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Senior Thesis
Presented in Partial Fulfillment
of the Requirements for the Bachelor of Science Degree in
Aviation Flight Science
Aviation Operations and Management
Lee Honors College

The U.S. Aviation Industry and the Professional Pilot Training Environment

By

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Abstract

This study provides background and analysis of the legislation enacted following the crash of Colgan Air 3407, and the impact that the more stringent qualifications have had on aspiring professional pilots. Participants in the study include professional pilots and aspiring professional pilots, governmental law-making agencies such as the United States (U.S.) Congress and the Federal Aviation Administration (FAA), major and regional airlines, and collegiate flight training programs. The study drew from the National Transportation Safety Board investigation (NTSB) of Colgan Air 3407, federal regulations regarding pilot training and certification standards, and current airline hiring and training programs.

Findings of this study show that the reaction to the Colgan accident imposed high barriers to entry for aspiring professional pilots, but it is unclear what impact this has had on the industry. It is recommended that the FAA and other industry leaders conduct additional research to reduce total flight hour requirements for entry-level airline pilots, and credit valuable flight experience such as flight instruction given. In addition, this study recommends an industry-wide pay increase, and continuation of hiring and retention bonuses at the regional airlines to attract qualified pilots to their workforces.

Keywords: pilot shortage, airline transport pilot, regional airline, Federal Aviation Administration, Colgan Air 3407, pilot training

The U.S. Aviation Industry and the Professional Pilot Training Environment

Background

Airmen qualifications for employment within the United States air transportation industry have undergone significant change within the past six years. The crash of Colgan Air 3407 in 2009 caused a perceived degradation in crewmember qualifications and performance, and placed great focus on the training procedures for airline pilots. As a result, legislative bodies increased minimum qualifications to act as the first officer of a scheduled air carrier, restricting the supply of qualified professional pilots to fill positions within the airline industry.

In 2010, the U.S. Congress enacted Public Law 111-216, tasking the FAA to reform crewmember qualifications (U.S. Congress, 2010). In response to the act, the FAA began requiring an airline transport pilot (ATP) certificate to act as a flight crewmember of a transport category aircraft (Federal Aviation Administration [FAA], 2016b), established higher hour minimums for the ATP certificate (FAA, 2016a), and created the Airline Transport Pilot Certification Training Program (ATP-CTP) (FAA, 2013). Along with the increased certification regulations for professional piloting, increased cost of pilot training has resulted in a sharp decline of roughly 65% in ATP pilot certificates issued from 1990–2009 (Blair & Freye, 2012).

In addition to new regulations for airmen certification, high rates of attrition of the current pilot workforce are beginning to deplete the existing pilot workforce. In 2007 the U.S. Congress raised the mandatory retirement age from 60 years old to 65 years old (U.S. Congress, 2007), prolonging the impending retirements from the pilot workforce an additional five years, into 2012. As a result, and shown in figure 1, 2012 marked the beginning of a sustained wave of mandatory retirements due to age, which is forecasted to reach nearly 18,000 pilot retirements by 2022. These mandatory retirements will create an industry-wide demand for qualified

professional pilots that must be met to keep the air transportation industry operating safely.

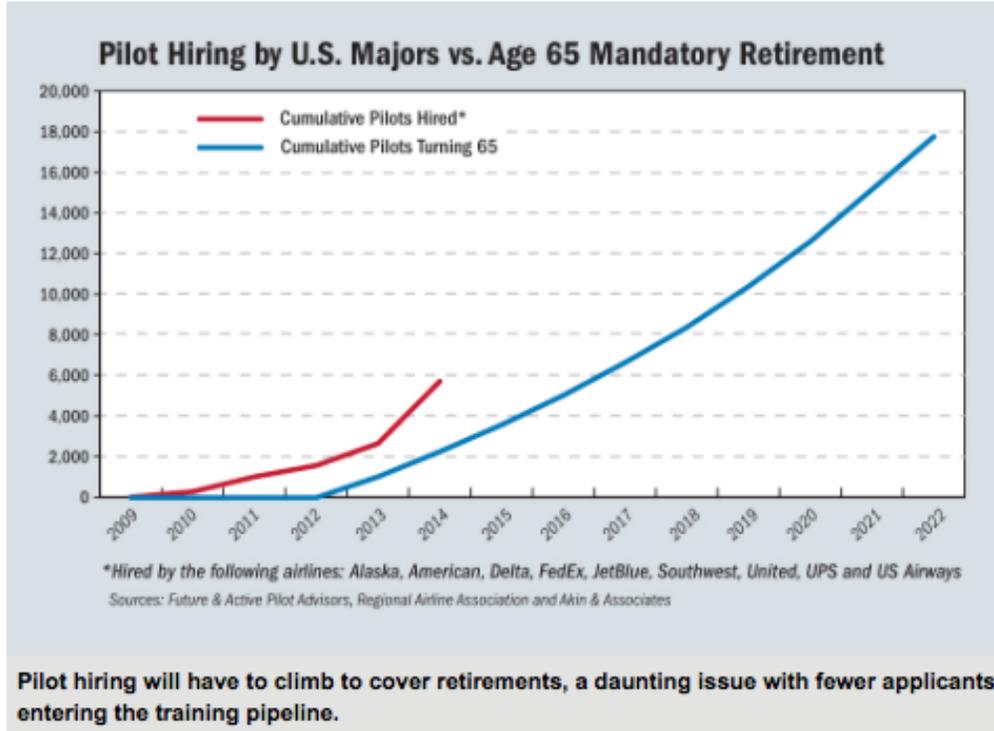


Figure 1.

