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COMPARISON OF TECHNICAL SCHOOL AND ON-THE-JOB TRAINING AS METHODS OF SKILL UPGRADING

By

Doris Black
Robert A. Bottenberg

PERSONNEL DIVISION
Lackland Air Force Base, Texas

December 1970

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13. ABSTRACT

In the Air Force, basic technical skills classified as Category B skills are those in which a portion of the total personnel requirement is formally trained in a technical training course and the remainder is trained on the job (OJT). Determination of the relative numbers of airmen to be trained in formal courses and in on-the-job training is based, in part, upon the time required to qualify a specialist at the five-skill, or fully qualified level. This report provides information on rates of progression to the five-skill level in Category B skills by comparing samples of technical school and on-the-job training personnel. Development of the methodology used to measure the rates of progression to the five-skill level was described, along with an explanation of the achievement ratio defined in this study. Achievement rates from Basic Military Training (BMT) graduation to award of the five-skill level were investigated. In the majority of the Category B specialties, there was inconclusive evidence of any advantage for technical training over OJT. In the specialties in which there were substantial differences between the two groups, the differences in most cases favored technical training. There were two specialties in which neither training group was superior to the other. The achievement rates after award of the three-skill level (i.e., apprentice level) to award of the five-skill level were not entirely consistent with achievement rates from BMT graduation to the five-skill level. In many cases, it was found that OJT personnel progressed more rapidly than technical school personnel from the three-skill to the five-skill level.

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FOREWORD

The work reported in this study was accomplished under Project 6323, Personnel Management Research and Development; Task 632304, Specific Analytical Studies of the Personnel System. The findings of this report were made in partial response to RPR 69-15, Comparison of Times for Qualification of Airmen in Category B and Category C Skills, originated by ATC (ATTMC).

This report has been reviewed and is approved.

George K. Patterson, Colonel, USAF
Commander

ABSTRACT

In the Air Force, basic technical skills classified as Category B skills are those in which a portion of the total personnel requirement is formally trained in a technical training course and the remainder is trained on the job (OJT). Determination of the relative numbers of airmen to be trained in formal courses and in on-the-job training is based, in part, upon the time required to qualify a specialist at the five-skill, or fully qualified, level. This report provides information on rates of progression to the five-skill level in Category B skills by comparing samples of technical school and on-the-job training personnel. Development of the methodology used to measure the rates of progression to the five-skill level was described, along with an explanation of the achievement ratio defined in this study. Achievement rates from Basic Military Training (BMT) graduation to award of the five-skill level were investigated. In the majority of the Category B specialties, there was inconclusive evidence of any advantage for technical training over OJT. In the specialties in which there were substantial differences between the two groups, the differences in most cases favored technical training. There were two specialties in which neither training group was superior to the other. The achievement rates after award of the three-skill level (i.e., apprentice level) to award of the five-skill level were not entirely consistent with achievement rates from BMT graduation to the five-skill level. In many cases, it was found that OJT personnel progressed more rapidly than technical school personnel from the three-skill to the five-skill level.

SUMMARY

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Problem

Basic technical skills for which airmen are trained are divided into three categories based on the complexity of training and the presumed adaptability of training to an on-the-job environment. Formal training is provided for one hundred percent of the personnel requirement in Category A skills; in Category C skills, one hundred percent of the personnel requirement receive directed duty assignment (DDA) for on-the-job training (OJT). In Category B skills, a portion of the total requirement are formally trained and the remainder are trained on-the-job. Adjustments in the relative numbers of airmen trained in formal courses and in OJT in B skills are based, in part, upon the time required to qualify a specialist at the five-skill, or fully qualified, level. A systematic methodology is needed to track the progress of airmen in Category B skills to provide Air Training Command program managers with an efficient means of determining the extent to which Category B skill requirements should be met through formal training and through on-the-job training. The objective of the present study was the development of a measure for achievement rates to the five-skill level in Category B skills and the comparison of technical school and on-the-job training as methods of skill upgrading.

Approach

To obtain information on the achievement rates to the five-skill level in Category B skills, a sample group was compiled of airmen whose sequence of Primary Air Force Specialty Codes (AFSCs) indicated a continuous progression within one of the Category B AFSCs. For each case within a specialty, the number of months of opportunity to achieve the five-skill level was determined; the end date for months of opportunity was taken to be the earliest of (*a*) the as-of date of the file (31 December 1969), (*b*) the date of separation, or (*c*) the date associated with the earliest Primary AFSC indicating transfer to a different specialty. Each case was identified as to whether or not the five-skill level had been achieved within the specialty in question during the available months-of-opportunity time span. If so, the number of elapsed months between Basic Military Training (BMT) graduation and award of the five-skill level was determined. Ratios of the number of cases who actually achieved the five-skill level in *n* months or less to the number of cases within the specialty who had *n* or more months of opportunity to achieve the five-skill level were developed from the data. The ratios were computed for each specialty for months of opportunity 0 through 36, with a breakdown by training group and by Armed Forces Qualification Test (AFQT) mental ability group (Mental Category).

Normally, upon completion of technical training, the three skill, or apprentice, level is awarded. The technical school graduate is then assigned to the field and enters a program of training on the job culminating in the award of the five-skill level. Airmen assigned directly to a duty assignment upon completion of BMT obtain both the three-skill and the five-skill level by means of an on-the-job training program. Progression rates to the five-skill level after award of the three-skill level were computed using the same methodology described previously to determine whether the method of acquiring the three-skill level (whether OJT or formal training) differentially affected the times required to attain the five-skill level. The beginning date for months of opportunity was the date of award of the three-skill level.

