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# Race & Gender Changes in Air Traffic Controller Selection, Hiring, Attrition & Success 1940-2015

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RACE & GENDER CHANGES IN AIR TRAFFIC CONTROLLER SELECTION, HIRING,  
ATTRITION & SUCCESS 1940-2015

by

Austin Kinley

B.S., Southern Illinois University, 2014

A Research Paper

Submitted in Partial Fulfillment of the Requirements for the  
Master of Public Administration degree

Department of Political Science  
in the Graduate School  
Southern Illinois University Carbondale  
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RESEARCH PAPER APPROVAL

RACE & GENDER CHANGES IN AIR TRAFFIC CONTROLLER SELECTION, HIRING,  
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A Research Paper Submitted in Partial

Fulfillment of the Requirements

for the Degree of

Master of Public Administration

in the field of Public Administration

Approved by:

Dr. Samuel Pavel, Chair

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April 5, 2016

## **AN ABSTRACT OF THE RESEARCH PAPER OF**

AUSTIN KINLEY, for the Master of Public Administration degree in PUBLIC ADMINISTRATION, presented on APRIL 5<sup>th</sup> 2016, at Southern Illinois University Carbondale.

TITLE: RACE & GENDER CHANGES IN AIR TRAFFIC CONTROLLER SELECTION, HIRING, ATTRITION & SUCCESS 1940-2015

MAJOR PROFESSOR: Dr. Samuel Pavel

The purpose of this research paper is to examine whether more applicants from underrepresented groups were hired after changes in the air traffic controller selection. More specifically, did the ethnic and gender makeup of the controller workforce change after the elimination of the Air Traffic Collegiate Training program (AT-CTI). I begin my research paper with a literature review of the air traffic controller selection and hiring processes from 1940 to 2015. I then evaluated the most recent change in the selection and hiring process using Department of Transportation and Federal Aviation Administration (FAA) data from 2005-2015. I found the diversity in hiring air traffic controllers increased after the termination of the AT-CTI. However applicants in underrepresented groups are more likely to be lost through attrition in the FAA Academy Air Traffic Controller Training Program.

*Keywords:* Air Traffic Control, AT-CTI, Race, Gender, Selection, ATC Hiring, ATC Selection, ATC Attrition

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## INTRODUCTION

One theory of government argues the Federal Government should represent the population served as explained by Samuel Krislov, author of Representative Bureaucracy. Throughout history the Federal Aviation Administration (FAA) has always tried to recruit and select Air Traffic Control Specialists (ATCS) in an effort to mirror the population they serve. In order to accomplish representative bureaucracy in the field of Air Traffic Control (ATC), the FAA made many changes to the ATC recruitment, selection and hiring process over time, with the most recent being the elimination of the Air Traffic Collegiate Training Initiative program (AT-CTI) in use since 1989. The elimination of the AT-CTI left graduates enraged because they no longer took hiring priority over the general public. Graduates of AT-CTI feel the change was unfair and felt they were entitled to the career after having completed the program because they were in the pool of qualified applicants waiting to be hired. AT-CTI graduates saw nothing wrong with the previous way of selection and hiring and felt the AT-CTI was achieving what the program should (see - [savecti.org](http://savecti.org), [cticonnection.org](http://cticonnection.org), [ctiassociation.org](http://ctiassociation.org), [ctistudents.com](http://ctistudents.com)). Some view the general public as not qualified because they did not attend a AT-CTI and therefore say the change is compromising safety (see – H.R. 5675: Safe Towers Act). In reality, many of the AT-CTI graduates are of the younger generation and thus having no recollection of how hiring had been done prior to their time. The underrepresented groups have not received the opportunities the typical white male has when examining the selection and hiring of ATCS.

A good understanding of what led up to the most recent changes in the selection and hiring process of ATCS must first be explained. More specifically, the goals and reasons to each change within the selection process must be tracked to gain a good perspective as to how and

why we got to where we are today. I begin this paper with a comprehensive literature review to examine the history of selection and hiring of ATCS. The review gives readers a better understanding of why the Federal Aviation Administration made the most recent changes to the selection process of ATCS. The literature review will be the basis for my research pertaining to whether the changes to the air traffic control selection process are achieving the hypothesized goals. The ATC selection process began with the initial establishment of job performance predictors and led to the creation of the first test battery. Applicants who received a passing score on the aptitude test were then selected for additional training at the FAA Academy Air Traffic Controller Training Program in Oklahoma City, OK (Academy). If an applicant was successful he or she would move to their assigned facility and receive on-the-job training. The PATCO strike in 1981 brought an unexpected amount of applicants and a higher pass rate at the Academy with the use of the previous test battery. Following the PATCO strike, fairness and adverse impact of test batteries became a pertinent issue and was heavily researched. Adverse impact led to programs to increase the diversity of the controller workforce including the AT-CTI. The termination of the AT-CTI was followed by the implementation of the biographical questionnaire formulated of biographical factors from proven successful Academy graduates.

I conclude the paper by examining data from the Department of Transportation (DOT) and the FAA to see if the changes to the selection and hiring process have increased the diversity of the controller workforce. More specifically, did the race/ethnic and gender makeup of the controller workforce change after the elimination of the AT-CTI.

## METHODOLOGY

### Data Source

I collected the data used for my findings from several different sources, in an effort to gather the most accurate and valid snapshot for each year. I first gathered the hiring, attrition, ethnic and gender information from the DOT's hiring and attrition statistics for each fiscal year. I then compared the numbers reported by the DOT to the hiring and attrition numbers from the FAA Workforce Report for each fiscal year examined. The hiring numbers I gathered from the DOT I then compared to the hiring numbers from the *Extension to Barrier Analysis of Air Traffic Control Specialist Centralized Hiring Process* report by aptMetrics (2013). The hiring source (public hires, CTI hires and Experience hires) and further attrition data (Academy, retirement, developmental and resignation, removal and death) I collected from the FAA Workforce Report for each fiscal year.

### Hiring Analysis

I first looked at the DOT hiring statistics ethnicity and gender as a whole in relation to the primary hiring source for each year. Since the change I am examining affected the public and AT-CTI source hires I had to single them out. I singled the CTI and public source hires out by pay grade and only hires within the FG-2152-01 pay grade were examined. The FG-2152-01 pay grade is Academy entrant trainees who are a combination of public hires as well as AT-CTI hires. I then examined the data in relation to the primary hiring source for each fiscal year. Then I sorted the data by only hires within the AT-2152-08 pay grade; what the FAA considers experienced. AT-2152-08 hires have prior ATC experience in the military or civilian facility

allowing them to enter at the higher pay grade and also bypass the Academy. I then examined the experienced hires data in comparison to the primary hiring source for each fiscal year.

### **Attrition Analysis**

Analyzing the attrition data was a little more difficult because a candidate who left or was terminated in 2006 may have been hired in 2005. In an attempt to correct for the training time, I first I examined Academy entrant's (FG-2152-01) attrition with use of a proxy. I adjusted the attrition numbers by taking any Academy entrant trainees leaving or being terminated within the first four months of the fiscal year and re-categorizing them to the previous fiscal year. I adjusted the attrition because an Academy entrant trainee takes anywhere from 1.8 to 4.4 months to complete the Academy. Therefore attrition in the Academy during the first two months of a fiscal year most likely had been hired in the previous fiscal year. I used four months as the proxy because Academy entrant trainees who take four months are enroute trainees who in the past have had the highest attrition rates. Since the 2016 quarter two numbers were not out at the time I wrote this paper, 2015 only includes attrition from the first three months of 2016 instead of four. Since I had no valid way of examining the attrition of experienced hires with the data I had, I examined developmental attrition instead. I classified developmental attrition as any who has completed the Academy but did not become a fully Certified Professional Controller (CPC) at their facility. In order to become a CPC, the developmental controller must certify or "check out" on each position at the facility. Developmental attrition includes anyone in the AT-2152-xC (Academy grad), xD (D1), xF (D2) and xG (D3) pay grades. I looked at developmental attrition as a whole because each facility is different in how long training takes to become a certified controller. The developmental attrition is represented by fiscal year and I included only termination, removal, resignation or death for the purpose of attrition in my paper. Lastly, I

examined the attrition data as a whole with both pay grades, but used the adjusted attrition to represent the Academy entrant trainees.

### **Attrition to Hiring Analysis**

After gathering and examining the data for hires and attrition separately, I then examined attrition as a function of hires. First I examined Academy entrant trainee attrition as a percent of Academy entrant trainee hires. I then examined both developmental attrition and Academy entrant trainee attrition as a percent of experienced and Academy entrant trainee hires. When I examined attrition as a function of hires I used the adjusted Academy entrant trainee attrition with the proxy. Lastly, in an attempt to display the “big picture” of what the diversity was among Academy entrant trainees who made it through the Academy, I subtracted the Academy entrant trainee attrition from the Academy entrant trainee hires, to represent the diversity among Academy graduates.

### **Assumptions and Limitations**

The primary assumption I made in this paper was the FAA moved to the new way of selection and hiring for the purposes of increasing the diversity within the applicant pool and thus increasing the diversity of hires between 2014 and 2015. Outtz and Hanges (2013) outlined in their barrier analysis report that the Air Traffic Selection and Training exam (AT-SAT) has been the largest barrier in hiring a greater amount of ethnicity and gender into the ATC workforce. aptMetrics (2013) further explained the centralized selection panels as well as the non-standardized initial minimum qualifications review were a barrier. I also made the assumption the AT-SAT is now pass/fail because of the change in the selection and hiring process after the release of reports highlighting the exam as a barrier. Pass/fail means if an applicant scores a 70 or higher they move on to the next step in the process rather than the old

way discussed in the literature review. The next assumption I made because of the new way of selection, is the process no longer includes centralized selection panels because facilities are not assigned until the new hire has passed the Academy. Lastly, I made the assumption the minimum qualifications review has been standardized and an applicant can qualify in one of five ways otherwise the applicant will be eliminated from the rest of the selection process.

I was unable to gather some data from select FAA workforce plans. The data in the fiscal year 2006 plan was vague in comparison to the following fiscal year plans. The fiscal year 2006 report did not mention the total amount of hires or breakdown hiring by source for the actual fiscal year 2005 data like the other plans did. Therefore I made the assumption the hiring sources were primarily experienced and AT-CTI with very little to no public hires for fiscal year 2005. The fiscal year 2006 plan also did not mention any total number for attrition data or breakdown the attrition data by source like the following plans did. The fiscal year 2015 plan did mention the actual amount of hires for fiscal year 2014 but did not have a breakdown of hires by source for fiscal year 2014. I made the assumption there was no AT-CTI hires in fiscal year 2014 due to the termination of the AT-CTI in December of 2013. I then also assumed the hiring source would have been dominated by public hires due to an off the street (OTS) announcement in 2014. When I wrote the paper the fiscal year 2016 plan was not yet available and therefore no actual numbers from the FAA workforce plan are available for the actual 2015 fiscal year.

### **Purpose**

The purpose of this paper is to examine whether more minorities and females were hired after the change in the selection and hiring process. More specifically, did the ethnic and gender makeup of the controller workforce change after the elimination of the AT-CTI?

## LITERATURE REVIEW

### 1941 – 1963

The initial establishment of job performance predictors lead to the creation of the first ATC aptitude test began in 1941 by the military. Mental ability tests had been developed and distributed to service men and women in the military in an effort to discover what abilities contributed to job performance. However, job performance in the civilian ATC world was measured by supervisor ratings. The rating system in the civilian world did not change until 1956 when the Civil Aeronautics Authority (CAA) became concerned with the lack of standardization in ATC training and created the FAA Academy and job performance measures were added to civilian ATC performance measurement (Sells, Dailey & Pickrel, 1984).

Beginning in the 1960's trainees entering the Academy would voluntarily take tests to further research pertaining to changes to selection and hiring procedures. Since the 1960's biographical data was collected and the questions with regard to biographical data would constantly be changed depending on what researchers were examining (VanDeventer, Taylor, Collins & Boone, 1983; Cobb & Nelson, 1974).

Trites (1961) used the biographical data to expanded job performance criteria to include five variables: active vs. inactive controller, with the FAA or not with the FAA, mean hours of sick leave, symptoms vs no symptoms and disciplinary vs no disciplinary. Age, psychological, biographical, education and marital status was used as predictors of his job performance criteria. Trites validated research by Brokaw from previous years in that experience was found to be a predictor of job performance, but when the age variable was removed, the experience variable was no longer found significant. Cobb (1962) administered a test battery to incoming students

for a year. Both Cobb and Trites came to the same conclusion aptitude tests were more superior in predicting training performance for enroute trainees. Experience was a better predictor of training performance for terminal trainees. Throughout the early research, researchers began to discover the negative impact of age on training performance (Sells et al., 1984).

The early research led to the recommendation an aptitude test as well as pre-employment and job related experience be used to select air traffic controllers. The aptitude test measured spatial perception, verbal and non-verbal reasoning and mental manipulation and applicants found to be most successful. Researchers such as Cronbach discovered personality measures were not a good predictor of job performance. Selection research from 1950 up until 1960 had been a contract by the CAA for the development of aptitude tests. The first CAA ATC selection research program began in 1960 with the creation of the Civil Aeromedical Research Institute (known as the Civil Aeromedical Institute (CAMI) today). The first aptitude test, the Civil Service Commission (CSC) test battery, began in 1962 to screen applicants who did not qualify based on experience. It was discovered shortly after analyzing the applicants and Academy graduates, the applicant scores on the CSC test were not successfully predicting training and job performance (Sells et al., 1984).

### **1964 – 1967**

In 1964 the FAA focused on reducing the Academy attrition rate, reducing the Academy attrition rate was done by implementing higher scoring standards for the CSC. Prior to 1964 the Academy attrition rate was 30.3% for the total group. In 1964 the CSC was used to screen all applicants regardless of applicants having experience or not. At the time scores of 210 were preferred but 190 and higher would also be considered. Higher scoring standards were preferred because fewer trainees were needed at the time. The level at which an applicant had to score



depended upon how much if any experience the person had. The high scoring standards remained in effect from 1964 to 1968 and screened out more than half the applicants, with no shortfall of qualified applicants. After 1964, the attrition rate at the Academy dropped to 22% for the total group of candidates who met the screening requirement. (Sells et al., 1984).

In 1966, the 16PF personality assessment began being used in the medical screening of applicants to identify applicants who should be referred to psychiatric evaluation (Sells et al., 1984).

### **1968 – 1972**

In 1968 the focus became making the selection process quicker. The National Airspace System rapid expansion program was initiated in 1968 and a revised set of selection standards was adopted. Applicants with “specialized” experience (radar control) could bypass the aptitude test and be appointed to starting at a higher pay grade such as GS-9 rather than GS-7 or lower. A specialized experience standard was designed to make the selection processes quicker to alleviate the shortage of full-performance-level (FPL) controllers. A separate test, later referred to as the Occupational Knowledge Test (OKT) was implemented as a way to measure the applicants claimed ATC experience and grant extra points based on related experience. A total score of 210 was established as a standard for prior military. A score of 225 was established for pilots, navigators, and applicants who have applied previously. A score of 240 was established for applicants with no aviation experience (Sells et al., 1984).

Additionally, in 1968 the 150 Program was implemented in an effort to hire more minorities. The 150 Program was a one year long program in which the person would be trained in a special training program at the Academy for six months. During the six months the trainee would be provided with background aviation knowledge before going through the Academy. In

1971 the Office of Personnel Management (OPM) concluded the 150 Program “provided an additional rung in the ladder” for many minorities who may not have become employed by the agency (Sells et al., 1984).

In 1970 through 1976 the Academy pass/fail training was suspended while a new training program was developed. Throughout the 70’s trainees were brought to the Academy for qualification training in which they were trained and assessed on their ability to operate simulated sectors from their home facility (Sells et al., 1984).