While the incoming pilot supply shrinks and the mandatory retirements begin to accumulate, the demand for domestic air transportation within the U.S. is projected to increase within the next several decades (FAA, 2016c). In addition, projections show an expansion in passengers carried within the U.S. at a rate of at least 2% annually through 2036 (FAA, 2016c). This combination of increasing demand for air travel and decreasing qualified pilot supply has already resulted in a shortage among scheduled air carriers. It is predicted that by 2034, the industry will require 95,000 new airline pilots to meet industry-wide demand (Boeing, 2016).

The air transportation industry is vital to the United States' economy, accounting for 5.4% of our gross domestic product and \$1.5 trillion in total economic activity in 2012 (See: https://www.faa.gov/air_traffic/publications/media/2014-economic-impact-report.pdf). Airlines have already begun to see the negative impact of the pilot shortage: a loss in an already minimal

profit margin. Republic Airways Holdings Inc., the most recent victim to the limited supply of qualified pilots, filed for bankruptcy in February of 2016, citing the shortage of pilots to fly their contracted routes for major airlines Delta Air Lines, American Airlines, and United Airlines (Cameron, 2016). It is imperative that the factors contributing to the pilot shortage are addressed and resolved to ensure the continuation of safe and efficient air transportation within the U.S.

Research Question

How did the legislation enacted following the crash of Colgan Air 3407 impact aspiring professional pilots?

Statement of the Problem

Existing requirements for the certification and qualifications of flight crewmembers for transport category aircraft increase the costs associated with professional flight training, which may exacerbate the pilot shortage created from the current aging pilot population and increased demand for commercial air travel.

Stakeholders

Future Professional Pilots. The changing landscape of the aviation industry, particularly the regional airline industry, will influence the economic reward of pursuing professional flying as a career. Aspiring pilots need to examine both the tangible and intangible benefits and costs of professional aviation in order to make a well-informed career decision.

Regional Airlines. As the first airline job generally available to entry-level professional pilots, regional airlines serve as a gateway to the more lucrative positions with major airlines. It is imperative to regional airlines that a sufficient supply of qualified pilots is available for hire to fly their routes. In addition, regional airlines need to ensure that the pilots entering their

workforce have received adequate training and are fully competent in the operation of a transportation category aircraft by the completion of the training process.

Major Airlines. Although it is predicted that the pilot shortage will not be nearly as great a detriment to the major airlines, the decreasing supply of pilots may create strain within hiring departments to find qualified applicants (McGee, 2015). Because major airlines require higher minimum flight experience than the regional airlines, their supply of qualified pilots is even more restricted. However, major airlines attract more applicants due to more lucrative pay scales. On average, captains at regional airlines make an annual income of \$55,000, while captains at major airlines with similar qualifications earn \$135,000 annually (Phoenix East Aviation, 2012).

Flight Schools. Both Federal Aviation Regulation (FAR) part 61 and part 141 flight schools have been affected by the restructuring of commercial pilot flight training. As the cost of training increases due to more stringent minimums at regional airlines, flight schools may experience a loss in total flight students. As the first step on the path to becoming a professional pilot, flight schools serve as the gateway from the general public to the aviation community. In addition, flight schools are responsible to provide training to create safe and competent pilots prior to the regional airline industry.

Users of the Air Transportation Industry. The public utilizes the air transportation industry daily throughout the country and the world. With over 850 million passenger enplanements on scheduled carriers in 2014, the United States' aviation industry is one of the leading modes of transportation within the country (See: http://www.rita.dot.gov/bts/press_releases/bts015_15). Passengers have come to expect safe and affordable travel on U.S. carriers. The reduction of qualified pilots may put the public at risk and

increase the overall price of airline tickets as airlines become constrained under the loss of flight revenue from the pilot shortage.

Definition of Key Terms

Aerodynamic Stall. A stall occurs when an airfoil exceeds its critical angle of attack, resulting in a sharp decrease in lift, and an increase in drag. All licensed pilots are trained in the recognition, prevention, and recovery from a stalled aircraft (AOPA, n.d.)

Airline Transport Pilot. The highest level of certification for pilots. Airline transport pilots are able to act as a required flight crewmember of FAR part 121 aircraft (FAA, 2016b). To reach this level of certification, pilots must meet the requirements outlined in FAR part 61, subpart G (FAA, 2016a).

Commuter Route. Any route operated by an airline that meets three criteria: The airline operates the majority of their available seat miles in aircraft with 70 seats or less, operates regularly scheduled routes, and provides flights primarily for code-share partner companies (FAA, 2015)

Cost of Attendance. Cost of attendance was calculated using the estimated costs per student for tuition, room, and board at the university.

Flight Training Cost. These costs were calculated using data provided by collegiate flight training programs, and normalized by including only the private single-engine land (PSEL) license, instrument rating, commercial multi-engine license (CMEL), and commercial single-engine land license (CSEL).

Opportunity Cost. The benefit or gain that is given up to pursue an alternative benefit. (Business Dictionary, 2016a).

Major Airline. Any airline that generates an annual operating revenue of at least one billion U.S. dollars (Business Dictionary, 2016b)

Regional Airline. Any airline that generates an annual operating revenue of below \$100 million (Business Dictionary, 2016c).

Causes and Effects of Airmen Certification Reform

Colgan Air 3407

Background. Colgan Air 3407, a commuter operated between Newark, NJ, and Buffalo, NY, crashed on February 12, 2009. Colgan Air Inc. operated the Bombardier DHC-8-400 (Q400) turboprop aircraft on a connecting flight for Continental Airlines. The crash killed all 49 people onboard the aircraft and one person on the ground (NTSB, 2010).

