

# Staffing Army ROTC at Colleges and Universities

*Alternatives for  
Reducing the Use of  
Active-Duty Soldiers*

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## PREFACE

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The increased tempo and range of military operations, coupled with reduced manning levels, are exerting pressure on the Army to use its active-duty soldiers optimally. Consequently, the Army is seeking opportunities to fill positions now occupied by active-duty soldiers with other personnel. Specifically, a recent Armywide Institutional/TDA Redesign Study called for the design and testing of staffing alternatives for the Senior Reserve Officer Training Corps (SROTC) program using a combination of Active Component, Reserve Component, or former military personnel. In support of this requirement, RAND was asked to develop staffing alternatives and design a test of their effectiveness. This report discusses such alternatives and describes a test design to assess their feasibility for implementation throughout SROTC.

In fiscal year 1997, RAND briefed the concept for the program and evaluation to the Vice Chief of Staff of the U.S. Army and senior officials in the Army training and personnel communities. The Vice Chief approved the concept and directed that the test begin in school year 1997–1998. If successful, the program could also help to shape and sustain the force in other areas, since it can be a prototype for making similar substitutions for active-duty soldiers.

This research is sponsored by the Deputy Chief of Staff for Personnel and the Commanding General, Cadet Command. It is being carried out in the Manpower and Training Program of RAND's Arroyo Center, a federally funded research and development center sponsored by the United States Army. This research was conducted in 1996 and 1997 and approved for public release in 1998.

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## CONTENTS

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Preface .....	iii
Figures .....	vii
Tables .....	ix
Summary .....	xi
Acknowledgments .....	xv
Acronyms .....	xvii
Chapter One	
INTRODUCTION .....	1
Background and Purpose .....	1
Approach .....	4
How This Report Is Organized .....	4
Chapter Two	
STAFFING ALTERNATIVES .....	7
Current Staffing .....	7
Staffing with Former Military and Other Civilians .....	8
Cost of Staffing with Former Military and Other Civilians .....	11
Availability of Former Military and Other Civilians .....	14
Staffing with Reservists and Civilians .....	18
Cost of Staffing with Reservists and Civilians .....	21
Availability of Reserve Personnel .....	24
Summary of Cost and Availability Considerations .....	26

Chapter Three	
EVALUATING THE SROTC STAFFING ALTERNATIVES . . .	31
Evaluation Design . . . . .	32
Recruiting and Retention . . . . .	32
Workload . . . . .	37
Advanced Camp Scores . . . . .	39
Effect of School Year Cycle . . . . .	40
Chapter Four	
CONCLUSIONS. . . . .	43
Appendix	
A. ADDITIONAL DETAILS OF THE TEST PLAN . . . . .	45
B. MILITARY PERSONNEL COSTS . . . . .	51
C. GEOGRAPHIC AVAILABILITY MODEL . . . . .	59
D. STATISTICAL POWER CALCULATIONS . . . . .	63
References . . . . .	67

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## FIGURES

---

1. Typical SROTC Battalion Staffing . . . . .	8
2. Former Military and Other Civilian Staffing Alternative . . . . .	9
3. Cost of Contracted Instructors . . . . .	12
4. Reservist and Civilian Staffing Alternative . . . . .	19
5. Workload Characteristics . . . . .	21
6. Chance of Detecting Change in Recruiting and Retention . . . . .	34
7. Effect of a Second Year on Testing Change in Recruiting and Retention . . . . .	36
8. Chance of Detecting Change in Workload of $\pm 5$ Hours per Week . . . . .	38
9. Chance of Detecting a 20-Point Change in Advanced Camp Scores . . . . .	39



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## TABLES

---

1. Replacement Qualifications: Former Military Alternative .....	10
2. Cost Comparison: AC Versus Former Military Personnel .....	13
3. Replacement Qualifications: Reserve Alternative .....	22
4. Cost Comparison: AC Versus Reserve Personnel .....	23
5. Estimated Availability and Cost of Replacement Personnel .....	29
6. Effect of Variation on Annual Commissions .....	33
7. Evaluation Alternatives .....	41
A.1. Colleges and Universities Participating in the 1997-1998 Staffing Experiment for Contracted Former Military and Other Civilians .....	46
A.2. Comparison of Experimental Units to Overall SROTC Program .....	47
B.1. Federal Benefits for Armed Forces Personnel .....	52
B.2. Annual Compensation Rates (1997\$) .....	57

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## SUMMARY

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This report analyzes alternatives to current Senior Reserve Officer Training Corps (SROTC) battalion staffing in which many active-duty soldiers performing teaching or training functions would be replaced by other personnel: contracted civilians with prior military service or reservists. Additionally, civilians (with or without military experience) would be contracted to help cover administrative and logistics functions now performed by active-duty soldiers. We developed two alternative staffing plans to be tested, each over a period of two years. One plan employs civilians with military experience working full time; the other employs drilling reservists working part time.

### **Feasibility and Cost of Alternatives**

This analysis focuses on the battalion (school) level elements within Cadet Command. Of approximately 2,500 total Active Component (AC) authorizations for the command, 2,200 are for the battalions. Over time, it appears feasible to replace a significant number of these AC soldiers by using either staffing alternative, perhaps at lower cost. If both options are found effective and implemented, the potential savings appear to be in the range of 700–900 assignments. The corresponding annual cost estimates for the replacement personnel are \$45–\$58 million (1997 dollars), not considering any savings from eliminating AC positions. If only one option (former-military or reservist) is implemented, the potential savings are about 100–200 assignments lower than the 700–900 range. These savings estimates, however, are subject to considerable uncertainty that can be resolved only by actual experience with the program.

It appears that using reservists could save resources, if the personnel savings are used to reduce AC endstrength. It is not clear whether using the former-military option would produce a net savings or cost increase; much of this uncertainty involves the cost of the fees that the Army will have to pay contractors to hire and manage replacement staff. Although it is likely to be less costly and might help cover more AC positions, the reservist option would take longer to phase in; it is not likely to be feasible on a broad basis for several years following an implementation decision. Achieving potential savings thus will take time. The Army's actual cost experience will depend on how the options are phased in, on contractor fees, and on the mix of replacement staff among reservists, retirees, younger former military, and other civilians.

### **Assessment of Impact on SROTC Program**

Although the staffing alternatives offer prospective benefits, they also carry potential risks. These include the possibility of adverse impacts on the effectiveness and efficiency of the SROTC program in key areas such as the number of officers commissioned, the quality of cadet training, and cadre workload. A test should detect such harmful impacts, which the Army might otherwise be forced to live with on a long-term basis. To assure the Army of detecting even large changes in these outcomes—for example, a 25 percent change in the number of commissions—our analysis indicates that a single-year evaluation would require assessing 25 trial battalions for each staffing alternative, a total of 50 units. Currently, there are 255 SROTC host battalions. We considered smaller-scale trials, but they would not have provided this crucial information with a reasonable degree of confidence.

We also judged that a two-year evaluation period was preferable to a one-year trial: It would substantially reduce the number of battalions needing to be restaffed with trial replacements (15 versus 25 per alternative). The longer, smaller trial would thus reduce startup effects in the test and cause less future personnel turbulence in the event it is not successful and the positions need to be filled once again by AC soldiers. The two-year test would also have a somewhat lower cost—about \$15 million in total by FY00 (1997 dollars), primarily for replacement staff costs. Last, because of the larger num-

ber of units required in the single-year evaluation and the longer lead time required to restaff these units, final results from the two-year trial of replacement staff at the smaller number of units would be available no later than those from the one-year trial: December 1999 for the former-military option, and a year later for the reserve option (due to longer phase-in requirements).

The two-year trial began in the 1997–1998 school year for the former-military option. Three battalions began implementing options including reservists. The full test of the reserve option will begin in the 1998–1999 school year.

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## ACRONYMS

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AC	Active Component
ACPC	Arroyo Center Policy Committee
AGR	Active Guard/Reserve
ANCOC	Advanced Noncommissioned Officer Course
APMS	Assistant Professor of Military Science
ARPERSCOM	Army Reserve Personnel Command
AT	Annual Training
CPS	Current Population Survey
DMDC	Defense Manpower Data Center
G&A	General and Administrative
GS	General Schedule
IDT	Inactive Duty Training
IRR	Individual Ready Reserve
MOS	Military Occupational Specialty
MUTA	Multiple Unit Training Assembly
NCO	Noncommissioned officer
OCAR	Office of the Chief, Army Reserve
PCS	Permanent Change of Station

PERSCOM	Personnel Command
PMS	Professor of Military Science
PUMA	Public Use Microdata Area
PUMS	Public Use Microdata Sample
RC	Reserve Component
ROTC	Reserve Officer Training Corps
SIDPERS	Standard Installation/Division Personnel System
SROTC	Senior Reserve Officer Training Corps
TDA	Table of Distribution and Allowances
TPU	Troop Program Unit
TRADOC	Training and Doctrine Command
USAR	United States Army Reserve
UTA	Unit Training Assembly
VCSA	Vice Chief of Staff, U.S. Army

## **BACKGROUND AND PURPOSE**

The post–Cold War drawdown has exerted considerable pressure on the Army to make the most effective use of its active-duty personnel. To do that, the Army is seeking opportunities to fill positions now occupied by active-duty soldiers with other types of personnel, e.g., civilians, retired military, or reservists. The Army commits a substantial number of active-duty personnel to Senior Reserve Officer Training Corps (SROTC) battalions at colleges and universities.<sup>1</sup> Army SROTC now faces significant pressure to reduce its resource use. Complicating this picture is the fact that program closures have not kept pace with earlier staff reductions. As a result, the average number of officers assigned per campus has fallen from 5.0 to 3.5 over the past decade. Today, the reduced cadre are struggling to execute their training mission while maintaining recruiting activity. With possible further reductions in endstrength looming, the Army faces a dilemma: It may have to further reduce the number of Active Component (AC) personnel in the SROTC battalions, but it will be difficult to close SROTC units. Such outright staff reductions jeopardize SROTC’s mission. If staffing substitutions can be achieved, however, Active Component commissioned officers and noncommissioned officers could be reassigned to meet other force needs, or

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<sup>1</sup>In addition to SROTC, there is also a Junior ROTC program (JROTC). JROTC uses very few active-duty personnel. Almost all JROTC instructor positions are filled by military retirees hired by local school districts.



the positions could be eliminated in compliance with drawdown requirements. Thus, the Army is seeking new ways to staff SROTC.

