

**QUALITY SOLDIERS:
COSTS OF MANNING
THE ACTIVE ARMY**

The Congress of the United States
Congressional Budget Office





PREFACE

The quality of the Army's active-duty enlisted recruits has advanced considerably in recent years. In fiscal year 1985, 90 percent held high school diplomas, up 40 percentage points from the low point of 1980. Scores on aptitude tests have shown comparable improvement. But concern has arisen over the Army's ability to sustain such success--let alone recruit even higher quality in coming years--at an acceptable cost. At the request of the House Armed Services Committee, this report looks at the costs and benefits to the Army of varying levels of recruit quality. In accordance with the Congressional Budget Office's (CBO's) mandate to provide objective analyses, the report makes no recommendations.

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June 1986



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SUMMARY

Every year the Army recruits about 125,000 young men and women into its active-duty enlisted force. Despite some trends that may make recruiting more difficult--higher rates of employment and declining numbers of military-age youths--the Army should continue to attract well-qualified candidates. Under CBO's baseline projection, well over 80 percent of the Army's male recruits over the next five years will hold high school diplomas.

This means that Army recruits will stay above the educational average for youth in general since only about 77 percent of the eligible population group holds high school diplomas. The percentage of high school graduates among Army recruits will also stay above historical averages. During the years of conscription 1964 through 1972, high school graduates made up only 68 percent of the Army's recruits; and during the 12 years of an all-volunteer force since then, about 71 percent have been graduates.

New recruits in coming years will also perform favorably on the Armed Forces Qualification Test (AFQT), the Defense Department's test of mental aptitude. More than a majority will score above the population's average, placing them in AFQT categories I-III. Only one recruit out of ten will score appreciably below average, in category IV. Of course, such projections rest on numerous assumptions that may not hold true in later years. Even so, prospects for a dramatic downturn in recruitment, on the scale that occurred in 1979 and 1980, seem quite remote.

THE ARMY'S PROGRAM FOR QUALITY

The Army would like to raise its recruiting standards even higher. In a recent report to the Congress, the Army set ambitious objectives under which at least 90 percent of all new recruits would be high school graduates. (Since all female recruits are graduates, about 88.5 percent of male recruits would have diplomas.) No more than 10 percent would score

in the lowest acceptable AFQT category (IV), and between 65 percent and 69 percent would be in the top three categories (I-III A). ^{1/}

Higher quality would offer definite advantages. Recruits in the top three AFQT categories, whether high school graduates or dropouts, tend to be more trainable than those in the lower categories. High school graduates are much more likely than dropouts to persevere through their initial term of service. Raising the proportion of graduates would therefore lessen personnel turnover and along with it the costs of travel and training, meaning less spending on ammunition, operation and maintenance, and the salaries of civilian trainers.

The added costs of recruitment would more than offset any such savings, though the net addition to the budget could be modest. CBO estimates that meeting the Army's goals with enlistment bonuses would raise net costs by \$410 million to \$785 million (in current dollars) over the next five years, depending on the percentage of recruits in AFQT categories I-III A (65 percent to 69 percent). This represents less than 1 percent of the full five-year variable costs of manning the Army.

ALTERNATIVES TO THE ARMY'S PROGRAM

In the present climate of budget austerity, any new spending might present difficulties. Moreover, costs might go much higher if the Army had to use comparatively expensive inducements to attract higher-quality recruits, such as education assistance or an across-the-board pay raise. For these reasons, CBO has looked at the trade-off between quality and cost of three alternatives to the Army's program for recruiting:

- o Holding the line on spending by keeping recruiting resources constant in real terms over the next five years;
- o Reducing recruiting resources for one year by suspending enlistment bonuses and pay raises for recruits in 1987 (similar to past Congressional actions); and

1. The Defense Department has recently revised the AFQT. In 1985 it adopted the 1980 national population of youths as a new reference standard, replacing the previous one that was based on the World War II mobilization population (under which category III A, for example, corresponded to the 50th to 65th percentile score range of officers and enlisted men on active duty as of December 31, 1944). Recent AFQT scores have therefore acquired a different interpretative meaning from scores on earlier tests. This report, to maintain historical continuity, expresses the Army's AFQT objectives under the previous standard. Thus, the Army's stated goal of between 59 percent and 63 percent AFQT I-III A recruits appears here as 65 percent to 69 percent.

