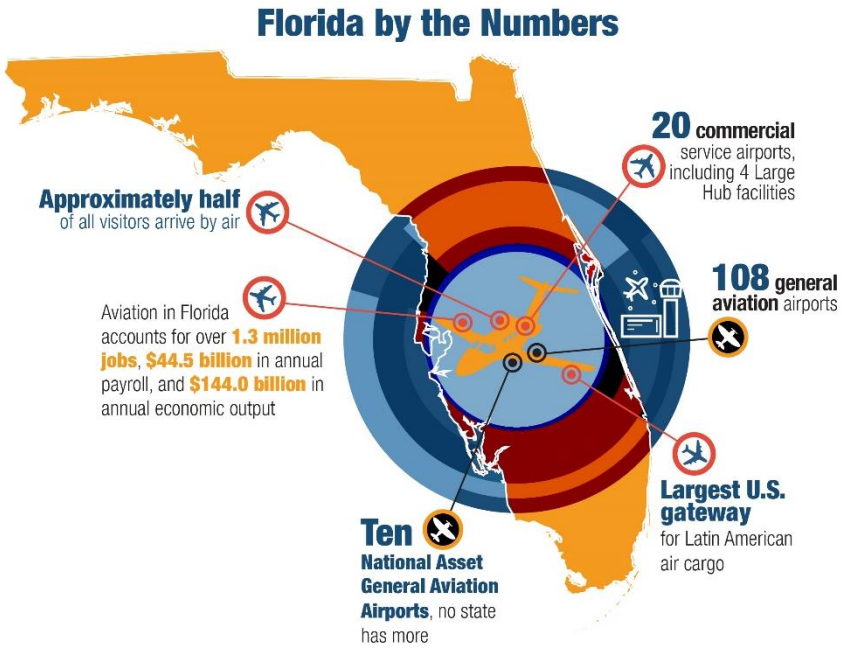
2 Florida's Aviation History and Identification of Current Issues

2.1 Current Florida System Overview

Florida offers the most dynamic and progressive aviation system in the United States (U.S.). The state's 128 public-use commercial service and general aviation (GA) airports (see **Figure 2-1**) supported nearly nine million aircraft operations in 2015, and that number is anticipated to continuously rise over the next 20 years. International air cargo is a multi-billion-dollar industry with over $64 billion in total air trade value in 2014. In total, 2.7 million tons of domestic and international air cargo passed through Florida's airports in 2014. Air transportation serves as a backbone of the state's tourism economy and links rural communities to lifesaving amenities, such as emergency medical care and firefighting services.

Figure 2-1: Florida by the Numbers



Aviation in Florida supports the economy, as well as the safety, resiliency, and security of the state's residents, visitors, and businesses. Over the past several years, a number of major shifts have impacted the aviation industry in Florida and across the U.S. Against a background of rapidly evolving industry trends, the Florida Department of Transportation (FDOT) Aviation and Spaceports Office (ASO), with the assistance of the Continuing Florida Aviation System Planning Process (CFASPP), updated the Florida Aviation System Plan (FASP) to ensure Florida's airports continue to provide a high level of service to all users. The FASP 2035 Update is grounded on the framework of the Florida Transportation Plan (FTP), the single overarching statewide plan guiding Florida's transportation future.

An initial task of the FASP was to examine the history of aviation in Florida and the issues currently affecting the airport system. With a long history of innovation and firsts, Florida's airport system continues to experience change that impacts its needs and must be considered in the context of the entire Florida transportation system. This historical perspective and identification of specific issues that are impacting or have the potential to impact Florida's aviation system provides a

backdrop for understanding the need to consider how the system might respond to address future activities.

2.2 History of Aviation in the State of Florida

Since the Wright brothers flew the first powered aircraft in Kitty Hawk, North Carolina on December 17, 1903, significant developments in the aviation industry have occurred around the world and in the Sunshine State. From the first commercial aircraft flight in St. Petersburg more than 100 years ago to the present day launches into space at Cape Canaveral, Florida has been at the forefront of aviation and aerospace development. Florida continues to advance aviation with research and training at leading aeronautical universities and growth in numerous sectors of the aviation industry, such as aircraft manufacturing.

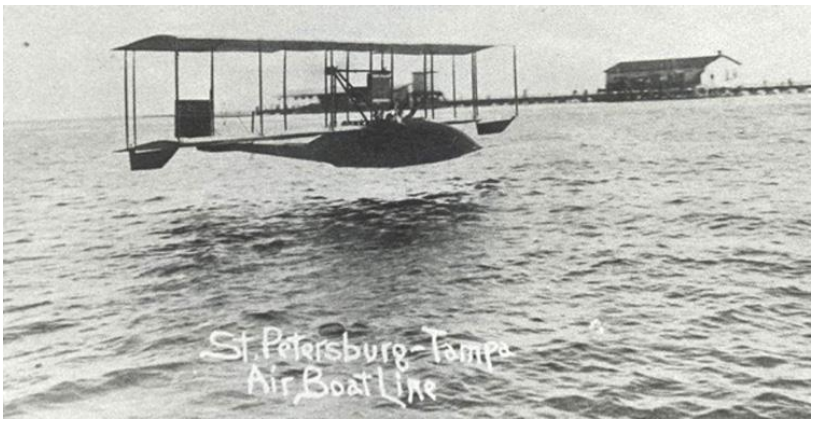
These historic advances have helped shape the future of the industry and have set the framework for the state of Florida to become one of the most active and dynamic aviation states in the U.S., serving to advance the industry and promote large-scale technological advancement. Very few states have played such an important role in aviation as the state of Florida.

2.2.1 First Commercial Flight in the U.S.

While the Wright brothers first flight was a remarkable achievement, aviation was still in its infancy at the turn of the 20th century. It took nearly a decade before aviation made its first tentative steps toward becoming a world-altering industry and Florida led the way. Advancing the aviation industry in the state of Florida, Percival E. Fansler conceptualized the development of the world's first commercial airline. Fansler, an electrical engineer from Jacksonville, teamed up with Thomas Benoist, owner of airboat manufacturer Benoist Aeroplane Company, to harness expertise and move forward in pursuing his goal.

Fansler negotiated with the City of St. Petersburg in order to make his idea of a commercial airline a reality. An auction was held for the inaugural flight, which was won by former St. Petersburg Mayor Abram Pheil who had bid $400 (approximately $9,500 in 2015 dollars) for the opportunity to be the first commercial airline passenger.

Figure 2-2: St. Petersburg-Tampa Air Boat Line



Source: http://www.historynet.com/st-petersburgtampa-airboat-line-worlds-first-scheduled-airline-using-winged-aircraft.htm

On January 1, 1914, the first commercial flight commenced at the Municipal Pier in St. Petersburg (see **Figure 2-2**). In view of more than 3,000 spectators, test pilot Tony

Jannus and Pheil took off on their flight, which landed 23 minutes later in Tampa's Hillsborough River. Following this historic flight, Jannus made a minimum of two regularly scheduled round trips to and from St. Petersburg and Tampa for the next few months before a final flight on May 5, 1914.

2.2.2 First International Flight

Pan American World Airways (Pan Am) was founded on March 14, 1927 by Majors Henry H. "Hap" Arnold, Carl A Spaatz, and John H. Jouett. After Arnold, Spaatz, and Jouett secured financing for the airline, the team pursued the goal of obtaining the U.S. Mail delivery contract to Cuba.

The Pan Am delivery contract was approved by the U.S. government under the assumption that there would be no competition for routes between Latin America and the U.S. Although the contract was approved and landing rights secured in Cuba, they had no plane capable of making the trip. Therefore, Pan Am looked to Aviation Corporation of the Americas (ACA), owner of a Fairchild F-2 Seaplane, to make the historic first flight. On October 28, 1927, Pan Am Flight No. 1 departed Key West, Florida, bound for Havana, Cuba, and performed the first scheduled international air service flight in U.S. history (see **Figure 2-3**).

Figure 2-3: Pan Am First Scheduled International Air Service Flight

PAN AM HISTORICAL FOUNDATION

FOKKER F-VII GENERAL MACHADO, FLEW THE FIRST PAA AIR MAIL FLIGHT FROM KEY WEST TO HAVANA OCTOBER 28, 1927

Source: Pan Am Historical Foundation

2.2.3 Wartime Pilot Training State

On April 6, 1917, the U.S. joined its allies—Britain, France, and Russia—to fight in World War I. During this time, the use of balloons was fairly commonplace and as aircraft were a relatively new technology, their usefulness during the war was often debated. Further into the 20th century, aircraft were employed in a number of wartime purposes, including reconnaissance, aerial combat, bombing, and ground attacks.

Shortly after the acceptance of aircraft as a tool of utilization, the U.S. Army identified the need to establish multiple training areas for its pilots. Due to its favorable weather conditions, Florida was a desirable location for training facilities. Army survey crews were sent to Florida in an effort to identify sites that would be suitable to construct airfields for military pilot training. The U.S. Army

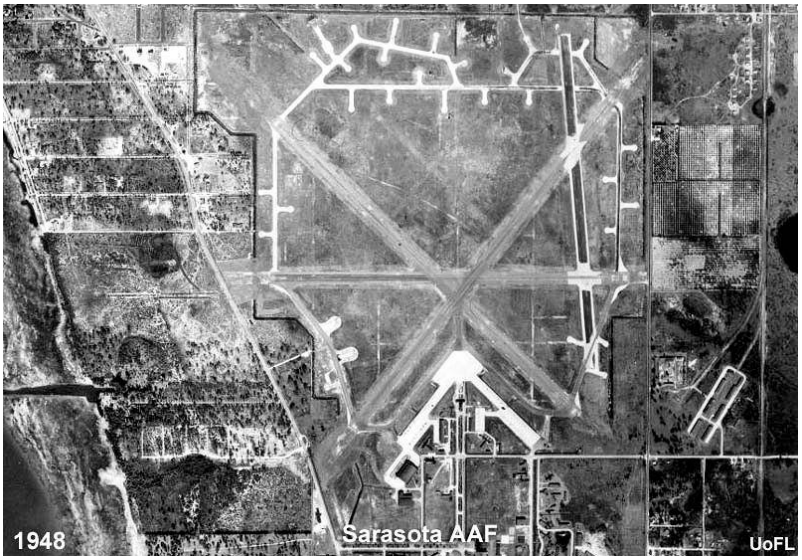
identified four sites in the Sunshine State—Carlstrom Field, which was located approximately six miles southwest of Arcadia; Dorr Field, which was located approximately 12 miles southwest of Arcadia; Valentine Field which was located in Labelle; and, finally, Chapman Field, which was located in Miami. The U.S. Army developed a number of hangars, barracks, a hospital, and other buildings that were utilized to support the military training efforts.

Figure 2-4: Sarasota Bradenton International Airport – Today

Source: http://srq-airport.com/noise-abatement

Dorr and Valentine fields served as auxiliary fields for Carlstrom; whereas, Chapman Field served as an aerial gunnery training facility. Upon Germany's surrender in World War I, Brigadier General Billy Mitchell, then commander of American air combat units in France, stated, "the only damage that has come to [Germany] has been through the air." The pilot training facilities in Florida were credited with producing some of the most skilled pilots leading to the air superiority of the allied forces.

Figure 2-5: Sarasota Army Airfield – 1948



Source: U.S. Department of Agriculture

The Japanese aerial attack on Pearl Harbor demonstrated early on that World War II would be a battle of the skies as much as it would be on the ground. In support of this need, the military invested immense funding to construct and improve a number of airfields within the state of Florida. Florida was preferable for aviation training due to its flat terrain and favorable weather conditions. By the mid-1940s, there were 40 airfields within the state utilized to train military personnel. By the end of the war, there were

approximately 172 military installations within the state, spanning from Key West to Pensacola. At the same time, as many as two million servicemen and women called Florida their home. After the allies' successful efforts in World War II, a large percentage of the military airfields throughout the state were deactivated and transferred back to their original owners. Following this transfer, some facilities were repurposed for non-aviation use, but most of them are presently operated as commercial service and GA airports, which has contributed to the extensive system of 128 public-use airports operating in Florida today. One example is the Sarasota Bradenton International Airport (**Figure 2-4**), which was once known as the Sarasota Army Airfield (**Figure 2-5**), a combat training base for new pilots. The airport was returned to civil use in 1946 after World War II.

2.2.4 First Modern Terminal to International Gateway

In 1927, Pan Am executives decided to relocate their base of operations from Key West to Miami. For the purpose of constructing a new airport facility, Pan Am purchased 116 acres along NW 36th Street from the Seminole Fruit and Land Company. When scheduled service began in September of 1928, three runways were constructed, and a $50,000 terminal was added, retrofitted from a modernized hangar facility (see **Figure 2-6**).

During the first year of operation, 8,600 passengers and 20 tons of freight were processed through the airport. In 1946, the Miami Dade Port Authority was created, acquiring the 223-acre airport along with an adjacent 262-acre tract of land. The airport was renamed the Miami International Airport.

Figure 2-6: Pan American Airways System Terminal Building, 3500 Pan American Drive, Miami, Miami-Dade

Source: U.S. Library of Congress

In February of 1957, a new $21 million terminal complex was constructed and in subsequent years additional hangar facilities and other improvements occurred. By the early 1960s, 32 scheduled airlines and 67 non-scheduled commercial carriers were operating at the airport. In 1977, the International-Satellite Terminal was opened and Runway 09R-27L was extended to a length of 13,000 feet. Over the next 35 years, the airport continued to grow through the addition of new terminal facilities, airport traffic control towers, people-mover systems, and rental car facilities.

Currently, Miami International Airport is one of the largest cargo airports in the country—ranked first in international freight among U.S. airports and ninth in international freight in the world.

Miami International Airport is the number one importer of flowers, fruits and vegetables, and fish in the entire country. Additionally, due to its location in Southeast Florida, Miami International Airport is ideally positioned to service the Caribbean and Latin America. Referred to as the "largest U.S. gateway for Latin America and the Caribbean," Miami International Airport was ranked second among U.S. airports in international passengers, and 10th in total passengers in 2013.

2.2.5 Aircraft Manufacturing

Over the years, Florida has managed to attract multiple aircraft manufacturing companies to the state, a notable achievement given the small number of aircraft manufacturers found in the U.S. Embraer Aircraft first established itself in Florida in 1979, having started as a Brazilian manufacturer of turboprop passenger airliners in 1969. It later moved its U.S. headquarters to Fort Lauderdale and selected Melbourne as the site of Phenom jet production facility, which started producing the corporate jet in 2011.[1] In August 2014, the company announced plans to build a $48 million facility in Melbourne that is expected to deliver Legacy 450 and 500 business jets starting in 2016.[2]

The roots of Piper Aircraft, best known for the iconic two-seat J-3 Cub aircraft, can be traced back to the late 1930s, when it started manufacturing small GA aircraft in Pennsylvania. The company began operations in Florida when it opened its Vero Beach offices in 1955, with aircraft production commencing in the early 1960s. Flooding of the company's Pennsylvania facilities in 1972 resulted in production shifting to Florida. Increased costs associated with product liability in the 1980s, which affected all GA manufacturers, drove Piper into bankruptcy in the 1990s. Piper emerged from bankruptcy in 1995 under new ownership. Control of the company changed hands several times after 2000, ultimately winding up in the hands of the government of Brunei in 2009. Its Vero Beach facility produces piston-powered single- and twin-engine GA aircraft, along with a single-engine turboprop model, the M500.[3] More recently, the company announced plans for a new turboprop aircraft, the M600, aimed at corporate customers instead of the traditional owner-flown customer. The company expects that demand for the M600 will drive new hiring.[4]

2.2.6 One of the Largest Airshows in the World

In 1974, the Experimental Aircraft Association (EAA) decided to organize a fly-in for aviation enthusiasts at the Lakeland Linder Regional Airport. The first fly-in occurred in January of 1975 and was limited strictly to pilots, EAA, Southeastern Sport Aviation Council (SESAC), and Florida Sport Aviation Antique and Classic Association (FSAACA) members. Despite this limitation, 1,980 guests and 365 aircraft attended the event. Due to its popularity, the event was expanded the following year to span an entire week. Since the early days of what is now Sun 'n Fun, the event

[1] Hemlock, D. and Close, K. (2014). "Brazil's Embraer Flying High in the United States," *Sun Sentinel*, August 31, 2014.
[2] Moorman, R. (2015). "Embraer to Build Legacy 450 and 500 in Florida," *Aviation Week*, June 15, 2015.
[3] www.piper.com/history/
[4] Ivice, P. and Kaiser, M. (2015). "Piper to Hire More Employees to Build New Planes," *TCPalm*, April 13, 2015.

has continued to increase in popularity and has subsequently continued to grow in attendance. In addition, new facilities have been constructed, including an Air Museum as well as an aviation-oriented high school facility that can accommodate up to 500 students.

The annual Sun 'n Fun International Fly-In & Expo at the Lakeland Linder Regional Airport is now the second largest airshow in the world (based on number of aircraft) and is the single largest convention in the state of Florida. Currently, "more than 200,000 people converge in Polk County to see an airshow, visit 500 exhibits, earn education credits at workshops and forums, introduce children to the world of aviation and view more than 4,500 aircraft from homebuilt to warbirds on 2,200 acres" (**Figure 2-7**).

Figure 2-7: Sun 'n Fun International Fly-In & Expo

Source: www.visitcentralflorida.org

2.2.7 U.S. Sport Aviation Expo

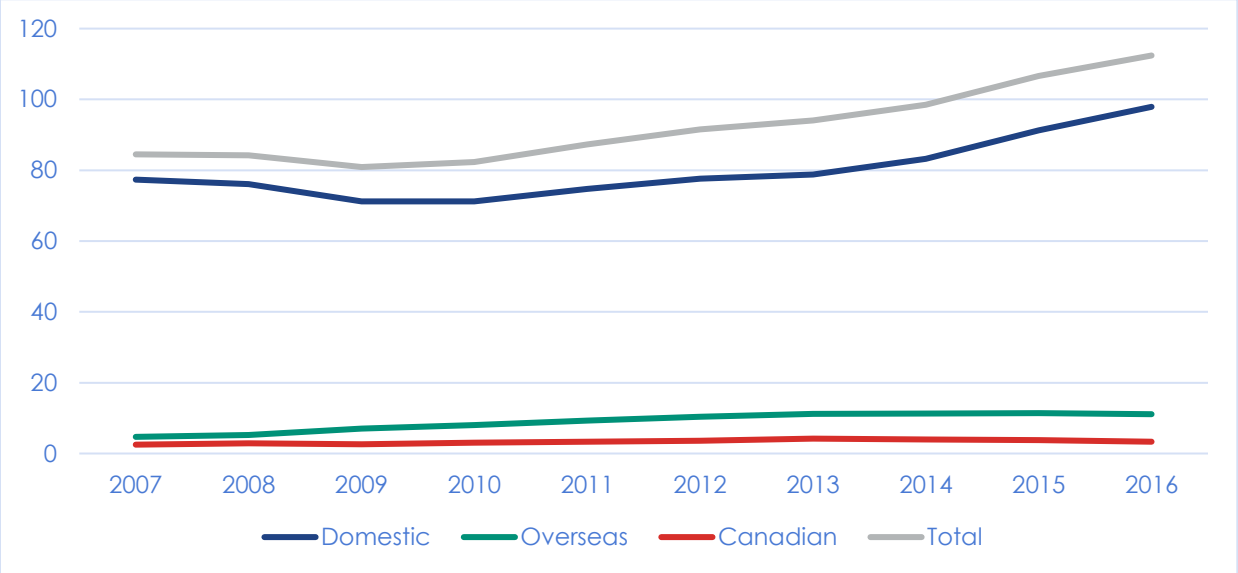
On July 20, 2004, the Federal Aviation Administration (FAA) released a new regulation which created a new category of aircraft known as the Light Sport Aircraft (LSA). Establishing this new category set standards and created rules for pilots of those aircraft that were previously unregulated. Sebring Regional Airport helped orchestrate the first U.S. Sport Aviation Expo, which began in 2004. The expo created a venue for LSA and equipment manufacturers to showcase their products. Since its inception in 2004, the event has continued to grow on an annual basis with an increasing number of both exhibitors and attendees. In 2014, approximately 16,000 people attended the expo, 30 percent of which came from outside of Florida and some visited from as far away as China, New Zealand, Africa, Romania, Australia, Italy, and the Czech Republic.

2.2.8 Growth of Population and Tourism Since 1920

The three largest factors which determine the need for aviation services are business, population, and tourism. The resident population itself directly creates aviation demand; however, the state's unique tourism industry lures a substantial number of visitors to Florida annually that also desire to travel by air. In the last 95 years, Florida's population has increased 20 times over—from 970,000 in 1920 to an estimated 20 million in 2015. The abundance of jobs in Florida and associated income created are directly attributable to the recreational and corporate aviation needs that impact the state's GA airports. During the early 1930s and 1940s, the state's largest assets included beaches, tropical climate, and the abundance of jobs that were created by recent influx of military activity. From 1959 through 1973, four notable attractions emerged which sparked and continued to fuel the state's tourism industry and ignite Florida's aviation industry indefinitely: Busch Gardens (1959 with a large expansion in 1965),

Daytona International Speedway (1959), Walt Disney World (1971), and Sea World Orlando (1973). Between 1989 and 1990, Hollywood Studios and Universal Studios opened. According to Visit Florida, nearly 115 million tourists visited the state of Florida in 2016, and this number continues to grow on an annual basis (see **Table 2-1**). Florida is one of the most traveled tourist destinations in the world.

Table 2-1: Historic Visitor Estimates (in millions)



Source: TNS TravelsAmerica; D.K. Shifflet & Associates, Inc; Individual Florida Airports; Statistics Canada; U.S. Department of Commerce, ITA, Tourism Industries; Visa Vue Travel; Diio, LLC aviation data

Notes: 2016 figures are preliminary; some figures may not add up due to rounding
In 2009 Visit Florida changed its visitor estimation methodology; therefore, estimates made prior to that year are not directly compariable.
In 2013, Statistics Canada implemented a major modernization initiative for the International Travel Survey (ITS) to improve the quality of its data and processes. According to Statistics Canada, any historical data comparisons should be made with caution. Therefore, it is highly likely that most of the year to year change shown for Canada in the table is results from the new methodology.

In addition to multiple tourist attractions, the state of Florida has five cruise ports, located in Tampa, Jacksonville, Port Canaveral, Fort Lauderdale, and Miami. These ports are regularly visited by residents and out-of-state visitors who take cruise vacations from Florida to destinations located throughout the Caribbean and as far south as South America. Each port is located within a short drive from one of Florida's commercial airports. In fiscal year (FY) 2012, Florida ports combined to report almost 14 million cruise passenger embarkations and debarkations (revenue passengers), with projected growth to 21.6 million by FY 2026, according to *Florida's Cruise Industry: A Statewide Perspective*.

With over half of the current business and recreational visitors to Florida traveling by air, the aviation presence within the state has increased tremendously and this growth continues to increase at a very rapid rate. Of the 128 public-use airports in the state, 20 provide commercial service as of 2017. Florida is the only state with four large hub airports—all of which ranked in the top 30 nationally in total passenger enplanements for 2014 (Miami International Airport – 11th,

Orlando International Airport – 14h, Fort Lauderdale International Airport – 21st, and Tampa International Airport – 29th). Collectively, more than 116 million passengers are processed through these four facilities on an annual basis.

2.2.9 Flight Training and Education

Florida is one of the busiest states in the country for both rotary-wing and fixed-wing aircraft flight instruction. Approximately 20 percent of the pilots throughout the world are trained in the Sunshine State.

In addition to flight training, there are two major universities catering specifically to students pursuing careers within the aviation industry. Florida Institute of Technology (FIT), which is located in Melbourne, Florida, was founded in 1958 as Brevard Engineering College to provide advanced education for professionals working in the space program. During the 2012-2013 academic year, FIT served approximately 16,000 students. Similar to FIT, Embry-Riddle Aeronautical University also offers a number of aviation-related degree programs. Embry-Riddle was founded in 1925 in Cincinnati, Ohio, for the purpose of training airmail pilots. Since 1965, the main campus has been the Daytona Beach location. Approximately 32,000 students are enrolled annually in the various undergraduate and graduate programs offered at Embry-Riddle.

2.3 Airport Issues

The aviation climate is constantly evolving with advances in technology, changes in the economy, and new and updated regulatory requirements. Understanding the numerous factors that can influence aviation in Florida, both GA and commercial airline service, during the 20-year planning period is important to prepare the system appropriately. These factors could potentially influence many characteristics of aviation within the state, including operational activity, flight hours, navigation, pilot growth, and other facets of aviation:

- Aging population
- Airline pilot shortage
- Autonomous vehicles (ground-based)
- Competition for space operations
- Contract towers
- Customs & Immigration
- Electric aircraft
- Florida economy
- Future of aviation gasoline (avgas)
- Legalization of gambling
- Medical certificate reform for Part 91 operations
- Next Generation Air Transportation System (NextGen) requirements (navigation and communication)
- Opening of Cuba market
- Pandemic fears

- Price of oil
- Reaction to terrorist activity
- Reduction in numbers of GA pilots
- Reliance on tourism
- Remote control towers
- Shortfall of aviation maintenance personnel
- Sustainability
- Transportation Security Administration (TSA) staffing
- Unmanned aircraft systems

Each of these topics is discussed in this section determine their impact, duration, and immediacy on both commercial service and GA study airports in the FASP. A more detailed industry perspective of a few of these topics is included in **Section 2.4 – Aviation Industry Trends.**

2.3.1 Aging Population

The demand for both commercial and GA services is closely tied to various demographic factors, most importantly population. Indicators that have been proven by the FAA to have a high correlation with demand for aviation services include population trends and growing demand on the aviation system. According to U.S. Census population data, Florida has been and will continue to be one of the fastest growing states in the U.S.

Aging population highlights:

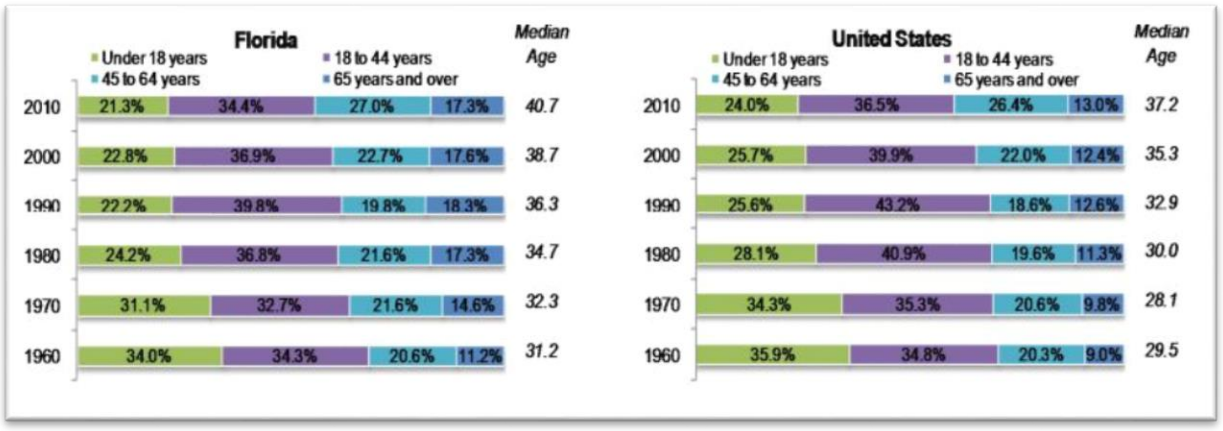
- Current population growth and growth trends are expected to continue, causing increasing congestion on Florida's modal transportation. Air travel and aviation facilities are key to meeting Florida's in-state travel needs now and in the future.[5]
- Each day, more than 900 new residents move to Florida. In 1970, the state had fewer than 7 million residents. Today, there are almost 19 million. An increase to 24 million residents is expected by 2025.
- Rapid growth strains all state infrastructures, especially the airport system. As the state's population continues to grow, demand for in-state, domestic, and international air travel will increase, as will the need to ship and receive goods by air.[5]
- The West Central Metropolitan Area (Tampa), the East Central Metropolitan Area (Orlando), and the Southeast Florida Metropolitan Area (Palm Beach, Fort Lauderdale, and Miami) have and will continue to have the highest concentrations of the state's population through 2025. The areas around Jacksonville, Fort Myers, and Pensacola are also projected to experience rapid population growth,[5] thus affecting the major airports in these regions of the state.
- Florida's population will become steadily older as the Baby Boom generation enters retirement (see **Table 2-2**). The senior age group will account for almost 40 percent of Florida's projected population increase between now and 2025. Florida's airports need

[5] http://www.cfaspp.com/FASP/Documents/634763253312886250-Florida_2025_Revised_2012.pdf

to become senior-friendly in their signage, audio systems, passenger accommodations, and intermodal connections.[5]

- Between 2010 and 2030, Florida's population is forecast to grow by almost 4.8 million. Florida's older population (age 60 and older) will account for most of Florida's population growth, representing 56.9 percent of the gains.[6]
- In order to accommodate the transportation needs of the elderly, consideration should be given to programs that offer increased mobility to the elderly through alternative transportation options. Providing more public transportation for the elderly and for caregivers, more private sector transportation from businesses that serve the elderly, and improved mass transit and the image of mass transit to the gaining population.