Specifically, the Institutional/TDA Army Redesign Study's Umbrella Issue 41 raised the possibility of using a combination of Active Component, Reserve Component, and contracted retired officers and NCOs to manage and execute the SROTC program.<sup>2</sup> In that context, this report identifies alternative staffing plans and evaluates them on cost and performance measures. The research includes two main elements: description of the options (staff mix, resource demands, and feasibility) and a test design (evaluation requirements, site selection, and costs).

We will describe in detail two alternatives for staffing some of the instructor and trainer positions in SROTC: One employs civilians with military experience working full time, and the other employs drilling reservists working part time. These two alternatives do not reflect the full range of options we considered. One option considered and rejected was the increased use of AGRs (Active Guard/Reserves, reservists serving on full-time duty). We concluded that current legislation, practice, and cost would not permit wide expansion of the use of AGRs for SROTC duty.<sup>3</sup> Another option considered and mostly rejected was the use of civilians without former military experience. Only people with substantial relevant military experience are likely to have accumulated the ability to perform the many functions required of instructors and trainers, including teaching military tactics, demonstrating customs and courtesies, recruiting, and acting as

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<sup>2</sup>Generally, Army units that go to war are organized under a Table of Organization and Equipment and are referred to as TO&E units. Units that perform more administrative functions such as the Army's schools are organized under a Table of Distribution and Allowances and are referred to as TDA units. The Institutional/TDA Army Redesign Study catalogued a number of possible approaches for shifting some of the Army's force away from TDA functions and toward TO&E functions. Each of the possible approaches was grouped into an "Umbrella Issue." Umbrella Issue 41 recommended a test of staffing alternatives for SROTC battalions.

<sup>3</sup>AGRs currently serve in SROTC battalions. Congress has authorized 275 AGRs to staff SROTC, although only about 206 are presently assigned. Because they tend to be more senior in grade structure and years of service than AC soldiers, their pay and allowances are higher than those of equivalent AC soldiers. For these cost reasons and because Congress has authorized a very limited number of AGRs in total, we did not consider it feasible to staff SROTC battalions with a significantly increased number of AGRs.

Army role models. We therefore concluded that teaching and training positions should be reserved for people with requisite levels of recent military experience. For certain administrative and logistical positions, however, a wider spectrum of individuals appears feasible. In both options described, we open full-time administrative and logistical positions to civilians with relevant military or nonmilitary experience.

The Army could organize a troop program unit (TPU) for the part-time reservists assigned to each school, or some other administrative structure might be used. Both of our staffing alternatives assume that the Army will contract with a commercial firm that will, in turn, hire former military members and other civilians. An obvious option is to have the Army or other federal government agency hire the personnel directly. We rejected that approach for two reasons. The first reason applies to retirees. Military retirees are required by law to forfeit all or part of their retirement pay if they accept a position with any organization of the federal government—a substantial disincentive. The second reason applies to all. If the Army rehired former military members directly as civilians, the Army would face limited civilian personnel ceilings and would have to create a personnel system to recruit, hire, assign, evaluate, and develop these employees. In view of the structure required and ceilings involved, the Army would likely be better off retaining the personnel on active duty.

We began by considering all positions for replacement. However, we concluded that some positions include duties that are inherently governmental in nature and should be staffed with military personnel. In addition, we considered it very important to retain a minimum of one full-time military member in each key functional area: instruction, recruiting, and training. Administrative and logistical duties were not subject to this restriction; those positions currently filled by military members may be reassigned to replacement personnel. Overall, in the typical battalion this would result in two commissioned officers and one noncommissioned officer as full-time military. The remaining active-duty positions—about four on average—could be filled with replacements.

## **APPROACH**

Once we determined what type of personnel we could use and in which positions, three other tasks remained: determine the cost of each alternative, determine whether adequate personnel were available, and design an evaluation plan.

We estimated the cost of present AC staff and potential replacements. Present AC staff and potential reservist replacements were costed using Army pay and force structure information. To develop costs for former military members and other civilians, we combined information from the U.S. Census with estimates of the costs of contracting.

We analyzed the potential availability of replacement personnel with a geography-based model that used U.S. Census data for former military personnel and other civilian replacements. For reservists, we used information from Army data systems in the same geography-based model.

We designed the evaluation plan to rely on existing measurements collected as part of Cadet Command operations wherever possible. We defined three key measures to be used to judge the success or failure of the replacement personnel: recruiting and retention (which measures future commission potential), cadre workload (which measures an important component of quality of life), and Advanced Camp scores of cadets (which is a standardized measure of cadet capability and training). These measures will be used to compare a selected experimental group of battalions with alternative staffing against other battalions with traditional staffing.

## **HOW THIS REPORT IS ORGANIZED**

The remainder of this report divides into three chapters and four appendixes. Chapter Two discusses staffing alternatives, their implied costs, and their potential to replace AC soldiers. Chapter Three lays out an evaluation framework and draws relevant implications for measures of effectiveness, the number of test sites required, and related costs. Chapter Four presents our conclusions and the recommended test design. Appendix A describes the test implementation, reporting on the selection of schools and noting some differences

from the plans presented in the main text. Appendixes B, C, and D contain additional details of the technical analyses for the computation of military personnel costs, the geographic availability model, and the statistical power calculations.

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**STAFFING ALTERNATIVES**

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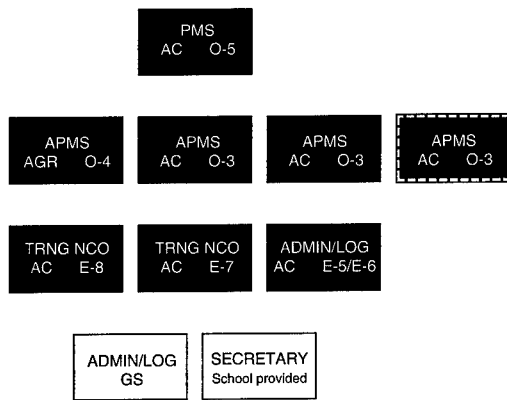
This chapter describes how SROTC battalions are now staffed and describes two alternatives: one uses primarily civilians who are former military personnel, and one uses primarily reservists. For each alternative, we provide a cost estimate and compare it with the present cost of staffing the SROTC battalions with AC personnel. We also consider the availability of the replacement personnel.

**CURRENT STAFFING**

In 1997, the typical SROTC battalion was authorized five officers, three NCOs, and one GS (general schedule) civilian as depicted in Figure 1. In addition, many schools funded a full-time or part-time secretary to serve the SROTC department at no cost to the Army. The number of assigned officer staff frequently falls below the authorized level, as shown by the dotted box. Officer assignments at this time were at most 80 percent of authorizations; NCO assignments were about 95 percent of authorizations, or higher. Because of differences in program size and staffing availability, battalions' actual staffing varies both in terms of total number of personnel assigned and grade distribution. The results presented in this report are based on the actual staffing patterns in place in 1997. Although there have been some subsequent changes in SROTC authorizations, the changes have not yet affected the number of assigned personnel.

The four officers assigned are typically divided as follows: one lieutenant colonel, who is the Professor of Military Science (PMS) and commander of the battalion; one major, who is often an AGR; and two AC captains. Aside from the PMS, all other officers are generally

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PMS = Professor of Military Science  
 APMS = Assistant Professor of Military Science  
 TRNG NCO = Training NCO

Figure 1—Typical SROTC Battalion Staffing

known as Assistant Professors of Military Science (APMS). There are three noncommissioned officers: two are primarily responsible for organizing and conducting training, and one is responsible for supply and logistics, or, in some battalions, administrative duties.

These personnel perform tasks in instruction, training, recruiting, mentoring, administration, and logistics. The work occurs in three principal settings: the college campus, field training, and summer camps. The discussion in this report focuses on the campus setting, although we also consider field training and summer camps.

### STAFFING WITH FORMER MILITARY AND OTHER CIVILIANS

We considered a number of staffing options. After extensive discussions with members of the Training and Doctrine Command (TRADOC), the Office of the Chief of the Army Reserve (OCAR), and others, we focused on two basic alternatives to the current staffing, which could be implemented singly or jointly. One is based on using civilians with former military service to replace instructors and train-

ers, shown in Figure 2. The figure compares a typical unit's current staffing to the alternative staffing.

To expand the potential of this alternative to replace AC soldiers, we include both retirees and more junior individuals, provided they meet specified conditions for length and recency of military service, as described in Table 1. The other staffing alternative, discussed later in this chapter, is based on using drilling reservists on a part-time basis.

In both staffing alternatives, we seek to replace as many AC soldiers as possible. (We are not concerned with replacing the existing AGR soldiers assigned to SROTC.) Each alternative retains three full-time military staff (AC or AGR), in the typical battalion, to ensure that full-time military staff can organize the key functions of management, teaching, recruiting, and training. Because inherently governmental functions such as decisions on cadet progress and commissioning must remain with government personnel, each alternative retains an AC or AGR PMS in every battalion. In the typical battalion, one single full-time soldier in addition to the PMS would not be sufficient to manage the key functions, including recruiting. Therefore, in the typical battalion, in addition to the PMS, each alternative retains one APMS and the senior NCO as full-time AC or AGR.

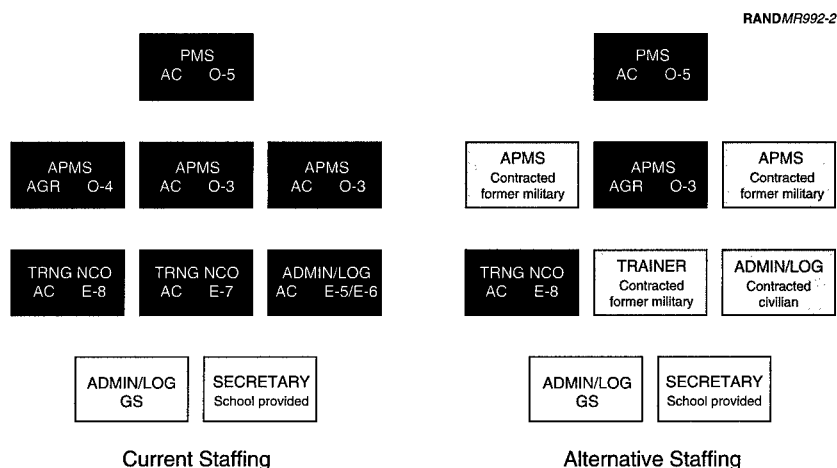


Figure 2—Former Military and Other Civilian Staffing Alternative

**Table 1**  
**Replacement Qualifications: Former Military Alternative**

Position	Qualifications
Instructor	Recent military experience (within 2 to 6 years) Branch qualified O-3 or higher Bachelor's degree Limit of 5 years in the job
Trainer	Recent military experience (within 2 to 6 years) E-7 or higher ANCOC graduate Platoon sergeant or branch-equivalent leadership experience Limit of 5 years in the job
Admin/log staff	Military experience not required Relevant job experience No limit on tenure in job

Also, consistent with a plan being developed by TRADOC, our plans include contracted civilians to replace the NCO admin/log staff position. Because of legal obstacles and given that the focus of Umbrella Issue 41 is on replacing AC soldiers, we do not contract out the admin/log GS (civilian) position, although this could be done at a later date. Secretaries, if provided by the school, are also retained.

