

TABLE 9. EXPECTED TIME OF PROMOTION AMONG SOLDIERS IN SELECTED OCCUPATIONS, BY EDUCATION AND AFQT CATEGORY (In months)

Occupation <u>a/</u>	High School Graduates			Nongraduates
	II <u>b/</u>	IIIB <u>c/</u>	IV <u>d/</u>	II <u>b/</u>
From E-4 to E-5				
Infantryman	22.0	23.9	25.4	22.6
M-60 Armor Crewman	20.3	22.2	23.9	21.7
Administrative Specialist	49.3	58.9	67.6	58.1
Unit Supply Specialist	31.5	33.8	35.9	34.8
From E-5 to E-6				
Infantryman	30.8	32.6	34.2	32.2
M-60 Armor Crewman	28.0	31.5	34.6	29.2
Administrative Specialist	118.3	130.3	138.8	130.2
Unit Supply Specialist	37.1	39.5	41.5	39.8

SOURCE: *Defense Manpower Quality*, Army Submission (May 1985), Appendix G.

- a. Brief descriptions appear in Appendix B.
- b. Based on soldier with an AFQT percentile score of 65.
- c. AFQT percentile score of 40.
- d. AFQT percentile score of 20.

Limits to the AFQT Results. Though a strong relationship exists between score on the AFQT and performance, many recruits in AFQT categories IIIB and IV make fine soldiers, while some high-aptitude recruits do not. HumRRO's job tests revealed that one category IV soldier out of three scored in the upper half of the performance distribution, while one AFQT I-III A soldier out of four scored in the lower half. More recent SQT data offer corroboration, since in many occupations AFQT scores explain less than one-fifth of the variation in individuals' performance on the SQT. Similar results hold when analyzing the civilian earnings of former service members--AFQT scores are only one of many factors affecting total performance. 11/

11. An analysis of veterans who served one term of military service found that AFQT has a positive, though generally weak, effect on their earnings. See Adele Massell and Gary Nelson, *The Estimation of Training Premiums for U.S. Military Personnel* (Santa Monica, Calif.: The Rand Corporation, June 1974).

High School Graduation and Performance

While job performance tests emphasize the importance of mental aptitude, other measures suggest that education is the crucial factor. A large-scale survey of supervisors--the Rand Corporation's Enlisted Utilization Survey--gave high school graduation priority over high AFQT rank in accounting for successful performance. The survey covered 16 occupations in the Army and 32 in the other services. Supervisors rated the "net" productivity of trainees at different points during their first terms, relative to an average specialist with four years of experience. (Net productivity takes into account the time forgone by senior personnel in supervising on-the-job training.) Using these ratings to construct profiles of enlisted productivity over the first term, analysts have found, for example, that the typical infantryman just out of basic training is only one-third as productive as the average infantryman with four years of service; after just one year, the new infantryman is well over one-half as productive.

By the end of their first terms, according to these supervisory ratings, high school graduates are generally more productive than nongraduates, though AFQT scores still affect performance (see Table 10). High-aptitude high school graduates generally received the top ratings. Supervisors judged soldiers in category IV about 10 percent less productive than those in categories I-III. Category IV high school graduates, however, were rated more productive than most nongraduates, except in high-skill jobs. As Chapter I brought out, graduates are far more likely than dropouts to complete the first term of service. Perhaps this tenacity signals greater motivation on the job, which could have been a key factor in supervisors' judgments.

Value of High School Graduation. Why should high school graduates make better soldiers? One reason may be education's socializing effect. Along with geometry, chemistry, and English, schools teach the psychological attitudes and social behaviors required of adults. Students learn to function routinely, over long periods, in roles that conform to teachers' expectations. The development of these "affective" characteristics (as opposed to "cognitive" skills in advanced reading and science) may be the central means by which education enhances on-the-job success. 12/

12. Herbert Gintis, "Education, Technology, and the Characteristics of Worker Productivity," in American Economic Association, *Papers and Proceedings of the Eighty-Third Annual Meeting, 1970* (*American Economic Review*, vol. 61, May 1971).

