
Federal Aviation
Administration
FAA AEROSPACE
FORECAST
Fiscal Years 2018-2038
TC18-0004

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Forecast Highlights (2018–2038)

Since its deregulation in 1978, the U.S. commercial air carrier industry has been characterized by boom-to-bust cycles. The volatility that was associated with these cycles was thought by many to be a structural feature of an industry that was capital intensive but cash poor. However, the great recession of 2007-09 marked a fundamental change in the operations and finances of U.S Airlines. Since the end of the recession in 2009, 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 industry experienced an unprecedented period of consolidation with three major mergers in five years. The results of these efforts have been impressive: 2017 marks the eighth consecutive year of profitability for the U.S. airline industry. Looking forward, there is confidence that U.S. airlines have finally transformed from a capital intensive, highly cyclical industry to an industry that generates solid returns on capital and sustained profits.

Fundamentally, over the medium and long term, aviation demand is driven by economic activity, and a growing U.S. and world economy provides the basis for aviation to grow over the long run. The 2018 FAA forecast calls for U.S. carrier passenger growth over the next 20 years to average 1.9 percent per year, slightly slower than last year's forecast. The uptick in passenger growth in 2016-17 will continue into 2018 spurred on by favorable economic conditions in the U.S. and the world. Oil prices averaged $48 per barrel in 2017 rising to $51 in 2018, and our forecast assumes they will increase thereafter to exceed $100 by 2030 and approach $119 by the end of the forecast period. The headwinds that have buffeted the global economy during the past few years – uncertainty surrounding "Brexit", recession in Russia and Brazil and inconsistent performance in other emerging economies, a "hard landing" in China, and lack of further stimulus in the advanced economies seem to be diminishing. The U.S. economy is showing signs of accelerating, powered by gains in the stock market and should see additional stimulus in 2018 with the passing of the tax cut bill in December 2017.

System traffic in revenue passenger miles (RPMs) is projected to increase by 2.3 percent a year between 2018 and 2038. Domestic RPMs are forecast to grow 1.9 percent a year while International RPMs are forecast to grow significantly faster at 3.2 percent a year. System capacity as measured by available seat miles (ASMs) is forecast to grow in line with the increases in demand. The number of seats per aircraft is growing, especially in the regional jet market, where we expect the number of 50 seat regional jets to fall to just a handful by 2030, replaced by 70-90 seat aircraft.

Although the U.S. and global economy saw growth accelerate in 2017, a combination of higher energy prices and labor cost increases resulted in profits for U.S. airlines falling from 2016's record levels. The FAA expects U.S. carrier profitability to remain steady or increase as solid demand fed by an improving economy offsets rising energy and

labor costs. 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 inflation, reflecting over the long term a growing U.S. and global economy.

The long-term outlook for general aviation is stable to optimistic, as growth at the high-end offsets continuing retirements at the traditional low end of the segment. The active general aviation fleet is forecast to remain relatively stable between 2018 and 2038. 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 continues to shrink over the forecast. While the fleet remains level, the number of general aviation hours flown is projected to increase an average of 0.8 percent per year through 2038, as growth in turbine, rotorcraft, and experimental hours more than offset a decline in fixed wing piston hours.

With increasing numbers of regional and business jets in the nation's skies, fleet mix changes, and carriers consolidating operations in their large hubs, we expect increased activity growth that has the potential to increase controller workload. Operations at FAA and contract towers are forecast to grow 0.9 percent a year over the forecast period with commercial activity growing at five times the rate of non-commercial activity. The growth in U.S. airline and business aviation activity is the primary driver. Large and medium hubs will see much faster increases than small and non-hub airports, largely due to the commercial nature of their operations.

Review of 2017

An improving economy both at home and abroad translated into a good year for U.S. aviation in 2017. Although costs increased due to higher energy prices and implementation of new labor contracts, the U.S. airline industry remained solidly profitable as growth in domestic traffic pushed revenues higher. The shift in the U.S. airline industry emphasis on market share to boosting returns on invested capital has resulted in sustained profitability. U.S. airlines are continually updating strategies for capturing additional revenue streams such as charging fees for services that used to be included in airfare (e.g. meal service), as well as for charging for services that were not previously available (e.g. premium boarding and fare lock fees). At the same time, the U.S. airline industry has become nimbler in adjusting capacity to seize opportunities or minimize losses. The impact from these initiatives is evident as the industry (passenger and cargo carriers combined) posted profits for the eighth consecutive year in 2017, despite flat yields and higher costs.

Demand for air travel in 2017 cooled from 2016's pace despite faster economic growth in the U.S. In 2017, system traffic as measured by revenue passenger miles (RPMs) increased 2.9 percent while system enplanements grew 2.6 percent. Domestic RPMs were up 3.0 percent while enplanements were up by 2.4 percent. International RPMs increased 2.6 percent despite enplanements growing by 4.1 percent. The system-wide load factor was 83.5 percent, unchanged from the 2016 level.

Yields increased for the first time since 2014. In domestic markets, continued expansion by ultra-low cost carriers such as Spirit and Allegiant helped to keep a lid on fare increases despite rising energy and labor costs as yield rose just 0.1 percent. International yield rose a mere 0.4 percent as strong gains in the Latin region offset modest declines in the Atlantic and Pacific regions. Despite flat yields and rising energy and labor costs, U.S. airlines remained solidly profitable in FY 2017. Data for FY 2017 show that the reporting passenger carriers had a combined operating profit of $21.6 billion (compared to a $26.6 billion operating profit for FY 2016). The network carriers reported combined operating profits of $15.3 billion while the low cost carriers reported combined operating profits of $5.7 billion as all carriers posted profits.

The general aviation industry recorded an increase of 4.2 percent in deliveries in 2017, with pistons up by 9.5 percent and turbines about the same as the previous year. Since the majority of increase was in the lower priced piston segment and the more expensive business jet deliveries were down by 0.2 percent, U.S. billings decreased 8.5 percent to $10.6 billion. General aviation activity at FAA and contract tower airports recorded a 0.1 percent increase in 2017 as local activity rose 0.9 percent, more than offsetting a 0.5 percent decline in itinerant operations.

Total operations in 2017 at the 517 FAA and contract towers were up 0.7 percent compared to 2016. This marks the first time since FY 1998-2000 that operations at FAA and funded towers have increased for three consecutive years. Air carrier activity increased by 4.4 percent, more than offsetting a decline in air taxi operations, while general aviation

and military activity rose slightly. Activity at large hubs rose by 0.1 percent, while medium hub activity increased by 1.3 percent and small/non-hub airport activity was up 0.8 percent in 2017 compared to the prior year.

Glossary of Acronyms

Acronym	Term
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
CBP	Customs and Border Patrol
CFR	Code of Federal Regulations
COAs	Certification of Authorizations
CRS	Commercial Resupply Services
CY	Calendar Year
DARPA	Defense Advanced Research Projects Agency
FAA	Federal Aviation Administration
FY	Fiscal Year
GA	General Aviation
GAMA	General Aviation Manufacturers Association
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
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NDAA	National Defense Authorization Act
NPRM	Notice of Public Proposed Rulemaking
PCE	Personal Consumption Expenditure
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
UAS	Unmanned Aircraft System(s)
USD	United States Dollar
VFR	Visual Flight Rules

Acknowledgements

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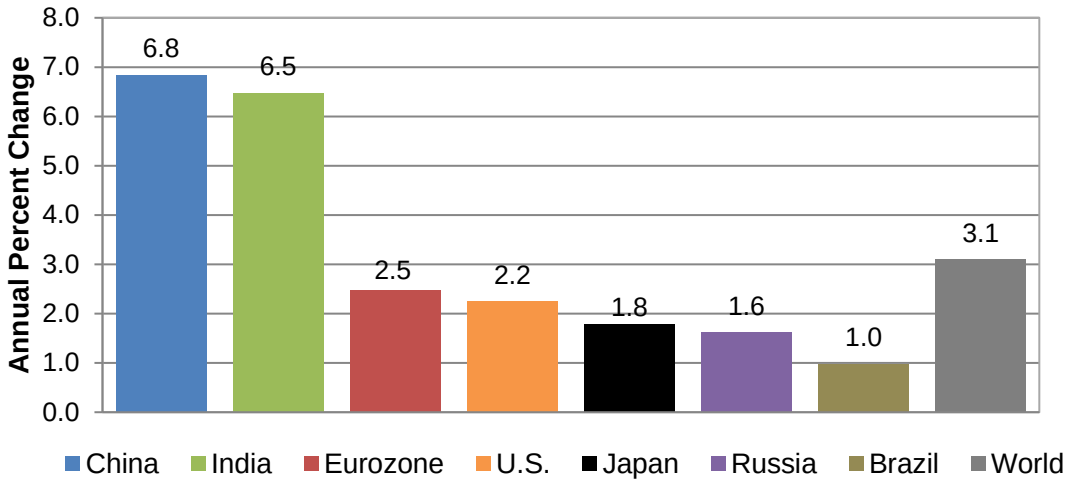
FAA Aerospace Forecasts
Fiscal Years 2018-2038

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

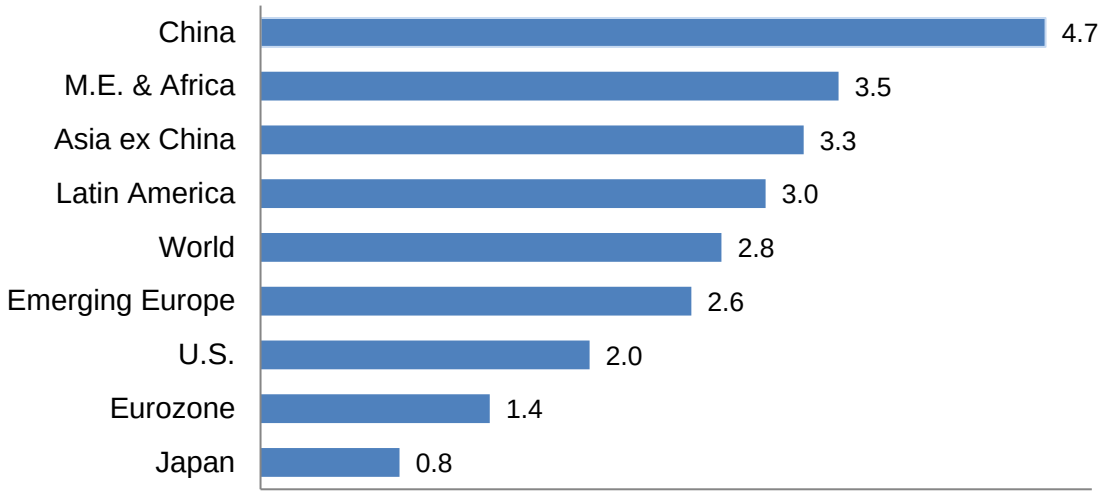


Source: IHS Global Insight

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

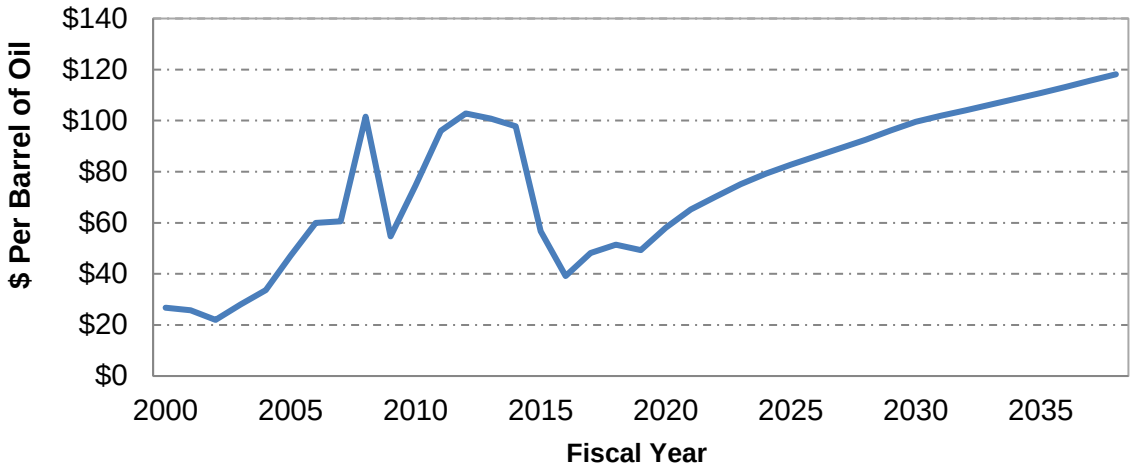
Annual GDP % growth 2018-2038



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.

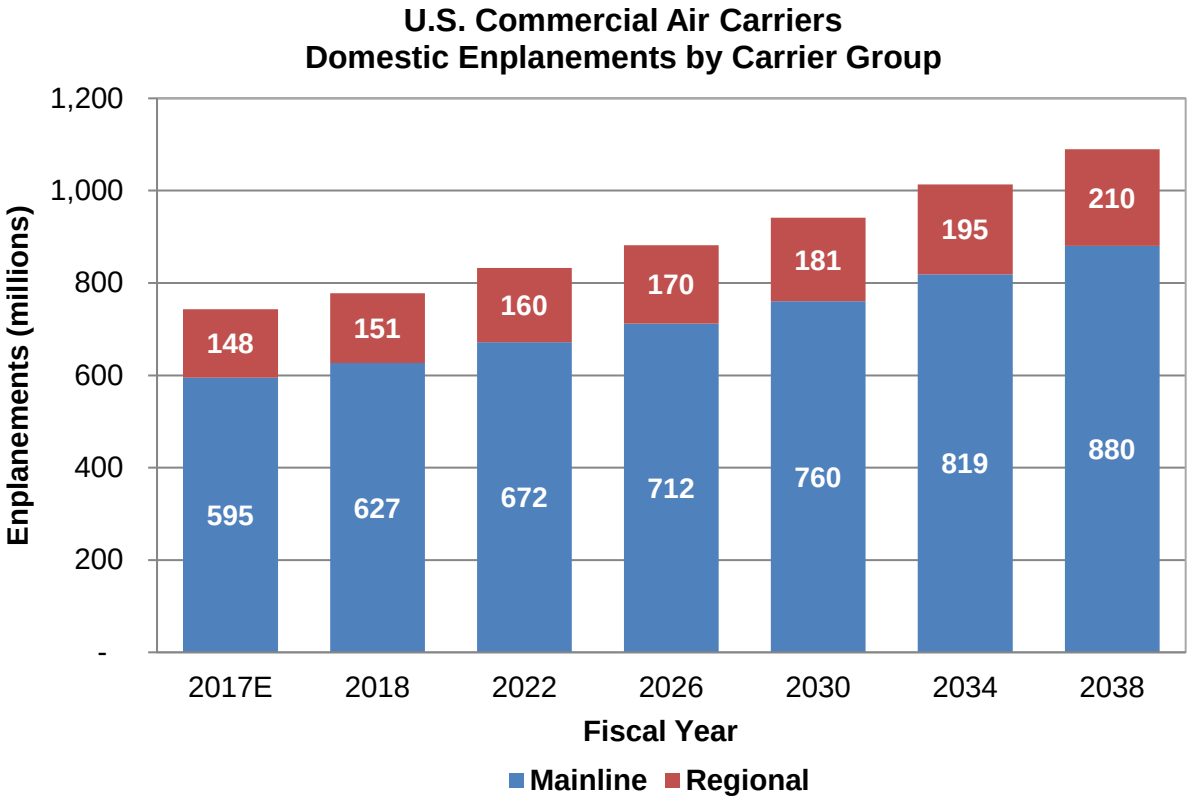
The commercial air carrier industry in 2018 will be shaped by four distinct trends: (1) easing capacity discipline; (2) steady growth of seats per aircraft, whether through up-gauging or reconfiguring existing aircraft; (3) increasing competitive pressure due to ultra-low-cost carrier expansion; and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

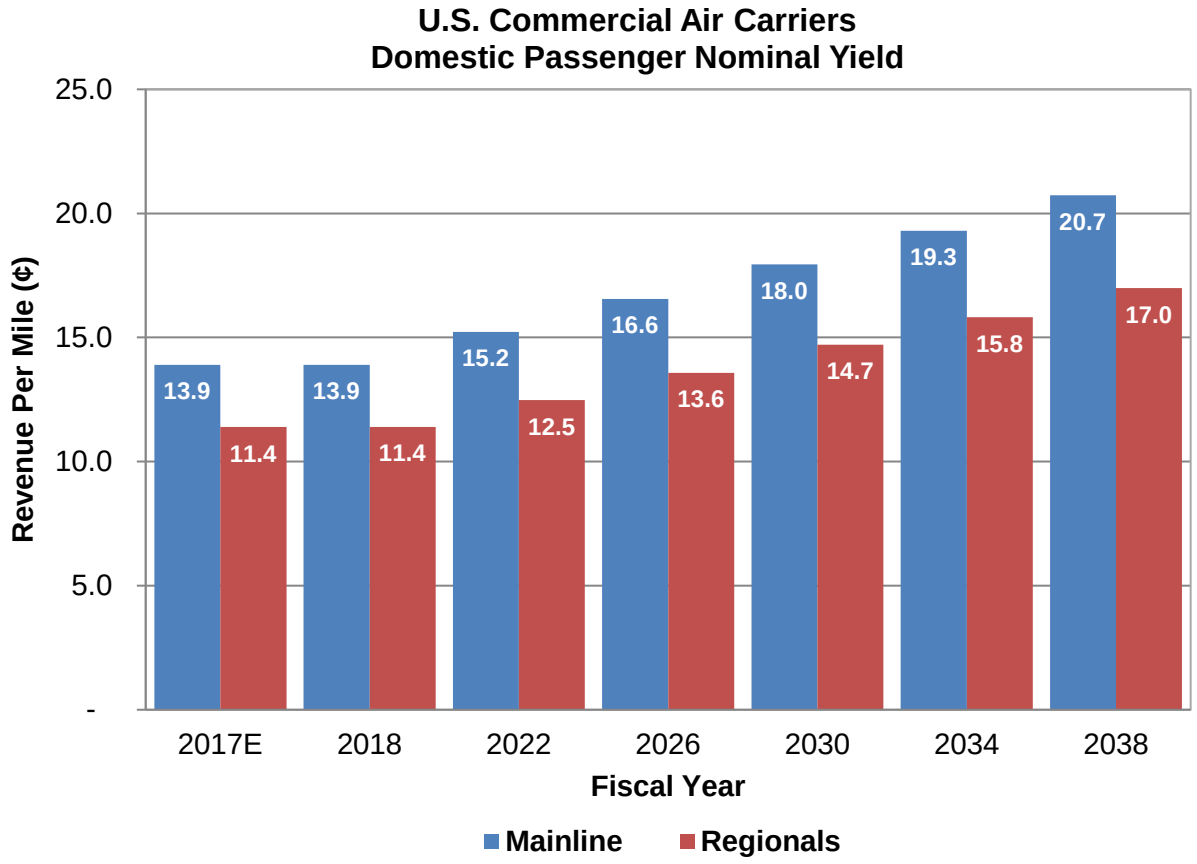
Following the 2007-09 recession, the U.S. airline industry underwent considerable restructuring that has resulted in an unprecedented period of capacity discipline, especially in domestic markets. Between 1978 and 2000, ASMs in domestic markets increased at an average annual rate of 4 percent a year, 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.

