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The Pilot Shortage Explained

Hans Gorowsky

Department of Economics

Abstract – In the United States for the next 20 years the demand for commercial airline pilots is expected to be at an all-time high. Boeing estimates a need for 117,000 new pilots in North America alone. The demand for pilots is increasing and the number of airline transport pilots (ATPs) are also increasing from year to year. From 2016 to 2017 the percent change in passengers went up 3.03% while the percent change of pilots was only up 1.22%. (U.S. Civil Airman Statistics 2018). The number of people traveling has increased in the last decade to almost a billion passengers per year. “over the next 10 years, IATA forecasts that passenger trips will grow by 4.3% annually”. The supply of pilots is analyzed through the number of certificates held in the following three categories. certified flight instructor, commercial pilot, and airline transport pilot certificate. The trend for the total amount of commercial pilots is falling from 2008 to 2017 which tells us that the airline industry is either losing pilots or is not hiring enough to replace retirees. The trend for new commercial pilots is increasing from 2015 to 2017 and this is a response to the industry recognizing a shortage. Each airline will have to make decisions based on their needs. Well qualified, certified pilots are an important factor for safe air travel and the airline industry needs these pilots for a profitable future.

I. Introduction

The United States will be at an all-time high for demand of commercial airline pilots spanning over the next twenty years. The acting Administrator for the Federal Aviation Administration (FAA) Daniel K. Elwell said “Air travel in the United States and around the world is growing rapidly with no signs of slowing down. Last year the international air transport association forecast the number of air passengers traveling will nearly double by 2036. The Boeing pilot outlook project’s this growth will require 117,000 new pilots in North America alone. But at a time when we need to see interest in aviation careers going up the data is actually trending in the opposite direction.” (AOPA 2018) For the data to be trending in the wrong

direction it means there are less people pursuing an interest at the beginning stages of aviation. If actions are not taken to bring more interest into aviation the airline industry will face a shortage. The question this paper aims to solve is why there is a shortage.

A shortage is when the quantity demanded of a product or service exceeds the quantity supplied in that market. The focus of this study will be on airline transport pilots (ATPs). The Airline Transport Pilot Multi-Engine certificate is the crown jewel of pilot ratings and is required for pilots flying passengers or cargo under Part 121 and some Part 135 operations. (Bergqvist 2015) The airline industry has seen shortages in the past resulting from the 9/11 terrorist attack and during the 2007 and 2008 economic downfall.

The demand for pilots is increasing and the number of pilots (ATPs) are also increasing from year to year. From 2016 to 2017 the percent change in passengers was up 3.03% while the percent change of pilots was only up 1.22%. (U.S. Civil Airman Statistics 2018) However, with air travel rapidly increasing and the mandatory retirement age of 65 the number of ATP’s will have to increase as demand rises. For instance, “Passengers on US airlines as of September 2018 was at 75.8 million which was up 11.5% from last year and up 3% from the previous month.” (Airline Traffic Data 2018)

The supply of ATP pilots comes from the civilian route or the military route to the airlines. This study focuses on the civilian side of the pilot market. The supply of pilots depends on the pathways to the airlines. There are three certificates that make a pilot employable in commercial air and the historical number of these certificates suggest there is a growing supply shortage. These pilot certificates are private pilot, commercial pilot, and Airline Transport pilot certificate. Each certification requires time and money and together they constitute a significant barrier to entry for commercial pilots. In addition, there have been times in the industry during which pilots were furloughed. “Furloughs occur when airlines contract.

