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Development of a Data Base for an AFROTC Management Control System

By

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ERRATA

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Page 5. Item 5:

For . . .Cost per Pilot: Cost per graduate plus cost of training one pilot times number entering pilot training divided by pilot training elimination rate.

Read . . .Cost per Pilot: Cost per graduate plus cost of training one pilot divided by pilot training graduation rate.

Page 5. Item 6:

For . . .Cost per Navigator: Cost per graduate plus cost of training one navigator times number entering navigator training divided by navigator elimination rate.

Read . . .Cost per Navigator: Cost per graduate plus cost of training one navigator divided by navigator training graduation rate.

Page 7. First paragraph, line 1.

For . . . Variables 1 through 60, Other

Read . . Variables 1 through 77, Other

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FOREWORD

The research and analyses described in this report were carried out in partial response to RPR (Requirement for Personnel Research) 66-2 originated by AFPTRE in response to a memorandum from the Department of Defense concerning the assembling of data relative to AFROTC detachment effectiveness. The work was accomplished under Project 7719, Development of Procedures for Increasing the Efficiency of Selection, Evaluation, and Utilization of Air Force Personnel; Task 771908, Factors Related to Effective Utilization of Personnel Selection Procedures and of Selection Systems.

This report has been reviewed and is approved.

F.L. McLanathan, Lt Col, USAF
Chief, Personnel Research Division

ABSTRACT

This report describes the origin and rationale of the concept of an AFROTC Management Control System, and the development of a data base upon which such a system must depend. A detailed list and descriptions of all variables in the data base are included. Some example distributions are included to illustrate the type and magnitude of differences existing between the various AFROTC detachments. It is concluded that substantial improvements in the cost-effectiveness of the AFROTC program are possible through the use of the AFROTC Management Control System but that the interrelationships between the various factors entering into such a system are so complex that the use of an electronic computer in the data analyses is a necessity.

TABLE OF CONTENTS

LIST OF TABLES

Table of Contents *(Continued)*

DEVELOPMENT OF A DATA BASE FOR AN AFROTC MANAGEMENT CONTROL SYSTEM

I. INTRODUCTION

At its inception the Reserve Officers Training Corps was regarded primarily as a training ground for inactive reserve officers who would be called to extended periods of active duty only in periods of national emergency. Not until the early 1950's was the Air Force Reserve Officers Training Corps (AFROTC) considered a source of reserve officers who would be required after college graduation to serve a period of extended active duty during which they would receive pilot or navigator training, technical training, or on-the-job training and subsequently would function usefully as fully qualified junior officers. And not until the late 1950's did the Air Force realize the potential of the AFROTC program as a source of career officers.

Along with changes in the mission of the AFROTC program has come an increase in the complexity of the program. There are approximately 170 AFROTC detachments. Some of these consist of a four-year program, two years of Basic and two years of Advanced; some of a two-year program, Advanced alone; and some of both a four-year and a two-year program. Cadets in the Advanced program are divided into four main categories: those who will go into pilot training upon entry into active duty, those who will go into navigator training, those with college majors in the scientific or engineering areas who will go into scientific or engineering career fields upon entry into active duty, and those who will enter other career fields. In addition some AFROTC cadets have been granted scholarships while others have not.

In late 1965 the Department of Defense (OSD/Manpower) directed that each service examine its ROTC program to determine whether certain detachments should be disestablished in order to increase the cost-effectiveness of the program. Originally the sole criterion of effectiveness was to be the number of graduates per year from the detachment. It was pointed out by Air Force personnel, however, that a more realistic criterion would be cost per graduate rather than the number of graduates; and further, that AFROTC detachments have been shown empirically to differ in many other ways, most of which should be considered before the ROTC program is abolished in any college or university. Accordingly, the DOD directive was revised to permit development of information pertaining to the quality of the graduates (as measured by aptitude, academic performance, and officer effectiveness), detachment retention rates (the percentage of the graduates from each detachment who became career officers), and cost per officer retained. Such data were to be obtained by detachment for a period of several years for use as the basis of an AFROTC Management Control System.

The purpose of the Management Control System was also to be extended beyond that of detachment disestablishment decisions. Ultimately it would be a computerized model of the AFROTC program which could be used to increase the cost-effectiveness of the program by optimizating one or more of a number of criteria.

For example, the relative strengths and weaknesses of each detachment could be examined, and improvements could be made where needed. The model could be used to establish differential and optimal quotas of the various categories of Advanced AFROTC cadets for each detachment. Or, it could be used to test out in advance the probable effects of any proposed policy changes or to seek out the necessary changes in policy to optimize any function (e.g., retention rate, cost per retained pilot, or career officers with the highest quality).

II. THE DATA BASE VARIABLES

A list of all variables with a description of each is given in Appendix I. Three general types of variables were considered desirable for the data base.