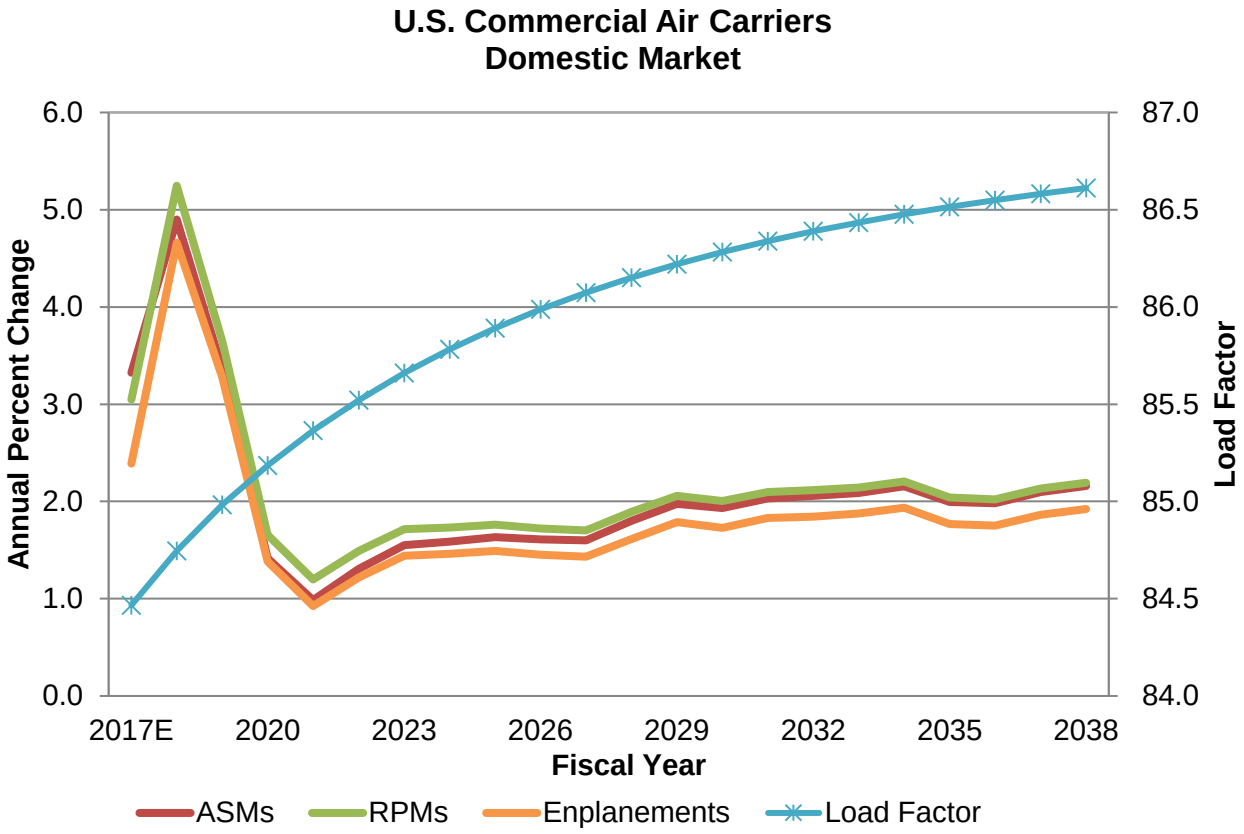
Another continuing trend is that of ancillary revenues. Carriers generate ancillary revenues by selling products and services beyond that of an airplane ticket to customers. This includes the un-bundling of services previously included in the ticket price such as

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.

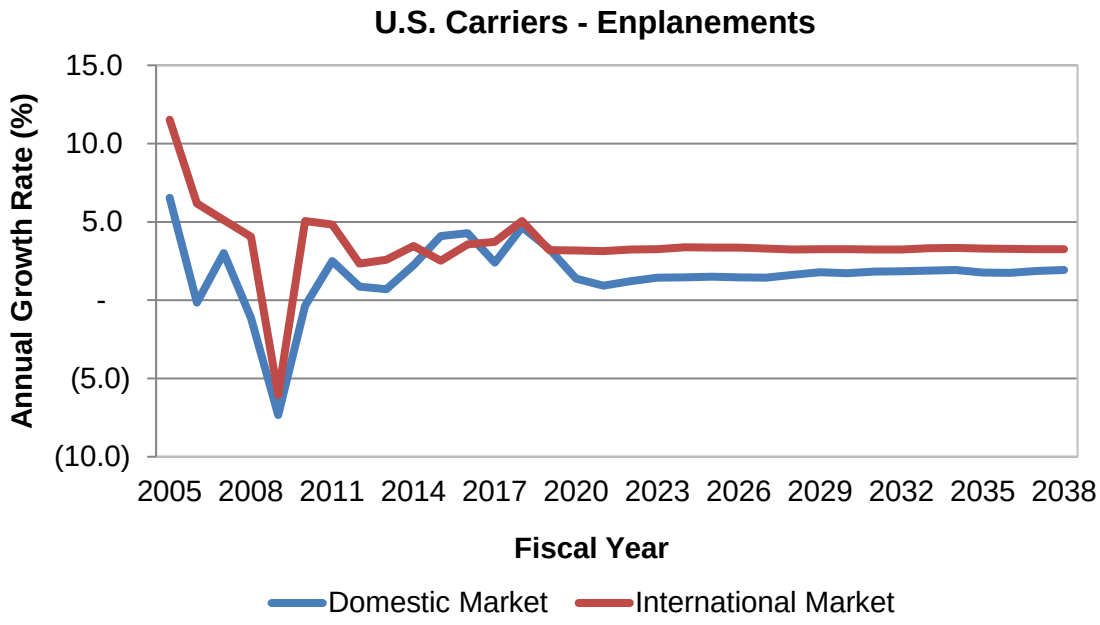
With relatively robust demand, industry capacity growth was up 2.9 percent in 2017 after a 4.2 percent increase in 2016. The increased passenger volume and traffic offset flat yields and along with higher ancillary revenues and relatively low fuel prices resulted in U.S. carriers solidly profitable in 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.

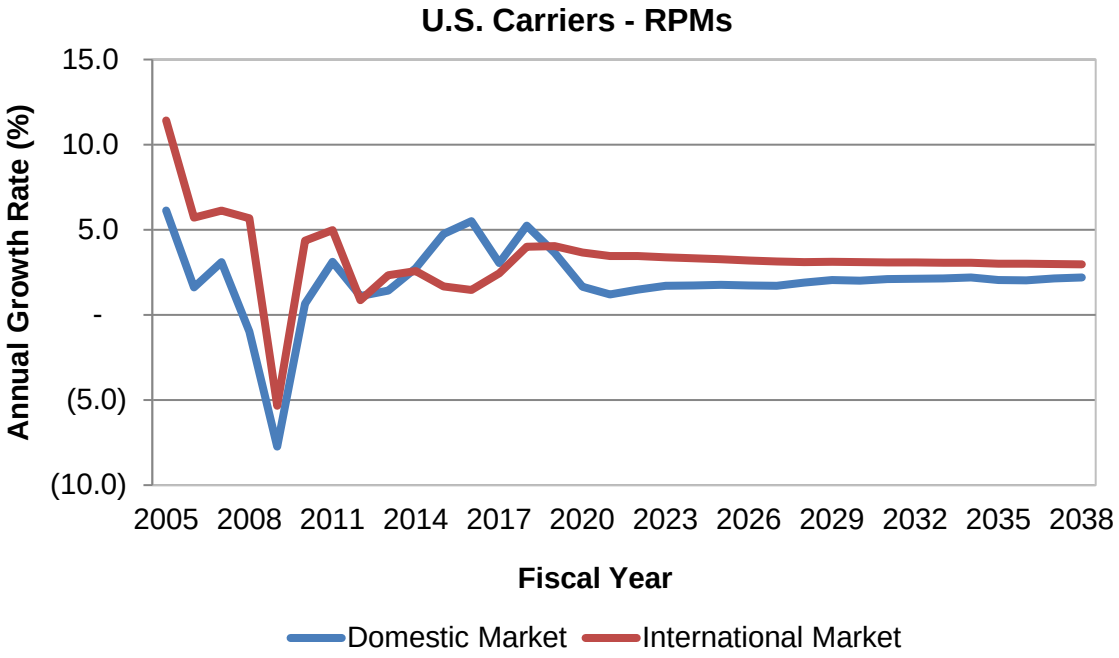
System load factor held steady while trip length increased 3.8 miles (0.3 percent) in 2017, even as seats per aircraft mile increased by 1.9 percent; again reflecting the trend towards using larger aircraft. Seats per aircraft mile system-wide increased to 154.3 seats (up 2.8 seats per aircraft mile),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

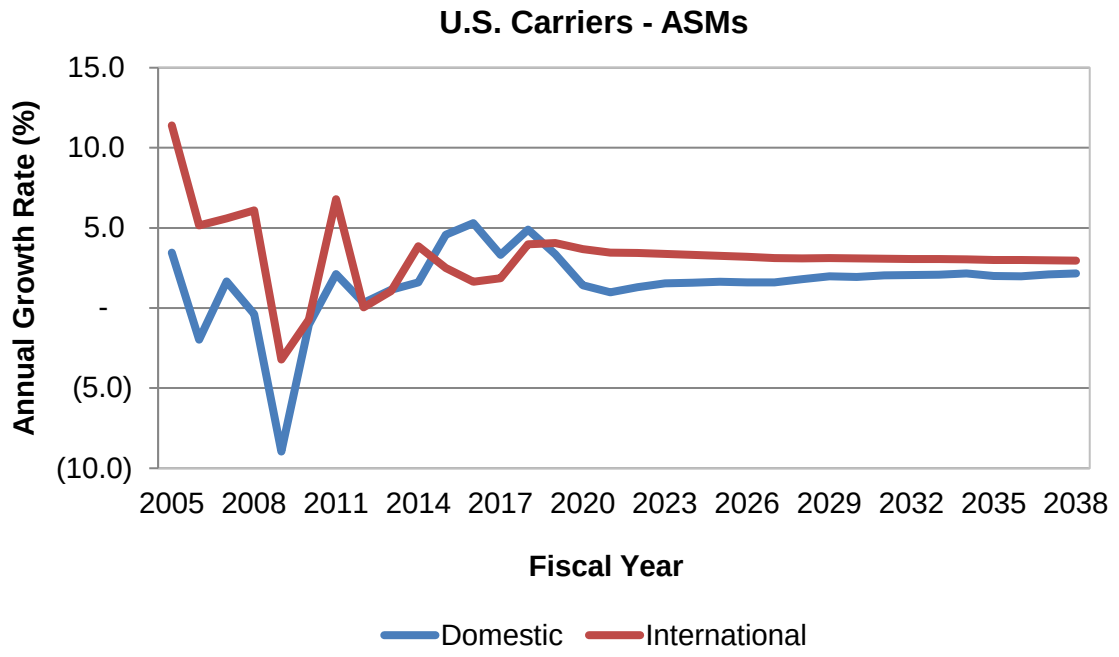
International Market

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.

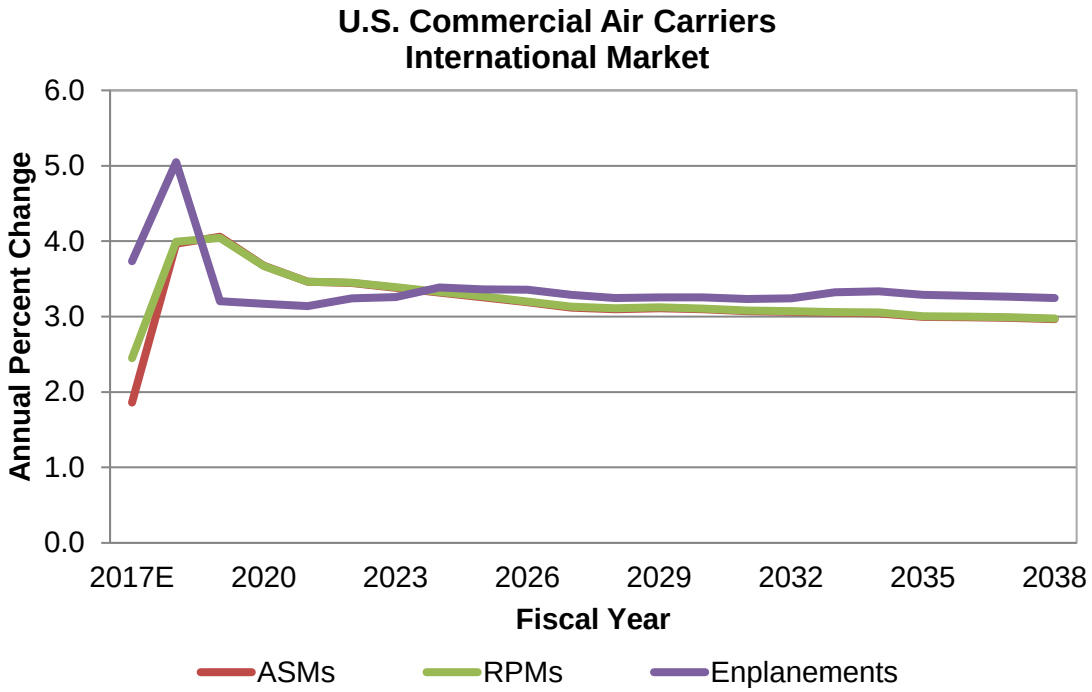
While factors that restrained international growth in recent years still largely remain, conditions have matured and some of the uncertainty has subsided. Most importantly, world economic growth and trade has picked up, fears of a "hard landing" in China have lessened, oil prices, though increasing, 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.

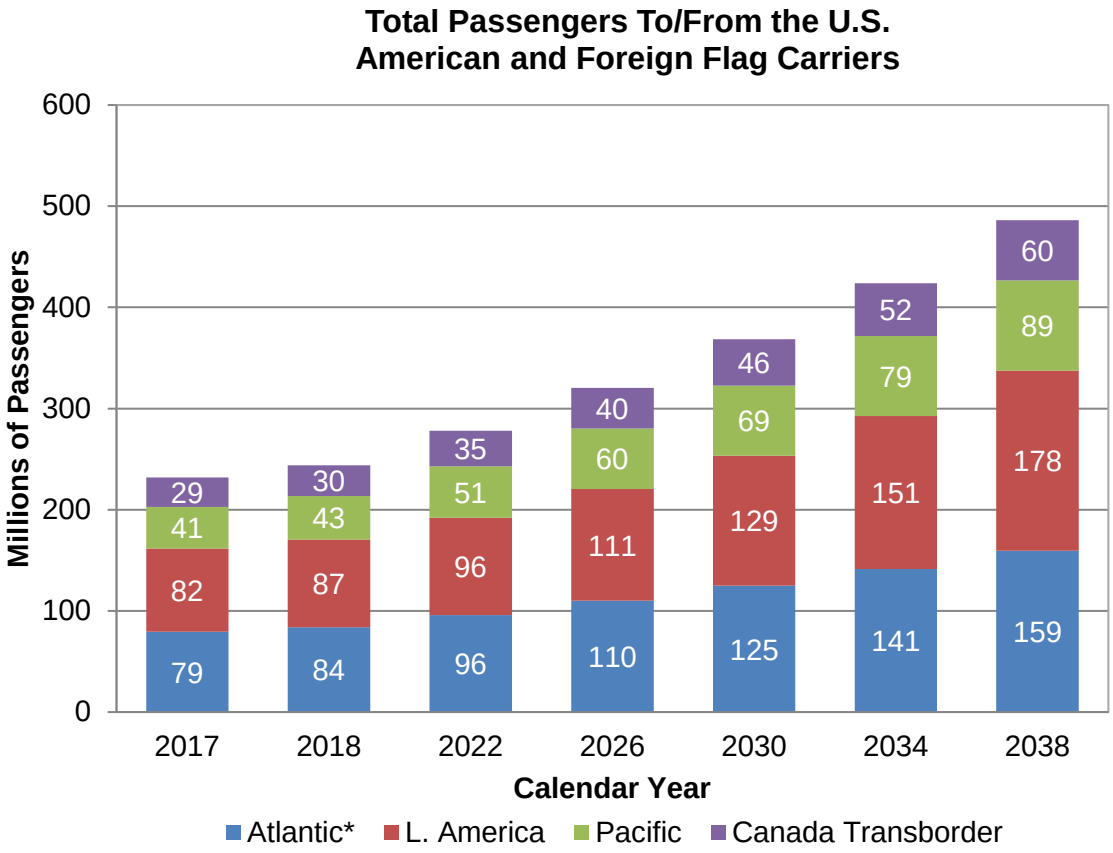


For U.S. carriers, Latin America remains the largest international destination despite the recent economic and political crises in Venezuela and Brazil. Enplanements in 2017 grew an estimated 6.3 percent while RPMs increased 3.2 percent. Growth is projected to remain strong in 2018 but then slow in 2019 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.

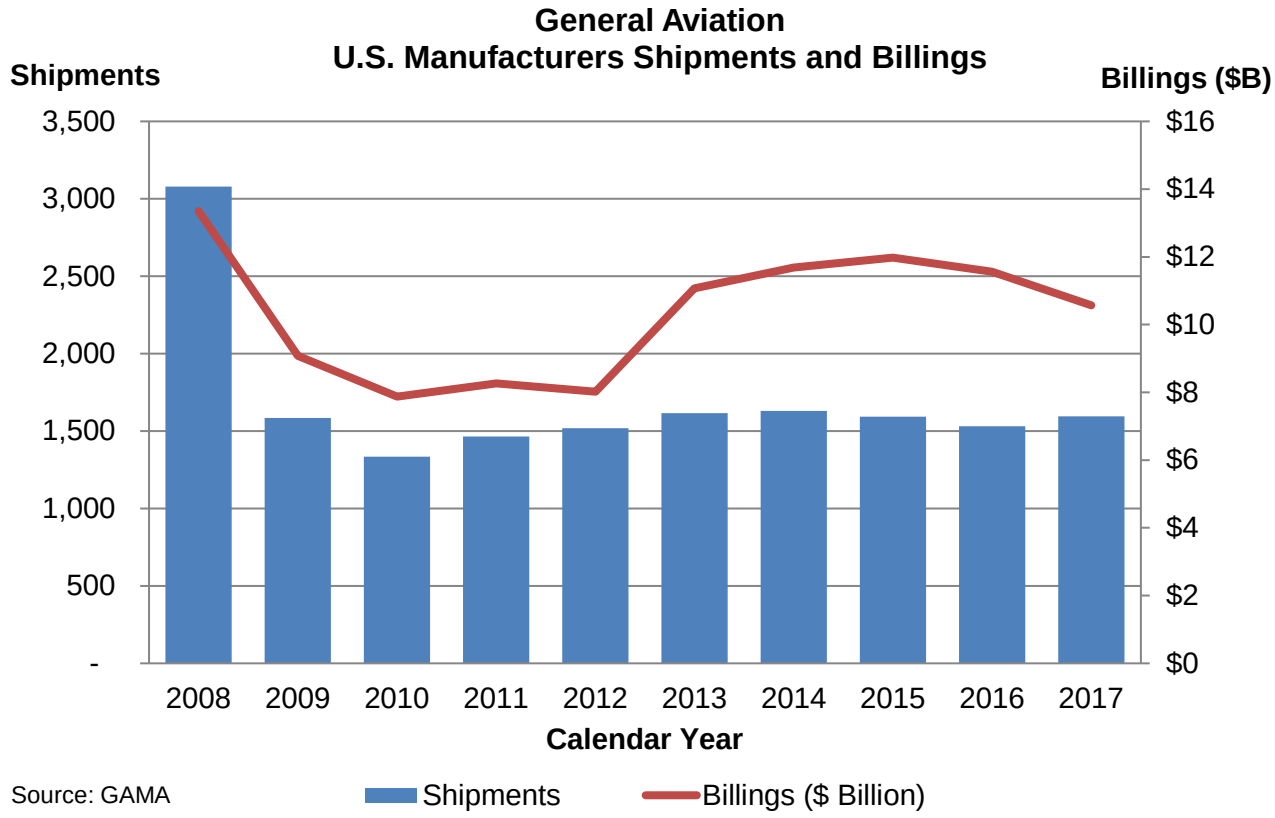
General Aviation

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.



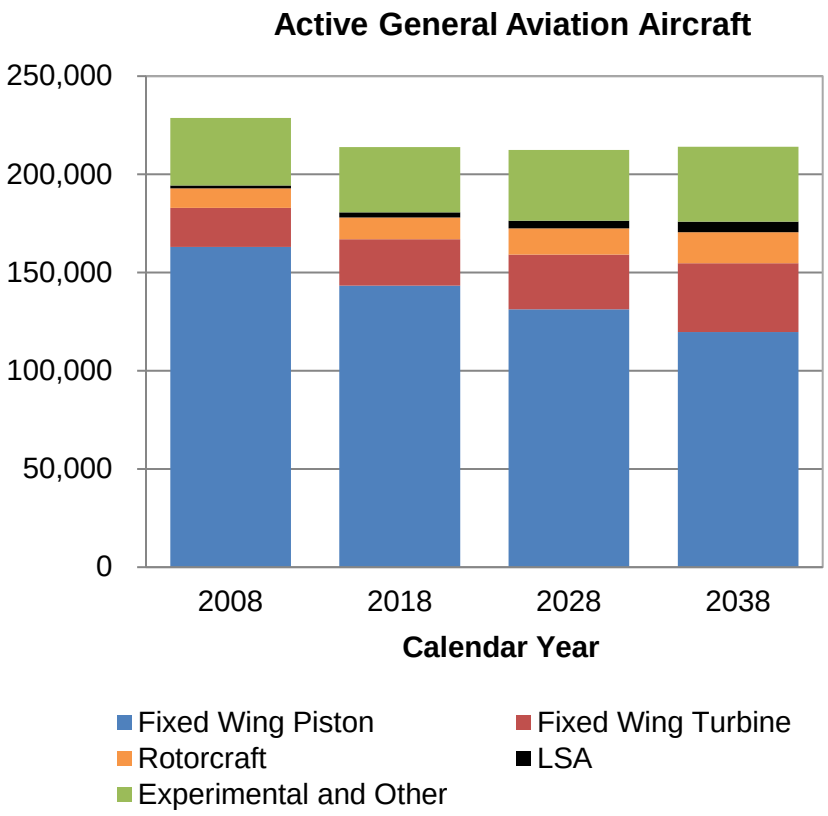
GAMA and industry experts also reported continuing decrease in rotorcraft deliveries has started to stabilize in 2017, as low oil prices began gradually to increase.

