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Evaluation of an Alternative Method for Hiring Air Traffic Control Specialists with Prior Military Experience

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16. Abstract

This study was conducted to assess an FAA program to hire former military air traffic control specialists to enter ATC field training directly without first attending the Academy screening program. Selection of military controllers was based on meeting prehire qualifications, subject matter expert ratings of ATC training and experience, supervisor recommendations, and final decisions of selecting officials. Selection of the comparison group of Academy graduates was based upon selection test scores, age, work experience, and medical and security qualifications. Facility assignments for the military controllers were partly based on prior experience. Academy graduates' facility assignments were partly based on Academy performance. Training records were obtained for 538 military controllers who entered field training as part of the special hiring program conducted in 1988. Their training status and other performance measures were compared with those for 1605 candidates who entered the Academy between January and December 1988. Academy entrants had a 36% loss rate, which was typical for this second-stage selection procedure. Facility assignments differed for the two groups; 89% of military hires were assigned to terminal facilities while only 31% of Academy graduates received terminal assignments. The 1024 Academy graduates and the GS-9 military hires had statistically equivalent failure rates from field training at their first facility (13% loss for Academy graduates as compared with 20% for GS-9 military hires in the terminal option; both groups had about a 21% loss rate in the en route option.) However, a substantial percentage of both groups have not yet completed their training; thus, increases in loss rates may occur later. Few differences were observed in other measures of training performance. One interpretation of these results is that hiring former military controllers is an adequate strategy because it appeared to produce developmental controllers who performed about as well as did graduates from the FAA Academy. Another interpretation is that the GS-9 military hires who have prior experience performed no better than did inexperienced Academy graduates. Factors limiting interpretation of the results are discussed and recommendations are made regarding collection of additional background information which could improve the interpretability of results in future evaluation studies.

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EVALUATION OF AN ALTERNATIVE METHOD FOR HIRING AIR TRAFFIC CONTROL SPECIALISTS WITH PRIOR MILITARY EXPERIENCE

INTRODUCTION

In January of 1988, the Federal Aviation Administration (FAA) learned that the military services were reducing their workforces due to Department of Defense budget reductions. For example, the U.S. Air Force was faced with a required reduction of 20,000 airmen, including a sizable number of air traffic controllers. In order to cut the required number of personnel during fiscal year 1988, the services began offering early releases to certain military personnel. The FAA's Southwest Region first identified this potential source of qualified candidates for FAA Air Traffic Control Specialist (ATCS) positions. It was hoped that hiring former military controllers would have certain advantages. Their controller experience meant that they might qualify for positions above the usual GS-7 entry grade. When hired at grades above GS-7, the agency can waive the requirement that newly-hired controllers must attend the FAA Academy screening program. If these military controllers perform as well in FAA field training as Academy graduates, then the agency could save the cost of providing the Academy course for each new GS-9 hire.

The purpose of this study was to evaluate the effectiveness of the GS-9 military hire program. Specifically, how well did those hired as part of the GS-9 military hire program perform during their training, as compared with Academy graduates having no prior ATC experience or others who had some type of ATC experience before entering the Academy? It would be expected that new employees having prior military ATC experience would perform better in field training (fail less frequently, and complete training in less time) than would new employees having no prior military ATC experience.

On the other hand, the ATC screen program is designed to "weed out" those who do not have the aptitude for controlling air traffic. Thus, those who successfully completed the Academy and entered field training might be equally as prepared as the GS-9 military hires for their first assignment, particularly if the military hires were assigned to work in facilities that control traffic of higher complexity than had been their experience. While some, but not all, former military controllers used IFR (instrument flight rules; radar) procedures to control traffic, their assignments could not have been considered comparable to assignments at levels 4 or 5 limited radar or radar facilities (e.g., DFW, O'Hare, Washington National), or most of the en route facilities. Thus, Academy graduates might be expected to perform as well as, or better than, military hires among ATCSs assigned to higher complexity facilities.

With anticipated cutbacks in the size of the military, groups of military controllers may become available for employment soon, and decisions about their placement may need to be made quickly. Thus, knowledge about the success of military hires from this program could contribute to employment decisions to be made about future military hires. Information from this program could also contribute to decisions to be made about hiring and placing other controllers who do not attend the Academy, such as retired military controllers or graduates from college and university-based ATC training programs.