In 1972 the specialized experience standard was eliminated and a screening standard with respect to age 30 was developed. The screening standard with respect to age was the first big change in the selection process. Aside from age, another factor found to have an inverse relationship to training was college education (Sells et al., 1984). At the time, college level education could be substituted in place of the general experience requirements. Based on research by Cobb, Mathews and Lay (1972) conducted on trainees who had entered the Academy in the 1960’s they found college graduates had higher attrition rates than Academy entrant trainees with high school diplomas.

Cobb et al., (1972) also examined sex as a factor in performance and attrition for candidates entering the Academy between 1968 and 1970. They discovered there was little difference in the attrition rates between sexes at the Academy. The difference was found in post Academy attrition. 48% of the women and only 22% of men who graduated the Academy resigned or were terminated in the field. Mathews, Collins and Cobb (1974), discovered through exit interviews and follow up phone calls attrition of women was attributed to primarily family problems (relocation, child care, home responsibilities) (27.5%), failed training (22.5%), discrimination (15%) and inadequate training (12.5%).

**1973 – 1978**

In 1974 a task force was commissioned by the FAA to review their selection policies. The task force recommended research and development in screening and testing of applicants, the CSC rating guide, and the evaluation of recruitment and testing for cultural bias against women and minorities. In response to the recommendations, CAMI began studies and extensive research (Sells et al., 1984). In 1975, the recommendations and studies lead to a congressional committee recommendation a standardized, centralized, validated program be designed (Ramos, Heil & Manning, 2001).

Up until 1976 training had gone through waves of centralization and decentralization with no standardization (Manning, Kegg & Collins, 1988). The attrition at the time was between 25% and 40% before reaching FPL primarily attributed to lack of proficiency. Therefore, following the recommendation made by the congressional committee and the attrition findings, the Academy became a pass/fail program in 1976, where the candidate entered either a 12 week enroute training program or a 16 week Terminal training program (Ramos et al., 2001). The goal was to assess the aptitude of a trainee with no prior knowledge of ATC by allowing them to learn a set of ATC rules as well as a series of laboratory scenarios (Sells et al., 1984).

CAMI began research in 1976 related to the uniform guidelines on employee selection procedures stemming from the 1964 civil rights act title VII and amended by congress in 1972. CAMI also accelerated an initiative to develop a new selection battery for the first time. Boone (1979) led the initiative to create a new selection battery. From 1976 until 1978, experimental tests were distributed at the Academy consisting of a biographical questionnaire, Dial Reading Test (DRT), the new Multiplex Controller Aptitude Test (MCAT) Directional Headings Test (DHT) and the CSC (Sells et al., 1984).

In 1976, Cobb, Young and Rizzuti (1976) validated the same results as Cobb et al. (1972) reported, pertaining to education and success in training. Education was found again to be inversely related to training success both before and after adjustment for age and other factors.

In 1978, the Uniform Guidelines on Employee Selection Procedures was adopted by the Equal Employment Opportunity Commission (EEOC), CSC, Department of Labor and Department of Justice. The uniform guidelines were important because they ruled any employers policies or practices that may have an adverse impact on employee opportunities of race, sex or ethnic group were/are illegal (Sells et al., 1984). A study by Boone (1978) of the 150 Program indicated the program aided the disadvantaged in achieving success at the Academy. Boone also found even though nonminority men and women were aided in the 150 Program, minority men predominantly African Americans, were not. Table 1 shows the demographic breakout of candidates hired through the 150 Program versus the traditional competitive way between 1976 and 1980.

Table 1

*Summary of ATC trainees hired from January 1976 through October 1980, from competitive (OPM registers) and non-competitive (Predevelopmental and Co-op Programs), by sex and race-ethnic group*

Gender/Ethnicity	Total Hires	Percent	Competitive Hires	Percent	Non-Competitive Hires	Percent
Men	6653	84.3	6218	93.5	435	6.5
Women	1241	15.7	7055	89.4	404	32.6
Total	7894	100	7055	89.4	839	10.6
White	6870	88.1	6442	93.8	428	6.2
Hispanic	220	2.8	134	60.9	86	39.1
African Amer.	618	7.9	300	48.5	318	51.5
Asian	66	0.9	61	92.4	5	7.6
American Indian	21	0.3	18	85.7	3	14.3
Total	7795	100	6955	89.2	840	10.8

Note. From "Selection of air traffic controllers," by S. B. Sells, J. T. Dailey and E. W. Pickrel, 1984, p. 541.

Prior to 1981, Executive Order 11813 signed in 1974 gave the Federal Government authority to hire Cooperative Education students as a means of bypassing the competitive bid process. The non-competitive hires represent candidates from the 150 and Cooperative Education Programs. The amount of underrepresented groups is greatly increased with the programs. At the same time, not many were hired in total for the five years the table represents.

### **1979 – 1984**

Lewis (1979) compared random sampled data containing similar characteristics to current ATCS selection samples to test the fairness of the ATCS selection samples to racial and ethnic groups. Lewis concluded the models were fair, but only under certain conditions. The application of each model depended on the goal of the agency. Lewis pointed out new selection devices did

not need to be developed but rather the need to modify the minority recruitment practices to comply with the Uniform Guidelines.

In 1980, research pertaining to the 16PF personality assessment in use for medical assessment purposes suggested further research to examine the relationship between life history data personality variables and on-the-job performance. To examine the variables, 21 new questions were added to the biographical questionnaire trainees take when they get to the field (VanDeventer, Taylor, Collins & Boone, 1983). Rock, Dailey, Ozur, Boone and Pickrel (1981) released a report to combine the previous nine years of research to improve the selection process. Based on the summary of research, Rock et al. recommended a revised test battery, including the Multiplex Controller Assessment Test (MCAT) and OPM test. The report combined the previous research to compare the scores of the CSC to the scores of the newly created MCAT to Academy success. The development of the MCAT had been going on since 1970. The MCAT consisted of the arithmetic reasoning and abstract reasoning sections from the CSC OPM test as well as an air traffic radar scope simulated scenario to test an applicant's aptitude for controlling aircraft. Rock et al. found the MCAT to be very successful in predicting success of air traffic controllers and the test was adopted for use in October of 1981. The MCAT was adopted for use just in time for the thousands of applicants who applied due to the PATCO strike. Just prior to 1981 when the MCAT was used, OPM noted the test had adverse impact on the underrepresented groups in the research sample. Though the test had adverse impact on the underrepresented groups, the 150 Program compensated for the unfairness. At the time, OPM recommended the MCAT be implemented as a "business necessity" (Sells et al., 1984).

Implemented with the MCAT, was the OKT used earlier for the specialized experience standard allowing applicants to bypass the aptitude test and begin at a higher pay grade. Now the

OKT is used to assign applicants additional points for prior experience. The applicant must first score above a 70 on the aptitude test and meet the requirements. Once eligibility is established, based on the applicants prior experience, determines how many additional points, if any, will be added to the score. Up to 15 additional points can be awarded (Sells et al., 1984).

From 1973 to 1981 there was a drastic decline in the recruiting demand. The selection process also remained unchanged and attrition increased with use of the new test. By 1982 the Academy had 26,000 certified applicants from 125,000 applicants. In 1982 the Academy attrition rate had again dropped to 17.9% with use of the MCAT. Applicants entering the Academy in 1982 included 479 from the old test and 965 from the new test. The pass rate at the Academy was 43% for the old testing group (CSC) and 71% for the new testing group (MCAT) (Sells et al., 1984).

In 1981 the Air Traffic Division formally implemented the Air Traffic Division Cooperative Education Program (CO-OP) under Executive Order 3120.11. The Co-op allowed students to parallel classroom study with career related paid work experience. The objectives for the Co-op as outlined in Order 3120.13B were to:

Attract and recruit quality students to meet long-range staffing needs, permit selections for career jobs based on proven performance, bring new educational methods and concepts into the work force, build stronger relationships between educators and Federal employers, assist students in applying classroom theory to "real world" work experiences and in meeting financial obligations by earning while learning, expand teaching resources and faculty knowledge of work force needs and assist in placement service activities.

(FAA Order 3120.13B, 1990, p. 1)

The Co-op was an affirmative employment program and therefore the recruitment was directed at educational institutions through which females and minorities could be targeted. The Co-op was just for higher education institutions up until Order 3120.13B expanded the Co-op to “include high school diplomas, technical, vocational, and trade school certificates or diplomas” (FAA Order 3120.13B, 1990, p. 2). Through the Co-op, students were guaranteed a job unlike the 150 Program and Airway Science Curriculum going on at the same time (FAA Order 3120.13B, 1990).

In 1982, the FAA initiated the Airway Science Curriculum with the OPM’s and congressional approval. The goal of the Airway Science Curriculum, at the time, was to use FAA curriculum as an alternative to the testing process conducted by OPM for not only ATC but also aviation safety inspector, electronics technician and computer specialist (Kraus, 2011). The objectives of the Airway Science Curriculum was to recruit/hire applicants who received the degree or equivalent college degree, evaluate applicants with the curricula background performed better than applicants recruited through existing methods and determine the impact on females and minorities employment in the career (Ruiz, 2003). The FAA provided over \$104 million to colleges for buildings and equipment during the duration of the Airway Science Curriculum was terminated in 1991 when the FAA realized they would not be able to hire enough candidates and gather data to validate the results (Kraus, 2011). Unlike the Co-op introduced shortly after the start of the Airway Science Curriculum, the Airway Science Curriculum did not guarantee employment as a controller (Ruiz, 2003).

Later in 1984, VanDeventer, Collins, Manning, Taylor and Baxter, began performing studies on 8,000 post-strike trainees entering the Academy between 1977 and 1982. With the new MCAT pass rates at the Academy increased to 63% from the prior 56% when the CSC was



in use. Aside from supporting prior research applicants with aviation experience had higher pass rates than applicants without and performance declining with age; they also tested biographical predictors of success. VanDeventer et al. (1984) found physical science high school grades for minorities and math high school grades for nonminorities were good predictors of success at the Academy.

### **1985 – 1991**

In 1985, the Common Screen was implemented at the FAA Academy. The Common Screen consolidated the enroute and terminal specific screening programs implemented in 1976, into one, being a nonradar screen. A common screen allowed trainees to be assigned facilities based on aptitude. Academy entrant trainees with a higher aptitude would be assigned a more complex facility with the idea the Common Screen would also save money because the FAA would not be spending money training someone who would fail in the field. Prior to switching to the Common Screen, an adverse impact study was conducted and discovered the prior way had caused some adverse impact against African Americans. The Common Screen was said implemented knowing the Common Screen would still have adverse impact against African Americans but less than the prior method of screening. At the time of the study, the Common Screen was reported to be a better predictor of later success in training on the job (Manning, Kegg & Collins, 1988). The Common Screen was successful in reducing field attrition. Attrition rates for candidates after the strike were 40% at the Academy and 11% in the field (Collins, Manning & Nye, 1990). Table 2 shows the increase in underrepresented groups graduating the Academy with the change to the Common Screen.

Table 2

*Demographics of FAA Academy Program Graduates*

Characteristic	En-Route Screen 1981-85		Terminal Screen 1981-85		Non-radar Screen 1986-92		Group Total	
	N	%	N	%	N	%	N	%
<b>Gender</b>								
Male	3,928	88.0%	2,814	83.0%	6,683	82.0%	13,425	83.9%
Female	535	12.0%	576	17.0%	1,465	18.0%	2,576	16.1%
Total	4,463	100.0%	3,390	100.0%	8,148	100.0%	16,001	100.0%
<b>Minority Status</b>								
Amer. Indian	19	0.4%	17	0.5%	47	0.6%	83	0.5%
Asian-Pac	28	0.6%	32	1.0%	98	1.2%	158	1.0%
African-Amer.	81	1.8%	119	3.5%	339	4.3%	539	3.4%
Hispanic	86	2.0%	73	2.2%	254	3.2%	413	2.6%
Non-Minority	4,194	95.1%	3,117	92.8%	7,182	90.7%	14,493	92.4%
Total	4,408	100.0%	3,358	100.0%	7,920	100.0%	15,686	100.0%
<b>Entry Type</b>								
Competitive	4,046	92.7%	2,722	80.9%	6,635	82.7%	13,453	85.4%
Airway Science	8	0.2%	4	0.1%	75	0.9%	87	0.6%
Pre-Devel.	57	1.3%	113	3.4%	155	1.9%	325	2.1%
Coop. Ed.	34	0.8%	49	1.5%	422	5.3%	505	3.2%
ATA	43	1.0%	94	2.8%	564	7.0%	701	4.5%
VRA	34	0.8%	41	1.2%	21	0.3%	96	0.6%
Noncompetitive	134	3.1%	237	7.0%	86	1.1%	457	2.9%
Former ATC	10	0.2%	54	1.6%	61	0.8%	125	0.8%
Former GS-9					2	0.0%	2	0.0%
Total	4,366	100.0%	3,364	100.0%	8,021	100.0%	15,751	100.0%
<b>Education</b>								
No coll. degree	2,346	53.3%	1,648	51.6%	5,230	64.9%	9,224	59.0%
College degree	2,053	46.7%	1,544	48.4%	2,824	35.1%	6,421	41.0%
Total	4,399	100.0%	3,192	100.0%	8,054	100.0%	15,645	100.0%

Note. From "Recovery of the FAA air traffic control specialist workforce, 1981-1992," by D. Broach, 1998, p. 27.

In 1989, Manning, Della Rocco and Bryant examined the field success of Academy entrants and applicants who had taken the MCAT between 1981 and 1985. Manning et al. (1989) found the MCAT to be a good predictor of field success for enroute trainees. Manning et al. also

found the MCAT had no relationship with the success of field training for terminal trainees but rather the OKT does predict field training performance. Research concluded Academy scores are a better predictor of field success than MCAT scores.

The AT-CTI was initiated in 1989 (Pavel, 2012). To test the concept of using a few accredited post-secondary institutions to screen and train air traffic controllers (3120.26, 1991). After the creation of the AT-CTI in 1989 there had been a total of 3 education programs going on at once, all with the similar objective to target females and minorities for selection and recruitment (Order 3120.13B, 1990; Ruiz, 2003; Pavel, 2012).

In 1990, Schroeder, Dollar and Nye examined a group of trainees who entered the Academy in 1987 and had taken the experimental DHT and DRT in addition to the MCAT. Schroeder et al. (1990) found both the DHT and DRT to be good predictors of success in the Common Screen at the Academy, but they concluded further research using more aptitude variables was needed to determine the validity.

A CAMI report in 1990 reported research needed to begin promptly for selection of air traffic controllers for automated systems coming two decades later in the 2000's. At the time research stated the automation may change the cognitive skills and abilities required and thus the need for a new selection system. The report concluded creating a new selection system would be a difficult task because of the lack of expectations about the eventual requirements of the job task (Della Rocco, Manning & Wing, 1990).

In 1990, Collins, Manning and Nye examined the bio-demographic characteristics of prestrike trainees and post-strike trainees. To begin, Collins et al. (1990) found there were fewer females and minorities as well as less people with experience entering the Academy after the strike. Table 3 shows the numbers from Collins et al. study.

Table 3

*Comparison of Demographics of FAA Academy Entrants*

<b>Characteristic</b>	<b>Prestrike 1976-1981 (N=6,059)</b>	<b>Immediate Post-strike 1981-1983 (N=8,159)</b>	<b>Recent Post-strike 1985-1987 (N=4,278)</b>
Average age	26.5	26.3	25.9
<b>Gender</b>			
Male	83%	85%	85%
Female	17%	15%	15%
<b>Education Level</b>			
High School Only	14%	9%	13%
Some College	48%	44%	42%
College Degree	38%	48%	45%
<b>Minority/Non</b>			
Minority	13%	7%	9%
Nonminority	87%	93%	91%
<b>Prior Experience</b>			
No Prior Experience	30%	68%	69%
Aviation Experience	20%	17%	10%
Prior ATC Experience	50%	15%	21%

Note. Adapted from "Studies of poststrike air traffic control specialist trainees: III. Changes in demographic characteristics of Academy entrants and bio demographic predictors of success in air traffic controller selection and Academy screening," by W.E. Collins, C.A. Manning and L.G. Nye, 1990, P. 3.