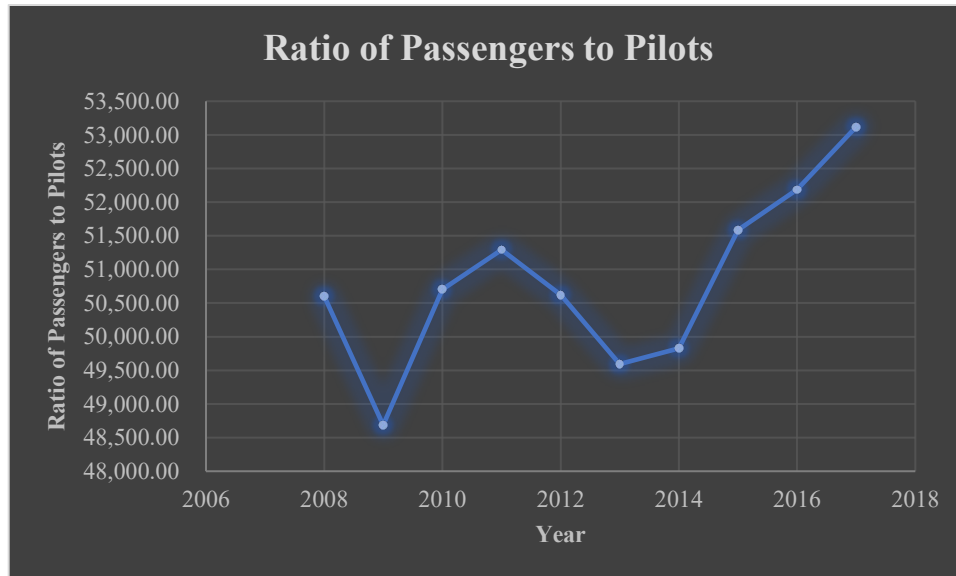


Figure 1. Bureau of Labor Statistics, U.S. Department of Labor & FAA Civil Airman Statistics 2018

They lay off pilots without pay until they start hiring again, at which point they offer those positions back to the furloughed pilots.” (McGee, 2015, p.18) Finally, the airline industry is unique because of the mandatory retirement at the age of 65. “About 42% of the pilots flying today for U.S. airlines will retire in the next 10 years. Most will do so upon reaching the federally-mandated retirement age of 65.” (Reed 2017).

The decrease in flow of pilots into the cockpit combined with an increase in flow of passengers traveling is leading to canceled flights. For example, according to Baker (2014), “A year ago, Great Lakes Airlines had 300 pilots. Today, the company has 78. The shortage of pilots led the company to suspend its mid-day flight service at the Cortez Municipal Airport.” To date, the growing shortage shows in the growing ration of passengers to pilots, as shown in **Figure 1**.

One of the factors influencing this ratio is the size of the airplane. However, many pilots have decided to not work in the passenger airline industry. There are several reasons that help to explain this lack of transition including there is a large population of pilots that are working in another profession. An airline pilot does not need a degree in aviation. Another reason for the pilot shortage would be the debt that a college graduate would incur along with low entry level pay and other additional inconveniences such as uncertain living arrangements. “The data further indicates that approximately 8.53% of future

pilots are no longer considering a career as an airline pilot due to the new ATP airline requirements and an additional 32.54% of future aviators are reconsidering their career as an airline pilot.” (Higgins, et al., 2013) The ATP requirements will be addressed specifically below. As the United States and the rest of the world rely so heavily on the airlines for transportation for reasons such as business, leisure and evacuation to name a few, it is important that this issue is investigated, and actions are taken to prevent a potential economic crisis.

II. Literature Review

In a comprehensive study entitled “An Investigation of the United States Airline Pilot Labor Supply,” Higgins, et al., (2013) conclude that the U.S. faces a shortage of airline pilots. They project a shortage of 35,000 pilots between 2013 and 2031. The authors list a set of reasons including:

- The increasing cost of flight training and declining potential for hire at major airlines
- Airline retirements are accelerating
- Growth of customers
- Certified flight instructors do not intend to work in the airline industry as a long-term career
- The requirement of an Airline Transport Pilot certificate prior to operating as a line pilot for an air carrier is seen as an obstacle.

They also predict that the major airlines may not experience the shortage over the next three to five years, but regional carriers may be affected by the shortages at a larger scale.

Lutte, et al., (2014) conducted an in-depth study of the pilot shortage. One of their findings was that over 45% of the commercial written exams for flight instructors were foreign pilots who had no intention of working as an airline pilot in the U.S. They project a shortage of 35,000 pilots, given that it takes five to seven years for a pilot to obtain all of their required certification to become eligible for employment at an airline.

Michael McGee in his dissertation called “Air Transport Pilot Supply and Demand”, (2014) surmises that one of the major reasons for a shortage includes the 2009 Colgan air crash, and the legislation that followed, changing rules governing requirements for airline transport pilots.