TABLE 10. ESTIMATED PRODUCTIVITY OF SOLDIERS AFTER FOUR YEARS OF MILITARY SERVICE, BY SKILL, EDUCATION, AND AFQT CATEGORY a/

Skill and Education		AFQT Category				
		I	II	III	I-III	IV
All Jobs	HSDG <u>b/</u>	109	103	100	102	95
	Non-HSDG	96	90	83	85	75
High Skill <u>c/</u>	HSDG	111	103	93	104	83
	Non-HSDG	*	98	95	96	*
Medium Skill <u>d/</u>	HSDG	106	104	100	104	95
	Non-HSDG	103	94	83	88	94
Low Skill <u>e/</u>	HSDG	105	101	99	100	96
	Non-HSDG	*	83	82	82	72

SOURCE: Richard Cooper, *Military Manpower and the All-Volunteer Force* (Santa Monica, Calif.: The Rand Corporation, September 1977), p. 139.

NOTE: Asterisks indicate there were fewer than 10 observations in the Enlisted Utilization Survey.

- a. Productivity expressed as a percentage relative to the average fully-trained soldier with four years' experience. Estimates were normalized so that the entire population averaged 100 percent.
- b. High school diploma graduate.
- c. Army occupations: Microwave Systems Repair, Field Radio Repair.
- d. Army occupations: Track Vehicle Repair, Helicopter Repair, Finance, Medical Specialist.
- e. Army occupations: Infantryman, Combat Engineer, Cannon Crew, Carpentry and Masonry, Motor Transport, Food Service.

Private employers are quite concerned about the social attitudes of young employees. When asked what they look for in new workers, they overwhelmingly prefer youths who "can be counted on to come to work regularly and on time; will easily accept supervision; and are able to get along well with people." 13/ This may go far to explain why military supervisors judge low-aptitude high school graduates superior to higher-aptitude nongraduates.

13. Robert Crain, "What Do Employers Really Think About the Quality of American High Schools?," *National Association of Secondary School Principals Bulletin*, vol. 69 (April 1985).

QUALITY VERSUS EXPERIENCE

Though the evidence suggests that high-quality recruits outperform other first-term soldiers, quality may at some point have an unfavorable trade-off with experience. Since high-aptitude soldiers reenlist at comparatively low rates, the career force will decline as the proportion of recruits in categories AFQT I-III A increases. Can a smaller though higher-quality career force be as effective as a larger career force of lower quality? Unfortunately, evidence on this important question is contradictory. Even the Army admits having too little data to draw final conclusions on the trade-off between experience and recruit quality.

Military Evidence on Experience

Many factors may weaken the relationship between aptitude and job performance during a recruit's first term. On-the-job training may improve the performance of lower-aptitude soldiers. So too may changes in assignment, marital status, or maturity. ^{14/} The job tests conducted by HumRRO suggest that experience on the job attenuates differences in performance (see Table 6). Over the first five years of service, soldiers in low AFQT categories learned the same job skills as others, but at a slower rate. After the fifth year, scores among the AFQT groups generally converged. (Whether this resulted from job experience or from an interaction of experience and selection--reenlistment, reassignment--cannot be certain.)

Army researchers found similar results after comparing scores for combat potential (taken from a subtest of the Armed Services Vocational Aptitude Battery) with the performance of tank gunners and drivers. Test scores correctly predicted that smarter people learn better during training. But when more experienced men were tested, aptitude made no difference, suggesting that gunners and loaders gained competence with experience. ^{15/} In this case, high aptitude chiefly signified the ability to acquire job skills rapidly.

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14. Office of the Assistant Secretary of Defense (Manpower, Reserve Affairs, and Logistics), *Department of Defense Efforts to Develop Quality Standards for Enlistment* (December 1981).
 15. James Kahan and others, *Individual Characteristics and Unit Performance: A Review of Research and Methods* (Santa Monica, Calif.: The Rand Corporation, February 1985).