Table 2-2: Comparison of Florida Median Age and National Averages, 1960 – 2010



Source: The Florida Legislature Office of Economic and Demographic Research; Economic Future and Impact of Aging[7]

2.3.2 Airline Pilot Shortage

There are significant concerns about the coming shortage of airline pilots in the U.S. Boeing forecasts the need for 88,000 new commercial airline pilots over the next two decades.[8] Approximately 20,000 U.S. airline pilots are expected to retire over the next seven years due to the FAA's mandate for retirement at age 65.[9] Concurrently, there are too few students opting for careers as airline pilots for reasons that include low starting pay, strict flight hours requirements for new pilots, and the high cost of an aviation college education and flight training. With the demand for pilots high and the supply low, there are concerns that smaller airports, which are served by regional airlines, will lose air service as flights are cut due to the dearth of pilots.[10]

[6] http://edr.state.fl.us/Content/presentations/economic/FlEconomicFuture&theImpactofAging_3-17-14.pdf
[7] http://edr.state.fl.us/Content/presentations/economic/FlEconomicFuture&theImpactofAging_3-17-14.pdf
[8] http://www.prnewswire.com/news-releases/airline-industry-leaders-gather-at-embry-riddle-to-discuss-pilot-shortage-300019100.html
[9] http://aviationweek.com/commercial-aviation/coming-us-pilot-shortage-real
[10] http://www.albanyherald.com/news/2015/mar/02/airport-director-pilot-shortage-cause-of-flight/

Conversely, the Airline Pilots Association (ALPA) claims the pilot shortage is a myth, and points to a 2014 Government Accountability Office report (GAO-14-232) titled *Aviation Workforce – Current and Future Availability of Airline Pilots* that supports its argument.[11] According to the ALPA, there is not a lack of qualified pilots. Rather, there is a lack of pilots who want to work for low pay and poor benefits.

Airline pilot shortage highlights:

- Regional airlines are already feeling the crunch of the airline pilot shortage, as increasing numbers of regional airline pilots leave the regional airlines for higher pay at the major airlines and the regional airlines are not able to fill new pilot training classes.[12]
- Flight cuts at smaller airports due to the shortage of pilots at regional airlines means fewer enplanements and less revenue at those airports.[13]
- For decades, U.S. airline pilots were hired from the ranks of retiring military pilots, but a gradual decline in military pilots has resulted in the airlines looking for civilian-trained pilots.[14]
- In response to the 2009 Colgan Air Flight 3407 accident in Buffalo, New York, the FAA published a new rule that requires first officers to hold an Airline Transport Pilot (ATP) certificate, requiring 1,500 hours total time as a pilot. Previously, first officers were required to have only a commercial pilot certificate, which requires 250 hours of flight time.[15, 16] This is an important factor that has discouraged students from choosing careers as airline pilots.
- Other reasons cited for the lack of students choosing to become airline pilots include the expense of a 4-year college degree (about $50,000 per year at Embry-Riddle Aeronautical University or the University of North Dakota), which is preferred by the airlines; low starting pay at the regional airlines (long-held at $20,000, lately increasing to $30,000 thanks to signing bonuses, retention pay, and other incentives); and the lack of interest in the lifestyle of a pilot, which can be affected by the heavy travel schedule and instability in the airline industry.[17]
- The ALPA states there are more than 700 ALPA pilots currently on furlough in North America and hundreds of other qualified pilots work abroad at airlines such as Emirates Airline, China Eastern Airlines, and Etihad Airways, because the pay is commensurate with skills and experience.[18]
- The 2014 GAO report that supports ALPA's argument concludes that 1) there is a large pool of qualified pilots relative to projected demand, and 2) data on wage earnings and employment growth are not consistent with the existence of an airline pilot shortage.

[11] http://www.alpa.org/portals/alpa/payandbenefitsshortage/Pilot-Shortage-Fact-Sheet.pdf
[12] http://aviationweek.com/commercial-aviation/coming-us-pilot-shortage-real
[13] http://www.albanyherald.com/news/2015/mar/02/airport-director-pilot-shortage-cause-of-flight/
[14] http://aviationweek.com/commercial-aviation/coming-us-pilot-shortage-real
[15] http://www.tulsaworld.com/business/aerospace/pilot-shortage-impacts-flight-frequency-market-service/article_09f210d3-2210-5f4a-b574-4cd384d3dfb0.html
[16] https://www.faa.gov/news/press_releases/news_story.cfm?newsId=14838
[17] http://aviationweek.com/commercial-aviation/coming-us-pilot-shortage-real
[18] http://www.alpa.org/portals/alpa/payandbenefitsshortage/Pilot-Shortage-Fact-Sheet.pdf

Section 2.4.4 explores the factors contributing to the commercial pilot shortage. **Chapter 8 – Alternative Scenarios** provides a look at alternative scenarios resulting from a reduction in the aviation workforce, including commercial ATP pilots.

2.3.3 Autonomous Vehicles (Ground Based)

Improvements in technology are driving towards a future where cars and other ground vehicles will no longer depend on or even require an onboard operator. Companies including Google and many major car companies are working to make self-driving cars a reality. This technological achievement has the potential to impact the operations on and around airports. However, regulatory and technological hurdles have yet to be overcome in a number of areas.

Autonomous vehicles (ground based) highlights:

- Autonomous ground vehicles will have implications for airport operations both airside and landside.
    - Airside operations will be impacted by the introduction of autonomous ground tugs, baggage carts, and other self-driving ground handling equipment.
    - Landside operations will need to figure out how to deal with self-driving cars, both privately owned and commercial.
- Commercial airports may experience a loss of auto parking revenue since departing passengers may opt to be dropped off at the airport by a self-driving car instead of having to park it in the airport garage.

Section 2.4.2 includes a detailed review of the impact of ground- and air-based autonomous vehicles on the aviation system.

2.3.4 Competition for Space Operations

Florida is an unquestioned leader nationally and internationally in the global aerospace industry (see **Figure 2-8**). Florida consistently ranks in the top five U.S. states for aerospace industry employment, with more than 20,000 aerospace and aerospace manufacturing companies across the state, employing more than 141,000 employees in 2014.[19]

The following facilities are unique to Florida and foster the growth of the aerospace industry:

- National Aeronautics and Space Administration (NASA) and U.S. Air Force rocket launching at Cape Canaveral
- Development of navigation and guidance control systems in Orlando and Clearwater
- Manufacturing of rocket engines and advanced helicopter systems in West Palm Beach
- Small satellite development in Gainesville
- Significant maintenance, repair, and overhaul (MRO) centers around the state, with particular strength in Miami, Jacksonville, Melbourne, and the Pensacola to Panama City corridor

[19] http://floridaspaceday.com/fsd-content/uploads/2013/07/County-by-County-2014.pdf

- Business jet research and development, and manufacturing in Melbourne

Space operations highlights:

- In 2014, the aerospace industry contributed more than $19.2 billion in revenue to Florida's economy.[20]
- Florida is a hub for the growing commercial space industry, with current and planned major operations for path-breaking companies such as SpaceX and XCOR.
- SpaceX currently leases two orbital launch sites at Cape Canaveral Air Force Station Space Launch Complex 40. These sites will accommodate both Falcon Heavy (spaceflight heavy lift launch vehicle) flights starting in 2017 and passenger-carrying flight missions in 2018.[21] XCOR Aerospace currently operates from the Kennedy Space Center Shuttle Landing Facility with manufacturing and assembly centers for the Lynx suborbital vehicle nearby.[22]
- Florida currently has the capacity to launch any class of launch vehicle using its existing infrastructure (with infrastructure improvements or modifications), and the ability to launch a large number of flights per year. The challenge for Florida is largely not one of physical infrastructure, but of positioning itself to stay competitive in nurturing existing industry and attracting emerging markets.

[20] http://www.spaceflorida.gov/why-florida
[21] http://www.spacex.com/
[22] http://xcor.com/press/2012/12-08-23_XCOR_to_establish_operations_in_florida.html

Figure 2-8: Florida's Existing Spaceport System and Assets

SYSTEM COMPONENT	DEFINITION	FLORIDA ASSETS
Spaceport 	A public gateway to space that typically provides both launch and re-entry sites. In the U.S., launch facilities that serve commercial, non-governmental customers must be licensed by the Federal Aviation Administration (FAA).	• **Cape Canaveral Spaceport**: commercial facilities at Kennedy Space Center (KSC) and the 45th Wing at Cape Canaveral Air Force Station (CCAFS). • **Cecil Spaceport**: a newly licensed facility in western Jacksonville.
Control Centers and Airspace 	Centers that coordinate the details for space flight operations. Airspace in space transportation is primarily concerned with *ranges*, a flight path area used for launching rockets, missiles, and vehicles designed to reach high altitudes.	• **Launch Control Center** (LCC) at KSC. • **Morrell Operations Center (MOC)** at CCAFS, manages the 15-million square mile Eastern Range. • **Dedicated Launch Vehicle Control Centers for the Atlas V, Delta IV, and Falcon 9,**
Launch Vehicles and Spacecraft 	A *launch vehicle* is a rocket used to launch a spacecraft or satellite into high altitude or orbit. Typically they are classified as reusable (RLVs) or expendable (ELVs). *Spacecraft* are manned or unmanned vehicles that are designed to operate in space to accomplish a specific mission.	• The **Atlas V**, **Delta IV**, and the **Falcon 9** that will launch from CCAFS. • Development of the **Space Launch System (SLS)** at KSC. • **Suborbital-ready facilities** at Cecil Spaceport.
Payload Processing Facilities 	Facilities that prepare payloads (the cargo necessary to complete a mission or flight's purpose) for launch, and processing following the flight.	• **12 major facilities at KSC and CCAFSs** with the capability to process a variety of payload types and sizes. • **Astrotech** in Titusville,
Intermodal Connections 	Transportation modes that enable the movement of people and goods to spaceports, including roadways, airports, seaports, and rail lines.	• **Strategic Intermodal System (SIS),** a system of key roadway, rail, airport, seaports, and spaceport infrastructure identified by the Florida Department of Transportation (FDOT).

Source: Space Florida, http://www.spaceflorida.gov/docs/spaceport-ops/florida-spaceport-systems-plan-2013_final.pdf?sfvrsn=2

2.3.5 Contract Towers

The FAA's Federal Contract Tower (FCT) program comprises over 100 contract towers nationwide and provides services to a wide range of users, including GA, commercial, air cargo, and military operators. Controllers at contract towers perform a host of important functions, including separating aircraft, issuing safety and weather alerts, and assisting with military, emergency response, and medical flights.[23]

FDOT has supported the FCT program by funding the construction of a number of air traffic control towers in Florida. However, FDOT is prohibited by statute from funding the operations of these towers should the federal government decide to cease funding them. One concern with allowing FDOT to fund some federal contract towers is that it may provide an incentive for the FAA to turn over responsibility for funding all federal contract towers in Florida to FDOT.

In 2013, the FAA was required to meet its $637 million in target savings under sequester. To accommodate the sequestration, the administration made the decision to close 149 federal contract towers nationwide as part of its sequestration implementation plan, including more than a dozen federal contract towers in Florida. Timely legislation allowed the FAA to reverse its tower closure decision, but the dilemma illustrated how vulnerable contract towers are to shifting political winds. Contract towers continue to provide air traffic control services at a lower cost than similar FAA towers.

Contract tower highlights:

- Based on a review of 30 randomly selected contract and 30 FAA towers with a comparable level of operations, a contract tower cost, on average, about $1.5 million less to operate than a similar FAA tower, based on FY 2010 data. This difference was mainly due to lower staffing and salary levels at contract towers versus similar FAA towers.[24]
- Benefits of the FAA FCT program: 1. enhanced aviation safety at smaller airports; 2. significant cost savings to the FAA and taxpayers; 3. retention and development of commercial air service and GA at smaller airports; 4. promotion of economic development and job creation; 5. connection to smaller airports and communities with the national air transportation system, and 6. higher customer service rankings from aviation users and pilots.[25]
- Advocates for pilots and airports said shutting the towers will harm safety and impose economic hardship on businesses such as flight schools that rely on controllers to guide planes.
- Without the towers, small airports are relying on pilots to alert each other by radio to their positions and to sequence landings and takeoffs. While that system works at less-

[23] http://www.bloomberg.com/news/articles/2013-03-22/faa-to-close-149-u-s-airport-towers-after-budget-cuts
[24] FAA (2012), *Contract Towers Continue to Provide Cost-Effective and Safe Air Traffic Services, but Improved Oversight of the Program is Needed.*
[25] http://contracttower.org/ctaannual/July2014_newsletter.pdf

trafficked airports, directors at busier airports worry about the risk of accidents without their control towers.[26]

- The companies currently operating towers under the FAA FCT program in Florida are Robinson Aviation (RVA) and Midwest Air Traffic Control.

2.3.6 Customs & Immigration

The continued threat of terrorism is impacting aviation by imposing new costs on the industry through regulation by the U.S. Department of Homeland Security.

Customs & Immigration highlights:

- Nearly 51,000 transportation security officers, transportation security inspectors, and behavior detection officers serve at more than 450 U.S. airports. Prior to September 11, 2001 (9/11), limited federal security requirements existed for cargo and baggage screening.[27]
- In early 2015, a proposal was presented by the President to increase TSA's aviation security efforts and raise the current funding allocations from $4.9 billion to $5.8 billion.[28]
- The costs associated with meeting new Customs & Immigrations standards are sometimes excessive. For example, U.S. Customs and Border Protection (CBP) requirements dictate that a minimum staffing level at an airport is eight agents, though many small and non-hub commercial service airports could be safely and efficiently served by a single agent.[29]
- There is a disparity in funding opportunities for customs projects. FDOT provides 80 percent of the cost of the customs project in some districts, and only 50 percent in other districts. This is also true in terms of charges for clearing international passengers. Some boating operations are not charged, while aviation operations are always assessed a fee.[30]
- Lack of funding for the U.S. Department of Homeland Security has the ability to halt hiring and training, research and development (including cargo screening initiatives), and furlough TSA staff.[31] CBP would remain stable, as these services are primarily funded through fees.[32]

2.3.7 Electric Aircraft

Sustainability in the aviation industry calls for aircraft that are significantly quieter, environmentally friendly, and more fuel efficient than today's fleet. Development of advanced

[26] http://www.reuters.com/article/2013/03/18/usa-fiscal-airports-idUSL1N0C5HD520130318
[27] http://www.dhs.gov/aviation-security
[28] http://www.washingtonpost.com/blogs/federal-eye/wp/2015/02/02/white-house-budget-homeland-agenda-includes-airport-security-and-plugging-gaps/
[29] Comment received during CRT meeting on August 20, 2015 in Orlando
[30] Comment received during CRT meeting on August 20, 2015 in Orlando
[31] http://mashable.com/2015/02/27/tsa-funding-shutdown/
[32] http://www.nytimes.com/2015/02/24/us/concerns-mount-as-homeland-security-shutdown-looks-likely.html?_r=0

technologies has led to increased interest in electric aircraft as a means to address these concerns.

The introduction of electric aircraft into the market has the possibility to:

- Increase opportunity in manufacturing sectors
- Increase employment opportunities
- Benefit training facilities across the state of Florida (education and operation)
- Make flying more affordable

Electric aircraft highlights:

- Companies such as Safran, S.A., Boeing, Airbus, and Raytheon have already revealed plans to re-conceptualize the modern plane. Boeing's concept aircraft, SUGAR Volt, combines electric and fuel to power flight. Airbus is planning a two-place trainer and a four-place personal aircraft for the U.S. GA market. The trainer is a battery-powered electric, the four-placer a hybrid drive. Airbus hopes to bring the battery-powered aircraft to market by 2017.
- It is estimated that the electric aircraft market is projected to reach over $22 billion in sales over the next 15 years.[33]
- Benefits of electric aircraft include increased reliability, elimination of risk of aviation fuel-fed fires, more quiet operations, improved comfort and maintenance, reduced life cycle costs, and no emissions.
- Growth in the aviation sector as cost of aircraft ownership decreases. The average electric aircraft takes the maintenance and fuel costs down potentially as much as 80 to 90 percent. Additionally, aircraft cost has the potential to be significantly less to purchase.[34]
- Various flight schools across the nation are exploring the options of electric aircraft for training and from an economic standpoint. Each of the solar-electric training aircraft cost about $200,000, a little less than a traditional trainer and, as previously discussed, has the potential to decrease operational and overall ownership costs. A full charge would enable the plane to fly for about three hours, a perfect amount of time for training flights.[35]
- In order for airports to properly allocate the costs of electricity for electric aircraft owners, airports may need to add electric meters to hangars.[36]
- Fuel sales, which are a prime source of revenue for most GA airports, can be expected to decline if electric aircraft are adopted.[37]

[33] http://www.theatlantic.com/sponsored/thomson-reuters-why-2025-matters/electric-flight/208/
[34] http://www.tulsaworld.com/businesshomepage1/spartan-school-of-aeronautics-fleet-to-include-solar-electric-aircraft/article_e7d921b6-12fa-5129-8e0c-4ed3b9aae672.html
[35] http://www.tulsaworld.com/businesshomepage1/spartan-school-of-aeronautics-fleet-to-include-solar-electric-aircraft/article_e7d921b6-12fa-5129-8e0c-4ed3b9aae672.html
[36] Comment received during CRT meeting on August 20, 2015 in Orlando. Commenter pointed out that at one airport, a T-hangar occupant, with fixed rent that includes electric, plugs his Tesla in while he is out flying.
[37] Comment received during CRT meeting on August 20, 2015 in Orlando

- Florida's $0.069 per gallon aviation fuel tax funds a substantial part of the Florida aviation budget. Electric aircraft would reduce demand for aviation fuel, diminishing this important revenue stream for the state.

2.3.8 Florida's Economy

Aviation demand in Florida is closely tied to the state's socioeconomic and demographic characteristics. As population, employment, and income levels rise in the state, so too does demand for air travel, air cargo shipments, and other aviation-related activities. The statistics below help explain the strong demand for aviation-related activities in Florida, and suggest this demand should continue well into the future.

Florida economy highlights:

- Florida's population grew from 16.0 million in 2000 to nearly 19.9 million in 2014. This represents a compound annual growth rate (CAGR) of 1.6 percent. The U.S. population grew at a CAGR of 0.9 percent during the same period.[38]
- Florida's 2014 estimated population of nearly 19.9 million people makes it the third most populated state in the U.S.[39]
- Florida's population is estimated to grow from nearly 19.9 million in 2014 to approximately 21.1 million by 2020 and approximately 25.6 million by 2040.[40]
- Florida's gross state product (the state equivalent of gross domestic product, or GDP) in 2013 was nearly $800.5 billion, ranking fourth in the U.S. This was an increase of 3.8 percent annually from $491.5 billion in 2000. By comparison, the national GDP also grew 3.8 percent annually during the same period.[41]
- Total employment in Florida grew from 8.9 million workers in 2000[42] to nearly 10.6 million workers in 2013, representing a CAGR of 1.3 percent. For the U.S. as a whole, total employment grew from 165.5 million workers in 2000 to 182.3 million workers in 2013 at a CAGR of 0.8 percent. This ranks Florida fourth in the U.S. in terms of total employment in 2013 and eighth in terms of total employment CAGR during the 2000 to 2014 time period.[43]
- Florida's total employment is projected to increase to nearly 12.0 million workers by 2020 and 14.0 million workers by 2030.[44]
- Florida's per capita personal income was $29,570 in 2000 and grew to $42,645 by 2014. This change represents a CAGR of 2.7 percent. On the national level, per capita personal income was $30,587 in 2000 and grew to $46,129 by 2014, representing a CAGR of 3.0

[38] U.S. Census Bureau
[39] U.S. Census Bureau
[40] http://edr.state.fl.us/Content/population-demographics/data/Medium_Projections.pdf
[41] Bureau of Economic Analysis
[42] 2014 *Florida Statewide Aviation Economic Impact Study Update*
[43] Bureau of Economic Analysis
[44] Woods and Poole Economics, Inc., 2015

percent. Florida ranks 29th in the U.S. in terms of per capita personal income in 2014 and 43rd in terms of per capita personal income CAGR during the 2000 to 2014 time period.[45]

- *Business Insider* recently ranked the economies of the 50 states on six measures: recent change in housing prices, nonfarm payroll job growth, unemployment rate, GDP per capita, average weekly wage, and state government surplus and deficit. Florida's economy ranked seventh best in the analysis.[46]

2.3.9 Future of Avgas

Avgas is the only remaining transportation fuel still containing lead. Lead acts as a protectant against engine knock or detonation in piston aircraft. The FAA is currently working with stakeholders, such as aircraft manufacturers, fuel producers, the Environmental Protection Agency (EPA), and aviation industry associations to develop a new, lead-free version of avgas that will make the smallest impact on the current GA fleet. This effort is called the Piston Aviation Fuels Initiative (PAFI).

Avgas highlights:

- More than 200,000 piston-engine aircraft rely on 100 low lead avgas for fuel.
- The PAFI steering committee includes the FAA, Aircraft Owners and Pilots Association (AOPA), American Petroleum Institute, the EAA, General Aviation Manufacturers Association, National Air Transportation Association, and National Business Aviation Association.
- PAFI has a goal of establishing an unleaded avgas for GA by 2018.
- In July of 2014, a replacement fuel proposal was submitted to the FAA. Factors considered in the fuel evaluation include toxicology, environmental impact, impact on existing GA fleet, production and distribution infrastructure, and cost of aircraft operations.
- In September of 2014, four fuels began further testing under Phase 1 of the program (one fuel each from Shell and TOTAL, and two fuels from Swift Fuels).
- Two or three fuels will be selected for Phase 2, which is expected to take two years.
- Airport managers have voiced the opinion that maintaining avgas is a losing proposition.[47]

2.3.10 Legalization of Gambling

Gambling in Florida is currently limited to Native American casinos (the Seminole Tribe) and slot casinos in Broward and Miami-Dade counties. The Seminole Tribe's gambling compact with the state gives it exclusive rights to offer table games. The compact includes a 25 percent revenue share for Florida (higher than any other state). Proposed expansion of casino gambling to other

[45] Bureau of Economic Analysis
[46] http://www.businessinsider.com/state-economy-rankings-q1-2015-2015-3#7-florida-44
[47] Comment received during CRT meeting on August 20, 2015 in Orlando

parts of the state would likely cut into the Seminole Tribe's revenues, and as a result, the state's share of that revenue.

Gambling highlights:

- During the fiscal year ending June 30, 2014, the Seminole Tribe generated $230 million for the state through their compact. During the same fiscal year, the Tribe reported an estimated $2.1 billion in revenue.
- The Seminole Tribe currently employs over 10,000 people at casinos.
- Outside of Native American casinos, slots are currently allowed only in Broward and Miami-Dade counties. Casinos at dog and horse tracks and jai-alai frontons generated $358 million and employed 3,452 people in 2013.
- In April of 2015, Florida House Bill 1233 proposed the expansion of state-authorized gambling at non-Tribe locations and passed (though the bill later died in review prior to becoming law).
- Results of an independent study performed by the Spectrum Gaming Group state that widespread expansion of Florida gaming would likely not have a drastically positive impact on the Florida economy. Expanding casino gambling throughout the state but forgoing the revenue share that results from the Seminole Tribe gaming compact may actually result in a net loss in gambling revenue in Florida.

2.3.11 Medical Certificate Reform for Part 91 Operations

During the past 25 years, the AOPA, EAA, and other organizations have submitted numerous requests to the FAA to eliminate or relax the third-class medical certificate[48] for various airmen certificates.[49] On July 15, 2016 President Barack Obama signed third class medical reforms into law as part of an FAA authorization extension passed by the U.S. House and Senate. On January 10, 2017, the FAA released a final rule on third class medical reform, though it won't be effective until May 1, 2017. After meeting the initial requirements to fly under the reform, pilots will need to visit any state-licensed physician at least once every four years and take the free aeromedical factors online course every two years.

Highlights of the new program, titled BasicMed, include:[50]

- Aircraft specifications: Up to six seats, up to 6,000 pounds (no limitations on horsepower, number of engines, or gear type)
- Flight rules: Day or night, visual flight rules (VFR) or instrument flight rules (IFR)
- Passengers: Up to five passengers
- Aeromedical factors: Pilots must take a free online course every two years and visit their personal physician every four years
- Altitude restriction: Up to 18,000 feet msl

[48] The FAA designates medical certificates for pilots as first-class, second-class, or third-class. Generally, first-class is designed for the airline transport pilot; second-class for the commercial pilot; and third-class for the student, recreational, and private pilot.
[49] http://www.aopa.org/Advocacy/Regulatory-,-a-,-Certification-Policy/AOPA-EAA-Medical-Exemption-FAQ#q1
[50] https://www.aopa.org/news-and-media/all-news/2017/january/10/faa-releases-final-rule-for-third-class-medical-reform

- Airspeed limitation: 250 knots indicated airspeed
- Pilot limitation: Cannot operate for compensation or hire

2.3.12 NextGen

NextGen is a long-term plan by the FAA to transform the way the U.S. air transportation system operates. Very broadly, it aims to shift air navigation from a ground-based system to a satellite-based system through modernization of aircraft tracking systems, communication systems, and weather monitoring and forecasting systems. The benefits of this transformation include shorter flight routes, increased operational efficiencies, reduced fuel consumption, reduced congestion and delay, reduced environmental impacts, airport and airspace capacity maximization, and greater safety for aircraft.

The $40 billion program has been criticized by the GAO for being more than $4 billion over budget and falling behind schedule.[51] Other complaints about the system include the high cost for equipping aircraft in comparison to the benefits received (especially for GA) and security issues surrounding the NextGen system.

NextGen highlights:

- Automatic Dependent Surveillance-Broadcast (ADS-B) uses a combination of ground stations, aircraft avionics, and the satellite global positioning system (GPS), to provide air traffic controllers with an aircraft's position, altitude, airspeed, and other information critical to ensuring aircraft separation (termed ADS-B Out). Because it relies on satellites instead of ground-based radars, ADS-B Out improves the coverage and situational awareness of air traffic controllers, including tracking of aircraft while taxiing at airports with adequate surveillance equipment.
- The ADS-B system is also capable of providing weather and aircraft position information for collision avoidance (termed ADS-B In) to properly equipped aircraft.
- The FAA has mandated that aircraft using most airspace in the U.S. be equipped with ADS-B Out by 2020. The minimum cost to do this is several thousand dollars per aircraft, which is comparatively less significant for the airlines compared to private aircraft owners, for whom the cost can be a substantial, potentially prohibitive burden. Furthermore, the biggest advantage for GA aircraft comes from ADS-B In, which imposes additional equipment and costs on the aircraft owner.
- The weather component of the NextGen system consists of several improvements to the collection and dissemination of weather information. The NextGen Weather Processor will identify weather hazards in the terminal and enroute environments. The Aviation Weather Display consolidates current weather displays and provides consistent weather information for terminal and enroute users. The Common Support Services modernizes information management services for weather and provides tailored weather products with the national airspace system through System Wide Information Management (see

[51] GAO (2012). *Air Traffic Control Modernization: Management Challenges Associated with Program Costs and Schedules Could Hinder NextGen Implementation*, GAO-12-223

below). Improved weather information is expected to yield dividends in the areas of reduced weather delays and enhanced safety.

