FAA-AM-78-7

USE OF THE OCCUPATIONAL KNOWLEDGE TEST TO ASSIGN EXTRA CREDIT IN SELECTION OF AIR TRAFFIC CONTROLLERS

Mary A. Lewis
Civil Aeromedical Institute
Federal Aviation Administration
Oklahoma City, Oklahoma

February 1978

Document is available to the public through the
National Technical Information Service,
Springfield, Virginia 22161

Prepared for
U.S. DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration
Office of Aviation Medicine
Washington, D.C. 20591

NOTICE

This document is disseminated under the sponsorship of the Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its contents or use thereof.

IFC

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
FAA-AM-78-7		

4. Title and Subtitle

USE OF THE OCCUPATIONAL KNOWLEDGE TEST TO ASSIGN EXTRA CREDIT IN SELECTION OF AIR TRAFFIC CONTROLLERS

5. Report Date
February 1978

6. Performing Organization Code

8. Performing Organization Report No.

7. Author(s)
MARY A. LEWIS

9. Performing Organization Name and Address
FAA Civil Aeromedical Institute
P.O. Box 25082
Oklahoma City, Oklahoma 73125

10. Work Unit No. (TRAIS)

11. Contract or Grant No.

13. Type of Report and Period Covered

12. Sponsoring Agency Name and Address
Office of Aviation Medicine
Federal Aviation Administration
800 Independence Avenue, S.W.
Washington, D.C. 20591

14. Sponsoring Agency Code

15. Supplementary Notes

Work was performed under Tasks AM-C-77-PSY-65 and AM-C-78-PSY-66.

16. Abstract

The Occupational Knowledge Test (OKT) 101-B was administered to 784 air traffic control trainees who entered the FAA Academy's 16-week training course in 1976. All trainees completed the nonradar laboratory portion of the training and in addition completed a preemployment questionnaire. Based on responses to the questionnaire, the trainees were assigned to one of three experience groups corresponding to groups given credit for experience using Civil Service Commission (CSC) selection procedures. It was found that the OKT was highly correlated with experience ($r = .64$) and in addition the OKT had a higher correlation with successful completion of the nonradar lab than did experience ($r = .25$ vs. $.12$). It was determined that use of an OKT score of 75 or above to assign extra credit would result in a failure rate of 3.1 percent for those receiving credit, while use of the current experience scale would result in a failure rate of 7.6 percent for those receiving extra credit on the CSC selection battery. The results held up for a cross-validation sample of 432 trainees who entered the Academy during 1977.

Based on the results, it is recommended that an OKT score of 75 or above be used to assign extra credit for experience in the selection of air traffic controllers.

17. Key Words	18. Distribution Statement
Selection Experience Air Traffic Controller	Document is available to the public through the National Technical Information Service, Springfield, Virginia 22161

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	10	

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

USE OF THE OCCUPATIONAL KNOWLEDGE TEST TO ASSIGN EXTRA CREDIT IN SELECTION OF AIR TRAFFIC CONTROLLERS

Current practice in the selection of air traffic control (ATC) trainees allows assignment of extra credit for certain types of prior experience for applicants who successfully pass the present Civil Service Commission (CSC) ATC test. The extra credit gives a candidate a higher CSC rating and thus increases the prospect of being selected. The idea of allowing extra credit for experience is not a new one and in fact has been used for a number of years by the Federal Aviation Administration (FAA). While the methods and standards for evaluating experience have varied over the years, a common element of the experience scales used has been their emphasis on aviation-related experience.

A detailed account of past and current methods of assigning credit for experience is available elsewhere (1). However, a brief description of the current method used by the CSC follows. Fifteen points extra credit is given to those applying for FAA ATC jobs who have had at least 1 year of previous (usually military) radar (IFR) ATC experience. Ten points extra credit is given to those with nonradar (VFR) ATC experience or less than 1 year of IFR ATC experience, ground control operator (GCA), Flight Service Station (FSS), or International Flight Service Station (IFSS) experience. Five points credit is given to those who have pilot, air carrier dispatcher, Air Defense Command, or navigation/bombardier experience, or have completed 1 year of post-college graduate study, or meet the Superior Academic Achievement criterion. The ratings involved in determining how many, if any, extra points are to be allocated to an individual based on experience are very time consuming for the rater, and the rating itself is not sensitive to the individual's quality of experience.

