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A Longitudinal Examination of Applicants to the Air Traffic Control Supervisory Identification and Development Program

Jennifer G. Myers, Editor

Civil Aeromedical Institute
Federal Aviation Administration
Oklahoma City, Oklahoma 73125

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16. Abstract

The Federal Aviation Administration began development of an extensive longitudinal database on its air traffic controller workforce following the strike of 1981. Since that time, data have been collected on thousands of air traffic controllers, spanning a period which covers their application to the federal government for employment to their achievement of a first-line supervisor position. This collection of papers examines a subset of air traffic control specialists who have completed the agency's supervisor selection program, beginning with their performance on the Office of Personnel Management test battery and other cognitive tests administered prior to completion of the air traffic controller Screen Program. Measures of academic, laboratory, and overall Screen performance were examined in relationship to aspects of performance in the supervisor selection program. Field training profiles were analyzed to determine differences between successful and unsuccessful supervisor selection program candidates and relationships with selection program performance. Finally, performance in the supervisor selection program was compared for those who were selected as first-line supervisors and those who were not.

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AN OVERVIEW OF THE AIR TRAFFIC CONTROL SPECIALIST AND FIRST-LINE SUPERVISOR SELECTION SYSTEMS

Jennifer G. Myers, Ph.D.

The air traffic control (ATC) job is unique in several ways. It is one of the few federal jobs where continued employment is based on the successful completion of a selection and training program wholely conducted by the government. The skills necessary to perform the job are not necessarily those acquired through formal vocational or university training, although university-based ATC training has recently been initiated on a test basis. Like other technical occupations, reaching journeyman status is based on the successive demonstration of the acquisition of increasingly complex job skills.

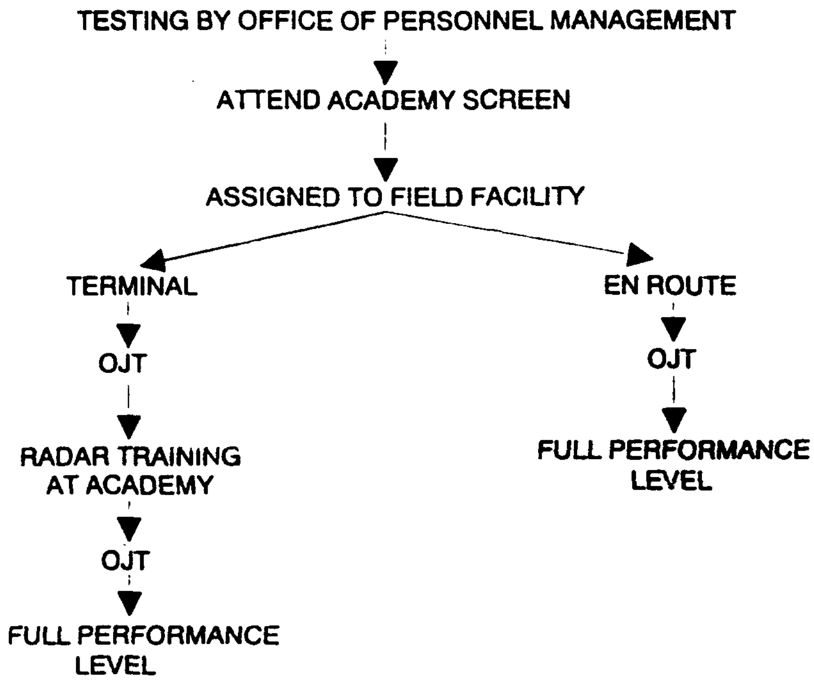
Individuals interested in applying for an ATC job first complete a battery of tests administered by the Office of Personnel Management in different regional locations. Eligibility for attending the FAA Academy Screen Program in Oklahoma City is based on a composite of the test battery scores, as well as meeting medical and security screening criteria. Following the successful completion of the Screen Program, individuals are assigned to a field facility for on-the-job training. The length of field training varies, depending on the type of facility (en route or terminal), and ranges from about 1 to 3 years (see Figure 1).

Air traffic control specialists (ATCS) who wish to advance into a supervisory position must apply to the Supervisory Identification and Development Program (SIDP). This is an agency-developed system for assessing individual competencies and determining eligibility to compete for first-line supervisory positions. The SIDP was first proposed in response to the recommendations of congressional committees following the air traffic controller strike in 1981. It was felt that by basing supervisory selections on factors other than prior training and technical performance, the organizational culture that precipitated the 1981 strike could be improved and future labor-management problems could be avoided. The SIDP was implemented on a test basis in 2 regions, Southwest and Northwest Mountain, in 1985 and continued until national implementation of the program in 1988. Since 1985, over 10,000 supervisors and non-supervisors have applied to the program and approximately 5,000 of those applicants have successfully completed the program.

Continued technical competence in air traffic control is required in the supervisory position because task performance includes supervision of the technical work of others. This entails a requirement for maintaining operational currency by performing in an operational position 16 hours per month. However, technical competence is but one of the competencies assessed in the SIDP. Rather, the SIDP is designed to allow applicants to demonstrate other skills needed for effective supervision of people and programs, such as communications and interpersonal skills. The SIDP is a multiple hurdle process for determining eligibility for supervisory positions (see Figure 2).

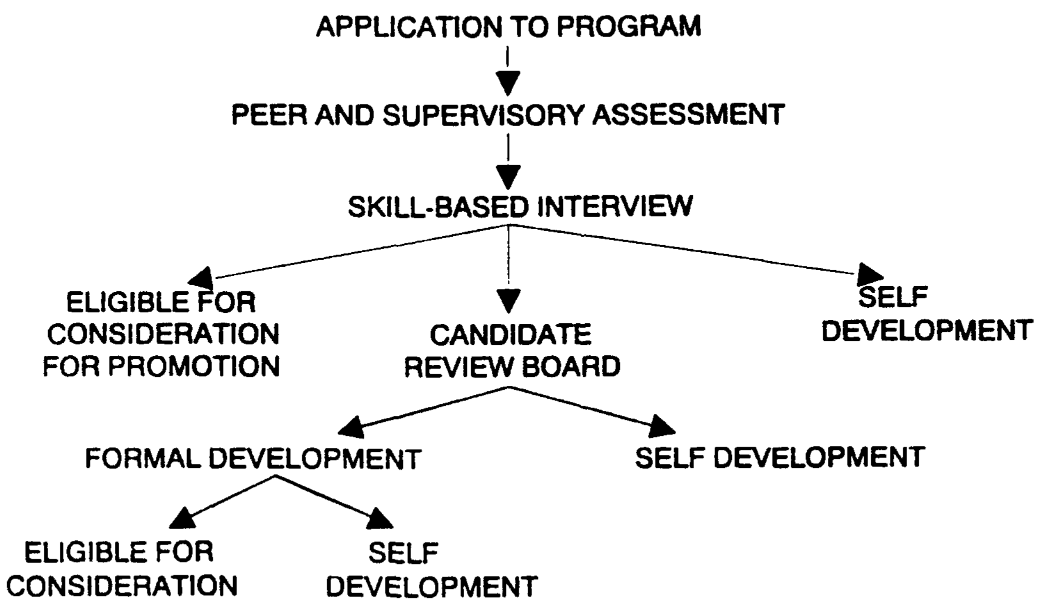
Controllers must have completed one year at the journeyman level and received a fully successful rating on their last performance appraisal to be eligible to apply to the program. The Peer-Supervisory Assessment process requires the SIDP applicant to identify from 4 to 7 peers (depending on the size of the facility) and one or more supervisors to rate him/her on 4 performance dimensions: Interpersonal, Communications, Direction and Motivation, and Technical Competence. A paired-comparison method is used to rate each applicant against other applicants and benchmarks on each of the dimensions. Supervisors and peer ratings are combined to produce a single score for each dimension. Dimension ratings are averaged to create a composite score and the top applicants (based on their composite score) are referred to the next stage of the selection process, the Skill-Based Interview (SBI).

The SBI is a combination of a face-to-face interview and role play exercises. In the face-to-



AIR TRAFFIC CONTROLLER SCREENING AND TRAINING

Figure 1



AIR TRAFFIC SUPERVISORY IDENTIFICATION
AND DEVELOPMENT PROGRAM

Figure 2

face interview, the candidate is asked 8 questions to assess Organizational Knowledge and Knowledge of the Supervisory Role. The role-plays are designed to simulate realistic situations encountered as a supervisor. Based on their performance in the scenarios, applicants are rated on 7 competencies (Problem Solving and Analytical Ability, Judgment, Decisiveness, Organizing and Planning Ability, Interpersonal skill, Communication Skill, and Direction and Motivation) by a trained panel of 3 interviewers and receive verbal and written feedback following the interview. A description of the competencies are contained in Appendix A.

There are 3 possible direct outcomes from the SBI: referral to (a) self-development, (b) the Candidate Review Board, or (c) the Eligible for Consideration list. Those who demonstrate ineffective performance in the SBI are counseled on their strengths and weaknesses and recommended for self-development prior to reapplying to the SIDP. Those who perform at a moderate level are referred to a Candidate Review Board. The board determines whether the individual will be placed in formal development for skill remediation or will be recommended for self-development activities before reapplying to a future announcement of the SIDP. Those who are assigned to formal development are provided resources for receiving training and/or additional experiences (e.g., details or "shadowing" assignments) that will remediate skill deficiencies and result in eligibility for supervisory positions. Applicants who perform at a high level on each of the competencies are placed on an Eligible for Consideration list and are referred to position vacancies.

Individuals who are on the eligible for consideration list are polled for their interest in applying for vacant supervisory positions. Once a list of eligible and interested bidders is established, the list is sent to the selecting officials along with a packet of information containing the PSA and SBI results and work history information (awards, training, and job experience) for each individual referred to the vacancy.

As demonstrated in the description of the ATCS selection and training program, individual advancement and recognition in nonsupervisory positions is based on the achievement of a high level of technical competence. However, for promotion to a first-line supervisor position, ATCSs must demonstrate not only technical competence but also skills in areas such as decision-making, communication, and leadership. Several questions arise in the selection of supervisors from a technical workforce: Given that technical competence is required to perform the first-line supervisor job, does prior technical training and journeyman performance relate to "promotability" or actual selection for a supervisor position? What characteristics distinguish those who are selected from the eligible pool from those that are not selected? These questions are addressed in the following papers, which examine ATCS entry level, screening, and training performance in relation to SIDP performance.

APPENDIX A
FIRST-LINE SUPERVISOR COMPETENCIES

ORGANIZATIONAL KNOWLEDGE: Demonstrates knowledges of the FAA organizational components, the mission(s) of each relevant organizational unit, and the principal programs in the FAA.

KNOWLEDGE OF SUPERVISORY ROLE PERFORMANCE: Displays knowledge of the roles, responsibilities, and duties of supervisors and managers; accurately assesses the impact upon others of role performance, and supports and promotes organizational decisions, policies, programs and initiatives such as EEO, Employee Assistance Program, Survey-Feedback-Action Program, and Affirmative Action.

COMMUNICATION SKILL: Presents and expresses ideas and information effectively and concisely in an oral and/or written mode; listens and comprehends what others are saying; shares information with others and facilitates the open exchange of ideas and information; is open, honest, and straightforward with others; provides a complete and timely explanation of issues and decisions in a manner appropriate for the audience; and present information and material in a manner which gains the agreement of others.

DECISIVENESS: Makes decisions, renders judgments, and takes action on difficult or unpleasant tasks in a timely fashion, to include the appropriate communication of both negative and positive information and decisions.

DIRECTION AND MOTIVATION: Motivates and provides direction in the activities of others to accomplish goals; gains the respect and confidence of others; appropriately assigns work and authority to others in the accomplishment of goals; provides advice and assistance as required; and establishes high quality work standards for self and others.

TECHNICAL COMPETENCE: Understands and appropriately applies procedures, requirements, regulations, and policies; maintains credibility with others on technical matters; and uses equipment, procedures, or systems in the operational and/or staff environment as the position requires.

INTERPERSONAL SKILL: Is aware of, responds to, and considers the needs, feelings, and capabilities of others; deals effectively with others in both favorable and unfavorable situations regardless of their status or position; accepts interpersonal and cultural differences; manages conflicts, confrontations, and disagreements in a positive manner which minimizes personal impact, to include controlling one's own feelings and reactions; and provides appropriate support to others.

JUDGMENT: Develops and evaluates alternative courses of action; makes decisions based on correct assumptions concerning resources and guidelines; supports decisions or recommendations with data or reasoning; defines and implements solutions to problems; and recognizes when no action is required.

PLANNING AND ORGANIZING: Identifies requirements, allocates, and effectively uses information, personnel, time, and other resources necessary for mission accomplishment; establishes appropriate courses of action for self and/or others to accomplish specific goals; develops evaluation criteria and tracking systems for monitoring goal progress and accomplishment; and specifies objectives, schedules, and priorities.

PROBLEM SOLVING AND ANALYTICAL ABILITY: Identifies existing and potential problems; notes, understands and includes the critical elements of problem situations; obtains and evaluates relevant information; demonstrates awareness that new and/or additional information sources are required; notes interrelationships among elements; identifies possible causes of the problems; recognizes the need to shift to an alternative course of action including innovative or creative approaches; and appropriately terminates information collection and evaluation activities.

COGNITIVE INDICATORS OF ATCS TECHNICAL ABILITY AND PERFORMANCE IN A SUPERVISORY SELECTION PROGRAM

David J. Schroeder, Ph.D.

Historically, first level supervisors have been selected with respect to their technical competence and their performance on the job they will supervise. Raza (1987), in a comprehensive review of the literature concerning the selection of first level supervisors, concludes that while supervisors, researchers, and human resource personnel have for a number of years felt that interpersonal skills are critically important factors in the performance of first-level supervisors, current selection procedures for those positions have, by and large, continued to emphasize technical competence. Furthermore, Raza (1987) provides convincing evidence that current procedures are less than optimal. The Supervisory Identification and Development Program (SIDP), developed by the FAA, is designed to incorporate information other than technical performance of the applicant in the selection process for supervisory Air Traffic Control Specialists (ATCSs).

