

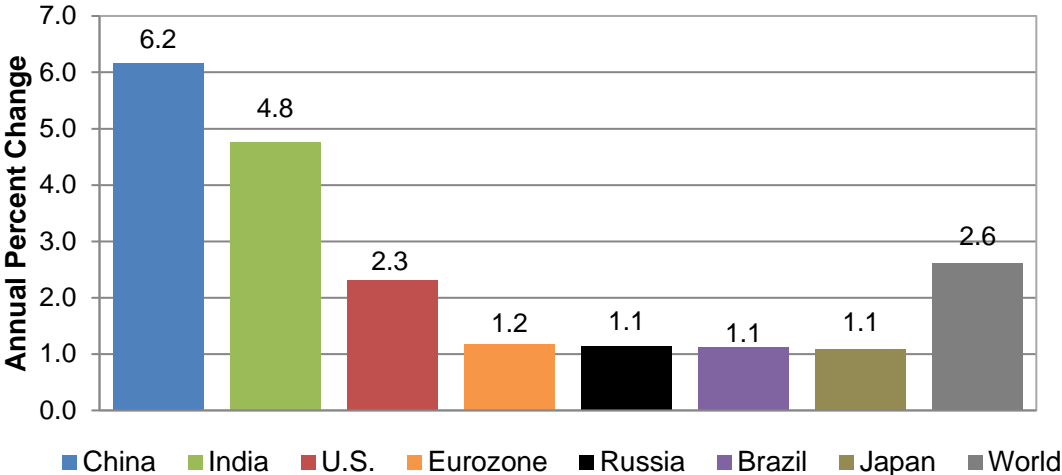
FAA Aerospace Forecasts Fiscal Years 2020-2040

Economic Environment

In the near term, IHS Markit projects that world economic growth will hold steady at about its 2019 rate of 2.6 percent after falling markedly from 3.2 percent in 2018. Economies will require several years to return to their long-run trend growth rates and in the meantime growth is projected at 2.5 percent in 2020 and 2.7 percent in 2021. Strong consumer spending continues to drive the U.S. economy and is expected to be sustained even as the effects of the recent fiscal stimulus wear off. European growth suffered in 2019 as Germany and Italy weakened considerably and political uncertainty impacted confidence, but moderate growth in France, reduced uncertainty about Brexit, and im-

proved financial conditions appear to be restraining the slowdown. Japan's economic growth is projected to slow sharply due to an increase in the consumption tax at the end of 2019 but fiscal stimulus and rising employment should mitigate the effects over the coming years. In emerging markets, China's growth rate continues to gradually decelerate through 6 percent, though braced by government efforts, while other countries such as Brazil and Russia feel the drag from China and headwinds of falling commodity prices and modest demand from advanced economies. India is expected to post growth rates of about 5 percent in the near-term as high debt levels and a need for structural reforms restrains activity.

China and India Led World Economic Growth in 2019



Source: IHS Markit

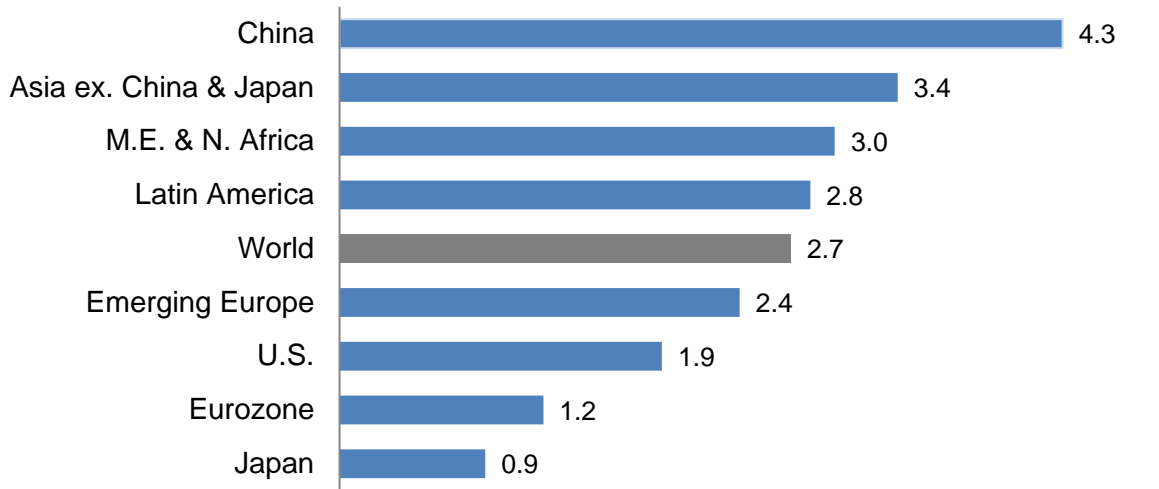
IHS Markit forecasts world real GDP to grow at 2.7 percent a year between 2020 and 2040. Emerging markets, at 4.0 percent a year, are forecast to grow above the global average but at lower rates than in the early 2000's. Asia (excluding Japan), led by India

and China, is projected to have the fastest growth followed by Africa and Middle East, Latin America, and Eastern Europe. Growth in the more mature economies (1.6 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 0.9 percent a year reflecting

deep structural issues associated with a shrinking and aging population.

**Asia and Middle East/N. Africa Lead Global Economic Growth
(annual GDP percent growth 2020-2040)**

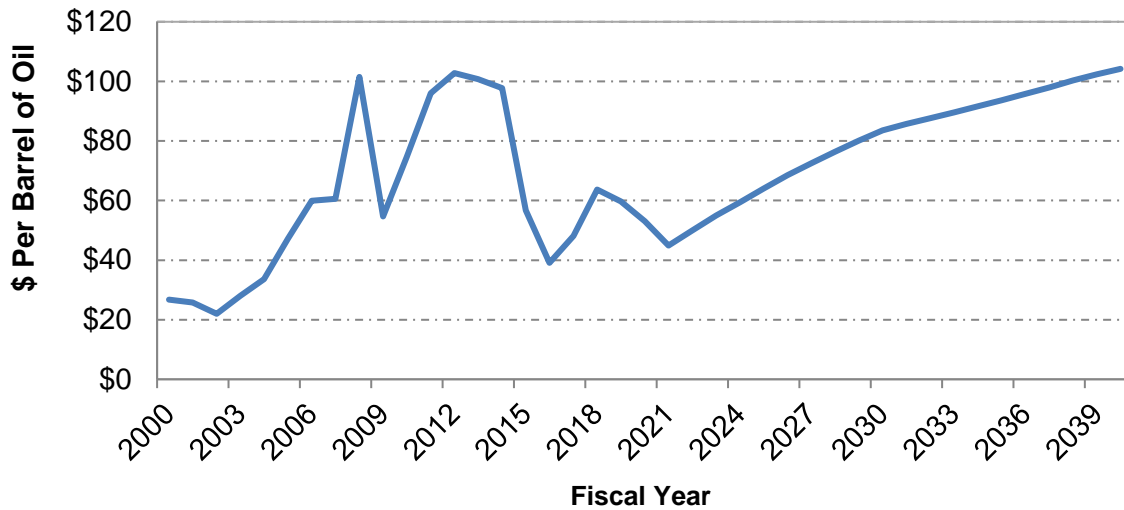


Source: IHS Markit, Dec 2019 World Forecast

The average crude oil price in 2019 was down 6 percent from the year before to about \$60 per barrel, partially offsetting the increases seen in 2017 and 2018. IHS Markit is projecting continued moderation in prices in 2020 and 2021 due to slowing global demand combined with modest non-OPEC

supply growth. The price of oil is projected to increase over the long run due to growing global demand and higher costs of extraction. IHS Markit forecasts U.S. refiner's acquisition cost of crude to cross the \$100 per barrel mark just before the end of the forecast in 2040.

