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THE EVOLUTION OF THE ATC SELECTION AND TRAINING PROCESS

Samuel R Pavel

Abstract

This paper explores the history of the Air Traffic Controller (ATC) selection and training process, showing how the process has evolved in an attempt to select a highly qualified and diverse controller workforce. Early ATC applicants were recruited from a pool of primarily white males with military aviation experience. Today the Federal Aviation Administration appears to favor the Air Traffic Collegiate Training Initiative (AT-CTI) program as the mechanism to produce the desired pool of ATC applicants. The AT-CTI program is then evaluated against the goals of selecting highly qualified and diverse ATC candidates. In theory, the AT-CTI program should produce well-qualified ATC applicants because of the high academic requirement of a college degree. However, the location and cost of attending an AT-CTI program can limit the ability of the FAA to attract candidates from all 50 states and has so far failed at increasing the diversity of the controller workforce.

Introduction

Since the day Archie League was hired as the first Air Traffic Controller in 1929, the selection process and qualification standards to become an Air Traffic Control Specialist (ATCS) have been in a state of continual evaluation, reevaluation, and change. The primary goal of this selection/screening process is to identify and hire those applicants who are most likely to survive the difficult and lengthy training program and become fully certified in an Air Traffic Control (ATC) facility, a Certified Professional Controller (CPC) – formerly called a Full Performance Level (FPL) Controller. The secondary goal of the process is to get a gender and racially diverse controller workforce. Usually the qualification standards set to achieve the first goal limited the ability to achieve the second goal.

This paper will explore the history of the ATC selection/screening process to show how the Air Traffic - Collegiate Training Initiative (AT-CTI) program became the primary tool for the process. It will then evaluate the AT-CTI to see how effective the program is at reaching the goals of recruiting a qualified and diverse ATC applicant pool.

Background of ATC Selection and Hiring

The journey to becoming a fully certified ATCS consists of several elements: application, selection, a medical exam, Federal Aviation Administration (FAA)

Academy training, and facility training.

Medical Exam

Over the years, the most consistent element of the FAA's selection/screening process is the requirement to pass a rigorous medical exam, which generally follows the medical standards for a commercial pilot (Cobb & Nelson, 1974; FAA Order 3930.3A; FAR 61.23). The medical standards have remained fairly constant over the years with the exception of the ever-changing list of forbidden pharmaceuticals, the addition of a psychological component in 1966, and the 1996 change where ATCSs under the age of 39 were required to undergo the medical exam every two years instead of annually (Cobb & Nelson, 1974; FAA Order 3930.3A).

Selection Prior to 1964

Prior to being selected for ATC training and given the medical exam applicants were ranked according to the existing qualification standards. Selection for an ATC training slot was based on this ranking and the number of ATC positions open. Before 1964 applicants for an ATC position were ranked according to their pre-employment experience, educational background, and an interview with ATC management officials. The highest rankings were given to applicants with prior military ATC experience, although it was believed that any aviation experience was positively related to successful ATC training (Cobb & Nelson, 1974). If the applicant did not have any aviation experience then either a four-year college degree or "at least

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three years of 'general' experience of a progressive responsible nature in administration, technical, or other work" was required (Cobb & Nelson, 1974).

Application and Selection After 1964

The first change in the ATC application process occurred between 1964 and 1968 when all applicants were required to take a U.S. Civil Service Commission battery of six aptitude tests. These tests became known as the CSC ATC Aptitude Screening Test (Cobb & Nelson, 1974). Applicants were required to receive a minimum score on the exam that was based on pre-employment screening: Applicants with pre-FAA ATC experience needed a score of 210 (70% of possible points); pilots, navigators, dispatchers, or those with communication or air surveillance experience needed a score of 225; applicants with little or no aviation experience needed a score of 240 (Cobb & Nelson, 1974).

To obtain a ranking of applicants, experience points were added to the test score (Test Score + Experience Points). Previous ATC experience was worth 15 experience points. Pilot experience of more than 300 hours was worth 10 points. Additionally 5 points were awarded for an applicant with military service who was honorably discharged, and another 5 points if the applicant was wounded in service (Cobb & Nelson, 1974).

Throughout the 1960's air traffic increased by over 100% while the number of controllers increased by only 10% (Rose, Jenkins, & Hurst, 1978). In an attempt to balance air traffic and ATC staffing, the FAA, in 1968, waived the requirement to take the CSC ATC Aptitude Screening test and pre-employment screening for applicants with "highly specialized" ATC experience, such as radar control (Cobb & Nelson, 1974). These applicants were placed directly into the FAA Academy ATC training. The result of the ATC screening process of the 1960's was a controller workforce made up of a large majority of white males who were former military ATCSs or pilots. (Cobb & Nelson, 1974)

The FAA recognized the lack of ATC controller diversity and attempted to diversify the controller workforce in 1968 by implementing the Predevelopmental "150" program (Boone, 1978). Most women and minorities did not have previous ATC or aviation experience because of socio-economic considerations. (Boone, 1978; Mathews, Collins, & Cobb, 1974; Cobb, Mathews, & Lay, 1972) Without previous ATC or aviation experience an applicant's ranking would be lower than other applicants with ATC/aviation experience. Because of this belief that previous aviation experience was key to successful completion of ATC training, a 1-year program was developed to give women and minorities aviation experience (Cobb & Nelson, 1974).