The FAA’s investigation of Flight 3407 led to the conclusion that the crash was pilot error. As a result, they recommended 25 new changes to Federal Aviation Regulations (FAR). These changes included:

- Flight and duty time
- Safety management systems
- Crew member training
- Crew member screening/qualifications
- ATP certificate requirement
- Mentoring
- Professional development
- Leadership
- Stall/upset recognition and recovery
- Remedial training programs

This was followed by congress passing the Airline Safety and Federal Aviation Administration Extension act of 2010. McGee states that two rules coming out of this legislation has exacerbated the pilot shortage. The two new rules are:

- (i) Pilot Certification and Qualification Requirements for Air Carrier Operations
- (ii) Flight crew Member Duty and Rest Requirements.

The Pilot Certification and Qualification Requirements for Air Carrier Operations prolonged

flight training. Flight Crew Member Duty and Rest Requirements was a safety measure, but it also limited the number of hours a pilot can log in a day which lowers the amount a pilot can amass in a month.

Lovelace and Lutte (2016) also investigate the pilot supply shortage focusing on the collegiate aviation flight students’ level. The main focus of their research was to survey collegiate aviators on the First Officer Qualification (FOQ) rule change and the perception of students on a career path to the regional airlines. Firstly, the FOQ was a direct result from the Colgan air crash in 2009. It now “requires all second-in-command pilots (first officers) to hold an Airline Transport Pilot (ATP) certificate, requiring that a pilot be 23 years of age and have 1,500 hours total flight time” (FAA, 2013a). As a result of the survey the students said in summary that it has a negative impact on career plans. The reason it has a negative impact was the increased time and money needed to meet the requirements. Besides the added requirements it is transparent that the first year pay at the regionals is unacceptable. Leaving college with more than \$100,000 in debt and entering the regional airline payroll with somewhere in the mid \$20,000 doesn’t necessary seem reasonable. Even the CEO of Republic stated, “There is no doubt entry level pilot pay at regionals is insufficient” (Bedford 2015).

III. The Pathways to The Airlines

Selecting the Right Flight School

The Federal Aviation Administration (FAA) provides rules for getting a pilot license (certificate) and the kind of certificate depends on the type of aircraft one wants to fly. Pilot licenses range from student pilot all the way up to airline transport pilot. Airline pilots start as commercial pilots and should have the FAA-issued Airline Transport Pilot (ATP) certificate. (“Summary” 2018) Along the way pilots must pass a written exam on the ground and a practical flying exam, called a check ride, in the right aircraft for each certificate. Specific requirements can be found in Federal Aviation Regulations (FAR). Flight schools can train student pilots either using rules from part 61 or from part 141.

Part 61 is very flexible for part time students who are training on a less regular schedule. The downside it may take longer and cost more money in flight time to finish out ratings. It requires 40 total hours of

flight time, 10 hours of solo time, 5 hours of solo cross-country flight time, 20 hours of dual instruction, 3 hours of each of the following; Instrument instruction, Night flying, and Cross country flying.

Part 141 is a much more structured training environment and better for full-time student pilots who are 100% sure on becoming a professional pilot. Part 141 follows a strict FAA- approved syllabus and the strict enforcement of the demanding schedule allows the student to obtain a Certificate in only 35 total hours of flight time. Of those 35 hours 5 of them are solo time, 3 hours of cross country, 20 hours of dual instruction, and 3 hours each of the following; Instrument instruction, Night flying, and Cross country flying.

Ratings and Certificates

After finding the right flight school a student pilot will work towards their Private Pilot License. “The instrument rating, which requires the student pilot the exact skills needed to fly in the clouds and under conditions of reduced visibility, it is the most frequent “next step” taken by private pilots seeking to advance their aeronautical education. If the private pilot certificate is the airman’s bachelor’s degree, the instrument rating is graduate school.” (Gruber 2016). After obtaining a Private Pilot Certificate and an instrument rating the next certificate to get a pilot closer to the airlines will be a Multi-Engine rating. The Multi-Engine rating is the cheapest and quickest to obtain. It will vary with each school and type of plane used but should be no more than \$1500 with 8 hours of instruction. This rating will enable the pilot to operate aircrafts with two or “twin” engines. Twin engine aircraft can be challenging but extremely safe for skilled pilots. Having a multi-engine rating makes flying over mountains, water, and poor weather much safer and at the same time one can fly further and faster than single engine airplanes. After the multi-engine the student will work towards a commercial pilot certificate. The commercial pilot certificate is similar in training to the private pilot license, but it requires the pilot to log longer cross-country flights and the check ride maneuvers are much stricter. As for the written portion of the training its questions are related to Commercial operations in aviation. The next certificate is not a required one but it’s extremely common and it is tough to build hours without it. Obtaining a Certified Flight Instructor Certificate allows a pilot in training to build hours as well as getting paid for it. In the wake of the pilot shortage