An FAA team headed by Dr. John T. Dailey has developed occupational knowledge tests that are designed to measure the applicability of applicants' past experience to the requirements of the FAA air traffic controller specialty (2). Tests were constructed in the hopes of replacing the current rating system with a better measure of the ATC-related knowledge the individual brings on board. If successful, an occupational knowledge test would be a much more cost effective means of accurately assigning extra credit than current time-consuming rating methods. The purpose of the present study is to determine whether or not it would be productive to use ATC Occupational Knowledge Test (OKT) 101-B to assign extra credit in place of the present ATC Rating Guide. In addition, the study will make recommendations about implementation of any new system of assigning extra credit using an OKT.

Validation

The sample used in this study was 784 ATC trainees who entered the FAA Academy's 16-week ATC training program between July 13 and December 14, 1976. All trainees completed a preemployment questionnaire, took ATC Occupational Knowledge Test (OKT) 101-B, and remained in the training program until they either passed or failed training. Of the trainees, 701 passed training and 83 failed.

Based on responses to a preemployment questionnaire, the trainees were divided into three experience groups:

Group 1: No prior creditable aviation-related experience.

Group 2: Some prior aviation-related experience (Air Defense Command, Control Tower Operator rating, ATC rating, Communications Operator, Airman Certificate).

Group 3: Prior VFR or IFR, Center or Tower or FSS experience.

Each individual was also scored on the OKT and was designated as either having passed or failed training. Of the 784 individuals, 250 (32 percent) were classified in experience Group 1, 207 (26 percent) were in Group 2, and 327 (42 percent) were in Group 3. The Pearson correlation between OKT scores and experience group was .64, and as Figure 1 demonstrates, OKT scores clearly differentiated the three groups. The average score (mean) for the three experience groups on OKT were as follows: No Experience, 52.5; Some Experience, 69.4; and ATC Experience, 77.6.

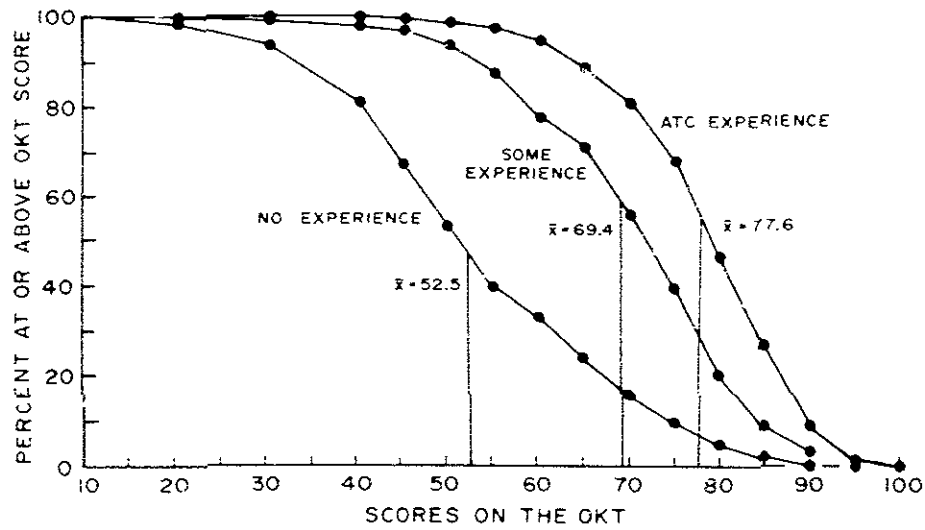

Figure 1. OKT scores by experience group 1976 validation sample.