In the alternative that staffs the battalion using a combination of AC soldiers and former military personnel, the model battalion has two full-time officer instructors (one AC and one AGR), two former military members serving as APMSs, one full-time AC training NCO, and one former military member serving as a trainer. The enlisted admin/log function is contracted to qualified civilians (with or without military experience).

Pursuant to our discussions with TRADOC, we established required qualifications for each of these positions. We require that instructors have military experience equivalent to an O-3 or above (captain), be



branch qualified,<sup>1</sup> and hold at least a bachelor's degree. For the trainers we require only significant military experience (equivalent to being in grade E-7). The contractor can fill the admin/log staff position with any civilian with relevant job experience.

### **Cost of Staffing with Former Military and Other Civilians**

To estimate costs for the civilian replacements, we combine estimates of base wages, fringe benefits, and overhead. The base wages are derived from the 1990 U.S. Census (5 percent Public Use Micro Sample). The census data report years of active-duty military service but not the grade at separation. To match years of service to pay grade, we use the current AC force pay grade by years of service distribution. Based on this analysis, we accept bachelor's degree holders with at least seven years of AC service as potential instructors (equivalent to O-3 and above).

We identify members in nonprofessional occupations with at least 16 years of AC service as potential trainers (equivalent to E-7 and above). For both categories, we restrict the population to those with military experience within the past six years.

For instructors, wages are computed based on the census wages of postsecondary teachers with the cited military experience. For trainers, nonprofessional job wages for persons with the cited military experience are used. For admin/log wages, we use the wages of civilian clerical workers. In each case, the base wages were estimated by averaging over individuals who reported 48–52 weeks of work during the year and 30–50 average hours per week.

Figure 3 shows the results of our estimates for the instructors. The estimates are calculated separately for nonretirees (7–19 years of AC service) and retirees (20 or more years). Because retirees are more senior, they have higher wages. Figure 3 displays the contribution of the three components—base salary, fringe benefits, and contractor overhead—to the overall cost and compares that cost with that of an AC soldier.

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<sup>1</sup>Branch qualification requires completion of the Officer Advanced Course and successful completion of company command or branch-equivalent command position.

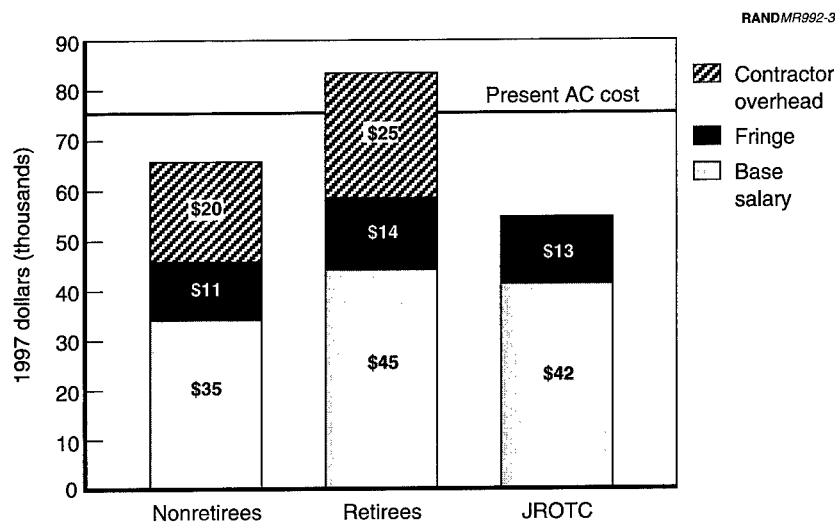


Figure 3—Cost of Contracted Instructors

To estimate the burdening and overhead that a contractor would apply, we used TRADOC guidance on preparing an independent government estimate for contracted services. We estimate fringe benefits at 31.6 percent. This figure is based on a sample of JROTC staff receiving employee benefits such as health coverage and pension contributions, which average 11.6 percent of base wages, plus 20 percent for legally required fringes such as FICA, disability insurance, unemployment insurance, and worker’s compensation.

We follow the TRADOC government estimate guidance to set overhead and G&A (general and administrative) expenses at a total of 30 percent, and profit at 10 percent. These estimates are based on using a national or regional contractor to recruit, hire, and manage staff. Such a procedure is likely to be used in the initial phase-in and test period of staffing alternatives. Upon full implementation, it might be possible to use other, cheaper contracting forms. For that reason, we compute a range for costs, assuming that fringe and overhead might be reduced by as much as one-third.

To assess the consistency of our wage estimates with known salaries of former military SROTC instructors, we compared the wages de-

rived from the census data to the wages of a sample of JROTC high school instructors, all retirees. (This sample was collected for another RAND research project.) The U.S. Census wage estimates for retirees teaching at the college level are very close to the JROTC wages, as shown in Figure 3. JROTC instructors are employees of the school districts, which pay at least half of the wages, plus all the fringes, and also cover any administrative overhead (not shown in the figure).

Table 2 shows our estimate of the present cost of AC soldiers staffing SROTC battalions and the cost of their potential civilian replacements. Appendix B contains details of the cost model used to compute the costs of the present AC staff. The costs include base pay, allowances, permanent change of station (PCS) costs, retirement benefits, and health care. In addition, the Army incurs costs for managing and training the AC personnel assigned to Cadet Command. Based on information from Cadet Command, we included an estimate of Cadet Command's personnel management overhead (0.6 percent of total costs). We did not include the personnel management overhead in other commands, such as PERSCOM.

These costs are based on the distribution of current instructors, trainers, and admin/log staff. In the typical battalion, we seek to replace two instructors, one trainer, and one admin/log staff. (Since the actual staffing varies slightly from these averages, the figures in Table 2 do not add exactly.) The costs for instructors depend on whether most positions are filled with retirees versus younger former military members. With only retirees, costs are likely to exceed the

**Table 2**  
**Cost Comparison: AC Versus Former Military Personnel**

Position (Number)	Present Cost per AC Position (\$000)	Estimated Replacement Cost (\$000)
Instructors (2)	76	56-84
Trainers (1)	59	53-63
Admin/log (1)	46	50-60
Average total cost of replacement staff per battalion	260	220-290

present cost of AC officers. With a mix, or with a less expensive contracting mechanism, costs are likely to be lower.

For trainers there is less of a range, since there is little opportunity to use less experienced former NCOs. Both trainer and admin/log staff costs depend on the contract terms.

The total cost reported compares only the AC soldiers subject to replacement to the cost of the replacements. If the replaced AC soldiers are assigned to other duties, the cost of replacements represents an additional cost to the Army of \$220,000–\$290,000 annually per SROTC battalion using alternative staffing. If the AC endstrength is reduced, the Army may experience cost savings of up to \$40,000 (\$220,000 versus \$260,000) or cost increases of up to \$30,000 (\$290,000 versus \$260,000) annually for each SROTC battalion using alternative staffing.

The cost of replacements is based primarily on the workload on campus. There may be some additional costs incurred in arranging for former military personnel to attend field training exercises and summer camps.<sup>2</sup> Since the AC personnel are replaced on a one-for-one basis and replacements are costed on a 12-month contract, we expect any additional cost to be modest.

### **Availability of Former Military and Other Civilians**

Cost is not the only consideration. The likely availability of replacement personnel also has to be taken into account. We assessed the potential availability of replacements for the AC SROTC battalion staff members using available data on current staffing in individual SROTC units and, for the potential civilian replacements, 1990 U.S. Census data for the same geographic areas. We identified the local pools of qualified replacements according to the position qualifications given earlier. We included all qualified persons within 50 miles of the local SROTC unit in the pools. Based on the replacement strategy described above, we sought two replacement instructors, one replacement trainer, and one replacement admin/log clerk for the typical unit.

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<sup>2</sup>Contract vehicles often call for higher travel costs than are incurred for AC personnel.

For instructor positions, we further restricted the population to those in professional, managerial, and skilled technical occupations who reported earning less than the average base wages we expected the contractor to offer. For instructors those wages correspond to the calculations shown in Figure 3.

For trainer positions, we restricted the population to those in occupations other than managerial, technical, or skilled technical occupations who reported earning less than the average base wages we expected the contractor to offer.

For admin/log positions, we did not require any military service; we required only that individuals were in administrative or logistical occupations and reported earning less than the average base wages we expected the contractor to offer.

For the instructor and trainer positions, some adjustments were required to scale the population of the 1990 census to reflect today's former military population numbers. Using the census data, we identified records corresponding to qualified individuals with active military service between September 1980 and the census date, April 1990. We used the September 1980 cutoff since it was the most recent available date. Since the military has been drawn down since the 1980s, we adjusted the populations for instructor and trainer positions. Enlisted numbers have been drawn down 32 percent (1.80 million average during the 1980s versus 1.22 million at September 30, 1996). Officer numbers have been drawn down 22 percent (299,000 during the 1980s versus 232,000 at September 30, 1996). For instructors, we reduced the population by 25 percent, slightly more than the 22 percent drawdown.<sup>3</sup> For trainers, we reduced the population by 32 percent, the reduction in enlisted personnel.

Next, we converted the population estimates to annual rates of new military members separating from the service. Since 9.5 years of separations were included in the September 1980–April 1990 period, we divided the population estimates by 9.5 to yield an annual estimated flow.

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<sup>3</sup>The census data do not distinguish between officers and enlisted. We use a criterion of sufficient years of service with a bachelor's degree. Since some (former) enlisted may have a bachelor's degree, we adjust the census population slightly downward.

Beyond these rather straightforward computations, there is substantial uncertainty over how many of the eligible population would be aware of the opportunity, qualified to do the work, and willing to accept these jobs. We made a series of assumptions that we believe are broadly reasonable, basing them on available data and judgment. But these assumptions have much uncertainty. To indicate the effect of variations up or down, we performed three different calculations: (1) a base case based on the factors described here, (2) a high estimate using double the population in the base case, and (3) a low estimate using half the population in the base case.

We believe that most of those taking contracted positions would do so immediately after separating from service, during the first year. In later years, former military members seeking employment might also seek contracted SROTC positions. The census reports respondents who indicated that they were looking for work. In the instructor population, 8 percent of respondents were looking for work. In the trainer population, the figure was 7 percent. In the admin/log population, it was 2.6 percent. These figures formed the base case.