there are actually too few of CFI’s because it is a job in aviation that is used as a stepping stone to build hours and move on. At the same time, it is the most rewarding rating or certificate a pilot can receive because it is giving back to the aviation community.

At this point in a pilot’s pathway to the airlines he or she will be at the building hours stage. This means that they are short of 1500 hours of total flight time and above 500 total flight hours, so they need to fly the remaining hours to be eligible to get their Airline Transport Pilot Certificate. However, pilots are able to apply for other types of flying jobs such as banner towing, private charter operation, and skydiving jump pilot to name a few. This is a very difficult time in a pilot’s career because these jobs are not high paying. The most important thing for a pilot during this period is the experience in flying and the flight time that will prepare them for airline interviews.

Furthermore, the student will get an Airline Transport Pilot Certificate, but the ATP certificate requires a pilot to have logged 1500 hours to even apply for it. Lastly, for a pilot to be competitive in the airlines it is required that they have a four-year degree. It is clear why there is a pilot shortage when all of the student loans and pilot training keep building up. This whole flight training process from 0 hours to 1500 can take anywhere from 2 to 3 years depending on how motivated and competent the student is.

IV. Barriers to Entry

In the theory of economics, “the barriers to entry” for any market is an obstacle or economic cost that a new entrant of any industry must incur that an incumbent of the industry does not. When looking at the airline industry a major reason for an insufficient number of pilots comes down to the barriers to entry. The decision to become an airline pilot is a consumer decision as Higgins states in *An Investigation of the United States Airline Pilot Labor Supply*. When he or she successfully lands a job at a major airline it is a reward. The airline industry can be looked at as a risk reward career. The risk is all in the early stages of the career, spending thousands on ratings and certificates to “potentially” one day have those investments pay off tenfold. “Pilots say more people would spend the \$150,000 to \$200,000 to acquire a commercial license if regional airlines paid more to starting pilots.” (Jansen 2015). Data on average cost of becoming a pilot is not easy to calculate as different types of flight

training have different requirements. A quick learner may spend less, and some students may require multiple repeat lessons costing more.

The lifestyle and salary of the starting pilot is not very attractive. In the article “‘Pilot Shortage’: For the Airline Industry, it’s an Inside job” Michael Boyd could not have said it better. “Today, the biggest barrier to entry to the airline piloting profession isn’t the cost of gaining requisite hours and qualifications. It’s the sacrifice these individuals must make after they’re hired. Take the \$60,000 that Envoy air, Piedmont, and others are promising... for the first year or maybe two. Then it’s back to the basic \$40,000 plus benefits, only to grow slowly until the pilot gets to transition to the major carrier.” (Boyd 2018).

On July 15th, 2013, the barriers to entry in the airline industry only got worse. The Federal Aviation Administration finished The First Officer Qualification (FOQ) Rule change.

The third column in **Table 1** lists the additional requirements for added with the first officer rule changes. These additional requirements greater increase the difficulty, time and expense of progressing through the early stages of an airline pilot’s career. While these rules increase passenger safety and reassurance, they also squeeze out potential pilots. Without some offsetting incentive, the shortage will grow even more rapidly.

