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The Utility of the Air Traffic Selection and Training Test Battery in Hiring Graduates of an Air Traffic-Collegiate Training Initiative Program

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16. Abstract

The FAA recruits applicants for Air Traffic Control Specialist (ATCS) training positions from multiple hiring sources. Each hiring source has requirements that applicants must meet for eligibility. These hiring sources include the Air Traffic – Collegiate Training Initiative (CTI) for applicants with specialized education in air traffic control (ATC) and general public (GP) applicants with no prior ATC education or experience. CTI and GP applicants must pass the Air Traffic Selection and Training (AT-SAT) test battery, a computerized pre-employment test battery designed to assess a candidate's aptitude for performing the duties of an ATCS. Applicants must score as Qualified with a score of 70 – 84.9 or Well-Qualified with a score of 85 or above for further consideration.

The current research provides an initial assessment of AT-SAT as part of the hiring process for CTI graduates. To consider the utility of AT-SAT in hiring CTI graduates, we compared the selection and training performance of CTI graduates and GP applicants taking AT-SAT between April 2007 and December 2009. In our sample, only 6.2% of CTI graduates and GP applicants failed to pass AT-SAT with a score of 70 or higher (2.3% CTI graduates, 6.9% GP applicants). There was variation in the scores of those who passed AT-SAT, but most were categorized as Well-Qualified (58.8%). Also, while most CTI graduates and GP applicants selected for training had scored as Well-Qualified on AT-SAT, more Qualified CTI graduates (24.2%) than GP applicants (5.8%) were selected. There was little difference between CTI and GP trainees in assignment to terminal or en route facilities (less than 2 percentage points). The majority of the trainees (63.4%) had completed training (successfully or unsuccessfully). CTI trainees were successful slightly more often (55.3%) than GP trainees (51.9%) and unsuccessful slightly less often (16.2% vs. 22.6%, respectively). Also, while Well-Qualified CTI trainees were successful at approximately the same level as Qualified CTI trainees (55.7% vs. 54.2%, respectively), they were unsuccessful less often (14.0% vs. 23.5%, respectively).

Our recommendations are to continue to use AT-SAT in the hiring process of CTI graduates and to select primarily those who score in the Well-Qualified score category.

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INTRODUCTION

The Federal Aviation Administration (FAA) hires and trains Air Traffic Control Specialists (ATCSs) to maintain a workforce of approximately 15,000 controllers (FAA, 2012). These ATCSs control air traffic within the National Airspace System (NAS) at both terminal and en route facilities. Terminal facilities include air traffic control towers and terminal radar approach controls (TRACONs). It is the responsibility of controllers within terminal facilities to organize the flow of air traffic into and out of airports. As air traffic leaves the terminal airspace, the responsibility for control transfers to ATCSs at air route traffic control centers (ARTCCs), commonly referred to as en route facilities.

Terminal and en route facilities are assigned a level based on the volume and complexity of air traffic. A description of the type, level, and number of FAA air traffic control facilities can be found in the FAA's Controller Workforce Plan (2012). For more information on air traffic facility levels, see FAA Order 7210.57. The Controller Workforce Plan, updated each year, presents the FAA's strategy for hiring, placing, and training controllers to safely meet the demands of air traffic.

In 2011, the FAA hired 824 controllers and anticipates selecting more controllers each year through 2020 (FAA, 2012). The FAA engages in an ongoing program of research to develop and continually improve strategies to select, place, and train candidates who are most likely to succeed as air traffic controllers. The current research contributes to that program. Our purpose is to examine the use of the Air Traffic Selection and Training (AT-SAT) test battery to select from among those applicants who have successfully completed an aviation-related program of study from a school participating in the FAA's Air Traffic Collegiate Training Initiative (CTI) program.

CTI Program

The CTI program is maintained by the FAA as a collaborative effort with 36 colleges and universities approved to participate in the program. The CTI program produces graduates with a basic understanding of air traffic control. The FAA provides schools in the program with air traffic curriculum, which includes approximately 200 hours of classroom instruction on air traffic control. The schools integrate the FAA-developed coursework into their own two- or four-year aviation program. Graduates bypass the first five weeks of basic qualification training in air traffic control at the FAA Academy. While they receive no guarantee of employment with the FAA, CTI graduates are considered as a primary hiring source of ATCSs (FAA, 2012). The FAA reported in October of 2011 that, since 2005, 39% of all ATCSs hired were from the CTI pool of applicants (FAA, 2011, Oct.).

The number of schools participating in the CTI program increased from five, in the original 1992 CTI Demonstration Program, to 13 in a 1997 program expansion (FAA, 2012). One of the original demonstration schools, the Minneapolis Community and Technical College (MCTC, previously referred to as the Midwest Aviation Resource Consortium, or MARC) was not considered one of the 13, because it was a congressionally-mandated, FAA-funded program, and all other schools were unfunded. In 2005, FAA funding was discontinued for the MARC program, and it became the 14th school in the CTI program. The number of schools remained the same for approximately the next 10 years. However, in 2006 and in response to ATC hiring needs, the FAA began to solicit applications from schools interested in joining the CTI program. As a result, 22 schools were added to the program from 2007 to 2009. There are currently 36 schools participating in the CTI program (see Appendix A).

AT-SAT

To be eligible for selection by the FAA as an air traffic controller, CTI graduates must pass AT-SAT. AT-SAT is a computerized pre-employment test battery designed to assess a candidate's aptitude for performing the duties of an ATCS. For a detailed description of the development and validation of AT-SAT, see the two-volume technical report edited by Ramos, Heil, and Manning (2001a, 2001b). AT-SAT was first used in ATCS selection in 2002. At that time, only those applicants with no prior experience or education in air traffic control were required to pass AT-SAT to be eligible for hiring as an FAA ATCS. A score of 70 is required to pass AT-SAT. Those applicants who score from 70 to 84.9 are categorized as "Qualified," and those who score from 85 to 100 are categorized as "Well- Qualified." In 2005, the requirement to pass AT-SAT for employment consideration was extended to those applicants who had graduated from a CTI program.