U.S. Refiners' Acquisition Cost



Source: IHS Markit

U.S. Airlines

Domestic Market

Mainline and regional carriers³ 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.

The commercial air carrier industry in 2020 will respond to four trends already underway: (1) selective capacity expansion; (2) steady growth of seats per aircraft, whether through up-gauging or reconfiguring existing aircraft; (3) increasing competitive pressure due to ultra-low-cost carrier expansion; and (4) in-

creasing price discrimination⁴ through ancillary revenues and revenue management systems.

Following the 2007-09 recession, the U.S. airline industry underwent considerable restructuring that has resulted in an unprecedented period of capacity discipline, especially in domestic markets. Since 2009, U.S. domestic ASMs have increased at an average rate of 2.6 percent per year while RPMs have grown 3.2 percent per year. Although those average rates of growth since the recession are modest, they conceal the fact

³ 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.

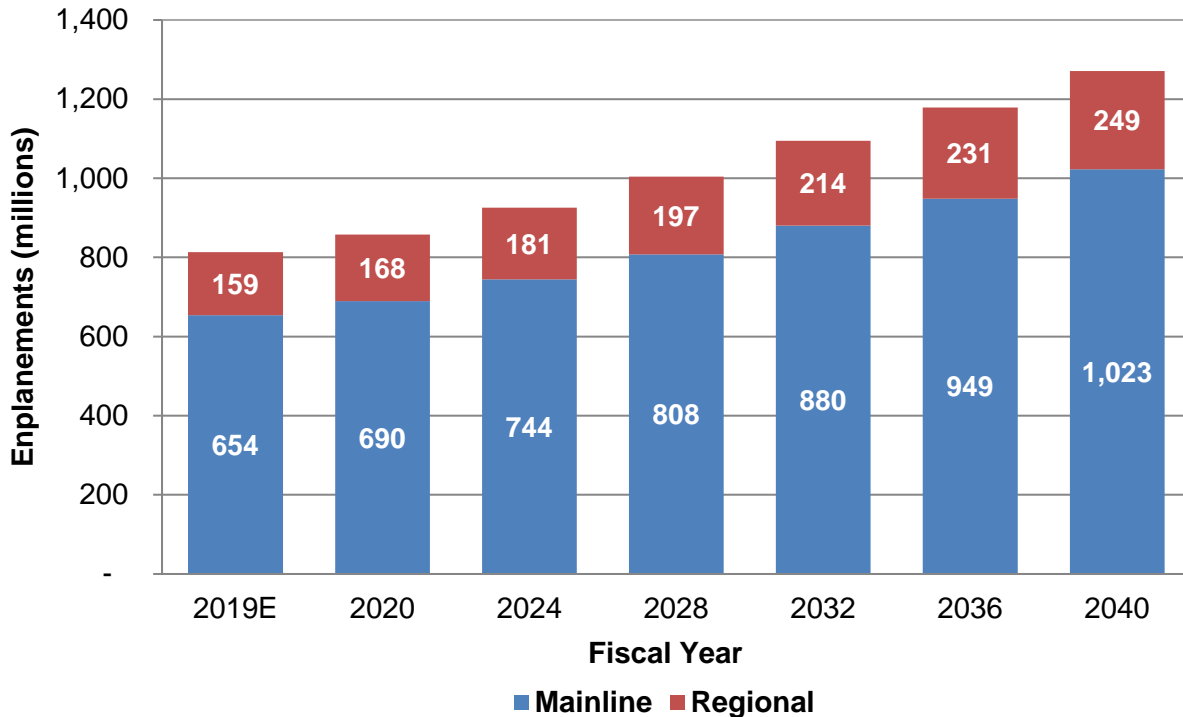
⁴ Simply defined as the business strategy of selling largely similar products to different customers at different prices.

that growth has been picking up over the period (4.4 percent and 4.6 percent a year since 2014, respectively). ASM growth has risen due to a variety of factors including upgauging, and the expansion of ultra-low-cost carriers and the competitive response by major carriers, driven in large part by low fuel prices. Looking ahead to the near-term, the acceleration of growth in ASM is likely to continue as some carriers have indicated plans to open new routes and potential new entrants have announced plans to begin operations. As new service begins, competitors may respond defensively by adding their own new routes, thus further boosting ASM growth.

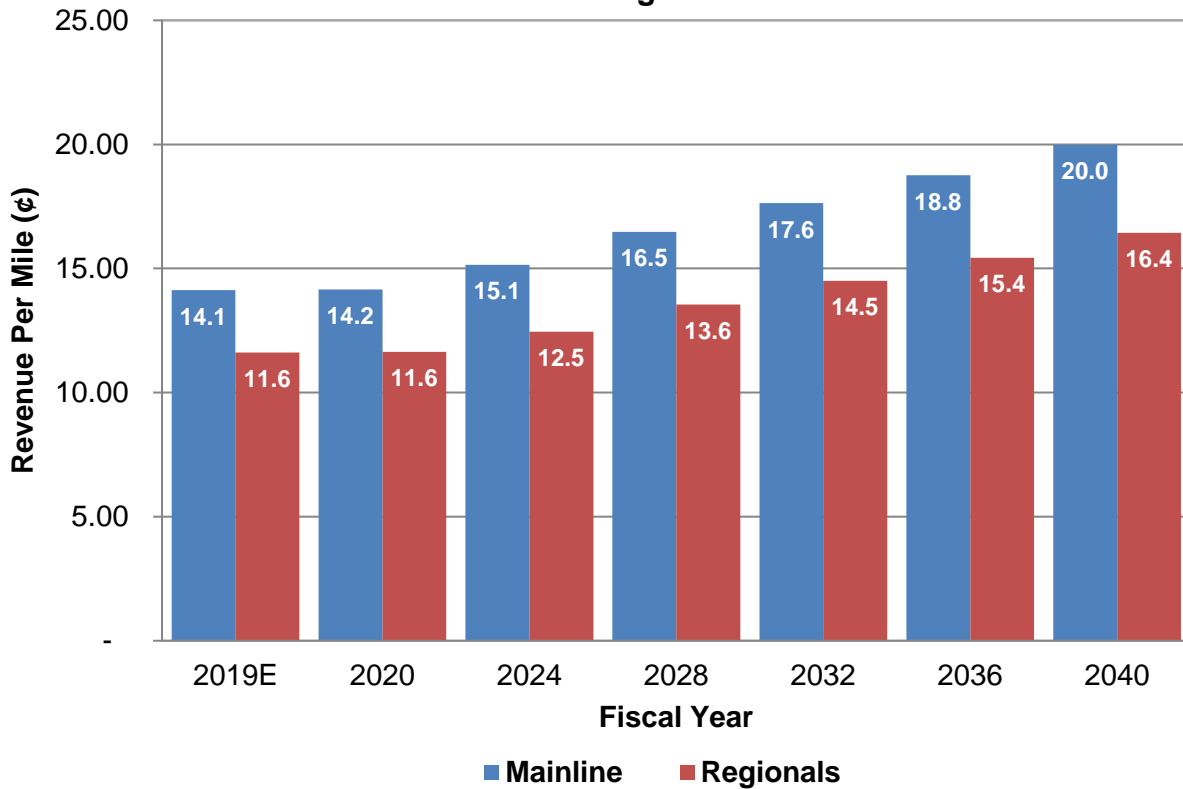
The period of domestic capacity restraint since 2007 has not been shared equally between the mainline carriers and their regional counterparts. In 2019, the mainline carrier group provided 19.2 percent more capacity than in 2007 while carrying 22.8 percent more passengers. Capacity flown by the regional group has risen 5.1 percent over the same 12-year period (with passengers carried up 2.1 percent).