We assumed that all of the military members who separated in the most recent year were seeking work. In each subsequent year we used the percentage looking for work. We analyzed two cases: six-year eligibility and two-year eligibility. Cadet Command recently has expressed a desire to limit eligibility to the more restrictive requirement of two years since separation from service.

Since admin/log positions are not filled from a military population, we used the looking-for-work figure applied to the eligible population to estimate the number of people seeking jobs. There are no initial-year and subsequent-year calculations for this group.

For each population, we then made several assumptions about who would accept contracted employment. We assumed that 90 percent of the relevant population would be aware of the opportunity and that at most 25 percent of those would be interested in Army SROTC.

For instructors and trainers we applied two additional factors: (1) the service individuals had served in while on active duty and (2) the effect of a five-year cutoff on tenure in the contracted positions. These factors did not apply to the admin/log positions.

With respect to the first additional factor, we assumed that former members of services other than the Army would accept Army SROTC positions at half the former Army service member rate (12.5 percent).

The second additional factor stems from Cadet Command's imposition of a five-year maximum term of employment for a contracted instructor or trainer. We expect that a significant number of otherwise qualified and interested individuals will be discouraged by this limitation. Using data from the Current Population Survey (CPS), we examined the length of time on the job for populations comparable to our instructor and trainer groups. Because the CPS does not include information on recency of military service, the available population breakdowns did not exactly correspond to our census groups. Based on our examination of the CPS data, we estimated that 50 percent of the instructor group and 60 percent of the trainer group could expect to be on a job longer than five years. We reduced the otherwise eligible and interested populations by these rates to account for the effect of the five-year maximum term.

Because of the five-year cutoff, at least 20 percent of instructor and trainer positions will have to be filled each year. We also expect some departures before five years. Therefore we estimated that 33 percent of the positions would require filling each year. Admin/log positions are not subject to the five-year cutoff, so position turnover would likely be less than for instructors and trainers; we estimated that one-sixth of admin/log positions would turn over each year.

To estimate fill rates, we selected the eligible and available population for each position, using the factors described above. We matched the population to each school's average annual demand for positions in the steady state, using the population within 50 miles of the school. The contractor could offer inducements for people to move to where the jobs are, perhaps at higher cost to the Army. We did not include any such effects. Appendix C provides details of the procedures used in the geographic availability model.

The results suggest that nearly all of the AC soldiers currently filling admin/log positions in SROTC units and the lion's share of those filling targeted trainer positions could be replaced by qualified civilians. Replacement of AC instructors appears to be more problematic: It may be difficult to replace more than about 60 percent of the

desired number of AC SROTC instructors, even with the more generous six-year eligibility. In total, the civilian (former-military) staffing alternative appears promising, covering about 720–760 of the 1,000 positions currently filled with AC soldiers. Restricting instructor and trainer positions to two-year eligibility yields estimates of about 720 positions replaced. Allowing six-year eligibility increases position coverage by about 40 assignments.

More details of these estimates are provided in Table 5, at the end of this chapter. The table also reports availability estimates for the reserve staffing alternative, which is described next.

### STAFFING WITH RESERVISTS AND CIVILIANS

Turning now to the staffing alternative using Reserve Component (RC) personnel, we again retain two full-time AC/AGR officers and one AC NCO. We replace three full-time AC personnel with a group of part-time reservists. Like the staffing alternative using former military personnel, one of the current AC positions is filled by a civilian: the enlisted admin/log position. And like the former-military option, the GS admin/log and secretary positions are left unchanged. Figure 4 shows the current typical unit staffing and the alternative staffing for that typical unit.

A basic difference between the two staffing alternatives is that the former-military alternative replaces each AC soldier with a single, full-time civilian, whereas the reserve alternative uses a group of reservists working part time. The USAR states that each reservist will be assigned five hours per week of duty during the academic year. The reservist will be paid for five drills each month based on this schedule.<sup>4</sup> Unlike traditional weekend drills, most of the reservists will serve between Monday and Friday for part of a day or two. To

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<sup>4</sup>Ordinarily a drill period lasts at least four hours. Five drills per month (e.g., a weekend drill running from Friday night through Sunday) represents at least 20 drill hours. The USAR intends to pay each reservist for five drills each month based on five hours assigned per week times four weeks per month, which is also equal to 20 drill hours. Reservists on weekend drills often serve more than the minimum number of hours, and we expect the same in SROTC duty.



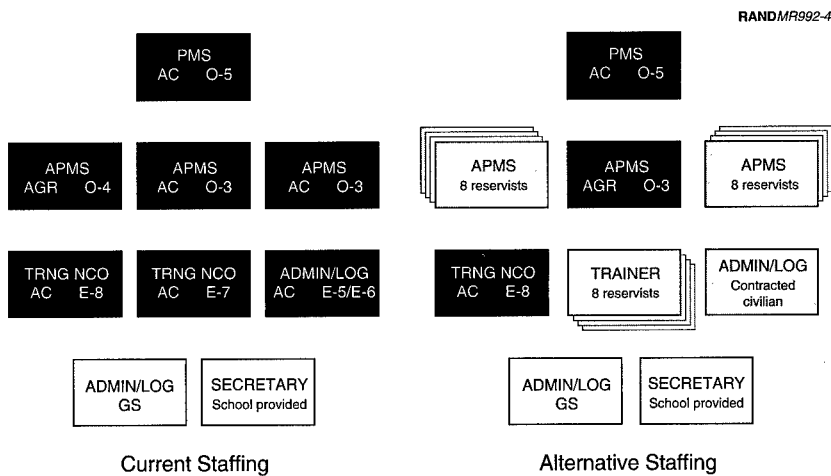


Figure 4—Reservist and Civilian Staffing Alternative

avoid overstating the number of replacements needed, the plan presented is based on the conservative assumption that present staff work about 40 hours per week, meaning that we will need eight reservists working five hours per week to replace each of the officer/NCO positions eliminated.<sup>5</sup> Therefore, in the above battalion, to replace two APMSs and one trainer we need a total of 24 reservists.

The USAR could organize these 24 reservists into a Troop Program Unit (TPU), within a larger administrative structure perhaps using brigades to group schools. The TPU members might be drawn from members of the Selected Reserves presently in other TPUs or from members of the Individual Ready Reserve (IRR), who would be converted to TPU status for SROTC. Alternatively, the USAR could activate individual IRR members for SROTC duty without converting them to TPU status.

<sup>5</sup>If present staff work substantially more than 40 hours per week, then more than eight TPU members would be required to cover their duties. Because the actual hours worked by both present staff and replacement staff are uncertain, we have designed the test to use eight replacements.

To maximize efficiency in replacing the AC staff, we distinguished the duties performed by each of the replaced AC soldiers by a workload analysis. Some rearrangement of duties may be required to make the best use of reservists.

Although Cadet Command has done some internal studies of the typical battalion workload, the studies are not comprehensive enough to allow predictions of how workload would be affected by staffing changes. We have used available information to estimate the division of duties into instruction, mentoring, recruiting, training, and other functions, which principally include administration and logistics. These duties represent the ones performed during the academic year on campus and at field training exercises. During the summer, different patterns apply on campus and at summer camp.

Figure 5 represents the total workload for the four officers and four NCOs in a typical battalion. One of the battalion NCOs is in a full-time admin/log position, as shown in the separated pie wedge. As noted, this position will be contracted out. Three of the remaining AC soldiers (two officers and one NCO) are to be replaced by TPU/IRR members. Based on our workload analysis, a reasonable, efficient replacement plan would consist of eight part-time instructors, six part-time trainers, and ten part-time admin/log support personnel. This plan shifts many of the mentoring and recruiting duties to the retained AC/AGR instructors. In return, some of their instruction, training, administrative, and logistics duties shift to the part-time replacement staff. Provisions for field training exercises and summer camps are discussed later.

In consultation with OCAR and Cadet Command, we specified qualifications for each of the TPU or IRR replacements; Table 3 summarizes these qualifications. Instructors can be branch-qualified officers at O-3 or above with a bachelor's degree. Because senior NCOs currently support instruction at some battalions, some of the part-time instructor positions could be expanded to include E-7 and above, working in conjunction with officers. Trainers are primarily E-7s with some E-6s and E-8s. The admin/log support replacements are E-4s to E-6s in admin/log MOSs. Although E-7s could serve as admin/log support, we limited replacements to grades E-4 to E-6 to preserve E-7s needed as trainers.

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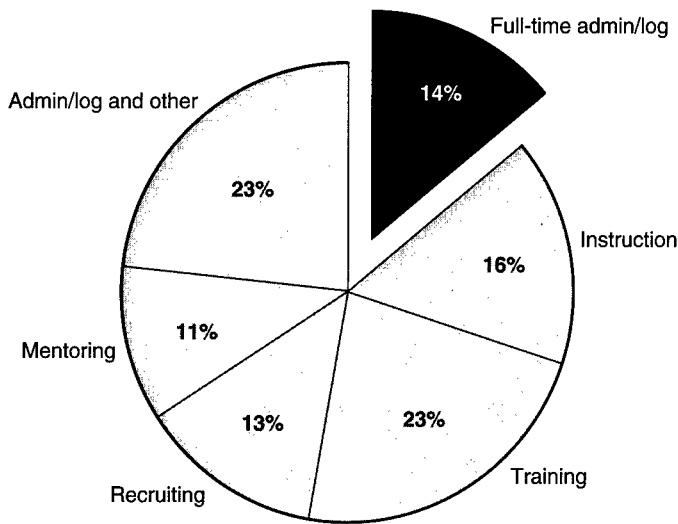


Figure 5—Workload Characteristics

As in the previous staffing alternative, the admin/log position contractor has responsibility for finding members of the general civilian population with the relevant experience for that position.

### Cost of Staffing with Reservists and Civilians

We computed a cost estimate for the reserve replacements. The cost estimates for the reservists are based on 48 annual drills, active training between 14 and 17 days (costed at 15.5 days), and 3 additional days of active-duty training during the year for field training exercises or other full-time activities. We thus assumed that the average reservist functioning in a TPU would serve 48 inactive-duty drills and an average of 18.5 total days of active duty or annual training. We assume that if IRR members were activated for duty without conversion to the TPU, they would be paid an equivalent amount to the TPU soldiers. Appendix B contains details of the cost model used.

