A Descriptive Analysis of Public Comments Submitted in Response to Notice of Proposed Rules on Air Carrier Pilot Qualification

Amy Chaffee Doolittle
Embry-Riddle Aeronautical University - Daytona Beach

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A DESCRIPTIVE ANALYSIS OF PUBLIC COMMENTS SUBMITTED IN RESPONSE TO NOTICE OF PROPOSED RULES ON AIR CARRIER PILOT QUALIFICATION

by

Amy Chaffee Doolittle

A Thesis Submitted to the College of Aviation, Department of Applied Aviation Sciences in Partial Fulfillment of the Requirements for the Degree of Master of Science in Aeronautics

Embry-Riddle Aeronautical University
Daytona Beach, Florida
July 2013
A DESCRIPTIVE ANALYSIS OF PUBLIC COMMENTS SUBMITTED
IN RESPONSE TO NOTICE OF PROPOSED RULES
ON AIR CARRIER PILOT QUALIFICATION

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Amy Chaffee Doolittle

This Thesis was prepared under the direction of the candidate’s Thesis Committee Chair, Dr. Guy M. Smith, Associate Professor, Daytona Beach Campus, and Thesis Committee Member Gregory A. Zahornacky, Assistant Professor, Daytona Beach Campus, and has been approved by the Thesis Committee. It was submitted to the Department of Applied Aviation Sciences in partial fulfillment of the requirements for the degree of Master of Science in Aeronautics.

Thesis Committee:

Guy M. Smith, Ed.D.
Committee Chair

Gregory A. Zahornacky, MSA
Committee Member

John M. Lanicci, Ph.D.
Graduate Program Chair
Applied Aviation Sciences

Tim Brady, Ph.D.
Dean, College of Aviation

Guy M. Smith, Ed.D.
Department Chair
Applied Aviation Sciences

Robert Oxley, Ph.D.
Associate Vice President of Academics

Date 13-13

ii
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Abstract

Researcher: Amy Chaffee Doolittle
Title: A Descriptive Analysis of Public Comments Submitted in Response to Notice of Proposed Rules on Air Carrier Pilot Qualification
Institution: Embry-Riddle Aeronautical University
Degree: Master of Science in Aeronautics
Year: 2013

In 2009, the crash of Colgan Flight 3407 in Buffalo, NY raised concerns regarding the adequacy of current pilot qualification standards for entering air carrier operations. In response, the U.S. Congress enacted Public Law 111-216, which requires a pilot to hold an Airline Transport Pilot (ATP) certificate in order to be qualified as a flight crewmember under 14 CFR, part 121, and also allows the Federal Aviation Administration (FAA) to modify the requirements to obtain an ATP certificate. In February 2012, the FAA issued a Notice of Proposed Rulemaking (NPRM) outlining these requirements and calling for public comments on the proposal. This study was a descriptive analysis of those comments. The results indicated several different findings, including a need for more qualitative standards. The majority of respondents suggested replacing the specific flight hour requirement to obtain an ATP certificate with competency-based standards. The majority of respondents indicated that full-motion simulation training is not necessary for the ATP Certification Training Program (CTP), and many suggested that the specific level of simulation should depend on the type of training being conducted. Responses were also vastly in favor of an ATP certificate with restricted privileges offered to those with military and/or academic training and experience, and many suggested expanding this option to other types of candidates.
# Table of Contents

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thesis Review Committee</td>
<td></td>
<td>ii</td>
</tr>
<tr>
<td>Acknowledgements</td>
<td></td>
<td>iii</td>
</tr>
<tr>
<td>Abstract</td>
<td></td>
<td>iv</td>
</tr>
<tr>
<td>List of Tables</td>
<td></td>
<td>viii</td>
</tr>
<tr>
<td>List of Figures</td>
<td></td>
<td>ix</td>
</tr>
<tr>
<td>I</td>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Significance of the Study</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Statement of the Problem</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Purpose Statement</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Research Questions</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Delimitations</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Limitations and Assumptions</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Definitions of Terms</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>List of Acronyms</td>
<td>5</td>
</tr>
<tr>
<td>II</td>
<td>Review of the Relevant Literature</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Current Requirements for Operation under Part 121</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>To Serve as Second-In-Command (SIC)</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>To Serve as Pilot-In-Command (PIC)</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>To Obtain an ATP</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Factors Leading up to Rulemaking</td>
<td>8</td>
</tr>
</tbody>
</table>
Population ......................................................................................25
Sources of the Data ...........................................................................26
Treatment of the Data .......................................................................27
  Descriptive Statistics ......................................................................27
  Qualitative Data ............................................................................27
IV Results and Discussion ....................................................................28
  Descriptive Statistics ......................................................................28
    Demographics ..............................................................................28
    NPRM Questions ..........................................................................29
    Overall Position ..........................................................................50
  Qualitative Data .............................................................................51
V Conclusions and Recommendations .................................................56
  Conclusions ....................................................................................56
    Qualitative Standards ....................................................................56
    ATP CTP ....................................................................................57
    Restricted ATP ..........................................................................58
    Grandfather Clause ......................................................................59
    Cross-country Minimums ..........................................................59
  Recommendations ..........................................................................59
References ........................................................................................................61
Appendices
  A Data Collection Device ...............................................................66
  B Academic Topics Recommended for ATP CTP ...............................69
List of Tables

Table

1 Academic and Practical Training Program Valuation with Regard to Aeronautical Experience Credits .......................................................... 12

2 Ten Most Frequent Comments from NPRM Responses .............................................. 52
List of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>28</td>
</tr>
<tr>
<td>2</td>
<td>29</td>
</tr>
<tr>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>31</td>
</tr>
<tr>
<td>5</td>
<td>31</td>
</tr>
<tr>
<td>6</td>
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</tr>
<tr>
<td>7</td>
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</tr>
<tr>
<td>8</td>
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</tr>
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<td>9</td>
<td>35</td>
</tr>
<tr>
<td>10</td>
<td>36</td>
</tr>
<tr>
<td>11</td>
<td>37</td>
</tr>
<tr>
<td>12</td>
<td>38</td>
</tr>
<tr>
<td>13</td>
<td>39</td>
</tr>
<tr>
<td>14</td>
<td>39</td>
</tr>
<tr>
<td>15</td>
<td>40</td>
</tr>
<tr>
<td>16</td>
<td>41</td>
</tr>
<tr>
<td>17</td>
<td>42</td>
</tr>
<tr>
<td>18</td>
<td>43</td>
</tr>
<tr>
<td>19</td>
<td>43</td>
</tr>
</tbody>
</table>
Question 14a .......................................................................................................................44
Question 14b .......................................................................................................................45
Question 15a .......................................................................................................................46
Question 15b .......................................................................................................................47
Question 16a .......................................................................................................................48
Question 16b .......................................................................................................................49
Question 16c .......................................................................................................................49
Question 17 .........................................................................................................................50
Overall Position on Public Law 111-216 and FOQ NPRM ...........................................51
Chapter I

Introduction

On February 12, 2009, Colgan Flight 3407 crashed outside of Buffalo (National Transportation Safety Board [NTSB], 2010). The crash was the result of the crew’s incorrect response to an aerodynamic stall. The nature of the accident brought to light issues of pilot training and experience in the air carrier industry. Members of industry and the general public began to question whether pilots were being sufficiently trained before entering the air carrier environment (Federal Aviation Administration [FAA], 2012a).

A little over a year after the Colgan crash, the U.S. Congress passed the Airline Safety and Federal Aviation Administration Extension Act of 2010. The Act requires all pilots serving in part 121 air carrier operations to hold an Airline Transport Pilot (ATP) certificate by August 2, 2013. The Act also allows the FAA Administrator to modify the requirements to obtain an ATP, based on certain types of experience and training (U.S. Congress, 2010; FAA, 2012a).

In response to the Act, the FAA released a Notice of Proposed Rulemaking (NPRM) on Pilot Certification and Qualification Requirements for Air Carrier Operations in February, 2012 (FAA, 2012a). The NPRM is a draft of the proposed rules divided into several different provisions, including the requirements of (a) an ATP certificate, (b) 50 hours of multiengine flight time, (c) an aircraft type rating, and (d) the completion of an ATP Certification Training Program (CTP). Another provision allows military pilots and graduates of a collegiate aviation degree program to obtain an ATP with restricted privileges, with lower qualification minimums. The document also includes a number of questions pertaining to each provision. After releasing the NPRM,
the FAA created a 60-day comment period for the public to submit responses to the questions.

This research analyzed the responses to the NPRM to determine both the range of responses and the most frequent answers.

**Significance of the Study**

The proposed rules will affect many aviation industry stakeholders. Regional airlines will have to change their hiring practices to align with the new qualification minimums. Aspiring pilots will need to spend more time and money meeting the higher minimums. Flight schools could see a decrease in enrollments as interest in professional pilot careers drops. Collegiate aviation programs could see an increase in enrollments due to the lower minimums for graduates of these programs. This research is also relevant to the FAA, which is expected to release a final rule by August 2013.

**Statement of the Problem**

The Colgan crash raised a number of questions about what adequately prepares a pilot for the air carrier environment (FAA, 2012a). It led many to believe there were airline pilots who were inexperienced and unqualified. The proposal to create a new set of qualification requirements for pilots in air carrier operations has generated much controversy throughout the aviation industry, especially the decision to raise the minimum required flight time to become a first officer by requiring an ATP. Following the publication of the NPRM in February 2012, the FAA solicited answers to 22 specific questions regarding the provisions of the rule, in addition to any other comments the respondent might have.
The research objective was to determine the scope of these responses and identify the most common answers to the pertinent questions.

**Purpose Statement**

The purpose of this study was to dissect and analyze the public comments submitted in response to the NPRM on *Pilot Certification and Qualification Requirements for Air Carrier Operations* (FAA, 2012a) within the 60-day review period.

**Research Questions**

- Does the majority of responses agree or disagree with the proposed rules?
- Which specific provisions of the proposed rules do responses agree and/or disagree with most frequently?

**Delimitations**

The research was limited to analyzing comments submitted within the review period of the NPRM, between February 29, 2012 and April 30, 2012. While there were 13 comments received after the comment period had closed, the researcher assumed that these were not taken into consideration by the FAA.

The researcher chose to focus on the provisions that will affect first officers in part 121 operations. There were several questions put forth in the NPRM which fell outside of that scope and were therefore excluded from the analysis. Answers to questions pertaining to other types of operation (part 91, part 135, etc.) and requirements to operate as Pilot-in-Command (PIC) were not examined.
Limitations and Assumptions

The researcher assumed that all information presented in the comments was correct and truthful, and that the respondents understood the provisions on which they commented.

Definitions of Terms

Air carrier  A person who undertakes directly by lease, or other arrangement, to engage in air transportation (Definitions and Abbreviations, 2013).

Part 61  A more flexible type of flight school outlining certificate and rating requirements for pilot certification through noncertificated schools and individual flight instructors (FAA, 2008).