The Predevelopmental "150" did increase the participant's chances for success at the FAA Academy ATC training. The program was also successful at increasing the percentage of women and minorities in the controller

workforce. (Boone, 1978) However, a study done by Mathew, Collins, & Cobb (1974) found the controller workforce in the early 1970's to still be 97% male.

The next major change to the ATC selection/screening process occurred in 1973 after researchers at the FAA's Civil Aviation Medical Institute (CAMI) produced two studies comparing training success rates of applicants with "highly specialized" experience to those applicants without aviation experience (Cobb, Lay, & Bourdet, 1971; Cobb, Mathews, & Nelson, 1972). The authors of these studies found that applicants with "highly specialized" experience did have a higher success rate at the FAA Academy ATC training program. However, the post-Academy attrition rate for the "highly specialized" experience trainees was slightly higher than the post-Academy attrition rate of the trainees with little or no aviation experience.

This finding contradicted the belief that pre-FAA ATC experience was key to the successful completion of FAA ATC training. What the researchers found to explain this result was an age variable. Previous experience was not the key variable to explain ATC training success. The key variable was age. These studies, and unpublished research cited by Cobb et al. (1971), show ATC training success is significantly greater for those 34 years old and younger, regardless of experience.

The FAA followed the recommendation of these studies and revised the selection standards in April of 1973. "Highly specialized" experience could no longer be used to waive the aptitude test of pre-employment screening. A maximum age of 30, regardless of experience, was added to the qualifications standards. All applicants must still pass a medical exam, however only score of 210 must be achieved on the CSC ATC Aptitude Test. Military service bonus points would still be added and bonus points would also be added for pre-FAA ATC experience, but only if the experience was in an IFR facility (Cobb & Nelson, 1974).

The April 1973 changes to the ATC selection process had at least two effects. First the selection process became based on scientific research. Second, the elimination of the experience bonus points would improve the competitive ranking of women and minorities (Cobb & Nelson, 1974). In 1976, 21% of FAA Academy ATC trainees were female and/or minorities (Boone, 1978) However, a detailed study of a sample of ATCSs in the northeast (Rose et al., 1978) found the controller workforce in that area to be *all* male, middle class, half had some college or a college degree, and 99% served in the military (69% ATC, 2% pilot or navigator, and 18% other aviation related activities).

As more scientific studies were focused on selection and training of the controller workforce, the applicability of the CSC ATC Aptitude Test results came into question. Researchers at CAMI began studying the

replacement of the CSC battery with a Multiple Task Performance Battery (MTPB). The MTPB is a combination of tasks including: warning lights monitoring, meter monitoring, mental arithmetic, pattern discrimination, group problem solving, and two-dimensional compensatory tracking. The MTPB was hypothesized to be a better predictor of ATC trainee success than the CSC ATC Aptitude Test (Chiles & West, 1974). In 1981, the CSC ATC Aptitude Test was replaced by an Office of Personnel Management (OPM) three-test battery: The Multiplex Controller Aptitude Test (MCAT), the Abstract Reasoning Test (ABSR), and the Occupational Knowledge Test (OKT) (Broach & Manning, 1997).

Any further changes or improvements to ATC selection/screening came to an abrupt halt in August of 1981. FAA management was given the task of replacing the 11,345 controllers fired by President Ronald Reagan because of the Professional Air Traffic Controllers Organization (PATCO) strike. The FAA responded by an enormous hiring effort that replaced most of the fired controllers. Between August 1981 and October 1985, 13,533 applicants entered the FAA Academy ATC training program (GAO, 1988). However, the success of the hiring effort was questionable. In the mid 1980's the Government Accounting Office (GAO) commissioned the Flight Safety Foundation to do a study of the controller workforce. The study found "conditions within the controller workforce in the past 5 years, and the air traffic control system safety has diminished since the 1981 controllers' strike" (GAO, 1986b, p. 6).

The GAO found many other problems with the hiring of new controllers. For example, the attrition rate of newly hired controllers was as high as 60% in the Air Route Traffic Control Centers (ARTCCs); the FAA did not meet the congressionally mandated goal of 10,450 FPL controllers by the end of fiscal year 1988; it took 100 applicants to produce 1 FPL controller; deficiencies in training were linked to impairments in air traffic safety; facility specific on-the-job training provided to developmental controllers was not standardized; the FAA did not keep sufficient data to oversee facility specific training; the FAA did not evaluate the contractor-provided training at the ARTCCs (GOA, 1986b; GOA, 1988; GOA, 1989).

On August 5, 1988, the FAA Administrator responded to the criticism and announced a program to evaluate, upgrade, and modernize the ATC training program. The ambitious program would include: the establishment of an Office of Training; the establishment of a national recruiting program; a new relationship with academia and industry; a new air traffic screening program; the establishment of an Institute for Human Resources Research to improve the FAA's research in the areas of selection, training, human performance, and human factors.

In October of 1988, the FAA Office of Training and Higher Education was created to elevate the status of training within the FAA and improve the management of training (GAO 1989).