The requirement for applicants to take AT-SAT stemmed from the FAA's decision to separate training from selection at the FAA Academy (Quartetti, Kieckhaefer, & Houston, 2001). Prior to development of AT-SAT, a two-stage process was used to select ATCSs from applicants with no prior experience. The first stage required candidates to pass an aptitude test battery administered by the Office of Personnel Management. The second stage was the Academy Screen, a nine-week program at the FAA Academy, used for both selection and training. The Academy screening program, as described by Heil and Reese (2002), contained both academics and non-radar simulated exercises. Applicants had to pass the Screen to advance to an ATC facility for on-the-job training. The Screen was a very difficult program. A reported 43% of applicants attending the Academy Screen from 1985 to 1992 failed or withdrew (Della Rocco, 1998). The

process was criticized as being inefficient due to the time and cost involved and the high failure rate. There was also a concern that training effectiveness was compromised by a focus on both selection and training.

In response, the FAA developed and validated AT-SAT (Ramos, et al., 2001a, 2001b) for use in selecting ATCSs and began emphasizing training rather than selection at the Academy (Heil & Reese, 2002). The FAA began in June 2002 using AT-SAT as the official Civil Service test to select ATCSs. "The goal of AT-SAT is to predict the likelihood of success in air traffic control training and, more importantly, subsequently on the job" (King, Manning, & Drechsler, 2007, p. 1).

CTI Program and the ATCS Hiring Process

The FAA has three primary hiring sources for air traffic controllers (FAA, 2011). In addition to CTI graduates (described earlier), the FAA recruits and hires controllers with prior experience as civilian or military controllers. A third source is from the general public (GP). GP candidates are not required to have prior experience or education in air traffic control. Separate vacancy announcements are used to advertise positions for candidates from each hiring source. Vacancy announcements for CTI graduates or for those with prior civilian or military air traffic control experience require specific education and/or experience, but applicants with prior aviation education and/or experience may also apply under announcements aimed at the general public. The current flowchart for hiring and training

ATCSs is shown in Figure 1 and described in more detail below.

Both CTI and GP applicants are required to pass AT-SAT with a minimum score of 70. Applicants with prior air traffic control experience do not take AT-SAT if applying in response to an announcement specifically designed for applicants with previous experience. Lists of eligible candidates for each vacancy announcement are organized by hiring source for review by a centralized selection panel. The candidate lists are also divided by AT-SAT score, with those scoring from 85-100 categorized as Well-Qualified and those scoring 70-84.9 categorized as Qualified. Consistent with merit systems principles in hiring, Well-Qualified candidates are considered for hiring by the selection panel before Qualified candidates. Qualified candidates cannot be considered until no more than two candidates remain on the Well-Qualified list.

CTI graduates are eligible for hiring through the CTI program for three years after their graduation date and may request one-year extensions until their 31st birthday. To be considered, CTI graduates must apply to each new announcement posted for CTI graduates. AT-SAT scores are valid for three years from the date taken or from graduation if AT-SAT is taken before the CTI student graduates. If AT-SAT is failed on the first attempt, it can be retaken after a one-year waiting period. When applying, CTI graduates must indicate one or two states within the U.S. and/or U.S. territories in which they would prefer to work. Their applications are only considered for vacancies within the state or states identified.
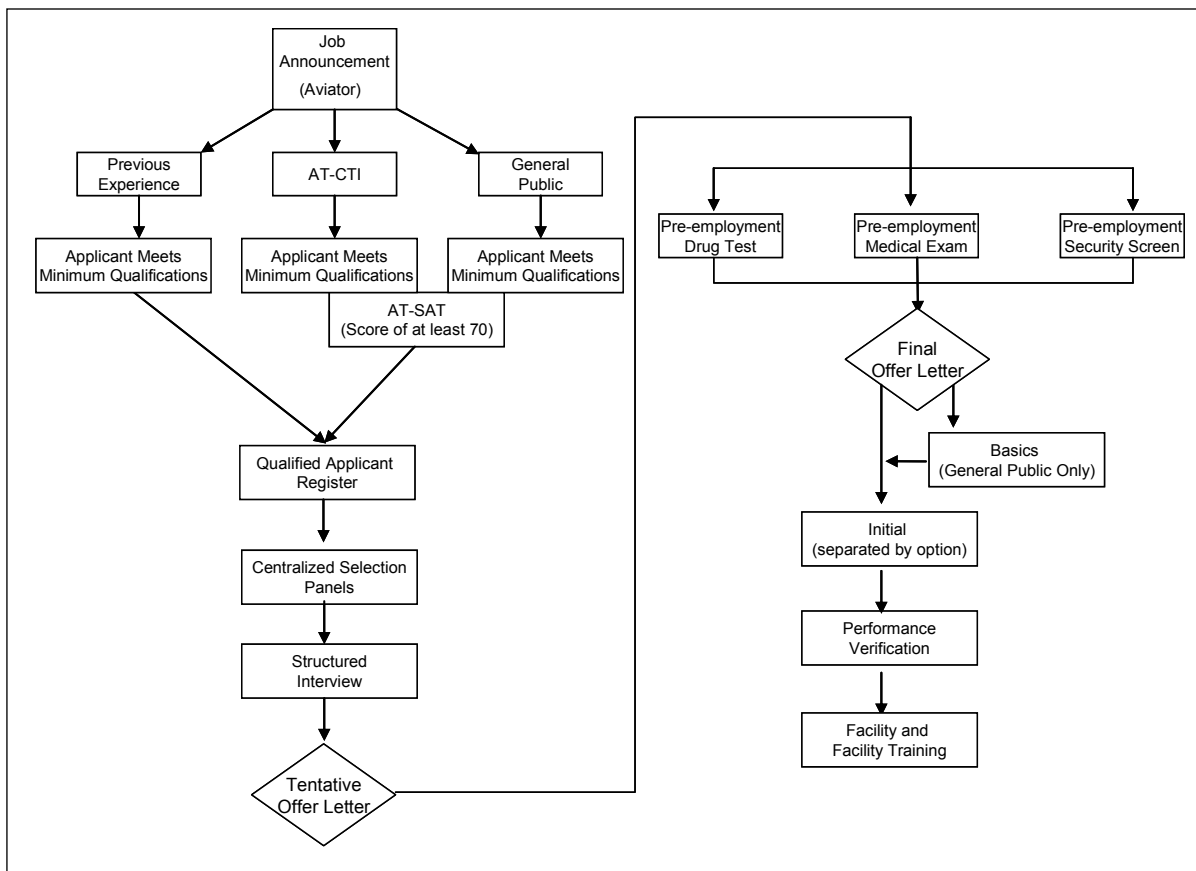