When Collins et al. (1990) examined the biographical factors of candidates who were successful versus unsuccessful, the findings were similar to VanDeventer et al. (1984) research. Collins et al. found age played a large factor in Academy success as well as candidates with a high reported high school math grade for all demographics. Collins et al. also found minorities who had taken the aptitude test three or more times, had average high school math grades, grown up in an urban environment and were 28 years or older when entering the Academy had small pass rates less than 40%. Women who grew up in urban environments and/or had taken the aptitude test multiple times were also found to have a low pass rate. Collin et al. concluded

the aptitude test had a higher predictive validity than biodata but having biodata in addition to an aptitude test improved the predictability of Academy success.

Broach (1991) conducted a study of the Airway Science Curriculum found the Airway Science Curriculum was not meeting objectives. The study reported hires through the Airway Science Curriculum performed as well as traditional hires. The attrition rate was greater for Airway Science Curriculum hires than traditional hires and there was no difference between groups for minority and female retention rates. The Airway Science Curriculum was terminated in 1991 (Kraus, 2011). In 1991, the Separation and Control Hiring Assessment (SACHA) project was initiated. SACHA was initiated to perform a job analysis of the air traffic control position to identify ways to measure ATC performance and new tests for selecting controllers (Ramos et al., 2001).

### **1992 – 1997**

Manning and Broach (1992) further examined the ability requirement of future automated ATC systems as a follow-up to her 1990 study suggesting further research on the issue. Manning and Broach found future controllers will have to have roughly the same abilities as the ones currently.

The Common Screen implemented in 1985 was terminated and replaced with the Air Traffic Control Specialist Pre-Training Screen (ATCS/PTS). The ATCS/PTS was a five day computer administered test battery taken upon passing the MCAT. The prior Common Screen was nine weeks long in which Academy entrant trainees who failed wasted a significant amount of government money. The goals for the new ATCS/PTS were to “reduce cost of selection, maintain validity and support agency cultural diversity goals” (Broach & Brecht-Clark, 1994, p.1). The ATCS/PTS was designed to assess cognitive and sensory abilities required to perform

the functions of a controller (Broach & Brecht-Clark, 1994). In 1993 the Co-op was suspended due to the creation of the ATCS/PTS (Ruiz, 2003).

Later in 1992 the FAA stopped allowing any more general public applications and beginning in 1993, President Clinton allowed controllers who had been fired in 1981 to re-apply. Over 5,000 applications had been submitted during a one month period in 1993, and up until 1997 approximately only 100 controllers were hired per year (Broach, 1998).

Morrison, Fotohui and Broach (1996) performed a formative evaluation of the AT-CTI and stated the AT-CTI at the initial five schools appeared to be functioning well. They also stated progress in the recruitment of minorities and females was being made. They concluded by stating the demand for controllers at the time might be a challenge for the AT-CTI.

In 1996, the SACHA contract started in 1991 expired. With the expiration of the SACHA contract began the AT-SAT project. The purpose of the AT-SAT project was to “develop a job related, legally defensible, computerized selection battery for ATC selection delivered to the FAA in 1997” (Ramos et al., 2001, p. 2). The need for a new test battery was because candidates could increase their test score on the MCAT by going to a company who offered coaching programs. Additionally, Ramos et al. (2001) reported the two stage process of the MCAT and ATCS/PTS was expensive and inefficient and the AT-SAT was going to replace the two stage process. Therefore, many candidates were failing out of the Academy training due to artificially inflated test scores.

In 1997 Schroeder and Dollar performed a study to examine the personality relationships of a post-strike group of applicants and compare the results to earlier studies from the 60's and 70's. Schroeder and Dollar (1997) confirmed the findings from earlier studies comparing ATC applicants to the normal population, ATC applicants “tend to be less anxious, report higher self-

discipline, more emotionally stable, more self-reliant and assertive” (p. i). Schroeder and Dollar concluded by stating the personality characteristics found would be the baseline with which to assess the characteristics of the new ATC workforce as the post-strike workforce begins to retire following year 2000.

### **1998 – 2002**

In 1998 CAMI produced a report entitled *The Recovery of the FAA Air Traffic Control Specialist Workforce, 1981-1992* within the report were a series of papers analyzing the employing, testing, screening and on the job success of controllers from 1981 – 1992. The report concluded

- the FAA was beginning to hire and train controllers so they are ready when controllers hired during the strike start retiring;
- the MCAT was a very successful, affordable, practical, valid and fair evaluation tool for the selection of controllers. The paper and pencil test costed \$20 per examinee whereas training at the Academy was \$10,000 per person;
- women succeeded as much as men in training and minorities had lower rates of achieving FPL than did non-minorities;
- many changes had occurred to the selection and training during the 80's, so it could not be determined why success rates increased (Broach, 1998).

Table 4 shows the amount of underrepresented groups entering the Academy since the implementation of the ATCS/PTS.

Table 4

*Demographic Profile of FAA Academy Entrants*

<b>Characteristic</b>	<b>Pre-strike 1976-1981 (N=6,059)</b>	<b>Post-Strike 1981-1985 (N=13,533)</b>	<b>Screen 1986-1992 (N=14,392)</b>
<b>Experience</b>			
No related experience	30%	65%	79%
Aviation Only	20%	17%	5%
ATC Operations	50%	18%	16%
<b>Average Age</b>	26.5	26.5	26.2
<b>Education</b>			
High School Only	14%	9%	11%
Some College	48%	44%	54%
College Degree	38%	47%	35%
<b>Gender</b>			
Male	83%	85%	80%
Female	17%	15%	20%
<b>Minority Status</b>			
Minority	13%	8%	12%
Non-Minority	87%	92%	88%

Note. From "Recovery of the FAA air traffic control specialist workforce, 1981-1992," by D. Broach, 1998, p. 22.

CAMI then released its first *Summative Evaluation of the CTI for Air Traffic Control Specialists Program: Progress of Minnesota Air Traffic Control Training Center Graduates in En Route Field Training* report. The report concluded

- the “AT-CTI appeared to be meeting the operational objectives in terms of employee diversity, progress in field training, and controller performance” (Broach, 1998, p. 38).
- there were few differences between AT-CTI and Academy graduates in terms of training.
- the Minnesota AT-CTI was less successful in recruiting minorities than the FAA but the AT-CTI could save the FAA a significant amount of money avoiding screening costs, Academy costs, and reduced training time in the field (Broach, 1998).

In 1999, Broach, Farmer and Young discovered the MCAT may have been excluding more African Americans than Whites but was not confirmed due to the lack of racial



identification by many of the applicants. They found the test was bias because they were accepting more applicants with scores 90 and hire rather than the recommended 70 or 75. By hiring applicants with 90 and above, they excluded many African Americans who did not score a 90 (Broach, Farmer & Young, 1999).

In 2002, the AT-SAT, which was supposed to be delivered to the FAA in 1997, was finally implemented. The AT-SAT was supposed to replace both the MCAT and the ATCS/PTS initially but at first only replaced the MCAT (Pavel, 2012). As reported in the *Documentation of Validity for the AT-SAT Computerized Test Battery*, “the goal of developing a selection test battery for the ATCS intended to be highly job related and fair to women and minorities was achieved” (Ramos et al., 2001, p. 5). Applicants were scored on the test and applicants falling with the 70-84% category were “qualified” whereas applicants within the 85% and higher category were “most qualified” (Pavel, 2012). An applicant had to receive at least a 70% to be qualified. No research has been done as to why applicants scoring an 85% and higher are more qualified than applicants who score between 70%-84%.

In 2002, Heil, Detwiler, Agen, Williams, Agnew and King performed a study to examine *The Effects of Practice and Coaching on the Air Traffic Selection and Training Test Battery*. Heil et al. (2002) concluded an applicant’s AT-SAT score is influenced by practice and coaching but the greater influence is coaching. They reported coaching could move an applicant from the failing category to qualified or from qualified to well qualified.

## 2003 – 2009

Expanding upon their personality research from 1997, Dollar and Schroeder began re-visiting the topic of personality types among air traffic controllers in 2003. In 2004, Dollar and Schroeder examined the Myers-Briggs Type Indicator (MBTI) personality types of candidates who had taken the MBTI upon entering the Academy between 1982 and 1985. Dollar et al. (2004) found more Academy entrants fell within the sensing-thinking and judging personality type as opposed to the MBTI norm. Dollar et al. reported there were weak relationships between the MBTI measures and training success as well as transition into supervisor and manager positions. Table 5 shows the comparison between the MBTI norm and different groups.

Table 5

### *Comparisons of ATCS Entrants with Population Norms and Career Status*

Pattern	Total Population Norms N=1267	Total ATCS Entrants N=6420	Total ATCS Pass N=3782	Total ATCS Not Pass N=2637	Total ATCS CPCs N=2873	Total ATCS Not CPCs N=909	Total ATCS Sup/Man N=539	Total ATCS Not Sup/Man N=2334
Extrovert	46.3	50	49.8	50.2	50.2	48.5	54.7	49.1
Introvert	53.7	50	50.2	49.8	49.8	51.5	45.3	51.9
Sensing	68.1	64.5	64.5	64.5	66.1	59.7	67.2	65.8
Intuitive	31.9	35.5	35.5	35.5	33.9	40.3	32.8	34.2
Thinking	52.9	81.5	82.4	80.2	82.4	82.7	86.8	81.3
Feeling	47.1	18.5	17.6	19.8	17.6	17.3	13.2	18.6
Judging	58.1	69.9	68.5	71.8	68	70.2	71.4	67.2
Perceptive	41.9	30.1	31.5	28.2	32	29.8	28.6	32.8

Note. Adapted from "A longitudinal study of myers-briggs personality types in air traffic controllers," by C. S. Dollar and D. J. Schroeder, 2004, p. 2.

Table 6 and Table 7 show the MBTI norm and different groups by gender group.

Table 6

*Comparisons of Male ATCS Entrants with Population Norms and Career Status*

Pattern	Population Male Norms N=599	ATCS Male Entrants N=5588	ATCS Male Passers N=3283	ATCS Males Not Pass N=2305	ATCS Male CPCs N=2521	ATCS Males Not CPCs N=762	ATCS Male Sup/Man N=457	ATCS Males Not Sup/Man N=2064
Extrovert	45.4	49.1	48.9	49.3	49	48.8	53.4	48
Introvert	54.6	50.9	51.1	50.7	51	51.2	46.6	52
Sensing	64.4	65	65.3	64.6	66.8	60.5	68.5	66.4
Intuitive	35.6	35	34.7	35.4	33.2	39.5	31.5	33.6
Thinking	68.6	82.8	83.8	81.3	83.6	84.4	87.3	82.8
Feeling	31.4	17.2	16.2	18.7	16.4	15.6	12.7	17.2
Judging	55.1	70.7	69.5	72.4	69	71.3	72.4	68.2
Perceptive	44.9	29.3	30.5	27.6	31	28.7	27.6	31.8

Note. Adapted from "A longitudinal study of myers-briggs personality types in air traffic controllers," by C. S. Dollar and D. J. Schroeder, 2004, p. 3.

Table 7

*Comparisons of Female ATCS Entrants with Population Norms and Career Status*

Pattern	Population Female Norms N=668	ATCS Female Entrants N=832	ATCS Female Passers N=499	ATCS Females Not Pass N=332	ATCS Female CPCs N=352	ATCS Females Not CPCs N=147	ATCS Female Sup/Man N=82	ATCS Females Not Sup/Man N=270
Extrovert	47.2	55.9	55.3	56.9	58.8	46.9	62.2	57.8
Introvert	52.8	44.1	44.7	43.1	41.2	53.1	37.8	42.2
Sensing	71.4	61.5	59.5	64.5	61.1	55.8	59.8	61.5
Intuitive	28.6	38.5	40.5	35.5	38.9	44.2	40.2	38.5
Thinking	38.8	73.2	73.7	72.6	73.6	74.1	84.1	70.4
Feeling	61.2	26.7	26.3	27.4	26.4	25.9	15.9	29.6
Judging	60.8	64.3	61.9	67.8	60.8	64.6	65.9	59.3
Perceptive	39.2	35.7	38.1	32.2	39.2	35.4	34.1	40.7

Note. Adapted from "A longitudinal study of myers-briggs personality types in air traffic controllers," by C. S. Dollar and D. J. Schroeder, 2004, p. 4.

In 2006 the AT-SAT was re-weighted due to low passing rates of minorities. Dattel and King (2006) found the “new weighting formula benefited all groups and is likely to reduce the potential of adverse impact” (p. 1). In 2007, further CAMI research by King, Manning and Drechsler (2007) confirmed previous research reweighting the AT-SAT paid dividends in eliminating the result of adverse impact.

### **2010 – Present**

In 2012 Dean and Broach published a CAMI report entitled *Development, Validation, and Fairness of a Biographical Data Questionnaire for the Air Traffic Control Specialist Occupation*. Dean and Broach (2012) concluded and recommended an 80 item Controller Background Assessment Survey (CBAS) be developed further and had potential to be an ATCS selection procedure. They also concluded the CBAS be looked at based on performance outcomes of candidates who took the CBAS and are in the field.

In December of 2013, the AT-CTI was terminated by the Federal Aviation Administration. Because of the change in the hiring process with the elimination of the AT-CTI, applicants within the qualified applicant pool existing under the previous way of selection were thrown out. Though the applicants were thrown out because the process changed, they could reapply to the new announcement because under the new selection process, the FAA no longer keeps a pool of qualified applicants. After the termination of the AT-CTI the hiring qualifications were changed back to the previous way of selection to include anyone with a 4 year degree or 3 years work experience. Shortly thereafter, the Federal Aviation Administration released the *Barrier Analysis of the Air Traffic Control Specialists Centralized Hiring Process* report by Outtz and Associates in May 2013. Outtz and Hanges (2013) reported the qualification determination of applications, AT-SAT testing phase, preparation of the referral list of eligible

and qualified applicants and the centralized selection panel determination of applicants to proceed to an interview were all barriers to racial/ethnic minorities.

Outtz and Hanges (2013) also reported “there are serious diversity consequences for not fully using the General Public application source” (p. 17). Much like the MCAT, Outtz and Hanges reported the FAA had been taking applicants in the well qualified band scoring 85 and higher on the AT-SAT before taking applicants in the qualified band scoring between 70 and 85. Outtz and Hanges found fewer minorities were in the well qualified band as opposed to the qualified band. Outtz and Hanges also reported “there is no evidence an applicant who scores in the highly qualified band on the AT-SAT is substantially superior to an applicant who scores in the qualified band” (p. 49). Therefore, considering highly qualified before qualified was reported to be the root cause of the racial and ethnic minority barrier. Table 8 emphasizes the amount of underrepresented applicants among the sources other than AT-CTI for the years 2007-2011.