Creation of the AT-CTI Program

One result of the FAA Administrator's proposal was the establishment of the Collegiate Training Initiative – Air Traffic Control Specialist (CTI-ATCS) program in 1989. The CTI-ATCS program was designed to test "the concept that non-federal, post-secondary educational institutions can develop, deliver, and implement air traffic control recruiting, selection, and training programs" (Morrison, Forouhi, & Broach, 1996). Two earlier FAA programs were designed to recruit and attract college students to air traffic related careers - The College Cooperative (Co-op) Education Program and the Airway Sciences Program. Both programs provided training in basic ATC skills and knowledge to prepare students for the FAA Academy. The CTI-ATCS program was designed to give students more comprehensive training to allow graduates to by-pass the initial training at the FAA Academy and be placed directly into ATC facilities.

To evaluate the potential benefits of an FAA/Collegiate partnership, the FAA entered a cooperative agreement with the Mid-America Aviation Resource Consortium (MARC) in Minnesota in February 1990. MARC was given \$3.4 million to create and implement an advanced ATC program, later becoming known as the Minnesota Air Traffic Control Training Center. In that year Hampton University was granted \$5.0 million to establish a second ATC program. The FAA formally established the CTI-ATCS program in 1991 and solicited the participation of additional schools (Morrison et al., 1996).

The FAA's criteria for selection into the new program was based on a number of factors including: the capacity to develop an ATC program; the use of advanced training methodologies; the ability to aggressively recruit female and minority students (Morrison et al., 1996). Three additional schools were added in 1991 bring the total to five institutions in the CTI-ATCS program (Figure 1):

- 1) Minnesota Air Traffic Control Training Center, Eden Prairie, MN
- 2) Hampton University, Hampton, VA
- 3) Community College of Beaver County, Monaca, PA
- 4) University of North Dakota, Grand Forks, ND
- 5) University of Alaska Anchorage, Anchorage, AK.

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Figure 1. Locations of the original AT-CTI institutions established in 1991.

The selection of the five institutions allowed for the potential of recruiting and training controllers with diverse backgrounds. The University of North Dakota and the University of Alaska Anchorage are four-year public universities located near large Native American populations. Hampton University, a private four-year university, is located in an urban center with a large Africa-American population. The Community College of Beaver County is a private two-year community college, and Minnesota Air Traffic Control Training Center houses a six-month technical training program.

The Human Resources Research Organization International, Inc. released a formative evaluation of the CTI-ATCS program in February of 1996 (Morrison, et al., 1996). The conclusion of the initial evaluation indicates the CTI-ATCS program “appears” to be generally successful at making innovations in recruitment, selection, and training of ATC candidates with some progress in recruiting women and minorities. The study concludes however, that more research was necessary.

A major obstacle to the new CTI-ATCS program was the need for new ATC applicants was limited. The controller workforce was approaching the 1981 pre-strike level (Aul, 1998). Exacerbating the limited need for new ATC applicants, in 1988 the military reduced the size of its

forces creating a large pool of military controller applicants. On February 21, 1992 the FAA closed the hiring process for general population applicants. Then later in the year FAA discontinued initial training at the FAA Academy. On August 12, 1993 President Clinton signed an executive order allowing former PATCO controllers who went on strike to be considered for re-employment. In 45 days the FAA received over 5,000 applications from former controllers. The five CTI-ATCS programs graduated 250 students between 1992 and 1995 (GAO, 1997). However, there were few ATC openings for them. Between 1992 and 1997 the FAA only hired approximately 100 new controllers per year (Aul, 1998).

The hiring situation began to change in 1997 when the post-strike air traffic controllers started reaching the eligible retirement age. Controllers could retire as young as 50 years of age with at least 20 years for ATC service. With 25 years of ATC service a controller could retire at any age. The mandatory retirement of an ATCS by Federal law is 56 years of age. Beginning in 1997 the FAA planned to hire over 570 new controllers, on average, through 2002 (Aul, 1998).

To meet the hiring demands of the projected retirements, FAA officials announced in January 1997 the intention to expand the CTI-ATCS program to including 18

new schools, preferably near hard-to-staff facilities. In addition the FAA Academy initial training program was revised and reopened in 1998. All newly hired ATC controllers, including the CTI-ATCS graduates, would be required to complete the technical skill-building portion of the new initial training program at the FAA Academy (GAO, 1997).

Instead of 18 new schools FAA only selected nine additional schools into the program; renamed the Air Traffic - Collegiate Training Initiative (AT-CTI). These schools included (Figure 2):

- 1) Daniel Webster College, Nashua, NH;
- 2) Embry-Riddle Aeronautical University, Daytona Beach, FL
- 3) Inter American University of Puerto Rico, San

Juan, PR

- 4) Miami-Dade Community College, Homestead, FL
- 5) Middle Tennessee State University, Murfreesboro, TN
- 6) Mount San Antonio College, Walnut, CA
- 7) Purdue University, West Lafayette, IN
- 8) Vaughn College of Aeronautics, Flushing, NY.

In a partnership agreement with the FAA none of the fourteen AT-CTI schools would receive FAA funding, however, if hired, the AT-CTI graduates would be exempt from attending the Air Traffic Basic portion of the new initial training program at the FAA Academy.