**Table 3**  
**Replacement Qualifications: Reserve Alternative**

Position	Qualifications
Instructor (part-time)	Currently drilling; or recent active or reserve experience (within 2 to 6 years) Branch qualified O-3 or higher Bachelor's degree Limited time on the job (to be determined)
Trainer (part-time)	Currently drilling; or recent active or reserve experience (within 2 to 6 years) E-7 Limited time on the job (to be determined)
Admin/log support (part-time)	Currently drilling; or recent active or reserve experience (within 2 to 6 years) E-4 to E-6 Admin/log MOS
Admin/log staff (full-time)	Military experience not required Relevant job experience No limit on tenure in job

As shown in Table 4, we estimate that the reserve replacements are less expensive than AC soldiers. (For example, the cost estimate for a reserve group replacing one instructor ranges from \$66,000 to \$73,000 compared to \$76,000 for the AC position.) Overall, the use of reservists to replace instructors and trainers and the use of contracted civilians to replace admin/log staff might save up to \$30,000 per battalion per year, compared to the full cost of AC personnel. These costs are based on the distribution of current AC instructors, trainers, and admin/log staff. In the typical battalion, we seek to replace two instructors, one trainer, and one admin/log staff with eight reservist instructors, six reservist trainers, and ten reservist admin/log staff, plus one full-time contracted civilian to perform admin/log duties. The relatively higher cost for civilian admin/log staff slightly reduces the cost savings associated with using reservists.

Of the total costs for this option, about \$50,000–\$60,000 per battalion per year is the estimated cost of the contracted civilian admin/log

**Table 4**  
**Cost Comparison: AC Versus Reserve Personnel**

Position (Number)	Present Cost per AC Position (\$000)	Estimated Replacement Cost (\$000)
Instructors (2)	76	66-73
Trainers (1)	59	52-54
Admin/log (1)	46	50-60
Average total cost of replacement staff per battalion	260	230-260

staff. About \$10,000–\$20,000 represents increased costs for the additional days of reservists' active duty or annual training over the normal amount. The remainder of the cost is the present cost of TPU members who would be diverted from existing missions to SROTC duty. The reserve replacements are cheaper because on average the grade level of the replacements is lower than that of the present AC staff. In particular, the duties of the APMSs are being divided among officers and NCOs, where officers handle teaching responsibilities and NCOs handle some of the administrative and logistical support responsibilities that are currently handled by full-time officers. Moreover, as is true for the AC soldiers, we include the reservists' benefits and allowances in addition to their basic pay. For reservists, however, some of these entitlements are received only during the two-week annual training period, not during the 48 annual inactive-duty drills.

Although this analysis includes the costs of using reservists for on-campus and field-training duties, some costs associated with summer camps are not included. This alternative staffing plan would require some reengineering in personnel assignments for summer camps. We have briefly examined the needs of the camps and believe that the replacement plan would leave enough full-time AC and AGR personnel to staff key positions at camp and on campus over the summer. Camps would have to use full-timers only in positions requiring continuity for the full summer, with reservists rotating throughout the summer to augment the full-timers. For example, the platoon staff positions might be reduced by one full-timer per platoon. In place of one full-time position, reservists would rotate

during the relevant weeks. Some committees, such as physical training, could be staffed only with reservists. Other committees would need a mix of full-time AC/AGR and reservists.

Reservists would come to camp for two weeks, with up to three extra days of duty authorized to smooth transitions. Depending on the position, there would be four to six different reservists filling a single rotating position. Travel costs to camp would increase, since several individuals would have to travel to camp each summer instead of one. Lodging costs might also increase, if there is time overlap between reservists.

### **Availability of Reserve Personnel**

We now examine the potential availability of qualified reservist replacements for the AC SROTC staff members in each battalion. Based on the replacement strategy described earlier, for the typical unit we seek reserve replacements for two AC instructors and one trainer, and one civilian replacement for the AC NCO admin/log clerk. Since members of the Selected Reserves and the IRR may be eligible to fill these positions, we examine both populations. The pool of local reservists eligible for the positions was identified based on SIDPERS data for USAR TPU members and ARPERSCOM's IRR databases. For the civilian clerical replacements we again used 1990 U.S. Census data for the schools' geographic areas. We included all qualified persons within 50 miles of the local SROTC unit in the pools. As described in Appendix C, this analysis used a geographic availability model similar to the one used for the contracted former military replacement staff. Table 5 shows the AC replacements possible when considering only members of the Selected Reserves now in TPUs (the row "USAR TPU"). The table also shows the increase in replacements when IRR members are used as well (the row "USAR TPU + IRR").

As in the case of the former military members, there is substantial uncertainty over the availability of qualified and motivated reservists who could make time when needed for SROTC duty. As in the earlier analysis, we estimate availability using three scenarios: a base case, a high case (double the base case), and a low case (half the base case).

In the estimates we make somewhat different assumptions about reservists now serving in TPUs and those in the IRR. In the case of reservists presently serving in TPUs whose primary duty would be instruction, we used the pool of branch-qualified officers, O-3 and higher, based on information from the Army databases. We assume that all such qualified reservists who teach at the postsecondary level in civilian life are qualified to teach, and that most teachers at the secondary and elementary levels could qualify as well. However, some of these reservists may not remain in the Selected Reserves if forced to accept SROTC duty, while others may not have time available during the days and hours needed by the local SROTC battalion, especially during normal weekday working hours. These qualifications and availability considerations lead us—based on educated judgment—to set the base case availability at 30 percent of otherwise eligible TPU members who are postsecondary teachers and 15 percent of elementary and secondary teachers as being available to staff SROTC battalions. As in the earlier analysis, the high and low cases are based on double and half of these percentages, respectively.

In addition, some nonteacher TPU members with the specified military experience and bachelor's degrees would be eligible. We assumed that about 60 percent would be qualified to teach, half of those would be interested, and one-quarter would have time available. We therefore included 7.5 percent of TPU members other than teachers with bachelor's degrees.

Because we anticipate more difficulty in attracting IRR members—who are not currently committed to a TPU—for the base case, we included 5 percent of branch-qualified IRR (O-3 and higher) with bachelor's degrees who had AC or drilling reserve service within the past six years. We did not have occupation data on IRR members, so we could not perform separate analyses for teachers versus nonteachers.

For training functions, the pool consisted of all local E-7s and 10 percent of E-6s and E-8s (to capture very senior or promotable E-7s as well as junior E-8s). We assumed that all such persons were qualified and that 25 percent of this pool was interested and available. For admin/log support functions, OCAR defined a list of qualified MOSs. We assumed that 25 percent of this pool was available.

In this staffing option, as in the former-military option, full-time admin/log positions are filled by contracted civilians, who cover almost all of the AC positions.

As is true for the earlier staffing alternative using former military personnel, the results suggest that most of the AC soldiers currently filling training positions in SROTC units could be replaced using the reservist option. Replacement of AC instructors again appears to be more problematic: In this case, it may be possible to replace about half of the current AC SROTC instructors using TPU members and up to three-quarters if IRR members are used as well. In total, the reservist staffing alternative appears promising, covering about 850 of the 1,000 positions currently filled with AC soldiers.

#### **SUMMARY OF COST AND AVAILABILITY CONSIDERATIONS**

Table 5 summarizes the overall implications of the availability and cost analyses for the two staffing alternatives, implemented both singly and jointly. Each row shows the number of assigned AC staff that is replaced. The chart also shows the estimated annual cost (in millions of 1997 dollars) of compensating the replacement personnel. Since the earlier estimates are in the form of ranges, we used the midpoints of the ranges to derive these replacement costs. The total costs are determined by the number of replacements and the cost per replacement.

For each alternative and population, the table reports the base case, a low case, and a high case. The low case is based on half the population of the base case; the high case is based on double the population of the base case.

For some positions, there is variation in the coverage depending on the assumptions about availability (as seen by comparing the low, base, and high cases). For civilian admin/log replacements, availability is excellent. Because there are so many qualified civilians around the country, doubling or halving the assumed rates makes almost no difference in the coverage for this position (247 versus 254 versus 255 for the three cases). There are a few schools located in very remote areas, meaning that about 20 positions are uncovered, even with the high assumptions.



The instructor and trainer positions show more variation over the three cases. Availability for trainer positions is higher for both options, so the impact of the alternative assumptions is low. For example, in the former-military (six-year eligible) alternative, moving from the low to high case increases coverage of trainers from 155 to 197, an increase of 27 percent. The population in the high case is four times larger than in the low case; this quadrupling of population has a quite modest effect. The pattern for trainers is similar across the alternatives.

For instructor positions, the population is smaller compared to requirements. This is apparent in the greater differences between the low, base, and high cases. Looking again at the former-military (six-year eligible) alternative, moving from the low to high case increases coverage of instructors from 223 to 389, an increase of 74 percent. In the two-year eligible alternative, the population is smaller because of the more stringent restriction on recency of service. The smaller population shows greater sensitivity: 365 versus 188, or a 94 percent increase from the low to high case.

The reservist cases also have limited populations for instructors. In addition, each school must have a minimum number of available reservists in order to replace one full-time AC position. If there are some available, but not enough to make a reasonably full group, we do not credit a replacement. The exact procedure is documented in Appendix C. Because of this requirement, cutting the reserve populations has a potentially severe effect on coverage. The TPU-only alternative shows this clearly. The low case fills 79 instructor positions, compared to 184 for the base case. In other words, reducing the population to 50 percent reduces coverage to 42 percent. This occurs because many schools fall below the threshold where they have enough reservists to fill a single instructor position.

If the present IRR members are included, reserve populations increase and coverage improves. In addition, the larger population is less sensitive to the assumptions.

As the population of eligible individuals broadens, the coverage rates become less sensitive to specific assumptions. If both the reserve and former-military options are used wherever feasible throughout

the country, the coverage is highest—and least sensitive to assumptions.

In the base case, if IRR members are included, the reservist coverage level compares favorably with the former-military alternative (745 for the reserve versus 718–759 for the former military). The costs per AC soldier replaced are also comparable, using the midpoints of the ranges presented earlier. However, the extent to which all of the required TPU and IRR members could be converted to SROTC duty is unknown, and our conversations with OCAR lead us to believe that the conversion process would require several years. Clearly, there is uncertainty about the availability of former military personnel, although the timetable to recruit the replacements and to resolve this uncertainty appears to be faster for the former-military alternative than for the reservist alternative. Thus, in essence, there is a timeline-versus-cost tradeoff between the two alternative staffing plans. Both plans benefit from the good projected availability of civilians to fill admin/log positions.

Using both former military personnel and reservists to staff SROTC battalions increases coverage, compared to either option implemented alone. The combined options appear able to cover 700 to 900 AC assignments, 100 to 200 more than either option singly. The estimated cost of the combined staffing is about \$45–58 million (1997 dollars).