Further, while pass/fail status correlated .25 with OKT, it correlated only .12 with ATC experience, and as shown in Figure 2, OKT scores also differentiated between passing and failing students: Passing Students, 68.8; and Failing Students, 55.7. Based on this evidence it appears that the OKT could be used in place of experience now given extra credit on the ATC Rating Guide to air traffic control applicants. The next step is to determine appropriate cutting scores on OKT for assigning extra credit.

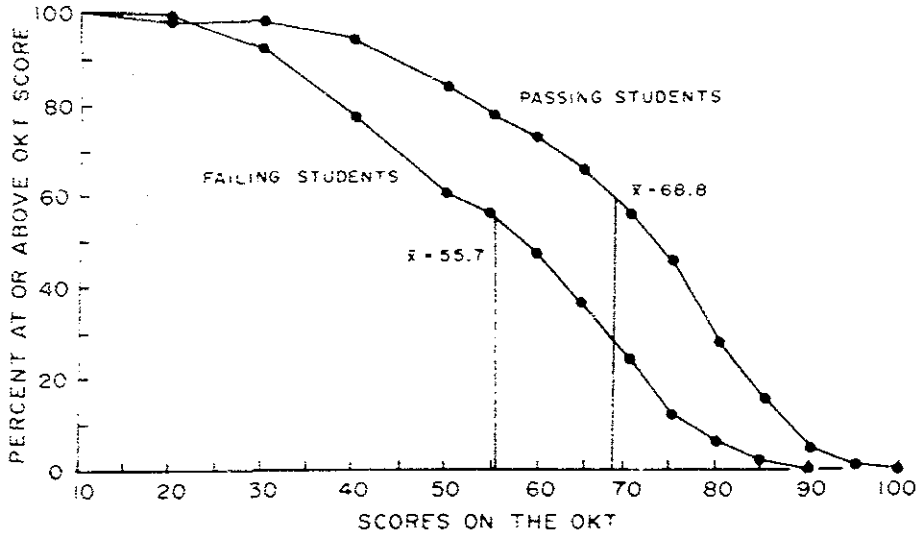

Figure 2. OKT scores by pass/fail status 1976 validation sample.

OKT cut scores. Table 1 gives the OKT score distributions for the total 1976 group, for passes and for failures, for each of the three experience groups, and for all groups combined. As can be seen from the table, the proportion of failures drops for all experience groups when those who scored less than 60 are compared with those who scored 60 or higher on the OKT. For all experience groups combined, the next dramatic drop in failure rate occurs for those whose OKT scores are greater than or equal to 75; if, however, failure rates across experience groups are examined, other possible cutting scores appear. For the No Experience group, the proportion of failures is fairly constant until the OKT scores are 80 or higher, but only 5 percent of the group had scores in this range. The failure rate for the Some Experience group indicates that a cutting score of 75 or higher might work best for that group, while the data for the ATC Experience group indicate clearly that 70 or higher would be a good cutting score. Preliminary scanning of the data identifies three possible cutting scores for assigning credit based on OKT scores, either 70, 75, or 80 points or higher.

Table 2 shows the passes and fails across experience groups when no cutting score is used and when each of the three cutting scores is used, for those who are above and those who are below the cut scores. As can be seen from Table 2, 53.7 percent of the sample scored above 70, 42 percent scored 75 or above,

TABLE 1

Passes and Failures at the FAA Academy Based on Occupational Knowledge Test Scores for Three 1976 Experience Groups and for the Total Group

OKT Score Range	All Experience Groups				No Experience				Some Experience				ATC Experience			
	Total	Pass	Fail	% Fail	Total	Pass	Fail	% Fail	Total	Pass	Fail	% Fail	Total	Pass	Fail	% Fail
0-59	227	184	43	18.9	167	135	32	19.2	44	37	7	15.9	16	12	4	25.0
60-64	59	50	9	15.3	22	19	3	13.6	16	15	1	6.3	21	16	5	23.8
65-69	77	67	10	13.0	21	18	3	14.3	32	31	1	3.2	24	18	6	25.0
70-74	92	81	11	12.0	15	13	2	13.3	35	31	4	11.4	42	37	5	11.9
75-79	125	120	5	4.0	13	11	2	15.4	38	36	2	5.3	74	73	1	1.4
80+	204	199	5	2.5	12	12	0	0.0	42	41	1	2.4	150	146	4	2.7
Total	754	701	83	10.6	250	208	42	16.8	207	191	16	7.7	327	302	25	7.6