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- o Reducing recruiting resources several years in a row by suspending enlistment bonuses in 1987, freezing recruits' pay in 1987, and limiting their pay raises in 1988 and 1989 to 3 percent.

These options would all give up some improvement in recruit quality to achieve budgetary savings. The Summary Table illustrates the scope of the trade-off. Holding the line would mean dropping the percentage of male high school graduates to 81 percent by 1991, roughly eight percentage points below the Army's program. Reducing recruiting resources for only one year would save between \$835 million and \$1,210 million, relative to the five-year costs of the Army's program. The percentage of high school graduates would fall to about 74 percent. Reducing resources for several years would save more, between \$1,215 million and \$1,590 million. But the percentage of high school graduates would dip to 68 percent, near the statutory minimum of 65 percent. (All these estimates assume that the proportion of recruits in AFQT category IV would stay at 10 percent.)

To judge these trade-offs, one needs to know about trends in the Army's requirements and, more important, to appreciate the relationship between recruit quality and soldiers' on-the-job performance. To what extent would altering recruit quality change the capability of the Army's enlisted force?

THE ISSUE OF MODERNIZATION

In light of the Army's drive to modernize its weapons, some would argue that recruit quality must go up. New weapons systems like the M-1 tank or the Single Channel Ground and Airborne Radio System are more sophisticated and complex than their predecessors. But despite the array of new equipment, the proportion of enlisted recruits assigned to comparatively technical jobs (such as operating and maintaining advanced electronic equipment) will increase by only about one percentage point between now and 1991. Moreover, new weapons systems do not necessarily make jobs more demanding. Emerging technologies may supplement high-quality personnel by making the new systems easier to maintain and to use. Thus, the key issue remains whether changes in recruit quality would make a significant difference in the Army's capability.

SUMMARY TABLE. EFFECTS OF ALTERNATIVE PROGRAMS FOR ARMY RECRUITING ON COSTS AND PERSONNEL: SUMMARY PROJECTION a/

	Army Program AFQT I-III A		Hold-the-Line Program	One-Year Cut in Resources	Three-Year Cut in Resources
	69 Percent	65 Percent			
Five-Year Costs (1987-1991) <u>b/</u>	97,370	96,995	96,585	96,160	95,780
Career Force in 1991					
Number (in thousands)	299.7	299.8	300.0	299.8	299.8
Percent AFQT I-III A	53.1	52.7	52.5	52.5	52.5
NPS Accessions in 1991 <u>c/</u>					
Number (in thousands)	127.1	127.0	128.4	130.3	131.9
Percent male HSDG <u>d/</u>	88.5	88.5	81.0	74.0	68.0
Percent AFQT I-III A	69.0	65.0	62.1	65.6	65.7
Annual Long-Run Costs <u>e/</u>	23,000	22,885	22,550	22,385	22,205
Long-Run Career Force					
Number (in thousands)	283.5	284.6	281.6	280.0	278.0

(Continued)

SUMMARY TABLE. (Continued)

	Army Program AFQT I-III A		Hold-the-Line Program	One-Year Cut in Resources	Three-Year Cut in Resources
	69 Percent	65 Percent			
Percent AFQT I-III A	66.6	63.2	61.7	62.1	61.0
Long-Run NPS Accessions <u>c/</u>					
Number (in thousands)	131.9	131.5	135.9	137.7	140.0
Percent male HSDG <u>d/</u>	88.5	88.5	79.0	75.0	69.5
Percent AFQT I-III A	69.0	65.0	65.0	65.7	62.9

SOURCE: Congressional Budget Office.