The first of these were variables directly available for each detachment, such as cost of the detachment, total number of graduates, and graduates by given categories.

The second type consisted of variables based on characteristics of the host institution of each detachment. Examples of these were type of college (whether public or private, religious or nonsectarian, technical or liberal arts, etc.), size of the college, and geographical location. Other college variables were based on characteristics of the student body, such as its average level of aptitude and its average level on a number of "attitude" or "personal orientation" scales.

The final type included variables derived from the individual characteristics of each graduate and averaged across all graduates from each detachment over a specified period of time. In this category were such variables as detachment retention rate, average officer effectiveness reports of graduates of each detachment, average grade-point average, and average Officer Quality Composite score as measured by the Air Force Officer Qualifying Test (AFOQT).

It should be noted that only a few of the data base variables are static; most will change slightly from year to year as additional data become available. The characteristics of the host college will in most instances remain relatively constant. Characteristics of the student body will change to some extent; but these changes will be slow, and each college will tend to maintain its position relative to other colleges on each variable. Variables based on the detachment itself and those derived from individual characteristics of the graduates of that detachment may be expected to change substantially from year to year (at least for the smaller detachments). Thus, it is suggested such variables be derived from data accumulated over a period of several years. If this is done the resulting variables may be expected to be quite stable and to reflect quite reliable detachment differences.

III. DISTRIBUTIONS OF SELECTED DETACHMENT VARIABLES

For illustrative purposes distributions have been made of certain of the data base variables; these data are presented in Tables 1 through 22 in Appendix II. Distributions for the detachment variables were derived from a sample of AFROTC graduates from 179 detachments who entered active duty from 1958 through 1962. This sample was selected for several reasons. First, by using data covering a five-year period it was expected that the detachment variables would have substantial reliability and stability. Second, data for graduates prior to 1958 were missing for a large number of cases, especially for those who are no longer active. Third, many officers entering active service after 1962 had not completed their obligated tours at the time the original data base information was obtained; thus, retention analyses based on the later groups might be misleading.

Tables 1 through 8 present distributions of the Quality Composite Index and its components (AFOQT Officer Quality Composite score, Adjusted Mean OER, and Corrected Grade Point Average) for all graduates entering active duty and for retained (active as of 1 January 1967) and lost (inactive) pilots, navigators, nonrated officers with science and engineering Duty AFSCs, and other nonrated officers.

Tables 9 through 12 show distributions of the Cost per Graduate, Detachment Retention Rate, and Cost per Officer Retained variables.

Tables 13 through 15 show numbers entered into active duty, numbers retained, retention rates, and cost figures for nonrated officers with Duty AFSCs in the science and engineering areas and those with Duty AFSCs in other areas.

Tables 16 through 22 present similar distributions for AFROTC graduates who entered pilot and navigator training. In addition, training elimination rates and cost of training data are shown.

Based on the distributions of the detachment variables, one conclusion is quite clear: detachments differ to a considerable extent, regardless of the variable under consideration. Detachments differ in size; in cost per graduate; in elimination rates from pilot and navigator training; in retention rates, whether these are based on all graduates or on subgroups of pilots or navigators or science and engineering officers or other nonrated officers; and finally in cost per officer retained. Most of these differences also appear to be quite stable and reliable across time (as indicated by other earlier unpublished studies).

It is also quite clear from even the simplest analysis of the detachment data that large dollar savings could be realized by disestablishment of certain of the detachments and/or by changes in the quotas for the various categories of AFROTC Cadets allotted to the detachments.

While differences among detachments are obvious from the tabular data, decisions regarding which detachments might be disestablished, or in just what manner the various quotas should be changed, should probably not be based on simple examination of the distributions. The relationships between detachment retention rates and the associated costs of the various officer subgroups are quite low. Thus, any planned or proposed changes might best be simulated on a computer to permit analysis of the effects of the changes on any one variable or on the other variables in the system. Or the computer could be programmed to indicate what changes would optimize any desired criterion and at the same time to indicate the effect of such changes on the entire system.

A final consideration which is relevant to the present analyses but which is based on a different set of studies is that these detachment differences appear to be inherent in the situation and almost entirely beyond the influence of any individual Professor of Air Service or detachment staff. In a series of unpublished prediction studies, it was found that characteristics of the student body of the institution as a whole (e.g., their average attitudes and expectations) and of the college itself (e.g., its geographical location whether it is public or private, is sectarian or nonsectarian, etc.) were quite highly related to detachment retention rates; in fact, detachment retention rates could be predicted with 60 per cent to 75 per cent accuracy. It was also found that these college and student body characteristics were differentially related to the different retention rate criteria. Retention rates for pilots, navigators, and nonrated officers, as well as criteria such as the average OERs of officers from each detachment, were predicted by different combinations of the college characteristics.

APPENDIX I: VARIABLES FOR THE AFROTC MANAGEMENT CONTROL SYSTEM DATA BASE

Primary Variables

The primary variables are basic to the AFROTC Management Control System and will be used in most analyses.