Other results suggest that high-aptitude people do comparatively better with experience, whether in the military or in the civilian sector. 16/ It may be they are able to use skills learned early in their careers more rapidly, and to acquire even more complex skills. When the Army analyzed firing range performance by tank crews under enlisted command, gunners' and commanders' AFQT scores were significantly related to the crews' overall performance; their experience was less so. 17/

Civilian Evidence on Experience

Economists have found that ability has a small but significant effect on the earnings of experienced civilian employees (at least through age 40). To generalize from two such studies, a typical high school graduate with just below-average aptitude (equivalent to AFQT category IIIB) might earn about 4 percent less than a graduate with above-average aptitude (categories I-III A); a graduate who is markedly below average (category IV) might earn about 8 percent less. 18/ Such effects of aptitude are not greatly different from those found in the first term of military service. Nevertheless, the link between ability and earnings does not necessarily establish a connection between earnings and performance. Labor markets do not always behave according to the postulates of marginal productivity theory, in which employers pay higher wages to their more productive workers. In practice, workers often get paid less than their marginal products. 19/

INDIVIDUAL QUALITY AND TEAM PERFORMANCE

The preceding discussion centered largely around individual performance. But military effectiveness depends upon performance as members of a team,

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16. See John Hause, "Earnings Profiles: Ability and Schooling," *Journal of Political Economy*, vol. 80, no. 3, Part II (May/June 1972).
 17. The Army simulated "tank-equivalent kills" to illustrate the relative importance of AFQT. About one-third of tank crews in the Army's sample were commanded by officers. See "Are Smart Tankers Better Tankers: AFQT and Military Productivity," in Department of Defense, *Defense Manpower Quality*, Appendix C, p. 19.
 18. See John Hause, *op. cit.*, and Zvi Griliches and William Mason, "Education, Income, and Ability," *Journal of Political Economy*, vol. 80, no. 3, Part II (May/June 1972).
 19. Peter Gottschalk, "A Comparison of Marginal Productivity and Earnings by Occupation," *Industrial and Labor Relations Review*, vol. 31, no. 3 (April 1978).

rather than as individuals. Many military duties require cooperation and coordination, whether it be food specialists preparing meals or armor crewmen engaging enemy tanks in battle. Effectiveness comes down to success for the group as a whole, not for individuals. Research suggests that high individual ability improves team performance, but that not all team members may need high ability to ensure good team performance.

A Rand Study

As soldiers learn to work together in a team, their overall performance should improve. ^{20/} But how individual ability enters into the dynamics of team performance is not well understood. The complex interactions that take place in most team activities make it exceedingly difficult to isolate and measure the contribution of any individual to overall performance. ^{21/}

Researchers at the Rand Corporation reviewed the literature on small group performance, looking into such questions as whether a single high-aptitude member can make up for a lower average degree of aptitude, or whether a single low-aptitude member might drag down an entire team's performance. They found that the relationship between individual abilities and team performance depends on the nature of the group's tasks. Sometimes the proficiency of the least-able member will correlate with success--as when tasks require contributions by all group members--but results are often ambiguous. Their most interesting finding may be that groups composed of all high-ability members do not necessarily perform better than groups composed of members with moderate abilities or with a range of abilities. Clearly, other factors besides individuals' abilities (such as attitudes) affect group performance. ^{22/}

Insights from the Army's Tank Crew Analysis

For empirical evidence on team performance, the Army analyzed data from a tank firing range. It statistically related the scores of individual tank

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20. In private industry, learning curves provide evidence of team productivity. These occur when the labor time necessary to produce a unit of output declines dramatically over the first three or four years of production, even though workers and equipment stay the same. Workers hone their existing skills and learn new ones through experience - -but they also learn to work together as a team. See Lester Thurow, *Dangerous Currents: The State of Economics* (New York: Vintage Books, 1984), pp. 204-205.
 21. R. H. Frank, "Are Workers Paid Their Marginal Product?," *American Economic Review*, vol. 74, no. 4 (September 1984), p. 555.
 22. James Kahan and others, *op. cit.*, p. 46.

crews--which include a tank commander, a gunner, a loader, and a driver--to the crewmembers' AFQT scores, education, time in position, and time in service. Crews manned either the M-60 or the new M-1 Abrams.