- The System Wide Information Management (SWIM) infrastructure is aimed at allowing more efficient data sharing among aviation users. It accomplishes this by establishing data format standards, translating data from different data systems into standard formats, and consolidating multiple data connections into a single access point. One example of how SWIM results in operational efficiencies is that the system allows collaboration between airline dispatchers and traffic managers by providing both user groups access to current weather and flight planning information. Using SWIM-enabled data, these two groups are able to cooperatively reroute traffic and take advantage of the most current information on weather, air traffic control traffic management initiatives, runway configurations, and airport deicing operations.
- By switching to the NextGen system, the FAA will be able to phase out older navigation equipment, which becomes costlier to maintain as it ages.

The impacts of NextGen are reviewed in greater detail in **Section 2.4.1**.

2.3.13 Opening of Cuba Market

In late 2014, the federal government announced the reopening of diplomatic relationships with Cuba after more than 50 years of hostility, trade embargo, and greatly restricted travel between the nations. In the past, special charter companies have offered travel between the U.S. and Cuba for those traveling for one of 12 specific purposes. On January 15, 2015, Cuban sanctions were eased, affecting travel to the country. The updated travel regulations state that those visiting Cuba must still fall under one of 12 permitted reasons for travel, but a specialized license issued by the U.S. government is no longer required. Travelers now require only a general license. This is effectively the government trusting that travelers that are traveling for one of 12 authorized reasons. However, the 2017 change in administration may place greater restrictions on travel to Cuba once again.

Cuba market highlights:

- There are 12 reasons for authorized travel:
    1. Family visits
    2. Official business of the U.S. government, foreign governments, and certain intergovernmental organizations
    3. Journalistic activity
    4. Professional research and professional meetings
    5. Educational activities
    6. Religious activities
    7. Public performances, clinics, workshops, athletic and other competitions and exhibitions
    8. Support for the Cuban people
    9. Humanitarian projects
    10. Activities of private foundations or research or educational institutes

11. Exportation, importation, or transmission of information or information materials
12. Certain authorized export transactions

- Eased travel restrictions include lifting per diem restrictions on expenses within Cuba, and the authorization to use U.S. credit and debit cards in Cuba.
- Eased restrictions are anticipated to cause a spike in family visits between the U.S. and Cuba.
- Several airlines added flights to Cuba, including American, Delta, United, JetBlue, and Southwest, many departing from Florida airports. After an initial surge in commercial service demand, airlines are reducing route frequency, using smaller aircraft, or cancelling service altogether to Cuba as a result of lower sustained demand.[52]
- Tourism is a major industry in Cuba, with over three million visitors each year. Nearly one million visitors come from Canada annually, while approximately 65,000 Americans visit Cuba each year.
- The potential for expanding tourism from American markets exists, but it would require substantial investment in lodging, utility, and transportation infrastructure in Cuba.

2.3.14 Pandemic Fears

In a globalized society, epidemics can turn to pandemics if not controlled. In recent years, outbreaks of swine and bird flus, SARS, and Ebola in foreign countries have caused concern that control methods are not sufficient to prevent an outbreak in the U.S. Public fear and panic over possible pandemics have already caused an impact to the aviation industry, and may continue to do so.

Pandemic highlights:

- British Airways Asia Pacific region traffic fell 27 percent during the height of the 2003 SARS scare in April and May. A $68.8 million loss resulted for the quarter.
- Mexican flight capacity took nearly eight months to bounce back to previous levels following the Mexican swine flu epidemic in 2009.
- In these cases, airlines experienced losses but activity eventually recovered to normal levels.
- In 2015, the Zika virus intensified and spread across more than a dozen countries. Warnings for travel to the tropical and subtropical regions of the Americas are still in place today, especially for women who are pregnant or plan to become pregnant due to the risk of brain anomalies in infants.
- The aviation industry is careful to add precautions without adding to the public's perception of risk.
- Global aviation and healthcare organizations formed the Collaborative Arrangement for the Prevention and Management of Public Health Events in Civil Aviation (CAPSCA). One major objective of CAPSCA is to assist states and territories in the establishment of national aviation pandemic preparedness plans.

[52] https://www.nbcnews.com/news/latino/why-u-s-airlines-are-dropping-flights-cuba-n733616

2.3.15 Price of Oil

The price of crude oil per barrel has fluctuated greatly over the last 10 to 15 years, directly affecting the cost of aviation fuel. The fluctuating cost of fuel is the largest variable in costs to airlines and airline customers. Many airlines have countered the unstable nature of fuel prices by agreeing to fuel hedge contracts which establish a fixed or capped cost. Such hedge agreements are greatly beneficial when costs fluctuate around a generally fixed mean, but when fuel costs drop dramatically (as they have in 2014 – 2015), they may result in airlines paying far more than market value for aviation fuel. Higher jet fuel costs also affect jet-based GA.

Oil price highlights:

- Price of crude oil per peaked in June 2008 at $144.51 per barrel.
- Price of crude oil bottomed out in February 2009 at $43.59 per barrel, but rose back to over $70 per barrel by June 2009 and fluctuated between that price and just over $115 per barrel until late 2014.
- In March 2015, the price of crude oil reached a six-year low at $47.72 per barrel.
- Lower oil prices have not yet resulted in dramatically lower airline ticket prices for multiple reasons.
    - The fuel hedging policies of many airlines have resulted in paying above market value for fuel during times of low cost per barrel, and therefore having little savings to pass along.
    - Some carriers, such as American Airlines, have not recently signed hedging contracts, but still benchmark their prices against all other airlines, banking additional profit as opposed to passing savings along to customers.

Chapter 8 – Alternative Scenarios explores, in more detail, the impacts of fluctuating oil prices on the commercial service and GA industries.

2.3.16 Reaction to Terrorist Activity

The 9/11 terrorist attacks caused widespread and long-lasting effects on the aviation industry, including both GA and commercial service. Immediate effects included public concern over the safety of commercial flight and a decrease in enplanements and industry revenues. Longer lasting effects include a substantial expansion to aviation security, including the passing of the Aviation and Transportation Security Act and founding of TSA, changes to passenger screening, and changes to commercial aircraft cockpit doors.

Terrorist activity reaction highlights:

- Worldwide commercial passenger enplanements fell by 2.7 percent in 2001.
- Airlines lost $13 billion in 2001 and $11.3 billion in 2002. The first post-9/11 profit year came in 2006.
- Passenger enplanements surpassed 2000 levels in 2003.

- Security measures foiled aviation-based terrorist attacks in 2001, 2006, 2009, and 2010. A terrorist attack in Russia was not prevented in 2004, and resulted in the destruction of two aircraft.
- Passenger information and record keeping has increased substantially worldwide.
- TSA employs approximately 47,000 Transportation Security Officers.
- TSA has an annual budget of approximately $7.6 billion.
- TSA has ramped up screening efforts since its inception, including restrictions on aerosols and gels and increasing screening technology and more extensive pat-down procedures.

2.3.17 Reduction in Numbers of GA Pilots

The number of private and recreational pilots has decreased significantly over the past several decades. The total number of pilots in the U.S. has plummeted from approximately 827,000 in 1980 to approximately 584,000 in 2016.[53, 54] At the same time, the number of single-engine aircraft manufactured in the U.S. fell from approximately 8,600 to approximately 700.[55] With fewer pilots and aircraft, the future of GA is in question.

GA pilot reduction highlights:

- Small on-airport businesses that cater to GA pilots, such as aircraft maintenance and repair, flight training schools, parts manufacturers, and air cargo companies are suffering because there are fewer pilots to buy their products and services.[56]
- Explanations for the declines in pilots and aircraft have been attributed to rising fuel prices, decreased interest in flying, heightened flying restrictions since the 9/11 terrorist attacks, and the lingering effects of the economic downturn, which left fewer people with discretionary income.[57]
- Some, however, have attributed the declines to excessive federal regulations that deter pilots from obtaining and renewing their licenses. Of these regulations, the most burdensome is the FAA's medical certification requirements, which is discussed in **Section 2.4.4.3.5.**
- The decline in GA pilots could impact the commercial airlines, since airline pilots come primarily from GA.[58]

[53] http://www.washingtonpost.com/business/on-small-business/small-aviation-businesses-say-pilot-shortage-could-drive-industry-into-the-ground/2014/02/08/2422cadc-8f5c-11e3-b46a-5a3d0d2130da_story.html
[54] FAA. *Aerospace Forecast FY 2015 – 2035*
[55] https://gama.aero/wp-content/uploads/2016-GAMA-Databook_forWeb.pdf
[56] http://www.washingtonpost.com/business/on-small-business/small-aviation-businesses-say-pilot-shortage-could-drive-industry-into-the-ground/2014/02/08/2422cadc-8f5c-11e3-b46a-5a3d0d2130da_story.html
[57] http://www.washingtonpost.com/business/on-small-business/small-aviation-businesses-say-pilot-shortage-could-drive-industry-into-the-ground/2014/02/08/2422cadc-8f5c-11e3-b46a-5a3d0d2130da_story.html
[58] http://www.washingtonpost.com/business/on-small-business/small-aviation-businesses-say-pilot-shortage-could-drive-industry-into-the-ground/2014/02/08/2422cadc-8f5c-11e3-b46a-5a3d0d2130da_story.html

Section 2.4.4.4.2 explores GA pilot growth trends and **Chapter 8 – Alternative Scenarios** documents historical GA activity in the state and factors that may contribute to fluctuation, including fuel prices.

2.3.18 Reliance on Tourism

Florida has a well-established tourism infrastructure, developed around its natural and man-made attractions and enjoyed by visitors of all ages. Tourism is the number one provider of jobs for Floridians. It is a major provider of tax revenue for cities, counties, and the state of Florida.

Tourism highlights:

- Tourism in Florida has gone from 82.3 million people in 2010 to nearly 115 million in 2016.[59] Part of that activity includes stops at GA airports by plane owners.[60]
- Nearly 50 percent of all of Florida's visitors arrive by air.
- Tourism related employment grew 53 straight months as of August 2014. For every 85 visitors to the state, one Florida job is supported.[61]

Section 2.4.5.1.3 includes a look at the impact of tourism as a part of the Boeing and Airbus industry outlooks. See **Chapter 8 – Alternative Scenarios** for an in-depth look at the history of tourism in the state and the associated economic impact.

2.3.19 Remote Control Towers

Remotely operated air traffic control systems are an emerging suite of technologies that provide full air traffic control capabilities to an airport without the need for a physical tower. The concept brings with it potential cost efficiencies by centrally locating controllers away from the airports they control. The application is viewed as having the greatest potential benefit at airports with existing towers and relatively low aircraft operational counts or those without towers and relatively high operational counts. In the U.S., GA reliever airports are thought to be most suitable but small commercial service airports may also benefit from the technology.

In the U.S., the use of remote towers is in the prototype stage. Leesburg Executive Airport in Leesburg, Virginia, partnered with Saab and the Virginia SATSLab, Inc. for a 90-day demonstration of remote tower technologies during the summer of 2015. Leesburg Executive Airport is a designated reliever for Washington-Dulles International Airport and is the second busiest GA airport in Virginia by operations.[62] The FAA will evaluate the results of the demonstration and decide whether to continue its assessment of the technology.

More recently, in October 2015, the FAA announced that Fort Collins-Loveland Municipal Airport was selected as the official test facility for the new Virtual Air Traffic Control Tower technology program. The project's $5.9 million test phase is fully funded by the Colorado Department of

[59] http://www.visitfloridamediablog.com/home/florida-facts/research/
[60] http://www.theledger.com/article/20140404/news/140409673; Statement by Governor Rick Scott in 2014
[61] http://www.flchamber.com/wp-content/uploads/FutureofFlorida_201409_WILL-SECCOMBE.pdf
[62] http://www.leesburgva.gov/government/departments/airport/remote-air-traffic-control-tower/remote-tower-faq-s

Transportation (CDOT) Aeronautics Division, while the technology was developed jointly by the FAA and CDOT.[63]

Remote towers present a middle ground between a fully-staffed tower and no tower at all. They may prove particularly useful at airports that routinely experience seasonal fluctuations in traffic. Using temporary remote towers during large sporting events could also be a suitable application. Large commercial service airports could potentially benefit from this technology—not replacing manned towers but complementing them by providing visibility in areas of the airport that are not visible from the tower. An example is Miami International Airport, where the sheer size of the airport and the many obstructions limit complete visibility for the tower. A combination of a traditional manned-tower with remote camera displays could be a major safety enhancement, allowing controllers to see all ground traffic.[64]

A remote tower center can control several airports or supplement large ones, operating on demand with flexible hours or around the clock. By dividing the relatively low workloads of several small airports to a single control center, operators can save on installation and running costs, adapt to changing traffic patterns, increase safety, and improve contingency operations in emergencies. The remote tower concept does not eliminate the human element, it is simply made less location-dependent.[65]

2.3.20 Shortfall of Aviation Maintenance Personnel

There are growing concerns in the aviation industry regarding a current and future shortage of aviation maintenance personnel. Chuck Horning, chair of the Aviation Maintenance Science program at Embry-Riddle Aeronautical University, has stated that despite the attention given in the news about the pilot shortage, there is actually a greater shortage of aviation maintenance technicians.[66] Evidence of the shortage can be found in a 2014 poll of Aeronautical Repair Station Association (ARSA) members at that trade group's annual symposium. In that poll, 86 percent of ARSA members reported having difficulty searching for qualified workers, and 26 percent said the search was "very difficult."[67] This trend is expected to continue as many current maintenance workers are reaching retirement age and enrollment in airframe and powerplant schools has dropped.[68] Boeing has predicted that about 600,000 aviation maintenance technicians will be needed by 2031, compared to the approximately 500,000 additional pilots needed to fill cockpits.[69]

One recently released report, however, does not substantiate the aviation industry's concerns. The report, titled *Aviation Workforce: Current and Future Availability of Aviation Engineering and*

[63] http://content.govdelivery.com/accounts/CODOT/bulletins/11d0af7?reqfrom=share
[64] http://airfactsjournal.com/2014/08/remote-atc-towers-coming-to-an-airport-near-you/
[65] http://www.gizmag.com/saab-remote-tower-system/37191/
[66] http://www.ainonline.com/aviation-news/business-aviation/2014-05-18/new-maintenance-techs-short-numbers-skills
[67] http://www.ainonline.com/aviation-news/business-aviation/2014-05-18/new-maintenance-techs-short-numbers-skills
[68] http://www.ainonline.com/aviation-news/business-aviation/2014-05-18/new-maintenance-techs-short-numbers-skills
[69] http://www.ainonline.com/aviation-news/business-aviation/2014-05-18/new-maintenance-techs-short-numbers-skills

Maintenance Professionals, was released by the GAO in February 2014.[70] The GAO was unable to find conclusive evidence of an aviation maintenance personnel shortage.

Maintenance personnel highlights:

- According to the *2015 Global Fleet and MRO Economic Assessment* released by ARSA in March 2015 and prepared by CAVOK, the total worldwide market for commercial aviation maintenance activity will surpass $100 billion by 2025. In the U.S., the aviation maintenance industry employs nearly 300,000 workers and generates more than $43 billion in economic activity, while producing more than $5 billion in federal corporate and individual income taxes.[71]
- In the *2015 Global Fleet and MRO Economic Assessment*, CAVOK estimates that California, Florida, Georgia, and Texas combined represent 35 percent of the total U.S. civil aviation maintenance employment with an estimated 101,147 employees. Total maintenance employment in Florida is estimated at nearly 19,700 workers. Total economic activity tied to aviation maintenance in Florida is estimated at nearly $2 billion.[72]
- According to Mike Lee, director of maintenance training business development for Flight Safety International, the market leader in business aviation training for pilots and technicians, "qualified people are just not available" for aviation maintenance positions.[73]
- Embry-Riddle Aeronautical University's Aviation Maintenance Science program has a placement rate at nearly 100 percent, according to Chuck Horning.[74]
- Online employment board operator JSfirm.com reports the skills most in demand in the corporate aviation sector are maintenance and avionics technicians, which account for 30 percent of expected hiring, whereas pilots represent only 7.5 percent.[75]
- There are several reasons for the decrease in the number of students enrolling in aviation maintenance programs: 1. reduced pay and benefits offered to aviation mechanics compared to other occupations such as auto repair and computer repair, 2. the cost of training and becoming certified is high, and increases as the number of schools for mechanics decreases, and 3. the aviation industry has lost its former glamour in the eyes of Generation X and Y, as aircraft are not seen as high-tech.[76, 77]
- The GAO's 2014 report specifically stated the following: "Data provide less support for a shortage of aircraft mechanics; while the occupation has had a low unemployment rate, both employment and earnings have stayed about the same, suggesting that demand for this occupation has not outstripped supply." The report also states that,

[70] http://gao.gov/assets/670/661239.pdf
[71] http://arsa.org/2015-legislative-day-arsa-lands-on-capitol-hill/
[72] http://arsa.org/wp-content/uploads/2015/03/ARSA-CAVOK-2015USOverview-20150330.pdf
[73] http://www.ainonline.com/aviation-news/business-aviation/2014-05-18/new-maintenance-techs-short-numbers-skills
[74] http://www.ainonline.com/aviation-news/business-aviation/2014-05-18/new-maintenance-techs-short-numbers-skills
[75] http://www.ainonline.com/aviation-news/business-aviation/2014-05-18/new-maintenance-techs-short-numbers-skills
[76] http://www.forbes.com/sites/johngoglia/2014/01/04/2014-outlook-for-aviation-careers-brightens-with-looming-pilot-and-mechanic-shortages/
[77] http://www.ainonline.com/aviation-news/business-aviation/2014-05-18/new-maintenance-techs-short-numbers-skills

according to Bureau of Labor Statistics employment projections, slower than average or no growth is expected for this occupation over the next 10 years.[78]

Chapter 8 – Alternative Scenarios documents the impacts of the aviation workforce shortage and adaptation strategies.

2.3.21 Sustainability

Airport sustainability is the practice of more efficiently using resources in an effort to reduce operational and capital costs resulting in a more self-sufficient airport. It accomplishes this through policies, procedures, and practices that are focused on reducing waste and increasing the productivity of airport resources. For example, sustainability planning and performance benchmarking and tracking can have a profound impact on costs, both hard and soft, as a result of reduced resource usage (typically resulting in fewer greenhouse gas emissions), improved passenger satisfaction (leading to increased terminal concessions revenue and positive public relations implications), a more strategic use of airport property (increasing non-aeronautical revenue and decreasing airport-wide costs), and reduced waste generation and increased recycling (lowering waste management fees).

In 2010, the FAA published guidance for its Sustainability Master Plan Pilot Program. The program—now complete—provided Airport Improvement Program (AIP) grants to airports for sustainability planning studies. In general, these planning studies take two forms. One is a sustainable master plan, where sustainability is considered for all aspects of a long-range facility plan. The other is a stand-alone sustainability management plan that examines how sustainability can be incorporated into an organization through its administrative, procurement, operations, maintenance, planning, design, and construction functions. The FAA has since expanded its AIP program to allow funding of sustainability studies.

The Airport Cooperative Research Program (ACRP) produced *ACRP Synthesis 10: Airport Sustainability Practices* to help inform airport operators, stakeholders, and policy makers about the most current sustainability trends in the industry.

In an effort to summarize the guidance available to airports on sustainability, FDOT set out to develop a statewide resource document that can be used by airports to develop sustainability-related documents, such as sustainable master plans and sustainability management plans, or to incorporate sustainability into their capital improvement planning processes.

Sustainability highlights:

- The FAA awarded sustainability grants to 44 airports under its pilot program. Four airports in Florida received grants—Fort Lauderdale-Hollywood International, Northeast Florida Regional Airport, Tampa International Airport, and Vero Beach Regional Airport.
- Vero Beach Regional Airport used its grant to conduct a sustainable master plan.

[78] http://gao.gov/assets/670/661239.pdf

- Tampa International Airport used its grant to conduct a sustainability management plan.

2.3.22 TSA Staffing

According to various sources, TSA will likely face continuing challenges to address projected growth in passenger airline travel while maintaining and improving upon the efficiency and effectiveness of passenger screening operations. Current issues facing TSA staffing include budget cuts resulting in staff reduction and privatization of screening operations. Impacts to the commercial service airports in the state are already apparent, with longer lines for screening and increased passenger wait times.

TSA staffing highlights:

- Privatization of TSA services holds the potential of addressing TSA service shortfalls. TSA's Screening Partnership Program is a program created by Congress to allow hiring of private screeners at various airports. The program currently operates at roughly 20 airports nationwide. In 2014, the TSA selected Trinity Technology Group Inc. as the private screening contractor for Orlando-Sanford International Airport under the partnership program. Orlando-Sanford International Airport and Key West International Airport are the only airports currently operating in Florida under the program.[79] As of March 2015, Orlando International Airport is considering making the transition to private screening.[80]
- Cuts to TSA staff could cause checkpoint delays that would get worse during busier travel times, such as for spring break and for summer holidays, with less ability to pay overtime to match a surge in flights.
- TSA says cuts to overtime, and a hiring freeze, will result in increased waiting times at security checkpoints. TSA said passengers can expect to spend two or three times longer waiting at checkpoints during peak periods.[81]
- The inability of TSA to pre-approve exit lane technology means that airports have to install this equipment and risk having TSA determine it doesn't meet its standards after the fact.[82]

2.3.23 Unmanned Aircraft Systems

Unmanned aerial systems (UAS) have grown in popularity in recent years due to a variety of factors. While remote-controlled aircraft have been in use for decades, improvements in engine technology, battery life, and miniaturization of components have resulted in decreased costs for easy-to-operate UAS. These lower costs have caused UAS use to proliferate, with many companies looking to exploit the advantages of UAS. The potential commercial uses of UAS range from surveillance of crops to package delivery by Amazon.

[79] http://www.tsa.gov/press/releases/2014/09/19/tsa-awards-private-screening-contract-orlando-sanford-international and http://www.usatoday.com/story/travel/news/2014/01/14/tsa-private-screeners-airports-mica-orlando-connolly/4473961/
[80] http://www.npr.org/2015/03/02/390119261/orlando-airport-considers-hiring-private-screeners
[81] http://miami.cbslocal.com/2013/03/18/tsa-cut-backs-cause-delays-at-mia/
[82] Comment received during CRT meeting on August 20, 2015 in Orlando

UAS highlights:

- The FAA finalized the first operational rules for routine commercial use of small unmanned aircraft systems under the Part 107 rule which went into effect in August 2016.
- Additional operations by UAS may have ramifications on airspace capacity, but it is unlikely that airport capacity will be significantly affected since a large number of UAS aircraft do not require runways to operate.
- Even after the FAA publishes a final UAS rule, there will still be unresolved issues, such as the coordination of responses to UAS complaints—what organization has the primary responsibility for handling UAS complaints and how do they coordinate with local authorities in the resolution of the complaint.[83]
- One idea for addressing some of these unresolved issues involves a state statute authorizing local law enforcement to take action against unauthorized UAS operations.[84]

Section 2.4.2.1 reviews the impact of UAS on the state system.

2.3.24 Airport Issues Summary

Each of the aforementioned airport issues are currently affecting or have the potential to affect both commercial service and GA airports in Florida. It is important to have a solid understanding of each topic in order to better plan and prepare for their impacts on Florida's aviation system. Each issue is unique in its varying degrees of influence on the system, which are identified as impact, duration, and immediacy. **Table 2-3** summarizes each airport issue and its corresponding measures.

Table 2-3: Airport Issues Summary Table

Issue	Impact		Duration		Immediacy	
	CS	GA	CS	GA	CS	GA
Aging population	Med	Low	Long	Long	Now	Now
Airline pilot shortage	High	Med	Long	Long	Now	Now
Autonomous vehicles (ground-based)	Med	Low	Long	Long	Near term	Near term
Competition for space operations	Low	Low	Short	Short	Now	Now
Contract towers	Low	Med	Unknown	Unknown	Near term	Near term
Customs & Immigration	High	Low	Unknown	Unknown	Now	Now
Electric aircraft	Low	Med	Long	Long	Far term	Far term
Florida economy	High	High	Long	Long	Far term	Far term

[83] Comment received during CRT meeting on August 20, 2015 in Orlando.
[84] Comment received during CRT meeting on August 20, 2015 in Orlando.

Issue	Impact		Duration		Immediacy	
	CS	GA	CS	GA	CS	GA
Future of avgas	Low	High	Unknown	Long	Near term	Near term
Legalization of gambling	Low	Low	Short	Short	Near term	Near term
Medical certificate reform for Part 91 operations	High	High	Long	Long	Near term	Near term
NextGen requirements (navigation and communication)	High	Med	Long	Long	Near term	Near term
Opening of Cuba market	Med	Med	Long	Long	Now	Now
Pandemic fears	High	Med	Short	Short	Near term	Near term
Price of oil	High	High	Long	Long	Now	Now
Reaction to terrorist activity	High	Med	Long	Long	Now	Now
Reduction in numbers of GA pilots	High	High	Long	Long	Now	Now
Reliance on tourism	Low	Low	Long	Long	Far term	Far term
Remote control towers	Low	Low	Long	Long	Now	Now
Shortfall of aviation maintenance personnel	High	High	Long	Long	Near term	Near term
Sustainability	Low	Low	Long	Long	Now	Now
TSA staffing	High	Med	Short	Unknown	Now	Now
Unmanned aircraft systems	High	Med	Long	Long	Now	Now

Near term = within 5 years
Long term = beyond 5 years

Figure 2-9 graphically depicts each airport issue within a matrix identifying the measures of impact, duration, and immediacy on commercial service airports, while **Figure 2-10** does the same for GA airports.

Figure 2-9: Florida's Existing Spaceport System and Assets

Duration	Impact: Low	Impact: Medium	Impact: High
Short	Competition for space operations Legalization of gambling		Pandemic fears TSA staffing
Unknown	Contract towers Future of avgas		Customs & Immigration
Long	Electric aircraft Reliance on tourism Remote control towers Sustainability	Aging population Opening of Cuba market Autonomous vehicles	Airline pilot shortage Florida economy Medical certificate reform for Part 91 Operations NextGen requirements (navigation and communication) Price of oil Reduction in numbers of GA pilots Shortfall of aviation maintenance personnel Reaction to terrorist activity Unmanned aircraft systems

Timeline: Red = Now, Purple = Within 5 years, Green = Beyond 5 years

Source: CDM Smith

Figure 2-10: GA Issues

Duration	Impact: Low	Impact: Medium	Impact: High
Short	Competition for space operations Legalization of gambling	Pandemic fears	
Unknown	Customs & Immigration	Contract towers TSA staffing	
Long	Aging population Autonomous vehicles Reliance on tourism Remote control towers Sustainability	Airline pilot shortage Electric aircraft NextGen requirements (navigation and communication) Opening of Cuba market Reaction to terrorist activity Unmanned aircraft systems	Florida economy Future of avgas Medical certificate reform for Part 91 operations Price of oil Reduction in numbers of GA pilots Shortfall of aviation maintenance personnel

Timeline: Red = Now, Purple = Within 5 years, Green = Beyond 5 years

Source: CDM Smith

2.4 Aviation Industry Trends

Section 2.3 contains a high-level overview of issues that may impact Florida airports over the planning period. This section provides a more detailed industry perspective on a few of those issues and the potential impact on Florida's aviation system. These include both initiatives driven by the state and the FAA, as well as market-driven trends that could alter how aviation operates in Florida. The trends listed below are discussed in the following sections.