Figure 1. ATCS Hiring and Academy Training Flowchart

As part of their qualification requirements, CTI graduates must receive a letter of recommendation from their CTI college or university for employment with the FAA. In addition to the unique requirements that must be met by the applicants with prior air traffic control experience or education, there are general criteria that all candidates must meet for eligibility. These criteria, which can be found at http://www.faa.gov/jobs, include the following:

- Complete three years of progressively responsible work experience, or a full four-year course of study leading to a bachelor's degree, or an equivalent combination of work experience and college credits
- Be a U.S. citizen
- Be able to speak English clearly enough to be understood over radios, intercoms, and similar communications equipment
- Be no older than age 31
- Pass stringent medical and psychological exams, an extensive security background investigation, and an interview

With few exceptions, those candidates selected for an ATCS position must attend at least one training course at the FAA Academy. Applicants hired with no prior air traffic control experience or education attend a Basics Course on the fundamentals of aviation and air traffic control. The Basics Course is followed by an Initial Course. Almost all candidates, regardless of hiring source, attend the Initial Course. The Initial Course is divided by terminal radar, tower, and en route options and provides both academic instruction and opportunities to practice on simulated scenarios designed to test particular skills. Once training is completed, all candidates must pass a Performance Verification (PV) test before advancing to their first facility for on-the-job training. The PV tests the candidate's performance in a simulated scenario, rather than on a written test.

The approach described above is known as the Multi-Path Hiring and Training Model (Heil & Reese, 2002). AT-SAT is seen as an important aspect in the application of the Multi-Path Hiring and Training Model as a method to screen and eliminate candidates who are not likely to perform well in training. However, the use of AT-SAT as a tool for assessing job performance has not been determined.

Independent Review Panel

In 2011, the FAA Administrator convened an Independent Review Panel (IRP) on air traffic controller selection, assignment, and training (Barr, Brady, Koleszar, New, & Pounds, 2011). An aspect of the panel's effort was to review the CTI program as a hiring source for air traffic controllers. A concern of the panel was the unequal capabilities of the CTI programs. To address the concern, the IRP proposed a strategy for distinguishing among the CTI programs.

The IRP recommended that the programs be ranked according to their capabilities. Programs that taught the basics of air traffic control and provided simulation capabilities for all options (tower, terminal radar, en route, and non-radar) would be classified as Level 4. Levels 1-3 would be assigned in a prescribed manner to CTI programs with fewer capabilities. The panel also recommended that the performance of CTI graduates be tracked and fed back to their institutions to support program improvement.

The IRP also proposed a model for selecting among FAA air traffic control applicants without prior air traffic control experience, including both CTI graduates and GP candidates. The proposed model was based on scores of four objective and two subjective components. The objective components were assigned CTI Program Level (as described above), AT-SAT score, college GPA, and a score on a test of air traffic Basics (which is not currently administered until after applicants are hired). The subjective components of the model would be derived from an interview with the candidate and an assessment by the selection panel of the entire application package.

Of the 100 points possible in the model algorithm, Program Level was proposed to be worth a maximum of 40 points and AT-SAT score a maximum of 15 points. A candidate who had attended a Level 4 Program would receive the maximum of 40 points. For each decrease in Program Level, 10 points would be subtracted from the candidate's score such that a candidate attending a Level 1 Program would receive 10 points. AT-SAT points were awarded based on AT-SAT scores, with higher AT-SAT scores being awarded more points. In the Panel's proposed model, an AT-SAT score of 99-100 would be awarded 15 points. Scores below 99 would be awarded points in decreasingly smaller amounts, with all scores 85 and below awarded a score of 1. Proposed weights for each of the other components can be found in the IRP's report (Barr, Brady, Koleszar, New, & Pounds, 2011).

Research Question

The IRP recommendations listed above are currently in review, and while it is unlikely that the recommendations will be implemented as originally planned, FAA leaders continue to discuss potential strategies to better identify the potentially good controllers from among all ATCS applicants. Another recommendation made by the IRP was that all selectees be tracked by hiring source and that a longitudinal study be conducted to determine the predictive value of AT-SAT. The current research effort provides an initial assessment of the hiring process for CTI graduates and specifically addresses the utility of AT-SAT in hiring CTI graduates. The approach is to compare the selection and training performance of CTI graduates and GP applicants. It is proposed that if CTI graduates do very well on AT-SAT and in training at the Academy and in the field in comparison to GP applicants, then eliminating AT-SAT in the selection process of CTI graduates might be justified.

METHOD

Sample

Samples for our analyses were created using data elements drawn from multiple data sources. The samples included application, selection, and training performance data for CTI graduates and GP applicants. Each of the databases used to generate the samples, with a brief description of the data source, is shown in Table 1.

Using the data sources identified above, we created two samples for our study. The first was a dataset of AT-SAT scores generated during AT-SAT testing from April 2007 through December 2009. There were 16,036 records in our dataset. We used our data sources to determine if the applicants were CTI graduates, GP applicants (with no previous aviation education or experience), or belonged to some other category based on their previous aviation education or experience. GP applicants found to have had previous aviation education or experience were removed from the GP applicant pool. All applicants that could not be classified as CTI graduates or GP applicants (with no previous aviation education or experience) were excluded from further analyses.