Applicants to the ATCS job must first complete a 2-stage selection process; a battery of selection tests administered by the Office of Personnel Management (OPM) and a 9 week, performance-based Screen program at the FAA Academy in Oklahoma City. This investigation was developed to determine the relationship between entry level information on applicants' cognitive aptitudes for performing ATCS work, as measured by tests in the OPM selection battery, and subsequent selection as a potential supervisor through the SIDP. Specifically, the interest was in determining if scores on the initial selection tests predict technical performance ratings received by the SIDP applicants. This analysis was undertaken in light of the previous research (Raza, 1987) that suggested that existing procedures for supervisory positions still tend to emphasize technical competence. If that remains true for the SIDP process, entry level measures of technical aptitude may well predict subsequent SIDP performance.

METHOD

Subjects

The OPM selection battery is administered to all applicants to determine hiring eligibility. OPM scores were entered into the analytic data base for 2,493 ATCSs who applied to SIDP between 1985 and 1989. Of this group, data were available for 1,215 who entered into the en route option and 1,084 in the terminal option. This division was based on the nature of the Academy Screen program (terminal or en route) and the type of facility to which the ATCSs were subsequently assigned following completion of the Academy Screen. The 2 types of facilities do involve significant differences in the overall complexity and type of air traffic they control. A small sample of en route and terminal Academy entrants also completed 2 experimental tests - the Directional Headings Test DHT: en route N=238, terminal N=136 and Dial Reading Test (DRT: en route N=139, terminal N=134).

Measures

OPM Selection Battery. The current OPM selection battery was implemented in 1981 (see Sells, Dailey and Pickrel, 1984 for information concerning the validation of the test battery) and is comprised of the Multiplex Controller Aptitude Test (MCAT), the Abstract Reasoning Test (ABSR), and the Occupational Knowledge Test (OKT). The MCAT is a speeded paper and pencil test that presents a simulated controller work sample. A map containing several aircraft on various air routes is presented, along with tabular data concerning the aircrafts' altitude, speed, and route for each question. Aircraft positions and interpretation of the tabular data are required to resolve questions concerning time and distance and possible conflicts between aircraft (see Figure 1). Harris (1986), in a study relating

MCAT scores to a battery of cognitive tests, concluded that the MCAT measures "both perceptual and cognitive reasoning abilities." This result was consistent with the research findings as reported in Sells, Dailey, and Pickrel (1984).

The ABSR consists of a series of figures or letters that illustrate principles of logic. The objective is to select from several alternatives the one that correctly completes a sequence. The ABSR measures aspects of logical reasoning and spatial-perceptual ability (see Figure 2). The OKT, a test of job knowledge, consists of questions about air traffic control phraseology and procedures, air navigation, and aviation weather. A transformed score, referred to as the Transmuted Composite (TMC), is derived by weighting the MCAT and ABSR to produce a distribution with a mean of 70 and a maximum score of 100. The final OPM rating includes the addition of extra points for the applicant's OKT score and veteran's preference points. OPM selection battery performance measures for this study included the raw scores for the MCAT, ABSR, and OKT and the TMC.

Dial Reading and Directional Heading Tests. The DRT and DHT are 2 experimental tests that were completed by a small sample of the SIDP applicant group. The DRT is a brief timed test in which individuals are asked to identify and correctly interpret seven different instrument dials for a series of questions (see Figure 3). The DRT was developed in the 1950's for the US Air Force to select candidates for undergraduate pilot training. Research by Boone (1979), Marshall-Mies and Colmen (1976) and Schroeder, Dollar and Nye (1990) has demonstrated the utility of the DRT in predicting success of ATCS trainees. The DHT is a speeded paper and pencil test of spatial ability. Each item is comprised of 3 bits of information that reflect the cardinal points on a compass (e.g., the letter "W", a symbol " ← ", and the notation "270", each denote "West", see Figure 4). Other letters, symbols, and notations refer to the other cardinal points on a compass (North, East or South). In the first of 2 parts of the DHT, the individual is asked to determine the direction indicated (if all information is consistent), or indicate that the information is inconsistent. In the second part of the test, the direction can be determined if 2 or more of the 3 types of information presented agree; the direction cannot be determined when *all* 3 types of information disagree. Research has also demonstrated that the DHT can be used successfully to select personnel for ATCS training (Cobb & Matthews, 1972; Boone, 1979; Schroeder, Dollar & Nye, 1990).

SIDP Performance. The SIDP process was described in the introduction by Myers (1992). PSA ratings used in this investigation include: the composite (COMP); communication (COMM); interpersonal skills (INTR); leadership (LEAD); and technical competence (TECH). Rating results from the Skill-Based Interview were summed to create an overall score (SBI TOTAL).

Analyses. Means and standard deviations for the OPM selection battery were obtained for the initial ATCS applicant group, entrants to the FAA ATCS Screen program, those who successfully completed the ATCS Screen program, SIDP applicants, SIDP candidates placed on the list of eligibles, and eligibles selected to fill supervisory positions. Separate analyses were completed for ATCSs in the terminal and en route options.

Correlations among OPM selection tests, DHT, and DRT with the PSA and SBI components of the SIDP were computed. The analyses were conducted separately for the 2 options.

RESULTS

Means and standard deviations of scores on each component of the OPM test battery for en route and terminal option ATCSs are presented in Table 1. The effects of restriction in range that occur as part of the selection process are evident in the higher MCAT scores of Academy entrants who subsequently enter the en route option (En Route M=90.0, Terminal M=88.5 versus M=69.7 for all applicants) and the corresponding smaller standard deviations (SD of 7.1 in en route; 7.3 terminal versus 16.1 for applicants). These differences were also mirrored in the ABSR scores for both options. The lack of evidence of any restriction in range for the OKT is due, in part, to the small number of applicants who actually have an ATC background. With the exception of a lower average MCAT score for those selected as supervisors in the terminal option (88.2 versus 90.2 for SIDP eligibles-but not selected), there was little difference in MCAT scores for the different SIDP groups or for those selected as supervisors. Supervisors selected in the terminal option had slightly lower average ABSR scores than eligibles. However within the en route option, those selected had slightly higher ABSR scores (41.7 versus 40.6)

The largest difference between the eligible and selected supervisor groups was evident in the OKT scores. Of those initially entering the en route option, the average scores for supervisors (M = 33.3) was statistically below ($F(1,466) = 7.4$, $p < .01$) that of the ATCSs who completed Academy training and entered the same option but were not yet selected (M = 38.1). In contrast, within those entering the terminal option, eligibles who were selected exhibited higher average OKT scores (M = 43.6) than those who graduated from the Academy, applied to become a supervisor, or were placed on the list of eligibles (M = 39.3, $F(1,459) = 7.6$, $p < .01$). The present analysis suggests that individuals who enter the terminal option with a more extensive background knowledge of ATC rules and procedures are more likely to be selected as supervisors, while the opposite proved to be true in the en route environment. However, there are many other factors that may have entered into the selection process that were not examined in this study.

While 4 of the correlations between the selection and experimental test scores and the various SIDP measures for ATCSs in the en route option were statistically significant, they were all quite low (see Table 2). Of the possible comparisons, significant correlations were noted between the MCAT and TMC with the TECH peer-supervisor ratings (.07 and .06) and between ABSR and SBI TOTAL (.10). Of the experimental tests, only the DRT exhibited a significant correlation with any of the SIDP measures; a correlation of .16 with TECH. Thus, there is weak evidence that some aspects of cognitive ability at the time of entry into the ATCS occupation are predictive of subsequent technical ratings and likelihood of being selected as a supervisor.

As was true for the en route option, correlations between aptitude scores and SIDP measures for terminal option applicants were low (see Table 3). Ratings of communication skills were positively correlated with ABSR ($r = .06$, $p < .05$) and DRT ($r = .22$, $p < .05$) but negatively correlated with HT ($r = -.17$, $p < .05$). A higher rating on interpersonal skills was associated with a lower score on the OKT ($r = .06$, $p < .04$) but higher ratings on ABSR ($r = .08$, $p < .05$) and DRT ($r = .18$, $p < .05$). Technical competence was significantly related to DRT scores only ($r = .22$, $p < .05$).

Results of these analyses reveal only limited evidence of any relationship between any of the aptitude measures and either the peer-supervisory ratings or the overall SBI rating. However, of all the possible correlations, the MCAT and DRT were most closely correlated with peer-supervisory ratings 2 of the technical (TECH) competence of the SIDP applicants in comparison to the other ratings. This finding was consistent across both options. The Abstract Reasoning Test (ABSR), which measures a related yet different aspect of the cognitive ability of ATCSs, tended to be more closely correlated with some of the other ratings, including the overall SBI rating for en route ATCSs.

DISCUSSION

These results offer weak support for the concept that measures of aptitudes for the ATCS job taken prior to entry into ATCS training are predictive of on-the-job ratings of technical proficiency. These findings are of increased interest when one considers the amount of time, training, and other activities that have transpired between initial selection and subsequent application to become a supervisor. Additionally, as trainees complete the various stages from selection through attainment of the full performance level status, continued loss of unsuccessful trainees ensures that the remaining workforce is relatively homogenous with respect to technical competence. Perceptions of on-the-job performance are therefore more likely due to the presence of untapped aptitudes or differences associated with various personality dimensions (e.g., self confidence, assertiveness). In any vent, one should be aware that the aptitude ıeasures included in this study represent only a imited number of cognitive abilities that are ritical for on-the-job performance of ATCSs. It ould be that a broader range of aptitude meaures would reveal more consistent and higher orrelations with the various ratings and meaures comprising the SIDP.

Given the current measures of aptitudes for he ATC profession, there was little support for ny relationship between these aptitudes and ither overall ratings during the Skill Based nterview or selection as a supervisor. However, ıackground knowledge of ATC and pilot proedures may enhance the chance of an indi'idual's selection as a supervisor for those ntering the terminal option. One possible exılanation is that within the terminal option, the ATCSs need to be more familiar with aircraft haracteristics and associated rules and proedures due to the nature of the work activities.

Therefore, those who enter the terminal ption with a more extensive experience in the ırea and general background knowledge are pereived to be more suited for a supervisory position. However, given the limited number of 'ariables included in this study and the large ıumber of additional factors that could play an xplanatory role, additional information and ınalyses are necessary to fully understand this lifference.

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TABLE 1
Descriptive statistics for the OPM selection battery

MCAT		ABSR		OKT			
M	*SD*	*M*	*SD*	*M*	*SD*	*N*	*Group*
				Applicants			
69.7	16.1	30.5	9.5	28.8	11.3	127,807	1981-1985[1]
				En Route			
90.0	7.1	39.8	5.9	36.2	12.9	5,993	Academy entrants[1]
91.6	6.5	40.5	5.8	37.6	13.2	3,337	Passed Academy
91.4	6.5	40.5	5.7	37.6	12.8	1,215	SIDP applicants
90.8	6.5	40.7	5.5	37.5	12.8	468	All SIDP eligibles
90.8	6.6	40.6	5.6	38.1	12.9	407	SIDP eligible - not yet selected
91.1	6.1	41.7	4.9	33.3	11.4	61	Selected
				Terminal Option			
88.5	7.3	39.1	6.3	39.4	13.4	3,095	Academy entrants[1]
89.4	6.9	39.6	6.1	41.2	13.7	2,186	Passed Academy
89.5	6.9	39.4	6.3	40.7	13.4	1,084	SIDP applicants
89.8	6.7	39.4	6.2	40.1	13.1	461	SIDP eligibles
90.2	6.5	39.6	6.1	39.3	12.9	85	SIDP eligible - not yet selected
88.2	7.3	38.7	6.6	43.6	13.8	85	Selected

NOTES: [1]From Manning, Della Rocco, and Bryant (1989)

TABLE 2
Correlations between the OPM selection tests, experimental tests and selected SIDP ratings for applicants entering the en route option

	Peer-Supervisory Assessment Ratings					
OPM & EXPERIMENTAL TESTS	COMP	COMM	INTR	LEAD	TECH	SBI TOTAL
MCAT	.05	.03	.03	.04	.07*	-.05
TMC	.04	.03	.02	.03	.06*	-.01
ABSR	-.01	.01	-.01	-.01	-.01	.10**
OKT	-.00	-.02	-.03	.00	.04	.00
DHT	.02	.04	-.00	.02	.04	.12
DRT	.06	.04	.02	.02	.16*	-.08

$^{*}p \leq .05$ $^{**}p \leq .01$

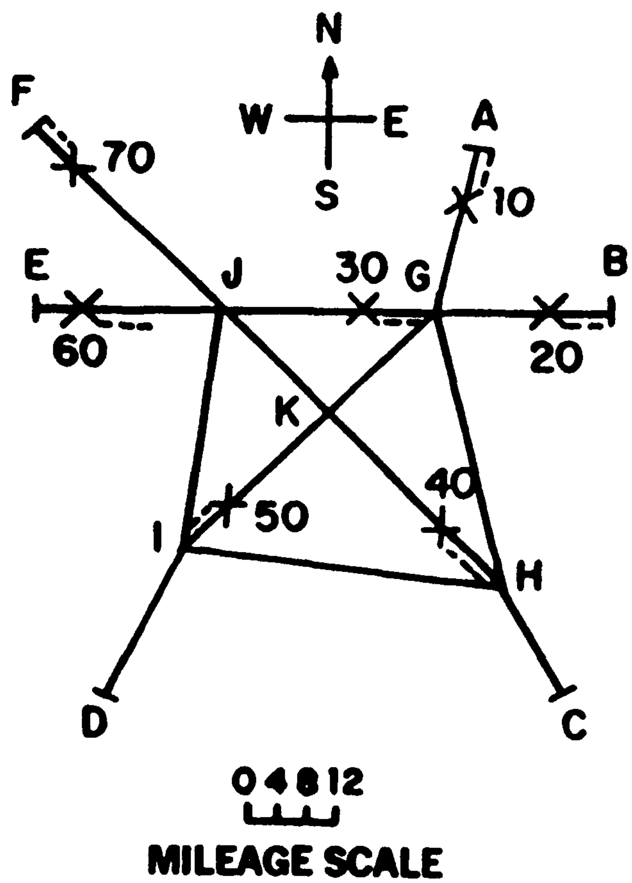
TABLE 3
Correlations between the OPM selection tests, experimental tests and selected SIDP ratings for applicants entering the terminal option

	Peer-Supervisory Assessment Ratings					
OPM & EXPERIMENTAL TESTS	COMP	COMM	INTR	LEAD	TECH	SBI TOTAL
MCAT	.03	.03	.00	.03	.05	.04
TMC	.05	.05	.03	.04	.05	.05
ABSR	.05	.06*	.08*	.05	.01	.04
OKT	-.03	-.02	-.06*	-.01	-.01	-.02
DHT	-.16	-.17	-.15	-.13	-.14	.15
DRT	.21*	.22**	.18*	.16	.22**	.11

$^{*}p \leq .05$ $^{**}p \leq .01$

MULTIPLEX CONTROLLER APTITUDE TEST (MCAT)

AIRCRAFT	ALTITUDE	SPEED	ROUTE
10	7000	480	AGKHC
20	7000	480	BGJE
30	7000	240	AGJE
40	6500	240	CHKJF
50	6500	240	DIKGB
60	8000	480	DIKJE
70	8000	480	FJKID



SAMPLE QUESTION

WHICH AIRCRAFT WILL CONFLICT?