Table 1. First Officer Qualification Rule Changes

Qualifications	Previous Requirements	New Requirements
Receive an ATP certificate with an airplane category and multi-engine class rating	<ul style="list-style-type: none"> • Be at least 23 years of age • Hold a commercial pilot certificate with instrument rating • Pass the ATM knowledge and practical test • Have 1500 total hours as a pilot 	<ul style="list-style-type: none"> • Meet all the previous requirements • Successfully complete an ATP Certification Training Program prior to taking the ATP knowledge test • Have 50 hours minimum in class of airplane
Receive an ATP certificate with restricted privileges (Restricted to serving as Second in command in part 121 operations – multi-engine class rating only)	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • 21 years of age • Hold a commercial pilot certificate with instrument rating • Completion of ATP Certification Training Program prior to taking ATP written test • Pass ATP practical and knowledge test • Meet Aeronautical experience requirements of §61.160. A pilot may be eligible if he or she was a military-trained pilot: a graduate of a four-year bachelor’s degree program with an aviation major; graduate of a two-year associate degree program with an aviation major; or has 1500 total time as a pilot
Serve as Second in Command (first officer) in part 121 operations	<ul style="list-style-type: none"> • Hold at least a commercial pilot certificate with an appropriate category and class training • Hold an instrument rating • Hold at least a second-class medical certificate 	<ul style="list-style-type: none"> • Hold an ATP certificate with appropriate aircraft type rating or – An ATP certificate with restricted privileges and an appropriate aircraft type rating • Hold at least a second-class medical certificate
Serve as Second in Command (first officer) in a flag or supplemental operation requiring three or more pilots	<ul style="list-style-type: none"> • Hold an ATP certificate with appropriate aircraft type rating • Hold a first class medical 	<ul style="list-style-type: none"> • Hold an ATP certificate with appropriate aircraft type rating • Hold a first class medical
Serve as Pilot in Command in part 121 operations	<ul style="list-style-type: none"> • Have at least 1500 hours of total time as a pilot • Hold an ATP certificate with appropriate aircraft type rating • Hold a first-class medical certificate 	<ul style="list-style-type: none"> • Meet all of the previous requirements • Have a minimum of 1000 flight hours in air carrier operations as Second in Command in part 121 operations. A PIC in operations under either §135.243(a)(1) or §91.1053(a)(2)(i), or any combination of these.

V. Pilot Demand

Between passenger growth, airplane fleet growth, and retirement, the demand for airline pilots is going to be high for many years to come. “By 2015, demand has surpassed 3000 new pilots/year, and by 2020 it passes the 4000 pilot/year threshold. The 15-year average is over 3900 pilots/year, creating uncharted territory for majors hiring of this duration.” (McGee, 2015, p. 45) Airline pilots make up a very small proportion of the overall pilot population. So, as the demand grows, wages should increase and hopefully more pilots will transition careers to the airlines.

The total number of pilots include Sport, Private, Rotorcraft, Glider, Student, and remote pilots. Pilots in these categories use their pilot ratings as a hobby, to join a club, to become a corporate pilot, crop duster, or fly themselves and not use the airlines. Unfortunately, only a fraction of these pilots become professionals. Thus, to increase the total number of pilots we can either increase this transition rate or attract more people to aviation.

However, the last two decades have been a rollercoaster for the major airlines. In this time the 9/11 attack made air travel unpopular, major airlines went bankrupt, consolidated, and even merged into other airlines. Some years later the great recession drastically reduced the demand for flight and once again many pilots were laid off. Now that the industry has recovered and is growing rapidly the airlines need to find ways to recruit these pilots back. The four major airlines in the U.S. are American Airlines, Delta, United, and Southwest. It is not likely there will be another merger or consolidation. What happened in the last two decades will likely not happen again.

The number of people traveling has increased in the last decade to almost a billion passengers per year. “Over the next 10 years, IATA forecasts that passenger trips will grow by 4.3% annually”. (CAE 12) Efficiency and aircraft utilization will be crucial to help maintain the pilot to aircraft ratio. There are three aircraft categories that are used to classify pilots. The regional aircraft which seats anywhere from 19 to 100 passengers and goes on trips from 30 minutes to 2 hours. The Narrow-body jets seats 100-200 passengers and its average flight time is between 3 to 5 hours. Wide-body jets seat 220 or more passengers and are fuel efficient as they can fly up to 15 hours non-stop. The Regional aircraft has a ratio of 10 pilots per plane, the Narrow-body jets have 11 pilots per plane and the Wide body Jets have 16 pilots per plane. By 2027, the global commercial fleet is expected to grow by 12,000 aircraft to roughly 37,000 aircraft. (Airline Pilot Demand Outlook, p.14) It is crucial that the airlines increase efficiency without deterring working conditions and employ enough pilots to keep the same ratios as demand rises.