- NextGen Air Transportation System
- Unmanned Vehicles
- Aviation Activities Occurring Within the state of Florida
- Commercial and GA Pilot Growth Trends
- Review of Boeing and Airbus Industry Outlook

2.4.1 NextGen Air Transportation System

NextGen is a long-term plan by the FAA to transform the way the U.S. air transportation system operates. Very broadly, it aims to shift air navigation from a ground-based system to a satellite-based system through modernization of aircraft tracking systems, communication systems, and weather monitoring and forecasting systems. The benefits of this transformation include shorter flight routes and reduced congestion.

2.4.1.1 History

NextGen originated with the Vision 100 – Century of Aviation Reauthorization Act, which was signed into law in December 2003. This legislation endorsed the concept of NextGen and set into motion the planning for the implementation of NextGen. Coordination of this large-scale effort was vested in the Joint Planning and Development Office (JPDO), a multi-agency, public/private organization formed under the FAA. JPDO was tasked with planning and coordinating the multi-billion-dollar effort involving the U.S. Department of Transportation, Department of Defense, Department of Commerce, NASA, and White House Office of Science and Technology Policy. In 2014, Congress canceled funding for JPDO, and the FAA replaced it with the Interagency Planning Office, which is now responsible for coordinating the various aspects of NextGen implementation.

In 2012, the GAO reviewed the major acquisition programs that enabled the transition to NextGen. The $40 billion program has been criticized by the GAO for being more than $4 billion over budget and falling behind schedule. Their review found that 11 of the 30 programs had cost overruns totaling $4.2 billion and 15 programs experienced schedule delays, ranging from two months to 14 years.[85]

More recently, concerns were raised over the unencrypted nature of the signals sent out by aircraft to support NextGen technologies. The president of the National Business Aviation Association, Ed Bolen, pointed out that under the NextGen system, each properly equipped

[85] GAO (2012). *Air Traffic Control Modernization: Management Challenges Associated with Program Costs and Schedules Could Hinder NextGen Implementation*, GAO-12-223

aircraft broadcasts its aircraft type, position, airspeed, and unique identification in real time. "Anyone with the right equipment can capture that real-time data and potentially use it for nefarious purposes," Bolen said.[86]

A final concern is the high cost of equipping aircraft to operate within the NextGen system. For commercial airlines and aircraft used in business, this cost may be passed along to consumers. For private aircraft owners, this is not an option, and this additional cost to operate within NextGen airspace may lead to decreased GA operations.

2.4.1.2 NextGen Components and Status of Implementation

NextGen is a complex system comprised of multiple components. This section summarizes the major components of NextGen and their current implementation status.

2.4.1.2.1 AUTOMATIC DEPENDENT SURVEILLANCE-BROADCAST (ADS-B)

ADS-B is a key component of NextGen and has two systems—ADS-B Out and ADS-B In. Using a combination of ground stations, aircraft avionics, and the satellite GPS, ADS-B Out provides air traffic controllers with an aircraft's position, altitude, airspeed, and other information critical to ensuring aircraft separation. Because it relies on satellites instead of ground-based radars, ADS-B Out improves the coverage and situational awareness of air traffic controllers, including tracking of aircraft while taxiing at airports with adequate surveillance equipment.

ADS-B In transmits weather and aircraft position information (for collision avoidance) to properly equipped aircraft.[87]

In 2014, the FAA established a network of 634 ground stations, which relay data broadcast from aircraft to air traffic control, enabling improved surveillance of aircraft. The FAA plans to continue improvements in operations of the ADS-B system until all required aircraft are ADS-B Out equipped. The FAA has established a deadline of January 1, 2020 for all aircraft operating in airspace under air traffic control jurisdiction to be equipped with ADS-B Out avionics[88] (the FAA does not require aircraft to be equipped with ADS-B In). The cost to equip and install ADS-B Out is several thousand dollars per aircraft, which is fairly insignificant for the airlines, but can be a substantial financial burden on private aircraft owners. Furthermore, the biggest advantage for GA aircraft is from ADS-B In, which imposes additional equipment and costs on the aircraft owner.

2.4.1.2.2 COLLABORATIVE AIR TRAFFIC MANAGEMENT TECHNOLOGIES (CATMT)

The Collaborative Air Traffic Management Technologies (CATMT) is focused on improving the FAA's Traffic Flow Management System, which is a wide-ranging system that delivers air traffic data to users through a variety of interfaces with the intention of improving the picture of the national air transportation system.[89] Users include airlines, military, air traffic control, and the

[86] Grady, M. (2015). NBAA Raises Concerns over ADS-B Security. AVweb, May 26, 2015; http://www.avweb.com/avwebflash/news/NBAA-Raises-Concerns-Over-ADS-B-Security.html on May 29
[87] FAA Office of NextGen (2015). *NextGen Implementation Plan 2015*
[88] Ibid
[89] http://aspmhelp.faa.gov/index.php/Traffic_Flow_Management_System_(TFMS)

traveling public. The data available is extensive, and includes weather and its impacts on the national airspace system, flight schedules, and air traffic control actions that influence the national airspace system.

2.4.1.2.3 DATA COMMUNICATIONS (DATA COMM)

The Data Communications (Data Comm) portion of NextGen enables controllers and pilots to communicate with digitally written messages instead of voice messages over the radio. This will allow complex messages, such as flight plan routings, to be transmitted quickly and with reduced risk of communication error to and from the aircraft cockpit.

The FAA began Data Comm in 2013 by delivering departure clearances (the initial routing an aircraft is expected to take) to flight crews operating at Memphis International Airport and Newark Liberty International Airport. The trials at Memphis and Newark have shown that use of the system can result in faster taxi outs, reduced delays, and reduced pilot and controller workload.[90] As of May 2015, the FAA estimated that 800 aircraft were equipped to use Data Comm.[91] The FAA hopes that 1,900 aircraft will be using the system by 2019, and plans call for expanding this service to 56 airports by 2019.[92] The FAA plans to expand its Data Comm services from air traffic control towers to all 20 air route traffic control centers (the facilities, commonly referred to as "centers," that provide air traffic control services during most of the enroute portion of a flight) by 2021.[93]

The FAA has implemented Data Comm at four airports in Florida as of April 2017.[94] Those four airports are:

- Orlando International Airport
- Miami International Airport
- Fort Lauderdale-Hollywood International Airport
- Tampa International Airport

2.4.1.2.4 NATIONAL AIRSPACE SYSTEM VOICE SYSTEM (NVS)

The National Airspace System Voice System (NVS) will replace the current switch-based voice communication system used by air traffic control with a router-based system that provides a nationwide networking, monitoring, and communication sharing capabilities. NVS is expected to enable direct communication between air traffic controllers and air crews, including operators of UAS vehicles.

Current communication technology limits the air traffic control facilities that an aircraft crew can reach based on geography. The NVS envisions an interconnected air traffic control communication system that can allow aircraft crews to reach any air traffic control facility

[90] FAA Office of NextGen (2015). *NextGen Implementation Plan 2015*
[91] Grady, M. (2015). *FAA Expands Data Comm Service*. AVweb, May 25, 2015; http://www.avweb.com/avwebflash/news/FAA-Expands-Data-Comm-Service-224145-1.html
[92] FAA Office of NextGen (2015). *NextGen Implementation Plan 2015*
[93] FAA Office of NextGen (2015). *NextGen Implementation Plan 2015*
[94] https://www.faa.gov/nextgen/update/progress_and_plans/data_comm/

networked into the NVS. This is important for purposes of shifting workload between facilities, or in the event that an air traffic control facility is out of service and its communications need to be switched to another facility. The NVS is undergoing testing with full operational capability planned for 2026.

2.4.1.2.5 NEXTGEN WEATHER

The weather component of the NextGen system consists of several improvements to the collection and dissemination of weather information. The NextGen Weather Processor will identify weather hazards in the terminal and enroute environments. The Aviation Weather Display consolidates current weather displays and provides consistent weather information for terminal and enroute users. The Common Support Services modernizes information management services for weather, and provides tailored weather products with the national airspace system through System Wide Information Management (see below). Improved weather information is expected to yield dividends in the areas of reduced weather delays and enhanced safety.

2.4.1.2.6 SYSTEM WIDE INFORMATION MANAGEMENT (SWIM)

The SWIM infrastructure is aimed at allowing more efficient data sharing among aviation users. It accomplishes this by establishing data format standards, translating data from different data systems into standard formats, and consolidating multiple data connections into a single access point. SWIM results in operational efficiencies by allowing collaboration between airline dispatchers and traffic managers and providing both user groups access to current weather and flight planning information. Using SWIM-enabled data, these two groups are able to cooperatively reroute traffic and take advantage of the most current information on weather, air traffic control traffic management initiatives, runway configurations, and airport deicing operations.[95]

2.4.1.2.7 EN ROUTE AUTOMATION MODERNIZATION (ERAM)

En Route Automation Modernization (ERAM) consists of improvements to equipment at air route traffic control centers that will better automate a number of air traffic control functions, extend surveillance range, and increase the tracking capacity for each center from its current limit of 1,100 aircraft to 1,900.[96] As of March 2015, ERAM was operational at all 20 of the continental centers. Additional enhancements are planned through 2017.

2.4.1.2.8 TERMINAL AUTOMATION MODERNIZATION AND REPLACEMENT (TAMR)

Terminal Automation Modernization and Replacement (TAMR) is an equipment upgrade program similar to ERAM, but for air traffic control towers and terminal radar approach control (TRACON) facilities. This is accomplished through the installation of a common automation platform called Standard Terminal Automation Replacement System (STARS). The FAA plans to

[95] FAA (2015). *System Wide Information Management (SWIM) Information Access to Transform the Aviation Community*
[96] FAA Office of NextGen (2015). *NextGen Implementation Plan 2015*

install STARS at more than 100 locations that lack this technology. TAMR is scheduled for completion by 2020.[97]

2.4.1.3 Making the Transition to NextGen in Florida

The state of Florida is well positioned to transition to the NextGen system, with several technologies either being tested or already implemented in Florida. Southern Florida served as the initial test bed for ADS-B operations in the U.S. with 11 ground stations becoming operational in late 2008. This was followed by the FAA extending ADS-B coverage over the Gulf of Mexico in late 2009, with the aid of ground stations based along Florida's Gulf Coast.

The FAA encourages airports to prepare for the transition to NextGen in several ways. The FAA has published a brochure[98] specifically for airports that details what NextGen will do for GA airports and for commercial airports. The FAA also encourages airports to learn how AIP funds can help finance NextGen improvements at airports. For example, AIP can fund surveys, obstruction mitigation, and runway lighting that may be needed for new satellite-based instrument approaches or for lower approach minimums on existing instrument approaches. The FAA is also considering allowing AIP funds to be used for ADS-B avionics installation in ground vehicles used on airports to reduce the risk of collision with aircraft.

The one area in need of the most support concerning the transition to NextGen is equipping GA aircraft with the proper avionics equipment. Without proper avionics installed, aircraft will be denied use of the majority of airspace by 2020. This unfunded mandatory upgrade for GA aircraft reduces the anticipated benefits from NextGen.

2.4.1.4 NextGen Summary

The components of the NextGen system aim to deliver a modernized air traffic control system based on satellite navigation and communication that improves upon the safety and efficiency of the current system. Some of the components have already demonstrated benefits; however, the FAA has found it challenging to deliver on these improvements within the budget and schedule originally set.

Aviation stakeholders have voiced concerns over the security of the unencrypted information transmitted by aircraft in the NextGen system. Furthermore, the burden of the cost to equip aircraft so they can operate within the NextGen system is of concern, particularly for private aircraft owners.

2.4.2 Unmanned Vehicles

As previously noted, improvements in technology are driving towards a future where many vehicles will no longer depend on or even require an onboard operator. This is already the case with UAS. Companies including Google and many major car companies are working to make driverless vehicles a reality. Both of these developments have the potential to impact the

[97] FAA Office of NextGen (2015). *NextGen Implementation Plan 2015*
[98] The FAA brochure is available at https://www.faa.gov/nextgen/media/nextgenForAirports.pdf

operations on and around airports. This section will first look at the status of UAS operations, and then examine developments with autonomous vehicles.

2.4.2.1 Unmanned Aerial Systems (UAS)

The popularity of UAS has grown exponentially in recent years, thanks to improvements in engine technology, battery life, and miniaturization of components that have resulted in decreased costs for easy-to-operate UAS. These lower costs have caused UAS use to proliferate, with many companies looking to exploit the advantages of UAS. The following industries are just a sample of the businesses that are looking to capitalize on UAS growth.

- Agriculture: UAS operations will provide farmers with information on how their crops are performing and provide the ability to apply pesticides, fertilizer, and seed to specific areas.
- Energy: Currently, pipeline and power line inspections are carried out by manned aircraft. UAS operations have the potential to conduct these inspections for reduced costs.
- Film Industry: The movie and TV industry expect to make use of UAS as aerial filming platforms.
- Insurance: UAS operations will provide the insurance industry with information more quickly and efficiently than current methods. For example, UAS can be used to inspect roofs to evaluate a homeowner's policy, or survey damage from a tornado to speed claims.
- Real Estate: UAS use is expected be a boon for the real estate industry, giving the ability to view hard to reach areas of properties and provide views that are inaccessible to those on the ground.
- Law Enforcement: Police departments are interested in using UAS to aid in tracking suspects and monitoring for illegal activity.
- Search and Rescue: UAS operations are ideal for when search and rescue is undertaken in remote areas where access is limited.

With tremendous growth happening in UAS operations, one issue of concern to airports and aviators is how the vehicles will be integrated safely into the national airspace system. The technology that would allow these aircraft to "see and avoid" as manned aircraft are required to do in order to help avoid collisions is still under development. Other considerations include the airspace these aircraft will be allowed to operate in, and the impact they will have on capacity. Many UAS aircraft are small enough that they can operate from almost anywhere, so adding to airport congestion is unlikely to be an issue.

In June 2016, the FAA finalized the first operational rules for routine commercial use of small UAS under the Part 107 rule which went into effect in August 2016.[99]

Under the final rule, the person actually flying a drone must be at least 16 years old and have a remote pilot certificate with a small UAS rating, or be directly supervised by someone with such a

[99] https://www.faa.gov/news/press_releases/news_story.cfm?newsId=20515

certificate. To qualify for a remote pilot certificate, an individual must either pass an initial aeronautical knowledge test at an FAA-approved knowledge testing center or have an existing non-student Part 61 pilot certificate. If qualifying under the latter provision, a pilot must have completed a flight review in the previous 24 months and must take a UAS online training course provided by the FAA. TSA will conduct a security background check of all remote pilot applications prior to issuance of a certificate.[100]

2.4.2.2 Autonomous Ground Vehicles

Improvements in technology are driving the future of ground transportation toward autonomous operations. These autonomous vehicles, more commonly called self-driving or driverless cars, are expected to have a profound impact on personal transportation. Additionally, these vehicles are likely to impact how operations are conducted at airports, both airside and landside.

2.4.2.2.1 AIRSIDE IMPACTS OF DRIVERLESS CARS

Airside operations are likely to be impacted by driverless cars in a number of ways. According to Dr. Alain Kornhauser, the faculty chairman of the Princeton Autonomous Vehicle Engineering department, one of the earliest areas likely to embrace autonomous vehicles are the ground handling vehicles servicing aircraft.[101] This includes baggage handling carts, aircraft tugs, cargo handling, and other aircraft servicing vehicles. Kornhauser said experts believe that fully autonomous vehicles will be operating by 2030.

2.4.2.2.2 LANDSIDE IMPACTS OF DRIVERLESS CARS

On the landside of airports, Kornhauser said that people mover systems, which already rely on driverless systems at many airports, are likely to expand operations from their exclusive pathways to non-exclusive pathways to take advantage of driverless technologies. Heathrow Airport in London is already making use of driverless technology with its Podcar system that operates four-seat transport pods that travel autonomously between Terminal 5 and the business car park.

Kornhauser predicted that rental car companies would take advantage of driverless cars by redesigning the way they store and deliver cars for arriving airport passengers.

2.4.2.2.3 OTHER IMPACTS OF DRIVERLESS CARS ON AIRPORTS

Kornhauser postulated that the biggest impact from driverless cars could be in reducing congestion at airports. For starters, Kornhauser said that driverless cars have the potential of making driving safer and more tolerable over longer distances, which could erode the demand for air travel in markets under 300 miles. This could lead airlines to consolidate routes and concentrate air travel even further at major airports.

Additionally, the availability of driverless cars may result in reduced parking revenue for airports as passengers can send their driverless car home after getting dropped off at the airport.

[100] https://www.faa.gov/news/press_releases/news_story.cfm?newsId=20515
[101] Kornhauser, A. (2013). *Impact of Driverless Cars on the Future of Airports*, Passenger Terminal Conference

2.4.2.3 Unmanned Vehicles Summary

Advances in technology are leading to the development of both unmanned aircraft and unmanned ground vehicles. The pace of driverless car technology is somewhat slower than UAS development, with fully autonomous vehicles expected no sooner than 2030, according to Kornhauser. Nevertheless, the technology is expected to shape operations at airports, from ground handling around aircraft to movement of passengers to, from, and around airport terminals. Additionally, driverless cars could compete with airline service on routes of less than 300 miles, and has the potential for undermining airport parking revenues when departing passengers no longer need to park at the airport but can send their driverless car back home instead.

2.4.3 Aviation Activities Occurring Within the State of Florida

Florida is one of the most active aviation states in the U.S. due to its tourist attractions, cargo operations, favorable weather, and flight training activity. Because of this diverse set of activities, there are a number of different types of aircraft that regularly operate at Florida airports which range from LSA to commercial jetliners. This section documents several notable types of aviation activities that commonly occur within the commercial service and GA sectors throughout Florida as well as recent trends in the growth of those activities. Continued growth in these activities could have implications for the future of Florida and its system of airports.

2.4.3.1 Commercial Service Activity

The state of Florida has a comprehensive network of 128 public-use airports to serve the needs of its citizens, businesses, and visitors. According to the FAA's *2015-2019 National Plan of Integrated Airport Systems (NPIAS) Report*, 19 of these airports are classified as commercial service airports. These airports include the following:

- Daytona Beach International Airport
- Destin-Fort Walton Beach Airport
- Fort Lauderdale-Hollywood International Airport
- Gainesville Regional Airport
- Jacksonville International Airport
- Key West International Airport
- Melbourne International Airport
- Miami International Airport
- Northwest Florida-Beaches International Airport
- Orlando International Airport
- Orlando-Sanford International Airport
- Palm Beach International Airport
- Pensacola International Airport
- Punta Gorda Airport
- Sarasota Bradenton International Airport
- Southwest Florida International Airport
- St. Pete-Clearwater International Airport

- Tallahassee International Airport
- Tampa International Airport

In addition, Northeast Florida Regional Airport, although not classified as a commercial service airport in the NPIAS, has been served by Frontier Airlines since May 2014 and is included as a commercial service airport in this discussion. All 20 of these airports (the 19 NPIAS airports and Northeast Florida Regional Airport) are critical transportation hubs that accommodate varying levels of air passenger and air cargo activity. These activities and associated trends are discussed below.

2.4.3.1.1 AIR PASSENGER SERVICE

Because of Florida's year-round good weather, multitude of tourist attractions, and excellent business climate, the state's commercial service airports serve as a gateway for millions of business and leisure visitors who arrive in Florida on scheduled airlines each year. According to the FDOT ASO's *Florida Statewide Aviation Economic Impact Study Update* completed in August 2014, approximately 43.1 million visitors come to Florida each year on commercial airlines. While in Florida, these visitors have expenditures for lodging, food, retail, transportation, recreation, and entertainment. These expenditures help to support many jobs in Florida and the annual payroll associated with these jobs. Total annual economic impacts, including multiplier impacts, supported by visitors arriving on commercial airlines in Florida in 2013 was as follows:[102]

- Total Jobs – 765,225
- Total Annual Payroll – $20.7 billion
- Total Annual Economic Activity (Output) – $67.2 billion

In the NPIAS, the FAA groups airports into two major categories: primary and nonprimary. Primary airports include airports that have scheduled airline service with 10,000 or more enplanements per year. Nonprimary airports are predominantly used by GA aircraft. Within the primary airports group, the FAA categorizes airports as large, medium, small, and non-hub based on the percentage of total U.S. passenger enplanements that occur at them. Large hubs are airports that account for one percent or more of total U.S. passenger enplanements. Medium hubs are defined as airports that each account for between 0.25 percent and one percent of total U.S. passenger enplanements. Small hubs are defined as those airports that enplane 0.05 percent to 0.25 percent of total U.S. passenger enplanements. Commercial service airports that enplane less than 0.05 percent of all commercial passenger enplanements but have more than 10,000 annual enplanements are categorized as nonhub primary airports. It should be noted that included in the nonprimary category of airports are nonprimary commercial service airports, which are defined as public airports receiving scheduled passenger service and between 2,500 and 9,999 enplaned passengers per year. None of Florida's airports included in the NPIAS meet this criterion. **Table 2-4** identifies the NPIAS hub designation of Florida's commercial service airports. Northeast Florida Regional Airport is not included in Table 2-4 since it is not classified as a commercial service airport in the NPIAS.

[102] 2014 *Florida Statewide Aviation Economic Impact Study Update*

Table 2-4: NPIAS Hub Designation of Florida Commercial Service Airports

Associated City	Airport Name	FAA ID
Large Hub: 1% or more of annual passenger boardings		
Fort Lauderdale	Fort Lauderdale-Hollywood International Airport	FLL
Miami	Miami International Airport	MIA
Orlando	Orlando International Airport	MCO
Tampa	Tampa International Airport	TPA
Medium Hub: between 0.25% and 1% of annual passenger boardings		
Fort Myers	Southwest Florida International Airport	RSW
Jacksonville	Jacksonville International Airport	JAX
West Palm Beach	Palm Beach International Airport	PBI
Small Hub: between 0.05% and 0.25% of annual passenger boardings		
Key West	Key West International Airport	EYW
Orlando	Orlando-Sanford International Airport	SFB
Panama City	Northwest Florida-Beaches International Airport	ECP
Pensacola	Pensacola International Airport	PNS
Sarasota	Sarasota/Bradenton International Airport	SRQ
St. Petersburg/Clearwater	St. Pete-Clearwater International Airport	PIE
Valparaiso	Destin-Fort Walton Beach Airport	VPS
Non-Hub: more than 10,000 but less than 0.05% of annual passenger boardings		
Daytona Beach	Daytona Beach International Airport	DAB
Gainesville	Gainesville Regional Airport	GNV
Melbourne	Melbourne International Airport	MLB
Punta Gorda	Punta Gorda Airport	PGD
Tallahassee	Tallahassee International Airport	TLH

Source: Florida Department of Transportation (FDOT) Aviation and Spaceports Office (ASO)

As shown in Table 2-4, four airports are designated large hubs, three airports are designated medium hubs, seven airports are categorized as small hubs, and five airports are classified as non-hubs.

Table 2-5 presents the number of enplanements at Florida's commercial service airports in 2010 and 2014. In 2010, there were nearly 68.2 million enplanements at Florida's commercial service

airports. By 2014, this figure grew to nearly 74.5 million enplanements, representing a CAGR of 2.2 percent. As shown in Table 2-5, all of Florida's commercial service airports experienced growth in passenger enplanements during the 2010 to 2014 period except for Jacksonville International Airport and Sarasota Bradenton International Airport, which saw declines of 1.7 percent and 2.7 percent, respectively. Punta Gorda Airport experienced the most rapid growth, increasing at a CAGR of 39 percent.

Table 2-5: Enplanements at Florida Commercial Service Airports, 2010 – 2014

Associated City	Airport Name	FAA ID	2010 Enplanements	2014 Enplanements	CAGR[1]
Large Hub: 1% or more of annual passenger boardings					
Fort Lauderdale	Fort Lauderdale-Hollywood International Airport	FLL	11,190,053	12,330,000	2.45%
Miami	Miami International Airport	MIA	17,713,056	20,255,009	3.41%
Orlando	Orlando International Airport	MCO	17,017,491	17,779,891	1.10%
Tampa	Tampa International Airport	TPA	8,368,499	8,790,177	1.24%
Medium Hub: between 0.25% and 1% of annual passenger boardings					
Fort Myers	Southwest Florida International Airport	RSW	3,791,110	4,060,599	1.73%
Jacksonville	Jacksonville International Airport	JAX	2,808,989	2,621,650	-1.71%
West Palm Beach	Palm Beach International Airport	PBI	2,936,763	2,940,798	0.03%
Small Hub: between 0.05% and 0.25% of annual passenger boardings					
Key West	Key West International Airport	EYW	287,359	383,776	7.50%
Orlando	Orlando-Sanford International Airport	SFB	566,995	1,080,252	17.49%
Panama City	Northwest Florida-Beaches International Airport	ECP	312,114	406,351	6.82%
Pensacola	Pensacola International Airport	PNS	742,301	778,233	1.19%
Sarasota/ Bradenton	Sarasota Bradenton International Airport	SRQ	670,992	601,486	-2.70%

Associated City	Airport Name	FAA ID	2010 Enplanements	2014 Enplanements	CAGR[1]
St. Petersburg/ Clearwater	St. Pete-Clearwater International Airport	PIE	384,394	663,810	14.63%
Valparaiso	Destin-Fort Walton Beach Airport	VPS	348,979	360,542	0.82%
Non-Hub: more than 10,000 but less than 0.05% of annual passenger boardings					
Daytona Beach	Daytona Beach International Airport	DAB	246,627	317,129	6.49%
Gainesville	Gainesville Regional Airport	GNV	164,977	213,014	6.60%
Melbourne	Melbourne International Airport	MLB	180,441	214,704	4.44%
Punta Gorda	Punta Gorda Airport	PGD	90,240	336,905	39.00%
Tallahassee	Tallahassee International Airport	TLH	336,598	353,244	1.21%
Non-Hub: more than 10,000 but less than 0.05% of annual passenger boardings					
St. Augustine	Northeast Florida Regional Airport	SGJ	0	21,000	100.00 %
Total			**68,157,978**	**74,508,570**	**2.25%**

Source: Airport Records, Florida Aviation Database (FAD); Federal Aviation Administration (FAA)
[1] CAGR = Compound Annual Growth Rate

An important trend observed at Florida's large hubs during the 2010 to 2014 period is the growth in international visitors. The large hubs—Miami International Airport, Orlando International Airport, Fort Lauderdale-Hollywood International Airport, and Tampa International Airport—serve as the primary gateways for international visitors arriving by commercial airline service in Florida. International visitors are an increasingly important segment of Florida's total annual visitors because they tend to stay longer and have higher expenditures than domestic visitors, which results in greater economic impacts for the state.[103] **Table 2-6** illustrates this trend, showing total international enplanements at the large hubs grew from more than 11.8 million enplanements to more than 14.6 million enplanements between 2010 and 2014. This growth represents a CAGR of 5.4 percent.

[103] http://www.flchamber.com/article/did-you-know-in-2014-more-than-97-million-visitors-came-to-florida/

Table 2-6: International Enplanements at Florida's Large Hubs, 2010 – 2014

Associated City	Airport Name	FAA ID	2010 International Enplanements	2014 International Enplanements	CAGR[1]
Large Hub: 1% or more of annual passenger boardings					
Fort Lauderdale	Fort Lauderdale-Hollywood International Airport	FLL	1,721,857	2,329,878	7.85%
Miami	Miami International Airport	MIA	8,339,061	9,848,845	4.25%
Orlando	Orlando International Airport	MCO	1,590,000[2]	2,144,112	7.76%
Tampa	Tampa International Airport	TPA	195,039	304,767	11.81%
Total			**11,845,957**	**14,627,602**	**5.41%**

Source: Airport Records
[1] CAGR = Compound Annual Growth Rate
[2] Source: "Fitch Affirms Greater Orlando Aviation Authority, FL's Sr Revs at 'AA-'; Outlook Stable," Press Release, Reuters, May 23, 2013.

