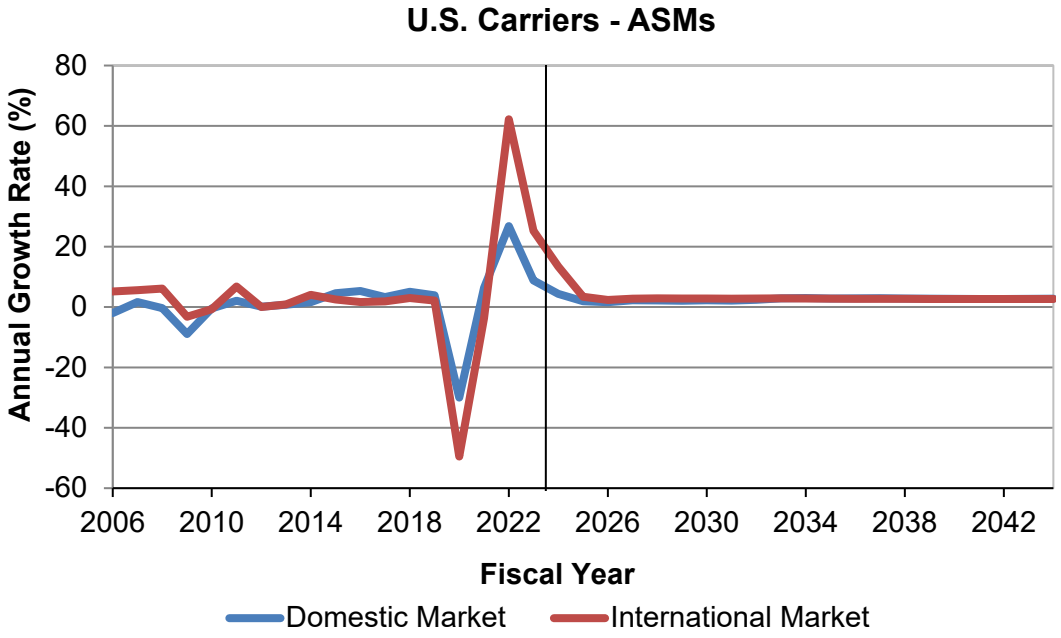
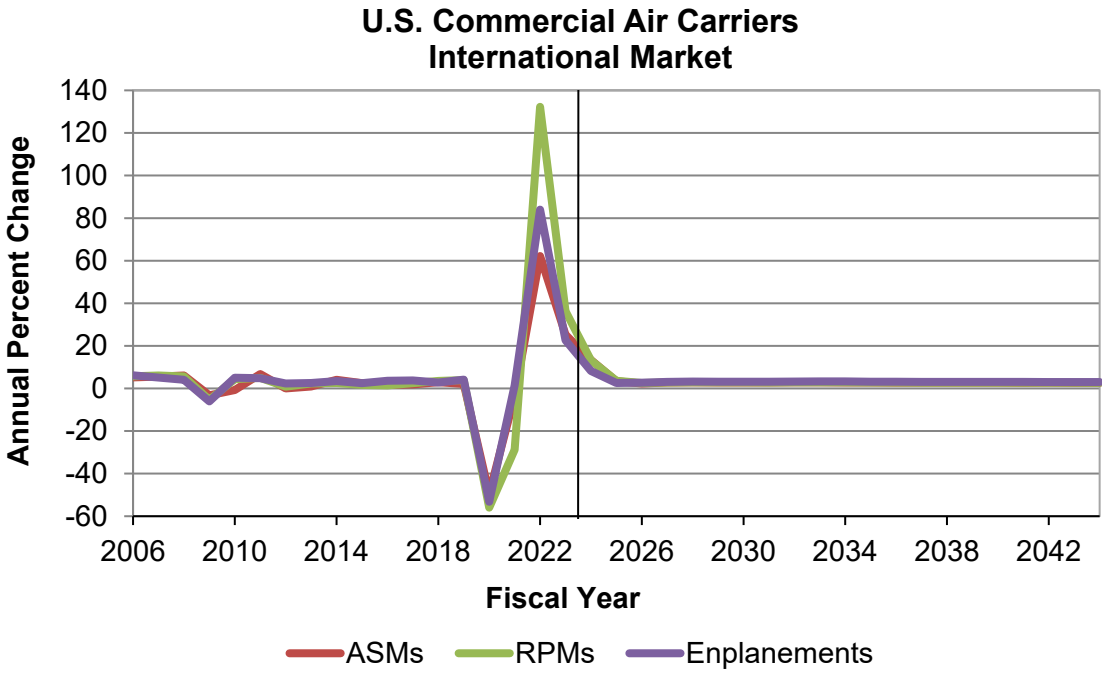
2042
Fiscal Year
Domestic Market
International Market



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.

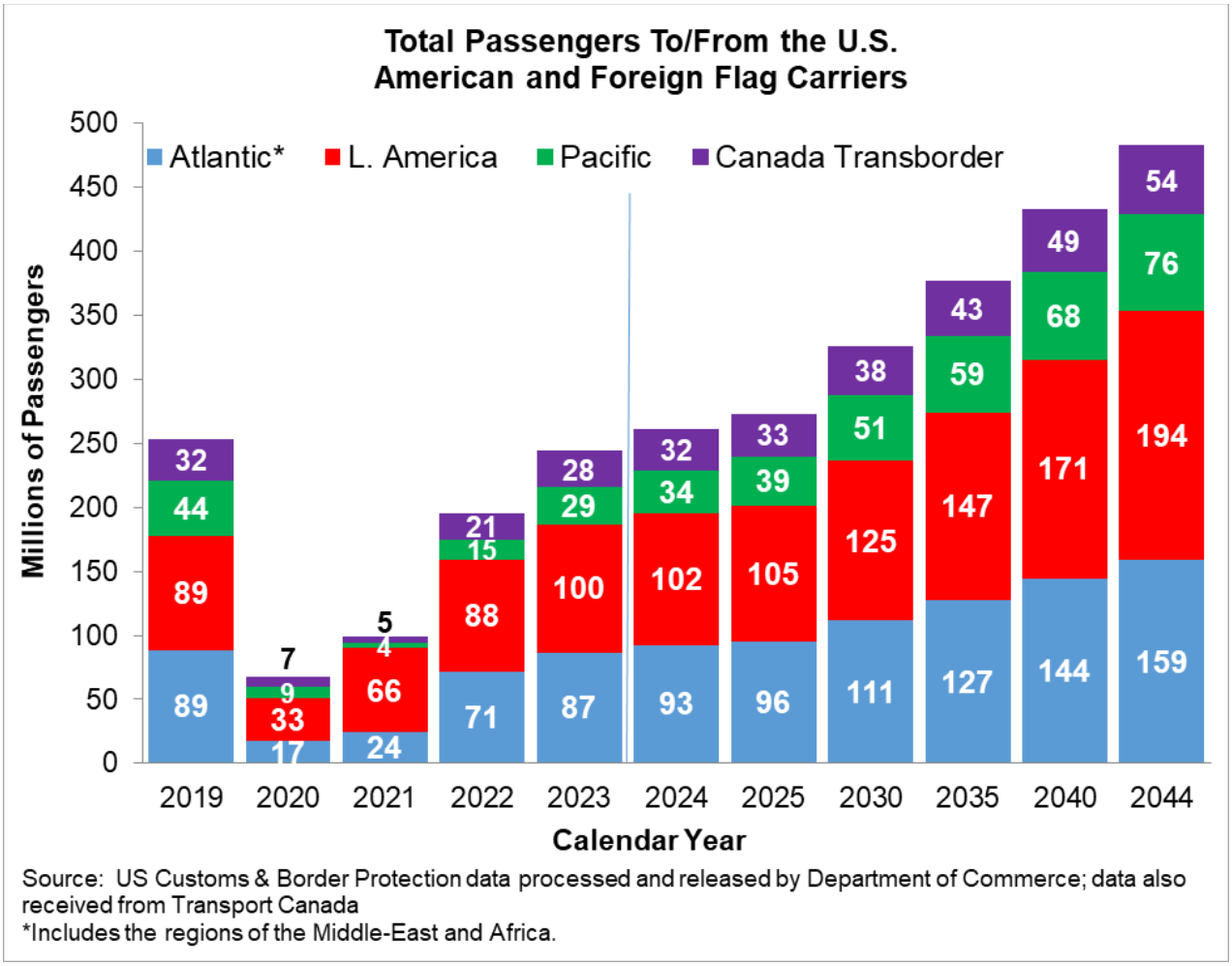
Pacific region passengers posted the strongest year-over-year growth of the four regions during 2023 (93.0 percent), but continue to fall short of the 43.8 million passengers in 2019. Passenger levels for this region are forecast to exceed pre-pandemic levels in 2027. During the first four years of the 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).

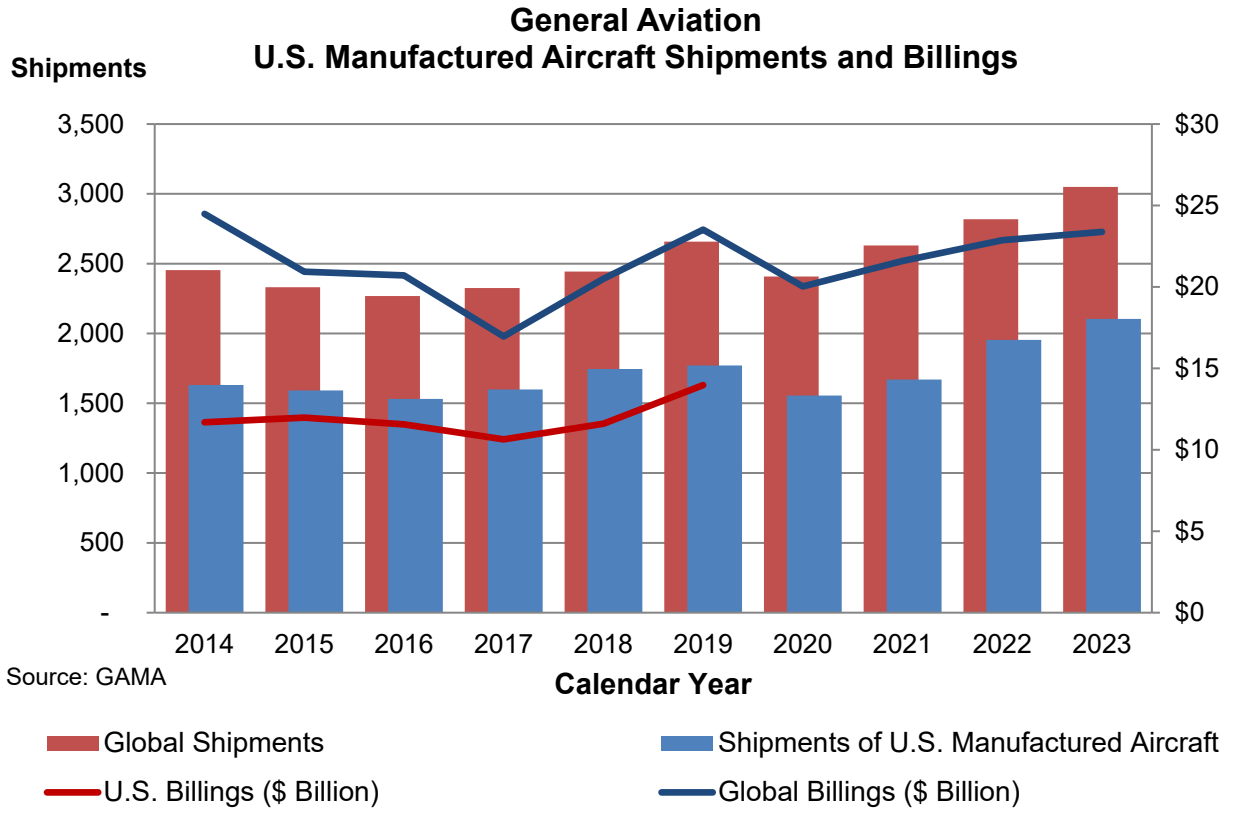
General Aviation

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.

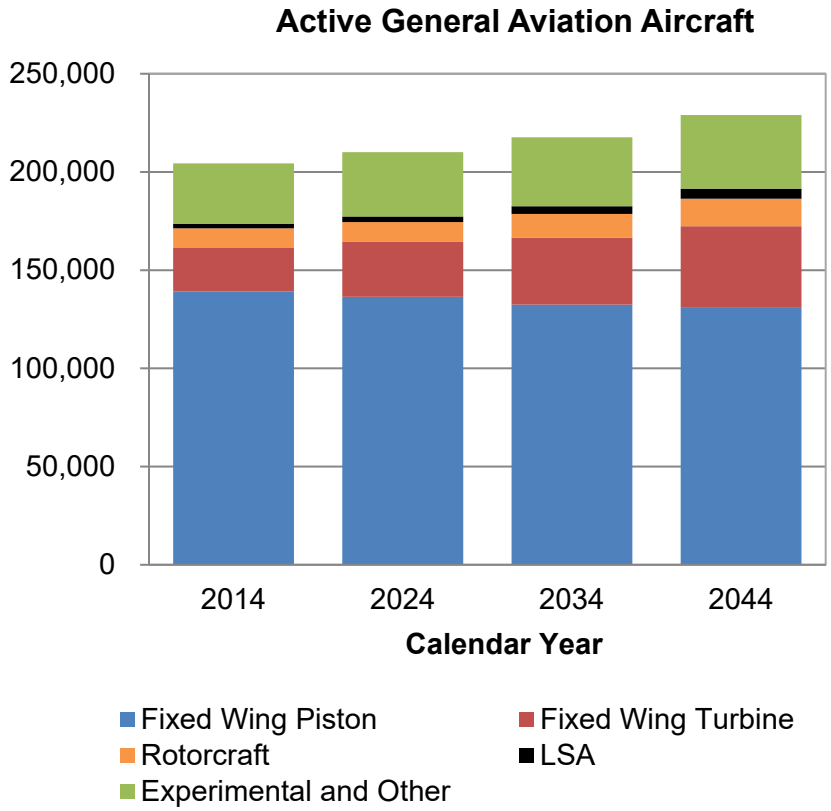
These current conditions indicate the GA sector, which had a much quicker recovery from the impacts of the pandemic than the airlines, surpassed the activity level of 2019. The active fleet in 2022 was only 0.7 percent below the 2019 level, with the fixed-wing turbine, experimental and other (gliders 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

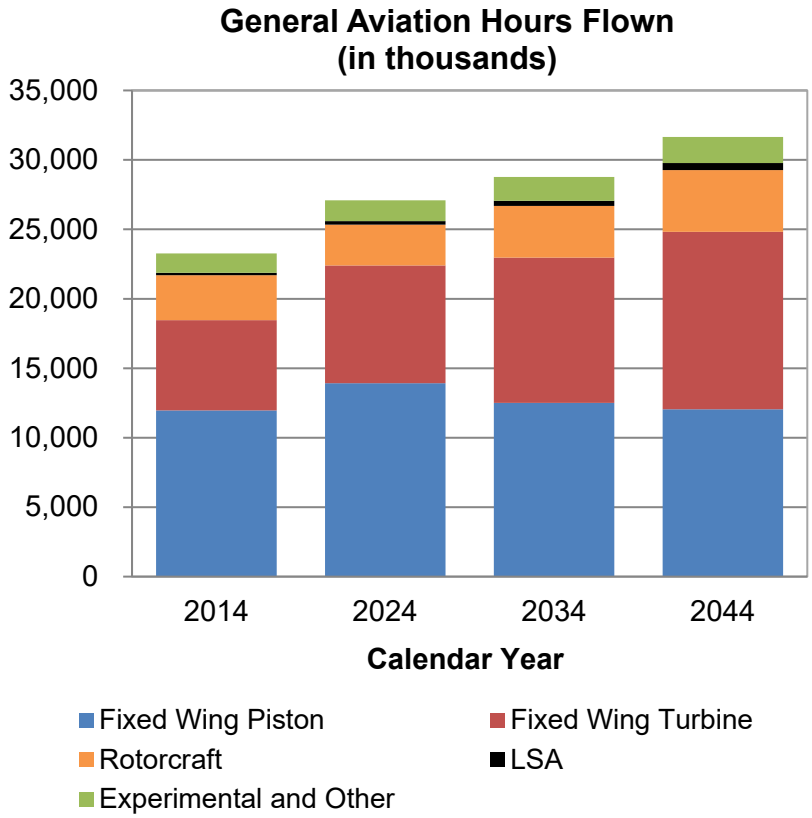
aircraft between 2022 and 2044, with an average annual growth rate of -0.2 percent. Unfavorable pilot demographics, overall increasing cost of aircraft ownership, availability of much lower cost alternatives for recreational usage, coupled with new aircraft deliveries not keeping pace with retirements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

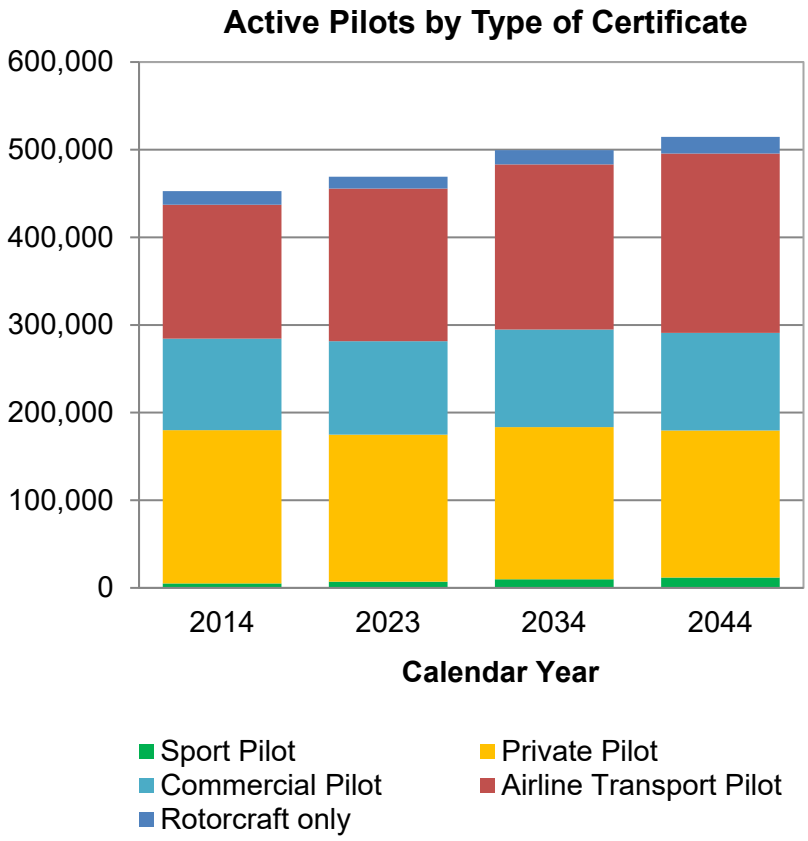
The FAA also conducts a forecast of pilots by certification categories, using the data compiled by the Administration's Mike Monroney Aeronautical Center. There were 806,940 active pilots certificated by FAA at the end of 2023. The number of certificates in most pilot categories continued to increase, 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.

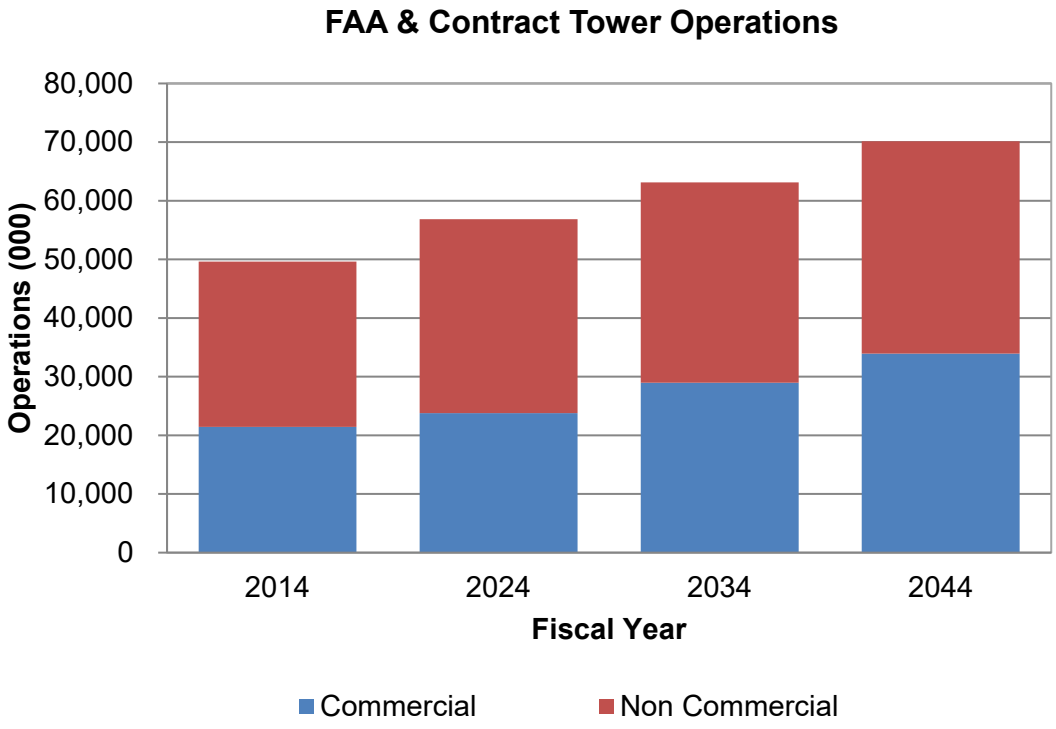
In the long run, economic the growth in air travel demand and the business aviation fleet will drive the long-term growth in operations at FAA facilities over the rest of the forecast period. Activity at FAA towers and contract towers is projected to increase at an average rate of 1.1 percent a year 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.

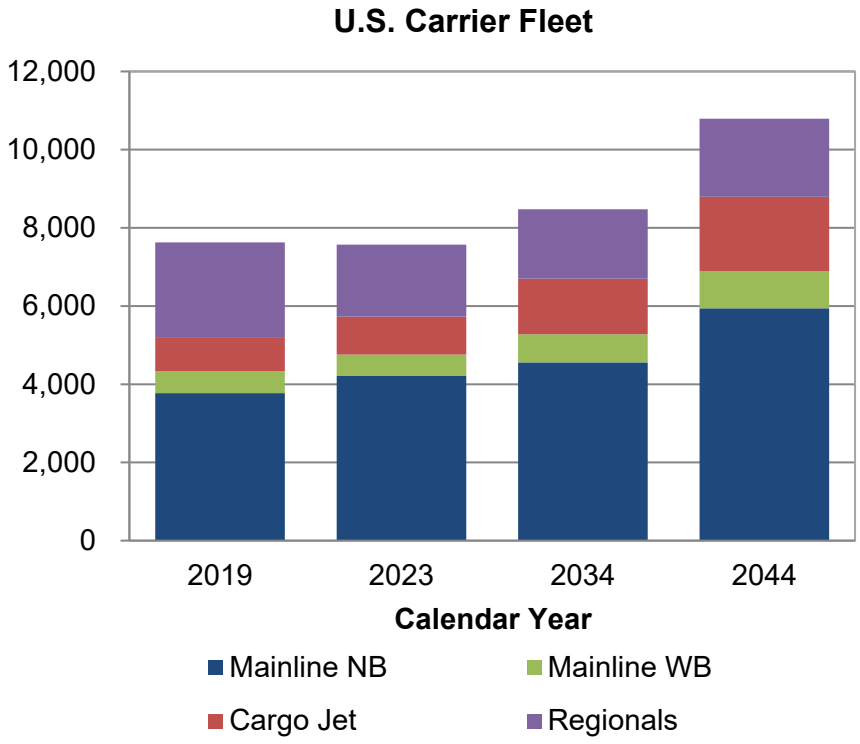
U.S. Commercial Aircraft Fleet

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

Commercial Space

The FAA's Office of Commercial Space Transportation (AST) licenses and regulates U.S. commercial space launch activities including launch and reentry of vehicles and operation of non-federal launch and reentry sites authorized by Executive Order 12465 and Title 51 U.S. Code, Subtitle V, Chapter 509 (formerly the Commercial Space Launch Act). Title 51 and the Executive Order also direct the U.S. Department of Transportation to encourage, facilitate, and promote U.S. commercial launches. The FAA's mission is to license and regulate commercial launch and reentry operations and non-federal launch sites to protect public health and safety, the safety of property, and the national security and foreign policy interests of the United States.