Results

In many of the Category B AFSCs represented in the sample, there was inconclusive evidence of any advantage for technical training over OJT when comparing how rapidly the two groups achieve the five-skill level after BMT graduation. The absence of clear-cut differences in many cases was attributable to inadequate sample size. There was suggestive evidence, when comparing the times from BMT graduation to award of the five-skill level, that technical training is superior to OJT with regard to AFSC 54750 (Heating Systems Specialist), AFSC 57150 (Fire Protection Specialist), and AFSC 81150 (Security Specialist). Conversely, in AFSC 58250 (Fabric and Rubber Products Repairman), there is suggestive evidence that OJT is superior to technical training when comparing times from BMT graduation to award of the five-skill level.

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In AFSC 55150 (Pavements Maintenance Specialist) and in AFSC 62250 (Cook), there is evidence that neither type of training is superior to the other when comparing times from BMT graduation to award of the five-skill level. Differences were noted in times to award of the five-skill level between the four AFQT Mental Categories which demonstrated that achievement of the five-skill level was more rapid for airmen in the higher Mental Categories. Rates of progression from the three-skill to the five-skill level were not entirely consistent with rates of progression from BMT graduation to the five-skill level. OJT personnel, in many cases, progressed from the three-skill to the five-skill level in higher proportions than technical school personnel, suggesting that achievement of the five-skill level is expedited for personnel who acquired the three-skill level by means of an on-the-job training program.

Conclusions

On the basis of these results, it was concluded that in AFSCs 54750, 57150, 81150, and 58250 differential rates of acquisition of the journeyman skill level provide a basis for shifting the emphasis in training policy toward either technical training or DDA. In AFSCs 54750, 57150, and 81150, a shift in emphasis toward technical training is indicated; in AFSC 58250, a shift toward DDA is indicated. It is recommended that factors contributing to more rapid acquisition of the fully qualified skill level via one type of training or the other be identified and studied. The role of such factors should be thoroughly understood before implementing irreversible decisions regarding the relative emphasis on type of training.

This summary was prepared by Doris Black, Computer and Management Sciences Branch, Personnel Division, Air Force Human Resources Laboratory.

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COMPARISON OF TECHNICAL SCHOOL AND ON-THE-JOB TRAINING AS METHODS OF SKILL UPGRADING

I. INTRODUCTION

Basic technical skills for which airmen are trained are divided into three categories. The complexity of training and the adaptability of training to an on-the-job environment are the bases for the categorization. In Category A skills, one hundred percent of the personnel requirement receive formal training; whereas, in Category C skills, one hundred percent of the personnel requirement receive directed duty assignment (DDA) for on-the-training (OJT). The Category B skills include those Air Force Specialties in which a proportion of the personnel requirement receive formal training in a technical training course while the remaining proportion are sent directly to a duty assignment upon completion of Basic Military Training (BMT). Adjustments in the relative numbers of airmen trained in formal courses and in OJT for the Category B skills are based, in part, upon the time required to qualify a specialist at the five-skill, or fully qualified, level.

In a study by Bateman (1965), an economic cost model using a Cobb-Douglas production function was formulated to determine the most cost-effective policy in the matter of appropriate allocations to training programs. In this formulation of the Cobb-Douglas model, the expected numbers of semiskilled and skilled man-weeks for airmen with a four-year enlistment are essential components of the production function. Skilled man-weeks are defined in terms of the number of man-weeks available at or above the five-skill level. The Bateman study, which considered only ten of the Category B skills, is primarily an illustrative application of an econometric approach. The analysis is based on the assumption that expected time to the five-skill level is greater for airmen trained in an OJT program than for those undergoing formal training. On the basis of this assumption and others involving the relationship between parameters of the Cobb-Douglas model, the conclusion was reached that the most cost-effective approach would be 100 percent formal training for one of the ten Air Force specialties. For five of the specialties, the most cost-effective approach would be OJT; for the four remaining, the optimum allocation would be some mix of both OJT and formal training. The present study represents an empirical analysis of the two types of training, providing comparative information on the time required to achieve the five-skill level for the two training groups. The results serve as a preliminary basis for evaluating assumptions underlying the management of training for Category B skills.

II. STATEMENT OF THE PROBLEM

In the development of a measure for achievement rates to the five-skill level (i.e., the time required to achieve to five-skill level) and in the comparison of technical training and OJT subgroups, primary interest centered on the time lapse from BMT graduation to award of the five-skill level. A secondary question was also investigated: The times from award of the three-skill, or apprentice, level to award of the five-skill level were compared for technical training and OJT subgroups. Normally, upon completion of technical training, the three-skill level is awarded. The airman is subsequently assigned to the field and enters a program of training on the job culminating in the award of the five-skill level. For the airman assigned directly to a duty assignment upon completion of BMT, the attainment of the three-skill level and, subsequently, the five-skill level is by means of an on-the-job training program. It was hoped that investigation of the secondary question would reveal whether the rate of progression from the three-skill level to the five-skill level was differentially affected by the method of acquiring the three-skill level, whether through OJT or formal training.

In addition to comparisons of rates of progression to the five-skill level in Category B skills for technical training and OJT subgroups, similar comparisons within Mental Category subgroups were made. The Mental Categories, from I through V, are based on the ranges of scores on the Armed Forces Qualification Test (AFQT), which divides the applicant population on the basis of this measure of general ability.