The regional market has continued to lose ground as the regionals compete for even fewer contracts with the remaining dominant carriers; this has meant paltry growth in enplanements and yields.

**U.S. Commercial Air Carriers
Domestic Enplanements by Carrier Group**



U.S. Commercial Air Carriers Domestic Passenger Nominal Yield



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. Furthermore, the regional airlines are facing some pilot shortages. Their labor costs are increasing as they raise wages to combat the pilot shortage while their capital costs have increased in the short-term as they continue to replace their 50 seat regional jets with more fuel-efficient 70 seat jets. The move to the larger aircraft will prove beneficial in the future, however, since their unit costs are lower.

Growing seats per aircraft has been a longstanding trend for regionals that saw this measure rise by more than 55 percent over

the decade from 1997 to 2007. The trend has slowed more recently, however, as regional seats per aircraft rose 17 percent over the ten years ending in 2019.

Mainline carriers have also been increasing the seats per aircraft flown although the trend has been accelerating – the reverse of regionals' behavior. From 1997-2007, mainline seats per aircraft expanded just one-half of one percent. Since 2009, this measure has grown 10 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 in the subsequent three years on rising fuel and labor costs, and flat yields. Nevertheless, profits remain solid and supported by ancillary revenues and the implementation of increasingly sophisticated revenue management systems. These systems enable carriers to price fares optimally for each day and time of flight and minimize foregone revenue. Besides this method of price discrimination, airlines are continuing to implement plans to further segment their passengers into more discreet cost categories based on comfort amenities like seat pitch, leg room, and access to social media and power outlets. In 2015, Delta introduced “Basic Economy” fares that provided customers with a main cabin experience at lower cost in exchange for fewer options. By the end of 2017 these fares were available in 100% of Delta’s domestic network. In February 2017, American began offering its version, and had expanded to the entire domestic network by September. United deployed its version of Basic Economy fares across its domestic network in May 2017, but quickly pulled back the

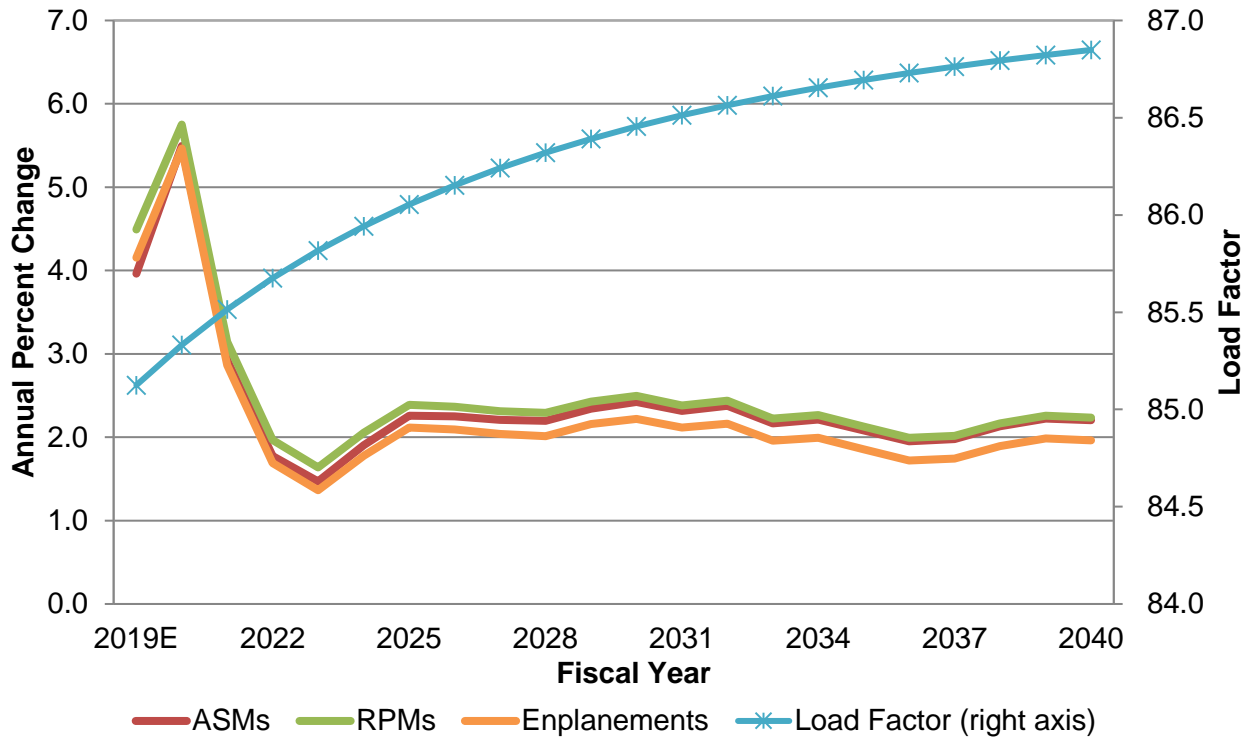
scale of deployment across its domestic network as negative revenue impacts were more than anticipated.

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. While mainline enplanements have increased almost 23 percent since 2007, and regionals' have risen 2 percent, low cost carrier enplanements have grown by 39 percent. RPMs over the same period show a similar pattern with mainline RPMs up almost 27 percent, regional RPMs up 11 percent and LCC RPMs fully 48 percent higher.

U.S. commercial air carriers’ total number of domestic departures rose for the second year in a row in 2019, leaving them about 15 percent below the 2007 level. ASMs, RPMs and enplanements, however, all grew in each of the past nine years; these trends underlie the expanding size of aircraft and higher load factors.⁵ In 2019, the domestic load factor bumped up to 85.1 percent – a new historic high. Load factor is forecast to rise and peak around 86.8 percent in the future due to the logistical difficulties inherent in matching supply perfectly with demand.

⁵ Commercial air carriers encompass both mainline and regional carriers.

U.S. Commercial Air Carriers Domestic Market



System (the sum of domestic plus international) capacity increased 3.4 percent to 1.236 trillion ASMs in 2019 while RPMs increased 4.3 percent to 1.044 trillion. During the same period system-wide enplanements increased 4.1 percent to 916.7 million. In 2019, U.S. carriers continued to prioritize the domestic over the international market in terms of allocating capacity as domestic capacity increased 4.0 percent while international capacity was up just 2.1 percent. U.S. carriers' domestic capacity growth will exceed their international capacity growth in 2020 but carriers will start expanding capacity in international markets faster than domestic markets beginning in 2022 and this trend is projected to continue through 2040 as the domestic market continues to mature.

U.S. mainline carrier enplanement growth in the combined domestic and international market was 4.3 percent in 2019 while regional carriers carried 3.5 percent more passengers.

In the domestic market, mainline enplanements increased for the ninth consecutive year, up 4.3 percent, marking the first time since 2000 that the industry recorded nine consecutive years of passenger growth in the domestic market. Mainline passengers in international markets posted the tenth year of growth, up 4.1 percent. Domestic mainline enplanement growth is forecast to remain strong, increasing at 5.5 percent in 2020 before slowing as economic activity cools and averaging 2.0 percent annually over the forecast. After slowing during the early part of

the forecast, international mainline enplanements are expected to accelerate to an average of 3.2 percent through the forecast horizon.