The FAA licenses launches or reentries carried out inside the U.S. and by U.S. persons (which includes U.S. corporations) inside or outside the United States. The FAA does not license launches or reentries the U.S. Government carries out for the Government (such as those owned and operated by National Aeronautics and Space Administration (NASA) or the Department of Defense). Amateur-class rockets do not require a FAA license or permit[10].

To accomplish its mission, the FAA performs the following major functions:

- Maintains an effective regulatory framework for commercial space transportation activities,
- Provides guidance to prospective commercial operators on how to comply with regulatory requirements for obtaining an authorization and operating safely,
- Evaluates applications for licenses, experimental permits, and safety element approvals for launch and reentry operations and related commercial space transportation activities,
- Evaluates applications for licenses for launch and reentry site operations,
- Monitors and enforces regulatory compliance through safety inspections of launches, reentries, sites, and other regulated commercial space activities,
- Provides U.S. Government oversight of investigations associated with the mishap of an FAA authorized launch or reentry,
- Facilitates the integration of commercial space launch and reentry operations into other modes of transportation including the National Airspace System (NAS) by establishing appropriate hazard areas and limits to ensure the protection of the public,
- Coordinates research into the safety, environmental, and operational implications of new technologies and the evolving commercial space transportation industry,

[10] Per 14 CFR Chapter 1, Part 1, section 1.1: Amateur rocket means an unmanned rocket that is propelled by a motor or motors having a combined total impulse of 889,600 Newton-seconds (200,000 pound-seconds) or less; and cannot reach an altitude greater than 150 kilometers above the earth's surface.

- Conducts outreach to the commercial space industry by hosting working groups and conferences,
- Collaborates with Government partners, such as the Department of Defense and NASA to assure consistent approaches to regulations, policy, and standards, and
- Conducts outreach to international counterparts to promote the U.S. regulatory framework across the world.

In addition to AST headquarters offices in Washington, D.C., AST maintains staff with assigned duty locations near active launch ranges to facilitate communication with space launch operators and to implement FAA's regulatory responsibilities more efficiently. AST personnel are currently assigned to duty locations in close proximity to: Kennedy Space Center and Cape Canaveral Space Force Station in Florida; Johnson Space Center in Texas; Wallops Flight Facility in Virginia; FAA's Western-Pacific Regional Office; Vandenberg Air Force Base, and the Mojave Air and Space Port in California. FAA also directly supports NASA's commercial space initiatives by providing on-site staff at both the Johnson Space Center and Kennedy Space Center to coordinate the FAA's regulatory and compliance activities with NASA's development and operational requirements for commercial space.

Regulatory Safety Oversight Activities of FAA

The business cycle from the time a firm first contacts FAA until the last launch of a licensed operation can be several years. There are many activities performed by FAA during this cycle. The most notable activities are described here.

Pre-Application Consultation for Licenses, Experimental Permits, and Safety Element Approvals

Prospective applicants seeking commercial space transportation licenses, experimental permits, or safety element approvals are required by regulation to consult with FAA before submitting their applications. During this period, FAA assists them in identifying potential obstacles to authorization issuance and determining potential approaches to regulatory compliance. In addition, many new operators are seeking to incorporate new technologies, vehicle types, or operational models creating opportunities for FAA to assist in determining the applicable regulations or approach to regulatory compliance.

Licenses, Permits, and Safety Element Approvals

FAA authorizes commercial space transportation activities via the issuance of licenses, permits, and safety element approval. Typically, FAA issues a license with a narrow scope to a single vehicle configuration and mission trajectory. With the dynamic commercial space industry, these licenses are required to be modified to add additional vehicle configurations and mission profiles. FAA's new regulatory regime under Part 450 allows more flexibility by allowing authorization to conduct launch or reentry activities for various vehicle configurations and trajectories from multiple sites.

Inherent in the review process is the requirement to conduct policy reviews and payload reviews. When conducting a policy review, FAA determines whether the proposed launch, reentry, or site operation presents any issues that would adversely affect U.S. national security or foreign policy interests or

be inconsistent with international obligations of the United States. If not otherwise exempt from review, FAA reviews a payload proposed for launch or reentry to determine whether the payload would jeopardize public health and safety, the safety of property, U.S. national security or foreign policy interests, or the international obligations of the United States. The policy and/or payload determination becomes part of the licensing record on which FAA's licensing determination is based.

FAA issues launch and reentry site operator licenses and license renewals. FAA coordinates with Federal, state, and local governments and with the commercial range operators or users for commercial space licenses and operations. As part of the evaluation of applications for launch licenses, reentry licenses, and site operator licenses, FAA also conducts environmental reviews consistent with its responsibilities under the National Environmental Policy Act.

FAA anticipates issuing a growing number of safety element approvals for space launch systems equipment, processes, technicians, training, and other supporting activities. FAA reviews, evaluates, and issues safety approvals to support the continued introduction of new safety systems, safety operations applications, and safety element approval renewal applications.

Safety Analyses

FAA conducts flight safety, system safety, maximum probable loss, and explosive safety analyses to support the evaluation and issuance of licenses and permits. FAA also evaluates and analyzes the performance of a vehicle operator's safety systems including safety-critical systems and any associated crew involved in the function of the safety system to determine how they affect public safety risk.

Inspections and Enforcement

FAA currently conducts as many as 750 preflight/ reentry, flight/ reentry, and post-flight/ reentry safety inspections per year. Inspections often occur simultaneously at any of the 14 licensed commercial space launch sites, as well as at 4 Federal launch ranges and 3 exclusive-use launch sites. The establishment of non-federal launch sites requires additional inspections in areas such as ground safety that have traditionally been overseen by the U.S. Air Force (now the U.S. Space Force) at Federal ranges. At spaceports and launch sites with high launch rates (e.g., Cape Canaveral Space Force Station, Kennedy Space Center, and Vandenberg Air Force Base), at least 70 percent of inspections are typically conducted by locally based field inspectors. Currently, the FAA is leveraging a risk-based approach in order to respond to a dynamic operational tempo, minimize cost, and increase efficiency.

Mishap Investigations

Mishap events have demonstrated that FAA needs to have the capacity to oversee the investigation of at least two space launch or reentry mishaps or accidents simultaneously anywhere in the world, and to lead/oversee as many as nine investigations during a single year. FAA anticipates an increase in mishaps with new operators coming online. FAA reviews all applicant mishap plans and accident investigation procedures as part of the license and permit evaluation process.

NAS Integration

AST works in partnership with all FAA lines-of-business, notably the Air Traffic Organization (ATO) and Office of Airports (ARP) to support the safe and efficient integration of

commercial launch and reentry operations through the NAS and its system of airports and air traffic managed by the ATO. Further, AST works with the ATO and the Office of NextGen (ANG) as FAA develops technologies to facilitate safe and efficient integration of commercial launch and reentry operations through the NAS, including technologies to improve the integration of launch and reentry data into FAA air traffic control systems and technologies to improve the timely and accurate development and distribution of notices of aircraft hazard areas.

FAA's Launch and Reentry Operations Forecast

FAA's 5-year launch and reentry operations forecast relies on data collected from operators and prospective applicants as the starting point for its launch and reentry forecasts, tying launch and reentry forecasts directly to anticipated operations by commercial space transportation firms known to FAA. As commercial space activity is still a highly dynamic and rapidly evolving industry, FAA's forecasting methodology continues to take a conservative view of industry growth by using historical launch activity data to establish better forecasting parameters for both new applicants and existing operators.

There are several factors that magnify the challenges associated with predicting the number of launches and reentries to expect in a given year. They include:

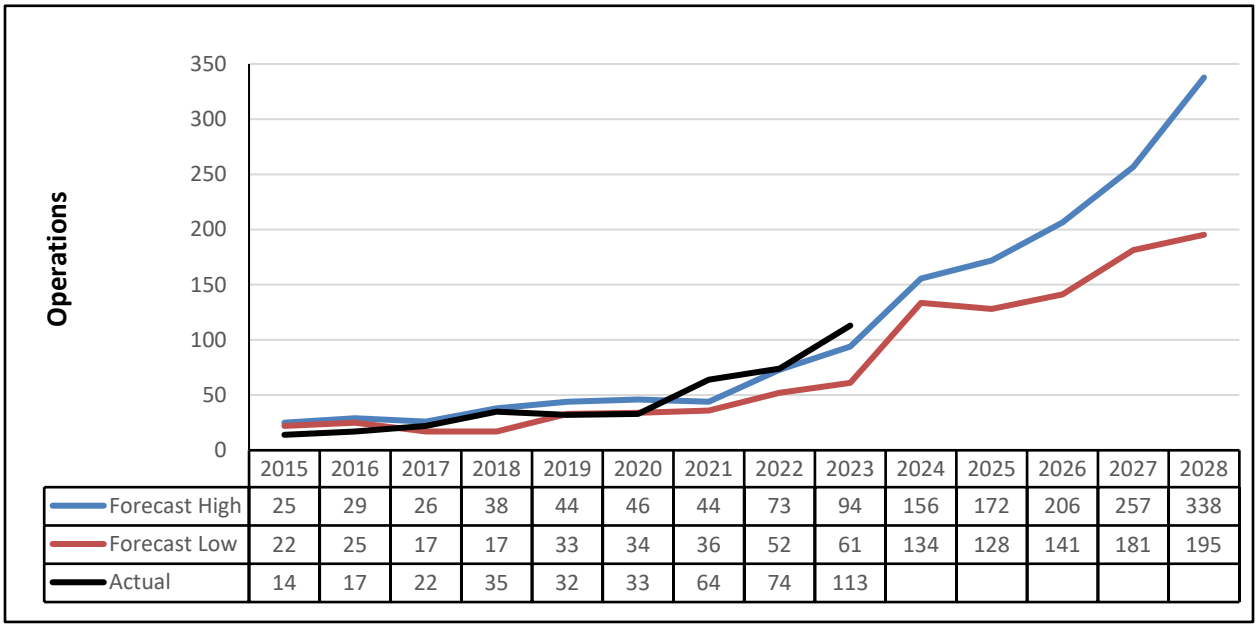
- list of firms intending to launch or actually launch is dynamic,
- continued development of new technologies,
- launch rates for reusable launch vehicles,
- commercial human spaceflight by both government astronauts and private citizens,
- dynamic nature of flight test programs, and
- mishaps.

New technologies [e.g., reusable launch vehicles] allow a faster operational tempo, and at the same time, early use of these technologies can increase the probability of a mishap. A mishap can drastically impact launch plans for one or more firms. Investigations and subsequent "return to flight" for firms impacted by a mishap can take months. FY2024 forecast data was collected in summer 2023 and finalized in September-November 2023.

There are reasons for optimism around the future of space activity moving forward. Space data, products, and services provide tangible benefits and economic opportunity to the American people as well as people all over the world. Firms are motivated towards new technology that is expected to increase launch cadences year over year. Interest and demand for space tourism as well as demands for placement of satellites and other equipment is anticipated to grow with each successful space mission. Likewise, as launch/reentry activities increase investment opportunities are also expected to grow with the global space economy approaching $1 trillion through the next decade. FAA has licensed approximately 676 launch/reentries since 1989, with 47% or 316 launch/reentries occurring in just the past five years (FY2019-2023). FY2023 actuals were the highest in U.S. history at 113, accounting for 17% of the activity since 1989.

FAA is forecasting launch and re-entry activity to increase from a low-high range of 134-156 in FY2024 to a low-high range of 195-338 by FY2028. Much of this increase is attributable to the lineup of reusable vehicles, the growing demand for commercial satellite services, and the expectation for increased human space exploration. Considering these factors, the following table and graph provide FAA's forecasts through 2028, as well as historical activity.

FAA's Authorized Operations Forecasts



	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Forecast High	25	29	26	38	44	46	44	73	94	156	172	206	257	338
Forecast Low	22	25	17	17	33	34	36	52	61	134	128	141	181	195
Actual	14	17	22	35	32	33	64	74	113					

It is important to note all FAA-authorized commercial space operations are included in this forecast, regardless of where they occurred in the world. That is, not all launch and reentry activity occur at one location, for example, at Cape Canaveral, Florida. In the past year, FAA licensed launches and reentries throughout the world, including multiple reentries in the Pacific and Atlantic Oceans and eight licensed launches from New Zealand. This forecast, however, does not include launch activity not authorized by the FAA (e.g., launches the Government carries out for the Government), launch activity for other nations, and this forecast is not tied exclusively to satellite demand.

Additional Factors Affecting Forecast Accuracy

Commercial space transportation is a rapidly evolving industry. The industry's growth through technological innovation and the development of new markets increases the challenges associated with forecasting commercial space transportation operations.

Increase in Flights Over Previous Projections

The FY2024 forecast includes a slight increase in flights over the FY2023 forecast for the high forecast and a significant increase over last year for the low forecast. This

change is largely a result of two factors: increased projections for flights by Space Exploration Technologies Corp. (SpaceX) due to its continued deployment of its Starlink communications satellites and decreased projects for other flights because of the bankruptcy of Virgin Orbit and the decision to cancel future Relativity Space's Terran 1 flights, discussed in further detail below. Roughly 60% of SpaceX's flights are largely to launch its Starlink satellite internet constellation. These satellites will also need to be replaced in five years from when they launched. The forecast shows a high of 338 projected launches in FY2028.

Changes to The List of Firms Intending to Launch

As previously mentioned, the list of firms intending to launch or that actually launch is dynamic. During the past year, Virgin Orbit filed for bankruptcy protection. It ceased operations and sold its assets and equipment to other aerospace companies. Other market changes could certainly occur in the future.

Move to Larger Launch Vehicles

As previously mentioned, SpaceX is working on a successor to the Falcon rockets, the Starship, which would be fully and rapidly reusable and could substantially reduce the number of future Falcon 9 launches needed for Starlink deployment. In addition, Relativity Space's Terran 1 is being stopped in favor of the larger Terran R. The medium-heavy lift rocket is targeted for its first launch in 2026.

New Commercial Launch Technologies and Operations are Emerging Rapidly

The commercial space transportation industry is exploring a variety of new technologies and new approaches to space launch and reentry. In late 2015, both Blue Origin and Space Exploration Technologies Corp. (SpaceX) successfully demonstrated the reusability of their vertically launched rockets. Both companies are now developing a new generation of much larger orbital vehicles that will launch and land in a vertical configuration. In 2022, 56 of 60 Falcon 9 launches were accomplished using reused boosters. While these new orbital-class vehicles are expected to lead to increases in the number of annual launch and reentry operations over the next four years, if the trend is realized, greater increases may continue in the future, as the upper end of the forecast shows in fiscal years 2024 through 2028. Other U.S. commercial entities are also developing several launch vehicles for medium and small payloads. In the medium launch sector ULA's Vulcan, Rocket Lab's Neutron, and Relativity Space's Terran R vehicles are scheduled to begin launching over the next few years. In the small launch vehicle sector Virgin Orbit's LauncherOne, Relativity Space's Terran 1, ABL's RS1, Firefly's Alpha, Astra Rocket 3 have all made their first launch attempts during the past few years. At the same time, state and local governments are joining with commercial firms to promote additional launch and reentry sites, and some firms are seeking to establish launch sites for their exclusive use. This added launch capacity sets the stage for simultaneous operations and an increase in the number operations per year.

New Markets for Commercial Space Transportation Continue to Emerge

The continuing development of commercial space transportation technology has spurred new markets for commercial space transportation services. As the commercialization of space flight demand increases on suborbital and orbital launches, new and reusable vehicles are emerging. With SpaceX and Blue Origin leading the way for reusable rocket

development, there are a number of other private companies following suit. The introduction of reusable rockets is a significant cost reducer and thereby encourages more exploration into space.

States and municipalities have sought to open new spaceports to attract commercial space transportation and associated high-tech firms and create technology hubs for research and development. In 2021, Blue Origin flew its first crewed human space flight mission into space and has conducted 6 total human space flight suborbital launches. Since 2008, NASA has managed the Commercial Resupply Services (CRS) program, which acquires transportation services from commercial providers to deliver cargo to and from the International Space Station (ISS). Starting in 2021 through 2023, SpaceX successfully transported NASA astronauts to the ISS 7 times and returned NASA astronauts from the ISS to Earth 6 times. Boeing's vehicle for NASA's crewed missions (Starliner) is scheduled for its first test flight no earlier than April 2024 with its first planned human space flight mission no earlier than August 2025. The commercial vehicles used by NASA for cargo and crew transportation will have other commercial applications that increase the capabilities of the commercial space transportation industry as a whole.

Looking further afield, there are several companies in the regulatory pipeline seeking authority to land commercial vehicles on the Moon, establish private-sector space stations, service satellites on-orbit, and establish launch sites using non-traditional technologies like railguns and tube launchers. The rapidly growing commercial space transportation industry will continue to demand FAA products and services enabling safe space transportation.

Emerging Aviation Entrants: Unmanned Aircraft System and Advanced Air Mobility

New Entrants: Analysis and Forecasts

This section of the Aerospace Forecast summarizes the drone forecasts. Additional details and accompanying analysis can be found in the UAS compendium.

https://www.faa.gov/data_research/aviation/aerospace_forecasts/Unmanned_Aircraft_Systems

Unmanned aircraft systems (UAS or drones) have been experiencing healthy growth in the United States and around the world over the past decade. The last few years have been no exception despite the profound impact of COVID-19 on the overall economy. A UAS consists of a remotely-piloted aircraft and its associated elements—including the ground control station and the associated communication links—that are required for safe and efficient operation in the national airspace system (NAS). The introduction of drones in the NAS has opened numerous possibilities, especially from a commercial perspective, such as package deliveries. That introduction has also brought operational challenges including safe and secure integration of drones into the NAS. Despite these challenges, the UAS sector holds enormous promise; potential uses range from individuals flying solely for recreational purposes to small businesses carrying out focused missions to large companies delivering commercial packages, infrastructure inspections and delivering medical supplies. Public service uses, such as conducting search and rescue support missions following natural disasters, are proving promising as well.

This section provides a broad overview covering recreational and commercial unmanned aircraft[11] of various sizes and their recent trends, as gathered from trends in registration, surveys, tracking overall market, and operational information. Using these trends and insights from the industry, the FAA produces several forecasts. Forecasts reported in the following sections are driven primarily by the assumptions of the continuing evolution of the regulatory environment, the commercial ingenuity of manufacturers and operators, persistent recreational uses, and underlying demand for drone services. The analyses in each section are enhanced by discussion of recent survey findings, data on imported equipment, remote pilots and waiver and exemptions of small UAS. Finally, an analysis of the new and emerging sector of Advanced Air Mobility (AAM) is provided together with some initial projections drawn

[11] These are also called, interchangeably, hobby or model and non-hobby or non-model UAS, respectively. On October 5, 2018, the President signed the FAA Reauthorization Act of 2018 (Pub. L. 115-254). Section 349 of that Act repealed the Special Rule for Model Aircraft (section 336 of Pub. L. 112-95; Feb. 14, 2012) and replaced it with new conditions to operate recreational sUAS without requirements for FAA certification or operating authority. The Exception for Limited Recreational Operations of Unmanned Aircraft established by section 349 is codified at 49 U.S.C. 44809 [see https://bit.ly/30tUf1Z for more details]. Recreational flyers, under Section 349, are referred to as "recreational flyers or modeler community-based organizations" [see https://bit.ly/2PUhMCI]. In previous notes including other documents of the Agency, these terms are often interchanged.

from FAA-sponsored and other research, government, and industry reports.

Small Recreational UAS

Given trends in recreational UAS registration and market developments, the FAA forecasts that the recreational small UAS market, which includes all UAS with weights greater than 0.55lbs and less than 55lbs operated for enjoyment, will saturate at around 1.88 million units over the next five years.[12],[13] However, there is still some upside uncertainty due to further changes in technology, including battery life, faster integration from a regulatory standpoint, and the likely event of continued decreasing prices. This leads to upside possibilities in the forecast of as many as 1.92 million units by 2028. In contrast, there are some low-side uncertainties, chief among them is the lack of renewals in the FAA's recreational registry (i.e., before and after the expiration dates), followed by expirations and cancellations in the registry.[14] The inertia, loss of interest, regulatory framework including implementation of remote ID requirements, or lack of recreational opportunities may be key factors leading to an observed decreasing trend in renewals. Nevertheless, if renewals are kept up over time, effective/active fleet would likely converge to the base-case forecast, i.e., derived from cumulative new registrations combined with estimates of aircraft ownership per registrant.

In the presence of slower renewal tendency, as registration data indicates, it is likely that the effective/active fleet will be lower than that derived from the base forecast. This provides the FAA with an opportunity to derive low-side forecasts using effective/active fleet calculations. Nonetheless, low-side uncertainty growth trajectory (i.e., annual growth rates) tracks closer to the base-case forecast in the outer years of 2027-2028. The base-case forecast (i.e., likely), together with high and low scenarios, is provided in the table below:[15]

[12] These forecasts have two dimensions worth emphasizing. When looked at from the cumulative base, "total" captures the number of drones that are reported to be in the system (i.e., base and high case); while "effective/active fleet" refers to aircraft that are presently operating in the system (i.e., low).

[13] As we extend the forecast time period by a year from 2027 to 2028 for rolling 5-year projections, the sector is expected to expand by around 60,000 from what we forecasted last year for 1.8234 million in 2027 to 1.8830 million in 2028. This trend is likely to continue due to secular growth in the sector.

[14] Recreational UAS operators are required to register with the FAA under 49 U.S.C § 44809. The code requires recreational flyers to register but does not require the registration of each aircraft flown by the recreational flyer.

[15] As noted earlier, low scenario reports effective/active fleet using a net gain/loss calculation. By definition, low-case scenario differs from base and high-case scenarios, which are based on new registrations only. Hence, a low scenario counting of fleet for the year 2023 is markedly different than the baseline and high-case scenario for the same year.

	Total Recreation/Model Fleet			
	(Million sUAS units)			
	Calendar Year	Low*	Base**	High**
Historical	2023	0.5573	1.7768	1.7768
Forecast	2024	0.5557	1.8264	1.8308
	2025	0.5832	1.8470	1.8674
	2026	0.6092	1.8673	1.8913
	2027	0.6213	1.8787	1.9075
	2028	0.6288	1.8830	1.9208
'*': effective/active fleet counts combined with multiplicity of craft ownership;				
'**': new registration counts combined with multiplicity of craft ownership;				

Last year, the FAA forecasted that the recreational small UAS sector would have around 1.75 million drones in 2023 in base case (i.e., new registrations), a growth rate exceeding 3.7% from the year before (2022). Actual data for 2023 came in higher by 26,613 units with around 1.78 million units accounted for by the end of 2023. Thus, our forecast of recreational small UAS last year undershot by around -1.50% for 2023, (1.78 million aircraft observed in 2023 vs the 1.75 million aircraft forecasted in the previous Aerospace Forecast). In contrast, our last year's forecast of the low-case scenario stood at around 620,472 for 2023. In reality, actual data came to be 557,300 (or around 63,000 lower). Thus, our previous forecast of the lower-range scenario overshot the actual data by over 11%.

The FAA uses the observed trends in registrations, particularly over the past year; the calculation of net gain/loss of registrants this year; information collected from a survey conducted in 2018 and the Survey of UAS Operated conducted in 2023; expert opinions distilled from Transportation Research Board annual workshops; review of available industry forecasts; market/industry research; and time-series models fitted on monthly data underlying annual data reported in the above table. These apply to all three elements reported above: low, base, and high-case forecasts. Using these, the FAA forecasts that the recreational small UAS fleet will likely (i.e., base-case scenario) maintain its peak with average or trend growth over the next five years, from the present 1.78 million units now to approximately 1.88 million units by 2028 thus attaining a cumulative annual growth rate of 1.2% during 2023-2028. In the previous Aerospace Forecast, the cumulative annual growth rate for small recreational UAS was reported to be 1.6% for 2022-2027.