Recruitment and Selection

GS-9 Military Hires. The Southwest Region sought to tap the applicant pool of military hires by opening a job announcement for air traffic controllers (GS-2152) at GS grade 9. The region intended to place selectees into non-radar terminal facilities. However, when the advantages of this hiring program became apparent, the FAA decided to expand the hiring to serve all regions and cover both terminal and en route facilities. The Southwest Region administered the program. Applications were accepted during the period February 17 through March 4, 1988. Initial eligibility determinations were based on the

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Office of Personnel Management's (OPM) qualification standards for air traffic controller positions: not having reached the 31st birthday, 3 years of general work experience (where years in college or prior aviation experience may equate), pass a special medical examination (at which time they are also administered the Sixteen Personality Factor Questionnaire, which is scored with a revised key: Cattell and Eber, 1962; Dailey, 1975), and pass a background investigation. The written civil service examination for controller positions was not used. That test is a mandatory selection instrument at GS grades 7 and below. For grades above GS-7, its use is optional, but applicants must have specialized experience in a military or civilian air traffic control facility which demonstrated the ability to perform air traffic control work of the higher grade.

The FAA received applications from approximately 1400 individuals deemed eligible by OPM standards. Under civil service rules, it was necessary to evaluate the degree to which each applicant possessed the knowledges, skills, and abilities needed for the job. The agency decided to conduct the evaluations using the original criteria established by the Southwest Region. Resource and time constraints precluded developing additional criteria for placing candidates in en route or radar terminal facilities. The original rating criteria allowed credit for radar experience, but did not distinguish between those with that experience and those without it. The factors used were:

- Ability to communicate effectively in a clear, concise manner, using prescribed phraseology.

- Knowledge of navigational aids and Instrument Flight Rules (IFR)/Visual Flight Rules (VFR)/Special Visual Flight Rules (SVFR) clearance procedures.

- Knowledge of air traffic control separation standards.

- Ability to compile, interpret, and disseminate technical data (i.e., current and forecast weather reports, pilot reports, etc.).

- Ability to perform duties effectively under stressful conditions (i.e., aircraft emergencies, equipment failures, hazardous weather conditions, etc.).

- Ability to complete job-related training within established time frames.

The evaluations were conducted by subject matter experts (personnel specialists and air traffic controllers) using a standard rating guide. The raters based their evaluations on the applicants' experience, education and training, and written statements by applicants describing how their backgrounds applied to each rating factor. Based upon this information, each applicant was assigned a numerical rating. The agency was required to select from among those with the highest numerical scores.

After the numerical ratings were assigned, the applications were sorted according to experience: radar, limited radar, and no radar experience. Each region established a minimum acceptable rating for a candidate to be considered in that region. Minimum scores were based on the number of qualified candidates and the number of vacancies. FAA air traffic controllers provided by each region for this project contacted the military air traffic control facilities for each candidate under consideration to verify their employment experience and obtain recommendations (if any). Finally, selecting officials in each region identified those to be selected and the personnel offices in each region made job offers to the candidates.

GS-7 ATCSs. A candidate for a GS-7 ATCS position must meet the same OPM qualification standards described above except for having specialized experience. They must also pass the Office of Personnel Management aptitude battery, consisting of two aptitude tests, the Multiplex Controller Aptitude Test (MCAT) and the Abstract Reasoning Test (OPM-157). Scores earned on these tests determine a qualifying score. Credit for demonstrated knowledge in air traffic control (as measured by an Occupational Knowledge Test; OKT) and for veteran's preference is added to the selection rating if the performance on the aptitude test battery of an applicant with

prior experience results in a score of 70.0 or greater, or performance of an applicant with no prior experience exceeds 75.1.

At this point, candidates may enter the system by a number of methods. Traditional competitive entrants are hired on the basis of their OPM rating. Althoug the qualifying score is much lower, a rating of 90 is usually preferred for competitive hire. In addition, there are a number of special entry programs, such as the Cooperative Education program, which provide occupation-specific training. For this and other programs, applicants must earn qualifying OPM ratings, but their ratings can be lower than those for competitive entrants.

GS-7 ATCS candidates must successfully complete an additional aptitude screening process prior to entering technical training at their respective facilities. Qualified candidates who accept appointment first proceed to the nonradar screening program at the FAA Academy in Oklahoma City. In this 3 month program, 60% of the final grade is based on student performance on a series of laboratory problems that simulate the control of air traffic under nonradar conditions in an en route environment. Unsuccessful candidates in the nonradar screen are removed from the ATC series. Those who pass the Academy screening program (they are now called "developmentals") are assigned to a specific air traffic control facility and may undergo additional centralized option-specific training before reporting for duty at their facility. These developmentals receive a promotion to GS-9 upon completing Academy training.