Table 1. Data Sources

Database	Data Source Description
Civil Aerospace Medical Institute (CAMI) Selection Research Team Database	CAMI maintains a selection database to support on-going research in selection, placement, and training of ATCSs. These data were used to develop an initial database of AT-SAT scores and the date AT-SAT was taken from April 2007 through December 2009.
Automated Vacancy Information Access Tool for On-line Referrals (AVIATOR)	AVIATOR is the FAA's on-line application system. Currently, all ATCS applicants use AVIATOR to apply for positions with the FAA. GP applicants apply before taking AT-SAT. CTI graduates apply after taking AT-SAT. Applicant information obtained from the AVIATOR database included: ▪ date the application was submitted, ▪ vacancy announcement the application was submitted under (e.g., CTI, GP, or other) ▪ applicant biographical information (e.g., age, gender). These data are maintained by FAA Human Resources at the Mike Monroney Aeronautical Center (MMAC). The AVIATOR data were used as a primary source to classify applicants as having previous aviation education (CTI graduates) or as having no previous aviation education or experience (GP applicants).
CTI Program Database	The CTI Program Office in Aviation Careers at the MMAC maintains the CTI Program database. Student information is provided to Aviation Careers by each of the CTI program colleges or universities. The CTI program school attended by each applicant was obtained from the CTI program database. These data were used to identify all applicants who had been enrolled in a CTI program.
Federal Personnel/ Payroll System (FPPS)	FPPS is the official system of records for FAA personnel. All ATCS applicants hired and paid by the FAA have a record in FPPS. These data were used to determine if and when ATCS applicants were hired and to match applicant social security numbers with their employee numbers used to track field training performance.
Academy Performance Verification (PV)	These data are maintained by the FAA Academy on the performance of trainees in the Academy. These data were used to determine trainee success or failure at the Academy.
National Training Database (NTD)	These data are maintained by the National Training Data Center on the training performance of ATCSs at ATC field sites. Information obtained from the NTD database included: ▪ type and level of FAA facility, terminal or en route, to which the trainee reported as their first facility, ▪ training status of the trainees at their first facility. These data were used to verify applicant's previous aviation education and experience, as noted in the AVIATOR database.

There were 1,912 applicants excluded from the original dataset. Reasons for exclusion were varied. There were 854 applicants excluded because, even though they were hired as GP applicants, their records indicated that they had previous military or civil experience in aviation. There were 1,058 records excluded for inconsistent information in regards to previous aviation education. Of those, 53 records were excluded because AVIATOR or NTD data indicated that the individual was hired as a CTI graduate, but was not in the CTI program database. The remaining 1,005 records were excluded because each individual was identified as being hired as a GP applicant in the AVIATOR or NTD databases, but was also in the CTI Program database. CTI graduates may apply for an ATCS position using the GP job announcement. Thus, some applicants who graduated from CTI programs may be in both the CTI and GP datasets. It is possible that some of these individuals were CTI graduates hired as GP applicants. It is also possible that some had entered, but had not completed a CTI program. Our data were insufficient to determine if the applicants were or were not qualified CTI graduates. Thus, we chose to exclude them from our analyses.

The remaining 14,124 applicants were used in our first sample. Of the 89% reporting gender, we found the sample to include 23.8% female and 76.2% male. Our sample included 2,090 CTI graduates and 12,034 GP applicants. Table 2 shows the number of CTI graduates and GP applicants hired by year.

From this first sample, we extracted a second sample, which included the CTI graduates and GP applicants that were selected for an ATCS training position and were onboard by January 2013. The second sample was used to examine training performance of the CTI graduates and GP applicants at the Academy and at their first facility.

Table 2. Number of Applicants by Hiring Source and Year AT-SAT Was Taken

| | | Year AT-SAT Was Taken | | | Total |
		2007	2008	2009	
Hiring Source	CTI	702	783	605	2,090
	GP	1,332	5,640	5,062	12,034
Total		2,034	6,423	5,667	14,124

There were 4,131 records in the second sample: 1,442 CTI graduates and 2,689 GP applicants. In comparison to the first sample, the proportion of males selected for an ATC trainee position was slightly higher than females selected (18.6% females and 81.4% males). The proportion of females and males hired as CTI graduates or GP applicants was similar. At the time the selected CTI graduates and GP applicants entered the Academy, their average age was 24.81 (*S.D.* = 2.76) and 26.29 (*S.D.* = 2.83), respectively. The number of CTI programs represented by graduates selected for an ATCS position and the year AT-SAT was taken are shown in Table 3. Not all CTI program schools were represented in the second sample. It is possible that graduates from some of the schools were excluded due to inconsistent data. It is also likely that some schools had not been in the CTI program long enough to produce graduates eligible for hiring under the CTI program. For example, Sacramento City College, Florida Institute of Technology, Hesston College, Western Michigan University, and Texas State Technology College all joined the program in 2009 and, thus, their graduates would not have been represented in this study.

Table 3. CTI Program School Attended by AT-SAT Test Date

	Year AT-SAT Was Taken			
	2007	2008	2009	Total
Arizona State University	0	2	1	3
Broward College	0	1	6	7
Community College of Beaver County	63	59	37	159
Daniel Webster College	19	29	3	51
Dowling College	6	5	7	18
Embry-Riddle Aeronautical University	116	107	59	282
Embry-Riddle Aeronautical University-Prescott	0	0	1	1
Florida State College	0	1	17	18
Green River Community College	0	9	5	14
Hampton University	7	3	2	12
InterAmerican University of Puerto Rico	7	5	3	15
Jacksonville University	0	0	1	1
Lewis University	0	0	4	4
Metro-State College	0	6	6	12
Miami Dade College	75	49	8	132
Middle Georgia College	1	6	5	12
Middle Tennessee State University	35	26	17	78
Minneapolis Community and Technical College	55	46	16	117
Mt. San Antonio College	61	41	25	127
Purdue University	15	26	5	46
St. Cloud State University	0	0	2	2
The Community College of Baltimore County	0	1	14	15
Tulsa Community College	0	1	0	1
University of Alaska-Anchorage	59	32	9	100
University of North Dakota	49	67	26	142
University of Oklahoma	0	1	0	1
Vaughn College	31	29	12	72
Total	599	552	291	1,442

Analyses

We examined AT-SAT scores by hiring source and in relationship to (a) selection decisions, (b) type and level of facility assigned for those selected and (c) training outcomes at the Academy and their first facility. Training outcome at the Academy is pass or fail based on a PV assessment. Facility training progress is categorized in the NTD as *completed*, *in progress*, *facility fail*, *transfer lower*, *transfer*, and *other* (Table 4). *Completed training, in progress, failed*, and *transferred lower* are reflections of the actual training performance of the trainees, referred to as developmentals while in field training. Outcome categories of *transfer* and *other* categories are reflections of factors other than training performance. Developmentals who completed training at their first facility were classified as successful. Those who failed or transferred lower were considered unsuccessful. Developmentals in progress were considered neither successful nor unsuccessful. Time to complete training varies by facility, but it is generally assumed that developmentals will complete training in approximately three years at en route facilities. At terminal facilities time to complete training is highly dependent on the volume and complexity of the traffic, but is generally less than three years.