The ability of the options to complement each other indicates that in full implementation it would be most desirable to have both former military and reservists available for staffing. We expect that the actual mix of the replacement staff would vary by location.<sup>6</sup>

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<sup>6</sup>Indeed, the belief that a mix of reservist and former military replacement staff would be used (as locally available) in any permanent version of the SROTC restaffing program led the VCSA to recommend testing of former-military and mixed staff options, rather than former-military and pure-reservist options.

Table 5  
Estimated Availability and Cost of Replacement Personnel

Item	Instructors	Trainers	Admin/Log	Total	Cost (1997 \$m)
Desired replacements	530	223	277	1,030	
<i>Replacement options and populations</i>					
Former military (six-year eligible)	Low	155	247	635	38.2
	Base	319	186	759	47.1
	High	389	197	841	52.7
Former military (two-year eligible)	Low	188	140	575	34.9
	Base	285	179	718	44.3
	High	365	195	815	50.9
USAR TPU	Low	79	109	435	24.9
	Base	184	149	587	34.7
	High	284	178	717	43.2
USAR TPU + IRR	Low	197	116	560	33.4
	Base	334	157	745	45.5
	High	403	185	843	51.8
USAR TPU + IRR + former military (six-year eligible)	Low	303	175	725	44.8
	Base	407	201	862	54.0
	High	453	206	914	57.6

NOTE: Contracted civilians fill admin/log positions in all options.

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**EVALUATING THE SROTC STAFFING ALTERNATIVES**

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The previous chapter described in detail two alternatives for staffing SROTC battalions. This chapter describes how the two alternatives could be evaluated. We identified three outcomes key to the effectiveness of SROTC battalions: recruiting and retention, which indicates the unit's future potential to produce commissions; the workload of the cadre members, which represents a proxy for their quality of life; and the Advanced Camp scores achieved by unit members, which represents the capability of the cadets and the effectiveness of their training. Because the alternatives reduce the presence of AC soldiers in the SROTC battalions and use persons who may differ from the AC staff they are replacing in experience, age, total hours available for work, and other characteristics, the new staffing plans could have effects on the functioning of the battalions. The use of reservists on a part-time basis is another notable change from current practice. Each of these changes could be for the better or worse. In both cases, we are concerned about the performance of each battalion as a whole. Therefore we use the three outcome measurements at the level of the battalion: recruiting and retention, workload, and Advanced Camp scores.

Collecting additional information about the effects of the staffing alternatives may be desirable. To understand program changes in more depth, attitude surveys or interviews could be used. While tracking contract costs is a given, detailed analyses of staffing and implementation costs could be conducted to assess the determinants of costs and how actual costs differ from the projections in this analysis.

## **EVALUATION DESIGN**

The proposed evaluation design divides SROTC battalions into three groups. The largest group is not affected by the proposed staffing changes—the “comparison group.” There are two, smaller groups in which the staffing alternatives are phased in on a trial basis: One uses the former-military option to replace AC staff; the other uses the reserve option. Recall that both options use civilians to fill the admin/log positions currently filled by active-duty soldiers.

The design allows us to identify postreplacement changes in outcomes in the trial replacement units and to compare these changes to the trends in the same outcomes in the comparison group over the same period. Given the current budgetary environment, it is inevitable that SROTC funding, staffing, or management practices could change during the evaluation period. For this reason, among others, the use of comparison units is especially valuable.

The evaluation plan treats each host battalion—together with any extension centers and cross-enrolled students—as a single unit in the evaluation. There are presently about 258 units (host battalions), although a few may be closed during the experiment period, reducing the number of schools in the comparison group.

### **Recruiting and Retention**

The most crucial measure of the effectiveness of a specific SROTC unit is the number of commissions produced over time. Large variations—up or down—have a major impact on the effectiveness and efficiency of the SROTC program. If the number of commissions is too low, the Army cannot meet its officer requirement or must expand SROTC substantially to do so. If the number of commissions is too high, then perhaps major economies in SROTC can be achieved. If these economies are not realized, then excessive commissionees are slotted into the IRR.

For these reasons, it is desirable that a trial of the alternative staffing plans have an excellent chance of detecting major changes in the future commissioning potential of SROTC. The contemplated test designs do not last long enough to observe a single cohort of cadets from entry through commission. Instead, the design of the test ob-

serves all cadets in the program over the course of each year. New cadets are recruited into the freshman, sophomore, and junior classes. Existing cadets retain or drop out from one year to the next. The evaluation computes the number of new cadets recruited into each class as well as the percentage retained from each class over a full year.

Because of the importance of this measure, it is desirable to have a test with a 90 percent chance of detecting large changes in the number of prospective commissions. This 90 percent level still leaves a one-in-ten chance that we would miss an important effect in the test. If achieving a 90 percent chance is not feasible, it is imperative that the probability of detecting large changes exceed 80 percent. Anything below 80 percent, or a one-in-five chance of missing important effects, gives us little confidence that the test will reveal the effects of alternative staffing. If the trial does not detect such prospective changes, they will become the new reality when the staffing alternatives are broadly implemented throughout the SROTC program—with potentially damaging effect.

The Army must decide how much variation from the current commissioning rates is acceptable on a long-term basis. As seen in Table 6, if the requirement is for 3,800 commissions annually, a 5 percent variation means that the actual number of commissions produced by the staffing alternatives could be as low as (about) 3,600. A 15 percent variation means that annual commissions could fall short of the 3,800 required by almost 600 officers. A 25 percent variation means that annual commissions could fall short of the 3,800 required by 950 officers. The same size variations could occur in the positive direc-

**Table 6**  
**Effect of Variation on Annual Commissions**

Undetected Variation from Requirement	Future Number of Commissions (versus 3,800 requirement)
-5%	3,610
-15%	3,230
-25%	2,850

NOTE: The same size variations are possible in the positive direction (i.e., 3,900, 4,370, or 4,750 future commissions versus 3,800 required).

tion as well. Clearly, these are substantial deviations from the targeted number of commissions. However, there is a tradeoff between the Army's willingness to accept substantially fewer (or greater) commissions on a long-term basis and the number of alternatively staffed units that must participate in the trial replacement to prevent such an outcome.

We would like to know the effects of a staffing alternative as soon as possible after its initial implementation, ideally after a one-year trial replacement. To estimate the number of commissions that a unit would produce under an alternative staffing plan, we can analyze the historical patterns in progression through the program—for example, first to second year, on-campus recruit to Basic Camp to third year, etc.—and commissioning. We can then test for changes in these patterns and use the changes detected to predict future commissions under alternative staffing.

Testing requires a large number of units because there is a great deal of variation in the rates at which cadets enter or drop out of SROTC across schools and from year to year. Specifically, suppose that in

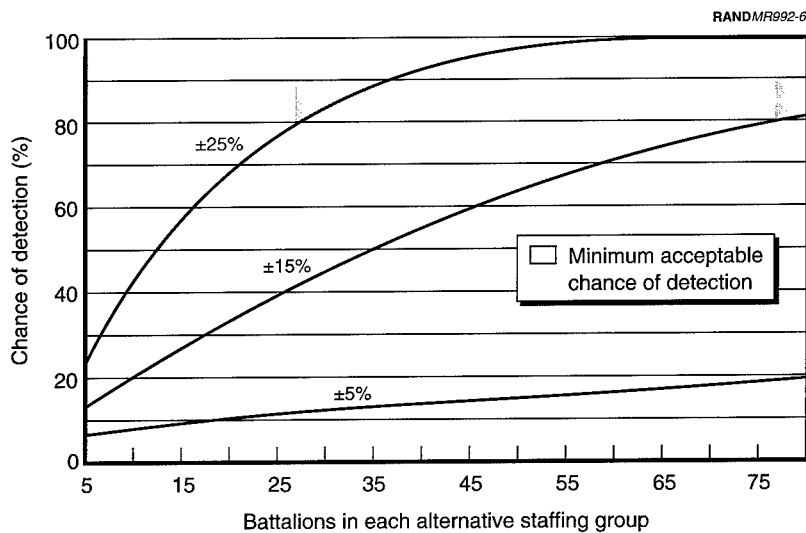


Figure 6—Chance of Detecting Change in Recruiting and Retention

the alternatively staffed units, recruiting and retention worsens to the extent of a 5 percent decrease in projected commissions compared to before the staffing change (corresponding to a full implementation change to 3,610 versus 3,800 required). As Figure 6 shows, our statistical analyses of historical data indicate that even with a very large number of test units, there is little chance of detecting this change. In contrast, the historical data imply that we could be confident of detecting the recruiting and retention falloff that translates into a 15 percent decrease in commissions (meaning a full implementation change to 3,230 versus 3,800), but only by testing a minimum of 75 units (for a trial replacement lasting one year). That is, only with about 75 test units do we exceed an 80 percent chance of detecting the change (shaded area). Fewer test units are needed if we are willing to accept the risk that we will only detect a change of 25 percent or larger (corresponding to a full implementation change to 2,850 commissions versus 3,800 required). Between 25 and 35 test units are required in a one-year trial replacement to have an 80–90 percent chance of detecting the 25 percent change.<sup>1</sup>

Clearly, we do not want to fail to detect a major change in recruiting and retention that we would be forced to live with after full implementation of a staffing alternative. Thus, we want to be sure we test enough units to detect harmful changes. At the same time, we do not want to test more units than necessary because, if a staffing alternative is harmful, we want to be able to undo it quickly, cheaply, and with as little personnel turbulence as possible. One approach to resolving this tradeoff is to extend the test period to two years. This allows additional data to be collected at each unit and reduces the

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<sup>1</sup>In computing the possible effect of changes on the rate of commissions, we analyzed various measures based on historical data. The power calculations reported in Figures 6 and 7 are based on changes in the rate of noncontracted MSIIIs (sophomores) contracting as MSIIIs (juniors). This rate is crucial to future commissions and represents an area most likely to be affected by replacement personnel. We believe this rate provides a reasonable representation of the complete set of transition measures we anticipate using in the actual analysis of the trial replacements. To generate the power calculations, we conducted a Monte Carlo simulation using actual historical data. Each trial of the simulation selected a random group of battalions from the historical data to be the experimental group. Other battalions were assigned to the comparison group. (Because two options may be tested simultaneously, the comparison group was reduced by twice the number of test units. For example, a total of 250 units would be divided into two 15-unit experimental groups and one 220-unit comparison group.) Appendix D provides more detail on the Monte Carlo simulation method.



number of units required to test each staffing alternative. This approach is illustrated in Figure 7.