Field Training for Developmental ATCSs

Air traffic facilities control different numbers and types of aircraft and perform different types of air traffic services. Upon arrival at their facility, developmentals undergo training which emphasizes the procedures appropriate for that facility's size and functions. Developmentals assigned to terminal radar facilities eventually return to the Academy for a radar screening program, which assesses their aptitude to control air traffic in a radar environment. Field training is conducted in a pass/fail mode; unsuccessful developmentals may separate from the occupation or be reassigned to facilities controlling lower complexity traffic, depending on how far they progressed in their training before failing. Training is conducted until developmentals are certified to perform various air traffic functions independently. These controllers are then said to have reached full performance level (FPL). In spite of some similarities in job functions, the technical training provided for en route and terminal controllers is very different, and within different types of terminal facilities, the training differs. Much of the reason for the differences in training is that air traffic control procedures differ according to the facility to which the student is assigned. At en route facilities, traffic is usually moving rapidly and at higher altitudes and must be kept further apart than at terminal facilities, where traffic is slowing down and converging on a single location. Thus, separation standards (the minimum distance that aircraft must be kept apart) differ for the different types of ATC facilities, and quite frequently, the training differs accordingly.

In the terminal option, there are 2 different types of controllers. Terminal radar approach controllers use radar equipment to separate aircraft converging on an airport. Tower cab controllers control traffic landing or taking off from an airport. Additional distinctions are often made within these two types of terminal controllers. Terminal radar approach controllers may work at lower level (2 or 3) or higher level (4 or 5) facilities. The numerical levels indicate the numbers and types of aircraft controlled by a facility; lower level facilities control fewer aircraft and/or less complex traffic. Similarly, tower cab facilities may also be of lower levels (1-3) or higher levels (4 & 5). The higher level facilities are usually called limited radar facilities because they use special radar equipment. For the purpose of this evaluation (or any analysis of ATCS performance in training or on the job), it is important to determine whether comparing controllers assigned to different types of facilities is warranted, especially when training times and success rates in training phases often differ.

METHOD

Subjects

GS-9 military hires. As part of the special hiring program described above, 555 military controllers were hired as FAA ATCSs and entered field training. The first military hires entered the FAA on March 13, 1988. Although 96% of those hired entered the FAA within the first year, 18 military hires entered the FAA more than a year after the program began. In fact, 1 military hire entered the FAA in February 1990. Because of the difficulty of assessing training performance for hires entering the system so much more recently than most of their peers, data for hires who entered the system more than 1 year after program initiation were eliminated. Training records for 538 GS-9 military hires were used in subsequent analyses.

Academy comparison group. A comparison group was chosen from among Academy entrants who were scheduled to start their field training at a time comparable to the entry of the GS-9 military hires. Classes of Academy students were identified who were scheduled to graduate from the Academy between January 12 and December 12, 1988. Many of the successful students remained at the Academy for up to an additional 1½ months to receive supplementary training. These classes were chosen because their graduates were scheduled to enter field training between plus or minus 2 standard deviations of the mean date of hire for GS-9s, July 17, 1988, resulting in the selection of 2140 entrants. Academy students who attended the program previously were eliminated from further analysis because their training performance had been demonstrated to differ from that of first-time entrants (Manning, Kegg, and Chen, 1988). Other types of students (former air traffic assistants and some other noncompetitive hires) were also eliminated because not enough of them were available to allow comparative analysis, and their Academy performance had been shown to be sufficiently different from that of other hires to prevent subsuming them in that grouping. The resulting comparison group consisted of 1609 GS-7 Academy entrants (hereafter referred to as "Academy entrants"). Of the 1609 Academy entrants, 1024 (hereafter referred to as "Academy graduates") successfully completed the Academy program.

Procedure

Demographic information was obtained for GS-9 military hires and Academy entrants. Training records were obtained for the GS-9 military hires and Academy graduates. The demographic information included race, gender, age, and type of prior ATC experience. Some of the information was obtained from candidates' applications; other information (for Academy entrants only) was taken from biographical questionnaires administered by the Civil Aeromedical Institute during the first week of the Academy screening program. The remaining Academy entrants were categorized by the amount and type of ATC background/experience they obtained before they entered the Academy. This classification resulted in the identification of 1093 hires who had no prior ATC experience, 128 hires who reported having prior aviation education or participated in the Cooperative Education program, and 206 hires reporting having had some prior military ATC experience.

Field training performance was examined in terms of training success (successful completion of training at the first assigned facility), and other measures of performance in training, such as the number of years required to complete developmental training, the number of hours of on-the-job training (OJT), and the number of days required to complete certain portions of the training program, as well as instructor ratings of developmental performance (compared with other developmentals the instructor has trained in the past) made on a Likert-type scale ranging from 1 (Bottom 10%) to 6 (Top 10%). Although the same information is collected for each type of controller, the distributions of values for each of the variables differs by the type of facility to which the controller is assigned (Manning, Della Rocco, and Bryant, 1989). For example, analysis of the FAA's Air Traffic Training Tracking System (Manning, 1991) shows that the average time required to complete the field training program after a controller enters his or her first facility ranges, on the average, from 2.7 years for en route developmentals (s.d. = .7 years), to

2.0 years for terminal approach controllers (s.d. = .8 years), to 1.1 years for controllers assigned to VFR towers (s.d. = .5 years).