Accident Probable Cause. After the extensive investigation of the flight, the National Transportation Safety Board (NTSB) published its findings of the accident and found the probable cause for the accident to be “the captain’s inappropriate response to the activation of the stick shaker, which led to an aerodynamic stall, from which the airplane did not recover” (NTSB, 2010, p. 155), among other less prominent factors.

Additional Factors. There were four factors identified by the NTSB that likely contributed to the flight crew’s assessment and reaction to the stall that resulted in the accident.

1. The crew’s inability to monitor the airspeed indications despite the multiple visual, aural, and physical warnings the aircraft issued. This decay of airspeed resulted in the passage of the aircraft’s critical angle of attack, resulting in the fatal stall.
2. The flight crew’s failure to comply with standard cockpit sterilization procedures. Colgan had a policy in place prohibiting unnecessary discussion during critical

phases of flight, such as takeoff, climb-out, approach, and landing. Cockpit voice recordings show the flight crew blatantly disregarding this procedure and engaging in discussion during the events preceding the crash.

3. The captain's inability to manage the flight effectively. This has a broad connotation, and refers to his physical control of the aircraft, as well as his leadership role and deviation from company policies and procedures.
4. The improper and inadequate procedures for calculating target airspeed during approaches to the airport environment when in icing conditions. The accumulation of ice radically changes the characteristics of lift producing airfoils, including the speeds and angles of attack at which the wing stalls, as well as stall characteristics (NTSB, 2010).

Captain Qualifications. During the investigation of the accident by the NTSB, the crewmembers' backgrounds were scrutinized in order understand their history as both student and professional pilots. According to the report, Colgan hired the captain with a total of 618 total flight hours. At the time of the accident, the captain had a total of 3,379 total hours, including only 111 hours on the Q400. One of the major findings however, is that during his flight training, the captain had received four FAA check-ride disapproval notices [he fell below the FAA standards for his certification examination]. Three of the check-ride failures occurred before his hire date at Colgan, but the captain only reported one failure at the time of his hiring. The last check-ride failure occurred during his employment at Colgan. In addition to these failures, the captain had also received notices for additional training from Colgan management and instructors on three separate occasions. Although the captain had obtained adequate hours to

qualify him for his position, a clear trend of deficiency was prevalent within his training records (NTSB, 2010).

First Officer (FO) Qualifications. After beginning her employment with Colgan with a total of 1,470 total flight hours, the FO had accumulated a total of 2,244 hours, including 774 hours in the Q400. During her flying career, she had only experienced one check-ride failure, which was reported to Colgan on her application for the position. The report also cites the fact that in her previous position working as a flight instructor, she frequently taught students stall recognition, prevention, and recovery (NTSB, 2010). She was significantly more qualified than the captain at their respective hire dates, and was fully qualified to operate the Q400 at the time of the accident.

Aftermath of Colgan Air 3407

Families of Continental Flight 3407. The devastation to the victims' family members led to litigious action resulting in significant pilot certification reform within the United States. Following the accident the Families of Continental Flight 3407 organization was founded, with the goal to advance aviation safety through legislative reform to professional pilot training. Through several lawsuits and legislative action, the group lobbied to reform training to avoid any type of this accident in the future (Families of Continental Flight 3407). By focusing on pilot training, they sought to reduce the inherent risks of air travel.

Review of Regulation Change to Pilot Certification

Public Law 111-216. One of the legislative acts that arose from the events following Colgan Air 3407 was Public Law 111-216, which drastically restructured the pilot training requirements for airline pilots. This act amends Title 49 of the United States Code to enable the FAA to effectively manage and improve airline safety. One of the clauses of the amendment

creates a requirement for air carriers to access and evaluate the FAA pilot record database for any individual, prior to their acting as a required flight crewmember. This was meant to remedy the gaps in employment and training records that were exhibited in Colgan. These audits must include a review of any certificates the airman holds, including licenses, medicals, and ratings. The carrier must also review any failures for practical tests the airman has accrued, as well as FAR violations resulting in certificate action. Lastly, the act demanded that the FAA review factors directly related to the crash of Colgan 3407. Although the crash was never specifically mentioned, many of the contributing factors and recommendations in the subsequent investigation were detailed in this act. It is important to note, however, that this regulation did not have any impact on the training of airmen or requirements for hiring practices at commercial air carriers (U.S. Congress, 2010).

Advisory Circular 61-138. This advisory circular published in 2013 outlines the Airline Transport Pilot Certification Training Program (ATP-CTP). “The ATP CTP is designed to bridge the knowledge gap between a pilot who holds a commercial pilot certificate and a pilot operating in an air carrier environment” (FAA, 2013 p. 3). The CTP program addresses areas identified in Public Law 111-216 as shortcomings to the airline transport industry, and requires additional training in areas such as aerodynamics, automation, adverse weather conditions, air carrier operations, transport airplane performance, professionalism, and leadership and development. Table 1 shows the curriculum specifics and minimum curriculum times outlined in AC 61-138.

<i>Advisory Circular 61-138 Required Classroom Instruction</i>		
<u>Topic</u>	<u>Subtopic</u>	<u>Min. Time (if specified)</u>
Aerodynamics		8.0 hours
	High Altitude Operations	
	Stall Prevention and Recovery	
	Upset Recovery and Prevention	
Meteorology		2.0 hours
	Airplane Weather Detection Systems	
	Air Carrier Low-Visibility Operations	
Air Carrier Operations		14.0 hours
	Physiology/Fitness for Duty	
	Communications	
	Checklist Philosophy	
	Operational Control	
	Minimum Equipment List and Configuration Deviation List	
	Ground Operations	
	Turbine Engines	
	Transport Airplane Performance	
	Automation	
	Navigation and Flightpath Warning System	
Leadership/Professional Development, Crew Resource Management, Safety Culture		6.0 hours
	Leadership/Professional Development	
	Crew Resource Management (CRM)	
	Safety Culture/Voluntary Safety Programs	

Table 1. (FAA, 2013).