TABLE 2

Possible Cutting Scores Across Experience Groups Showing Pass/Fail Status at the Academy

With No Cutting Score on OKT

	Total	Pass	Fail	% Fail
All Groups	784	701	83	10.6
No Experience	250	208	42	16.8
Some Experience	207	191	16	7.7
ATC Experience	327	302	25	7.6

For Those Who Scored 70 or Better on OKT

	Total	Pass	Fail	% Fail
All Groups	421	400	21	5.5
No Experience	40	36	4	10.0
Some Experience	115	108	7	6.1
ATC Experience	266	256	10	3.8

For Those Who Scored Less Than 70 on OKT

	Total	Pass	Fail	% Fail
All Groups	363	301	62	17.1
No Experience	210	172	38	18.1
Some Experience	92	83	9	9.8
ATC Experience	61	46	15	24.6

For Those Who Scored 75 or Better on OKT

	Total	Pass	Fail	% Fail
All Groups	329	319	10	3.0
No Experience	25	23	2	8.0
Some Experience	80	77	3	3.8
ATC Experience	224	219	5	2.2

For Those Who Scored Less Than 75 on OKT

	Total	Pass	Fail	% Fail
All Groups	455	382	73	16.0
No Experience	225	185	40	17.8
Some Experience	127	114	13	10.2
ATC Experience	103	83	20	24.1

For Those Who Scored 80 or Better on OKT

	Total	Pass	Fail	% Fail
All Groups	204	199	5	2.5
No Experience	12	12	0	0.0
Some Experience	42	41	1	2.4
ATC Experience	150	146	4	2.7

For Those Who Scored Less Than 80 on OKT

	Total	Pass	Fail	% Fail
All Groups	580	502	78	13.4
No Experience	238	196	42	17.6
Some Experience	165	150	15	9.1
ATC Experience	177	156	21	11.9

and 26 percent scored above 80. The proportion of failures was reduced from 10.6 percent in the overall sample to 5.5 percent, 3.0 percent, and 2.5 percent, respectively, for the three cutting scores. It is evident that the .5 reduction in percentage of failures gained by going from a cut score of 75 to a cut score of 80 does not justify the 16-percent drop in the proportion of trainees above the latter cut score. The decision on appropriate cutting scores is narrowed down to being between 70 and 75.

The evidence indicates that a cutting score of 75 is consistently better than the cut score of 70, although the differences are not dramatic. It is possible that the differences observed between the two cutting systems will not hold up under cross-validation. In order to determine this, a second sample of 432 trainees who entered and completed training in 1977 and had taken the OKT was evaluated.

Cross-Validation

There were 432 trainees in the cross-validation sample who entered training between January 11, 1977, and March 8, 1977, and who either passed or failed training, had taken the OKT, and for whom experience information was known. Table 3 shows the number of those who passed and failed and the

TABLE 3

Cross-Validation Sample 1977

Group	Total N	Pass	Fail	% Fail
Total	432	376	56	13.0
No Experience	124	99	25	20.0
Some and ATC Experience	308	277	31	11.0
Greater than or equal to 70 on OKT	253	240	13	5.1
Less than 70 on OKT	179	136	43	24.0
Greater than or equal to 75 on OKT	185	178	7	3.8
Less than 75 on OKT	247	198	49	19.8

proportion of failures for the following groups: (1) the total group, (2) those with experience, (3) those without experience, (4) those who scored at or above the OKT cut scores of 70 and 75, and (5) those who scored below the cut scores of 70 and 75. As can be seen from Table 3, the data from the 1977 sample is consistent with that from the 1976 sample. The proportion of failures for those who received credits for experience is 11 percent while the failure rate drops to 5.1 percent for those who scored above 70 on OKT and to 3.8 percent for those who scored above 75. As shown in Figure 3, OKT again