With relatively robust demand, industry capacity growth was up 3.4 percent in 2019 after a 4.4 percent increase in 2018. The increased passenger volume and traffic offset slow yield growth and along with higher ancillary revenues and relatively low fuel prices, U.S. carriers were solidly profitable in 2019. Domestic mainline capacity is expected to match the pattern of enplanements with strong 5.7 percent growth in 2020, followed by more moderate growth at about the long

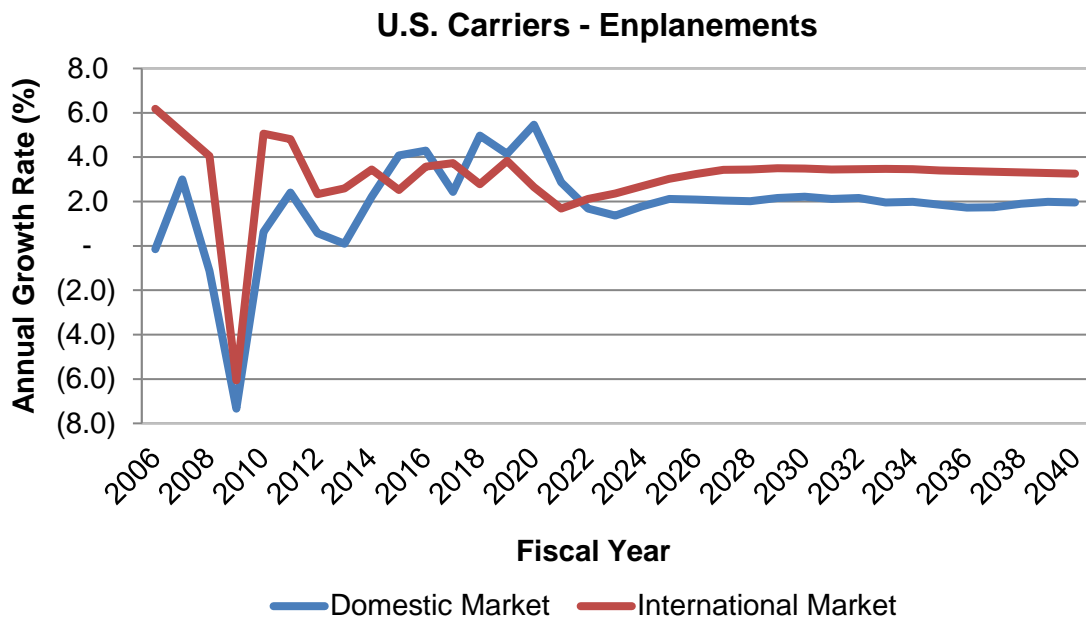
term trend. International mainline enplanements are forecast to slow somewhat over the next two years before picking up and returning to growth of about 3.4 percent through the remainder of the forecast.

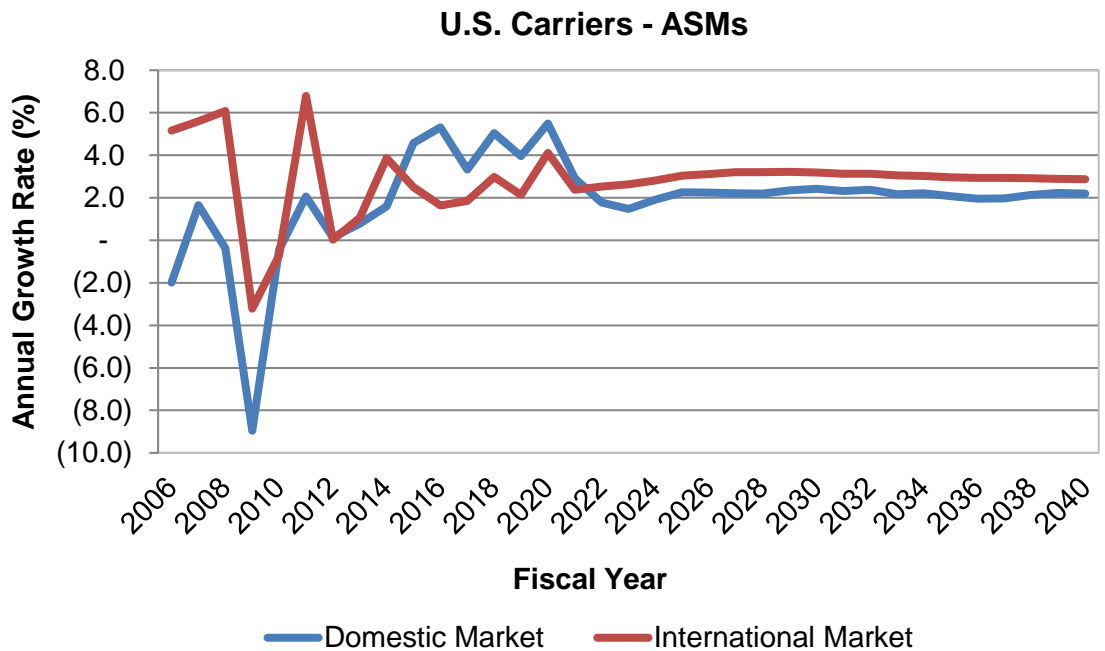
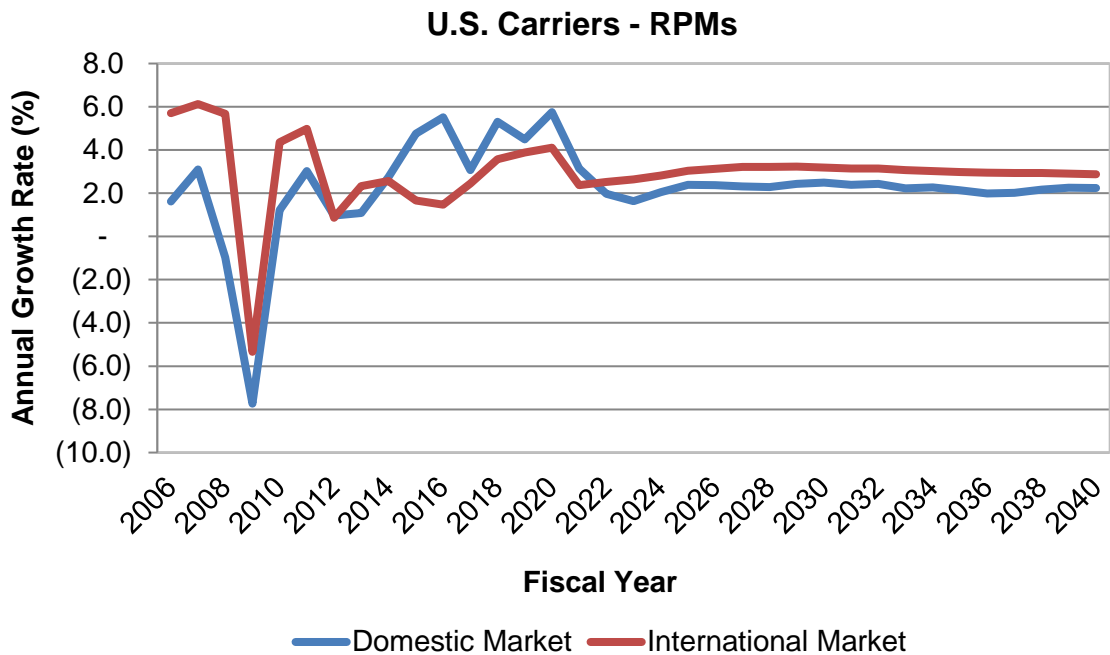
System load factor rose by seven tenths of a percentage point while trip length increased 2.2 miles (0.2 percent) in 2019, even as seats per aircraft mile increased by 0.9 percent; again reflecting the trend towards using larger aircraft. Seats per aircraft mile system-wide increased to 157.5 seats (up 1.3 seats per aircraft mile), the highest level since 1990.

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 U.S. domestic market. In 2015 and 2016, growth in the domestic market surged, outpacing international markets. However, in 2017 enplanement growth in international markets exceeded that in domestic markets, only to be reversed again in 2018 and 2019. Domestic enplanement growth is expected to outpace that of international markets for the next couple of years when longer term economic trends begin to reassert themselves. The average annual growth rate (FY 2020-2040) of the international market (comprised of mainline and regional carriers) for enplanements is forecast to be 3.1 percent and, RPM and ASM are both forecast at 3.0 percent.