In addition to the classroom instruction, applicants must complete 10 hours of simulator training in a level 4 or higher Flight Training Device (FTD), including at least six hours of training in a level C or higher Full Flight Simulator (FFS). These changes are especially significant for pilots who had not completed the FAA ATP knowledge test prior to July 31, 2013, because they increase both the training cost and time to reach the necessary qualifications to fly for a regional airline (FAA, 2013).

FAR § 121.436. Amended in 2013, this regulation details the crewmember qualifications for both pilot-in-command and second-in-command of a FAR part 121 aircraft. To act as the pilot-in-command of an aircraft operating as an air carrier operation, the pilot must have an ATP certificate in the aircraft category and class, a type rating for the aircraft, and 1,000 hours of total flight time as the second-in-command crewmember in the applicable type of aircraft. This portion applies to pilots who were not acting as pilot-in-command prior to July 31, 2013. While not as crucial to newer professional pilots, this segment of the regulation adds more upgrade time from first officer to captain. In addition, this regulation states that any crewmember acting as the second-in-command must also possess an ATP certificate and type rating in the aircraft (FAA, 2016b). This presents a significantly higher cost of necessary training for aspiring professional pilots.

FAR § 61 Subpart G. Subpart G of FAR part 61 outlines the eligibility and requirements of Airline Transport Pilot certification applicants. The new ATP regulations outline new hour requirements for ATP certificates, and establish the Restricted-ATP certificate. Along with the hours listed in table 2 other eligibility requirements state that the applicant of an ATP certificate must be of good moral character, and must possess the ability to read, speak write, and understand the English language (FAA, 2016a).

<i>Multi-Engine ATP Requirements</i>		
<u>Requirement</u>	<u>Restricted ATP</u>	<u>Unrestricted ATP</u>
Minimum Age	21	23
ATP-CTP Course Completion	Required	Required
Certification	C MEL, Instrument Rating	C MEL, Instrument Rating
Total Time		1,500
Military Pilot	750	N/A
Bachelor's Degree in Aviation	1,000	N/A
Associate's Degree in Aviation	1,250	N/A
Non-Aviation/No college	1,500	N/A
Cross Country (50+ nm)	200	500
Pilot in Command	250	250
Pilot in Command Cross Country	100	100
Night	100	100
Pilot in Command Night	25	25
Instrument	75	75
Multi-Engine	50	50
*Some exceptions apply due to accreditation towards simulator time, refer to FAR 61.159 & 61.160 for additional information		

Table 2. (FAA, 2016a).

Analysis of Regulations and Effectiveness of Accident Prevention

Flight Time. The regulations imposed from the period from 2010-2013 effectively raised the hiring minimum for all regional airlines from the commercial license minimum of 250 hours to between 750 and 1,500 total flight hours for the ATP certificate, depending on training experience (See: table 2). However, the Colgan 3407 captain and FO both had over 2,200 hours total at the time of the crash. These regulations were enacted to address the pressure from both the Families of Continental Flight 3407 and the public following the accident, but they fail to address the root of the accident: the captain's inability to manage the flight effectively (NTSB, 2010). Had these regulations been required at the time of the accident, both crewmembers still would have been found qualified to operate the flight. Total flight time was not the cause of the

accident, and the regulations served only to satisfy public pressure following the accident, nor was a lack of adequate training.

Flight Records. The regulations did address the need for accurate public records detailing the training and employment history of professional pilots. Public Law 111-216 imposed requirements for the FAA for the creation and maintenance of training records, check-ride failures, regulation violations, and employment history. In addition, it demanded that employers access and evaluate these records as part of their pre-employment examination (U.S. Congress, 2010). This section of the regulation may have disqualified the captain from employment within the airline industry before the accident occurred.

Restricted ATP. The restricted ATP (R-ATP) acts as an intermediate certificate for ATP applicants who do not fulfill all of the criteria for an ATP certificate. Pilots eligible for the R-ATP certificate must meet the criteria of FAR § 61 Subpart G based on their training background (See table 2). This allows graduates of accredited collegiate flight training programs and members of the United States military to act as the second-in-command crewmember of a scheduled air carrier (FAA, 2016b). Despite the overall increase in total flight experience necessary to act as a required flight crewmember within the air transportation industry, the restricted ATP is a measure to help alleviate some of the burden from well-trained commercial pilots.

Industry Response to Regulation Change. Prior to the implementation of the regulations, the notice of proposed rules commentary period opened, allowing industry professionals to submit responses to the proposed regulations. The first theme identified by Doolittle was that industry professionals agreed that the quality of flight instruction and experience far outweighs the total flight time of a crewmember (2013). The crash of Colgan Air

3407 had little to do with the flight time of the captain and first officer. The second trend that Doolittle identified was a generally positive reaction to the ATP-CTP course, provided that flight schools retained flexibility implementing the required subject areas within their existing curriculum. The third trend identified was strong support of restricted ATP applicability to military pilots and graduates of accredited flight programs. Lastly, the comments show a general desire for lower cross-country minimums for ATP applicants, citing the lack of quality for long distance, straight-line flights (Doolittle, 2013).