Following somewhat different growth trajectory than the base or high growth scenarios, there will likely be approximately 628,800 active/effective small UAS (or, 71,500 more than what was observed during 2023) over the next five years in 2028, which is now the low-case scenario forecast for recreational/model small UAS. This ensures a cumulative annual growth rate of 2.4% during 2023-2028. Active/effective fleet count is derived and projected based on the net gain/loss of recreational registrants; hence,

the rate influencing lower forecasts growth is different than the base-case forecast, which is derived using new registrations. The high-case scenario, on the other hand, may reach as high as 1.92 million units (or, 1.6% cumulative annual growth rate). The high-case scenario projection is based on the trends in the base-case forecast.

Notice that the saturation of the market is at a higher level in comparison to the previous Aerospace Forecast, reflects continued new registrations, *albeit* at a slower rate, by recreational flyers observed during 2023 and the shift of the forecast horizon by a year. The increased new registration trend, in partly driven by COVID-19, may or may not continue in the longer run.[16] In comparison, the low-case scenario forecast assumes the present trend in renewals combined with new registrations followed by similar expirations and cancellations trends. Nevertheless, the growth rates underlying these numbers are fairly steady in the initial years but fade faster in the last two to three years. The gradual saturation that is projected in five years and beyond in the recreational small UAS fleet parallels other consumer technology products and the Agency's projections from the last few years, particularly with respect to base and high-case forecasts. However, both the numbers and the growth trajectory for the low-case scenario (i.e., effective/active fleet) are fundamentally different than years earlier compared to the past couple years for reasons described above. Nevertheless, it provides a lower bound that is likely to be closer to reality in terms of small UAS that are in use and operationally active in the NAS.

Commercial/Non-Model Aircraft

Last year, the FAA forecasted that the commercial UAS sector, which includes all UAS with weights greater than 0.55lbs and less than 55lbs operated for non-recreational purposes, would include over 805,000 small UAS in 2023 for the base case, a growth rate exceeding 11% over the previous year (2022). Actual data came in over 842,000 aircraft by the end of 2023. Our forecast of commercial small UAS in the previous Aerospace Forecast thus undershot (around -4.4%) for 2023 (or 842,460 actual aircraft vs 805,448 projected aircraft). In the low-case scenario, the FAA forecasted 349,000 units to be effective/active for the year 2023 in the previous Aerospace Forecast; but in reality, the number was around 361,000 thus undershooting the lower-case scenario by -3.3%. Forecasting in a time of tremendous uncertainty is indeed challenging, especially given the economic slowdown during COVID-19 and its impact on the UAS sector. The commercial small UAS sector's fast growth and adjustments during the pandemic demonstrate this fact. Nevertheless, the errors of our forecast for both recreational and commercial small UAS appear to be within the bounds of reasonableness.

[16] It is quite likely that many users were buying and experimenting with recreational small drones given the COVID-19 public health emergency and the substantial portion of the workers presently working from home. This trend may or may not continue once regular work patterns resume.

Total Commercial/Non-Model Fleet (Thousand sUAS units)				
Calendar Year		Low*	Base**	High**
Historical	2023	361	842	842
Forecast				
	2024	369	951	960
	2025	371	1032	1050
	2026	372	1083	1113
	2027	373	1110	1152
	2028	374	1122	1176
'*': effective/active fleet counts.				
'**': new registration counts based fleet counts.				

The FAA uses the trends observed in part-107 registrations during previous years, calculation of net gain/loss from the part-107 registry, information from the survey conducted in 2018 and again this year, a review of available industry forecasts/workshops, and past FAA Drone Symposiums, and FAA-sponsored research.[17] Using these data sources and with the help of a time series model fitted onto the monthly data, the FAA forecasts that the commercial UAS fleet will likely (i.e., base-case scenario) exceed the million aircraft mark with around 1.12 million by 2028. This is 1.3 times larger than the current number of new commercial small UAS.[18]

Using low-case scenario or effective/active fleet, the FAA forecasts an expansion of the small UAS fleet by 12,800, 1.03 times larger than the currently calculated effective/active fleet of around 361,000 units.[19] As the present base-case scenario (i.e., the cumulative total) increases, the FAA anticipates the growth rate of the sector will slow down over time, and the effective/active fleet will likely catch up with the growth trajectory of new registrations. Nevertheless, the sector will be much larger than what was understood only a few years earlier.

In order to understand the growth trajectory of the sector better, this report makes use of two categories of commercial UAS: consumer grade and professional grade aircraft. Consumer-grade commercial UAS have a wide range of prices, below $10,000 with an average unit price of approximately $1,500.[20] The professional grade, on the other hand, is typically priced above $10,000 with an average unit price assumed to be around $30,000.[21] For both consumer-grade and

[17] See https://bit.ly/432Gxn5.

[18] Last year, the ratio of end-year forecast to base-year forecast was 1.31-times. That is, the FAA forecasted end-year to be 1.31 time base year's (2022) numbers in 5-year (2027). Higher forecasts are often the result of improved regulatory environments, as noted below, and environments following the process of rule-making evaluation (See fn. #30-33 for these).

[19] This is driven by the combined effects of projected underlying growth rates of cancellations, expiry, new registrations, and renewals.

[20] See https://tinyurl.com/5dswkz6b for more details.

[21] Because of this wide range in prices between types of small drones in commercial activities, start-up costs for a business may vary between $2,500 and $30,000.

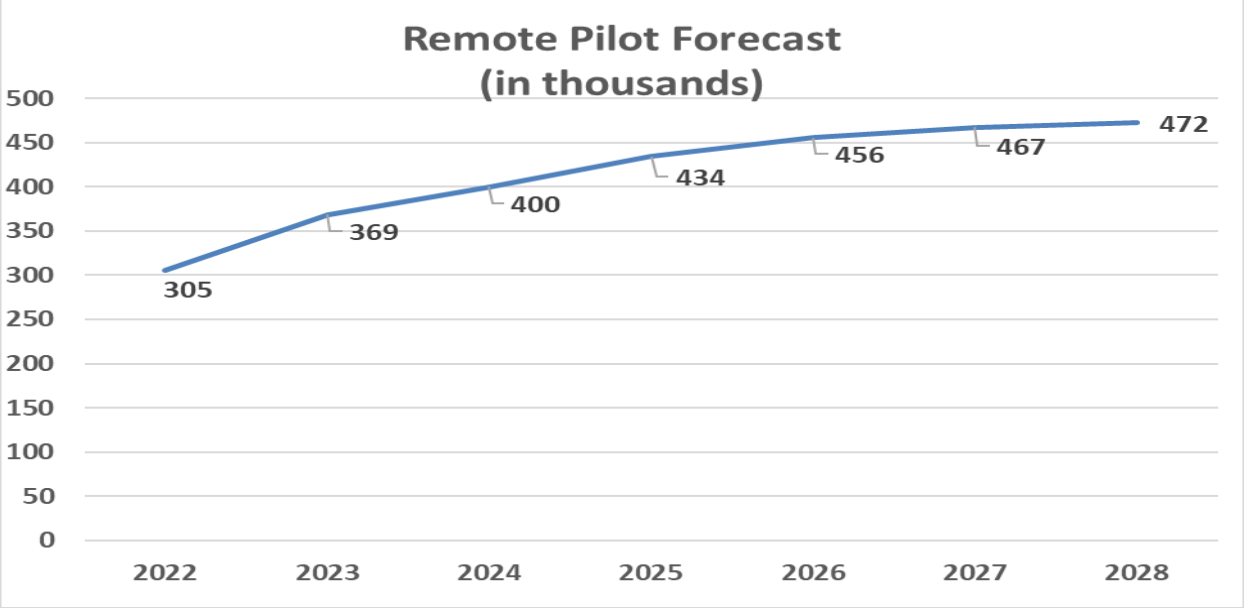
professional-grade UAS, the average price has fallen over time, particularly over the last few years. Currently, the consumer grade dominates the commercial UAS sector, with a market share approaching 90%. However, as the sector matures and the industry begins to consolidate, the share of consumer grade commercial UAS is likely to decline, though it will still be dominant.

At present, the sector has numerous uses, primary among them is the general photography and real estate. While real estate draws chiefly from the Part 107 registrants, general photographers are often drawn from recreational registrations. Despite this difficulty in using strict definition, it is instructive to note that the distribution of industries/businesses reported by Part 107 operators, and to some extent, recreational flyers, match the distributions reported by the Teal Group[22]

US Commercial Market (Units)		
Units (Air Vehicles) in 2023	Total	Percentages
Construction	29,000	3.96%
Energy	22,220	3.03%
Agriculture	43,000	5.86%
Communications	300	0.04%
Insurance	10,250	1.40%
Gen. Photography/Real Estate	600,300	81.88%
Other Industrial Inspection	7,600	1.04%
Entertainment	20,000	2.73%
Delivery	500	0.07%
Total	733,170	100.00%

[22] https://tinyurl.com/5dswkz6b

Remote Pilots



An important final metric in commercial small UAS is the trend in remote pilot (RP) certifications. RPs[23] are used primarily to facilitate commercial and public use small UAS flights, as discussed in the preceding section. As of December 2023, a total of 368,883 RP certifications had been issued, an increase of almost 64,000 from the same time last year (2022) and almost 120,000 higher than the year before in 2021.

Given the actual numbers of RPs at the end of 2023, RPs are set to experience tremendous growth following the growth trends of the commercial small UAS sector. Starting from the base-case scenario of 368,883 RPs in 2023, commercial activities may require over 472,269 RPs in five years, a 1.3-fold increase that may provide tremendous opportunities for growth in employment—over 103,386 new RP opportunities—associated with commercial and public use activities of small UAS. Potential for RPs may enhance even more if larger UAS are used in commercial activities.

Large UAS

Part 107 limits the gross takeoff weight of unmanned aircraft to below 55lbs, which categorizes these aircraft as small UAS. Thus, UAS with gross takeoff weights above 55lbs must operate under separate rules and are thus considered a separate category of UAS for this forecast, which we refer to as simply large UAS (lUAS). Since these lUAS are not type certified and do not fall under the Part 107 operating rules, operation of these aircraft require a section 49 U.S.C § 44807 exemption or a public aircraft operator (PAO)

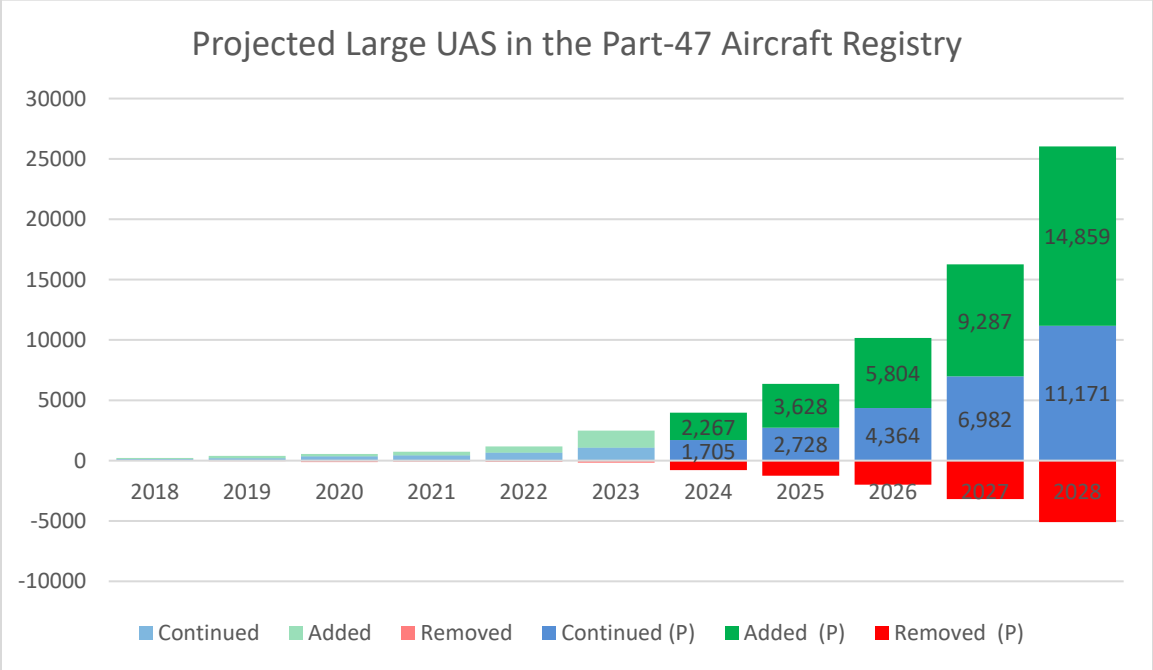
[23] In our accounting of RPs, we take pilots who passed the initial knowledge test (or Part 107), plus current traditional pilots who took online training in lieu of the knowledge test (or Part 61).

certification.[24] In addition, the FAA requires lUAS operating under a 44807 exemption or PAO to receive a tail number by registering the unmanned aircraft in the part-47 aircraft registry.[25] As such, the lUAS fleet and operations can be separated from the forecast of small UAS, which utilizes the recreational and part-107 registries.

Since lUAS are required to register with the Part-47 Aircraft Registry (PAR), we can use the PAR to estimate the lUAS active fleet. Using the Aircraft Reference file from the publicly available PAR, we identify the lUAS in the Aircraft Registration Master file and the Deregistered Aircraft file from which we calculate the active fleet of lUAS.[26] In 2023, 1,066 new lUAS aircraft were added to the PAR, a 174 percent increase from 2022. Sixteen percent of aircraft registered at the end of 2022 (173) were delisted in 2023, producing an active fleet of 2,311 lUAS by the end of 2023.

With robust demand for lUAS operations indicated by a rapid increase in the 44807 exemptions granted, we expect the growth of new lUAS over the next five years to keep pace with the growth observed in 2023. As such, we expect 14,859 new lUAS will be added to the PAR in 2028, with a total active lUAS fleet of over 24,000 aircraft by the end of 2028. This forecast assumes that 44807 exemptions, or an equivalently permissive rule, remains in place until 2028. However, the uncertainty regarding the availability of the 44807 exemptions presents a headwind for the expansion of the lUAS sector.

[24] See bit.ly/3KxiuVX for more details.
[25] See bit.ly/3ZIcCxJ.
[26] The Public Aircraft Registry data for 2022 is available at https://bit.ly/433iqET. Unmanned aircraft are separated from manned aircraft using the “NO-SEATS” field in the Aircraft Reference file. The “AC-WEIGHT” field is used to remove all small unmanned aircraft, and the “TYPE-ACFT” field is used to remove all lighter-than-air aircraft, including blimps and balloons. The remaining codes – held within the “CODE” field – are matched with the “MFR MDL CODE” in the Aircraft Registration Master file and the Deregistered Aircraft file, and adjusted based on the “STATUS CODE” field. The remaining aircraft are sorted for the year the registered using the “CERT ISSUE DATE” or “LAST ACTION DATE”. The count of new registration, older registrations, and delisted registrations are used to construct the active lUAS fleet.



Advanced Air Mobility

In September 2017, NASA launched a market study for a new segment of aviation. This segment of piloted electric and vertical takeoff and landing (eVTOL) vehicles with progressively remote-piloted or automated control options, broadly called AAM, is defined as "a safe and efficient system for air passenger and cargo transportation, inclusive of small parcel delivery and other urban drone services, which supports a mix of onboard/ground-piloted and increasingly-autonomous operations."[27] [28] Urban air mobility (UAM), contained within the broader AAM category, is thus envisioned as a transportation system that is likely to use piloted and progressively automated aircraft to transport passengers and cargo at lower altitude within urban and suburban areas. AAM/UAM aircraft are expected to adopt electric engine and vertical takeoff and landing technologies to improve operability in urban settings.

Despite many regulatory and technological issues and given the fact that the AAM services have not yet begun using this new type of aircraft within the US, projection of AAM demand, at best, is challenging and somewhat hypothetical and arbitrary.[29] Nevertheless, drawing from FAA-sponsored research

[27] The community is in the process of establishing nomenclature. Only recently, the community-at-large has moved on to coining earlier-used "urban air mobility" (UAM) as "advanced air mobility" (AAM) to broaden its operational scope, technical characteristics, economic opportunities, and regulatory framework. Under this broad characterization, UAM is considered a subset of AAM.

[28] See https://go.nasa.gov/40Y4hXM.

[29] As reported throughout this document, the FAA routinely forecast sectors (i.e., manned and unmanned air transportation) for which services exist, and therefore, a great deal of data exist. For AAM services using eVTOLs, neither services nor data are available at present. However, a great

and other market analyses, we provide an estimate of a base-case scenario (likely; or potential adjusted by above-discussed risk factors) and lower-range scenario for departure forecasts for the hypothetical years of one through six after these aircraft enter into service[30] in the table below:

			Departure Forecasts*			
	Year1	Year2	Year3	Year4	Year5	Year6
Base	295,530	494,637	827,887	1,385,657	2,319,213	3,881,730
Low	206,871	346,246	579,521	969,960	1,623,449	2,717,211
*': Base (risk-adjusted potential) is based on linear interpolation of ASSURE forecasts;						
Low forecast is 30% lower than base forecasts.						

In May 2022, the FAA announced that it will certify winged eVTOL aircraft, which suits AAM/UAM operations, as powered-lift aircraft as "special class" under its 14 CFR 21.17(b) regulations, rather than under the 14 CFR Part 23 rules used for small fixed-wing aircraft.[31] This change comes after the FAA has previously accepted several G-1 certification basis issue papers from eVTOL companies with the understanding that Part 23 rules, supplemented by special conditions, were applicable. In December 2022, the proposed airworthiness criteria for the Archer Midnight aircraft were published in the Federal Register by the FAA.[32] These announcements suggest that the regulatory landscape is evolving to accommodate AAM into service. An example of this evolution is that the FAA has proposed a Special Federal Aviation Regulation (SFAR), 'Integration of Powered-Lift: Pilot Certification and Operations,[33] to establish temporary operating and pilot certification regulations for powered-lift.

However, to account for regulatory uncertainties, only two scenarios that are comparable and drawn from FAA-sponsored research projections, base and low-case forecasts are reported in the table above.[34]

deal of need, particularly for planning and allocation of scarce resources, leading to understanding the sector and its future trends is now essential. To meet these needs, the FAA is providing the forecasts for overall guidance. We plan to update and revise these forecasts once services begin and data become widely available.

[30] Many in the AAM community identifies 2025-2027 as likely point of entry in time [see https://tinyurl.com/5n7yzbvy for an analysis] but it depends on numerous factors, some of which have been outlined above. Depending on resolution of these issues and business case for AAM continues to hold, service may begin in 2025-2027 or soon thereafter. Furthermore, we keep the forecast horizon short to Year 6 afterwards because the industry will undergo rapid changes once it begins service due to inherent dynamism and promises it holds. Hence, we keep the forecast horizon short so that we can learn from the data and revise the projected numbers and growth trajectories annually on a rolling basis, like in case of UAS sector, drawing from concurrent developments.

[31] See https://bit.ly/3UbsyqZ. At present, FAA operating rules apply to five operational categories and associated aircraft: domestic, commuter, flag, on-demand and supplement carriers. Through the powered-lift NPRM, provided it is finalized, the FAA is proposing adding powered-lift to the list.

[32] See https://bit.ly/436vucv for more details.

[33] See https://bit.ly/3Mi3f4O for more details.

[34] Higher scenarios will be determined by many factors including the growth trajectories following EIS, types of missions/services, expansion into many metro areas, number of departures and passengers, commercial success, and success-

Given the Entry Into Service (EIS) in Year 1-2, likely departures may reach a level of 295,530 to begin with to a cumulative 790,000 in the base-case scenario within a couple year. Assuming EIS successful, AAM departures will then likely accelerate and reach almost 3.9 million a year in a very short time (i.e., by the end of Year 6), provided outstanding integration issues involving new entrants have been appropriately addressed and resolved. In the lower-case scenario estimate, the likely departures are expected to be around 207,000 to a level of 553,000 cumulatively by Year 2. It may likely reach around 2.7 million by end of the projection in Year 6.

Although there are several aircraft under development for the AAM/UAM market[35] , we assume relatively low load factors (e.g., 2-3 passengers per departures for lower and base cases, respectively).[36] Using this assumption, the number of passengers corresponding to the departure scenarios may be calculated and are reported in the table below:

	Passenger Flow* Corresponding to Departures					
	Year1	Year2	Year3	Year4	Year5	Year6
Base	886,590	1,483,910	2,483,661	4,156,972	6,957,638	11,645,190
Low	413,742	692,491	1,159,042	1,939,920	3,246,898	5,434,422
*': 3 passengers per departure and 2 passengers per departures corresponding to base and low forecasts, respectively.						

Starting from an anticipated 887,000 passengers annually, a cumulative 2.3 million passengers may be reached soon after EIS by Year 2 in the base-case scenario or risk-adjusted potential scenario. In the lower-range scenario, passenger levels may reach a cumulative of 1 million passengers by Year 2 driven by the assumption of lower number of departures and low load factors.

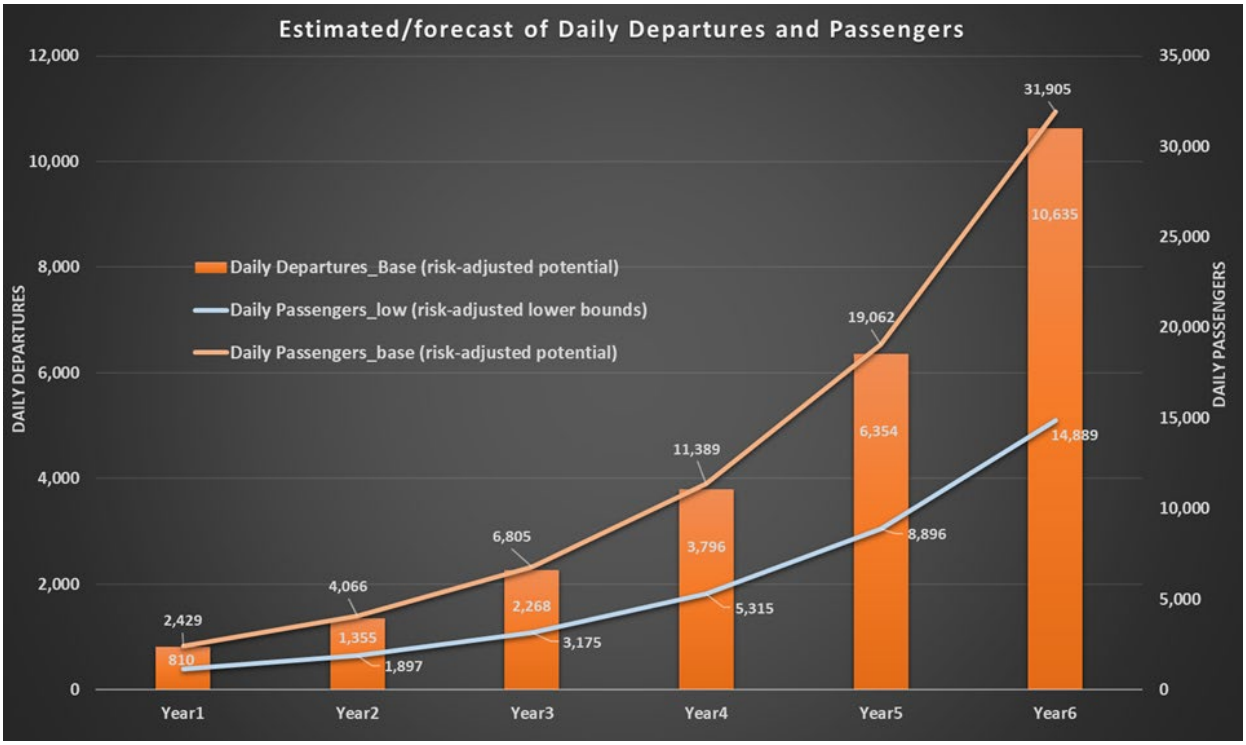
Translating the above annual numbers to daily departures/passengers (e.g., total departures and passengers divided by 365

ful integration into NAS. Due to much higher levels of impending uncertainties on the upside, we are leaving the upper level of forecasts out of these initial projections.