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.

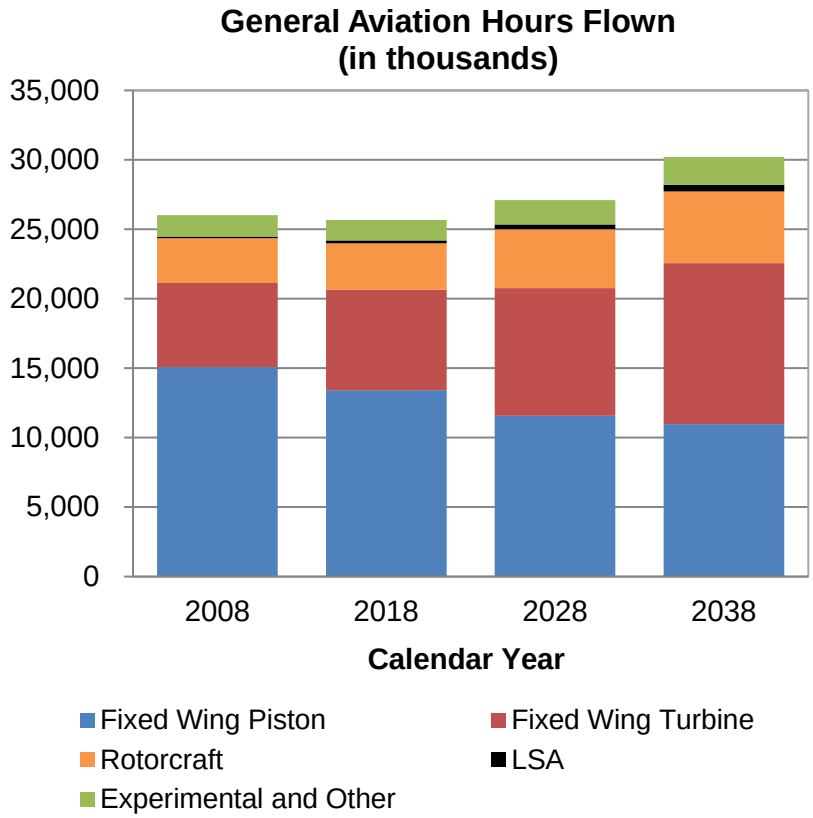
The more expensive and sophisticated turbine-powered fleet (including rotorcraft) is projected to grow by 15,255 aircraft -- an average rate of 2.0 percent a year over the forecast period, with the turbojet fleet increasing 2.2 percent a year. The growth in U.S. GDP and corporate profits are catalysts 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.

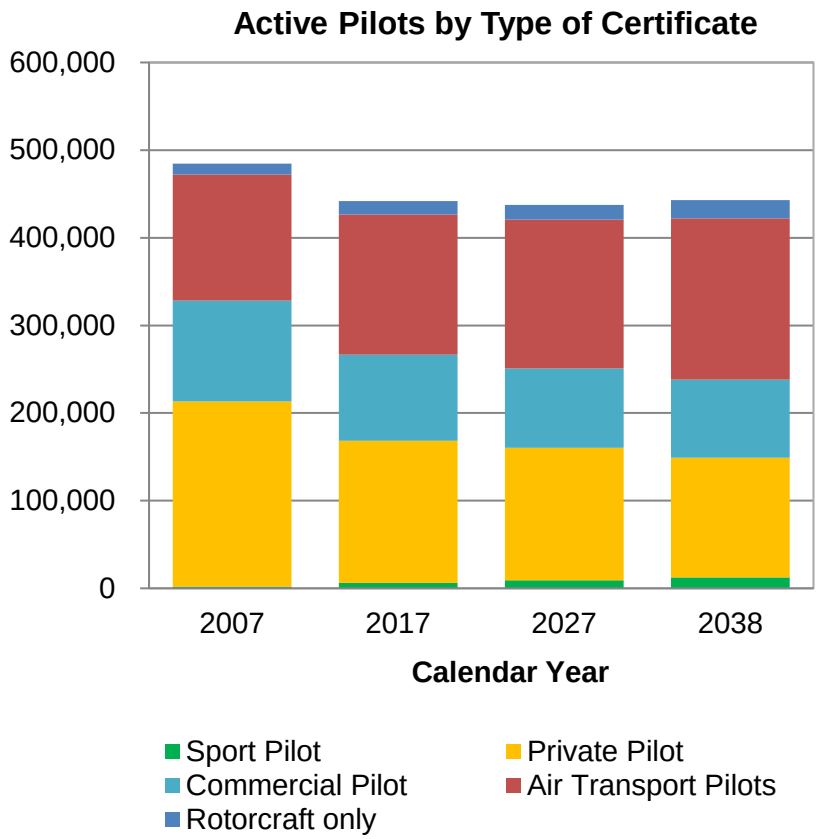
The FAA also conducts a forecast of pilots by certification categories, using the data compiled by the Administration's Mike Monroney Aeronautical Center. There were 609,306 active pilots certificated by FAA at the end of 2017. All pilot categories, with the exception of rotorcraft only certificates, 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.

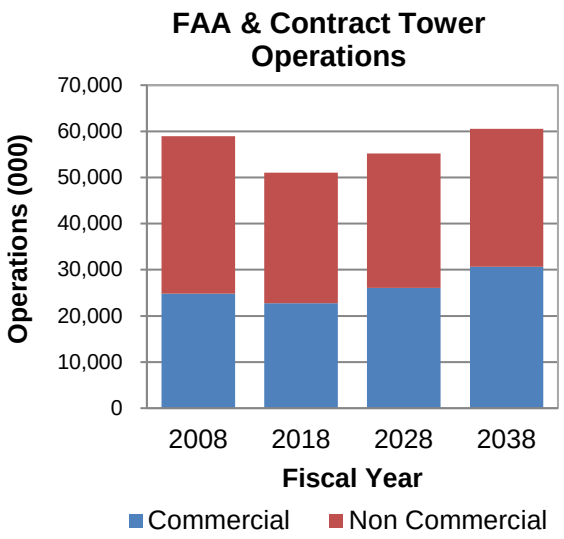
The number of active general aviation pilots (excluding students and ATPs) is projected to decrease about 22,600 (down 0.4 percent yearly) over the forecast period. The ATP category is forecast to increase by 22,600 (up 0.7 percent annually). The much smaller category of sport pilots are predicted to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



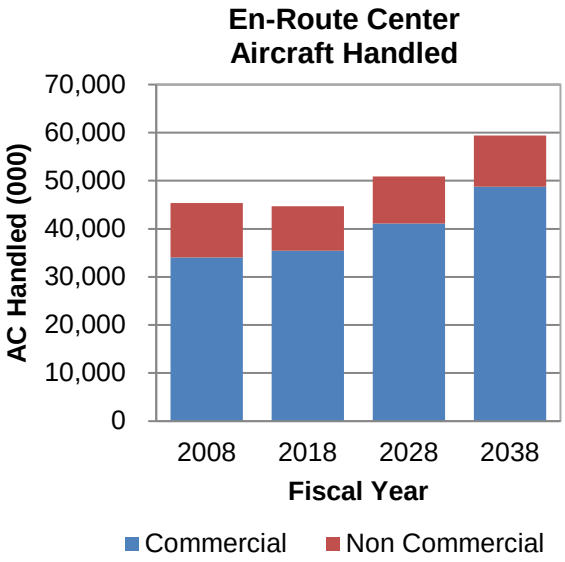
FAA Tracon (Terminal Radar Approach Control) Operations[5] are forecast to grow slightly faster than at towered facilities. This is in part a reflection of the different mix of activity at Tracons. Tracon operations are forecast to increase an average of 1.0 percent a year between 2018 and 2038. Commercial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



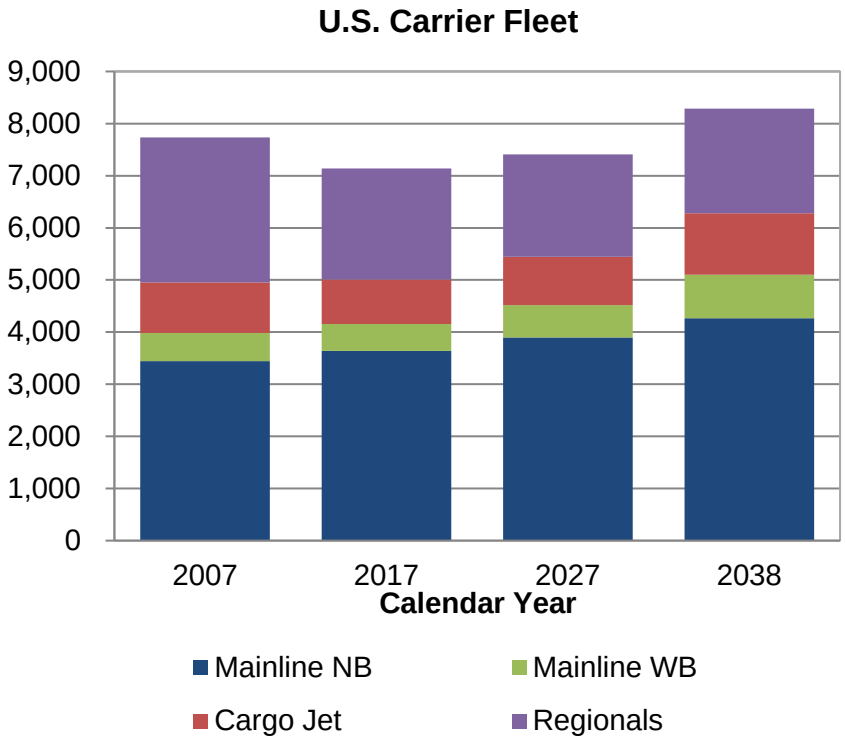
U.S. Commercial Aircraft Fleet

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

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). Notably, AST's purview does not extend to military or civilian government [e.g., National Aeronautics and Space Administration (NASA)] launches. Title 51 and the Executive Order also direct the U.S. Department of Transportation to encourage, facilitate, and promote U.S. commercial launches. The FFA'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. With its dual mission of regulating and also promoting the emerging commercial space transportation industry, FAA faces unique challenges.

The FAA licenses launches or reentries carried out by U.S. persons 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 operated for and by NASA or the Department of Defense). FAA does not license or grant permits for amateur-class rockets which are unmanned rockets that have less than 200,000 pound-seconds of total impulse and cannot reach an altitude greater than 150 kilometers above the Earth's surface.

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

- Maintains an effective regulatory framework for commercial space transportation activities by developing regulations and guidance,
- 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 approvals for launch and reentry operations and related commercial space 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 the National Airspace System (NAS) by coordinating airspace use and regulatory oversight with air traffic management and Federal launch ranges,
- Coordinates research into the safety, environmental, and operational implications of new technologies and the

evolving commercial space transportation industry,

- Conducts outreach to the commercial space industry by hosting working groups and conferences,

- Collaborates with Government partners, such as NASA, Defense Advanced Research Projects Agency (DARPA), and the U.S. Air Force to assure consistent approaches to regulation, policy, and standards, and

- Conducts outreach to international counterparts to promote a balanced and consistent regulatory framework across the world.

In addition to FAA headquarters offices in Washington, D.C., AST maintains field offices 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 four field offices in close proximity to: Kennedy Space Center in Florida; Johnson Space Center in Texas; and, Vandenberg Air Force Base and the Mojave Air and Space Port in California. Due to industry expansion, FAA is considering additional field offices to accommodate the anticipated increase in launch and reentry operations in other parts of the United States. 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 enforcement 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 important activities performed by FAA during this cycle. The most notable activities are described here.

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

Prospective applicants seeking commercial space transportation licenses, experimental permits, or safety 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. The growth in both the number of commercial space operators and the number of operations will likely increase FAA's pre-application consultation workload over the next five years. Furthermore, many new operators are seeking to incorporate new technologies, vehicle types, or operational models that create challenges for FAA in determining the applicable regulations or approach to regulatory compliance.

Licenses, Permits and Safety Approvals

An increasing number of applicants for licenses, permits, safety approvals, and renewals has a direct impact on the number of launches and reentries at some uncertain point in the future. Though many licenses authorize multiple launches (for mature launch systems), the need remains for FAA to also issue individual launch licenses for systems that are still maturing, especially those systems for human space flight missions. Furthermore, with the dynamic commercial space industry, FAA often evaluates launch and reentry systems and operations that are

evolving and changing, which may ultimately require license modifications or issuance of new licenses.

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 jeopardize public health and safety or the safety of property, 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 or payload determination becomes part of the licensing record on which FAA's licensing determination is based.

FAA also reviews and issues launch and reentry site operator licenses and license renewals. FAA also reviews and evaluates launch site license applications for launch sites located in foreign countries but operating with U.S.-licensed launch or reentry systems. FAA coordinates range planning among Federal, state, and local governments and with the commercial range operators or users. 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 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 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 and capabilities of space flight crews to determine how human factors affect overall public safety risk. As commercial firms become more involved with human space flight activity, FAA will evaluate, analyze, and determine the health risks to the space flight participants (crew and "passengers") due to natural and flight-induced launch and reentry environments, as well as any hazardous ground operations directly associated with the flight. FAA will also need to evaluate the safety of ground operations at "spaceports" and exclusive-use sites.

Inspections and Enforcement

FAA currently conducts as many as 400 preflight/ reentry, flight/ reentry, and post-flight/ reentry safety inspections per year, often conducting several inspections simultaneously, at any of the approximately 20 U.S. and international commercial space 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 at Federal ranges. At spaceports and launch sites with high launch rates (e.g., Cape Canaveral Air Force Station, Vandenberg Air Force Base, the Mid-Atlantic Regional Spaceport, and Spaceport America), at least 85 percent of the inspections must be conducted by locally-based field inspectors in order to respond to a dynamic operational

tempo, minimize cost, and increase efficiency.

Mishap Investigations

Multiple mishap events in 2015 demonstrated that FAA must have the capacity to investigate at least two space launch or reentry mishaps or accidents simultaneously anywhere in the world, and to lead as many as six investigations during a single year. FAA must have the capabilities and resources to safely perform the investigations lasting as long as 16 weeks at remote sites with no infrastructure or facilities. FAA must have the capability and resources to efficiently review 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 into the NAS and its system of airports and air traffic managed by the ATO. AST expects an increased level of interaction with the ATO, ARP, and the FAA Office of NextGen (ANG). This includes an increased presence at the Air Traffic Control System Command Center and other locations to assist in the strategic and tactical planning of launch and reentry operations, as well as to provide support during these operations. Further, AST will continue the development of technologies to facilitate safe and efficient integration of commercial launch and reentry operations into the NAS, in partnership with ANG and ATO, 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 Operations Forecast

To improve its workforce planning process, in 2014, FAA adopted an approach to estimate its future staffing needs based on the ratio of regulatory safety oversight staff to a forecast of launch and reentry operations within the purview of the FAA mission. Although it was a modest improvement, this change set the groundwork for FAA to implement a more objective and transparent process for projecting staffing requirements and also necessitated development of credible operations forecasts. Since 2014, FAA has made several important improvements to its operations forecast:

- In 2015, FAA began using planned launch and reentry data collected from operators and prospective applicants as the starting point for its launch and reentry forecasts. This change enabled FAA to simplify and improve its forecasting methodology by tying launch and reentry forecasts directly to anticipated operations by commercial space transportation firms known to FAA, rather than to aggregate industry demand.

- Because commercial spaceflight is a highly dynamic and rapidly evolving industry, it was quickly determined that operator-provided data alone were not a reliable indicator of future activity. There is a natural, inherent bias by industry to be optimistic about their business prospects. Consequently, FAA adopts a cautionary view of what industry representatives say will happen versus what may reasonably be expected to happen. A primary pillar of FAA's forecasting methodology is to err on the side of caution and take a conservative view of industry growth. Therefore, in

2016, FAA further refined its forecasting methodology by using observations about historical launch activity to establish better forecasting parameters for both new applicants and existing operators.

Based on proprietary information available to FAA, an increase in launch and reentry activities expected in the coming years. 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:

- the list of firms intending to launch or actually launch is dynamic,
- the continued development of new technologies, and
- mishaps.

For example, the number of firms actively communicating with FAA increased from 14 in August of 2014 to 46 three years later, an increase of more than 300%. New technologies [e.g., reusable launch vehicles (RLVs)] 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 derail launch plans for one or more firms. Investigations and subsequent "return to flight" for firms impacted by a mishap can take months to years. Taking these factors into account, the following table and graph provide historical activity and FAA's forecast through calendar year 2020.

Fiscal Year	*Actual/Forecast*	*AST Licensed and Permitted Operations*
2013	*Actual*	*20*
2014	*Actual*	*20*
2015	*Actual*	*14*
2016	*Actual*	*17*
2017	*Actual*	*22*
2018	*Forecast*	*27 – 38*
2019	*Forecast*	*43 – 48*
2020	*Forecast*	*39 – 61*

Notes:
1. *Forecast entries represent the Low to High estimate.*
2. *Six mishaps in 2015 caused the number of launch and reentry operations to fall significantly from the previous year rather than increase as expected.*

Note: FY2017 forecast finalized second quarter FY2017. FY2018-20 forecast finalized second quarter FY2018.

It is important to note that the operations included in the forecast will occur at a variety of locations throughout the National Airspace System (NAS). That is, not all launch and reentry activity occurs at one location, for example, at Cape Canaveral, Florida. In the past year, FAA licensed launches and reentries throughout the NAS and beyond, including multiple reentries in the Pacific Ocean and one licensed launch from New Zealand. Furthermore, the forecast above only deals with launches and reentries licensed by FAA. It does not include launch activity for the rest of the world, and it 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.

New Commercial Launch Technologies and Operations are Emerging on an Accelerated Basis

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 rockets, a development that could significantly reduce the cost of operations and lead to an increase in the number of launch and reentry operations per year. Several other U.S. commercial entities are also pursuing the development of reusable launch vehicles (RLVs). 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 are Emerging

The continuing development of commercial space transportation technology has spurred new markets for commercial space transportation services. As private industry continues to develop and test new vehicles capable of taking space flight participants on suborbital and orbital flights, companies and organizations are proposing to offer human space flight training and several organizations have already begun to provide this service. States and municipalities have sought to open new spaceports to attract commercial space transportation and associated high-tech firms and create business hubs for research and development. Since 2008, the 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). NASA is also working with commercial companies under its Commercial Crew Transportation Capabilities contract to develop vehicles that will provide transportation for astronauts and international partners to and from the ISS. These vehicles are expected to commence test flights and subsequent operational missions within the next five years. 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. Extensive FAA resources will be needed to determine how these unprecedented commercial space ventures will impact public safety and U.S. national interests.

Unmanned Aircraft Systems

From its infancy, just a few years ago, unmanned aircraft systems (UAS) have been experiencing robust growth in the United States and throughout the world. A UAS is an unmanned aircraft and its associated communication links and control components required for the safe and efficient operation of the unmanned aircraft in the national airspace system (NAS). While the introduction of UAS into the NAS has opened up numerous possibilities, it has also created unique operational challenges. Despite these challenges, the UAS sector holds enormous potential, with commercial applications ranging from aerial photography to package delivery.

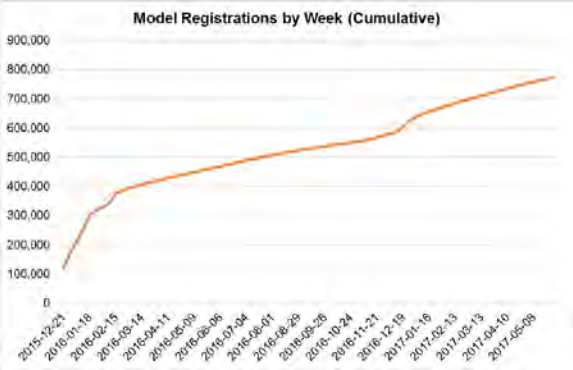
This section covers trends across the broad landscape of the established and emerging UAS industry, from model to non-model aircraft[6] . Using these trends and insights from industry, the FAA has produced a number of forecasts. The forecasts reported in this section are driven primarily by the assumption of the continuing evolution of the regulatory environment, the commercial ingenuity of manufacturers and operators, and underlying demand, including business models. These drivers will continue to advance safe integration of UAS into the NAS.