1. Cost per Graduate: Total cost of a detachment over a given time period divided by the number of graduates during that time period.
2. Number of Graduates: Total number of graduates from a detachment during a given time period.
3. Pilot Training Elimination Rate: Total number of graduates entering but not graduating from pilot training divided by total number entering pilot training during a given time period.
4. Navigator Training Elimination Rate: Total number of graduates entering but not graduating from navigator training dividedby total number entering navigator training during a given time period.
5. Cost per Pilot: Cost per graduate plus cost of training one pilot times number entering pilot training divided by pilot training elimination rate.
6. Cost per Navigator: Cost per graduate plus cost of training one navigator times number entering navigator training divided by navigator elimination rate.
7. Pilot Retention Rate: Number of pilot graduates from a detachment during a given time who remained on active duty past their obligated service date divided by number of pilot graduates from the detachment.
8. Navigator Retention Rate: Number of naviator graduates from detachment during a given time who remained on active duty past their obligated service date divided by number of navigator graduates from the detachment.
9. Cost per Pilot Retained: Cost per pilot divided by pilot retention rate.
10. Cost per Navigator Retained: Cost per navigator divided by navigator retention rate.
11. Scientific and Engineering Officer Retention Rate: Number of graduates with duty AFSCs in the S&E career areas who were retained divided by the total number of S&E graduates.
12. Non Scientific and Engineering Officer Retention Rate: Number of nonrated graduates with duty AFSCs in career areas other than S&E who were retained divided by the total number of such graduates.
13. Cost per Scientific and Engineering Officer Retained: Cost per graduate divided by S&E officer retention rate.
14. Cost per Non Scientific and Engineering Officer Retained: Cost per graduate divided by Non-S&E officer retention rate.
15. Nonrated Officer Retention Rate: Number of nonrated officers (S&E plus Non-S&E) retained divided by number of such officers entering active duty.
16. Cost per Nonrated Officer Retained: Nonrated officer retention rate divided by cost per graduate.
17. Overall Detachment Retention Rate: Number of all graduates retained divided by number of graduates entering active duty.
18. Overall Cost per Retained Officer: Overall detachment retention rate divided by cost per graduate. Note that this cost figure does *not* include cost of training pilots and navigators.

19. Detachment Average AFOQT OQ Score: Sum of AFOQT scores for all graduates divided by number of graduates.

20. Detachment Average Adjusted OER Score: Sum of Mean Adjusted OERs for each graduate divided by number of graduates. The Mean Adjusted OER is an OER index computed in such a way that the effects of inflation and form changes on OERs have been minimized.

21. Detachment Average Corrected Grade-Point Average: Sum of Corrected Grade-Point Averages for all graduates divided by total number of graduates. The Corrected Grade-Point Average is obtained by applying a factor to each Grade-Point Average to adjust it for differences in the aptitude level of the study body of the host college.

22. Officer Quality Composite Index Detachment Average: Sum of Officer Quality Composite Indexes for all graduates divided by number of graduates. The Officer Quality Composite Index is obtained by an equal weighting of the AFOQT OQ, the Corrected Grade-Point Average, and the Mean Adjusted OER.

Variables 19 through 22 of the primary variables may also be computed for various subgroups of graduates such as Pilot Training Eliminees, Pilot Training Graduates, Retained Pilots, and Lost Pilots, and for the other subgroups entering into Variables 3 through 16.

Secondary Variables

The secondary variables are available in the basic data file of the AFROTC Management Control System but will ordinarily not be used in analyses.

Variables 1 through 13, the Astin Variables, were developed by Alexander Astin (1965) for use in studies of differences between colleges and universities.

1. Intellectualism: Primarily a measure of motivation for graduate work.
2. Estheticism: Interest and achievement in writing and art.
3. Status: High socioeconomic background and a motivation toward careers in business or law.
4. Pragmatism: Interest in careers in engineering and agriculture.
5. Masculinity: Primarily a measure of the percentage of males in the student body.
6. Estimated Selectivity: Primarily a measure of the aptitude level of the student body as estimated by the number of times the college was listed as a choice by Merit Scholarship Finalists divided by the size of the freshman class. This variable was used to adjust the grade-point averages for college differences in ability level.
7. Size: Size of study body in 1959 as reported by the American Council on Education.
8. Realistic Orientation: Proportion of BA degrees conferred in Engineering Agriculture, Forestry, etc.
9. Scientific Orientation: Proporton of BA degrees conferred in Physics, Chemistry, etc.
10. Social Orientation: Proportion of BA degrees conferred in Psychology, Education, etc.
11. Conventional Orientation: Proportion of BA degrees conferred in Business, Accounting, etc.
12. Enterprising Orientation: Proportion of BA degrees conferred in Business and Public Administration, Pre-Law, etc.
13. Artistic Orientation: Proportion of BA degrees conferred in Fine Arts, Journalism, Languages, etc.