In order to provide information on the rate at which the five-skill level is achieved in the different Category B skills, data were extracted from the Project 100,000 data file maintained by the Personnel Division. This file provides a data base which makes it possible to track the progression of an airman from enlistment to the as-of date of the file. Project 100,000 was initiated in January 1967. It is intended primarily to make possible

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Table 1. **Category B Air Force Specialties Represented in the Sample**

AFSC	Air Force Specialty	Number of Cases
20650	Imagery Interpreter Specialist	125
23352	Motion Picture Laboratory Specialist	Less than 100
23354	Still Photographic Laboratory Specialist	128
23650	Motion Picture Camera Specialist	Less than 100
23651	Still Photographic Camera Specialist	Less than 100
29150	Communications Center Specialist	1,234
36150	Outside Wire and Antenna Maintenance Repairman	125
36154	Cable Splicing Specialist	99
47250	Base Maintenance Equipment Repairman	Less than 100
47251	Special Vehicle Repairman	128
47350	General Purpose Vehicle Repairman	422
47351	Vehicle Body Repairman	Less than 100
53150	Machinist	Less than 100
54250	Electrician	109
54251	Electric Power Line Specialist	Less than 100
54750	Heating Systems Specialist	290
55150	Pavements Maintenance Specialist	504
55151	Construction Equipment Operator	333
55250	Carpentry Specialist	166
55254	Protective Coating Specialist	242
55255	Plumbing Specialist	282
55450	Real Estate Cost-Management Analysis Specialist	Less than 100
56350	Water and Waste Processing Specialist	282
56650	Engineering Entomology Specialist	Less than 100
57150	Fire Protection Specialist	1,184
58250	Fabric and Rubber Products Specialist	103
62250	Cook	1,039
63150A	Fuel Specialist-Petroleum Fuels (Changed to 63150, Fuel Specialist, effective 1 March 70)	1,135
64750	Materiel Facilities Specialist	1,851
70250	Administrative Specialist	5,310
72150	Information Specialist (Changed to 79150, Information Specialist, effective 1 July 69)	181
81150	Security Specialist	6,273
90250	Medical Service Specialist	739
90650	Medical Administrative Specialist	166
91350	Physical Therapy Specialist	Less than 100
91351	Occupational Therapy Specialist	Less than 100
98150	Dental Specialist	262

comparisons between low-level mental ability, marginal physical standards, and control group segments of the airman population. The Project 100,000 file contains records on all airmen in Mental Categories I and IV (AFQT centile ranges 93-99 and 10-30, respectively) and an approximately ten-percent random sample of Mental Categories II and III (AFQT centile ranges 65-92 and 31-64, respectively) who entered active duty on or after 1 January 1967. The as-of date of the file was 31 December 1969.

A small number of personnel are awarded the three-skill level upon completion of Basic Military Training through the by-pass specialist program. Initially, interest was expressed in comparing five-skill level achievement of the by-pass specialist subgroup with formal training and OJT subgroups. However, the number of cases available for analysis in the by-pass specialist group was too small to provide meaningful comparisons.

III. SAMPLE

Cases selected for inclusion in the sample were limited to those whose records contained a sequence of Primary Air Force Specialty Codes (AFSCs) which indicated a continuous progression within one of the Category B specialties. A total of 23,118 cases in Category B specialties were selected. The list of specialties represented in the sample, along with the number of cases in each, is displayed in Table 1.

IV. VARIABLES

Definition of the criterion variable of primary interest in this study was based largely on considerations involving the nature of the Project 100,000 population. A question regarding the time required to achieve the five-skill level suggests an analysis in terms of the average number of months across cases following a similar career progression path. The computation of such an average assumes that the number of months to achieve the five-skill level is known for all cases on whom the average is obtained. Use of data from the Project 100,000 file makes it impossible to compute such averages, however, since a significant proportion of cases within a specialty had not attained the five-skill level as of 31 December 1969. The use of an average time to the five-skill level for only a subset of cases within a specialty who had achieved the five-skill level on or before 31 December 1969 would distort the findings by providing underestimates of true average time to the five-skill level. The extent of the distortion resulting from this approach would be difficult, if not impossible, to estimate.

An alternative method of summarizing the rate of progression to the five-skill level was employed. The number of months of opportunity to achieve the five-skill level was determined for each case within a specialty. The beginning date for months of opportunity was considered to be date of graduation from Basic Military Training. The end date for months of opportunity was taken to be the earliest of (*a*) the as-of date of the file, (*b*) the date of separation, or (*c*) the date associated with the earliest Primary AFSC indicating transfer to a different specialty. Each case was also identified as to whether or not the five-skill level had been achieved within the specialty in question during the available months-of-opportunity time span. If so, the number of elapsed months between graduation from Basic Military Training and award of the five-skill level was determined. With these data, it was possible to develop the ratio of the number of cases who actually achieved the five-skill level in n months or less to the number of cases within the specialty who had n or more months of opportunity to achieve the five-skill level. Such a ratio shows for each value of n the proportion of those cases who could have achieved the five-skill level who actually did achieve the five-skill level. The same methodology was employed in computing rates of progression to the five-skill level from award of the three-skill level. In this case, the beginning date for months of opportunity was considered to be the date of award of the three-skill level.