Table 8

*Subgroup Race/Ethnicity and Gender by Application Source*

Ethnicity	Weighted Average FY2007-FY2011											
	Veterans Recruitment Appointment (VRA)		Retired Military Controller (RMC)		Other (CTO)		Public		Reinstatement- DOD CPC		College Training Initiative (CTI)	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Asian	414	2.1%	318	2.2%	239	2.1%	1,136	2.7%	62	1.9%	154	4.6%
African- American	6,646	33.5%	6,100	41.8%	3,291	29.3%	12,433	29.8%	844	26.4%	179	5.3%
Hawaiian	141	0.7%	67	0.5%	63	0.6%	274	0.7%	27	0.8%	16	0.5%
Hispanic	1,182	6.0%	849	5.8%	628	5.6%	2,390	5.7%	183	5.7%	219	6.5%
Multi	1,409	7.1%	920	6.3%	797	7.1%	2,920	7.0%	210	6.6%	231	6.9%
Native American	109	0.5%	72	0.5%	66	0.6%	225	0.5%	20	0.6%	9	0.3%
Unanswered	1,054	5.3%	707	4.8%	529	4.7%	1,890	4.5%	223	7.0%	191	5.7%
White	8,894	44.8%	5,546	38.0%	5,638	50.1%	20,400	49.0%	1,634	51.0%	2,373	70.4%
<b>Gender</b>												
Female	4,203	21.2%	3,522	24.2%	2,316	20.6%	9,846	23.6%	652	20.4%	577	17.1%
Male	13,321	67.1%	9,278	63.6%	7,595	67.5%	27,151	65.2%	2,114	66.0%	2,481	73.6%
Unanswered	2,325	11.7%	1,779	12.2%	1,340	11.9%	4,671	11.2%	437	13.6%	314	9.3%
Total	19,849		14,579		11,251		41,668		3,203		3,372	

Note. From "The barrier analysis of the air traffic control specialists centralized hiring process," by J. L. Outtz and P. J. Hanges, 2013, p. 33.

In Table 8, there were no CTO numbers for 2006, there was no public numbers for 2006, 2010 or 2011, there was no DOD numbers for 2006 and there was no AT-CTI numbers for 2006 and 2007.

Prior to the barrier analyses being released, Broach, Byrne, Manning, Pierce, McCauley and Bleckley (2013) released a report in March about the validity of the AT-SAT. Broach et al. reported "a larger proportion of controllers in the well qualified band achieved CPC than did

controllers in the qualified band” (p. 5). Broach et al. reported the AT-SAT was a valid predictor of CPC achievement at the first facility.

A report was issued by Pierce, Bleckley and Crayton (2013) shortly thereafter in June. Pierce et al. examined the selection and training performance of AT-CTI grads and general public applicants who had taken the AT-SAT between 2007 and 2009. Pierce et al. reported AT-CTI trainees were successful more often and unsuccessful less often both in the Academy and at the first facility than OTS hires. Pierce et al. recommended at the time the FAA “continue the use of the AT-SAT in hiring AT-CTI grads and select primarily applicants scoring in the well qualified band” (p. 13).

In 2014 was the first off-the-street announcement in which applicants were hired under the new selection process. An applicant must first take and pass a biographical questionnaire as part of the initial application, if the applicant passes there application is then reviewed by HR to verify the applicant meets the minimum qualifications on the announcement, the applicant then moves on to take the AT-SAT, if the applicant achieves a qualifying score they are then sent on to the Academy for either enroute or terminal training (pre-determined), after achieving a qualifying score at the Academy the applicant selects from the list of available facilities at the time of graduation from the Academy to a field facility, upon reaching the facility the trainee must pass all developmental stages prior to becoming a certified controller (USAJobs, 2014; Coyne, 2014; aptMetrics, 2013).

Prior to February 2014 there had been OTS hiring occasionally but the selection process was a multiple hurdle approach and the biographical assessment was not a part of the application process. The selection process prior to 2014 consisted of the applicant applying to a vacancy announcement, the HR personnel would then review the applications to see if they meet the

minimum qualifications for the certain vacancy announcement, upon meeting minimum qualifications they would then move on to take the AT-SAT, if the applicant achieved at least a 70 they would move onto the generation of referral lists, the applicant would be referred if there location preference aligned with the state/facility hiring needs, if the applicant was not referred they would remain in the hiring pool, a centralized selection panel would then convene to select individuals to fill certain facility vacancies, applicants selected would go through an interview at the closest facility and move on to a medical screen, upon passing the medical the applicant would go through a security clearance, if successful throughout the entire process, the applicant would go to the Academy for training (aptMetrics, 2013).

The problems found in the previous way of selection as outlined by Outtz and Hanges, (2013) applicants scoring higher on the AT-SAT would be selected prior to applicants with a lower score. There were more white males scoring in the higher band than there was the underrepresented groups', thus being a barrier to the selection process (Outtz & Hanges, 2013; aptMetrics, 2013). aptMetrics (2013) also mentioned the centralized selection panel was a barrier in the selection process due to the human aspect. With the new way of selection, the AT-SAT is taken after the biographical questionnaire.

In October Pierce, Broach, Byrne and Bleckley (2014) released a report on *Using Biodata to Select Air Traffic Controllers*. Again they reported candidates with higher AT-SAT scores were more likely to complete training successfully than candidates with lower scores. Pierce et al. concluded the report stating the "evidence for using biodata items for controller selection is weak" (p. 9). They recommended if biodata be used in the selection of controllers, more research is needed to validate biodata items predictive of success in training



## RESULTS

The results of the data collected from the DOT workforce statistics as well as the FAA workforce plans for the years 2005-2015 are displayed below. The data has been broken up by pay band, as described in the methodology chapter of this paper, and depicts the percentage of underrepresented groups by fiscal year. The data can be compared in a variety of ways after knowing the primary hiring source for each fiscal year.

To begin, Table 9 shows the total amount of hires by source for each fiscal year.

Table 9

### *Hiring Numbers by Source*

Source	Fiscal Year										
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Experience		575	666	720	262	226	188	190	129	Appl. but Unk.	
AT-CTI		541	1019	823	335	252	245	467	361	Terminated	
General Public			130	653	1134	520	391	268	64	Appl. but Unk.	
Total from DOT	375	1008	1813	2192	1722	980	804	907	543	1154	1375
Total from Forecast	NA	1116	1815	2196	1,731	998	824	925	554	1112	NA
	Representation of primarily CTI			Representation of CTI and Public Mix. (Heavy Pub. In 09)						New Way	

The predominant hiring source for each year will be important when comparing the data to examine whether there was a change or not. Since data is difficult to compare one year to another, the data will primarily be examined in three separate time periods. 2005-2007 representing primarily AT-CTI hires, 2008-2013 represents a mix of sources with the primary in 2009 being public hires, and 2014-2015 being the new way of selection with the biographical questionnaire, thus only public hires.

Figure 1 shows the percentage of total hires (both experienced and Academy entrant trainees) by race/ethnicity for each fiscal year.

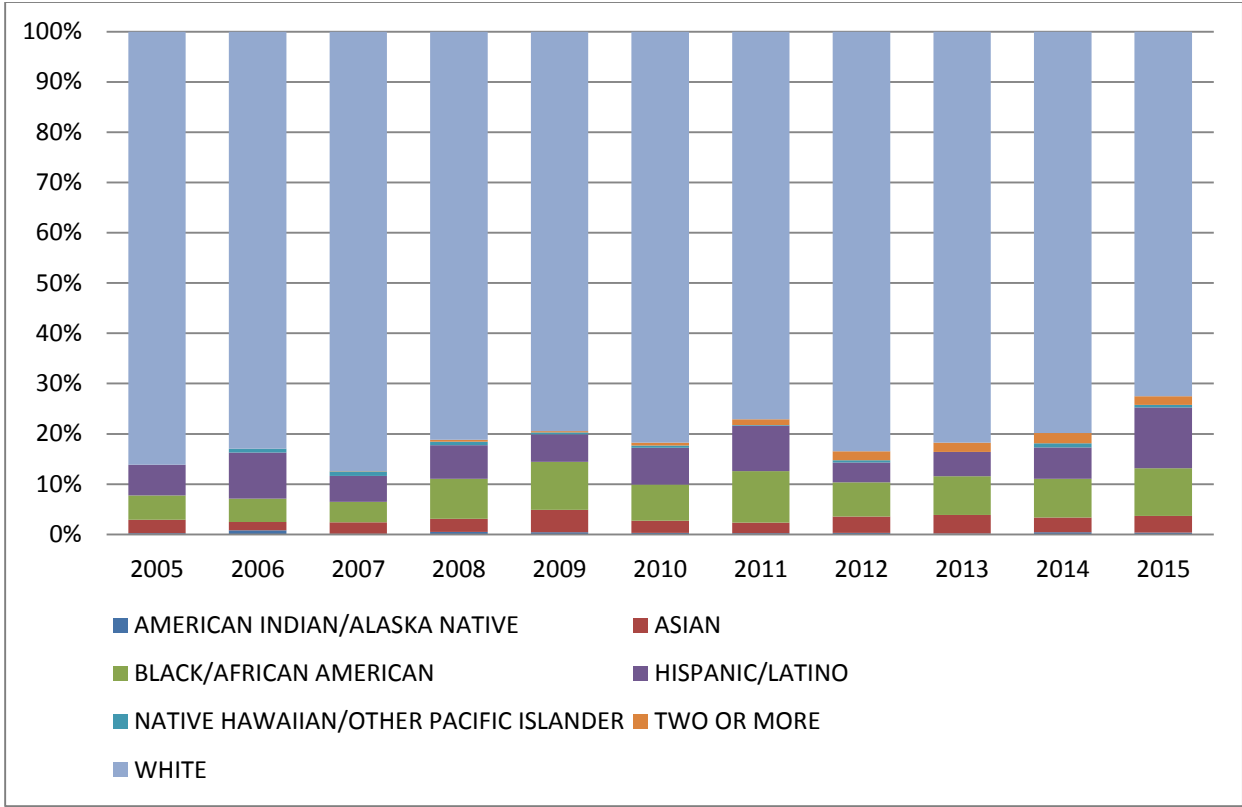
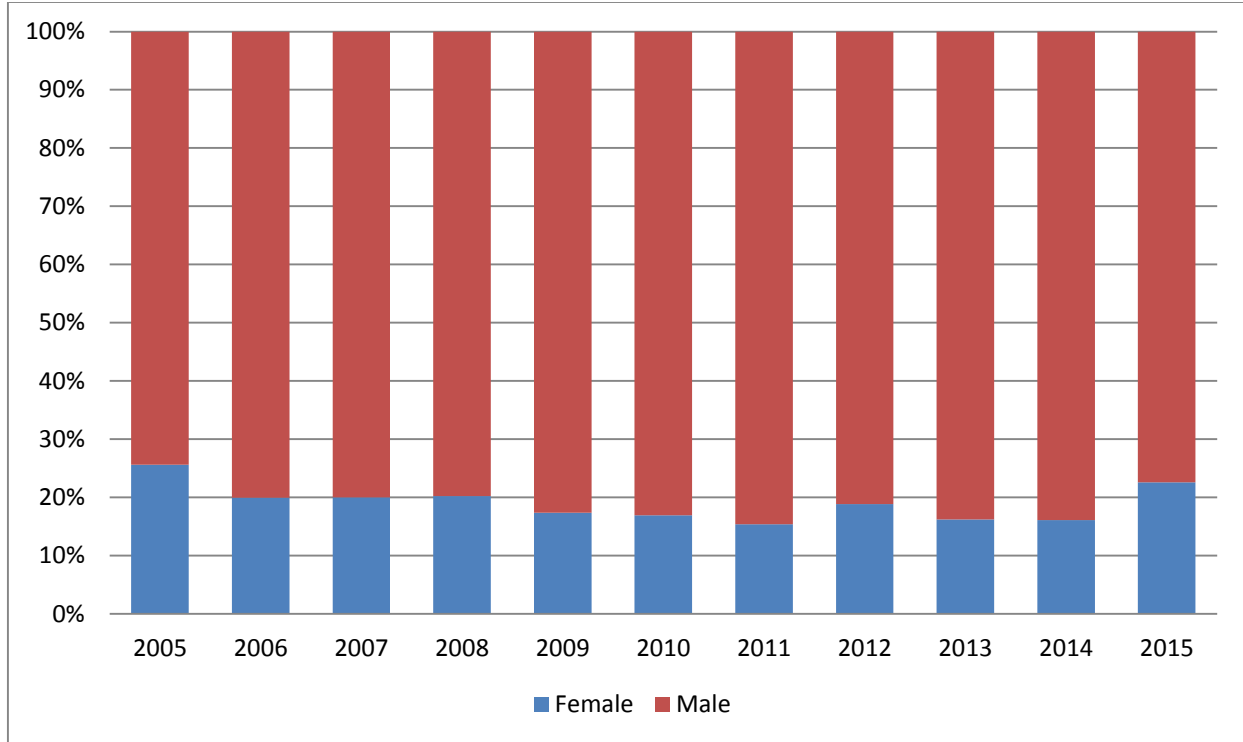


Figure 1. Total experienced and Academy entrant trainee hires by race/ethnicity.

Comparing 2005-2007 (primarily AT-CTI) with 2008-2013 (mix), the percent of underrepresented groups of the total hires is much greater with more public hires. The data shows an increase in the percent of underrepresented groups among the total hires in 2014-2015 in comparison with 2005-2007.

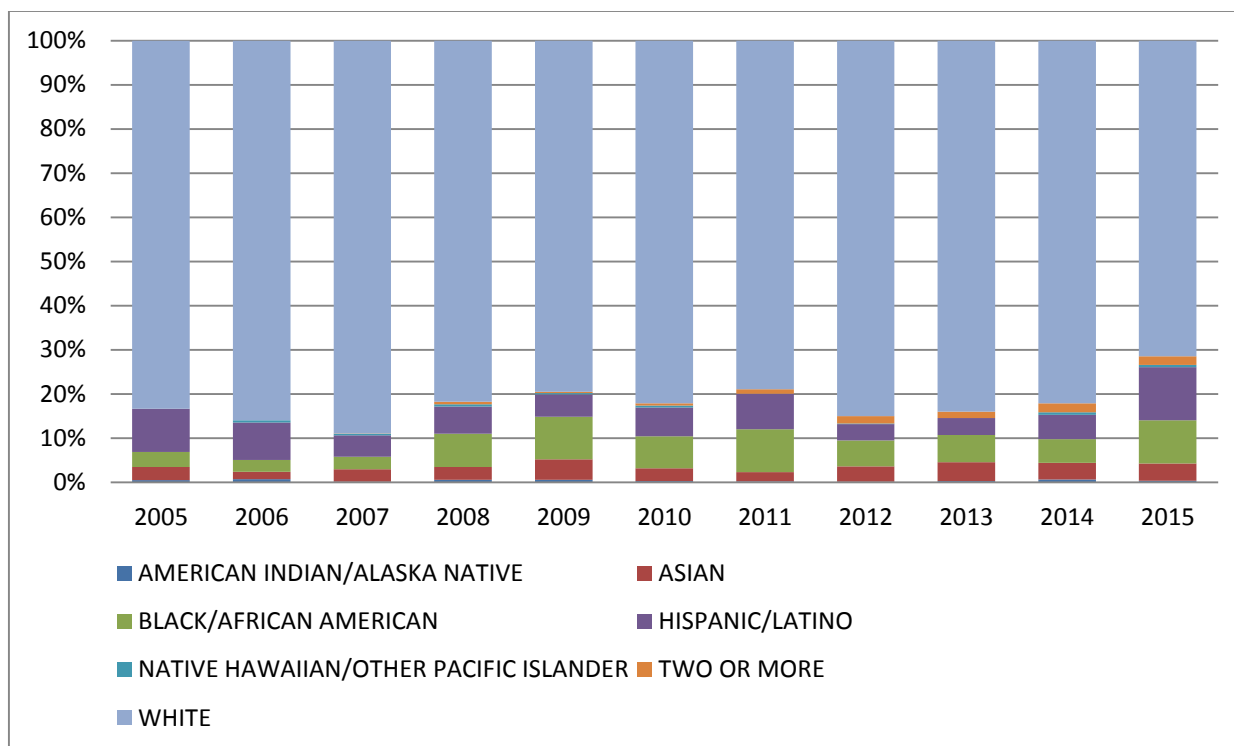
Figure 2 shows the percentage of total hires (Academy entrant trainees and experienced) by gender for each fiscal year.