[35] It is not conclusive to what extent lower overall load factors (e.g., dead-heading back from revenue missions) and lower utilization will impact business cases negatively and thus may jeopardize services altogether. Many assumptions have been made, and at this point, the FAA is not certain how pricing, lower load factors or utilization of aircraft, types of services and market adoption, supply chains, funding, manufacturing and role of operating partners, infrastructure including access to airspaces and airports/vertiports will ultimately impact the business cases of AAM services. As more information become available in the future via research, and information from the industry, we plan to improve on these initial projections going forward.

[36] Generally speaking, eVTOLs are assumed to have, for majority of vehicles that have been presently designed (over 200), one to four passengers with one pilot on board. On average, trips are expected to have a passenger load of three riders for airport shuttle, as reported by market studies accounting for the shared route model of Air Metro [see https://bit.ly/40Wik0t]. The base case reported in the table (i.e., 3 passengers) draws on this recent finding. However, air taxi is expected to have much lower passenger load (1 passenger) due to on-demand nature of services and associated mobility flexibility.

days), in the base-case scenario, we calculate a few hundred departures transporting a few hundreds to around 2,400 passengers daily to begin with in Year 1. Around 2,100 cumulative daily departures transporting around 3,000-6,500 cumulative passengers (i.e., lower to base cases, respectively) may be attained soon after by Year 2. It may reach a level of over 10,000 daily departures in base case transporting around 15,000 daily passengers in lower-range scenario to around 32,000 in base-case scenario in Year 6.



Despite our efforts to provide initial projections of the AAM sector, there are numerous factors that may possibly create a shroud of uncertainty around the numbers discussed above. One of the major challenges of eV-TOL entering the AAM marketplace is infrastructure. In a recently published report, GAO (2022)[37] estimates that for smaller metropolitan areas (1.5-2.5 million population), 6 vertiports will be needed while for larger metro areas (7-10 million population), the numbers may go up as high as 77. Total estimated ground cost for smaller metro areas have been estimated to be $50 million while for larger metros, it is almost 5-times higher at $240 million. ASSURE (2022) reported that an estimated 75-300 vertiports will be required for each metro area. In total, ASSURE estimates 2,500-3,500 vertiports will be needed to establish a mature AAM passenger network nationwide in the US. Costs in-

[37] GAO (2022): Transforming Aviation: Congress Should Clarify Certain Tax Exemptions for Advanced Air Mobility; GAO-23-105188.

volving setting up such a network will be expensive as reported in GAO report and elsewhere:[38]

FAA-sponsored research estimated revenues from AAM/UAM operations to be modest; at around $150 million in around 2025-2026 that is likely to reach around $2.7 billion in 2030. Combining these revenue projections with departure and passenger forecasts reported above, average fare per passengers is calculated to be around $80-$120 corresponding to base and lower-range cases, respectively. Recent service announcement[39] implies price (i.e., around $136-$200 for a full cabin of 4 passengers or $34-$50 per person] to be around half that ASSURE-implied prices calculated from revenue estimates.[40]

AAM services are likely to face stiff competition from technological advances in industries with close substitutes, such as ground transportation (i.e., emerging automated solutions on increasingly electric-powered vehicles). Furthermore, economic and financial tradeoffs underlying the emergence of AAM may have changed following COVID-19, changing travel patterns and perhaps long-term living arrangements. Finally, the high costs of urban infrastructure, community acceptance, associated noise, and environmental issues pose considerable challenges to greater adoption.

As eVTOL aircraft enter service for AAM operations, new initiatives will be undertaken with new missions envisioned and operationalized. The FAA, together with numerous stakeholders including the industry, and NASA will be keeping a keen eye on understanding overall trends in AAM. It is likely that AAM services will become a reality in the US by 2025-2027 and will become incrementally available in urban and suburban areas followed by an accelerated growth trajectories targeted to reach farther and distant travel destinations and routes over time. With this anticipated travelscape is imagined and drawn over the next few years as more information becomes available, the FAA will revise emerging trends and forecasts for AAM reported in this section in the near future.

[38] See ASSURE (2022) for a detailed discussion drawing on the existing literature.

[39] See https://bit.ly/3ZMllPb. Furthermore, Blade with existing services in many parts of the country including the NYC reported first successful completion of a historic piloted test flight of BETA's ALIA-250 electric and vertical aircraft (EVA) at the Westchester County Airport in White Plains, New York on February 14, 2023. Blade reported it to be a significant milestone towards transition from its use of helicopters to EVA in the near future [see https://bit.ly/3lZgAUY for more details].

[40] Research studies, industry reports and analysis tend to suggest a broad range of price estimates with varying effects on AAM demand: $2.25 per seat mile to as much as $11 per seat mile as summarized and reported here: https://bit.ly/3KySwS6.

Forecast Uncertainties

The forecasts in this document are forecasts of aviation demand, driven by models built on forecasts of economic activity. There are many assumptions in both the economic forecasts and in the FAA models that could affect the degree to which these forecasts are realized. Now that passenger and traffic volumes have returned to pre-COVID levels, this year's forecast is driven, at least in the near-term, by the strength of the U.S. and global economies that may be offset partially by supply chain constraints, most notably aircraft deliveries. It does go without saying that terrorism remains among the greatest worldwide risks to aviation growth. Any terrorist incident aimed at aviation could have an immediate and significant impact on the demand for aviation services that could be greater than its impact on overall economic activity.

In addition, changes in the geo-political landscape could lead to outcomes very different than the forecasts provided in this document. The ongoing crises in Ukraine and in the Middle East represent a very large uncertainty to this year's forecast. The impacts are still evolving and dependent in large part on the outcome of the armed conflicts. While there was an initial negative impact on airline bookings as well as a surge in oil prices, those impacts have diminished over time. The impact of the economic sanctions on Russia pushed the Russian economy (the world's 10th largest as of 2021) into a sharp four-quarter recession in 2022. European economic growth remained muted in 2023 as Europe moved to further restrict trade with Russia and its allies and reduce its dependence on energy from Russia. Many forecasters see continued low European economic growth in 2024 as well due to the impacts of the conflict. In the longer run, most analysts are seeing a return to higher tensions between Russia and the West resulting in higher expenditures on defense that may push taxes higher and leave consumers with less money to spend on items like air travel.

The rapid spread of the novel coronavirus (COVID-19) that began in early 2020 resulted in the largest decline in aviation activity since the jet era began in the late 1950's. While aviation activity has almost fully recovered to pre-pandemic levels, there is still a good deal of uncertainty about the long run path of aviation activity once the recovery from the 2020 downturn is complete. There are questions as to whether the strategies that U.S. and foreign carriers are employing to recover from the downturn in demand will be successful in a post-COVID environment. Other questions surround the stability of consumer attitudes and behaviors towards aviation in a post-COVID environment, as well as the breadth and depth of the and the speed and nature of the economic recovery, all of which apply both domestically and globally.

The future direction of oil prices presents another considerable uncertainty in producing the forecast. The FAA's baseline forecast (derived from economic assumptions in S&P Global December 2023 U.S. macro forecast and 30-Year Focus released during November 2023) calls for oil prices to fall from $78 per barrel in 2023 to $73 per barrel in 2025. Over the long term, the FAA baseline forecast assumes that oil prices will rise gradually to about $89 per barrel in 2030 and about $107 per barrel by the end of the forecast period in 2044. However, there are other oil price forecasts that vary considerably from the FAA base forecast in the next 2-5 years. These include the latest Energy Information

Administration (EIA) Short Term Energy Outlook released in March 2024, the International Monetary Fund (IMF) Commodity Price Forecast released in October 2023 and the World Bank Commodity Price Forecast released in October 2023. The EIA forecast projects the spot price of oil will reach $85 per barrel by 2025, considerably above the FAA base forecast of $73. The IMF forecast sees the price of oil around $73 in 2025 and falling to $66 per barrel in 2028, well below the FAA base forecast of $86 per barrel. The World Bank forecast has oil prices at $80 per barrel in 2025. Over the long run, lower oil prices give consumers an impetus for additional spending, including air travel, and should enhance industry profitability. In the case where oil prices turn out to be higher than the FAA forecast, we would expect lower spending on air travel by consumers, higher costs for fuel to airlines and reduced industry profitability.

The baseline forecast incorporates additional infrastructure spending in 2023 and beyond. However, there is considerable uncertainty as to the magnitude, timing, and nature of these programs that ultimately determines the impact on the future growth of the U.S. economy. In addition, how the U.S. will engage with the rest of the global economy over the next several years continues to evolve. Under the right conditions, a period of sustained high and more inclusive growth along with increased financial stability could occur. However, considering the recent Russia-Ukraine conflict there is an increased possibility of an outcome that leads to greater global economic fragmentation due to rising tensions resulting in slower growth and increased financial instability.

The baseline forecast assumes that the global economic recovery that began at the end of 2020 will continue but at a slower pace in 2024. Thereafter, the baseline forecast assumes that China and India will be growth engines for emerging economies. The forecast assumes China successfully transitions the economy from heavy reliance on manufacturing and resource industries to one more oriented towards the services and technology sectors and India continues to implement reforms to make its economy more competitive. Many analysts are concerned that in light of the Russia-Ukraine conflict, China moves closer to Russia, limiting opportunities to further transition its economy away from manufacturing and resource intensive industries. In the case of India, the impact of the Russia-Ukraine conflict on energy prices and food prices may put pressure on trade and fiscal deficits resulting in a slowdown of reforms.

In the United States, economic growth in the near term is expected to be slow as the impacts of the Federal Reserve’s moves to reduce inflation by raising interest rates are felt by consumers and businesses. The forecast anticipates that inflation returns to acceptable levels by 2024. Over the forecast horizon economic growth (real GDP) remains below 2 percent as population growth and productivity growth remain lower than historic averages. The forecast does not assume any measure of fiscal restraint will be implemented, despite government debt as percent of GDP exceeding 100 percent and approaching levels that were last seen at the end of World War 2. In Japan, the United Kingdom, and the European Union economic growth over the next few years will be well below rates seen over the past few years as these regions recovered from the COVID-19 recession. Demand growth will remain slow in these regions over the forecast horizon as they continue to be constrained by structural

economic problems (high debt, slow population growth, weak public finances, for example) and political instability. In most of the major advanced economies, governments need to shore up their finances after the increases in government spending to offset the impacts of COVID-19. If implemented, higher tax rates or reduced government spending would further contribute to suppress demand growth and a delayed strengthening of finances could result in even greater impacts. The current forecasts call for strong passenger growth for travel between the United States and other world regions, especially over the next few years. An unexpected slowing of worldwide economic activity could push the return of international passenger demand to pre-COVID levels beyond our current forecast of 2024.

Although demand has recovered and U.S. airline finances have improved considerably since the devastating impacts of COVID-19, the outlook for U.S. airline finances is not without risk. For the large network carriers, the steps taken to pay down debt incurred during COVID-19 has reduced the risk of bankruptcy in the next few years. However, many carriers have placed large orders for new aircraft to be delivered over the next 5 years and as new contracts with labor groups (pilots, flight attendants, mechanics) are negotiated and put into effect, U.S. airlines face substantially higher costs. If the demand recovery is slower than forecast, the increase in debt that these carriers are servicing plus the financing of large new aircraft orders along with higher labor costs increase the possibility of a bankruptcy or liquidation. Based on FY 2023 data, the top 6 (American, Delta, United, Southwest, Alaska and JetBlue) accounted for about 84 percent of the U.S. airline industry capacity, and a combined Alaska and Hawaiian would make up about 6.5 percent.

The forecast assumes the addition of sizable numbers of large regional jets (70 to 90 seats) into the fleets of regional carriers. While the recovery in air travel demand from the COVID downturn has been robust, we are not projecting a uniform recovery across all segments. As network carriers continue to adjust the size and breadth of their networks in anticipation of the post-COVID environment, they are continuing to move forward with plans to significantly reduce the numbers of small regional jets they will need. Strong air travel demand has not ensured financial stability for regional carriers, as the bankruptcy filings of Republic Airways in 2016, Great Lakes Airlines in 2018 and Trans States Airlines in 2020 have shown. Financially strong and well positioned regional carriers may see increased opportunities for regional flying because of the network carrier actions, but the overall impact will most likely reduce opportunities for many regional carriers. In addition to managing changing relationships with network carriers, regional carriers have struggled with pilot shortages that have exacerbated during the pandemic recovery. The downturn prompted mainline carriers to reduce costs by, among other measures, offering voluntary retirements to flight crews but, as activity picked up, they drew replacements from the ranks of regionals, causing additional shortages for those carriers. To attract and recruit crews, carriers have raised salaries and offered bonuses, further increasing financial pressures, and possibly leading to new consolidation in the regional airline industry.

The general aviation sector did suffer a downturn in activity in 2020 due to the impacts of COVID-19, but the magnitude of the decline was much less than the decline in commercial aviation. By the end of 2021 most sectors, including corporate and business aviation, were at or exceeding pre-COVID activity levels and GA flight hours exceeded pre-COVID levels. Once returning to pre-COVID levels of activity, future growth in business and corporate aviation is based largely upon the prospects for economic growth and corporate profits. Uncertainty in these leading indicators poses a risk to the forecast, but the risk is not limited to these factors. Other influences, such as potential environmental regulations and taxes do not seem to be as much of a concern in the short term, but over the long term, uncertainties about the direction of these influences may place downward pressure on the forecast.

Overall activity at FAA and contract towers rose 3.7 percent in 2023 and exceed pre-COVID levels. Activity at large and medium hub airports (64 in total) increased 3.9 percent and 0.7 percent, respectively, in 2023, resulting in congestion and delays. In the long run, operations at large and medium hub airports grow faster than the overall national trend and congestion and delays could become critical limits to growth over the forecast period. FAA's forecasts of both demand and operations are unconstrained in that they assume that there will be sufficient infrastructure to handle the projected levels of activity. Should the infrastructure be inadequate and result in even more congestion and delays, it is likely that the forecasts of both demand and operations would not be achieved.

Not only is the volume of aircraft operating at most large hubs expected to increase over the next 20 years, but the mix of aircraft is changing for this same period. The expected increases in the numbers of larger regional jets and business jets as well as the anticipated widespread deployment of UAS and Advanced Air Mobility (AAM) vehicles into the national airspace system will make the FAA's job more challenging. For example, in adding these new vehicles to the system, they could replace existing traditional aircraft. The integration of UAS and AAM could add to the workload above and beyond the current demand for aviation services.

As passenger demand and activity levels have returned to pre-COVID levels, there have been increasing concerns about the resources needed by the FAA to effectively manage the nation's airspace. The projected increase in activity by traditional aviation sectors (airlines, general aviation) coupled with anticipated growth in new entrant activity (commercial space, UAS/AAM) has renewed focus on FAA resources. In addition, much of the physical infrastructure supporting the nation's air traffic control system needs to be repaired or replaced, further exacerbating the resource concerns. FAA resources may prove to be inadequate to effectively address the myriad of future challenges. The likely result would be greater congestion and delays at airports, increasing airline passenger dissatisfaction. Furthermore, slower growth in new entrant activity could occur, delaying or reducing the benefits to the nation from expansion of these activities.

Increasing concerns about aviation's environmental impacts, including noise and emissions, could potentially limit or delay aviation's ability to grow to meet national economic and mobility needs. Airspace modernization and airport expansion, including new construction, are often contentious because of concerns over noise, air quality, and water quality. Efforts to mitigate aviation's climate

impacts could affect future aviation growth. In Europe, concerns about aviation's climate impact are leading to restrictions on airport expansion activities and proposals to limit short-haul domestic flights. Community concerns across the U.S. about aviation noise have led to increasing levels of public debate, political interest, and even litigation. Without effective measures to mitigate and abate aviation noise, the infrastructure projects and airspace redesign efforts needed to support currently forecasted aviation growth may be delayed. Similarly, community concerns about environmental and/or other considerations (e.g., privacy concerns) associated with UAS, AAM, and commercial space launch activity could impact growth in these aviation areas.

In addition to providing economic benefits, technologies to improve aircraft fuel efficiency and reduce fuel consumption provide benefits in terms of reduced emissions, impacting air quality and climate. Some technologies that improve fuel efficiency also result in reduced noise. Airlines are increasing their use of sustainable aviation fuels, which provides benefits in terms of improved local air quality and lifecycle greenhouse gas emissions reductions. The implementation of the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), a global market-based measure for international carbon dioxide emissions, will help ensure an approach that is economically preferable to a patchwork of State or Regional-level regulations around the world, and will help to further address aviation's climate impacts. Industry, the U.S. government, and international aviation, through ICAO, have all set an ambitious goal of moving the sector to net zero carbon dioxide emissions by 2050. Continued advancements and fleetwide uptake of sustainable aviation fuels and new aircraft and engine technologies that result in improved fuel efficiency, reduced fuel consumption, noise reduction and reduced emissions are required to ensure that access restrictions or operating limitations on the in-service fleet are minimized.

Widespread deployment of UAS and AAM vehicles, and the electrification of conventional general aviation and short haul aircraft are other potential near-term tools for reducing aviation emissions, provided they replace traditional aircraft in the movement of people and goods and their power requirements are met using sustainable sources. Otherwise, such vehicles would result in a net life-cycle increase in environmental impacts related to greenhouse gas emissions. The environmental impacts of these new entrants from a noise perspective must also be properly understood, recognizing that these vehicles may interact with communities in different ways than the traditional vehicles they replace. The expansion of commercial space launch activity could also change the mix of aircraft in service, with associated impacts on aviation noise and emissions. The emissions from commercial space operations are expected to have a negative impact on both the climate and the ozone layer; however, the magnitude of the impacts is unknown at this time due to the various fuel types currently used to launch vehicles.

Appendix A: Alternative Forecast Scenarios

Uncertainty exists in all industries, but especially in the commercial air travel industry. As volatility in the global environment has increased, the importance of scenarios for planning purposes has increased. To help stakeholders better prepare for the future, the FAA provides alternative scenarios to our baseline forecasts of airline traffic and capacity.

To create the baseline domestic forecast, economic assumptions from S&P Global's November 2023 30-year U.S. Macro Baseline was used. To develop the alternative scenarios, assumptions from S&P Global's 30-year optimistic and pessimistic forecasts from their August 2023 *US Economic Outlook* were utilized. Inputs from these alternative scenarios were used to create "high" and "low" traffic, capacity, and yield forecasts.

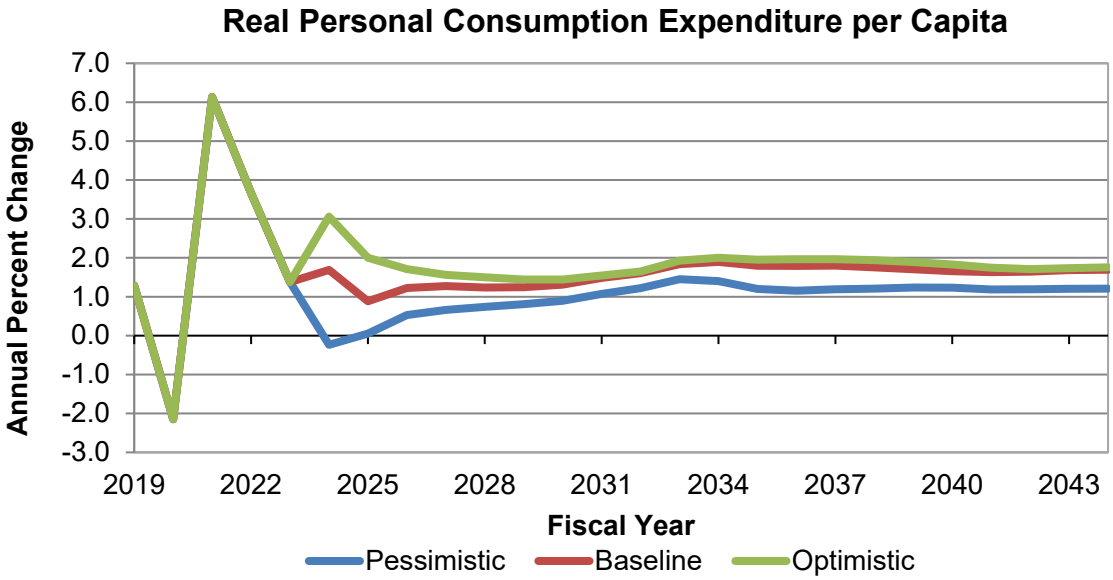
International passengers and traffic are primarily driven by country specific Gross Domestic Product (GDP) forecasts provided by S&P Global. Thus, the alternative scenarios use inputs based on ratios derived from S&P Global's Major Trading Partner and Other Important Trading Partners optimistic and pessimistic forecasts to create high and low cases.

Scenario Assumptions

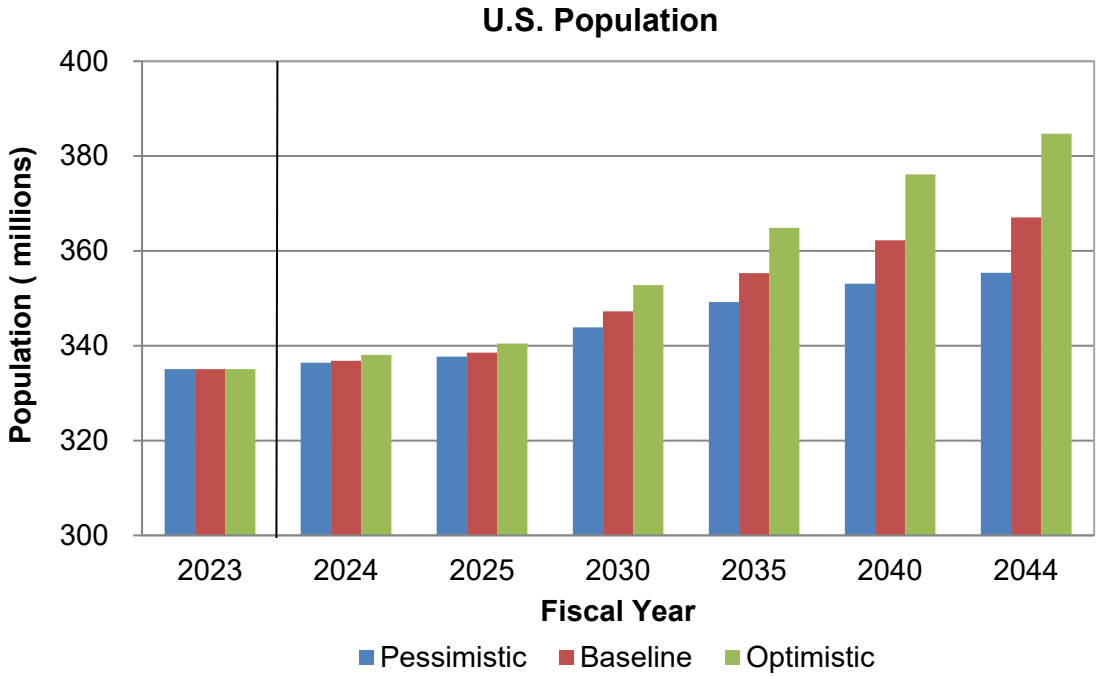
The FAA's domestic baseline forecast assumes very slow growth in the first half of 2024 followed by only slightly stronger activity for the remainder of the year. Both 2024 and 2025 see positive, but below-trend GDP growth of about 1.4 percent. Growth returns to about its long-term potential rate of 1.7 percent in subsequent years although that rate has been nudged down in recent years due to lower capital investment and labor force growth forecasts. The below-trend rate in the near term causes the unemployment rate to rise and peak at 4.7 percent in 2025. Slower growth and higher unemployment contribute to tamp down inflation and the Federal Reserve is able to begin lowering interest rates. The economy returns to equilibrium with GDP growth at 1.7 percent and unemployment at 4.2 percent. Crude oil remains roughly flat at its 2023 level of $78 per barrel for several years until global economic activity begins to pick up. With increasing global demand, the oil price rises to $107 per barrel at the end of the forecast.