Figure 2. Location of the 9 additional AT-CTI programs added in 1997.

*Evolution of the ATC Selection Process***Creation of the AT-SAT Test Battery**

The ATC selection/screening process was further revised in June 2002 with the operational implementation of a new aptitude test called the Air Traffic Selection and Training (AT-SAT) section test battery (King, Manning, & Drechsler, 2007). The AT-SAT was designed to replace the two-stage selection process – the OPM test battery and a nine-week screening program at the FAA Academy. However, the test battery was still used like the OPM test battery it replaced. Applicants are ranked according to their performance on the battery. The difference with the AT-SAT and the previous OPM test battery is that the ranking scores are grouped. Applicants scoring from 70%- 84% are grouped as “qualified.” Applicants scoring 85% or higher are grouped as “most

qualified” (King et al., 2007)

In 2003 Congress enacted Vision 100, the FAA’s four-year reauthorization. Vision 100 required the FAA management to develop a plan to ensure adequate staffing for air traffic control facilities (FAA, 2004). The plan the FAA developed was called *A Plan for the Future: The FAA’s 10-Year Strategy for the Air Traffic Control Workforce*. In this plan the FAA officials outline the planned attrition, hiring, and staffing of the ATC workforce for the next 10 years. In the plan the FAA projected a large portion of the controller workforce will begin retiring beginning in 2006. Total attrition from the controller workforce was anticipated to be 12,500 controllers over a 10-year period (Figure 3).

Figure 3. Total projected attrition from the ATC workforce from 2005 - 2014

Source: FAA – (2004)

Expansion of the AT-CTI Program

The planned controller attrition and an evaluation of the AT-CTI program completed in 2006¹, prompted the FAA to expand the number of institutions approved to offer the AT-CTI curriculum in 2007 (Figure 4).

- 1) Arizona State University, Mesa AZ
- 2) Community College of Baltimore, Baltimore, MD
- 3) Florida Community College at Jacksonville, Jacksonville, FL
- 4) Green River Community College, Auburn, WA
- 5) Lewis University, Romeoville, IL
- 6) Kent State University, Kent, OH
- 7) Metropolitan State College of Denver, Denver, CO
- 8) Middle Georgia College, Eastman, GA
- 9) University of Oklahoma, Norman, OK.

Figure 4. Location of the 9 additional AT-CTI programs added in 2007.

¹ This evaluation of the existing AT-CTI programs is touted as a reason for the expansion of the AT-CTI program, however, the FAA Office of Technical Training does not have a copy of the evaluation. I was told to contact each program individually and ask for a copy of their evaluation.

- 1) Aims Community College, Greeley, CO
- 2) Broward Community College, Miramar, FL
- 3) Eastern New Mexico University, Portales, NM
- 4) Embry-Riddle Aeronautical University – Prescott, Prescott, AZ
- 5) Jacksonville University, Jacksonville, FL
- 6) Le Tourneau University, Longview, TX
- 7) St. Cloud State University, St. Cloud, MN
- 8) Tulsa Community College, Tulsa, OK.

Figure 5. Location of the 8 additional AT-CTI programs added in 2008.

In 2010 the program was expanded once again to 36 schools by adding 5 additional programs (Figure 6).

- 1) Florida Institute of Technology, Melbourne, FL
- 2) Hesston College, Hesston, KS
- 3) Sacramento City College, Sacramento, CA
- 4) Texas State Technical College, Waco, TX
- 5) Western Michigan University, Battle Creek, MI.

Figure 6. Location of the additional 5 AT-CTI programs added in 2010.

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The FAA plans to eventually increase the number of AT-CTI programs to 40 by adding 4 additional schools in the near future (FAA, 2010).

Current ATC Selection and Training

Today the selection process for potential FAA air traffic controllers consists of one of three paths:

Path 1 – Prior experience as an air traffic controller

Path 2 – No prior air traffic control experience

Path 3 – Recommendation from an AT-CTI program

(Source: FAA website)

Path 1

Path 1 is for persons with previous experience in either civilian or military air traffic control. Three groups are the focus of this path:

- 1) Veterans with military air traffic control experience.
- 2) Retired military air traffic controllers
- 3) Current and prior civilian air traffic controllers

Path 1(1) allows qualified veterans to apply to be a controller under the Veteran's Recruitment Appointment (VRA) authority and be selected for an air traffic control opening without competition. Path 1(2) allows retired military controllers 31 -56 year old to apply for a short-term, 5-year, position in the controller workforce. The position may be renewed at the FAA's discretion for additional 5-

year terms until the controller reaches the age of 56. Path 1(3) is for a variety of civilians with air traffic control experience. Former FAA controllers can apply to be reinstated to an FAA air traffic controller position. Civilians who worked as a controller at a Department of Defense (DoD) ATC facility can apply for an FAA air traffic controller position. Persons with an FAA Control Tower Operator (CTO) certificate can apply for the FAA controller workforce, provided they are under 31 years old and pass the FAA Academy Initial Training program.