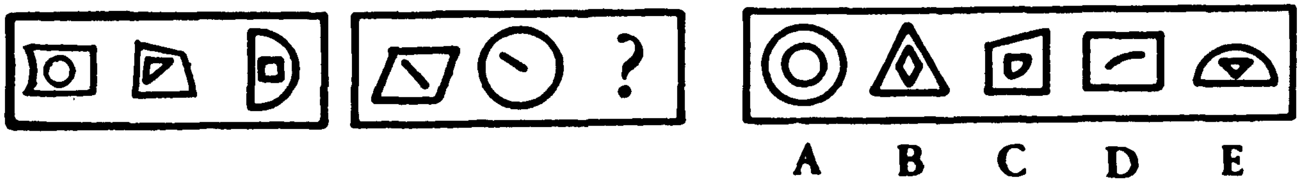
A. 60 AND 70
B. 40 AND 70
C. 20 AND 30
D. NONE OF THESE

FIGURE 1

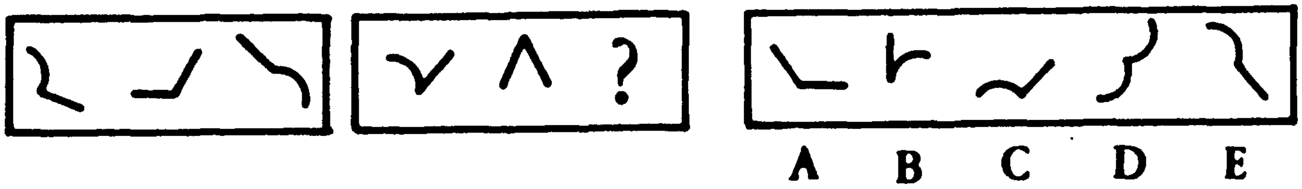
ABSTRACT REASONING

Symbols

1.



2.



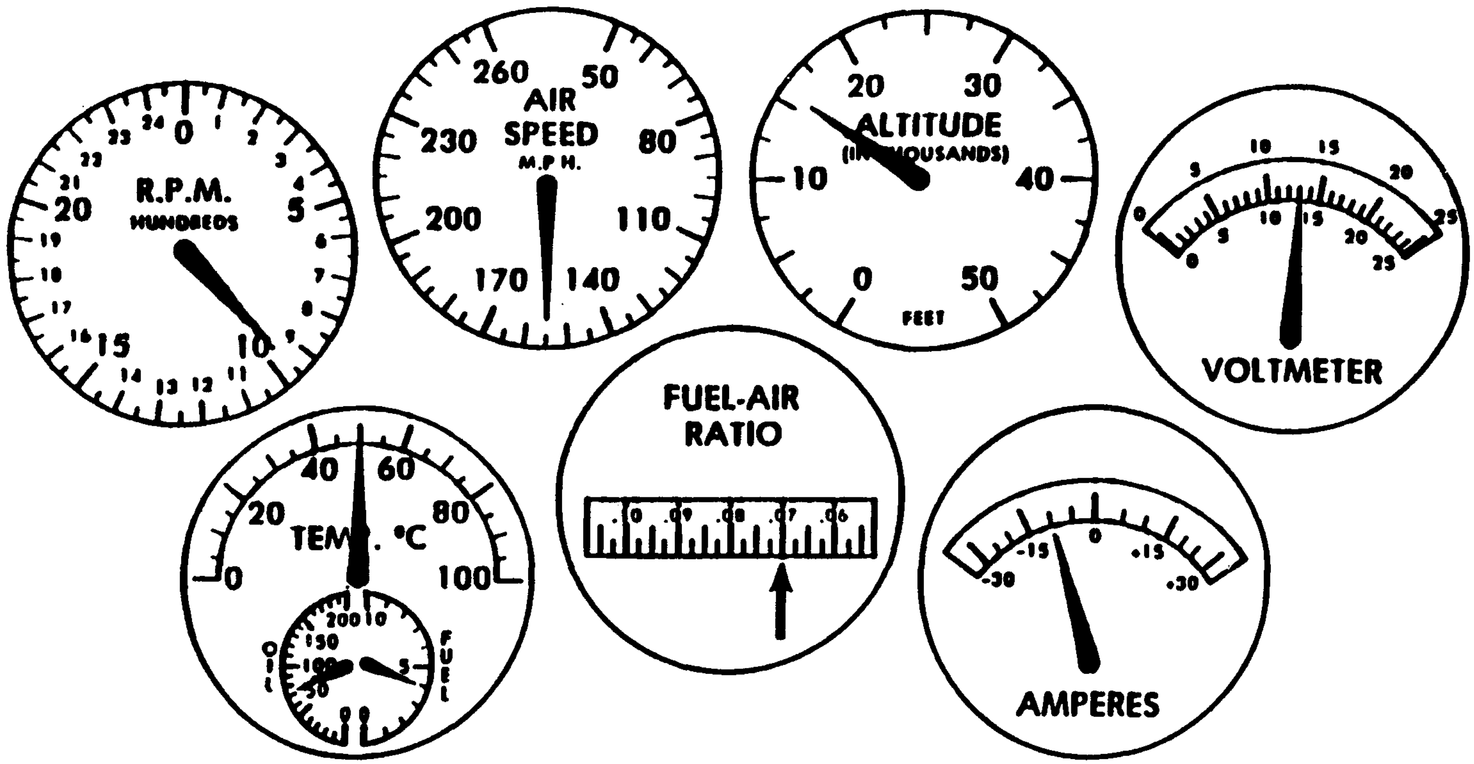
Letters

1) XCXDXEX A) FX B) FG C) XF D) EF E) XG

2) ARCSETG A) HI B) HU C) UJ D) UI E) IV

FIGURE 2

DIAL READING TEST



SAMPLE PROBLEMS:	A	B	C	D	E
1. R. P. M.	91.0	89.5	9.5	92.0	105.0
2. AMPERES	16.0	-15.5	14.0	-10.0	-2.0
3. ALTITUDE	157.5	15.5	155.0	1.5	152.0

FIGURE 3

DIRECTIONAL HEADINGS TEST

DATA DISPLAY

LETTER		ARROW		DEGREES		HEADING
E	or	→	or	90	▪	EAST
S	or	↓	or	180	▪	SOUTH
W	or	←	or	270	▪	WEST
N	or	↑	or	360	▪	NORTH

EXAMPLES

				(A) EAST	(B) SOUTH	(C) WEST	(D) NORTH	(E) CONF.
1.	N	360	↑	=	=	=	=	=
2.	N	360	←	=	=	=	=	=
3.	W	270	→	=	=	=	=	=
4.	E	90	←	=	=	=	=	=

FIGURE 4

AIR TRAFFIC CONTROL SPECIALIST TECHNICAL COMPETENCE IN INITIAL TRAINING AND SELECTION AS A FIRST-LINE SUPERVISOR

Pamela S. Della Rocco, M.A. and Dana Broach, Ph.D.

A first-line supervisor holds a key spot in an organization, serving as the main point of contact between the rank-and-file and management and as the person responsible for the day-to-day organizational performance. The selection of first-line supervisors was considered essen-tially settled as a result of many studies between 1947 and 1965 (Dooher & Marting, 1957; Raza, 1987). Corporations generally selected first-line supervisors on the basis of their technical skills, rather than managerial skills (Northrup, Cowin, Vanden Plas, Fulmer, Bolick, Bellace, & Rosenzweig, 1978; Patton, 1974).

However, evidence from indirect sources suggests that such selection procedures for first line supervisors may be suboptimal. For example, Raza (1987) noted that surveys of first line supervisors suggested a need for training in communication and management skills. Myers (1990) reached much the same conclusions through an analysis of the FAA biennial Job Satisfaction Survey and Survey-Feedback-Action Program. Phillips (1985) argued that while technical skills and experience may be important, they are not necessarily related to the skills and abilities required of a successful supervisor. Given these two disparate lines of research, we asked what relationship prior technical performance in training, for example, had to promotability and ultimate selection for supervisory positions. To answer that question, we investigated the relationship of performance in initial, technical air traffic control specialist (ATCS) training to selection as a first-line air traffic control supervisor through the Federal Aviation Administration Supervisory Identification and Development Program (SIDP).

Air Traffic Control Specialist Initial Qualification Training

Since 1976, candidates selected for the occupation of Air Traffic Control Specialist (ATCS) with the FAA, in the En Route and Terminal options, were required to complete a 2 stage selection process. The first stage consisted of a battery of written tests and was administered by the U.S. Office of Personnel Management (OPM, formerly the Civil Service Commission) prior to hiring by the FAA. The second stage of the ATCS selection process was a performance-based pass/fail initial training course administered at the FAA Academy after FAA hire. This study focuses on ATCS performance in the Academy initial qualification courses as a potential predictor of selection as a first line supervisor.

ATCSs work in 1 of 3 options: En Route, Terminal, and Flight Service Station. En Route and Terminal controllers ensure the separation of aircraft by using information about the speed, direction, and altitude of aircraft to formulate clearances and communicate them to pilots. Clearances are sets of instructions for pilots, designed to ensure the safe, orderly, and expeditious flow of air traffic. En Route controllers ensure the separation of aircraft traveling between airports. There are 2 types of terminal controllers. Terminal radar approach and departure controllers use radar to separate aircraft converging on or departing from an airport. Tower cab controllers control traffic landing or taking off from the airport, most often without the direct use of radar. First-line En Route and Terminal supervisors oversee and coordinate the actions of controller teams responsible for specific sectors, or segments of contiguous airspace. Flight Service Station specialists, on the other hand, provide other services to pilots, such as weather briefings, filing flight plans, and helping to locate lost aircraft. Flight Service Station specialists do not issue control instructions to aircraft; rather, they relay En Route or Terminal controller clearances, as appropriate. Given the fundamental difference in the options, we focused on En Route and Terminal ATCSs and their supervisors, as they are responsible for issuing clearances to aircraft, and excluded Flight Service Station ATCSs from this analysis.

The FAA Academy initial qualification

courses for the En Route and Terminal options were essentially based upon a miniaturized training testing personnel selection model (Siegel, 1978, 1983; Siegel & Bergman, 1975) in which individuals with no prior knowledge of the occupation could be assessed for their potential to succeed in air traffic control. Individuals who failed were separated from the occupation. Separate En Route and Terminal Academy programs were administered until October 1985. All candidates included in the present study were graduates of these dual programs. Each of the screening courses, the En Route Initial Qualification Training and the Terminal Initial Qualification Training, trained and assessed students on the application of nonradar procedures in each type of airspace, respectively. Although there were a number of specific differences between the 2 programs, both generally consisted of an academic and a laboratory phase. Didactic classroom training on nonradar air traffic control (ATC) rules and principles was given in the academic phases of the optionspecific courses. Academic content included aircraft separation rules, cooperative agreements, phraseology, and flight progress strip-marking. Students then applied these rules, principles, and procedures of ATC in a series of thirty-minute scripted scenarios in the laboratory phases of the dual courses of instruction. Students were evaluated in academics based upon multiple choice examinations and a map test of the synthetic airspace. In the laboratory, students were graded for their performance on 6 scripted scenarios. A final timed, paper-and-pencil exam assessed application of ATC rules. A composite of these scores determined pass/fail status. The composite score was heavily weighted on laboratory performance. A successful candidate was required to achieve a final composite score of 70 or better.

Performance in the ATCS screening courses appears to predict future performance in field training reasonably well. For example, Manning, Della Rocco, & Bryant (1989) reported a raw correlation of -.24 ($p \leq .01$, $N = 2,992$) between the En Route Initial Qualification Course final composite scores for 1981-1985 Academy graduates and status in En Route field training. Field training status in that study was coded 1 = *Full performance level*, 2 = *In training in original option*, 3 = *Switched options*, and 4 = *Failed*. Correcting for range restriction due to explicit selection on the predictor resulted in a corrected correlation of -.44 between En Route Initial Qualification Course scores and field training status. Manning et al., also examined the relationship of the Terminal Initial Qualification Course composite final scores to Terminal training performance. They divided Terminal controllers into 2 groups for that analysis: those assigned to Terminal facilities without radar (visual flight rules, or "VFR"; $N = 441$); and those assigned to Terminal facilities with radar ("Radar"; $N = 966$). While the raw correlations between Terminal course scores and status in VFR training was non-significant ($r = -.08$, $p > .01$), the initial qualification course score was significantly related to various indices of time in training at specific positions within the tower cab. In contrast, status in the Radar Terminal training program was predicted reasonably well by the Terminal Initial Qualification Course final composite scores ($r = -.28$, $p \leq .01$, $N = 962$). Adjusting for restriction in range due to explicit selection on the predictor improved that overall correlation to -.51 between Terminal course scores and Radar Terminal training status. Overall, the FAA Academy ATCS option-specific screening programs appeared to predict field training status reasonably well. In other words, developmental controllers who performed well in the FAA Academy programs appeared to go on to perform well in technical field training. While supporting data are not easily available, it may be reasonably supposed that persons who did well in the ATCS initial qualification courses and field training were also likely to do well upon reaching full performance level.