*Figure 2.* Total experienced and Academy entrant trainee hires by gender.

The data shows a slight increase in the percent of underrepresented gender group in 2015 when comparing to fiscal years 2008-2013. The percent of underrepresented gender group declined from when the source was primarily AT-CTI to when the source was primarily OTS.

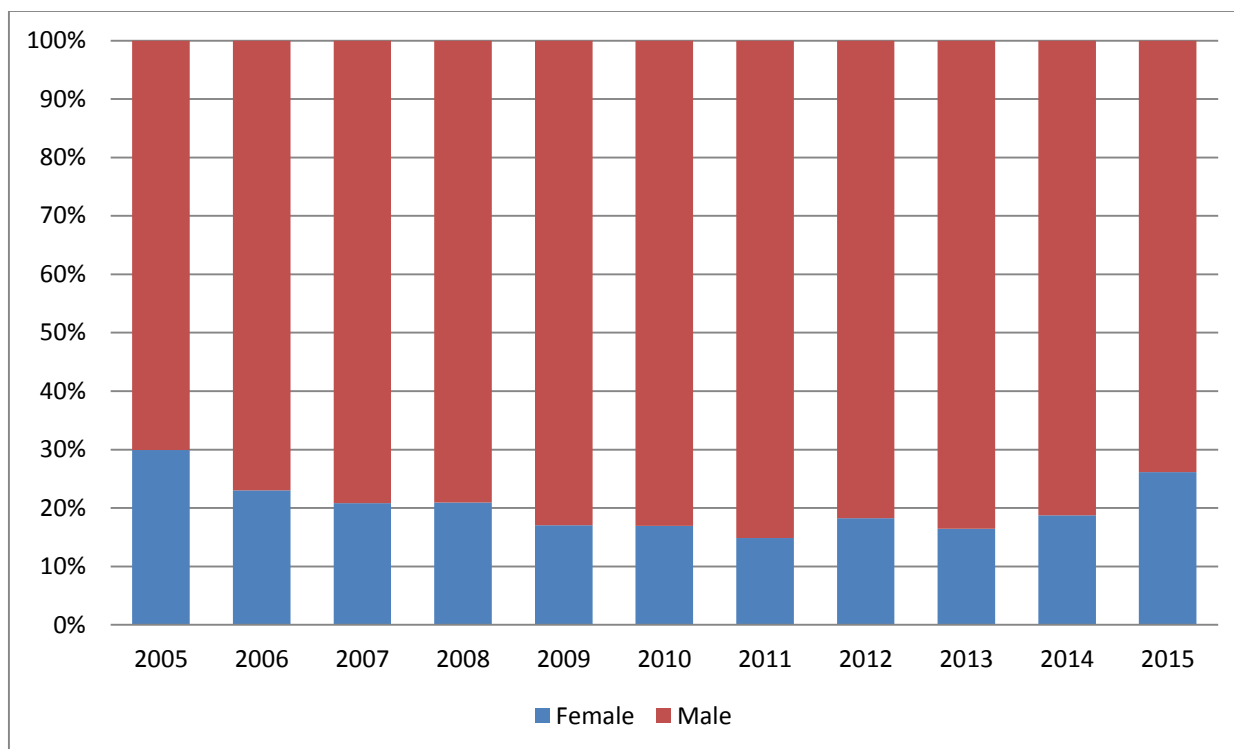
Figure 3 shows the percentage of total Academy entrant trainee hires by race/ethnicity for each fiscal year.



*Figure 3. Total Academy entrant trainee hires by race/ethnicity.*

The data shows a downward trend in the percent of underrepresented groups entering the Academy when AT-CTI was the primary hiring source. Once the hiring had been opened to the public in 2007, 2008 and 2009, the data shows an upward trend in underrepresented groups entering the Academy from 2008-2011. Much like the other data, the percent of underrepresented groups entering the ACADEMY in 2015 increased significantly from all other years.

Figure 4 shows the percentage of total Academy entrant trainee hires by gender for each fiscal year.



*Figure 4.* Total Academy entrant trainee hires by gender.

Again, the data shows a downward trend when the hiring source was primarily AT-CTI in 2005-2007. Additionally, the percent of the underrepresented gender group entering the Academy increased significantly in 2015 from all other years except 2005.

Figure 5 shows the percentage of total experienced hires broken by race/ethnicity for each fiscal year.

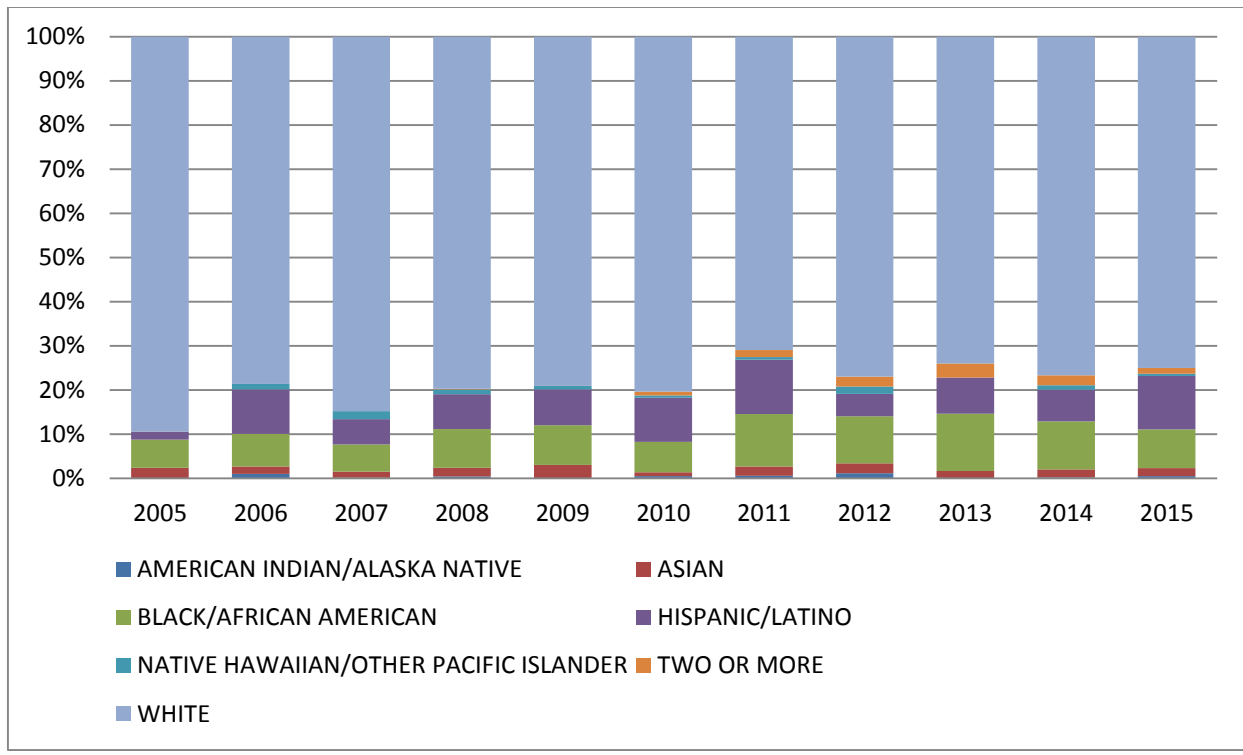


Figure 5. Total experienced hires by race/ethnicity.

The percent of underrepresented experienced hires has increased slightly from 2005-2007 with a spike in 2011. For the most part, the percent of underrepresented experienced hires has remained somewhat constant around 20% of the total experienced hires.

Figure 6 shows the percentage of total experienced hires by gender for each fiscal year.

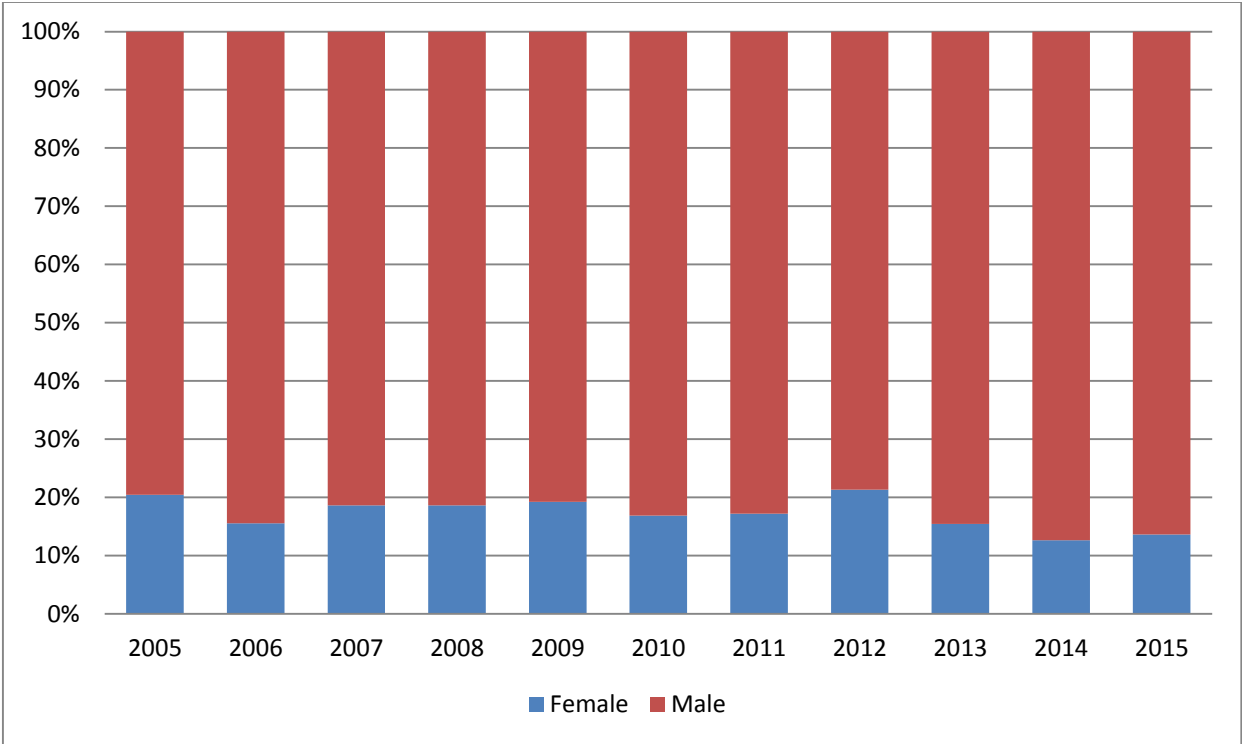
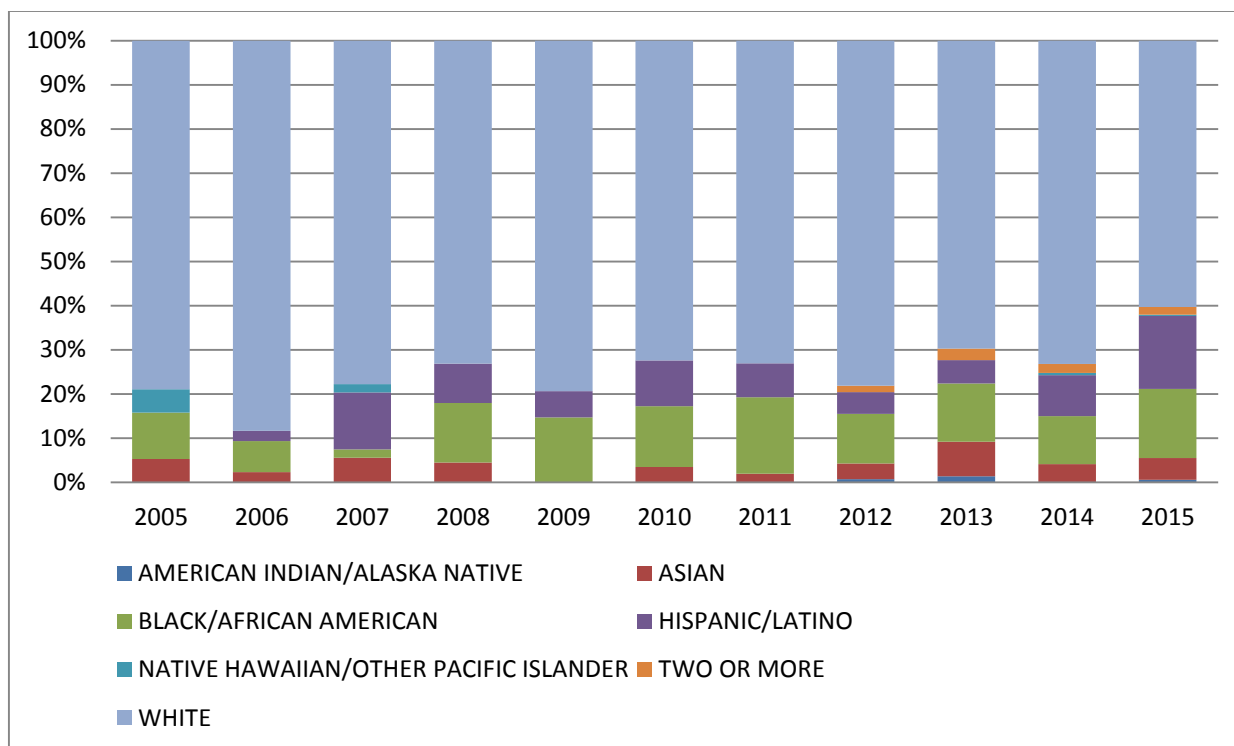


Figure 6. Total experienced hires by gender.

Since 2005, the percent of experienced underrepresented gender group hires has generally been declining with the exception of a slight spike in 2012.

Figure 7 shows the percentage of total Academy entrant trainee adjusted attrition by race/ethnicity for each fiscal year.

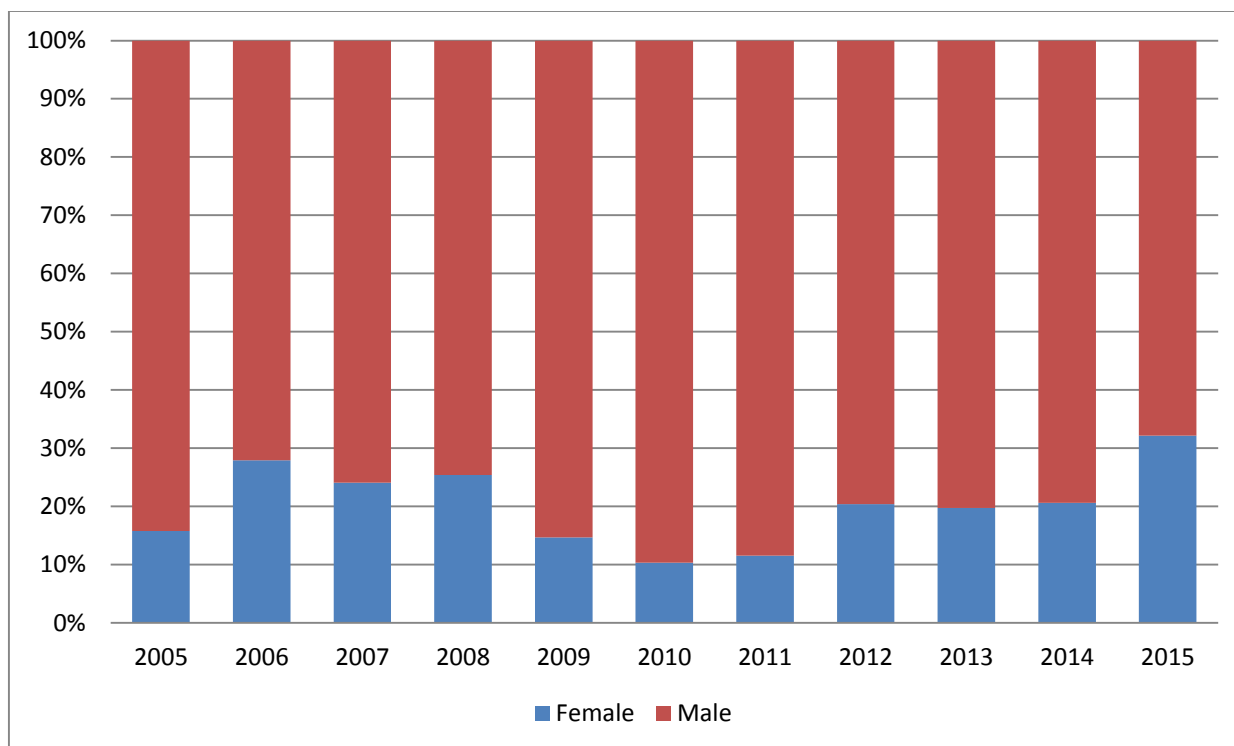


*Figure 7.* Total Academy entrant trainee adjusted attrition by race/ethnicity.

