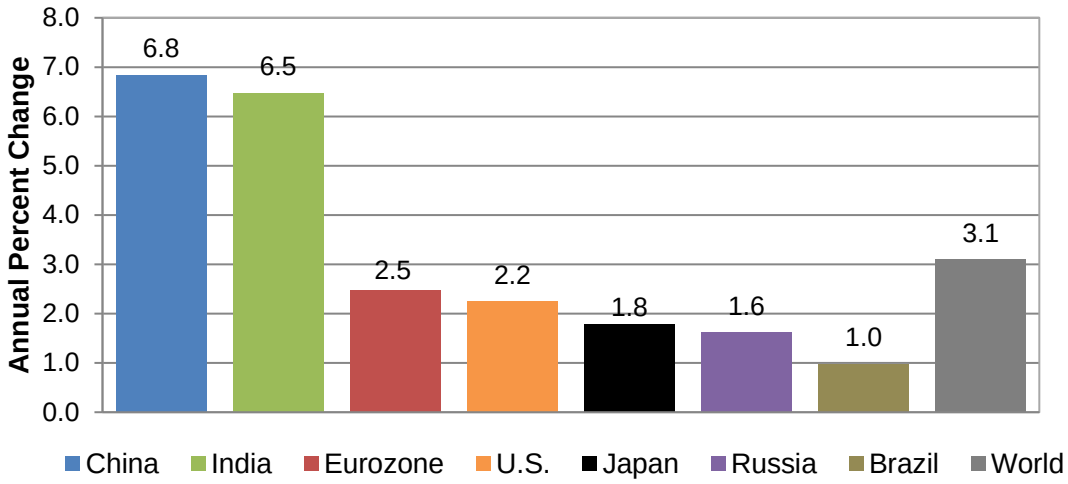
FAA Aerospace Forecasts
Fiscal Years 2018-2038

Economic Environment

In the near term, IHS Global Insight projects that world economic growth will hold steady near its 2017 rate of 3.1 percent. Growth is projected at 3.2 percent in 2018 and 3.1 percent in 2019. The U.S. economy is forecast to be supported by the strength of underlying fundamentals while European policy remains accommodative in the face of political uncertainty. Japan's economic growth is projected to slow but remain relatively solid, helped by domestic demand and exports. In emerging markets, China's growth continues to ease, though stabilized by the government, while other countries such as Brazil and Russia build on 2017's momentum helped by higher commodity prices and increased demand for exports. India is expected to return to growth rates in excess of 7 percent after slowing slightly in 2017 due to policy shocks.

China and India led World Economic Growth in 2017

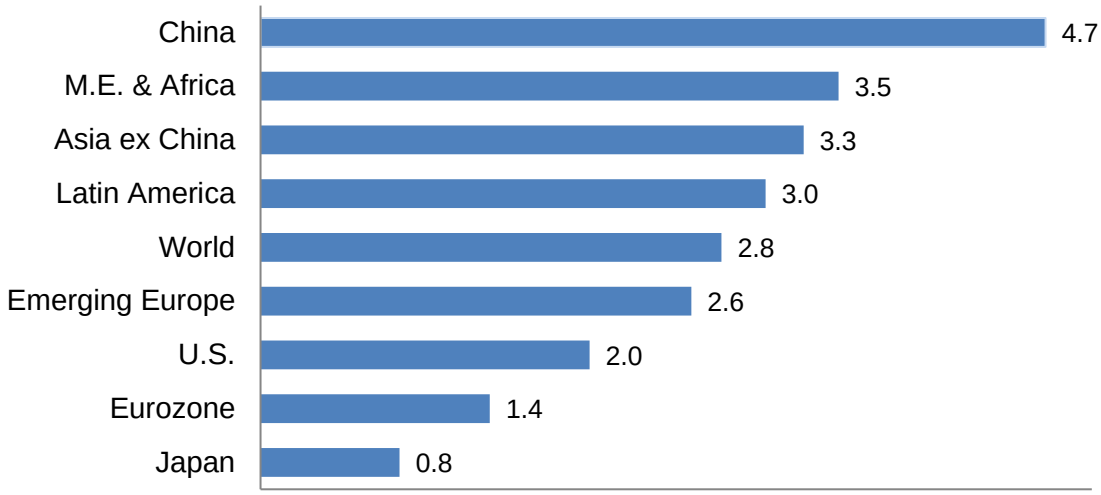


Source: IHS Global Insight

IHS Global Insight forecasts world real GDP to grow at 2.8 percent a year between 2018 and 2038. Emerging markets, at 4.1 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 Middle East and Africa, Latin America, and Eastern Europe. Growth in the more mature economies (1.7 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 0.8 percent a year reflecting deep structural issues associated with a shrinking and aging population.

Asia and Africa/Middle East lead global economic growth

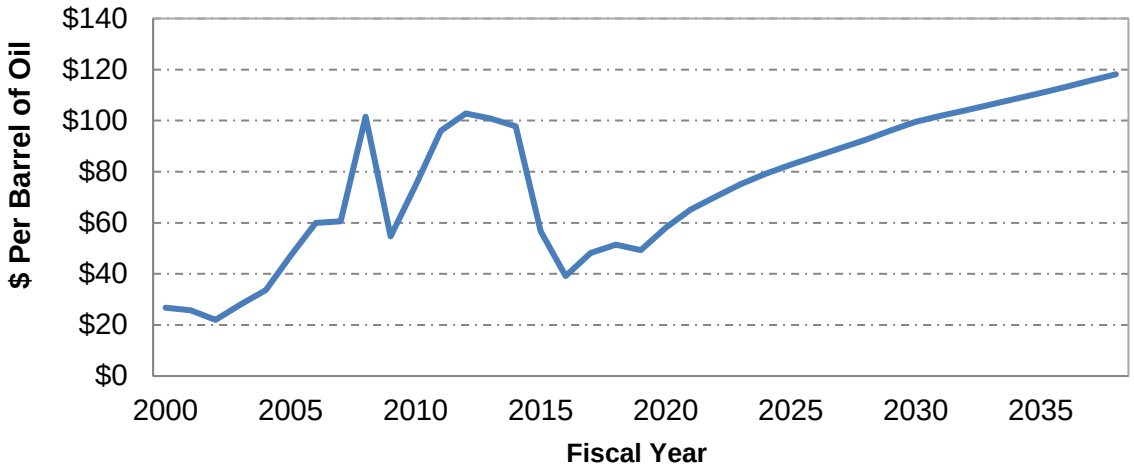
Annual GDP % growth 2018-2038



Source: IHS Global Insight, Jan 2018 World Forecast

The average crude oil price in 2017 rose 23 percent to about $48 per barrel, bringing an end to the declines seen over the past four years. Although IHS Global Insight is projecting little change in prices in 2018 and 2019 due to supply growth, that pause will be short lived as prices rise in subsequent years. The price of oil is projected to increase over the long run due to growing global demand and higher costs of extraction. IHS Global Insight forecasts U.S. refiner's acquisition cost of crude to surpass $100 per barrel in 2030 and continue to rise modestly thereafter to $119 in 2038.

U.S. Refiners' Acquistion Cost



Source: IHS Global Insight

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.