Growth of major global economies has begun to slow from the above-trend rates of recent years. Several moderating factors are at work, including dampened credit growth, 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. In turn, this has been driven by trade disputes as well as China's continuing gradual slowdown which has been managed by the government and is unlikely to decline sharply. Overall, global conditions appear to be on a stable path but one with growth rates that are closer to long-term trends than the higher rates of the recent past. Nevertheless, combined with moderate oil prices, this presents a supportive environment for air travel demand.



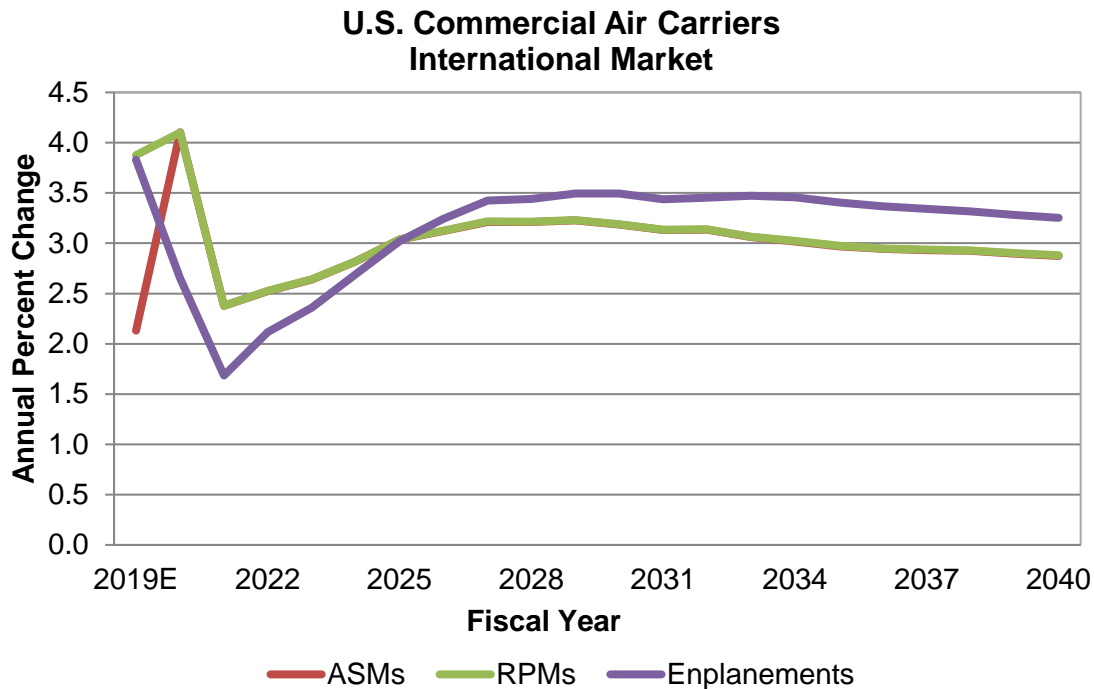


As of the preparation of this forecast, growth rates of international activity for U.S. carriers in 2020 were expected to be solid at 2.7, 4.1, and 4.1 percent a year for enplanements, RPMs, and ASMs, respectively. This performance is predicated on strong U.S. economic fundamentals combined with nascent

upturns in foreign economies but does not include impacts from the novel coronavirus.

Following the early part of the forecast, demand growth picks up to average about 3.0 percent for each measure. Airlines will continue to match capacity growth with traffic

growth and load factor is expected to stabilize around 82.9%. This surpasses the previous record high load factor seen in 2013.



For U.S. carriers, Latin America remains the largest international destination despite the recent economic and political crises in Venezuela and Brazil. Enplanements in 2019 grew an estimated 4.0 percent while RPMs increased 2.2 percent. Growth is projected to ease considerably in 2020 and 2021 as U.S. carriers trim capacity expansion to support yields. Enplanements and RPMs are forecast to increase 0.6 and 1.1 percent, respectively, in 2020. Over the twenty-year period 2020-2040, Latin America enplanements are forecast to increase at an average rate of 3.8 percent a year while RPMs grow 4.0 percent a year.

The Pacific region is the smallest in terms of enplanements despite the economic growth and potential of air travel to the region's emerging markets. In 2019, U.S. carriers

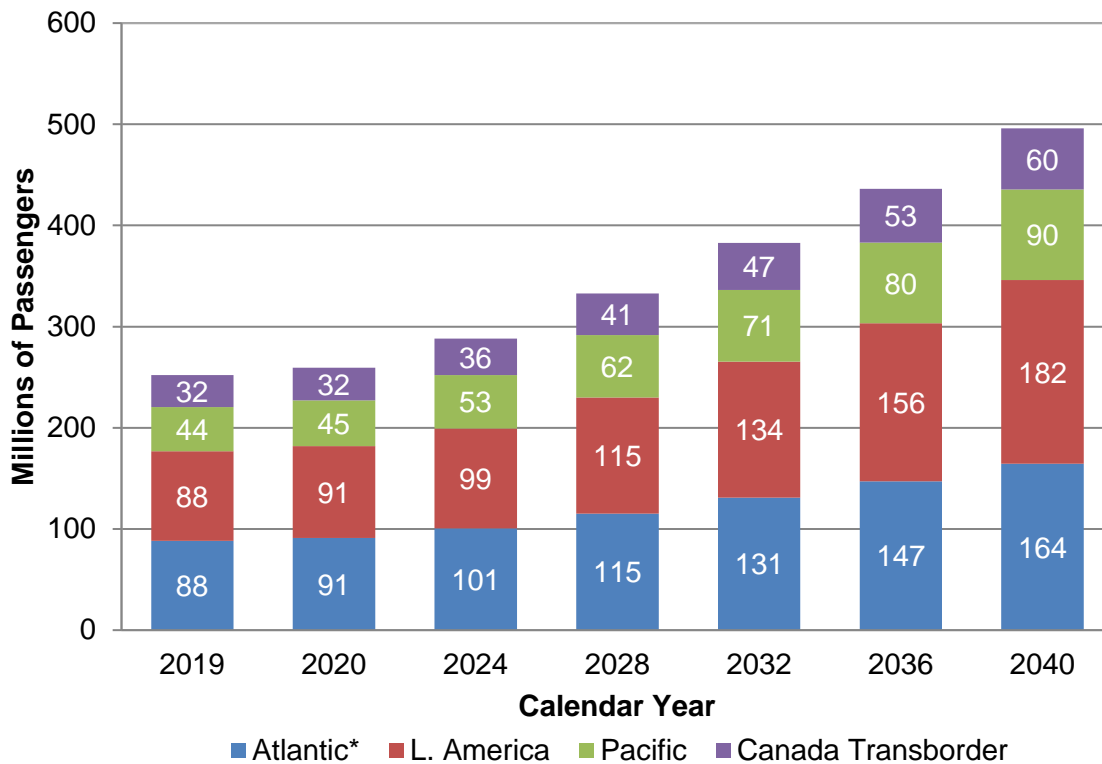
saw enplanements decline 0.9 percent from their 2018 levels, mainly due to a sharp slowdown in travel between the U.S. and China and India, markets that had recently posted very strong growth. Meanwhile, traffic (RPMs) increased by just 0.4 percent. Although the region is forecast to have the highest economic growth of any region over the next 20 years, led by China and India, U.S. carrier enplanements and RPMs for the Pacific region are forecast to grow a modest 2.2 and 2.3 percent a year, respectively. Traffic growth is relatively moderate in part because U.S. carriers continue to have a majority of their service in the region to Japan as opposed to faster growing countries.