2.4.3.1.2 AIR CARGO ACTIVITY

In addition to their air passenger role, Florida's commercial service airports serve as a critical air cargo system that supports the transport of air cargo in and out of Florida to other airports in the U.S., as well as Latin America, the Caribbean, Europe, and Asia. Significant volumes of air cargo are transported each year on integrated express carriers such as FedEx, UPS, and DHL; all cargo-carriers such as China Airlines and AmeriJet; and commercial passenger carriers such as Delta, American, and Lufthansa with either dedicated all-cargo or wide-body passenger aircraft. Many businesses in Florida rely on this transport of air cargo.

The economic impacts Florida realizes from air cargo activity at its commercial service airports are impressive. **Table 2-7** presents these economic impacts for 2013, as estimated in the 2014 *Florida Statewide Aviation Economic Impact Study Update*. Note that economic impacts tied to off-airport air cargo activity, such as off-airport businesses dedicated to the sorting, storing, and ground movement of air cargo, and U.S. Postal Service activity associated with the transport of First Class mail, is also presented.[104] In all, air cargo activity at Florida's commercial service airports was responsible for nearly $10.3 billion in total annual economic activity (output) in 2013, which supported nearly 129,300 total jobs earning a total annual payroll of more than

[104] First Class mail originating in Florida or destined to the state moves by air. As a result, a portion of the economic activity of the U.S. Postal Service is supported by aviation.

$5.0 billion.[105] Economic impacts tied to on- and off-airport air cargo activity at Florida's GA airports are not included in Table 2-7.

Table 2-7: Total Economic Impacts of Air Cargo Activity at Florida Commercial Service Airports, 2013

Activity	Total Jobs[1]	Total Annual Payroll[1]	Total Annual Economic Activity[1]
On-Airport Air Cargo	22,362	$804,731,000	$1,376,682,000
Off-Airport Air Cargo	30,178	$1,243,495,000	$3,786,712,000
Off-Airport USPS	76,724	$2,969,817,000	$5,123,127,000
Total	**129,264**	**$5,018,043,000**	**$10,286,521,000**

Source: Florida Department of Transportation (FDOT) Aviation and Spaceports Office (ASO) 2014, Florida Statewide Aviation Economic Impact Study Update
[1] Includes multiplier impacts.

Table 2-8 identifies the volumes of air cargo loaded and unloaded on aircraft at Florida's commercial service airports between 2010 and 2014. Total tonnage handled during this time period increased from more than 2.5 million short tons in 2010 to more than 2.7 million short tons in 2014, a CAGR of 2.1 percent.[106] As shown in Table 2-8, Pensacola International Airport experienced the largest CAGR (116.2 percent), but Miami International Airport (CAGR of 2.1 percent) accounted for most of the state's increase.

Table 2-8: Total Air Cargo Tonnage Handled at Florida Commercial Service Airports, 2010 – 2014

Associated City	Airport Name	FAA ID	2010 Total Tonnage (Short Tons)	2014 Total Tonnage (Short Tons)	CAGR
Daytona Beach	Daytona Beach International Airport	DAB	93	146	11.9%
Fort Lauderdale	Fort Lauderdale-Hollywood International Airport	FLL	98,068	99,289	0.3%
Fort Myers	Southwest Florida International Airport	RSW	17,084	16,735	-0.5%
Gainesville	Gainesville Regional Airport	GNV	117	3	-60.0%
Jacksonville	Jacksonville International Airport	JAX	73,474	71,308	-0.7%
Key West	Key West International Airport	EYW	508	510	0.1%
Melbourne	Melbourne International Airport	MLB	79	126	12.4%

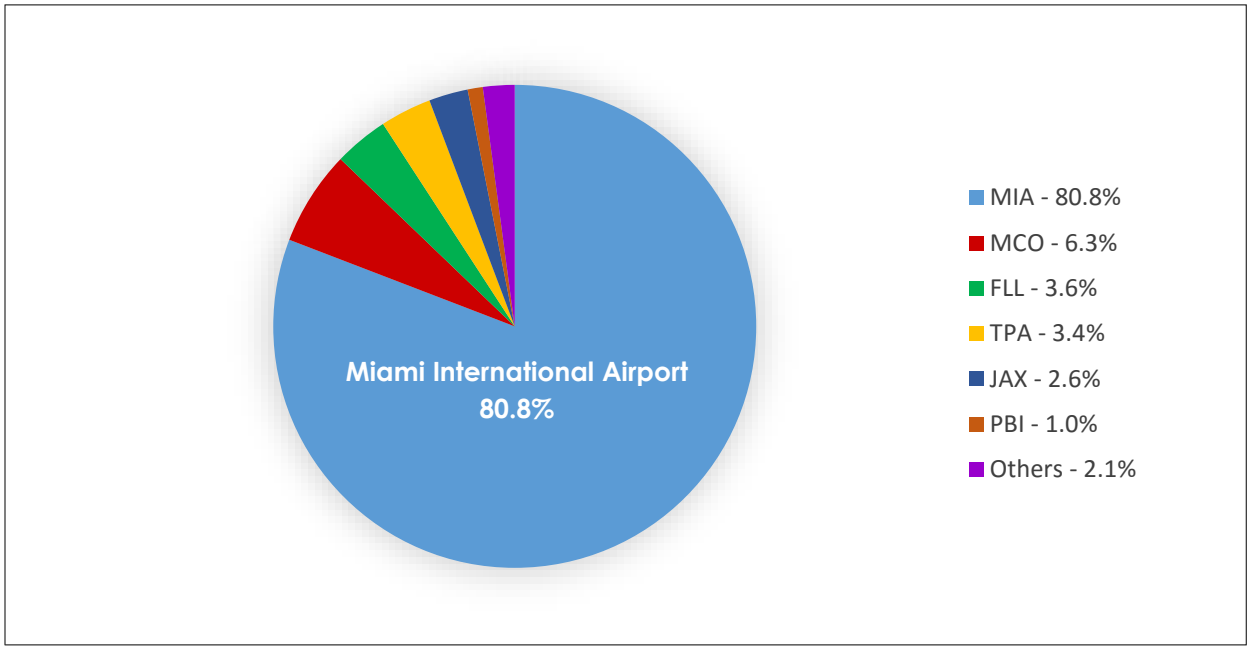
[105] All impacts include multiplier impacts
[106] One short ton equals 2,000 pounds

Associated City	Airport Name	FAA ID	2010 Total Tonnage (Short Tons)	2014 Total Tonnage (Short Tons)	CAGR
Miami	Miami International Airport	MIA	2,024,032	2,203,726	2.1%
Orlando	Orlando International Airport	MCO	149,799	172,869	3.6%
Orlando	Orlando-Sanford International Airport	SFB	3,555	1,627	-17.7%
Panama City	Northwest Florida-Beaches International Airport	ECP	8	51	58.9%
Pensacola	Pensacola International Airport	PNS	305	6,668	116.2%
Punta Gorda	Punta Gorda Airport	PGD	0	0	0.0%
Sarasota	Sarasota Bradenton International Airport	SRQ	215	230	1.7%
St. Augustine	Northeast Florida Regional Airport	SGJ	0	0	0.0%
St. Petersburg/ Clearwater	St. Pete-Clearwater International Airport	PIE	15,591	21,771	8.7%
Tallahassee	Tallahassee International Airport	TLH	10,417	9,796	-1.5%
Tampa	Tampa International Airport	TPA	96,890	93,684	-0.8%
Valparaiso	Destin-Fort Walton Beach Airport	VPS	24	19	-5.7%
West Palm Beach	Palm Beach International Airport	PBI	19,018	27,642	9.8%
Total			**2,509,277**	**2,726,200**	**2.1%**

Source: Airport Records; Airports Council International – North America; USDOT BTS T-100
[1] CAGR = Compound Annual Growth Rate

Miami International Airport is a major international gateway that drives the air cargo landscape within Florida. As shown in **Figure 2-11**, Miami International Airport handled nearly 81percent of the total annual tonnage at Florida's commercial service airports in 2014.

Figure 2-11: Percentage of Total Air Cargo Tonnage Handled at Florida Commercial Service Airports, 2014[1]



Source: Airport Records; Airports Council International – North America; USDOT BTS T-100
[1] Percentages may not sum due to rounding

2.4.3.2 GA Activity

GA comprises an additional component of the aviation activity that occurs throughout Florida. GA flights not only occur at most of Florida's commercial service airports, but also at the 110 GA airports that comprise the Florida airport system. A wide variety of GA flights occur at Florida's airports, some of which Florida is particularly well known for, including training flights, air charter operations, and LSA activity. These activities and associated recent growth trends are discussed in the following sections.

2.4.3.2.1 FLIGHT TRAINING

Florida has long been known as a world leader in providing many types of aviation-related education, including flight training. Many of Florida's flight schools attract students from beyond the state, and often from international locations. Florida appeals to students seeking flight training due to the state's ideal climate, diverse population, availability of numerous training providers, and international accessibility through several commercial service airports. Examples of highly respected flight schools found in Florida include Embry-Riddle Aeronautical University at Daytona Beach International Airport, FIT Aviation at Melbourne International Airport, Aerosim Flight Academy at Orlando-Sanford International Airport, Bristow Academy at Space Coast Regional Airport, Europe-American Aviation at Naples Municipal Airport, and Broward College's Aviation Institute at North Perry Airport.

The significant economic impacts that aviation education have in Florida were documented in FDOT's 2014 *Florida Statewide Aviation Economic Impact Study Update*. These impacts,

generated through the training of pilots, mechanics, flight attendants, air traffic controllers, aviation managers, and other aviation professionals, are identified in **Table 2-9**. As shown in the table, which presents both on- and off-airport impacts, total economic impacts of aviation education in 2013, including multiplier impacts, were approximately 11,900 total jobs, $488.0 million in total annual payroll, and $983.0 million in total annual economic activity (output).

Table 2-9: Total Economic Impacts of Aviation Education in Florida, 2013

	Total Jobs[1]	Total Annual Payroll[1]	Total Annual Economic Activity[1]
On-Airport Aviation Education	10,700	$427,889,000	$851,357,000
Off-Airport Aviation Education	1,191	$59,971,000	$132,027,000
Total	**11,891**	**$487,860,000**	**$983,384,000**

Source: Florida Department of Transportation (FDOT) Aviation and Spaceports Office (ASO) 2014, Florida Statewide Aviation Economic Impact Study Update
[1] Includes multiplier impacts.

Table 2-10 presents data from the FAA's Air Traffic Activity Data System (ATADS) on total local GA aircraft operations from 2010 to 2014 at the 43 airports in the Florida airport system with air traffic control towers.[107] The FAA defines local GA operations as those performed by aircraft that:

- Operate in the local traffic pattern or within sight of an airport,
- Are known to be departing for or arriving from flight in local practice areas within a 20-mile radius of the airport, or
- Are executing practice instrument approaches.

All other operations are considered itinerant.

While not all local GA aircraft operations at an airport are flight training-related, it is widely accepted that many of them are associated with flight training. This means these operations can be used as an indication of the level of flight training activity that occurs at the facility. Table 2-10 shows that local GA operations at the towered airports grew from nearly 1.5 million operations to more than 1.8 million operations at a CAGR of 5.4 percent. Based on this data, there appears to be an increase in flight training activity at Florida's towered airports since 2010.

[107] Only airports with air traffic control towers were included in this analysis of flight training operations due to the reliability of aircraft operations data at those airports.

Table 2-10: Local GA Operations at Florida Airports, 2010 – 2014

	2010 Local GA Operations	2014 Local GA Operations	CAGR[1]
Commercial Service Airports[2]	402,739	418,304	1.0%
GA Airports[2]	1,090,884	1,423,660	6.9%
Total	**1,493,623**	**1,841,964**	**5.4%**

Source: Federal Aviation Administration (FAA) Air Traffic Activity Data System (ATADS)
[1] CAGR = Compound Annual Growth Rate
[2] Includes only the 43 airports in the Florida airport system with air traffic control towers.

2.4.3.2.2 AIR CHARTER ACTIVITY

For people and businesses seeking opportunities to better utilize their time, use of charter aircraft has become indispensable. Air charter refers to a variety of services available that allow individuals, corporations, or groups to move people and cargo in the fastest, most efficient manner available today. It can include the transporting of business people to open new markets, the transfer of patients during medical emergencies, the shipping of time-sensitive cargo, as well as any other use where time and convenience are of the essence. More specifically, air charter is defined as the business of providing nonscheduled flights that carry passengers or cargo where the party receives the exclusive use of the aircraft. The aircraft can be large or small, and flights can be one-way or round-trip. The charter could be made on a flight-only basis, or could be part of a complete travel package.

Air charter can eliminate logistical ineffectiveness by providing immediate point-to-point travel services that are fast and reliable. Moreover, flight time itself is much more productive as charter aircraft have the capability to allow their passengers to operate much as they would in a professional office. Air charter operators board passengers closer to their points of origin and deliver them closer to their final destination by effectively utilizing the country's vast GA airport network. This not only makes travel more convenient, it also allows businesses to operate in, or develop markets outside of major metropolitan areas due to the speed and accessibility provided by air charter.

Florida realizes and benefits from significant air charter operations throughout its airport system. With more than 70 companies providing air charter services based at Florida airports, air charter is a driving force within the state.[108] Examples of these companies include Hop-A-Jet Worldwide Jet Charter at Fort Lauderdale Executive Airport, ExecuJet Charter Service at Tampa International Airport, Noble Air Charter at Miami-Opa Locka Executive Airport, Fair Wind Air Charter at Witham Field, Bay Air Charter at Albert Whitted Airport, and Naples Air Inc. at Naples Municipal Airport. As evidenced by the pronounced use of Florida airports by operators such as NetJets, Flight Options, XOJET, and Hop-A-Jet, air charter is an important tool that helps businesses to continue to operate, while also serving as a potential incentive for new businesses to locate within the state. Since Florida is an internationally recognized vacation destination,

[108] 2014 *Florida Statewide Aviation Economic Impact Study Update*

charter aircraft operations have proven to be a critical component in moving tourists to and from distant destinations. Air charter operations are also regularly used to support professional and collegiate sports teams and their fans as they travel for games and tournaments. Additionally, an important aspect of air charter service is that it can serve as a lifeline during emergency medical events where immediacy and accessibility save lives. These are just a few of the ways that air charter is used in Florida and how it benefits the state.

Table 2-11 sheds light on recent growth trends in air charter activity in Florida. Data presented in the table shows total itinerant air taxi operations for the 2010 to 2014 period at Florida's 24 GA airports in the airport system with air traffic control towers.[109] The FAA uses the term "air taxi" as the general term used for all types of chartered aircraft.[110] Itinerant air taxi operations grew from approximately 62,500 operations to approximately 85,600 operations between 2010 and 2014, which represents a CAGR of 8.2 percent.

Table 2-11: Itinerant Air Taxi Operations at Florida GA Airports, 2010 – 2014

	2010 Itinerant Air Taxi Operations	2014 Itinerant Air Taxi Operations	CAGR[1]
GA Airports[2]	62,529	85,633	8.2%

Source: Federal Aviation Administration (FAA) Air Traffic Activity Data System (ATADS)
[1] CAGR = Compound Annual Growth Rate
[2] Includes only the 24 GA airports in the Florida airport system with air traffic control towers.

2.4.3.2.3 LIGHT SPORT AIRCRAFT (LSA) ACTIVITY

A component of GA that is gaining popularity across the country as well as in Florida is LSA activity. LSA is a relatively new category of aircraft created in 2004 by the FAA in a joint effort by the ultralight aircraft manufacturers and organizations that had supported and controlled the ultralight industry, including Aerosports Connection (ASC), U.S. Ultralight Association (USUA), and the EAA.[111] The intent of the regulation was to fill the gap between ultralight aircraft and GA aircraft.[112] The FAA defines LSAs as meeting the following criteria:

- A maximum of two occupants,
- A maximum takeoff weight of 1,320 pounds (seaplanes 1,430 pounds),
- A 45-knot maximum stall speed,
- A 120-knot top speed in level flight,
- A maximum of one engine/motor (if powered),
- A fixed-pitch or ground adjustable propeller,
- An unpressurized cabin, and

[109] Air taxi operations at the commercial service airports are not included, since the FAA includes operations conducted by regional/commuter airlines in the air taxi category in ATADS.
[110] https://www.faa.gov/about/office_org/field_offices/fsdo/fat/local_more/media/consumers_guide_to_chartering_aircraft.pdf
[111] http://www.sportpilotaviation.com/index.php?option=com_content&view=article&id=87&Itemid=229
[112] http://www.bydanjohnson.com/index.cfm?b=6

- Fixed landing gear (except for seaplanes and gliders).[113]

LSAs include fixed-wing aircraft, weight-shift control aircraft (trikes), powered parachutes, gliders, gyroplanes, and lighter-than-air aircraft (balloons and airships).

Included in the regulation introducing this new class of aircraft was the creation of the new sport pilot certificate that is required to fly an LSA.[114] A sport pilot is permitted to fly any aircraft meeting the above-referenced criteria that he/she is trained and authorized to fly through logbook endorsement. [115] Flying must occur using VFR, during daylight hours, below ten thousand feet above mean sea level and 2,000 feet above ground level, in Class E and G airspace (and B, C, and D airspace with appropriate training), and be for transportation (not for hire) or recreation only. Further, three statute mile visibility and visual contact with the ground are also required.[116]

The requirements to earn and maintain a sport pilot certificate are much less stringent than those required for more advanced pilot certificates, with the training process being comparable to driver's education. For example, because sport pilots fly with fewer occupants and must fly during the daylight in good weather and at a slower speed, the minimum number of training hours required to earn a sport pilot certificate ranges from only 20 hours to fly a fixed-wing LSA, gyroplane, airship, or trike to a mere seven hours to fly a balloon.[117] A private pilot certificate, on the other hand, requires a minimum of 35 or 40 hours of training time, depending on the curriculum.[118] This is because private pilots are allowed to fly with an unrestricted number of occupants at higher speeds in varying weather conditions into more complicated airspace managed by air traffic control towers.[119] Another significant difference between a sport pilot certificate and other pilot certificates is that sport pilots do not need to undergo a medical examination on a regular basis to verify their medical fitness to fly. For example, a third-class medical certificate, which is the most basic medical certificate a pilot other than a sport pilot can possess, requires a medical examination a minimum of once every two years. A sport pilot is only required to possess a valid U.S. driver's license as evidence of their medical fitness.[120]

The introduction of the LSA category of aircraft and the associated sport pilot certificate has provided the opportunity to people who have dreamed of flying, but were deterred due to the time and expense involved in earning a private pilot certificate. It has also provided the prospect of flying for pilots who may not be able to maintain an FAA medical certificate required for more advanced pilot certificates. An additional advantage of this category of flying is the cost. The purchase cost of LSAs are much lower (although not as low as originally hoped

[113] https://www.eaa.org/en/eaa/aviation-communities-and-interests/light-sport-aircraft/getting-started-in-light-sport-aircraft-flying/become-a-sport-pilot-and-fly-light-sport-aircraft/faa-sport-pilot-rule
[114] Any certificated pilot can fly an LSA, but sport pilots can only fly aircraft that meet the definition of an LSA.
[115] http://www.sportpilotaviation.com/index.php?option=com_content&view=article&id=87&Itemid=229
[116] https://www.eaa.org/en/eaa/aviation-communities-and-interests/light-sport-aircraft/getting-started-in-light-sport-aircraft-flying/become-a-sport-pilot-and-fly-light-sport-aircraft/sport-pilot-limitations-and-privileges
[117] https://www.eaa.org/en/eaa/aviation-communities-and-interests/aviation-beginners-and-newcomers/learn-how-to-fly-and-discover-the-freedom-of-flight/how-to-become-a-sport-pilot
[118] Ibid
[119] Sport pilots can receive further training to attain more flying privileges, such as flying in controlled airspace.
[120] http://www.bydanjohnson.com/index.cfm?b=6&m=4&i=7/

when the LSA category was first introduced) than standard aircraft,[121] and since they run on standard automobile gasoline (also known as mogas), LSAs are much less expensive to operate.[122] The result has been LSAs are growing in popularity in ways nobody thought possible.

In Florida, evidence of the popularity of LSAs is seen in the large number of LSA businesses located throughout the state. ByDanJohnson.com is a website published by Dan Johnson, one of the foremost authorities on LSA, ultralight aircraft, and homebuilt aircraft that sport pilots may fly. According to the "Flight Instruction, Rental, and Maintenance for Light-Sport Aircraft List" on this website, there are 25 verified businesses in Florida that provide LSA flight instruction, rental, and/or maintenance.[123] Florida and California (which also has 25 LSA businesses that provide these services) have the most LSA businesses in the country. Texas ranks third with 12 businesses. Examples of Florida LSA businesses include First Landings Aviation at Orlando Apopka Airport, Renegade Light Sport Aircraft LLC at DeLand Municipal-Sidney H. Taylor Field, Breezer Aircraft USA LLC at Lakeland Linder Regional Airport, and Flamingo Aviation at Miami Executive Airport. It should be noted that the 25 businesses in Florida do not include LSA manufacturers or businesses that provide LSA sales only, several of which are also located in the state. Internet research identified 22 additional companies engaged in these activities. Examples include Evolution Trikes at Zephyrhills Municipal Airport, Progressive Aerodyne in Tavares, and Phoenix Air USA at Melbourne International Airport.

Sebring Regional Airport in Sebring, Florida is a particularly notable location for LSA activity. Several LSA companies cluster at the airport, including Float Planes and Amphibs (FPNA), Lockwood Aviation, Sebring Aviation, and Tecnam US Inc., a leading manufacturer of LSAs. Also, the airport hosts the annual U.S. Sport Aviation Expo, which draws aviation enthusiasts from around the U.S. and several foreign countries. Established in 2004, this event's mission is to encourage interest in and promote recreational sport aviation. The Expo originally focused on being a showcase for sport pilots and LSA, but it recently expanded to include ultralights, homebuilt aircraft, and refurbished production aircraft.[124] The show is known in the aviation world as the premier event for aircraft manufacturers and other exhibitors to display aircraft and accessories for sale and for buyers and sellers to interact. In fact, the January 2015 Expo set a new record with approximately 18,500 attendees[125] visiting nearly 140 exhibitors covering over 21 acres of exhibit space.[126]

ByDanJohnson.com collects data that illustrates the growth in LSA activity in the U.S. since the FAA created the LSA aircraft category in 2004. According to this website, through December 2014 there were a total of 2,786 fixed-wing Special LSAs (SLSAs) registered with the FAA since the

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[121] Lee, Marc C. (2015). "Light-Sport Aircraft – A New Way to Adventure," *Plane&Pilot*.
[122] http://www.pipmarketing.com/florida-is-one-of-three-lsa-manufacturers-in-the-world/
[123] The Flight Instruction, Rental, and Maintenance List published on ByDanJohnson.com is regarded as a premium resource directory composed exclusively of verified LSA businesses. The staff of ByDanJohnson.com personally contacted the flight instruction and rental businesses on the list to confirm the N-numbers of LSAs that can be used for flight instruction and solo flights. Maintenance organizations were contacted to verify that they possess an A&P Mechanic or LSA Repairman certificate.
[124] Expo News (2015). "Expo 2016 Marks 12th Annual Event," *Expo News*, May 20, 2015.
[125] Expo News (2015). "Exhibitors and Final Numbers Give 2015 U.S. Sport Aviation Expo Good Grades – 2016 Exhibitor Registration to Open Soon," *Expo News*, March 12, 2015.
[126] Expo News (2015). "The U.S. Sport Aviation Expo… A Unique Experience," *Expo News*, January 20, 2015.

first aircraft was accepted by the FAA in April 2005.[127] SLSAs are fully manufactured LSAs, as opposed to Experimental Amateur Built (EAB), or homebuilt, aircraft and Experimental LSAs (ELSAs), which owners are responsible for assembling a certain percentage of the aircraft from kits. As shown in **Table 2-12**, the total number of registered SLSAs in the U.S. increased at a CAGR of 9.2 percent from 2010 to 2014.[128]

Table 2-12: Total Registered Special LSAs in the U.S., 2010 – 2014

	2010	2014	CAGR[1]
Special LSAs[2]	1,960	2,786	9.2%

Source: ByDanJohnson.com
[1] CAGR = Compound Annual Growth Rate
[2] SLSAs are fully manufactured aircraft. Data includes only fixed-wing aircraft. Weight-shift control aircraft, powered parachutes, gliders, gyroplanes, and others are excluded due to the lack of reliable data.

Another measure of the growth in LSA activity is the number of sport pilot certificates held in the U.S. The annual FAA Aerospace Forecast summarizes historic and anticipated trends in several components of civil aviation activity. One of the components included in the forecast is active pilots. **Table 2-13** presents data on the number of sport pilot certificates held in the U.S. during the 2010 to 2014 period. Sport pilot certificates increased from 3,682 certificates to 5,157 certificates, representing a CAGR of 8.8 percent.

Table 2-13: Sport Pilot Certificates Held in the U.S., 2010 – 2014

	2010	2014	CAGR[1]
Sport Pilot Certificates	3,682	5,157	8.8%

Source: Federal Aviation Administration (FAA) Aerospace Forecast FY 2015 – 2035
[1] CAGR = Compound Annual Growth Rate

Data indicating historic growth in LSA activity in Florida is limited. Available data includes sport and recreational pilot certificates held in Florida, which the FAA combines into one category in its statewide data. Sport and recreational pilot certificates held in Florida grew from 329 in 2010 to 473 in 2014 at a CAGR of 9.5 percent (see **Table 2-14**).

Table 2-14: Sport and Recreational Pilot Certificates Held in Florida, 2010 – 2014

	2010	2014	CAGR[1]
Sport and Recreational Pilot Certificates	329	473	9.5%

Source: Federal Aviation Administration (FAA)
[1] CAGR = Compound Annual Growth Rate

[127] The data excludes weight-shift control aircraft, powered parachutes, gliders, gyroplanes, and others due to unreliable information, per ByDanJohnson.com.
[128] Florida-specific data on registered LSAs is not available.

2.4.3.3 Aviation Activities Summary

Florida is fortunate to have an abundance of airports that range in size from large hubs able to accommodate aircraft as large as the Airbus A380, such as Miami International Airport, to small, privately owned airfields with turf runways serving single engine airplanes, such as Flying Ten Airport. Florida's airports support a wide variety of commercial service and GA activities, including air passenger service, air cargo operations, flight training, air charter flights, and LSA activity, among many others. The combination of these aviation activities and Florida's geography, climate, and diverse and expanding population generates a significant number of economic impacts for the state, as confirmed in the 2014 *Florida Statewide Aviation Economic Impact Study Update*. Since evidence of growth in each of these activities has been observed since 2010, a well-planned airport system capable of meeting the demand will be required to accommodate future growth.

2.4.4 Commercial and GA Pilot Growth Trends

The benefits Florida realizes from aviation industry is intrinsically tied to the aircraft and pilots. Since the aviation industry is a large economic generator for Florida's economy, a reduction in the number of trained pilots will negatively impact both the aviation industry and the state's economy. This section examines commercial and GA pilot growth trends and projections and discusses their potential impact on the future of the Florida aviation industry.

2.4.4.1 Historical Growth Trends of the Pilot Population

The sections below provide an overview of historical growth trends in the number of pilots nationwide and in Florida.

2.4.4.1.1 THE U.S. PILOT POPULATION

The FAA publishes annual forecasts that summarize anticipated trends in most components of civil aviation activity. Each published forecast, known as the FAA Aerospace Forecast, revisits previous activity forecasts and updates them after examining the prior year's trends in aviation and economic activity. Many factors are considered in the FAA's development of forecasts, some of the most important of which are U.S. and international economic growth and anticipated trends in fuel costs. The FAA Aerospace Forecast generally provides one of the most detailed analyses of historic and forecasted aviation trends and provide the framework for examining future levels of aviation activity for the nation as well as in specific states and regions.

