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Delays in Hiring Air Traffic Collegiate Training Initiative (AT-CTI) Graduates and the Impact on Their Training Success Rate

Terra Jorgenson

DELAYS IN HIRING AIR TRAFFIC COLLEGIATE TRAINING INITIATIVE (AT-CTI) GRADUATES AND THE IMPACT ON THEIR TRAINING SUCCESS RATE

by

Terra A. Jorgenson
Bachelor of Science, Southern Illinois University of Carbondale, 1996
Bachelor of Science, DeSales University, 2007

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_____
Kimberly A. Kenville, Ph. D., Chairperson

_____
Brett D. Venhuizen, J.D.

_____
Elizabeth Bjerke, Ph.D.

This thesis is being submitted by the appointed advisory committee as having met all the requirements of the Graduate School at the University of North Dakota and is hereby approved.

_____
Wayne E. Swisher, Ph.D.
Dean of the Graduate School

_____
May 1, 2013

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Terra A. Jorgenson
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ABSTRACT

This research project identified three distinct groups of individuals the Federal Aviation Administration (FAA) utilizes when filling the employee ranks of Air Traffic Controllers (ATC). After a nationwide strike, President Reagan fired the entire ATC workforce in 1981 (Pavel, 2012). Since then the FAA has worked very diligently in filling the vacant positions. Now three decades later the impending retirements and attrition of those hired earlier is estimated at nearly 14,000 controllers over the next 10 years (FAA CWP, 2012).

In response to this shortage it would be advantageous for the FAA to minimize the time lapsed in the selection, hiring and training processes. If the hiring process time was decreased, it would save the FAA money in terms of a reduction in the initial cost of training Air Traffic Controllers (GAO, 2012; IRP, 2011).

Traditionally the FAA hires from three distinct groups of people. The first is those with prior ATC experience which was usually obtained through the military. Second the general public with no experience and third the Air Traffic Collegiate Training Initiative (AT-CTI) candidates. The AT-CTI program is a valued partner with the FAA that helps educate the next generation of Air Traffic Controllers; however in the past the program has had difficulty producing the total number of replacement controllers needed. Due to the delay some CTI graduates may choose other career paths rather than wait and be hired to go to the FAA Academy which will further reduce the number of candidates for

the FAA to hire. To date, no public research has been done pertaining to the time delay in the hiring process of AT-CTI candidates and the impact on training success at the FAA Academy and at the CTI's first FAA facility.

This study used a survey tool to gather information on how long AT-CTI graduates wait to be hired to attend the FAA Academy. Information was gathered on the factors that may affect the time lapse between graduation and the time they arrive at the FAA Academy. In addition, the effect of the wait on the success rate of training at the FAA Academy and at the candidate's first facility was examined. Data was collected to examine the relationship between a CTI graduate's performance in the CTI program and the individual's performance during FAA training at the FAA Academy and assignment to their first facility.

Through correlation analysis of the Air Traffic Basics (AT-Basic), Air Traffic Selection and Training (AT-SAT) and Performance Verification (PV) scores there was significant correlation between the AT-Basic and PV scores. As the AT-Basic score increases so does the PV scores. There needs to be future research on GPA's, PV's, AT-SAT and AT-Basics scores to determine if any of them are predictors of CTI's success in training. If the FAA can better predict if an applicant will be successful in training, it can save the FAA money in the selection, hiring and training process.

CHAPTER I

INTRODUCTION

In 1981, thousands of air traffic controllers who participated in a nationwide strike were fired and subsequently barred by a presidential directive from reemployment with the Federal Aviation Administration (FAA) as Air Traffic Controllers (ATC). As a result of the strike, the FAA was forced to hire, over a three to four year period, thousands of new air traffic controllers to rebuild its controller workforce (GAO, 1988; Pavel, 2012). Of the controllers hired after the strike, 3,064 became eligible to retire by the end of 2011, which accounts for one third of the controller workforce at that time (FAA, 2012; GAO, 2012).

There are three distinct sources from which the FAA hires new ATC candidates. The first source for new hires is candidates with previous experience consisting of Department of Defense (DOD) controllers and the pool of fired controllers that were allowed to return to the FAA in 1993. The second source is Air Traffic Collegiate Training Initiative (AT-CTI) candidates. CTI's are graduates of post-secondary educational institutions that have Air Traffic Control curriculum. Lastly, the FAA has hired ATC candidates with no previous air traffic experience coming from the general public (Pavel, 2012).

With the large number of Air Traffic Controllers required over the next 10 years it would be advantageous for the FAA to reduce the time dedicated to their selection and hiring processes. If the hiring process time was decreased, it could save the FAA money

in terms of a reduction in the initial cost of training Air Traffic Controllers (GAO, 2012; IRP, 2011).

In order to have data to reassess the Air Traffic Control Specialist (ATCS) selection, assignment and training process the FAA would need to track employees from time of application to retirement date (IRP, 2011). In the case of CTI graduates, they should be tracked from college graduation date to retirement date to make the process more efficient. This study looked at possible correlations between the length of time lapse between graduation and the CTI's arriving at the FAA Academy, along with the success rate in training both at the FAA Academy and at their first facility.

Treutel (2012) conducted a study on CTI graduates from Embry-Riddle Aeronautical University (ERAU) concerning the choices that graduates made after graduating while waiting for the FAA to hire them. This study provides a starting point and a place to add to the research already completed on CTI graduates.

Additional studies are needed to assess the impact of extended wait times between college graduation and reporting to the FAA Academy. The FAA considers the AT-CTI program to be an important source for hiring Air Traffic Controllers. Some graduates are choosing other careers, possibly due to the long wait to be hired; therefore reducing the number of CTI graduates for the FAA to hire (Treutel, 2012). Which increases the need to hire from the other sources previously indicated.

The FAA Administrator convened the Independent Review Panel (IRP) to help more efficiently plan the placement and training of new hire controllers. A proposed model for ATCS selection, for AT-CTI graduates only, was to take into consideration Air Traffic Selection and Training test (AT-SAT) scores, the level of CTI school from which

the applicant graduated, college GPA, job interview and an assessment by a panel of FAA Officials (IRP, 2011).

In the literature review the history of the ATC selection, hiring and training process will be explored. This will help explain the current process and how it could be improved. There will be a discussion of the Air Traffic Collegiate Training Initiative (AT-CTI) Program and how the FAA relies on this program to supply them with educated, well rounded and diverse Air Traffic Control Specialist (ATCS) candidates. It will review previous studies by the FAA, IRP, and Treutel. These studies provide an informed starting point for more research.

Purpose of Study

The importance of this study is shown in the Independent Review Panel (IRP) study which discusses the need for more research into the factors involved in the selection and hiring process of ATCS. In a 2009 study completed the Department of Transportation's Office of the Inspector General (DOT OIG) identified factors related to training failures:

> a series of factors that could indicate trends and potential root causes of training failures. Those include: … (3) hiring source and previous experience, (4) AT-SAT test scores and (5) Academy Performance Verification (PV) scores… there were not sufficient data on these factors to identify trends… aggregated data on these types of factors will become increasingly important." To improve the predictability of the AT-SAT battery, it is important for the FAA to attempt to correlate controller training success and failure with specific scores on AT-SAT (IRP, 2012, p. 9).

In order to create a workable selection, hiring and placement program within the FAA the FAA Officials need analyzed data to make more informed decisions. Additional studies should be conducted to analyze the possible correlation between CTI School, AT-SAT scores, PV score and college GPA to training success as an Air Traffic Controller. By studying many different factors in the education and hiring process of the CTI graduates there will be an examination of what factors show correlation to success in ATC training. This study examined the time CTI graduates must wait to arrive at the FAA Academy for training and the predictability of their success in training at the FAA Academy and their first facility.

Research Questions

1. What is the average time lapse, for CTI Graduates, between graduation date and the date arriving at the FAA Academy for training?
2. How does the length of time waiting to be hired by the FAA correlate to the training success at the FAA Academy?
3. How does the length of time waiting to be hired by the FAA correlate to the training success at their first facility?
4. What is the relationship between CTI Graduates performance in the CTI Program to the performance in FAA training?
5. Is there an impact on the FAA training performance with demographic differences?

Literature Review

Due to the large number of Air Traffic Controllers hired to replace the fired Air Traffic Controllers after the Professional Air Traffic Controller Organization (PATCO) strike in 1981, the FAA must hire nearly 14,000 Air Traffic Controllers, from 2011 to

2021. The controllers hired after the strike in 1981 are now reaching retirement age. The FAA needs to replace the controllers retiring and replace controllers lost due to attrition (Pavel, 2012; FAA CWP, 2012). There have been many changes in the FAA selection and hiring process throughout the years. Today's process consists of three distinct groups the FAA utilizes to fill the employee ranks of ATC. The first is prior ATC experience; second the Air Traffic Collegiate Training Initiative (AT-CTI) candidates; and finally the general public with no ATC experience. The AT-CTI program was developed in 1991 in an attempt to ease the shortage of qualified applicants and is the FAA's preferred group to hire ATC candidates, as it provides the FAA with well rounded, educated and diverse workforce (FAA AT-CTI, 2012).

In 2007, the AT-CTI program accounted for 56% or 1,019 new controllers (FAA, 2007). In 2008, the AT-CTI program accounted for 37% or 823 new controllers (FAA, 2009). In 2009 there was a major hiring push and the AT-CTI program was unable to supply the total number of controllers necessary (Pavel, 2012). The AT-CTI program still accounted for 19% or 335 of the new controllers (FAA, 2010). Overall from 2006 through 2009 the AT-CTI program accounted for 36% or 3,437 new controllers (Pavel, 2012).

History of ATC Hiring Process

Prior to 1964 the selection and hiring of ATC applicants required an application, selection, medical exam, Federal Aviation Administration (FAA) Academy training and facility training. The selection process consisted of the application and ranking (according to their pre-employment work experience), educational background, and an interview with ATC management. The highest ranking score was given to applicants with prior ATC experience, usually gained in the military. Any aviation experience was

also looked at favorably. If there was no aviation experience then they looked for a four-year degree or three years of general work experience (Cobb & Nelson, 1974; Pavel, 2012).

After 1964, the application process changed and the FAA required applicants to take an exam consisting of six U.S. Civil Service Commission aptitude tests. Depending on their pre-employment experience, applicants were required to receive a minimum score on the exam. After passing the exam with the required score they would add points to the score for work experience. Prior ATC experience was worth an additional 15 points, pilot experience with more than 300 hours was worth 10 points, military service with an honorable discharge was worth 5 points, and another 5 points if wounded while in military service (Cobb & Nelson, 1974; Pavel, 2012).

Even though air traffic doubled during the 1960's the controller force only increased by 10% (Rose, Jenkins & Hurst, 1978). In order to increase controller staffing in 1968 the FAA waived the requirements to take the Civil Service Commission ATC Aptitude Screening test and pre-employment screening of applicants with highly specialized, such as radar control, ATC experience (Cobb & Nelson, 1974; Pavel, 2012).

Due to hiring applicants with previous military ATC experience or pilot experience, the FAA realized the controller workforce was lacking overall diversity including gender, race and ethnicity (Cobb & Nelson, 1974; Pavel, 2012). To increase diversity the FAA created a new hiring program called the Predevelopmental "150" Program (Boone, 1978; Pavel, 2012). This was a one year program that gave women and minorities aviation experience which would increase their chances to succeed in ATC training (Cobb & Nelson, 1974; Pavel, 2012).

In 1973, another change in the selection and hiring process took place (Pavel, 2012). The FAA's Civil Aviation Medical Institute (CAMI) did two studies comparing training success rates of the applicants with highly specialized experience to the applicants without experience and found that the experienced applicants did have a higher success rate at the Academy. The second study compared the attrition rate at the facilities level and determined the experienced controllers had a slightly higher attrition rate than applicants with no aviation experience (Cobb, Lay & Bourdet, 1971; Cobb, Mathews & Nelson, 1972).Due to the new findings; the experienced applicants were no longer waived from taking the aptitude tests. The study also found that ATC training success was significantly greater for Air Traffic Control Specialists that were 34 and younger regardless of experience. It was determined that age was a variable to the success rate; therefore the FAA added a maximum age of 30 to the initial qualification requirements (Cobb et al, 1971; Pavel, 2012).

Due to the changes in the ATC candidate selection process in 1973, 21% of the FAA Academy trainees were women and minorities by 1976 (Boone, 1978). Even with the increase of women and minorities at the Academy, another study was completed in the northeast part of the United States and found that 100% of the controllers were male, middle class; half had some college or a college degree and 99% served in the military (Rose et al, 1978). This clearly indicated that more work was needed to attract women and minorities into the Air Traffic Controller workforce.

The applicability of the U.S. Civil Service Commission (CSC) ATC Aptitude Test was analyzed and in 1981 the test was replaced by the Office of Personnel Management (OPM) three-test battery. The OPM three-test battery consisted of the Multiplex

Controller Aptitude Test (MCAT), the Abstract Reasoning Test (ABSR) and the Occupational Knowledge Test (OKT) (Broach & Manning, 1997).