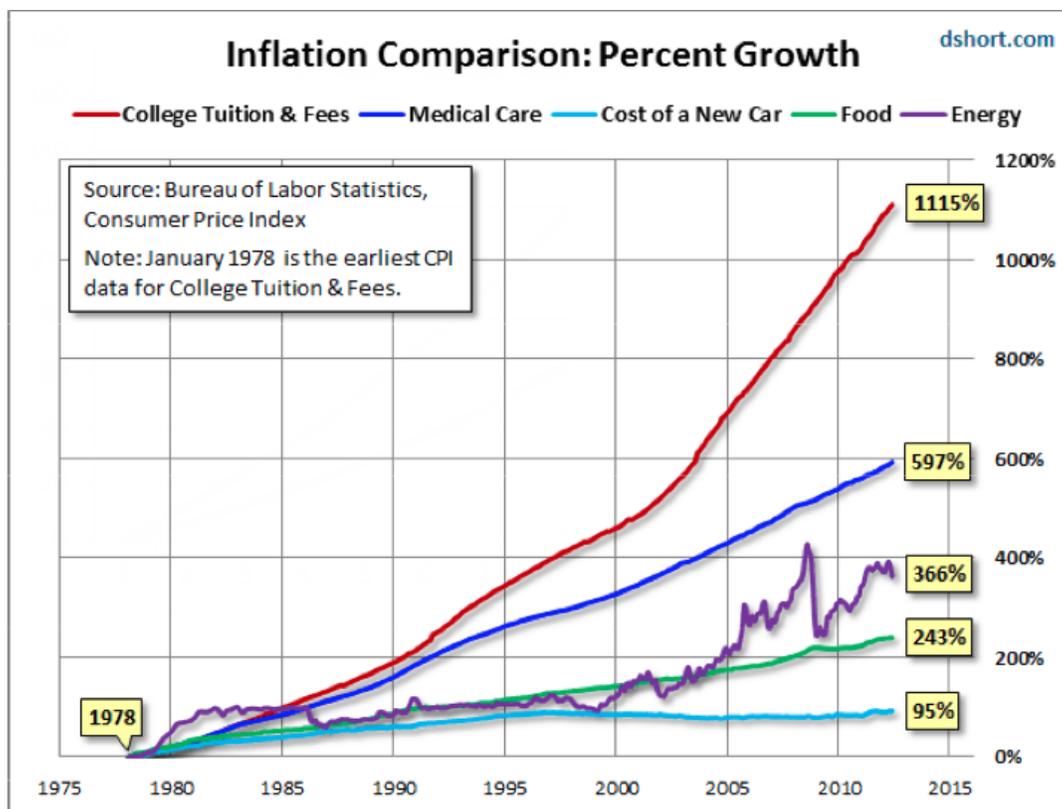
Pilot Shortage Factors

Increased Pilot Training Costs

College Cost of Attendance. While not explicitly required by law to act as a flight crewmember within scheduled air carrier operations, education obtained from accredited collegiate programs allows pilots to bypass many of the required total flight hours for the ATP certificate (See: table 2). Blair and Freye (2012) predict that collegiate flight training will be the preferred type of training due to the legislation following Colgan Air 3407. In addition, many airlines give preference when hiring to graduates of a four-year college program (table 3). As a result, approximately 95% of airline pilots have at least 4-year college degrees (Spangler, n.d.). However, the cost of college has spiked significantly in recent decades. Studies show that the cost of college attendance, including necessary expenses such as room and board, books, and so forth has increased 1,115% from 1978 to 2012 (See figure 2). This will increase the overall costs associated with professional flight training in collegiate programs.

<i>Published Airline Flight Time Minimums</i>		
<u>Major Airlines</u>	<u>Requirement</u>	<u>Education Required</u>
Delta Airlines	1,500 hours total time	4 year college degree
	1,000 hours fixed-wing turbine	
	50 hours fixed-wing multi-engine	
Southwest Airlines	2,500 hours total time	4 year college degree (Preferred)
	OR	
	1,500 hours turbine	
	1,000 hours turbine pilot in command	
Spirit Airlines	2,000 hours total time	4 year college degree (Preferred)
	1,000 multi-engine time	
United Airlines	1,000 hours fixed-wing turbine	4 year college degree (Preferred)
Sources:		
http://www.deltajobs.net/pilot_qualifications.htm , https://www.southwest.com/html/about-southwest/careers/positions/pilots.html , https://www.united.com/web/en-US/content/company/career/pilot.aspx https://re12.ultipro.com/SPI1000/JobBoard/JobDetails.aspx?__ID=*1D9069A6974B413D ,		

Table 3.



<http://globeconomicanalysis.blogspot.com/2012/08/trading-caps-and-gowns-for-mops-why-go.html>

Figure 2.

Flight Training Cost. Flight training is an inherently expensive part of the certification process for professional pilots, due to costs such as aircraft rental, fuel, oil, and flight instructor fees. Prior to ATP training, student pilots complete training and certification for their private license, instrument rating, and commercial licenses. Many pilots also elect to obtain flight instructor certificates in order to build the necessary hours for the ATP certificate. As shown in table 4, published prices for the PSEL, instrument rating, CMEL, and CSEL at collegiate flight training programs vary between \$34,000 and \$85,000. Flight instruction certificates add even more expense to the students. In addition to the initial flight training cost, pilots seeking employment within the airline industry now face the additional cost associated with the ATP-CTP program, and the total hours that must be reached prior to airline employment. ATP Flight

School, a leading provider of full-motion simulator training, offers the ATP-CTP program for \$4,995 (See: <https://atpflightschool.com/atp/ctp/>). Total training costs incurred by pilots may exceed \$100,000 to obtain the necessary certificates and ratings to fly for scheduled air carriers.

Opportunity Cost. It is important to note that the increased hour regulations for first officer positions within the airline industry change the opportunity cost of reaching the qualifications required. Because the minimum legal flight time allowable at the airlines increased from 250 hours to 750-1500, more time is required to obtain this experience. Pilots working towards ATP minimums not only give up money spent on training, but also their income had they specialized in other industries.