Path 2

Path 2 is identical to the two-stage selection process used in the past, except the AT-SAT battery is used instead of the OPM test battery. Any US citizen, under 31 years old, who can speak clear English, has a four-year college degree or three years of work experience (or a combination of the two) can apply to take the AT-SAT battery. If the applicant scores at least an 85% on the AT-SAT, is selected by a hiring panel of FAA officials, passes a medical exam, security investigation and interview, the applicant will be sent to the FAA Academy for initial training.

Path 3

Path 3 is for graduates with a two or four year degree from one of the 36 AT-CTI schools listed above. The graduate must receive an employment recommendation from an official in the AT-CTI school and score at least a 70% on the AT-SAT exam. If selected by the FAA hiring panel then the AT-CTI graduate will be sent to the FAA Academy for initial training

ATC Hiring Sources

In 2006 the FAA had 3,792 applicants available to fill 930 projected controller openings (Figure 7).

Figure 7. Source of available qualified candidates for ATC positions.
Source: FAA (2006)

The primary source of controllers in 2006 was 2,155 previous controllers. These included VRA, DoD civilian controllers, retired military controllers, former PATCO controllers, and reinstatements. The 14 CTI programs was the next largest source with 1,260 recommended graduates. The general public was the smallest source contributing only 377 applicants.

The AT-CTI source became the largest source of controller hiring in 2007, representing over 56% of the new controllers hired (Figure 8).

Figure 8. Number of Controllers hired and source of applicant in 2007
Source: FAA (2007)

The AT-CTI program was still the largest source of new controllers hired in 2008 with over 37% of newly hired controllers. The AT-CTI program was also expanded in 2008 to include a total of 31 schools (Figure 9).

Figure 9. Number of Controllers hired and source of applicant in 2008
Source: FAA (2009)

Evolution of the ATC Selection Process

A major hiring push was implemented in 2009 and number of graduates from the AT-CTI programs was not large enough to fill the demand. The CTI program graduates only comprised of a little more than 19% of total controller hiring. The general public source was the largest source with over 65% of controllers hired (Figure 10). However, the increase in general public hiring was expected to only be short-term (FAA 2010).

Figure 10. Number of Controllers hired and source of applicant in 2009
Source: FAA (2010)

Overall, the AT-CTI program still was the largest source of ATC applicants. Since 2005 the AT-CTI program graduates have comprised over 36% of the newly hired controllers (Figure 11). Five additional schools were added to the AT-CTI program in 2009 bringing the total to 36 schools, with a goal of having 40 AT-CTI schools producing 1,000-1,500 graduates per year (FAA 2010). It appears that the CTI program will be the primary future source of newly hired controllers.

Figure 11. Total Controller hiring and source of applicant from 2006 through 2009
Source: Author's Calculations

ATC Hiring and Losses

Calculating the number of controllers to hire in any given year is a complicated process. The number of controllers needed in the controller workforce is based on traffic growth in the National Airspace System (NAS), technological advances, and controller attrition. This process requires three future projections: Required facility staffing, given future traffic levels; The time it takes a developmental controller to become facility certified; The attrition of controllers from the controller workforce by training failures, transfers, promotions, resignations, or retirements.

The time it takes for a developmental to complete facility certification is complicated by the fact that each facility is unique and there is no standard average training time. However, on average it takes controllers over 1.38 years to fully certify in a terminal facility and 2.62 years to fully certify in an ARTCC (FAA 2010). The overall average training time to facility certification is 1.89 years. A developmental needs to be hired at least two years before a controller is projected to leave the workforce.

Controller attrition because of training failures, transfers, promotions and resignations should be relatively stable over time using historical averages. Projecting controller attrition because of anticipated retirement is more complex because the retirement age of a controller can vary. A controller must retire at age 56 because of 5 U.S.C.8335 (a), with certain exceptions extending the age to 61. However a controller may retire before age 56 with 25 years of service or after age 50 with 20 years of service (GAO 2002). However, projecting retirement in the following two years should be fairly easy to calculate with demographic data and surveys of facility personnel specialists.

Figure 12 shows the projected attrition from the ATC workforce presented in *A Plan for the Future* (The Plan) from the years 2005-2010. Each year The Plan lists the projected controller attrition for the next 10 years. The projected attrition is revised each year as actual attrition numbers become available. One would expect the projections to converge over time and new data is added to attrition calculations.

Figure 12. Projected attrition from the Controller Workforce

Source: FAA *A Plan for the Future*, various years.

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The 2005 Plan projected the controller attrition to be 654 controllers. The projected attrition was revised to 800 controllers in The 2006 Plan. Similar revisions occurred for each year following. The 2007 projected attrition was 907, 1,007, and 1,197 in the 2005-2007 editions. The 2008 projected attrition was 967, 1,008, 1,276, and 1,621 in the 2005-2008 editions. The 2009

projected attrition was 1,032, 1,017, 1,308, 1,608, and 1,538 in the 2005-2009 edition. There appears to be very little correlation between each year's data.

Figure 13 shows actual attrition from the controller workforce compared to projected attrition from 2005 through 2009.

Figure 13. Actual and projected attrition from the Controller Workforce
Source: FAA *A Plan for the Future*, various years.