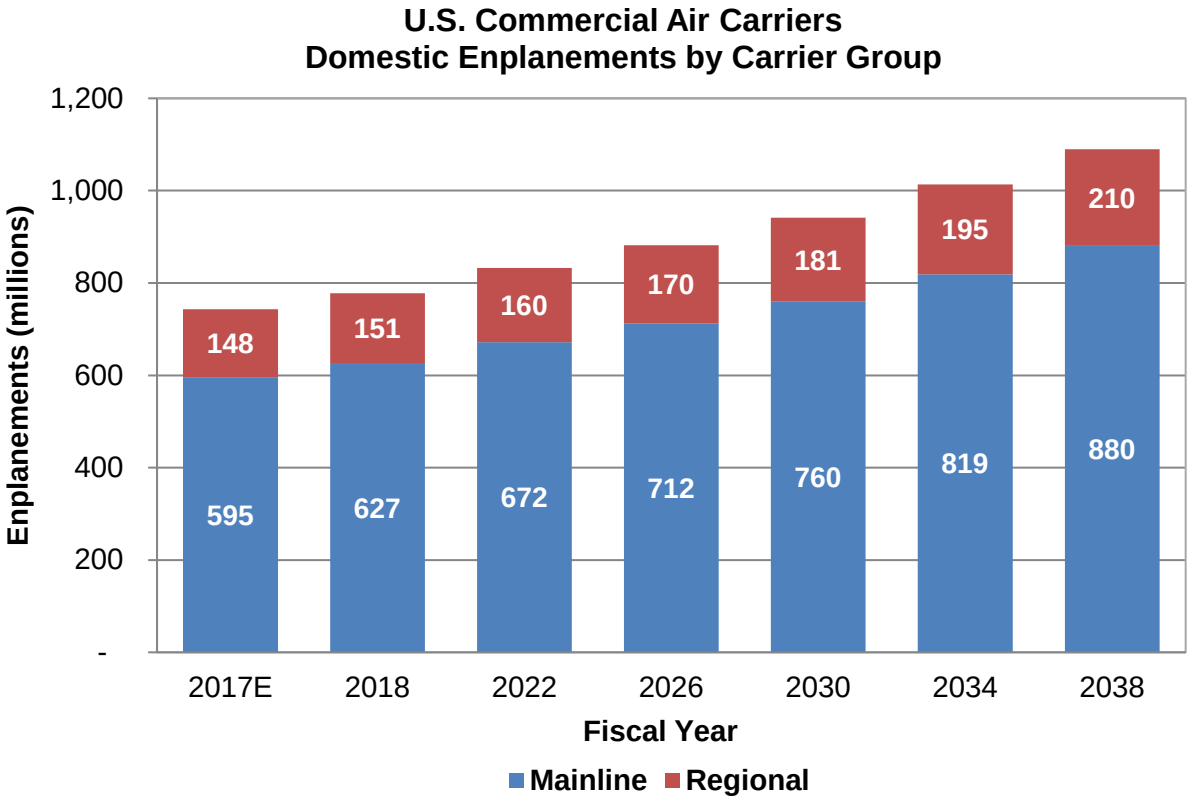
The commercial air carrier industry in 2018 will be shaped by four distinct trends: (1) easing capacity discipline; (2) steady growth of seats per aircraft, whether through up-gauging or reconfiguring existing aircraft; (3) increasing competitive pressure due to ultra-low-cost carrier expansion; and (4) continued reliance on ancillary revenues.

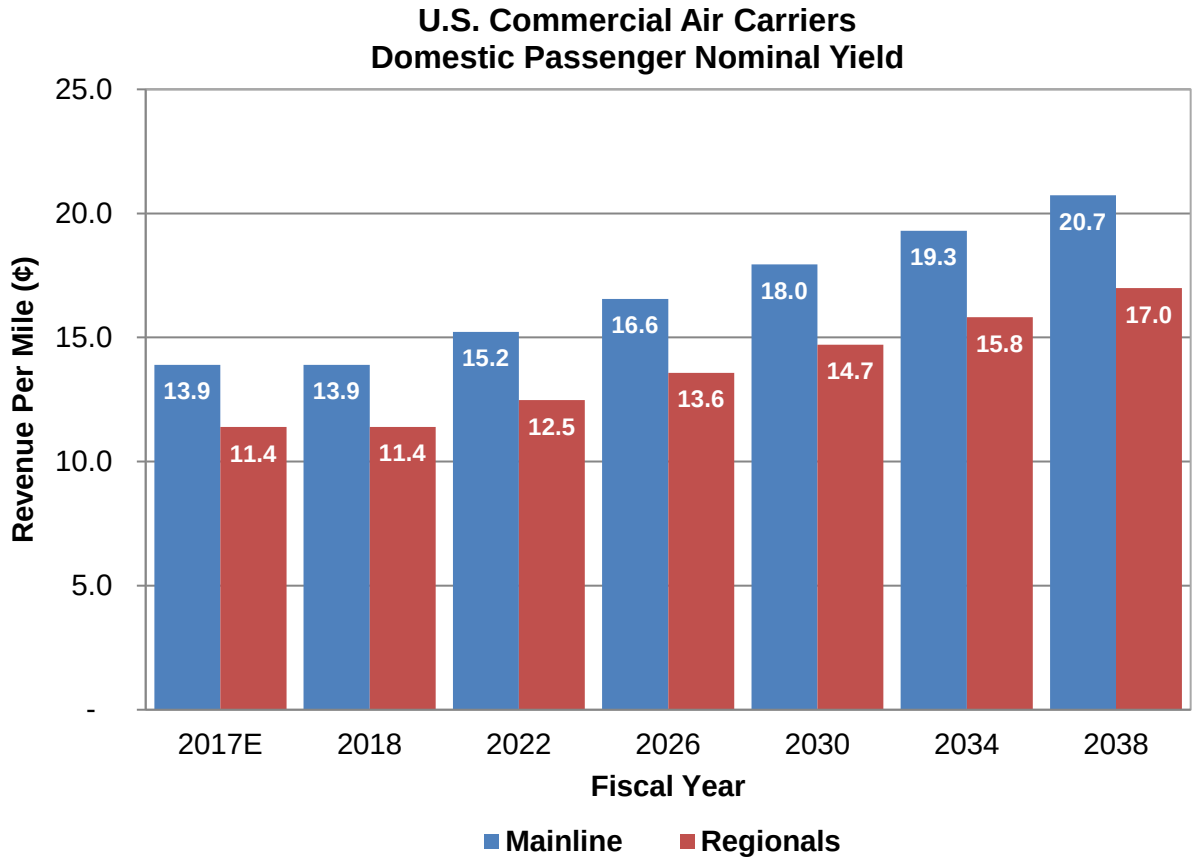
Following the 2007-09 recession, the U.S. airline industry underwent considerable restructuring that has resulted in an unprecedented period of capacity discipline, especially in domestic markets. Between 1978 and 2000, ASMs in domestic markets increased at an average annual rate of 4 percent a year, recording only two years of decline. Even though domestic ASMs shrank by 6.9 percent in FY 2002, following the events of September 11, 2001, growth resumed and by 2007, domestic ASMs were 3.6 percent above the FY 2000 level. Since 2009, U.S. domestic ASMs have increased at an average rate of 2.1 percent per year while RPMs have grown 2.8 percent per year. Although those average rates of growth since the recession are low, they conceal the fact that growth has been picking up over the period (4.4% a year since 2014). 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, that earlier restraint in ASM growth is likely to continue easing as some carriers have indicated plans to open new routes. As new service begins, competitors may respond 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 2017, the mainline carrier group provided 9 percent more capacity than in 2007 while carrying 11.8 percent more passengers. Capacity flown by the regional group has shrunk by 2.8 percent over the same period (with passengers carried down 5.1 percent).

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

[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 less seats and whose routes serve mainly as feeders to the mainline carriers.


U.S. Commercial Air Carriers
Domestic Enplanements by Carrier Group
Enplanements (millions)
1,200
1,000
800
600
400
200
-
148
151
160
170
181
195
210
595
627
672
712
760
819
880
2017E
2018
2022
2026
2030
2034
2038
Fiscal Year
Mainline
Regional



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 pilot shortages and tighter regulations regarding pilot training. 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 26 percent over the ten years ending in 2017.

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 2007, this measure has grown about 8 percent.