In August of 1981, the Professional Air Traffic Controllers Organization (PATCO) went on strike and 11,345 controllers were subsequently fired by President Ronald Reagan. The FAA was tasked with hiring replacements for the fired controllers. By October 1985, 13,533 applicants had entered the FAA Academy ATC Training (GAO, 1988). The Government Accounting Office (GAO) commissioned the Flight Safety Foundation to study the controller workforce. This study covered the size and composition of the controller work force, controller workload, and high overtime, the training of new controllers, FAA management practices and controller morale. Data was collected from two sources. The first source was FAA payroll, personnel and air traffic activity systems. The second source was a survey of 4,500 radar controllers, 1,000 first-line supervisors, the managers of the 20 Air Route Traffic Control Centers and 54 of the busiest terminal facilities in the United States. The findings of this study showed concerns over the inadequate number of Full Performance Level (FPL) controllers at the busiest facilities, record level air traffic activity, FPL Controllers spending 25% more time on position per day, overtime is expected to stay high, problems with the quality and amount of on-the-job training and widespread employee/management problems at facilities that adversely affected controller and supervisor morale (GAO, 1986).

Staffing concerns were due to high attrition rate for newly hired controllers in Enroute Centers, the congressional mandate to hire 10,450 Full Performance Level (FPL) controllers by the end of 1988 was not met, they screened 100 applicants in order to hire and train one FPL controller, deficiencies in training caused safety issues, and

standardized training at many facilities was not evident, and contract training at the Enroute Centers was also an issue (GAO, 1986; GAO, 1988; GAO, 1989).

In August of 1988, the FAA Administrator responded by creating a program to establish an Office of Training. This office established 1) a national recruiting program, 2) new relationships with academia and industry, 3) new air traffic screening program and an 4) Institute for Human Resources Research to improve selection, training, human performance and human factors research. In October of 1988, the FAA Office of Training and Higher Education was created (GAO, 1989).

In 1988, the majority of ATC applicants came from a large downsizing of the military forces and so many military controllers applied for FAA positions. In 1992 the FAA closed the hiring process for the general population. Later in 1992 the FAA discontinued initial training at the FAA Academy. In August of 1993 President Clinton signed an executive order allowing former PATCO controllers to be considered for re-employment. The FAA only hired approximately 100 controllers a year from 1992 to 1997 (Aul, 1998; Pavel, 2012).

By 1991, as a response to better manage training, to increase the controller work force and have a positive effect on the diversity of the controller workforce; the FAA Office of Training and Higher Education established the Air Traffic Collegiate Training Initiative program (AT-CTI). Two earlier programs, the College Cooperative (Co-op) Education Program and the Airway Sciences Program, were designed to recruit and attract college students in air traffic related careers. In response to the earlier programs, the AT-CTI program was designed to give students more comprehensive pre-training to allow graduates to by-pass the initial training at the FAA Academy and be placed directly

into ATC facilities (Morrison, Forouhi & Broach, 1996; Pavel, 2012; FAA AT-CTI, 2012).

After evaluating the potential benefits of AT-CTI programs at five schools including Community College of Beaver College, Hampton University, Minneapolis Community & Technical College, University of Alaska and University of North Dakota the FAA formally established the AT-CTI program in 1996. In 1997 the AT-CTI schools were increased to thirteen (FAA AT-CTI, 2012).

Beginning in 1997 hiring increased again and the FAA was planning to hire more than 570 controllers a year until 2002. The post-strike Air Traffic Controllers were reaching retirement age of 56. The FAA also reopened the FAA Academy and all newly hired Air Traffic Controllers had to pass the technical skill-building portion (Aul, 1998; GAO, 1997).

In 2002, the FAA revised the aptitude test and renamed it the Air Traffic Selection and Training test (AT-SAT) (King, Manning & Drechsler, 2007). The FAA decided, with the introduction of the AT-SAT, the AT-CTI schools would no longer need to focus on selection and screening and would instead concentrate on teaching basic air traffic knowledge (FAA AT-CTI, 2012). With this change all AT-CTI graduates would have to attend the FAA Academy but would be able to bypass the AT Basics Academy portion of training and only attend a pass/fail skills based course. Too increase the number of ATC applicants the FAA expanded the AT-CTI program by 9 in 2007 again in 2008 by 8 and in 2009 by 5 for a total of 36 programs (FAA AT-CTI, 2012). The increased number of ATC applicants is necessary to replace the ATC workforce that is expected to retire from 2005 through 2021 (FAA, 2004; FAA, 2012; Pavel, 2012).

ATC Current Hiring Process

As seen from the history of the selection and hiring process of Air Traffic Controllers (ATC), throughout the years there have been many changes. This section will explain today's requirements to apply as an Air Traffic Controller, testing requirements and the three paths to follow in order to be a candidate to take the Air Traffic Selection and Training (AT-SAT) test. In order to apply to be an Air Traffic Controller you must be a U.S. citizen. Applicants must be able to read, write, speak and understand the English language (Pavel, 2012; FAA AT-CTI, 2012).

Once a candidate has met the previous conditions they can take the AT-SAT test. After completing the AT-SAT and passing with a score of 70% or better they are put on a list of qualified candidates. If they score 85% or higher they are considered very qualified. When there are vacancies, the FAA selects names from this list (Pavel, 2012; FAA AT-CTI, 2012).

Once a candidate is selected they must complete an FAA interview and pass an FAA medical exam, drug test, and a background investigation for security suitability. The current hiring process, as in the past, consists of three different paths in which a candidate may be chosen from. The first path is to have prior experience as an Air Traffic Controller, usually from the military. To qualify as prior experience you must have been a veteran with military air traffic control experience, retired military Air Traffic Controller or current and prior civilian air traffic control experience. Veterans with controller experience can apply through the Veteran's Recruitment Appointment (VRA) authority and be selected for an opening without competition. Retired military controllers between the ages of 31 – 56 years old can apply for a five year position as a controller. At the end of five years the FAA can renew the position for an additional five

years up until the age of 56. Current or prior experience can be former FAA controllers and controllers from Department of Defense (DOD) facilities. Air Traffic Controllers with previous experience must be under the age of 31 and pass the FAA Academy Initial Training Program (FAA website; Pavel, 2012; FAA AT-CTI, 2012).

The second path to employment is a candidate with no prior air traffic control experience, called "off the street hires". Without prior ATC experience the applicant must be under the age of 31, speak clear English, have a four year college degree or three years work experience or a combination of the two. The applicant can apply to take the AT-SAT test and must score an 85% or better. If selected by the panel of FAA officials they must then pass a medical exam, security investigation and an interview. Then they will be sent to the FAA Academy and must pass the FAA Academy initial training (FAA website; Pavel, 2012; FAA AT-CTI, 2012).

The third hiring path is for college graduates from the 36 AT-CTI schools. This option will be discussed in more detail in the following section along with a discussion of the AT-CTI program in general (FAA website; Pavel, 2012; FAA AT-CTI, 2012).

In 2007 the largest numbers of Air Traffic Controllers were hired from the AT-CTI program accounting for 1,019 or 56% of new hires (FAA, 2007). AT-CTI applicants again in 2008 were also the largest source of new hires with 823 which was over 37% (FAA, 2009). CTI graduates have accounted for 36% or 3,437of all new hires from 2005 to 2009 (FAA, 2010). In 2009 there was a major hiring initiative as the AT-CTI programs could not fill the demand. Once again, the FAA began hiring from the general public (Pavel, 2012).

Air Traffic Collegiate Training Initiative Program

The FAA Air Traffic Collegiate Training Initiative (AT-CTI) Program was designed to establish partnerships with higher education institutions to broaden the employment opportunities in the aviation industry, including air traffic controllers. AT-CTI graduates are not guaranteed jobs as air traffic controllers although the FAA considers AT-CTI graduates a valuable hiring resource for air traffic control specialist (ATCS) positions (FAA AT-CTI, 2012). In 1991 when the AT-CTI program was initially established the intent was for graduates to go directly to their first facility upon their hire date (Pavel, 2012; FAA AT-CTI, 2012).

According to the FAA (2012) "The goal of the program is to encourage high school graduates to pursue aviation related degrees that will benefit the FAA and aviation as a whole." (FAA website)

However, there is no guarantee that a student will be hired due to their graduation from a designated program. Each person pursuing a career as an air traffic controller has to fulfill the basic requirements. They may not be eligible for employment for various reasons including not passing the prerequisite Air Traffic Skills and Training (ATSAT) test, an aptitude test given to candidates with no previous air traffic control experience, not being recommended by their institution, not passing the security check and not passing the medical exam (FAA AT-CTI, 2012). Therefore, students should prepare themselves to pursue other careers if necessary.

The FAA has agreements with 36 institutions across the country that include curriculum covering the fundamentals of aviation and air traffic management within their degree programs (FAA AT-CTI, 2012). The fundamentals include basic information such as the topics and objectives listed in Appendix C.

Each school submits their degree curriculum, to the FAA, to be considered part of the program. Currently the 36 institutions offer 15 different Associate degrees, 37 Bachelor degrees, and three Master's degree programs (FAA AT-CTI, 2012).

In addition to successful completion of a degree program, there are other requirements that a CTI student should consider before committing themselves. In order to be considered, you must be a United States citizen and, if required, registered for the selective service. A CTI graduate must receive an official school recommendation. Each school determines the criteria for recommendation to the FAA, which could include grade point average, attendance, and/or a Capstone project or test. In most cases, a graduate cannot have reached age 31 prior to the appointment (offered a job as an air traffic controller). Additional requirements are to pass a medical examination, pass both a background and a security investigation, obtain a score of at least 70 on the FAA pre-employment test (ATSAT), complete an interview to determine whether the candidate possesses the personal characteristics necessary for the performance of air traffic control work and that the candidate is able to speak English clearly enough to be understood over communications equipment (FAA AT-CTI, 2012)

Provided one meets all of the aforementioned requirements, the candidate will be allowed to apply for a job as an air traffic controller under the CTI Announcement. Selection for a job as an air traffic controller is dependent on the application and resume, experience, where the candidate is willing to work and their ATSAT score. Once the candidate has been selected and received a Firm Offer Letter, they will be scheduled to begin their training at the FAA Academy in Oklahoma City to become an air traffic controller (FAA AT-CTI, 2012).

As a graduate of the CTI Program a candidate will bypass the otherwise required course of Air Traffic Basics and be placed in initial training for the facility option for which they were selected. The length of training is 37 days for Tower and 62 days for En Route. After successful completion of the initial training, a candidate will go to their first facility for on-the-job training. The FAA Aviation Careers Division maintains an inventory of students enrolled in the AT-CTI program provided by school officials, and of eligible AT-CTI graduates. The FAA uses the AT-CTI inventory to track information on applicants eligibility, graduation dates, school recommendation status, and for scheduling the pre-employment test (FAA AT-CTI, 2012).

CTI graduates can stay in the inventory for at least three years after they graduate from their AT-CTI program. The initial eligibility period is three years from their graduation date or their 31st birthday, if sooner. After that, a candidate can stay in the inventory only if they apply each year for an extension (FAA, 2012).

Recommendations for the ATCS Selection and Hiring

In September, 2011, the Independent Review Panel convened by the FAA Administrator produced a report that reviewed ATSC selection, assignment and training including a review of the AT-CTI program. The National Air Traffic Controllers Association (NATCA) working group showed their support for change when making the statement "an improved training and screening process should reduce attrition rates" (IRP, 2011). Previously in 2008, the FAA Air Traffic Controller Hiring Process Tiger Team Report stated "as a short term modification the need to improve reporting capabilities and applicant tracking" (IRP, 2011).

The first section of the IRP reviewed the AT-CTI program and selection process. The panel observed the AT-CTI programs from 36 different institutions. The finding was

that programs ranged from teaching only the Air Traffic Basics to others that taught a full air traffic control curriculum including high-fidelity simulators. The IRP suggested the FAA should distinguish between the AT-CTI programs. The CTI schools should be categorized by levels according to the programs curriculum strengths (IRP, 2011).

Table 1. Four levels of AT-CTI schools

Level	Level Description
1	Those institutions that teach only Air Traffic Basics including aircraft identification and performance
2	Those institutions that teach Air Traffic Basics and the theory of at least one option with no supporting lab(s).
3	Those institutions that teach Air Traffic Basics and at least one option with supporting lab(s)
4	Those institutions that teach Air Traffic Basics and all options (Tower, Terminal Radar, En Route and Non-Radar) with supporting labs for each option

The next suggestion was to track performance of the individual CTI schools. The panel suggested the FAA track the success of each hiring source so that it can determine from which source success is prevalent (IRP, 2011). By sharing this information with the institutions; the institutions can then better determine their course strengths and weaknesses and therefore be able to strengthen their curriculum.