The Army found that AFQT scores of commanders and gunners are significant determinants of overall performance, expressed as the number of "tank-equivalent kills." Crews whose gunner and commander are both in AFQT category I score more tank equivalent-kills than other types of crews, particularly on the M-60 tank. Table 11 shows the number of kills that Army analysts predict for different types of crews; one in which both the commander and the gunner are in AFQT category IIIB serves as a "benchmark crew."

On the M-60 tank, the presence of a single low-aptitude crewman significantly reduces unit performance. Replace the benchmark's gunner or commander with an AFQT IV crewman, and tank-equivalent kills drop at

TABLE 11. EFFECTS OF CREWMEMBERS' AFQT SCORES ON TANK CREWS' PERFORMANCE

Gunner's AFQT	Tank Commander's AFQT									
	I	II	IIIA	IIIB	IV	I	II	IIIA	IIIB	IV
	Number of Tank-Equivalent Kills					Percentage Change from Benchmark Crew				
M-60 Tank										
I	10.2	9.9	9.5	9.0	8.1	37	33	27	20	8
II	9.8	9.5	9.1	8.6	7.8	31	27	22	15	4
IIIA	9.2	8.9	8.5	8.1	7.3	23	19	14	8	-3
IIIB	8.5	8.3	7.9	7.5	6.7	14	11	6	0	-10
IV	7.4	7.2	6.3	6.5	5.8	-1	-4	-16	-13	-22
M-1 Tank										
I	12.8	12.7	12.7	12.6	12.5	10	10	10	9	8
II	12.5	12.5	12.4	12.4	12.3	8	8	7	7	6
IIIA	12.1	12.1	12.1	12.0	11.9	5	5	4	4	3
IIIB	11.7	11.7	11.6	11.6	11.5	1	1	0	0	-1
IV	10.9	10.9	10.9	10.8	10.7	-6	-6	-6	-7	-7

SOURCE: Barry Scribner and others, "Are Smart Tankers Better Tankers: AFQT and Military Productivity," in Report to the House and Senate Committees on Armed Services, *Defense Manpower Quality*, Army Submission (May 1985).

least 10 percent. Put AFQT IV soldiers into both positions, and the performance deficit doubles. Conversely, while a single high-aptitude gunner or commander raises the number of tank-equivalent kills, performance improves most when both key crewmen are in the upper AFQT categories. Crews with both an AFQT I gunner and commander score 37 percent more kills than the benchmark crew.

Results differ on the newer M-1 tank, where the tank commander's AFQT rank is not as important, nor the disparity among crews as wide, as on the M-60 tank. Replace the benchmark crew's commander with one in either AFQT category I or IV, and little changes. In contrast, a high-aptitude gunner not only improves performance, but makes up for a low-aptitude commander. A crew with an AFQT category I gunner, whatever the AFQT of its commander, kills 8 percent to 10 percent more tank-equivalents than the benchmark crew.

Clearly, individual ability matters for successful team performance, but not all crew members need be of high aptitude. The loader and the driver--one-half of a tank's crew--can be of low aptitude without affecting performance. And on the M-1 tank, which eventually will displace the M-60 in active Army units, the commander's AFQT is relatively unimportant, so long as the gunner is highly able. Whether these results carry over into other team activities is uncertain. If so, the Army might want to favor category IV high school graduates over higher-aptitude nongraduates; attrition would improve, with little damage to team performance.

COHORT Gains

The COHORT program (Cohesion, Operational Readiness, and Trainng) trains soldiers together as a unit, and periodically deploys them overseas as a unit. Its purpose is to improve combat readiness and fighting ability by fostering a strong sense of group identity. The continued expansion of COHORT units might further the Army's capacity to absorb lower-quality recruits.