Although these measures of training performance were available for most developmentals, it must be understood that a number of outside factors - - besides technical performance - - may affect their value. For example, time to reach FPL status may be affected by delays in training caused by the operational need to use the controller to control traffic. The number of OJT hours used may be affected by the type of traffic the developmental controlled during training. The subjective rating of developmental potential could be affected by a number of rating biases familiar to psychologists (e.g., leniency, severity, central tendency, halo effect, egocentric effects, and evaluator bias; see Siegel and Lane, 1982). Withdrawal from training usually occurs because of failure; less than 3% of developmentals withdraw voluntarily from training, according to analysis of the Air Traffic Training Tracking System (Manning, 1991).

RESULTS

Results will be discussed in the context of research questions that address factors that are relevant for different groupings of controllers.

Question 1: How similar were the characteristics and facility assignments for the GS-9 military hires and both Academy entrants and Academy graduates?

To compare the performance of the two groups, it is necessary to determine in what ways the groups might differ and how that might affect their performance. Unfortunately, it was not feasible to collect information about the aptitude of members of both groups because the GS-9 military hires were not required to take the OPM entrance test. The only information available about the groups was demographic: age at hire, gender, and race. Comparisons were made between the GS-9 hires and both a) the entire group of Academy entrants, and b) the subgroup of Academy graduates who passed and progressed into field training.

Table 1 shows demographic characteristics for the GS-9 military hires, as compared with the Academy comparison groups. The average age of the GS-9 military hires was significantly greater than the age of both those entering the Academy $F(1,2115) = 27.90$, $p < .0001$, and those passing the Academy, $F(1,1533) = 42.43$, $p < .0001$. Age at Academy entry has been shown to be an important predictor of success in the Academy screen program (see Collins, Boone, and VanDeventer, 1981, for a discussion of related historical research). However, the practical significance of the difference between these groups was minimal ($\eta^2 < .03$).

No significant differences were observed between groups in the proportions of men and women. However, the GS-9 military hires included a slightly higher percentage of minorities than did the Academy comparison groups; $\chi^2(1) = 17.2$, $p < .0001$ for GS-9s as compared with Academy entrants, and $\chi^2(1) = 18.3$, $p < .0001$ when compared with Academy graduates.

Although it was deemed not relevant to compare prior experience of Academy students with GS-9 military hires, Table 1 shows that three-fourths of Academy entrants and almost three-fourths of Academy graduates did not have prior military experience or an aviation education background.

Facility assignments were compared for GS-9 military hires and Academy graduates (see Table 2). The majority of Academy graduates were assigned to en route centers (about 69%), while the GS-9 military hires' facility assignments were spread more evenly across the different types of facilities (35% to level 2 & 3 radar facilities, 24% to level 4 & 5 radar facilities, and between 11 and 18% to VFR/nonradar towers, limited radar towers, or en route centers). Table 2 also shows facility assignments by region. It appears from examining this table that the regions used different criteria to assign their employees to facilities. For example, the Alaskan and Northwest Mountain regions assigned a relatively high proportion of their GS-9 military hires to en route centers (50% and 40% respectively, although the totals are very small). The other regions assigned a much lower percentage of GS-

9 military hires, and sometimes none at all, to en route facilities. Furthermore, the Eastern region assigned the majority of its GS-9 military hires (68%) to level 4 & 5 radar facilities, while the other regions assigned a much lower proportion of their GS-9 employees in that way. Few Academy graduates were assigned to limited radar facilities or level 4 & 5 radar terminals.

Table 1

Demographic Characteristics of GS-9 Military Hires and Both Academy Comparison Groups

	GS-9 N=538	All Academy N=1605	Academy Graduates N=1024	
Average age	26.8	26.0	25.9	
Gender				
	87.2	87.7	88.5	% males
	12.8	12.3	11.5	% females
Minority Status				
	.6	.5	.3	% Am Indian
	.4	.4	.4	% Asian
	6.1	2.4	2.2	% Black
	3.5	2.5	2.3	% Hispanic
	81.4	91.6	93.0	% nonmin
	8.0	2.6	1.8	% unknown
Experience				
	N/A	76.6	73.9	% no exper
		9.2	9.1	% aviation ed
		14.2	17.0	% military ATC