Part 121  Set of rules governing the operating requirements for domestic, flag, and supplemental operations (Applicability, 2013b).

Part 135  Set of rules governing the operating requirements for commuter and on-demand operations (Applicability, 2013a).

Part 141  A more structured type of flight school certificated by the FAA, which includes an FAA-approved curriculum for meeting certificate and rating requirements (FAA, 2008).

Part 142  A type of flight training center with an FAA-approved curriculum for meeting certificate and rating requirements, with a heavy emphasis on simulator training (FAA, 2008).
FFS  A full-size replica of a specific make, model and/or type airplane cockpit which includes both a visual system providing an out-of-the-cockpit view and force (motion) cueing system (FAA, 1992).

FTD  A full-scale replica of an airplane’s instruments, equipment, panels, and controls in an open flight deck area or an enclosed airplane cockpit which does not require a force (motion) cueing or visual system (FAA, 1992).

List of Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AABI</td>
<td>Aviation Accreditation Board International</td>
</tr>
<tr>
<td>AJT</td>
<td>Advanced Jet Training</td>
</tr>
<tr>
<td>ALPA</td>
<td>Air Line Pilots Association, International</td>
</tr>
<tr>
<td>AMEL</td>
<td>Airplane Multiengine Land</td>
</tr>
<tr>
<td>ANPRM</td>
<td>Advance Notice of Proposed Rulemaking</td>
</tr>
<tr>
<td>AOPA</td>
<td>Aircraft Owners and Pilots Association</td>
</tr>
<tr>
<td>ATA</td>
<td>Air Transport Association of America</td>
</tr>
<tr>
<td>ATP</td>
<td>Airline Transport Pilot certificate</td>
</tr>
<tr>
<td>BUF</td>
<td>Buffalo Niagara International Airport</td>
</tr>
<tr>
<td>CAPA</td>
<td>Coalition of Airline Pilots Associations</td>
</tr>
<tr>
<td>CFI</td>
<td>Certificated Flight Instructor</td>
</tr>
<tr>
<td>CFII</td>
<td>Certificated Flight Instructor-Instrument</td>
</tr>
<tr>
<td>CFR</td>
<td>Code of Federal Regulations</td>
</tr>
<tr>
<td>CRM</td>
<td>Crew Resource Management</td>
</tr>
<tr>
<td>CTP</td>
<td>Certification Training Program</td>
</tr>
</tbody>
</table>
DOT  Department of Transportation
FAA  Federal Aviation Administration
FOQ ARC  First Officer Qualification Aviation Rulemaking Committee
FFS  Full Flight Simulator
FSTD  Flight Simulation Training Device
ICAO  International Civil Aviation Organization
MEI  Multiengine Instructor
MPL  Multicrew Pilot License
NADA/F  National Air Disaster Alliance/Foundation
NAFI  National Association of Flight Instructors
NBAA  National Business Aviation Association
NPRM  Notice of Proposed Rulemaking
NTAS  National Training Aircraft Symposium
NTSB  National Transportation Safety Board
PCI  Pilot Career Initiative
PIC  Pilot-in-Command
RAA  Regional Airline Association
SIC  Second-in-Command
TEM  Threat and Error Management
UAA  University Aviation Association
UND  University of North Dakota
VMC  Visual Meteorological Conditions
Chapter II

Review of the Relevant Literature

On February 29, 2012, the FAA (2012a) released the NPRM on Pilot Certification and Qualification Requirements for Air Carrier Operations. There were a number of factors leading up to this publication. In February 2009, the crew of a Colgan Air flight lost control of the aircraft during their approach into Buffalo, NY and crashed, killing 50 people. The NTSB (2010) later identified the accident’s cause as pilot error. Because of the nature of the accident and the high number of fatalities, questions arose as to whether pilots were being adequately prepared for operating in the air carrier environment (FAA, 2012a). A year after the accident, President Obama signed the Airline Safety and Federal Aviation Administration Extension Act of 2010. The Act, known as Public Law 111-216, raised qualification minimums for entry into an air carrier pilot position and gave the FAA authority to help define these minimums (U.S. Congress, 2010). The NPRM was issued as a preliminary version of these definitions.

While there are several different provisions included in the proposed rules, the most significant difference from the current rules is the requirement for every pilot operating under Title 14, Code of Federal Regulations (CFR) part 121 to hold an Airline Transport Pilot (ATP) certificate (FAA, 2012a). The requirement for an ATP certificate will significantly increase the minimum amount of flight experience needed to be an airline pilot, and is expected to place a burden on pilots, airlines, training centers, and various other aspects of industry.
Current Requirements for Operation under Part 121

To serve as second-in-command (SIC). The current requirements to operate as SIC and PIC in air carrier operations are dictated by 14 CFR part 121, Section 437, *Pilot Qualification: Certificates Required* (2013). The regulation states that, in order to serve as SIC, a pilot must hold a commercial pilot certificate with appropriate category and class ratings for the aircraft, and an instrument rating. Because there are no single-engine operations under part 121, an SIC is required to have a commercial pilot certificate with an airplane multiengine land (AMEL) rating.

To serve as Pilot-in-Command (PIC). 14 CFR part 121, Section 437, *Pilot Qualification: Certificates Required* (2013), states that in order to serve as PIC, a pilot must hold an ATP and an appropriate type rating for the aircraft.

To obtain an ATP. The current requirements to obtain an ATP are outlined in 14 CFR part 61, Subpart G, *Airline Transport Pilots* (2013). To be eligible for an ATP, a pilot must be at least 23 years old, hold a commercial pilot certificate with an instrument rating, have logged at least 1,500 hours of flight time, and be of strong moral character. Of these hours, at least 500 hours must be cross-country flight time, 100 hours must be night flight time, and 75 hours must be simulated or actual instrument flight time. To receive an ATP, a pilot must pass a written test and a practical test.

Factors Leading up to Rulemaking

Colgan 3407. On the night of February 12, 2009, Continental Connection Flight 3407 lost control and crashed in a small town outside of Buffalo, New York (NTSB, 2010). The aircraft, a Bombardier DHC-8-400, was operated by Colgan Air, Inc. At the time of the accident, the flight crew was conducting an instrument approach into Buffalo
Niagara International Airport (BUF). Upon loss of control, the aircraft crashed into a residential area in Clarence Center, New York. The accident led to a total of 50 fatalities, including everyone aboard the aircraft and one person on the ground (NTSB, 2010).

According to the NTSB (2010) accident report, the probable cause of the accident was “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” (p. 155). The stick shaker is a device which alerts the flight crew to an impending aerodynamic stall so that the crew can make the necessary changes to avoid the stall (NTSB, 2010). Minutes before the crash, the stick shaker activated. Instead of using proper recovery techniques, which include lowering the nose of the aircraft and adding power, the captain pulled back on the control column, causing the nose to pitch up. The aircraft’s increased pitch attitude resulted in higher load factors, a higher angle of attack, and a lower airspeed. At this point the stick pusher, which automatically applies a pitch-down input, activated. Again, the captain pulled back on the control yoke and overpowered the stick pusher, which worsened the stall. All of these factors led to a stall and spin scenario from which the flight crew was unable to recover. The aircraft experienced severe pitch and roll oscillations and crashed about five miles from the airport (NTSB, 2010).

The NTSB (2010) cited four other contributing factors to the accident. These factors include:

1) the flight crew’s failure to monitor airspeed in relation to the rising position of the low-speed cue, 2) the flight crew’s failure to adhere to sterile cockpit procedures, 3) the captain’s failure to effectively manage the flight, and 4) Colgan
Air’s inadequate procedures for airspeed selection and management during approaches in icing conditions. (p. 155)

The flight crew for Colgan 3407 consisted of a first officer and a captain. Captain Marvin Renslow was 47 years old and held his ATP certificate. He was hired at Colgan with a total flight time of 618 hours. At the time of the accident, he had logged a total of 3,379 hours of flight time. Of these hours, Renslow had logged 3,051 in turbine airplanes, 1,030 hours PIC time, and 111 hours in the Q400. His advanced training included the first officer training program at Gulfstream Training Academy in Fort Lauderdale, FL (NTSB, 2010). First officer Rebecca Lynne Shaw was 24 and held a commercial pilot certificate. She was hired at Colgan with 1,470 flight hours. By the time of the accident she had logged 2,244 hours, which included 774 in the Q400 (NTSB, 2010).

As a result of the accident, the NTSB issued several recommendations regarding pilot training. One of these recommendations was for flight training centers to implement stall recovery training, including fully developed stalls and unexpected stalls. The NTSB (2010) also recommended that the FAA establish minimum fidelity requirements for the simulators used in stall and upset recovery training.

ANPRM. In response to the Colgan accident, the FAA revisited a number of airline accidents which had occurred recently, and found that training had been insufficient in a number of areas. Among these subjects were manual aircraft handling, stall and upset recovery, monitoring skills, Crew Resource Management (CRM), and operations at high altitudes and in icing (FAA, 2010). The FAA (2010) released an Advance Notice of Proposed Rulemaking (ANPRM) on February 8, 2010. The ANPRM called for comments on several different topics including (a) the requirement for all pilots
in part 121 operations to hold an ATP certificate; (b) whether or not academic training should be allowed as a substitute for flight hours; (c) the requirement for all pilots in part 121 operations to hold a commercial pilot certificate with an endorsement for training in difficult operating conditions; and (d) the issuance of authorization to work as a required crewmember to a commercial pilot, provided he has met the air carrier’s qualification standards (FAA, 2010).

The FAA received close to 1,300 responses during the 30-day response period (FAA, 2012a). The responses were submitted by a variety of organizations including major and regional airlines, flight schools, different industry associations, and individuals (FAA, 2012a). According to the NPRM, these comments were generally in favor of academic training as a substitute for flight hours. However, because Public Law 111-216 came out between the ANPRM and the NPRM, several of the proposals in the ANPRM became impossible. The FAA did not discuss the responses to the related questions because they were considered irrelevant. Therefore, it is unclear how the public responded to the other subjects (FAA, 2012a).

**FOQ ARC.** On July 16th, 2010, the FAA established the *First Officer Qualifications Aviation Rulemaking Committee* (FOQ ARC) to facilitate discussions on qualification standards for pilots to operate as SIC in air carrier operations. The FOQ ARC was made up of members of the Air Line Pilots Association, International (ALPA); Air Transport Association of America (ATA); Aircraft Owners and Pilots Association (AOPA); Aviation Accreditation Board International (AABI); the Coalition of Airline Pilots Associations (CAPA); National Air Disaster Alliance/Foundation (NADA/F);
National Business Aviation Association (NBAA); Pilot Career Initiative (PCI); and the Regional Airline Association (RAA) (FAA, 2012a).

The FOQ ARC released its final report in September 2010 summarizing its recommendations (FOQ ARC, 2010). The ARC’s major recommendations were that all part 121 pilots should have an appropriate aircraft type rating, have flown at least 50 hours in multiengine airplanes, and have received Advanced Jet Training (AJT) (FOQ ARC, 2010). The ARC also established recommendations for academic credit, which can be seen in Table 1. While the FAA did not adopt this system fully in the NPRM, it used a modified version to create standards for a restricted-privileges ATP (FAA, 2012a).