The FAA's high case forecast uses S&P Global's optimistic forecast. The optimistic scenario is characterized by a faster resolution to the fighting in Gaza and a cessation of fighting in the Russia-Ukraine war resulting in lower energy prices. Near-term differences from the baseline include GDP growth of 2.2 percent in 2024 compared to 1.4 percent in the baseline, driven mainly by stronger consumer spending. Consumer spending rises 2.3 percent in 2024 and 2.1 percent in 2025, versus 1.9 percent and 1.5 percent in the base forecast. Stronger spending results from lower energy expenditures and increased confidence due to lessened political tensions. The unemployment rate still rises but it peaks 3 tenths of a percent lower than in the baseline.

Conversely, FAA's low case forecast uses S&P Global's pessimistic scenario. In this forecast, the worse outcome is mainly due to a decline in consumer spending caused by tighter lending standards and higher energy costs. Banking sector turmoil curtails lending and worsening conflicts in Ukraine and Gaza drive oil prices higher. GDP growth in 2024 is 0.6 percent compared to 1.4 percent in the baseline while consumption grows 0.8 percent compared to 1.9 percent. Over the forecast horizon, average GDP growth is four tenths slower than in the baseline. Oil prices rise sharply throughout the forecast to end 69 percent higher than the baseline in 2044. As in the baseline, the unemployment rate peaks in 2025 but is one and a quarter percentage points higher than the baseline at that time. It remains elevated by about half a percentage point through the end of the forecast.



Source: S&P Global



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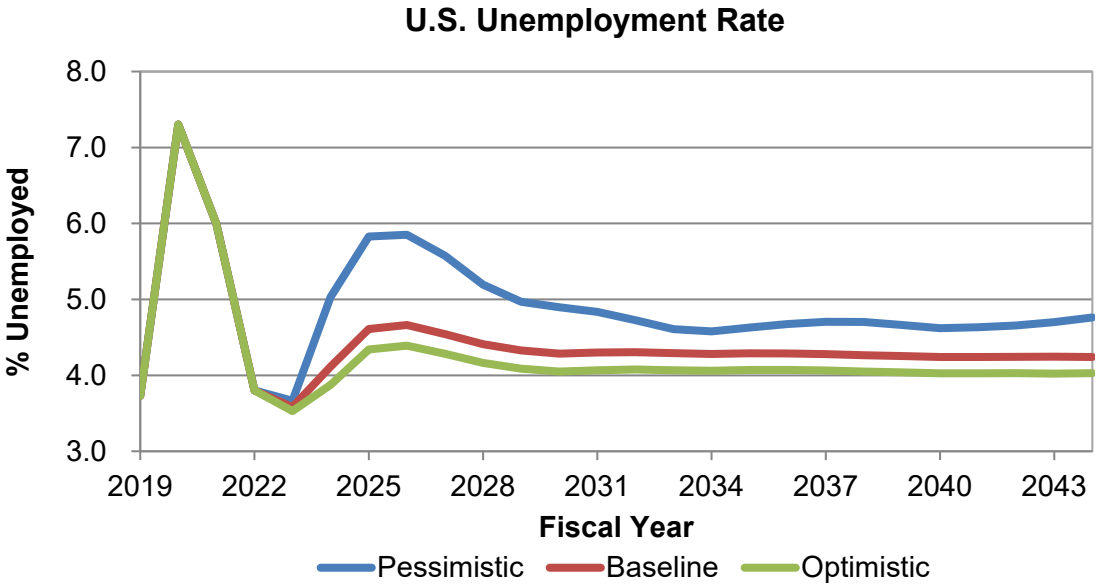

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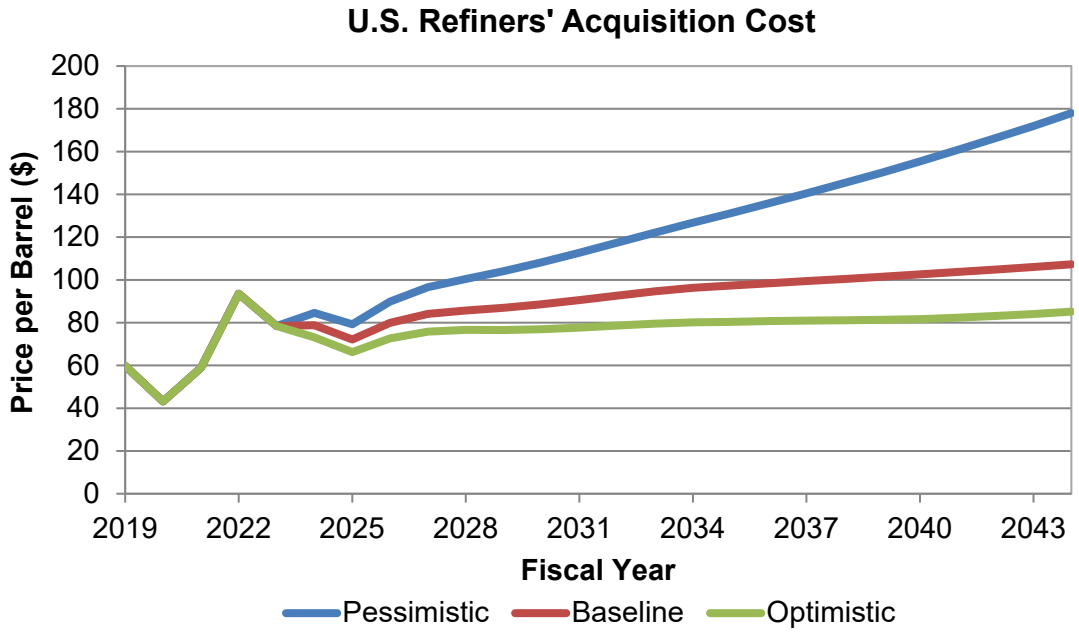
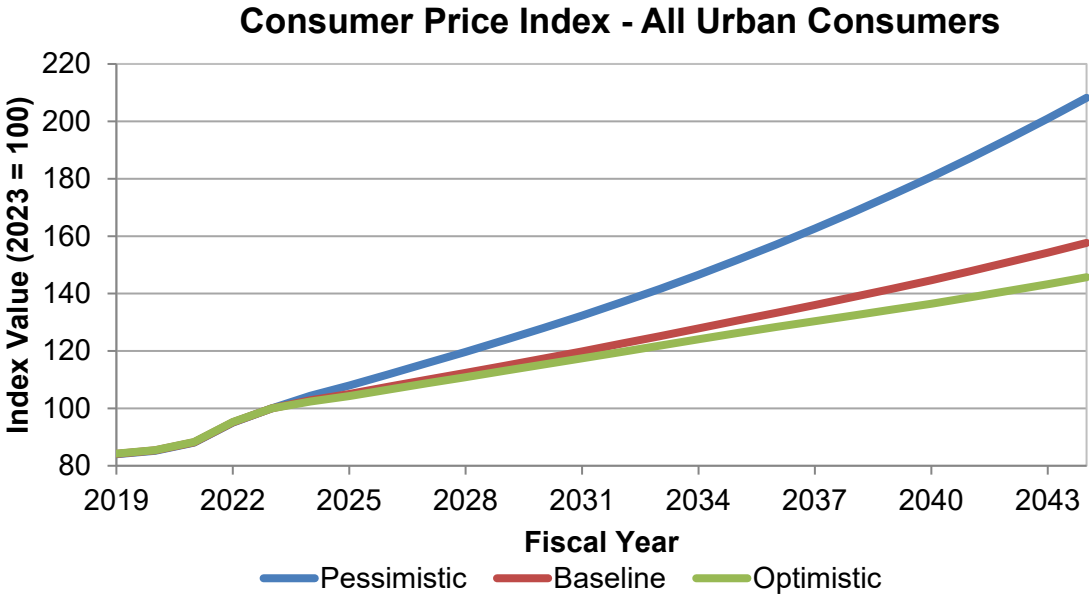


Source: S&P Global

The price of energy is one of the drivers in the growth of consumer prices over the forecast period. In the optimistic case, slow growth of energy prices and import prices counteracts faster growth of other consumer goods prices causing the optimistic CPI to rise somewhat slower than the baseline. In the pessimistic case, energy prices, wages and import prices all rise more rapidly compared to the baseline.



Source: S&P Global

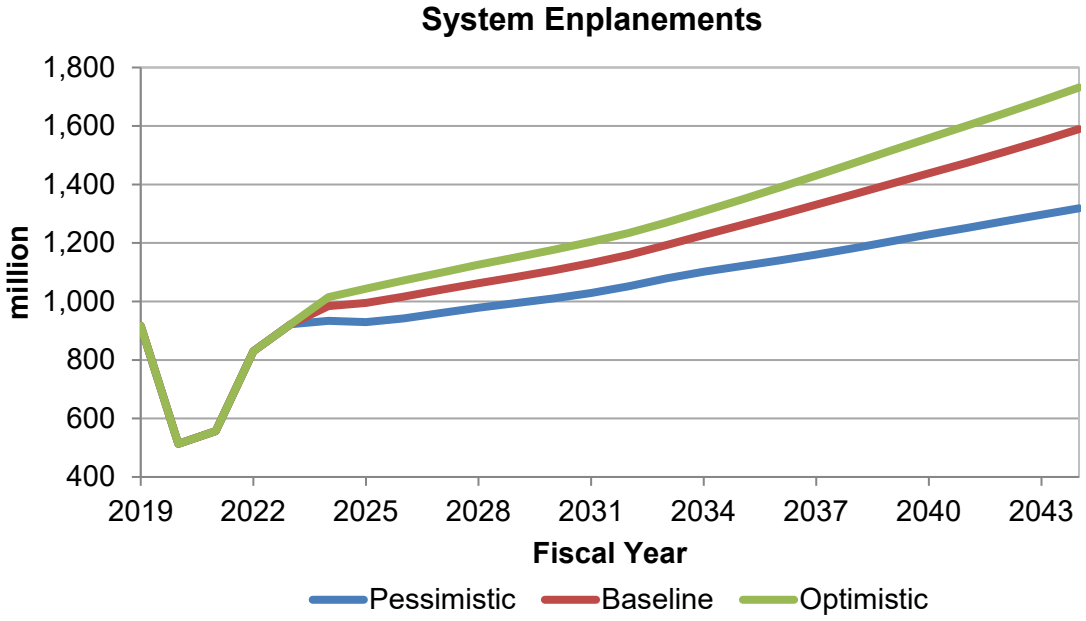
Alternative Forecasts

Enplanements

In the baseline forecast, system enplanements are forecast to grow at an average annual rate of 2.6 percent a year over the forecast horizon of 2024-2044 (with domestic and international passengers increasing at rates of 2.5 and 3.3 percent, respectively).

In the optimistic case, enplanements grow at a slightly quicker pace, averaging 3.05 percent per year (up 2.95 percent domestically and 3.69 percent internationally). This scenario is marked by a more favorable business environment and lower fuel prices which make the price of flying more affordable to business and leisure travelers. By the end of the forecast period in 2044, system passengers in the optimistic case are 9 percent above the baseline, totaling 1.7 billion, 142 million greater than in the baseline.

The pessimistic case is characterized by a period of weakened consumer spending combined with high inflation, leading to higher interest rates, and curtailed investment. In this scenario, enplanements grow an average of 1.7 percent per year (domestic up 1.6 percent and international up 2.8 percent). In the pessimistic case, system passengers in 2044 are 17 percent below the baseline case, totaling 1.3 billion, or 271 million fewer than in the baseline.

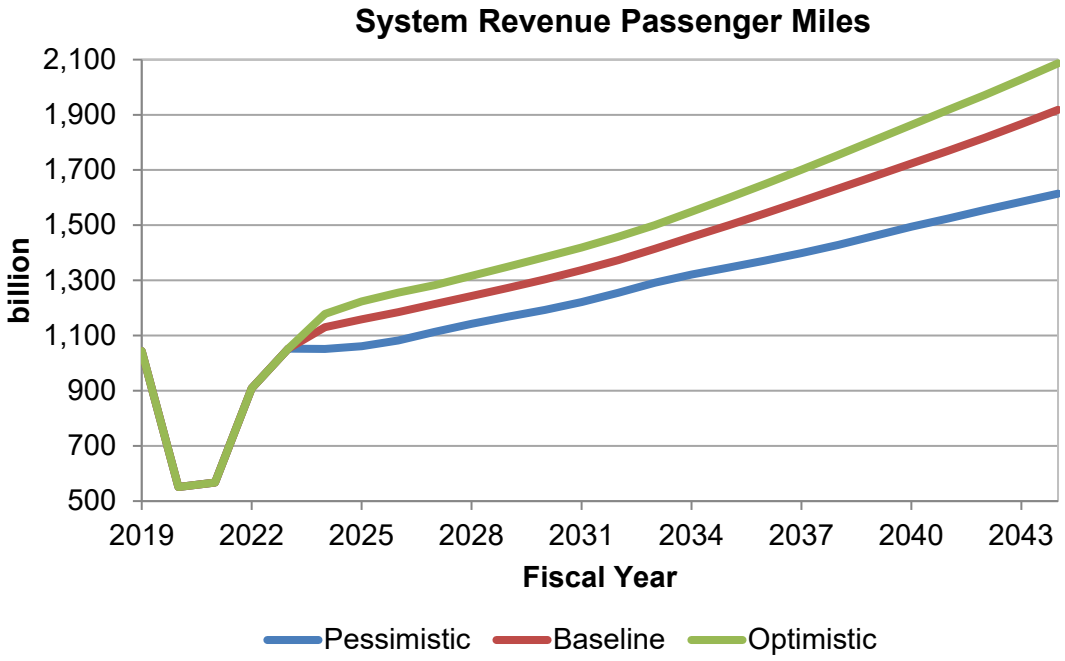


Revenue Passenger Miles

In the baseline forecast, system RPMs grow at an average annual rate of 2.9 percent a year over the forecast horizon (2024-2044), with domestic RPMs increasing 2.7 percent annually and international RPMs growing 3.3 percent annually.

In the optimistic case, the faster growing economy coupled with lower energy prices drives RPMs higher than the baseline, with growth averaging 3.3 percent per year (domestic and international RPMs up 3.2 and 3.7 percent, respectively).

In the pessimistic case, the combination of a slower growing economy and higher energy prices result in RPM growth averaging 2.1 percent annually with domestic markets growing 1.8 percent a year while international traffic grows 2.7 percent annually.



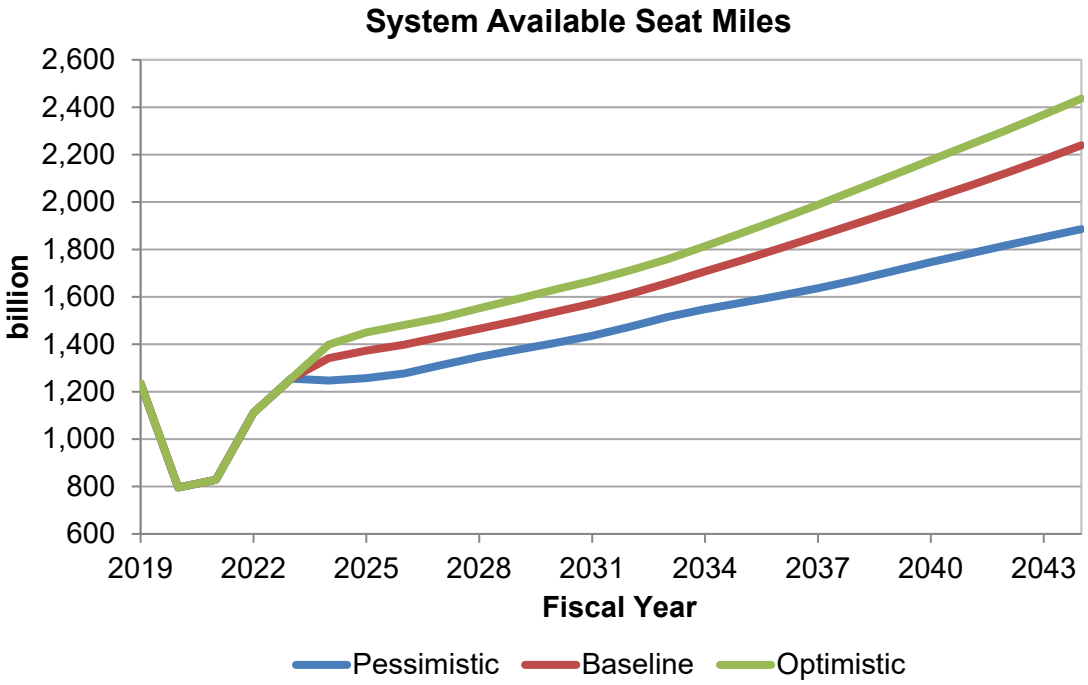
Available Seat Miles

In the base case, system capacity is forecast to increase an average of 2.8 percent annually over the forecast horizon with growth averaging 2.6 percent annually in domestic markets and 3.3 percent a year in international markets.

In the optimistic case, capacity grows somewhat faster than in the baseline forecast, averaging 3.2 percent annually system-wide (3.0 and 3.6 percent for domestic and international markets, respectively). Carriers increase capacity compared to the baseline forecast to accommodate increased travel

demand brought about by a more favorable economic environment.

In the pessimistic case, demand for air travel is lower than in the baseline, thus system capacity grows at a slower pace of 2.0 percent annually (domestic growth of 1.6 percent annually and international up 2.7 percent annually).



Load Factor

System load factors over the 20-year forecast period are similar for all three forecast scenarios. System load factor rises from 83.9 percent in 2023 to 85.7 (optimistic), 85.6 (pessimistic), and 85.7 (baseline) percent in 2044.

In all three scenarios it is assumed that carriers will keep load factors on the high side by actively managing capacity (seats) to more precisely meet demand (passengers).

The domestic load factor increases over the forecast horizon from 84.1 percent to 86.4 percent in the baseline, optimistic and pessimistic scenarios.

The international load factor rises in the baseline from 83.4 percent to 83.9 percent; in the optimistic to 83.8 percent; and in the pessimistic to 83.8 percent. This reflects in part the relative growth in demand and capacity in the three (Atlantic, Latin, and Pacific) international regions under each scenario.

Yield

In the baseline forecast, nominal system yield increases 1.5 percent annually, rising from 16.57 cents in 2023 to 22.42 cents in 2044. In domestic markets, yield in the baseline forecast rises from 16.44 cents in 2023 to 22.04 cents in 2044. International yield rises from 16.90 cents in 2023 to 23.33 cents in 2044.

System yield rises in the optimistic case at a slower rate than in the baseline, up 1.1 percent annually to 20.88 cents in 2044. Domestic yield increases to 20.17 cents while international yield increases to 22.58 cents. The moderate growth in yield in both cases is due to advancements in technology, gains in productivity, and modestly rising fuel and other prices.

In the pessimistic case, nominal yields rise more rapidly than in the baseline, growing an average of 2.6 percent annually, reaching 28.61 cents by 2044 (29.52 cents domestically and 26.65 cents internationally). This scenario reflects higher general domestic inflation and markedly higher energy prices than in the baseline, forcing carriers to increase fares to cover the higher costs of fuel, labor, and capital.

TABLE A-1

FAA FORECAST ECONOMIC ASSUMPTIONS

FISCAL YEARS 2023-2044

		Historical	FORECAST					PERCENT AVERAGE ANNUAL GROWTH				
Variable	Scenario	2023E	2024	2029	2034	2039	2044	2023-24	2024-29	2024-34	2024-39	2024-44
Economic Assumptions												
Real Personal Consumption	Pessimistic	45,752	45,644	46,931	49,835	52,894	56,162	-0.2%	0.6%	0.9%	1.0%	1.0%
Expenditure per Capita	Baseline	45,752	46,525	49,319	53,463	58,364	63,380	1.7%	1.2%	1.4%	1.5%	1.6%
(2012 $)	Optimistic	45,752	47,151	51,156	55,690	61,314	66,885	3.1%	1.6%	1.7%	1.8%	1.8%
Refiners Acquisition Cost -	Pessimistic	78.4	84.5	104.1	126.8	150.2	178.0	7.8%	4.3%	4.1%	3.9%	3.8%
Average - $ Per Barrel	Baseline	78.4	78.8	87.0	96.3	101.4	107.3	0.5%	2.0%	2.0%	1.7%	1.6%
	Optimistic	78.4	73.1	76.6	80.2	81.4	85.2	-6.7%	0.9%	0.9%	0.7%	0.8%
Consumer Price Index	Pessimistic	3.02	3.16	3.74	4.43	5.27	6.29	4.4%	3.5%	3.5%	3.5%	3.5%
All Urban, 1982-84 = 1	Baseline	3.02	3.11	3.47	3.87	4.28	4.77	2.9%	2.2%	2.2%	2.2%	2.2%
	Optimistic	3.02	3.09	3.42	3.75	4.06	4.40	2.4%	2.0%	1.9%	1.8%	1.8%
Civilian Unemployment Rate	Pessimistic	3.6	4.9	4.9	4.5	4.6	4.7	37.3%	-0.3%	-0.9%	-0.5%	-0.3%
(%)	Baseline	3.6	4.1	4.3	4.3	4.3	4.2	14.9%	1.0%	0.4%	0.2%	0.2%
	Optimistic	3.6	3.9	4.1	4.1	4.1	4.1	9.8%	1.1%	0.5%	0.3%	0.2%

Source: S&P Global

TABLE A-2

FAA FORECAST OF AVIATION ACTIVITY*

FISCAL YEARS 2023-2044

		Historical	FORECAST					PERCENT AVERAGE ANNUAL GROWTH				
Variable	Scenario	2023E	2024	2029	2034	2039	2044	2023-24	2024-29	2024-34	2024-39	2024-44
System Aviation Activity												
Available Seat Miles (BIL)	Pessimistic	1,255.0	1,246.8	1,376.6	1,548.1	1,708.6	1,885.8	-0.7%	2.0%	2.2%	2.1%	2.1%
	Baseline	1,255.0	1,341.3	1,499.7	1,707.1	1,960.7	2,239.4	6.9%	2.3%	2.4%	2.6%	2.6%
	Optimistic	1,255.0	1,398.6	1,590.3	1,814.1	2,113.7	2,436.1	11.4%	2.6%	2.6%	2.8%	2.8%
Revenue Passenger Miles (BIL)	Pessimistic	1,052.6	1,051.3	1,168.6	1,321.0	1,461.2	1,614.2	-0.1%	2.1%	2.3%	2.2%	2.2%
	Baseline	1,052.6	1,130.4	1,273.1	1,457.2	1,677.6	1,918.1	7.4%	2.4%	2.6%	2.7%	2.7%
	Optimistic	1,052.6	1,178.5	1,350.1	1,548.7	1,808.8	2,086.6	12.0%	2.8%	2.8%	2.9%	2.9%
Enplanements (MIL)	Pessimistic	922.1	934.0	994.8	1,101.8	1,205.6	1,318.5	1.3%	1.3%	1.7%	1.7%	1.7%
	Baseline	922.1	984.1	1,083.8	1,227.2	1,402.4	1,589.4	6.7%	1.9%	2.2%	2.4%	2.4%
	Optimistic	922.1	1,015.0	1,151.1	1,308.8	1,516.2	1,731.6	10.1%	2.5%	2.6%	2.7%	2.7%
Psgr Carrier Miles Flown (MIL)	Pessimistic	7,413.2	7,347.8	7,937.8	8,769.1	9,539.6	10,383.4	-0.9%	1.6%	1.8%	1.8%	1.7%
	Baseline	7,413.2	7,834.4	8,649.8	9,687.5	10,934.7	12,267.8	5.7%	2.0%	2.1%	2.2%	2.3%
	Optimistic	7,413.2	8,131.7	9,180.9	10,341.3	11,893.0	13,519.1	9.7%	2.5%	2.4%	2.6%	2.6%
Psgr Carrier Departures (000s)	Pessimistic	8,469.3	8,452.7	8,821.3	9,432.1	10,022.2	10,666.6	-0.2%	0.9%	1.1%	1.1%	1.2%
	Baseline	8,469.2	8,852.3	9,584.4	10,465.3	11,559.5	12,683.9	4.5%	1.6%	1.7%	1.8%	1.8%
	Optimistic	8,469.3	9,093.9	10,156.0	11,157.6	12,541.3	13,930.3	7.4%	2.2%	2.1%	2.2%	2.2%
Nominal Passenger Yield (cents)	Pessimistic	16.57	16.74	18.91	21.34	24.68	28.61	1.0%	2.5%	2.5%	2.6%	2.7%
	Baseline	16.57	16.51	17.91	19.37	20.80	22.42	-0.3%	1.6%	1.6%	1.6%	1.5%
	Optimistic	16.57	16.42	17.68	18.90	19.86	20.88	-0.9%	1.5%	1.4%	1.3%	1.2%

* Includes domestic and international activity.