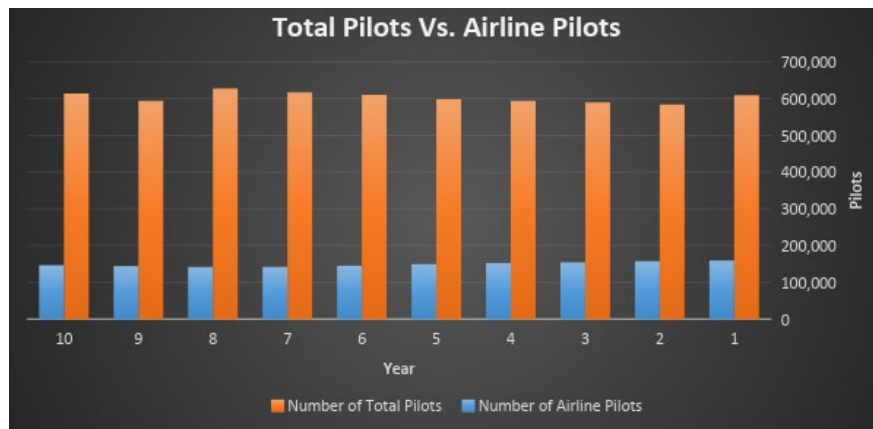


Figure 2. FAA Civil Airman Statistics 2018

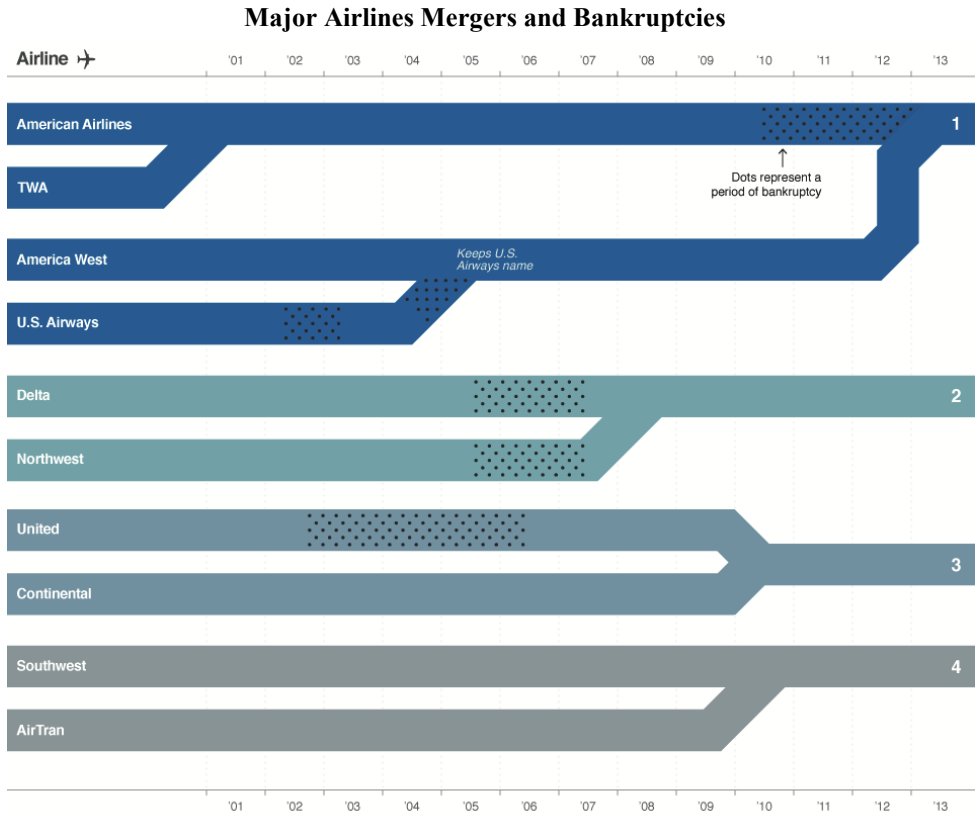


Figure 3. Source McGee, 2015, p. 82