The FAA has begun to provide performance feedback to CTI partner institutions. The performance feedback is sent to each institution with their individual data and includes a comparison of all CTI Schools combined. The feedback includes Air Traffic Basics Subject Area Performance, Air Traffic Basics Average Scores, and lists partner institution graduates who have attained Certified Professional Controller (CPC) status at their field facility for the year being reported (FAA AT-CTI, 2012).

The Air Traffic Basics Subject Area Performance is divided into 14 Air Traffic Basics objective sections, as shown in Appendix C. These sections include the number and percentage of test questions answered correctly on the Air Traffic Basics exam (FAA AT-CTI, 2012). This will allow institutions to continually assess which areas their graduates have had difficulty in and increase curriculum focus in these areas.

The next section is the Air Traffic Basics Average Scores and uses historical data to report averages for all Air Traffic Basics testing. This is reported by institution and then compared to all CTI Schools (FAA AT-CTI, 2012).

The final section is the CPC success in facility training report for graduates from each institution. This section includes the number of students, average facility level, attrition, number of students in which training is still in progress, total number of students attaining CPC certification, and average time to CPC (FAA AT-CTI, 2012).

The IRP reviewed the Air Traffic Selection and Training (AT-SAT) battery and selection testing. In reviewing the AT-SAT it was determined there had not been any completed studies that determined if the AT-SAT actually predicted training success of those who took the exam. Without a study and analysis of the predictability of the AT-SAT the FAA cannot be positive the AT-SAT is accomplishing its original goals (IRP, 2011).

The FAA reviewed the ranking of the AT-SAT scores. They currently band 85 to 100 as well qualified and 70 to 84.9 as qualified. A study by the Department of Transportation's Office of the Inspector General (DOT OIG) in 2009 identified

> a series of factors that could indicate trends and potential root causes of training failures. Those include: … (3) hiring source and previous experience, (4) AT-SAT test scores and (5) Academy Performance Verification (PV) scores… there

> were not sufficient data on these factors to identify trends… aggregated data on these types of factors will become increasingly important (IRP, 2011, p. 9).

The FAA needs to attempt to correlate controller training success and failure with AT-SAT scores in order to improve the predictability of the AT-SAT (IRP, 2011).

Many field facilities question the effectiveness of the AT-SAT as a major factor in selecting candidates for air traffic control training. A study by the DOT OIG (2010) stated:

> overall AT-SAT scores have been higher than originally expected. Although the FAA scientists who designed the AT-SAT predicted that only 67.5 percent of all applicants would pass AT-SAT as originally designed, nearly 93 percent of all applicants currently achieve a passing score. AT-SAT has a high pass rate primarily because FAA reweighed elements from the original test (IRP, 2011, p 9).

Since the AT-SAT passing rate is much higher than projected the FAA needs to study the effectiveness and predictability of the AT-SAT to determine if it is a reliable factor for selecting air traffic control candidates.

The AT-SAT is currently administered through a contractor and the applicants are notified of a date, time and location when they must be available to take the test. The IRP recommended that already established FAA approved test sites that administer tests for pilots and aviation mechanics be allowed to administer the AT-SAT and then students could take the test at their convenience. Additional concerns were the frequency of the exam retakes. When applicants take the AT-SAT, they are not allowed to retake the test if they score a 70% or higher, for 3 years. The IRP recommends the FAA allow applicants to retake the exam at one year (IRP, 2011).

After the IRP reviewed the FAA's selection process for Air Traffic Controllers they looked at the United States Air Force method for selecting pilots for undergraduate pilot training to come up with a recommendation for a better selection process for ATC. Table 2 lists the factors recommended by the IRP (2011) for the ATCS selection process.

Table 2. Model for ATCS Selection Process

Objective	Points	Subjective	Points
AT-SAT	15	Interview	15
College GPA	10	Selection Panel Assessment	15
Air Traffic Basics Score	5		
AT-CTI Level	40		

The IRP (2011) went into detail how the above points could be calculated and how this is only a starting point for the selection panel decisions. The IRP suggested that CTI graduates should be tracked from graduation through training success or failure to give the selection panel more data to determine the final model for the selection process (IRP, 2011).

Section 2 of the IRP report addressed Academy training and the assignment process for ATC candidates. Some of their concerns had been stated in earlier studies by the DOT OIG. A recent study by the DOT OIG (2010) found that:

> new controller candidates are being assigned to some of the busiest air traffic control facilities in the nation with little consideration of whether they have the knowledge, skills and abilities necessary to become certified controllers at those locations. (IRP, 2011, p. 22)

A report by the FAA (2009) explains how the ATC facility levels are classified using a formula designed to take into account the traffic volume and complexity factors such as the varying mix in speed and performance characteristics of aircraft using the

airport or transiting airspace under the control of the terminal; the airport configuration in terms of runway and taxiway layout, lengths and capacities; provision of control services for secondary airports; proximity of other airports; class of airspace; weather observation responsibilities; terrain; interaction with foreign countries; and military operations (FAA, 2009). As the DOT OIG (2010) states above if the new hires are placed in facilities that are above their skills and abilities and have a high volume of traffic and difficult complexity it can hinder their ability to be successful in training (DOT OIG, 2010).

The report by the DOT OIG (2010) later states:

> The FAA Academy provides an opportunity for many experienced controllers to evaluate candidates in a controlled environment. However, FAA does not use candidates' performance during initial training in determining the level of facility in which the candidates are placed. FAA personnel at FAA Headquarters, the FAA Academy and selected air traffic control facilities almost unanimously supported making facility assignments after Academy graduation (IRP, 2011, p. 22).

The OIG report released in 2011 showed the attrition rate for 2008 was 31%, 2009 was 21% and 2010 was 22%. The IRP recommends that ATC candidates at the Academy should be assigned a track based on the results of their Air Traffic Basics test, Introduction Tower Training evaluation, Introduction TRACON Training evaluation, Introduction En Route Training evaluation, candidate preference and the needs of the FAA (IRP, 2011).

Once the track is decided the IRP (2011) recommends delaying the facility assignment until the Advanced Terminal or En Route Training evaluation has been

completed. The candidate's aptitude assessment should be accomplished by field management (IRP, 2011).

Controller Workforce Plan (CWP) 2012 - 2021

Since 2004, an annual Controller Workforce Plan has been required by Section 221 of Public Law 108-176 (updated by Public Law 111-117), which requires the FAA Administrator to report to the Senate Committee on Commerce, Science and Transportation and the House of Representatives Committee on Transportation and Infrastructure on the state of the controller workforce (FAA CWP, 2012).

The FAA would like to have a pool of applicants between 2000 and 3000 at any given time. At the conclusion of Fiscal Year 2011 the FAA pool was over 5000. In 2011, the FAA hired from the general public but they expect to reverse this trend because of the number of applicants available from the AT-CTI program and military sources (FAA CWP, 2012).

The estimated controller losses are based on historical rates. These losses include resignations, removals (other than developmental attrition) and deaths which account for 57 to 59 controllers a year. The developmental attrition, which are trainees who terminate from the FAA for failure to successfully complete training, are estimated to range from 115 to 162 controllers per year. Academy attrition is new hires that are not successful in the training program at the FAA Academy. The Academy attrition accounts for 55 to 91 controllers per year. Controller attrition due to promotions and other transfers account for 276 to 386 per year. The rest of the losses are accounted for in expected retirements. The total projected controller losses from 2011 to 2021 range from 937 to 1,346 a year (FAA CWP, 2012).

The attrition rate attributed to resignations can be a concerning number. A study by Jaska, Hogan & Ziegler (2012) discussed the possible changes management, in the FAA, may have to make in their management styles due to Generation Y employees. Generation Y are persons born after 1981. The Jaska et al (2012) research question was "how much do the general attitudes of Gen Y members differ from the general attitudes of Gen X and Boomers?" (Jaska, et al, 2012, p. 3)

The study by Jaska, et al (2012) states "Gen Ys general attitude towards life is enigmatic, and they like being individualistic and bringing change to their environment. They dislike bossiness and the status quo in corporate culture." (Jaska, et al, 2012, p. 3) The Gen X believes that Gen Y workers are lazy and undisciplined. A study by Gursoy, Maierb & Chi (2008) describes the difference in work ethic between Baby Boomers and Gen X as "Baby Boomers lived to work and Gen Xers work to live." A study by Aquino (2012) described that Generation-Y members "work to fund their lifestyle."

The current culture in the FAA is very structured and disciplined. If the Gen Y employee's do not like the work environment the FAA may find difficulty in keeping the Gen Y members from resigning. This will cause an increase in training costs and difficulty in maintaining appropriate staffing level of ATCS facilities.

Figure 1 shows the projected number of controllers planned to be hired and estimated losses from 2011 to 2021.

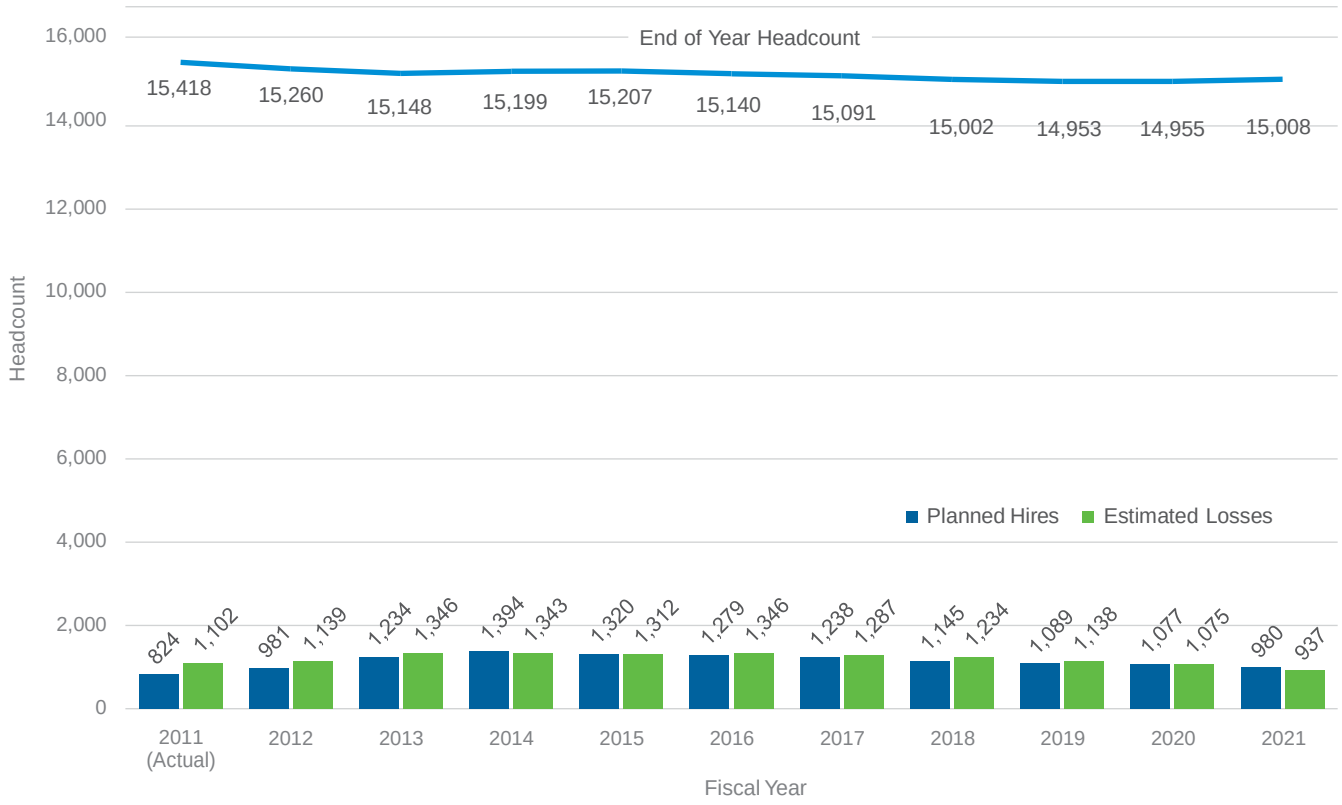

Figure 1: Projected Controller Workforce
(FAA 2012 Controller Workforce Plan)

The FAA is spreading out the hiring in an effort to reduce the magnitude of the effect of retirements in the future years (FAA-CWP, 2012).

Figure 2 shows the large number of Air Traffic Controllers eligible for retirement in 2011 and how many for each year through 2021 (FAA-CWP, 2012). With the large number of controllers needed each year it would benefit the FAA to reduce the required time for the application process in order to get the CTI graduates processed and hired as soon as possible after graduation.