- a. All programs assume that the proportion of AFQT IV recruits (all of whom are high school graduates) is held at 10 percent.
- b. In millions of current dollars (adjusted for inflation).
- c. Signifies recruits who are non-prior-service--without previous military experience. A detailed distribution of accessions appears in Appendix C.
- d. High school diploma graduates.
- e. In millions of 1987 dollars.

THE RELATIONSHIP OF RECRUIT QUALITY TO INDIVIDUAL PERFORMANCE

Empirical research into individuals' quality and performance offers few conclusive findings. One reason is the difficulty of defining performance in a peacetime military setting, let alone measuring it directly. Researchers have to rely on various proxies to gauge performance: written tests of job knowledge (like the Army's Skill Qualification Tests, known as the SQT), hands-on job proficiency tests, rates of promotion, and supervisors' judgments.

One key finding is that during the first term (years of service one through four), high-aptitude soldiers perform 10 percent to 20 percent better than lower-aptitude soldiers. Those in AFQT categories I-III A are more likely to pass the SQT, and score higher on job performance tests. Typically, they receive faster promotions--even though promotion boards do not see their AFQT scores--and they are generally judged more productive by their supervisors.

The relative value of a high school diploma is less certain. Some studies find education unimportant, insofar as having a diploma does not compensate for a relatively low AFQT score. Others suggest that high school graduates are generally more productive than nongraduates. Supervisors, for instance, tend to rate lower-aptitude graduates as superior to higher-aptitude dropouts.

INDIVIDUAL QUALITY AND TEAM PERFORMANCE

Teams, not individuals, accomplish most military missions. In some instances, depending on the nature of a team's mission, one less able member can drag down an entire unit's performance. But groups made up entirely of high-quality members do not always outperform groups made up of soldiers with more modest ability, as shown by Army analysis of tank crews under simulated battle conditions.

Tanks have a driver, a loader, a gunner, and a commander. In the older M-60 tank, crews with gunners and commanders of high aptitude markedly outperform others. In the newer M-1 tank, a high-aptitude gunner can compensate for a commander's low aptitude. Moreover, all crews do

better in the M-1, regardless of their AFQT scores; an M-1 crew whose commander and gunner are both in AFQT category IV will score 5 percent more tank-equivalent kills than even the best M-60 crew.

While higher recruit quality should lead to a more capable first-term force, it could also diminish the career force. At the end of their first term, soldiers in the upper AFQT categories are less likely than others to reenlist. This raises a trade-off between the performance of lower-aptitude but experienced soldiers, and that of less experienced, high-aptitude soldiers. The evidence is sparse, and not consistent. Some researchers find that soldiers' scores on job performance tests converge after several years' experience, suggesting that over time such factors as training on the job, the nature of the assignment, maturity, and marital status, may be more important than measured quality. But other studies of military performance suggest that soldiers with high AFQT scores are able to raise their relative productivities with experience on the job (a finding mirrored in the civilian labor force by the relationship of earnings over time to individual ability).

EFFECTS ON PRODUCTIVITY OF DIFFERENT RECRUITING OBJECTIVES

CBO used the empirical findings on performance to consider the effects that different recruiting objectives might have on the enlisted force's overall "productivity." Productivity--which presumably varies according to soldiers' aptitude, education, and experience--was measured by an index reflecting these characteristics. The index required specifying the relative productivity of different groups. For instance, the average first-term high school graduate in AFQT category IV may be 20 percent less productive than the average nongraduate in AFQT categories I-III A. Because of ambiguities in the empirical evidence, the index includes a variety of such assumptions. CBO then projected the long-run composition of the Army's enlisted force under a range of recruiting standards and observed the relationship between the index of productivity and the costs of manning the force.