TABLE 2
FACILITY ASSIGNMENTS BY REGION
FOR GS-9 MILITARY HIRES AND ACADEMY GRADUATES

FACILITY TYPE

	VFR-NONR TOWERS		LEVEL 2 & 3 RADAR TWRS		LIM RADAR TWRS		LEVEL 4 & 5 RADAR TWRS		CENTERS		TOTAL
GS-9 MILITARY HIRES	N	%	N	%	N	%	N	%	N	%	
REGION											
ALASKAN	4	33.3%	2	16.7%	0	0.0%	0	0.0%	6	50.0%	12
CENTRAL	7	19.4%	21	58.3%	3	8.3%	2	5.6%	3	8.3%	36
EASTERN	1	1.5%	6	9.2%	11	21.5%	44	67.7%	0	0.0%	65
GREAT LAKES	16	16.0%	53	53.0%	14	11.0%	20	20.0%	0	0.0%	100
NEW ENGLAND	19	55.9%	6	17.6%	7	20.6%	2	5.9%	0	0.0%	34
NW MOUNTAIN	1	1.8%	24	43.6%	3	5.5%	5	9.1%	22	40.0%	55
SOUTHERN	0	0.0%	45	42.9%	6	5.7%	30	28.6%	24	22.9%	105
SOUTHWEST	24	35.8%	27	40.3%	4	6.0%	7	10.4%	5	7.5%	67
W PACIFIC	22	34.4%	4	6.3%	19	29.7%	18	28.1%	1	1.6%	64
TOTAL	**94**	**17.5%**	**188**	**34.9%**	**67**	**12.5%**	**128**	**23.8%**	**61**	**11.3%**	**538**
ACADEMY GRADUATES	N	%	N	%	N	%	N	%	N	%	
REGION											
ALASKAN	3	7.5%	4	10.0%	0	0.0%	0	0.0%	33	82.5%	40
CENTRAL	12	17.6%	10	14.7%	1	1.5%	0	0.0%	45	66.2%	68
EASTERN	7	7.8%	16	17.8%	4	4.4%	16	17.8%	47	52.2%	90
GREAT LAKES	28	9.5%	31	10.5%	1	.3%	3	1.0%	233	78.7%	296
NEW ENGLAND	22	37.9%	6	10.3%	0	0.0%	1	1.7%	29	50.0%	58
NW MOUNTAIN	3	4.6%	0	0.0%	0	0.0%	0	0.0%	62	95.4%	65
SOUTHERN	15	12.3%	27	22.1%	2	1.6%	0	0.0%	78	63.9%	122
SOUTH 'EST	27	15.0%	22	12.2%	2	1.1%	2	1.1%	127	70.6%	180
W PACIFIC	42	40.0%	5	4.8%	3	2.9%	6	5.7%	49	46.7%	105
TOTAL	**159**	**15.5%**	**121**	**11.8%**	**13**	**1.3%**	**28**	**2.7%**	**703**	**68.7%**	**1024**

Question 2: What are the comparative loss rates for the two groups?

Table 3 shows the relative loss rates for the GS-9 military hires, Academy entrants, and Academy graduates. The GS-9 hires had a much lower overall loss rate (20%) than did the Academy entrants (48%); $z = 11.43$. Clearly, the main difference in loss rates was due to the 36% attrition rate from the Academy. The average loss rate for Academy entrants in the screen program is often at least 40%, since the program is designed to be a second-stage selection procedure (see Manning, Kegg, and Collins, 1988). Although a similar initial loss did not occur in the FAA for the GS-9 military controllers, presumably some type of either formal selection process or self-selection (resulting in an unknown loss rate) had already occurred when they were in the military service.

Table 3

Comparison of Overall Loss Rates for GS-9s, Academy Entrants, and Academy Graduates

Program	GS-9	Academy Entrants	Academy Graduates
Total entering	538	1605	1024
% Failed Academy	N/A	36%	N/A
% Failed 1st facility	20%	12%	19%
% Still training	10%	24%	37%
% Reached FPL	70%	28%	44%

Because loss due to selection already occurred for the GS-9 military hires, perhaps it would be more appropriate to compare loss rates of the GS-9 military controllers with those of Academy graduates. From examining the table, it appears that the loss rates were fairly comparable for the two groups, but a considerably higher percentage of GS-9 hires than Academy graduates reached FPL; $z = 9.78$. The results suggest that the GS-9 hires completed their training in a shorter period of time than did the Academy graduates.

However, because the controllers in the two groups were differentially assigned to facilities of different complexity, it is necessary to examine loss rates and training performance for controllers assigned to similar types of facilities. Table 4 shows results of these analyses. It is clear for both groups that failure rates were lower at lower complexity facilities (VFR/Non-radar and Level 2 & 3 radar) than at higher complexity facilities (level 4 & 5 radar facilities and en route centers.) It is also clear that a higher percentage of developmentals in both groups were still in training at the higher complexity facilities than were training at the lower complexity facilities. Within similar facilities, however, the percentages of GS-9 military hires and Academy graduates who failed, were still in training, or who reached FPL did not differ significantly.The apparently lower percentage of Academy graduates who reached FPL status (as shown in Table 3) may thus be attributed to their disproportionate placement in en route facilities. However, in the higher level facilities, a significant proportion of the developmentals were still in training at the time this report was written, thus, their final disposition was unknown. In fact, more than one-third of the developmentals assigned to en route facilities were still in training at the time of publication. A review of the status of these developmentals should be undertaken after September 1992 to determine final training status for these groups.