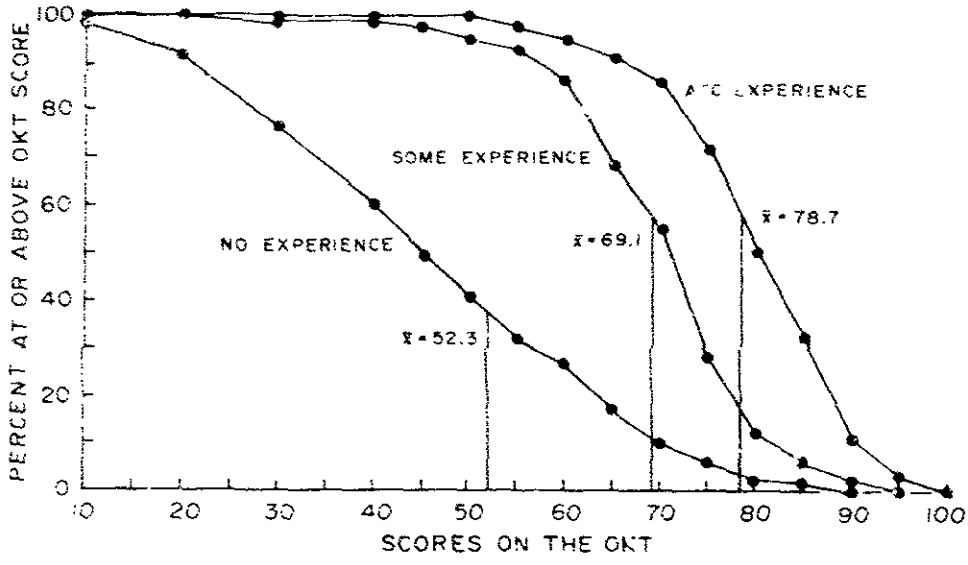

Figure 3. OKT scores by experience group 1977 cross-validation sample.

clearly differentiated experienced individuals from those with no experience. The correlation of experience and OKT was .67. Figure 4 shows the proportion of passing and of failing students who scored at the same level or above OKT scores for the 1977 sample. Again, the OKT scores separate the groups and

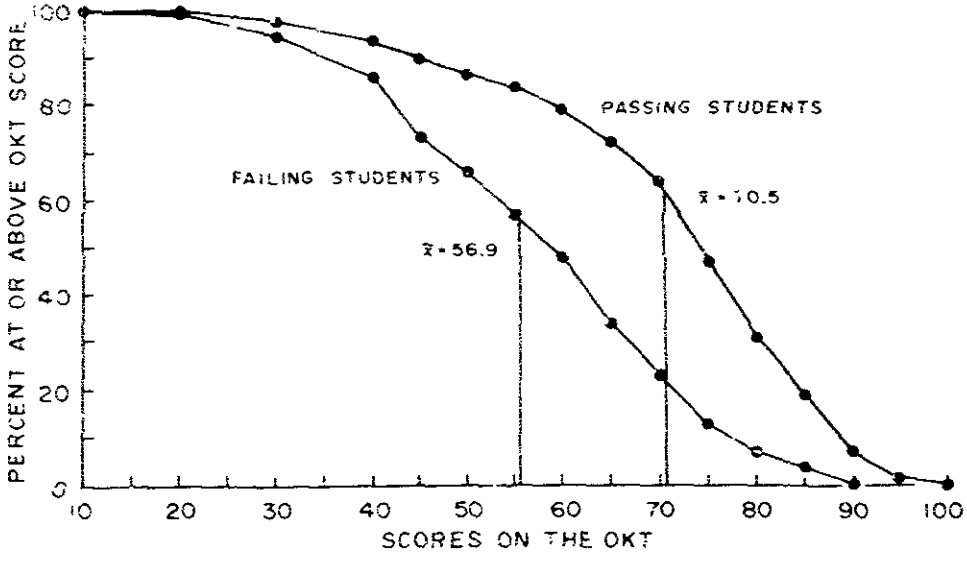

Figure 4. OKT scores by pass/fail status 1977 cross-validation sample.