We performed two types of analyses. The first compared the selection statistics for CTI graduates and GP applicants. The second compared the training performance at the Academy and the first facility of CTI to GP trainees. Throughout the results, we did not assess the statistical significance of the differences found in the data. When using datasets with a large number of participants, the likelihood of attaining statistical significance, even with relatively small differences, is high. Therefore, our approach was to describe the data, highlighting differences. The datasets used in the analyses and the results for the two types of analyses are presented next.

Table 4. National Training Database Training Categories

Developmental Status Description	Developmental Status Category
Successfully Completed Training	Completed
Active Military Duty Prior to Completion	In Progress
Extended Medical Absence Prior to Completion	
In Progress	
In Progress - Returned to Training by Training Manager	
Temporary Loss of Medical Prior to Completion	
Waiting for Training Review	
Employee Withdrew From Training	Facility Fail
Employment Terminated Prior to Completion	
Employment Termination Letter Issued	
Reassigned to a non-ATC FAA position	
Training Discontinued by ATM	
Training Failure - Pending HR Action	
Reassigned to Another 2152 Facility	Transfer Lower
ERR Employee Requested Reassignment – Transferred Prior to Completion	Transfer
Vacancy Announcement – Transferred Prior to Completion	
Verified Hardship ERR Employee Requested Reassignment – Transferred	
Employee Died Prior To Completion	Other
Employee Resigned From Agency Prior to Completion	
Employee Retired Prior to Completion	
Employment Contract Not Renewed Prior to Completion	
Employment Terminated - Medical - Prior to Completion	
Employment Terminated - Security - Prior to Completion	
Retired or Resigned	
Training Stopped Pending Security Investigation	

RESULTS

Selection

The first dataset, intended to examine the testing results of CTI graduates as compared with GP applicants, contained 14,124 applicants. Of these, 2,090 were CTI graduates and 12,034 were GP applicants. The average AT-SAT score of the CTI and the GP applicants, along with the standard deviation and standard error of the means, are shown in Table 5. CTI graduates averaged 2.49 points higher on AT-SAT than the GP applicants.

Also examined was the ranking category, based on AT-SAT score, assigned to CTI and GP applicants. Recall that a minimum score of 70 is needed to pass AT-SAT. The percentages of CTI graduates and GP applicants scoring within each of the defined AT-SAT ranges (Not Qualified (< 70), Qualified (70-84.9), and Well-Qualified (85-100)) are shown in Table 6. There were 2.3% of the CTI graduates receiving an AT-SAT score less than 70, compared to 6.9% of GP applicants. As shown in Table 6, slightly more than 10% of the CTI graduates (68.1%) scored as Well-Qualified than GP applicants (57.2%).

Of the 14,124 CTI graduates and GP applicants who applied between 2007 and 2009, only 4,131 (29.2%) were selected for an ATC trainee position with the FAA by January 2013. Of the 2,090 CTI graduates, 1,442 (69.08%) were selected, while 2,689 (22.3%) of the 12,034 GP applicants were selected (Table 7).

Table 8 shows the categorization rank of those applicants selected for ATCS trainee positions by hiring source. The majority of those selected (87.5%) from both hiring sources were classified as Well-Qualified. As shown in Table 8, a higher percentage of CTI graduates than GP applicants were selected from the Qualified range (24.2% and 5.8%, respectively). Nine CTI graduates and two GP applicants did not pass AT-SAT on their first attempt. To be hired, they had to have retaken and passed AT-SAT at a later date. This research used the scores on

Table 5. AT-SAT Means, Standard Deviations, and Standard Error of the Means by Hiring Source

Hiring Source	N	Mean	Std. Deviation	Std. Error Mean
CTI	2,090	88.16	8.05	.176145
GP	12,034	85.67	9.49	.086473

Table 6. AT-SAT Score Categories by Hiring Source

AT-SAT Category	Hiring Source		Total
	CTI	GP	
Well-Qualified	1,424 (68.1%)	6,887 (57.2%)	8,311 (58.8%)
Qualified	617 (29.5%)	4,319 (35.9%)	4,936 (34.9%)
Not Qualified	49 (2.3%)	828 (6.9%)	877 (6.2%)
Total	2,090	12,034	14,124

Table 7. Selected by Hiring Source

Selected	Hiring Source		Total
	CTI	GP	
No	648 (31.0%)	9,345 (77.7%)	9,993 (70.8%)
Yes	1,442 (69.0%)	2,689 (22.3%)	4,131 (29.2%)
Total	2,090	12,034	14,124

Table 8. Selected Applicants AT-SAT Category by Hiring Source

AT-SAT Category	Hiring Source		Total
	CTI	GP	
Well-Qualified	1,084 (75.2%)	2,531 (94.1%)	3,615 (87.5%)
Qualified	349 (24.2%)	156 (5.8%)	505 (12.2%)
Not Qualified	9 (.6%)	2 (.1%)	11 (.3%)
Total	1,442	2,689	4,131

the first administration of AT-SAT.

The next set of tables describes the type of facility to which applicants selected for an ATC trainee position were assigned. Placement decisions are made based on a number of factors, to include the needs of the FAA and the preference of the selectee. Table 9 shows that a slightly higher percentage of all trainees were assigned to terminal facilities (55.9%). This was true for both CTI and GP trainees. The difference was less than 2 percentage points between the type of assignments CTI and GP trainees received following successful completion of the Academy.

Of the 1,761 trainees assigned to en route facilities, the majority (1,735) were assigned to levels 10, 11, and 12 facilities. There were only 26 applicants assigned to en route level 8 or 9 facilities in our database. The number of trainees assigned to each level facility for CTI graduates and GP applicants is shown in Table 10. A higher percentage of CTI than GP trainees were

assigned to level 10 and 11 facilities. At level 12 facilities, a higher percentage of GP than CTI trainees were assigned. Differences in the proportion of trainees assigned to level 11 and 12 facilities were approximately 10%. There were 10% more CTI trainees assigned to level 11 facilities and 10% more GP trainees assigned to level 12 facilities.