TABLE A-3

FAA FORECAST OF DOMESTIC AVIATION ACTIVITY

FISCAL YEARS 2023-2044

		Historical	FORECAST					PERCENT AVERAGE ANNUAL GROWTH				
Variable	Scenario	2023E	2024	2029	2034	2039	2044	2023-24	2024-29	2024-34	2024-39	2024-44
Domestic Aviation Activity												
Available Seat Miles	Pessimistic	907.3	911.9	959.9	1,055.8	1,160.0	1,277.4	0.5%	1.0%	1.5%	1.6%	1.7%
(BIL)	Baseline	907.3	946.9	1,045.7	1,185.3	1,363.8	1,558.2	4.4%	2.0%	2.3%	2.5%	2.5%
	Optimistic	907.3	969.0	1,111.5	1,267.6	1,478.3	1,701.2	6.8%	2.8%	2.7%	2.9%	2.9%
Revenue Passenger Miles	Pessimistic	762.7	772.4	820.1	908.8	1,001.5	1,104.1	1.3%	1.2%	1.6%	1.7%	1.8%
(BIL)	Baseline	762.7	802.1	893.4	1,020.3	1,177.5	1,346.9	5.2%	2.2%	2.4%	2.6%	2.6%
	Optimistic	762.7	820.8	949.6	1,091.2	1,276.4	1,470.5	7.6%	3.0%	2.9%	3.0%	3.0%
Enplanements	Pessimistic	811.0	832.0	867.3	947.9	1,030.9	1,121.7	2.6%	0.8%	1.3%	1.4%	1.5%
(MIL)	Baseline	811.0	863.9	944.8	1,064.2	1,212.1	1,368.3	6.5%	1.8%	2.1%	2.3%	2.3%
	Optimistic	811.0	884.1	1,004.2	1,138.1	1313.9	1,494.0	9.0%	2.6%	2.6%	2.7%	2.7%
Psgr Carrier Miles Flown	Pessimistic	5,867.2	5,884.0	6,130.8	6,641.6	7,180.9	7,782.8	0.3%	0.8%	1.2%	1.3%	1.4%
(MIL)	Baseline	5,867.2	6,110.7	6,680.7	7,432.3	8,366.5	9,352.0	4.2%	1.8%	2.0%	2.1%	2.2%
	Optimistic	5,867.2	6,254.1	7,102.7	7,979.5	9,159.9	10,375.8	6.6%	2.6%	2.5%	2.6%	2.6%
Psgr Carrier Departures	Pessimistic	7,765.1	7,811.8	8,028.8	8,483.3	8,954.3	9,474.0	0.6%	0.5%	0.8%	0.9%	1.0%
(000s)	Baseline	7,765.1	8,097.7	8,720.2	9,459.6	10,394.6	11,342.4	4.3%	1.5%	1.6%	1.7%	1.7%
	Optimistic	7,765.1	8,271.9	9,242.8	10,104.7	11,303.6	12,489.0	6.5%	2.2%	2.0%	2.1%	2.1%
Nominal Passenger Yield	Pessimistic	16.44	16.50	19.06	21.99	25.45	29.52	0.3%	2.9%	2.9%	2.9%	3.0%
(cents)	Baseline	16.44	16.20	17.57	19.02	20.43	22.04	-1.5%	1.6%	1.6%	1.6%	1.5%
	Optimistic	16.44	16.06	17.18	18.28	19.18	20.17	-2.3%	1.4%	1.3%	1.2%	1.1%

*Includes mainline and regional carriers.

TABLE A-4

FAA FORECAST OF INTERNATIONAL AVIATION ACTIVITY*

FISCAL YEARS 2023-2044

		Historical	FORECAST					PERCENT AVERAGE ANNUAL GROWTH				
Variable	Scenario	2023E	2024	2029	2034	2039	2044	2023-24	2024-29	2024-34	2024-39	2024-44
International Aviation Activity												
Available Seat Miles	Pessimistic	347.7	334.9	416.7	492.3	548.6	608.4	-3.7%	4.5%	3.9%	3.3%	3.0%
(BIL)	Baseline	347.7	394.4	454.0	521.8	596.9	681.2	13.4%	2.9%	2.8%	2.8%	2.8%
	Optimistic	347.7	429.6	478.9	546.5	635.4	734.9	23.5%	2.2%	2.4%	2.6%	2.7%
Revenue Passenger Miles	Pessimistic	289.9	278.9	348.5	412.2	459.7	510.1	-3.8%	4.6%	4.0%	3.4%	3.1%
(BIL)	Baseline	289.9	328.4	379.7	436.9	500.2	571.2	13.3%	2.9%	2.9%	2.8%	2.8%
	Optimistic	289.9	357.7	400.6	457.6	532.4	616.1	23.4%	2.3%	2.5%	2.7%	2.8%
Enplanements	Pessimistic	111.1	102.1	127.5	153.8	174.6	196.8	-8.1%	4.6%	4.2%	3.6%	3.3%
(MIL)	Baseline	111.1	120.2	139.0	163.0	190.3	221.0	8.2%	3.0%	3.1%	3.1%	3.1%
	Optimistic	111.1	130.9	146.8	170.7	202.2	237.6	17.8%	2.3%	2.7%	2.9%	3.0%
Psgr Carrier Miles Flown	Pessimistic	1,546.0	1,463.8	1,807.0	2,127.5	2,358.7	2,600.6	-5.3%	4.3%	3.8%	3.2%	2.9%
(MIL)	Baseline	1,546.0	1,723.7	1,969.2	2,255.2	2,568.2	2,915.8	11.5%	2.7%	2.7%	2.7%	2.7%
	Optimistic	1,546.0	1,877.6	2,078.2	2,361.9	2,733.1	3,143.3	21.5%	2.1%	2.3%	2.5%	2.6%
Psgr Carrier Departures	Pessimistic	704.2	640.9	792.4	948.8	1,067.9	1,192.6	-9.0%	4.3%	4.0%	3.5%	3.2%
(000s)	Baseline	704.2	754.6	864.2	1,005.7	1,164.9	1,341.5	7.2%	2.7%	2.9%	2.9%	2.9%
	Optimistic	704.2	822.0	913.2	1,052.9	1,237.7	1,441.3	16.7%	2.1%	2.5%	2.8%	2.8%
Nominal Passenger Yield	Pessimistic	16.90	17.40	18.53	19.90	23.03	26.65	2.9%	1.3%	1.4%	1.9%	2.2%
(cents)	Baseline	16.90	17.27	18.70	20.19	21.67	23.33	2.2%	1.6%	1.6%	1.5%	1.5%
	Optimistic	16.90	17.27	18.87	20.39	21.48	22.58	2.1%	1.8%	1.7%	1.5%	1.3%

*Includes mainline and regional carriers.

Appendix B: Forecast Tables

TABLE 1

U.S. SHORT-TERM ECONOMIC FORECASTS

ECONOMIC VARIABLE	FISCAL YEAR 2023				FISCAL YEAR 2024				FISCAL YEAR 2025			
	1ST. QTR.	2ND. QTR.	3RD QTR.	4TH. QTR.	1ST. QTR.	2ND. QTR.	3RD QTR.	4TH. QTR.	1ST. QTR.	2ND. QTR.	3RD QTR.	4TH. QTR.
Real Personal Consumption Expenditure per Capita												
(2017 $)	45,358	45,735	45,768	46,145	46,364	46,515	46,567	46,654	46,747	46,860	46,997	47,141
Year over year change	0.7%	1.6%	1.3%	1.9%	2.2%	1.7%	1.7%	1.1%	0.8%	0.7%	0.9%	1.0%
Refiners' Acquisition Cost - Average												
(Dollars per barrel)	83.05	74.46	74.05	82.12	82.91	75.33	76.41	80.66	72.74	68.92	70.57	76.26
Year over year change	8.7%	-19.5%	-32.7%	-13.6%	-0.2%	1.2%	3.2%	-1.8%	-12.3%	-8.5%	-7.6%	-5.5%
Consumer Price Index												
(1982-84 = 1)	2.99	3.01	3.03	3.06	3.08	3.10	3.12	3.14	3.16	3.16	3.18	3.20
Year over year change	7.1%	5.8%	4.1%	3.6%	3.2%	2.7%	2.8%	2.7%	2.5%	2.2%	1.9%	1.9%

Source: S&P Global

TABLE 2

U.S. LONG-TERM ECONOMIC FORECASTS

FISCAL YEAR	REAL GROSS DOMESTIC PRODUCT (Billions 2017 $)	REAL PERSONAL CONSUMPTION EXPENDITURE PER CAPITA (2017 $)	CONSUMER PRICE INDEX (1982-84=1.00)	REFINERS' ACQUISITION COST AVERAGE (Dollars per barrel)
Historical				
2010	16,675	36,370	2.17	74.61
2019	20,531	41,921	2.54	59.77
2020	20,291	41,021	2.58	43.15
2021	21,127	43,537	2.67	58.91
2022	21,786	45,130	2.88	93.50
2023E	22,205	45,752	3.02	78.42
Forecast				
2024	22,609	46,525	3.11	78.83
2025	22,875	46,936	3.17	72.12
2030	24,802	49,965	3.55	88.63
2035	26,949	54,423	3.95	97.39
2040	27,141	57,563	4.35	106.31
2044	31,308	63,380	4.77	107.28
Avg Annual Growth				
2010-23	2.2%	1.8%	2.6%	0.4%
2023-24	1.8%	1.7%	2.9%	0.5%
2024-34	1.6%	1.4%	2.2%	2.0%
2024-44	1.6%	1.6%	2.2%	1.6%
Source: S&P Global				

TABLE 3

INTERNATIONAL GDP FORECASTS BY TRAVEL REGION

	GROSS DOMESTIC PRODUCT (In Billions of 2019 U.S. Dollars)				
CALENDAR YEAR	CANADA	EUROPE / AFRICA / MIDDLE EAST	LATIN AMERICA / CARIBBEAN / MEXICO	JAPAN / PACIFIC BASIN / CHINA / OTHER ASIA / AUSTRALIA / NEW ZEALAND	WORLD
Historical					
2010	1,439	21,622	4,647	19,890	67,023
2019	1,744	25,872	5,414	30,637	87,496
2020	1,656	24,461	5,051	30,377	84,837
2021	1,743	25,950	5,404	32,368	90,099
2022	1,810	26,981	5,617	33,425	92,833
2023E	1,831	27,231	5,741	34,879	95,312
Forecast					
2024	1,845	27,534	5,831	36,261	97,520
2025	1,877	28,069	5,986	37,705	100,049
2030	2,064	30,973	6,948	45,656	114,268
2035	2,253	33,906	8,021	54,382	129,739
2040	2,456	36,960	9,210	63,888	146,423
2044	2,631	39,477	10,280	72,059	160,775
Avg Annual Growth					
2010-23	1.9%	1.8%	1.6%	4.4%	2.7%
2023-24	0.8%	1.1%	1.6%	4.0%	2.3%
2024-34	1.8%	1.9%	3.0%	3.8%	2.6%
2024-44	1.8%	1.8%	2.9%	3.5%	2.5%

Source: S&P Global, Comparative World Overview Tables (Interim Forecast, Monthly)

TABLE 4

INTERNATIONAL GDP FORECASTS – SELECTED AREAS/COUNTRIES

	GROSS DOMESTIC PRODUCT (In Billions of 2019 U.S. Dollars)				
CALENDAR YEAR	NORTH AMERICA (USMCA)	EUROZONE	UNITED KINGDOM	JAPAN	CHINA
Historical					
2010	19,990	11,952	2,398	4,731	7,549
2019	24,571	13,489	2,851	5,117	14,278
2020	23,892	12,647	2,556	4,903	14,594
2021	25,271	13,394	2,777	5,032	15,828
2022	25,818	13,857	2,898	5,080	16,297
2023E	26,433	13,926	2,913	5,178	17,177
Forecast					
2024	26,841	13,990	2,910	5,218	17,985
2025	27,212	14,189	2,938	5,275	18,810
2030	29,520	15,247	3,106	5,488	23,397
2035	32,155	16,196	3,267	5,714	28,356
2040	34,974	17,110	3,446	5,919	33,623
2044	37,468	17,855	3,593	6,041	37,945
Avg Annual Growth					
2010-23	2.2%	1.2%	1.5%	0.7%	6.5%
2023-24	1.5%	0.5%	-0.1%	0.8%	4.7%
2024-34	1.6%	1.4%	1.1%	0.8%	4.3%
2024-44	1.7%	1.2%	1.1%	0.7%	3.8%

Source: S&P Global, Comparative World Overview Tables (Interim Forecast, Monthly)

TABLE 5

U.S. COMMERCIAL AIR CARRIERS[1]

TOTAL SCHEDULED U.S. PASSENGER TRAFFIC

	REVENUE PASSENGER ENPLANEMENTS (Millions)			REVENUE PASSENGER MILES (Billions)		
FISCAL YEAR	DOMESTIC	INTERNATIONAL	TOTAL	DOMESTIC	INTERNATIONAL	TOTAL
Historical						
2010	635	77	712	555	231	786
2019	813	104	917	752	292	1,044
2020	465	49	513	423	129	551
2021	508	49	557	476	92	567
2022	739	91	830	696	213	909
2023E	811	111	922	763	290	1,053
Forecast						
2024	864	120	984	802	328	1,130
2025	872	123	995	818	340	1,159
2030	963	143	1,106	913	391	1,304
2035	1,093	168	1,261	1,050	449	1,499
2040	1,242	196	1,438	1,210	514	1,723
2044	1,368	221	1,589	1,347	571	1,918
Avg Annual Growth						
2010-23	1.9%	2.8%	2.0%	2.5%	1.8%	2.3%
2023-24	6.5%	8.2%	6.7%	5.2%	13.3%	7.4%
2024-34	2.1%	3.1%	2.2%	2.4%	2.9%	2.6%
2024-44	2.3%	3.1%	2.4%	2.6%	2.8%	2.7%

Source: Forms 41 and 298-C, U.S. Department of Transportation.

[1]Sum of U.S. Mainline and Regional Air Carriers.

TABLE 6

U.S. COMMERCIAL AIR CARRIERS[1]

SCHEDULED PASSENGER CAPACITY, TRAFFIC, AND LOAD FACTORS

	DOMESTIC			INTERNATIONAL			SYSTEM		
FISCAL YEAR	ASMs (BIL)	RPMs (BIL)	% LOAD FACTOR	ASMs (BIL)	RPMs (BIL)	% LOAD FACTOR	ASMs (BIL)	RPMs (BIL)	% LOAD FACTOR
Historical									
2010	679	555	81.7	281	231	82.1	961	786	81.8
2019	883	752	85.2	352	292	82.9	1,235	1,044	84.5
2020	618	423	68.3	178	129	72.3	796	551	69.2
2021	658	476	72.3	171	92	53.5	829	567	68.5
2022	834	696	83.4	278	213	76.6	1,112	909	81.7
2023E	907	763	84.1	348	290	83.4	1,255	1,053	83.9
Forecast									
2024	947	802	84.7	394	328	83.3	1,341	1,130	84.3
2025	965	818	84.8	408	340	83.4	1,373	1,159	84.4
2030	1,069	913	85.4	467	391	83.7	1,536	1,304	84.9
2035	1,219	1,050	86.2	536	449	83.7	1,755	1,499	85.4
2040	1,401	1,210	86.4	613	514	83.8	2,013	1,723	85.6
2044	1,558	1,347	86.4	681	571	83.9	2,239	1,918	85.7
Avg Annual Growth									
2010-23	2.2%	2.5%		1.6%	1.8%		2.1%	2.3%	
2023-24	4.4%	5.2%		13.4%	13.3%		6.9%	7.4%	
2024-34	2.3%	2.4%		2.8%	2.9%		2.4%	2.6%	
2024-44	2.5%	2.6%		2.8%	2.8%		2.6%	2.7%	

Source: Forms 41 and 298-C, U.S. Department of Transportation.

[1]Sum of U.S. Mainline and Regional Air Carriers.

TABLE 7

U.S. COMMERCIAL AIR CARRIERS[1]

TOTAL SCHEDULED U.S. INTERNATIONAL PASSENGER TRAFFIC

	REVENUE PASSENGER ENPLANEMENTS				REVENUE PASSENGER MILES			
FISCAL YEAR	ATLANTIC (Mil)	LATIN AMERICA (Mil)	PACIFIC (Mil)	TOTAL INTERNATIONAL (Mil)	ATLANTIC (Bil)	LATIN AMERICA (Bil)	PACIFIC (Bil)	TOTAL INTERNATIONAL (Bil)
Historical								
2010	25	40	13	77	109	63	59	231
2019	28	63	13	104	121	96	75	292
2020	11	32	6	49	48	49	31	129
2021	6	43	1	49	27	60	4	92
2022	23	65	3	91	100	97	15	213
2023E	32	72	7	111	141	106	43	290
Forecast								
2024	34	75	11	120	152	110	66	328
2025	34	76	13	123	154	113	74	340
2030	37	92	14	143	169	138	84	391
2035	41	112	16	168	186	169	95	449
2040	44	134	18	196	204	204	106	514
2044	48	154	20	221	220	235	117	571
Avg Annual Growth								
2010-23	2.0%	4.6%	-4.2%	2.8%	2.0%	4.1%	-2.4%	1.8%
2023-24	7.4%	3.9%	53.2%	8.2%	7.8%	4.1%	53.4%	13.3%
2024-34	1.6%	3.7%	3.2%	3.1%	1.8%	4.0%	3.4%	2.9%
2024-44	1.7%	3.7%	2.8%	3.1%	1.9%	3.9%	2.9%	2.8%

Source: Forms 41 and 298-C, U.S. Department of Transportation.

[1]Sum of U.S. Mainline and Regional Air Carriers.

TABLE 8

U.S. AND FOREIGN FLAG CARRIERS

TOTAL PASSENGER TRAFFIC TO/FROM THE UNITED STATES

	TOTAL PASSENGERS BY WORLD TRAVEL AREA (Millions)				
CALENDAR YEAR	ATLANTIC	LATIN AMERICA	PACIFIC	U.S./CANADA TRANSBORDER	TOTAL
Historical					
2010	56	53	27	22	158
2019	89	89	44	32	253
2020	17	33	9	7	67
2021	24	66	4	5	99
2022	71	88	15	21	195
2023E	87	100	29	28	244
Forecast					
2024	93	102	34	32	261
2025	96	105	39	33	273
2030	111	125	51	38	326
2035	127	147	59	43	377
2040	144	171	68	49	433
2044	159	194	76	54	483
Avg Annual Growth					
2010-23	3.4%	5.0%	0.7%	2.1%	3.4%
2023-24	6.7%	2.8%	15.6%	12.0%	6.8%
2024-34	3.0%	3.3%	5.4%	2.9%	3.5%
2024-44	2.7%	3.2%	4.1%	2.7%	3.1%

Source: US Customs & Border Protection data processed and released by Department of Commerce; data also received from Transport Canada.

TABLE 9

U.S. COMMERCIAL AIR CARRIERS' FORECAST ASSUMPTIONS[1]

SEATS PER AIRCRAFT MILE AND PASSENGER TRIP LENGTH

	AVERAGE SEATS PER AIRCRAFT MILE			AVERAGE PASSENGER TRIP LENGTH		
FISCAL YEAR	DOMESTIC (Seats/Mile)	INTERNATIONAL (Seats/Mile)	SYSTEM (Seats/Mile)	DOMESTIC (Miles)	INTERNATIONAL (Miles)	SYSTEM (Miles)
Historical						
2010	121.9	216.4	139.7	874.9	2,988.0	1,104.2
2019	141.1	221.3	157.4	924.9	2,813.9	1,138.8
2020	141.1	217.1	153.1	909.2	2,647.9	1,073.7
2021	144.9	198.6	153.4	937.3	1,859.6	1,018.9
2022	149.0	215.4	161.5	941.2	2,347.5	1,094.8
2023E	154.6	224.9	169.3	940.4	2,610.0	1,141.6
Forecast						
2024	155.0	228.8	171.2	928.4	2,732.5	1,148.7
2025	155.3	229.9	171.8	938.4	2,759.6	1,164.0
2030	157.0	230.7	173.8	948.8	2,722.2	1,178.8
2035	160.2	231.6	176.8	961.3	2,669.1	1,189.2
2040	163.7	232.7	180.0	974.0	2,618.9	1,198.4
2044	166.6	233.6	182.5	984.3	2,584.2	1,206.8
Avg Annual Growth						
2010-23	1.8%	0.3%	1.5%	0.6%	-1.0%	0.3%
2023-24	0.2%	1.7%	1.1%	-1.3%	4.7%	0.6%
2024-34	0.3%	0.1%	0.3%	0.3%	-0.2%	0.3%
2024-44	0.4%	0.1%	0.3%	0.3%	-0.3%	0.2%

Source: Forms 41 and 298-C, U.S. Department of Transportation.

[1]Sum of U.S. Mainline and Regional Air Carriers.

TABLE 10

U. S. MAINLINE AIR CARRIERS

SCHEDULED PASSENGER TRAFFIC

	REVENUE PASSENGER ENPLANEMENTS (Millions)			REVENUE PASSENGER MILES (Billions)		
FISCAL YEAR	DOMESTIC	INTERNATIONAL	SYSTEM	DOMESTIC	INTERNATIONAL	SYSTEM
Historical						
2010	473	75	548	480	230	710
2019	654	100	754	674	290	963
2020	370	47	417	376	127	503
2021	402	47	449	422	90	512
2022	613	89	701	634	211	845
2023E	696	109	805	710	289	998
Forecast						
2024	740	118	858	746	327	1,073
2025	745	121	866	760	339	1,099
2030	817	141	957	844	389	1,232
2035	927	165	1,092	969	447	1,416
2040	1,053	193	1,246	1,116	511	1,627
2044	1,161	217	1,378	1,242	569	1,811
Avg Annual Growth						
2010-23	3.0%	3.0%	3.0%	3.1%	1.8%	2.7%
2023-24	6.4%	8.2%	6.6%	5.0%	13.3%	7.4%
2024-34	2.0%	3.1%	2.2%	2.4%	2.9%	2.5%
2024-44	2.3%	3.1%	2.4%	2.6%	2.8%	2.7%

Source: Form 41, U.S. Department of Transportation.