In 2006 the projected controller attrition was calculated to be 800 controllers. 1,036 controllers actually left the workforce. The 2007 Plan had a projected attrition of 1,197 controllers. 1,559 controllers actually left the workforce. The 2008 Plan projected controller attrition would be 1,621 controllers. 1,689 controllers actually left the workforce. In 2009 The Plan projected that 1,538 controllers would leave the workforce. 1,342 controllers

actually left the workforce. The FAA's attrition projections and actual attrition do not appear to be correlated.

This difference might be explained by the difficulty in projecting retirement. Table 1 shows projected and actual controller retirements and projected attrition and actual attrition from 2006 through 2009.

Table 1

Difference between projected and actual Controller retirement and attrition

	Projected Retirement	Actual Retirement	Difference	Projected Attrition	Actual Attrition	Difference
2006	467	583	+116	800	1,038	+238
2007	700	828	+128	1,197	1,559	+362
2008	809	781	-28	1,621	1,689	+68
2009	726	520	-206	1,538	1,342	-196

Source: FAA *A Plan for the Future*, various years.

The errors in retirement projection might explain the difference between projected and actual attrition only in 2009. The other years seem to need some other explanation.

The number of controllers hired should lead attrition. Ideally when one controller leaves the workforce another should become a CPC. Figure 14 shows the projected hiring into the controller workforce.

Figure 14. Projected hiring into the Controller Workforce
Source: FAA *A Plan for the Future*, various years.

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As with the projected attrition data, the projected hiring data is revised each year as new data is gathered. The projections should converge as the new data is added. However, like the attrition projections, the hiring projections do not seem to be correlated.

The 2005 Plan projected controller hiring to be 1,249 controllers. The projected hiring was revised to 930 controllers in The 2006 Plan. The 2007 projected hiring

was 1,248, 1,136, and 1,386 in the 2005-2007 editions. The 2008 projected hiring was 2,204, 1,143, 1,420, and 1,877 in the 2005-2008 editions. The 2009 projected hiring was 1,152, 1,238, 1,514, 1,914, and 1,742 in the 2005-2009 edition. There appears to be very little correlation between each year's data.

Figure 15 shows actual hiring with projected hiring from 2005 through 2009.

Figure 15. Actual and projected hiring into the Controller Workforce
Source: FAA *A Plan for the Future*, various years.

In 2006 the projected controller hiring was calculated to be 930 controllers. 1,116 controllers were actually hired into the workforce. The 2007 Plan projected hiring of 1,386 controllers. 1,815 controllers were actually hired. The 2008 Plan projected 1,877 controllers needed to be hired. 2,196 controllers were actually hired. In 2009 The Plan projected that 1,742 new controllers were

needed. 1,731 controllers were actually hired. Again, the FAA's attrition projections and actual attrition do not appear to be correlated.

Regardless of the accuracy of the attrition and hiring projections, the actual hiring should lead actual attrition. Figure 16 shows actual attrition and actual hiring for the years 2006 through 2009.

Figure 16. Actual hiring into and attrition from the Controller Workforce.
Source: FAA *A Plan for the Future*, various years.

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In 2006 1,116 controllers were hired and 1,038 controllers left the workforce. In 2007 1,815 controllers were hired and 1,559 controllers left the workforce. In 2008 2,196 controllers were hired and 1,689 controllers left the workforce. In 2009 1,731 controllers were hired and 1,342 controllers left the workforce. Hiring did exceed the number of controllers who left the workforce. However, there is no lead in hiring. Overall, there appears to be very little correlation between projected attrition and actual hiring of replacement controllers.

Accessibility and Cost of an AT-CTI Program

The AT-CTI program was created in response to two major studies of the ATC training program and justified by four assumptions (Morrison, et al., 1996):

- 1) A college education will promote better job performance and flexibility.
- 2) Additional training programs will increase the number of qualified applicants for ATC positions and create a more diversified controller workforce in terms of the proportion of women and minorities.
- 3) Collegiate training will promote professionalism of the controller workforce.
- 4) Collegiate programs will improve controller training by developing innovating approaches to training.

Five schools were initially selected to evaluate the viability of this new training concept in 1989. The FAA Office of Aviation Management published an evaluation of the new program in 1996 (Morrison, et al., 1996). The evaluation concluded:

[T]he programs at the five participating educational institutions appear to be functioning well. Specifically, the

programs are making innovations in recruitment, selection, and training that may be of benefit to the FAA. Some progress in recruiting women and minorities is being made... Overall, the CTI-ATCS program appears to be generally successful, but further study is required (Morrison et al., 1996).

Location of AT-CTI programs and Hard to Staff Facilities

The AT-CTI program was expanded in 1997. The FAA never gives an explicit explanation for the expansion, but it can be assumed that the evaluation of the program was an influencing factor. Further expansion of the AT-CTI program in 2007, 2008, and 2009, and the selection of the new schools in the program was based upon the schools ability to meet the four criteria listed above (FAA 2009). In addition, at AT-CTI Best Practices Conferences FAA officials emphasized that geographic diversity, and locations near "hard to staff" facilities were also primary goals in the school selection process. How well does the location of an AT-CTI program fulfill the criteria for recruiting and training a diverse controller workforce, and provide an ample supply of applicants near "hard to staff" facilities?