CBO's analysis suggests that the Army's program might add less to the enlisted force's productivity than to its cost. For example, as the percentage of high school graduates rises from 76 to 90 (while the percentage of AFQT I-III A recruits stays at 65), the force's overall productivity increases by about 1.1 percent. But the annual long-run cost of manning the Army increases by about \$405 million, or roughly 1.8 percent--driven largely by increases in enlistment bonuses. Similarly, raising the percentage of AFQT I-III A recruits from 65 to 69 (with 90 percent of them high school graduates) improves productivity about 0.25 percent, whereas long-run costs increase about 0.50 percent.

This sort of analysis has various limitations. Foremost, a 1 percent improvement in productivity is not necessarily worth a 1 percent increase in costs, depending on its contribution to national defense. In addition, the analysis requires making simplifying assumptions about the relationship between individual soldiers' performance and wider military capability. Measures of overall productivity should therefore be used together with other criteria: the average quality of the population from which the Army draws its recruits, or historical recruiting patterns.

REVIEWING THE ALTERNATIVES: PROS AND CONS

All three of the alternatives CBO looked at would save money at the cost of giving up some potential improvement in the Army's overall capability. They would also lessen the Army's hedge against unexpected future problems, such as a decline in retention that would boost the need for recruits. But the difference in capability between the Army's program and the first alternative (holding the line on costs) or the second alternative (reducing resources for one year) might not be great. Though both alternatives would mean fewer high-quality recruits, the Army still would be comparatively well off. Over the next five years, the percentage of recruits in above-average categories I-III A would be in the mid-sixties, and the percentage of high school graduates generally above 80--figures comparing well with historical standards, and with the average quality of the youth population.

The third option, cutting recruits' pay or benefits several years in a row, would have stronger effects. The proportion of male high school graduates would fall to 68 percent (near the statutory minimum) by 1991. Not only would this be below the population average, but it would greatly lessen the Army's hedge against unexpected recruiting problems. Nevertheless, the Army would continue to enjoy better recruiting than in 1980, with close to 20 percentage points more male high school graduates, and 40 percentage points fewer recruits in AFQT category IV.

CHAPTER I

INTRODUCTION AND BACKGROUND

Over the next five years more than half a million young men and women will enter enlisted service in the active Army. The Army would like them to be better educated than in the past, and brighter. Such recruits generally learn faster than others, stay longer, and quite possibly perform better. But they will cost more to attract, particularly as economic and demographic factors shrink the pool from which recruiters can draw. If the economy continues to expand, more youths may favor civilian over military employment. And population trends clearly show that there will be fewer and fewer youths eligible to serve in the Army.

Nevertheless, the Army has endorsed very high standards for recruit quality over the next five years. ^{1/} Nine recruits out of ten would be high school graduates; at least six out of ten, above average in mental aptitude. Some feel that the Army cannot support such high standards at an acceptable cost. The costs of recruiting, which include television advertising, enlistment bonuses, and education benefits, now run more than \$600 million a year and would certainly increase if standards were raised. How much more can the Army spend in a period when all defense costs may have to be cut? And how much recruit quality does the Army need?

Manpower quality is as much an issue for the other services as it is for the Army. The Navy, Air Force, and Marine Corps will also have to grapple in future years with unfavorable economic and demographic trends. But the Army faces the most serious challenge because its needs are greatest. It takes about four out of every ten new recruits entering active-duty service. Moreover, Army recruiting must make up for a particularly dismal past: no other service suffered as great a decline in recruit quality in 1979 and 1980.

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1. Office of the Assistant Secretary of Defense (Manpower, Installations, and Logistics), Report to the House and Senate Committees on Armed Services, *Defense Manpower Quality*, vol. 2, Army Submission (May 1985).