Table 1

*Academic and Practical Training Program Valuation with Regard to Aeronautical Experience Credits*

<table>
<thead>
<tr>
<th>Educational Source of Aeronautical Knowledge</th>
<th>Aeronautical Experience Credit Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-year Aviation University/College Accredited Flight Training Program</td>
<td>350</td>
</tr>
<tr>
<td>4-year Aviation University/College Flight Training Program</td>
<td>200</td>
</tr>
<tr>
<td>2-year Aviation College Accredited Flight Program</td>
<td>150</td>
</tr>
<tr>
<td>2-year Aviation College Flight Training Program</td>
<td>100</td>
</tr>
<tr>
<td>Flight Academy (Part 141/142) Flight Training Program</td>
<td>100</td>
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<tr>
<td>Part 141 Training Program</td>
<td>50</td>
</tr>
<tr>
<td>Part 61 Flight Training Program</td>
<td>0</td>
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<tr>
<td>Military “Fixed Wing” Flight Training Program</td>
<td>750</td>
</tr>
<tr>
<td>Military “Rotary Wing” Flight Training Program</td>
<td>500</td>
</tr>
<tr>
<td>Initial flight instructor certificate</td>
<td>100</td>
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<tr>
<td>Each additional flight instructor rating</td>
<td>50</td>
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<tr>
<td>Military Instructor Pilot</td>
<td>200</td>
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<tr>
<td>AJT Course not resulting in a type rating</td>
<td>200</td>
</tr>
<tr>
<td>AJT Course resulting in a type rating</td>
<td>250</td>
</tr>
</tbody>
</table>

*Note.* Adapted from “The First Officer Qualifications Aviation Rulemaking Committee Report,” by the FOQ ARC, 2010, p. 9.
**Congressional mandates.** The families who had lost loved ones in the Colgan accident, referred to as the “Families of Continental Flight 3407,” lobbied the U.S. Congress for improvements to aviation safety, specifically to create more stringent standards of flight training for pilots in air carrier operations (Public Broadcasting System, 2010; FAA, 2012a; “Families,” 2012).

In August 2010, after 15 months of lobbying from the families, Congress enacted Public Law 111-216, *Airline Safety and Federal Aviation Administration Extension Act of 2010*. The Act consists of two major changes related to pilot qualification under part 121. These provisions are found in Section 216: *Flight Crewmember Screening and Qualifications* and Section 217: *Airline Transport Pilot Certification*. Section 216 states that all pilots under part 121 must hold an ATP certificate by August 2, 2013 (FAA, 2012a). This provision effectively raises the minimum number of hours required to become a first officer from 250 hours to 1,500 hours. However, Section 217 gives the FAA the authority to modify the requirements to receive an ATP based on academic experience or training. Public Law 111-216 Section 217 (2010) states:

> The Administrator may allow specific academic training courses…to be credited toward the total flight hours required… The Administrator may allow such credit based on a determination by the Administrator that allowing a pilot to take specific academic training courses will enhance safety more than requiring the pilot to fully comply with the flight hours requirement (p. 22).

Section 217 of the law also stipulates that the FAA must issue a final rule by August 2, 2013 (FAA, 2012A; U.S. Congress, 2010).
Proposed Rules


**Provisions of the NPRM.** The NPRM (FAA, 2012a) contains six provisions, five of which directly relate to the qualification of first officers in air carrier operations. These are described below.

**ATP certificate for all pilots operating under part 121.** Under the proposed rules, in compliance with Section 216 of Public Law 111-216 (U.S. Congress, 2010), each flight crewmember in part 121 operations must hold an ATP certificate by August 1, 2013. Aside from the proposed restricted-privileges ATP, the proposed requirements to obtain an ATP include all the current requirements – the candidate must be 23 years of age, have a minimum of 1,500 flight hours, hold a commercial certificate with an instrument rating, and pass a knowledge and practical test – plus several new requirements (FAA, 2012a).

The most significant change from this provision is the increase in minimum flight hours (FAA, 2012a). Many members of the aviation industry believe raising the number of flight hours will lead to air carriers employing more experienced and thus safer pilots. Others believe the number of hours a pilot has flown is not necessarily a good indicator of experience, whereas the quality of training is. During the *Pilot Source Study*, Smith, Bjerke, NewMyer, Niemczyk, and Hamilton (2010) gathered data on 2,156 new-hire regional airline pilots from six different carriers. The research showed that pilots who had
the most success in their initial training were the ones who had between 500 and 1,000 flight hours before being hired (Smith et al., 2010). In another study, Liang and Higgins (2010) looked back through 100 sequential accidents which had occurred under part 121 and found that only one of the pilots involved had fewer than 1,500 hours (Lovelace & Higgins, 2010). Others, such as Captain Chesley “Sully” Sullenberger, believe flight experience is crucial to being a safe pilot. In January 2009, Sullenberger and his first officer, Jeff Skiles, landed US Airways Flight 1549 safely in the Hudson River after a bird strike incapacitated the aircraft (Sullenberger, 2012). If it had not been for the many years of experience between the two of them, Sullenberger believes Flight 1549 would have seen a different outcome (Sullenberger, 2012).

**Aeronautical experience requirement in the class of airplane for the ATP certificate sought.** This provision requires a pilot to have flown a minimum of 50 hours in the class of airplane for which the pilot seeks an ATP certificate. Because there are no single-engine operations authorized under part 121, a pilot acting as SIC under this part must have at least 50 hours of multiengine flight time. Up to 10 of the required 50 hours can be acquired from time in a multiengine Full Flight Simulator (FFS) (FAA, 2012a).

According to the NPRM, the FAA (2012a) expects this provision to have little impact on ATP candidates:

The FAA believes that this proposal would have minimal impact on pilots seeking an ATP certificate because the hours most often would be acquired while engaged in other commercial aviation activities such as flight instruction or part 135 air carrier operations. (p. 9)
**Aircraft type rating for all pilots operating under part 121.** One provision of the NPRM (FAA, 2012a) requires all pilots in the air carrier environment to hold an appropriate aircraft type rating by August 1, 2013. During the practical test for a type rating, pilots are tested to the same standards as they are for an ATP certificate.

**ATP CTP for an airplane category multiengine class rating or type rating.** The proposed rule requires candidates for an ATP with multiengine class ratings or an aircraft type rating to complete an ATP CTP before taking the FAA written test (FAA, 2012a).

The FAA (2012b) drafted an advisory circular to outline the objectives and outcomes of the proposed CTP. According to the advisory circular, the CTP will consist of 24 hours of academic instruction and 16 hours of training in a Flight Simulation Training Device (FSTD). The academic segment will cover topics such as high altitude operations, meteorology, CRM, automation, and the operation and performance of turbine engines. The FSTD segment will be divided into two parts: one which must occur in an FFS (full-motion) and one which may occur in an FTD (non-motion) (FAA, 2012b).

FSTDs are certificated under Title 14 CFR 60, *Flight Simulation Training Device Initial and Continuing Qualification and Use* (2013). There are specific performance requirements for both FFSs and FTDs. FTDs are classified on a scale from 1-6, with 6 being the highest level of sophistication and fidelity; FFSs are classified on a scale from A-D, with D being the most sophisticated (Flight Simulation Training Device, 2013).

Research on the merits of full-motion training has been inconclusive. The most common measure of the effectiveness of motion cueing has been the transfer of training from the simulator to the actual airplane. A positive transfer of training would include outcomes such as shorter reaction times and greater accuracy of aircraft handling.
Researchers have found very little evidence to suggest that motion cueing in simulators leads to positive transfer of training to the airplane. Multiple studies done by the FAA Volpe Flight Simulator Human Factors Program (Burki-Cohen & Go, 2005; Burki-Cohen, Sparko, Jo, & Go, 2009) have shown that there are no operationally relevant effects of motion-based training. Within this program, Burki-Cohen and Go (2005) found little evidence of positive transfer of training with motion cues in an experiment conducted among airline pilots in initial training (subjects were unfamiliar with characteristics of the airplane). Burki-Cohen, Sparko, Jo, and Go (2009) found similar results with airlines pilots going through recurrent training. Burki-Cohen and Go (2005) also showed that motion cues from FFSs are not necessarily a good representation of motions in the actual airplane. In such cases, “bad” motion cues can cause a negative transfer of training from the simulator to the airplane, in which pilots have longer response times and/or respond incorrectly to motion cues.

Much earlier studies on the effectiveness of motion-based simulator training have yielded similar results. While such research attributes better pilot performance in the airplane to simulator-based training, it provides no evidence that motion cueing is what makes the difference (Jacobs, 1976).

*ATP certificate with restricted privileges based on academic or military training.* Section 217 of Public Law 111-216 (U.S. Congress, 2010) gave the FAA the authority to modify the requirements for an ATP. The NPRM (FAA, 2012a) states, “Minimum number of flight hours shall be at least 1,500 flight hours. A pilot need not fully comply with the flight hours requirement above provided specific academic training courses, beyond those listed below, as determined by the Administrator” (p. 2). In the
proposed rules, an ATP with restricted privileges will be offered to certain pilots with a lower hour requirement. To be eligible for a restricted-privileges ATP, a candidate must have military flight experience or have graduated from an accredited 4-year baccalaureate aviation degree program. Graduates of collegiate aviation programs must also have received their commercial certificate and instrument rating from an affiliated part 61 flight school. Military pilots can receive a restricted ATP with 750 hours of flight time; graduates of aviation programs qualify with 1,000 hours. A pilot cannot serve as PIC for an air carrier with a restricted ATP, but they can serve as SIC, as long as there are not more than two flight crewmembers required (FAA, 2012a). The first phase of the Pilot Source Study (Smith et al., 2010) found that the new-hire pilots who saw the most success in their initial airline training included those who had graduated from an accredited collegiate aviation program.

The NPRM also mentions alternative licensing structures for part 121 operations. Although not specifically mentioned as one of the proposed rules, Question 17 of the NPRM asks, “Should the FAA consider an alternative licensing structure for pilots who desire only to fly for a part 121 air carrier (e.g., multicrew pilot license [MPL])?” (FAA, 2012a, p. 12). The MPL is a form of ab initio training, meaning pilots are taken from having zero flight hours and trained from day one to be an airline pilot. This type of training is based on competency of specific tasks, rather than on flight hours alone. Pilots undergo four phases of rigorous training, including Core, Basic, Intermediate, and Advanced training. The overarching theme of training is a concept of CRM known as threat and error management (TEM), in which pilots are trained to recognize, trap, and mitigate threats and errors on the flight deck. MPL training prepares the pilot to become a
functioning crewmember in a multi-pilot operation (Schroeder & Harms, 2007). The MPL was first introduced in 2006, and is used in training pilots around the world. It has been implemented in countries such as Germany, China and Australia; however it has not yet been adopted as a method of licensing by the FAA (Schroeder & Harms, 2007). If the FAA were to adopt an alternative licensing structure similar to the MPL, it would be specific to part 121 operations (FAA, 2012a).