Variables 1 through 60, Other College Variables, were obtained from two primary sources: *Earned Degrees Conferred* for various years as reported by the Office of Education of the Department of Health, Education, and Welfare (1964) and *American Universities and Colleges* published by the American Council on Education (Cartter, 1964). It should be noted that there is a considerable degree of overlap between these variables and the Astin variables and within these variables themselves.

1. Percentage of Male Students
2. Number of Units (1,000 students per unit) Enrolled
3. Percentage of Foreign Students
4. Total Number of BA Degrees Conferred for 12 Scientific Course

   Type of Scientific Degree: Variables 5 through 16 were obtained by dividing the number of BA degrees in each of the respective courses by the total of the 12 courses.

5. General
6. Astronomy
7. Chemistry
8. Metallurgy
9. Meteorology
10. Physics
11. Geology
12. Geophysics
13. Engineering
14. Mathematics
15. Statistics
16. Other Earth Sciences

    Percentage in Each Science Area: Variables 17 through 28 were obtained by dividing the number of BA degrees in each of the respective courses by the approximate total number of males enrolled (non-science plus science).

17. General
18. Astronomy
19. Chemistry
20. Metallurgy
21. Meteorology
22. Physics
23. Geology
24. Geophysics
25. Engineering
26. Mathematics
27. Statistics
28. Other Earth Sciences

Variables 29 through 77 are categorical; a value of *1* is assigned if the characteristic is true of the college and *0* if it is not true.

29. HEW Type: University
30. HEW Type: Liberal Arts College
31. HEW Type: Teacher's College
32. HEW Type: Independent Technical School
33. Control: State
34. Control: Local/State
35. Control: Non-Religious/Non-Profit
36. Control: Roman Catholic
37. Control: Other Religious
38. Predominantly Male Enrollment
39. Predominantly Co-ed Enrollment
40. Land Grant College: No
41. Land Grant College: Yes
42. Land Grant College: Indeterminant
43. OBE Region 1: New England
44. OBE Region 2: Mideast
45. OBE Region 3: Great Lakes
46. OBE Region 4: Plains
47. OBE Region 5: Southeast
48. OBE Region 6: Southwest
49. OBE Region 7: Rocky Mountains
50. OBE Region 8: Far West
51. OBE Region 9: Alaska, Hawaii, and outlying parts
52. Class 0: Co-ed Liberal Arts, 4 Year, Private
53. Class 1: State College, 4 Years
54. Class 2: Liberal Arts for Men, 4 Years, Private
55. Class 4: State and City Universities
56. Class 5: Private Universities
57. Class 6: Engineering, Technical and Service Academies
58. Level 0: BA, BS, and/or 1st Professional Degree
59. Level 1: MA, MS, and/or 2nd Professional Degree
60. Level 2: Ph.D. and equivalent Degrees

Variables 61 through 71 are types designated in *American Colleges and Universities.*

61. Type 0: Liberal Arts and General
62. Type 2: Primarily Teacher Preparatory
63. Type 3: Liberal Arts and General and Teacher Preparatory
64. Type 4: Liberal Arts and General, Teacher Preparatory, and Terminal Occupational
65. Type 5: Professional only
66. Type 6: Professional and Teacher Preparatory
67. Type 7: Professional and Terminal Occupational
68. Type 8: Liberal Arts and General with 1 or 2 Professional Schools
69. Type 9: Liberal Arts and General with 3 or more Professional Schools (most universities fall into this type)
70. Private
71. Public
72. Air Force ROTC only (Detachment Code 3)
73. Air Force and Army ROTC (Detachment Code 5)
74. Air Force and Navy ROTC (Detachment Code 6)
75. Air Force, Navy, and Army ROTC (Detachment Code 7)
76. Race: Negro
77. Race: Other

APPENDIX II. DISTRIBUTIONS OF SELECTED DETACHMENT VARIABLES BASED ON GRADUATES FROM 179 AFROTC DETACHMENTS WHO ENTERED ACTIVE DUTY FROM 1958 THROUGH 1962

Data presented in the tables in this appendix are detachment frequencies for the given variables. In each case, the table title indicates the variable under consideration, and the tabulated frequencies indicate the number of detachments of the 179 in the sample for which the variable is applicable.

When used in the tables, the term *Officers Retained* refers to those officers who were in active duty as of 1 January 1967; *Officers Lost* refers to those officers who were inactive as of that date. The *Scientific and Developmental Engineering* (S&DE) career areas referred to include the 25XX, 26XX, 27XX, and 55XX AFSCs. The term *Non-Scientific and Developmental Engineering* (Non-S&DE) refers to all other AFSCs.