Terminal facilities are grouped by level. Lower level facilities, 4 through 6, are considered small; mid-level facilities, 7 through 9, are medium; and higher level facilities, 10 through 12, are large. For terminal facility assignments, a higher proportion of GP trainees were assigned to lower level facilities than CTI trainees. CTI trainees were assigned to medium and large facilities at a slightly higher rate than GP trainees. The difference in assignment to small facilities was 9.2%, all other differences between CTI and GP trainees in assignment to terminal facilities were less than 5% (Table 11).

Table 9. Terminal or En Route Facility Assignments by Hiring Source

	Hiring Source		
Option	CTI	GP	Total
En Route	620 (43.0%)	1,141 (42.4%)	1,761 (42.6%)
Terminal	803 (55.7%)	1,505 (56.0%)	2,308 (55.9%)
Not Assigned or Unknown	19 (1.3%)	43 (1.6%)	62 (1.5%)
Total	1,442	2,689	4,131

Table 10. En Route Level Assignments by Hiring Source

	Hiring Source		
En Route Levels	CTI	GP	Total
8	3 (.5%)	8 (.7%)	11 (.6%)
9	7 (1.1%)	8 (.7%)	15 (.9%)
10	116 (18.7%)	194 (17%)	310 (17.6%)
11	245 (39.5%)	342 (30.0%)	587 (33.3%)
12	249 (40.2%)	589 (51.6%)	838 (47.6%)
Total	620	1,141	1,761

Table 11. Terminal Level Assignments by Hiring Source

	Hiring Source		
Terminal Levels	CTI	GP	Total
Small (4-6)	254 (31.6%)	614 (40.8%)	868 (37.6%)
Medium (7-9)	346 (43.1%)	582 (38.7%)	928 (40.2%)
Large (10-12)	199 (24.8%)	307 (20.4%)	506 (21.9%)
Missing	2 (.1%)	4 (.5%)	6 (.3%)
Total	803	1,505	2,308

Training Performance at the First Facility

The next set of analyses examined the training performance of the trainees at the Academy and as they progressed through ATC training at their first facility. Training status was gathered from the Academy and the NTD database. We started our analyses with all CTI graduates and GP applicants selected for an ATC trainee position. As shown in Table 7, there were 4,131 trainees in our sample. We used Academy and NTD training performance data to examine training status as of February 2013 of all selected trainees by hiring source. Training outcomes include declined to attend or resigned from the Academy, still in training at the first facility, successfully completed training at the first facility, failed at the Academy or unsuccessful in field training, or other field training outcomes not related to performance (see Table 4 for a listing of these factors), or training outcome has not been documented in any available data source.

As can be seen in Table 12, slightly more CTI trainees were still in training or successfully completed training than GP trainees. Conversely, slightly more GP than CTI trainees declined to attend or resigned from the Academy, or were unsuccessful at the Academy or in field training. Differences were 5 percentage points or less.

The data reported in Table 12 were further refined to include only those outcomes related to performance. Performance-related outcomes are successful, unsuccessful, or still in training. When considering only the performance-related outcomes, there is a greater difference between CTI and GP trainees, especially in regards to unsuccessful performance. There was a difference of 6.4% percentage points between CTI and GP trainees, with more GP than CTI trainees being unsuccessful in the Academy or at their first facility (Table 13).

Table 12. Outcome by Hiring Source

Outcomes	Hiring Source		Total
	CTI	GP	
Academy Resigned or Declined	6 (.4%)	29 (1.1%)	35 (.8%)
Successfully Completed Training	702 (48.7%)	1,203 (44.7%)	1,905 (46.1%)
In Training at First Facility	362 (25.1%)	590 (21.9%)	952 (23.0%)
Unsuccessful (Academy/Field)	206 (14.3%)	523 (19.4%)	729 (17.6%)
Other (Non-performance)	134 (9.3%)	267 (9.9%)	401 (9.7%)
Unknown	32 (2.2%)	77 (2.9%)	109 (2.6%)
Total	1,442	2,689	4,131

Table 13. Performance-Related Outcomes by Hiring Source

Outcomes	Hiring Source		Total
	CTI	GP	
Successfully Completed Training	702 (55.3%)	1,203 (51.9%)	1,905 (53.1%)
In Training at First Facility	362 (28.5%)	590 (25.5%)	952 (26.5%)
Unsuccessful (Academy/Field)	206 (16.2%)	523 (22.6%)	729 (20.3%)
Total	1,270	2,316	3,586

For outcomes related to performance, we also examined the data by facility type and level. There were 3,586 trainees in the dataset. These trainees had successfully completed training, were still in training, or had been unsuccessful either at the Academy or at their first assigned facility. These trainees had been assigned to en route (1,571) or terminal (2,015) facilities.

The training performance of trainees assigned to en route facilities is shown in Table 14. Because there were so few trainees at Level 8 and 9 en route facilities, the data were combined. Except for Levels 8-9, CTI trainees had completed training successfully at a higher percentage than GP trainees. Also, again except for Levels 8-9, the percentage of CTI trainees who were unsuccessful was less than the percentage of unsuccessful GP trainees. Across all levels, the percentage of trainees still in training was similar.

We then examined the training performance of trainees at small, medium, and large terminal facilities (Table 15). Again, we only considered outcomes related to performance (successfully completed training, in training and unsuccessful). The percentage of trainees still in training at the first facility varied, but overall there was a higher percentage of CTI than GP trainees still in training at terminal facilities. Based on percentages, GP trainees were slightly more successful than CTI trainees at small and medium-level facilities, but at large facilities CTI trainees were more successful than GP trainees. GP trainees were proportionately more unsuccessful at all levels of facilities than CTI trainees.