**Minimum of 1,000 hours in air carrier operations to serve as PIC in part 121 Operations.** This provision requires first officers to have a minimum of 1,000 hours as SIC before they can upgrade to PIC. The FAA’s reasoning behind the provision was to promote the mentorship of the first officer by the captain. Under the current regulations, this tends to happen naturally (FAA, 2012a). A pilot is hired as SIC without an ATP and with fewer than 1,500 hours. Then, the pilot builds experience under the supervision of a captain until the pilot meets the ATP requirements and can upgrade to PIC. Under the proposed rules, a pilot gets hired after obtaining an ATP. Without the provision requiring 1,000 hours of SIC time to upgrade, the pilot technically could serve as PIC without building any flight time under the supervision of an experienced captain (FAA, 2012a).

**Stakeholders**

**Pilots.** Pilots aspiring to have a career in air carrier operations will undoubtedly be impacted considerably by the new rules. With significant increases in both the time and money it will take to achieve the new minimums, many pilots will be forced to change their career paths. As part of the NPRM (FAA, 2012a), the FAA estimated costs per pilot for the ATP CTP and the ATP and/or type rating practical test. Assuming an
ATP CTP is taught as a seven-day course, it will cost each pilot an estimated $5,771. The ATP and/or type rating practical test will cost an additional $1,641 (FAA, 2012a).

The biggest impact on pilots, however, will most definitely come from building 1,500 hours of flight time. In order to build flight hours, the majority of pilots turn to flight instructing. According to the *Pilot Source Study* (Smith et al., 2010), about 73% of new-hire pilots at air carriers have a Certificated Flight Instructor (CFI) certificate (Smith et al., 2010). This is a popular route since pilots can build time while getting paid and gaining experience. However, another obstacle for aspiring air carrier SICs is the cross-country time requirement of 500 hours. Bjerke and Malott (2011) have estimated that it could take the average CFI at a part 61 collegiate aviation program over 4 years of instructing to meet this requirement (Bjerke & Malott, 2011).

**Airlines.** The NPRM (FAA, 2012a) is expected to have a large impact on the airlines, particularly the regional airlines. The NPRM states:

The FAA believes this proposal would have the greatest impact on air carriers that operate regional jet airplanes and/or turbopropeller airplanes. These air carriers generally hire pilots with a commercial pilot certificate and typically less than 1,500 hours total time as a pilot. (p. 8)

In preparation for the new first officer qualifications, regional airlines have been increasing their minimum requirements for hiring first officers. Currently, all of the main regional airlines require at least 1,000 hours total flight time. Cape Air (2012) and Trans States Airlines (2012) require 1,000 hours, ExpressJet (2012) and Republic Airways (2012) require 1,300 hours, and Skywest Airlines (2012) and Great Lakes Airlines (2012) require 1,500 hours. None of the regional airlines, with the exception of Cape Air (2012),
require fewer than 50 hours of multiengine time. Great Lakes (2012) requires a minimum of 50 hours, ExpressJet (2012) and SkyWest (2012) require 100 hours, and Mesa Airlines (2012), Republic Airways (2012), and Trans States (2012) require 200 hours of multiengine time. Cape Air (2012) requires 25 hours PIC time in a multiengine airplane. In addition to the minimum hour requirements, most of the regional airlines now require first officer candidates to have completed their ATP written exam before being hired. Cape Air (2012) and Trans States (2012) are the only two airlines which do not have this requirement.

A number of industry experts predict there will be a pilot shortage in the near future resulting from a combination of the proposed rules and several other factors. According to the FAA (2012c), the demand for pilots is expected to increase in the next decade. This is due to the fact that the number of annual passengers in the air carrier industry is projected to reach one billion by 2024, according to the 2012 FAA forecast (FAA, 2012c). However, the pilot supply is expected to shrink, with more pilots leaving the industry than joining it. A study conducted by the University of North Dakota’s (UND) Aviation Department estimated a shortage of around 66,000 pilots between 2011 and 2031 (Lovelace & Higgins, 2010).

One factor contributing to a shortage is the mandatory retirement age of 65. Lovelace and Higgins (2010) estimate that nearly 60,000 pilots will be forced to retire by 2020. Furthermore, there may be less interest in a career as a professional pilot; as the time commitment and cost of training increase, interest in the career decreases. On top of these factors, the proposed pilot qualifications will delay pilots from being eligible for a
job at an air carrier. All of these factors will contribute to a shrinking pilot pool (Lovelace & Higgins, 2010).

**Flight schools.** With higher qualification minimums being required to enter an industry with low starting salaries, people are reconsidering becoming professional pilots. This is expected to negatively impact flight schools, as some people may turn away from flight training altogether. According to the National Association of Flight Instructors (NAFI) (Blair & Freye, 2012), the total number of certificates issued by the FAA has decreased 40% since 1990. This includes private and commercial certificates, instrument ratings, ATP certificates, and other ratings (Blair & Freye, 2012).

In a 2009 survey of UND flight instructors (Lovelace & Higgins, 2010), 56% said they wanted to pursue a career as an airline pilot. The same group of instructors was surveyed again recently and the original 56% had decreased to 24% (Lovelace & Higgins, 2010).

Blair and Freye (2012) predict that collegiate flight training institutions will become the favored method of training for career-oriented pilots. With the restricted ATP as an option for only those coming from the military and collegiate part 61 training programs, other flight schools are at a significant disadvantage. As a result, part 61 flight schools and certain part 61 schools which are not affiliated with collegiate aviation programs are especially at risk of losing students (Blair & Freye, 2012). Additionally, it has been predicted that the quality of flight instruction will decrease as a large number of pilots become instructors to build time (Blair & Freye, 2012).
Summary

The crash of Colgan Flight 3407 focused attention on air carrier pilot qualifications. As a result, these qualification minimums were reconsidered and modified. The *Airline Safety and Federal Aviation Administration Extension Act of 2010* created new qualification minimums, requiring all pilots entering the air carrier industry to have a minimum of 1,500 flight hours and hold an ATP. The Act gave the FAA the authority to modify these requirements based on academic experience. Thus, the FAA developed a set of proposed rules. The FAA took many factors into consideration when drafting the NPRM, including the NTSB safety recommendations following the Colgan accident, the public’s responses to the ANPRM, and the recommendations by the FOQ ARC.

The NPRM includes six different provisions for pilot qualification standards. The first provision comes directly from the congressional mandates, which will require all part 121 flight crewmembers to hold an ATP. While some industry members expect the increased hour minimum to enhance safety, other research has shown that pilots with fewer total flight hours have been more successful in initial airline training.

Other provisions will require pilots in air carrier operations to have at least 50 hours of multiengine flight time and hold an aircraft type rating. Under the proposed rules, pilots seeking an ATP certificate will need to complete an ATP CTP before taking the knowledge test. The ATP CTP will consist of ground training and training in both FTDs and FFSs. Research has failed to provide conclusive evidence that motion cueing in simulation leads to a positive transfer of training in the airplane.

One provision of the NPRM allows military pilots and graduates of an accredited, collegiate aviation degree program to obtain an ATP with restricted privileges with 750
hours and 1,000 hours, respectively. Studies have shown that graduates of such programs tend to be most successful in initial airline training. Lastly, pilots will need 1,000 hours as SIC before serving as PIC under part 121.

The proposed changes to air carrier pilot qualifications will affect all aspects of the aviation industry. Projected growth of the industry will cause a higher demand for pilots, while the pilot supply dwindles due to retirements and higher qualification standards. The combination of these factors is likely to lead to a pilot shortage. Pilots will be forced to spend more time and money building the necessary flight hours. Regional airlines will need to change their hiring practices and spend time and resources bringing all of their current pilots up to standards. Flight schools will likely experience a drop in enrollments as people lose interest in career flying.

The FAA has not yet issued a final rule on part 121 air carrier pilot qualifications. The FAA is expected to release a final rule between the time of this writing and August 2013. While there is no way to be certain what the final rule will consist of, it will undoubtedly have a significant effect on the aviation industry.
Chapter III

Methodology

Research Approach

The study included descriptive research using secondary data. The researcher analyzed external data initially gathered by the Department of Transportation (DOT) and made available to the public. With the issuance of the NPRM (FAA, 2012a), the FAA invited comments to 22 opinion-based questions related to the proposed rules. The comments were submitted to the DOT between February 29, 2012 and April 30, 2012. After the response period ended, comments were posted online (“Comments,” 2012), and made available to the public. The researcher gathered these comments and organized them into different categories in a Microsoft Excel® spreadsheet.

Design and procedures. The researcher retrieved the comments from the online Docket for the NPRM (“Comments,” 2012) and entered them into the spreadsheet. The spreadsheet contained several columns for demographic information, and a different column for each question. Next to each question were all the possible responses. The researcher excluded several of the questions that were not directly related to serving as SIC under part 121. Questions 5, 10, 11, and 18-22 were excluded. After the data had been entered, the researcher analyzed the comments by determining the frequency of answers given.

Population

The population of this study consisted of all the submitted responses to the NPRM within the specified response period. Certain records were removed if they were duplicates or if they did not answer any of the pertinent questions. There were 536
records included in the analysis. The study was an analysis of the entire population of responses; the researcher was only concerned with this particular group of responses and did not attempt to generalize findings to other groups.

Sources of the Data

The data collected consisted of comments submitted by a wide variety of industry members. The researcher gathered comments from regional and major airlines, collegiate aviation programs, flight schools and training centers, industry associations and organizations, and individuals. A number of comments were casual in nature, whereas others were more deliberate. For example, the University Aviation Association (UAA) worked for several weeks, including meetings and conference calls among the 103 colleges and universities within the Association, to come up with the UAA comment to the NPRM (G. Smith, personal communication, February 27, 2013). A comment such as the UAA’s most likely took more time and effort than a comment submitted by an individual.

The data also ranged widely in length, format, and content. Some responses consisted of only a few sentences, while others were many pages long. While some responses were in paragraph form, others included a list of the questions provided with the answers after each one; some were a combination of both. Some respondents chose only one or two questions to answer, while others answered most of the questions. Very few respondents answered every question. Appendix A contains four complete examples of these responses.
Treatment of the Data

**Descriptive statistics.** Demographic information consisted of type of organization and level of flight experience. While it was not specifically asked whether respondents had flight experience, many included this information anyway. For reporting flight experience, the researcher included only individuals, as it would have been difficult to determine within a group of people whether individuals had flight experience.

The responses to the NPRM questions are displayed in both pie and bar charts. Several of the questions have multiple parts; in most cases these results are displayed in separate charts.