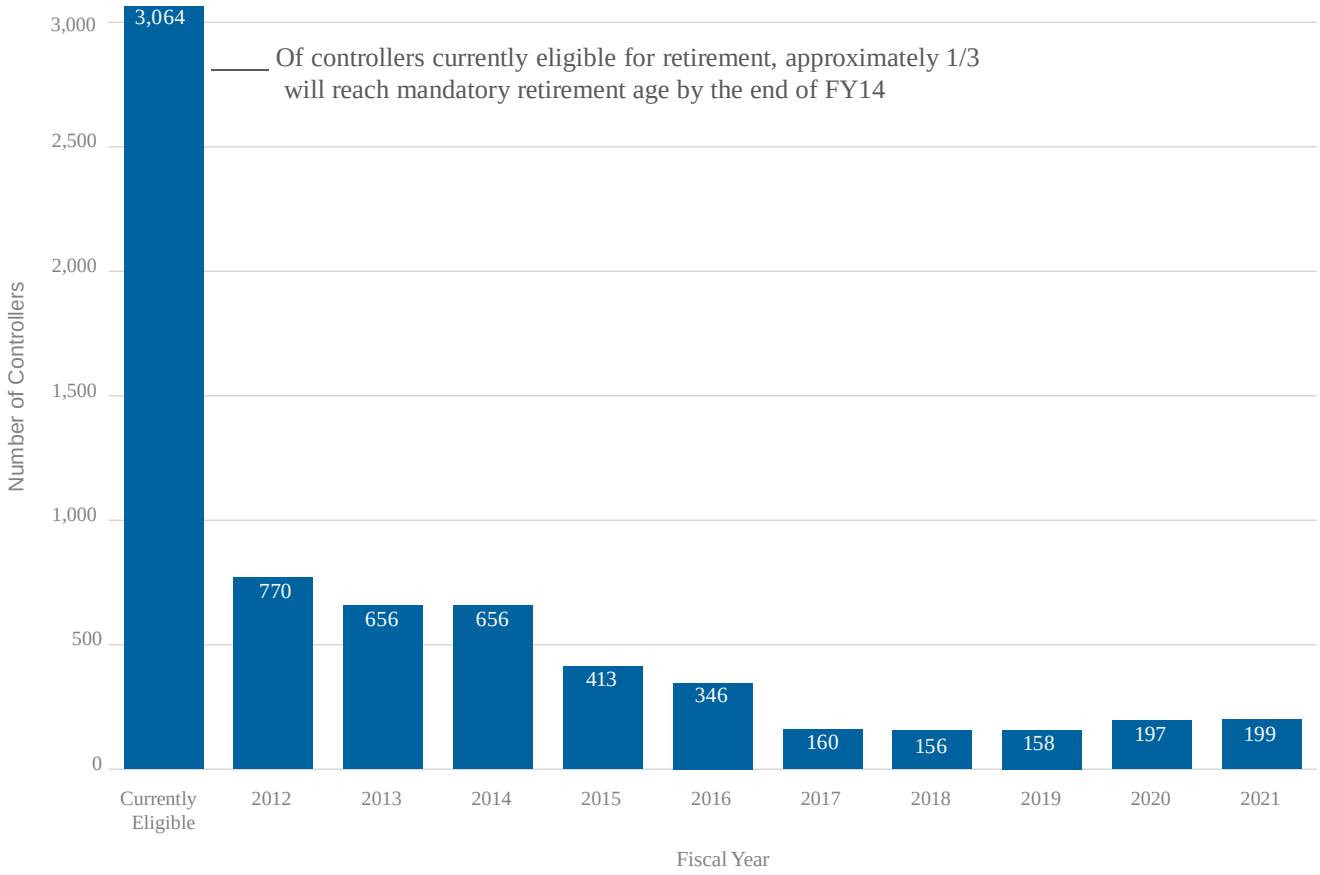

Figure 2: ATCS Qualified to Retire from 2011 to 2021.
(FAA, 2012 Controller Workforce Plan)

Figure 3 shows the training time to become certified at en route and terminal facilities.

Facility Type	Facility Level	Training Target	FY 2009	FY 2010	FY 2011
En Route	All	3.0	2.62	2.62	2.79
Terminal	4-6	1.5	1.08	1.39	1.34
	7-9	2.0	1.48	1.82	2.01
	10-12	2.5	1.65	2.01	2.39

Figure 3: Years to Certify from 2009 to 2011
(FAA 2012 Controller Workforce Plan)

Delays in Hiring AT-CTI Graduates

In order to have data to continue to reassess the ATCS selection, assignment and training process the FAA needs to track employees from application to retirement date (IRP, 2012). In the case of CTI graduates, it would be useful to track CTI graduates from freshman year in college to retirement date to evaluate their college performance and see if there is any correlation to their success in the FAA.

Treutel (2012) surveyed CTI graduates from Embry-Riddle Aeronautical University (ERAU) concerning the options that graduates had to make after graduation while waiting for the FAA to hire them. The delay in hiring can be caused by many factors. The data collected was intended to help the personnel offices better serve future graduates in determining their choices while they wait to be hired by the FAA. The second part of this research was concerned with the question on what factors affect how long a graduate waits before being placed in the FAA.

Some of the broad choices made by the graduates were to continue their education by pursuing an advanced degree or employment. Of the 98 respondents 79 or 80.6% of them still planned to pursue a job as an Air Traffic Controller or already were Air Traffic Controllers. However 19.4% chose other career opportunities (Treutel, 2012).

The study looked at factors that may affect the wait time for employment with the FAA, to see if there was any significance to why the wait time was longer with some graduates than others. The factors they gathered information on was the year the CTI graduated, the number of respondents that did an internship with an FAA facility and which states they picked on their applications. All showed no significance, however again this was a small population surveyed (Treutel, 2012). The IRP, (2011) report recommended the FAA allow the applicants to choose a location by indicating a region, states or anywhere. This could drastically reduce the time CTI graduates spend waiting to be hired by the FAA. The AT-CTI program was originally designed to allow CTI graduates to go directly to their first FAA facility, without having to go to the FAA Academy for training. This would reduce the time CTI graduates would have to wait to receive a class date at the FAA Academy.

The Treutel (2012) study was limited to the graduates from the ERAU Daytona Beach campus and there was only one month to collect the information using a survey. The study did not account for those alumni who did not apply to be an Air Traffic Controller with the FAA (Treutel, 2012). This research is the start to better understanding the effects of the delay in time to be hired by the FAA on CTI graduates.

CHAPTER II

METHODOLOGY

AT-CTI graduates frequently face delays in starting training at the FAA Academy as Air Traffic Controllers and employment by the FAA is not guaranteed. Students are advised that the wait could range from graduation to three years. Some graduates decide while waiting to pursue other careers and others are disqualified by failing either the AT-SAT, interview, medical exams or security check.

This study examined the correlation between positive performance rate at the Academy and the CTI candidate's first facility certification with the amount of time spent waiting for the initial training to commence. Additionally, the study examined the demographics and how the tests administered throughout the education and evaluation process of the graduates may correlate or predict success rates in training outcomes. This chapter discusses the study population, sample, and research design in detail.

Population

The population examined by this study is AT-CTI graduates from three secondary educational institutions. There are 36 AT-CTI schools in total. This population should enable feedback from a cross section of AT-CTI graduates at different locations and levels of education. Also the introduction to the survey will encourage participants to forward the survey link to any CTI Graduates that want to participate. This will widen the population to graduates of other CTI schools. One of the variables, the AT-SAT test began being administered in 2002 therefore the population will consist of the CTI

Graduates from 2002 to present. Some of the survey questions will not pertain to all graduates therefore we will allow students to answer the questions that concern them individually. The only surveys that will be eliminated will be the ones that do not answer any questions.

Sample

The study will survey AT-CTI graduates from three secondary educational institutions. The graduates are from the University of North Dakota in Grand Forks, ND; Community College of Beaver County in Monaca, PA; and Embry-Riddle Aeronautical University with campuses in Daytona Beach, FL and Prescott, AZ.

Graduates from these three institutions for the past ten years, starting in 2002, were surveyed. These three schools were chosen due to their geographic diversity across the United States and the different institutional types. The University of North Dakota is a public four year institution; Embry-Riddle Aeronautical University is a private four year institution; and Community College of Beaver County is a two year institution. Participants will not be compensated for their time and all responses are anonymous and voluntary.

Study Design

Selection of the sample population will be done by sending a link, to an electronic survey, to graduates from an Air Traffic Control Program at the Community College of Beaver County, Embry-Riddle Aeronautical University and the University of North Dakota. The survey link will be forwarded by the researcher to contacts at Community College of Beaver County and Embry-Riddle Aeronautical University and they will send it to their graduates. The Air Traffic Control Alumni from the University of North

Dakota, from the past 10 years, were contacted via Facebook to participate in the survey. The survey link was posted on Facebook so the graduates can participate anonymously.

Data Collection

The survey was available from any computer with internet and there was no time constraint. The survey was administered on Qualtrics, an online survey tool. Once the participant loaded the survey, the first page included a description of the research and instructions on how to complete the survey. The survey was open for responses for four weeks.

The survey included both qualitative and quantitative questions (see Appendix B). When the survey collection period ended, the responses were reviewed. The quantitative data was imported into SPSS for analysis while other qualitative data was exported into Microsoft Excel to be categorized. The survey allows participants to have an opportunity to provide more information if they wish by using open ended questions. There are 25 questions broken down into seven sections. Appendix D lists the quantitative variables that were analyzed.

The first section of the survey was the introduction. The second section asks questions regarding which CTI school they attended, grades, graduation date and are they a U.S. citizen. The third section asks for demographic information such as gender, race, AT-SAT score and did they apply for an ATC position with the FAA. The fourth section will only be answered if the graduate indicates they have applied for a job with the FAA. The questions in this section will be concerned with what two states they selected on their application, what was their primary objective while waiting to be hired and have they been hired yet. The fifth section will ask questions such as what date did they arrive at

the FAA Academy, what was their age, what was their AT-Basics test score, what was their PV score, and whether they were successful in training at the Academy. If they were successful in training at the Academy they will go on to the sixth section which asks questions regarding which option was their first facility, what level facility was it, did they successfully complete training to CPC status, and have they ever resigned from the FAA and if so what was the reason. The final section was a question to allow the participants to add any additional comments they would like.

Data Analysis

Quantitative data was imported into SPSS for analysis. The researcher read through all qualitative data to obtain a general sense of the information, code the data and then classify the data into themes for reporting. Results were displayed both by listing categorical themes and through narrative passages from participants. All data was reviewed to ensure reliability.

The quantitative data has been analyzed by running logistic regression analysis was run on the dependent variable of success at the FAA Academy and the independent variable of the number of months waiting between college graduation and arriving at the FAA Academy for training to determine any predictability. Additional logistic regression was completed on the dependent variable of success at the first FAA facility and the independent variable of the number of months waiting between college graduations and arriving at the FAA Academy for training to determine predictability.

The demographic data was analyzed running descriptive statistics frequency analysis to show the details of the makeup of the participants in the survey. The demographics of gender and initial ATC Facility Level were analyzed to determine if

there was any predictability of success in training at the FAA Academy and to CPC status at the CIT graduates first FAA facility.

Validity and Limitations

The survey was designed by the researcher for this topic. Some questions were derived from previous research studies and researcher experience. A panel of experts validated the survey. In addition, members of the subject population reviewed it before being administered to ensure that the survey was comprehensible for the target population.

To ensure validity of qualitative data analysis the researcher ensured that the categories were built from multiple participant responses. Information that does not fit into the categories will also be reported so as to ensure a balanced report.

The study has several limitations. Since the survey is anonymous there is no way for the researcher to follow up in case of questions regarding responses. In addition, due to this anonymity there is no way to ensure that individuals only took the survey one time. Due to some of the dates and details of the survey it was necessary to allow participants to leave the survey and return to the survey so they could finish it at a later date. Given the sensitive nature of some of the questions asked it is possible some participants will begin the survey and chose not to complete it. Also, due to anonymity some of the questions, such as scores received on tests and GPA's, it is possible a participant may answer with a higher or lower score than they actually had. It is also possible, on the questions asking for elapsed time of events, that participants may estimate and therefore times may be longer or shorter than the actual times. The intent of the survey was for it to be completed by participants that were successful as well as not

successful in training with the FAA as an Air Traffic Controller. While reviewing the data it was discovered that the majority of the respondents were successful in training therefore making it hard to make comparisons as to why the few did not succeed in training.

Protection of Human Subjects

Participants volunteered their time and responses for this survey. Every effort was made to protect participants from harm. The survey received approval from the Institutional Review Board (IRB) of the University of North Dakota. In addition, the survey received approval from Community College of Beaver County and the Embry-Riddle Aeronautical University IRB and forwarded the survey to their CTI graduates via e-mail. The e-mail can be seen in Appendix A. No personally identifiable information was collected. All subjects were informed that participation was voluntary and that they need only answer questions they felt comfortable answering. Any response received in the open-ended questions that could identify a participant was de-identified by the researcher. The survey tool did not collect any data that could link any specific survey to a participant.

CHAPTER III

RESULTS

Introduction

Qualtrics was the survey software used to design the survey. The survey was computer based and available through a link sent out via Facebook and e-mails. The survey was anonymous and voluntary. Embry-Riddle Aeronautical University and Community College Beaver County disseminated the survey link through e-mails to their Air Traffic Management Alumni.