This sophisticated and rigorous screening and on the job training system assured the tech-nical competence of the ATCS journeyman or full performance level (FPL) workforce. Systematic selection of first line supervisors of controllers is accomplished through the SIDP. These supervisors, as previously noted, oversee controller teams responsible for air traffic operating within contiguous areas or sectors of airspace For example, first-line En Route ATCS supervisors, or Area Supervisors, carefully monitor current and anticipated activities in the assigned sectors making up the "area of specialization." These Area Supervisors ensure that available controller staffing is optimally deployed (Federal Aviation Administration, 1989). Technical competence is required of these Area Supervisors to interpret sector and area activity, and to render assistance to the controller teams as needed. An analogous situation can be found among the supervisors on the tower lab and Terminal Radar Approach Control (TRACON) facilities. These supervisors are selected from the controller workforce through the SIDP.

The Supervisory Identification and Development Program

The SIDP was designed to emphasize factors such as communication and leadership, in addition to technical capability, as supervisory selection criteria. As described by Myers (1992), SIDP utilized a 2-stage procedure to select supervisors. Applicants were first rated by peers and supervisors on a number of dimensions in the Peer/Supervisory Assessment (PSA) stage of SIDP. Candidates scoring above the cutoff on a composite of PSA ratings then participated in a Skill-Based Interview (SBI). Candidates who were successful in the SBI were then placed on an "Eligible for Further Consideration" (EFC) list from which supervisors were actually selected as openings became available.

Because it may be important that supervisors in the ATCS occupation demonstrate technical competence, we hypothesized that successful SIDP candidates, in general, would demonstrate better technical performance as early in their careers as the FAA Academy initial qualification courses. We reasoned that (a) if persons doing well in initial training did well in field training, as the available data suggested, and that (b) if persons doing well as FPL controllers, then (c) such persons were more likely to be selected into first-line supervisory positions through SIDP. We tested this reasoning by investigating the following 3 research questions:

(1) How did scores in the initial qualification training courses correlate with subsequent SIDP PSA measures that included a rating of technical competence?

(2) Did SIDP applicants, selected through the SIDP program, demonstrate better technical skills in the initial qualification courses than unsuccessful SIDP applicants?

(3) Did Academy initial qualification course scores predict future selection as a first-level supervisor in the SIDP program?

METHOD

Subjects

ATCSs who entered the FAA Academy in either the En Route or Terminal screening programs between August 1981 and September 1985 and applied to the SIDP between 1985 and 1988 were selected for these studies. Some applicants changed options after they passed the FAA Academy initial qualifications programs. For purposes of this analysis, only those applicants who completed the Academy and were still working in their original option were included. Of the 1,128 applicants meeting these sampling requirements, 468 were in the En Route option, while 660 were in the Terminal option.

All of the controllers in this sample entered on duty with the FAA after the illegal 1981 strike and before the FAA Academy program changed in October, 1985. The sample was predominantly male (85%) and nonminority (93%). The modal formal education completed was "some college" (48%), with about a third (33%) having completed a baccalaureate degree. About a third (34%) had at least some prior aviation-related experience prior to joining the agency.

Three groups of applicants were compared, based upon success in the SIDP selection process: (1) candidates who were successful on the PSA and referred to the SBI (*Referred* versus *Not referred*); (2) based upon the SBI, candidates were deemed "eligible for consideration" (EFC) or not (*EFC* versus *Not EFC*); and (3) candidates selected as supervisors from the EFC list or not (*Selected* versus *Not selected*).

Three-quarters of the sample (N = 844) were referred to the Skill-Based Interview step in the SIDP. About half (55%, N = 615) of the total sample, or three-quarters of those referred to the SBI, were rated as "Eligible for Further Consideration" in the SIDP. Just 14% (N = 160) of the total sample, or 26% of the persons rated as "Eligible for Further Consideration," were selected as first-line supervisors as of March 1991. Table 1 presents data on applicant status in SIDP by career option.

Measures

Thirteen performance measures were collected on each student during approximately 9 weeks at the FAA Academy. Five of the measures were multiple-choice tests covering the academic materials. These assessed the candidate's ability to learn and retain the basic knowledge required for the job. A sixth measure was a map test, which assessed the student's ability to learn a map of the relatively simple synthetic airspace. These 6 measures accounted for 10% of the student's final score. For purposes of this paper, scores from 4 multiple-choice tests and the map test were combined into a Block Test Average (BA). The fifth multiple choice test was a comprehensive final exam on the academic phase, the Comprehensive Phase Test (CPT), and was analyzed as a separate measure.

In the laboratory phase, six 30-minute standardized laboratory problems were formally graded. A student received two scores from a grading instructor on each problem. The first score, the technical assessment (TA), was a numeric assessment of the student's errors in application of ATC rules and procedures. The second score, the instructor assessment (IA), was a subjective instructor rating of the student's global performance on the problem. These 2 scores were averaged for the final problem score. The student's lowest score of the 6 laboratory problems was dropped. Thus, only 5 of the 6 graded problems were counted toward the final comprehensive course score. The graded laboratory simulation problems comprised 65% of the final score. Finally, the students were given a timed, multiple-choice test, the Controller Skills Test (CST), which was a paper-and-pencil assessment of the student's ability to apply ATC rules and procedures. This test comprised 25% of the Final Comprehensive Score (COMP). Table 2 summarizes these FAA Academy initial qualifications training performance measures.

Analyses

Because the En Route and Terminal Initial Qualification Courses were different programs utilizing measures similar in name only, analyses were conducted for the En Route and terminal options separately. Analyses were conducted to address the following research questions:

Research Question 1

What was the relationship between FAA Academy technical performance and PSA ratings, especially the technical competence PSA rating? We hypothesized that there would be a non-zero correlation between the FAA Academy measure of technical performance and PSA ratings, particularly the PSA technical competence category or dimension.

Research Question 2

Was performance in FAA Academy initial technical qualification training better for successful than for unsuccessful SIDP applicants at each stage of SIDP? We hypothesized that there would be significant differences in FAA Academy scores for successful compared to unsuccessful participants at each stage of SIDP. We used multiple analysis of variance (MANOVA) to test this hypothesis.

Research Question 3

Did performance in the FAA Academy initial ATCS qualification training program predict success at each stage of SIDP? We hypothesized that higher performance in the FAA Academy would improve the odds for success at each stage of SIDP. We used logistic regression (Hosmer & Lemeshow, 1989; Norusis, 1990) to test this hypothesis.

RESULTS

Research question 1: Academy performance - PSA ratings

Because the PSA contained an evaluation of the applicant's technical abilities, an analysis was conducted to determine the extent of the relationship between Academy measures and PSA ratings. Table 3 presents the correlations among the SIDP PSA measures and Academy scores for the En Route and Terminal options. Results of these analyses revealed that there were small but statistically significant correlations between all of the Academy measures and the PSA Technical rating, except for the CPT, for the En Route option. In the Terminal option, however, the hypothesized correlations between the PSA Technical ratings and laboratory measures were not found.

Research question 2: Academy performance - SIDP outcomes

The purpose of research question 2 was to compare Academy performance of successful SIDP applicants to unsuccessful applicants at each stage of the SIDP selection process. We hypothesized that successful SIDP applicants demonstrated better technical performance as early in their careers as the Academy initial qualification training courses. Table 4 presents descriptive statistics for the SIDP applicants' Academy performance scores by outcome at each stage of SIDP. Results of MANOVAs utilizing the Academy variables as dependent variables revealed no statistically significant differences between groups for (1) referral to SBI for either En Route or Terminal, (2) eligibility for consideration for Terminal only, and (3) selection for either En Route or Terminal supervisor. A MANOVA comparing the En Route *EFC* and *Not EFC* groups was significant ($F = 2.73$, $p \leq .01$). Univariate analyses of variance ($df = 1, 349$ in each analysis) demonstrated significant differences between *EFC* and *Not EFC* groups on the following Academy variables: AVLS ($F = 7.33$, $p \leq .01$); AVIA ($F = 12.96$, $p \leq .001$); AVTA ($F = 5.61$, $p < .05$); and COMP ($F = 4.83$, $p \leq .05$). The mean score for each of these variables was lower for the *EFC* group than for the *Not EFC* group. The hypothesis that successful SIDP candidates had demonstrated better Academy performance than their unsuccessful SIDP counterparts could not be supported.

Research question 3: Academy performance and the odds for success in SIDP

As ATCS initial qualification course scores predicted technical job performance, and since that technical competence was required of controller first-line supervisors, we hypothesized that better performance in the ATCS Academy initial qualification courses improved the odds for referral to the Skill-Based Interview, for making the Eligible for Consideration list, and for selection as a supervisor. The independent variables, representing Academy performance, were: academics block test average (BA); academics comprehensive phase test (CPT); average of the 6 graded laboratory problem technical performance assessments (AVTA); average of the 6 graded laboratory problem instructor assessments of potential (AVIA); and score on the final Controller Skills Test (CST). These independent variables were logistically regressed on the categorical outcomes at each stage of SIDP. Results of the logistic regression, used to test this hypothesis, are presented below.

Referral to SBI. The probability of being referred to the SBI was estimated using the SPSS logistic regression procedure (Norusis, 1990); the independent variables were entered into the equation, and model goodness-of-fit evaluated. The analysis indicated that previous performance in technical training did not predict referral to SBI in either the En Route or Terminal options. Assessment of the goodness-of-fit using -2 times the log likelihood (-2 LL) of the model indicated a poor fit to the data (En Route: -2 LL $\chi^2(467)=526.3$, $p < .05$; Terminal: -2 LL $\chi^2(658) = 737.0$, $p < .01$), where the null hypothesis was that the model fit the data. Inspection of the classification table resulting from the model supported the conclusion of a poor model fit. While the overall correct classification rate of 75.0% and 74.7%, for En Route and Terminal, respectively, appeared acceptable, all but 2 of the Terminal cases not actually referred to the SBI were predicted as referrals. In other words, the model predicted that all, except 2, cases would have been referred to the SBI. Thus, performance in the ATCS initial qualification courses did not provide useful information about characteristics predicting eferral to the Skill-Based Interview.

Eligibility for Consideration. The probability of making the "Eligible for Consideration" list after referral to the SBI was estimated by entering the independent variables into the equation, and evaluating model goodness-of-fit. The analysis indicated that previous technical training performance did not predict making the EFC list from the Skill-Based Interview. Assessment of the goodness-of-fit using the -2 times the log likelihood of the model indicated a poor fit to the EFC data (En Route: -2 LL $\chi^2(348)$ = 399.2, p < .05; Terminal: -2 LL $\chi^2(491)$ = 563.4, p < .05) under the null hypothesis that the model did fit the data. The overall rate of correct classifications by the model was 72.6% for En Route and 73.4% for Terminal. However, the model predicted that all but 6 En Route and 1 Terminal applicant would have made the EFC list. This result indicated that performance in initial technical training failed to provide useful information for the practical prediction of making the EFC list from the interview process.

Selection as a supervisor. Finally, the probability of selection from the EFC list as a supervisor was estimated by once again entering the independent variables into the equation and assessing model goodness-of-fit. This analysis also indicated that previous performance in initial training did not predict actual selection for a first-line supervisory position in the air traffic controller occupation. The null goodness-of-fit hypothesis that the model fit the data for the Terminal option was rejected based on -2 times the log likelihood of the model (-2 LL $\chi^2(361)$ = 428.4, p <.01) despite an overall rate of 70.8% correct classifications. This time the model predicted that no cases would been selected as a supervisor from the Terminal option EFC list. For the En Route option, the null goodness-of-fit hypothesis was not rejected based upon the -2 times the log likelihood of the model (-2LL $\chi^2(251)$ = ?61.9, p < .31). Although the overall correct classifications from the model was 78.6%, no selections from the EFC list were predicted based upon this model using performance in initial technical training. As with the previous logistic regression analyses, the Academy measures of technical performance failed to provide useful information for predicting selection as a supervisor.

DISCUSSION

The purpose of this study was to examine the relationship of success in the Supervisory Identification and Development Program and prior performance in the FAA Academy ATCS initial qualification courses. Previous studies had demonstrated significant correlations between Academy scores and subsequent field training performance (Manning, Della Rocco, & Bryant, 1989; Della Rocco, Manning, & Wing, 1990). The basic premise that persons who perform well in initial technical training for a technically demanding occupation would be more likely to be selected for first-line supervisory positions in that occupation was tested from three perspectives.

The first research question examined the relationship between Academy scores and the ratings from the Peer/Supervisory Assessment. Small, significant correlations were found between Academy scores and the PSA technical competence assessment for the En Route option. Thus, there was some evidence that En Route Academy scores were related to Full Performance Level (FPL) or journeyman-level performance. The reason that the correlations were small is not evident because greater correlation has been reported between these Academy scores and field training performance (Manning, et al., 1989). However, candidates completed the Academy up to 7 years prior to the assessment for SIDP which is a considerable length of time between the 2 sets of assessments. The predicted relationship between Academy laboratory measures and PSA technical ratings was not found for the Terminal option, however. This finding corresponds to findings of Manning et al., (1989) of the correlations between the Academy and subsequent field training measures for terminal option controllers.

The second research question assessed the mean differences in Academy scores between successful and unsuccessful applicants to SIDP at 3 stages of the SIDP selection process. The hypothesis that successful applicants would have performed better in the Academy courses was not supported. Although the average of most of the Academy scores were slightly higher for the successful candidates, the difference was not significant. In fact, the successful candidates deemed "eligible for further consideration" had statistically significantly lower average scores than the unsuccessful candidates in the En Route option. No significant differences were found between any of the SIDP groups in the Terminal option.

The final research question investigated the extent to which Academy scores predicted selection in SIDP using logistic regression. The analyses, based on a relatively large sample of controllers, indicated that performance in initial technical training was, in fact, not predictive of referral to the initial stages of a Supervisory Identification and Development Program nor of selection as a supervisor.