**Qualitative data.** Because the FAA solicited open-ended responses, there was a multitude of comments that were not direct answers to any of the questions. Some of these comments were further explanations of answers to the questions. The researcher incorporated these comments into the discussion of each question’s responses. Other comments addressed issues that may not have been adequately covered by the NPRM, and were mentioned by numerous respondents. The ten most frequent comments are displayed in a word table.
Chapter IV

Results and Discussion

Descriptive Statistics

Demographics. The researcher analyzed 536 responses to the FOQ NPRM. The responses were categorized by type, including Individual, Flight Training, Association, Industry Organization/Company, Air Carrier, Manufacturer, and Government. Figure 1 shows the distribution of the types of responses.

![Figure 1](image)

Figure 1. Distribution of type of response.

The largest percentage of responses came from individuals, followed by flight training institutions and aviation associations. Flight Training institutions include part 61 flight schools, part 141 and 142 training academies, and collegiate aviation programs. The Air
Carrier category includes part 121 and 135 operators conducting passenger and cargo operations.

Although not specifically asked in the NPRM questions, 35% of the 443 individual respondents reported having some level of flight experience. Figure 2 shows the distribution of levels of flight experience. Not all of the individuals who reported having flight experience specified the level of experience they had. The CFI category includes all instructor ratings (CFI, Certificated Flight Instructor-Instrument [CFII], and Multiengine Instructor [MEI]).

Figure 2. Highest certificate/rating or level of experience as reported by individuals.

NPRM Questions. Question 1 of the NPRM asked, “Is a minimum of 1,500 hours adequate in order to receive an unrestricted ATP certificate?” There were 288 responses to the question. Figure 3 shows the distribution of answers to Question 1.
Figure 3. Question 1. *Note.* Is a minimum of 1,500 hours adequate in order to receive an unrestricted ATP certificate?

The majority of respondents indicated that 1,500 hours is adequate to obtain an ATP certificate. A number of respondents who answered “yes” justified the response by stating that it is important to keep FAA standards in line with ICAO standards, which are 1,500 hours for an ATP.

Although not specifically asked in the NPRM, many respondents offered their opinions on how many flight hours a pilot should have before operating as an SIC under part 121. Figure 4 shows these responses, rounded to the nearest increment of 250 hours. The majority of respondents (258) answered that quality of training is more important than requiring a set number of hours. For example, a pilot who gains 1,000 hours towing banners behind a single-engine airplane may not be as qualified for part 121 operations as a pilot who gains 1,000 hours from a part 135 operation. The pilot who flew under part 135 gained more experience in a multi-crew setting, night and instrument operations, and adverse weather conditions than the pilot towing banners.
Many of the responses also provided opinions on whether or not a pilot should hold an ATP in order to be qualified as an SIC in part 121 operations. The majority of respondents stated that a pilot should not need an ATP before being hired as an SIC.

See Figure 5.
Question 2 of the NPRM asked, “As a result of the new ATP requirement for pilots in part 121 operations, what will be the impact on pilot supply for part 121 operations? For part 135 operations? For part 141 pilot schools? For part 142 training centers?” Note that not everyone gave an answer for every type of operation; for example, one response may have only given an answer for part 121 and part 135. There were 249 responses that answered at least one part of the question. Figure 6 shows the answers to Question 2.

Figure 6. Question 2. Note. As a result of the new ATP requirement for pilots in part 121 operations, what will be the impact on pilot supply for part 121 operations? For part 135 operations? For part 141 pilot schools? For part 142 training centers?

Most respondents answered that there would be a decrease in pilot supply. Some attributed this decrease to an overall decline in interest. With a high cost of training (among other barriers to entry), and a low starting regional airline salary, fewer students will be looking towards flight as a career goal. As fewer students enroll in part 61 and 142 flight schools, there will be a smaller pool of pilots to feed part 135 and part 121 operations. Of the 221 responses indicating a decrease in the pilot supply for part 121
operations, 147 stated they believed there would be a shortage of pilots. There were 23 responses that indicated there would probably be an increase in enrollments at part 142 training centers. Several of these responses attributed this increase to the proposed FSTD requirements outlined in the ATP CTP requirements. Part 142 training centers could possibly benefit from increased FSTD requirements because they are more likely to be equipped with full-motion FFSs.

Question 3 asked, “Is 50 hours in class of airplane too high, too low, or adequate in order to receive an ATP certificate with airplane category multiengine class rating?” There were 166 responses the question, as shown in Figure 7. A number of respondents who agreed with the proposed 50 hours of multiengine time said they did not think this would be as much of an obstacle to getting an ATP as the cross-country time requirement, for example.

*Figure 7. Question 3. Note. Is 50 hours in class of airplane too high, too low, or adequate in order to receive an ATP certificate with airplane category multiengine class rating?*
Question 4 asked, “Should SICs in part 121 air carrier operations be required to hold an aircraft type rating?” There were 194 responses to the question. Figure 8 shows the distribution of responses. The majority stated that this requirement would be appropriate; SICs should be completely proficient in operating the specific type of aircraft before sitting in the right seat. The PIC should act as a mentor to the SIC to some degree, however this only works if the SIC is already fairly comfortable flying the airplane. Otherwise, the PIC might spend all his/her time getting the SIC up to speed, which may become a burden.

![Figure 8](image.png)

*Figure 8. Question 4. Note. Should SICs in part 121 air carrier operations be required to hold an aircraft type rating?*

Question 6 asked, “Should pilots wanting to obtain an ATP certificate with airplane category multiengine class rating or type rating be required to take an additional training course prior to taking the knowledge test?” There were 196 answers to Question 6, as shown in Figure 9.
Figure 9. Question 6. Note. Should pilots wanting to obtain an ATP certificate with airplane category multiengine class rating or type rating be required to take an additional training course prior to taking the knowledge test?

Around 50% responded that pilots should be required to take an additional training course before taking the ATP written test. A number of these respondents added that the ATP written exam itself needs updating. Because the exam’s question base is public knowledge, there are concerns that pilots are simply memorizing the answers to the questions; thus, they are not really gaining a complete understanding of the material. There were 37 responses that suggested there be an option to embed the proposed ATP CTP into a current program, either a collegiate aviation program or another flight training curriculum. A number of flight training institutions and their trainees indicated that their programs already covered most, if not all of the topics and objectives listed in the draft advisory circular (FAA, 2012b).

Question 7 asked, “If academic training is required in an ATP certification training course, what topics are appropriate? How many hours are appropriate for such a course?” There were 102 responses to this question. There were 37 responses indicating that the topics listed in the NPRM and/or the draft advisory circular (FAA, 2012b) were
appropriate; 33 responses stated that the topics listed in the FOQ ARC recommendations were appropriate. While the organization of topics in each document is slightly different, both documents essentially include all the same topics. The remaining 32 responses listed a multitude of different topics; some listed many topics, and some listed only a few. However, everything that was mentioned in these “Other” responses had already been mentioned in the NPRM or the FOQ ARC recommendations. A full list of these recommended topics can be found in Appendix B.

There were 99 responses to Question 7b. Figure 10 shows the distribution of answers.

![Figure 10](image)

*Figure 10. Question 7b. *Note. How many hours would be appropriate for such a course?

The majority of responses stated that instead of requiring a certain number of hours, the academic portion of the ATP CTP should be outcome-based. This method would take the quality of academic training and the students’ comprehension of topics into account, whereas a set hour requirement would not. One candidate may not have a
solid understanding of the topics in 24 hours, whereas another candidate may have mastered the subject matter in less time. There were 23 responses that recommended a number of hours between 21 and 30. Many of these responses indicated that the proposed course length of 24 hours was appropriate.

Question 8 asked, “Should an ATP certification training course include non-type specific FSTD training on concepts that are generally universal to transport category aircraft?” There were 97 responses to this question, shown in Figure 11. The majority responded favorably to the non-type specific FSTD requirement.

![Graph showing responses to Question 8](image)

**Figure 11. Question 8. Note.** Should an ATP certification training course include non-type specific FSTD training on concepts that are generally universal to transport category aircraft?

Question 9 asked, “If FSTD training is required, what level of FSTD is appropriate? How many hours are appropriate?” There were 115 responses suggesting a specific minimum level of FSTD (i.e., at least a level x FSTD). These responses are indicated in Figure 12.
Figure 12. Question 9a. Note. If FSTD training is required, what level of FSTD is appropriate?

It became apparent from the responses that the bigger debate was not on what specific level of FSTD should be required, but whether full-motion simulation added value to the training. There were a number of responses that did not provide a specific level of FSTD, but indicated whether they thought training in a full-motion simulator should be required. These responses were combined with the responses to Question 9a, and are displayed in Figure 13. Any response indicating Level 1 through Level 6 (non-motion FTDs) were added to the “No” category, and any response indicating Level C (full-motion FFSs) were added to the “Yes” category.
There were 51 responses to Question 9b. These are displayed in Figure 14. The majority indicated that the proposed 16 hours was appropriate; however, almost the same number of responses indicated that the completion of the course should not be based on hours, but should be based instead on outcomes.
Question 12 asked, “Should the FAA offer an ATP certificate with restricted privileges for pilots with fewer than 1,500 flight hours based on academic training and/or experience? If so, how many hours would be appropriate? Should anyone other than military pilots or graduates of 4-year colleges and universities with aviation-related degrees and commercial pilot certificates with instrument ratings obtained from an affiliated part 141 pilot school be eligible?” There were 371 responses to the first part of the question. About three quarters of these responses indicated that the FAA should offer a restricted ATP based on academic training and/or experience, as shown in Figure 15.

Figure 15. Question 12a. Note. Should the FAA offer an ATP certificate with restricted privileges for pilots with fewer than 1,500 flight hours based on academic training and/or experience?

Of the 280 responses in favor of offering the restricted ATP, 223 suggested an hour requirement for graduates of a collegiate aviation degree program, and 140 suggested an hour requirement for military pilots. A number of the respondents offered hour requirements for both. The distribution of the suggested hours is shown in Figure
16. There seem to be inconsistencies in responses with regard to the importance of quality of training. As shown in Figure 4, a great majority of responses indicated that quality of training is more important than a minimum hour requirement when it comes to serving as SIC under part 121. However, in response to Question 12b, only a small minority mentioned quality of training for the restricted ATP; most gave a specific number of hours.

![Figure 16. Question 12b. Note. How many hours would be appropriate?](image)

There were 257 responses to the third part of Question 12. Figure 17 shows that the majority were in favor of expanding the restricted ATP to other candidates besides those listed in the NPRM. Respondents listed a very wide variety of candidates who should also be eligible. These included, but were not limited to

- graduates of collegiate aviation programs with affiliated part 61 flight schools,
- graduates of 2-year collegiate aviation programs
• graduates of collegiate aviation programs who did flight training off campus
• pilots with prior part 121 experience
• pilots who hold a bachelor’s degree (not necessarily aviation-related)
• pilots who have completed upset/recovery training
• pilots who have completed advanced jet training (AJT)

Another common response to Question 12c suggested adopting the FOQ ARC recommendations for academic credit (See Table 1 in Chapter II). Many responses even encouraged offering the restricted ATP to everyone with the required certificates and ratings, but suggested these pilots have a higher hour requirement.