Trends in UAS and Forecast

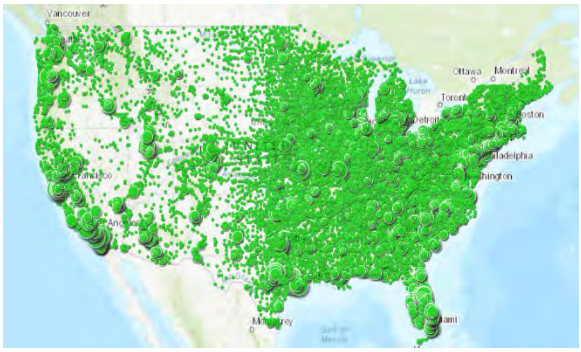
FAA's online registration system went into effect on Dec. 21, 2015. This required all UAS weighing more than 0.55 pounds (250 grams) and less than 55 pounds to be registered using a new on-line system (https://www.faa.gov/uas/getting_started/registration/) or using the existing (paper-based) aircraft registration process. However, the U.S. Court of Appeals issued an order suspending the registration requirement for model aircraft owners on May 19, 2017. On December 12, 2017, the President signed the 2018 National Defense Authorization Act (NDAA), which reinstated the registration requirement for all model aircraft.

By the end of May 2017, more than 772,000 owners had already registered with the FAA. While mandatory registration was in effect until the last week of May 2017, the trend was one of slowing growth over time. On average, weekly registration ranged from 4,000-5,000 from January-May, 2017, with some expected peaks during the holiday season. Following the Court Order, the online registry continued to accept voluntary registrations from modelers. However, the registration data from the second half of 2017 may not reflect an accurate trend for model aircraft growth.

[6] These are also called, interchangeably, hobby and non-hobby UAS, respectively. In previous notes including other documents of the Agency, these terms are often interchanged.



Model registration and thus ownership of small model UAS is distributed across the country. A spatial distribution of ownership demonstrates that sUAS are distributed throughout the country with denser ownership mapping closely against the population centers of the country.



Registration does not translate to aircraft in the system, the primary focus of the Agency. Unlike registration for non-model aircraft, the registration rule does not require modelers to register each individual aircraft; owners may register once and apply their registration number to multiple model aircraft. For each registration, therefore, one or more aircraft are possibly owned (with few exceptions of no equipment being owned as well).

Under the sponsorship of the UAS Implementation Plan, the FAA has launched various research activities to understand the possible magnitude of the UAS sector, implications on the spectrum of aircraft that may be used for model flying, and the safety implications of the gradual integration of the UAS fleet into the NAS. The Agency has also engaged outside consulting firms to aid forecasting efforts for both the model and non-model UAS fleet.

Prior to undertaking the forecast, the first task was to extrapolate the trends of model ownership registration beyond May 2017 for the entire year, using data from earlier years and industry information. This introduces considerable uncertainty in the forecast, particularly for model aircraft. Thus, the FAA continues to recognize, as in earlier years, that uncertainty abounds in projections for both the model and non-model UAS fleet. Hence, we provide a forecast base (i.e. likely) with high (or optimistic) and low ranges in the following table for the model UAS fleet.

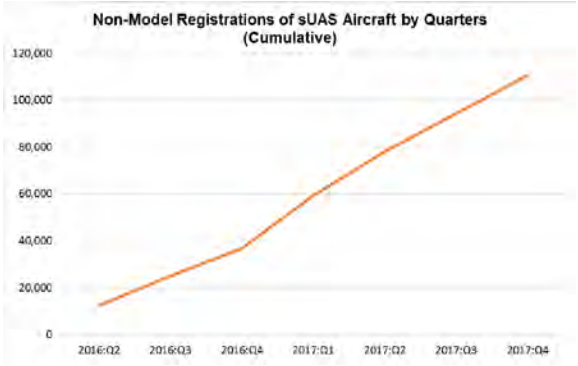
With over 873,000 modelers registered as of December 31, 2017 (extrapolated from June-December), we project that there are around 1.1 million sUAS identified distinctly as model aircraft. In contrast to last year's projection of 1.1 million units, the actual number of model aircraft was around 788,570 for 2016 – 28% lower than what we projected. A comparison of last year's data with this year's (2017) shows the compound annual growth rate to be around 40%. This is still a substantial growth rate, as anticipated from the introduction of drones as a hobby, facilitated by falling equipment prices, improved technology such as built-in cameras, and the relative ease of maneuvering. However, the trend is likely to slow as the pace of falling prices slow and early adopters begin to experience limits to their experiments. Given the trend observed in the number of registrations, expert opinions collected in Transportation Research Board (TRB) annual workshops, re-

view of available industry forecasts, and market/industry research, we forecast that the model fleet will likely (i.e. base scenario) more than double in size over the next 5 years, from the present 1.1 million units to over 2.4 million units. The high/optimistic scenario suggests this growth may be as high as 3.17 million units, while the low scenario shows it could be as low as 1.96 million units. The growth rates underlying these numbers are fairly steady in the initial years but more modest in the last 2 years. The gradual market saturation that is projected in 5 years and beyond in the model aircraft fleet parallels other consumer technology products such as cell phones and video game-consoles, and prior to that, video cameras and video players.

	Total Model Fleet (Million sUAS Units)		
year	Low	Base	High
2017	1.10	1.10	1.10
2018	1.50	1.60	1.73
2019	1.76	2.00	2.35
2020	1.87	2.20	2.73
2021	1.92	2.30	2.94
2022	1.96	2.40	3.17

Commercial UAS Forecast

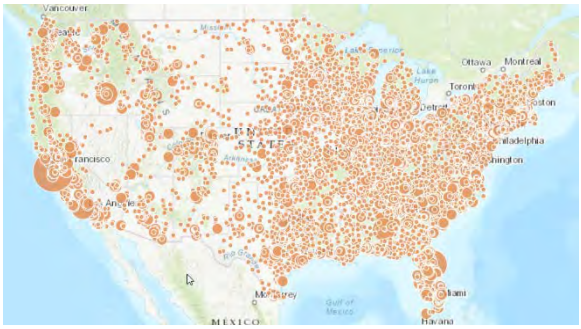
The online registration system for the non-model fleet went into effect on April 1, 2016. Unlike the rules for model ownership, non-model owners must register each individual UAS. Since the launch of on-line registration, more than 110,000 commercial operators had registered their equipment by the end of 2017. Information contained here shows the trend in the total fleet size since the time when registration began in the 2nd quarter of 2016.



For each week the registration has been available, over 1,000 aircraft have been registered. As in the case of model UAS ownership, non-model UAS are distributed across

the country. A spatial distribution of unit registration (using data for October 2017) demonstrates that non-model UAS are distributed throughout the country, with denser activities correlating closely with the economic or commercial activities of the country.

The non-model sector is primarily commercial in nature. It is very dynamic and appears to be at an early stage of growth. Unlike the model sector, we anticipate that the growth rate in this sector will continue to accelerate over the next few years. Additional commercial uses will likely result from both the clarity that Part 107 has provided and the possibilities for waivers, which will likely facilitate further growth in the sector.



Last year, we forecasted that the non-model sector would comprise approximately 108,000 aircraft in 2017, a growth rate exceeding 150% from the base of 42,000 in 2016. Actual data indicate there were 110,604 UAS registered at the end of 2017. Considering the trend observed in the registrations, expert opinions provided during the TRB workshops, review of available industry forecasts, internal research, and market/industry research, we project that the non-model fleet by 2022 will likely (i.e. base scenario) be four times larger than the current number of non-model aircraft. As the present base (i.e. cumulative total) gets larger, we anticipate the growth rate of the sector will slow down over time as well.

The forecast of non-model UAS does not fundamentally change from the growth path laid out last year. Similar to last year, we project the non-model sUAS sector will be over 450,000 in 2022.

We divide the non-model sector into two types of UAS aircraft: consumer grade and professional grade. The consumer grade non-model aircraft have a wide price range, below US $10,000 with an average unit price of around $2,500. The professional grade is typically priced above $10,000, with a unit price assumed to be around $25,000. Currently, the consumer grade dominates the non-model sector, with a market share approaching 98%. However, as the sector matures and the industry begins to consolidate, the share of consumer grade non-model aircraft is likely to decline but remain dominant. By 2022, FAA projects this sub-sector will have less than a 90% share of the overall consumer grade non-model UAS sector.

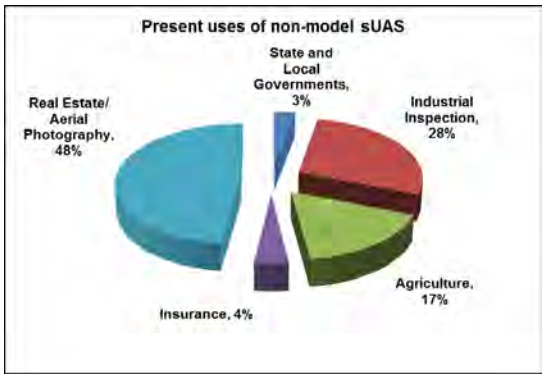
Starting from a low base of around 3,000 aircraft in 2017, professional grade non-model UAS stand to expand rapidly over time, especially as newer and more sophisticated uses are identified, designed, and planned. If, for example, professional grade UAS meet feasibility criteria of operations, safety, regulations, and economics/business, and they enter into the logistics chain via delivery of small packages, the growth in this sector will likely be phenomenal. In a similar vein, the Low Altitude Authorization and Notification

Capability (LAANC)[7], which began testing in 2017 and is planned to be rolled out nationally over this year, is designed to allow considerable flexibility in UAS operations and facilitate non-modelers' use of the NAS. While most of the near-term growth in non-model UAS will still come from operations with consumer grade UAS (over 90%), we anticipate the remainder will come from professional grade non-model UAS.

Unlike the model counterpart, it is extremely difficult to put a lower bound on the growth of the non-model sector due to its composition (i.e. consumer vs. professional grades) and the varying business opportunities and growth paths. As non-model aircraft become operationally more efficient and safe, battery life expands, and regulatory constraints are reduced, new business models will begin to develop, thus enhancing robust supply-side responses. These responses, in turn, will pull demand forces (e.g. consumer response to receiving commercial packages, routine blood delivery to hospitals, etc.) that are presently latent. As a result, we provide a likely or base scenario together with the enormous potential embodied in the "high" scenario, representing cumulative annual growth rates of 33% and 46%, respectively.

	Total non-Model Fleet (no. of units)	
year	Base	High
2017	110,604	110,604
2018	158,900	168,339
2019	229,400	268,937
2020	312,100	410,862
2021	407,400	604,550
2022	451,800	717,895

Non-model UAS are presently used for numerous purposes. A review of market analyses and industry information reveals their present uses (following chart) have not changed much from last year:



Non-model UAS are primarily used for aerial imaging and data collection, including real estate photography (48%), industrial and utility inspection (28%), and agricultural applications (17%), including crop inspection. Increasingly, state and local governments are using UAS for emergency services, including search and rescue operations, and presently employ around 3% of all non-model UAS. As the sector grows, there will be many more non-model UAS in use.

[7] Through LAANC, the FAA will grant real-time authorizations for operations complying with Part 107 via speeding up processing time (i.e., real-time) of the authorization requests. It is likely to reduce any distractions of controllers at the Towers.

One way of identifying early trends of non-model UAS uses is to analyze the waiver applications granted to non-model UAS operators. Both the magnitude and relative composition of waiver types may indicate the direction of the non-model UAS sector as a whole. A breakdown of the waiver requests granted is shown in the chart below:

Beyond what is presently allowed under Part 107, expanding non-model applications requires waivers for night operations (86% of all waivers granted), operation of multiple unmanned aircraft by one pilot (1.5%), and operations above current altitude limits (1.3%). Many of these waivers include combinations of multiple waived provisions, and hence, totaling waivers granted by provision (more than 1,600 in December 2017) exceeds 100%. The Agency issues these waivers to facilitate expanded commercial activities by non-model UAS on a case-by-case basis, while it develops additional regulations to enable more advanced operations on a routine basis. Analysis of these waiver applications allows us to understand the industry trends, one of many metrics essential for understanding and projecting the trajectory, course corrections, and growth trends of the sector.

Finally, almost 13,000 airspace authorizations and waivers were approved for UAS operations in controlled airspaces by the end of December 2017. While over half of them were for operation in class D airspace (i.e., smaller airports with control towers), waivers for operation in other classes were also requested and approved.

Total Approvals	Auths	Waivers	Total
Class B	1,823	18	1,841
Class C	2,715	49	2,764
Class D	6,905	97	7,002
Class E	1,351	22	1,373
TOTAL	12,794	186	12,980

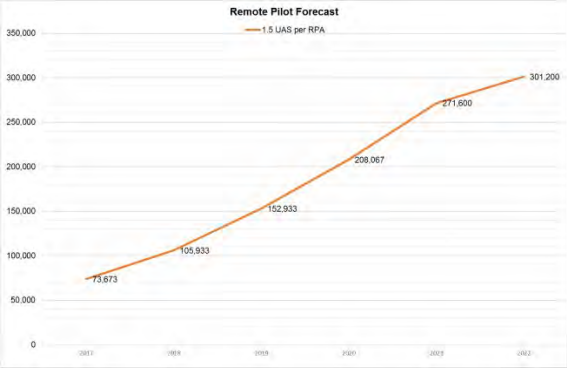
Large UAS

According to FAA rules, UAS weighing more than 55 pounds must be registered using the existing aircraft registration process (14 CFR part 47). Many of these aircraft are operated within the NAS by federal agencies, state and local governments, and national research organizations. While many of these organizations require certificates of waiver or authorization (COAs) to fly, others have their own procedures for authorizations, e.g. Military, Customs and Border Patrol (CBP), etc. While the FAA has a great deal of experience enabling operations with this class of UAS within the NAS, we do not have the equivalent level of understanding of the fleet numbers and trends in the growth of these types of UAS. Further examination and research may lead us to better identify trends and eventually develop a forecast in the future.

Remote Pilot Forecast

An important final metric in non-model sUAS is the trend in remote pilot certifications (RPCs). RPCs are issued in accordance with part 107 and are used primarily to facilitate non-model sUAS flights for commercial activities. As of December 2017, more than

73,000 RPCs were issued. Over 90% of individuals who took the required aeronautical knowledge exam passed and obtained an RPC. The RPC forecasts presented are based on two data sources: (a) trends in RPCs issued; and (b) trends in non-model sUAS registration and fleet forecasts. For projecting RPCs, we assume that one pilot is likely to handle 1.5 units of non-model sUAS.



Combining these assumptions with the base scenario of non-model sUAS forecast, we project RPCs in the above graph. As evident, RPCs are set to experience tremendous growth following the growth trends of the non-model sUAS sector. Starting from the base of 73,673 RPCs in 2017, non-model activities may require over 300,000 new remote pilots in 5 years, providing tremendous opportunities for growth in employment associated with commercial activities of the UAS.

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. This year's forecast is powered, at least in the short-term, by a number of factors including the strength of the U.S. and global economies. Shifting international dynamics and impacts resulting from the U.S. administration's economic policies could drive further changes. Also, as numerous incidents in the past few years remind us, 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.

Although oil prices remained below $50 per barrel for most of 2017, the recent volatility reminds us there is still considerable uncertainty as to the future direction of oil prices. The FAA's baseline forecast (derived from economic assumptions in IHS Global Insight's January 2018 U.S. macro forecast and 30-Year Focus released during the fourth quarter of 2017) calls for oil prices to increase to $54 per barrel in 2018 and rise steadily after 2020. By 2030 oil prices exceed $100 per barrel and approach $120 per barrel by the end of the forecast period in 2038. Some forecasters are calling for a more gradual rebound in the price of oil. In October 2017, the World Bank released its latest commodity price forecast. The forecast calls for oil prices to rise to $56 per barrel in 2018, remaining below $65 until 2025, and reaching $70 per barrel by 2030. The International Monetary Fund (IMF) also sees oil prices increasing at more moderate rates than the FAA's base forecast. In its July 2017 release, the IMF forecast had oil prices increasing from $49 per barrel in 2017 to only $54.80 per barrel by 2022. Over the long run, lower oil prices give consumers an impetus for additional spending, including air travel, and should enhance industry profitability.

The baseline forecast incorporates the December 2017 U.S. tax cuts and some additional infrastructure spending in 2018 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 be evolve. Under the right conditions, a period of sustained high and more inclusive growth along with increased financial stability could occur but there is also the possibility of an outcome that leads to greater global economic fragmentation, slower growth, and increased financial instability.

The baseline forecast assumes that global economic growth will accelerate after 2017, but weakness in certain regions may threaten the strength and sustainability of the expansion. The baseline forecast assumes that China and India will be growth engines for emerging economies as China successfully transitions the economy from reliance on heavy 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. While economic

growth appears to be accelerating in the U.S., there are concerns about the strength of demand in Japan and in the European Union as these areas continue to be constrained by structural economic problems (high debt, slow population growth, weak public finances for example) and the outcome of political elections. Furthermore, the actions taken to stabilize the global economy during the Great Recession continue to hamper economic policy makers. There are concerns that central banks may not raise interest rates in time to contain asset bubbles and inflationary expectations or raise rates too fast and undermine the recovery. In advanced economies, governments need to shore up their finances and recent actions have many analysts concerned that policy makers will not take the steps needed. There exists a non-trivial possibility that authorities will either act prematurely or be excessively timid and late in taking necessary steps to maintain a healthy global economy. The current forecasts assume strong passenger growth for travel between the United States and other world regions. Any slowing of worldwide economic activity could seriously inhibit the growth in global passenger demand.

With the approval of the Alaska Airlines/Virgin America merger, the outlook for further consolidation via mergers and acquisitions (M&A) appears to be rather limited. Based on FY 2017 data, the top 6 (American, Delta, United, Southwest) plus Alaska/Virgin and JetBlue accounted for more than 85% of the U.S. airline industry capacity and traffic. For many low cost carriers, the sheer size of merger transactions or the amount of risk associated with a merger makes further merger activity unlikely. For the network carriers, it is unclear how regulatory authorities will respond to any future proposed mergers.

The forecast assumes the addition of sizable numbers of large regional jets (70 to 90 seats) into the fleet of regional carriers. However, network carrier consolidation and new rules on pilot training have left regional carriers saddled with either excess capacity or a lack of pilots. Although air travel demand continues to recover, the bankruptcy filing of Republic Airlines in February 2016 is a reminder that financial pressures on regional operators have not abated. Network carriers continue to adjust the size and breadth of their networks. In many cases there are not opportunities for regional carriers to backfill the loss of the mainline service. Delta is well along in its plans to reduce its small (read 50 seat) regional jet fleet and plans to retire another 50 to bring its total to just 125 by 2018, down from almost 500 at the end of 2009. United has reduced the number of small regional jets flown by its partners from an estimated 380 in 2012 to 256 by the end of 2017. However, it plans to add 40 more small regional jets to its fleet in 2018 as part of its latest expansion plan. Meanwhile American has trimmed its small regional jet fleet by 90 aircraft since the beginning of 2015 from 297 to 207 aircraft and has plans to reduce an additional 5 aircraft in 2018. At the same time the carrier plans to add 15 larger regional jets to its fleet in 2018, on top of the 86 that have been added since 2015. While these actions may provide some opportunities for well positioned regional carriers, the overall impact of consolidation so far has been to reduce opportunities for regional flying substantially.

After suffering through a significant downturn in 2009, business and corporate aviation have seen a partial recovery during the past eight years. The future pace of the recovery 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. On the other hand, there could be a pent-up demand for business jets in the near term that could push the forecast higher. While corporate profits have been high for several years, perceived economic and political uncertainties have caused companies to postpone their purchase of new business aircraft. With the U.S. administration's emphasis on policies designed to stimulate economic growth and limit regulation, and the favorable terms of the new tax law, companies are feeling more optimistic about their future prospects that can translate into additional business jet sales. The impact of fuel price movements on business aircraft demand is also uncertain. Overall, the positive effect of declining fuel prices on corporate profits translates to increased demand for business aircraft. However, business aircraft demand from energy related industries will be negatively impacted if fuel prices remain low (by historic standards) for an extended period in the future.