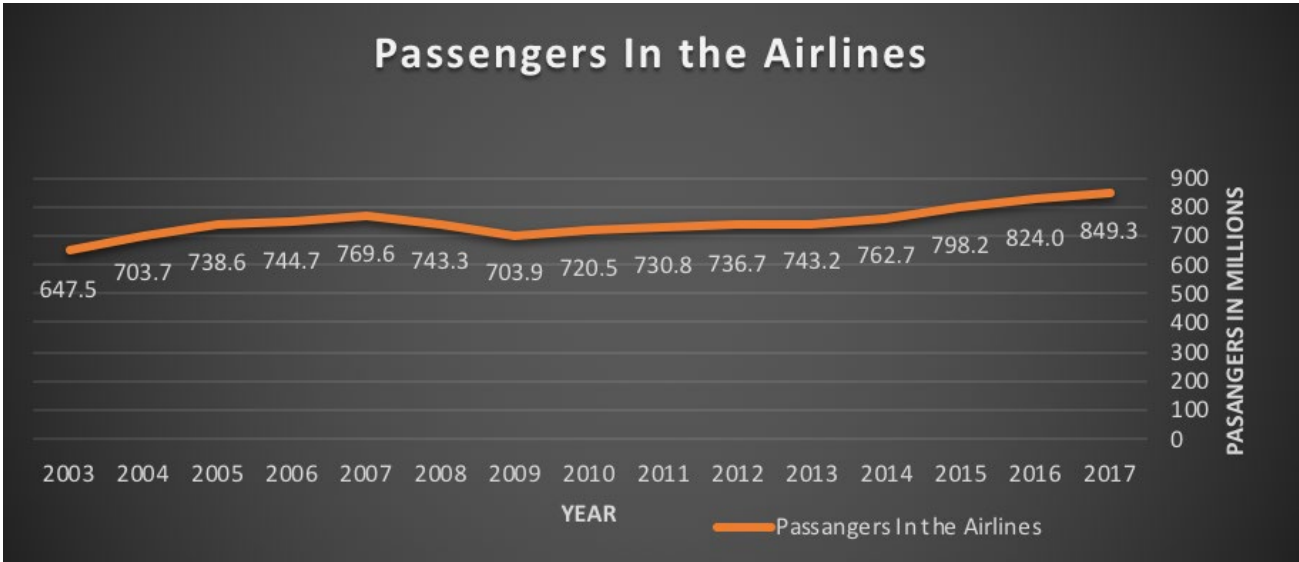


Figure 4. Bureau of Transportation Statistics Annual Passengers on All U.S. Scheduled Airlines (Domestic & International), 2003-2017