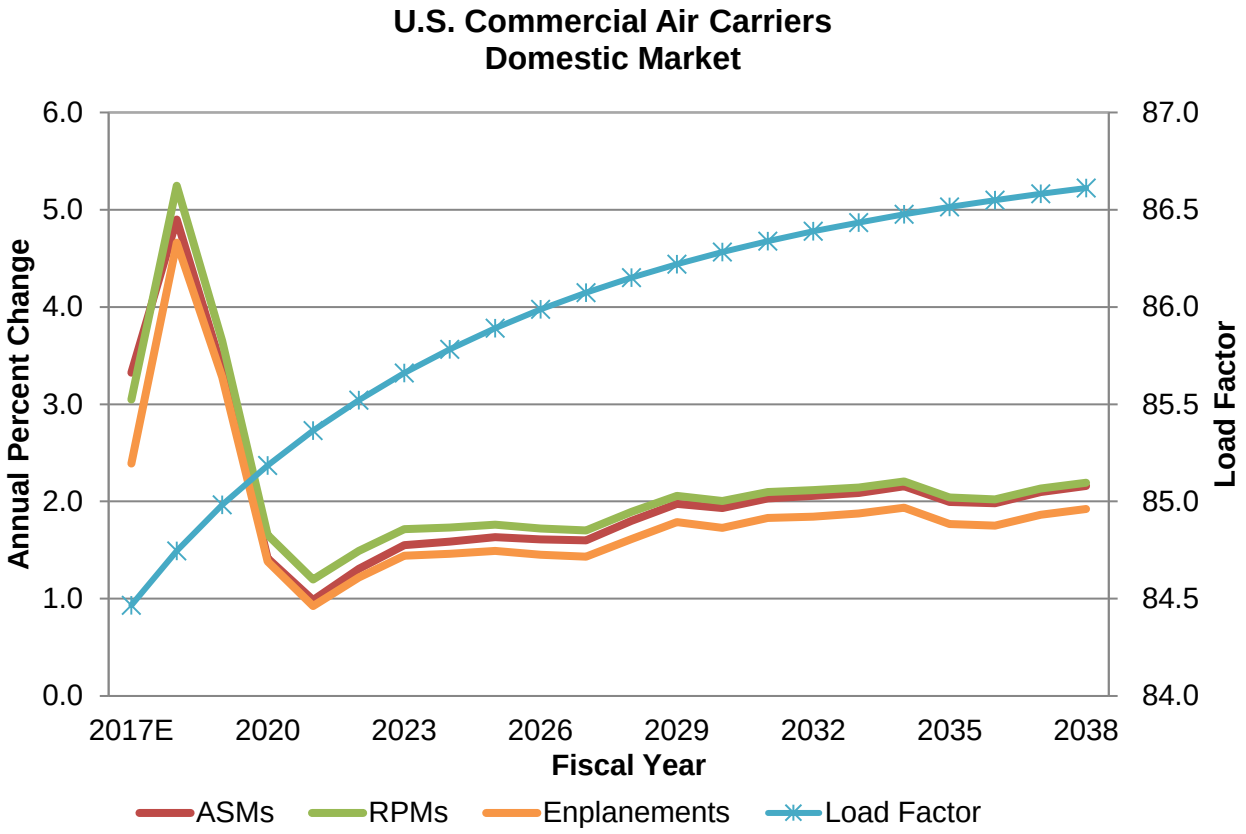
Another continuing trend is that of ancillary revenues. Carriers generate ancillary revenues by selling products and services beyond that of an airplane ticket to customers. This includes the un-bundling of services previously included in the ticket price such as

checked bags and on-board meals, and by adding new services such as boarding priority and internet access. Although U.S. passenger carriers posted record net profits in 2016, profits declined in 2017 on rising fuel and labor costs and flat yields. Nevertheless, ancillary revenues remained a contributing factor to overall profitability. Airlines are also 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 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 in February 2017, and had expanded to the entire domestic network by September. United deployed its version of Basic Economy fares across its domestic network in May, 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 about 12 percent since 2007, and regionals' have shrunk about 5 percent, low cost carrier enplanements have grown by almost 30 percent. RPMs over the same period show a similar pattern with mainline RPMs up 15 percent, regional RPMs up 1 percent and LCC RPMs fully 41 percent higher.

U.S. commercial air carriers' total number of domestic departures rose in 2016 for the first time since 2007 but then pulled back in 2017 and are about 18 percent below the 2007 level. ASMs, RPMs and enplanements all grew in each of the past six years; these trends underlie the expanding size of aircraft and higher load factors.[2] In 2017, the domestic load factor came off a historic high reached the year before but at 84.5 percent, remains near the peak for commercial air carriers. Load factor is forecast to rise and peak around 86.6 percent in the future due to the logistical difficulties inherent in matching supply perfectly with demand.

[2] Commercial air carriers encompass both mainline and regional carriers.



System, that is the sum of domestic plus international capacity, increased 2.9 percent to 1.144 trillion ASMs in 2017 while RPMs also increased 2.9 percent to 955 billion. During the same period system-wide enplanements increased 2.6 percent to 840.7 million. In 2017, U.S. carriers continued to prioritize the domestic over the international market in terms of allocating capacity as domestic capacity increased 3.3 percent while international capacity was up just 2.0 percent. U.S. carriers' domestic capacity growth will exceed their international capacity growth in 2018 but carriers will start expanding capacity in international markets faster than domestic markets beginning in 2019 and this trend is projected to continue through 2038 as the domestic market continues to mature.

U.S. mainline carrier enplanement growth in the combined domestic and international market was 3.6 percent in 2017 while regional carriers carried 2.1 percent fewer passengers.

In the domestic market, mainline enplanements increased for the seventh consecutive year, up 3.6 percent, marking the first time since 2000 that the industry recorded seven consecutive years of passenger growth in the domestic market. Mainline passengers in international markets posted the eighth year of growth, up 4.0 percent. Domestic mainline enplanement growth is forecast to remain solid, increasing at about 3.4 percent during the early part of the forecast before slowing as economic activity cools. After surging 5.2 percent in 2018, international enplanements

are forecast to grow steadily at about 3.3 percent through the forecast horizon.

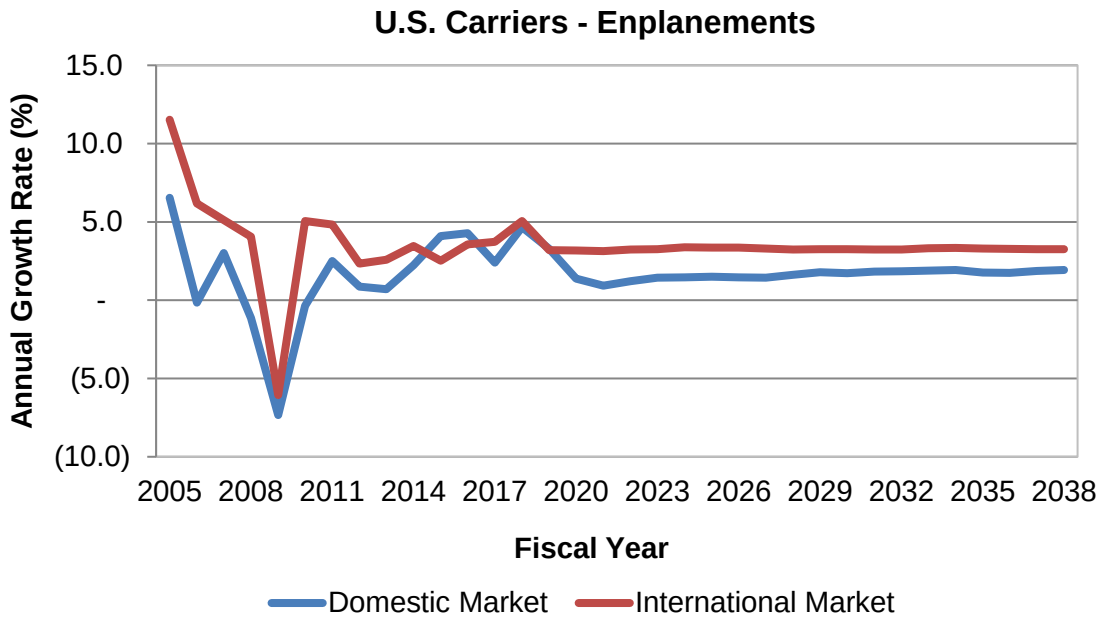
With relatively robust demand, industry capacity growth was up 2.9 percent in 2017 after a 4.2 percent increase in 2016. The increased passenger volume and traffic offset flat yields and along with higher ancillary revenues and relatively low fuel prices resulted in U.S. carriers solidly profitable in 2017. Domestic mainline capacity is expected to match the pattern of enplanements with a solid 3.4 percent growth in the near term, followed by a few years of slower growth before returning to trend. International mainline enplanements are forecast to grow at about 3.9 percent over the next three years and then moderate slightly through the remainder of the forecast.