After contracting in 2015 and 2016, the Atlantic region has accelerated steadily in recent years. By 2019, enplanements grew of

7.0 percent as and RPMs expanded by 7.7 percent. This growth has been supported by U.S. demand as well as growth of Middle East and African markets, even as the European economies slowed in 2019. While 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 larger 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 twenty-year period from 2020 to 2040, enplanements in the Atlantic region are forecast to grow at an average annual rate of 2.2 percent a year while RPMs grow 2.5 percent a year.

**Total Passengers To/From the U.S.
American and Foreign Flag Carriers**



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

* Per past practice, the Mid-East region and Africa are included in the Atlantic category.

Total passengers (including Foreign Flag carriers) between the United States and the rest of the world increased an estimated 3.2 percent to 252 million in 2019 as all regions

posted gains led by a 4.1 percent increase in the Atlantic region.

FAA projects total international passenger growth of 2.9 percent in 2020 as global economic growth remains modest with the highest passenger growth expected in the Atlantic and Pacific regions. Moderate global economic growth averaging 2.9 percent a year over the next 20 years (2020-2040) is the foundation for the forecast growth of international passengers of 3.3 percent a year, as levels almost double from 252 million to 496 million.

The Latin American region is the largest international market and is projected to grow at the fastest rate (3.5 percent a year) of any region over the forecast period. Within the region, Mexico and Dominican Republic are the two largest markets and are expected to post average annual growth rates of 3.6 percent and 4.4 percent, respectively.

Powered by economic growth and rising incomes in China, India and South Korea, total

passengers in the Pacific region are forecast to more than double to 90 million by 2040. From 2020 to 2040, passengers between the United States and the Pacific region are forecast to grow 3.5 percent a year.

Both the Atlantic and Canada regions are more mature markets and are projected to have somewhat slower growth than the Latin or Pacific regions. The Atlantic region is forecast to grow at an average rate of 3.0 percent a year as an increasing share of the passengers in this region come from the Middle East and Africa markets. Though sizable and comparable to Mexico in passenger traffic, the Canadian transborder market is considerably smaller than the Atlantic region. With solid North American economic growth, Canada transborder passengers are forecast to grow at an annual average of 3.2 percent a year over the next 20 years.

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.

U.S. air carriers flew 42.9 billion revenue ton miles (RTMs) in 2019, up just 0.2 percent from 2018 with domestic cargo RTMs increasing 2.8 percent to 16.2 billion while international RTMs contracted 1.3 percent to 26.6 billion. Air cargo RTMs flown by all-

cargo carriers comprised 80.3 percent of total RTMs in 2019, with passenger carriers flying the remainder. Total RTMs flown by the all-cargo carriers increased 2.3 percent in 2019 while total RTMs flown by passenger carriers fell by 7.2 percent.

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

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.

After increasing by just 0.2 percent in 2019, total RTMs are expected to recover and grow 4.5 percent in 2020. 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 3.5 percent for the balance of the forecast period (from 2020 to 2040).

Following a 2.8 percent increase in 2019, domestic cargo RTMs are projected to grow 1.9

percent in 2020 as the global trade slowdown impacts domestic activity. Between 2020 and 2040, domestic cargo RTMs are forecast to increase at an average annual rate of 1.9 percent. In 2019, all-cargo carriers carried 90.9 percent of domestic cargo RTMs. The all-cargo share is forecast to grow modestly to 92.2 percent by 2040 based on increases in capacity for all-cargo carriers.

International cargo RTMs fell 1.3 percent in 2019 after posting a 10.0 percent increase in 2018. Trade disputes and slower economic growth around the world have materially impacted global trade. Growth in international RTMs recover in 2020, growing at 6.2 percent as foreign economies regain their footing and some trade disputes are resolved. For the forecast period (2020-2040), international cargo RTMs are expected to increase an average of 4.2 percent a year based on projected growth in world GDP with the Other International region having the fastest growth (5.0 percent), followed by the Pacific (4.7 percent), Atlantic (3.1 percent), and Latin America regions (1.3 percent).

The share of international cargo RTMs flown by all-cargo carriers is forecast to increase from 73.8 percent in 2019 to 79.0 percent by 2040.

General Aviation

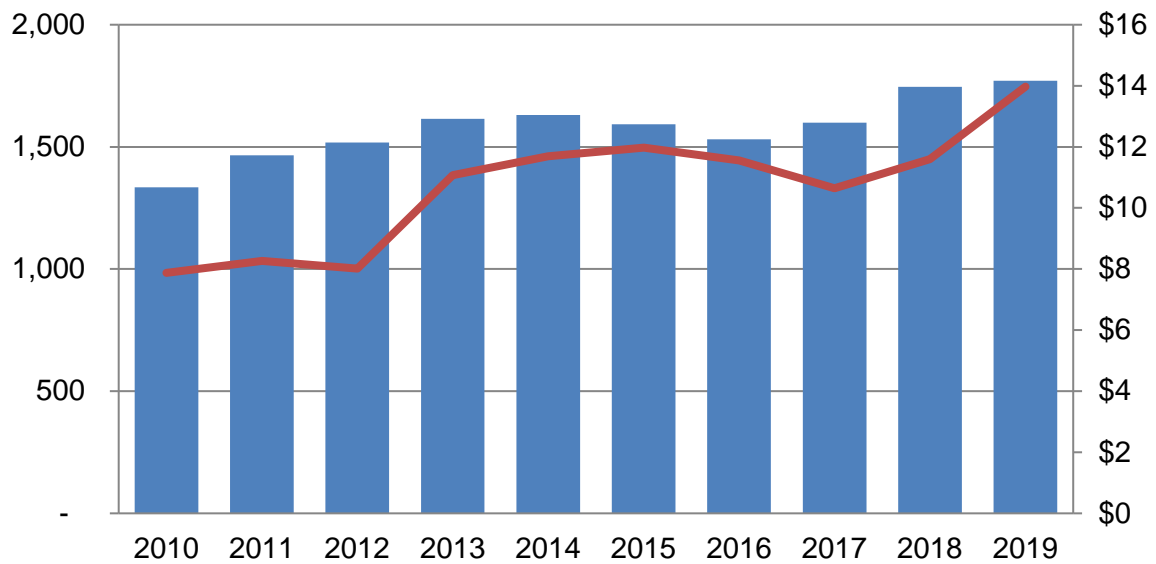
The FAA uses estimates of fleet size, hours flown, and utilization rates from the General Aviation and Part 135 Activity Survey (GA Survey) as baseline figures to forecast the GA fleet and activity. Since the survey is conducted on a calendar year (CY) base and the records are collected by CY, the GA 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, produce 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,”⁶ 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 June.

The results of the 2018 GA Survey, the latest available, were consistent with the results of surveys conducted since 2004 improve-

ments to the survey methodology. The active GA fleet was estimated to be 211,749 aircraft in 2018 (0.0 percent change from 2017), as increases in fixed wing piston, fixed wing turbine, and experimental aircraft were offset by declines in rotorcraft and other aircraft (gliders and lighter than air). Total hours flown were estimated to be 25.5 million, up 1.2 percent from 2017. Increases in fixed wing piston and fixed wing turbine aircraft more than offset sharp declines in rotorcraft and experimental aircraft.

In 2019, deliveries of the general aviation aircraft manufactured in the U.S. increased slightly to 1,771, 1.4 percent higher than in CY 2018. Deliveries of single-engine piston aircraft were up 7.0 percent while multi-engine piston deliveries were flat. Business jet deliveries were up by 6.3 percent, but turbo-prop deliveries were down by 13.3 percent. Overall piston deliveries were up 6.5 percent while turbine shipments were down by 3.2 percent. Based on figures released by GAMA, they amounted to \$14.0 billion in factory net billings, a record for the U.S. industry.