To answer the latter part of the question, the Figure 17 lists the locations of the 36 AT-CTI programs and location of the 21 ARTCCs and the ten largest Terminal Radar Approach Controls (TRACONs) These 31 facilities are a proxy for "hard to staff" facilities and they employ over half of the controller workforce.

Figure 17. AT-CTI programs and the location of the ARTCCs and largest TRACONs

Source: FAA

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AT-CTI programs are located in 19 of the states that also have an ARTCC within the state. Salt Lake City ARTCC and Boston ARTCC do not have an AT-CTI program in the same state in which they are located. However, Daniel Webster College in NH is relatively near Boston Center. The only TRACON of the largest ten TRACONs that does not have an AT-CTI program also located in the state is Charlotte TRACON.

States that have at least one AT-CTI program but no ARTCC are Arizona, Michigan, New Hampshire, North Dakota, and Oklahoma. Oklahoma and Arizona also have two AT-CTI programs located within the state. Other states with more than one AT-CTI programs located within the state are California (2), Colorado (2), Minnesota (2), New York (2), Texas (2), and Florida (6).

The location of the AT-CTI programs raises questions about their ability to provide potential staffing for the larger ATC facilities. Are Salt Lake City ARTCC and Charlotte TRACON easier facilities to staff than other comparable facilities, so there does not need to be a nearby AT-CTI program? Why does the California, the largest US state, with two ARTCCs (Oakland and Los Angeles) and two of the largest and busiest TRACONs (Northern California and Southern California) have only two AT-CTI programs located within the state. Does Colorado need two AT-CTI programs that are located within 60 miles of each other? Why does Florida need six (6) AT-CTI programs? The locations of the AT-CTI programs appears only loosely determined by the larger ATC facilities.

Racial Diversity

Are the AT-CTI programs located to better recruit a more diverse pool of applicants? According to DOT employment records, at the end of 2000 the FAA employed 23,048 people classified as permanent series 2152 (Air Traffic Control). The data does not differentiate between those people actively controlling air traffic from managerial and staff positions. However, all series 2152 personnel would have gone through the ATC selection and screening process². The demographic breakdown of the employees is as follows (Table 2):

² DOT employment data for January 2011 used later in the paper is more detailed. I compared the racial composition of all series 2152 employees and series 2152 employees assigned to a facility controlling live air traffic. There is no significant difference in the racial composition of the two groups.

Table 2

Racial composition of the DOT series 2152 employees at the end of FY2000

	Female	Male	Total	
American Indian or Alaskan Native	33	239	272	1.18%
Asian or Pacific Islander	44	268	312	1.35%
Black or African American	308	918	1,226	5.32%
Hispanic or Latino	131	735	866	3.76%
Undetermined	8	39	47	0.20%
White, Not of Hispanic Origin	2,894	17,431	20,325	88.19%
Total	3,411	19,911	23,048	
	14.63%	85.37%		

Source: Department of Transportation 2000 employment data

AT-CTI programs at the University of North Dakota and the University of Alaska Anchorage were established partially because of their location to Native American populations (Morrison et al., 1996). According to the US Census Bureau, Native Americans and Alaskan Natives comprise .9% of the US population or 2,932,248 people. The Native American and Alaskan Native population in North Dakota, South Dakota, and Alaska is 32,320, 71,648, and 105,114 respectively. The total Native American and Alaskan Native population for the three states are 209,082, or 7% of the total Native American and Alaskan Native population.

California has the largest Native American and Alaskan Native population, over double Alaska, North Dakota, and South Dakota's total. Two AT-CTI programs were established in California in 1997 and 2010. The next two states with the largest Native American and Alaskan Native population are Oklahoma and Arizona (US Census,

2010). Each state has two AT-CTI programs located within them.

The largest minority groups in the United States are Black or African American (African American), comprising of 12.6% of the total population, and persons of Hispanic or Latin (Hispanic) origin, comprising 16.3% of the total population. The following diagram shows the location of the AT-CTI schools and states whose populations have more than one million African American and/or one million people of Hispanic origin. States whose population is comprised of over one million African American are shaded light grey (AL, GA, LA, MD, MI, MS, NC, OH, PA, SC, TN, VA). The population of Arizona (AZ) is comprised of over one million people of Hispanic origin. The darkest shaded states have populations comprised of over one million African American *and* over one million people of Hispanic origin (CA, FL, IL, NJ, NY, TX).

Figure 18. AT-CTI locations and the states with the highest African American and Hispanic populations
Source: FAA and US Census Bureau

There are six states with populations consisting of over one million African Americans, and these states do not have an AT-CTI program located within the state (AL, LA, MS, NC, NJ, SC). Over 7.9 million African Americans live in a state without an AT-CTI program. Over 1.6 million people of Hispanic origin live in a state without an AT-CTI program. One half of the states in the United States, twenty-six (26) states, do not have an AT-CTI program located within the state.