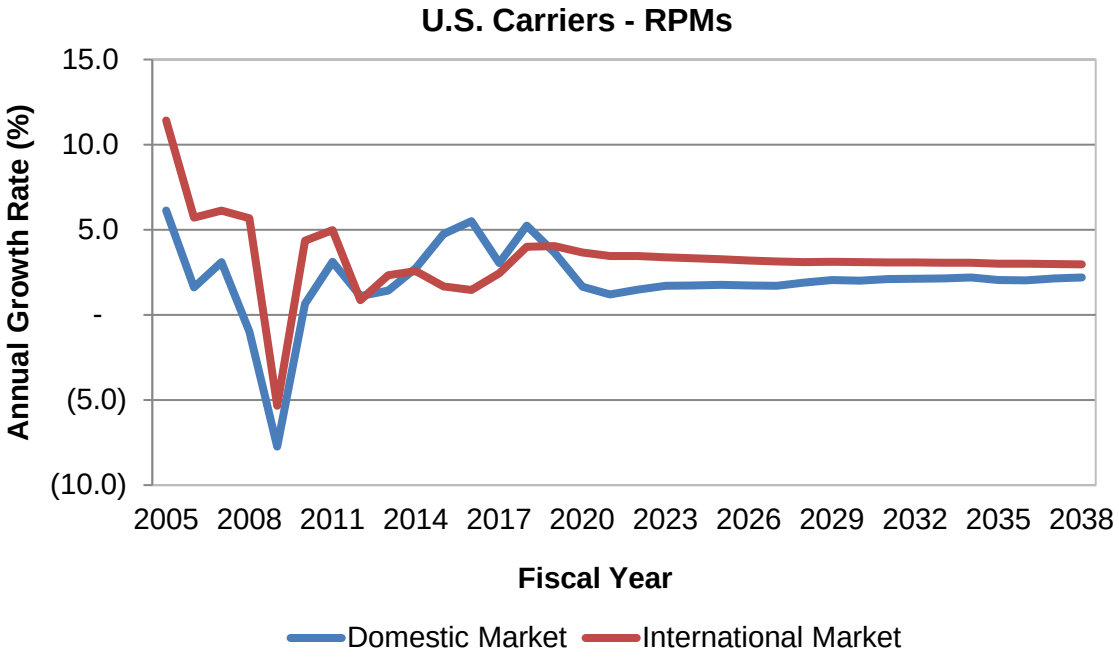
System load factor held steady while trip length increased 3.8 miles (0.3 percent) in 2017, even as seats per aircraft mile increased by 1.9 percent; again reflecting the trend towards using larger aircraft. Seats per aircraft mile system-wide increased to 154.3 seats (up 2.8 seats per aircraft mile), the highest level since 1990.

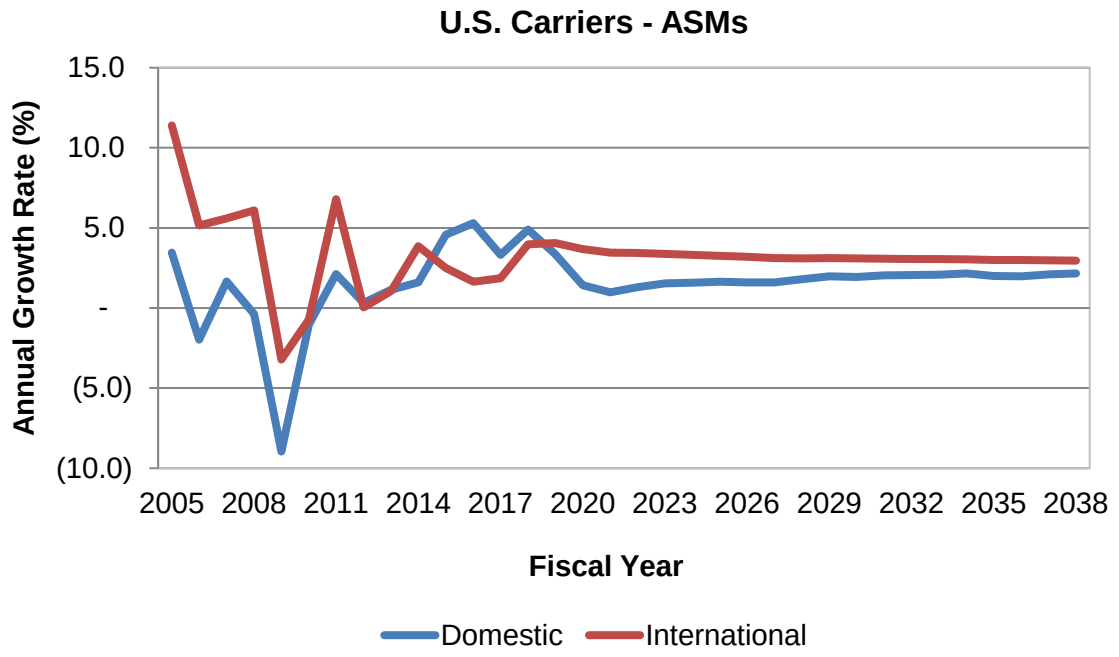
International Market

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 – an outcome that is expected to continue throughout the forecast horizon. Average annual growth rates (FY 2018-2038) of the international market (comprised of mainline and regional carriers) for enplanements, RPMs and ASMs are forecast at 3.4, 3.3, and 3.3 percent, respectively.

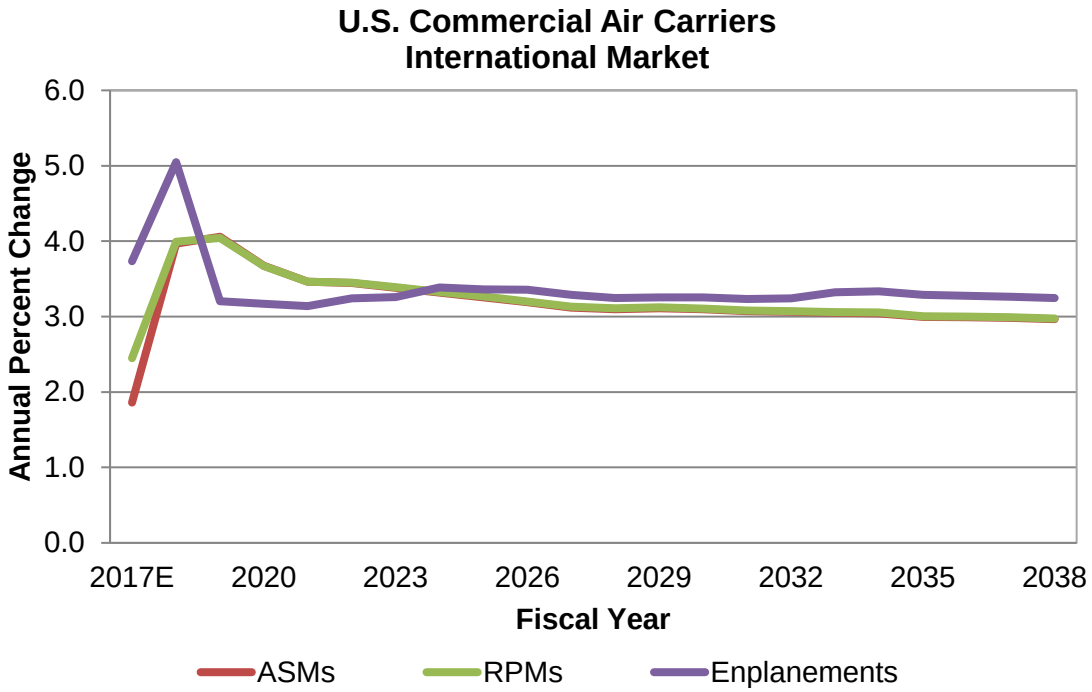
While factors that restrained international growth in recent years still largely remain, conditions have matured and some of the uncertainty has subsided. Most importantly, world economic growth and trade has picked up, fears of a "hard landing" in China have lessened, oil prices, though increasing, appear to be on a steadier path, some progress has been made in defining the terms of Brexit, and the war against ISIS has turned a corner. None of these constraints has disappeared, of course, and security concerns continue to loom over the world as a threat to international travel.