TABLE 11

U.S. MAINLINE AIR CARRIERS

SCHEDULED PASSENGER CAPACITY, TRAFFIC, AND LOAD FACTORS

	DOMESTIC			INTERNATIONAL			SYSTEM		
FISCAL YEAR	ASMs (BIL)	RPMs (BIL)	% LOAD FACTOR	ASMs (BIL)	RPMs (BIL)	% LOAD FACTOR	ASMs (BIL)	RPMs (BIL)	% LOAD FACTOR
Historical									
2010	581	480	82.7	279	230	82.2	860	710	82.5
2019	785	674	85.8	349	290	83.0	1,134	963	85.0
2020	547	376	68.7	176	127	72.4	723	503	69.6
2021	582	422	72.6	169	90	53.4	751	512	68.2
2022	756	634	83.9	276	211	76.6	1,032	845	81.9
2023E	842	710	84.3	346	289	83.4	1,188	998	84.1
Forecast									
2024	877	746	85.0	393	327	83.3	1,270	1,073	84.5
2025	893	760	85.1	406	339	83.4	1,299	1,099	84.6
2030	983	844	85.8	465	389	83.7	1,448	1,232	85.1
2035	1,121	969	86.5	534	447	83.7	1,654	1,416	85.6
2040	1,287	1,116	86.7	610	511	83.8	1,897	1,627	85.8
2044	1,431	1,242	86.8	678	569	83.9	2,109	1,811	85.9
Avg Annual Growth									
2010-23	2.9%	3.1%		1.7%	1.8%		2.5%	2.7%	
2023-24	4.2%	5.0%		13.5%	13.3%		6.9%	7.4%	
2024-34	2.2%	2.4%		2.8%	2.9%		2.4%	2.5%	
2024-44	2.5%	2.6%		2.8%	2.8%		2.6%	2.7%	

Source: Form 41, U.S. Department of Transportation.

TABLE 12

U.S. MAINLINE AIR CARRIERS

SCHEDULED INTERNATIONAL PASSENGER ENPLANEMENTS

	REVENUE PASSENGER ENPLANEMENTS (MIL)			
FISCAL YEAR	ATLANTIC	LATIN AMERICA	PACIFIC	TOTAL
Historical				
2010	24.5	37.2	12.9	74.6
2019	27.9	59.2	13.2	100.2
2020	10.8	30.3	5.6	46.7
2021	5.7	40.9	0.8	47.4
2022	22.6	63.3	2.6	88.5
2023E	31.8	69.7	7.4	109.0
Forecast				
2024	34.2	72.4	11.3	117.9
2025	34.4	73.9	12.6	120.9
2030	37.4	89.2	14.2	140.7
2035	40.7	108.5	15.9	165.2
2040	44.4	130.3	17.9	192.6
2044	47.7	149.9	19.6	217.2
Avg Annual Growth				
2010-23	2.0%	5.0%	-4.2%	3.0%
2023-24	7.4%	3.8%	53.2%	8.2%
2024-34	1.6%	3.7%	3.2%	3.1%
2024-44	1.7%	3.7%	2.8%	3.1%

Source: Form 41, U.S. Department of Transportation.

TABLE 13

U.S. MAINLINE AIR CARRIERS
SCHEDULED PASSENGER CAPACITY, TRAFFIC, AND LOAD FACTORS
BY INTERNATIONAL TRAVEL REGIONS

	ATLANTIC			LATIN AMERICA			PACIFIC			INTERNATIONAL		
FISCAL YEAR	ASMs (BIL)	RPMs (BIL)	% LOAD FACTOR	ASMs (BIL)	RPMs (BIL)	% LOAD FACTOR	ASMs (BIL)	RPMs (BIL)	% LOAD FACTOR	ASMs (BIL)	RPMs (BIL)	% LOAD FACTOR
Historical												
2010	131	109	82.9	78	62	79.2	70	59	84.1	279	230	82.2
2019	146	121	82.9	112	94	83.5	91	75	82.6	349	290	83.0
2020	69	48	69.3	63	48	76.2	44	31	71.8	176	127	72.4
2021	57	27	47.8	92	59	63.5	20	4	22.4	169	90	53.4
2022	128	100	78.1	121	96	79.6	27	15	56.3	276	211	76.6
2023E	171	141	82.6	122	104	85.8	54	43	80.5	346	289	83.4
Forecast												
2024	184	152	82.6	127	109	85.8	82	66	80.9	393	327	83.3
2025	186	154	82.6	130	111	85.8	90	74	81.7	406	339	83.4
2030	205	169	82.6	158	136	85.8	101	84	82.5	465	389	83.7
2035	225	186	82.6	194	167	85.8	115	95	82.5	534	447	83.7
2040	247	204	82.6	234	201	85.8	129	106	82.5	610	511	83.8
2044	266	220	82.6	271	232	85.8	141	117	82.5	678	569	83.9
Avg Annual Growth												
2010-23	2.1%	2.0%		3.5%	4.1%		-2.1%	-2.4%		1.7%	1.8%	
2023-24	7.8%	7.8%		4.0%	4.0%		52.7%	53.4%		13.5%	13.3%	
2024-34	1.8%	1.8%		4.0%	4.0%		3.2%	3.4%		2.8%	2.9%	
2024-44	1.9%	1.9%		3.9%	3.9%		2.8%	2.9%		2.8%	2.8%	

Source: Form 41, U.S. Department of Transportation.

TABLE 14

U.S. MAINLINE AIR CARRIER FORECAST ASSUMPTIONS

SEATS PER AIRCRAFT MILE

		INTERNATIONAL				
FISCAL YEAR	DOMESTIC (Seats/Mile)	ATLANTIC (Seats/Mile)	LATIN AMERICA (Seats/Mile)	PACIFIC (Seats/Mile)	TOTAL (Seats/Mile)	SYSTEM (Seats/Mile)
Historical						
2010	152.0	231.7	171.7	287.2	220.9	169.2
2019	166.0	251.6	177.9	269.9	225.6	180.7
2020	166.7	256.2	178.5	256.5	221.8	177.4
2021	171.7	255.4	178.8	205.8	202.4	177.8
2022	171.0	260.0	180.4	265.8	218.3	181.5
2023E	172.2	256.3	183.1	278.8	227.2	185.2
Forecast						
2024	172.7	256.8	183.6	279.5	231.0	187.4
2025	173.3	257.3	184.1	280.3	232.1	188.2
2030	175.8	259.8	186.6	284.0	233.0	190.9
2035	178.9	262.3	189.1	287.8	233.8	193.6
2040	182.5	264.8	191.6	291.5	234.9	196.6
2044	185.3	266.8	193.6	294.5	235.8	199.0
Avg Annual Growth						
2010-23	1.0%	0.8%	0.5%	-0.2%	0.2%	0.7%
2023-24	0.3%	0.2%	0.3%	0.3%	1.7%	1.1%
2024-34	0.3%	0.2%	0.3%	0.3%	0.1%	0.3%
2024-44	0.4%	0.2%	0.3%	0.3%	0.1%	0.3%

Source: Form 41, U.S. Department of Transportation.

TABLE 15

U.S. MAINLINE AIR CARRIER FORECAST ASSUMPTIONS

AVERAGE PASSENGER TRIP LENGTH

		INTERNATIONAL				
FISCAL YEAR	DOMESTIC (Miles)	ATLANTIC (Miles)	LATIN AMERICA (Miles)	PACIFIC (Miles)	TOTAL (Miles)	SYSTEM (Miles)
Historical						
2010	1,015	4,433	1,660	4,587	3,077	1,296
2019	1,030	4,330	1,582	5,709	2,890	1,278
2020	1,015	4,442	1,577	5,634	2,725	1,207
2021	1,050	4,756	1,434	5,809	1,906	1,140
2022	1,035	4,435	1,517	5,835	2,388	1,206
2023E	1,020	4,428	1,498	5,841	2,649	1,241
Forecast						
2024	1,008	4,446	1,501	5,851	2,774	1,250
2025	1,020	4,464	1,505	5,861	2,801	1,269
2030	1,033	4,527	1,524	5,902	2,762	1,287
2035	1,046	4,563	1,536	5,929	2,706	1,297
2040	1,059	4,586	1,544	5,941	2,654	1,306
2044	1,070	4,604	1,550	5,945	2,618	1,314
Avg Annual Growth						
2010-23	0.0%	0.0%	-0.8%	1.9%	-1.1%	-0.3%
2023-24	-1.3%	0.4%	0.3%	0.2%	4.7%	0.8%
2024-34	0.3%	0.2%	0.2%	0.1%	-0.2%	0.4%
2024-44	0.3%	0.2%	0.2%	0.1%	-0.3%	0.2%

Source: Form 41, U.S. Department of Transportation.

TABLE 16

U.S. MAINLINE AIR CARRIER FORECAST ASSUMPTIONS

PASSENGER YIELDS

	REVENUE PER PASSENGER MILE					
	DOMESTIC		INTERNATIONAL		SYSTEM	
FISCAL YEAR	CURRENT $ (Cents)	FY 2023 $ (Cents)	CURRENT $ (Cents)	FY 2023 $ (Cents)	CURRENT $ (Cents)	FY 2023 $ (Cents)
Historical						
2010	12.62	17.55	12.84	17.85	12.69	17.64
2019	14.12	16.79	13.47	16.00	13.92	16.55
2020	13.40	15.70	13.48	15.79	13.42	15.72
2021	11.73	13.31	12.84	14.57	11.93	13.53
2022	15.58	16.37	15.35	16.14	15.52	16.31
2023E	16.65	16.65	16.93	16.93	16.73	16.73
Forecast						
2024	16.41	15.95	17.30	16.83	16.68	16.22
2025	16.55	15.76	17.55	16.72	16.86	16.05
2030	18.09	15.42	19.03	16.23	18.39	15.67
2035	19.57	14.99	20.53	15.73	19.88	15.22
2040	21.02	14.53	22.01	15.23	21.33	14.75
2044	22.35	14.17	23.37	14.83	22.67	14.38
Avg Annual Growth						
2010-23	2.2%	-0.4%	2.2%	-0.4%	2.1%	-0.4%
2023-24	-1.4%	-4.2%	2.2%	-0.6%	-0.3%	-3.1%
2024-34	1.6%	-0.6%	1.6%	-0.6%	1.6%	-0.6%
2024-44	1.6%	-0.6%	1.5%	-0.6%	1.5%	-0.6%

Source: Form 41, U.S. Department of Transportation.

TABLE 17

U.S. MAINLINE AIR CARRIER FORECAST ASSUMPTIONS

INTERNATIONAL PASSENGER YIELDS BY REGION

	REVENUE PER PASSENGER MILE							
	ATLANTIC		LATIN AMERICA		PACIFIC		TOTAL INTERNATIONAL	
FISCAL YEAR	CURRENT $ (Cents)	FY 2023 $ (Cents)	CURRENT $ (Cents)	FY 2023 $ (Cents)	CURRENT $ (Cents)	FY 2023 $ (Cents)	CURRENT $ (Cents)	FY 2023 $ (Cents)
Historical								
2010	12.73	17.71	13.33	18.54	12.50	17.38	12.84	17.85
2019	14.04	16.69	14.20	16.88	11.63	13.83	13.47	16.00
2020	13.49	15.80	14.60	17.10	11.75	13.77	13.48	15.79
2021	11.82	13.41	12.59	14.28	22.48	25.49	12.84	14.57
2022	15.68	16.48	14.63	15.38	17.79	18.70	15.35	16.14
2023E	17.09	17.09	16.75	16.75	16.85	16.85	16.93	16.93
Forecast								
2024	17.49	17.01	17.08	16.61	17.23	16.76	17.30	16.83
2025	17.77	16.92	17.29	16.47	17.51	16.68	17.55	16.72
2030	19.35	16.50	18.59	15.86	19.08	16.28	19.03	16.23
2035	21.01	16.10	19.87	15.22	20.76	15.91	20.53	15.73
2040	22.69	15.70	21.09	14.59	22.47	15.54	22.01	15.23
2044	24.24	15.39	22.22	14.10	24.04	15.26	23.37	14.83
Avg Annual Growth								
2010-23	2.3%	-0.3%	1.8%	-0.8%	2.3%	-0.2%	2.2%	-0.4%
2023-24	2.3%	-0.5%	2.0%	-0.8%	2.2%	-0.5%	2.2%	-0.6%
2024-34	1.7%	-0.5%	1.4%	-0.8%	1.7%	-0.5%	1.6%	-0.6%
2024-44	1.6%	-0.5%	1.3%	-0.8%	1.7%	-0.5%	1.5%	-0.6%

Source: Form 41, U.S. Department of Transportation.

TABLE 18

U.S. MAINLINE AIR CARRIER FORECAST ASSUMPTIONS

JET FUEL PRICES

	DOMESTIC		INTERNATIONAL		SYSTEM	
FISCAL YEAR	CURRENT $ (Cents)	FY 2023 $ (Cents)	CURRENT $ (Cents)	FY 2023 $ (Cents)	CURRENT $ (Cents)	FY 2023 $ (Cents)
Historical						
2010	219.16	304.74	220.12	306.08	219.49	305.20
2019	205.67	244.45	207.82	247.00	206.42	245.33
2020	166.65	195.23	167.21	195.88	166.84	195.45
2021	177.23	201.01	171.82	194.86	175.49	199.02
2022	309.28	325.03	315.20	331.25	311.24	327.10
2023E	295.26	295.26	290.77	290.77	293.70	293.70
Forecast						
2024	289.91	281.87	285.49	277.58	288.37	280.38
2025	264.64	251.98	260.61	248.15	263.24	250.65
2030	291.17	248.19	286.74	244.42	289.63	246.88
2035	320.85	245.71	315.97	241.97	319.15	244.41
2040	338.45	234.00	333.30	230.44	336.66	232.77
2044	353.96	224.52	348.58	221.11	352.10	223.34
Avg Annual Growth						
2010-23	2.3%	-0.2%	2.2%	-0.4%	2.3%	-0.3%
2023-24	-1.8%	-4.5%	-1.8%	-4.5%	-1.8%	-4.5%
2024-34	0.9%	-1.3%	0.9%	-1.3%	0.9%	-1.3%
2024-44	1.0%	-1.1%	1.0%	-1.1%	1.0%	-1.1%

Source: Form 41, U.S. Department of Transportation

TABLE 19

U.S. COMMERCIAL AIR CARRIERS

AIR CARGO REVENUE TON MILES[1, 2, 3]

	ALL-CARGO CARRIER RTMS (Millions)			PASSENGER CARRIER RTMS (Millions)			TOTAL RTMS (Millions)		
FISCAL YEAR	DOMESTIC	INT'L.	TOTAL	DOMESTIC	INT'L.	TOTAL	DOMESTIC	INT'L.	TOTAL
Historical									
2010	11,306	15,971	27,276	1,495	6,246	7,742	12,801	22,217	35,018
2019	14,737	19,668	34,405	1,468	6,984	8,452	16,205	26,652	42,857
2020	16,665	21,964	38,630	1,136	4,130	5,266	17,801	26,095	43,896
2021	18,555	26,580	45,135	1,318	4,836	6,154	19,873	31,416	51,289
2022	18,376	26,090	44,466	1,447	5,625	7,072	19,823	31,715	51,539
2023E	16,358	24,174	40,532	1,219	5,521	6,740	17,577	29,695	47,272
Forecast									
2024	16,900	24,888	41,788	1,248	6,258	7,506	18,147	31,146	49,293
2025	17,299	25,762	43,061	1,265	6,887	8,152	18,564	32,649	51,212
2030	19,367	32,298	51,665	1,350	7,995	9,345	20,717	40,293	61,010
2035	21,448	38,535	59,983	1,421	8,801	10,222	22,869	47,336	70,205
2040	23,532	45,493	69,026	1,479	9,545	11,025	25,012	55,039	80,050
2044	25,323	51,840	77,163	1,523	10,127	11,651	26,846	61,967	88,814
Avg Annual Growth									
2010-23	2.9%	3.2%	3.1%	-1.6%	-0.9%	-1.1%	2.5%	2.3%	2.3%
2023-24	3.3%	3.0%	3.1%	2.4%	13.3%	11.4%	3.2%	4.9%	4.3%
2024-34	2.2%	4.1%	3.4%	1.2%	3.3%	3.0%	2.1%	3.9%	3.3%
2024-44	2.0%	3.7%	3.1%	1.0%	2.4%	2.2%	2.0%	3.5%	3.0%

Source: Form 41, U.S. Department of Transportation

[1]Includes freight/express and mail revenue ton miles on mainline air carriers and regionals/commuters.

[2]Domestic figures from 2000 through 2002 exclude Airborne Express, Inc.; international figures for 2003 and beyond include new reporting of contract service by U.S. carriers for foreign flag carriers.

[3]Domestic figures from 2003 and beyond include Airborne Express. Inc.

TABLE 20

U.S. COMMERCIAL AIR CARRIERS

INTERNATIONAL AIR CARGO REVENUE TON MILES BY REGION[1, 2]

FISCAL YEAR	ATLANTIC (MILLIONS)	LATIN AMERICA (MILLIONS)	PACIFIC (MILLIONS)	OTHER INTERNATIONAL (MILLIONS)	TOTAL (MILLIONS)
Historical					
2010	6,786	1,990	7,897	5,545	22,217
2019	7,426	1,661	10,429	7,135	26,652
2020	6,669	1,296	10,198	7,931	26,095
2021	7,603	1,608	11,555	10,650	31,416
2022	8,763	1,666	10,905	10,382	31,715
2023E	8,352	1,418	12,005	7,920	29,695
Forecast					
2024	8,636	1,446	12,669	8,395	31,146
2025	8,909	1,476	13,197	9,067	32,649
2030	10,241	1,698	15,793	12,560	40,293
2035	11,588	1,889	18,457	15,402	47,336
2040	13,016	2,031	21,304	18,687	55,039
2044	14,243	2,146	23,863	21,716	61,967
Avg Annual Growth					
2010-23	1.6%	-2.6%	3.3%	2.8%	2.3%
2023-24	3.4%	2.0%	5.5%	6.0%	4.9%
2024-34	2.7%	2.5%	3.5%	5.8%	3.9%
2024-44	2.5%	2.0%	3.2%	4.9%	3.5%

Source: Form 41, U.S. Department of Transportation

[1]Includes freight/express and mail revenue ton miles on mainline air carriers and regionals/commuters.

[2]Figures for 2003 and beyond include new reporting of contract service by U.S. carriers for foreign flag carriers.

TABLE 21

U.S. MAINLINE AIR CARRIERS

PASSENGER JET AIRCRAFT

	LARGE NARROWBODY				LARGE WIDEBODY						
CALENDAR YEAR	2 ENGINE	3 ENGINE	4 ENGINE	TOTAL	2 ENGINE	3 ENGINE	4 ENGINE	TOTAL	LARGE JETS	REGIONAL JETS	TOTAL JETS
Historical											
2010	3,120	8	1	3,129	470	9	43	522	3,651	71	3,722
2019	3,775	0	0	3,775	553	0	0	553	4,328	60	4,388
2020	2,860	0	0	2,860	298	0	0	298	3,158	23	3,181
2021	2,828	0	0	2,828	281	0	0	281	3,109	23	3,132
2022	3,429	0	0	3,429	426	0	0	426	3,855	60	3,915
2023E	4,210	0	0	4,210	550	0	0	550	4,760	72	4,832
Forecast											
2024	4,268	0	0	4,268	580	0	0	580	4,848	37	4,885
2025	4,263	0	0	4,263	603	0	0	603	4,866	17	4,883
2030	4,205	0	0	4,205	650	0	0	650	4,855	4	4,859
2035	4,684	0	0	4,684	740	0	0	740	5,424	4	5,428
2040	5,350	0	0	5,350	838	0	0	838	6,188	0	6,188
2044	5,944	0	0	5,944	950	0	0	950	6,894	0	6,894
Avg Annual Growth											
2010-23	2.3%	N.A.	N.A.	2.3%	1.2%	N.A.	N.A.	0.4%	2.1%	0.1%	2.0%
2023-24	1.4%	N.A.	N.A.	1.4%	5.5%	N.A.	N.A.	5.5%	1.8%	N.A.	1.1%
2024-34	0.7%	N.A.	N.A.	0.7%	2.2%	N.A.	N.A.	2.2%	0.9%	N.A.	0.8%
2024-44	1.7%	N.A.	N.A.	1.7%	2.5%	N.A.	N.A.	2.5%	1.8%	N.A.	1.7%

Note: N.A. - Not Applicable

TABLE 22

U.S. MAINLINE AIR CARRIERS

CARGO JET AIRCRAFT

	LARGE NARROWBODY				LARGE WIDEBODY				
CALENDAR YEAR	2 ENGINE	3 ENGINE	4 ENGINE	TOTAL	2 ENGINE	3 ENGINE	4 ENGINE	TOTAL	TOTAL
Historical									
2010	153	104	31	288	265	200	97	562	850
2019	216	10	2	228	419	120	112	651	879
2020	200	10	0	210	414	115	109	638	848
2021	213	8	0	221	434	111	110	655	876
2022	219	7	0	226	469	118	122	709	935
2023E	225	9	0	234	494	107	133	734	968
Forecast									
2024	239	7	0	246	516	107	140	763	1,009
2025	242	5	0	247	538	107	143	788	1,035
2030	328	0	0	328	695	107	143	945	1,273
2035	324	0	0	324	884	104	138	1,126	1,450
2040	293	0	0	293	1,241	25	115	1,381	1,674
2044	292	0	0	292	1,505	5	97	1,607	1,899
Avg Annual Growth									
2010-23	3.0%	-17.2%	N.A.	-1.6%	4.9%	-4.7%	2.5%	2.1%	1.0%
2023-24	6.2%	-22.2%	N.A.	5.1%	4.5%	0.0%	5.3%	4.0%	4.2%
2024-34	3.4%	N.A.	N.A.	3.1%	5.0%	0.0%	0.1%	3.6%	3.5%
2024-44	1.0%	N.A.	N.A.	0.9%	5.5%	-14.2%	-1.8%	3.8%	3.2%

Note: N.A. - Not Applicable

TABLE 23

TOTAL JET FUEL AND AVIATION GASOLINE FUEL CONSUMPTION

U.S. CIVIL AVIATION AIRCRAFT

(Millions of Gallons)

	JET FUEL					AVIATION GASOLINE			
	U.S. AIR CARRIERS[1, 2]								
FISCAL YEAR	DOMESTIC	INT'L.	TOTAL	GENERAL AVIATION	TOTAL	AIR CARRIER	GENERAL AVIATION	TOTAL	TOTAL FUEL CONSUMED
Historical									
2010	12,036	6,315	18,351	1,435	19,786	2	221	223	20,009
2019	14,648	7,043	21,691	1,510	23,202	2	200	202	23,404
2020	10,538	4,732	15,270	1,342	16,612	2	204	206	16,818
2021	11,578	4,823	16,402	1,909	18,311	2	229	231	18,542
2022	14,154	6,094	20,248	2,048	22,295	2	233	235	22,531
2023E	14,470	6,921	21,391	2,077	23,467	2	231	233	23,700
Forecast									
2024	14,952	7,771	22,723	2,107	24,830	2	228	230	25,060
2025	15,089	7,958	23,047	2,138	25,184	2	225	227	25,412
2030	15,903	8,665	24,568	2,321	26,889	2	215	217	27,107
2035	17,254	9,471	26,725	2,547	29,272	2	211	213	29,485
2040	18,861	10,300	29,161	2,768	31,929	2	206	208	32,137
2044	20,165	11,001	31,166	2,933	34,099	2	205	207	34,306
Avg Annual Growth									
2010-23	1.4%	0.7%	1.2%	2.9%	1.3%	0.0%	0.3%	0.3%	1.3%
2023-24	3.3%	12.3%	6.2%	1.4%	5.8%	0.0%	-1.0%	-1.0%	5.7%
2024-34	1.3%	1.8%	1.5%	1.8%	1.5%	0.0%	-0.8%	-0.8%	1.5%
2024-44	1.5%	1.8%	1.6%	1.7%	1.6%	0.0%	-0.5%	-0.5%	1.6%

Source: Air carrier jet fuel, Form 41, U.S. Department of Transportation; all others, FAA APO estimates.

[1]Includes both passenger (mainline and regional air carrier) and cargo carriers.