Table 14. Outcome by En Route Facility Level and Hiring Source

Facility Level	Outcomes by En Route Facility Level	Hiring Source	
		CTI	GP
8 - 9	Successfully Completed Training	1 (10%)	3 (21.4%)
	In Training at First Facility	4 (40%)	6 (42.9%)
	Unsuccessful (Academy/Field)	5 (50%)	5 (35.7%)
10	Successfully Completed Training	71 (67.0%)	104 (58.1%)
	In Training at First Facility	20 (18.9%)	32 (17.9%)
	Unsuccessful (Academy/Field)	15 (14.2%)	43 (24.0%)
11	Successfully Completed Training	99 (46.9%)	107 (38.5%)
	In Training at First Facility	72 (34.1%)	90 (32.4%)
	Unsuccessful (Academy/Field)	40 (19.0%)	81 (29.1%)
12	Successfully Completed Training	98 (43.2%)	218 (39.9%)
	In Training at First Facility	87 (38.3%)	204 (37.4%)
	Unsuccessful (Academy/Field)	42 (18.5%)	124 (22.7%)
Total		1,017	554

Table 15. Outcome by Terminal Facility Level and Hiring Source

Facility Level	Outcomes by Terminal Facility Level	Hiring Source	
		CTI	GP
Small (4-6)	Successfully Completed Training	145 (61.4%)	332 (62.6%)
	In Training at First Facility	64 (27.1%)	105 (19.8%)
	Unsuccessful (Academy/Field)	27 (11.4%)	93 (17.5%)
Medium (7-9)	Successfully Completed Training	178 (56.5%)	299 (57.8%)
	In Training at First Facility	91 (28.9%)	116 (22.4%)
	Unsuccessful (Academy/Field)	46 (14.6%)	102 (19.7%)
Large (10-12)	Successfully Completed Training	110 (66.7%)	140 (55.6%)
	In Training at First Facility	24 (14.5%)	37 (14.7%)
	Unsuccessful (Academy/Field)	31 (18.8%)	75 (29.8%)
Total		716	1,299

Table 16. Outcome at First Facility by AT-SAT Category

AT-SAT Category	Outcomes	Hiring Source	
		CTI	GP
Qualified	Successfully Completed Training	168 (54.2%)	56 (43.4%)
	In Training at First Facility	69 (22.3%)	14 (10.9%)
	Unsuccessful (Academy/Field)	73 (23.5%)	59 (45.7%)
Total		310	129
Well-Qualified	Successfully Completed Training	531 (55.7%)	1145 (52.4%)
	In Training at First Facility	289 (30.3%)	576 (26.4%)
	Unsuccessful (Academy/ Field)	133 (14.0%)	464 (21.2%)
Total		953	2,185

We also examined the outcome data in relationship to AT-SAT score categories. We excluded those in our dataset that did not pass AT-SAT on the first administration. The results can be seen in Table 16. The highest proportion of CTI and GP trainees, scoring in either the Qualified or Well-Qualified range on AT-SAT, had successfully completed training. Both CTI and GP Qualified trainees were unsuccessful more often than Well-Qualified trainees.

DISCUSSION

These data paint a picture of the selection and initial training performance of ATCSs hired from among CTI and GP applicants. These applicants are required to pass AT-SAT as part of the hiring process. The cost to the FAA for administering AT-SAT is approximately $360 per applicant (L. Waterford, personal communication, February 9, 2012). The question asked in this study is whether or not CTI graduates should continue to take AT-SAT as part of the selection process.

In reviewing the data, we found that the CTI graduates tested from April 2007 through December 2009 scored an average of 2.49 points higher on AT-SAT as compared to GP applicants. More than 97% of the CTI graduates and 93% of the GP applicants passed AT-SAT. Given the high pass rate, it is clear that AT-SAT is not eliminating as many applicants from consideration as it did before reweighting (Wise, Tsacoumis, Waugh, Putka, & Hom, 2001). However, there was variability in the proportion of applicants scoring in the Well-Qualified and Qualified score categories, with more than 50% of test takers scoring in the Well-Qualified category and approximately one-third as Qualified. We will now consider these differences in relationship to training performance.

The remaining results will be discussed in two sections. The first will focus on the comparison of CTI graduates and GP applicants in the selection process. The second will review the training performance of CTI and GP trainees at the Academy and at their first facility. Again, no statistical analyses were performed due to the large number of applicants, so percentage differences noted are merely observational to highlight areas that may be of interest for further review. The differences are not considered statistically significant.

Selection

Of the CTI graduates who took AT-SAT (n=2,090), 1442 (69.0%) were selected for a training position. This compared to the selection of 2,689 (22.3%) of GP applicants who took AT-SAT (n=12,034). Although the proportion of CTI graduates selected was much higher than the proportion of GP applicants selected, there were almost twice as many GP applicants selected as CTI graduates. As shown in Table 8, the majority of CTI graduates and GP applicants selected for an ATCS trainee position scored in the Well-Qualified range on AT-SAT (75.2% and 94.1%, respectively). This is not surprising given that the selection panel, as a matter of policy, selected from among the Well-Qualified applicant pool before considering Qualified applicants. Of interest, however, is that the selection panel selected more CTI-Qualified applicants than GP-Qualified applicants. Of the applicants selected, 349 (24.2%) CTI graduates selected scored in the Qualified range on AT-SAT, whereas only 156 (5.8%) of the GP applicants selected scored in the Qualified category. This may demonstrate a preference for CTI-Qualified applicants over GP-Qualified applicants or may merely indicate that more CTI-Qualified applicants were available for selection at the vacancy sites. The latter explanation is unlikely, however, since GP applicants can be considered nationwide, independent of their U.S. state or territory preference, whereas CTI graduates may only be considered for positions within the two U.S. states or territories identified by the graduate as preferred locations on their application (A. Wint, personal communication, December 12, 2012).

There was little difference in assignment of CTI or GP trainees to an en route or terminal facility. Approximately, the same proportion of CTI and GP trainees were assigned to en route and terminal facilities. There were, however, some differences in the level of facility to which the trainees were assigned. Specifically, fairly large differences were noted for assignment to en route level 11 and 12 facilities. There were 9.5% more CTI trainees assigned to en route level 11 facilities, while 10.4% more GP trainees were assigned to en route level 12 facilities. However, at terminal facilities, more CTI trainees were assigned to medium- and large-level facilities than GP trainees. Again, differences in facility level assignment may be due to the applicants available to the selection panel per location. However, there is no reason

to assume that the availability of applicants per location should differ in a way that would systematically affect the proportion of CTI or GP trainees assigned to the most complex en route or terminal facilities. Selection panel preferences, however, may be influencing facility level assignments. The selection panel may favor GP applicants for the most complex en route facilities and CTI graduates for the more complex terminal facilities. Why these preferences exist, however, is unclear.