After adjusting the Academy attrition, the percent of underrepresented Academy attrition, fiscal year 2015 is still significantly higher than the following years and the attrition during the mixed time period is generally higher than during the primarily AT-CTI source period.

Figure 8 shows the percentage of total Academy entrant trainee adjusted attrition by gender for each fiscal year.

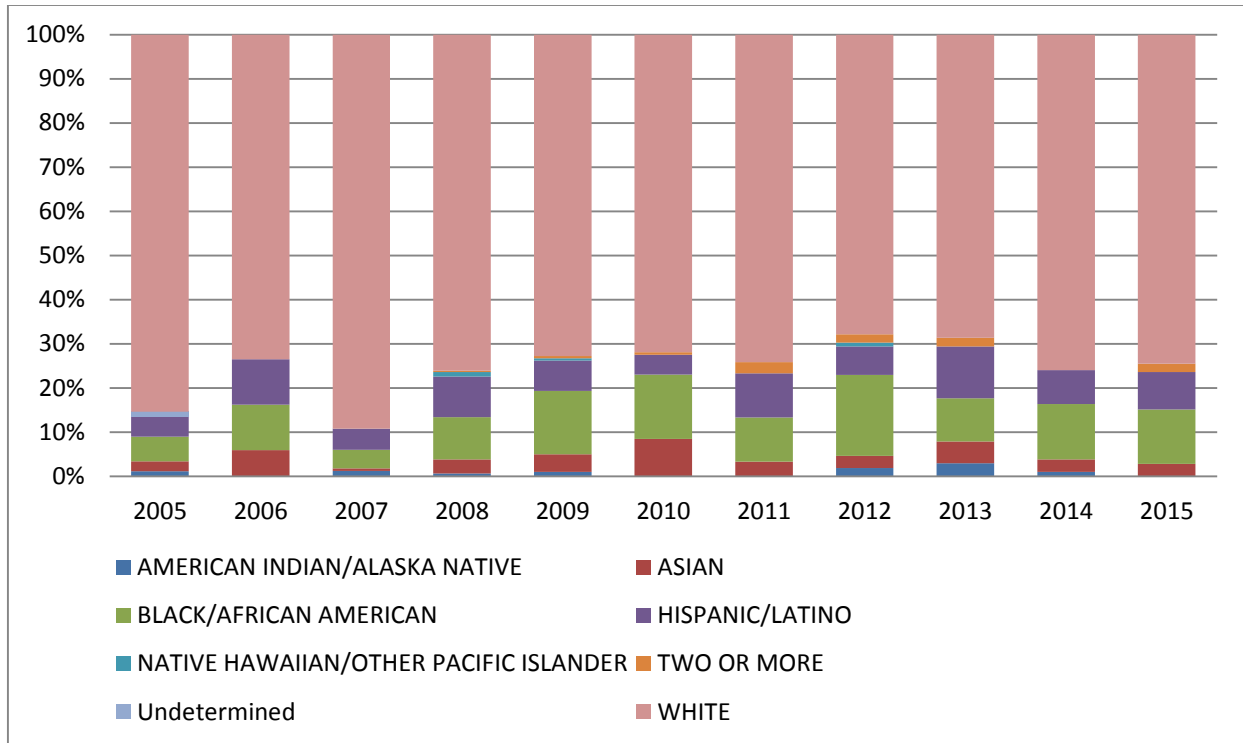




*Figure 8.* Total Academy entrant trainee adjusted attrition by gender.

The percent of the underrepresented gender group remained the highest in 2015 after adjusting the gender attrition. There is also less of a difference between 2007 and 2008 making the AT-CTI source time period more comparable to the new way of selection.

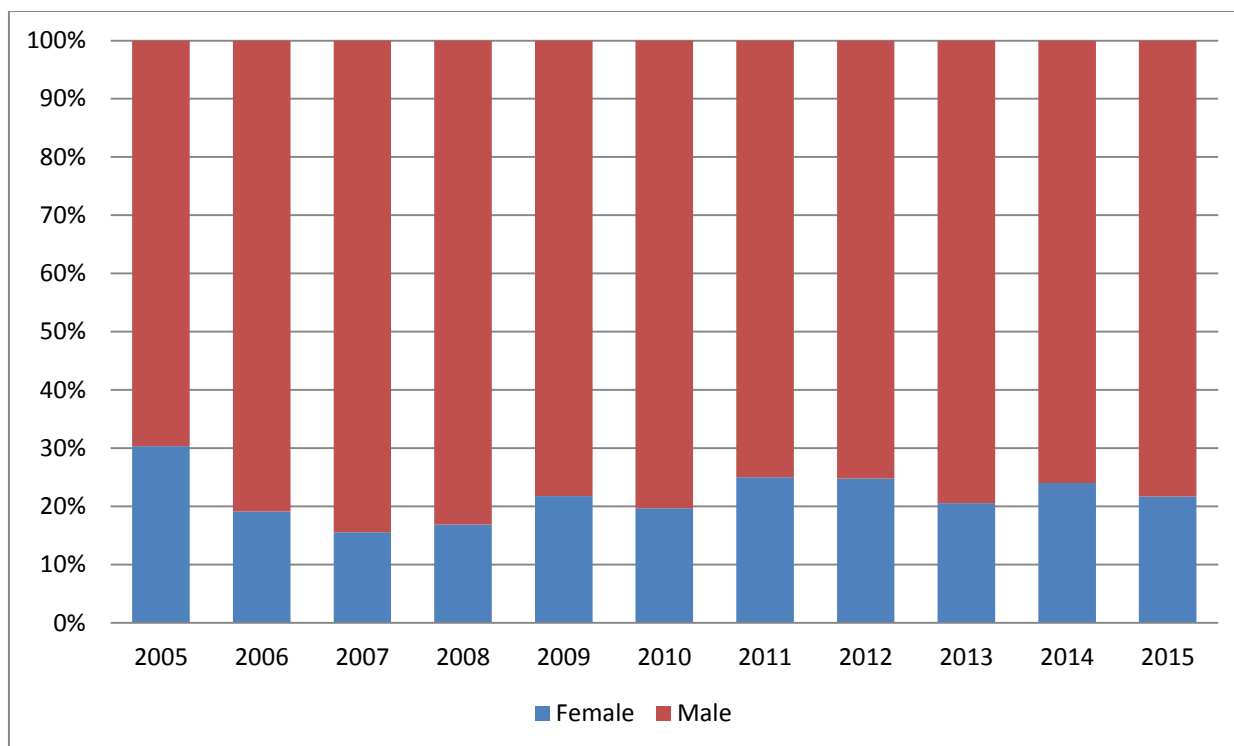
Figure 9 shows the percentage of total developmental attrition by race/ethnicity for each fiscal year.



*Figure 9.* Total developmental attrition by race/ethnicity.

The developmental underrepresented group attrition was generally lower during 2005-2007 than 2008-2013 but has improved in 2014 and 2015 since the change in the process.

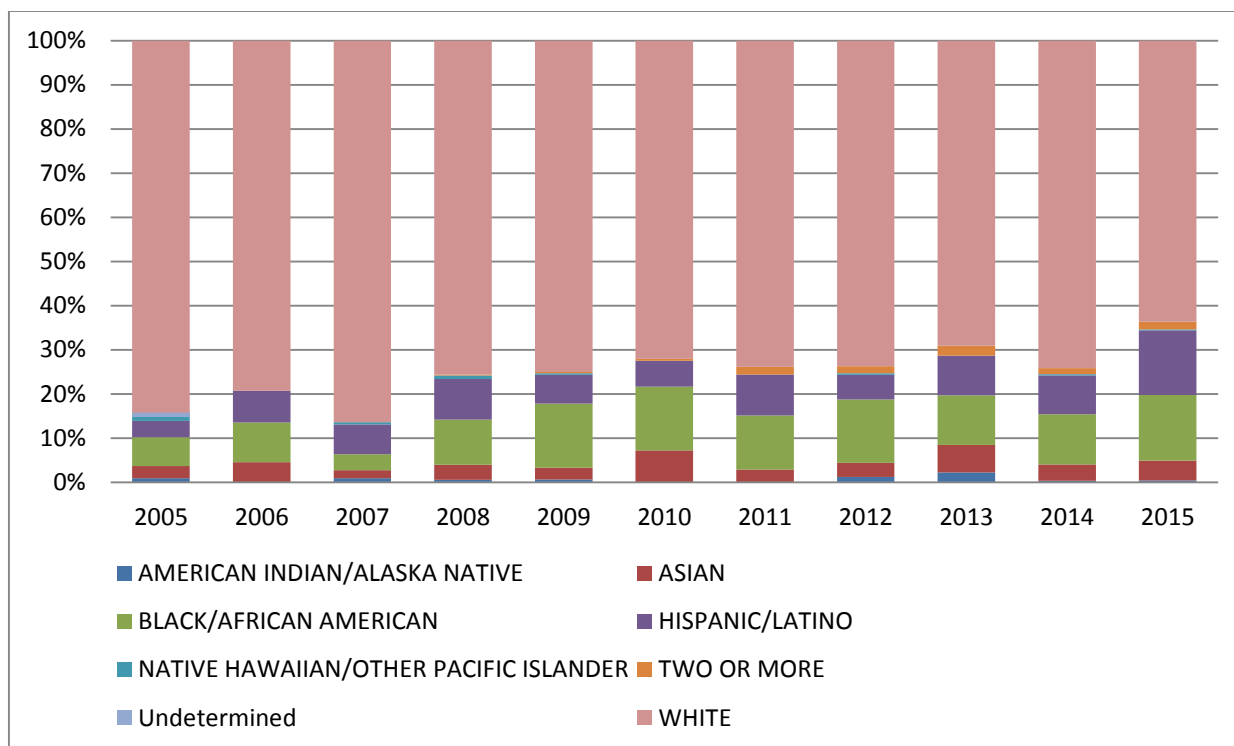
Figure 10 shows the percentage of total developmental attrition by gender for each fiscal year.



*Figure 10.* Total developmental attrition by gender.

The developmental underrepresented gender attrition was declining from 2005-2007 but has slightly increased again from 2008 to 2015.

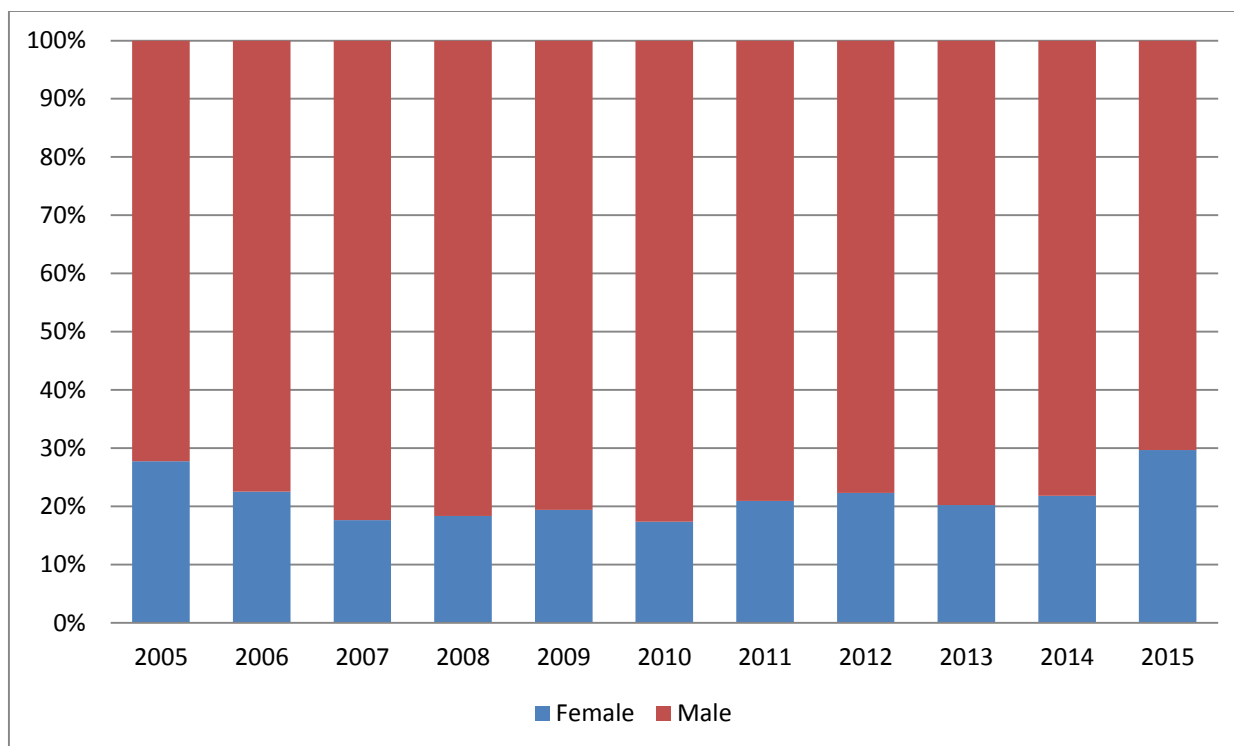
Figure 11 shows the percentage of total Academy entrant trainee and developmental attrition by race/ethnicity.



*Figure 11.* Total Academy entrant trainee adjusted attrition and developmental attrition by race/ethnicity.

The percent of underrepresented group attrition as a whole has generally increased from the fiscal years 2005-2007 compared to all other years.

Figure 12 shows the percentage of total Academy entrant trainee and developmental attrition by gender.



*Figure 12.* Total Academy entrant trainee adjusted attrition and developmental attrition by gender.

The percent of underrepresented gender attrition as a whole from 2007-2013 slightly increased while 2015 and 2005 are pretty comparable.

Table 10 shows the percent of Academy entrant trainee adjusted attrition of Academy entrant trainee hires by race/ethnicity and gender.