Low Starting Pay

Starting Income at Various Regional Airlines. Basic economic principles describe that when the labor supply of a given industry is low and the labor demand is high, the earnings of the workers will be relatively high (Borjas, 2016). This is true with most industries, but regional airlines have escaped this economic principle by paying relatively low wages to professional pilots (See: <https://www.alpa.org/~media/ALPA/Files/pdfs/advocacy/pilot-pay-chart.pdf>). It is important to note, however, that regional airlines have begun raising wages for first-year pilots. In addition, several airlines now utilize retention bonuses to increase overall pay for the pilots. Combined annual salary and retention, signing, and recruitment bonuses have given the top paying regional airlines an average effective wage of \$40,700 annually (See table 5). While this is an improvement from historical regional airline pay, it is only a fraction of the costs associated with professional pilot training.

Airline	Signing/Retention Program	Effective Wages Year One
Endeavor	\$80,000 4-year Pilot Retention Program	\$50,600
Silver	\$5,000 ATP Tuition Reimbursement as CFI plus \$6,000 Retention Bonus OR a \$12,000 Signing Bonus	\$31,500
GoJet	\$5,000 ATP Tuition Reimbursement as CFI plus \$6,000 Retention Bonus OR a \$10,000 signing bonus	\$43,500
Piedmont	\$5,000 ATP Tuition Reimbursement as CFI plus \$6,000 Retention Bonus and ATP-CTP OR a \$5,000 Signing Bonus	\$40,600
Envoy Air	\$5,000 ATP Tuition Reimbursement as CFI plus \$6,000 Retention Bonus OR a \$11,000 Signing Bonus	\$35,600
Republic	\$7,500 Signing Bonus	\$48,300
SkyWest	\$7,500 Signing Bonus	\$38,100
Mesa	\$5,000 ATP Tuition Reimbursement as CFI plus \$6,000 Retention Bonus and ATP-CTP	\$33,500
Trans States	\$5,000 ATP Tuition Reimbursement as CFI plus \$6,000 Retention Bonus OR a \$5,000 Signing Bonus	\$41,600
Compass	\$5,000 ATP Tuition Reimbursement as CFI plus \$6,000 Retention Bonus	\$42,800
ExpressJet	\$1,000 profit sharing bonus	\$41,600

Table 5. (Templeton, 2015).

Quantity Vs. Quality: Flight Experience

Effects of Legislation. The new legislation that increased the total flight hours to act as a flight crewmember in the airline industry by 400% (250 to 1,000 hours) following the Colgan Air 3407 accident sought to address both the quantity and the quality of training that professional pilots receive prior to employment.

ATP-CTP. The ATP-CTP was drafted to improve training quality by creating a bridge between less complex types of aircraft and modern transport category aircraft, as well as address other operational considerations within the airline industry (FAA, 2013). For example, pilots exiting the training environment are not likely familiar with the aerodynamic forces and required

operations of an aircraft operating at high altitude. By ensuring student knowledge through classroom instruction and simulator training in transport category aircraft though, this hurdle can be overcome. This effectively addresses the shortcomings in training quality demonstrated by the crew of Colgan Air 3407.

Total Flight Time. The increase in total flight time required for airline pilots was in direct response to the Colgan Air 3407 accident, however the new regulations for total flight time have little to do with the factors leading to the crash. There was no evidence that the crewmembers' total flight time both during the accident, and at their initial hire, significantly contributed to the accident (NTSB, 2010). In addition, the requirements may have an unintended consequence of the degradation of fundamental skills and knowledge that students obtain during flight training due to lack of recent experience. Bad habits that pilots may have developed during their time-building flying will be reinforced and will be much more difficult to correct during airline initial training. The more stringent hour minimums inappropriately responded to the reasons behind the accident, and impose unnecessarily high burden on aspiring professional pilots.

Pilot Success During Airline Initial Training

Background. Numerous studies have been conducted analyzing the factors that may influence pilot success during initial training within the regional airline environment. Researchers studied first-year regional airline pilots entering their initial training, measuring extra training events required and progress and stage check failures for each pilot, to identify applicable factors that help pilots succeed in efficient flight training.

Cortés. In a sample of 452 regional airline pilots hired from 2006-2007, Cortés (2008) found several clear trends that undermine the credibility of the legislation enacted following

Colgan Air 3407. The following analysis of flight and education experience shows the percentage of each pilot group that required no extra training during their airline standardization:

- 72% of pilots holding degrees from aviation higher education with Certified Flight Instructor (CFI) certificates, and less than 500 hours of total flight time;
- 63% of pilots with prior military flight experience;
- 52% of pilots who held degrees from aviation higher education; and
- 40% of pilots without a degree in higher education.

The study also found that the least successful trainees had obtained their commercial flight training through non-collegiate flight programs, had non-aviation higher education, or no higher education degrees.

Smith, Bjerke, NewMyer, Niemczyk, & Hamilton. This study analyzed 2,156 pilots hired at six regional airlines from 2005-2009. Using very similar techniques to Cortés (2008), researchers studied extra training events and incomplete training for each pilot and found very consistent results from the previous study. The researchers discovered that the best performing pilots were those who held a flight instructor certificate, graduated from accredited collegiate flight training programs with a degree in an aviation related field, and had between 500-1,000 total flight hours prior to employment. Other characteristics that were analyzed and shown to have minimal impact on training efficiency were whether or not pilots had obtained non-aviation college degrees, and whether or not the pilot had prior corporate or airline experience (Smith, Bjerke, NewMyer, Niemczyk, & Hamilton, 2010).