[2]Forecast assumes 1.0% annual improvement in available seat miles per gallon for U.S. Commercial Air Carrier

TABLE 24

U.S. REGIONAL CARRIER FORECAST ASSUMPTIONS

	AVERAGE SEATS PER AIRCRAFT MILE			AVERAGE PASSENGER TRIP LENGTH			REVENUE PER PASSENGER MILE**	
FISCAL YEAR	DOMESTIC (Seats/Mile)	INT'L (Seats/Mile)	TOTAL (Seats/Mile)	DOMESTIC (Miles)	INT'L. (Miles)	TOTAL (Miles)	CURRENT $ (Cents)	2023 $ (Cents)
Historical								
2010	56.1	53.2	56.1	464	503	465	15.74	21.88
2019	64.1	70.9	64.3	492	670	496	11.48	13.64
2020	64.6	70.7	64.8	494	675	497	10.96	12.84
2021	66.0	72.9	66.1	508	662	511	9.63	10.92
2022	66.3	72.5	66.4	488	640	490	12.77	13.42
2023E	66.9	73.4	67.1	458	630	461	13.61	13.61
Forecast								
2024	67.4	73.7	67.6	455	626	458	13.42	13.05
2025	67.9	74.0	68.0	459	632	462	13.54	12.89
2030	70.4	75.5	70.5	478	658	481	14.79	12.61
2035	73.0	77.0	73.1	487	671	491	16.00	12.25
2040	75.8	78.5	75.8	497	684	500	17.17	11.87
2044	78.0	79.7	78.0	505	695	508	18.25	11.58
Avg Annual Growth								
2010-23	1.4%	2.5%	1.4%	-0.1%	1.7%	-0.1%	-1.1%	-3.6%
2023-24	0.7%	0.4%	0.7%	-0.6%	-0.6%	-0.6%	-1.4%	-4.1%
2024-34	0.7%	0.4%	0.7%	0.6%	0.6%	0.6%	1.6%	-0.6%
2024-44	0.7%	0.4%	0.7%	0.5%	0.5%	0.5%	1.5%	-0.6%

Source: Form 41 and 298C, U.S. Department of Transportation.

** Reporting carriers.

TABLE 25

U.S. REGIONAL CARRIERS

SCHEDULED PASSENGER TRAFFIC

(In Millions)

	REVENUE PASSENGERS			REVENUE PASSENGER MILES		
FISCAL YEAR	DOMESTIC	INTERNATIONAL	TOTAL	DOMESTIC	INTERNATIONAL	TOTAL
Historical						
2010	162	3	164	75,028	1,347	76,375
2019	159	4	163	78,358	2,376	80,734
2020	94	2	96	46,667	1,229	47,896
2021	106	2	108	53,699	1,221	54,921
2022	127	2	129	61,839	1,335	63,175
2023E	115	2	117	52,785	1,348	54,133
Forecast						
2024	124	2	126	56,357	1,440	57,796
2025	127	2	129	58,355	1,491	59,846
2030	146	3	149	69,800	1,783	71,583
2035	166	3	169	80,797	2,064	82,861
2040	188	3	192	93,653	2,393	96,045
2044	208	4	212	104,824	2,678	107,501
Avg Annual Growth						
2010-23	-2.6%	-1.7%	-2.5%	-2.7%	0.0%	-2.6%
2023-24	7.4%	7.4%	7.4%	6.8%	6.8%	6.8%
2024-34	2.7%	2.7%	2.7%	3.4%	3.4%	3.4%
2024-44	2.6%	2.6%	2.6%	3.2%	3.2%	3.2%

Source: Form 41 and 298C, U.S. Department of Transportation.

TABLE 26

U.S. REGIONAL CARRIERS

SCHEDULED PASSENGER CAPACITY, TRAFFIC, AND LOAD FACTORS

	DOMESTIC			INTERNATIONAL			TOTAL		
YEAR	ASMs (MIL)	RPMs (MIL)	% LOAD FACTOR	ASMs (MIL)	RPMs (MIL)	% LOAD FACTOR	ASMs (MIL)	RPMs (MIL)	% LOAD FACTOR
Historical									
2010	98,454	75,028	76.2	1,857	1,347	72.5	100,311	76,375	76.1
2019	98,120	78,358	79.9	3,116	2,376	76.3	101,236	80,734	79.7
2020	70,861	46,667	65.9	1,812	1,229	67.9	72,673	47,896	65.9
2021	75,964	53,699	70.7	1,836	1,221	66.5	77,800	54,921	70.6
2022	77,916	61,839	79.4	1,833	1,335	72.8	79,749	63,175	79.2
2023E	65,416	52,785	80.7	1,685	1,348	80.0	67,101	54,133	80.7
Forecast									
2024	69,576	56,357	81.0	1,793	1,440	80.3	71,369	57,796	81.0
2025	72,044	58,355	81.0	1,856	1,491	80.3	73,900	59,846	81.0
2030	85,855	69,800	81.3	2,212	1,783	80.6	88,067	71,583	81.3
2035	98,467	80,797	82.1	2,537	2,064	81.4	101,004	82,861	82.0
2040	113,793	93,653	82.3	2,932	2,393	81.6	116,725	96,045	82.3
2044	127,221	104,824	82.4	3,278	2,678	81.7	130,499	107,501	82.4
Avg Annual Growth									
2010-23	-3.1%	-2.7%		-0.7%	0.0%		-3.0%	-2.6%	
2023-24	6.4%	6.8%		6.4%	6.8%		6.4%	6.8%	
2024-34	3.2%	3.4%		3.2%	3.4%		3.2%	3.4%	
2024-44	3.1%	3.2%		3.1%	3.2%		3.1%	3.2%	

Source: Form 41 and 298C, U.S. Department of Transportation.

TABLE 27

U.S. REGIONAL CARRIERS

PASSENGER AIRCRAFT

	REGIONAL AIRCRAFT											
				31 TO 40 SEATS			OVER 40 SEATS			TOTAL FLEET		
AS OF JANUARY 1	LESS THAN 9 SEATS	10 TO 19 SEATS	20 TO 30 SEATS	PROP	JET	TOTAL	PROP	JET	TOTAL	NON JET	JET	TOTAL
Historical												
2010	440	92	82	144	28	172	99	1,728	1,827	857	1,756	2,613
2019	374	72	19	11	0	11	39	1,846	1,885	515	1,846	2,361
2020	276	74	20	11	0	11	40	1,434	1,474	421	1,434	1,855
2021	268	69	16	10	0	10	38	1,406	1,444	401	1,406	1,807
2022	247	59	18	3	3	6	49	1,623	1,672	376	1,626	2,002
2023E	245	57	7	3	1	4	24	1,435	1,459	336	1,436	1,772
Forecast												
2024	240	56	7	0	1	1	22	1,468	1,490	325	1,469	1,794
2025	235	55	7	0	1	1	23	1,482	1,505	319	1,483	1,802
2030	210	49	6	0	0	0	23	1,424	1,447	288	1,424	1,712
2035	185	43	5	0	0	0	23	1,551	1,574	257	1,551	1,808
2040	156	36	4	0	0	0	23	1,703	1,726	219	1,703	1,922
2044	130	30	4	0	0	0	23	1,813	1,836	187	1,813	2,000
Avg Annual Growth												
2010-23	-4.4%	-3.6%	-17.2%	N.A.	-22.6%	-25.1%	-10.3%	-1.4%	-1.7%	-6.9%	-1.5%	-2.9%
2023-24	-2.0%	-1.8%	0.0%	N.A.	0.0%	-75.0%	-8.3%	2.3%	2.1%	-3.3%	2.3%	1.2%
2024-34	-2.2%	-2.3%	-2.4%	N.A.	N.A.	N.A.	0.4%	0.3%	0.3%	-2.0%	0.3%	-0.1%
2024-44	-3.0%	-3.0%	-3.1%	N.A.	N.A.	N.A.	0.2%	1.1%	1.0%	-2.7%	1.1%	0.5%

Note: N.A. - Not Applicable

TABLE 28

ACTIVE GENERAL AVIATION AND AIR TAXI AIRCRAFT

	FIXED WING						ROTORCRAFT						TOTAL		
		PISTON			TURBINE								GENERAL		
AS OF DEC. 31	SINGLE ENGINE	MULTI-ENGINE	TOTAL	TURBO PROP	TURBO JET	TOTAL	PISTON	TURBINE	TOTAL	EXPERI-MENTAL**	LIGHT SPORT AIRCRAFT**	OTHER	AVIATION FLEET	TOTAL PISTONS	TOTAL TURBINES
Historical*															
2010	139,519	15,900	155,419	9,369	11,484	20,853	3,588	6,514	10,102	24,784	6,528	5,684	223,370	159,007	27,367
2019	128,926	12,470	141,396	10,242	14,888	25,130	3,089	7,109	10,198	27,449	2,675	4,133	210,981	144,485	32,239
2020	124,059	11,947	136,006	10,317	15,316	25,633	2,930	6,816	9,746	26,367	2,570	3,818	204,140	138,936	32,449
2021	126,735	11,885	138,620	10,391	15,270	25,661	3,012	7,020	10,032	27,960	2,650	4,271	209,194	141,632	32,681
2022	126,076	11,652	137,728	10,713	16,126	26,839	2,748	7,021	9,769	28,062	2,666	4,476	209,540	140,476	33,860
2023E	125,490	11,580	137,070	10,785	16,570	27,355	2,765	7,160	9,925	28,160	2,730	4,490	209,730	139,835	34,515
Forecast															
2024	124,965	11,520	136,485	10,860	17,045	27,905	2,780	7,310	10,090	28,265	2,835	4,525	210,105	139,265	35,215
2025	124,485	11,460	135,945	10,935	17,540	28,475	2,800	7,465	10,265	28,465	2,935	4,555	210,640	138,745	35,940
2030	122,580	11,220	133,800	11,270	20,235	31,505	2,915	8,305	11,220	29,555	3,445	4,650	214,175	136,715	39,810
2035	121,105	11,030	132,135	11,800	23,115	34,915	3,040	9,195	12,235	30,665	4,015	4,700	218,665	135,175	44,110
2040	120,215	10,900	131,115	12,535	26,030	38,565	3,165	10,070	13,235	31,805	4,615	4,740	224,075	134,280	48,635
2044	119,930	10,860	130,790	13,255	28,325	41,580	3,265	10,760	14,025	32,705	5,105	4,770	228,975	134,055	52,340
Avg Annual Growth															
2010-23	-0.8%	-2.4%	-1.0%	1.1%	2.9%	2.1%	-2.0%	0.7%	-0.1%	1.0%	-6.5%	-1.8%	-0.5%	-1.0%	1.8%
2023-24	-0.4%	-0.5%	-0.4%	0.7%	2.9%	2.0%	0.5%	2.1%	1.7%	0.4%	3.8%	0.8%	0.2%	-0.4%	2.0%
2024-34	-0.3%	-0.4%	-0.3%	0.7%	2.8%	2.1%	0.8%	2.1%	1.8%	0.7%	3.2%	0.4%	0.4%	-0.3%	2.1%
2024-44	-0.2%	-0.3%	-0.2%	1.0%	2.6%	2.0%	0.8%	2.0%	1.7%	0.7%	3.0%	0.3%	0.4%	-0.2%	2.0%

* Source: 2001-2010, 2012-2022, FAA General Aviation and Air Taxi Activity (and Avionics) Surveys.

**Experimental Light-sport category that was previously shown under Sport Aircraft is moved under Experimental Aircraft category, starting in 2012.

Note: An active aircraft is one that has a current registration and was flown at least one hour during the calendar year.

TABLE 29

ACTIVE GENERAL AVIATION AND AIR TAXI HOURS FLOWN

(In Thousands)

	FIXED WING												TOTAL		
	PISTON			TURBINE			ROTORCRAFT						GENERAL		
AS OF DEC. 31	SINGLE ENGINE	MULTI-ENGINE	TOTAL	TURBO PROP	TURBO JET	TOTAL	PISTON	TURBINE	TOTAL	EXPERI-MENTAL**	LIGHT SPORT AIRCRAFT**	OTHER	AVIATION HOURS	TOTAL PISTONS	TOTAL TURBINES
Historical*															
2010	12,161	1,818	13,979	2,325	3,375	5,700	794	2,611	3,405	1,226	311	181	24,802	14,773	8,311
2019	12,700	1,731	14,431	2,619	3,926	6,546	628	2,369	2,997	1,269	189	135	25,566	15,059	8,914
2020	11,603	1,336	12,939	2,344	3,336	5,681	537	1,871	2,408	1,176	202	86	22,492	13,477	7,552
2021	12,808	1,494	14,302	2,720	4,868	7,587	578	2,178	2,756	1,394	245	156	26,441	14,880	9,765
2022	12,999	1,432	14,431	2,846	5,238	8,084	537	2,238	2,775	1,279	231	153	26,953	14,969	10,322
2023E	12,702	1,458	14,160	2,932	5,355	8,287	551	2,305	2,857	1,311	240	157	27,012	14,711	10,593
Forecast															
2024	12,449	1,478	13,927	2,994	5,479	8,473	563	2,377	2,940	1,339	251	162	27,092	14,490	10,850
2025	12,145	1,487	13,632	3,044	5,614	8,657	575	2,444	3,020	1,365	262	165	27,102	14,208	11,102
2030	11,312	1,489	12,802	3,165	6,446	9,611	635	2,780	3,414	1,477	319	170	27,794	13,436	12,391
2035	10,954	1,492	12,446	3,313	7,371	10,684	684	3,106	3,789	1,560	380	174	29,033	13,130	13,789
2040	10,616	1,508	12,124	3,515	8,323	11,838	730	3,427	4,156	1,638	445	176	30,378	12,854	15,265
2044	10,517	1,528	12,045	3,718	9,061	12,780	762	3,684	4,445	1,698	500	178	31,646	12,807	16,463
Avg Annual Growth															
2010-23	0.3%	-1.7%	0.1%	1.8%	3.6%	2.9%	-2.8%	-1.0%	-1.3%	0.5%	-2.0%	-1.1%	0.7%	0.0%	1.9%
2023-24	-2.0%	1.3%	-1.6%	2.1%	2.3%	2.2%	2.1%	3.1%	2.9%	2.1%	4.7%	3.0%	0.3%	-1.5%	2.4%
2024-34	-1.2%	0.1%	-1.1%	0.9%	2.8%	2.1%	1.8%	2.5%	2.4%	1.4%	3.9%	0.7%	0.6%	-0.9%	2.2%
2024-44	-0.8%	0.2%	-0.7%	1.1%	2.5%	2.1%	1.5%	2.2%	2.1%	1.2%	3.5%	0.5%	0.8%	-0.6%	2.1%

* Source: 2001-2010, 2012-2022, FAA General Aviation and Air Taxi Activity (and Avionics) Surveys.

**Experimental Light-sport category that was previously shown under Sport Aircraft is moved under Experimental Aircraft category, starting in 2012.

Note: An active aircraft is one that has a current registration and was flown at least one hour during the calendar year.

TABLE 30

ACTIVE PILOTS BY TYPE OF CERTIFICATE, EXCLUDING STUDENT PILOTS*

AS OF DEC. 31	RECREA-TIONAL	SPORT PILOT	PRIVATE	COMMERCIAL	AIRLINE TRANSPORT	ROTOR-CRAFT ONLY	GLIDER ONLY	TOTAL LESS STUDENT PILOTS	INSTRUMENT RATED PILOTS[1]
Historical**									
2010	212	3,682	202,020	123,705	142,198	15,377	21,275	508,469	318,001
2019	127	6,467	161,105	100,863	164,947	14,248	19,143	466,900	314,168
2020	105	6,643	160,860	103,879	164,193	13,629	19,753	469,062	316,651
2021	85	6,801	161,459	104,610	163,934	13,191	20,328	470,408	317,169
2022	79	6,957	164,090	104,498	166,738	13,180	20,804	476,346	321,217
2023	71	7,144	167,711	106,711	174,113	13,428	21,292	490,470	332,313
Forecast									
2024	66	7,390	170,450	108,250	178,900	13,650	21,700	500,406	340,200
2025	65	7,640	172,350	109,250	179,200	13,800	22,100	504,405	340,600
2030	55	8,855	174,900	111,100	183,000	15,150	23,400	516,460	346,200
2035	40	10,020	173,200	111,375	190,000	16,600	24,050	525,285	354,300
2040	20	11,085	170,050	111,425	198,000	17,950	24,300	532,830	363,100
2044	5	11,885	167,650	111,450	204,700	18,900	24,400	538,990	370,500
Avg Annual Growth									
2010-23	-8.1%	5.2%	-1.4%	-1.1%	1.6%	-1.0%	0.0%	-0.3%	0.3%
2023-24	-7.0%	3.4%	1.6%	1.4%	2.7%	1.7%	1.9%	2.0%	2.4%
2024-34	-3.8%	2.9%	0.2%	0.3%	0.5%	1.8%	1.0%	0.5%	0.4%
2024-44	-12.1%	2.4%	-0.1%	0.1%	0.7%	1.6%	0.6%	0.4%	0.4%

** Source: FAA U.S. Civil Airmen Statistics.

*Starting with April 2016, there is no expiration date on the new student pilot certificates. This generates a cumulative increase in the student pilot numbers and breaks the link between student pilot and private pilot or higher level certificates. Since there is no sufficient data yet to forecast the student certificates unter the new rule, student pilot forecast is suspended and excluded from this table.

[1]Instrument rated pilots should not be added to other categories in deriving total.

Note: An active pilot is a person with a pilot certificate and a valid medical certificate.

TABLE 31

GENERAL AVIATION AIRCRAFT FUEL CONSUMPTION

(In Millions of Gallons)

	FIXED WING								TOTAL FUEL CONSUMED		
	PISTON		TURBINE		ROTORCRAFT						
CALENDAR YEAR	SINGLE ENGINE	MULTI-ENGINE	TURBO PROP	TURBO JET	PISTON	TURBINE	EXPERI-MENTAL** / OTHER	LIGHT SPORT**	AVGAS	JET FUEL	TOTAL
Historical*											
2010	133	54	187	1,123	11	125	22	1	221	1,435	1,656
2019	131	45	213	1,170	8	127	16	1	200	1,510	1,711
2020	146	35	201	1,036	8	105	14	1	204	1,342	1,546
2021	155	47	230	1,557	8	123	18	1	229	1,909	2,138
2022	158	45	242	1,683	8	123	21	1	233	2,048	2,281
2023E	154	46	248	1,703	8	125	21	1	231	2,077	2,308
Forecast											
2024	151	46	253	1,725	8	129	22	1	228	2,107	2,335
2025	147	46	256	1,750	8	132	22	1	225	2,138	2,363
2030	136	45	261	1,914	9	146	24	2	215	2,321	2,537
2035	130	44	267	2,122	10	158	25	2	211	2,547	2,758
2040	123	44	277	2,323	10	168	26	2	206	2,768	2,974
2044	122	44	289	2,471	11	173	27	3	205	2,933	3,138
Avg Annual Growth											
2010-23	1.1%	-1.2%	2.2%	3.3%	-2.4%	0.0%	0.0%	-0.8%	0.3%	2.9%	2.6%
2023-24	-2.2%	0.9%	1.7%	1.3%	2.0%	2.9%	2.2%	4.7%	-1.0%	1.4%	1.2%
2024-34	-1.4%	-0.4%	0.5%	1.9%	1.7%	2.0%	1.3%	3.3%	-0.8%	1.8%	1.5%
2024-44	-1.1%	-0.3%	0.7%	1.8%	1.4%	1.5%	1.1%	3.0%	-0.5%	1.7%	1.5%

*Source: FAA APO Estimates.

**Experimental Light-sport category that was previously shown under Sport Aircraft is moved under Experimental Aircraft category, starting in 2012.

Note: Detail may not add to total because of independent rounding.

TABLE 32

TOTAL COMBINED AIRCRAFT OPERATIONS AT AIRPORTS WITH FAA AND CONTRACT TRAFFIC CONTROL SERVICE

(In Thousands)

			GENERAL AVIATION			MILITARY				NUMBER OF TOWERS	
FISCAL YEAR	AIR CARRIER	AIR TAXI/ COMMUTER	ITINERANT	LOCAL	TOTAL	ITINERANT	LOCAL	TOTAL	TOTAL	FAA	CONTRACT
Historical											
2010	12,658	9,410	14,864	11,716	26,580	1,309	1,298	2,607	51,255	264	244
2019	16,192	7,234	14,245	13,109	27,354	1,349	1,134	2,483	53,264	264	256
2020	11,737	5,472	12,608	12,333	24,941	1,192	1,020	2,212	44,362	264	256
2021	12,214	5,885	13,775	13,479	27,254	1,290	1,077	2,366	47,720	264	258
2022	15,150	6,522	14,635	14,029	28,664	1,288	986	2,274	52,610	264	260
2023	16,158	6,456	14,591	15,282	29,873	1,194	866	2,060	54,547	264	262
Forecast											
2024	17,303	6,476	15,125	15,900	31,026	1,194	866	2,060	56,864	264	262
2025	18,374	6,549	15,489	16,283	31,772	1,194	866	2,060	58,755	264	262
2030	20,703	6,457	15,965	16,714	32,679	1,194	866	2,060	61,899	264	262
2035	22,611	6,819	16,176	17,011	33,186	1,194	866	2,060	64,677	264	262
2040	24,692	7,187	16,392	17,318	33,709	1,194	866	2,060	67,649	264	262
2044	26,454	7,490	16,569	17,571	34,140	1,194	866	2,060	70,144	264	262
Avg Annual Growth											
2010-23	1.9%	-2.9%	-0.1%	2.1%	0.9%	-0.7%	-3.1%	-1.8%	0.5%		
2023-24	7.1%	0.3%	3.7%	4.0%	3.9%	0.0%	0.0%	0.0%	4.2%		
2024-34	2.5%	0.4%	0.6%	0.6%	0.6%	0.0%	0.0%	0.0%	1.2%		
2024-44	2.1%	0.7%	0.5%	0.5%	0.5%	0.0%	0.0%	0.0%	1.1%		

Source: FAA Air Traffic Activity.

TABLE 33

TOTAL TRACON OPERATIONS

(In Thousands)

FISCAL YEAR	AIR CARRIER	AIR TAXI/ COMMUTER	GENERAL AVIATION	MILITARY	OVERFLIGHT	TOTAL
Historical						
2010	12,575	8,512	10,761	2,050	4,840	38,738
2019	16,014	6,600	10,960	1,946	3,706	39,227
2020	11,617	5,153	9,691	1,763	3,050	31,274
2021	12,045	5,462	10,742	1,894	3,393	33,536
2022	14,967	5,925	11,376	1,825	3,601	37,694
2023	15,957	5,823	11,001	1,699	3,509	37,988
Forecast						
2024	17,093	5,842	11,425	1,699	3,670	39,729
2025	18,158	5,833	11,712	1,699	3,806	41,208
2030	20,464	5,635	12,031	1,699	4,051	43,880
2035	22,361	5,956	12,172	1,699	4,291	46,478
2040	24,428	6,291	12,317	1,699	4,549	49,282
2044	26,178	6,566	12,435	1,698	4,766	51,643
Avg Annual Growth						
2010-23	1.8%	-2.9%	0.2%	-1.4%	-2.4%	-0.2%
2023-24	7.1%	0.3%	3.9%	0.0%	4.6%	4.6%
2024-34	2.5%	0.1%	0.6%	0.0%	1.5%	1.5%
2024-44	2.2%	0.6%	0.4%	0.0%	1.3%	1.3%

Source: FAA Air Traffic Activity.

TABLE 34

IFR AIRCRAFT HANDLED
AT FAA EN ROUTE TRAFFIC CONTROL CENTERS
(In Thousands)

	IFR AIRCRAFT HANDLED			
FISCAL YEAR	COMMERCIAL	GENERAL AVIATION	MILITARY	TOTAL
Historical				
2010	30,965	6,550	2,982	40,498
2019	35,783	6,309	1,645	43,737
2020	25,608	5,096	1,404	32,108
2021	26,449	6,124	1,525	34,098
2022	32,891	7,034	1,511	41,437
2023	34,436	6,461	1,416	42,313
Forecast				
2024	38,739	6,684	1,416	46,840
2025	40,978	6,846	1,416	49,241
2030	45,361	7,117	1,416	53,895
2035	49,797	7,311	1,416	58,524
2040	54,622	7,514	1,416	63,552
2044	58,696	7,684	1,416	67,796
Avg Annual Growth				
2010-23	0.8%	-0.1%	-5.6%	0.3%
2023-24	12.5%	3.5%	0.0%	10.7%
2024-34	2.4%	0.8%	0.0%	2.1%
2024-44	2.1%	0.7%	0.0%	1.9%

Source: FAA Air Traffic Activity