![Figure 17. Question 12c. Note. Should anyone other than military pilots or graduates of 4-year colleges and universities with aviation-related degrees and commercial pilot certificates with instrument ratings obtained from an affiliated part 141 pilot school be eligible?](image)

N=257

Yes N=146 57%
No N=111 43%

Question 13 asked, “Should military pilots be allowed to receive an ATP certificate with restricted privileges? If so, is the proposed 750 hours too high, too low, or adequate?” There were 225 responses to the first part of the question. The majority
answered that military pilots should be eligible for a restricted ATP, mainly because they are exposed to very rigorous training and held to high standards. This is shown in Figure 18. A number of responses that answered “no” indicated that military flight training, which includes mainly single pilot operations, does not necessarily correlate to multi-pilot airline operations.

Figure 18. Question 13a. Note. Should military pilots be allowed to receive an ATP certificate with restricted privileges?

Out of the 146 “yes” responses to Question 13a, 133 answered Question 13b. Figure 19 shows these responses.

Figure 19. Question 13b. Note. Is the proposed 750 hours too high, too low, or adequate?
The majority responded that 750 hours is adequate for military pilots to obtain a restricted ATP. This observation is in line with the responses from Question 12b (see Figure 16), the majority of which suggested 750 hours was appropriate for military pilots to receive a restricted ATP. A small percentage indicated that the requirement should be based on quality and/or type of training instead of a set number of flight hours.

Question 14 asked, “Should graduates of 4-year colleges and universities with aviation-related majors and commercial pilot certificates with instrument ratings obtained from an affiliated part 141 pilot school be allowed to receive an ATP certificate with restricted privileges? If so, is the proposed 1,000 hours too high, too low, or adequate?” There were 361 responses to the first part of this question. Figure 20 shows the responses to Question 14a.

![Figure 20. Question 14a. Note. Should graduates of 4-year colleges and universities with aviation-related majors and commercial pilot certificates with instrument ratings obtained from an affiliated part 141 pilot school be allowed to receive an ATP certificate with restricted privileges?](image)

Three quarters of the responses indicated that graduates of 4-year aviation degree programs as described should be able to receive a restricted ATP. Several of these
responses cited the *Pilot Source Study* (Smith et al., 2010) as evidence that these candidates can be safe and effective pilots with fewer hours than traditional candidates. Of the responses that answered “yes” to Question 14a, 227 answered Question 14b. These responses are shown in Figure 21.

Most responses indicated that 1,000 hours was too high for graduates of 4-year collegiate flight training programs. The responses to this question reiterate the responses to Question 12b (Figure 16), to which the majority replied that between 500 and 750 hours was appropriate for collegiate aviation graduates to receive a restricted ATP.

![Figure 21. Question 14b. Note. Is the proposed 1,000 hours too high, too low, or adequate?](image)

Question 15 asked, “Should military pilots and/or graduates of 4-year colleges and universities with aviation-related majors and commercial pilot certificates with instrument ratings obtained from an affiliated part 141 pilot school be allowed to receive an ATP certificate without restrictions with fewer than 1,500 hours? If so, how many
hours would be appropriate?” There were 177 responses to this question. The distribution of responses is shown in Figure 22 and 23.

Figure 22. Question 15a. Note. Should military pilots and/or graduates of 4-year colleges and universities with aviation-related majors and commercial pilot certificates with instrument ratings obtained from an affiliated part 141 pilot school be allowed to receive an ATP certificate without restrictions with fewer than 1,500 hours?

Most responses indicated that an unrestricted ATP should not be an option with fewer than 1,500 hours. Out of the 50 responses that answered “yes” to Question 15a, 37 answered Question 15b. Figure 23 shows the number of hours recommended for the unrestricted ATP, rounded to the nearest increment of 250 hours.
The most common answer was 1,000 hours, followed by 750 hours. One response stated that qualification for an unrestricted ATP should be determined by quality of training instead of number of flight hours.

Question 16 asked, “Should a pilot who obtains a degree with an aviation-related major from a 4-year college or university and a commercial pilot certificate with instrument rating from a part 141 pilot school not affiliated with the college or university be eligible for a restricted privileges ATP certificate? If so, how many hours should they be required to have? And, should there be a time limit between the baccalaureate training and the flight training if they were not done concurrently?” The first part of the question received 197 responses, which are shown in Figure 24.
Figure 24. Question 16a. Note. Should a pilot who obtains a degree with an aviation-related major from a 4-year college or university and a commercial pilot certificate with instrument rating from a part 141 pilot school not affiliated with the college or university be eligible for a restricted privileges ATP certificate?

The majority of the responses indicated that the restricted ATP should not be an option for students who graduate from an aviation-related degree program but get their commercial and/or instrument ratings off-campus. There were 64 responses that indicated this should be an option, and 44 of these responded to Question 16b, which asked how many hours would be appropriate. These responses are displayed in Figure 25.
Figure 25. Question 16b. Note. How many hours should they be required to have?

Of the 64 “yes” responses to Question 16a, 22 also gave an answer to 16c, which asked about a time limit between academic training and flight training. This is shown in Figure 26.

Figure 26. Question 16c. Note. Should there be a time limit between the baccalaureate training and the flight training if they were not done concurrently?
Question 17 asked, “Should the FAA consider an alternative licensing structure for pilots who desire only to fly for a part 121 air carrier (e.g. multicrew pilot license)?” There were only 79 responses to this question, which are shown in Figure 27. Several of the “yes” responses indicated it would be a good idea for the FAA to look into such an alternative, but that it would be more appropriate to look at in the near future instead.

*Figure 27. Question 17. Note. Should the FAA consider an alternative licensing structure for pilots who desire only to fly for a part 121 air carrier?*

**Overall position.** The researcher categorized each response into an overall position on the Congressionally mandated 1,500 flight hours and the FAA proposed ruling. Responses were classified as Agree, Disagree, or Partial. A classification of “Agree” means the response generally was in favor of the rules, and a classification of “Disagree” means the response was generally opposed to the rules. If a response was unclear one way or the other, or if the comment only addressed one or two provisions of the rule, it was classified as “Partial.” Figure 28 shows the breakdown in Overall Position.
Slightly over half of the responses generally disagreed with the rules. A number of the comments only pertained to Public Law 111-216, while others only addressed the FAA proposed ruling.

**Qualitative Data**

Many of the responses included comments relating to points not specifically addressed in the NPRM questions. While difficult to quantify, the researcher felt the comments added depth and perspective to the responses. The questions posed by the FAA did not necessarily cover all the relevant topics. Table 2 shows the ten most frequent comments.

The most frequent comment refers to the high cost of training required to become a pilot in air carrier operations. A number of the comments pertaining to this topic mentioned that it might cost over $150,000 just to build the 1,500 hours necessary for an unrestricted ATP, using even small single-engine airplanes. Several of the comments remarked that this cost is on par with the cost of obtaining a license to practice law or
medicine, and that with the low salaries being offered by regional airlines, it may deter prospective pilots from entering the field altogether.

Table 2

*Ten Most Frequent Comments from NPRM Responses*

<table>
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<tr>
<th>Comment</th>
<th>Frequency</th>
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<tbody>
<tr>
<td>Cost of training for prospective part 121 SICs is a big factor</td>
<td>57</td>
</tr>
<tr>
<td>Higher flight hour requirement would not have prevented Colgan accident</td>
<td>53</td>
</tr>
<tr>
<td>Cross-country requirements should be reduced</td>
<td>50</td>
</tr>
<tr>
<td>References to <em>Pilot Source Study</em> (Smith et al., 2010)</td>
<td>48</td>
</tr>
<tr>
<td>There needs to be some sort of grandfather clause</td>
<td>27</td>
</tr>
<tr>
<td>Training at the airline is more important than building hours before hire</td>
<td>20</td>
</tr>
<tr>
<td>There should be “one level of safety”</td>
<td>18</td>
</tr>
<tr>
<td>Ruling is a “knee-jerk” reaction and/or overreaction to Colgan accident</td>
<td>13</td>
</tr>
<tr>
<td>Eliminate the age requirement for ATP</td>
<td>10</td>
</tr>
<tr>
<td>Don’t water down the rules</td>
<td>10</td>
</tr>
</tbody>
</table>

Many responses remarked that the higher flight-hour requirement resulting from Public Law 111-216 would not have prevented the Colgan accident. Both flight crewmembers involved in the accident had well over 1,500 flight hours. In addition, there were comments indicating there were factors other than flight time and/or experience to blame in the Colgan accident, including quality of training, fatigue, and crew professionalism.

Another frequent comment was that the cross-country time requirement to receive an ATP should be reduced. A pilot will have to log 325 hours of cross-country time to receive a restricted ATP, and 500 hours to receive an unrestricted ATP. Many of these
comments expressed the difficulty of logging cross-country time in the flight training environment, especially as a flight instructor. The majority of flight time built as a flight instructor comes from time spent in the traffic pattern or the practice area. In addition, many respondents suggested that there is little merit in cross-country time. To be considered cross-country time, the flight must be conducted a straight-line distance of at least 50 miles away from the departure airport; however, the pilot does not necessarily have to land at another airport. Because most of the time is spent in the cruise phase of flight, there may not be as much value as there would be practicing maneuvers or takeoffs and landings. Several respondents felt that 325 hours is not enough of a reduction for a restricted ATP, and recommended a requirement of 100 or even 75 hours.

A good portion of the responses referenced the conclusions drawn from the Pilot Source Study (Smith et al., 2010). Several of these comments indicated that pilots with between 500 and 1,000 hours can be safe and effective pilots, and they tend to perform better in initial airline training than pilots with more flight time. Some of the comments specified that pilots with baccalaureate collegiate aviation degrees performed better; other comments did not.

Another frequent comment referred to the need for some type of grandfather clause, either for pilots who are currently serving as SIC under part 121, or for pilots already going through flight training with the goal of becoming a pilot in air carrier operations. If such a clause is not put in place, there will be pilots who are currently qualified for a job with the airlines who will become unqualified on August 1, 2013 when the law goes into effect.
There were a number of comments which stated the need for ‘one level of safety.’ ‘One level of safety’ refers to holding all pilots to the same qualification standards, regardless of seat position or type of airline. The argument for ‘one level of safety’ is that peoples’ lives are always at stake no matter what type of flight operation is being conducted.

Several responses indicated that the new pilot qualification rules were a sudden, “knee-jerk” reaction to the crash of Colgan Flight 3407. Some stated that the ruling is more political in nature, and not necessarily something that will enhance safety. Others said the ruling is an overreaction to one aviation accident.

Several responses had comments regarding the age requirement for an ATP. These respondents felt that there should not be a minimum age to obtain an ATP. Under both the current and proposed requirements for an ATP, a candidate must be at least 23 years old. To obtain a restricted ATP, a candidate will have to be at least 21 years old. Most of the comments regarding the age limitation referred to the age for a restricted ATP; however, there were also a few that referred to the unrestricted ATP. These respondents believe age has very little to do with whether or not a pilot is qualified for air carrier operations.