Herchko. This study of 420 regional pilots, conducted from 2005-2010, analyzed initial training, initial operating experience, and first year recurrent training within regional airlines. Background factors including education, flight experience, and military service were reviewed

for each applicant to identify the most critical components to training success for entry-level airline pilots. The study confirmed the work of previous research, identifying the most successful participants in the study as those with a college degree, an aviation degree from an Aviation Accreditation Board International endorsed program, a flight instructor certificate, and between 500-1,000 hours of total flight time (Herchko, 2012).

Analysis. Regulations enacted in reaction to Colgan Air 3407 did not adequately incorporate factors that influence entry-level training success for pilots or flight crewmember proficiency. The three studies identify the most successful applicants having significantly lower total flight hours than current regulations require for regional airline pilots. This indicates that the increase in total required flight hours and other crewmember qualifications may have been an overreaction to the accident and is dramatically contributing the industry-wide pilot shortage. In addition, pilots holding a CFI certificate fared much better in training, indicating that the quantity of total flight time may not be quite as crucial as the quality of the flight time.

Current Proposed Solutions to Address and Mitigate Pilot Shortage

Jetblue Airways Corporation (Jetblue) Approach to Pilot Shortage

Program Background. Jetblue is working on a trial program to enhance the training of pilots slated for airline positions. The experimental training curriculum will focus more heavily on simulator training in a crew environment, while placing the participants in airline operational scenarios (Pasztor, 2015). The program could prove the excessiveness of the new ATP hour regulations if the pilots produced from the study meet and exceed all skill-based criteria in lower than required hours.

Methods. The study will include roughly 24 participants with no prior flight experience. The applicants will be expected to pay for the flight training they receive, but the training will be

conducted entirely by Jetblue. Provided the applicants meet required standards throughout the training, they will be guaranteed jobs at Jetblue once the full FAA standards are met. It is expected that the training will take approximately four years to complete. Following hire at Jetblue, the applicants will be scrutinized in order to determine the program's effectiveness in initial and advanced training procedures (Pasztor, 2015).

Analysis. The Jetblue program may provide an excellent example of the ideal flight experience and training background required to produce safe and proficient airline pilots. Although the company denies that the program is in direct response to the crash of Colgan Air 3407, a pool of successful applicants would undermine the perceived necessity for the increase in hiring requirements such as the higher total hours and ATP-CTP program (Pasztor, 2015).

Hiring and Retention Bonuses

In an effort to attract new pilots to the regional airline workforce, many airlines are now offering monetary bonuses to pilots for recruitment referral, initial hire, training completion, and annual retention (Templeton, 2015). These bonuses significantly raise the effective entry-level wage at the regionals and provide much greater incentive to prospective pilots. As shown in table 5, this effectively increases the first year annual wage of some regionals to between \$30,000 and \$50,000. However, even with aggressive bonuses, the regional airline employment is still declining. During 2014–2015, the regional airline industry experienced a .3% loss in total employees (See: <http://www.raa.org/resource/resmgr/AR2015/RegAirlineEmployees.jpg>).

Pilot Pipeline and Internship Programs

Many airlines are introducing or expanding pilot pipeline programs with professional collegiate flight training programs. Airlines seek to hire college students and secure employees for the future. Students in many of the programs can be hired before senior year and work as a

flight instructor for their university while receiving pay and benefits from the airline. Upon reaching the minimum requirements for first officer positions within the airline, the applicants are automatically hired and sent to initial training.

Industry Recommendations

In order to better manage the supply of qualified professional pilots within the airline industry, several key points must be examined more closely:

1. Regional airlines must continue and expand incentives to newly hired pilots such as the signing and retention bonuses. In addition, regional airlines must work to increase pay to attract qualified pilots.
2. Industry professionals such as the Regional Airline Association and the Airlines for America should conduct further research into success factors for newly hired regional pilots, as well as lobby for the restructuring of airline pilot qualifications for U.S. carriers.
3. The FAA should review the legislative reaction to Colgan Air 3407 and total flight experience required to serve as a flight crewmember under FAR part 121 operations. In addition, the success factors identified in previous studies should be noted and additional credit for flight instruction hours should be awarded to CFIs to reduce training time and costs.

Conclusions

The impact of Colgan Air 3407 has significantly increased the quantity and quality of experience required to act as a flight crewmember of a FAR part 121 aircraft. Following the introduction of legislation increasing the hour minimums for the ATP certificate, the requirement of an ATP certificate to act as an airline first officer, and the ATP-CTP course, significant barriers to entry have been added for aspiring professional pilots.

This study found that the ATP-CTP program enhances the quality of flight training, but the increase in total flight hours required did not adequately address the problems identified by the accident investigation. Review of regional pilot success demonstrates that the ideal candidate for employment at the regional airlines has considerably less total flight time than current regulations allow. This disconnect between the requirement and the ideal number costs freshly minted professional pilots time and money to achieve the necessary qualifications for ATP certification.

Some members of the industry have identified this disconnect and are working to reform the professional pilot training environment. Regional airlines have introduced pilot pipeline programs to target college enrolled student pilots and entice them to working at their company. In addition, regional airlines are attempting to stabilize current pilot employment numbers within their workforce through the implementation of large signing and retention bonuses. These bonuses increase the overall effective pay within the company and attract new pilots, as well as retain more experienced pilots. Regional airlines must continue to offer these incentives to maintain future professional pilot streams of qualified pilots.

The effect of the increased costs associated with the new legislation is still unclear, and the impact this legislation will have on the professional pilot supply and quality is unknown. It is recommended that industry leaders closely monitor the trend in pilot enrollment in both collegiate and non-collegiate to identify any downturn in enrollment and pilot supply. In addition, it is recommended that industry professionals study and advocate the reduction in total flight hours required for employment within the airlines.