Hence, this report's focus on the Army, specifically on recruitment of enlisted personnel. 2/

THE RECRUITING SYSTEM

Today's active Army numbers 781,000 personnel, of whom about 667,000 are enlisted soldiers. Almost all enter service without having had previous military experience. In 1985, about 103,700 men and 15,400 women entered as new recruits (so-called non-prior-service accessions); another 6,000 had previous military experience (prior-service accessions). They signed up through the U.S. Army recruiting command, which staffs 2,000 recruiting stations throughout the country. Payroll and overhead costs to operate this network of stations amount to over \$400 million a year. The Army also spends about \$95 million on advertising and more than \$150 million on special monetary incentives for selected high school graduates--enlistment bonuses (up to a maximum of \$8,000), and supplemental education benefits (up to a maximum of \$14,400).

New recruits spend their first few months in training, where they learn first the attitudes, habits, and basic skills of military life (basic training), and then a specific skill (skill training). 3/ About 12 percent wash out of training for medical reasons, lack of motivation, disciplinary problems, and so on. Analysts refer to these losses, before the completion of the first term of service, as attrition. Those who complete training report to duty assignments, often overseas, where they serve out their two, three, or four years of enlistment. At that point, they may reenlist for another term of service, eventually to become "career" personnel--the trained and experienced part of the Army.

WHAT IS QUALITY?

In the context of recruiting statistics, "quality" has precise and narrow meanings: achievement on an aptitude test and achievement in education.

2. Though quality is also an issue for the Army's officer component, the recruitment of officers poses relatively few problems. For one thing, the Army needs only about 10,000 new active officers a year; it needs about 125,000 enlisted recruits. Moreover, most officers enter service through the Reserve Officer Training Corps program, located in over 300 colleges across the country. The Army's 12,000 ROTC scholarships (as authorized by the Congress) should continue attracting high-quality college students over the next few years.
3. For certain skills, the Army combines basic and skill training into a single course, One-Station Unit Training.

High school diploma graduates who score above average on the military entrance examination have come to be called "high-quality." Because they have more alternative opportunities than those less educated or less able, high-quality youths (particularly males) are in scarce supply to the military.

In practice, quality encompasses a wide range of attributes that contribute to a productive, capable, and well-motivated force. These include cognitive ability, ingenuity, tenacity, flexibility, sacrifice, and loyalty. ^{4/} Test scores and education alone cannot be expected to measure all of these attributes. But the military needs quantifiable measures for screening applicants, so over the years it has come to rely on test scores and education.

Test Scores

All potential recruits take an entrance examination called the Armed Services Vocational Aptitude Battery (ASVAB). It was developed to predict trainability, not performance on the job. The battery consists of 10 subtests that purport to gauge different aspects of an applicant's ability. The Department of Defense combines scores on four of the subtests (work knowledge, paragraph comprehension, arithmetic reasoning, and numerical operations) to form the Armed Forces Qualification Test, known as the AFQT.

Test scores on the AFQT are grouped in several broad categories that relate to potential for successful training. Applicants scoring average or above, who are easiest to train, fall in categories I, II, and IIIA; those scoring below average fall in categories IIIB, IV, and V. By law, the active military services cannot accept applicants who score in category V. ^{5/} By regulation, the services will not take category IV applicants who lack high school diplomas. Each service is also limited as to the proportion of all recruits in category IV, for which the Congress has legislated a 20 percent maximum. ^{6/}

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4. Richard Cooper, *Military Manpower and the All-Volunteer Force* (Santa Monica, Calif.: The Rand Corporation, 1977), p. 129; and Paul Nelson, "Personnel Performance Prediction," in Roger Little, ed., *Handbook of Military Institutions* (Beverly Hills, Calif.: Sage Publications, 1971).
 5. In 1980, 5 percent of a broad random sample of male youths scored in category I; 35 percent in II; 14 percent in IIIA; 15 percent in IIIB; 23 percent in IV; and 8 percent in category V.
 6. In the fiscal year 1981 Authorization Act.