The next five years will feature a rebuilding of international demand by the U.S. carriers with moderate growth averaging around 3.6, 3.7, and 3.7 percent a year for enplanements, RPMs, and ASMs, respectively. Airlines will continue to match capacity growth with traffic growth and load factor is expected to stabilize around 81.1%. Load factors this high were last seen in 2014.

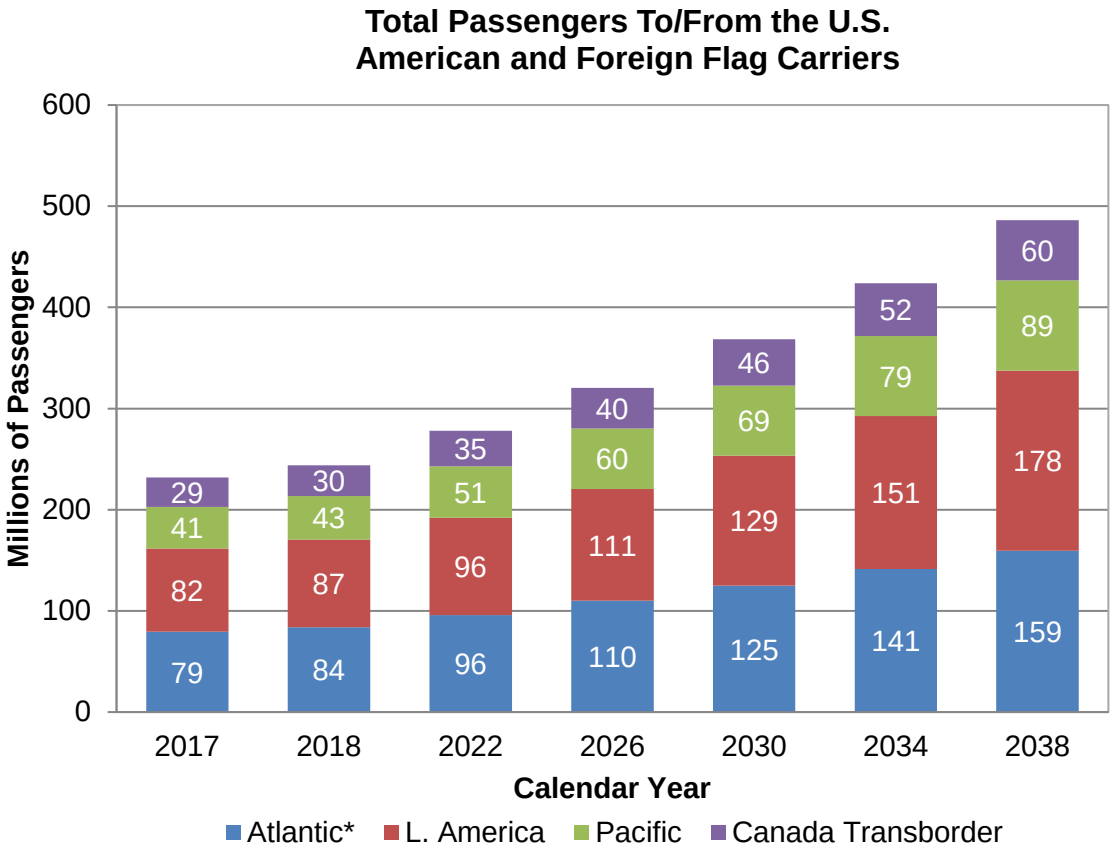


For U.S. carriers, Latin America remains the largest international destination despite the recent economic and political crises in Venezuela and Brazil. Enplanements in 2017 grew an estimated 6.3 percent while RPMs increased 3.2 percent. Growth is projected to remain strong in 2018 but then slow in 2019 as U.S. carriers trim capacity expansion to help stabilize yields. Enplanements and RPMs are forecast to increase 7.2 and 6.4 percent, respectively, in 2018. Over the twenty-year period 2018-2038, Latin America enplanements are forecast to increase at an average rate of 3.8 percent a year while RPMs grow 4.1 percent a year.

The Pacific region is the smallest in terms of enplanements despite the economic growth and potential of air travel to China and India. In 2017, U.S. carriers saw enplanements decline 0.8 percent from their 2016 levels while traffic (RPMs) increased by 3.0 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 2.5 and 2.6 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 markets.

After slower activity in 2016, the Atlantic region saw an increase in enplanements of 1.9 percent as well as an increase in RPMs of 1.6 percent in 2017. Demand strengthened with the firming European economy and as the route to Brexit became slightly clearer. As conditions continue to improve, enplanement and RPM growth will strengthen further in coming years. Over the twenty-year period from 2018 to 2038, enplanements in the Atlantic region (including the Middle East and Africa) are forecast to grow at an average annual rate of 2.6 percent a year while RPMs grow 2.9 percent a year. While Western Europe is a mature area with moderate economic growth, the economically smaller Mid-

dle 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.



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 5.4 percent in 2017 (231.9 million) as all regions posted gains led by a 6.4 percent increase in the Atlantic region.

FAA projects total passenger growth of 5.2 percent in 2018 as global economic growth accelerates with the highest growth expected in the Latin region. Stable global economic growth averaging 2.9 percent a year over the next 20 years (2018-2038) is the foundation for the forecast growth of international passengers of 3.5 percent a year, as levels double from 244 million to 486 million.

The Latin American region is the largest international market and is projected to grow at the fastest rate (3.7 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 3.4 percent and 4.3 percent, respectively.

Powered by economic growth and rising incomes in China and South Korea, total passengers in the Pacific region are forecast to more than double to 88 million by 2038. From 2018 to 2038, passengers between the United States and the Pacific region are forecast to grow 3.7 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 3.3 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 3.4 percent a year over the next 20 years.

Cargo

Air cargo traffic contains 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.

U.S. air carriers flew 39.2 billion revenue ton miles (RTMs) in 2017, up 9.6 percent from 2016 with domestic cargo RTMs increasing 9.5 percent to 14.6 billion while international RTMs rose 9.7 percent to 24.5 billion. Air cargo RTMs flown by all-cargo carriers comprised 80.4 percent of total RTMs in 2017, with passenger carriers flying the remainder. Total RTMs flown by the all-cargo carriers increased 9.9 percent in 2017 while total RTMs flown by passenger carriers grew by 8.4 percent.

U.S. carrier international air cargo traffic can be divided into four regions consisting of Atlantic, Latin, Pacific, and 'Other International.' Total international RTMs in 2017 increased 9.7 percent to 24.5 billion, with all regions posting gains.

Historically, air cargo activity tracks with GDP. Other factors that affect air cargo growth are fuel price volatility, movement of real yields, and globalization. In addition, a number of significant structural changes have occurred in the air cargo industry since 2000. These include air cargo security regulations by the FAA and TSA, maturation of the domestic express market, a shift from air to other modes (especially truck), use of all-cargo carriers (e.g., FedEx) by the U.S. Postal Service to transport mail, and the increased use of mail substitutes (e.g. e-mail, cloud-based services).