Table 1. **Average Quality Composites**

(Based on Total Sample)

Quality Composite	Detachment Frequency	Cumulative Frequency	Percentile
675-699	1	1	99.4
650-674	0	1	99.4
625-649	3	4	97.8
600-624	1	5	97.2
575-599	5	10	94.4
550-574	16	26	85.5
525-549	26	52	71.0
500-524	32	84	53.1
475-499	36	120	33.0
450-474	35	155	13.5
425-449	14	169	5.7
400-424	4	173	3.5
375-399	1	174	2.9
350-374	3	177	1.2
325-329	1	178	0.6
300-324	1	179	0.0

Median Quality Composite 496
Mean Quality Composite 498
SD 55

Table 2. **Average AFOQT Officer Quality Scores**

(Based on Total Sample)

Officer Quality Score	Detachment Frequency	Cumulative Frequency	Percentile
95	0	0	100.0
90-94	1	1	99.4
85-89	1	2	98.8
80-84	4	6	96.6
75-79	9	15	91.6
70-74	13	28	84.4
65-69	20	48	73.2
60-64	42	90	49.8
55-59	33	123	31.4
50-54	20	143	20.2
45-49	20	163	9.0
40-44	8	171	4.6
35-39	4	175	2.4
30-34	1	176	1.8
25-29	3	179	0.0

Median Officer Quality Score 60.0
Mean Officer Quality Score 59.1
SD 11.1

Table 3. **Average Adjusted Mean OERs**

(Based on Total Sample)

Adjusted Mean OER	Detachment Frequency	Cumulative Frequency	Percentile
47-48	0	0	100.0
45-46	1	1	99.4
43-44	4	5	97.2
41-42	17	22	87.7
39-40	51	73	59.3
37-38	50	123	31.4
35-36	33	156	13.0
33-34	12	168	6.3
31-32	5	173	3.5
29-30	2	175	2.4
27-28	1	176	1.8
25-26	3	179	0.0
23-24	0	179	0.0

Median Adjusted Mean OER	38.5
Mean Adjusted Mean OER	38.0
SD	2.9

Table 4. **Average Corrected Grade-Point Averages**

(Based on Total Sample)

Corrected Grade-Point Average	Detachment Frequency	Cumulative Frequency	Percentile
3.90-4.00	0	0	100.0
3.70-3.89	1	1	99.4
3.50-3.69	1	2	98.8
3.30-3.49	4	6	96.6
3.10-3.29	12	18	89.9
2.90-3.04	31	49	72.6
2.70-2.89	41	90	49.8
2.50-2.69	45	135	24.7
2.30-2.49	31	166	7.4
2.10-2.29	10	176	1.8
1.90-2.09	2	178	0.6
1.70-1.89	1	179	0.0
1.50-1.69	0	179	0.0

Median Corrected Grade-Point Average	2.70
Mean Corrected Grade-Point Average	2.67
SD	0.32

Table 5. **Average Quality Composites for Retained and Lost Nonrated Officers Assigned to Scientific and Developmental Engineering Areas**

	S&DE Officers Retained			S&DE Officers Lost		
Quality Composite	Detachment Frequency	Cumulative Frequency	Percentile	Detachment Frequency	Cumulative Frequency	Percentile
775-799	1	1	99.4	0	0	100.0
750-774	1	2	98.8	0	0	100.0
725-749	0	2	98.8	1	1	99.3
700-724	2	4	97.6	2	3	97.8
675-699	6	10	94.0	4	7	94.9
650-674	4	14	91.6	4	11	92.0
625-649	12	26	84.3	7	18	87.0
600-624	24	50	69.9	6	24	82.6
575-599	16	66	60.3	16	40	71.0
550-574	26	92	44.6	14	54	60.9
575-549	25	117	29.6	24	78	43.5
500-524	20	137	17.5	20	98	29.0
475-499	8	145	12.7	18	117	16.0
450-474	11	156	6.1	11	127	8.1
425-429	4	160	3.7	5	132	4.4
400-424	3	163	1.9	1	133	3.7
375-399	1	164	1.3	1	134	3.0
350-374	0	164	1.3	2	136	1.5
325-329	2	166	0.0	1	137	0.8
300-324	0	166	0.0	0	137	0.8
275-279	0	166	0.0	1	138	0.0
No Officers in Category	13			41		
Quality Composite for Officers Retained				Quality Composite for Officers Lost		
Mean	559			Mean	539	
Median	560			Median	535	

Table 6. **Average Quality Composites for Retained and Lost Nonrated Officers in Career Areas Other Than S&DE**