Another frequent comment encouraged the FAA not to “water down” the proposed rules. The majority of these comments suggested eliminating the restricted ATP option. Many stated that these rules are long overdue, and will have lasting benefits to safety and to the industry as a whole. In addition to enhancing safety, some respondents indicated that the new rules will have a positive effect on the public’s perception of aviation safety, which is also important. Others predicted that with the higher
requirements for entry into a regional airline career, airlines will be forced to offer higher salaries and benefits to pilots.
Chapter V

Conclusions and Recommendations

The purpose of the new proposed pilot qualification rules is to enhance safety by ensuring all pilots operating in part 121 operations are fully qualified to fly in the right seat of a large, transport aircraft. The intentions behind the legislation are valid, and the FAA has done an admirable job amending the previous requirements to help fit the Congressional mandates of the Public Law 111-216 (U.S. Congress, 2010). However, an analysis of the public responses to the NPRM has highlighted certain concerns that still need to be addressed before the final rule is issued.

Conclusions

There was a very wide variety of comments submitted in response to the NPRM on pilot certification and qualification. While the range of answers to each question was diverse, there were some common themes that arose.

Qualitative standards. The researcher found that many respondents felt quality and type of training were more important than a specific minimum number of hours. Pilots come from all types of backgrounds; therefore, they acquire skills and knowledge at different rates and through different methods. Instead of developing a “one-size-fits-all” system of standards, the FAA should consider gearing requirements towards outcomes rather than hours. Although Congress has already mandated the requirement for all pilots serving in part 121 operations to hold an ATP certificate, the FAA has the authority to modify the specific requirements to obtain an ATP. Rather than basing qualification for an ATP on a minimum number of flight hours, the FAA should adopt a more qualitative system. The FOQ ARC spent a significant amount of time and effort
developing a credit system based on academic training and different types of flight experience; the FAA should revisit this system and reconsider its implementation.

According to the majority of responses, the FAA should require a pilot to log 50 hours of flight time in a multiengine airplane before obtaining an ATP certificate. The FAA should also require a type rating for pilots wanting to serve as SIC under part 121. These two requirements will help ensure that a pilot is ready to be a true flight crewmember in air carrier operations, not just a new pilot who is still learning the ropes.

**ATP CTP.** The FAA should require pilots to complete the ATP CTP before taking the ATP written exam, as long as flight training institutions are allowed to integrate the course objectives into current curricula. This course should cover all the topics listed in the draft advisory circular (FAA, 2012b), and the knowledge test should be updated to reflect these subjects. Instead of requiring the proposed 24 hours of academic training, the FAA should be more flexible with the length and consider allowing candidates to complete the course only after mastering the subjects. This will not only ensure that candidates are ready to take the written exam, but that they actually have a comprehensive understanding of subjects that will be applied to everyday air carrier operations.

The ATP CTP should incorporate training in non-type specific FSTDs. This type of training, which is applicable to all large transport aircraft, can provide valuable skills that a pilot will use on the flight deck. These skills include CRM, threat and error management, safety management systems, weather avoidance, etc.

The FAA should consider removing the requirement of eight hours of training in a full-motion FFS. This type of training is too costly for both institutions and individuals,
and there is little evidence that motion-based training provides any benefit over fixed-base training. The ATP CTP should incorporate training in at least a Level 5 FSTD. Ideally, the minimum level of FSTD required should be tailored to the task being trained. Likewise, 24 hours is an appropriate length of time for FSTD training; however, a better measure of course completion would be proficiency in the course objectives.

**Restricted ATP.** The area of the NPRM that received the most attention in the responses was the proposal of the restricted ATP. Almost three-fourths of the responses had something to say about the restricted ATP, and the vast majority was in favor of this option. The FAA should offer the restricted ATP to military pilots, and graduates of collegiate aviation programs and affiliated part 141 training programs once they have logged at least 750 hours. In addition, the FAA should consider expanding this option to other candidates. Other eligible candidates could include graduates of collegiate aviation programs with affiliated part 61 schools (such as Purdue University), or graduates of 2-year collegiate aviation programs (Associate degrees which include flight training, for example). This may be done either on a case-by-case basis, or by revisiting the FOQ ARC credit system.

The FAA should consider some type of alternative licensing structure (i.e., the MPL), which would prepare pilots specifically for flying in the right seat of an aircraft operating under part 121. However, this question received the fewest responses from the public. Therefore, the FAA should do further research on the subject to see if such an alternative would be feasible and/or successful, but it should not overshadow the development of a restricted privileges ATP. It may be more appropriate to research this option in the near future.
The FAA should also remove the requirement to be at least 21 years old in order to receive a restricted ATP. Many of the comments indicated that age should not determine whether a pilot is qualified for air carrier operations, and that this will succeed in disqualifying bright young pilots who meet all the other requirements.

**Grandfather clause.** The FAA should establish some type of grandfather clause for pilots currently serving as SIC in part 121. If a pilot has already been hired at an airline and already has some experience in line operations, there is no reason that he or she should be laid off or furloughed as a result of the new rules. Such a pilot is likely more qualified to fly in the right seat than a pilot coming in with 1,500 flight hours and no airline experience.

**Cross-country minimums.** The FAA should consider reducing the cross-country time requirements for both a restricted ATP and an unrestricted ATP. Many responses suggested that there is no real merit to flying long, straight-line distances, especially if there is no requirement that the pilot land at another airport. The FAA might consider bringing these requirements into alignment with the ICAO requirement of 200 hours.

**Recommendations**

In the future with similar NPRMs, the FAA should task an individual (or a small group) with helping to develop questions and analyzing the responses at the end of the public comment period. This process would help ensure that the questions are reaching the core of each issue and soliciting meaningful answers. There were certain questions in this NPRM which were ambiguous, and therefore solicited vague answers.

The FAA may also want to improve upon the methods in which comments are submitted. For example, using a web-based survey tool could help expedite both the
collection and analysis of responses. With a web-based survey, the FAA could easily
gather responses to each individual question, and also leave room for open-ended
comments. This would ensure both quantitative and qualitative data gets collected. By
improving the public commenting process, the FAA can help make sure the public’s
opinions are actually heard. This may present a higher workload, but it will help achieve
the bottom line of safety throughout the aviation industry.
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Appendix A

Data Collection Device
<p>| Comment ID       | Name                                | Organization                                      | Type of Organization | Report Flt Exp? | Which Ratings? | Hours? | Q1a | Q1b | Q1c | Q2a | Q2b | Q2c | Q2d | Q3 | Q4 | Q6 | Q7a | Q7b | Q8 | Q9a | Q9c | Q12a | Q12b | Q12c |
|-----------------|-------------------------------------|---------------------------------------------------|----------------------|----------------|----------------|--------|-----|-----|-----|-----|-----|-----|-----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| FAA-2010-0100-1463 | Thomas Peterson                    | National Training Aircraft Symposium              | Individual           | NA             | NA             | NA     | NA  | NA  | NA  | NA  | NA  | NA  | NA  | NA | NA | NA  | NA  | Yes | Yes | Yes | Yes | No  | Yes | Yes | Yes | Yes | Yes | Yes | NA  |
| FAA-2010-0100-1553 | National Training Aircraft Symposium | Aerosim Flight Academy                            | Flight Training      | NA             | NA             | NA     | NA  | NA  | NA  | NA  | NA  | NA  | NA  | NA | NA | NA  | NA  | Yes | Yes | Yes | Yes | No  | Yes | Yes | Yes | Yes | Yes | Yes | NA  |
| FAA-2010-0100-1850 | Paul Woessner                      | National Training Aircraft Symposium              | Industry Organization| NA             | NA             | NA     | NA  | NA  | NA  | NA  | NA  | NA  | NA  | NA | NA | NA  | NA  | Yes | Yes | Yes | Yes | No  | Yes | Yes | Yes | Yes | Yes | Yes | NA  |
| FAA-2010-0100-1858 | Air Line Pilots Association, International | National Training Aircraft Symposium              | Organization         | NA             | NA             | NA     | NA  | NA  | NA  | NA  | NA  | NA  | NA  | NA | NA | NA  | NA  | Yes | Yes | Yes | Yes | No  | Yes | Yes | Yes | Yes | Yes | Yes | NA  |</p>
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**Grandfather Clause**

- Research shows motion isn't very important in simulators, ATP CTP could be imbedded in college program
- FAA should accept ARC recommendations for education credit; revise AC-61-ATP to encourage training providers to embed the acquisition of air carrier-related competencies throughout their program rather than as a post graduation event; delete level C sim requirement; develop a combination of oral, written, and practical examinations that focus on demonstrated knowledge and competencies rather than arbitrary hours of training exposure; release the rule outcome of the FOQ NPRM with a calendar that allows all stakeholders time for orderly planning and implementation
- There should be provisions to accommodate those pilots already engaged in part 121 operations (with commercial certificate) to make obtaining an ATP/restricted ATP and a type rating relatively simple and inexpensive

**Overall Agree/Disagree**

- Partial
- Disagree
- Disagree
- Agree
Appendix B

Academic Topics Recommended for ATP CTP
AC-61 ATP Draft Recommendations

10. ACADEMIC TRAINING TOPICS. The ATP certification training program must include at least 24 hours of classroom instruction. The aeronautical knowledge areas to be trained should include, but are not limited to, the following areas:

a. High Altitude Operations (minimum: 5 hours).

(1) Aerodynamics.
(a) Flight above flight level (FL) FL180 and FL350.
(b) Mach versus indicated airspeed (IAS) versus true airspeed (TAS).
(c) Bank angle at high altitude.
(d) Relationship between altitude capability and weight.
(e) Convergence of high and low stall speeds (coffin corner).
(f) Speed reductions at high altitude.
(g) Excursions behind the power curve at high altitudes and associated recovery techniques (high altitude slowdowns).
(h) Low speed approach to stall recovery techniques at high altitudes.
(i) Upset recovery techniques at high altitudes.
(j) Turbulent air penetration speeds.

(2) Physiology.
(a) Physics of the atmosphere and composition.
(b) Physical gas laws and relationship to respiration and circulation.
(c) Hypoxia (signs, symptoms, and effects).
(d) Times of useful consciousness.
(e) Preventative measures against hypoxia.
(f) Hyperventilation.
(g) Pressurization and decompression.
(h) Slow decompression, rapid decompression, and explosive decompression.
(i) Use of oxygen equipment for flightcrews.
(j) Effects of over-the-counter medication and alcohol on performance.
(k) Effects of fatigue on performance, including mitigation strategies.

b. Meteorology (minimum: 3 hours).

(1) Adverse Weather Phenomena That May Affect Air Carrier Operations.
(a) Wind shear detection and avoidance (convective activity).
(b) Turbulence detection and avoidance.
(c) Icing detection, avoidance, and operation strategies.
(d) Icing conditions on the ground, including the use of holdover tables, calculating holdover times (HOT), and pretakeoff contamination checks.
(e) Airplane deice/anti-ice procedures.
(f) Mountain wave activity.
(g) Crosswinds with gusts.
(h) Meteorology technology tools to avoid adverse weather.
(i) Knowledge of air carrier low-visibility operations, including low-visibility surface movement.
(j) Category (CAT) II and CAT III Approaches.
(k) Braking action reports (Mu).