Two hundred and sixty eight participants started the survey (n = 268). Thirty eight (n = 38) surveys were removed from analysis due to the fact that they did not answer any questions. Twenty three (n = 23) surveys were partially completed but not submitted therefore Qualtrics (survey software) recorded the data when the survey was closed. Two hundred and seven (n = 207) participants completed and submitted the survey in its entirety. After removal of surveys that did not answer any questions two hundred and thirty (N = 230) surveys remained to be included in the analysis. The survey was anonymous and voluntary.

Demographics

To get an understanding of the sample population that took the survey numerous demographic questions were asked. To get as many participants as possible three schools helped disseminate the survey to their Air Traffic Management Alumni. In the survey introduction the participants were encouraged to forward the link to any CTI graduates

that may want to participate. The demographics are examined and explained in the following sections.

Participants Schools

The survey was sent to graduates of the University of North Dakota, Embry-Riddle Aeronautical University and Community College Beaver County as shown in Table 3. In the survey introduction the participants were given the option to forward the survey link to other CTI graduates that may be interested in participating. Three surveys were from other institutions and one survey with missing data as seen in Table 3.

Table 3. Number of Surveys Completed by School

School		Frequency	Percent	Valid Percent
	University of North Dakota	167	72.6	72.9
	Embry-Riddle Aeronautical University	48	20.9	21.0
	Community College Beaver County	11	4.8	4.8
	Other	3	1.3	1.3
	Total	229	99.6	100.00
Missing		1	.4	
Total		230	100.00	

One hundred and sixty seven or 72.9% of participants that participated in the survey were from the University of North Dakota, forty eight or 20.9% were from Embry-Riddle Aeronautical University and eleven or 4.8% were from Community College of Beaver County.

There were three participants that selected other and these institutions are listed in Table 4 and were Green River Community College, Mt. San Antonio College (MTSAC) and University of Alaska Anchorage.

Table 4. Three Additional Institutions

School	Frequency	Percent	Valid Percent
Green River Community College	1	.4	.4
MTSAC	1	.4	.4
University of Alaska Anchorage	1	.4	.4
Total	230	100.0	100.0

The two hundred and thirty (n = 230) is the total number of participants that answered this question. The three additional institutions are 1.2% of the total participants.

Participants Gender

Additional demographic data collected was gender, race and age. Table 5 displays the gender split and percentages. Females account for 20% and males account for 76.5%. There are eight surveys that did not answer this question accounting for 3.5% of the total N = 230.

Table 5. Gender

	Frequency	Percent	Valid Percent
Male	176	76.5	79.3
Female	46	20.0	20.7
Total	222	96.5	100.0
Missing	8	3.5	
Total	230	100.0	

Participants Racial Origin

The survey questions discussing demographics asked the participants race. Out of two hundred and thirty participants two hundred and twenty two (n = 224) answered this question. Six (n = 6) of the participants did not answer this question and are shown as missing data. Of the race origins reported white's still are the overwhelming majority at 89.1%. All other race origins combined are 8.3% of participants. The six participants that did not answer this question are 2.6% of total participants. This data can be seen in Table 6.

Table 6. Racial Origin

		Frequency	Percent	Valid Percent
	White	205	89.1	91.5
	African American	3	1.3	1.3
	Hispanic	7	3.0	3.1
	Asian	5	2.2	2.2
	Other	4	1.7	1.8
	Total	224	97.4	100.0
Missing		6	2.6	
Total		230	100.0	

Four (n = 4) participants answered other and these results will be found in Table 7. Of the four (n = 4) participants that answered other only two entered, in text, their race therefore only two show up as data collected. The other two without data entered and the six that did not participate are included in the two hundred and twenty eight. Data collected is shown in Table 7.

Table 7. Other Racial Origin

		Frequency	Percent	Valid Percent
	European American	1	.4	.4
	Latin	1	.4	.4
Total		230	100.0	100.0

Participants Age

The participants were asked what age they were when they arrived at the FAA Academy for training. The ages ranged from twenty one to thirty two. One hundred and forty five (n = 145) participants answered this question.

Figure 4 is a graph of the ages the participants were when they arrived at the FAA Academy for training and the frequency of each. The graph indicates the majority of the ages fall between twenty two and twenty seven.

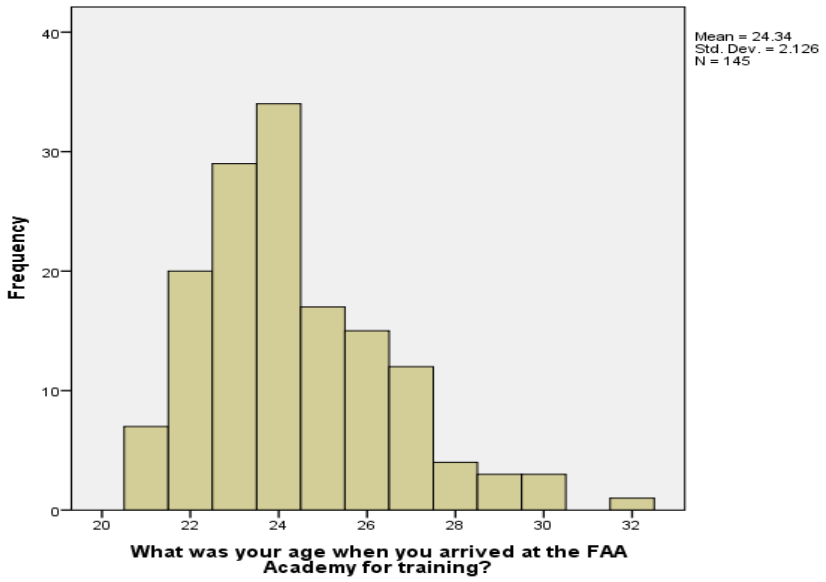

Figure 4: Age

Age 22 to 27 account for one hundred and twenty seven (n = 127) and a 67.5% of the total one hundred and forty five participants (n = 145). There were 85 participants or 37% that did not answer this question.

First ATC Facility

The survey questions discussing demographics asked which level ATC facility CTI graduates were first assigned to after completing training at the FAA Academy. The results are shown in Table 8.

Table 8. ATC Level of First FAA Facility

	Frequency	Percent	Valid Percent
ATC Level 5	13	5.7	9.5
ATC Level 6	21	9.1	15.3
ATC Level 7	22	9.6	16.1
ATC Level 8	8	3.5	5.8
ATC Level 9	11	4.8	8.0
ATC Level 10	11	4.8	8.0
ATC Level 11	27	11.7	19.7
ATC Level 12	24	10.4	17.5
Total	137	59.6	100.00
Missing	93	40.4	
Total	230	100.0	

Out of two hundred and thirty participants one hundred and thirty seven (n = 137) responded to this question. Ninety three (n = 93) of the participants had missing data for this question.

Time Lapse

In order to determine what the average time lapse was for CTI graduates between college graduation and the date arriving at the FAA Academy for training, two of the survey questions requested the date of graduation for each participant and the date each participant arrived at the FAA Academy. These dates were then used to determine the number of months each participant waited to arrive at the FAA Academy for training. One hundred and thirty seven (n = 137) surveys answered these questions. Through descriptive analysis shown in Table 9 the minimum time waited was two months, the maximum time waited was 78 months and the average time lapse is 19.69 months.

Table 9. Time Lapse Descriptive Statistics

	n	Minimum	Maximum	Mean	Std. Deviation
Number of Months	137	2	78	19.69	12.651

Training Success at the FAA Academy vs. Time Lapse

To analyze the impact and predictability of the time lapse, between college graduation and waiting to arrive at the FAA Academy, on the training success at the FAA Academy the time lapsed for each participant was examined through logistic regression. When running binary logistic regression, as used here, the dependent variable can only include two categorical outcomes. In this case the participants either successfully completed training or they were unsuccessful in training at the FAA Academy. The independent variable is the number of months that lapsed between college graduation and arriving at the FAA Academy. The data analysis is shown in Table 10.

Table 10. FAA Academy Success vs. Time Lapse

	B	S.E.	Sig.	Exp(B)	95% C. I. for EXP(B)	
					Lower	Upper
Months	.016	.031	.602	1.016	.957	1.079
Constant	-3.489	.841	.000	.031		

The selected data cases included one hundred and forty two (n = 142) surveys. Twenty one (n = 21) surveys had missing data. The total surveys included in the analysis is one hundred twenty one (n = 121). Of the one hundred and twenty one cases analyzed one hundred and sixteen were successful in training at the FAA Academy and five were unsuccessful.

The most important statistic in Table 10 is the odds ratio also known as Exp(B). The odds ratio is an indicator of the change in odds resulting from a unit change in the predictor or independent variable. Since the Exp(B) is 1.016, this is greater than one and indicates that as months increase the odds of success increase. The next statistic to look at is the significance. Significance is .602, since it is > .05 it indicates no significant

effect. Due to the low number of participants being unsuccessful in training it is difficult to draw any conclusion from this data.

Training Success at First FAA Facility vs. Time Lapse

The third research question was designed to analyze the impact of the months waiting after college graduation to go to the FAA Academy on success in training at the participant's first FAA facility. The selected data cases included ninety nine (n = 99) surveys. Thirteen (n = 13) surveys had missing data. The total surveys included in the analysis is eighty six (n = 86). Of the 86 analyzed 78 were successful in training at their first FAA facility and eight were not. The data analysis is shown in Table 11.

Table 11. Training Success at First FAA Facility vs. Time Lapse

	B	S.E.	Sig	Exp(B)	95% C.I. for EXP(B)	
					Lower	Upper
Months	-.020	.033	.542	.980	.919	1.045
Constant	-1.927	.652	.003	.146		

Since the Exp(B) is less than one at .980 it indicates that as months increase the odds of success in training at the first FAA facility decreased. The significance is .542 which is > .05 indicating no significant effect. Again, due to the low number of participants being unsuccessful in training it is difficult to draw a conclusion from this data.

CTI Graduates Performance in the CTI Program

The fourth research question was designed to analyze the relationship between CTI graduates performance in the CTI program and the predictability of success in training at the FAA Academy and at the graduate's first FAA facility. The first analysis will consist of the dependent or outcome variable of success in training at the FAA

Academy and the CTI Graduate's cumulative grade point average (GPA). The data analysis is shown in Table 12.

Table 12. GPA Predictability of Training Success at the FAA Academy

	B	S.E.	Sig.	Exp(B)	95% C.I. for EXP(B)	
					Lower	Upper
GPA	-1.237	1.137	.277	.290	.031	2.694
Constant	.978	3.680	.790	2.659		

The selected data cases included one hundred and forty two (n = 142) surveys. Three (n = 3) surveys had missing data. The total surveys included in the analysis is one hundred and thirty nine (n = 139). Of the 139 analyzed 133 were successful in training at the FAA Academy and six were unsuccessful.

Since the Exp(B) is less than one at .290 this indicates that as GPA increases the odds of success in training decrease. The significance is at .277 > .05 which indicates no significant effect. Again, due to the low number of participants being unsuccessful in training it is difficult to draw any conclusion from this data.

The second analysis is the logistic regression of the dependent or outcome variable, success in training at the CTI graduate's first FAA facility, and the independent variable or their cumulative GPA. The analysis is shown in Table 13.

Table 13. GPA Predictability of Training Success at the first FAA Facility

	B	S.E.	Sig.	Exp(B)	95% C.I. for EXP(B)	
					Lower	Upper
GPA	-.477	.982	.628	.621	.091	4.258
Constant	-.816	3.277	.803	.442		

The selected data cases included ninety nine (n = 99) surveys. Two (n = 2) surveys had missing data. The total surveys included in the analysis is ninety seven (n = 97). Of the ninety seven analyzed eighty nine (n = 89) were successful in training at their first FAA facility and eight (n = 8) were unsuccessful.

Exp(B) is the odds ratio which is an indicator of the change in odds resulting from a unit change in the predictor or independent variable. Since the Exp(B) is less than one at .621 this indicates that as GPA increases the odds of success in training decreases. The significance is > .05 at .628 which indicates no significant effect. Again, due to the low number of participants being unsuccessful in training it is difficult to draw any conclusion from this data.

Demographic Analysis

The fifth research question asks if there is an impact in the FAA training performance with demographic differences. Among the demographics collected the ATC Levels and gender were analyzed to determine if there is any significant predictability in success of training at the FAA Academy and at the CTI graduates first FAA facility.

ATC Facility Level Predictability of Training Success

For analysis the FAA ATC Levels were combined into three groups. The first group consisted of ATC Level four, five and six. This group is mainly VFR Towers with lower levels of traffic volume and complexity. The second group was ATC Level seven, eight and nine. This group is a combination of higher volume VFR Towers and medium size Tower/TRACONs. The third group consisted of ATC Level ten, eleven and twelve. This group can be characterized as the largest facilities which consist of Towers,

Approach Controls, Tower/TRACON and Enroute Centers with the highest traffic volume and highest complexity.

The first analysis was conducted to determine the predictability of success in training to CPC status at the CTI graduates first facility versus the level of facility the CTI graduate initially was sent to after successfully completing training at the FAA Academy. The results are shown in Table 14.