One measure of national aviation activity which is monitored and projected in the annual FAA Aerospace Forecast is the number of active pilots. The FAA Aerospace Forecast categorizes pilot certificates into one of eight classifications. These classifications include:

- Student Pilot: Pilots in training. Student pilots may fly aircraft solo when properly authorized by a flight instructor. In 2010, the FAA eased the requirements for a student pilot, resulting in a significant increase in student pilots.
- Sport Pilot: Certified to fly LSA. Limited to 2-seats and day-time flying only. This category did not exist in 2000.

- Recreational Pilot: Certified to fly aircraft with up to 180 horsepower and four seats. Limited to day-time flying only.
- Private Pilot: Certified to fly aircraft, as long as it is not for compensation or hire.
- Commercial Pilot: Certified to fly for compensation or hire. Required to have 250 hours of flight time.
- Airline Transport Pilot: Certified to fly as pilot in command for a scheduled airline. In 2010, the FAA required all Part 121 (scheduled airline) flight crew members to hold an ATP certificate by August 2013. The ATP certificate requires 1,500 hours of flight time. This new requirement resulted in a decline in the number of commercial pilots accompanied by an increase in the number of ATPs, as commercial pilots previously serving as second in command airline pilots obtained the higher-level ATP certificate.
- Rotorcraft Pilot: Pilots certified to fly helicopters and gyrocopters. This category includes those people who are certified to fly only rotorcraft. Pilots who are certified to fly both fixed wing and rotorcraft are included in the appropriate previously mentioned categories.
- Glider Pilot: Pilots certified to fly gliders and sailplanes. This category includes those people who are certified to fly only gliders. Pilots who are certified to fly aircraft in addition to gliders are included in the appropriate previously mentioned categories. In 2002, the FAA changed the method of counting glider pilots, resulting in a large increase.

Table 2-15 identifies the number of pilot certificates held in the U.S. in 2000 and 2014, according to the FAA Aerospace Forecast. As shown, the total number of pilots in the U.S. has fallen by 5.1 percent since 2000, despite changes in counting methodology that significantly boosted student and glider pilot numbers during the period.

Table 2-15: Pilot Certificates Held in the U.S.

Pilot Certificate	Number of Certificates		Percent Change
	2000	2014	
Airline Transport Pilot	141,596	152,933	8.0%
Commercial	121,858	104,322	-14.4%
Private	251,561	174,883	-30.5%
Recreational	340	220	-35.3%
Sport	0	5,157	N.A.
Student	93,064	120,546	29.5%
Rotorcraft	7,775	15,511	99.5%
Glider	9,387	19,927	112.3%
Total Certificates	**625,581**	**593,499**	**-5.1%**

Source: Federal Aviation Administration (FAA) Aerospace Forecast FY 2009 – 2025 and FY 2015 – 2035

2.4.4.1.2 THE FLORIDA PILOT POPULATION

The number of active FAA certified pilots in Florida (**Table 2-16**) has increased for almost all certificate types, with the exception of recreational, private, and commercial.

Table 2-16: Active FAA Certified Pilots and Flight Instructors in Florida

Year	Total Pilots	Students	Recreational	Sport	Private	Commercial	Airline Transport	Rotor, Glider, & Balloon	Remote Pilot	Flight Instructor
2007	48,244	7,510	13	137	15,614	10,331	14,639	*	*	8,147
2008	49,991	7,467	13	198	16,307	11,102	14,904	*	*	8,359
2009	48,163	6,543	12	262	15,462	11,000	14,884	*	*	8,638
2010	51,671	10,917	13	316	14,857	10,727	14,841	*	*	8,805
2011	52,037	11,572	11	357	14,490	10,515	15,092	*	*	8,965
2012	52,566	11,946	8	397	14,302	10,336	15,577	*	*	9,138
2013	52,437	12,185	6	434	13,694	9,953	16,165	7,031	*	9,283
2014	52,967	12,501	7	466	13,437	9,786	16,770	6,999	*	9,592
2015	54,254	13,177	7	499	13,552	9,797	17,222	6,984	*	9,904
2016	55,692	13,844	6	544	13,090	9,959	18,249	7,167	1,783	10,183
Diff. (2007 – 2016)	**+7,448**	**+6,334**	**-7**	**+407**	**-2,524**	**-372**	**+3,610**	**+7,167**	**+1,783**	**+2,036**

**info not available*
Source: General Aviation Manufacturers Association (GAMA)General Aviation Statistical Databook & Industry Outlook (2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016)

2.4.4.1.3 DECLINE IN THE PILOT POPULATION

The overall trend in the national pilot population since 2000 has been a decline in pilots, primarily private pilots. Although the total number of pilots in Florida has increased since 2000, the trend in the reduction of private pilots is also evident, with the number of private pilots decreasing from approximately 16,000 pilots to approximately 13,000 pilots (see Table 2-16).

The drop in private pilots is of particular concern since this is the single largest segment of pilots, and represents the pool of pilots from which future airline pilots will come. The decline in private pilots can be explained by a number of factors, including rising fuel prices, waning interest and heightened flying restrictions following the 9/11 terrorist attacks, fewer people with discretionary income following the 2007 – 2009 recession, and the FAA's medical certification requirements. Some of these factors are discussed in more detail in the section below.

2.4.4.2 Forecasts of Pilot Population and Demand

The following sections examine forecasts of the U.S. pilot population and pilot demand. Forecasts of pilots on the national level include the FAA Aerospace Forecast and Boeing's *Current Market Outlook 2015 – 2034*, while future pilot projections for Florida were gleaned from the Florida Research and Economic Information Database Application.

2.4.4.2.1 FORECAST OF PILOTS IN THE U.S.

The FAA Aerospace Forecast of the active pilot population in the U.S. through 2035 is presented in **Table 2-17**. As shown in the table, the total number of pilots is projected to increase from 593,500 pilots in 2014 to 617,000 pilots by 2035 at an average annual growth rate of 0.2 percent. This is an increase of 23,500 pilots. Sport and rotorcraft pilots are anticipated to see the most rapid growth, with average annual growth rates of 5.2 percent and 2.2 percent, respectively, forecast through 2035. Air transport and commercial pilots are both projected to experience moderate growth of 0.5 percent and 0.4 percent, respectively. Private pilots are forecast to see negative growth, with a decrease of nearly 11,300 pilots expected by 2035.

Table 2-17: Forecast of Active Pilot Population in the U.S.

Year	Students	Recreational	Sport Pilot	Private	Commercial	Airline Transport	Rotorcraft	Glider	Total Pilots
2014	120,546	220	5,157	174,883	104,322	152,933	15,511	19,927	593,499
2015[E]	119,650	220	5,600	173,750	104,250	153,000	15,335	19,885	591,690
2020	118,250	220	7,700	171,950	105,550	154,300	16,440	19,815	594,225
2025	116,300	215	9,900	168,650	107,050	158,100	20,300	19,615	600,130
2030	114,350	210	12,450	165,900	109,700	162,900	23,010	19,730	608,250
2035	112,200	210	14,950	163,600	113,350	168,600	24,440	19,650	617,000
Average Annual Growth									
2014–24	-0.3%	-0.2%	6.2%	-0.3%	0.2%	0.3%	2.3%	-0.2%	0.1%
2014–35	-0.3%	-0.2%	5.2%	-0.3%	0.4%	0.5%	2.2%	-0.1%	0.2%

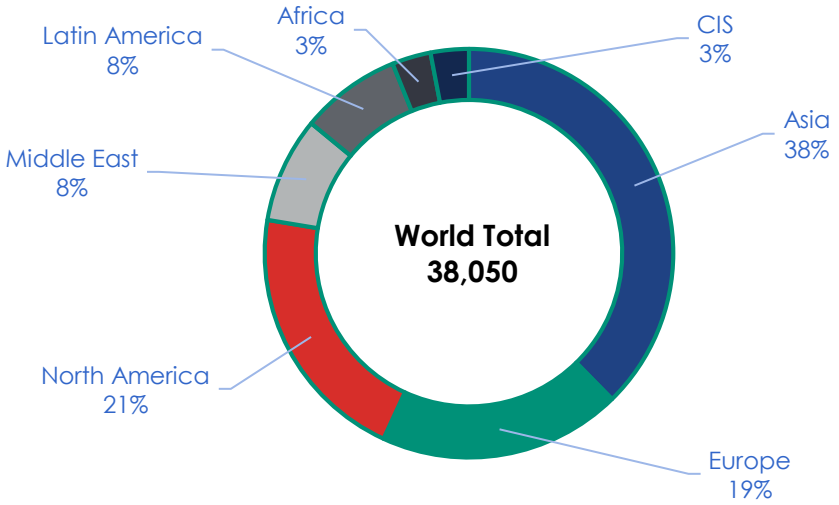
Source: Federal Aviation Administration (FAA) Aerospace Forecast FY 2015 – 2035
E = Estimate

The Boeing Company, the world's largest aerospace company and leading manufacturer of commercial jetliners and defense, space and security systems, issues an annual long-term forecast of air traffic volumes, airplane demand, and pilot and technician demand. In this forecast, Boeing factors the effects of current business conditions and developments into its analysis of the long-term drivers of air travel. The forecast not only assists Boeing with its product

strategy and long-term business planning, but since it is shared with the public, it also informs decisions by airlines, suppliers, and the financial community.

In its *Current Market Outlook 2015 – 2034*, Boeing projects significant expansion of the world's airlines during the forecast period. As shown in **Figure 2-12**, Boeing projects 38,050 new jetliners will be added to the global fleet over the next 20 years. Nearly 7,900 of these aircraft will be added in North America, where demand is driven largely by the U.S.

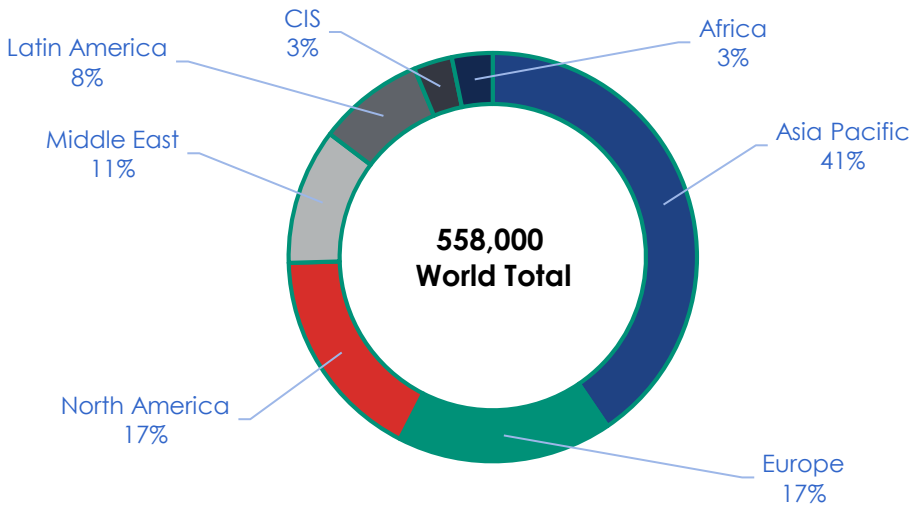
Figure 2-12: New Airplanes by Region 2015 – 2034



Source: Boeing Current Market Outlook 2015 – 2034

As the airlines take delivery of thousands of new jetliners over the next 20 years, Boeing projects an unprecedented demand for pilots to fly these aircraft. **Figure 2-13** shows that the world will need 558,000 new commercial airline pilots between 2015 and 2034, with 95,000 needed in North America.

Figure 2-13: New Pilots by Region 2015 – 2034



Source: Boeing Current Market Outlook 2015 – 2034

2.4.4.2.2 FORECAST OF PILOTS IN FLORIDA

Neither the FAA nor Boeing provide forecasts of pilots on the state level. The Florida Research and Economic Information Database Application (FREIDA), however, provides Occupational Employment Projections for two categories of pilots in Florida for the 2014 – 2022 period: airline pilots, copilots, and flight engineers; and commercial pilots. **Table 2-18** shows that airline pilots, copilots, and flight engineers are forecast to increase from nearly 5,000 positions in 2014 to more than 5,300 positions by 2022. Commercial pilots are expected to grow from approximately 3,100 positions in 2014 to more than 3,400 positions by 2022.

Table 2-18: Occupational Employment Projections for Pilots in Florida, 2014 – 2022

Occupational Title	2014 Estimated Employment	2022 Projected Employment	Total Percent Change
Airline Pilots, Copilots, and Flight Engineers	4,985	5,340	7.1%
Commercial Pilots	3,101	3,413	10.1%
Total	**8,086**	**8,753**	**8.2%**

Source: Florida Research and Economic Information Database Application, August 2015

2.4.4.3 Pilot Shortage

With the historical growth trends and future forecast data provided above serving as a backdrop, there is widespread concern throughout the aviation industry that a pilot shortage is looming or, according to the Regional Airline Association, has already begun.[129] Concerns of a pilot shortage are not new. There have been concerns of imminent pilot shortages for various reasons dating back to the 1940s. Past concerns of pilot shortages were based primarily on the loss of large numbers of military-trained pilots. Both World War I and World War II produced a large number of trained pilots, who, after serving their duty in the military, went on to careers in various commercial airlines and other aviation professions. Each time that particular "wave" of pilots entered retirement age, there were concerns of a pilot shortage. The predicted shortages never materialized, even though the number of pilots retiring, serving, and being trained at any given time has always fluctuated.

The current situation, however, is viewed by many as more likely and worrisome. A 2012 article in the *Wall Street Journal* stated, "U.S. airlines are facing what threatens to be their most serious pilot shortage since the 1960s."[130] John Allen, the FAA's Director of Standards, has referred to the problem as "astounding and dramatic," and has added that "we don't have a system to address this issue."[131] There are several factors causing the potential commercial and GA pilot shortage identified in the media and literature. These factors are discussed below, followed by a brief examination of the other side of the debate, where some industry and government organizations say the impending pilot shortage is a myth.

2.4.4.3.1 RECENT LEGISLATION INCREASING NEW AIRLINE PILOT FLIGHT TIME MINIMUMS

On February 12, 2009, Colgan Air Flight 3407, a scheduled passenger flight en route from Newark, New Jersey to Buffalo, New York, crashed while attempting to land at Buffalo Niagara International Airport, killing 50 people.[132] The cause of the crash was determined to be pilot error. In response to this accident, Congress enacted the Airline Safety and Federal Aviation Administration Extension Act of 2010, which directed the FAA to ensure flight crewmembers have proper qualifications and experience.[133] As previously mentioned, the FAA implemented a new rule for air carrier operations[134] that requires first officers to hold an ATP certificate, effectively increasing the flight time minimums for new airline pilots from approximately 250 hours to 1,500 hours.[135] This new requirement, which went into effect in August 2013, has played a key role in

[129] Pope, S (2015). "RAA: Pilot Shortage has Started," *Flying Magazine*, March 19, 2015.
[130] Carey, S et al. (2012). "Airlines Face Acute Shortage of Pilots," *Wall Street Journal*, November 12, 2012.
[131] Ibid
[132] Garrison, P (2010). "Aftermath: The Mystery of Colgan 3407," *Flying Magazine*, May 27, 2010.
[133] McGee, M (2015). *Air Transport Pilot Supply and Demand: Current State and Effects of Recent Legislation*, Pardee Rand Graduate School.
[134] Air carrier operations include regional airlines (e.g., SkyWest), major airlines (e.g., Delta), and large cargo carriers (e.g., UPS).
[135] The 1,500-hour minimum is reduced by 500 hours for pilots who received their pilot training at an accredited four-year undergraduate institution, 250 hours for pilots who received their pilot training at an accredited two-year undergraduate institution, and 750 hours for pilots who received their training from the U.S. military.

discouraging students from enrolling in professional pilot programs at four-year aviation schools.[136]

2.4.4.3.2 WANING INTEREST IN A CAREER AS AN AIRLINE PILOT

New legislation regarding flight time minimums is not the only factor deterring students from pursuing a career as an airline pilot. College and flight school graduates who choose this career path begin flying as first officers with the regional airlines. In these entry positions, pilots can expect to earn between $29,000 and $38,000 per year. [137] Despite the low initial pay, regional airline pilots can look forward to the promise of pay increases that ultimately may reach six-figure salaries as they build their flight time and are eventually hired away by the major airlines. It is believed that this long lag between the low starting salaries with the regional airlines and the significantly higher pay later in their careers with the major airlines is unappealing to many prospective students.[138]

Beyond a low initial salary, there is concern among some aviation college officials that students no longer desire the lifestyle of a pilot, which despite the glamorous stereotype, can be affected by a heavy travel schedule, furloughs and pension cuts, and industry upheaval due to events such as the 9/11 terrorist attacks, Chapter 11 Bankruptcy reorganizations, and economic recessions.[139] Many students may be opting for more attractive career options in the aviation industry.[140] To illustrate this declining interest in the airline pilot profession, a 2014 GAO report noted that the cumulative number of graduates (completions) of undergraduate professional pilot-degree programs (which are those most likely to pursue a career as an airline pilot) in the U.S. decreased approximately 23 percent from academic years 2000 – 2001 through 2011 – 2012.[141]

2.4.4.3.3 MANDATORY RETIREMENTS

In December 2007, President George W. Bush signed the *Fair Treatment for Experienced Pilots Act*, which raised the mandatory retirement age of airline pilots from 60 to 65. The legislation went into effect in July 2009 and effectively postponed the retirements of a large number of airline pilots. As those pilots have now reached 65, retirements from the airlines started accelerating in 2014 and are expected to continue to do so until they peak at over 3,000 per year in 2021 and remain at that level through 2028.[142]

2.4.4.3.4 DECLINE IN MILITARY PILOTS

As mentioned previously, aviator ranks swelled following World War I and World War II from returning pilots and servicemen who took advantage of the G.I. Bill to earn a pilot certificate. For

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[136] "The Coming U.S. Pilot Shortage is Real," *Aviation Week & Space Technology*, February 16, 2015.
[137] http://onlinepubs.trb.org/Onlinepubs/trnews/trnews304feature.pdf
[138] Ibid
[139] Ibid
[140] http://www.alpa.org/advocacy/pilot-pay-shortage
[141] *Aviation Workforce: Current and Future Availability of Airline Pilots*, GAO Report to Congressional Requesters, February 2014.
[142] McGee, M (2015). *Air Transport Pilot Supply and Demand: Current State and Effects of Recent Legislation*, Pardee Rand Graduate School.

decades afterwards, U.S. airline pilots were hired from the ranks of retiring military pilots, but that generation of aviators has experienced severe attrition since 2001. Prior to 2001, 70 percent of airline pilots hired came from the military, but this has decreased to 30 percent today.[143] This is due to an average of 2,400 pilots separating from the military each year from FY 2001 through FY 2012.[144] The result has been the airlines seeking civilian-trained pilots to fill their cockpits.[145]

2.4.4.3.5 MEDICAL CERTIFICATION REQUIREMENTS

The reduction in the number of private pilots throughout the U.S. and in Florida is widely attributed to excessive federal regulations that deter pilots from obtaining and renewing their licenses. As previously mentioned, the most burdensome of the regulations is the FAA's medical certification requirements, which currently require private and recreational pilots under age 40 to pass a comprehensive medical exam every five years and every two years once they turn 40.[146]

During the past 25 years, the AOPA, EAA, and other organizations have submitted numerous requests to the FAA to eliminate or relax the third-class medical certificate[147] for various airmen certificates.[148] On July 15, 2016 President Barack Obama signed third class medical reforms into law as part of an FAA authorization extension passed by the U.S. House and Senate. On January 10, 2017, the FAA released a final rule on third class medical reform, though it won't be effective until May 1, 2017. After meeting the initial requirements to fly under the reform, pilots will need to visit any state-licensed physician at least once every four years and take the free aeromedical factors online course every two years.

Highlights of the new program, titled BasicMed, include:[149]

- Aircraft specifications: Up to six seats, up to 6,000 pounds (no limitations on horsepower, number of engines, or gear type)
- Flight rules: Day or night, VFR or IFR
- Passengers: Up to five passengers
- Aeromedical factors: Pilots must take a free online course every two years and visit their personal physician every four years
- Altitude restriction: Up to 18,000 feet msl
- Airspeed limitation: 250 knots indicated airspeed
- Pilot limitation: Cannot operate for compensation or hire

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[143] *Aviation Workforce: Current and Future Availability of Airline Pilots*, GAO Report to Congressional Requesters, February 2014.
[144] Ibid
[145] "The Coming U.S. Pilot Shortage is Real," *Aviation Week & Space Technology*, February 16, 2015.
[146] Harrison, J.D. (2014). "Small Aviation Businesses Say Pilot Shortage Could Drive Industry into the Ground," *The Washington Post*, February 9, 2014.
[147] The FAA designates medical certificates for pilots as first-class, second-class, or third-class. Generally, first-class is designed for the airline transport pilot; second-class for the commercial pilot; and third-class for the student, recreational, and private pilot.
[148] http://www.aopa.org/Advocacy/Regulatory-,-a-,-Certification-Policy/AOPA-EAA-Medical-Exemption-FAQ#q1
[149] https://www.aopa.org/news-and-media/all-news/2017/january/10/faa-releases-final-rule-for-third-class-medical-reform

2.4.4.3.6 THE OTHER SIDE OF THE DEBATE

It is important to note that some industry and government organizations do not believe a pilot shortage is approaching or currently exists. Most prominent among these organizations is the ALPA, which claims the pilot shortage is a myth. The ALPA argues that low starting pay and benefits and little opportunity for career advancement are making it difficult for the regional airlines to attract new pilots to the profession. Considering that many new pilots complete their college education and training after investing $150,000 or more, the ALPA believes "new pilots need to be compensated commensurate with the level of training, education, and expertise that the flying public expects whenever they board an aircraft."[150] The ALPA also states that there are more than 700 ALPA pilots currently on furlough in North America and hundreds of other qualified pilots who work abroad at airlines such as Emirates Airline, China Eastern Airlines, and Etihad Airways, because the pay is commensurate with skills and experience.[151] Ultimately, according to ALPA president Captain Tim Canoll, "The issue isn't a shortage of qualified pilots but that few pilots are willing to take jobs that pay measly wages and offer no career advancement trajectory."[152]

To support its argument, the ALPA points to a 2014 Government Accountability Office report (GAO-14-232) titled *Aviation Workforce – Current and Future Availability of Airline Pilots*. The GAO examined the pilot shortage issue and concluded that there is a large pool of qualified pilots relative to projected demand, and data on wage earnings and employment growth are not consistent with the existence of an airline pilot shortage.[153]

2.4.4.4 Impacts of a Pilot Shortage on Florida

If the concerns regarding a pilot shortage are valid, there could be significant negative impacts on the aviation industry in Florida in the future. Specific examples of these impacts are discussed below.

2.4.4.4.1 REGIONAL AIR SERVICE

One of the most widely discussed impacts of a pilot shortage found in the media and literature is that a shortage could threaten regional airports across the country, including those in Florida. Regional airports serve smaller cities throughout the U.S. and act as spokes connected to the major airlines' hubs. Passengers are flown by regional airlines from the spoke cities to the hub cities, where they board aircraft flown the major airlines and fly to their ultimate destinations. Some smaller regional airports are already reporting flight frequency cuts by regional airlines due to a shortage of pilots,[154] and this will likely increase the second half of 2015.[155] With fewer flights comes a decrease in revenue and enplanements at the regional airports, which has a negative economic impact on not only the airport itself, but also the community it serves. There is concern

[150] http://www.alpa.org/advocacy/pilot-pay-shortage
[151] http://www.alpa.org/~/media/ALPA/Files/pdfs/advocacy-section/pilot-shortage-fact-sheet.pdf?la=en
[152] http://www.alpa.org/en/advocacy/pilot-pay-shortage
[153] Ibid
[154] Fletcher, C. (2015). "Airport Director: Pilot Shortage Cause of Albany Flight Cuts," *Albany Herald*, March 2, 2015.
[155] Wiegand, J (2015). "Looming Pilot Shortage Threatens Regional Airports," *Alliance for Aviation Across America*, April 12, 2015.

in the industry that some regional airports could potentially close over the next two years due to frequency cuts.[156]

The lack of pilots at the regional airlines stems from the major airlines recruiting pilots from the regionals to fill their staffing needs. When a major airline loses a captain to retirement or adds an aircraft to its fleet, that airline will typically promote a first officer, or co-pilot, of one of its aircraft to fill the captain seat. The major airline will then hire a captain from their smaller regional carrier to fill their vacant first officer seat. The regional pilots typically are eager to move up to the major airlines since, as discussed earlier, they can expect higher salaries and more enticing benefits. The regional airline, having lost one of its captains, will then promote its own first officer to the captain position, but will have difficulty finding a new co-pilot.[157]

Exacerbating this dilemma is the fact that airlines are transitioning away from the 50-seat regional jets that typically operate at the regional airports and flying larger aircraft that are more cost effective to operate. Airlines have been taking additional pilots from the regional jets to fly the larger aircraft. Also, many regional airports are unable to accommodate the larger aircraft, which leads to further service cuts.[158]

Florida could be significantly affected by this problem, since regional airlines are responsible for a substantial percentage of the commercial air service activity at several airports throughout the state, as shown in **Figure 2-14**. For example, 100 percent of the airline departures and 100 percent of the enplanements at Gainesville Regional Airport in 2014 were on regional airlines. At Tallahassee International Airport, these figures were 91 percent and 79 percent, respectively.

[156] Ibid
[157] Ibid
[158] Ibid

Figure 2-14: Regional Air Service in Florida, 2014

Total # of passengers enplaned	
Regionals	5,430,235
Industry	69,605,804
Regional Share	8%

Total # of airline departures	
Regionals	126,800
Industry	624,508
Regional Share	20%

Percentage of Regional flights and enplanements for each airport

		✈	🧍
APF	Naples	100%	100%
DAB	Daytona Beach	43%	23%
DSI	Destin	100%	100%
ECP	Panama City	28%	13%
EYW	Key West	77%	46%
FLL	Fort Lauderdale	14%	6%
GNV	Gainesville	100%	100%
JAX	Jacksonville	50%	31%
MCO	Orlando	8%	4%
MIA	Miami	18%	6%
MLB	Melbourne	41%	19%

		✈	🧍
PBI	West Palm Beach	19%	9%
PGD	Punta Gorda	0%	0%
PIE	St. Petersburg	0%	0%
PNS	Pensacola	70%	43%
RSW	Fort Myers	15%	5%
SFB	Orlando-Sanford	0%	0%
SRQ	Sarasota/Bradenton	36%	21%
TLH	Tallahassee	91%	79%
TPA	Tampa	11%	3%
VPS	Fort Walton Beach	90%	79%

Source: Regional Airline Association (RAA) 2014 Annual Report
Note: Although the RAA includes Naples Municipal Airport (APF) and Destin Executive Airport (DSI) in Figure 2-14, neither airport is a commercial service airport. Both airports are served only by Part 135 charter operators.

2.4.4.4.2 GA IMPACTS

One of the most startling statistics that illustrates the effects of the decline in the U.S. pilot population is that the annual number of single-engine aircraft manufactured in the U.S., such as the Cessna 172, plummeted from approximately 8,600 aircraft to approximately 700 during the 1980 to 2014 period.[159] Fewer aircraft have been manufactured, as there have been fewer pilots to fly those aircraft.

Florida currently ranks second in the U.S. behind the state of California in terms of the number of aircraft manufacturing and parts establishments.[160] In 2013, Florida was ranked first in the U.S. in the number of engine and engine parts manufacturing establishments.[161] FDOT's 2014 *Florida Statewide Aviation Economic Impact Study Update* estimated the economic impacts of businesses engaged in aircraft and parts manufacturing and aviation maintenance in Florida at more than 76,200 total jobs and $13.6 billion in total economic output.[162] These impacts include aircraft manufacturers such as Piper Aircraft, headquartered in Vero Beach, Florida, and one of the world's leading manufacturers of single- and twin-engine aircraft. The manufacturing of small aircraft in Florida could be negatively impacted if the U.S. pilot population continues to decrease.

[159] General Aviation Manufacturers Association (2014). *2014 General Aviation Statistical Databook & 2015 Industry Outlook*.
[160] Florida TaxWatch (2014). *Ready for Takeoff: Florida Can Lead the Nation in Aircraft Manufacturing*.
[161] Ibid
[162] Figures include multiplier impacts.