Other factors, such as new and more efficient product offerings and increased competition from new entrant manufacturers, serve to broaden the potential of the industry. Raising the level of security restrictions, and the subsequent travel hassles placed on airline passengers, could make corporate jet travel look increasingly appealing.

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 regional jets and business jets as well as the anticipated widespread deployment of UAS into the national airspace system will make the FAA's job more challenging. This change in the mix of aircraft will most likely add to workload above and beyond the increasing demand for aviation services resulting from the growth in operations over the forecast period.

While overall activity at FAA and contract towers increased 0.7 percent in 2017, activity at large and medium hub airports (60 in total) increased 0.4 percent in 2017 and delays remained at historically high levels at many U.S. airports. FAA forecasts operations at these airports to grow substantially faster than the overall national trend. As demand continues to grow and workload increases, 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.

Increasing concerns about aviation environmental impacts could potentially limit or delay the ability of the aviation sector to grow to meet national economic and mobility needs. Airspace modernization and airport expansion or new construction are often contentious because of concerns over noise, air quality, and water quality. Community concerns 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 needed to achieve aviation growth may be delayed.

The environmental noise and emissions issues associated with overflight operations also present global challenges. In addition to providing economic benefits, technologies to improve aircraft fuel efficiency and reduce fuel consumption provide benefits in terms of reduced noise and emissions. 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. Continued advancements in technologies that result in improved fuel efficiency, reduced fuel consumption, noise reduction and reduced emissions are also required to ensure that access restrictions or operating limitations are not imposed on the in-service fleet, which in turn may depress growth.

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. In order 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 IHS Global Insight's 10-year and 30-year U.S. Macro Baselines were used. To develop the alternative scenarios, assumptions from IHS Global Insight's 10-year optimistic and pessimistic forecasts from their January 2018 Baseline U.S. Economic Outlook were combined with the optimistic and pessimistic forecasts from their Fall 2017 30-year U.S. Macro forecast. Inputs from these alternative scenarios were used to create a "high" and "low" traffic, capacity, and yield forecast.

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

Scenario Assumptions

The FAA's domestic baseline forecast assumes that economic growth remains solid over the next few years as both consumer and business spending provide support. Recent tax cuts result in some near-term stimulus to both sectors. Oil prices remain relatively low by historic standards and there are no external shocks.

The FAA's high case forecast uses IHS Global Insight's optimistic forecast. The optimistic forecast sees stronger overall growth driven initially by a recovery in the housing market. After struggling in 2017, household formation rates recover, leading to increased residential investment and consumer spending. Higher business investment generates stronger productivity growth, which combines with lower oil prices to restrain wage and price pressures. Confidence is high and the stock market sees strong gains while interest rates remain slightly lower than in the baseline scenario. Stronger imports accompany the increased domestic demand but exports rise as well with improving foreign economic conditions.

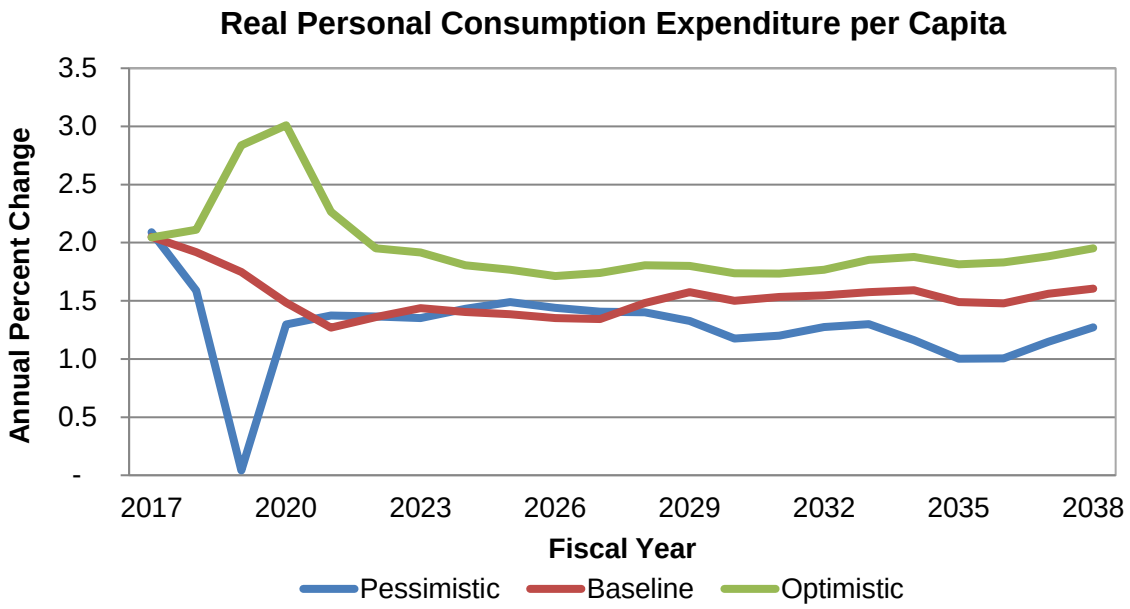
In this scenario, real personal consumption expenditure (PCE) per capita growth averages 0.6 percentage points faster per year

than the baseline forecast and unemployment averages 0.7 points lower on a fiscal year basis than the baseline.[8]

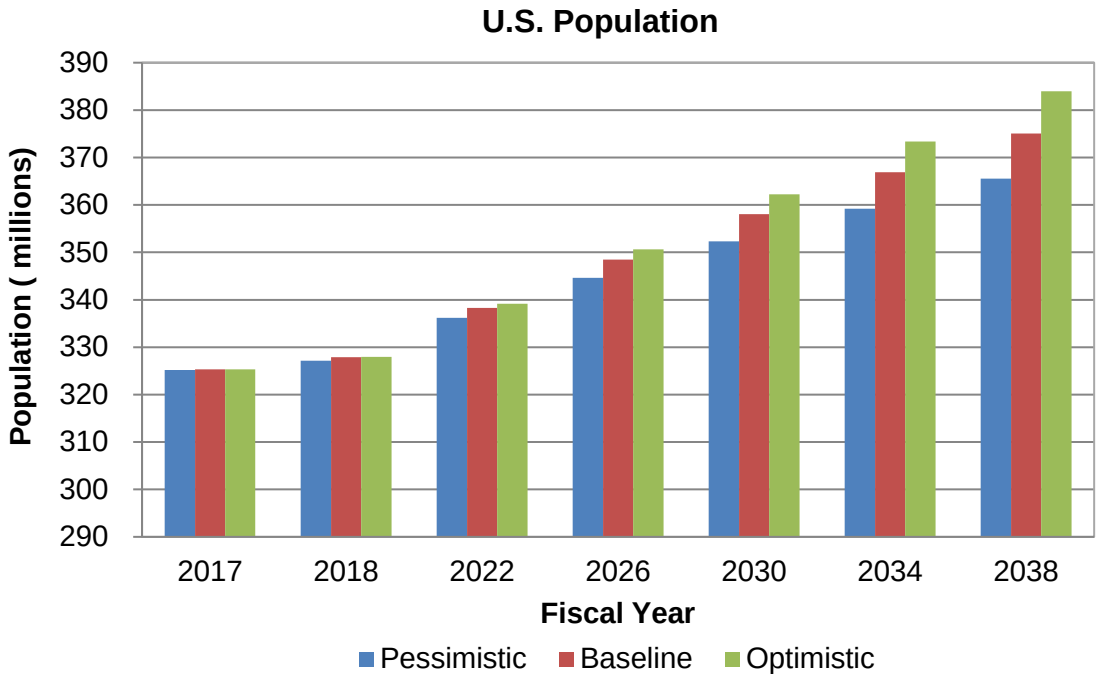
Conversely, FAA's low case forecast uses IHS Global Insight's pessimistic scenario. In this forecast, contraction of an overheated commercial real estate market combined with a shock to confidence ends the long-running expansion. The economy suffers a two-quarter recession in the second half of 2018 and GDP growth averages 0.3 percentage points lower than in the baseline over the first ten years of the forecast. Long-term interest rates rise, derailing the housing recovery and pushing residential investment 9.0 percentage points below the baseline in the first two years of the forecast. The higher interest rates constrain business investment and consumer spending as well, adding to the drag on the economy and the stock market falls sharply. Monetary policy effectively lowers short-term interest rates, which provides support to the economy, bringing it out of recession and boosting it slightly above the baseline for a few subsequent years. Oil prices rise faster than the baseline throughout the forecast.

Real PCE per capita in this scenario grows 0.4 percentage points slower per year than in the baseline; and unemployment, on average, is 0.4 points higher on an annual basis than in the baseline.

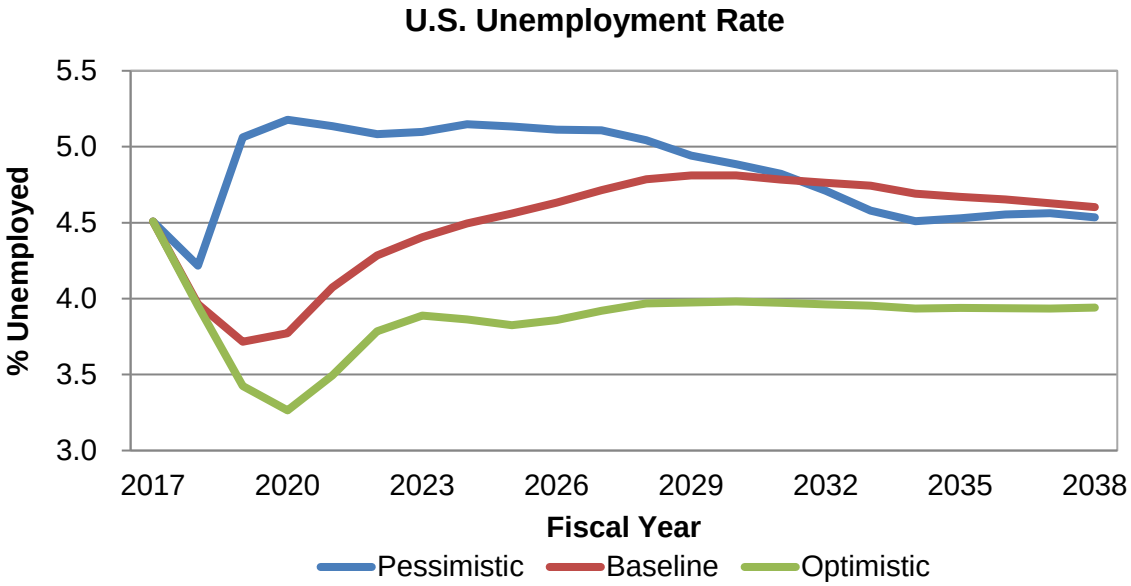
[8] Real personal consumption expenditure per capita and unemployment are used as input variables to the FAA's base, high and low forecasts of enplanements.



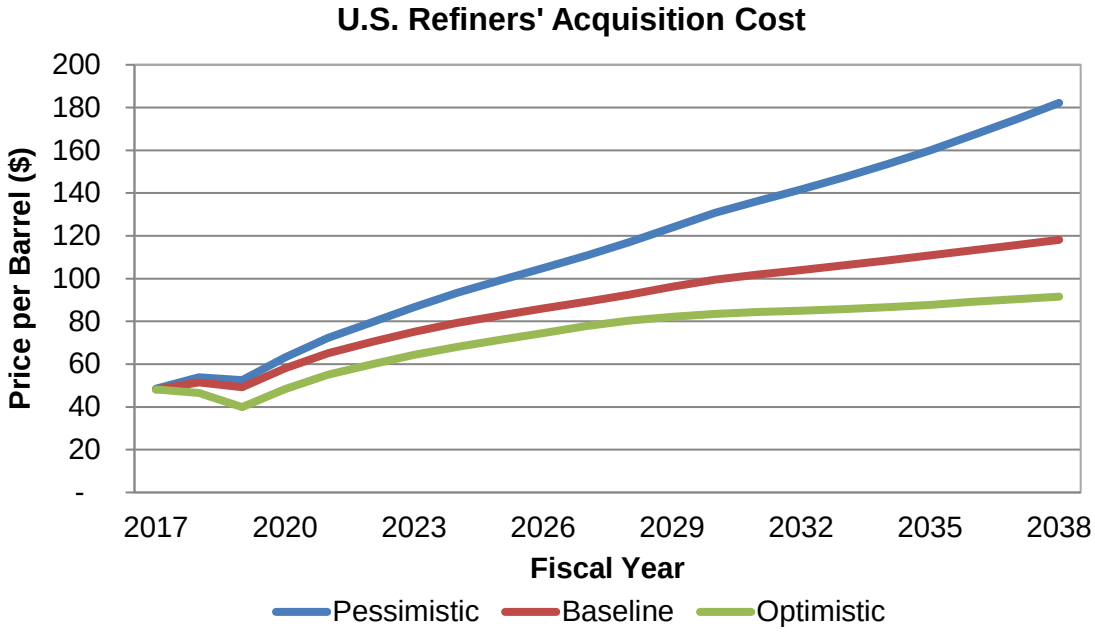
Source: IHS Global Insight



Source: IHS Global Insight

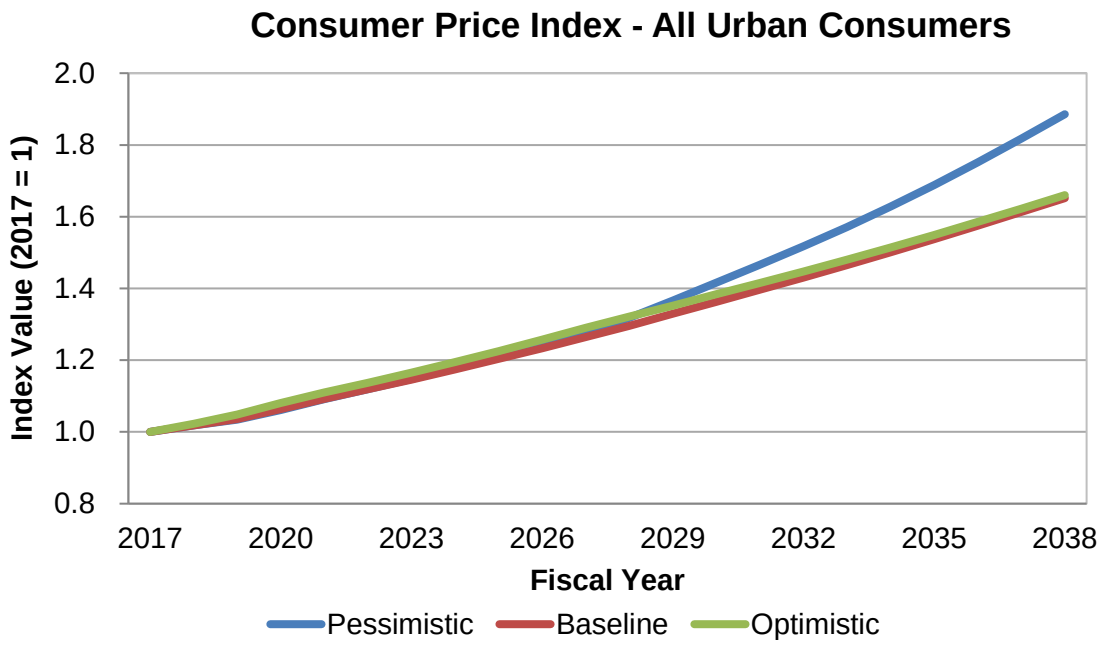


Source: IHS Global Insight



Source: IHS Global Insight

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 similarly to the baseline. In the pessimistic case, energy prices, wages and import prices all rise more rapidly compared to the baseline.



Source: IHS Global Insight

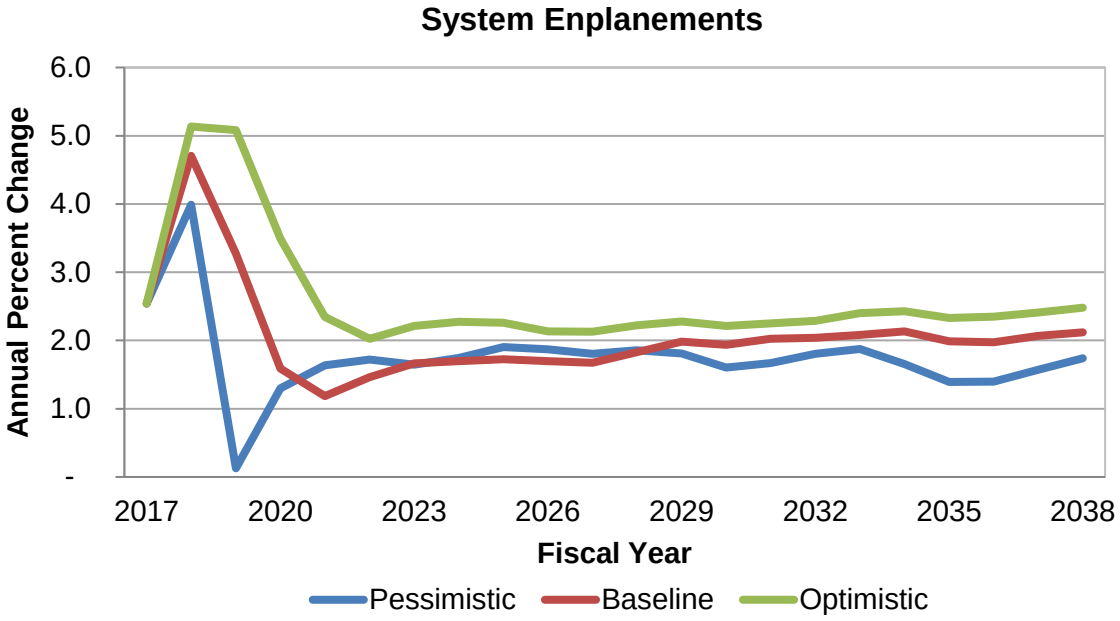
Alternative Forecasts

Enplanements

In the baseline forecast, system enplanements are forecast to grow at an average annual rate of 1.9 percent a year over the forecast horizon of 2018-2038 (with domestic and international passengers increasing at rates of 1.7 and 3.3 percent, respectively).

In the optimistic case, enplanements grow at a quicker pace, averaging 2.5 percent per year (up 2.3 percent domestically and 3.4 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 2038, system passengers in the optimistic case are 12.3 percent above the baseline, totaling 1.4 billion, 158 million greater than in the baseline.

The pessimistic case is characterized by a period of weakened consumer confidence combined with a contraction in the commercial real estate market, leading to higher interest rates, and curtailed investment and spending. In this scenario, enplanements grow an average of 1.6 percent per year (domestic up 1.4 percent and international up 3.2 percent). In the pessimistic case, system passengers in 2038 are 6.4 percent below the baseline case, totaling 1.2 billion, or 82 million fewer than in the baseline.

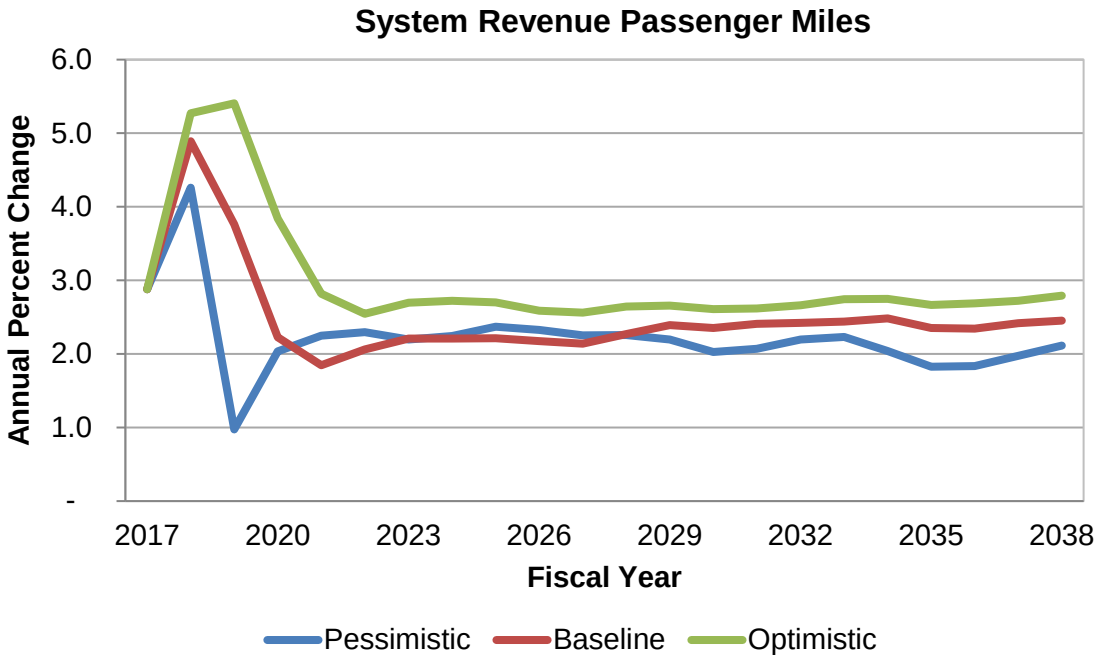


Revenue Passenger Miles

In the baseline forecast, system RPMs grow at an average annual rate of 2.4 percent a year over the forecast horizon (2018-2038), with domestic RPMs increasing 2.0 percent annually and international RPMs growing 3.2 percent annually.