Table 4

Training Success at First Facility by Type of Assignment
for GS-9 Military Hires as Compared with Academy Graduates

Type facility Group	Total N	Training Status: % Failed	% In Training	% FPL
VFR/Nonradar tower				
GS-9	94	13	1	86
Academy	159	8	1	91
Level 2 & 3 radar twr				
GS-9	188	17	2	82
Academy	121	17	5	78
Limited radar				
GS-9	67	28	0	72
Academy	13	8	0	92
Level 4-5 radar				
GS-9	128	26	15	59
Academy	28	25	7	68
En route centers				
GS-9	61	21	49	30
Academy	703	21	52	27

While no apparent differences were found in overall training success, it is possible that GS-9 hires performed better than Academy graduates in certain specific phases or courses of field training. Failure rates in important phases of training at each type of facility were analyzed. Manning, Della Rocco, and Bryant (1989) found that some ATC training phases resulted in virtually no training failures, while others resulted in losses of between 5 and 15%. For VFR towers and Limited radar facilities, the training phase of interest was Local Control, because that phase is failed most frequently and Radar Control training is not provided. Local Control and Radar were the training phases examined at level 2 & 3 radar facilities because those facilities usually provide both functions. At level 4 & 5 radar facilities, the radar function is often split from the tower cab; thus, only performance in radar training was examined. At en route centers, performance measures in initial OJT for both Radar Associate and Radar training were examined. In subsequent OJT, developmentals are responsible for different numbers of sectors (or portions of airspace), depending on the number of radar positions in their area of specialization, and it is necessary to adjust the training times for the number of sectors on which the developmental has trained. Furthermore, because many of the developmentals assigned to centers had not completed their training, information about training times for final radar training would not yet be available.

Table 5 shows the percentage of GS-9 military hires and Academy graduates who failed significant ATC training phases by the type of facility to which they were assigned. No significant differences were observed in the rates of failure or withdrawal from any phase of training at any type of facility. Although the percentage of GS-9 military hires who passed the Radar phase at level 4 and 5 radar facilities was higher than for Academy graduates, the difference was not statistically significant.

Table 5

Status in Field Training by Facility Type
for GS-9 Military Hires as
Compared with Academy Graduates

Type facility Group	Total N	Training Grade % Passed	% Failed	% Withdrew
VFR/Nonradar tower				
Phase IV: Local control				
GS-9	88	93.2	3.4	3.4
Academy	149	96.6	2.7	.7
Level 2 & 3 radar twr				
Phase IV: Local control				
GS-9	175	94.9	2.9	2.3
Academy	108	94.4	1.9	3.7
Phase VI: Radar				
GS-9	160	93.1	3.1	3.8
Academy	95	95.8	2.1	2.1
Limited radar				
Phase IV: Local control				
GS-9	54	94.4	3.7	2.3
Academy	12	100.0	0.0	0.0
Level 4 & 5 radar				
Phase VI: Radar				
GS-9	87	87.4	10.3	1.5
Academy	24	75.0	25.0	0.0
En route centers				
Phase VIII: Radar associate lab				
GS-9	54	90.7	7.4	1.9
Academy	672	93.0	5.8	1.2
Phase IX: Radar associate OJT				
GS-9	48	97.9	2.1	0.0
Academy	609	94.7	3.6	1.6
Phase XII: Radar				
GS-9	37	100.0	0.0	0.0
Academy	463	97.4	1.7	0.9

Another important issue is the point during training at which failure occurred. Even if overall failure rates were similar, the average amount of time that elapsed before failure occurred might be later in training for one or the other group. Such results would be important in assessing the relative performance of the groups. On the one hand, if one group failed later in training than the other, then it would cost more to train the group of developmentals who eventually failed. On the other hand, the farther one group progressed in training before failure occurred, the more likely they were to be reassigned to a lower complexity facility and remain productive, instead of being separated from the occupation.

Several analyses were conducted to assess these issues. The results are displayed in Tables 6 and 7. Table 6 shows the mean time until failure for the 2 groups by the type of facility to which they were assigned. Time of entry was computed as the Entry on Duty date for the GS-9 hires, and as 3 days after completion of the last phase of Academy training for Academy graduates (to allow for travel time to the facility). The results displayed in Table 6 show that Academy graduates at en route centers took a significantly longer period of time to fail than did GS-9 hires, $F(1,159) = 7.32$, $p < .01$. Times to attrition varied considerably, and too few people failed at the other facilities to allow an adequate comparison to be made.