Lastly, governmental review of the effectiveness of new legislation must be conducted to determine the effectiveness of total flight hours on flight safety records in order to mitigate the

detrimental impacts that excessively high required qualifications imposes on professional pilots and regional airlines.

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Table 4

*Flight School
Tuition &
Flight Fees*

<u>Flight Program</u>	<u>In State Tuition</u>	<u>Out of State Tuition</u>	<u>Flight Fees</u>	<u>Total Cost In State</u>	<u>Total Cost Out of State</u>	<u>Website</u>
Arizona State University	\$24,348.00	\$38,947.00	\$70,425.00	\$167,817.00	\$226,213.00	http://poly.engineering.asu.edu/aviation/wp-content/uploads/sites/2/2016/02/ASU-ATP-Price-Estimate-2016.pdf , http://www.collegedata.com/cs/data/college/college_pg03_tmpl.jhtml?schoolId=1096
Bridgewater State University	\$20,553.00	\$26,693.00	\$34,850.00	\$117,062.00	\$141,622.00	http://microsites.bridgew.edu/ccs/bridgewater-flight-academy , https://my.bridgew.edu/departments/Aviation/SitePages/Flight%20Training%20Fees.aspx
Delta State University	\$13,360.00	\$13,360.00	\$46,101.60	\$99,541.60	\$99,541.60	http://www.deltastate.edu/PDFFiles/Commercial%20Aviation/dsu-flight-training-program-costs-2014-2015.pdf , http://www.collegedata.com/cs/data/college/college_pg03_tmpl.jhtml?schoolId=1670
Embry-Riddle Aeronautical University	\$45,100.00	\$45,100.00	\$85,612.07	\$266,012.07	\$266,012.07	http://daytonabeach.erau.edu/college-aviation/flight/flight-course-costs/index.html , http://daytonabeach.erau.edu/admissions/estimated-costs/
Kansas State Polytechnic	\$7,949.00	\$21,090.00	\$55,740.00	\$87,536.00	\$140,100.00	https://polytechnic.k-state.edu/aviation/K-State_Aviation_CostSheet.pdf , https://www.k-

University						state.edu/admissions/finaid/
Kent State University	\$23,780.00	\$31,980.00	\$50,260.00	\$145,380.00	\$178,180.00	https://du1ux2871uqv.cloudfront.net/sites/default/files/file/FlightCourseFees2015.pdf , http://www.kent.edu/financialaid/coa
Louisiana Tech University	\$19,362.00	\$36,879.00	\$42,878.50	\$120,326.50	\$190,394.50	http://liberalarts.latech.edu/aviation/financial/fees.php , http://www.collegedata.com/cs/data/college/college_pg03_tmpl.jhtml?schoolId=1521
The Ohio State University	\$25,631.00	\$42,595.00	\$54,700.00	\$157,224.00	\$225,080.00	https://aviation.osu.edu/sites/aviation.osu.edu/files/uploads/cas_fees_sheet_sp14.pdf , http://www.collegedata.com/cs/data/college/college_pg03_tmpl.jhtml?schoolId=1807
Purdue University	\$20,032.00	\$38,834.00	\$44,970.00	\$125,098.00	\$200,306.00	https://www.purdue.edu/bursar/tuition/feerates/2015-2016/aviation.html , http://www.admissions.purdue.edu/costsandfinaid/tuitionfees.php
Rocky Mountain College	\$24,530.00	\$24,530.00	\$49,400.00	\$147,520.00	\$147,520.00	https://www.rocky.edu/admissions/pdf/SpecialLetterAviation.pdf , http://college-tuition.startclass.com/1/2289/Rocky-Mountain-College
Southern Illinois University	\$26,669.00	\$39,922.00	\$70,324.00	\$177,000.00	\$230,012.00	http://aviation.siu.edu/management/financial%20aid/flight-fees.php , http://www.collegedata.com/cs/data/college/college_pg03_tmpl.jhtml?schoolId=1744
University of Nebraska-Omaha	\$20,414.00	\$32,126.00	\$32,300.00	\$113,956.00	\$160,804.00	http://www.unomaha.edu/college-of-public-affairs-and-community-service/aviation/flight-training/flight-training-information.php
University of North Dakota	\$21,967.00	\$32,901.00	\$46,457.00	\$134,325.00	\$178,061.00	http://media.aero.und.edu/avit.und.edu/documents/ProjectedProgramCostsFY16.pdf , http://www.collegedata.com/cs/data/college/college

Utah Valley University	\$15,722.00	\$25,538.00	\$57,978.00	\$120,866.00	\$160,130.00	e_pg03_tmpl.jhtml?schoolId=735 http://www.uvu.edu/aviation/docs/flight_training_costs_spring_2016_2.pdf, https://www.uvu.edu/financialaid/consumer/cost.html
Western Michigan University	\$20,340.00	\$35,024.00	\$59,305.60	\$140,665.60	\$199,401.60	http://wmich.edu/aviation/files/programs/avs/flight-fees-2015-2016.pdf, http://www.collegedata.com/cs/data/college/college_pg03_tmpl.jhtml?schoolId=1716
Westminster University	\$32,104.00	\$32,104.00	\$55,500.00	\$183,916.00	\$183,916.00	https://www.westminstercollege.edu/pdf/aviation/2012-03%20Flight%20Training%20Costs.pdf, https://www.westminstercollege.edu/accounts_receivable/?parent=5318&detail=8457
Averages	\$22,616.31	\$32,351.44	\$53,550.11	\$144,015.36	\$182,955.86	