In the optimistic case, the faster growing economy coupled with lower energy prices drives RPMs higher than the baseline, with growth averaging 2.9 percent per year (domestic and international RPMs up 2.6 and 3.5 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 1.6 percent a year while international traffic grows 3.1 percent annually.



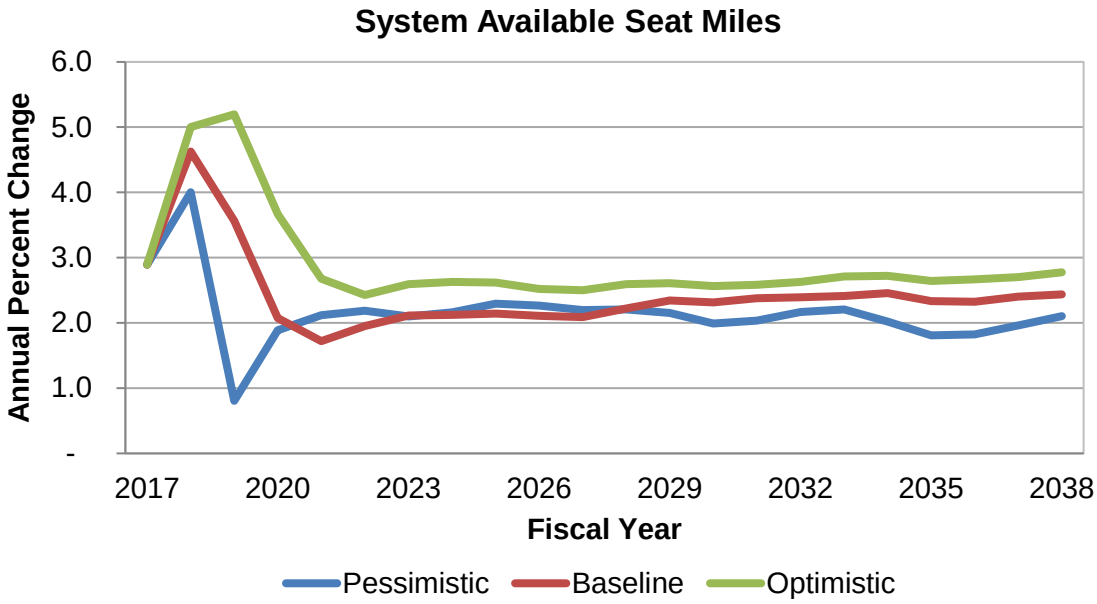
Available Seat Miles

In the base case, system capacity is forecast to increase an average of 2.3 percent annually over the forecast horizon with growth averaging 1.9 percent annually in domestic markets and 3.2 percent a year in international markets.

In the optimistic case, capacity grows at a faster clip than in the baseline forecast, averaging 2.8 percent annually system-wide (2.5 and 3.5 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 1.5 percent annually and international up 3.1 percent annually).



Load Factor

System load factors over the 20-year forecast period are relatively similar for all three forecast scenarios. System load factor rises from 83.7 percent in 2018 to 84.8 (optimistic), 84.7 (pessimistic), and 84.7 (baseline) percent in 2038, respectively.

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 84.7 percent to 86.6 percent in all three scenarios, optimistic, pessimistic and baseline.

The international load factor is forecast to hold steady near 81.1 throughout the period in the optimistic scenario and rise slightly to 81.2 percent in the pessimistic and baseline scenarios. 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 1.9 percent annually, going from 13.48 cents in 2018 to 19.82 cents in 2038. In domestic markets, yield in the baseline forecast rises from 13.64 cents in 2018 to 20.34 cents in 2038. International yield rises from 13.06 cents in 2018 to 18.79 cents in 2038.

System yield rises in the optimistic case at the same rate as in the baseline, up 1.9 percent annually to 19.71 cents by 2038. Domestic yield increases to 20.14 cents while international yield increases to 18.78 cents. The modest growth in yield in both cases is due to advancements in technology, gains in productivity, and relatively favorable fuel prices.

In the pessimistic case, nominal yields rise more rapidly than in the baseline, growing an average of 2.5 percent annually, reaching 22.08 cents by 2038 (23.79 cents domestically and 18.80 cents internationally). This scenario reflects higher general domestic inflation and higher energy prices than in the baseline, forcing carriers to increase fares in order to cover the higher costs of fuel, labor, and capital.

TABLE A-1

FAA FORECAST ECONOMIC ASSUMPTIONS

FISCAL YEARS 2017-2038

		Historical	FORECAST					PERCENT AVERAGE ANNUAL GROWTH				
Variable	Scenario	2017E	2018	2023	2028	2033	2038	2017-18	2018-23	2018-28	2018-33	2018-38
Economic Assumptions												
Real Personal Consumption	Pessimistic	36,308	36,885	38,929	41,802	44,493	47,036	1.6%	1.1%	1.3%	1.3%	1.2%
Expenditure per Capita	Baseline	36,294	36,990	39,769	42,622	46,020	49,684	1.9%	1.5%	1.4%	1.5%	1.5%
(2009 $)	Optimistic	36,292	37,058	41,713	45,529	49,723	54,553	2.1%	2.4%	2.1%	2.0%	2.0%
Refiners Acquisition Cost -	Pessimistic	48.5	53.8	86.7	117.0	147.3	182.2	10.9%	10.0%	8.1%	6.9%	6.3%
Average - $ Per Barrel	Baseline	48.1	51.5	75.1	92.5	106.3	118.1	6.9%	7.8%	6.0%	5.0%	4.2%
	Optimistic	48.1	46.6	64.3	80.4	85.8	91.6	-3.2%	6.6%	5.6%	4.2%	3.4%
Consumer Price Index	Pessimistic	2.44	2.48	2.80	3.21	3.83	4.60	1.8%	2.4%	2.6%	2.9%	3.1%
All Urban, 1982-84 = 1.0	Baseline	2.44	2.48	2.79	3.16	3.57	4.03	1.9%	2.4%	2.4%	2.5%	2.4%
	Optimistic	2.44	2.49	2.84	3.22	3.61	4.05	2.3%	2.6%	2.6%	2.5%	2.5%
Civilian Unemployment Rate	Pessimistic	4.5	4.2	5.1	5.0	4.6	4.5	-6.5%	3.9%	1.8%	0.6%	0.4%
(%)	Baseline	4.5	4.0	4.4	4.8	4.7	4.6	-12.1%	2.1%	1.9%	1.2%	0.7%
	Optimistic	4.5	4.0	3.9	4.0	4.0	3.9	-12.4%	-0.3%	0.0%	0.0%	0.0%

Source: IHS Global Insight

TABLE A-2

FAA FORECAST OF AVIATION ACTIVITY*

FISCAL YEARS 2017-2038

Variable	Scenario	Historical 2017E	FORECAST 2018	2023	2028	2033	2038	PERCENT AVERAGE ANNUAL GROWTH 2017-18	2018-23	2018-28	2018-33	2018-38
System Aviation Activity												
Available Seat Miles (BIL)	Pessimistic	1,143.7	1,189.5	1,301.7	1,453.0	1,612.9	1,775.9	4.0%	1.8%	2.0%	2.1%	2.0%
	Baseline	1,143.7	1,196.6	1,339.6	1,489.0	1,673.9	1,883.9	4.6%	2.3%	2.2%	2.3%	2.3%
	Optimistic	1,143.7	1,200.9	1,413.1	1,604.5	1,826.1	2,086.6	5.0%	3.3%	2.9%	2.8%	2.8%
Revenue Passenger Miles (BIL)	Pessimistic	954.6	995.3	1,096.1	1,227.5	1,364.8	1,503.6	4.3%	1.9%	2.1%	2.1%	2.1%
	Baseline	954.6	1,001.3	1,128.4	1,258.2	1,416.8	1,596.0	4.9%	2.4%	2.3%	2.3%	2.4%
	Optimistic	954.6	1,004.9	1,191.0	1,356.9	1,547.0	1,769.6	5.3%	3.5%	3.0%	2.9%	2.9%
Enplanements (MIL)	Pessimistic	840.4	873.9	931.5	1,020.1	1,112.7	1,201.8	4.0%	1.3%	1.6%	1.6%	1.6%
	Baseline	840.4	879.9	963.5	1,049.5	1,159.4	1,283.7	4.7%	1.8%	1.8%	1.9%	1.9%
	Optimistic	840.4	883.6	1,025.5	1,143.6	1,280.4	1,441.6	5.1%	3.0%	2.6%	2.5%	2.5%
Psgr Carrier Miles Flown (MIL)	Pessimistic	7,411.7	7,646.3	8,097.8	8,839.6	9,626.1	10,395.7	3.2%	1.2%	1.5%	1.5%	1.5%
	Baseline	7,411.7	7,695.8	8,355.1	9,076.0	10,009.1	11,062.7	3.8%	1.7%	1.7%	1.8%	1.8%
	Optimistic	7,411.7	7,725.5	8,852.6	9,832.5	10,981.7	12,330.8	4.2%	2.8%	2.4%	2.4%	2.4%
Psgr Carrier Departures (000s)	Pessimistic	9,010.2	9,207.5	9,402.0	9,962.4	10,533.6	11,033.6	2.2%	0.4%	0.8%	0.9%	0.9%
	Baseline	9,010.2	9,266.7	9,712.3	10,214.9	10,932.6	11,740.0	2.8%	0.9%	1.0%	1.1%	1.2%
	Optimistic	9,010.2	9,284.7	10,325.0	11,130.1	12,060.4	13,167.6	3.0%	2.1%	1.8%	1.8%	1.8%
Nominal Passenger Yield (cents)	Pessimistic	13.42	13.48	15.09	16.91	19.32	22.08	0.4%	2.3%	2.3%	2.4%	2.5%
	Baseline	13.42	13.48	14.98	16.52	18.15	19.82	0.4%	2.1%	2.1%	2.0%	1.9%
	Optimistic	13.42	13.52	15.10	16.71	18.15	19.71	0.7%	2.2%	2.1%	2.0%	1.9%

* Includes domestic and international activity.

TABLE A-3

FAA FORECAST OF DOMESTIC AVIATION ACTIVITY

FISCAL YEARS 2017-2038

Variable	Scenario	Historical	FORECAST					PERCENT AVERAGE ANNUAL GROWTH				
		2017E	2018	2023	2028	2033	2038	2017-18	2018-23	2018-28	2018-33	2018-38
Domestic Aviation Activity												
Available Seat Miles (BIL)	Pessimistic	809.0	842.2	890.1	971.6	1,058.7	1,140.5	4.1%	1.1%	1.4%	1.5%	1.5%
	Baseline	809.0	848.6	924.2	1,002.8	1,108.1	1,228.1	4.9%	1.7%	1.7%	1.8%	1.9%
	Optimistic	809.0	852.5	990.2	1,102.9	1,237.4	1,398.3	5.4%	3.0%	2.6%	2.5%	2.5%
Revenue Passenger Miles (BIL)	Pessimistic	683.3	713.8	762.5	837.0	915.1	987.8	4.5%	1.3%	1.6%	1.7%	1.6%
	Baseline	683.3	719.2	791.7	863.9	957.8	1,063.7	5.2%	1.9%	1.9%	1.9%	2.0%
	Optimistic	683.3	722.4	848.2	950.1	1,069.5	1,211.0	5.7%	3.3%	2.8%	2.7%	2.6%
Enplanements (MIL)	Pessimistic	743.5	772.2	813.1	880.7	950.2	1,012.1	3.9%	1.0%	1.3%	1.4%	1.4%
	Baseline	743.5	778.1	844.3	909.1	994.6	1,089.9	4.7%	1.6%	1.6%	1.6%	1.7%
	Optimistic	743.5	781.7	904.6	999.8	1110.7	1,240.9	5.1%	3.0%	2.5%	2.4%	2.3%
Psgr Carrier Miles Flown (MIL)	Pessimistic	5,867.0	6,043.9	6,223.1	6,662.4	7,134.7	7,556.2	3.0%	0.6%	1.0%	1.1%	1.1%
	Baseline	5,867.0	6,090.4	6,463.7	6,878.8	7,470.1	8,140.1	3.8%	1.2%	1.2%	1.4%	1.5%
	Optimistic	5,867.0	6,118.2	6,927.8	7,569.1	8,346.6	9,273.8	4.3%	2.5%	2.2%	2.1%	2.1%
Psgr Carrier Departures (000s)	Pessimistic	8,328.6	8,494.9	8,590.1	9,023.5	9,454.4	9,788.1	2.0%	0.2%	0.6%	0.7%	0.7%
	Baseline	8,328.6	8,553.1	8,893.8	9,268.9	9,838.3	10,468.2	2.7%	0.8%	0.8%	0.9%	1.0%
	Optimistic	8,328.6	8,570.6	9,492.9	10,159.9	10,932.6	11,850.2	2.9%	2.1%	1.7%	1.6%	1.6%
Nominal Passenger Yield (cents)	Pessimistic	13.63	13.64	15.44	17.49	20.36	23.79	0.1%	2.5%	2.5%	2.7%	2.8%
	Baseline	13.63	13.64	15.28	16.92	18.60	20.34	0.1%	2.3%	2.2%	2.1%	2.0%
	Optimistic	13.63	13.70	15.43	17.16	18.58	20.14	0.5%	2.4%	2.3%	2.1%	1.9%

TABLE A-4

FAA FORECAST OF INTERNATIONAL AVIATION ACTIVITY*

FISCAL YEARS 2017-2038

		Historical	FORECAST					PERCENT AVERAGE ANNUAL GROWTH				
Variable	Scenario	2017E	2018	2023	2028	2033	2038	2017-18	2018-23	2018-28	2018-33	2018-38
International Aviation Activity												
Available Seat Miles	Pessimistic	334.7	347.3	411.6	481.4	554.2	635.3	3.8%	3.5%	3.3%	3.2%	3.1%
(BIL)	Baseline	334.7	348.0	415.4	486.2	565.8	655.7	4.0%	3.6%	3.4%	3.3%	3.2%
	Optimistic	334.7	348.5	423.0	501.7	588.7	688.3	4.1%	4.0%	3.7%	3.6%	3.5%
Revenue Passenger Miles	Pessimistic	271.3	281.5	333.6	390.4	449.7	515.8	3.8%	3.5%	3.3%	3.2%	3.1%
(BIL)	Baseline	271.3	282.1	336.7	394.3	459.0	532.3	4.0%	3.6%	3.4%	3.3%	3.2%
	Optimistic	271.3	282.5	342.8	406.7	477.5	558.6	4.1%	3.9%	3.7%	3.6%	3.5%
Enplanements	Pessimistic	96.9	101.7	118.4	139.4	162.5	189.6	4.9%	3.1%	3.2%	3.2%	3.2%
(MIL)	Baseline	96.9	101.8	119.2	140.4	164.9	193.7	5.0%	3.2%	3.3%	3.3%	3.3%
	Optimistic	96.9	101.9	120.9	143.8	169.7	200.6	5.1%	3.5%	3.5%	3.5%	3.4%
Psgr Carrier Miles Flown	Pessimistic	1,544.8	1,602.4	1,874.7	2,177.2	2,491.3	2,839.4	3.7%	3.2%	3.1%	3.0%	2.9%
(MIL)	Baseline	1,544.8	1,605.4	1,891.4	2,197.2	2,539.0	2,922.6	3.9%	3.3%	3.2%	3.1%	3.0%
	Optimistic	1,544.8	1,607.3	1,924.9	2,263.4	2,635.1	3,057.1	4.0%	3.7%	3.5%	3.4%	3.3%
Psgr Carrier Departures	Pessimistic	681.6	712.6	811.9	938.9	1,079.2	1,245.5	4.5%	2.6%	2.8%	2.8%	2.8%
(000s)	Baseline	681.6	713.6	818.6	946.0	1,094.3	1,271.8	4.7%	2.8%	2.9%	2.9%	2.9%
	Optimistic	681.6	714.2	832.1	970.2	1,127.8	1,317.4	4.8%	3.1%	3.1%	3.1%	3.1%
Nominal Passenger Yield	Pessimistic	12.89	13.06	14.28	15.67	17.20	18.80	1.3%	1.8%	1.8%	1.9%	1.8%
(cents)	Baseline	12.89	13.06	14.27	15.66	17.20	18.79	1.3%	1.8%	1.8%	1.9%	1.8%
	Optimistic	12.89	13.06	14.26	15.66	17.19	18.78	1.3%	1.8%	1.8%	1.8%	1.8%

*Includes mainline and regional carriers.

Appendix B: FAA Forecast Accuracy

Forecasts, by their nature, have a degree of uncertainty incorporated in them. They involve not only statistical analyses and various scientific methods, but also judgment and reliance on industry knowledge and the forecaster's experience to incorporate industry trends not yet reflected in recent results. The FAA's annual Aerospace Forecast is no exception. Given the volatile nature of the U.S. airline industry, it is not surprising that each year's forecast would contain a certain degree of forecast variance. Therefore, FAA forecasters have tried to build forecast models that give a consistent and predictable pattern of results. Analysts relying on the forecasts produced by the models would then be able to adjust for the predictable variance from actual results.

The table below presents an analysis of the variance from historical results for a primary forecast assumption along with five key forecast metrics during the FY 2010-2017 forecast period. Although many of the forecasts prepared for the period examined were developed while the U.S. airline industry was going through upheaval, the FAA's forecast methodology remained consistent during this time. For this reason, inclusion of prior periods in an analysis of forecast variance might lead to inconclusive or inaccurate implications about the accuracy of FAA's current forecast methodology.

The table below contains the mean absolute percent errors for the projected values versus the actual results for U.S. carriers' system operations along with the projected values versus actual results for U.S. GDP. Each metric has five values showing the relative forecast variance by the number of years in advance the preparation of the forecast took place. For example, the "3 Years" column for ASMs shows that the mean absolute percent error was 5.3 percent for ASM forecasts prepared 3 years in advance. For the period under examination, preparation of the forecasts for FY 2010 through FY 2017 occurred in FY 2006 through FY 2016. [9]

[9] It should be noted that the first forecasted year for each respective fiscal year is that very same year. Therefore, FY 2010's first forecasted year is FY 2010, and the third forecasted year is FY 2012.

U.S. AIR CARRIERS
SYSTEM SCHEDULED PASSENGER ACTIVITY
FORECAST EVALUATION

Forecast Variable	Mean Absolute Percent Error (Combined FY 2010 - FY 2017) (Forecast Variance from Actual) Forecast Performed Years Prior to Actual				
	1 Year	2 Years	3 Years	4 Years	5 Years
U.S. Real GDP	1.2%	2.8%	5.5%	7.9%	9.5%
ASMs	0.9%	2.3%	5.3%	9.2%	13.5%
RPMs	1.0%	1.8%	4.4%	7.7%	11.1%
Passenger Enplanements	0.7%	1.5%	4.5%	7.7%	10.7%
Mainline Domestic Yield	2.7%	5.3%	6.9%	6.6%	7.8%
IFR Aircraft Handled*	1.5%	3.2%	6.3%	10.5%	15.5%

*Total - scheduled and nonscheduled commercial plus noncommercial

Presenting forecast variances from actual data in such a manner simplifies a review of longer-term trends. Typically, one would expect the variances to increase as the forecast year is moves away from the year the forecast is prepared. Presenting forecast variances in this way allows an examination of changes in the relative variances by time horizon, signaling when dramatic shifts in accuracy occur.