V. RESULTS

Table 2 is an example of the tables of achievement rates prepared for each of 37 Category B specialties. In this case, the achievement rates from BMT graduation to award of the five-skill level are displayed for AFSC 81150 (Security Specialist). Each column represents a combination of Mental Category and type of training. The rows indicate months of opportunity. Strictly interpreted, this means "n or more" months of opportunity. The cell entries indicate the proportion of cases in the subgroup in question having n or more months of opportunity and achieving the five-skill level within n months or less after graduation from BMT. For example, Table 2 indicates that in

Table 2. **Achievement Rates from BMT Graduation to Award of the Five-Skill Level for AFSC 81150 for Technical School and On-the-Job Training Subgroups**

(Non-Prior-Service Airmen Achieving 5-Skill Level in n or Fewer Months Expressed as a Proportion of Those Having n or More Months of Opportunity)

Months of Opportunity	Mental Category I		Mental Category II		Mental Category III		Mental Category IV	
	Tech Sch	OJT	Tech Sch	OJT	Tech Sch	OJT	Tech Sch	OJT
10	0.335	0.395	0.336	0.369	0.302	0.260	0.231	0.171
11	0.451	0.548	0.453	0.423	0.401	0.329	0.327	0.232
12	0.610	0.619	0.578	0.523	0.515	0.388	0.407	0.289
13	0.693	0.632	0.655	0.579	0.587	0.429	0.478	0.341
14	0.735	0.694	0.754	0.639	0.673	0.498	0.551	0.395
15	0.772	0.765	0.797	0.690	0.756	0.526	0.616	0.433
16	0.811	0.788	0.813	0.711	0.810	0.599	0.663	0.493
17	0.863	0.821	0.862	0.756	0.862	0.696	0.716	0.569
18	0.899	0.815	0.884	0.803	0.897	0.768	0.757	0.625
19	0.912	0.852	0.909	0.840	0.912	0.808	0.780	0.680
20	0.930	0.889	0.952	0.853	0.930	0.857	0.810	0.730
21	0.934	0.885	0.952	0.867	0.950	0.872	0.838	0.772
22	0.947	0.885	0.959	0.887	0.955	0.882	0.860	0.808
23	0.957	0.870	0.966	0.892	0.965	0.895	0.869	0.834
24	0.957	0.870	0.961	0.919	0.970	0.911	0.888	0.858

Mental Category I, 0.335, or 33.5 percent, of the technical school personnel who had 10 or more months of opportunity after BMT graduation achieved the five-skill level in 10 months or less.

In general, the proportions increase as months of opportunity increase. There are a few instances in which the reported proportion decreases as months of opportunity increase. These reversals usually appear at high values of months of opportunity. They are accounted for by the use of a small frequency in the denominators of two successive ratios. For example, if five cases have 20 or more months of opportunity and four of the five have achieved the five-skill level, the proportion is 0.80. If two of these five were separated within the 21st month, both of whom had achieved the five-skill level, there would be three cases with 21 or more months of opportunity, two of whom had achieved the five-skill level. The resulting ratio would be 0.67, which on the surface would appear to indicate a decrease in proportion achieving the five-skill level with an increase in months of opportunity. Such fluctuation of ratios, typical where frequencies are small, limits interpretation of data based upon them.

In addition to the 37 tables with achievement rates from BMT graduation to the five-skill level, a second set of 37 tables was prepared with achievement rates from award of the three-skill level to award of the five-skill level. Their construction was similar to that of the first set. However, the beginning date for months of opportunity was the date of award of the three-skill level, rather than BMT graduation.

Summary material descriptive of the two sets of 37 tables appears in Tables 3 and 4. Table 3 deals with the progression rates to the five-skill level from BMT graduation. Table 4 deals with the progression rates to the five-skill level from award of the three-skill level. The achievement ratio averages and ranges for technical school and OJT subgroups at specific months-of-opportunity points are displayed within Mental Categories. A minimum of 25 cases by the 15th month in each BMT disposition group within a Mental Category was selected as a cutoff for inclusion of an AFSC in the computation of summary statistics displayed in Tables 3 and 4. The AFSCs which met the requirement for each Mental Category are indicated in the tables. It is noted that only two AFSCs, 29150 and 81150, had adequate subgroup sample sizes to be included in the computation of Mental Category I summary statistics displayed in Tables 3 and 4.

In Tables 3 and 4, achievement ratio averages and ranges are displayed for specific months-of-

opportunity points. The four time points selected for reporting purposes in these tables were chosen to cover observed achievement rates in the range from .20 to .80 insofar as possible. In Table 3, where progression rates from BMT graduation to award of the five-skill level are involved, the time points are months 12, 15, 18, and 21. Table 4, dealing with progression rates from the three-skill level to the five-skill level, displays achievement ratio averages and ranges for months 6, 9, 12, and 15.

The averages displayed in Tables 3 and 4 are simply arithmetic means which have not been weighted by the number of cases in the different AFSCs. In Table 3, the average for technical school personnel in Mental Category I for month 12 was computed using the sum of the ratios encountered in month 12 for Category I technical school personnel in AFSCs 29150 and 81150. All the averages in Tables 3 and 4 were computed similarly, with a varying number of AFSCs involved in computing the averages for a Mental Category.

Progression Rates from BMT Graduation to Five-Skill Level

It can be seen from Table 3 that within each type of assignment the average achievement ratio for Mental Category IV for a given month was less than the corresponding average for Mental Category III. In all cases the Mental Category III average for a given month was less than the corresponding Mental Category II average. The Mental Category II averages were less than their corresponding Mental Category I averages except for the case of the technical school average in month 21.