Table 14. ATC Level vs. Success in Training to CPC

Group	B	S.E.	Sig.	Exp(B)	95% C.I. for EXP(B)	
					Lower	Upper
ATC Group 1	-1.016	1.129	.368	.362	.040	3.306
ATC Group 2	-.307	.769	.690	.735	.163	3.322
Constant	-2.028	.476	.000	.132		

Ninety nine (n = 99) participants responded to which ATC Level Facility they were assigned to after successfully completing training at the FAA Academy. Ninety (n = 90) of the respondents were successful in training to CPC status at their first facility. Nine (n = 9) were not successful in training to CPC status.

ATC Group One combined ATC Level four, five and six facilities. Group One consisted of twenty two (n = 22) participants with twenty one (n = 21) being successful in training and one (n = 1) unsuccessful. The significance is reported at .368 which is > .05 therefore indicating no significant effect. The Exp(B) or odds ratio is less than one at .362 and the B coefficient is a -1.016 indicating that as the facility level increased the success rate decreased.

ATC Group Two combined ATC Level seven, eight and nine facilities. Group Two consisted of thirty four (n = 34) participants with thirty one (n = 31) being

successful in training and three (n = 3) unsuccessful. The significance is reported at .690 which is > .05 and indicates no significant effect. The Exp(B) is less than one at .735 and the B coefficient is -.307 indicating as the ATC Level increases the training success rate decreases.

ATC Group Three combined ATC Level ten, eleven and twelve facilities. Group Three consisted of forty three (n = 43) participants with thirty eight (n = 38) participants being successful in training to CPC status and five (n = 5) were unsuccessful in training. As table 14 shows ATC Group Three was not included in the final model analysis. SPSS eliminated ATC Group Three in the analysis due to the factor that group three did not significantly add to the predictability of the model as a whole.

Gender Predictability of Training Success

The second analysis on the demographic statistics is on gender and the predictability of success in training at the FAA Academy and at the CTI graduates first facility. When comparing the training success rate at the FAA Academy to gender we had one hundred and forty two (n = 142) participants. Of the one hundred and forty two, one hundred and fifteen (n = 115) were male and twenty seven (n = 27) were female. One hundred and thirty six (n = 136) were successful in training at the FAA Academy and six (n = 6) were unsuccessful. Of the twenty seven (n = 27) females, twenty six (n = 26) were successful in training and one (n = 1) was unsuccessful. Of the males one hundred and ten (n = 110) were successful and five (n = 5) were unsuccessful. The analysis in Table 15 only shows data for females as the software determined that adding the males to the model did not add significantly to the predictability of the model. The analysis can be seen in Table 15.

Table 15. Success in Training at FAA Academy vs. Gender

	B	S.E.	Sig.	Exp(B)	95% C.I. for EXP(B)	
					Lower	Upper
Gender (F)	.167	1.117	.881	1.182	.132	10.551
Constant	-3.258	1.019	.001	.038		

Reviewing the data in Table 15 the significance is reported at .881 which is > .05 indicating no significant effect. The Exp(B) is over one and the B coefficient is a positive number therefore indicating as the number of females increase the training success rate at the FAA Academy increases.

Due to the low number of unsuccessful outcomes in training it is difficult to detect any significant predictability of training success according to gender. Male controllers had a 4.5% unsuccessful training rate which is not unusual since males were 81% of the population. Females had a 3.8% failure rate but they were only 19% of the population.

The next analysis is to examine the predictability of the training success at the participant's first FAA facility versus gender. There were ninety nine (n = 99) participants of which eighty five (n = 85) were male and fourteen (n = 14) were female. Ninety (n = 90) participants were successful in training to CPC status at their first facility and nine (n = 9) were unsuccessful in training. Seventy nine (n = 79) males were successful in training and six (n = 6) males were unsuccessful. Eleven (n = 11) females were successful in training and three (n = 3) were unsuccessful. Table 16 only displays the data for males since adding the females to the model did not add significantly to the predictability of the model.

Table 16. Success in Training to CPC Status vs. Gender

	B	S.E.	Sig.	Exp(B)	95% C.I. for EXP(B)	
					Lower	Upper
Gender (M)	-1.278	.777	.100	.278	.061	1.277
Constant	-1.299	.651	.046	.273		

Reviewing the data in Table 16 the significance is reported at .100 which is > .05 indicating no significant effect. The Exp(B) is less than one at .278 and the B coefficient is a negative number at -1.278 therefore indicating as the number of males increases the training success rate to CPC at the participant's first FAA facility decreases.

Due to the low number of unsuccessful outcomes in training it is difficult to detect any significant predictability of training success according to gender. Male controllers had a 7.6% unsuccessful training rate which is not unusual since males were 79.8% of the population. Females had a 27.3% failure rate but they were only 14.1% of the population.

Correlation Analysis

The next analysis is to see if there is any correlation or relationship between the AT-Basics, AT-SAT and PV scores. The analysis examines the scores relationship using the correlation bivariate test in SPSS. There is no correlation between the AT-SAT scores and either of the AT-Basics or PV Scores. This is indicated by the significance of .275 for the AT-Basics and AT-SAT which is > .01 indicating no significant correlation. The AT-Basics and PV scores do show a correlation which is indicated by the .002 significance which is < .01 indicating a significant relationship. This is a positive correlation since r = .604 indicating as the AT-Basic score improves the PV scores improve. The data is displayed in Table 17.

Table 17. Correlation - AT-Basic, AT-SAT and PV Scores

		AT-SAT	AT-Basics	PV
AT-SAT	Pearson Correlation	1	-.095	-.108
	Sig. (1-tailed)		.275	.277
	N	166	42	32
AT-Basics	Pearson Correlation	-.095	1	.604
	Sig. (1-tailed)	.275		.002
	N	42	166	20
PV Score	Pearson Correlation	-.108	.604	1
	Sig. (1-tailed)	.277	.002	
	N	32	20	166

To verify the findings using Pearson's r the Kendall's tau test was used and also found a significant correlation between the AT-Basics and PV scores. The correlation is .404 with a significance of .011 which is < .05 indicating a significant correlation. The correlation being a positive number indicates they are positively correlated meaning as the AT-Basic score increases so should the performance on the PV.

Additionally, after getting Pearson's r, to measure the amount of variability in one variable that is shared by another can square .604 to determine $R^2 = .3648$, this is further interpreted as 36.5% of the variability between AT-Basics and PV scores.

Objectives While Waiting for Employment with the FAA

Two hundred and two (n = 202) participants answer the question regarding what their primary objective was while waiting for employment with the FAA. While CTI graduates waited to be hired by the FAA 94.1% chose to get employment. 2.0% of the graduates went on to earn an advance degree and 4.0% chose other. The data can be found in Table 18.

Table 18. Primary Objective While Waiting for Employment with the FAA

	Frequency	Percent	Valid Percent
Advanced Degree	4	1.7	2.0
Employment	190	82.6	94.1
Other	8	3.5	4.0
Total	202	87.8	100.0
Missing	28	12.2	
Total	230	100.0	

Participants were given the opportunity to add comments as to what other choices they made. Some of the additional comments were “work as a Remote Pilot Operator (RPO) and graduate school”, “life experiences”, “open a restaurant” and “went military ATC”.

CHAPTER IV

DISCUSSION

In 1981, thousands of air traffic controllers who participated in a nationwide strike were fired and subsequently barred by a presidential directive from reemployment with the Federal Aviation Administration (FAA) as Air Traffic Controllers (ATC). As a result of the strike, the FAA was forced to hire, over a three to four year period, thousands of new air traffic controllers to rebuild its controller workforce. Of the controllers hired after the strike, 3,064 became eligible to retire by the end of 2011 (FAA, 2012; GAO, 2012).

CTI graduates are a valued resource to the FAA to replace the now retiring controllers and the additional controllers lost through attrition. The FAA will need nearly 14,000 controllers from 2011 to 2021. The FAA also has a challenge to determine what the next generation ATCS aptitude requirements will be with Nex Gen on the horizon. These changes will also present a challenge for the CTI schools to implement changes to the training.

Demographics

The demographics that were examined through descriptive analysis were the schools that participated in the survey, gender, racial origin, age and first ATC facility level. The collection of the demographics was important to examine how far the FAA has come in diversifying the workforce and what factors may impact success in training. Analysis was performed using logistic regression on the first ATC facility level of each

participant and the predictability of success in training. The second analysis was performed on gender and its predictability of success in training. Both demographics were analyzed for success in training at the FAA Academy and the participant's first FAA facility.

Participants Schools

Through descriptive analysis the data shows that the institution that had the highest number of responses was the University of North Dakota which is not surprising since the study was conducted by a graduate student from the University of North Dakota. It would have been advisable to include a larger number of schools to increase the number of respondents and to increase the responses from participants that were unsuccessful in training. This would have given more data to examine what factors related to ATC may have caused or impacted training success.

Participants Gender

The descriptive analysis on gender indicates that there has been little change in the number of females versus males in the FAA workforce in the last 20 years. In the mid 1980's before the CTI program the FAA had a program called the Co-op program in which minorities applied and when selected they would be sent to FAA facilities to study and become more familiar with ATC procedures. It was thought that this would help minorities be more successful in training and therefore increase the diversity in the workforce. In 1991 the FAA established the CTI program to try again to increase minorities in the workforce. Examining the gender split it shows that the number of women is only 20% of the workforce. The FAA can't change who chooses to go to school to become an Air Traffic Controller. The CTI program can help the FAA attract

well rounded, educated professionals. These professionals will have better skills and abilities to move into management positions.

Gender Predictability of Training Success

The second analysis on the demographic statistics is on gender and the predictability of success in training at the FAA Academy and at the CTI graduates first facility. This study shows the gender split as males 79.4% and females 20.6% over all. Some of the cases were not included in the analysis due to not all participants had completed training at the FAA Academy yet. For this analysis the sample make up is males 81% and females 19%. Male controllers had a 4.5% unsuccessful training rate while females had a 3.8% failure rate.

The first analysis performed for gender was logistic regression and the predictability of success in training at the FAA Academy. The sample size was one hundred and forty two (n = 142). Of the one hundred and forty two, one hundred and fifteen (n = 115) were male and twenty seven (n = 27) were female. One hundred and thirty six (n = 136) were successful in training at the FAA Academy and six (n = 6) were unsuccessful. Of the twenty seven (n = 27) females, twenty six (n = 26) were successful in training and one (n = 1) was unsuccessful. Of the males one hundred and ten (n = 110) were successful and five (n = 5) were unsuccessful. SPSS only included data for females as the software determined that adding the males to the model did not significantly add to the predictability of the model.

The findings were not significant but did show as the number of females increased the success rate increased. The sample size is small and does not meet the necessary sample size of 350 to achieve the power of .8. With the low number of

unsuccessful training events it is also impossible to say if the FAA hired more women they would have a higher training success rate but with a more even number of men and women it would be interesting to see what the predictability of the success rate would be.

The second analysis for gender was the predictability of success in training to CPC status at the participant's first FAA facility. The sample size for this analysis was ninety nine (n = 99) participants of which eighty five (n = 85) were male and fourteen (n = 14) were female. Ninety (n = 90) participants were successful in training to CPC status at their first facility and nine (n = 9) were unsuccessful in training. Seventy nine (n = 79) males were successful in training and six (n = 6) males were unsuccessful. Eleven (n = 11) females were successful in training and three (n = 3) were unsuccessful.

The sample size is small at ninety nine (n = 99) and does not meet the sample size of 350 necessary to achieve the power of .8. The findings were significance of .100 which is > .05 indicating that for males the success rate decreases. This could be explained by the fact that males are the majority of the workforce.

Recommendations are to do further research and use a larger sample size. A more equal sample of women and men would also allow the research to see if there is any indication of one gender or another failing in training more frequently.

ATC Levels

ATC facility levels are determined by a formula designed to consider both traffic volume and complexity. Each facility maintains a daily traffic count either manually or through use of automation. However, traffic count is just a piece of the equation. Complexity is determined by analyzing type of traffic, crossing or converging runways,

mountainous terrain, traffic congestion and type of facility which together with traffic count determines the Classification Index or facility level (FAA, 2009).

For analysis the FAA ATC Levels were combined into three groups. The first group consisted of ATC Level four, five and six. This group is mainly VFR Towers with lower levels of traffic volume and complexity. The second group was ATC Level seven, eight and nine. This group is a combination medium to higher volume VFR Towers and more complex combined Tower/TRACONs. The third group consisted of ATC Level ten, eleven and twelve. These are the largest facilities which consist of Towers, Approach Controls, combined Tower/TRACONs and Enroute Centers with the highest traffic volume and highest complexity.