(2) Weather Radar.

c. Air Carrier Operations (minimum: 12 hours).

(1) Automation.
(a) Introduction to computer-assisted piloting (pilot/system interface).
(b) Flight director (FD) mode of operation and interpretation.
(c) Introduction to the concepts of vertical navigation (VNAV).
(d) Importance and utilization of the flight management system (FMS).
(e) Mitigation strategies, including control inputs, for managing automation anomalies (e.g., managing the airplane with pitch and power with the loss of airspeed indications).
(f) Recovery techniques from automation input errors.
(g) Properly interpreting mode annunciation.

(2) Communications.
(a) Sterile flight deck rules.
(b) Voice communication strategies at high-demand airports (i.e., La Guardia Airport (KLGA) or Chicago O'Hare International Airport (KORD)) and high-workload environments (i.e., rejected takeoff).
(c) Advantages of proper briefings.
(d) How to properly accomplish professional briefings for all phases of ground and flight operations.
(e) Clearance delivery, Controller-Pilot Data Link Communications (CPDLC), multiple ground sector control, advanced communications such as a data link.

(3) Crew Resource Management.
(a) Operating in a multicrew environment.
(b) Introduction to crew resource management.
(c) The added dimension of Flight Attendants (F/A) and passengers.
(d) Knowledge-based decisionmaking.
(e) Pilot monitoring responsibilities.
(f) Professional responsibility including leadership and ethics.
(g) Risk management (RM).
(h) Threat and error management.
(i) Error trapping.
(j) Voluntary safety programs to include:
   • Aviation Safety Reporting System (ASRS),
   • Flight operational quality assurance (FOQA),
   • Aviation Safety Action Program (ASAP),
   • Line Operations Safety Audit (LOSA), and
• Safety Management System (SMS).

(4) Checklist Philosophy.
(a) Checklist philosophies (read/do, do/verify, flows).
(b) Proper use of quick reference handbook and checklists.
(c) Use of Aircraft Flight Manual (AFM) during normal procedures like ground deicing.

(5) Operational Control.
(a) Introduction to air carrier operations specifications (OpSpecs).
(b) Air carrier operational control concept.
(c) Dispatch and flight following.
(d) Introduction to minimum equipment lists (MEL) and Configuration Deviation List (CDL).
(e) Dispatch with MEL items.
(f) Dispatcher and pilot responsibilities.
(g) Emergencies and decisionmaking.

(6) Ground Operations.
(a) Runway Incursion Prevention, Including:
   • Professionalism during taxi operations, including sterile flight deck,
   • Airport situational awareness,
   • Taxi route planning and briefings including hot spot identification and runway crossings, and
   • Technology (Electronic Flight Bag (EFB), moving maps).
(b) Practical Knowledge of Airport Surface Operations, Including:
   • Airport movement areas,
   • Ramp procedures and communications,
   • Standard taxi routes,
   • Complex taxi procedures, and
   • Surface movement guidance and control systems.

(7) Turbine Engines.
(a) Turbine engine theory.
(b) Differences in thrust application of a turbine engine versus a reciprocating engine.
(c) Turbine engine malfunctions (surge, compressor stalls, rollback).
(d) Precautionary engine shutdown (windmill effect).
(e) Catastrophic failure.
(f) Engine re-starts at high altitude.
(g) Knowledge of turbine-powered engine monitoring systems, including:
   • Engine indicating and crew alerting system (EICAS) or electronic centralized aircraft monitoring (ECAM); and
   • Engine pressure ratio (EPR), N1, N2, and engine gas temperature (EGT) indications.
(8) Transport Airplane Performance.
   (a) Weight and altitude relationship.
   (b) Flap retraction schedule.
   (c) Leading edge devices (advantages and disadvantages).
   (d) Turbine-powered airplane flight characteristics, power curve.
   (e) Review of maximum lift over drag ratio (L/DMax).
   (f) Flight characteristics of swept wing airplanes such as a dutch roll.
   (g) Flight operations performance characteristics of VMCG, VMCA, V1, V2, and mach speeds at altitude.
   (h) Demonstrate the proper use of rudder in transport category airplane and discuss the limitations associated with its use to include airplane certification standards.
   (i) Stalls and recovery techniques of transport category airplane.
   (j) Weight and Balance (W&B).
      • W&B loading.
      • Introduction to air carrier W&B systems (average weight program; indexing).
   (k) Performance calculations.
      • Air carrier performance requirements including balanced field length, accelerate-go, accelerate-stop, VMCG, and second segment climb performance.
      • Performance calculations required for dispatch.
      • Performance calculations required for takeoff.
      • Air carrier en route performance requirements.
      • Performance calculations required for landing.
      • Contaminated runway considerations for takeoff and landing.
      • Additional air carrier maintenance and operational procedures required in order to dispatch with components or items of equipment deferred in accordance with the MEL.
      • Additional air carrier procedures and operational limitations (i.e., speed restrictions) required in order to operate with exterior access doors, hatches, fairings, etc., removed in accordance with the CDL.
      • Maintenance release procedures for air carrier operations.

(9) Navigation.
   (a) Airspace speed restrictions.
   (b) Class II navigation.
   (c) Transport airplane advanced avionics systems (FMS, glass cockpit).
   (d) Area Navigation (RNAV) capabilities, lateral navigation (LNAV), VNAV, Required Navigation Performance (RNP), and required equipment.
   (e) Traffic Alert and Collision Avoidance System (TCAS), Automatic Dependent Surveillance-Broadcast (ADS-B).
   (f) Ground proximity warning systems (GPWS), Enhanced Ground Proximity Warning System (EGPWS)
FOQ ARC Recommendations

ADVANCED AIRCRAFT SYSTEMS AND PERFORMANCE

A. Exhibits satisfactory knowledge of jet transport aerodynamics.

B. Exhibits satisfactory knowledge of specific aircraft flight characteristics.

C. Exhibits satisfactory knowledge of turbine engine theory.

D. Exhibits satisfactory knowledge of jet transport engine monitoring systems, such as the engine indication and crew alerting system.

E. Exhibits satisfactory knowledge of flight operations engineering to include air carrier aircraft performance, weight and balance (W&B), and hydroplaning, including the ability to determine—
   - W&B loading,
   - Air carrier takeoff performance requirements,
   - Air carrier en route requirements, and
   - Air carrier landing requirements.

F. Exhibits satisfactory knowledge of modern transport aircraft avionics systems.

G. Exhibits satisfactory knowledge of air carrier aircraft emergency, irregular, and non-normal procedures including—
   - Checklist philosophies,
   - Proper use of quick reference handbook/checklists, and
   - Use of flight manual procedures.

NAVIGATION IN AIR CARRIER OPERATIONS

A. Exhibits satisfactory knowledge of high altitude airspace.

B. Exhibits satisfactory knowledge of navigation systems for practical use in all phases of flight incorporating relative and coordinate-based navigation systems.

C. Exhibits Extended-Range Twin-Engine Operational Performance Standards.

D. Exhibits Reduced Vertical Separation Minimum.

E. Exhibits satisfactory knowledge of jet transport navigation and approach chart interpretation.

F. Exhibits satisfactory knowledge of jet transport flight management systems (FMS).
G. Exhibits satisfactory knowledge in the selection and application of all available levels of automation (including hand flying), and the actions necessary to readily transition between levels of automation.

H. Exhibits satisfactory knowledge of flight guidance systems used in air carrier operations.

I. Exhibits satisfactory knowledge of air carrier route planning techniques and tools.
AIR CARRIER OPERATIONS AND SAFETY AND SECURITY

A. Exhibits satisfactory knowledge of part 121 Certification and Operations: Domestic, Flag, and Supplemental Air Carriers and Commercial Operators of large aircraft. Also, exhibits satisfactory knowledge of aviation security concepts, including—
   • Transportation Security Administration requirements,
   • Airport security requirements, and
   • Ground/in-flight security roles and responsibilities.

B. Exhibits satisfactory knowledge of the Department of Transportation’s dangerous goods requirements to include proper identification, packaging, and loading of dangerous goods aboard air carrier aircraft.

C. Exhibits satisfactory knowledge for the use of air carrier operations specifications.

D. Exhibits satisfactory knowledge of high altitude physiology.

E. Exhibits satisfactory knowledge of the effects of fatigue on performance, including mitigation strategies.

F. Exhibits satisfactory practical knowledge of airport surface operations, including—
   • Taxi route planning,
   • Airport movement areas,
   • Ramp procedures and communications,
   • Charted procedures,
   • Complex taxi procedures,
   • Aircraft configurations for specific weather conditions,
   • Aircraft configurations for fuel economy, and
   • Surface movement guidance and control systems.

G. Exhibits satisfactory knowledge of air carrier operational control, including—
   • Dispatch and flight following,
   • Dispatcher and pilot responsibilities, and
   • Emergencies.

H. Exhibits satisfactory knowledge of air carrier maintenance procedures appropriate to flight operations, including—
   • Maintenance release procedures,
   • Use of the master minimum equipment list (MEL)/configuration deviation list (CDL) in developing an air carrier MEL/CDL, and
   • Use of the MEL/CDL.
AIR CARRIER WEATHER PLANNING

A. Exhibits satisfactory knowledge of high altitude weather characteristics.

B. Exhibits satisfactory knowledge of high altitude weather and weather planning tools used in part 121 operations.

C. Exhibits satisfactory knowledge of adverse weather phenomena that affects air carrier operations such as windshear, turbulence, and icing.

D. Exhibits satisfactory knowledge of the use of technology tools to avoid adverse weather.

E. Exhibits satisfactory knowledge of air carrier low-visibility operations, including—
   • Low-visibility surface movement and
   • Category II (CAT II) and CAT III approaches.

COMMUNICATIONS

A. Exhibits satisfactory knowledge of air carrier communication requirements and systems, including—
   • Voice communication and
   • Advanced communications such as data link.

B. Exhibits satisfactory knowledge of ATC communication requirements and systems.

C. Exhibits ATC phraseology:
   • ATC phraseology,
   • Complex ATC clearances, and
   • Communications at high-density airports.
STALL AND UPSET RECOGNITION AND RECOVERY

A. Exhibits satisfactory knowledge of in-flight loss of control and appropriate upset recovery techniques in transport category aircraft.

B. Exhibit satisfactory knowledge of loss of control phenomena, such as—
   • Stalls,
   • Wake turbulence,
   • Flight instrumentation failure, and
   • Flight control failure.

AIR CARRIER PILOT PROFESSIONALISM

A. Exhibits satisfactory knowledge of a pilot’s professional responsibility and ethics, to include communications, risk management, decisionmaking, and leadership.


C. Exhibits satisfactory knowledge of good customer service to include passenger communications, affairs, and regulations.