	Officers Retained			Officers Lost		
Quality Composite	Detachment Frequency	Cumulative Frequency	Percentile	Detachment Frequency	Cumulative Frequency	Percentile
750-774	1	1	99.4	1	1	99.4
725-749	1	2	98.9	0	0	99.4
700-724	1	3	98.3	0	0	99.4
675-699	0	3	98.3	0	0	99.4
650-674	0	3	98.3	1	2	98.8
625-649	2	5	97.2	1	3	98.3
600-624	8	13	92.7	2	5	97.1
575-599	11	24	86.5	13	18	89.7
550-574	11	35	80.4	22	40	77.2
525-549	32	67	62.4	21	61	65.2
500-524	37	104	41.6	26	87	50.3
475-479	27	131	26.5	36	123	29.8
450-474	27	158	11.4	20	142	18.3
425-449	11	169	5.2	13	156	10.9
400-424	5	174	2.4	9	165	5.8
375-399	3	177	0.6	4	169	3.5
350-370	0	177		2	171	2.4
325-349	1	178	0.0	3	174	0.6
300-324	0	178	0.0	1	175	0.0
No Officers in Category	1			4		
Quality Composite for Nonrated Officers Retained				Quality Composite for Nonrated Officers Lost		
Mean	513			Mean	481	
Median	513			Median	500	

Table 7. **Average Quality Composites for Retained and Lost Pilots**

Quality Composite	Pilots Retained			Pilots Lost		
	Detachment Frequency	Cumulative Frequency	Percentile	Detachment Frequency	Cumulative Frequency	Percentile
700-724	1	1	99.4	0	0	100.0
675-699	1	2	98.9	0	0	100.0
650-674	1	3	98.3	0	0	100.0
625-649	0	3	98.3	2	2	98.8
600-624	1	4	97.7	2	4	97.7
575-599	4	8	95.5	6	10	94.2
550-574	7	15	91.5	7	17	90.1
525-549	28	43	75.7	14	31	81.9
500-524	32	75	57.7	21	52	69.6
475-499	36	111	37.4	35	87	49.2
450-474	39	150	15.4	33	120	29.9
425-449	14	164	7.5	19	139	18.8
400-424	6	170	4.1	21	160	6.5
375-399	3	173	2.4	7	167	2.5
350-374	1	177	0.0	2	169	1.3
325-349	0	177	0.0	2	171	0.0
No Officers in Category	2			8		

Quality Composite for Pilots Retained
Mean 492
Median 490

Quality Composite for Pilots Lost
Mean 478
Median 476

Table 8. **Average Quality Composites for Retained and Lost Navigators**

Quality Composite	Navigators Retained			Navigators Lost		
	Detachment Frequency	Cumulative Frequency	Percentile	Detachment Frequency	Cumulative Frequency	Percentile
675-699	1	1	99.4	0	0	100.0
650-674	0	1	99.4	0	0	100.0
625-649	2	3	98.3	0	0	100.0
600-624	2	5	97.1	2	2	98.8
575-599	5	10	94.3	4	6	96.6
550-574	17	27	84.6	10	16	90.9
525-549	26	53	69.7	16	32	81.7
500-524	35	88	49.8	23	85	86.0
475-499	28	116	33.8	27	82	53.2
450-474	20	136	22.3	27	109	37.8
425-449	21	157	10.4	28	137	21.8
400-424	10	167	4.6	19	156	10.9
375-399	3	170	2.9	10	166	5.2
350-374	2	172	1.8	7	173	1.2
325-349	1	173	1.2	0	173	1.2
300-324	2	175	0.0	0	173	1.2
275-279	0	0	0.0	1	174	0.6
250-274	0	0	0.0	1	175	0.0
No Officers in Category	4			4		

Quality Composite for Navigators Retained
Mean 498
Median 499

Quality Composite for Navigators Lost
Mean 470
Median 470

Table 9. **Average Cost[a] per AFROTC Graduate**

Cost in Thousands per Graduate	Frequency
20.0-20.9	1
16.0-19.9	0
15.0-15.9	1
14.0-14.9	0
13.0-13.9	5
12.0-12.9	3
11.0-11.9	5
10.0-10.9	10
9.0- 9.9	16
8.0- 8.9	19
7.0- 7.9	36
6.0- 6.9	37
5.0- 5.9	23
4.0- 4.9	17
3.0- 3.9	6
Average Cost	$7,550
Median Cost	$7,300

[a]Based on average of 1958-62 cost data provided by Hq AFROTC.

Table 10. **Total Number of AFROTC Graduates Entering Active Duty and Total Retained**

	Detachment Frequency	
Number of Graduates	Entered Active Duty	Active as of Jan 67
696	1	0
312	0	1
275-299	1	0
250-274	1	0
225-249	2	0
200-224	6	0
175-199	5	0
150-174	5	0
125-149	12	1
100-124	29	6
75- 99	39	12
50- 74	36	32
25- 49	37	82
00- 24	5	45
Mean	94	44
Median	81	39

Table 11. **Total Retention Rate by Detachment**

Retention Rate	Detachment
.90-.99	0
.80-.89	0
.70-.79	7
.60-.69	12
.50-.59	52
.40-.49	58
.30-.39	30
.20-.29	19
.10-.19	1
.00-.09	0
Mean Retention Rate 0.46	
Median Retention Rate 0.47	

Table 12. **Average Cost[a] per Retained Officer**
(Based on Total Sample)

Cost in Thousands to Retain One Officer	Detachment Frequency
43-45	2
40-42	1
37-39	2
34-36	3
31-33	4
28-30	5
25-27	12
22-24	19
19-21	22
16-18	30
13-15	46
10-12	31
7- 9	2
Mean Cost to Retain One Officer	$18,300
Median Cost to Retain One Officer	$16,200

[a]Active duty training costs are not included.