In all four Mental Categories, across the four points in time, technical school achievement ratio averages were greater than their corresponding OJT achievement ratio averages with two exceptions: in Mental Category I, month 21, as has been indicated, and in Mental Category II, month 12, for which the OJT average was slightly greater than the technical school average.

[1] For the purposes of this presentation, a significant difference is a difference between ratios greater than or equal to 0.10. This usage is not necessarily consistent with the notion of statistical significance.

[2] Unless otherwise indicated, when significant differences are reported for at least two month points per Mental Category, the same trend existed at the intermediate month points. If a significant difference is reported for only one month point in a Mental Category, the advantage for the same disposition group was found at the adjacent month points and, in some instances, at month points even more remote.

Table 3 suggests an overall trend in which technical school personnel, when compared with OJT personnel having the same time opportunity after graduation from Basic Military Training, progress from BMT graduation to the five-skill level in higher proportions. In view of this trend there might be a tendency to favor a general shift in training policy toward technical training. However, the question of such a shift in any AFSC is dependent on the trend that exists in the individual AFSC. Inspection of the individual AFSCs entering the averages displayed in Table 3 reveals that this trend is not true in all cases.

To determine the trend for an individual AFSC, a summarization procedure was used: The technical school and OJT progression rates from BMT graduation to the five-skill level within an AFSC and Mental Category were compared at three specific time points, or months of opportunity to achieve the five-skill level. A comparison within a Mental Category at a given month was not performed unless each disposition subgroup had a minimum of 30 cases at the month point in question. Three unique month points for each AFSC were selected. The month points selected for each AFSC were the median for the AFSC as a whole and two month points which were spaced symmetrically on either side of the median so as to provide an adequate range.

There were two AFSCs, 55150 (Pavements Maintenance Specialist) and 62250 (Cook), in which there was evidence that neither training group was superior to the other when comparing the times from BMT graduation to award of the five-skill level. There were eight AFSCs for which there was suggestive evidence that one disposition group was superior to the other. It should be noted, however, that for several of the eight AFSCs, the only Mental Category subgroup in which sample size was considered sufficient was Mental Category IV. A brief description of the results for each of the eight AFSCs is presented.

1. AFSC 29150, Communications Center Specialist. At the earliest month point of interest, month 10, in each Mental Category, the OJT and technical school ratios were approximately the same. At the month point representing the median, month 14, the technical school ratio was significantly[1] greater than the OJT ratio in Mental Categories I and III. At the latest month point of interest, month 18, the technical school ratio was significantly greater than the OJT ratio in Mental Categories III and IV. No other significant differences were encountered.[2]

Table 3. **Average Progression Rate from BMT Graduation to Award of Five-Skill Level for Technical School and On-the-Job Training Subgroups Within AFQT Mental Categories**

Months of Opportunity	Average Progression Rate from BMT to Five-Skill Level for AFQT Mental Categories							
	Category I (Based on 2 AFSCs)		Category II (Based on 2 AFSCs)		Category III (Based on 6 AFSCs)		Category IV (Based on 14 AFSCs)	
	Tech School	OJT	Tech School	OJT	Tech School	OJT	Tech School	OJT
12 Months								
Average	0.56	0.49	0.46	0.47	0.38	0.34	0.22	0.18
Range	0.50-0.61	0.36-0.62	0.34-0.58	0.42-0.52	0.21-0.52	0.26-0.46	0.03-0.41	0.06-0.32
15 Months								
Average	0.80	0.72	0.78	0.65	0.69	0.54	0.44	0.38
Range	0.77-0.83	0.67-0.76	0.76-0.80	0.61-0.69	0.42-0.84	0.36-0.70	0.10-0.64	0.19-0.58
18 Months								
Average	0.90	0.84	0.85	0.81	0.78	0.71	0.59	0.52
Range	0.89-0.90	0.82-0.87	0.82-0.88	0.80-0.82	0.54-0.90	0.57-0.81	0.26-0.76	0.27-0.79
21 Months								
Average	0.92	0.94	0.94	0.92	0.88	0.84	0.72	0.67
Range	0.91-0.93	0.88-1.0	0.92-0.95	0.87-0.96	0.66-1.0	0.76-0.94	0.42-0.88	0.33-0.90

Note.—AFSCs included in computations for Mental Categories:

29150—I, II, III, IV	55254— IV	58250— IV	70250— III, IV
47350— IV	55255— IV	62250— IV	81150—I, II, III, IV
54750— IV	56350— IV	63150—III, IV	
55150— IV	57150—III, IV	64750—III, IV	

Table 4. **Average Progression Rate from Award of Three-Skill Level to Award of Five-Skill Level for Technical School and On-the-Job Training Subgroups Within AFQT Mental Categories**