There is also concern throughout the GA industry that if the number of private and recreational pilots continues to decline, many small, on-airport businesses such as fixed base operators (FBOs) and aircraft maintenance businesses will suffer. These concerns stem from the fact that private and recreational pilots are the primary customers of many of these on-airport businesses.[163] This problem could impact hundreds of businesses at Florida's GA airports.

2.4.4.5 Pilot Growth Trends Summary

The U.S. pilot population, particularly private pilots, has been decreasing for many years, while there is strong demand for pilots projected over the next 20 years as the major airlines are expected to experience significant growth. Boeing projects demand for 95,000 new commercial airline pilots and 7,890 new jetliners in North America by 2034. With the pilot supply declining and demand increasing, a pilot shortage could be approaching, the implications of which could be severe for the state of Florida and the entire nation. Regional airports could experience flight frequency cuts, which would result in decreased revenues and enplanements. GA aircraft manufacturers could suffer due to the lack of pilots to fly aircraft. Further, hundreds of on-airport businesses that cater to pilots at GA airports could experience reduced profits and eventually close their doors. Policymakers and industry experts are not in agreement of a pending pilot shortage, but they need to determine if a shortage is imminent, so that if necessary, a strategy can be developed that ensures the pilot pipeline continues to be filled with enough new pilots to meet the demand.

Chapter 8 – Alternative Scenarios provides an alternative look at the shortage of aviation professionals, including pilots.

2.4.5 Review of Boeing and Airbus Industry Outlook

Each year, Boeing and Airbus publish their respective industry reports that present forward looking viewpoints of the global air transport sector's evolution, accounting for factors such as demographic and economic growth, tourism trends, oil prices, development of new and existing routes, and ultimately highlighting demand for new aircraft. In addition to Boeing's *Current Market Outlook 2015 – 2034* and Airbus' *Global Market Forecast 2014 – 2033*, both firms release supplemental reports providing a more in-depth focus on the air cargo industry. It is important to have an understanding of industry trends since both segments—passenger and cargo—of the commercial aviation industry are major forces that shape both Florida's economy and its airport system. These documents do not contain Florida-specific forecasts; however, with this industry insight, FDOT can better understand Florida's system in a global context and anticipate changing conditions.

A summary of the key takeaways from each of the following documents is provided in this section, and were considered in the development of the FASP 2035 Update:

- Boeing *Current Market Outlook 2014 – 2033*

[163] Harrison, J.E. (2014). "Small Aviation Businesses Say Pilot Shortage Could Drive Industry into the Ground," *The Washington Post*, February 9, 2014.

- Boeing *Current Market Outlook 2015 – 2034*
- Boeing *World Air Cargo Forecast 2014 – 2015*
- Airbus *Global Market Forecast 2014 – 2033*
- Airbus *Global Market Forecast 2014 Freight*

Information from two successive Boeing documents, *Current Market Outlook 2014 – 2033* and *Current Market Outlook 2015 – 2034*, was incorporated in this section as the latter (*Current Market Outlook 2015-2034)* was published midway through the FASP 2035 development. This report follows the general framework of the Boeing *Current Market Outlook* documents and therefore the majority of the information in this report is Boeing-sourced. Relevant data from the Airbus documents were incorporated where applicable.

2.4.5.1 Economic Environment

The commercial aviation industry is continually evolving in response to internal and external market forces. Key factors that influence the industry are fuel prices, economic growth and development, environmental regulations, infrastructure, market liberalization, airplane capabilities, other modes of transportation, airline business models, and emerging markets. Aviation, like any industry, is subject to the larger economic cycles that impact the demand for its product. Fortunately, since aviation has become an essential component of the global economy a certain level of demand will persist even in the most difficult economic circumstances. However, growth is essential to the health of the aviation industry, and aviation industry growth is more closely tied to global economic growth patterns than the baseline demand. Therefore, understanding the outlook of the global economy is essential to projecting growth of the aviation industry.

After several years of economic recession and slow recovery, the global economy is beginning to pick up accelerate despite lingering potential for new turbulence due to geopolitical issues. This positive outlook is the result of ongoing recovery experienced in developed economies coupled with sustained economic growth in emerging markets. In the U.S., improved household finances, strengthening private investment, and reduced fiscal drag are key drivers behind the improved outlook. Similarly, Western Europe is gaining traction as credit conditions ease and capital spending accelerates. Emerging economies on the other hand, fueled by a growing middle class, provide a more optimistic outlook for growth. The middle class of the Asia-Pacific region is expected to double over the next 20 years.

As a result of this two-speed economic world, the global economy is projected to look very different from today by the end of the 20-year planning period. By 2023, China will move from the second largest economy to the largest, and India will move from tenth to third. However, China and India will be ranked 63rd and 120th in GDP per capita by 2023, indicating a large remaining potential for further economic development in emerging markets. The rapid credit expansion in China has created vulnerabilities in real estate, banking, and local government, but government spending and fiscal policies support near-term growth.

2.4.5.1.1 ENERGY

Over the past several decades, worldwide oil demand has increased in response to economic growth; however, supply has not fully kept pace due to lack of investment. External geopolitical events such as military conflict or civil unrest has triggered supply disruptions on a more consistent basis in various parts of the world. At the same time, China, India, and other emerging markets have added to the global appetite for crude oil.

At the end of the last century, oil prices were as low as $17 per barrel. In 2013, this price rose to $110 per barrel, representing a 540 percent jump in price.[164] During this period, passenger air traffic grew by 70 percent despite the extreme growth in fuel costs. This illustrates both the importance people place on air travel and the improvements in the efficiencies achieved by the air transport industry. Despite recent declines in oil prices, the long-term stability of oil prices remains uncertain.

Forecasting oil price is extremely challenging due to the multitude of variables to consider. At the low end, IHS Energy[165] projects $160 per barrel by 2030 due to a growing supply from non-conventional sources combined with declining demand, whereas on the high the International Monetary Fund (IMF) forecasts greater than $300 per barrel by 2030 as a result of declining supply. Sustainable aviation fuels show great potential to reduce aviation's carbon footprint and balance supply issues from conventional sources, but are currently only proven on a very small scale commercially. Airbus feels it is possible for synthetic aviation fuels to constitute roughly one-third of the fuel supply by 2030 if enough resources are devoted to the cause. In any scenario, airlines must be prepared to face a world of ever-changing fuel costs into the foreseeable future.

Fuel has become the largest single component of airlines cost structure. In 2013 airlines spent more than $200 billion on Jet A, representing more than 30 percent of total operating costs. This figure was only $40 billion and 14 percent in the year 2000. Since aviation currently has no economically viable alternative fuel source, the aviation industry has had a heightened focus on fuel efficiency. Airlines are saving fuel by reducing and more accurately measuring onboard weight, cruising at higher altitudes, making greater use of flight-management systems, and conducting more in-depth analyses of weather conditions. In addition, they are modernizing their fleets with more fuel-efficient aircraft, upgauging aircraft size, increasing passenger density and load factors, redesigning hubs and schedules to alleviate congestion, and purchashing fuel in bulk.

An in-depth look at the impacts of fluctuating oil prices is provided in **Chapter 8 – Alternative Scenarios.**

[164] http://www.macrotrends.net/1369/crude-oil-price-history-chart
[165] IHS Inc. is a global information and analysis firm that produces reports to support the decision-making process of various industries, including aerospace, defense, and energy.

2.4.5.1.2 DEMAND FOR AIR TRAVEL

In 1970, 75 percent of worldwide air passenger capacity originated in the top 10 countries; by 2013, the share of the top 10 countries decreased to below 60 percent with worldwide traffic now more equally distributed. As global population has nearly tripled from 1950 to 2014, the world's economic center of gravity has moved south and east. This trend is expected to continue as the population is projected to grow by another 35 percent by 2050.

Due to massive improvements in agricultural activity, more of the world's population is living in urban areas than ever before. When pollution and congestion are efficiently managed, urban agglomerations result in a more efficient society where there are concentrated activities, economies of scale, lower transportation costs, and effective dissemination of goods and services. The percentage of the world's population living in urban areas grew from 30 percent in 1950 to over 50 percent in 2013, and is projected by the United Nations (UN) to be two-thirds by 2050. Emerging markets in Asia, Latin America, and Africa will remain the primary contributors to this growth in urbanization.

New potential air transport consumers from the middle classes will emerge from urban agglomerations, where workers are able to earn higher wages and as the majority of major metropolitan areas already have strong levels of existing aviation infrastructure in place. In a more globalized world, efficient international mobility has become a necessity. According to the UN World Trade Organization, the purpose of travel in 2012 was 15 percent business, 51 percent leisure, and 27 percent visiting family and friends. Of these three categories of travel purpose, the visiting family and friends category has proven particularly resistant to crises, as people consider it necessary to meet their closest relations in person. International migrants are a major driver of this type of trip, as international migrants have increased from around 150 million in 1990 to 230 million in 2013. International migrants primarily come from advanced economies, but the share of migrants originating in less developed economies has increased to 41 percent in 2013.

2.4.5.1.3 TOURISM

For emerging economies, the development of a tourism industry can be closely linked with the development of an economy, acting for many countries as an "economic growth catalyst." Similarly, the development of tourism can be closely linked with the development of aviation, acting as an "air transport growth catalyst." Both aviation and tourism are codependent on each other. A strong aviation presence is essential to a growing tourism economy, and a growing tourism industry will spur demand for aviation industry growth. Globally, air is the largest of mode of border crossing and is growing faster than any mode. From 1995 to 2012, aviation has been the largest contributor to growth in international tourist arrivals, growing at an average annual rate of 5.5 percent. For comparison, over the same period of international tourist arrivals grew at an annual rate of 4.1 percent by road, 2.3 percent by sea, and 1.5 percent by rail. The share of tourists arriving by air has grown from 45 percent in 1995 to 58 percent in 2012. According to the World Trade Organization's long term forecast, "Tourism 2020 Vision," the number of global tourists is expected to grow from 5.7 percent annually to 1.6 billion by 2020.

International students are another major driver of aviation demand. According to Organisation for Economic Co-operation and Development (OECD) data, the number of international students has tripled over the last 25 years. The younger generation is increasingly more aware of the benefits of having international experiences in a more globalized world.

2.4.5.2 Airline Strategies and Business Models

Strategic planning is a continual process for airlines. Plans must take into account the challenging and ever-changing competitive environment as well as how passengers define value. For example, business travelers are sensitive to flight times and expect a high level of service. Short-haul business travelers tend to be more sensitive to ticket prices than long-haul business travelers. Leisure travelers are more sensitive to price but less demanding about service levels. Over the last several decades, two distinct airlines business models have emerged: low-cost carriers (LCCs) and network carriers.

The LCC business model has grown tremendously over the past two decades. Southwest Airlines in the U.S. and Ryanair in Europe are pioneers of this model. The LCC model focuses on cost saving operational practices, such as operating at secondary airports, operating single aircraft type, high aircraft utilization rates, direct sales, single class, and low labor costs. LCCs have on average 20 to 40 percent lower unit cost versus other carriers, which results in lower fares, subsequently stimulating traffic. As they have grown, recently LCCs have been diversifying their product offering to suit varying passenger tastes; i.e. more frills, longer routes.

At the other end of the spectrum, the network carrier model includes the largest airlines in the world, such as American Airlines, Air-France-KLM, and Lufthansa. In the U.S., network carriers are also referred to as "legacy carriers," having had established interstate routes prior to the Airline Deregulation Act of 1978. Network carriers tend to employ major hub operations, have large and complex fleets, are members of airline alliances, and provide a broad array of services such as lounges, meals, and cabin products. Their hubs, which serve domestic, regional, and international operations, enable one-stop connections to around the globe and increase the network reach of the airline and the alliance of airlines in which the hub airline is a member of. Airlines hubs use their geographic advantages to capitalize on both short- and long-haul traffic. Long-haul traffic has seen strong growth over the past decade.

Alliances are powerful tools for expanding networks, enhancing revenue, and reducing costs. The three major alliances (OneWorld, SkyTeam, and Star Alliance) account for over 60 percent of global capacity and 76 percent of long-haul available-seat-kilometers (ASKs). Code-sharing[166] has grown by eight percent over the last decade. Joint ventures and equity stakes are other methods used by airlines to open new markets, obtain new traffic, and rationalize costs. Mergers have catalyzed industry consolidation, allowing participants to remain competitive. Subsidiaries allow airlines to expand brands to foreign countries and stay within regulatory limits.

[166] As defined by the U.S. Department of Transportation, code sharing is a marketing arrangement in which an airline places its designator code on a flight operated by another airline and sells tickets for that flight, thereby strengthening its market presence and competitive ability.

2.4.5.3 Network and Hub Analysis

Airline networks are constantly evolving to stay competitive and grow as efficiently as possible. Only about 40 percent of ASKs are flown on routes that were operated 20 years ago. Airline networks are now relatively stable, suggesting new route driven fragmentation has matured. Network stability is also a result of airlines' ability to better access the impact of network development decisions and focus on profitable routes. Future growth is expected to be met with increasing aircraft size and frequency rather than new routes. Growth strategies employed by airlines include frequency growth, new market expansion, and hub development. The most successful airlines blend frequency growth and network expansion to develop and compete profitably.

Since daily service is the key to establishing a market foothold, established airlines can increase market share with schedule-conscious travelers by adding frequency. Frequency growth boosts connectivity; for example, approximately 60 percent of domestic growth in China over the last decade came from frequency increases. In more mature networks such as the U.S. and Europe, frequency growth has slowed as these markets reach saturation. The recent trend in these markets is moving towards increasing available seats in particular markets by upping aircraft gauge. Over the past 20 years, the average capacity of narrow body aircraft has increased by 20 seats, a trend that is projected to continue as airlines optimize configurations for unit cost efficiency and demand for seats.

Airline network growth is most impacted by new market expansion, which brings in new revenue streams for the carrier and accelerates economic growth in the newly connected market. New, more efficient long-range aircraft such as the Boeing 787 and Airbus A350 are enabling airlines to open new market segments, better matching capacity to market demand. Examples of new "long, thin routes" made possible by the introduction of the Boeing 787 include Tokyo (NRT) to Dusseldorf (DUS), London (LHR) to Austin (AUS), San Francisco (SFO) to Chengdu (CTU), and Beijing (PEK) to Boston (BOS).

Airline hubs are also important components of airline networks, as the hub-and-spoke model aims to serve as many large spokes as possible. Once a hub reaches a critical size, the cost to open a new route reduces, allowing opening of routes with lower direct traffic potential. The short haul threshold for a new route is about 50 passengers per day, while long haul is about 150 per day. Many of the largest hubs are in what Airbus calls an "aviation mega-city." Aviation mega-cities are cities where at least 10,000 daily long-haul passengers are handled. In 2013, there were 42 global aviation mega-cities, and Airbus predicts that there will by 91 aviation mega-cities in 2033. Approximately 95 percent of all long-haul widebody flights operate between aviation mega-cities.

2.4.5.4 Technology and Capabilities

Technology developments in commercial aviation sector are aimed at improving operating economics, which in turn enhance airlines' bottom lines. Since fuel is expected to remain the largest component of an airline's operating cost, the latest generation of aircraft focus on

reducing fuel consumption through the application of new engine technology, lightweight materials (composites), aerodynamics, and manufacturing techniques to drive improvements. Reduced fuel consumption improves range and payload capabilities, consequently expanding airline networks and passenger/cargo capacity while simultaneously increasing profit potential.

In the air, several technologies are enhancing operations. Electronic flight bags allow pilots to quickly upload the latest navigation charts to their devices and monitor weather in flight, adjust flight plans to optimize fuel use, use moving runway and taxiway maps for improved situational awareness, and use a variety of applications to improve crew productivity and safety. The growing prevalence of personal electronic devices among passengers is allowing airlines to eliminate costly and weighty in-flight entertainment systems in favor of streamed content as onboard Wi-Fi speeds improve.

On the ground, advances in information technology (IT) can improve all parts of an airline's planning cycle in real time, such as crew legality, weather, airport traffic congestion, baggage handlers, gate agents, caterers, fuel providers, and passengers on the ground. Maintenance and engineering benefit through updated engine management systems that provide better prognostic capabilities, with the ability to predict maintenance events and connect with maintenance during flight. This can minimize the number and duration of flight disruptions, improving system wide performance. Other improvements involve digital delivery of manuals and technical information, supply chain solutions optimizing inventory management/parts procurement, and loadable software airplane parts (LSAP).

Despite these advancements in technology and productivity, the fact that such significant gains occurred in the last decade suggests that there is still much room for improvement. The IT infrastructure of many developing economies remains a challenge to carriers operating there, particularly new entrants. Once the IT infrastructure is developed, airlines in these markets can compete more effectively with global carriers. Cyber security is a growing concern for the aviation industry, requiring manufacturers, regulators, and IT vendors to work together to better understand and reduce the risks of cyber-attacks. The benefits realized by the higher levels of IT connectivity brings with it more inherent risk.

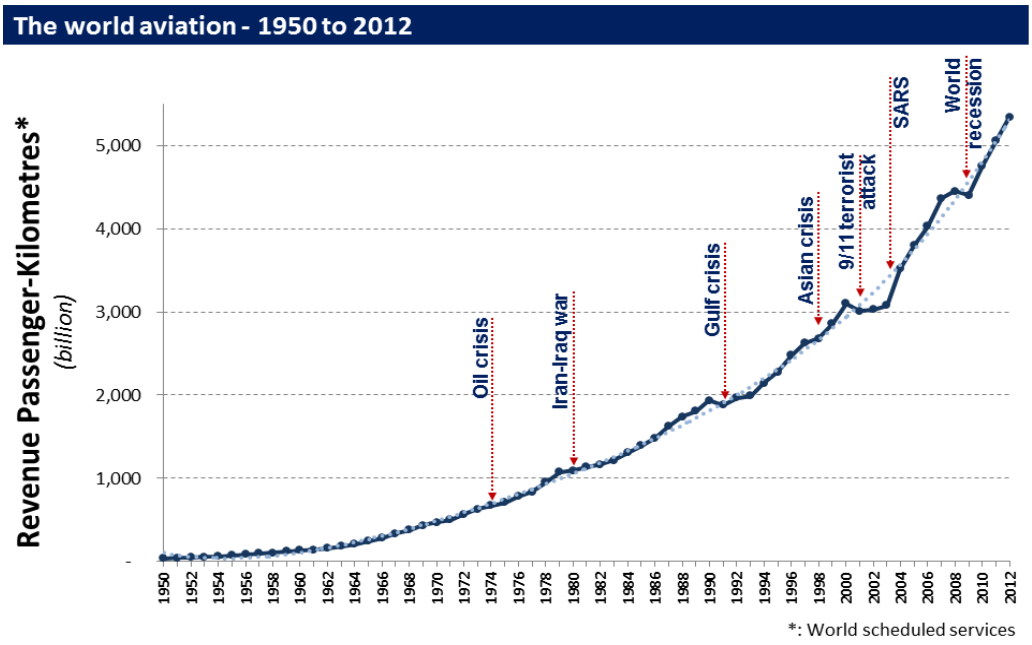
Airlines face competition primarily from high speed rail in developed economies such as Europe, China, Taiwan, and Asia. Unlike aviation, high speed rail requires major infrastructure investment on the ground, which makes it less cost effective on longer distances. Airline assets provide the highest level of network connectivity that are highly flexible, more deployable, all with a much lower requirement for infrastructure investment. Potential intermodal solutions between high speed rail and aviation do exist, albeit in limited situations. Short haul airline networks in Europe and China face the strongest competition from high speed rail, but overall it is not a major threat to aviation demand.

2.4.5.5 Traffic and Market Outlook

Like any industry, aviation is subject to occasional shocks, but the demand has proven to be resilient. Commercial airline service is essential to serve the travel needs of business, family events, and vacations. The demand for these types of travel needs will fluctuate with disruptions;

however, a certain level of demand remains. Air travel is an established component of the global economy. Over the last 30 years, the aviation industry has experienced four recessions, two financial crises, two Gulf Wars, one oil shock, one near pandemic (H1N1 influenza virus), and 9/11. Despite these disruptions, global air traffic continued to grow at five percent annually. **Figure 2-15** illustrates the growth in global aviation demand juxtaposed with disruptive global events.

Figure 2-15: Historic Global Aviation Growth



Source: International Civil Aviation Organization (ICAO)

Over the past several years, airlines have been focusing on consolidation to match demand with capacity. This has resulted in minimal revenue-passenger-kilometer (RPK) growth, but profitability has been improved drastically. The rise of LCCs has traditionally led to lower fares, higher traffic stimulation, and subsequently more rapid RPK growth for those markets than those same markets might have achieved in the otherwise.

2.4.5.5.1 EVOLVING AIR TRAVEL DEMAND

Air travel is a discretionary expenditure for emerging markets, but it is one of the first discretionary items to be added as consumers join the middle class. As emerging markets develop, nonscheduled service to leisure destinations is generally the first step, then demand may migrate to scheduled service on LCCs, then network carriers will enter the market to serve business and leisure passengers. In developed markets, the demand for essential travel has typically already been met and growth comes in discretionary travel, which is influenced less by GDP. The propensity to travel increases with increases in per capita income of a particular geography.

2.4.5.5.2 KEY INDICATORS

GDP is a strong indicator for Boeing's Current Market Outlook. IHS Economics is forecasting global GDP to grow at 3.1 percent over the next 20 years, where regional variations are prevalent and emerging economies grow at a faster pace than established economies. Based on the expected GDP growth, global airline passenger traffic (in RPKs) is projected by Boeing to grow at 4.9 percent annually from 2015 to 2034. By market region, China's domestic market is projected to grow the fastest at 6.2 percent annually, eventually overtaking North America by 2034 as the largest travel market. For comparison, RPKs within Europe and North America, which were the two largest markets in 2014, are projected to grow at a pace of 3.3 percent and 2.4 percent annually.

In North America, the strong economy is strengthening domestic traffic, while globally, greater diversification continues among the world's airlines. Twenty years ago, the majority of passengers traveled on airlines based in Europe or North America, but by 2014 this number had shrunk to 49 percent, and is projected to be 39 percent in 2034.

2.4.5.5.3 FLEET DEVELOPMENTS

According to Boeing, in 2014 there were approximately 21,600 jets in commercial operation, with the largest fleets based in the U.S., China, Russia, the United Kingdom, and Germany. The global fleet is projected to double over the next 20 years, which creates a need for over 38,000 new airplanes. Forty-two percent will be for replacement of aging aircraft in mature markets (U.S., Europe), while 58 percent will be driven by growth in emerging markets (Latin America and Asia Pacific), LCC growth, and Gulf Carrier growth (Sixth Freedom[167] business model). The need for these new aircraft will be relatively well-balanced among world regions, with Asia needing 40 percent, Europe and North America combined needing 40 percent, and remaining regions will combine for the remaining 20 percent.

The 160-seat aircraft size remains the heart of the single-aisle market, currently representing approximately 65 percent of the global fleet and will likely be 70 percent by 2033. Over the past 20 years, the average aircraft size across short, medium, and long regional routes has been converging on 160 seats. This size aircraft provides the flexibility to fly more directly, more often, and more efficiently. Within the short- and medium-haul regional sectors, high fuel prices drove carriers to shift towards larger aircraft in order to achieve lower unit cost. Airplane size on the longer-haul regional sector (i.e. transcontinental missions) has flattened over the past 15 years right around 160 seats, which is right in the sweet spot of the Boeing 737-800 and Airbus A320-200. These two aircraft models continue to be the heart of market in this size category and will continue to be over the next 20 years with forthcoming updates. In current aircraft backlog, approximately 75 percent of airplanes to be delivered are in this size category.

In the widebody segment, fleet growth continues as airlines expand their international footprint into new markets using right-sized airplane range and capacity. Boeing projects that over the next 20 years, long-haul international traffic will grow five percent annually, driving a need for

[167] Sixth freedom of the air is the right to carry passengers or cargo from a second country to a third country by stopping in one's own country.

about 8,800 new widebody aircraft. Over the past 20 years, airlines have moved away from the large widebody aircraft such as the Boeing 747 in favor of small and medium widebody aircraft as they focus on flexibility and efficiency. In 1994, large widebody aircraft accounted for 24 percent of all widebody aircraft, whereas in 2014 this number had dropped to 15 percent. By 2034, this number is expected to account for only five percent of the widebody fleet as airlines increase the number of medium widebody aircraft in operation. Geographically, the Asia Pacific, Europe, and Middle East regions will account for 90 percent of new widebody demand over the next 20 years due to the prevalence of high traffic trunk routes in these regions.

2.4.5.5.4 BUSINESS MODELS

The once clear division between network carriers, LCCs, and charter carriers is now much less clear. Network carriers are operating low-cost, short-haul subsidiaries, while LCCs are providing frequencies and higher levels of services to attract business passengers. Several LCCs have entered into long-haul and international service. Some charter carriers are even venturing into single seat sales. LCCs are the fast-growing business segment of the U.S. market, having taken advantage of the flight reductions of rationalized network carriers and backfill on those routes. LCCs have growth from roughly seven percent of the world market in 2003 to 16 percent in 2013, and are projected by Boeing to reach 21 percent by 2033. In contrast, network carriers declined from 66 percent in 2003 to 62 percent in 2013, and are projected to comprise 56 percent in 2033.

2.4.5.6 Outlook by Region

As emerging markets grow and aviation continues to become an integral part of life, there is greater geographical diversity in the airplane customer base. In 1994, more than 73 percent of all traffic was carried by airlines in Europe and North America. By 2033 that proportion will shrink to 38 percent as Asia Pacific and the Middle East become more prominent in global aviation. The LCC business model continues to grow as a viable option in emerging markets, allowing consumers to choose air over traditional modes of transportation. Modern widebody aircraft allow smaller operators to compete on longer routes traditionally dominated by foreign carriers.

Each region responds to its unique situation and conditions with specialized requirements. In the Middle East, airlines continue to focus on widebodies with premium services to leverage the area's geographic advantages and prominence in business travel. In Europe and North America, airlines respond to growing competition from LCCs by replacing older, less fuel-efficient aircraft with more economical narrowbody aircraft. The large existing fleet of aircraft in these regions generates a considerable need for replacement aircraft, even though growth is slower than in other parts of the world. Asia will see rising demand for all types of wide and narrowbody aircraft. All regions face similar challenges of fuel price volatility, emission control regulations, and airport congestion as the world fleet seeks to keep pace with growing demand for air travel.

North America and Europe have, by far, the highest propensity to fly, but this is shifting with the middle-class growth of emerging markets. Mirroring the fact that economic growth in emerging markets is outpacing that of developed economies, all of the top 20 fastest growing origin and destination (O&D) traffic flows are between or within emerging markets.

2.4.5.6.1 NORTH AMERICA

North America leads global profitability and is riding a five-year wave of record profits, which is all the more striking by the fact that it comes after a decade of massive losses. According to Boeing, the International Air Transport Association (IATA) calculates the 2014 net income of North America airlines, fueled largely by U.S. airline performance, at more than $12 billion, which is two-thirds of the projected net income for the entire global airline industry. The resurgence of U.S. airlines can be attributed to the significant restructuring undertaken, including mergers and acquisitions, fleet and network rationalization, capacity discipline, and strict focus on financial performance. The four major airline mergers that have occurred since 2008 have resulted in four airlines holding about 85 percent of all ASKs.

Boeing projects that the U.S. domestic market will grow in the range of 2.5 to 3.0 percent from 2015 to 2020. With a load factor of 83 percent in 2014 and an average over 80 percent over the past five years, network carriers may be prompted to ease capacity discipline as a result of competitive pressures and continued economic recovery. Boeing's forecasts a need of nearly 7,900 aircraft over the next 20 years in North America, with narrowbody aircraft comprising 64 percent of demand. Growth in total RPKs between North America and all world regions (including within North America) is projected to grow at a rate of 3.4 percent annually from 2,119 billion RPKs in 2014 to 4,056 billion RPKs in 2034. Worldwide, total RPKs are projected to grow at 4.9 percent annually, while growth within North America is projected at 2.4 percent annually. The fastest growing market flow involving North America is projected to be Africa-North America at 6.2 percent annually.