To date, COHORT units show improvement over regular units on several counts: higher personnel stability, lower attrition, and higher SQT scores. ^{23/} Indeed, the Army's tank crew data offer analytic evidence that keeping units together is beneficial. Increasing a gunner's time in position from two months to twelve months raises his crew's tank firing score about 6 percent.

23. Department of Defense, *Manpower Requirements Report for Fiscal Year 1986*, vol. 3 (February 1985), p. III-16.

WEAPONS MODERNIZATION AND MANPOWER QUALITY

For several years the Army has been carrying out a far-reaching program of equipment modernization. Dozens of new weapon systems will enter the active-duty inventory in increasing numbers over the next few years. Some are new versions of older, less complex systems--the M-1 Abrams tank, for instance, or the new Single Channel Ground and Airborne Radio System (SINCGARS). Others, like the Multiple Launch Rocket System (MLRS), represent brand-new concepts. As modernization proceeds, will the previously discussed research lose its relevance? The answer may be no, because the Army's future requirements for personnel are likely to resemble today's, both in the balance between more technical and less technical jobs, and in the skills needed to excel in any particular job.

The Balance of Jobs

Despite the array of new weapon systems, the Army expects a change of less than 4 percent in the number of positions it describes as "Very Technical." ^{24/} The term Very Technical applies to one of five occupational groupings devised by the Army (the others being Combat, Semi-Skilled, Administrative, and Technical). It defines a broad category including soldiers who operate and maintain advanced electronic equipment (such as aerial radar sensor repairers, tactical computer systems repairers, and ground surveillance systems operators), communications and intelligence specialists, medical specialists, and some soldiers whose jobs are not typically thought of as very technical (such as practical nurses and tank turret repairers). Since only about one-third of new recruits enter such occupations, the overall proportion of recruits needed for very technical jobs should rise by only about one percentage point. ^{25/}

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24. Projections of military skill needs are subject to wide margins of error. Many factors influence occupational requirements besides technological innovations, including major strategic decisions, force structure changes, and future staffing policies. See Harold Wool, *The Military Specialist: Skilled Manpower for the Armed Forces* (Baltimore: The Johns Hopkins Press, 1968).
 25. The Army might benefit from rising technical standards in the other services. Both the Air Force and Navy are experiencing sizable increases in the percentage of very technical jobs. As the roster of technical jobs grows--thus boosting, on average, the minimum aptitude score on the ASVAB needed for enlistment--the pool of youths qualified to serve in either the Navy or Air Force will shrink. Some of those disqualified youths (many of whom would still be in high AFQT categories, or high school graduates) would enlist in the Army, thus offsetting some of the projected decline in recruiting.

Skill Requirements

Though the balance of jobs is unlikely to change much, advances in weapons technology may change the skill requirements of individual jobs. On the one hand, new systems tend to be more complex than their predecessors, placing greater emphasis on computerized command, control, communications, and intelligence functions. 26/ Requirements for maintaining the new generation of communications-electronic equipment could become particularly complex; some analysts believe that their internal diagnostic features (built-in test equipment) do not work very well because faults occur in combinations that require a mastery of troubleshooting. 27/

On the other hand, emerging technology may simplify the operation of new systems and reduce their maintenance. Systems of similar functional complexity have tended to become more, not less, reliable as they have progressed from transistor to integrated circuit technology. 28/ Further, the Department of Defense has argued that the emergence of automatic test equipment (ATE) and built-in test equipment will greatly improve productivity: one Air Force study showed that ATE provided a 50-to-1 to 100-to-1 test-time reduction over manual testing for digital circuit boards. 29/ The Secretary of Defense states that the readiness of the land forces has improved as more reliable, easier-to-maintain equipment has entered the inventory. 30/

The case of the M-1 Abrams tank underscores the potential of new technology for improving performance. During its development and testing, the M-1 received a good deal of adverse publicity. Yet on the tank firing range, M-1 crews outshoot the older M-60 series tank by more than 40 percent. More important, the new tank reduces the importance of mental ability. Whereas on the M-60 tank, crews of AFQT category I soldiers