On one hand, these data lend support to the contention by Phillips (1985) that technical skills and experience may be unrelated to the skills and abilities required of supervisors. On the other hand, it may be argued that the initial technical training is so distant, both temporally and conceptually, from the supervisory selection process as to be meaningless. Indicators of technical performance measured closer in time to consideration for SIDP, such as performance in field training, may be more indicative of managerial potential. Another alternative interpretation is that the level of homogenous technical competence within the workforce is assured by the nature of the upfront screening process represented by the ATCS initial qualification courses. Thus, other factors, such as communication skills, knowledge of agency programs, may be more predictive of successful completion of the multiple hurdles embedded within SIDP.

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TABLE 1
Sample status at each stage of SIDP by ATC option

	Option	
Status	En Route	Terminal
	Referral to Skill-Based Interview (SBI)	
Referred	351 (75%)	494 (75%)
Not Referred	117 (25%)	166 (25%)
	Eligible for Further Consideration	
Eligible	252 (72%)	363 (73%)
Not Eligible	99 (28%)	131 (27%)
	Selected for a Supervisory Position	
Selected	54 (21%)	106 (29%)
Not Selected	198 (79%)	257 (71%)

TABLE 2
FAA Academy ATCS initial qualifications training measures

Phase	Weight	Measure	Description
Academics	10%	Block test average (BA)	4 multiple-choice instructional block tests and map test
		Comprehensive Phase Test (CPT)	comprehensive multiple-choice test over all academic topics
Laboratory	65%	Average technical score (AVTA)	average technical performance assessments on best 5 out of 6 graded laboratory problems
		Average instructor score (AVIA)	average instructor assessment of potential on best 5 out of 6 graded laboratory problems
		Average laboratory score (AVL5)	average overall score on best 5 out of 6 graded laboratory problems
Final examination	25%	Controller Skills Test (CST)	comprehensive, multiple-choice examination
Final score		Final composite score (COMP)	70% required to pass

TABLE 3
Correlations between FAA Academy performance measures and PSA ratings by ATC option

	PSA Rating Categories				
Measure	Communication	Leadership	Interpersonal	Technical	Composite
		En Route			
BA	.061	.092*	.080	.104*	.089
CPT	.059	.085	.050	.081	.073
AVL5	.034	.023	-.032	.106*	.032
AVTA	.028	.020	-.034	.097*	.027
AVIA	.046	.031	-.013	.107*	.042
CST	.106*	.118*	.089	.143*	.120*
COMP	.068	.065	.006	.144*	.072
		Terminal			
BA	.103*	.081*	.066	.039	.079*
CPT	.151*	.128*	.127*	.084*	.132*
AVL5	.040	.044	-.004	.046	.033
AVTA	.056	.070	.016	.063	.055
AVIA	.007	.027	-.030	.018	.005
CST	.071	.093*	.043	.081*	.079*
COMP	.080*	.090*	.028	.082*	.075

* $p \leq .05$

TABLE 4
Comparison of FAA Academy performance measures by ATC option and outcome at each stage of SIDP

Option	Measure	Referred to SBI				Eligible for Further Consideration				Selection			
		Not Referred		Referred		Not Eligible		Eligible		Not Selected		Selected	
		M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
En Route	BA	95.2	6	96.1	5	96.0	4	96.2	5	96.0	5	96.9	3
	CPT	92.7	5	93.6	5	93.0	5	93.8	5	93.6	5	94.6	5
	AVL5	75.8	8	77.1	8	78.9	8	76.4	7*	76.4	7	76.5	7
	AVTA	57.5	11	59.4	11	61.7	13	58.5	11**	58.2	11	59.3	11
	AVIA	85.3	5	86.2	6	87.9	6	85.5	6**	85.5	6	85.6	5
	CST	81.5	7	82.9	7	82.8	7	82.9	7	82.7	7	83.7	6
	COMP	79.0	6	80.3	6	81.3	6	79.8	5*	79.8	5	80.2	5
Terminal	BA	95.5	3	96.0	3	95.5	3	96.1	3	96.0	3	96.6	3
	CPT	86.0	9	88.1	7	86.9	7	88.5	7	87.8	7	90.2	5
	AVL5	77.6	7	78.2	8	78.5	8	78.1	8	78.1	8	78.0	8
	AVTA	63.3	10	64.6	11	64.7	11	64.6	11	64.5	11	64.9	11
	AVIA	79.8	7	80.1	7	80.2	7	80.1	7	80.2	7	79.8	6
	CST	80.3	8	81.2	9	80.8	9	81.4	9	81.5	9	81.0	9
	COMP	79.3	5	80.1	6	80.1	6	80.1	5	80.1	5	80.1	6

* $p \leq .05$, ** $p \leq .01$

RELATIONSHIPS BETWEEN PERFORMANCE IN AIR TRAFFIC CONTROL SPECIALIST TECHNICAL TRAINING AND SUPERVISORY SELECTION PROGRAMS

Carol A. Manning, Ph.D.

After successfully completing the Federal Aviation Administration's (FAA) 2-stage selection procedure, as described in Della Rocco and Broach (1991), Air Traffic Control Specialists (ATCSs) enter technical training programs in their respective field facility assignments. The type and duration of the training depends on the type of facility (option) and amount of aircraft traffic controlled by the facility. A brief discussion of the types of air traffic control facilities will be presented, followed by a description of the training programs provided by each facility type.

ATCS Options

Air Traffic Controllers in the FAA can be split into 3 options or specialties: en route, terminal, and flight service station (FSS). En route and terminal ATCSs ensure the separation of aircraft traveling between airports (en route) and approaching or departing from airports (terminal) by formulating and issuing clearances (sets of instructions for aircraft regarding their appropriate altitudes and directions of flight). The clearances are designed to ensure aircraft separation and maximize fuel efficiency. Flight Service Station specialists provide services to pilots such as giving weather briefings, filing flight plans, and helping to locate lost aircraft. For this study, the relationship between technical training performance and performance in the Supervisory Identification and Development Program (SIDP) was limited to en route and terminal controllers, because the screening, training and technical requirements of the FSS specialist's job are considerably different than those for ATCSs in the other options.

ATCS Field Technical Training

In spite of some similarities in job functions, the technical training provided for en route and terminal controllers is very different, and even 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 high 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) vary by type of ATC facilities and the training varies as well.

In the en route option, the unit of air traffic control operation is the sector, a piece of airspace for which a team of 2 or 3 controllers is responsible (during times of slow traffic, only 1 controller may be responsible for a sector). A group of between 5 and 8 sectors is combined into what is called an area of specialization. An en route controller is assigned to only 1 area of specialization, but is responsible for learning to control traffic in all sectors within that area. The team of en route controllers working at most sectors handles duties related to radar separation of aircraft (radar duties, including formulating clearances to ensure separation and delivering them by radio to pilots, handing off responsibility for an aircraft to another controller), duties to assist the radar controller (radar associate duties, including maintaining records about clearances that have been issued or other changes in the flight plan of an aircraft, identifying potential problems, communicating information not directly related to aircraft separation of aircraft to pilots or other controllers), or other support activities (assistant controller duties, including entering data into the computer, ensuring that all records of flight progress are available for the controller in charge). En route controllers are trained on assistant controller duties first, then are given training on increasingly difficult responsibilities (radar associate duties, then radar duties). Training on concepts is conducted first in the classroom, then applied in a laboratory setting, then reinforced during on-the-job training (OJT) conducted in a supervised setting. At some facilities, all radar associate training is completed on each sector before radar training begins; at other facilities, both radar associate and radar training are provided for a specific sector before training begins on the next sector. En route controllers must complete up to 9 phases of field training, depending on the type of training provided by the facility.

In the terminal option, there are 2 different types of controllers. At approach control facilities, the terminal controllers use radar equipment to separate aircraft converging on or departing from an airport, although these aircraft are slower and closer together than they are in the en route environment. Approach controllers may work in pairs but often work alone to manage the aircraft within their radar position (equivalent to an en route sector). Thus, training for terminal approach controllers generally involves the combined duties of a radar controller, instead of splitting out the functions into several training phases, as is seen in the en route environment. Also, approach controllers can be required to train to journeyman level in up to 10 sectors (called "positions" in the terminal environment) in comparison to a maximum of 8 sectors for en route controllers. Approach controllers take at least 2 phases of field training (flight data and radar, and nonradar training is optional) but may take up to 6 phases if their facility is combined with a tower cab.

Tower cab controllers control traffic landing or taking off from an airport. At tower cab facilities, controllers perform duties associated with different independent functions, e.g., (entering and updating flight data, delivering clearances related to the flight to pilots who have not yet entered the taxiway, directing air traffic moving along the taxiways back and forth from the runway, and directing aircraft to take off and land). Some of the functions may be combined, but the separate functions are not usually performed as a team. Thus, training is conducted on 1 function at a time. Tower cab controllers complete 4 phases of field training.

Available Measures of Field Training Performance

Several types of information on performance are obtained for each phase of air traffic control field training: the start and completion dates, the number of hours used to complete OJT, and the grade (Pass, Fail, or Withdraw). A rating of controller potential, measured on a 1 to 6 scale, is made by an instructor or supervisor who most frequently observed the student during that phase. This information can be compiled to derive measures of training performance, such as the amount of time (in years) required to reach journeyman or full performance level (FPL) status, mean instructor ratings computed across certain training phases, time (in days) to complete OJT in certain training phases, and total number of OJT hours required to complete those phases. Total OJT hours and days generally vary by facility type (Manning, Della Rocco & Bryant, 1989). For example, en route controllers, average 2.7 years to reach FPL status, while terminal approach controllers average 1.7 years; average training completion time for tower cab controllers is .7 years.

Although these assessments of training performance are available for most students, it must be understood that a number of outside factors (besides aptitude and technical proficiency) may affect the accuracy of their measurement. For example, time to reach FPL status may be affected by delays in training caused by the need to use the controller in an operational position, the number of other students undergoing OJT on the same airspace, and/or the availability of the training laboratory. The number of OJT hours used may be affected by insufficient exposure to different types of traffic during training. The subjective rating of student potential could be affected by a number of rating biases familiar to psychologists (e.g., leniency, central tendency, severity, halo effect, contrast and similarity errors). Withdrawal from training before completion usually occurs because of training failure, but students occasionally withdraw from the training program of their own accord.

Despite the measurement problems associated with these training performance measures, they are the best measures currently available to describe performance in ATCS technical training programs. Some of the measures described above have been used as criteria against which to validate ATCS selection procedures (Manning, Kegg, & Bryant, 1989). Statistically significant (though somewhat small) correlations were found between the Office of Personnel Management rating and training status, instructor ratings, and time to reach FPL (a negative correlation) for students in the en route option; somewhat higher correlations were found between the Academy score and the same measures of field training performance.

For students assigned to terminal radar approach control facilities, the OPM score predicted training status, instructor ratings, and time to reach FPL, while Academy scores only predicted training status and instructor ratings. For students assigned to tower cabs, the OPM score was not predictive of any measure of field training performance. However, the Occupational Knowledge Test score, which adds extra credit points to the earned rating for those who demonstrate job knowledge, was significantly correlated with days and hours in training phases, as well as time to reach FPL status and instructor ratings. The Academy score was significantly correlated with all training times and instructor ratings for students at tower cab facilities.

For this study, one question of interest was how well the available measures of field training performance would predict the ratings which determined whether the candidate progressed to the next stage of supervisory selection. It was expected that measures reflecting technical proficiency, such as training status or times to complete certain portions of the training program, would predict ratings of technical competence used in the Peer-Supervisory Assessment (PSA) phase of the SIDP but would be unrelated to other types of ratings. On the other hand, instructor ratings of student potential might be related to ratings reflecting other qualities of the candidate, such as interpersonal skills.

Another question of interest was how well the available measures of field training performance would predict success in the 3 stages of the supervisory selection process. It was also expected that instructor ratings of student potential might be predictive of referral to the Skill-Based Interview (SBI), which is based on the results of the PSA. On the other hand, it might be expected that none of the measures would igibility for Consideration (EFC), an assessment made by an independent group of raters.

METHOD

Subjects

Records of field training performance were obtained for 1,352 applicants to the SIDP program who entered the FAA Academy between August 1981 and September 1985, successfully completed that program, and entered ATCS field training. Three records were discarded because the field training data were unavailable. For other records, field training data were occasionally incomplete, resulting in some missing data.

Training Performance Measures

Because of the differences in the amount and content of training provided to ATCSs assigned to different types of facilities, some measures of field training performance should not be compared for the 3 types of air traffic controllers. The only available measures of training performance appropriate for assessing general technical competence are instructor ratings and whether or not the controller was successful in training at his or her first facility. (Controllers who are unsuccessful in their initial assignment may be reassigned to a facility with lower air traffic count and complexity. Some controllers who failed at their first facility could eventually reach FPL status at a subsequent facility and eventually apply for the SIDP program.) However, it is reasonable to analyze the relationships between more specific measures of field training performance, such as the amount of time required to reach FPL status and times to complete specific phases of training for students who were assigned to comparable facilities. Such analyses were conducted for controllers assigned to en route, terminal approach control, and tower cab facilities.

RESULTS

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

Question 1: For the combined group of all controllers, how does proficiency in technical training relate to success in SIDP?

The only measures of technical training performance relevant for all controllers are instructor ratings and overall training success. Table 1 shows the relationship between instructor ratings and status in the different stages of the SIDP process. Those referred to the SBI had significantly higher instructor ratings than those not referred, $t(1217) = 2.37, p < .02$, and those selected to be supervisors had significantly higher instructor ratings than those not selected, $t(672) = 2.46$, $p < .02$. However, there was no difference in the instructor ratings as a function of SBI eligibility for consideration status.

Table 2 shows the relationship between training success and SIDP status. The likelihood of being successful in training was independent of referral to the SBI, $\chi^2(1) = .0005, p > .98$, and was also independent of eligibility for consideration, $\chi^2(1) = 1.98$, $p > .15$. However, training success was related to supervisory selection, $\chi^2(1) = 5.54$, $p < .02$. A higher percentage of those who were selected for supervisory positions were successful in training at their first facility than those who were not selected.