Examination of the forecast variances reveals several items. First, the forecast variances for GDP, a key exogenous variable, are similar to the variances of the key traffic measures, Passenger Enplanements and RPMs. This suggests that a substantial amount of the forecast variance for the traffic variables is attributable to the forecast error in the exogenous variables. Second, all the metrics examined have increasing variances as the forecast time horizon lengthens. Third, the variance in the IFR aircraft handled relative to ASM variance is stable for the 2 to 4 year out horizon. This suggests that beyond a 2 year forecast horizon carriers are able to accommodate changes in capacity by means other than adjusting operations. Many carriers have been systematically reducing the number of smaller regional jets in their fleets, replacing them with larger 70-90 seat aircraft. This has allowed carriers to increase capacity without increasing flights. It is worth noting that the forecast variance in these two metrics is relatively consistent even as the time horizon increases suggesting that over the long run ASM growth is a good indicator of operations growth.

Appendix C: Forecast Tables

TABLE 1

U.S. SHORT-TERM ECONOMIC FORECASTS

	FISCAL YEAR 2017				FISCAL YEAR 2018				FISCAL YEAR 2019			
ECONOMIC VARIABLE	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												
(2009 $)	36,059	36,178	36,407	36,530	36,727	36,902	37,082	37,246	37,404	37,562	37,713	37,865
Year over year change	2.3%	1.3%	2.6%	1.4%	2.2%	1.9%	2.0%	1.8%	1.7%	1.7%	1.6%	1.6%
Refiners' Acquisition Cost - Average												
(Dollars per barrel)	46.52	49.96	47.66	48.43	54.10	52.85	50.09	48.90	48.35	48.44	50.69	49.65
Year over year change	38.4%	33.0%	-17.2%	6.7%	55.7%	-8.9%	-19.3%	-9.1%	-4.5%	0.8%	19.8%	-7.9%
Consumer Price Index												
(1982-84 equals 100)	242.2	244.1	243.9	245.2	247.3	248.2	248.5	249.5	250.6	251.7	253.3	254.6
Seasonally Adjusted Annual Rate	3.0%	3.1%	-0.3%	2.0%	3.5%	1.6%	0.4%	1.7%	1.7%	1.8%	2.5%	2.0%

Source: IHS Global Insight

TABLE 2

U.S. LONG-TERM ECONOMIC FORECASTS

FISCAL YEAR	REAL GROSS DOMESTIC PRODUCT (Billions 2009 $)	REAL PERSONAL CONSUMPTION EXPENDITURE PER CAPITA (2009 $)	CONSUMER PRICE INDEX (1982-84=1.00)	REFINERS' ACQUISITION COST AVERAGE (Dollars per barrel)
Historical				
2010	14,685	32,186	2.17	74.61
2015	16,390	34,842	2.37	56.69
2016	16,640	35,565	2.39	39.12
2017E	16,987	36,294	2.44	48.14
Forecast				
2018	17,433	36,990	2.48	51.48
2023	19,344	39,769	2.79	75.12
2028	21,188	42,617	3.16	92.53
2033	23,379	46,014	3.57	106.28
2038	25,840	49,678	4.03	118.15
Avg Annual Growth				
2010-17	2.1%	1.7%	1.7%	-6.1%
2017-18	2.6%	1.9%	1.9%	6.9%
2018-28	2.0%	1.4%	2.4%	6.0%
2018-38	2.0%	1.5%	2.4%	4.2%
Source: IHS Global Insight				

TABLE 3

INTERNATIONAL GDP FORECASTS BY TRAVEL REGION

	GROSS DOMESTIC PRODUCT (In Billions of 2010 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	1,614	25,097	5,204	19,056	65,935
2015	1,803	27,347	5,790	23,925	75,537
2016	1,828	27,900	5,715	24,978	77,341
2017E	1,882	28,601	5,788	26,165	79,737
Forecast					
2018	1,928	29,309	5,897	27,380	82,275
2023	2,141	32,756	6,824	34,071	95,466
2028	2,358	36,351	7,942	41,756	109,954
2033	2,588	40,114	9,230	49,665	125,382
2038	2,845	44,143	10,729	58,186	142,187
Avg Annual Growth					
2010-17	2.2%	1.9%	1.5%	4.6%	2.8%
2017-18	2.4%	2.5%	1.9%	4.6%	3.2%
2018-28	2.0%	2.2%	3.0%	4.3%	2.9%
2018-38	2.0%	2.1%	3.0%	3.8%	2.8%

Source: Global Insight website, GDP Components Tables (Interim Forecast, Monthly)

TABLE 4

INTERNATIONAL GDP FORECASTS – SELECTED AREAS/COUNTRIES

	GROSS DOMESTIC PRODUCT (In Billions of 2010 U.S. Dollars)				
CALENDAR YEAR	NORTH AMERICA (NAFTA)	EUROZONE	UNITED KINGDOM	JAPAN	CHINA
Historical					
2010	17,636	12,634	2,441	5,701	6,082
2015	19,700	13,136	2,705	5,998	8,885
2016	20,005	13,370	2,758	6,054	9,483
2017E	20,467	13,702	2,806	6,162	10,132
Forecast					
2018	21,002	14,019	2,840	6,239	10,798
2023	23,291	15,166	3,099	6,517	14,509
2028	25,593	16,241	3,404	6,838	18,781
2033	28,317	17,324	3,731	7,117	22,917
2038	31,384	18,438	4,084	7,369	27,170
Avg Annual Growth					
2010-17	2.1%	1.2%	2.0%	1.1%	7.6%
2017-18	2.6%	2.3%	1.2%	1.2%	6.6%
2018-28	2.0%	1.5%	1.8%	0.9%	5.7%
2018-38	2.0%	1.4%	1.8%	0.8%	4.7%

Source: Global Insight website, GDP Components 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
2015	696	90	787	629	261	890
2016	726	93	820	663	265	928
2017E	743	97	840	683	271	955
Forecast						
2018	778	102	880	719	282	1,001
2023	844	119	964	792	337	1,128
2028	909	140	1,050	864	394	1,258
2033	995	165	1,159	958	459	1,417
2038	1,090	194	1,284	1,064	532	1,596
Avg Annual Growth						
2010-17	2.3%	3.3%	2.4%	3.0%	2.3%	2.8%
2017-18	4.7%	5.0%	4.7%	5.2%	4.0%	4.9%
2018-28	1.6%	3.3%	1.8%	1.9%	3.4%	2.3%
2018-38	1.7%	3.3%	1.9%	2.0%	3.2%	2.4%

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

FISCAL YEAR	DOMESTIC			INTERNATIONAL			SYSTEM		
	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
2015	744	629	84.5	323	261	80.7	1,067	890	83.4
2016	783	663	84.7	329	265	80.6	1,112	928	83.5
2017E	809	683	84.5	335	271	81.0	1,144	955	83.5
Forecast									
2018	849	719	84.7	348	282	81.1	1,197	1,001	83.7
2023	924	792	85.7	415	337	81.1	1,340	1,128	84.2
2028	1,003	864	86.2	486	394	81.1	1,489	1,258	84.5
2033	1,108	958	86.4	566	459	81.1	1,674	1,417	84.6
2038	1,228	1,064	86.6	656	532	81.2	1,884	1,596	84.7
Avg Annual Growth									
2010-17	2.5%	3.0%		2.5%	2.3%		2.5%	2.8%	
2017-18	4.9%	5.2%		4.0%	4.0%		4.6%	4.9%	
2018-28	1.7%	1.9%		3.4%	3.4%		2.2%	2.3%	
2018-38	1.9%	2.0%		3.2%	3.2%		2.3%	2.4%	

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
2015	25	52	14	90	107	83	71	261
2016	24	55	14	93	105	87	73	265
2017E	25	58	14	97	106	90	75	271
Forecast								
2018	26	62	14	102	109	96	77	282
2023	30	73	16	119	133	115	89	337
2028	34	88	18	140	151	142	101	394
2033	38	106	20	165	171	173	115	459
2038	43	128	23	194	192	210	130	532
Avg Annual Growth								
2010-17	0.2%	5.5%	1.1%	3.3%	-0.3%	5.2%	3.4%	2.3%
2017-18	3.0%	6.9%	0.8%	5.0%	2.5%	6.2%	3.4%	4.0%
2018-28	2.9%	3.6%	2.5%	3.3%	3.3%	4.0%	2.7%	3.4%
2018-38	2.6%	3.7%	2.5%	3.3%	2.9%	4.0%	2.6%	3.2%

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
2015	70	75	36	27	208
2016	75	79	39	28	220
2017E	79	82	41	29	232
Forecast					
2018	84	87	43	30	244
2023	99	99	53	36	288
2028	117	119	64	43	344
2033	137	145	76	50	409
2038	159	178	89	60	486
Avg Annual Growth					
2010-17	5.1%	6.4%	6.2%	4.2%	5.6%
2017-18	5.9%	5.1%	4.7%	4.3%	5.2%
2018-28	3.4%	3.2%	4.1%	3.5%	3.5%
2018-38	3.3%	3.7%	3.7%	3.4%	3.5%

Source: US Customs & Border Protection data processed and released by Department of Commerce; data also received fro 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	121.8	216.4	139.7	874.8	2,988.0	1,104.2
2015	131.5	214.8	149.0	902.7	2,892.6	1,131.0
2016	134.8	214.8	151.5	913.2	2,833.7	1,132.2
2017E	137.9	216.7	154.3	919.1	2,798.7	1,135.9
Forecast						
2018	139.3	216.8	155.5	924.3	2,770.6	1,137.9
2023	143.0	219.6	160.3	937.7	2,824.6	1,171.1
2028	145.8	221.3	164.1	950.3	2,808.0	1,198.9
2033	148.3	222.8	167.2	963.0	2,784.4	1,222.0
2038	150.9	224.4	170.3	975.9	2,747.2	1,243.3

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
2015	543	87	630	556	259	815
2016	575	90	665	590	262	852
2017E	595	93	689	612	269	881
Forecast						
2018	627	98	725	646	280	926
2023	682	115	797	711	334	1,045
2028	734	136	871	776	391	1,167
2033	803	160	964	859	456	1,315
2038	880	189	1,069	954	528	1,482
Avg Annual Growth						
2010-17	3.3%	3.3%	3.3%	3.5%	2.3%	3.1%
2017-18	5.3%	5.2%	5.3%	5.6%	4.0%	5.1%
2018-28	1.6%	3.3%	1.8%	1.8%	3.4%	2.3%
2018-38	1.7%	3.3%	2.0%	2.0%	3.2%	2.4%

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
2015	653	556	85.1	321	259	80.8	973	815	83.7
2016	692	590	85.3	325	262	80.7	1,017	852	83.8
2017E	718	612	85.2	331	269	81.1	1,049	881	83.9
Forecast									
2018	756	646	85.5	345	280	81.1	1,100	926	84.1
2023	823	711	86.4	412	334	81.1	1,235	1,045	84.6
2028	893	776	86.9	482	391	81.2	1,375	1,167	84.9
2033	986	859	87.2	561	456	81.2	1,547	1,315	85.0
2038	1,091	954	87.4	651	528	81.2	1,742	1,482	85.1
Avg Annual Growth									
2010-17	3.1%	3.5%		2.5%	2.3%	-0.2%	2.9%	3.1%	
2017-18	5.3%	5.6%		4.0%	4.0%	0.0%	4.9%	5.1%	
2018-28	1.7%	1.8%		3.4%	3.4%	0.0%	2.3%	2.3%	
2018-38	1.9%	2.0%		3.2%	3.2%	0.0%	2.3%	2.4%	

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
2015	24.6	48.6	14.0	87.2
2016	24.4	51.5	14.0	89.9
2017E	24.8	54.7	13.9	93.5
Forecast				
2018	25.6	58.7	14.1	98.3
2023	30.5	69.0	16.0	115.4
2028	34.2	84.2	18.0	136.4
2033	38.2	101.9	20.4	160.4
2038	42.7	123.2	22.9	188.9
Avg Annual Growth				
2010-17	0.2%	5.7%	1.1%	3.3%
2017-18	3.0%	7.2%	0.8%	5.2%
2018-28	2.9%	3.7%	2.5%	3.3%
2018-38	2.6%	3.8%	2.5%	3.3%
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
2015	133	107	80.0	101	81	80.3	86	71	82.5	321	259	80.8
2016	134	105	78.0	104	85	81.4	87	73	83.9	325	262	80.7
2017E	134	106	79.5	107	88	82.3	91	75	82.2	331	269	81.1
Forecast												
2018	137	109	79.5	113	93	82.3	94	77	82.2	345	280	81.1
2023	167	133	79.5	137	112	82.3	108	89	82.2	412	334	81.1
2028	190	151	79.5	169	139	82.3	123	101	82.2	482	391	81.2
2033	215	171	79.5	207	170	82.3	140	115	82.2	561	456	81.2
2038	242	192	79.5	251	207	82.3	158	130	82.2	651	528	81.2
Avg Annual Growth												
2010-17	0.3%	-0.3%		4.6%	5.1%		3.7%	3.4%		2.5%	2.3%	
2017-18	2.5%	2.5%		6.4%	6.4%		3.4%	3.4%		4.0%	4.0%	
2018-28	3.3%	3.3%		4.1%	4.1%		2.7%	2.7%		3.4%	3.4%	
2018-38	2.9%	2.9%		4.1%	4.1%		2.6%	2.6%		3.2%	3.2%	

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
2015	157.7	237.0	173.9	272.1	219.5	173.8
2016	159.9	241.7	174.1	266.6	219.8	175.1
2017E	162.3	243.4	176.4	267.5	221.8	177.3
Forecast						
2018	162.9	243.9	176.9	268.2	221.8	177.7
2023	165.9	246.4	179.4	272.0	224.2	181.6
2028	168.5	248.9	181.9	275.7	225.5	184.8
2033	170.6	251.4	184.4	279.5	226.8	187.5
2038	172.7	253.9	186.9	283.2	228.1	189.9

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
2015	1,023	4,336	1,669	5,080	2,969	1,292
2016	1,027	4,291	1,650	5,176	2,917	1,283
2017E	1,028	4,278	1,602	5,373	2,875	1,279
Forecast						
2018	1,031	4,256	1,589	5,507	2,844	1,276
2023	1,044	4,351	1,629	5,566	2,893	1,311
2028	1,057	4,425	1,650	5,610	2,869	1,341
2033	1,070	4,474	1,668	5,641	2,840	1,365
2038	1,083	4,497	1,676	5,658	2,798	1,386

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 2017 $ (Cents)	CURRENT $ (Cents)	FY 2017 $ (Cents)	CURRENT $ (Cents)	FY 2017 $ (Cents)
Historical						
2010	12.62	14.15	12.84	14.40	12.69	14.23
2015	14.79	15.23	14.16	14.59	14.59	15.03
2016	13.96	14.24	12.88	13.14	13.62	13.90
2017E	13.89	13.89	12.93	12.93	13.60	13.60
Forecast						
2018	13.90	13.64	13.10	12.86	13.66	13.41
2023	15.56	13.58	14.31	12.49	15.16	13.23
2028	17.23	13.30	15.71	12.12	16.72	12.90
2033	18.95	12.94	17.25	11.77	18.36	12.53
2038	20.73	12.55	18.84	11.41	20.05	12.14
Avg Annual Growth						
2010-17	1.4%	-0.3%	0.1%	-1.5%	1.0%	-0.6%
2017-18	0.0%	-1.8%	1.3%	-0.6%	0.4%	-1.4%
2018-28	2.2%	-0.3%	1.8%	-0.6%	2.0%	-0.4%
2018-38	2.0%	-0.4%	1.8%	-0.6%	1.9%	-0.5%

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 2017 $ (Cents)	CURRENT $ (Cents)	FY 2017 $ (Cents)	CURRENT $ (Cents)	FY 2017 $ (Cents)	CURRENT $ (Cents)	FY 2017 $ (Cents)
Historical								
2010	12.73	14.28	13.33	14.95	12.50	14.02	12.84	14.40
2015	14.64	15.08	14.38	14.81	13.20	13.59	14.16	14.59
2016	13.83	14.11	12.72	12.98	11.69	11.94	12.88	13.14
2017E	13.58	13.58	13.50	13.50	11.36	11.36	12.93	12.93
Forecast								
2018	13.76	13.51	13.65	13.40	11.51	11.31	13.10	12.86
2023	15.10	13.17	14.74	12.86	12.60	10.99	14.31	12.49
2028	16.65	12.85	16.01	12.36	13.89	10.72	15.71	12.12
2033	18.35	12.53	17.42	11.89	15.34	10.47	17.25	11.77
2038	20.18	12.22	18.82	11.39	16.90	10.23	18.84	11.41
Avg Annual Growth								
2010-17	0.9%	-0.7%	0.2%	-1.4%	-1.4%	-3.0%	0.1%	-1.5%
2017-18	1.3%	-0.5%	1.1%	-0.7%	1.4%	-0.5%	1.3%	-0.6%
2018-28	1.9%	-0.5%	1.6%	-0.8%	1.9%	-0.5%	1.8%	-0.6%
2018-38	1.9%	-0.5%	1.6%	-0.8%	1.9%	-0.5%	1.8%	-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 2017 $ (Cents)	CURRENT $ (Cents)	FY 2017 $ (Cents)	CURRENT $ (Cents)	FY 2017 $ (Cents)
Historical						
2010	219.16	240.87	220.12	241.93	219.49	241.23
2015	207.29	209.21	211.77	213.73	208.96	210.90
2016	146.17	146.17	147.01	147.01	146.47	146.47
2017E	162.31	162.31	160.79	160.79	161.46	161.46
Forecast						
2018	174.76	171.58	173.12	169.97	173.84	170.68
2023	253.68	221.35	251.31	219.27	252.36	220.19
2028	314.56	242.77	311.62	240.50	312.92	241.50
2033	362.34	247.42	358.95	245.10	360.44	246.12
2038	402.42	243.70	398.65	241.42	400.31	242.43
Avg Annual Growth						
2010-17	-4.2%	-5.5%	-4.4%	-5.7%	-4.3%	-5.6%
2017-18	7.7%	5.7%	7.7%	5.7%	7.7%	5.7%
2018-28	6.1%	3.5%	6.1%	3.5%	6.1%	3.5%
2018-38	4.3%	1.8%	4.3%	1.8%	4.3%	1.8%

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	11,243	16,733	27,976	1,580	6,332	7,912	12,823	23,065	35,888
2015	11,636	16,008	27,643	1,453	6,704	8,157	13,089	22,712	35,801
2016	11,851	15,687	27,538	1,469	6,476	7,944	13,320	22,163	35,483
2017E	13,031	17,569	30,600	1,605	6,967	8,572	14,636	24,536	39,172
Forecast									
2018	14,069	19,265	33,334	1,719	7,527	9,247	15,788	26,792	42,580
2023	15,728	25,837	41,565	1,848	9,361	11,209	17,576	35,198	52,774
2028	16,810	32,841	49,652	1,897	11,003	12,900	18,707	43,844	62,551
2033	18,798	41,437	60,235	2,034	12,797	14,831	20,832	54,233	75,065
2038	20,829	51,902	72,731	2,177	14,721	16,898	23,006	66,623	89,629
Avg Annual Growth									
2010-17	2.1%	0.7%	1.3%	0.2%	1.4%	1.2%	1.9%	0.9%	1.3%
2017-18	8.0%	9.7%	8.9%	7.1%	8.0%	7.9%	7.9%	9.2%	8.7%
2018-28	1.8%	5.5%	4.1%	1.0%	3.9%	3.4%	1.7%	5.0%	3.9%
2018-38	2.0%	5.1%	4.0%	1.2%	3.4%	3.1%	1.9%	4.7%	3.8%

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	6,865	1,991	8,348	5,860	23,065
2015	6,669	1,639	9,021	5,383	22,712
2016	6,601	1,566	8,761	5,253	22,181
2017E	7,061	1,689	9,939	5,848	24,536
Forecast					
2018	7,475	1,817	11,097	6,404	26,792
2023	9,203	2,030	14,706	9,259	35,198
2028	10,849	2,084	18,399	12,513	43,844
2033	12,676	2,178	23,096	16,283	54,233
2038	14,771	2,285	28,729	20,837	66,623
Avg Annual Growth					
2010-17	0.4%	-2.3%	2.5%	0.0%	0.9%
2017-18	5.9%	7.6%	11.7%	9.5%	9.2%
2018-28	3.8%	1.4%	5.2%	6.9%	5.0%
2018-38	3.5%	1.2%	4.9%	6.1%	4.7%