Months of Opportunity	Average Progression Rate from Three-Skill Level to Five-Skill Level for AFQT Mental Categories							
	Category I (Based on 2 AFSCs)		Category II (Based on 2 AFSCs)		Category III (Based on 4 AFSCs)		Category IV (Based on 13 AFSCs)	
	Tech School	OJT	Tech School	OJT	Tech School	OJT	Tech School	OJT
6 Months								
Average	0.24	0.46	0.22	0.36	0.17	0.25	0.13	0.22
Range	0.14-0.35	0.42-0.50	0.17-0.28	0.36-0.37	0.13-0.23	0.24-0.26	0.06-0.21	0.11-0.43
9 Months								
Average	0.67	0.77	0.66	0.67	0.49	0.54	0.38	0.46
Range	0.56-0.78	0.77-0.77	0.59-0.72	0.66-0.68	0.32-0.64	0.49-0.68	0.20-0.52	0.30-0.63
12 Months								
Average	0.88	0.84	0.82	0.82	0.74	0.73	0.59	0.62
Range	0.84-0.91	0.78-0.90	0.79-0.86	0.78-0.85	0.53-0.85	0.69-0.86	0.36-0.76	0.50-0.90
15 Months								
Average	0.92	0.88	0.91	0.86	0.82	0.88	0.70	0.78
Range	0.91-0.94	0.81-0.96	0.90-0.92	0.85-0.86	0.65-0.90	0.84-0.97	0.43-0.90	0.64-0.97

Note.—AFSCs included in computations for Mental Categories:

29150—I, II, III, IV	55255—IV	62250— IV	81150—I, II, III, IV
54750— IV	56350—IV	63150— IV	
55150— IV	57150—IV	64750—III, IV	
55254— IV	58250—IV	70250—III, IV	

2. *AFSC 54750, Heating Systems Specialist.* Sufficient data were available only for Mental Category IV personnel. At each of the three month points of interest, the Mental Category IV technical school ratio was significantly greater than the Mental Category IV OJT ratio.

3. *AFSC 56350, Water and Waste Processing Specialist.* Sufficient data were available only for Mental Category IV personnel. At the earliest month point of interest, month 13, Mental Category IV OJT and technical school ratios were approximately the same. At the month point representing the median, month 16, and at the latest month point of interest, month 19, the Mental Category IV technical school ratio was significantly greater than the Mental Category IV OJT ratio.

4. *AFSC 57150, Fire Protection Specialist.* Sufficient data were available for Mental Categories III and IV. At each of the three month points of interest, the Mental Category IV technical school ratio was significantly greater than the Mental Category IV OJT ratio. Mental Category III technical school personnel had a significantly higher ratio than Mental Category III OJT personnel at the earliest month point, month 11. There were insufficient data for Mental Category III at the other two month points.

5. *AFSC 58250, Fabric and Rubber Products Repairman.* Sufficient data were available for Mental Category IV only. At the earliest month point of interest, month 9, and at the median month point, month 14, Mental Category IV OJT personnel had significantly higher ratios than Mental Category IV technical school personnel. At one of the interim month points, the difference dropped below 0.10, but the difference was consistently in favor of OJT. There were insufficient data for Mental Category IV at the third point of interest.

6. *AFSC 64750, Materiel Facilities Specialist.* Sufficient data were available for Mental Categories III and IV. At the earliest month of interest, month 11, and at the median month point, month 15, the Mental Category III technical school ratio was significantly higher than the Mental Category III OJT ratio. At one of the interim month points, the difference was less than 0.10, but consistently in favor of technical school. The Mental Category IV technical school ratio was significantly greater than the Mental Category IV OJT ratio in month 15. No other significant differences were encountered.

7. *AFSC 70250, Administrative Specialist.* Sufficient data were available for Mental Categories II, III, and IV. At the earliest month point of interest, month 13, the Mental Category II OJT ratio was significantly higher than the Mental Category II technical school ratio. There were insufficient data for Mental Category II at the other two month points. At the latest month point of interest, month 23, the Mental Category III OJT ratio was significantly greater than the Mental Category III technical school ratio. No other significant differences were encountered in Mental Category III, and no significant differences were encountered in Mental Category IV.

8. *AFSC 81150, Security Specialist.* In each of the Mental Categories II and III, the technical school ratio was significantly higher than the OJT ratio at the median month point, month 14, and at the latest point of interest, month 17. In Mental Category IV, the technical school ratio was significantly higher than the OJT ratio at all three month points of interest. In Mental Category I, at the earliest month point of interest, month 11, the OJT ratio was significantly higher than the technical school ratio. Otherwise, no significant differences were encountered in Mental Category I.

Table 5 in the appendix displays additional data on progression rates from BMT graduation to award of the five-skill level.

Progression Rates from Three-Skill Level to Five-Skill Level

From Table 4 it can be seen that, within each type of assignment, the Mental Category IV achievement ratio average for a given month was less than the corresponding Mental Category III achievement ratio average. The Mental Category III averages were less than their corresponding Mental Category II averages except for a slight reversal of OJT average at month 15. In all cases, the Mental Category II average for a given month was less than the corresponding Mental Category I average.

In Mental Category IV, OJT achievement ratio averages were greater than their corresponding technical school achievement ratio averages. In Mental Category III, OJT averages were greater than their corresponding technical school averages except for one case: In month 12, the technical school average was slightly greater than the OJT average. In Mental Categories I and II, OJT averages were greater than their corresponding

technical school averages in months 6 and 9, while in months 12 and 15, technical school averages were greater than or equal to their corresponding OJT averages.