The first analysis was performed on the ATC level facility the participant was first assigned to after successfully completing training at the FAA Academy and its predictability of success in training to CPC status. The findings were not of significant effect however there did show a trend. The odds ratio, Exp(B), was less than one for both ATC Group One and Two. This indicates that as the ATC level increases the success rate decreases. The sample size was one hundred and thirty seven (n = 137) which is less than the 350 needed to get to a power of .8. Also, the total number of participants that were successful in training to CPC status was ninety (n = 90) and the total number of participants that were unsuccessful in training to CPC status was nine (n = 9). Again, we have a low number of participants that are unsuccessful in training. The recommendation would be to have data collection from existing data that would be more reliable as far as accuracy of scores and dates, to have the ability to have a larger sample size and include

both persons that were successful and unsuccessful in training. This was impossible to achieve in this study because the survey was anonymous and voluntary.

Recommendations that were made by the Independent Review Panel (2011) to wait to assign a CTI graduate to a facility after completing training at the FAA Academy is a positive step in the right direction. This would increase the chances of success as the trainees would be better matched with their abilities. To save additional money the FAA could also send FAA Certified Professional Controllers to schools with simulation and observe a CTI graduates abilities without having to pay the expense of sending them to the Academy. Not all AT-CTI schools have simulation so there would still be a portion of the graduates that would have to still attend the FAA Academy but it could still be a cost savings.

Time Lapse

The research into the impact of the time lapse between a CTI's graduation date and arriving at the FAA Academy for training does show a trend. When comparing the number of months from graduation to arriving at the FAA Academy and the predictability of success in training at the CTI's first FAA facility shows a trend with an increase of months there is a decrease in the training success to CPC status. The significance was .542 which is > .05 indicating no significant effect, however the Exp(B) or odds ratio being less than one at .980 and the B coefficient at -.020 indicates that as the months increase the training success decreases.

Throughout the research there has been a concern for the small sample size. Not all participants answered each of the questions therefore making it difficult to get a complete data set. When the survey was designed and three schools offered to send the

survey to their Alumni the initial estimate had been at least three hundred (n = 300) completed surveys. When the survey was closed it showed a total of two hundred and seven (n = 207) submitted surveys but a total of two hundred and sixty eight (n = 268) had started the survey. Two hundred and thirty (n = 230) surveys had some questions answered.

The analysis of the impact of the time lapse between CTI graduation and arriving at the FAA Academy for training on the success of training at the FAA Academy had one hundred and twenty one (n = 121) surveys input data to complete the analysis, out of the total two hundred and thirty (n = 230) surveys submitted. One hundred and sixteen (n = 116) were successful in training and five (n = 5) were unsuccessful in training at the FAA Academy.

When analyzing the time lapse impact between CTI graduations and arriving at the FAA Academy for training on the success in training at the CTI graduates first FAA facility there was the same issues with the ability to get an adequate sample size of unsuccessful training outcomes. There were a total of eighty six (n = 86) surveys completed. There were seventy eight (n = 78) that were successful in training and only eight (n = 8) that were not successful in training at their first FAA facility.

The training CTI graduates obtain in college is AT-Basics classroom and lab simulation. This differs between each college as they all design their programs individually and submit the programs to the FAA for approval. When the CTI graduates train at the FAA Academy they also do classroom and lab simulation. There is not a significant difference between some colleges training and the FAA Academy training. The FAA Academy is more like refresher training for graduates from colleges that offer a

full Air Traffic Management curriculum with lab simulation. This may be why the unsuccessful training rate at the academy is not as great as at their first facility.

All schools must teach AT-Basics but how in-depth the curriculum differs from school to school. CTI graduates by pass AT-Basics at the academy and a lengthy time lapse between graduation and arriving at the FAA Academy may diminish the AT-Basic knowledge gained in college.

Once the CTI graduates get to their first facility the impact of time waiting after graduation takes on an increased effect. The study had an odds ratio, Exp(B), less than one which indicates as months increase training success decreases. The analysis indicated a possible trend and warrants additional research with a larger samples size. Using existing data from the FAA would be more accurate and allow a sample size of thousands instead of hundreds.

Again this lack of significance can be partially explained by the sample size. The G Power analysis software was used to analyze what the sample size should be to obtain a power of .8. The test was run for Logistic Regression and the type test was post hoc to determine the sample size of 350 would be needed for a power of .8. Since the samples for these two tests were both smaller than 350 it would be recommended that further research with a larger sample size be performed.

The FAA can reduce their costs having the CTI graduates, from colleges with full AT-Basics curriculum and lab simulation, go directly to their first FAA facility. If they can reduce the time the selection and hiring process takes along with by-passing the FAA Academy the CTI graduates would get to their on the job training sooner and not be at risk of losing the knowledge they gained in college. With retention of this knowledge the

CTI graduates will be more likely to complete training in a shorter time and be more successful in training therefore saving the FAA additional money in the selection and hiring process.

CTI Graduates Performance in the CTI Program

The study analyzed the CTI graduates performance in the CTI program by performing logistic regression to determine if the CTI graduates GPA showed predictability of success in training at the FAA Academy and at the CTI graduates first FAA facility. The sample sizes were small with a total of only one hundred and thirty nine (n = 139) surveys completing the questions necessary for this analysis. From the test performed with G Power it was determined that the study needed 350 samples to find a power of .8.

The analysis had a significance of .277 being > .05 indicating no significant effect. Additional challenges with the study was that the majority of the participants were successful in training giving very little data to analyze to determine what would have been predictive of an unsuccessful training outcome.

The sample size for the logistic regression analysis on the GPA predictability of training success at the CTI graduates first FAA facility was ninety seven (N = 97). Just as the study before this one the sample size was too small to achieve a power of .8. Also the participants that were unsuccessful in training was eight (N = 8). If CTI graduates were able to by-pass the FAA Academy and go directly to their first FAA facility for training within a few months of graduating there is a possibility that their GPA would be more of a predictor of success as they would have a greater opportunity to retain the knowledge gained in college. Another issue with GPA is that some CTI schools are only

two year institutions and only learn AT-Basics so their GPA would show their ATC knowledge whereas four year institutions require general studies that may reduce their GPA but they may still have a very high AT-Basic knowledge.

Scores Correlation Analysis

The final analysis was done to determine if there was any correlation between the AT-SAT, AT-Basics and PV scores. The AT-SAT is given prior to hiring to determine if the applicant has an aptitude to be an Air Traffic Controller. The AT-Basics test is given at the FAA Academy and is the information that all CTI schools are supposed to be teaching the CTI students. This is why CTI graduates are able to by-pass the AT-Basics portion of training at the FAA Academy. The PV score is the score received on the final performance evaluation at the FAA Academy.

The analysis shows that there is no correlation between the AT-SAT and either of the AT-Basic or PV scores. However the AT-Basics and PV scores show a significant correlation at .002 which is < .01.

This indicates that the better a CTI graduate does on the AT-Basics the better they will perform on the performance evaluation at the FAA Academy. This is important from the aspect that if the FAA delays CTI graduates arrival to the FAA Academy for training and to their first FAA facilities it can reduce the chances of success in training. The longer CTI graduates have to wait to start training the more of a chance they will have of diminishing the knowledge they were taught in college and reduce their chances for success in training.

Objectives While Waiting for Employment with the FAA

In the survey the participants were asked what their priorities were and what options they chose while waiting to go to the FAA Academy for training. The first option was advanced degree and four chose this option or 1.7%. The second choice was employment which was selected by 190 participants or 82.6%. The primary of objective of most CTI graduates is to look for employment as soon as they graduate.

Only four CTI graduates indicated that they pursued an advanced degree after graduation. An advanced degree can be very helpful after getting hired by the FAA as well as in finding another career if necessary. When applying in the FAA for promotions education receives additional points as well as the level of education you have.

The greatest concern for CTI graduates is the long time lapse between graduation and getting hired by the FAA. Once they are notified by a temporary offer letter they begin the long process of the interview, medical exam, background check, psychology test and interview. After this is complete if they are hired by the FAA they then have to wait for a date to go to the FAA Academy for additional training. The whole process can take anywhere from a few months to three years or more.

The question was asked if any CTI graduates had chosen an alternate career instead of waiting for the FAA. If they had chosen a new career what was the reason.

The leading concern for CTI graduates was getting their student loans paid off. Some graduates have taken other jobs but are still hoping to be hired by the FAA. The major concern by CTI graduates was that the hiring process took too long. Some graduates did feel also that the process may be unfair. The time to get hired by the FAA can take anywhere from immediately after graduation to three years or more. The

students contact the FAA and let them know they are still interested in employment if they have not been hired within three years of graduation. An additional concern was the lack of guidance and uncertainty in the FAA hiring process. This was also a concern in earlier research by Treutel (2012) from Embry-Riddle Aeronautical University.

CTI graduates are still waiting to get hired but are either looking for other employment or are taking classes to prepare for another career if the time becomes too long waiting for the FAA to hire them. Fifty three (n = 53) participants responded. Ten participants (n = 10) or 18.9% started working new careers due to the need to make money and pay their student loans. Twelve participants (n = 12) or 22.6% stated the hiring process was too long and some were concerned about the age requirement. One participant (n = 1) or 1.9% developed health issues.

There were a set of comments centered on work environment issues. Three participants (n = 3) or 5.7% responded in reference to work environment issues in the FAA. One participant (n = 1) or 1.9% chose a new career due to personal reasons. Two (n = 2) or 3.8% of participants were unsuccessful in training. Four participants (n = 4) or 9.4% have found new careers but are working in aviation.

The remaining participants either were working jobs until they were hired by the FAA or are currently working as an Air Traffic Controller.

Additional Comments

The last question on the survey was an open ended question to allow participants to give input. Most of the comments gave input on the FAA selection and hiring process that was different than the current system. The survey needed to be explained clearer

since some participants were hired prior to 2002 and all the questions did not pertain to them. Only graduates from 2002 to 2012 should have responded.

The AT-SAT test was given starting in 2002 so some of the alumni had not taken this exam. There were concerns that the AT-SAT was not predictive of training success as an Air Traffic Controller.

As always the FAA selection and hiring process changes frequently. The graduates that were allowed to select regions or up to five states were happier than the graduates that only were able to select two states. The other hiring process comments were concerned with AT-CTI students spending considerable amount of money on school and they felt candidates with prior experience in the military were being hired before them causing additional time to lapse before being hired. Additional comments recommended that the FAA let the graduates know what facilities needed controllers and place them in those facilities. Another suggestion was to do pre-graduation screening and then be prepared to hire the AT-CTI graduates immediately after graduation. This would also allow the graduates to immediately use their knowledge gained in school and increase the success rate in training.

Many graduates found the FAA hiring process too long to wait and they felt it reduced their ATC knowledge by the time they arrived at the FAA Academy for training. Two graduates stated that they were hired within three months of graduating and felt this helped them be successful in training.

Some graduates stated the FAA did not take into account the quality of the education received. The recommendation made by the IRP (2011) that the CTI schools should be split into four categories addresses this concern. The IRP recommended that

each candidate receive 10 points for level one, 20 points for level two, 30 points for level three and 40 points for level four schools. The schools offering classroom and lab for all ATC options would enable their graduates to earn more points in the selection process.

There were complaints addressed to some of the schools. Some graduates felt they were not communicated the extent of the wait time possible after graduation. The FAA is clear that getting a degree in Air Traffic Management is not a guarantee that the graduates will be hired by the FAA. Some schools do a very good job in relating this information but it is important for all schools to continue to make sure students are given the necessary information to plan their futures.

Limitations

There are numerous limitations to this study. The fact that this was an anonymous and voluntary study allowed for no actual control over who filled out the survey therefore most of the participants were successful in training and there was not enough input from CTI graduates that were unsuccessful in training to determine predictability and significant effects.

There was no control over how many CTI graduates participated. Also not all participants answered all the questions so the sample sizes were further reduced for each research question.

Since many of the tests did not detect a power of .8 there was a need to examine why. To better understand the sample sizes that should have been used to detect a power of .8, G Power statistical software was used. The test used was for Logistic Regression and since the survey has been completed the Post Hoc test was completed to determine

what the optimal sample size was necessary to detect the power at .8. The optimal sample size would need to be 350.

Future Studies

This was the first study completed specifically regarding the impact of the time lapse between CTI student's graduation and arriving at the FAA Academy for training on the ability to successfully complete training both at the FAA Academy and at the participant's first FAA facility.

Due to all the limitations from an anonymous and voluntary survey it would be advantageous to use de-identified data already collected by the FAA both at CAMI and at the facility levels. This would allow a study to have a larger sample size of thousands compared to hundreds to further study trends. It is important to have an outside source evaluate this data to receive an unbiased interpretation of the data.

Due to anonymity requirements of this survey, it will be important in the future for studies to collect a larger sample size to determine if there are other relationships that should be considered and to examine the demographics further. The future studies need to be able to make sure the survey is not being taken twice by participants. Additionally, there needs to be a mechanism to include data from participants not successful in training to be able to address the data appropriately.

The FAA needs to take advantage of information available to them by tracking CTI graduates from the time they enter the CTI program until they retire. The information can be de-identified for analysis and is invaluable so the agency does not spend additional money and time on testing that does not predict success in training.