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				LARGE	REGIONAL	TOTAL
CALENDAR YEAR	2 ENGINE	3 ENGINE	4 ENGINE	TOTAL	2 ENGINE	3 ENGINE	4 ENGINE	TOTAL	JETS	JETS	JETS
Historical											
2010	3,120	8	1	3,129	470	9	43	522	3,651	71	3,722
2015	3,319	2	0	3,321	492	0	31	523	3,844	99	3,943
2016	3,457	2	0	3,459	490	0	27	517	3,976	97	4,073
2017E	3,539	1		3,540	517	0	0	517	4,057	98	4,155
Forecast											
2018	3,616	1	0	3,617	526	0	0	526	4,143	98	4,241
2023	3,710	1	0	3,711	601	0	0	601	4,312	80	4,392
2028	3,844	0	0	3,844	619	0	0	619	4,463	79	4,542
2033	4,012	0	0	4,012	718	0	0	718	4,730	78	4,808
2038	4,190	0	0	4,190	833	0	0	833	5,023	78	5,101
Avg Annual Growth											
2010-17	1.8%	-25.7%	N/A	1.8%	1.4%	N/A	-100.0%	-0.1%	1.5%	4.7%	1.6%
2017-18	2.2%	0.0%	N/A	2.2%	1.7%	N/A	N/A	1.7%	2.1%	0.0%	2.1%
2018-28	0.6%	N/A	N/A	0.6%	1.6%	N/A	N/A	1.6%	0.7%	-2.1%	0.7%
2018-38	0.7%	N/A	N/A	0.7%	2.3%	N/A	N/A	2.3%	1.0%	-1.1%	0.9%

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
2015	228	22	2	252	309	156	72	537	789
2016	235	19	2	256	328	149	77	554	810
2017E	243	16	2	261	360	149	85	594	855
Forecast									
2018	246	15	2	263	365	148	82	595	858
2023	254	11	2	267	415	109	97	621	888
2028	265	2	0	267	488	76	113	677	944
2033	270	0	0	270	621	37	129	787	1,057
2038	272	0	0	272	759	11	136	906	1,178
Avg Annual Growth									
2010-17	6.8%	-23.5%	N/A	-1.4%	4.5%	-4.1%	-1.9%	0.8%	0.1%
2017-18	1.2%	-6.3%	N/A	0.8%	1.4%	-0.7%	-3.5%	0.2%	0.4%
2018-28	0.7%	N/A	N/A	0.2%	2.9%	-6.4%	3.3%	1.3%	1.0%
2018-38	0.5%	N/A	N/A	0.2%	3.7%	-12.2%	2.6%	2.1%	1.6%

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]			GENERAL		AIR	GENERAL		TOTAL FUEL
FISCAL YEAR	DOMESTIC	INT'L.	TOTAL	AVIATION	TOTAL	CARRIER	AVIATION	TOTAL	CONSUMED
Historical									
2010	11,973	6,290	18,263	1,435	19,698	2	221	223	19,921
2015	12,682	6,481	19,163	1,383	20,545	2	196	198	20,743
2016	13,337	6,363	19,699	1,437	21,136	2	206	208	21,345
2017E	13,642	6,526	20,168	1,535	21,703	2	209	211	21,914
Forecast									
2018	14,169	6,717	20,886	1,615	22,502	2	207	209	22,711
2023	14,681	7,629	22,311	1,832	24,143	2	194	196	24,339
2028	15,157	8,496	23,653	1,967	25,620	2	188	190	25,810
2033	15,935	9,407	25,342	2,105	27,447	2	185	187	27,634
2038	16,804	10,374	27,178	2,247	29,424	2	184	186	29,610
Avg Annual Growth									
2010-17	1.9%	0.5%	1.4%	1.0%	1.4%	0.0%	-0.7%	-0.7%	1.4%
2017-18	3.9%	2.9%	3.6%	5.2%	3.7%	0.0%	-1.0%	-1.0%	3.6%
2018-28	0.7%	2.4%	1.3%	2.0%	1.3%	0.0%	-1.0%	-1.0%	1.3%
2018-38	0.9%	2.2%	1.3%	1.7%	1.4%	0.0%	-0.6%	-0.6%	1.3%

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)	2017 $ (Cents)
Historical								
2010	56.1	53.2	56.0	464	503	465	15.74	17.65
2015	59.9	62.6	60.0	475	695	480	10.94	11.27
2016	61.5	68.8	61.8	481	721	487	11.32	11.56
2017E	63.0	66.1	63.1	482	717	487	11.29	11.29
Forecast								
2018	64.0	66.4	64.0	484	720	489	11.30	11.09
2023	67.2	67.9	67.2	494	735	500	12.64	11.03
2028	69.7	69.4	69.7	504	750	510	13.98	10.79
2033	72.3	70.9	72.3	514	765	520	15.37	10.49
2038	75.1	72.4	75.0	525	780	530	16.80	10.17
Avg Annual Growth								
2010-17	1.7%	3.1%	1.7%	0.5%	5.2%	0.7%	-4.6%	-6.2%
2017-18	1.5%	0.5%	1.5%	0.4%	0.4%	0.4%	0.0%	-1.8%
2018-28	0.9%	0.4%	0.9%	0.4%	0.4%	0.4%	2.2%	-0.3%
2018-38	0.8%	0.4%	0.8%	0.4%	0.4%	0.4%	2.0%	-0.4%

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	75,030	1,347	76,377
2015	153	3	156	72,754	2,116	74,870
2016	152	4	155	72,964	2,556	75,520
2017E	148	3	152	71,502	2,463	73,965
Forecast						
2018	151	4	155	73,236	2,522	75,759
2023	163	4	166	80,390	2,769	83,159
2028	175	4	179	88,216	3,038	91,254
2033	191	4	196	98,395	3,389	101,784
2038	210	5	215	109,962	3,787	113,750
Avg Annual Growth						
2010-17	-1.2%	3.6%	-1.1%	-0.7%	9.0%	-0.5%
2017-18	2.0%	2.0%	2.0%	2.4%	2.4%	2.4%
2018-28	1.5%	1.5%	1.5%	1.9%	1.9%	1.9%
2018-38	1.6%	1.6%	1.6%	2.1%	2.1%	2.1%

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	98,461	75,030	76.2	1,857	1,347	72.5	100,318	76,377	76.1
2015	90,681	72,754	80.2	2,819	2,116	75.0	93,500	74,870	80.1
2016	91,158	72,964	80.0	3,506	2,556	72.9	94,665	75,520	79.8
2017E	90,853	71,502	78.7	3,374	2,463	73.0	94,226	73,965	78.5
Forecast									
2018	92,763	73,236	79.0	3,445	2,522	73.2	96,207	75,759	78.7
2023	100,829	80,390	79.7	3,744	2,769	73.9	104,573	83,159	79.5
2028	110,127	88,216	80.1	4,089	3,038	74.3	114,216	91,254	79.9
2033	122,514	98,395	80.3	4,549	3,389	74.5	127,063	101,784	80.1
2038	136,688	109,962	80.4	5,076	3,787	74.6	141,763	113,750	80.2
Avg Annual Growth									
2010-17	-1.1%	-0.7%		8.9%	9.0%	0.1%	-0.9%	-0.5%	
2017-18	2.1%	2.4%		2.1%	2.4%	0.3%	2.1%	2.4%	
2018-28	1.7%	1.9%		1.7%	1.9%	0.1%	1.7%	1.9%	
2018-38	2.0%	2.1%		2.0%	2.1%	0.1%	2.0%	2.1%	

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

TABLE 27

U.S. REGIONAL CARRIERS

PASSENGER AIRCRAFT

	REGIONAL AIRCRAFT											
AS OF	LESS THAN	10 TO 19	20 TO 30	31 TO 40 SEATS			OVER 40 SEATS			TOTAL FLEET		
JANUARY 1	9 SEATS	SEATS	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
2015	346	68	13	32	0	32	57	1,628	1,685	516	1,628	2,144
2016	365	55	0	59	0	59	40	1,637	1,677	519	1,637	2,156
2017E	321	65	10	26	0	26	65	1,644	1,709	487	1,644	2,131
Forecast												
2018	276	63	10	25	0	25	55	1,651	1,706	429	1,651	2,080
2023	220	50	8	20	0	20	53	1,716	1,769	351	1,716	2,067
2028	158	36	6	14	0	14	52	1,663	1,715	266	1,663	1,929
2033	101	23	4	9	0	9	50	1,756	1,806	187	1,756	1,943
2038	39	9	1	4	0	4	48	1,910	1,958	101	1,910	2,011
Avg Annual Growth												
2010-17	-4.4%	-4.8%	-26.0%	-21.7%	N/A	-23.7%	-5.8%	-0.7%	-0.9%	-7.8%	-0.9%	-2.9%
2017-18	-14.0%	-3.1%	N/A	-3.8%	N/A	-3.8%	-15.4%	0.4%	-0.2%	-11.9%	0.4%	-2.4%
2018-28	-5.4%	-5.4%	N/A	-5.6%	N/A	-5.6%	-0.6%	0.1%	0.1%	-4.7%	0.1%	-0.8%
2018-38	-9.3%	-9.3%	N/A	-8.8%	N/A	-8.8%	-0.7%	0.7%	0.7%	-7.0%	0.7%	-0.2%

TABLE 28

ACTIVE GENERAL AVIATION AND AIR TAXI AIRCRAFT

	FIXED WING														
	PISTON			TURBINE			ROTORCRAFT				LIGHT		TOTAL GENERAL		
AS OF DEC. 31	SINGLE ENGINE	MULTI-ENGINE	TOTAL	TURBO PROP	TURBO JET	TOTAL	PISTON	TURBINE	TOTAL	EXPERI-MENTAL**	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
2015	127,887	13,254	141,141	9,712	13,440	23,152	3,286	7,220	10,506	27,922	2,369	4,941	210,031	144,427	30,372
2016	129,652	12,986	142,638	9,779	13,751	23,530	3,344	7,233	10,577	27,585	2,478	4,986	211,794	145,982	30,763
2017E	130,330	12,935	143,265	9,430	14,075	23,505	3,405	7,400	10,805	27,865	2,585	5,025	213,050	146,670	30,905
Forecast															
2018	130,500	12,895	143,395	9,195	14,390	23,585	3,465	7,565	11,030	28,140	2,705	5,050	213,905	146,860	31,150
2023	125,330	12,720	138,050	9,025	16,220	25,245	3,750	8,375	12,125	29,595	3,330	5,045	213,390	141,800	33,620
2028	118,740	12,465	131,205	9,870	18,120	27,990	4,035	9,200	13,235	30,980	3,995	5,060	212,465	135,240	37,190
2033	112,620	12,170	124,790	11,225	20,085	31,310	4,345	10,105	14,450	32,105	4,705	5,060	212,420	129,135	41,415
2038	107,800	11,845	119,645	12,855	22,195	35,050	4,675	11,110	15,785	33,105	5,440	5,065	214,090	124,320	46,160
Avg Annual Growth															
2010-17	-1.0%	-2.9%	-1.2%	0.1%	2.9%	1.7%	-0.7%	1.8%	1.0%	1.7%	-12.4%	-1.7%	-0.7%	-1.1%	1.8%
2017-18	0.1%	-0.3%	0.1%	-2.5%	2.2%	0.3%	1.8%	2.2%	2.1%	1.0%	4.6%	0.5%	0.4%	0.1%	0.8%
2018-28	-0.9%	-0.3%	-0.9%	0.7%	2.3%	1.7%	1.5%	2.0%	1.8%	1.0%	4.0%	0.0%	-0.1%	-0.8%	1.8%
2018-38	-1.0%	-0.4%	-0.9%	1.7%	2.2%	2.0%	1.5%	1.9%	1.8%	0.8%	3.6%	0.0%	0.0%	-0.8%	2.0%

* Source: 2001-2010, 2012-2016, 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				LIGHT		GENERAL		
AS OF DEC. 31	SINGLE ENGINE	MULTI-ENGINE	TOTAL	TURBO PROP	TURBO JET	TOTAL	PISTON	TURBINE	TOTAL	EXPERI-MENTAL**	SPORT AIRCRAFT**	OTHER	AVIATION FLEET	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
2015	11,217	1,608	12,825	2,538	3,837	6,375	798	2,496	3,294	1,295	191	162	24,142	13,623	8,871
2016	11,865	1,683	13,548	2,708	3,847	6,554	780	2,348	3,128	1,224	187	193	24,834	14,328	8,902
2017E	11,878	1,666	13,543	2,674	4,274	6,948	810	2,427	3,237	1,248	197	195	25,369	14,353	9,376
Forecast															
2018	11,765	1,647	13,412	2,642	4,604	7,246	834	2,510	3,344	1,273	208	196	25,679	14,246	9,756
2023	10,608	1,578	12,187	2,621	5,616	8,237	933	2,884	3,817	1,415	269	196	26,120	13,119	11,122
2028	10,021	1,546	11,567	2,863	6,331	9,194	1,009	3,239	4,248	1,556	336	196	27,097	12,576	12,433
2033	9,625	1,545	11,170	3,259	7,067	10,326	1,088	3,593	4,681	1,677	409	197	28,460	12,257	13,919
2038	9,419	1,556	10,976	3,742	7,849	11,591	1,172	3,980	5,152	1,799	490	198	30,206	12,148	15,571
Avg Annual Growth															
2010-17	-0.3%	-1.2%	-0.5%	2.0%	3.4%	2.9%	0.3%	-1.0%	-0.7%	0.3%	-6.3%	1.1%	0.3%	-0.4%	1.7%
2017-18	-0.9%	-1.1%	-1.0%	-1.2%	7.7%	4.3%	3.0%	3.4%	3.3%	2.0%	5.5%	0.5%	1.2%	-0.7%	4.1%
2018-28	-1.6%	-0.6%	-1.5%	0.8%	3.2%	2.4%	1.9%	2.6%	2.4%	2.0%	4.9%	0.0%	0.5%	-1.2%	2.5%
2018-38	-1.1%	-0.3%	-1.0%	1.8%	2.7%	2.4%	1.7%	2.3%	2.2%	1.7%	4.4%	0.1%	0.8%	-0.8%	2.4%

* Source: 2001-2010, 2012-2016, 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
2015	190	5,482	170,718	101,164	154,730	15,566	19,460	467,310	304,329
2016	175	5,889	162,313	96,081	157,894	15,518	17,991	455,861	302,572
2017	153	6,097	162,455	98,161	159,825	15,355	18,139	460,185	306,652
Forecast									
2018	150	6,385	162,450	96,650	161,300	15,250	18,050	460,235	307,000
2023	125	7,915	157,450	92,000	165,900	15,650	17,650	456,690	308,600
2028	100	9,520	149,600	90,150	171,000	17,100	17,350	454,820	313,000
2033	85	11,050	142,400	89,400	177,100	18,950	17,150	456,135	318,600
2038	65	12,340	136,650	89,150	183,900	21,050	17,100	460,255	325,100
Avg Annual Growth									
2010-17	-4.6%	7.5%	-3.1%	-3.3%	1.7%	0.0%	-2.3%	-1.4%	-0.5%
2017-18	-2.0%	4.7%	0.0%	-1.5%	0.9%	-0.7%	-0.5%	0.0%	0.1%
2018-28	-4.0%	4.1%	-0.8%	-0.7%	0.6%	1.2%	-0.4%	-0.1%	0.2%
2018-38	-4.1%	3.3%	-0.9%	-0.4%	0.7%	1.6%	-0.3%	0.0%	0.3%

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

*Starting in 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. As the implementation is very new and there is not sufficient data 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		EXPERI-				
CALENDAR YEAR	SINGLE ENGINE	MULTI-ENGINE	TURBO PROP	TURBO JET	PISTON	TURBINE	MENTAL* * / OTHER	LIGHT SPORT**	AVGAS	JET FUEL	TOTAL
Historical*											
2010	133	54	187	1,123	11	125	22	1	221	1,435	1,656
2015	128	40	191	1,063	10	128	15	1	196	1,383	1,578
2016	137	42	207	1,117	10	113	17	1	206	1,437	1,643
2017E	137	42	203	1,211	10	121	20	1	209	1,535	1,744
Forecast											
2018	135	41	200	1,291	10	124	20	1	207	1,615	1,823
2023	121	39	194	1,498	12	140	21	1	194	1,832	2,026
2028	114	38	207	1,606	12	153	22	2	188	1,967	2,155
2033	108	37	232	1,705	13	167	24	2	185	2,105	2,290
2038	104	38	260	1,801	14	186	25	3	184	2,247	2,430
Avg Annual Growth											
2010-17	0.4%	-3.5%	1.2%	1.1%	-0.8%	-0.5%	-1.2%	N/A	-0.7%	1.0%	0.7%
2017-18	-1.0%	-1.5%	-1.7%	6.6%	2.6%	2.9%	-1.3%	2.4%	-1.0%	5.2%	4.5%
2018-28	-1.7%	-0.9%	0.4%	2.2%	1.8%	2.1%	1.4%	4.7%	-1.0%	2.0%	1.7%
2018-38	-1.3%	-0.4%	1.3%	1.7%	1.7%	2.0%	1.3%	4.3%	-0.6%	1.7%	1.4%

*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)

	AIR	AIR TAXI/	GENERAL AVIATION			MILITARY				NUMBER OF TOWERS	
FISCAL YEAR	CARRIER	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
2015	13,755	7,895	13,887	11,691	25,578	1,292	1,203	2,495	49,722	264	252
2016	14,417	7,580	13,904	11,632	25,536	1,317	1,145	2,462	49,995	264	252
2017E	15,047	7,179	13,838	11,732	25,570	1,326	1,200	2,526	50,322	264	253
Forecast											
2018	15,677	7,037	13,868	11,939	25,807	1,326	1,200	2,526	51,047	264	253
2023	18,617	5,442	14,040	12,136	26,176	1,326	1,200	2,526	52,761	264	253
2028	20,418	5,672	14,217	12,338	26,555	1,326	1,200	2,526	55,171	264	253
2033	22,336	5,971	14,399	12,547	26,947	1,326	1,200	2,526	57,780	264	253
2038	24,362	6,288	14,587	12,764	27,351	1,326	1,200	2,526	60,527	264	253
Avg Annual Growth											
2010-17	2.5%	-3.8%	-1.0%	0.0%	-0.6%	0.2%	-1.1%	-0.4%	-0.3%		
2017-18	4.2%	-2.0%	0.2%	1.8%	0.9%	0.0%	0.0%	0.0%	1.4%		
2018-28	2.7%	-2.1%	0.2%	0.3%	0.3%	0.0%	0.0%	0.0%	0.8%		
2018-38	2.2%	-0.6%	0.3%	0.3%	0.3%	0.0%	0.0%	0.0%	0.9%		

Source: FAA Air Traffic Activity.

TABLE 33

TOTAL TRACON OPERATIONS

(In Thousands)

FISCAL YEAR	AIR CARRIER	AIR TAXI/ COMMUTER	GENERAL AVIATION	MILITARY	TOTAL
Historical					
2010	13,174	9,511	13,864	2,438	38,987
2015	13,948	7,861	13,076	2,286	37,171
2016	14,640	7,672	13,090	2,311	37,713
2017E	15,276	7,281	13,276	2,254	38,085
Forecast					
2018	15,902	7,176	13,317	2,254	38,649
2023	18,819	5,351	13,537	2,254	39,961
2028	20,626	5,583	13,841	2,254	42,303
2033	22,550	5,895	14,166	2,254	44,865
2038	24,582	6,226	14,505	2,254	47,567
Avg Annual Growth					
2010-17	2.1%	-3.7%	-0.6%	-1.1%	-0.3%
2017-18	4.1%	-1.4%	0.3%	0.0%	1.5%
2018-28	2.6%	-2.5%	0.4%	0.0%	0.9%
2018-38	2.2%	-0.7%	0.4%	0.0%	1.0%

Source: FAA Air Traffic Activity.

TABLE 34

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

	IFR AIRCRAFT HANDLED				
FISCAL YEAR	AIR CARRIER	AIR TAXI/ COMMUTER	GENERAL AVIATION	MILITARY	TOTAL
Historical					
2010	22,342	8,624	6,550	2,982	40,498
2015	25,270	7,847	7,007	1,795	41,918
2016	26,318	7,787	7,301	1,826	43,231
2017E	26,074	8,591	7,428	1,765	43,857
Forecast					
2018	27,896	7,525	7,513	1,765	44,699
2023	31,120	6,640	7,737	1,765	47,261
2028	34,780	6,332	8,039	1,765	50,916
2033	38,437	6,400	8,411	1,765	55,013
2038	42,174	6,614	8,822	1,765	59,374
Avg Annual Growth					
2010-17	2.2%	-0.1%	1.8%	-7.2%	1.1%
2017-18	7.0%	-12.4%	1.1%	0.0%	1.9%
2018-28	2.2%	-1.7%	0.7%	0.0%	1.3%
2018-38	2.1%	-0.6%	0.8%	0.0%	1.4%
Source: FAA Air Traffic Activity					