Table 13. **Number of Nonrated S&E Officers and Retention Rates**

Number of Officers	Detachment Frequency	Retention Rate	Detachment Frequency
72	1	1.00	31
.	.	.90-.99	0
.	.	.80-.89	19
40-42	1	.70-.79	28
37-39	1	.60-.69	32
34-36	3	.50-.59	32
31-33	1	.40-.49	16
28-30	.	.30-.39	4
25-27	0	.20-.29	4
22-24	5	.10-.19	0
19-21	4	.01-.09	0
16-18	10	.00	3
13-15	16	Total	169
10-12	22		
07-09	25		
04-06	34		
01-03	43		
00	10		

5-year average number of nonrated S&E Officers	9.3	Average Retention Rate	.69
1-year average number of nonrated S&E Officers	1.9	Median Retention Rate	.68
5-year median number of nonrated S&E Officers	7.0		
1-year median number of nonrated S&E Officers	1.4		

Table 14. **Number of Nonrated Non-S&E Officers and Retention Rates**

Number of Officers Entered Active Service	Detachment Frequency	Retention Rate	Detachment Frequency
395	1	1.00	3
.	.	.90-.99	2
150-159	2	.80-.89	8
140-149	2	.70-.79	16
130-139	0	.60-.69	39
120-129	2	.50-.59	59
110-119	4	.40-.49	29
100-109	1	.30-.39	14
90-99	3	.20-.29	8
80-89	8	.10-.19	0
70-79	10	.01-.09	0
60-69	19	.00	1
50-59	14		
40-49	29	Total	179
30-39	27		
20-29	40		
10-19	15		
01-09	2		

5-year average number of nonrated non-S&E Officers	50	Average Retention Rate	.57
1-year average number of nonrated non-S&E Officers	10	Median Retention Rate	.56
5-year median number of nonrated non-S&E Officers	40		
1-year median number of nonrated non-S&E Officers	8		

Table 15. **Average Cost per Retained Nonrated Officer**

Cost in Thousands of Retaining one Officer	Detachment Frequency	
	S&E Officers	Non-S&E Officers
40-44	1	1
35-39	0	2
30-34	1	3
25-29	2	5
20-24	6	16
15-19	23	34
10-14	60	74
05-09	67	42
03-04	3	0

Average Cost per Retained Nonrated S&E Officer	$11,300
Median Cost per Retained Nonrated S&E Officer	$11,000
Average Cost per Retained Nonrated Non-S&E Officer	$13,800
Median Cost per Retained Nonrated Non S&E Officer	$13,000

Table 16. **Number of Pilot Training Entries and Graduates**

Number Entered Pilot Training 1958-62	Detachment Frequency	Number Graduated Pilot Training 1958-62	Detachment Frequency
205	1	163	1
.	.	.	.
90-99	2	80-89	0
80-89	3	70-79	1
70-79	7	60-69	2
60-69	6	50-59	11
50-59	11	40-49	12
40-49	21	30-39	21
30-39	39	20-29	39
20-29	41	10-19	64
10-19	35	01-09	27
01-09	13	00	1
00	0		

5-year average number entering pilot training	34	5-year average number graduated	24
1-year average number entering pilot training	7	1-year average number graduated	5
5-year median number entering pilot training	30	5-year median number graduated	19
1-year median number entering pilot training	6	1-year median number graduated	4

Table 17. **Pilot Training Elimination Rates and Cost per Pilot Graduate[a]**

Elimination Rate	Detachment Frequency	Cost in Thousands per Pilot Graduate	Detachment Frequency
1.00	1	250	1
.90-.99	0	230-234	1
.80-.89	1	225-229	1
.70-.79	2	220-224	1
.60-.69	3	215-219	0
.50-.59	13	210-214	1
.40-.49	30	205-209	2
.30-.39	41	200-204	1
.20-.29	61	195-199	7
.10-.19	24	190-194	12
.01-.09	2	185-189	53
.00	1	180-179	15
Total	179	Total	178
Average Elimination Rate .33		Average Cost per Pilot Graduate $180,000	
Median Elimination Rate .30		Median Cost per Pilot Graduate $184,000	

[a]Cost of pilot training for one pilot is conservatively estimated at $170,000 when elimination rate is .30.