Logistic regression analyses were conducted to assess the relative contribution of both instructor rating and training success in predicting status in the 3 stages of the SIDP program. Using a forward selection procedure, it was found that adding the mean instructor rating to a model containing no variables was a significant improvement in predicting referral for the Skill Based Interview, $\chi^2(1) = 5.07$, $p < .03$, while adding training status to that model provided no significant improvement, $\chi^2(1) = .18, p > .65$. Neither mean instructor rating nor training status contributed significantly to the prediction of eligibility for consideration. Adding training status to a model containing no variables significantly improved the prediction of supervisory selection, $\chi^2(1) = 9.02$, $p < .03$, but adding mean instructor rating to that model did not add significantly to the prediction, $\chi^2(1) = 2.44, p > .10$.

It must be mentioned that the goodness of fit of the model is somewhat questionable; the -2 Log Likelihood (-2 LL) statistics, indicating how well the model fits the data, were significantly different from 1 for the prediction of SBI Referral and supervisory selection; -2 LL (SBI referral) = 1344.55, $p < .01$, $df = 1218$, and -2 LL(supervisory selection) = 752.49, $p < .02$, $df = 673$. However, the goodness of fit statistics for the same models did not lead to the rejection of the models; Goodness of fit (SBI referral) = 1219.0, $p > .48$, $df = 1218$, and Goodness of fit (supervisory selection) = 674.0, $p > .48$, $df = 673$. The prediction of eligibility for consideration by the logistic regression model resulted in a classification of all applicants as "eligible," and the prediction of selection by the model resulted in a classification of all candidates as "not selected." Thus, while the model successfully predicted EFC and supervisory selection in a statistical sense, the resulting classifications predicted by the model are of questionable utility.

Question 2: For en route controllers, do any of the specific measures of training performance predict success in SIDP?

The measures of technical training performance relevant to the analyses concerning the en route option included time to reach FPL status (in years), the number of calendar days and OJT hours required to complete training, and mean instructor ratings in OJT. Table 3 shows means and standard deviations for the field training performance measures by status in each stage of the SIDP program. Those referred to the SBI had significantly higher instructor ratings than those not referred. ($F(1,456) = 14.3$, $p < .001$), and used significantly fewer OJT hours to complete training than did those not referred ($F(1,453) = 4.49$, $p < .04$). No differences in field training performance as a function of eligibility for consideration were observed. Those selected as supervisors spent significantly fewer years in training ($F(1,239) = 7.65$, $p < .01$), and significantly fewer days in OJT, ($F(1,243) = 6.34$, $p < .02$), than did those not selected.

Logistic regression analyses were conducted to assess the relative contribution of the training measures in predicting status in each phase of SIDP. A model was developed to predict SIDP status, using the following as independent variables: the number of hours and calendar days used to complete OJT on the first 2 sectors, mean instructor ratings for OJT phases, and the amount of time (in years) to reach FPL status. A model containing mean instructor rating significantly predicted referral to the SBI ($\chi^2(1) = 16.5$, $p < .001$) while the other variables contributed nothing more to the prediction of the model ($\chi^2(3) = 1.95$, $p > .58$). None of the variables contributed significantly to a model predicting eligibility for consideration ($\chi 2(4) = 6.61$, $p > .15$). A model containing only the time to reach FPL status significantly predicted supervisory selection ($\chi^2(1) = 7.20$, $p < .01$), while the other variables contributed nothing to the prediction of the model ($\chi^2(3) = 4.16$, $p > .24$).

It must be noted that the goodness of fit of the model is somewhat questionable. The -2 LL statistic, indicating how well the model fits the data, was significantly different from 1 for the prediction of SBI referral status (-2 LL = 488.15, $p < .04$, $df = 435$) but the goodness of fit statistics for the same model did not lead to the rejection of the model (Goodness of fit = 436.0, $p > .47$, $df = 435$.) The prediction of eligibility for consideration by the logistic regression model resulted in a classification of all but 2 applicants as "eligible." Although both goodness of fit statistics for the model predicting supervisory selection suggested that the model fit the data, the prediction of selection by the model resulted in a classification of all candidates as "not selected." Thus, while the model successfully predicted EFC and supervisory selection in a statistical sense, the classifications predicted by the model are of questionable utility.

Question 3: For en route controllers, in what ways are the measures of training performance related to the rating dimensions used to determine success in SIDP?

Table 4 shows descriptive statistics for the predictors and rating dimensions for en route controllers, and Table 5 shows correlations between the predictors and the SIDP rating dimensions. Several of the measures of training performance had statistically significant, though somewhat low, correlations with the PSA ratings, and had virtually no relationship with ratings from the SBI.

Regression analyses, with results shown in Table 6, were conducted to assess the relative contribution of the training measures in predicting each of the rating dimensions in the SIDP program. While the training performance measures were significantly related to ratings made on PSA dimensions, very little relationship was observed between training measures and ratings made on the SBI. OJT hours and the number of days in OJT were significantly related to the composite score, and the Communications, Interpersonal and Leadership rating dimensions of the PSA. A model containing both OJT time and instructor rating predicted the PSA Technical rating dimension. However, most of the SBI rating dimensions were not predicted by measures of training performance. The number of years to reach FPL status had a modest relationship with ratings on Knowledge of Supervisory Role Performance; OJT time had a modest relationship with the ratings on Decisiveness. Training performance measures accounted for 10% or less of the variance in the PSA and SBI ratings.

Question 4: For terminal radar approach controllers, do any of the specific measures of training performance predict success in SIDP?

The measures of technical training performance relevant to the analyses dealing with terminal radar approach controllers included time to reach FPL status (in years), calendar days and OJT hours required to complete radar training, and an instructor rating in radar training. The training days and OJT hours were adjusted by dividing them by the number of radar positions in the airspace for which their facility was responsible.

Table 7 shows means and standard deviations for the field training performance measures by status in each stage of the SIDP program. Those referred to the SBI took significantly fewer years to reach FPL status than did those who were not referred, $F(1,314) = 4.33$, $p < .04$. Logistic regression analyses were then conducted to assess the relative contribution of the training measures in predicting status in each phase of SIDP. A model was developed to predict SIDP status, using the measures described above as independent variables and the 3 stages of advancement in SIDP as the dependent variables. A model containing time to reach FPL status marginally predicted referral to the Skill-Based Interview, $\chi^2(1) = 3.74$, $p < .06$, while instructor rating, OJT hours, and number of days spent in radar training did not contribute significantly to the model, $\chi^2(3) = 4.09$, $p > .25$. The training variables did not contribute significantly to the prediction of eligibility for consideration, nor did they contribute to the prediction of supervisory selection.

Although both goodness of fit statistics for the model predicting referral for the SBI suggested that the model fit the data (-2 LL $= 303.57$, $p > .26$, $df = 289$), the prediction of eligibility by the model resulted in a classification of all candidates as "eligible." Thus, while the model successfully predicted EFC status in a statistical sense, the classifications are not useful.

Question 5: For terminal radar approach controllers, in what ways are the measures of training performance related to the rating dimensions used to determine success in SIDP?

Table 8 shows descriptive statistics for all predictors and criteria. Table 9 shows correlations between the predictors and SIDP rating dimensions. The number of years to attain FPL status was significantly correlated with several of the PSA rating dimensions, but only with the Supervisory Role rating dimension of the SBI (in the opposite direction than was predicted). OJT hours also had significant negative correlations with the PSA rating dimensions but were positively correlated with the Judgment rating dimension of the SBI.

Regression analyses, shown in Table 10, were conducted to assess the relative contribution of the training measures in predicting each of the rating dimensions in the SIDP program. Measures of technical training performance were again more highly related to ratings made by peers and supervisors than ratings made by those conducting the Skill-Based Interview. For radar approach controller candidates, OJT hours significantly predicted ratings on all the PSA scales except for the Technical scale, which was predicted by a model containing both instructor ratings and time to complete training. Regression models containing OJT hours also predicted ratings on the SBI Judgment and Decisiveness scales, but the relationship was not in the predicted direction. None of the models containing measures of training performance accounted for more than 10% of the variance in the ratings.

Question 6: For tower cab controllers, do any of the specific measures of training performance predict success in SIDP?

The measures of technical training performance relevant to the analyses dealing with tower cab controllers included time to reach FPL status (in years), calendar days and OJT hours required to complete training on the local control position, and the mean instructor rating for OJT. Those referred to the SBI had significantly higher instructor ratings than did those not referred, $F(1,230) = 5.14$, $p < .03$. No significant differences in field training performance were observed as a function of eligibility for consideration or supervisory selection. Logistic regression analyses were conducted to assess the relative contribution of the training measures in predicting status in each phase of SIDP. A model was developed to predict SIDP status, using the measures described above as independent variables and status in the 3 stages of SIDP as the dependent variables. None of the measures of field training performance sufficiently predicted any stage of the SIDP process to justify including them in a model.

Question 7: For tower cab controllers, in what ways are the measures of training performance related to the rating dimensions used to determine success in SIDP?

Table 12 shows descriptive statistics for all predictors and criteria. Table 13 shows correlations of the predictors with PSA and SBI rating dimensions. The only significant correlations were between the training measures and the Organizing/Planning rating dimension of the SBI. Regression analyses, shown in Table 14, were conducted to assess the relative contribution of the training measures in predicting each of the rating dimensions in the SIDP program. For tower cab controllers, none of the training performance measures significantly predicted the PSA scales, but the number of years required to reach FPL status predicted ratings on both the Organizing/Planning and the Direction/Motivation SBI rating dimensions. However, the percentage of variance in the ratings accounted for by the number of years to reach FPL status was less than 5%.

DISCUSSION

The purpose of this study was to assess the contribution of measures of ATCS field training performance in predicting 1) outcomes in the multiple hurdles of the Supervisory Identification and Development Program, 2) ratings made by peers and supervisors, and 3) ratings of knowledges and skills made by a panel during role plays.

Descriptive statistics were computed and regression and logistic regression analyses were conducted for all terminal and en route controllers combined. The Instructor rating in on-the-job training was related to referral for the SBI and training status was related to supervisory selection.

Analyses were also conducted separately for en route, terminal radar approach control, and tower cab air traffic controllers because they perform different job functions and undergo different types of training. The measures of field training performance were found to contribute in different ways to the prediction of success in SIDP for the controllers in different options. In the en route option, instructor ratings were related to referral to the SBI, and the amount of time required to reach FPL status was related to supervisory selection. None of the training measures predicted eligibility for consideration as a supervisor. For terminal radar approach controllers, the number of years required to reach FPL status was related to referral to the SBI, but none of the training measures predicted eligibility for consideration or actual selection. For tower cab controllers, none of the training measures contributed significantly to the prediction of status in SIDP. In all cases, the logistic regression analyses produced models which predicted that all applicants would be referred for consideration and no applicants would be selected. Thus, while statistically significant results were observed, no meaningful distinction among candidates was found.

Additional regression analyses were conducted which included the technical training performance measures that were specific to each controller option. For en route and terminal radar approach controllers, the results suggested that candidates' technical proficiency demonstrated in training was related to subsequent peer and supervisor ratings of technical competence. The measures of technical proficiency contributed to the prediction of ratings made by peers and supervisors who were aware of the candidates' technical skills. On the other hand, those who rated candidates during the SBI did not rate nor were they familiar with the candidates' technical proficiency. Correspondingly, the measures of candidates' technical training performance were generally not significantly or highly predictive of their SBI ratings. This outcome is as expected; the purpose of the SBI is to reinforce selection on factors other than technical competence alone.

Furthermore, in examining more closely the correlations between measures of training performance and PSA ratings, the measures of the amount of time required to complete certain training phases predicted ratings on scales presumably unrelated to technical skills--leadership, communication, and interpersonal skills. This finding suggests that perceptions of technical proficiency may bias how peers and supervisors interpret other aspects of employees' performance, and subsequently influence their interpretation of supervisory potential. On the other hand, the rating dimensions may tap overlapping characteristics; for example, peers and supervisors may interpret leadership to include technical components, thus resulting in significant correlations between training performance and ratings made on other dimensions.

Moreover, measures of technical proficiency and instructor ratings both contributed to the prediction of ratings made on the PSA Technical scale, although the instructor rating did not contribute significantly to regression models predicting ratings made on any of the other PSA scales. This result might suggest that some factor other than performance alone contributes to the assessment of technical proficiency, but such a speculation is not confirmed by observing particularly high correlations between instructor ratings and other PSA rating scales that might measure this other factor (such as communication or interpersonal skills).

Finally, similar results were not observed for tower cab controllers. One reason might be that insufficient numbers of candidates had trained at tower cab facilities as their first facility. Also, it is possible that the measures of training performance do not describe technical proficiency for the tower cab controller as well as they do for other types of controllers who spend longer periods of time in training.

In summary, available measures of field training performance, though hindered by measurement problems, are somewhat predictive of both ratings of future potential for success as a first-line supervisor and of successfully completing the SIDP program, a prerequisite for becoming a first-line supervisor. In one sense, the result is somewhat predictable, because at least minimal technical competence is a requirement for a first-line supervisor (however, see Slusher, Van Dyke, & Rose, 1972). Although Della Rocco & Broach, (1991) suggested that technical proficiency measured in the FAA Academy was not predictive of SIDP outcomes, the training performance measures used here occurred in a setting that resembled the job more closely than did the ATC screen program, and the measures were obtained more recently than were the screen performance measures.

On the other hand, the results are somewhat unexpected, because a) the training performance measures are fairly global and do not describe specific strengths or weaknesses in performance, b) instructor ratings were usually made by personnel untrained in the use of the rating scales (and thus, were very likely tainted by a number of rater biases), c) the measures were obtained during training and reflect skill learning rather than job performance, and d) a number of other factors besides technical success are assessed in determining success in the SIDP program. At the same time, it must be remembered that none of the measures of training performance accounted for more than 10% of the variance in ratings of supervisory potential made for candidates to the SIDP program. At best, these measures might be added to regression models containing other variables to provide additional contribution to the prediction of SIDP ratings.

It is not suggested that the available measures of field training performance sufficiently describe controller performance. A future research study is planned to identify and develop better measures of performance during training and on the job. When those measures are available, it will be interesting to return to the question of the relationship between technical performance and supervisory success and determine whether the relationships found in this study are still relevant.