As shown, to have better than an 80 percent chance of detecting changes in recruiting and retention equivalent to a 15 percent change in projected commissions requires a minimum of about 40 units in a two-year test, compared with 75 or more in the one-year assessment. To detect a 25 percent change requires a minimum of about 15 units in a two-year test, compared with 25 or more test units over a single year. As we will see next, a 25-unit single-year test or a 15-unit two-year test also would detect important changes in cadre workload (quality of life) and cadet performance (capability and training effectiveness).

A two-year test has the additional benefit that it reduces the impact of any startup effects in integrating the replacement staff into the units. Since the experiment calls for replacing about half the personnel in a unit, we are concerned about disruptions. But this concern is tempered because the average turnover in a unit is one-third (based on average three-year assignments). A turnover of one-half is

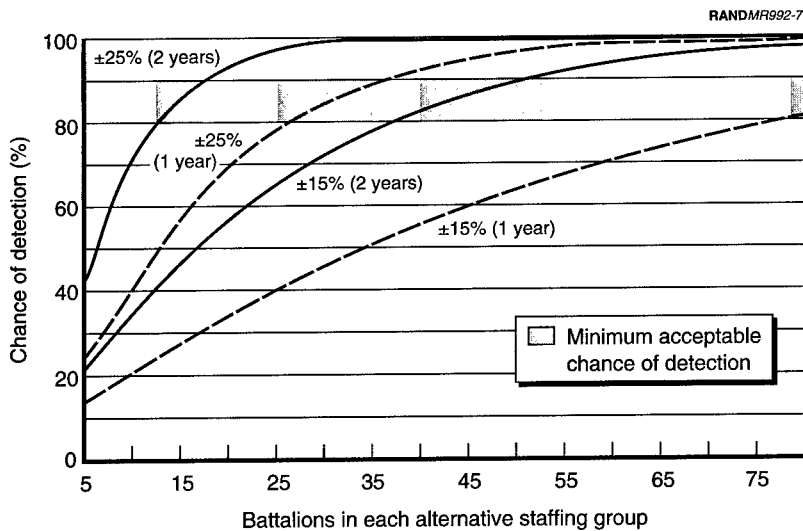


Figure 7—Effect of a Second Year on Testing Change in Recruiting and Retention

higher than normal but not completely unusual. Using fewer units over two years does increase the risk that the results will be affected by one or two exceptionally good or bad units. Therefore, we would not want to reduce the number of units participating below about 10–15 no matter how long the test lasts.

A longer test might allow a better chance to detect harmful changes that do not reach the 25 percent level. Extending the test to four or more years—or adding additional units—is an option that the Army might consider at the end of a two-year test, especially if the projected effects do not pass the test of statistical significance but are in an undesirable direction. For example, if the two-year test generates data that indicate a projected 20 percent decline in recruiting and retention but lack statistical power to confirm this result, continuing or expanding the test would help to confirm whether the projection was cause for genuine concern.

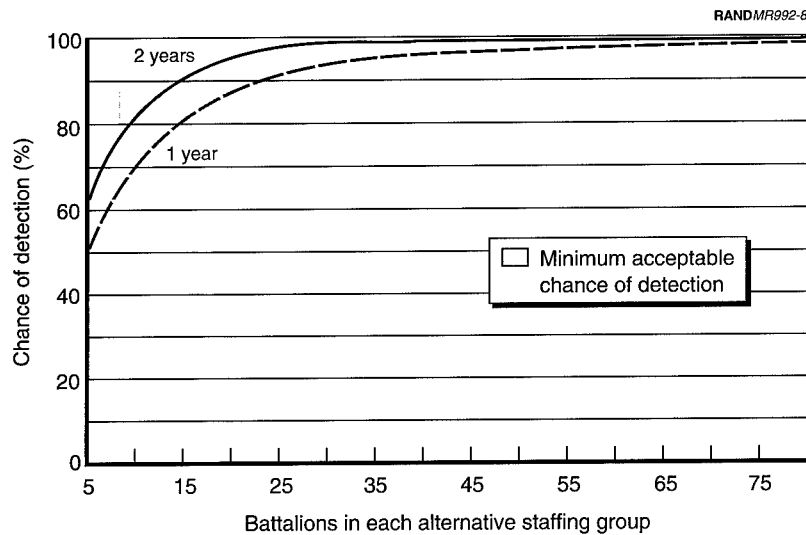
## Workload

Testing the change in cadre workload follows the same principles as testing changes in commissions. Our object is to determine if the remaining full-time military cadre (AC, AGR, or civilian) in the experimental units have to work harder than their counterparts in comparison units. We also would like to know if alternative staffing is so efficient that it reduces workload for the remaining full-time military.

For workload, however, there is no existing data system to collect information. We have therefore designed a survey to collect information on the workload of cadre members in SROTC battalions. We pilot tested the survey during the 1996–1997 school year and will implement it during the staffing experiment. Because we did not have historical data to use in estimating the power of this measure, we made assumptions about the underlying distribution of workload, considering variation across schools, over time, and among individuals.<sup>2</sup> Since this was a theoretically derived distribution, it was

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<sup>2</sup>Specifically, we assumed that each observation of a specific individual's workload would have a standard deviation of about 10 hours per week. The computations were based on the variance that resulted from seven administrations per year of a new workload survey that we designed for this purpose. On average, each experimental battalion would have three full-time military cadre members responding to the survey



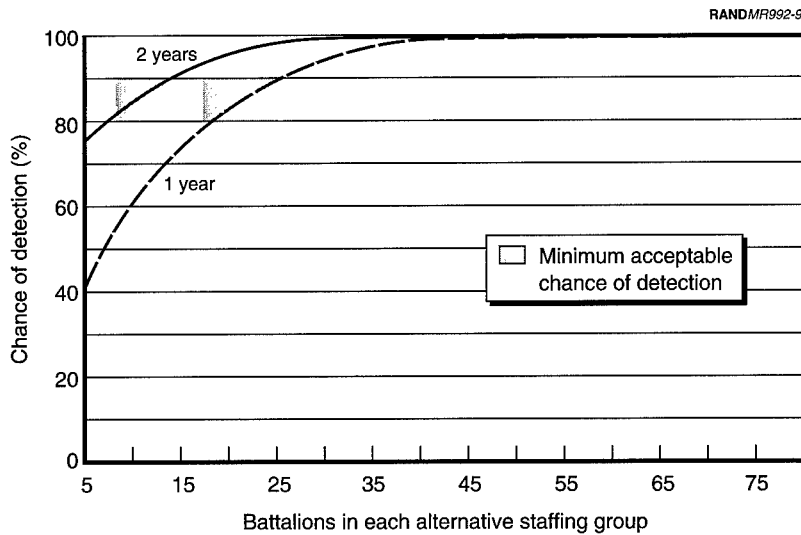
**Figure 8—Chance of Detecting Change in Workload of  $\pm 5$  Hours per Week**

convenient to use a standard power calculation for testing equality of means between the experimental and comparison groups. The results appear in Figure 8. As shown, an increase (or decrease) in workload of five hours per week per full-time cadre member (about one hour per day) requires 15–25 units to have at least an 80 percent chance of detection in a one-year test. Over two years, about 10–15 units are needed. If these theoretical calculations are validated by the actual data collected, we will likely need just one year of administration of the workload survey to collect sufficient information to assess changes in workload during the experiment.

The workload survey is also suitable for use by the replacement staff, contracted former military, and other civilians as well as reservists. Although their responses to the survey do not form part of this outcome measure, they may generate useful insights about the changing

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in addition to the replacement staff. The unit of analysis here was the average reported workload over all full-time military respondents during the survey period. As detailed in Appendix D, our assumptions implied that the workload average in a one-year test had a standard deviation of 6.2 hours per week; in a two-year test it had a standard deviation of 5.2 hours per week.



**Figure 9—Chance of Detecting a 20-Point Change in Advanced Camp Scores**

distribution of workload within experimental units. This data also may help to establish specific causes of the effects noted on full-time military cadre workload or recruiting and retention performance.

### Advanced Camp Scores

Advanced Camp scores capture training effectiveness, capability, and leadership potential for SROTC cadets entering their senior year of the program. A large change in program effectiveness could result in a shift in average camp scores of 20 points, which would mean about 15 percent of cadets moving from above average to below average (or vice versa).<sup>3</sup> As Figure 9 shows, historical data on camp scores show that such a change requires 20–25 units to be detected in

<sup>3</sup>Advanced Camp is currently scored on a 1,000-point scale. Passing scores are 700 and above. Cadets failing Advanced Camp often drop out before completion. Since they do not complete all the scoring events at camp, they do not receive valid scores. Therefore, we focus on passing scores, which range from 700 to 1000. In 1995, the mean passing score was 899, with a standard deviation of 83.

to startup effects. These features and equivalent endpoint make a two-year test preferable to a one-year test.

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**CONCLUSIONS**

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This report has discussed alternatives to current SROTC battalion staffing in which many active-duty soldiers performing teaching or training functions would be replaced by other personnel: contracted civilians with former military service, or reservists. Additionally, civilians (with or without military experience) would be contracted to help cover administrative and logistics functions now performed by active-duty soldiers. We recommend testing two alternative staffing plans. One plan focuses on former military personnel; the other focuses on reservists.

Over time, it appears feasible to replace a significant number of AC positions, perhaps at lower cost. But the final number of positions that could be replaced by either civilians (former military personnel for teaching and training) or reservists must be determined. Combining reservists and civilians would further enhance coverage of AC positions. The potential savings appear to be in the range of 700–900 assignments. At the high end, this represents half of the AC soldiers in SROTC battalions. Achieving such savings would likely require the combined use of reservists, former military personnel, and other civilians (for admin/log positions).

It is possible that using replacement staff could save resources, if the AC staff savings are used to reduce endstrength. Although the use of reservists appears slightly cheaper on average, it is not clear whether either option would produce a net savings or cost increase. The reservist–contracted civilian option would take longer to phase in, however, and is not likely to be feasible on a broad basis before FY00 or later. Achieving potential savings thus will take time, and the

**Table A.1**  
**Colleges and Universities Participating in the 1997-1998 Staffing Experiment for**  
**Contracted Former Military and Other Civilians**

Academic Institution	PMS/APMS		Trainer		Admin/Log	
	Replacements	Military	Replacements	Military	Replacements	Military
Rochester Institute of Technology	2	2	1	1	1	0
Providence College	2*	3	1	2	1	0
Campbell University	2	4	1	2	1	0
University of Arkansas-Pine Bluff	1	2	1	1	0	1
Grambling State University	2*	2	1	1	1	1
University of Michigan	2	2	1	1	1	0
University of Colorado-Colorado Springs	2	2	1	1	0	0
Florida State University	2	3	1	1	1	1
Truman State University	2	2	1	1	0	0
University of Cincinnati	2*	2	1	1	0	0
Western Illinois	2	3	1	2	1	1
University of Texas Pan American	1	2	1	1	0	0
Northwestern State University of Louisiana	2	3	1	1	1	1
Pittsburg State University (Kansas)	2*	2	0	2	0	1
University of Utah	2*	2	1	1	0	0
<b>TOTAL</b>	28	36	14	19	8	6
( First Year	23	41	14	19	8	6 )
Replacement rate (average over both years)	40%		42%		57%	

SOURCE: Cadet Command, October 15, 1997.