Training Performance at the First Facility
A subset of the data was used to examine training status of CTI and GP trainees. As of February 2013, the majority of CTI and GP trainees had completed training, either successfully or unsuccessfully. Considering only performance-related outcomes (successful, unsuccessful, or still in training), and across both en route and terminal facilities, 53.1% of CTI and GP trainees were successful and 20.3% were unsuccessful. However, overall, a larger proportion of CTI trainees were successful and a smaller proportion unsuccessful than GP trainees. The largest difference between CTI and GP trainees was in unsuccessful performance. With only one exception (en route Level 8-9 Facility), the proportion of unsuccessful CTI trainees was less than the proportion of unsuccessful GP trainees. Simply based on training performance, a preference for CTI graduates over GP applicants at both en route and terminal facilities seems warranted. Future researchers should investigate the statistical significance of the difference between CTI and GP trainees, while controlling for factors such as level of facility. Future researchers may also want to investigate selection panel decision processes.

In examining training performance of CTI and GP trainees, we also found that a higher proportion of Well-Qualified trainees were successful than Qualified trainees (53.4% and 51.0%, respectively) and a smaller proportion were unsuccessful (19.0% and 30.1%, respectively). Similar differences existed for both CTI and GP trainees, although the difference between the performance of Well-Qualified and Qualified GP trainees was more than the difference between Well-Qualified and Qualified CTI trainees. These differences may support the tendency of the selection panel to favor Qualified CTI graduates over GP-Qualified applicants.

CONCLUSIONS AND RECOMMENDATIONS

At this time, we conclude that the value of AT-SAT in hiring CTI graduates may be more in its ability to categorize them for use by the selection panel than as a tool to eliminate applicants from consideration. We also cannot support awarding points to CTI graduates based on AT-SAT score, as proposed by the IRP (Barr, et al., 2011). We do not have sufficient data to assess the relationship between individual scores on AT-SAT and training performance, and there is no evidence to suggest that differences of one or two points on AT-SAT would predict training outcomes. However, there was 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.

Our recommendation is to continue using AT-SAT in the hiring of CTI graduates. Our recommendation is based on our examination of the training performance of both Well-Qualified and Qualified trainees. Well-Qualified trainees performed better in training than Qualified trainees. They succeeded at a higher rate and failed at a lower rate than Qualified trainees. Selecting Well-Qualified trainees should improve overall training performance at the Academy and in the field. However, if there is a need to hire from the Qualified applicant pool, we recommend that Qualified CTI graduates be given preference over Qualified GP applicants.

Limitation
    A limitation of this research was our inability to classify all AT-SAT test takers as having or not having graduated from a CTI program, based on the data sources to which we had access. There were 1,058 people in our original database of AT-SAT test takers that could not be classified. The data for these people were inconsistent. There were 53 that were hired under a CTI vacancy announcement as noted by hiring source in the AVIATOR database, but these people were not identified as CTI students in the CTI Program Database. More troubling, 1,005 people took AT-SAT and were identified as having attended a CTI school based on the CTI program database. However, they were not identified as CTI graduates based on hiring source in the AVIATOR or NTD databases. In addition, CTI students entered into the CTI program database are not removed from the database if they leave the program. After some period of time, they may be noted as inactive, but there is generally a delay between the student leaving the CTI program and being identified as inactive. Also, CTI students qualified to apply for an ATCS training position as a CTI graduate may also apply and be selected based on a GP vacancy announcement. For those people in the CTI program database not hired based on a CTI vacancy announcement, they may or may not have graduated from a CTI program and may or may not have been qualified to apply as a CTI graduate. Thus, these records were excluded from both the CTI and GP samples. Future researchers interested in comparing selection and training performance differences between CTI graduates and GP applicants will require a strategy to more accurately classify individuals as having or not having prior aviation experience, independent of vacancy announcement or hiring source.

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APPENDIX A

Approved CTI Schools by Location

	School Name	City	State	Year Accepted
1	University of Alaska	Anchorage	AK	1992
2	Arizona State University	Mesa	AZ	2007
3	Embry-Riddle Aeronautical University	Prescott	AZ	2008
4	Sacramento City College	Sacramento	CA	2009
5	Mount San Antonio College	Walnut	CA	1996
6	Metropolitan State College of Denver	Denver	CO	2007
7	Aims Community College	Greeley	CO	2008
8	Embry-Riddle Aeronautical University	Daytona Beach	FL	1992
9	Miami Dade College	Homestead	FL	1996
10	Florida State College at Jacksonville	Jacksonville	FL	2007
11	Jacksonville University	Jacksonville	FL	2008
12	Florida Institute of Technology	Melbourne	FL	2009
13	Broward College	Pembroke Pines	FL	2008
14	Middle Georgia College	Cochran	GA	2007
15	Lewis University	Romeoville	IL	2007
16	Purdue University	West Lafayette	IN	1996
17	Hesston College	Hesston	KS	2009
18	The Community College of Baltimore County	Baltimore	MD	2007
19	Western Michigan University College of Aviation	Battle Creek	MI	2009
20	Minneapolis Community and Technical College	Eden Prairie	MN	1992
21	St. Cloud State University	St. Cloud	MN	2008
22	University of North Dakota	Grand Forks	ND	1992
23	Daniel Webster College	Nashua	NH	1996
24	Eastern New Mexico	Roswell	NM	2008
25	Vaughn College of Aeronautics and Technology	Flushing	NY	1996
26	Dowling College	Shirley	NY	1996
27	Kent State University	Kent	OH	2007
28	University of Oklahoma	Norman	OK	2007
29	Tulsa Community College	Tulsa	OK	2008
30	Community College of Beaver County	Beaver Falls	PA	1992
31	InterAmerican University of Puerto Rico	San Juan	PR	1996
32	Middle Tennessee State University	Murfreesboro	TN	1996
33	LeTourneau University	Longview	TX	2008
34	Texas State Technical College	Waco	TX	2009
35	Hampton University	Hampton	VA	1992
36	Green River Community College	Auburn	WA	2007