⁶ An active aircraft is one that flies at least one hour during the year.



GAMA and industry experts reported the rotorcraft deliveries declined in 2019 in both piston and turbine segments.

Against these current conditions, the long-term outlook for general aviation, driven by turbine aircraft activity, remains stable. The active general aviation fleet is projected to decrease slightly from its current level, as the declines in the fixed-wing piston fleet remain just above the increases in the turbine, experimental, and light sport fleets. The total active general aviation fleet changes from an estimated 212,335 in 2019 to 210,380 aircraft by 2040 (a small decline of 0.9 percent).

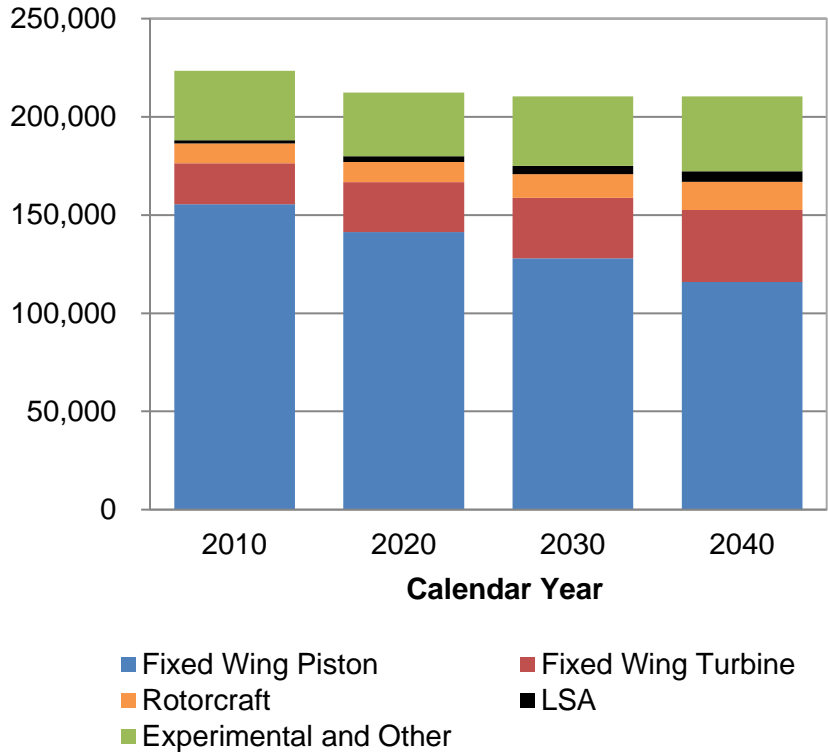
The more expensive and sophisticated turbine-powered fleet (including rotorcraft) is projected to grow by 14,640 aircraft -- an average rate of 1.8 percent a year between

2019 and 2040, with the turbojet fleet increasing 2.3 percent a year. 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 over the forecast period by 26,365 aircraft (an average annual rate of -1.0 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 3.4 percent annually, adding about 2,730 new aircraft by 2040, more than doubling its 2018 fleet size.

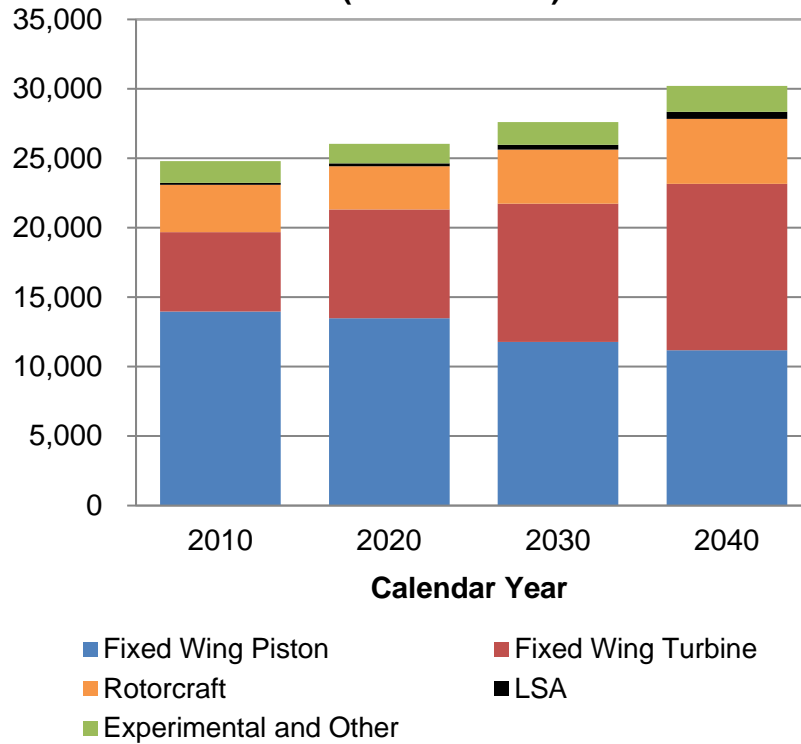
Active General Aviation Aircraft



Although the total active general aviation fleet is projected to marginally decline, the number of general aviation hours flown is forecast to increase an average of 0.7 percent per year through 2040 from 25.5 million in 2018 to 30.2 million, as the newer aircraft fly more hours each year. Fixed wing piston hours are forecast to decrease by 1.0 percent, the same rate as the fleet decline.

Countering this trend, hours flown by turbine aircraft (including rotorcraft) are forecast to increase 2.2 percent yearly between 2019 and 2040. Jet aircraft are expected to account for most of the increase, with hours flown increasing at an average annual rate of 2.7 percent over the forecast period. The large increases in jet hours result mainly from the increasing size of the business jet fleet.

General Aviation Hours Flown (in thousands)



Rotorcraft activity, which was not as heavily impacted by the previous economic downturn as other aircraft and rebounded earlier, faces the challenges brought by lower oil prices, a trend which has been continuing. The low oil prices impacted utilization rates and new aircraft orders both directly through decreasing activity in oil exploration, and also through a slowdown in related economic activity. While significant use in other activities such as air medical, training, air taxi and tours continues, the 2018 GA Survey showed a 5.0 percent decrease in the active fleet and a 12.0 percent decrease in hours flown. The fleet is projected to grow at a similar rate to previous year's forecast, although starting from a lower base and at a slower pace in the piston segment. Rotorcraft hours are projected to grow by 2.1 percent annually over the forecast period.

Lastly, the light sport aircraft category is forecasted to see an increase of 4.2 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 664,565 active pilots certificated by FAA at the end of 2019. The number of certificates in most pilot categories continued to increase, with the exception of private, rotorcraft only and recreational certificates. The FAA has suspended the student pilot forecast for the third consecutive year. 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,

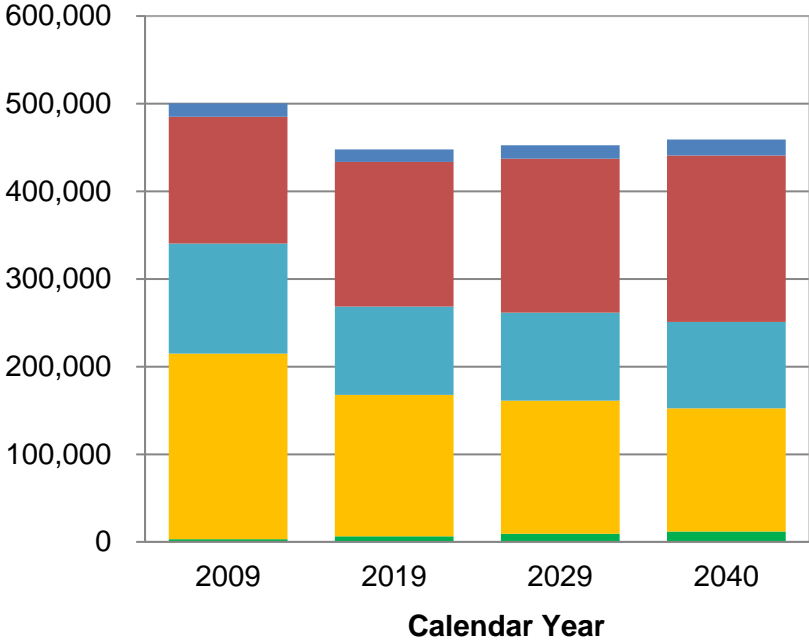
and to 197,665 at the end of 2019. The 2016 rule change generates a cumulative increase in the certificate numbers and breaks the link between student pilot and advanced certificate levels of private pilot or higher. There is no sufficient data yet to perform a reliable forecast for the student pilots.