The averages of achievement ratios of personnel progressing to the five-skill level after award of the three-skill level displayed in Table 4 suggest some apparent inconsistencies when compared with the averages of achievement ratios of personnel progressing from BMT graduation to the five-skill level displayed in Table 3. In Table 4, it appears that, in Mental Categories III and IV (and to a certain extent in Mental Categories I and II), there is a trend in which higher proportions of OJT personnel progress to the five-skill level from the three-skill level than technical school personnel within a given period of time. The progression rates from the three- to the five-skill level for the individual AFSCs entering the averages displayed in Table 4 were investigated in the same manner described previously. Only two of the eight AFSCs mentioned before had the same outcome as they had in the first analysis:

1. AFSC 29150, Communications Center Specialist. At the earliest month point of interest, month 4, in all Mental Categories, OJT and technical school ratios were approximately the same. At the median month point, month 8, the technical school ratio was significantly greater than the OJT ratio in Mental Category III. At the latest month point of interest, month 12, the technical school ratio was significantly greater than the OJT ratio in Mental Categories III and IV. In Mental Category III, at one of the interim month points between months 8 and 12, a difference less than 0.10 was encountered, but it was consistently in favor of technical school. No other significant differences were encountered.

2. AFSC 70250, Administrative Specialist. Sufficient data were available for Mental Categories II, III, and IV. At the earliest month point of interest, month 6, the Mental Category II OJT ratio was significantly higher than the Mental Category II technical school ratio. There were insufficient data for Mental Category II at the other two month points. At all three month points of interest, in each of the Mental Categories III and IV, the OJT ratio was significantly higher than the technical school ratio.

Another two of the eight AFSCs mentioned previously had totally reversed outcomes:

1. AFSC 64350, Materiel Facilities Specialist. Sufficient data were available for Mental Categories III and IV. The only significant differences were at the median month point, month 9, in each of the Mental Categories III and IV where the OJT ratio was significantly higher than the technical school ratio.

2. AFSC 81150, Security Specialist. At the earliest month point of interest, month 7, in each of the Mental Categories I, II, and III, the OJT ratio was significantly higher than the technical school ratio. No other significant differences were encountered.

Investigation of the progression rates from the three- to the five-skill level for the four remaining AFSCs mentioned previously revealed inconclusive results for AFSC 58250. Further, in AFSCs 54750, 56350, and 57150, it was revealed that neither disposition group was superior to the other when comparing times from the three- to the five-skill level. There were four additional AFSCs, however, for which there was rather strong suggestive evidence of superiority of one type of training over the other for progression from the three-skill level to the five-skill level. These four AFSCs, when analyzed with respect to progression from BMT graduation to the five-skill level, had either inconclusive results or had results which indicated that neither disposition group was superior to the other. A brief description of trends found in the four additional AFSCs is given.

1. AFSC 55150, Pavements Maintenance Specialist. Sufficient data were available only for Mental Category IV. At the earliest month point of interest, month 7, and at the median month point, month 12, the Mental Category IV OJT ratio was significantly higher than the Mental Category IV technical school ratio. No other significant differences were encountered.

2. AFSC 55254, Protective Coating Specialist. Sufficient data were available for Mental Category IV only. At the median month point, month 11, and at the latest month point of interest, month 15, the Mental Category IV OJT ratio was significantly higher than the Mental Category IV technical school ratio. No other significant differences were encountered.

3. AFSC 55255, Plumbing Specialist. Sufficient data were available for Mental Category IV only. At the median month point, month 9, the Mental Category IV OJT ratio was significantly greater than the Mental Category IV technical school ratio. No other significant differences were encountered.

4. AFSC 62250, Cook. Sufficient data were available for Mental Categories III and IV. At the earliest month point of interest, month 7, the Mental Category III OJT ratio was significantly higher than the Mental Category III technical school ratio. There were insufficient data for Mental Category III at the other two month points. At each of the three month points of interest, the Mental Category IV OJT ratio was significantly higher than the Mental Category IV technical school ratio.

VI. DISCUSSION

In the process of reviewing the results of this study, it has become evident that many of the Category B specialties represented in the sample did not have a sufficient number of cases to permit meaningful comparisons between technical training and OJT subgroups. In some of the Category B AFSCs for which sufficient data were available, there was no conclusive difference in the time from BMT graduation to award of the five-skill level between the two subgroups. In the AFSCs in which there were substantial differences between OJT and technical training subgroups in the time from BMT graduation to award of the five-skill level, the differences, in most cases, were in favor of technical training. Differences in the times to award of the five-skill level were also noted between the four Mental Categories. The Mental Category I group achieved the five-skill level more rapidly than the Mental Category II group. The Mental Category II group achieved the five-skill level more rapidly than the Mental Category III group, and the Mental Category III group achieved the five-skill level more rapidly than the Mental Category IV group.

It was found that rates of progression from the three- to the five- skill level were not entirely consistent with rates of progression from BMT graduation to the five-skill level. According to the results, OJT personnel, in many cases, progress from the three- to the five-skill level at a faster rate than technical school personnel. Most of the inconsistencies were noted in the Mental Category IV subgroup. It should not be erroneously concluded, however, that the inconsistencies between the two progression rates are limited to Mental Category IV; in most cases, the Mental Category IV subgroup was the only subgroup having adequate sample size for making comparisons.

In an effort to account for the apparent inconsistencies between the progression rates from the three-skill to the five-skill level and the rates from BMT graduation to five-skill level, one hypothesis has been formulated. The hypothesis maintains that unfamiliarity with a new work environment may impede progression from the three-skill to the five-skill level. Technical school personnel, who appear to be progressing from the three-skill to the five-skill level at a slower rate than OJT personnel, may be using the extra time to become accustomed to their first field assignment, to a new supervisor and to a work rather than a school environment. On the other hand, OJT personnel, having been in their field assignment since BMT graduation, have no adjustment to make after award of the three-skill level. In addition, having acquired their three-skill level in the field, they are experienced in the process of skill upgrading. This additional familiarity with OJT and Career Development Courses should expedite the achievement of the five-skill level for these personnel.