Table 6

Number of Days until Failure by Type of Assignment
for GS-9 Military Hires as Compared with Academy Graduates

		Time (days) until Failure	
Type facility Group	Total N	Mean	s.d.
VFR/Nonradar			
GS-9	12	288.2	227.2
Academy	11	241.4	128.4
Level 2 & 3 radar twr			
GS-9	31	400.9	248.8
Academy	16	383.5	223.9
Limited radar			
GS-9	19	307.6	230.4
Academy	1	108.0	N/A
Level 4 & 5 radar			
GS-9	33	380.7	201.5
Academy	1	184.0	N/A
En route centers			
GS-9	13	349.0*	285.9
Academy	148	574.1	287.7

* Statistically significant at $p < .05$.

Another issue examined was whether the percentage of training failures who were reassigned to lower complexity facilities, compared with being separated from the GS-2152 series, differed between the groups. Table 7 shows the percentage of GS-9 military hires and Academy graduates who failed and their current disposition. Training failures at VFR/Nonradar towers are least likely to be reassigned to another facility (in accordance with FAA Order 3330.30B, "Employment Policy for Developmental Air Traffic Control Specialists," commonly known as the "up or out" order.) Training failures from level 4 & 5 terminal radar facilities are most likely to be reassigned rather than separated.

No statistically-significant differences between the groups by facility type were observed in rates of reassignment. However, the small numbers of training failures assigned to each type of facility reduced the power of the statistical tests.

Table 7

Reassignment Rates by Type of Facility for GS-9 Military Hires and Academy Graduates Who Failed Training

Facility type Group	Total N	System Status: % in ATC	System Status: % Separated
VFR/Nonradar tower			
GS-9	12	16.7	83.3
Academy	13	15.4	84.6
Level 2 & 3 radar twr			
GS-9	31	38.7	61.3
Academy	21	23.8	76.2
Limited radar			
GS-9	19	42.1	57.9
Academy	1	0.0	100.0
Level 4 & 5 radar			
GS-9	33	78.8	21.2
Academy	7	85.7	14.3
En route centers			
GS-9	13	23.1	76.9
Academy	149	38.9	61.1

Question 3: How successful were inexperienced Academy graduates as compared with Academy graduates with some prior experience and the GS-9 military hires?

Table 8 shows relative success rates at centers for Academy graduates who had no prior experience as compared with graduates who claimed they had prior aviation or some type of prior military ATC experience. Success rates were not examined at other types of facilities because not enough Academy graduates with prior experience were assigned to other facilities to warrant conducting a statistical analysis.

Chi-square tests comparing relative frequencies of occurrence showed that failure rates for those with no prior experience were not significantly different than failure rates for any other group, including GS-9 military hires. However, those reporting aviation education failed significantly more often than did Academy graduates claiming prior military experience [$\chi^2(2) = 9.47$, $p < .01$].

Table 8

Success Rates at En Route Centers for Academy Graduates with No Prior ATC Experience, or with Aviation Education or Military Experience

Type of prior experience	Training status			
	Total N	% Failed	% In Training	% FPL
No prior experience	536	22	52	26
Aviation education	58	33	45	22
Military ATC experience	109	13	57	30
GS-9 military hires	61	21	49	30

Question 4: For those controllers who did not fail field training, how comparable are the training measures for the two groups?

Another way of assessing the relative skills and abilities of the two groups is to compare the performance in training of those who were successful. Differences in measures of training performance such as instructor ratings, numbers of OJT hours and days required to complete particularly difficult training phases, and the amount of time required to reach FPL status might suggest that one group performed better than the other, although their failure rates did not differ significantly.

Table 9 compares training performance measures, by facility type, for GS-9 hires and Academy graduates who did not fail. It is apparent that there was considerable variability in the times required to complete different phases of training. Statistical comparisons of the groups resulted in a few significant differences. GS-9 military hires at VFR/Nonradar facilities and at level 2 & 3 radar facilities took significantly less time to reach FPL status than did Academy graduates, $F(1,212) = 4.90$, $p < .03$, and $F(1,239) = 16.18$, $p < .001$, respectively. GS-9 military hires at level 4 & 5 radar facilities took fewer OJT hours and fewer days to complete Radar training than did Academy graduates, $F(1,92) = 5.79$, $p < .02$, and $F(1,92) = 4.37$, $p < .04$, respectively. At en route centers, GS-9 military hires took significantly fewer OJT hours and fewer days to complete initial radar training than did Academy graduates, $F(1,395) = 5.08$, $p < .03$. and $F(1,395) = 5.06$, $p < .05$, respectively.

These differences should be interpreted with caution, because the differences in the number of people in the groups could affect the validity of the results, and because the differences observed, while statistically significant, accounted for very little of the variance in the dependent measures ($\eta^2 < .07$ for all analyses.)