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 both commercial pilot and ATP certificates have been increasing for the last three years, to 100,863 and 164,947, respectively by the end of 2019.

The number of active general aviation pilots (excluding students and ATPs) is projected to decrease about 12,120 (down 0.2 percent yearly) between 2019 and 2040. The ATP category is forecast to increase by 25,150 (up 0.7 percent annually). The much smaller category of sport pilots are predicted to increase by 2.9 percent annually over the forecast period. On the other hand, both private and commercial pilot certificates are projected to decrease at an average annual rate of 0.6 and 0.1 percent, respectively until 2040.

Active Pilots by Type of Certificate



- Sport Pilot
- Private Pilot
- Commercial Pilot
- Airline Transport Pilot
- Rotorcraft only

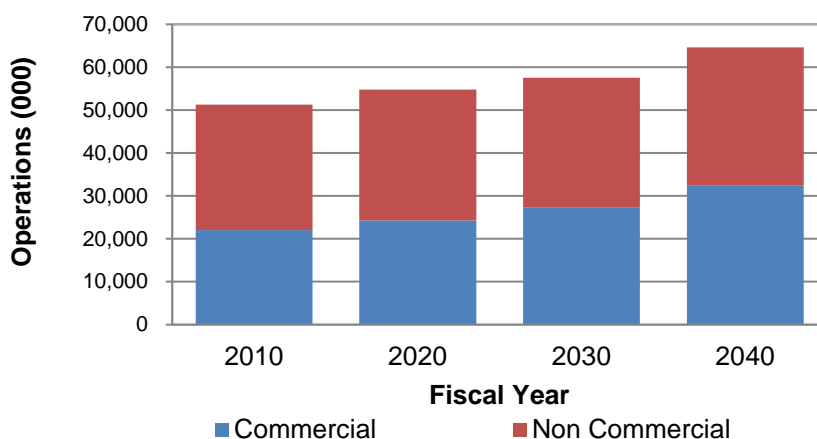
FAA Operations

The growth in air travel demand and the business aviation fleet will drive growth in operations at FAA facilities over the forecast period. Activity at FAA and contract towers is forecast to increase at an average rate of 0.9 percent a year through 2040 from 53.3 million in 2019 to close to 64.6 million in 2040. Commercial operations⁷ at these facilities are forecast to increase 1.6 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 (1.6 percent versus 2.2 percent) over the forecast period due primarily to larger aircraft (seats per aircraft mile) and higher load factors. Both of these

trends allow U.S. airlines to accommodate more passengers without increasing the number of flights. General aviation operations (which accounted for 51.4 percent of operations in 2019) are forecast to increase an average of 0.4 percent a year as increases in turbine powered activity more than offset declines in piston activity.

The growth in operations at towered airports is not uniform. Most of the activity at large and medium hubs⁸ is commercial in nature, given that these are the airports where most of the passengers, about 88 percent in 2019, in the system fly to.

FAA & Contract Tower Operations



⁷ Sum of air carrier and commuter/air taxi categories.

⁸ Large hub is defined to have 1 percent or more of total U.S. revenue passenger enplanements in FY 2019. There are 30 airports in this category.

Medium hub is defined to have at least 0.25 percent but less than 1 percent of total U.S. revenue passenger enplanements in FY 2019. There are 31 airports classified as medium hubs.

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 small towered airports including small FAA towers⁹ and FAA contract towers¹⁰. The forecasted annual growth is 1.7 percent at large hubs, 1.6 at medium hubs, 0.5 percent at small FAA towers and FAA contract towers between 2019 and 2040.

Among the 30 large hubs, the airports with the fastest annual growth forecast are those located along the coastal sections of the country where most large cities are located. Large cities have historically shown to generate robust economic activity, which in turn drives up the airline demand. On the other hand, the airports forecast to have slower annual growth tend to be located in the middle of the country.

FAA Tracon (Terminal Radar Approach Control) Operations¹¹ are forecast to grow slightly faster than at towered facilities. This is in part a reflection of the different mix of activity at Tracons. Tracon operations are forecast to increase an average of 1.1 per-

cent a year between 2019 and 2040. Commercial operations accounted for approximately 60 percent of Tracon operations in 2019 and are projected to grow 1.5 percent a year over the forecast period. General aviation activity at these facilities is projected to grow only 0.25 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 and business aviation 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 1.5 percent a year, with commercial activity growing at the rate of 1.7 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.¹² In 2019, the share of commercial IFR aircraft handled at FAA En-Route centers is about 82 percent, which is greater than the 60 percent share at Tracons or the 44 percent share at FAA and Contract Towers.

⁹ Small FAA towers are defined as towered airports that are neither large or medium hubs nor FAA contract towers.

¹⁰ FAA contract towers are air traffic control towers providing air traffic control services under contract with FAA, staffed by contracted air traffic control specialists.

¹¹ 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.

¹² 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

The number of aircraft in the U.S. commercial fleet is forecast to increase from 7,628 in 2019 to 9,421 in 2040, an average annual growth rate of 1 percent a year. Increased demand for air travel and growth in air cargo is expected to fuel increases in both the passenger and cargo fleets.

Between 2019 and 2040 the number of jets in the U.S. mainline carrier fleet is forecast to grow from 4,388 to 5,310, a net average of 44 aircraft a year as carriers continue to remove older, less fuel efficient narrow body aircraft. The narrow-body fleet (including E-series aircraft as well as A220-series at Jet-Blue and A220-series at Delta) is projected to grow 35 aircraft a year as carriers replace the 757 fleet and current technology 737 and A320 family aircraft with the next generation MAX and Neo families. The wide-body fleet grows by an average of 12 aircraft a year as carriers add 777-8/9, 787's, A350's to the fleet while retiring 767-300 and 777-200 aircraft. In total the U.S. passenger carrier wide-body fleet increases by 1.8 percent over the forecast period.

The regional carrier fleet is forecast to decline from 2,361 aircraft in 2019 to 2,320 in

2040 as the fleet shrinks by 1.7 percent (41 aircraft) between 2019 and 2040. 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 after 2020. By 2031 only a handful of 50 seat regional jets remain in the fleet. By 2040, the number of jets in the regional carrier fleet totals 2,192, up from 1,846 in 2019. The turboprop/piston fleet is forecast to shrink by 71% from 515 in 2019 to 128 by 2040. These aircraft account for just 5.5 percent of the fleet in 2040, down from 21.8 percent in 2019.

The cargo carrier large jet aircraft fleet is forecast to increase from 879 aircraft in 2019 to 1,791 aircraft in 2040 driven by the growth in freight RTMs. The narrow-body cargo jet fleet is projected to increase by 11 aircraft a year as 757's and 737-800's are converted from passenger use to cargo service. The wide body cargo fleet is forecast to increase 33 aircraft a year as new 747-800, 777-200, and new and converted 767-300 aircraft are added to the fleet, replacing older MD-11, A300/310, and 767-200 freighters.

U.S. Carrier Fleet