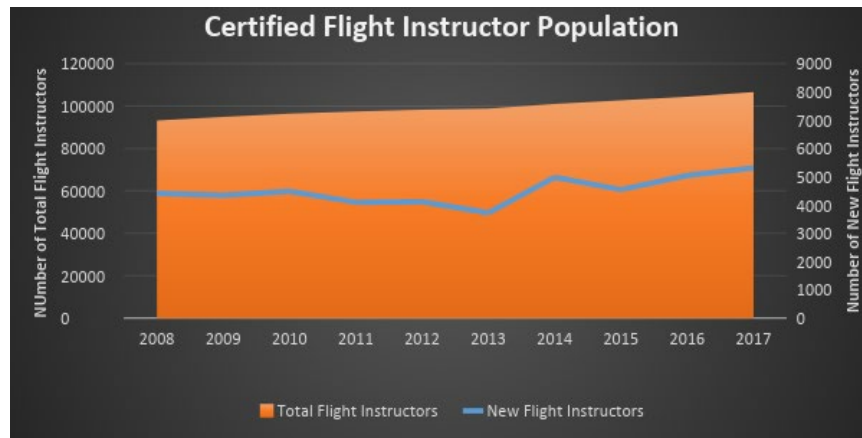


Figure 5. U.S. Civil Airmen Statistics. 2018

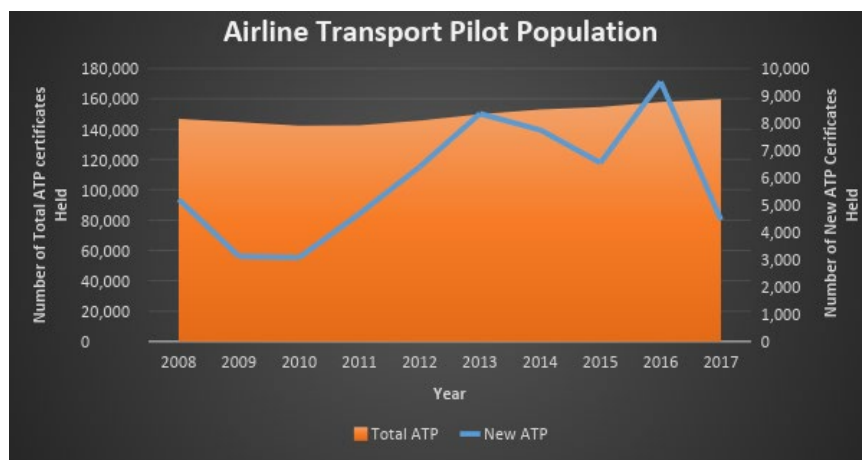


Figure 6. U.S. Civil Airmen Statistics 2018

VII. Pilot Supply

The supply of pilots is analyzed using the number of certificates held in the following three categories. Certified Flight Instructor, Commercial Pilot, and Airline Transport Pilot certificate. Any of the three certificates make a pilot eligible for employment. When examining the pilot shortage in the airlines it is important to look at the number of certificates held compared to the number of new certificates held per year.

As described in the pathways to the airlines section above the Certified Flight Instructor (CFI) is a stepping-stone to becoming an airline Transport Pilot (ATP). The graph in **Figure 5** compares the total certified flight instructors and the New Certified Flight instructors per year. Notice that there are two different ranges of values on the right and left axis. The left side of the figure (in red) measures the total certified flight instructor population and the right side represents new

certified flight instructors coming into the industry each year. Thus, the total number of new CFI’s are increasing each year, however two observations are needed. First there may be many young professionals recognizing the shortage and beginning their training for the airlines. However, these data don’t specify whether these new instructors are full or part time. If too many are only part-time instructors, this growth will be insufficient.

Ultimately, the most important certificate when looking at the supply of pilots for the airlines is the ATP certificate. Daniel K Elwell states “But at a time when we need to see interest in aviation careers going up the data is actually trending in the opposite direction” (AOPA 2018) **Figure 6** shows this decline from 2016 to 2017. This decline in combination with the rising demand for air travel will continue to put pressure on airline services.

VIII. Conclusion

“It is clear from the data that the United States faces a shortage of airline pilots.” (Higgins 2013 p. 29). However, the shortage will not affect the major airlines for several years. In the meantime, the regional airlines are already feeling the pinch and it is likely to get worse in years to come. Regional airlines will have to become aggressive in recruiting and rely on an increase in wages as well as offering large signing bonus to attract qualified pilots.

“In regard to research question one, results indicated that the FOQ rule had an impact on the career plans of the collegiate aviation students surveyed. As noted, 8% of respondents indicated that they no longer plan to fly for the airlines due to the rule change, and another 28% are reconsidering the airline career path due to the rule change.” (Lutte and Lovelace 2016) With the FOQ rule change will take more time and money to get to the regionals where the pay is sub-par. Aspiring pilots need to be better educated on the career earning potential as a pilot versus entry level pay.

Regional airlines are very important in providing air service throughout the U.S. Regional airlines serve 681 airports all over the U.S. If the “regional airlines have to reduce service due to the

inability to hire qualified pilots, many communities will see a reduction in air service” (Higgins 2013). Higgins also suggests a twofold solution. One is to reduce costs related to flight training with scholarships and funding with future employment and provide a pathway to the major airlines and the other to recruit CFI’s. Currently about 47% of the CFI’s do not intend to become airline pilots. However, if these pilots could be lured into the industry, the shortage may be mitigated.

The Marsh Report (2016) also states that the airlines will have find creative ways to attract and retain crew beyond just increasing salaries. One would be to put in place an aviation employee benefits program.

Each airline will have to make decisions based on their needs. “Many industry experts believe that this decision will be reactive rather than proactive” Duggar, et al., (2015). Well qualified, certified pilots are an important factor for safe air travel and the airline industry needs these pilots for a profitable future.

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