Changes in the population that is used to define the AFQT categories may confuse the debate over recruiting. Each AFQT category corresponds to the range of percentile scores shown in Table 1. Until 1984, these percentile scores were linked to the World War II reference population, so that percentile scores from recent versions of the AFQT had roughly the same interpretative meaning as scores from earlier versions, back to 1950. Whether a recruit enlisted in 1974 or 1984, a percentile score of 93 to 100 (AFQT category I) meant placement in the top 8 percent of those mobilized during the 1940s.

This link was severed in 1985 when the Defense Department changed the reference population to a broad sample of youths tested in 1980. As a result, the proportions of recruits in the various AFQT categories changed. Some who would have been classified in category IIIA under the old reference population now fell into category IIIB. When recruits' scores in

TABLE 1. ARMED FORCES QUALIFICATION TEST CATEGORIES

AFQT Category	Percentile Scores	World War II Reference Population Percent Distribution
I	93-100	8
II	65-92	28
IIIA	50-64	17
IIIB	31-49	17
IV	10-30	21
V _a	1-9	9

SOURCE: Office of the Assistant Secretary of Defense for Manpower, Reserve Affairs, and Logistics, *Profile of American Youth: 1980 Nationwide Administration of the Armed Services Vocational Aptitude Battery* (March 1982).

a. Those scoring in category V are not allowed to enlist.

1984 are interpreted against the old reference population, 63 percent place in AFQT categories I-III A; when their scores are interpreted against the new reference, only 54 percent place in the top three categories.

Comparing new and old AFQT percentages raises methodological problems. One may take 1984 statistics as an example. The change in reference population reduced the proportion of AFQT I-III A recruits by 14 percent, from 63 to 54 percent. But if those recruits in 1984 who fell just short of the new category III A could have taken the test again, many would have boosted themselves into that category. According to one rule of thumb (used in the past by the Defense Department) one-third of them would have done so. Thus, the new reference population would have reduced the AFQT I-III A proportion in 1984 from 63 percent to 57 percent, not 54 percent.

In its report to the Congress on manpower quality, the Army expressed its goals for AFQT percentages according to the new reference population. This study expresses recruiting statistics under the older reference population to facilitate historical comparisons, using the aforementioned one-third rule of thumb to reformulate the Army's goals. 7/

Education

The second common measure of recruit quality is education. High school diploma graduates have markedly lower attrition than nongraduates. 8/ About 75 percent of Army high school graduates complete their first term of enlistment; about 50 percent of nongraduates complete theirs. 9/ In

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7. This method necessarily introduces some imprecision into the AFQT percentages. But even the AFQT statistics that have been formulated under the new reference population entail some uncertainty. Periodically, the Defense Department introduces new forms of the ASVAB for testing recruits. If scores on a newer test are to be interpreted in terms of the norms on previous tests, the Defense Department must convert the newer test's scale to that of some older one. This process, known as calibration, is like any human endeavour not error-proof. If mistakes are found, and later corrected, the proportions of recruits in the various AFQT categories may again change. Hence, the reader should be cautioned against attributing too great a degree of precision to any single AFQT statistic, whether based on the old or on the new reference population.
 8. See Richard Buddin, *Analysis of Early Attrition Behavior* (Santa Monica, Calif.: The Rand Corporation, July 1984).
 9. Statement of Assistant Secretary of Defense for Manpower, Installations, and Logistics before the Subcommittee on Manpower and Personnel, Senate Armed Services Committee, March 11, 1985.

1981, the Congress legislated that no more than 35 percent of all Army male recruits without previous military service may be without high school diplomas.

Though AQFT scores are not significantly related to attrition, they show some relationship to the willingness of high school graduates to reenlist. High-scoring graduates are less likely to stay past their first terms of service, perhaps because their civilian opportunities are brighter. Among graduates whose three- or four-year terms ended during 1985, those in AFQT categories I-III A were about 12 percent less likely than others to reenlist.