correlate with pass/fail status .28. Clearly, the use of the Occupational Knowledge Test would be an improvement over the use of experience (which correlated with pass/fail status .18) as a means of assessing an applicant's

ATC-related knowledge prior to training. OKT scores appear to be very closely related to prior experience, yet at the same time are more sensitive to those aspects of prior experience that relate to success in ATC training.

OKT Cut Score

The ultimate decision on which cut score to use on the OKT is a subjective one. If the data for 1976 and 1977 are combined, a cut score of 70 would result in a failure rate of 5.0 percent for those getting credit, while a 75 cut score would result in a 3.3-percent failure rate. If we assume that there will be 1,600 trainees during the year, and that the proportions failing and scoring at or above 70 and 75 on OKT will remain relatively constant, we can project the effect of this cutting system over a year. If a cutting score of 70 is used, 887 of the trainees would get extra points, and 45 of those trainees would fail. If a cutting score of 75 is used, 676 trainees would get points and 22 of those trainees would fail. This means that 211 people who would pass and get extra points with a 70 cutoff score would not get extra points with a 75 cut score. Twenty-three of the people who would get extra points with a 70 cutoff but would fail, would not get extra points with the 75 cut score. Approximately 11 percent of the individuals who scored between 70 and 75 on the OKT would subsequently fail training, indicating that a meaningful savings could be made by using a cut point of 75 instead of 70 on the OKT. If prior experience were used to assign extra credit, 1,108 of the 1,600 students would receive extra credit and 95 of them would fail. Based on the data cited above, it is recommended that the OKT with a cut score of 75 be used to assign extra credit for the selection of air traffic controllers, in place of the current experience scale.

Implications

The results of this study indicate that the OKT could be a practical means of assigning extra credit to ATC applicants with useful aviation knowledge. It appears that the OKT would improve current methods for allowing extra credit for experience because it relates to the quality rather than just the quantity of past experience. Because the OKT is very highly related to prior experience, many of the people receiving credit for past experience under the current procedure would also receive extra credit based on the OKT. However, many of those individuals currently receiving extra credit for experience who subsequently fail training would not receive extra credit if OKT scores were used.

The use of the OKT to replace the assessment of previous experience would be a very cost effective means of assigning extra credit. It would minimize the need to review CSC Form SF-171's to determine the applicants' relevant experience and would reduce the number of work hours required to assign extra points. In addition, the proportion of individuals who now receive extra credit based on the ATC Rating Guide and who later fail training would be

reduced from 7.6 percent to 3.8 percent. Thus, it is recommended that the OKT with a cut score of 75 be used in place of the experience scale to assign extra credit.

Additional Research

The Federal Aviation Administration in conjunction with the Civil Service Commission is in the process of evaluating changes to the CSC ATC selection test battery. As part of this effort, the OKT will be examined to determine if it makes a meaningful contribution to a revised battery, and if so, how many additional points for ATC job-related experience should be allowed based on OKT scores. It is probable that the OKT will continue to make a meaningful contribution to any selection procedure since the correlations of OKT with other possible battery components are very small. It appears that the Occupational Knowledge Test is a valid measure of those experiences that an individual brings on board that are related to success as an FAA air traffic controller.

References

1. Cobb, B. B., and P. L. Nelson: Aircraft-Pilot and Other Preemployment Experience as Factors in the Selection of Air Traffic Controller Trainees. FAA Office of Aviation Medicine Report No. FAA-AM-74-8, 1974.

2. Marshall-Mies, J., J. G. Colmen, and O. Domenech: Predicting Success of Applicants for Positions as Air Traffic Control Specialists in the Air Traffic Service, Education and Public Affairs, Washington, D.C., 1977.

END

April 23, 1981