Table 18. **Number of Pilots Retained and Lost**

Number Retained	Detachment Frequency	Number Lost	Detachment Frequency
116	1	47	1
.	.	.	.
55-59	0	25-29	0
50-54	1	20-24	7
45-49	2	15-19	11
40-44	6	10-14	33
35-39	6	05-09	57
30-34	5	01-04	65
25-29	11	00	4
20-24	21		
15-19	30	Total	178
10-14	35		
05-09	37		
01-04	23		
Total	178		
5-year average number of pilots retained 16		5-year average number of pilots lost 07	
1-year average number of pilots retained 03		1-year average number of pilots lost 01.4	
5-year median number of pilots retained 13		5-year average number of pilots lost 06	
1-year median number of pilots retained 02.6		1-year median number of pilots lost 01.2	

Table 19. **Pilot Retention Rates and Cost per Retained Pilot**

Pilot Retention Rate	Detachment Frequency	Cost in Thousands per Pilot Retained	Detachment Frequency
1.00	4	918	1
		812	1
.90-.99	5	748	1
		675-699	1
.80-.89	27	650-674	1
		625-649	1
.70-.79	56	600-624	0
		575-599	0
.60-.69	51	550-574	0
		525-549	0
.50-.59	19	500-524	0
		475-499	1
.40-.49	9	450-474	1
		425-449	1
.30-.39	2	400-424	4
		375-399	4
.20-.29	5	350-374	7
		325-349	10
.10-.19	0	300-324	14
		275-299	24
.01-.09	0	250-274	43
		225-249	42
Total	178	200-224	17
		175-199	4
		Total	178
Average Pilot Retention Rate .69		Average Cost per Pilot Retained $291,000	
Median Pilot Retention Rate .70		Median Cost per Pilot Retained $260,000	

Table 20. **Number of Navigator Training Entries and Graduates**

Number Entered Navigator Training	Detachment	Number Graduated Navigator Training	Detachment
108	1	99	1
.		.	
55-59	1	55-59	0
50-54	1	50-54	1
45-49	1	45-49	1
40-44	1	40-44	2
35-39	7	35-39	5
30-34	13	30-34	11
25-29	11	25-29	13
20-24	18	20-24	17
15-39	39	15-19	33
10-14	41	10-14	41
05-09	32	05-09	37
01-04	13	01-04	17
00	0	00	0
5-year average number entered navigator training 18		5-year average number graduated navigator training 16	
1-year average number entered navigator training 3		1-year average number graduated navigator training 3	
5-year median number entered navigator training 15		5-year median number graduated navigator training 11	
1-year median number entered navigator training 3		1-year median number graduated navigator training 2	

Table 21. **Navigator Training Elimination Rates and Cost per Graduate[a]**

Elimination Rates	Frequency	Cost in Thousands per Navigator Graduate	Frequency
.55-.59	1	64-65	1
.50-.54	1	58-59	1
.45-.49	0	54-55	1
.40-.44	1	52-53	1
.35-.39	0	50-51	1
.30-.34	2	48-49	2
.25-.29	1	46-47	2
.20-.24	8	44-45	2
.15-.19	6	42-43	13
.10-.14	25	40-41	15
.05-.09	40	38-39	45
.01-.04	16	36-37	56
.00 --	78	34-35	34
Total	179	32-33	5
		Total	179
Average Elimination Rate	.06	Average Cost per Navigator Graduate	$38,000
Median Elimination Rate	.06	Median Cost per Navigator Graduate	$37,000

[a]Cost of navigator training is estimated at $29,000 per graduate when elimination is .00.

Table 22. **Navigator Retention Rates and Cost per Retained Navigator**

Navigator Retention Rate	Detachment Frequency	Cost in Thousands per Navigator Retainted	Detachment Frequency
1.00	2	140-149	1
.90-99	5	130-139	0
.80-89	21	120-129	2
.70-79	56	110-119	4
.60-69	46	100-109	1
.50-59	31	90- 99	4
.40-49	7	80- 89	5
.30-39	7	70- 79	9
.20-29	0	60- 69	33
.10-19	0	50- 59	71
.01-09	0	40- 49	42
.00	4	30- 39	2
Total	178	Total	174
Average Navigator Retention Rate	.67	Average Cost per Navigator Retained	$60,000
Median Navigator Retention Rate	.68	Median Cost per Navigator Retained	$57,000

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13. ABSTRACT

This report describes the origin and rationale of the concept of an AFROTC Management Control System, and the development of a data base upon which such a system must depend. A detailed list and descriptions of all variables in the data base are included. Some example distributions are included to illustrate the type and magnitude of differences existing between the various AFROTC detachments. It is concluded that substantial improvements in the cost-effectiveness of the AFROTC program are possible through the use of the AFROTC Management Control System but that the interrelationships between the various factors entering into such a system are so complex that the use of an electronic computer in the data analyses is a necessity.

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