Table 10

*Academy Entrant Trainee Adjusted Attrition of Academy Entrant Trainee Hires*

Characteristic	Fiscal Year										
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
<b>Race/Ethnicity</b>											
American Indian/Alaska Native	0%	0%	0%	0%	0%	0%	0%	100%	100%	0%	67%
Asian	17%	10%	9%	7%	0%	9%	8%	20%	33%	32%	44%
Black/African American	29%	19%	3%	8%	10%	15%	15%	37%	38%	60%	56%
Hispanic/Latino	0%	2%	13%	6%	8%	12%	8%	26%	25%	50%	48%
Native Hawaiian/Other Pacific Islander	None	0%	25%	0%	0%	0%	None	0%	None	25%	20%
Two or More	None	None	0%	0%	0%	0%	0%	17%	33%	31%	32%
White	9%	7%	4%	4%	7%	7%	8%	18%	15%	26%	30%
<b>Gender</b>											
Female	5%	9%	5%	5%	6%	5%	7%	22%	22%	33%	43%
Male	11%	7%	5%	4%	7%	8%	9%	19%	17%	29%	32%
Grand Total	9%	7%	5%	4%	7%	8%	8%	19%	18%	30%	35%

Note. "none" indicates none were hired and none terminated or resigned.

When examining the percent of Academy entrant trainee adjusted attrition as a function of the Academy entrant trainee hires, the amount of diverse candidates lost has significantly increased in 2014 and 2015 for all groups. Also the majority groups (white) have been relatively little as opposed to the underrepresented groups.

Table 11 shows the percent of Academy entrant trainee adjusted attrition and developmental attrition of Academy entrant trainee and experienced hires by race/ethnicity and gender.

Table 11

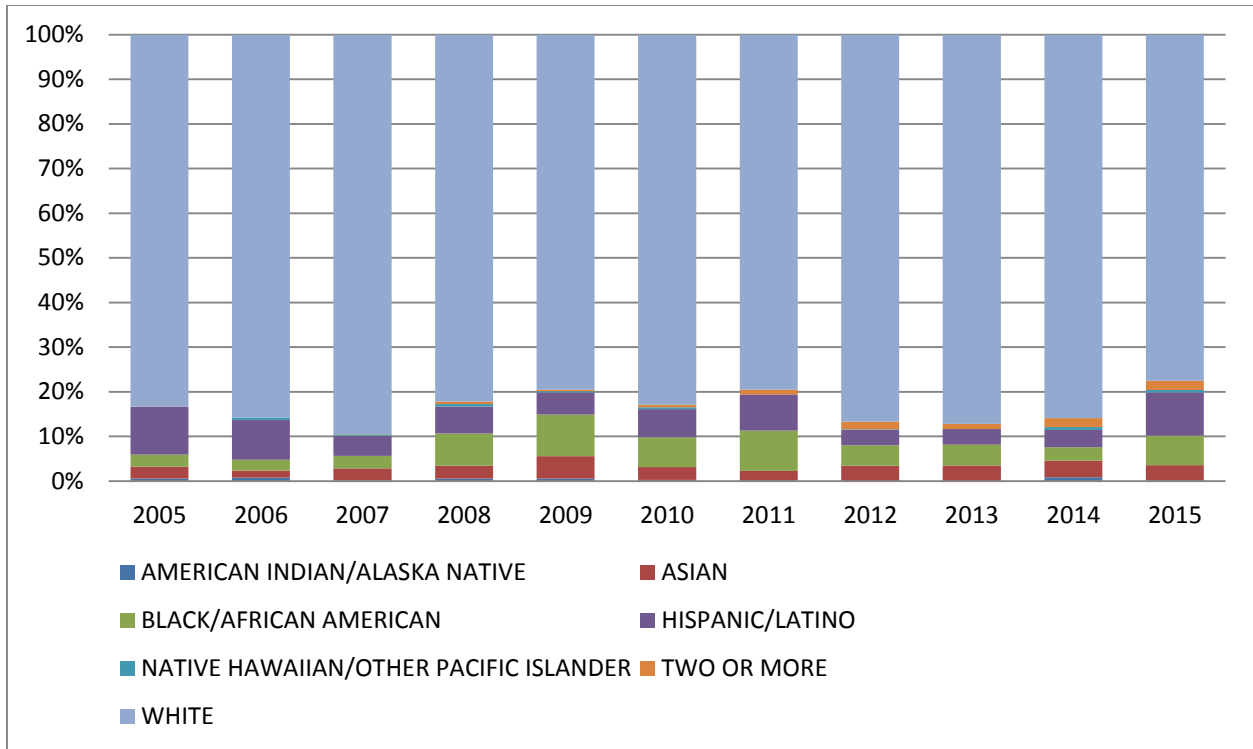
*Academy Entrant Trainee Adjusted Attrition and Developmental Attrition of Academy Entrant Trainee and Experienced Hires*

Characteristic	Fiscal Year										
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
<b>Race/Ethnicity</b>											
American Indian/Alaska Native	100%	0%	100%	18%	25%	0%	0%	100%	400%	20%	40%
Asian	30%	29%	10%	23%	11%	71%	29%	28%	55%	32%	43%
Black/African American	39%	21%	11%	22%	27%	49%	26%	58%	48%	38%	52%
Hispanic/Latino	17%	9%	16%	24%	21%	19%	22%	39%	62%	36%	40%
Native Hawaiian/Other Pacific Islander		0%	6%	20%	17%	0%	0%	25%	None	11%	14%
Two or More	None	None	0%	11%	20%	17%	33%	25%	40%	17%	33%
Undetermined	Unk.										
White	28%	11%	12%	16%	17%	21%	20%	24%	28%	24%	29%
<b>Gender</b>											
Female	31%	12%	11%	16%	20%	25%	29%	33%	41%	35%	43%
Male	28%	11%	13%	18%	17%	24%	20%	26%	31%	24%	30%
Grand Total	29%	11%	12%	17%	18%	24%	21%	28%	33%	26%	33%

Note. "none" indicates none hired and none terminated or resigned. Also, in 2005 one Native Hawaiian/Other was terminated or resigned but none were hired and therefore the cell remains blank.

When examining the Academy entrant adjusted attrition and developmental attrition as a percent of Academy entrant hires and experienced hires, the majority groups have been relatively little as opposed to the underrepresented groups.

Figure 13 shows the percent of Academy graduates by race/ethnicity for each fiscal year.

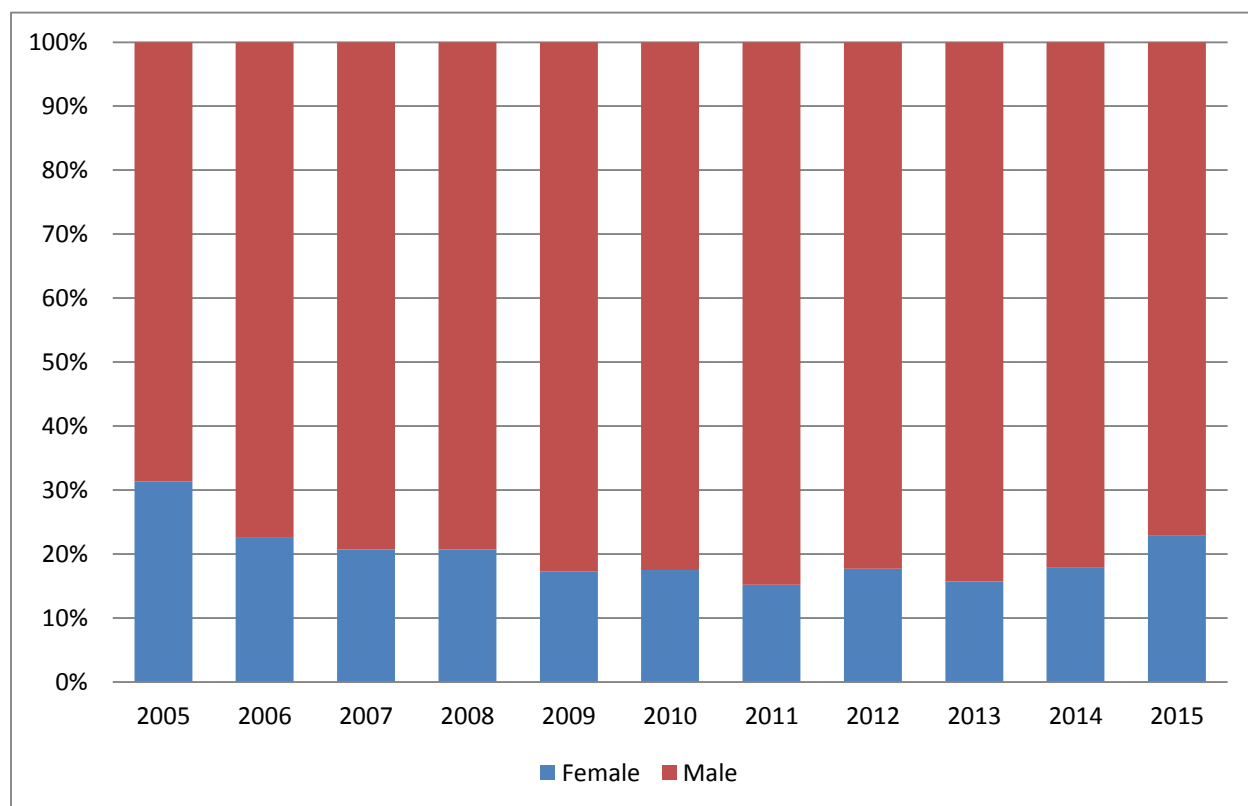


*Figure 13. Academy graduates by race/ethnicity.*

The percent of underrepresented groups graduating from the Academy has increased slightly in 2015 when compared with 2011 and 2009. There is a noticeable change from the years 2005-2007 when compared to 2008-2015.



Figure 14 shows the percent of Academy graduates by gender for each fiscal year.



*Figure 14.* Academy graduates by gender.

The percent of underrepresented gender group graduating the Academy has increased after the change in the selection process. Additionally the data shows a downward trend from 2005 to 2007 and an upward trend from 2013-2015.

## DISCUSSION

To AT-CTI graduates the data could seem shocking because the data shows an increase in the ethnic and gender makeup of the controller workforce after the elimination of the AT-CTI. To others the data might be of no surprise, the change in the selection process did what intended. Upon the termination of the AT-CTI in December of 2013, many AT-CTI students were angry because they felt they were better than OTS hires because they had education (see - [savecti.org](http://savecti.org), [cticonnection.org](http://cticonnection.org), [ctiassociation.org](http://ctiassociation.org)). AT-CTI graduates wondered how the government could throw out a pool of qualified applicants. After some of the dust settled and AT-CTI students began to realize the primary purpose to the change in the ATCS selection process was to increase the diversity, many AT-CTI students began to challenge the change (see - [savecti.org](http://savecti.org), [cticonnection.org](http://cticonnection.org), [ctiassociation.org](http://ctiassociation.org), [ctistudents.com](http://ctistudents.com)).

### **Hiring Comparison**

The *Extension to Barrier Analysis of Air Traffic Control Specialist Centralized Hiring Process* by aptMetrics (2013) used all available data to examine the selection process from 2008 through 2011. I did take the barrier analysis report into consideration when gathering data for this research paper but I did not use any of the data from the report because the hiring numbers vary greatly from the DOT statistics. The total hires for 2008 through 2011 the report displayed was 4,237. The total from 2008 through 2011 as displayed by the DOT statistics was 5,858. The total hires as added up from the FAA workforce plans was 5,749. The assumption I made for the discrepancy is the report somehow followed the applicants all the way through the hiring process from application till hired. Additionally, the report only examined 2007-2011 when the primary hiring source for AT-CTI graduates was 2005-2007. The report mentioned a change in the

selection process had not been fully implemented until 2007 and they had no way of tracking or following the applicants up until 2007 and is the reason they did not use data before then. As can also be seen, there is a small discrepancy between the hiring numbers from the DOT statistics and the FAA workforce plan. The total number of series 2152 (air traffic control specialist) hires for each fiscal year as reported by the DOT did not match up with the total number of hires as reported by the FAA for any fiscal year. The discrepancies by fiscal year can be further examined in Table 12.

Table 12

*Hiring Number Comparison between FAA Workforce Plan and DOT Statistics*

Source	Fiscal Year										
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total from FAA Plan	NA	1116	1815	2196	1731	998	824	925	554	1112	NA
Total from DOT Statistics	394	1045	1843	2229	1770	1014	845	936	578	1183	1441
Total Difference		-71	28	33	39	16	21	11	24	71	

Displayed in Table 13 is the total number of hires as reported by the FAA workforce plan & broken down by source.

Table 13

*Hiring Number Comparison by Source between FAA Workforce Plan and DOT Statistics*

Source	Fiscal Year										
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Experience from FAA Plan		575	666	720	262	226	188	190	129	Appl. but Unk.	
AT-CTI from FAA Plan		541	1019	823	335	252	245	467	361	Terminated	
General Public from FAA Plan			130	653	1134	520	391	268	64	Appl. but Unk.	
AT-CTI & Public from FAA Plan		541	1149	1476	1469	772	636	735	425		
Total from FAA Plan	NA	1116	1815	2196	1731	998	824	925	554	1112	NA
Experience from DOT Statistics	171	417	666	682	234	219	186	178	123	498	389
AT-CTI & Public from DOT Statistics	204	591	1147	1510	1488	761	618	729	420	656	986
Total from DOT Statistics	375	1008	1813	2192	1722	980	804	907	543	1154	1375
Experience Difference		-158	0	-38	-28	-7	-2	-12	-6		
AT-CTI & Public Difference		50	-2	34	19	-11	-18	-6	-5		
Total		-108	-2	-4	-9	-18	-20	-18	-11	42	

The DOT numbers represent the way the numbers broke down for the purposes of this research paper. AT-CTI and Public hires represents the FG-2152-01 pay grade reported by the DOT.

Experienced represents hires within the AT-2152-08 pay grade as reported by the DOT.

### **Findings in Hires**

Overall, the amount of diversity among both experienced and Academy entrant trainees have increased with the change in the selection process. Additionally, the amount of women increased in 2015 from the years 2009-2014 but is still not as much as in 2005 when the hiring pool was dominated by AT-CTI students. The amount of diversity in 2015 among Academy entrant trainee hires is the most diverse the Academy has been in the time period examined. Since the Academy entrant trainee hires are the ones the new selection process affected, the finding is a significant finding supporting the ethnic makeup of the controller workforce changed after the elimination of the AT-CTI. The amount of female Academy entrant trainee hires increased in 2015 from 2006-2014 but is still not as high as when AT-CTI students dominated the hiring source in 2005. The finding is still significant and supports the gender makeup of the controller workforce changed after the elimination of the AT-CTI. The prior way of selection did need to be modified and is apparent when examining the 2009 in comparison with 2015. The amount of underrepresented groups among Academy entrant trainee hires in 2009 when there was the largest amount of public hires was still not as great as the amount of underrepresented groups among Academy entrant trainee hires in 2015. Even though the amount of female Academy entrant trainee hires in 2015 is not as high as in 2005, I foresee the amount of female Academy entrant trainee hires becoming equal to or greater than 2005 when the 2016 numbers are available.

The amount of diversity among the experienced hires has remained relatively constant with a lull in 2005 and a spike in 2011. The lack of underrepresented groups among the experienced hires in 2005 has yet to be explained but was compensated for by the amount of diversity recruited through the AT-CTI source in 2005. The amount of experienced female hires had remained somewhat constant through 2012 hovering around 20% and dropping off in 2013 through 2015. A reason for the decline in experienced female hires could be there are fewer females in the military. The new selection process did not affect the experienced hires and therefore does not impact the hypothesis of this paper. I used the experienced numbers as a comparison for the Academy entrant trainee numbers as well as to get a better idea if there really was a change in the Academy entrant trainee underrepresented group numbers after the change in the selection process. Using the experienced hiring numbers allows me to see there was relatively no change in the amount of underrepresented groups in 2012-2015 but examining the Academy entrant trainee hires, there was an increase in 2012-2015. With there being no change among the experienced hires and change among the Academy entrant trainee hires the change in the selection process becomes more apparent showing the change really did bring in more diversity among Academy entrant trainees.