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TABLE 1

Relationship between overall instructor rating and SIDP status for all ATC options

SIDP Status	*M*	*SD*	*N*
Referred	4.09	.87	926
Not referred	3.96	.85	293
Eligible	4.09	.86	674
Not eligible	4.11	.88	248
Selected	4.23	.81	166
Not selected	4.04	.88	508

TABLE 2

Training success at first facility and SIDP status for all ATC options

SIDP Status	*% Successful*	*% Not Successful*	*N*
Referred	82.1	17.9	1018
Not referred	82.2	17.8	331
Eligible	83.1	16.9	739
Not eligible	79.3	20.7	275
Selected	88.8	11.2	179
Not selected	81.3	18.8	560

Table 3
Relationship between field training performance and status in SIDP En Route controllers

	Referred to SBI				Eligible for Further Consideration				Supervisory Selection			
	Not Referred		Referred		Not Eligible		Eligible		Not Selected		Selected	
Field Training Measures	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Instructor Rating	4.1	.5	4.3	.5	4.4	.6	4.3	.5	4.2	.5	4.4	.6
Years to FPL	2.7	.6	2.6	.6	2.5	.6	2.6	.6	2.6	.6	2.4	.5
OJT Days	150.5	76.3	139.5	83.3	148.4	98.2	136.3	77.2	142.7	82.0	112.6	49.4
OJT Hours	250.8	88.5	230.3	88.3	231.0	93.8	230.3	86.6	235.4	89.9	212.0	71.0

Table 4
Descriptive statistics for predictors and SIDP rating dimensions for En Route controllers

Measures	*M*	*SD*	*N*
	Training Performance		
Instructor Rating	4.25	.53	458
Years to reach FPL	2.60	.59	442
OJT Hours	235.33	88.68	455
OJT Days	142.17	81.67	454
	PSA Ratings		
Composite	61.04	15.52	467
Communication	62.01	15.34	466
Interpersonal	60.34	17.57	466
Leadership	60.22	16.91	466
Technical	61.59	15.76	466
	SBI Ratings		
Agency Programs	3.66	.83	313
Supervisory Role	3.84	.81	313
Problem Solv/Analytical	3.96	.89	313
Judgment	3.82	.94	313
Decisiveness	4.07	.87	313
Organizing/Planning	3.93	.91	313
Interpersonal Skill	4.21	.85	313
Communication	4.06	.89	313
Direction/Motivation	3.94	.93	313

Table 5
Correlations between SIDP rating dimensions
and training measures for En Route controllers

SIDP Ratings	Training Measures: Years to FPL Status	Instructor Rating	OJT Hours	OJT Days
	PSA Ratings (N=435)			
Composite	-.10*	.24**	-.20**	-.18**
Communication	-.08	.21**	-.18**	-.15**
Interpersonal	-.06	.19**	-.16**	-.16**
Leadership	-.11*	.22**	-.20**	-.17**
Technical	-.14**	.31**	-.20**	-.22**
	SBI Ratings (N=291)			
Agency Programs	.01	.02	-.08	.00
Supervisory Role	-.13*	.01	-.01	-.02
Prob Solv/Analytical	.07	-.05	.00	.00
Judgment	.08	-.05	-.07	-.09
Decisiveness	.02	.04	-.06	-.11
Organizing/Planning	.09	-.06	-.04	-.05
Interpersonal Skill	-.01	-.05	.02	-.08
Communication	.03	-.01	-.03	.08
Direction/Motivation	.05	-.09	.00	.06

$^{*}p \leq .01$ $^{**}p \leq .001$

Table 6
Results of regression analyses using field training performance measures as predictors of component rating dimension scores in SIDP En Route controllers

Criterion	Predictors	R	R^2	β	F	p
		PSA Ratings				
Composite	OJT Hours	.23	.05	-.23	16.13	.0001
Communication	OJT Hours	.18	.03	-.18	9.35	.003
Interpersonal	OJT Hours	.18	.03	-.18	9.57	.003
Leadership	OJT Hours	.24	.06	-.24	16.91	.0001
Technical	OJT Hours	.32	.10	-.25	16.60	.0001
	Inst Rating			-.15		
		SBI Ratings				
Agency Programs	*ns*					
Supervisory Role	Years to FPL	.14	.02	-.14	5.35	.03
Problem Solving	*ns*					
Judgment	*ns*					
Decisiveness	OJT Hours	.12	.01	-.12	4.14	.05
Organizing	*ns*					
Interper Skill	*ns*					
Communication	*ns*					
Direction/Motiv	*ns*					

Table 7
Relationship between field training performance and status in SIDP Terminal Radar Approach controllers

	Referred to SBI				Eligible for Further Consideration				Supervisory Selection			
	Not Referred		Referred		Not Eligible		Eligible		Not Selected		Selected	
Field Training Measures	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Instructor Rating	4.1	.8	4.0	.9	4.0	.8	4.0	.9	4.0	.9	4.1	.8
Years to FPL	2.0	1.0	1.8	.8	1.7	1.0	1.8	.8	1.9	.8	1.7	.9
OJT Days	89.3	58.9	96.8	68.8	87.4	65.7	99.5	69.5	98.6	65.7	99.9	76.9
OJT Hours	62.3	42.1	62.0	40.3	50.9	27.7	64.5	42.3	66.5	44.3	60.4	37.7

Table 8
Descriptive statistics for predictors and SIDP rating dimensions for Terminal Radar Approach controllers

Measures	*M*	*SD*	*N*
	Training Performance		
Instructor Rating	4.04	.84	368
Years to reach FPL	1.84	.87	316
OJT Hours	62.04	40.60	338
OJT Days	95.06	66.65	339
	PSA Ratings		
Composite	57.66	13.77	378
Communication	59.49	13.46	377
Interpersonal	57.58	15.32	378
Leadership	56.38	15.74	378
Technical	57.38	15.42	378
	SBI Ratings		
Agency Programs	3.84	.79	270
Supervisory Role	3.88	.76	270
Problem Solv/Analytical	4.00	.89	270
Judgment	3.84	.89	270
Decisiveness	4.11	.91	270
Organizing/Planning	3.98	.89	270
Interpersonal Skill	4.24	.83	270
Communication	4.13	.80	270
Direction/Motivation	3.96	.91	270

Table 9

Correlations between SIDP rating dimensions and training measures for Terminal Radar Approach controllers

SIDP Ratings	Training Measures: Years to FPL Status	Instructor Rating	OJT Hours	OJT Days
	PSA Ratings (*N* = 304)			
Composite	-.12*	.03	-.15**	-.10
Communication	-.07	.00	-.15**	-.06
Interpersonal	-.03	-.03	-.14*	-.06
Leadership	-.13*	.02	-.14*	-.10
Technical	-.21**	.09	-.12*	-.14*
	SBI Ratings (*N* = 220)			
Agency Programs	.05	-.00	.02	.00
Supervisory Role	.13*	.09	-.06	-.05
Prob Solv/Analytical	.02	-.04	.11	.07
Judgment	.05	-.04	.15*	.05
Decisiveness	.03	-.03	.08	-.01
Organizing/Planning	.06	-.06	.13	.09
Interpersonal Skill	.01	-.07	.12	.05
Communication	.06	-.10	.08	.02
Direction/Motivation	.01	-.07	.05	-.01

*$p \leq .05$ **$p \leq .01$

Table 10
Results of regression analyses using field trainings performance measures as predictors of component rating dimension scores in SIDP Terminal Radar Approach controllers

Criterion	Predictors	R	R^2	β	F	p
			PSA Ratings			
Composite	OJT Hours	.24	.06	-.24	12.66	.001
Communication	OJT Hours	.21	.05	-.21	9.95	.002
Interpersonal	OJT Hours	.23	.05	-.23	11.38	.001
Leadership	OJT Hours	.19	.04	-.19	8.14	.005
Technical	Inst Rating	.28	.08	.18	8.68	.001
	OJT Days			-.17		
			SBI Ratings			
Agency Programs	*ns*					
Supervisory Role	*ns*					
Problem Solving	*ns*					
Judgment	OJT Hours	.16	.02	.16	5.30	.03
Decisiveness	*ns*					
Organizing	OJT Hours	.14	.02	.14	3.97	.05
Interper Skill	*ns*					
Communication	*ns*					
Direction/Motiv	ns					

Table 11

Relationship between field training performance and status in SIDP Tower Cab controllers

	Referred to SBI				Eligible for Further Consideration				Supervisory Selection			
	Not Referred		Referred		Not Eligible		Eligible		Not Selected		Selected	
Field Training Measures	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Instructor Rating	4.0	.8	4.3	.9	4.3	.9	4.4	.9	4.3	1.0	4.4	.8
Years to FPL	.7	.3	.7	.4	.7	.4	.6	.3	.6	.3	.6	.3
OJT Days	164.1	81.7	162.1	111.0	169.2	116.7	157.5	108.3	160.7	116.2	146.7	76.1
OJT Hours	110.9	50.3	101.5	42.3	106.5	44.3	98.8	41.3	96.8	42.5	105.4	36.9

Table 12
Descriptive statistics for predictors and SIDP rating dimensions for Tower Cab controllers

Measures	*M*	*SD*	*N*
	Training Performance		
Instructor Rating	4.23	.90	232
Years to reach FPL	.66	.35	240
OJT Hours	104.17	44.81	238
OJT Days	162.65	103.38	247
	PSA Ratings		
Composite	57.12	15.52	251
Communication	59.10	15.88	251
Interpersonal	56.84	17.92	251
Leadership	55.65	17.18	251
Technical	56.83	16.62	251
	SBI Ratings		
Agency Programs	3.49	.88	162
Supervisory Role	3.75	.86	162
Problem Solv/Analytical	3.85	1.02	162
Judgment	3.66	.93	162
Decisiveness	3.83	1.04	162
Organizing/Planning	3.75	1.01	162
Interpersonal Skill	4.05	.87	162
Communication	3.88	.99	162
Direction/Motivation	3.76	.98	162

Table 13
Correlations oetween SIDP rating dimensions and training measures for Tower Cab controllers

SIDP Ratings	Training Measures: Years to FPL Status	Instructor Rating	OJT Hours	OJT Days
	PSA Ratings			
Composite	.01	.08	-.00	.01
Communication	-.01	.06	.01	-.01
Interpersonal	-.01	.07	.03	.02
Leadership	.01	.08	-.00	-.00
Technical	.05	.11	-.05	.03
	SBI Ratings			
Agency Programs	.01	.01	-.07	-.04
Supervisory Role	-.09	.13	.03	-.05
Prob Solv/Analytical	-.15	.11	-.09	-.11
Judgment	-.08	.07	-.04	-.10
Decisiveness	-.14	.03	-.09	-.09
Organizing/Planning	-.20*	.13	.18*	-.17*
Interpersonal Skill	-.15	.12	-.08	-.06
Communication	-.15	.11	-.04	-.06
Direction/Motivation	-.17*	.06	-.12	-.13

*$p \leq .01$ **$p \leq .001$

Table 14
Results of regression analyses using field training performance measures as predictors of component rating dimension scores in SIDP Tower Cab controllers

Criterion	Predictors	R	R^2	β	F	p
		SBI Ratings				
Agency Programs	*ns*					
Supervisory Role	*ns*					
Problem Solving	*ns*					
Judgment	*ns*					
Decisiveness	*ns*					
Organizing	Years to FPL	.20	.04	-.20	6.12	.02
Interper Skill	*ns*					
Communication	*ns*					
Direction/Motiv	Years to FPL	.17	.03	-.17	4.04	.05

CANDIDATE PERFORMANCE IN A SUPERVISORY SELECTION PROGRAM AND SUBSEQUENT SELECTION DECISIONS

Jennifer G. Myers, Ph.D.

Small surveys of private organizations have reported that fewer than half of these organizations have formal selection systems in place for first-line supervisors (Levine, 1986; Rendero, 1980). Given the importance of first-line supervisors in ensuring employee productivity by directing subordinate work activity, as well as their role in representing management and the organizational mission to subordinates, the lack of reported formal supervisory selection systems is somewhat surprising. Recent research on supervisory selection systems and promotion decisions is also noticeably absent.

A recent review of federal agencies' supervisor selection programs (U. S. Merit Systems Protection Board, 1989) described the typical situation. In general, applicants to first-line supervisory jobs document training and experience information typically based on their prior nonsupervisory work history. As noted in the review, the problem for the selecting official becomes one of evaluating an individual's ability or potential for performing supervisory tasks that have never been done before. Given the makeup of the application materials, selecting officials primarily see the applicant's prior technical work experience. Personal interviews with applicants may be restricted by the associated costs, since Merit Promotion Plan regulations require all or none of the eligible candidates to be interviewed. The frequent result in the federal government is that the most highly technically qualified person is chosen for the supervisory job, rather than someone with demonstrated management skills. This outcome is similar to that found in private industry (Northrup, Cowin, Vanden Plas, Fulmer, Bolick, Bellace, & Rosenzwig, 1978). However, selections based on technical performance may result in the promotion of someone unsuitable for the position, since technical skills and experience are not necessarily related to supervisory competence (Phillips, 1985).

Technical competence has been identified as an important factor in the performance of supervisory tasks (Myers & Stutzman, 1991). However, Myers and Stutzman (1991) found that other competencies such as communications skills and interpersonal skills were mentioned more frequently than was technical competence as important in successful task performance. One method of ensuring the applicant for a first-line supervisory position has the right mix of technical and supervisory skills is to formalize the assessment of the most important competencies through a structured selection program. Still, selecting officials could emphasize the importance of technical over supervisory competence, by selectively attending to factors in the work history that demonstrate the applicant's technical competence. As already suggested by Phillips (1985), this may not be an optimal strategy for selecting the best candidate for the position. As one example, a study of engineers (Slusher, Van Dyke, & Rose, 1972) found that the most highly technically qualified supervisors were least likely to adopt a managerial role and in turn, were lowest in group productivity among the groups studied.