The forecasts of Revenue Ton Miles (RTMs) are based 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 is driven by economic growth.

The forecasts of RTMs are based on 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 are based on growth in world and regional GDP, adjusted for inflation. The distribution of RTMs between passenger and all-cargo carriers is forecast based on an analysis of historic trends in shares, changes in industry structure, and market assumptions.

After increasing by 9.6 percent in 2017, total RTMs are forecast to grow 8.7 percent in 2018. Driven by steady U.S. and world economic growth, total RTMs are projected to increase at an average annual rate of 3.8 percent for the balance of the forecast period.

Following a 9.5 percent increase in 2017, domestic cargo RTMs are forecast to grow 7.9 percent in 2018 as the U.S. economic recovery accelerates, stimulated in part by the recently passed tax cuts. Between 2017 and 2038, domestic cargo RTMs are forecast to increase at an average annual rate of 1.9 percent. In 2017, all-cargo carriers carried 89.0 percent of domestic cargo RTMs. The all-cargo share is forecast to grow to 90.6 percent by 2038 based on increases in capacity for all-cargo carriers and ongoing security considerations.

International cargo RTMs rose 9.7 percent in 2017 after posting a 1.4 percent decline in 2016. Faster economic growth in the U.S. and Europe helped to fuel a pickup in worldwide trade. Growth in international RTMs remain strong in 2018 at 9.2 percent as global trade growth continues to be robust. For the forecast period (2017-2038) international cargo RTMs are forecast to increase an average of 4.7 percent a year based on projected growth in world GDP with the Other International region having the fastest growth, followed by the Pacific, Atlantic, and Latin regions, respectively.

The share of international cargo RTMs flown by all-cargo carriers increased from 49.3 percent in 2000 to 71.6 percent in 2017. Continuing the trend experienced over the past decade, the all-cargo share of international RTMs flown is forecast to increase modestly to 77.9 percent by 2038.

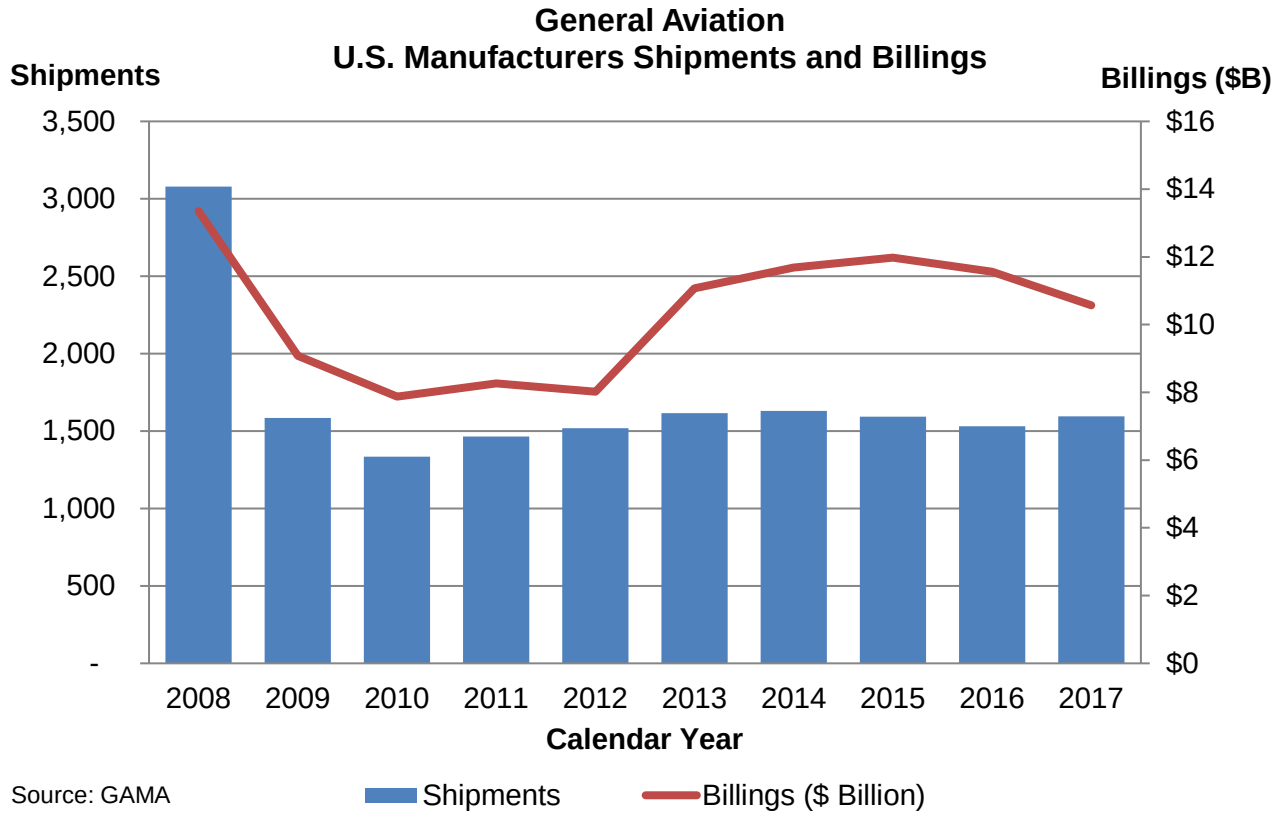
General Aviation

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. 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,"[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 May and January.

The results of the 2016 GA Survey, the latest available, were consistent with the results of surveys conducted since 2004 improvements to the survey methodology. The estimate of the GA active fleet was in decline between 2007 and 2013, especially between 2011 and 2013, primarily due to the impact of the 2010 Rule for Re-Registration and Renewal of Aircraft Registration, which removed cancelled, expired or revoked records from the Registry. In 2014, the GA fleet recorded its first increase since 2008, and the 2016 Survey results showed continuing increase for one more year. The active GA fleet was estimated as 211,793 aircraft in 2016 (up 0.8 percent from 2015), with 24.8 million hours flown (up 2.9 percent from 2015).

In 2017, the previous slow decline in deliveries of the general aviation industry reversed course with increases in the piston segment. Single engine piston deliveries by U.S. manufacturers were up 8.8 percent, while the smaller category of multi-engine piston deliveries went up by 24.2 percent. Business jet deliveries were about the same as the previous year, marginally down by 0.2 percent. Turboprop deliveries were also slightly down by 0.5 percent. Based on figures released by GAMA, U.S. manufacturers of general aviation aircraft delivered 1,596 aircraft in CY 2017, 4.2 percent more than CY 2016. Overall piston deliveries were up 9.5 percent while turbine shipments were down by 0.4 percent.