\*Indicates one fewer replacement scheduled to be in effect during the first year of the test. In these schools, it was not feasible to implement all replacements at the start of the test because of Army personnel rotations.

NOTE: Desired rate of replacements is 50 percent for PMS/APMS, 50 percent for trainers, and 100 percent for admin/log.

**Table A.2**  
**Comparison of Experimental Units to Overall SROTC Program**

Measure	Experimental Units	Overall Program
Number of schools	15	239
Production		
Average commissions 1992-1996	12.9	13.4
Staffing assigned		
Officers	4.2	4.0
NCOs	2.9	3.0
Civilians	1.4	1.3
Institutional type		
Public	80%	72%
Private (Scholarship Tier IA)	7%	10%
Private (other)	13%	19%
Ethnic market		
Historically black colleges and universities	13%	9%
Hispanic-serving institutions	7%	6%
Geography		
Region 1 (East)	27%	35%
Region 2 (Midwest)	47%	35%
Region 4 (West)	27%	30%

NOTE: Extension centers, military colleges, schools on the Program Efficiency Closure list, and schools with 1997-1998 reserve option staffing are excluded from the overall statistics.

Because of the need to accommodate personnel rotations, several units do not have the desired level of replacements, especially during the first year of the test. Some of this deficiency will be made up during the second year. The overall replacement rate for officers (PMS and APMS) is 40 percent averaged over the two years of the test, compared to a desired 50 percent replacement. For trainers, the overall replacement rate is 42 percent compared to 50 percent desired; for admin/log the overall replacement rate is 57 percent compared to 100 percent desired.

We believe that the admin/log replacements will have little effect on the unit performance, since these functions are less connected to cadet retention and training. The lower level of replacements for



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**MILITARY PERSONNEL COSTS**

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We conducted an analysis of personnel costs in order to compare the cost of AC, RC, and civilian personnel. The main text describes the data and methods used to project the costs of contracted civilians. The analysis of military personnel costs is documented here.

**MILITARY COMPENSATION**

Military compensation is composed of several pays, allowances, and other benefits. Military pay includes basic pay and a number of special and incentive pays such as flight pay, hazardous duty pay, and bonuses. Allowances are provided to members to offset the cost of living in the form of allowances for quarters, subsistence, and clothing. Other benefits include factors such as the availability of medical care, retirement pay, and other similar considerations. However, not all members of the Armed Forces receive the same compensation elements nor at the same rate. Many of these costs vary based on the service member's grade, longevity, and component of military service.

We included the following elements of cost in our analysis: Basic Pay, Basic Allowance for Quarters (BAQ), Variable Housing Allowance (VHA), Basic Allowance for Subsistence (BAS), clothing-replacement allowance, retirement pay accrual, military medical care, and FICA. Added to this amount for Active Component personnel was the cost of permanent change of station (PCS). Table B.1 lists the AC and RC entitlements to these pays and benefits. As shown in the table, RC pays and benefits differ during inactive duty training (IDT) drills and annual training (AT).

System. For the purposes of this study, the “with dependents rate” was applied to service members occupying government quarters to establish an “in-kind” rate for this allowance.

### **Basic Allowance for Subsistence (BAS)**

Active Component members and reservists during AT receive an allowance to offset the cost of meals. Reservists in an inactive-duty status, such as unit training assemblies, are not authorized an allowance for subsistence (BAS). We used the “authorized to mess separately” rates for officers and enlisted personnel that went into effect January 1, 1996, contained in the *1996 Uniformed Services Almanac*.

### **Clothing-Replacement Allowance**

Active Component enlisted members are issued a standard wardrobe when they enter active duty and receive a clothing replacement allowance each year. The replacement allowance is paid at the “basic” rate for members with less than three years of service and a “standard” rate for members with three or more years of service. Active Component officers receive a one-time payment upon commissioning to buy clothing and do not receive any allowance to maintain their uniforms. Reservists are not usually eligible for a clothing replacement allowance unless they are called to active duty for more than six months. We used the “clothing-replacement allowance” rates for enlisted personnel that went into effect October 1, 1995, contained in the *1996 Uniformed Services Almanac*.

### **Retirement Benefit Accrual**

Members of the Armed Forces accrue retirement benefits based on their service component and the retirement plan in effect when they entered military service. Active Component personnel receive monthly retirement income from the military retirement system upon retirement from active duty. Reserve Component personnel earn retirement points during inactive-duty training and annual training and must achieve 20 satisfactory years of service and be 60 years old before retirement pay commences. (Satisfactory years of

service are ones in which the reservist earns a minimum of 50 retirement points.)

There are also three distinct nondisability benefit formulas within the military retirement system. Military personnel who entered the Armed Services before September 8, 1980, receive retirement pay based on their terminal basic pay. For members entering service on or after September 8, 1980, a "high-three" average of basic pay is used in the computation. In addition, members entering the Armed Services on or after August 1, 1986, are subject to a penalty if they retire with fewer than 30 years of service (until they reach age 62).

The true effect of staffing decisions on retirement costs depends on how the Army alters its force structure, for example reducing accessions and/or reducing various promotion rates. The conventional budgeting approach uses retirement accrual normal cost percentage (NCP) rates for each retirement benefit formula to calculate the retirement benefit cost. We used current years of service to indicate which benefit formula applied, assuming that the service members had served continuously for those years of service. This calculation used the retirement NCP rates in effect during FY96 contained in the *Valuation of the Military Retirement System* dated September 30, 1996, published by the DoD Office of the Actuary.

### **Military Medical Care**

Active Component and Reserve Component personnel during AT are entitled to health care services provided by the military health care system. Reservists while on inactive-duty training only have limited access to military medical care. Family members of AC personnel are also eligible to receive health care from the military health care system. Reserve family members are not eligible during short-term reserve duty.

The cost to DoD to provide health care services differs by beneficiary category, e.g., for service members as opposed to family members. We used the cost per user by beneficiary category for FY96 to calculate the cost of the military health care benefit by pay grade. We valued the health care benefit for reservists with limited access during inactive-duty training at 50 percent of the total cost for full-time service members.

the populations that would be available to fill each position. For instructors, we used the distribution of O-3 through O-6 TPU members whose civilian occupations are in secondary or postsecondary teaching. For trainers, we used the average E-7 pay rate. For the admin/log support positions, we used the population distribution of E-4 through E-6 in the OCAR-designated admin/log MOSs.<sup>1</sup> Populations were derived from SIDPERS using the appropriate criteria. To compute the estimated costs of the TPU/IRR SROTC battalion staffing, we combined these average rates with the staffing plan in Chapter Two of the report.

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<sup>1</sup>This admin/log support position is used to fill part of the replacements for APMS and trainer positions. It is not related to the full-time admin/log staff position.

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**GEOGRAPHIC AVAILABILITY MODEL**

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With the current AC and AGR staffing for SROTC battalions, the Army orders soldiers to report to the college locations as required to staff each battalion. Alternative staffing plans would not allow the Army to directly order personnel to fill vacancies. Instead, positions would be filled by reservists or contracted civilians.

Since reservists are typically employed (aside from their part-time reserve duty), they may well be unlikely to move in order to accept a part-time SROTC position. We developed a geographic availability model to estimate the number of reservists who would be able to staff SROTC positions, based on the population of reservists within 50 miles of each SROTC program.

The contractor employing civilians, including former military, might be able to induce potential staff to locate near available positions. But the preferences of individuals—and the limited permitted job tenure for former military—would reduce the chance that civilians would locate much differently from current patterns. We therefore estimated the availability of civilians within 50 miles of each SROTC program using a geographic model based on the actual location of civilians with the required qualifications as reported in the 1990 U.S. Census.

The data for civilians is derived from the 5 percent Public Use Microdata Sample (PUMS) of the 1990 U.S. Census, weighted to represent the entire U.S. population. We selected the observations with the appropriate military experience, education, and occupation as described in Chapter Two of the main text. Separate pools of observations were constructed for instructor, trainer, and admin/log eligible

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## STATISTICAL POWER CALCULATIONS

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The main text indicates the basic methods used to estimate the statistical power of the measures for commissions, workload, and Advanced Camp scores.

### NUMBER OF COMMISSIONS

We developed the power calculations for number of commissions using historical data on cadet progress and commissioning. As noted in the main text, the calculations reported are based on changes in the rate of noncontracted MSIIIs (sophomores) contracting as MSIIIs (juniors).

We estimated power using a Monte Carlo simulation. The simulation procedure selected the desired number of experimental units at random from the pool of eligible units. Each unit was equally likely to be selected, and no attempts were made to balance the selected experimental units with the overall population. To account for a second simultaneous experimental group, the procedure deleted an equal number of units from the pool. The remainder formed the comparison group. The simulation used two recent consecutive years of data to compute the rate of noncontracted MSIIIs in the first year contracting as MSIIIs in the second year of the data for each school.

In the comparison group, the simulation used the raw historical data. In the experimental group, the historical data were adjusted to simulate the effect of a performance degradation. Specifically, the simulation multiplied a disturbance by the historical data. Because we

known exactly, the large size of the comparison group means that the variance could be estimated very precisely. In this light, the simplification of using the formula for known variance comparisons seemed reasonable.

### **ADVANCED CAMP SCORES**

Power calculations for Advanced Camp scores were based on a Monte Carlo procedure similar to that used for the number of commissions. Because the historical data report individual scores at camp, we used the individual-level data.

As in the earlier procedure, the Monte Carlo simulation randomly selected units for the experimental group and comparison group. The simulation ran ordinary least squares regression on the camp scores, with a dummy variable indicating if the cadet record belonged to a school designated as an experimental unit.

Because of the potential for common factors to affect the performance of cadets from the same school, we adjusted the resulting number of units required to achieve a given level of power by a computed design effect.

In this situation, the design effect is given by the F-statistic from a one-way ANOVA of camp score on school. For this data, the F-value was 1.7. To be slightly conservative, we set the design effect a bit higher, at 2.

The reported power percentages are based on 1,000 trials for each group size and effect level.

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