As noted in the introduction of this technical report, the Federal Aviation Administration implemented the Air Traffic Supervisory Identification and Development Program (SIDP) to change the emphasis on technical performance in promotability decisions to include other skills, such as decision-making and communication, that reflect supervisory potential. In order to understand how the different competencies may distinguish between successful and unsuccessful candidates at different phases of the SIDP, comparisons were made of candidate performance on SIDP performance measures, as well as measures of technical performance and experience. The influence of technical performance and skills measured in the SIDP on success in each of the phases was also assessed.

METHOD

Subjects

Subjects were 985 nonsupervisory air traffic control specialists who entered the En Route or Terminal Screen Program in the Academy between 1981 and 1985, applied to SIDP between 1985 and 1988, and completed their field training in an En Route or Terminal facility. The average age of this group at the time they applied to SIDP was 32.14 years and the average full performance level (FPL) experience was 3.69 years. Fifteen percent were female and 85% were male. All applicants were required to have at least a fully successful rating on their last performance appraisal; 29.6% were rated fully successful, 52.5% were rated exceptional, and 17.9% were rated outstanding.

Measures

Peer-Supervisory Assessment. Applicants to SIDP identify a combination of peers and first-line supervisors to complete the Peer-Supervisory Assessment (PSA). A paired comparison approach is used to rate applicants against other applicants and benchmarks on 4 different dimensions: Technical Competence, Communication Skills, Interpersonal Skills, and Leadership. Scores are computed on a 0 to 100 scale; the composite PSA score is a simple arithmetic mean of the 4 dimension scores. Successful completion of this hurdle results in referral to the next step in the SIDP process, the Skill-Based Interview (SBI).

Skill-Based Interview. The SBI is a combination of a face-to-face interview and 3 role-plays. Three interviewers provide consensus ratings on a 1 (weak) to 5 (outstanding) scale on the following 9 dimensions: Organizational Knowledge, Knowledge of Supervisory Role Performance, Organizational Planning, Problem-Solving and Analytical Ability, Judgment, Decision-Making, Communication Skills, Interpersonal Skills, and Leadership. Based upon the combination of ratings received during the SBI, individuals are determined to be (1) "promotable" and placed on the Eligible for Consideration (EFC) list, allowing them to apply for first-line supervisor positions, (2) in need of further skill remediation prior to placement on the EFC, or (3) recommended for further self-development and reapplication to SIDP at a later date.

Journeyman Level Technical Performance. Technical performance at the journeyman level was identified through 2 broad measures: (a) the number of months of journeyman level experience the applicant had at the time of application to SIDP and (b) the most recent performance appraisal rating prior to application to SIDP. Although performance ratings can actually range from 1 (unacceptable) to 5 (outstanding), the program requirement for a fully successful (3) rating to apply to SIDP restricted the range to the 3 highest possible ratings.

Two different sets of analyses were conducted to examine 3 different groups: (a) whether the individual was referred to the SBI or not (*Referral*), (b) whether or not the applicant was placed on the Eligible for Consideration list (*Promotability*), and (c) whether or not the person was selected for a first-line supervisor position (*Selection*). Multivariate analysis of variance (MANOVA) was used primarily as "protection" from an inflated alpha level on the univariate tests comparing PSA and SBI composite ratings and technical performance measures between the groups. Although statistically significant differences are not unexpected, primarily because of the large sample size, these differences may not have a meaningful impact on the likelihood of success in the different phases of SIDP. Thus, logistic regression analyses were conducted to determine the relative influence of the SIDP and performance variables on the probability of dichotomous (i.e, "pass-fail") SIDP outcomes.

RESULTS

Correlations were computed between each of the dimensions rated in the SIDP. High correlations among PSA ratings and among SBI ratings (see Table 1) suggested that composite variables for the PSA and SBI might be needed. Separate factor analyses (principle components and orthogonal rotation) were conducted for the PSA and SBI dimension ratings. Only 1 factor was found for the PSA; scores on each dimension were averaged for a PSA Composite score. Two factors were found for the SBI ratings: a knowledge factor made up of the 2 knowledge rating dimensions (Knowledge of Supervisory Role Performance and Organizational Knowledge) and a skill factor made up of the remaining seven rating dimensions. Because ratings on the knowledge dimensions are based on answers to questions rather than performance in role-play scenarios, there was some concern that the 2 factors reflected method variance rather than separate dimensions. Thus, all items were included in an item analysis using the reliabilities procedure in SPSS® (Nye, 1990). Item statistics suggested that the 2 SBI factors should be kept separate for subsequent statistical analyses. Ratings for each respective factor were summed to create a SBI Knowledge Composite and a Skill Composite. Correlations between the composite variables and the technical performance variables are shown in Table 2; descriptive statistics for the variables for different group comparisons are shown in Table 3.

Referral to the SBI

Analysis of variance (ANOVA) was used for comparing mean differences between the *Referred* and *Not Referred* groups. Only the Performance Rating and Months FPL Experience were included since the PSA composite operationally defines who will be referred to the SBI and would be expected to be lower for the *Not Referred* group than the *Referred* group. The *Referred* and *Not Referred* groups had significantly different mean Performance Ratings ($F = 101.81$, $df = 1{,}983$, $p < .001$) but were not significantly different on Months FPL Experience ($F < 1.0$).

The probability of being referred to the SBI was estimated using the SPSS® logistic regression procedure (Norušis, 1990). In the first regression, the PSA Composite, Performance Ratings, and Months FPL Experience were entered into the regression equation using the forward stepwise method. The second regression excluded the PSA Composite. It was felt that comparison of the 2 regressions would help to identify the impact of the peripheral performance variables on the probability of referral to the SBI. Results of the first regression showed that only the PSA Composite and Performance Rating variables predicted the referral decision. The goodness-of-fit was tested using -2 times the log likelihood (-2 LL) of the model and indicated a good fit to the data (-2 LL, $\chi^2(1{,}982)=555.42$, $p=1$). The overall classification rate was 89.85%. When the PSA Composite was excluded from the equation, Performance Rating was still identified as a predictor. However, the fit to the data was somewhat poor (-2 LL, $\chi^2(1{,}983)=986.10$, $p=.47$) and all cases were predicted to be referred to the SBI.

Promotability

A multivariate analysis of variance test was used to examine mean differences on the PSA composite, Performance Rating, and Months FPL Experience between those who were placed on the EFC list (*EFC*) and those who were not (*Not EFC*). SBI variables were excluded from this analysis because the combination of rating scores on the dimensions operationally determines who is placed on the EFC list. The multivariate test was not significant.

Again, 2 logistic regression analyses were conducted. The first regression equation included the SBI Knowledge and Skill Composites, as well as the PSA Composite, Performance Rating, and Months FPL Experience. Only the SBI Knowledge and Skill Composites predicted the promotability decision. The goodness-of-fit was tested using -2 times the log likelihood (-2 LL) of the model and indicated a good fit to the data (-2 LL, $\chi^2(1{,}742)=195.98$, $p=1$). The overall classification was 95.03%. Given that the SBI ratings are used to operationally determine assignment to the EFC list, this finding is not surprising. The second regression analysis excluded the SBI composite variables; the PSA Composite and technical performance variables did not enter into the prediction of promotability status.

Selection

The dependent variables included in the MANOVA were: SBI Knowledge Composite, SBI Skill Composite, PSA Composite, Performance Rating, and Months FPL Experience. The MANOVA test was statistically significant (Pillai's Trace criterion, $F=4.00$, $df=5,543$ $p<.001$). ANOVA tests demonstrated significantly different group means on the PSA Composite ($F=13.56$, $df=1,547$, $p<.001$), the SBI Knowledge Composite ($F=4.67$, $df=1,547$, $p<.05$), and Performance Rating ($F=4.74$, $df=1,547$, $p<.05$).

The logistic regression analysis included all the variables used in the MANOVA. The results showed that only the PSA Composite entered intothe equation for predicting selection for a supervisory position. Assessment of the goodness-of-fit of the model indicated a poor fit to the data ($\chi^2(1,547)=605.78$, $p=.04$). Although the overall classification rate was 74.86%, the model predicted that no one had been selected for a supervisory position.

DISCUSSION

The results of the analysis of the referral variable identified a significant difference between the *Referred* and *Not Referred* groups on the PSA Performance Ratings. In addition, the PSA composite and performance rating predicted referral to the SBI. Although the applicant's performance rating is not considered in the SIDP as part of the decision to refer to the SBI, it may contain information that is redundant with peer and supervisory ratings of the applicant on the PSA dimensions. In fact, performance ratings *did* show small but significant correlations with each of the PSA dimension ratings. Thus, the performance rating may reflect similar or additional information on the differences among applicants in supervisory and technical abilities.

The two groups considered in the analysis of promotability were not significantly different on the PSA Composite or technical performance variables. Of the independent variables used in the logistic regression analysis, only the SBI composite predicted promotability. This is perhaps as it should be, since the SBI is meant to identify more keenly the skills rated by supervisors and peers in the PSA (excluding technical competence) and additional important competencies as identified in a study of FAA air traffic control first-line supervisor competencies (Myers & Stutzman, 1991). Because the SBI is conducted with interviewers who do not know the candidate and the content of the scenarios does not include aspects of the air traffic controller's operational job, technical performance (as measured by performance ratings and experience) should not play a role in performance at this stage. Of course, an individual's performance in the SBI may be enhanced through other types of work experience, for example, prior staff positions or experience as an on-the-job-training or Academy instructor. These types of experiences bring with them opportunities to interact with others to accomplish tasks unlike those normally found in the air traffic controller's operational position, and can enhance current supervisory skills and the development of new skills.

Differences between those who were selected for a supervisory position and those who were not were found for the PSA Composite, SBI Knowledge Composite, and Performance Rating variables. Although we cannot know for certain which factors the selecting official is emphasizing in making a selection decision based on this analysis, it does appear that several factors are being considered in the selection of supervisors. The measures for which there were significant mean differences encompassed the 5 most frequently mentioned competencies important to task accomplishment (communication, leadership, and interpersonal skills; knowledge of supervisory role performance, and technical competence) identified by incumbent air traffic control supervisors (Myers & Stutzman, 1991). Thus, selection officials appear to be choosing individuals for supervisory positions in line with incumbent perceptions of important competencies in performing the supervisory job. Given the various sources of the ratings (peers, supervisors, and trained assessors) selecting officials may also be considering multiple inputs on the applicant's qualifications in making the selection decision. However, these results must be considered in light of the fact that only the PSA Composite entered into the logistic regression equation to predict selection status and the model did not fit the data well. The importance of different factors in attaining a supervisory position is still not well defined.

Interviews with air traffic facility selecting officials conducted during an evaluation of the SIDP noted that factors other than SIDP performance, such as diversity in work experiences and references from applicants' supervisors, play a large part in the selection decision (Office of the Associate Administrator for Human Resource Management, 1991). Identification of important factors in the selection decision is needed as part of the validation of the SIDP. In addition, collection of information on applicant experiences, education, and other biodata might suggest what additional types of factors may relate to successful performance in SIDP. This type of information could be provided to applicants to improve their chances for success in the selection program, as well as improving their effectiveness as a supervisor.

Obviously, this study did not span the domain of possible predictors of success in SIDP and selection as a first-line supervisor. Future research in areas such as biodata, achievement motivation, and personality factors is needed to contribute to the theoretical base for managerial potential and assist in improving the operation of SIDP.

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Table 1

Correlations among technical performance measures, PSA ratings, and SBI ratings

Measures	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1) Perf Rating															
2) Months FPL	.00														
3) Communication	.21**	-.06													
4) Interpersonal	.16**	-.09*	.83**												
5) Leadership	.26**	-.05	.82**	.77**											
6) Technical	.27**	.05	.64**	.53**	.71**										
7) Org Knowledge	-.00	-.01	.16**	.12**	.12**	.05									
8) Supv Role	.03	-.05	.11**	.09*	.09*	.04	.55**								
9) Prob Solving	.02	.01	.06	.06	.06	-.03	.29**	.29**							
10) Judgment	.05	-.04	.07	.05	.06	-.03	.31**	.34**	.73**						
11) Decisive	.01	.04	.03	.02	.04	-.02	.29**	.35**	.69**	.68**					
12) Planning/Org	.03	-.00	.12**	.10**	.10**	-.01	.35**	.37**	.72**	.68**	.69**				
13) Interpersonal	.03	-.03	.09*	.10**	.08*	-.00	.28**	.28**	.52**	.60**	.45**	.52**			
14) Communication	-.00	-.04	.06	.08*	.05	-.04	.30	.35**	.54**	.56**	.55**	.60**	.61**		
15) Dir/Motiv	.05	-.00	.08*	.08*	.07*	-.00	.33**	.37**	.73**	.77**	.71**	.72**	.63**	.62**	

* $p \leq .05$ ** $p \leq .01$ ($N = 743$)

Table 2
Correlations between performance variables

Measures	1	2	3	4	5
1) PSA Composite					
2) SBI Knowledge	.13*				
3) SBI Skill	.07	.44*			
4) Performance Rating	.25*	.00	.03		
5) Months to FPL	-.04	-.03	-.01	.00	

*$p \leq .01$ ($N = 743$)

Table 3A
Mean scores by referral status

	Referred to SBI (*N* = 746)		Not Referred (*N* = 239)	
Measures	*M*	*SD*	*M*	*SD*
Performance Rating	4.00	.67	3.52	.57
Months FPL Experience	44.46	13.75	43.56	14.79

Table 3B
Mean scores by promotability status

	Eligible for Consideration (*N* = 549)		Not Eligible (*N* = 197)	
Measures	*M*	*SD*	*M*	*SD*
PSA Composite	64.13	10.80	63.07	11.59
Performance Rating	4.01	.67	3.98	.67
Months FPL Experience	44.46	13.75	44.52	14.04

Table 3C
Mean scores by selection status

	Selected (*N* = 138)		Not Selected (*N* = 410)	
Measures	*M*	*SD*	*M*	*SD*
PSA Composite	67.03	11.38	63.16	10.44
SBI Knowledge Composite	8.09	1.45	7.91	.67
SBI Skill Composite	30.61	2.90	30.33	2.84
Performance Rating	4.12	.70	3.97	.66
Months FPL Experience	45.20	13.03	44.18	13.83

*U.S.GPO:1992-661-063/40076