2.4.5.6.2 ALL REGIONS

Boeing projects global RPKs to grow an average annual rate of 4.9 percent from 2014 to 2034, while Airbus projects global RPKS to increase at a rate of 4.7 percent annually between 2013 and 2033. **Table 2-19** lists Boeing's 20-year growth projection of RPKs by regional flow (excludes passenger flows not involving North America), in descending order.

Table 2-19: Boeing Forecast of Regional Passenger Traffic Flows 2014 – 2034

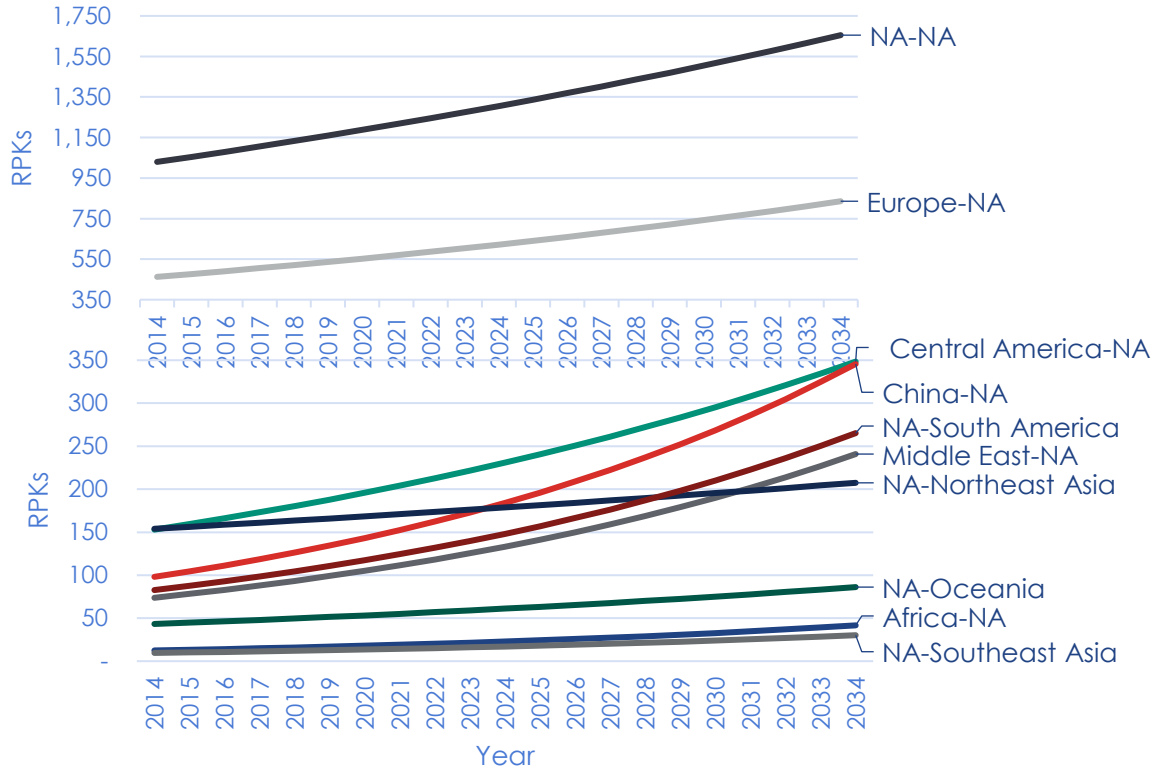
	RPK Growth (in billions)		
Regional Flow of Passenger Traffic	**2014**	**2034**	**AAGR**
China-North America	98.1	345.7	6.5%
Africa-North America	12.5	41.6	6.2%
Middle East-North America	73.7	240.9	6.1%
North America-South America	82.7	265.2	6.0%
North America-Southeast Asia	9.6	30.2	5.9%
Central America-North America	153.0	348.4	4.2%
North America-Oceania	43.3	86.2	3.5%

Regional Flow of Passenger Traffic	RPK Growth (in billions) 2014	2034	AAGR
Europe-North America	462.7	835.7	3.0%
North America-North America	1,029.9	1,655.0	2.4%
North America-Northeast Asia	154.0	207.4	1.5%
All North America Flows	2,119.5	4,056.2	3.3%
Global Total (all regions)	**6,246.0**	**16,153.2**	**4.9%**

Source: Boeing Current Market Outlook 2015 – 2034

Measured in RPKs, Boeing projects the fastest growing regional flow of passengers to be North America-China with an annual growth rate of 6.5 percent from 2014 to 2034. North America-China is closely followed by North America-Africa, North America-Middle East, and North America-South America, each with an annual growth rate above 6.0 percent. North America-Southeast Asia rounds out the top five with a projected growth rate of 5.9 percent. Intra North America flows will grow at a rate of 2.4 percent annually, while the combined growth rate of flows between North America and all regions will be 3.3 percent annually. This compares to a global growth rate of 3.3 percent annually. These projected growth rates of regional passenger flow are illustrated in **Figure 2-16**.

Figure 2-16: Boeing Forecast of Regional Passenger Traffic Flows 2014 – 2034



Source: Boeing Current Market Outlook 2015 – 2034

Airbus' growth forecast primarily includes larger world regions with the exception of a few major countries such as the U.S., Canada, Mexico, PRC (China), Japan, and India. As shown in **Table 2-20**, Airbus forecasts that the regional flows with the most rapid growth in RPKs between 2013 and 2033 will be U.S.-Middle East, and U.S.-PRC, with both growing at an annual rate of 6.6 percent. The passenger flow of India-U.S. will be third fastest with a 6.3 percent annual growth rate, while flows involving Canada and various regions comprise the next six rankings. Passenger traffic flying to, from, and within North America is forecast to grow at 3.4 percent annually. Traffic between the U.S. and Latin American markets, a segment where Florida airports play a major role, is projected to exhibit strong growth.

Table 2-20: Airbus Forecast of Country Passenger Traffic Flows 2013 – 2033

Passenger Traffic Flow	AAGR 2013 – 2033
Middle East-U.S.	6.6%
PRC-U.S.	6.6%
Indian SC-U.S.	6.4%
Canada-PRC	6.3%
Canada-Indian SC	5.8%
Canada-South America	5.6%
Canada-Caribbean	5.5%
Canada-Middle East	5.5%
Canada-Central America	5.3%
South America-U.S.	5.3%
Central America-U.S.	4.9%
Domestic U.S.	1.9%
Global Total	**4.7%**

Source: Airbus Global Market Forecast 2014 – 2033
Note: Includes Top-10 North America-involved flows plus Domestic U.S.

2.4.5.6.3 FLEET GROWTH

From the perspective of a major aircraft manufacturer, the primary purpose for conducting a 20-year global forecast each year is to gain a better understanding of the global aviation market and the economic forces that shape it in order to better position the company to capitalize on industry needs and ultimately sell aircraft. Boeing and Airbus both include projections of new aircraft deliveries by region and aircraft category for the 20-year planning period. Through a combination of new deliveries, freighter conversions, and retirements, Boeing forecasts that the global fleet of 21,600 aircraft will grow to 43,560 by 2034 (including freighters). **Table 2-21** summarizes Boeing's forecast of new aircraft deliveries by region.

Table 2-21: Boeing Forecast of New Aircraft Deliveries by Region*

Aircraft Category	Asia	North America	Europe	Middle East	Latin America	CIS	Africa	World
Large wide-body	140	20	40	300	-	40	-	540
Medium wide-body	1,530	490	510	880	30	40	40	3,520
Small wide-body	1,920	690	910	560	310	120	260	4,770
Single aisle	10,370	5,070	5,770	1,410	2,520	760	830	26,730
Regional jets	370	1,620	80	30	160	190	40	2,490
Total	**14,330**	**7,890**	**7,310**	**3,180**	**3,020**	**1,150**	**1,170**	**38,050**

Source: Boeing Current Market Outlook 2015 – 2034
**Note: Includes Passenger and Freighter Aircraft*

In terms of global aircraft fleet growth, Boeing forecasts a need of over 38,000 new aircraft by 2034, 70 percent of which will be narrowbody and 23 percent will be widebody. Due to the growth in traffic demand, the majority of the new aircraft deliveries will be to airlines in Asia. North America and Europe follow with approximately 7,900 and 7,300 new aircraft deliveries by 2034.

Excluding freighters under 10 metric tons and passenger aircraft under 100 seats, Airbus projects the global fleet of will grow from 18,460 in 2013 to 37,463 by 2033. Airbus projects a global need for 31,358 new aircraft between 2013 and 2033. As shown in **Table 2-22**, the Asia Pacific region is forecast to have the most aircraft deliveries of any region (over 12,000), which is also consistent with the region's projections of high passenger growth rates. With roughly half the projected aircraft deliveries of Asia-Pacific, Europe ranks second and North America third. Due to the relative maturity of these markets, Europe and North America fleets generally have the oldest average aircraft age, increasing their need for replacement aircraft.

Table 2-22: Airbus' Forecast of New Aircraft Deliveries by Region*

Aircraft Category	Africa	Asia-Pacific	CIS	Europe	Latin America & Caribbean	Middle East	North America	World
Single-Aisle	734	8,066	1,036	4,895	1,784	826	4,730	22,071
Small Twin-Aisle	162	2,535	134	763	356	486	709	5,145
Intermediate Twin-Aisle	57	1,147	39	410	125	543	320	2,641
Very Large Aircraft	32	724	32	185	29	387	112	1,501
Total	**985**	**12,472**	**1,241**	**6,253**	**2,294**	**2,242**	**5,871**	**31,358**

Source: Airbus Global Market Forecast 2014 – 2033
**Note: Includes Passenger Aircraft ≥100 Seats & Freighter Aircraft ≥10 Metric Tons*

It is important to note that unlike Boeing's forecast of new aircraft deliveries, Airbus' forecast only includes passenger aircraft with 100 seats or more and freighter aircraft of 10 metric tons or greater. This excludes the regional jets counted by Boeing. Both the Boeing and Airbus forecasts of new aircraft deliveries include both passenger and freight aircraft; however, freight aircraft comprise a relatively small percentage of the projected total aircraft deliveries. Airbus and Boeing both estimate that freight aircraft will only make up about 2.5 percent of the global total of new aircraft deliveries by 2034. It is common for many older, less-efficient passenger aircraft to be converted for use as freighters, subsequently reducing the need for new dedicated freighter aircraft.

2.4.5.7 Pilot and Technicians Outlook

The projected increase in global passenger traffic will require a major increase in the worldwide fleet of aircraft. To meet this demand, Boeing projects that 533,000 new commercial airlines pilots and 584,000 new maintenance technicians will be needed to fly and maintain the world fleet over the next 20 years. The greatest need will be in the Asia Pacific region, but the projections of pilots and technicians in the Middle East have increased dramatically, reflecting expected fleet expansion plans by the region's airlines.

Airlines across the world are expanding fleets and schedules to meet surging aviation demand in emerging markets. Emerging markets that have historically relied heavily on recruitment of pilots from outside their home markets will need to establish strong pilot training programs. As shown in **Table 2-23**, the Asia Pacific region is projected to see the largest growth new pilots and technicians by 2034—twice as many as in Europe, the next highest region. North America is projected to require 88,000 new pilots and 109,000 new technicians by 2034.

Table 2-23: Boeing Forecast of New Pilots and Technicians Needed by 2034

Region	Pilots	Technicians
Asia Pacific	216,000	224,000
Europe	94,000	102,000
North America	88,000	109,000
Middle East	55,000	62,000
Latin America	45,000	44,000
CIS	18,000	24,000
Africa	17,000	19,000
Total	**533,000**	**584,000**

Source: Boeing Current Market Outlook 2015 – 2034

As new generation aircraft become increasingly prevalent in airline fleets, reliability will improve and maintenance intervals will lengthen. Although this trend will moderate growth, the global requirement for maintenance technicians remains significant. The projected growth of the global fleet coupled with the increasing trend of outsourcing MRO services to third parties in emerging markets will drive the need for the number of qualified technicians to increase and geographical sources of trained technicians to expand.

2.4.5.8 Air Cargo Outlook

Although generally a smaller focus than the commercial passenger sector, air cargo is a vital component of the global aviation industry. Air cargo growth is both a contributor to and bellwether of a region's economic health. Air cargo is typically among the first services cut during difficult economic conditions, and is often one of the last to resume after a rebound. This section draws upon Boeing's *World Air Cargo Forecast 2014 – 2015* and Airbus' *Global Market Forecast 2014 Freight* to provide an outlook of the air cargo industry.

Air cargo is essential to global trade, as it transports approximately 33 percent of total trade by value. Much like with passenger airlines, emerging markets are the key to growth as advanced economies have a more mature air cargo market. The forces of globalization, urbanization, and industrialization has resulted in rapid middle class expansion in emerging markets, which is a major drivers of air cargo growth.

The air cargo industry rapidly expanded during the 1980s and 1990s, but slowed significantly through the 2000s as a result of various factors such as 9/11, high fuel costs, an economic recession, and an ongoing modal shift. As air cargo customers became less sensitive to shipping time and more sensitive to shipping cost, air cargo lost market share to the trucking and containerized shipping industries. However, the modal shift only exists for certain commodities and has been occurring long before any crises. The shift is cyclical in that old generation products continually become cheaper and move onto sea transport, replaced in cargo aircraft by higher end products. For example, personal computers once delivered by aircraft in the

1990s gave way to smartphones and tablet computers towards the late 2000s. Evolving business models also influence air cargo, as the increased prevalence of zero-stock policies increases the share of air transportation as need for faster transport increases. High value, time-sensitive commodities such as perishables and pharmaceuticals are largely immune to transport costs.

Despite the fact that overall air cargo growth stagnated over the past decade, the international express market has been more resilient to crises, having grown by a total of 50 percent from 2006 to 2013. International express now accounts for approximately 16 percent of total international air freight, focusing on high tech products and heavy machinery.

Trends in passenger airlines also influence air cargo trends, as significant quantities of air freight are carried as belly cargo in the lower decks of passenger aircraft. Over the past 40 years, belly capacity on widebody aircraft has nearly doubled as aircraft size increases to accommodate increasing numbers of passengers. Despite this growth, belly capacity is not a driving force behind aircraft design—passenger capacity is. The belly capacity per passenger has remained stable over this timeframe. Worldwide, widebody belly capacity has always been about twice as high as the demand for air cargo traffic, meaning all cargo could have been transported using only passenger belly capacity. However, passenger and cargo capacities don't always align on the same routes. Dedicated freighters are important for specific flows such as Europe-Africa, unlike U.S.-Europe, which has substantial belly capacity on passenger aircraft.

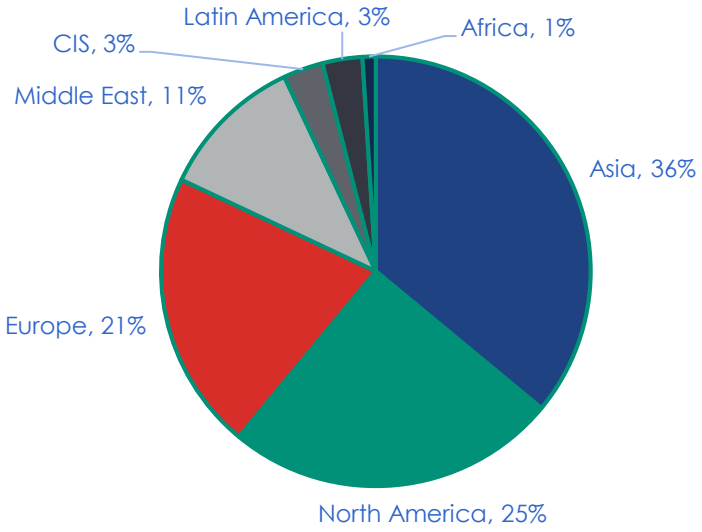
In 2013, 51 percent of air cargo volume was belly cargo. As passenger traffic is projected to outgrow dedicated cargo traffic, this figure is projected by Airbus to grow to 56 percent by 2033. This will be especially true on long-haul flows where large freighters compete with widebody passenger aircraft.

After rebounding more than 19 percent in 2010 after the depressed levels of 2009, world air cargo traffic stagnated from mid-2011 to early 2013. This prolonged period of weak growth can be attributed to two factors: a weak world economy and lagging trade growth. Since the onset of the global economic crisis in 2008, world air cargo traffic averaged only 1.7 percent growth per year through 2013. On a positive note, world air cargo traffic began to grow again in the second quarter of 2013. By July 2014, traffic had grown 4.4 percent compared with the first seven months of 2013.

2.4.5.8.1 MARKET SHARE BY REGION

Air cargo growth varies by an airline's home market. The market share of airlines based in Asia and the Middle East has grown relative to that of airlines based in other regions. Of the 207.8 billion revenue-ton-kilometers (RTKs) carried by the global air cargo industry in 2013, Asia makes up the largest market share with 36 percent of the total. This reflects the rapid expansion of Asian export markets. North America, Europe, and the Middle East follow with 25 percent, 21 percent, and 11 percent. Since 2000, carriers based in the Middle East have capitalized on their geographic position at the crossroads between Africa, Asia, and Europe by rapidly expanding their widebody passenger and freighter fleets, allowing them to increase their market share from 4.0 percent in 2004 to 11 percent in 2013. **Figure 2-17** illustrates the global air cargo market share by region in 2013.

Figure 2-17: 2013 World Air Cargo Market Share by Region



Source: Boeing World Air Cargo Forecast 2014 – 2015

2.4.5.8.2 GLOBAL AIR CARGO GROWTH

World air cargo traffic is defined as the sum of freight and mail. World air freight is strongly related to GDP and average yield. The world airmail component, however, depends less on yield and therefore correlates most strongly with GDP. Boeing projects low, baseline, and high growth scenarios for both world air freight and world airmail. High and low scenarios correspond to GDP growth of 0.5 percent above or below long-term projections, respectively. This results in forecasted world air cargo (freight + airmail) growth scenarios of 5.5 percent, 4.7 percent, and 4.0 percent. At a baseline growth rate of 4.7 percent per year, world air cargo will more than double from 207.8 billion RTKs in 2013 to more than 520 billion RTKs by 2033. Sustained economic growth, along with decreasing yields, contributes significantly to the growth of the air cargo industry. Boeing's world air cargo growth scenarios are presented in **Table 2-24**.

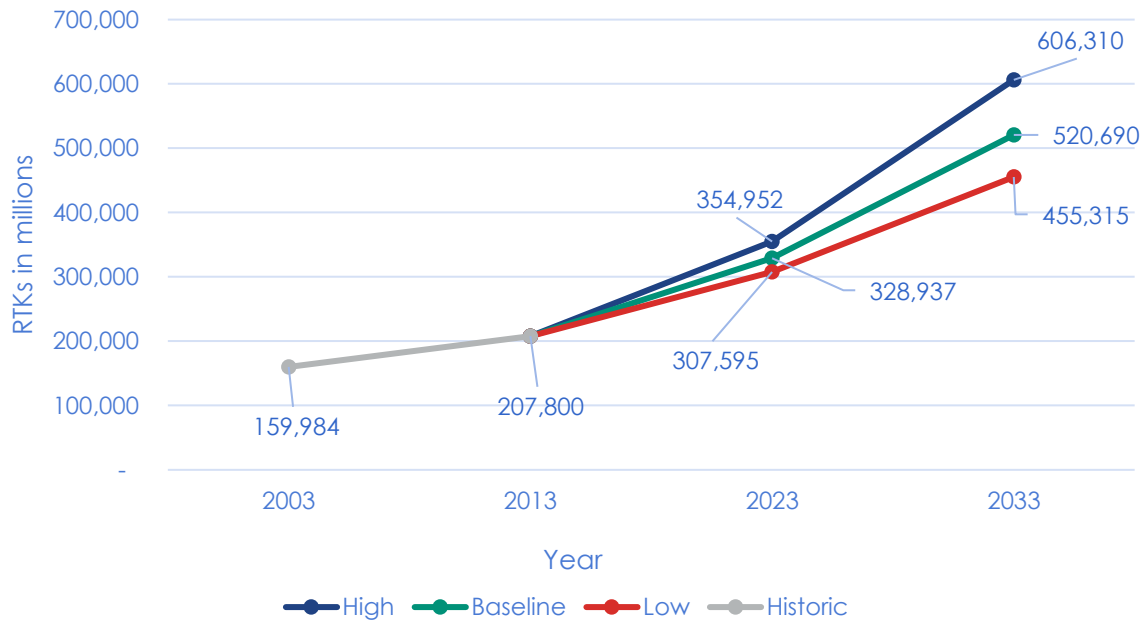
Table 2-24: Boeing World Air Cargo Forecast Scenarios 2013 – 2033

2013 – 2033 Growth Scenario	World Air Freight AAGR	World Airmail AAGR	World Air Cargo (Freight + Airmail) AAGR	2033 World Air Cargo RTKs (in millions)
High	5.6%	1.2%	5.5%	606,310
Baseline	4.8%	1.0%	4.7%	520,689
Low	4.1%	0.9%	4.0%	455,315

Source: Boeing World Air Cargo Forecast 2014 – 2015

Airbus projects a similar growth rate of 4.5 percent annually for global air cargo from 2013 to 2033. The high, baseline, and low growth scenarios for world air cargo projected by Boeing are illustrated in **Figure 2-18** in 10-year increments from 2003 through 2033.

Figure 2-18: Boeing World Air Cargo Forecast Scenarios 2003 – 2033



Source: Boeing World Air Cargo Forecast 2014 – 2015

2.4.5.8.3 GROWTH BY REGION

Air cargo traffic growth will be largely driven by emerging markets, which are projected to represent 75 percent of total air cargo traffic in 2033. The single largest regional flow of air cargo in 2013 was Asia-North America, while the Europe-Asia traffic ranked as the second largest flow by RTKs. By forecasted growth, Intra-Asia traffic is projected to grow faster than any other international world market, averaging 6.5 percent growth per year through 2033. The Asia-North America and Europe-Asia markets will grow at an average of 5.4 percent and 5.3 percent per year. Domestic China will be the fastest growing contiguous market in the world, averaging 6.7 percent annual growth through the forecast period.

The mature markets of North America and Intra-Europe will grow more slowly at 2.1 percent and 2.0 percent per year. Also projected to trail behind the world average growth rate of 4.7 percent are the market flows of Europe-North America at 3.1 percent, Middle East-Europe at 4.0 percent, and Africa-Europe at 4.3 percent growth.

Other markets projected to grow at or above the world average growth rate are South Asia-Europe, Latin America-Europe, and Latin America-North America at 4.7 percent, 4.8 percent, and 5.2 percent, respectively. Intra-Asia is currently the fifth largest air cargo market, but because it is projected to grow 6.5 percent per year it will become the third largest market by 2033. The share of world air cargo markets associated with Asia, including domestic China and domestic Japan, will increase from 51.3 percent in 2013 to 61.1 percent in 2033. Boeing's projected air cargo growth rates of various global markets are presented in **Table 2-25**.

Table 2-25: Boeing Regional Air Cargo Growth Rates

Regional Flow	2013 RTK Ranking	2003 – 2013 RTK AAGR	2013 – 2033 RTK AAGR
Asia-North America	1	2.3%	5.4%
Europe-Asia	2	4.8%	5.3%
Intra-Asia	5	3.0%	6.5%
Europe-North America	4	0.6%	3.1%
Intra-North America	3	-1.6%	2.1%
Domestic China	7	9.9%	6.7%
Latin America-Europe	6	5.0%	4.8%
Latin America-North America	8	2.5%	5.2%
Africa-Europe	9	1.0%	4.3%
South Asia-Europe	11	5.1%	4.7%
Middle East-Europe	10	4.1%	4.0%
Intra-Europe	12	1.6%	2.0%
World		**2.6%**	**4.7%**

Source: Boeing World Air Cargo Forecast 2014 – 2015

2.4.5.8.4 NORTH AMERICA

In 2013, air cargo moving to, from, and within the U.S. and Canada accounted for 9.1 percent of the world's air cargo traffic in terms of RTKs and 14.1 percent in terms of tonnage alone. The U.S. domestic market, accounts for 95.9 percent of the North American market, while Canadian domestic cargo accounts for 2.2 percent. Transborder traffic between the two countries accounted for 1.6 percent of the 2013 North American market. North America air cargo traffic is projected to average 2.1 percent growth from 2013 to 2033. The U.S. domestic market, which is the largest influence on North American growth rates, is projected to grow at an average annual rate of 2.1 percent through 2033. The Canadian domestic market will grow at an average annual rate of 2.3 percent over the same period, while transborder air trade between the two countries will grow by 4.4 percent annually.

Air cargo trade between North America and Europe accounted for approximately of 6.6 percent of global air cargo tonnage and 8.4 percent of global RTKs. Since the global economic recession, air cargo between Europe and North America has been volatile, decreasing a total of 16.3 percent from its peak in 2007 to 2013. The U.S. accounted for 91 percent of North America's air exports to Europe and 90 percent of the region's air imports from Europe in 2013. Seventy percent of the commodities moved between Europe and North America are industrial products and manufactured goods. Air cargo trade between Europe and North America is projected to grow by 3.1 percent over 20 years. This relatively low growth rate is due to assumption that both continents will continue to focus on trade with Asia.

Latin America is another major trade partner with North America, specifically the U.S. and Florida in particular. The U.S. accounts for 90 percent of Latin America's imports from North America and 93 percent of its exports to North America. Boeing defines Latin America as South America, Central America (including Mexico), and the Caribbean. Trade between North America and each of these sub regions is unevenly distributed, with South America being the largest trade flow by a wide margin. Commodities data shows that cargo flows to Latin America consist primarily of higher value manufactured commodities, while flows from Latin America were made up primarily of perishables. Florida, and Miami International Airport in particular, is a major gateway for the perishables import sector, handling nearly 72 percent of total U.S. perishables imports in 2013. Miami International Airport controls the north-south cargo flows in the Western Hemisphere, handling 85 percent of all air imports and 80 percent of all exports from the Latin American/Caribbean region.[168] The air cargo market between Latin America and North America is projected to grow by 5.2 percent per year between 2013 and 2033. By subregion, South America, Central America, and the Caribbean will grow by 5.3 percent, 5.4 percent, and 1.8 percent annually.

2.4.5.9 Boeing and Airbus Forecast Summary

The forecasts by Boeing and Airbus provide two different viewpoints on the expected growth of the commercial aviation industry in terms of both passengers and air cargo. As shown in **Table 2-26**, Boeing's projections for global GDP, airplane fleet, airline RPKs, and cargo RTKs are more optimistic than those of Airbus, but only slightly as they differ by only a few tenths of a percentage.

Table 2-26: Comparison of Airbus and Boeing Forecasts

Projected Growth by Category (AAGR)	Airbus GMF 2013 – 2033	Boeing CMO 2013 – 2033	Boeing CMO 2014 – 2034
World Economy GDP	2.9%	3.2%	3.1%
Airplane Fleet	2.8%	3.6%	3.6%
Airline RPK	4.7%	5.0%	4.9%
Cargo RTK	4.5%	4.7%	4.7%

Source: Airbus Global Market Forecast 2014 – 2033; Boeing Current Market Outlook 2015 – 2034

2.5 Summary

With numerous issues and trends that have the potential to impact Florida's aviation system, it is critical for the FASP to identify and explore possible outcomes. As such, a high-level review of 23 issues is provided in this Chapter, along with a more detailed exploration of the most prominent industry trends currently impacting or with future potential to impact aviation in Florida. **Chapter 8 – Alternative Scenarios** includes alternative scenarios related to oil price fluctuations, resiliency,

[168] www.miami-airport.com/pdfdoc/MIA_Cargo_Brochure.pdf

and tourism in the state. With insight into these aviation industry trends, the FASP 2035 is better positioned to prepare the system for changing conditions.