In addition, finding out what factors can impact or predict if students are unsuccessful in training can tell us as much as those that are successful.

Conclusion

Traditionally the FAA hires from three distinct groups of people. The first is those with prior ATC experience which was usually obtained through the military, then the general public with no experience and finally the Air Traffic Collegiate Training Initiative (AT-CTI) candidates. The AT-CTI program is a valued partner with the FAA to help educate the next generation of Air Traffic Controllers

CTI schools range from technical schools, two year private and public institutions and four year private and public institutions. The curriculum ranges from text book learning only to complete AT-Basics with all air traffic options offered in high definition simulation.

The FAA selection and hiring process can be time consuming. The process has changed numerous times throughout the years as hiring needs and requirements change. With the large number of Air Traffic Controllers required over the next 10 years it would be advantageous for the FAA to reduce the time dedicated to their selection and hiring processes. If the hiring process time was decreased, it would save the FAA money in terms of a reduction in the initial cost of training Air Traffic Controllers and reduce training time. The timely hiring process can delay CTI graduates from entering training and the longer it takes the harder it is for them to retain the knowledge they received in college.

The research into the impact of the delays did show a trend as the months waiting until CTI graduates arrive at the FAA Academy increased the training success at the CTI

graduates first FAA facility decreased. The findings were not significant but with further research expanding the sample size and controlling the population so data can be collected on both training successes and failures there can be a better understanding how the process can be changed to increase training success and help the agency process be more efficient which will help the FAA save money in the testing, selection and hiring processes.

While researching the correlation of the AT-SAT scores with AT-Basics and PV scores it showed no correlation. If there is no correlation to the CTI graduates succeeding in completing the AT-Basics and PV at the FAA Academy then there needs to be more research as to if this exam is worth the resources that it takes to administer it.

CTI graduates need to understand that with their education in Air Traffic Control that they can use these skills in other occupations in the aviation industry. Graduates with additional education in areas such as communication, public relations, journalism atmospheric sciences etc. can take their love of aviation and find employment in other aviation related companies. Schools can help graduates by explaining to them to choose additional courses that can supplement their ATC knowledge and help them focus in other career opportunities in the aviation industry if necessary.

There needs to be continued research with a larger sample size to achieve a power of .8. There were trends discovered and correlation between the AT-Basics and PV scores. With further research and adequate sample sizes there can be additional information to improve the agency selection, hiring and training process to the benefit of the FAA and the CTI graduates.

APPENDICES

Appendix A

E-mail to Contacts to distribute to CTI Graduates

Hello

This survey is being administered for completion of a graduate student's master's thesis at the University of North Dakota. It is designed to research the selection and hiring process of Air Traffic Collegiate Training Initiative (AT-CTI) Graduates. The information gathered will help to understand what factors affect the hiring process time line and how it can be improved. It will also examine the relationship between test scores and training success at the FAA Academy and the first FAA Facility.

The Information requested is Collegiate GPA, AT-SAT score, AT Basics score (at the FAA Academy) and PV score. Additionally, dates such as graduation date from a CTI school and date candidate arrived at the FAA Academy for training.

Participation in this survey is voluntary and completely anonymous.

Please feel free to forward this survey link to any other CTI graduates you would like.

Click on the survey link below to begin the survey:

https://und.qualtrics.com/SE/?SID=SV_3yfv8ZTSb9q5fvL

Thanks,

Terra Jorgenson

Appendix B

Survey

Introduction

Welcome To All!

This survey is being administered for completion of a graduate student's master's thesis at the University of North Dakota. It is designed to research the selection and hiring process for Air Traffic Collegiate Training Initiative (AT-CTI) Graduates. The information gathered will help to understand what factors affect the hiring process time line and how it can be improved.

Participation is voluntary, you may answer all questions or only those you feel comfortable answering. You will not be asked to identify yourself and your identity will not be linked to your survey in any way; this is a completely anonymous survey. At any point you wish to discontinue taking the survey you may do so.

If there are any questions please feel free to contact Terra Jorgenson via e-mail at tjorgenson@aero.und.edu or contact the University of North Dakota Institutional Research Board at 701-777-4279. Thank you!

To begin this survey, please select the "Next" button.

What CTI School did you graduate from?

- ❍ University of North Dakota
- ❍ Embry-Riddle Aeronautical University
- ❍ Community College Beaver County
- ❍ Other _____

What month and year did you graduate from a CTI School?

What was your Cumulative College GPA?

Are you a U. S. citizen and eligible to be hired as an Air Traffic Controller by the Federal Aviation Administration (FAA)?

- ❍ Yes
- ❍ No

What is your gender?

- ❍ Male
- ❍ Female

What is your Racial Origin?

- ❍ White
- ❍ African American
- ❍ Hispanic
- ❍ Asian
- ❍ American Indian
- ❍ Other _____

What was your AT-SAT score?

Did you apply to be an Air Traffic Controller with the FAA?

- ❍ Yes
- ❍ No

While waiting for employment with the FAA, what was your primary objective?

- ❍ Advanced Degree
- ❍ Employment
- ❍ Other _____

Which two states did you choose on your application?

Have you been hired by the FAA?

- ❍ Yes
- ❍ No

What was the month and year you started training at the FAA Academy?

What was your age when you arrived at the FAA Academy for training?

What was your AT-Basics test score at the FAA Academy?

What was your PV score at the FAA Academy?

Did you successfully complete training at the FAA Academy?

- ❍ Yes
- ❍ No
- ❍ Other

What option best describes your first facility?

- ❍ Tower
- ❍ TRACON
- ❍ Enroute Center

What ATC Level was your first FAA Facility?

- ❍ ATC Level 4
- ❍ ATC Level 5

- ❍ ATC Level 6
- ❍ ATC Level 7
- ❍ ATC Level 8
- ❍ ATC Level 9
- ❍ ATC Level 10
- ❍ ATC Level 11
- ❍ ATC Level 12

Did you successfully complete training to CPC status at your first ATC Facility?

- ❍ Yes
- ❍ No
- ❍ Other

Have you ever resigned from the FAA? If so what is the reason for resigning.

Are you still waiting to be hired by the FAA as an Air Traffic Controller?

- ❍ Yes
- ❍ No

Did you choose an alternate career, other than Air Traffic Control, due to the time required to wait before being hired by the FAA?

- ❍ Yes
- ❍ No

What was your reason for choosing an alternate career to the FAA?

Please add any additional comments.

Appendix C

Topics and Objective for Air Traffic Basic Training (FAA, 2012).

Lesson/Topic	Objectives
Introduction of the ATC System and National Airspace System	1. Elements of the National Airspace System (NAS) 2. Role of the Traffic Management System (TMS) within the NAS. Identify the primary functions and associated team responsibilities for the Air Traffic Control Tower, Approach Control, Air Route Traffic Control Center. and Flight Service Station Controller Positions. Identify ATC duty priorities, procedural preference and operational priorities.
Teamwork in the ATC Environment	1. Characteristics of effective teams 2. Functions affecting team performance 3. Stages of group development
Airports	Identify Airport 1. Lighting 2. Markings
Airspace	Identify 1. Classes of airspace and their use. 2. Special Use Airspace
Introduction to Federal Aviation Regulations	Identify 1. Terms and Definitions 2. General Operating Rules 3. General Flight Rules 4. ATC Certification 5. Medical Requirements
Wake Turbulence	Identify the following categories related to wake turbulence 1. Definition of Wake Turbulence 2. Factors Affecting Wake Turbulence Intensity 3. Wingtip Vortices 4. Induced Roll 5. Helicopter Downwash 6. Jet Blast

Lesson/Topic	Objectives
Aircraft Characteristics and Aircraft Recognition	Identify Aircraft: 1. Categories 2. Weight Classes 3. Designators 4. Performance Characteristics 5. Identification Features Recognize selected aircraft
Special Operations	Special Military Operations Identify flights requiring special handling Know terms and definitions associated with these flights
Basic Navigation	Students will identify: 1. Reference lines of the Earth and their purpose 2. Great circle route, distance, and direction measurement 3. Methods of time conversion and acronyms used with time 4. Magnetic variations and headings 5. Basic methods of navigation 6. Basic calculations for time, speed, and distance 7. Effects of wind on flight 8. Effects of altitude and temperature on speed
Radio and Satellite Navigation	Identify the characteristics of: 1. Radio and Satellite Navigation 2. Federal Airway System
VFR Charts and Publications	Identify the purpose, features, contents, and specific items and information related to: 1. Sectional Aeronautical Charts 2. VFR Terminal Area Charts 3. World Aeronautical Charts 4. Airport/Facility Directory
En Route IFR Charts	Identify the purpose, types, contents, and specific items and information related to: 1. Low Altitude 2. High Altitude 3. IFR Area

Lesson/Topic	Objectives
SIDS and STARS	Identify the purpose, types, contents, and specific items and information related to: 1. SIDS 2. STARS
Approaches	Identify types of approaches; and the purpose, contents, and specific items and information of an Instrument Approach Procedure (IAP) Chart. Identify the contents and geographical features of an Instrument Approach Procedure (IAP) Chart.
Pilot Environment	Identify the following: 1. Characteristics and uses of aircraft instrumentation 2. Physiological factors affecting flight
Introduction to Emergencies	Identify the following: 1. The meaning of distress, urgency, mayday, and pan-pan. 2. Roles and responsibilities of the pilot and controller during an emergency 3. Information necessary to handle an emergency 4. Types of emergencies
Search and Rescue	Identify the following: 1. Purpose of the National Search and Rescue Plan 2. Roles, responsibilities, and procedures of search and rescue
Fundamentals of Weather and Aviation Weather Services	Identify the following: 1. Characteristics of the atmosphere 2. Principles of atmospheric temperature 3. Characteristics and modification of air masses 4. Characteristics of atmospheric pressure 5. Formation and types of fronts 6. Characteristics of convection currents 7. Causes of wind 8. Formation and types of clouds 9. Formation and types of precipitation Identify the duties and responsibilities of the National Weather Service (NWS) and the Center Weather Service Unit (CWSU)

Lesson/Topic	Objectives
Hazardous Weather	Identify the characteristics of hazardous weather that impacts aviation.
Current Weather	Identify the contents of METAR, including associated contractions and terms. Decode weather reports and METARS.
Pilot Reports (PIREPS)	Identify the purpose, uses and contents of Pilot Weather Reports (PIREPs). Decode Pilot Weather Reports (PIREPs).
Forecasts and Advisories	Identify the contents and purpose of the following weather products and be able to decode the reports: 1. Aviation Terminal Forecast (TAF) 2. Area Forecast (FA) 3. Airman's Meteorological Information (AIRMET) 4. Significant Meteorological Information (SIGMET) 5. Convective SIGMET (WST) 6. Center Weather Advisory (CWA) 7. Meteorological Impact Statement (MIS) 8. Winds Aloft Forecast (FD)
Basic Communications	Identify the following: 1. Radio and interphone communications 2. ICAO phonetics 3. Numbers usage 4. Basic phraseology 5. Coordination procedures Purpose and steps of the position relief briefing.
Stripmarking	Identify the following 1. Purpose and legal requirements of flight progress strips 2. Meaning of selected abbreviations and symbols used in stripmarking 3. Content requirements of selected blocks in terminal, enroute and flight service strips
ATC Clearances	Identify the following: 1. Purpose of an ATC clearance 2. Pilot's responsibility for compliance with an ATC clearance 3. ATC clearance items and their sequence 4. Clearance prefixes and their use 5. Types of ATC clearance

Appendix D

Variable List

Variable Name	Variable Description	Values
CTI SCHOOL	CTI school participant graduated from	1 – University of North Dakota 2 – Embry-Riddle Aeronautical University 3 – Community College Beaver County 4 - Other
MONTHS	Number of months between graduation and arriving at FAA Academy	1-100
GPA	Cumulative Grade Point Average at Graduation	0-4.0
GENDER	Gender	1 – Male 2 - Female
ETHN	Ethnicity	1 – White 2 – African American 3 – Hispanic 4 – Asian 5 – American Indian 6 - Other
AT-SAT	Air Traffic Selection And Training Test	0 - 100
AGE	Age of participant when arriving at the FAA Academy for training	20-32
AT-BASICS	Air Traffic Basics test scores at FAA Academy	0 - 100
PV	Academy Performance Verification at FAA Academy	0 - 100
ACADEMY SUCCESS	Was participant successful in training at the FAA Academy	1 – Yes 2 – No 6 - Other
FACILITY OPTION	Type ATC facility	1 – Tower 2 – TRACON 3 – Enroute Center

Variable Name	Variable Description	Values
ATC LEVEL	Level of participants first ATC facility	1 – ATC Level 4 2 – ATC Level 5 3 – ATC Level 6 4 – ATC Level 7 5 – ATC Level 8 6 – ATC Level 9 7 – ATC Level 10 8 – ATC Level 11 9 – ATC Level 12
SUCCESS TO CPC	Did the participant complete training to CPC status	1 – Yes 2 – No 3 - Other

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