Table 9

Comparison of Training Performance Measures
for GS-9 Military Hires and Academy Graduates

	GS-9 Military Hires			Academy Graduates		
	N	Mean	s.d.	N	Mean	s.d.
VFR/Nonradar						
Instructor rating	77	4.2	1.0	142	4.0	1.0
Years to FPL	80	.7	.5	134	.8	.4
OJT hrs local control	80	105.2	63.0	143	115.2	37.9
Days in local control	80	164.7	134.2	143	193.1	111.1
Level 2 & 3 radar						
Instructor rating	154	4.0	.8	100	4.0	.7
Years to FPL	150	1.3	.7	91	1.6	.5
OJT hrs local control	154	100.0	40.4	97	106.7	35.6
Days in local control	154	168.0	109.5	97	177.1	80.5
OJT hrs in radar	148	72.9	37.5	91	70.1	29.2
Days in radar	148	104.3	70.9	91	101.1	52.7
Limited radar						
Instructor rating	45	3.7	1.1	11	4.1	.8
Years to FPL	41	1.0	.5	12	.8	.3
OJT hrs local control	46	124.3	44.2	12	107.7	24.4
Days in local control	46	203.1	82.6	12	157.3	60.0
Level 4 & 5 radar						
Instructor rating	92	4.0	.8	21	3.8	1.0
Years to FPL	76	1.7	.6	18	1.9	.6
OJT hrs in radar	76	52.6	25.9	18	70.2	36.2
Days in radar	76	60.9	37.8	18	84.2	58.8
En route centers						
Inst rating RA OJT	43	4.1	.9	479	4.0	.8
OJT hrs radar assoc	45	170.7	58.9	526	179.6	54.9
Days in radar assoc	45	89.1	38.2	527	103.0	49.9
Inst rating radar OJT	32	4.2	.7	327	4.1	.8
OJT hrs radar	34	181.6	53.8	363	207.5	64.9
Days in radar	34	100.5	37.8	363	126.5	66.3

CONCLUSIONS

Performance was compared for two groups of air traffic control specialists undergoing field training during comparable periods of time. The first was a group of former military ATCSs hired as part of a special program. These controllers bypassed the Academy screen, usually required of new hires, and entered field training directly at grade GS-9. Members of the second group were hired at grade GS-7 and attended the Academy screen program before proceeding to field training. Just under 40% of the latter group was screened out. The Academy graduates were promoted to grade GS-9 and entered training at field facilities at approximately the same time as did the GS-9 military hires. Failure rates, rates of reassignment after failure, time elapsed until failure occurred, instructor ratings, and training times were compared for members of the 2 groups. It was necessary to conduct the analyses for controllers within 5 different facility types because those facilities controlled traffic of differing amounts and complexities, and thus, the training at those facilities differed as well. Within the facility types examined, no differences in failure rates were observed, and only negligible differences in measures of training performance were observed. This result would appear to suggest that hiring former military controllers is an adequate strategy, because it appears to produce developmental controllers who perform about the same as do graduates from the FAA Academy.

Another way to interpret these results is that the GS-9 military hires having previous experience performed no better, even when assigned to the more complex facilities, than did Academy graduates who had never worked as controllers before.

A number of factors other than the performance of the 2 groups may be responsible for the finding of no difference. It must be noted that for most of the comparisons, there were inadequate numbers of controllers to provide sufficient power to detect significant differences between groups. The reason for this was that assignments of controllers to facilities differed; GS-9 military hires were assigned more-or-less equally to the 5 types of air traffic facilities, while most of the Academy graduates were assigned to en route centers. Furthermore, there was considerable variability in the measures of times required to complete different training phases. While almost no statistically significant differences were observed, if members of the 2 groups had been assigned to air traffic control facilities in comparable numbers, it would be easier to determine whether or not the performance of the groups was equivalent. Another relevant factor is that, especially in the most complex facilities, a significant proportion of the developmental controllers were still in training at the time the report was written, and some of those may eventually fail. To reach a final conclusion about the effectiveness of the GS-9 program as it applies to this group of controllers, it will be necessary to obtain updated information about the controllers' training performance after September 1992, when at least 90% of en route developmentals should have completed their training.

However, even if the controllers in the 2 groups had been assigned to comparable facilities, one might still not be confident that there were no real differences between the groups because not enough information is available about the aptitude of the group members. The GS-9 military hires, unlike Academy entrants, were not required to take the OPM entrance exam, which would have provided information about their aptitude to perform the job. Without having OPM test scores (or some other measure of aptitude) for members of both groups, it is impossible to determine whether differences in performance were not found because the type of prior ATC experience made no difference in facility training, or because the groups were different before selection and their differences in aptitude compensated for lack of experience. Without having additional information about the background, knowledge level, and aptitude of the groups, misinterpretation of the results would be more likely. In future evaluations, obtaining additional information about candidates' experience and aptitude would aid properly evaluating the effectiveness of this type of program. Unfortunately, because of cost and other factors, it is unlikely that such information will be made available.

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