VII. RECOMMENDATIONS AND CONCLUSIONS

In the majority of the AFSCs under study, there is inconclusive evidence for any advantage for technical training over OJT when comparing how rapidly the groups achieve the five-skill level. The absence of clear-cut differences in many of the AFSCs is attributable to inadequate sample size. However, in [redacted] two AFSCs which have adequate sample size, there is evidence that neither type of training is superior to the other when comparing the time from BMT graduation to achievement of the five-skill level. The two AFSCs, 55150 (Pavements Maintenance Specialist) and 62250 (Cook), might be candidates for a change in category status. For a limited number of AFSCs, technical training appears to produce fully qualified personnel in higher proportions than an OJT program within any given period of time. There is suggestive evidence, when comparing the times from BMT graduation to award of the five-skill level, that technical training is superior to OJT with regard to AFSC 54750 (Heating Systems Specialist), AFSC 57150 (Fire Protection Specialist), and AFSC 81150 (Security Specialist). In AFSCs 54750 and 57150, the evidence is more conclusive for the Mental Category IV subgroup. In AFSC 58250 (Fabric and Rubber Products Repairman) there is suggestive evidence that OJT is superior to technical training when comparing

times from BMT graduation to the award of the five-skill level. In this AFSC, however, the evidence is more conclusive for the Mental Category IV subgroup. In these few AFSCs, there appears to be some basis for shifting the emphasis toward technical training or toward directed duty assignment to OJT. In AFSCs 54750, 57150 and 81150, it may be appropriate to shift emphasis to technical training; while in AFSC 58250, it may be appropriate to shift emphasis toward OJT.

This study does not address the question of why a given training program produces fully qualified personnel more rapidly than another. It is recommended that factors contributing to more rapid achievement of the five-skill level be identified before final decisions for shifting emphasis are made. A thorough understanding of these factors is essential to a cost-effective decision.

REFERENCE

Bateman, C.W. Formal and on-the-job training in military occupations. *Proceedings of the NATO conference on operational and personnel research in the management of manpower systems*, Brussels, 1965.

APPENDIX. SUBGROUP PROGRESSION RATIOS BY MENTAL CATEGORY

Progression ratios from BMT graduation to award of the five-skill level are displayed in the following tables by Mental Category. Ratios are displayed by AFSC for each BMT disposition group at month points 12, 15, 18, and 21. Progression ratios are displayed only if the denominators for both training groups are greater than 25 at the corresponding month point. This cutoff for denominator size eliminated many of the Category B AFSCs from inclusion in these tables.

Table 5. **Progression Rates for Technical Training and On-the-Job Training Subgroups by AFQT Mental Ability Categories**

	Progression Rate for Technical School and OJT Subgroups							
	Month 12		Month 15		Month 18		Month 21	
AFSC	Tech Sch	OJT	Tech Sch	OJT	Tech Sch	OJT	Tech Sch	OJT
			Mental Category I					
29150	0.50	0.36	0.83	0.67	0.89	0.87	0.91	1.00
81150	0.61	0.62	0.77	0.77	0.90	0.82	0.93	0.88
			Mental Category II					
29150	0.34	0.42	0.76	0.61	0.82	0.82	-	-
64750	0.30	0.52	-	-	-	-	-	-
70250	0.26	0.38	-	-	-	-	-	-
81150	0.58	0.52	0.80	0.69	0.88	0.80	0.95	0.87
			Mental Category III					
29150	0.28	0.26	0.71	0.36	0.81	0.57	0.88	0.77
57150	0.45	0.34	0.66	0.59	-	-	-	-
62250	0.52	0.33	-	-	-	-	-	-
63150	0.46	0.46	0.84	0.70	0.85	0.75	-	-
64750	0.39	0.29	0.73	0.62	0.87	0.81	0.97	0.94
70250	0.21	0.28	0.42	0.43	0.54	0.60	0.66	0.76
81150	0.52	0.39	0.76	0.53	0.90	0.77	0.95	0.87
			Mental Category IV					
29150	0.24	0.23	0.57	0.39	0.69	0.48	0.86	0.66
47350	0.03	0.10	0.10	0.24	0.26	0.27	-	-
54750	0.23	0.06	0.58	0.24	0.75	0.37	0.85	0.78
55150	0.16	0.19	0.33	0.40	0.55	0.51	0.69	0.60
55254	0.16	0.06	0.30	0.19	0.35	0.38	0.50	0.55
55255	0.17	0.24	0.37	0.46	0.56	0.55	0.63	0.71
56350	0.18	0.09	0.39	0.37	0.59	0.41	0.73	0.60
57150	0.36	0.16	0.56	0.38	0.73	0.51	0.81	0.70
58250	0.24	0.29	0.47	0.58	0.68	0.79	0.88	0.90
62250	0.21	0.18	0.36	0.39	0.42	0.53	0.57	0.56
63150	0.36	0.32	0.64	0.56	0.74	0.73	0.85	0.82
64750	0.28	0.19	0.58	0.42	0.75	0.62	0.83	0.82
70250	0.12	0.14	0.31	0.31	0.46	0.45	0.60	0.63
81150	0.41	0.29	0.62	0.43	0.76	0.62	0.84	0.77