At the beginning of 2011, twenty years after the establishment of the AT-CTI program the DOT employment statistics show little improvement in the racial diversity of the series 2152 employees. Most notably, the percentage of African American employees only increased from 5.32% to 6.21% of total employment. Hispanic employment only increased from 3.76% to 5.98% of total employment (Table 3)

Table 3
Racial composition of DOT series 2152 employees in January 2011

	Female	Male	Total	
American Indian or Alaskan Native	24	170	194	0.96%
Asian	70	310	380	1.88%
Black or African American	292	962	1,254	6.21%
Hispanic or Latino	211	996	1,207	5.98%
Native Hawaiian or Pacific Islander	16	65	81	0.40%
Other	0	5	5	0.02%
Two or More	18	63	81	0.4%
White, Not of Hispanic Origin	2,738	14,243	16,981	84.14%
Total	3,369	16,814	20,183	
	16.69%	83.31%		

Source: Department of Transportation 2010 employment data

According to the 2010 census, the US population is comprised of 16.3% people of Hispanic or Latino origin, 12.6%, Black or African American, and 4.2% Asian. The only racial group that is over-represented, besides White, is Native Hawaiian or Pacific Islanders, composing 0.4% of the series 2152 employees but only 0.2% of the US Population. Females are grossly under-represented in controller workforce. The US population is 50.7% female, while the series 2152 employment is only 16.69% female (US Census Bureau, 2010).

Cost of Attending an AT-CTI Program

Cost is another aspect that must be considered when evaluating the accessibility of an AT-CTI program. The AT-CTI program is made up of publically funded and privately funded, two and four year colleges and universities. Tuition and fees at each AT-CTI program is set by the Administration of each institution. Public colleges and universities also vary tuition by residential status of a student. The state government subsidizes resident student tuition and fees.

The following table shows the range of tuition and fees at the AT-CTI programs around the nation.

Table 4
Cost to attend an AT-CTI program

School Type	In-State Tuition and Fees	Out-of-State Tuition and Fees	Additional AT-CTI fees
Two-Year Public	\$812 - \$5,850	\$3,849 - \$16,290	\$0 - \$4,850
Two-Year Private	\$20,720		\$13,450
Four-year Public	\$2,918 - \$9,070	\$7,410 - \$26,622	\$0 - \$13,984
Four-Year Private	\$13,870 - \$28,910		\$0 - \$6,605

Source: School websites and telephone interviews

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The total cost an individual must incur to attend an institution with an AT-CTI program varies significantly depending on location. If a student wants to attend an AT-CTI program and is fortunate to live in a state with a publicly funded college or university, the cost of the degree with an AT-CTI recommendation would be comparable to other degrees, although the addition costs for the AT-CTI program could be almost \$14,000. However, if the student happens to live in a state without a publicly funded institution with an AT-CTI program, the total cost of the program – tuition, fees, and additional AT-CTI costs – ranges from \$7,698 - \$54,800 for a two-year degree and \$29,640 - \$116,992 for a four-year degree (author's calculations). The total cost would approximately double if you include living cost, textbook cost, and other incidental expenses. Travel expenses would add additional costs depending on the residence location of the student.

If a high school graduate from Chicago wanted to attend a four-year school with an AT-CTI program within one state of her or his home, this student would need to come up with a minimum of \$79,864 to pay for tuition and fees alone. A student from New Orleans would need to come up with \$92,450 to pay for tuition and fees. A student from Charlotte would need to come up with a minimum of \$46,730 for tuition and fees. When the student does get a four-year degree and an AT-CTI recommendation, there is still no guarantee that the FAA will hire her or him.

Cost alone can eliminate a significant number of potential ATC applicants, especially people with lower incomes, especially African America or Hispanic households. According to the US Census Bureau, African American households earn 40% less on average than White households. Hispanic households earn 30% less on average than White households.

Conclusion

Examining the history of the ATC selection/training process reveals two recurring themes. First, the process should recruit and select people who are best suited to complete the rigorous ATC training program.

Second, the process should be designed to diversify the controller workforce by race and gender.

To meet the challenges of recruiting a diverse and well-qualified application pool for ATC openings, the FAA appears to be making the AT-CTI program the primary tool of the selection process. The only publically available study shows the success rate of AT-CTI and general public applicants for ATC positions is comparable. In theory, the AT-CTI program should produce a more "well-rounded" ATC applicant because of the higher educational requirements needed to graduate when compared to a general public applicant.

In the area of recruiting a diverse ATC applicant pool the AT-CTI program is severely deficient. The locations of the existing AT-CTI programs might help with gender diversity but there are *no* AT-CTI programs in six states with the highest African America or Hispanic minority populations. In three of the other states with highest minority population there are only privately funded institutions that are significantly more expensive than publically funded institutions.

The cost of attending an AT-CTI program places the opportunity to become an ATCS out of financial reach for a significant number of the US population; especially African America or Hispanic people who, on average, have lower household income. The planned expansion of the AT-CTI program by four additional programs will not significantly reduce the problem of recruiting racial minorities.

If the AT-CTI program continues to be the primary recruiting tool for future ATCS's then either the program must be expanded to include qualified publically funded institutions in every state, and/or financial resources need to be made available to potential AT-CTI applicants, especially African America or Hispanic applicants. Otherwise, only the relatively few white people who can afford to pay the tuition and fees, and live relatively close to an AT-CTI program will be selected to pursue an ATC career. ➔

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