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



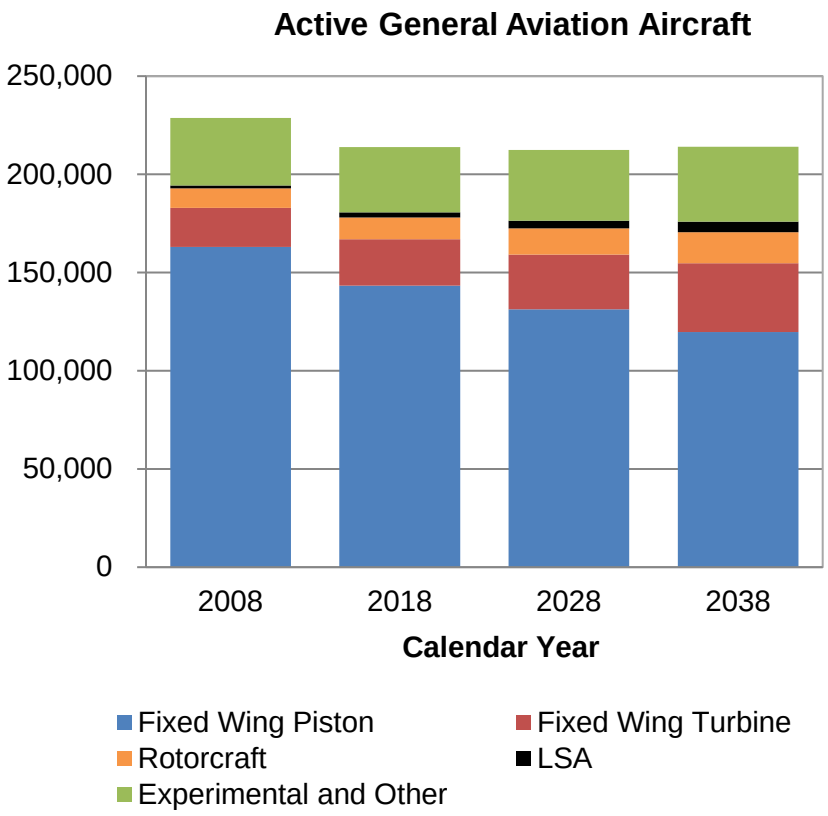
GAMA and industry experts also reported continuing decrease in rotorcraft deliveries has started to stabilize in 2017, as low oil prices began gradually to increase.

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 remain around its current level, with the declines in the fixed-wing piston fleet being offset by increases in the turbine, experimental, and light sport fleets. The total active general aviation fleet changes from an estimated 213,050 in 2017 to 214,090 aircraft by 2038.

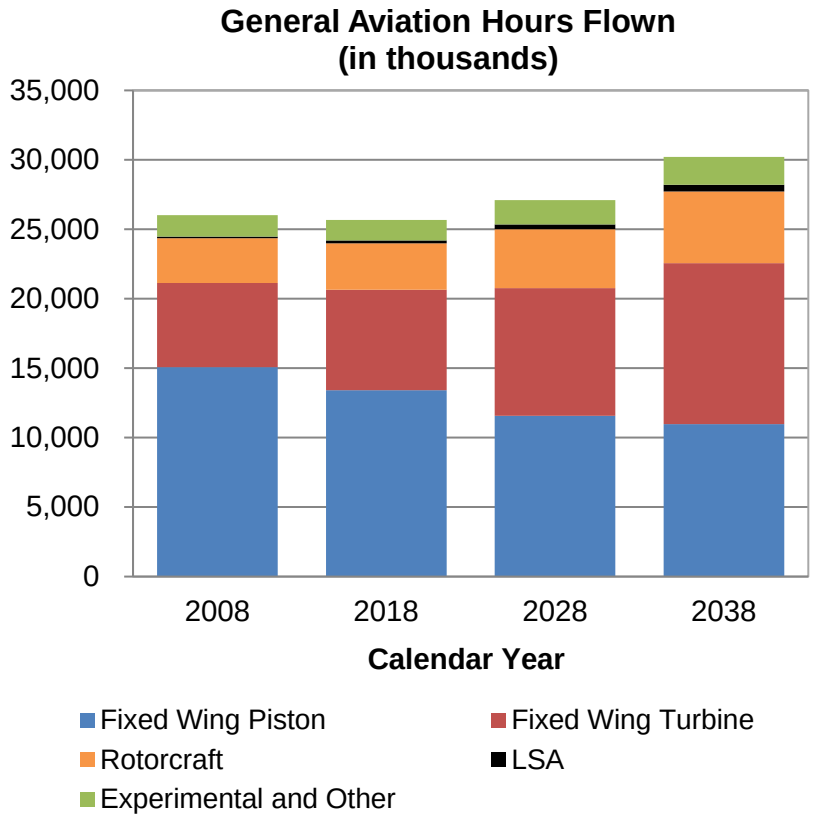
The more expensive and sophisticated turbine-powered fleet (including rotorcraft) is projected to grow by 15,255 aircraft -- an average rate of 2.0 percent a year over the forecast period, with the turbojet fleet increasing 2.2 percent a year. The growth in U.S. GDP and corporate profits are catalysts 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 22,350 aircraft (an average annual rate of -0.8 percent). Unfavorable pilot demographics, overall increasing cost of aircraft ownership, 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 3.6 percent annually, adding about 2,850 new aircraft by 2038, more than doubling its 2016 fleet size.



Although the total active general aviation fleet is projected to remain stable, the number of general aviation hours flown is forecast to increase an average of 0.8 percent per year through 2038 from 24.8 million in 2016 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, slightly faster than the fleet decline of 0.9 percent. Countering this trend, hours flown by turbine aircraft (including rotorcraft) are forecast to increase 2.4 percent yearly over the forecast period. 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, along with estimated increases in utilization rates.



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 now started to stabilize. 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. Rotorcraft hours are projected to grow by 2.2 percent annually over the forecast period.

Lastly, the light sport aircraft category is forecasted to see an increase of 4.4 percent a year in hours flown, primarily driven by growth in the fleet.

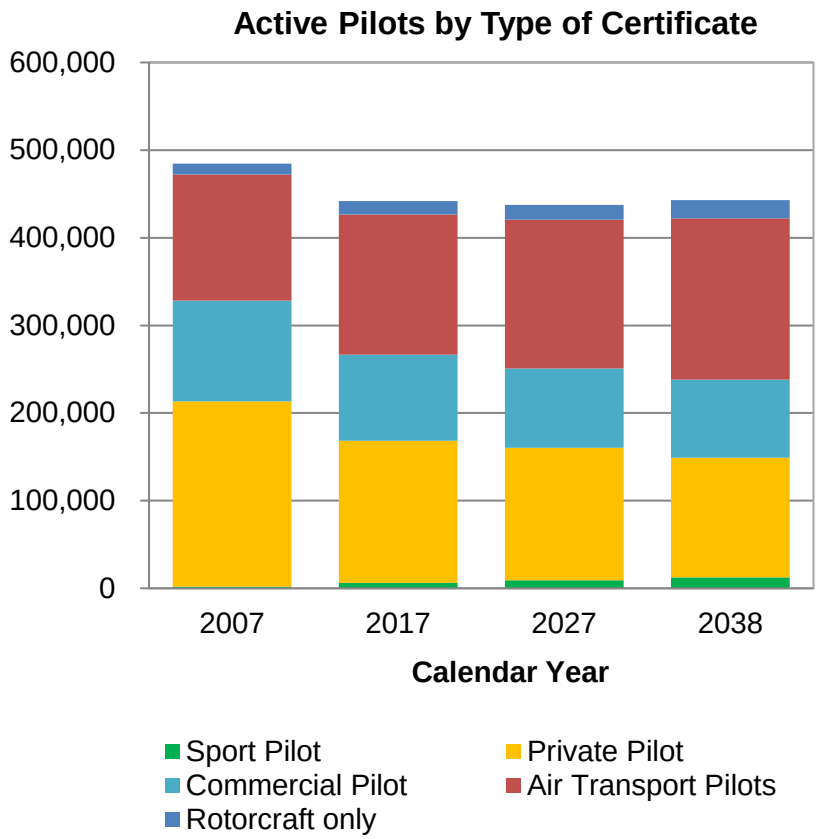
The FAA also conducts a forecast of pilots by certification categories, using the data compiled by the Administration's Mike Monroney Aeronautical Center. There were 609,306 active pilots certificated by FAA at the end of 2017. All pilot categories, with the exception of rotorcraft only certificates, continued to increase. The number of student pilot certificates has been affected by two recent regulatory changes; first, the 2010 rule that increased the duration of validity for student pilot certificates for pilots under the age of 40 from 36 months to 60 months. The second one, which went into effect in April 2016 removed the expiration date on the new student pilot certificates. The number of student pilots increased from 72,280 in 2009 to 119,119 in 2010. By 2016 they totaled 128,501 and with no expiration of certificates jumped to 149,121 by the end of 2017.