### **Attrition Comparison**

Much like the hiring data comparisons, I made comparisons in the attrition numbers between the FAA plan and the DOT attrition statistics. The biggest discrepancies in attrition numbers is between the two data sources for each fiscal year. Once broken down to the different areas like the FAA plans did, the discrepancies in the data used for this research paper became much smaller. After examining more closely, the largest discrepancies were in the number of retirements for each fiscal year. The FAA does not clearly define each type of attrition within the

workforce plan. Within the FAA plan they break subcategorize attrition into retirements, developmental, promotions/transfers, Academy and resignations, removal and death attrition. Within the DOT attrition statistics the data is broken up into separations-other, transfer, retirement and resignation. For the purposes of this research paper, the attrition numbers for both DOT and FAA represent everything but transfers, promotions and retirements. There were very few retirements and transfers for the experienced group as displayed by the DOT statistics. Additionally, the only kinds of attrition among Academy entrant trainees were separation – other and resignation. Separation-other consisted of only Academy entrant trainees who were terminated due to a failing score. The total number of series 2152 (air traffic control specialist) attrition for each fiscal year as reported by the DOT did not match up with the total number of attrition as reported by the FAA for any fiscal year. The comparisons by fiscal year can be further examined in Table 14.

Table 14

*Attrition Number Comparison between FAA Workforce Plan and DOT Statistics using Adjusted Attrition*

Source	Fiscal Year										
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total from FAA Plan		1038	1559	1689	1342	1072	1102	1132	1302	1245	
Total from DOT Statistics	1103	2750	1524	1626	1155	1045	1099	1249	1460	1430	1601
Total Difference		1712	-35	-63	-187	-27	-3	117	158	185	

The DOT numbers represent the way the numbers broke down for the purposes of this research paper. Academy represents the FG-2152-01 pay grade reported by the DOT. Developmental represents the AT-2152-xC, xD, xF, or xG pay grades as reported by the DOT. The attrition numbers in Table 14 only include termination, removal, resignation and death. Table 15 shows the adjusted attrition for the DOT statistics Academy numbers as discussed earlier.

Table 15

*Attrition Number Comparison between FAA Workforce Plan and DOT Statistics using Adjusted Attrition*

Source	Fiscal Year										
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
<b>FAA Plan</b>											
Academy		48	60	66	105	74	55	138	116	150	
Developmental			164	324	201	192	129	105	90	71	
Resignations, Removals, Deaths		261	100	117	86	43	57	39	46	47	
Total from FAA Plan	NA	309	324	507	392	309	241	282	252	268	NA
<b>DOT Statistics</b>											
Academy	19	43	54	67	102	58	52	142	76	194	345
Developmental	89	68	167	314	202	178	120	109	102	104	106
Total from DOT Statistics	108	111	221	381	304	236	172	251	178	298	451
Total Difference		-198	-103	-126	-88	-73	-69	-31	-74	30	

Note. The FAA workforce plan for 2007 did not report developmental attrition for 2006. The DOT statistics academy and developmental numbers include resignation, removal and death. The DOT academy numbers are adjusted.

### Findings in Attrition

All of the attrition findings were unexpected with the most unexpected finding being the largest amount of diverse Academy entrant trainees were lost in 2015 compared to the whole time period examined. The fewest amount of diverse Academy entrant trainees were lost in 2005 when the hiring pool was dominantly AT-CTI graduates. At the same time, there were also very few diverse Academy entrant trainees hired. No correlation can be made to say when the amount of hires increases so does the attrition because in 2007 many diverse Academy entrant trainees were lost when and was also the year the fewest number of diverse Academy entrant trainees were hired. Additionally, 2012-2014 demonstrates a time period when a comparable percent of the Academy entrant trainee hires were diverse but for some reason there was a larger amount of the diverse Academy entrant trainees lost in 2013 than in 2012 and 2014 when both have comparable attrition amounts. The amount of female Academy entrant trainee attrition was the largest in 2007 with the fewest being in 2010. Another surprising finding was in 2006, 2007 and

2008 they hired the same percentage of female Academy entrants but for some reason 2007 had the highest attrition of the three years as well as the largest of the whole time period examined. The smallest amount of female Academy entrant trainee attrition was in 2010 which was also a year they had relatively few female Academy entrant trainee hires. The suspected reason for the large amount of Academy entrant trainee attrition in 2015 will be explained later in the implication and recommendation section.

### **Field attrition.**

The developmental attrition gives a good picture of how much gender and diversity is leaving or being terminated prior to becoming a CPC. There was no valid way for me to separate Academy graduates versus experienced once Academy entrant trainees graduate from the Academy. Each facility is different in the amount of training time to become a CPC and training at some facilities can take as long as three years. So far, 2014 and 2015 do have a smaller amount of diversity lost as opposed to the previous years. The small amount of diversity lost in 2014 and 2015 illustrates underrepresented groups have better success in the field than at the Academy. If 2016 developmental attrition numbers were to remain the same as 2015 or decrease further, the Academy should then be investigated as to why underrepresented group hires are successful in the field but not at the Academy. Developmental underrepresented group attrition was the lowest in 2005 and 2007 when the hiring was dominantly AT-CTI graduates. At the same time, the amount of developmental female attrition was rather high in 2005 and 2007. The female developmental attrition from 2014 and 2015 is the lowest in the time period examined; illustrating females are successful at training in the field but for some reason have a high attrition rate at the Academy. Looking at both Academy entrant trainee adjusted attrition and



developmental attrition combined, 2015 was the year with the largest amount of diversity and females lost. 2005 through 2007 were the years with the least amount of diversity lost.

### **Academy graduates.**

The amount of adjusted Academy entrant trainees lost out of Academy entrant trainees hired has increased dramatically from 2012 to 2015. More specifically, Whites are the second lowest amount lost out of Academy entrant trainees hired. All the other ethnicities other than Native Hawaiian/Other Pacific Islander and White, have lost more than 30% of Academy entrant trainees hired in 2015. Academy entrant trainees and developmental attrition of Academy entrant trainee and experienced hires follows the same trend. All other ethnicities other than Native Hawaiian/Other Pacific Islander and White, have lost more than 29% of the total hired. I was surprised to see the difference in field success of the underrepresented groups versus Academy success. The underrepresented groups are successful once in the field but for some reason are not as successful while in the Academy.

### **Findings Following History**

The results found within this paper are to be expected after tracing the history of ATC selection and hiring changes. The AT-SAT ultimately replaced the CSC which was the first aptitude test used to select ATC applicants. Eventually research found CSC test scores were not successfully predicting training and job performance. To reduce the Academy attrition rate they implemented higher scoring standards on the CSC and the Academy attrition rate dropped. The MCAT replaced the CSC because the MCAT was found to be a better predictor of success. The reason for the implementation of the AT-SAT was because applicants could increase their test score by going to a company who offered coaching programs. The AT-SAT was also supposed to save money by replacing the ATCS/PTS and MCAT.

Looking back, the AT-SAT has all the same problems the MCAT did. Applicants can artificially inflate their test scores with programs designed with the same scenario areas as the AT-SAT test. After initial use of the MCAT the scoring standards were raised much like with the AT-SAT when the scoring was reweighted after initial implementation. Applicants selected from the AT-SAT were primarily in the well qualified band much like with the MCAT applicants with the higher score were also selected.

Each of the programs the FAA implemented as a test all had the same goals of targeting females and minorities but all ended up being terminated at some point. The theme among the programs is programs costing money lasted the shortest (Co-op and Airway Science Curriculum). Programs lasting the longest were replaced with some sort of screening test (150 Program and AT-CTI). Diversity programs began with the 150 Program in 1968 which was terminated in 1996. The Co-op was then implemented in 1981 as an affirmative action program but was terminated in 1993 because the Academy ATCS/PTS had the goal of cultural diversity. The Airway Science Curriculum was implemented in 1982 and was terminated in 1991 because the attrition rate for candidates in the Airway Science Curriculum was greater than traditional hires. The AT-CTI was created in 1989 and terminated at the end of 2013 because of the new selection process implemented in 2014. The AT-CTI has ultimately been replaced with the biographical questionnaire.

The biographical questionnaire is designed to target the personality type of successful controllers formulated since as early as the 1960's. The personality type was discovered from experimental tests distributed at the Academy when Academy entrants started the Academy. Over the course of five decades, the FAA has discovered the personality type proven to be most

successful as an air traffic controller. Questions on the biographical questionnaire are designed to target each of the categories within the preferred personality type.

With the new selection process implemented in 2014, the ATC hiring applications are open to the public who meet the primary qualifications of 3 years work experience or a 4 year degree. The AT-SAT still remains a part of the process but is taken after the applicant successfully passes the biographical questionnaire and the HR review of their application. With the new way of selection I made the assumption the AT-SAT is pass/fail due to Outtz and Hanges (2013) highlighting the AT-SAT as a barrier. To pass the AT-SAT and move on to the next hurdle in the selection process, an applicant must achieve a 70 or greater.

Additionally, I made the assumption the amount of diversity among applicants hired should increase because the application is open to the public, allowing a larger amount of diverse candidates to apply. The AT-SAT is then taken, in which Outtz and Hanges found a large amount of the diverse candidates to score in the qualified band having achieved a passing score of 70.

### **Implications**

Prior to examining the reason for the increase in Academy entrant trainee attrition, we must first review the conclusions of two reports released just prior to the change in the selection process. Pierce et al. (2013) reported AT-CTI trainees were successful more often and unsuccessful less often in the Academy and at the first facility than OTS hires and recommended to continue using the AT-SAT to select AT-CTI graduates and select primarily applicants who are well qualified. The only previous research demonstrating applicants scoring within the well qualified band are more successful than applicants in the qualified band is the report by Pierce et al. Pierce et al. examined an AT-SAT dataset of OTS hires as well as AT-CTI graduates from

April 2007 to December 2009. 3,615 of the 4,131 selected applicants achieved a well-qualified score, 505 achieved a qualified score and 11 achieved a not qualified score. Pierce et al. examined both Academy success as well as first facility success. Pierce et al. reported “there is a difference in the training performance of well qualified and qualified trainees in our sample such that well qualified trainees did better in training than qualified trainees (p. 13).”

The report by Pierce et al. was written the same time as the *Barrier Analysis of the Air Traffic Control Specialists (ATCS) Centralized Hiring Process* by Outtz and Associates. The report demonstrates the reason for very little diversity within the ATCS field was because applicants being selected were applicants scoring primarily in the well qualified band and a larger amount of the diverse candidates were scoring within the qualified band where fewer applicants were being selected from.

One of the only reasons for the increase in attrition with the new way of selection could be applicants achieving a well-qualified score on the AT-SAT are more likely to be successful in the Academy than applicants in the qualified category like Pierce et al. found. Thus since the AT-SAT is now pass/fail in which one must achieve only a 70 or above, they are accepting more “qualified” applicants who are the ones leaving or being terminated from the Academy in the end.

## **Recommendations**

After examination of results from this study as well as correlation with the history of the ATC selection processes, one recommendation I would make is the government setup a program like the Co-op. The Co-op had proven success and was terminated because the pre-training screen was cheaper. Additionally, the FAA should make the applicant data of applicants who disclose the information as well as applicants who don't (total number, race/ethnicity and

gender) available to the public. Making applicant data public will allow future researchers to help in achieving a better way of recruiting diverse candidates as well as make the selection process more transparent. In the end, if the government wishes to have a representative bureaucracy, the government must be willing to spend money to achieve representative bureaucracy. If the biographical assessment has targeted the most successful personality type of an air traffic controller, the AT-SAT should be eliminated. The AT-SAT has fell prey to the problems previous ATC aptitude tests have. With all of the automation taking over air traffic control, software should take over the role of an instructor at the Academy to score simulations. Software or some other non-biased evaluation method should be developed with the ability to score the person based on scenario errors. Software with a grading ability would help in taking out the human bias aspect potentially occurring in the selection process as well.

## CONCLUSION

Early on and up until the PATCO strike, new hires were primarily ex-military controllers thus being experienced and having no need for an Academy and kept field attrition little to none. With the few non experienced hires during the early times, there was a need for a test to predict Academy success to save money. After the PATCO strike, with the implementation of the MCAT successful in predicting Academy success, there was many OTS hires with little to no experience. Many were passing the Academy because of the need for controllers in the field. After getting to the field, there was a high attrition rate because the controllers were not well trained. With higher attrition in the field, the focus shifted to something to better predict field attrition (retention). The Common Screen was implemented to combine both the enroute and terminal training paths. The Common Screen was proven successful at reducing field attrition but was funded by the FAA increasing the Federal Government deficit.

Around 1990 there was a push for a test to better predict success with the automated systems coming later on. So studies pertaining to a new test battery began. Biographical questionnaire's from Academy entrants as early as 1960 to the current time were examined further as to groups who were more successful. In 1991 the AT-CTI was implemented with the ultimate goal of the post-secondary education institutions taking the role of the Academy. In 1992 the Common Screen was eliminated and the pre-training-screen was implemented. The pre-training-screen was a computerized test battery designed to predict success in the field for very little cost as opposed to the Co-op and Common Screen. The problem bringing about the implementation of the AT-SAT in 2002 was people could be coached on the MCAT and then

could easily achieve a passing score (Heil et al., 2002). Many were passing the test and failing out at the Academy increasing FAA costs.

In 2004 MBTI personality types were examined again from candidates entering the Academy during 1982 and 1985. Dollar et al. (2004) found a larger amount passing the Academy fell in the sensing-thinking and judging personality type. In 2006 the AT-SAT was reweighted due to the low passing rates of the underrepresented groups. The AT-CTI was terminated at the end of 2013 and hiring qualifications went back to the way they were prior to the AT-CTI implementation. Additionally Outtz and Hanges (2013) reported how much of a barrier the AT-SAT is in the selection process. Throughout the changes, a goal of the Co-op and AT-CTI was to increase the amount of underrepresented groups in the career field. An assumption could be made having done away with the programs; they were not achieving the diversity goal. The government is no longer worried about saving money, but rather increasing the representation of the population served and thus reopening the hiring to off-the-street hires.

In 2014 was the first off-the-street announcement in which applicants were hired under the new selection process. An applicant must first take and pass a biographical questionnaire as part of the initial application, if the applicant passes the biographical questionnaire there application is then reviewed by HR to verify the applicant meets the minimum qualifications on the announcement, the applicant then moves on to take the AT-SAT, if the applicant achieves a qualifying score they are then sent on to the Academy for either enroute or terminal training (pre-determined), after achieving a qualifying score at the Academy the applicant selects from the list of available facilities at the time of graduation from the Academy to a field facility, upon reaching the facility the trainee must pass all developmental stages prior to becoming a certified controller. The biographical questionnaire allows the FAA to hire from a larger more diverse

group of applicants while selecting only applicants who have the personality type proven to be most successful. The successfulness is then first tested by having the applicant take the AT-SAT proven to predict applicants who would be most successful in the field.

The results of this study demonstrate there has been a change in the ethnic and gender makeup of the controller workforce after the elimination of the AT-CTI. Even though the amount of females being hired into the Academy is not as high as in 2005, the amount is very close and if the study is to be performed again with 2016 data I would suspect the amount of females would be greater. Although there has been a noticeable change in the diversity and gender of Academy entrant trainee hires after the elimination of AT-CTI, the amount of diversity and gender lost through attrition is greater than previous years. Even though there will always be attrition, the FAA should focus on limiting attrition as much as possible by getting to the root of the problem. I believe the first step toward getting to the root of the problem would be to install software or some other non-biased evaluation method at the Academy allowing the computers to score the individual running an air traffic control scenario. Software could remove the potential instructor bias from the process. The FAA should eliminate the AT-SAT which is having the same problems as previous aptitude tests. The findings in this research paper demonstrate the underrepresented groups are not as successful at the Academy as they are in the field. The findings lead me to believe a change needs to occur with/at the Academy.



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