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 showed a faster decline in commercial pilot numbers, accompanied by a higher rate of increase in ATP certificates.

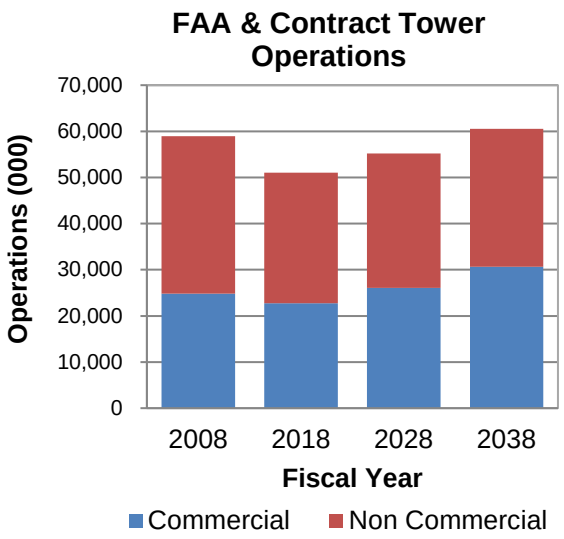
The number of active general aviation pilots (excluding students and ATPs) is projected to decrease about 22,600 (down 0.4 percent yearly) over the forecast period. The ATP category is forecast to increase by 22,600 (up 0.7 percent annually). The much smaller category of sport pilots are predicted to increase by 3.3 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 0.8 and 0.5 percent, respectively until 2038.

Student pilot forecast is currently suspended because of the April 2016 rule change that the new student pilot certificates do not expire. This 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 not sufficient data currently to perform a reliable forecast for the student pilots.



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 between 2018 and 2038. Commercial operations[4] at these facilities are forecast to increase 1.5 percent a year, five times faster than non-commercial operations. The growth in commercial operations is less than the growth in U.S. airline passengers (1.5 percent vs. 1.9 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 50.8% of operations in 2017) are forecast to increase an average of 0.3 percent a year as increases in turbine powered activity more than offset declines in piston activity.



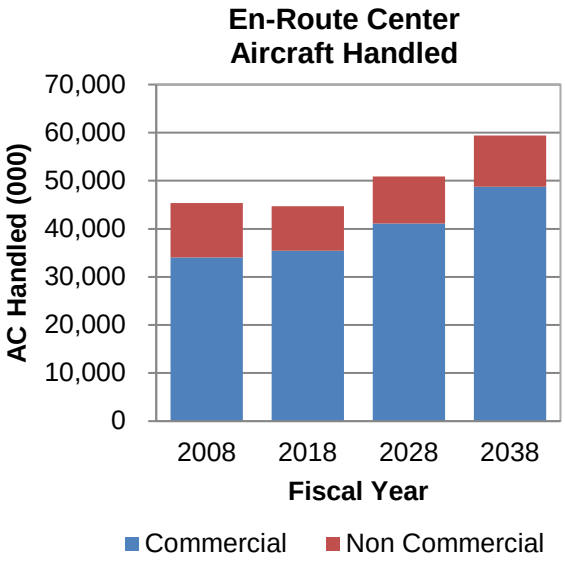
FAA Tracon (Terminal Radar Approach Control) Operations[5] are forecast to grow slightly faster than at towered facilities. This is in part a reflection of the different mix of activity at Tracons. Tracon operations are forecast to increase an average of 1.0 percent a year between 2018 and 2038. Commercial operations accounted for approximately 59 percent of Tracon operations in 2017 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 0.4 percent a year over the forecast.

The number of IFR aircraft handled is the measure of FAA En-Route Center activity. In 2017, aircraft handled at FAA En-Route Centers increased 1.4 percent, led by increases

[4] Sum of air carrier and commuter/air taxi categories.

[5] 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.

in the Air Taxi and General Aviation categories. 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 1.4 percent a year as increases in Air Carrier and General Aviation activity offset declines in Air Taxi activity. Activity at En-Route centers is forecast to grow faster than activity at towered airports because more of the activity at En-Route centers is from the faster growing commercial sector and high-end (mainly turbine) general aviation flying. Much of the general aviation activity at towered airports, which is growing more slowly, is local in nature, and does not impact the centers.



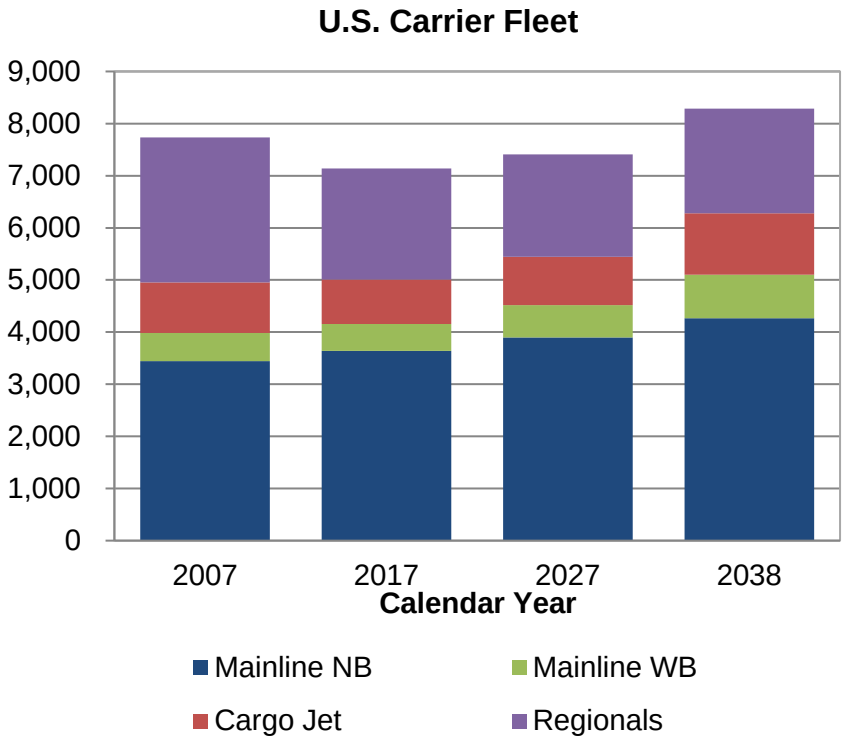
U.S. Commercial Aircraft Fleet

The number of aircraft in the U.S. commercial fleet is forecast to increase from 7,141 in 2017 to 8,290 in 2038, an average annual growth rate of 0.7 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 2017 and 2038 the number of jets in the U.S. mainline carrier fleet is forecast to grow from 4,155 to 5,101, a net average of 45 aircraft a year as carriers continue to remove older, less fuel efficient narrow body aircraft. The narrow body fleet (including E-series aircraft at JetBlue and C-series at Delta) is projected to grow 27 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 15 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 61 percent over the forecast period.

The regional carrier fleet is forecast to decline from 2,131 aircraft in 2017 to 2,011 in 2038 as the fleet shrinks by 10.5 percent (202 aircraft) between 2017 and 2028. 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 2030 only a handful of 50 seat regional jets remain in the fleet. By 2038, the number of jets in the regional carrier fleet totals 1,910, up from 1,644 in 2017. The turboprop/piston fleet is forecast to shrink by 79% from 487 in 2017 to 101 by 2038. These aircraft account for just 5.0 percent of the fleet in 2038, down from 22.9 percent in 2017.

The cargo carrier large jet aircraft fleet is forecast to increase from 855 aircraft in 2017 to 1,178 aircraft in 2038 driven by the growth in freight RTMs. The narrow-body cargo jet fleet is projected to increase by less than 1 aircraft a year as 757's and 737's are converted from passenger use to cargo service. The wide body cargo fleet is forecast to increase 15 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
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2007
2017
2027
2038
Calendar Year
Mainline NB
Mainline WB
Cargo Jet
Regionals