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26. Martin Binkin, *America's Volunteer Military: Progress and Prospects* (Washington, D.C.: The Brookings Institution, 1984), pp. 35-38.
 27. General W. DePuy, USA (Ret), *The All Volunteer Force -- The Demand Side -- Army Perspective*, paper delivered at the All-Volunteer Force Conference, Annapolis, Maryland (November 1983).
 28. Seymour Deitchman, *Military Power and the Advance of Technology* (Boulder, Colorado: Westview Press, 1984), pp. 224-225.
 29. Statement of William Perry, Under Secretary of Defense for Research and Engineering, before the Senate Armed Services Committee, December 4, 1980.
 30. *Annual Report of the Secretary of Defense, Fiscal Year 1986*, p. 137.

typically score almost 80 percent more "tank-equivalent kills" than do crews of category IV soldiers, on the M-1 tank the higher-ability crews score only 20 percent more kills. Indeed, the test results suggest that an M-1 crew composed entirely of AFQT category IV soldiers should be able to kill more enemy tanks than an M-60 crew composed entirely of soldiers in category I.

The key point is that modernization of itself does not necessarily pose an urgent need for improved recruit quality. To be sure, the empirical evidence presented here argues strongly against revisiting the years of 1979 and 1980, when five recruits out of ten were in the lowest acceptable AFQT category. Such a reversal would surely degrade performance. But given the cost of attracting high-quality recruits, how much quality can the Army afford? Chapter V takes up this issue in detail.



CHAPTER V

ALTERNATIVES TO THE ARMY'S PROGRAM

Military capability forms the ultimate justification for recruiting soldiers of high quality. Recruits with above-average mental aptitude or high school diplomas tend to make better than average soldiers, as evidenced by their performance on job-related tests, by their rates of promotion, and by their supervisors' ratings. The Army's program for recruiting would almost certainly make for a more effective fighting force--and a more expensive one. By CBO's estimate, the Congress might have to fund up to an additional \$785 million over the next five years to support the Army's recruiting objectives.

Against the backdrop of a \$75 billion budget for the active Army, \$155 million a year to improve quality may seem modest. Still, at a time of widespread concern about the federal deficit, the Congress may view any real increase in defense spending as significant. The cost of the Army's program could well be higher than the above estimate, particularly if the Congress shies away from enlistment bonuses as the instrument to attract more high-quality recruits.

Nor does the Army's continuing modernization necessarily pose an urgent need for improving quality. Over the next five years, the Army will need comparatively few new additional recruits for very technical skills. Moreover, advances in military technology may make many of today's skilled jobs less demanding, particularly as computers become more powerful, smaller, and less expensive. By performing more sophisticated mental functions, they may therefore supplement the Army's need for high-quality personnel. 1/

At a time of budgetary stringency, the Congress may want to spend less on recruiting rather than more. It may therefore want to consider alternatives to the Army's program. Rarely does the Congress control quality directly; usually it does so through the funding of military pays and

1. Russell Rumberger, "High Technology and Job Loss," *Technology in Society*, vol. 6 (1984), p. 278.

benefits that influence recruitment. This chapter looks at three alternative strategies for military pay, each less costly than the Army's program, and estimates their likely effects on the quality of personnel:

- o The Congress could hold the line on spending, and so keep recruiting resources constant in real terms over the next five years, rather than letting them grow as the Army's program would require;
- o The Congress could reduce recruiting resources for one year (thus repeating past actions) by suspending enlistment bonuses and pay raises for junior personnel in 1987; or
- o The Congress could reduce recruiting resources for several years in a row by limiting pay raises for junior personnel through 1989, in addition to suspending the enlistment bonus program in 1987.

Ultimately, the Congress will have to weigh budgetary cost against personnel quality in deciding on a level of support for Army recruitment. This chapter reviews the pros, and discusses some possible cons, of the Army's program. It then judges the effects of the three cost-saving alternatives.

ADVANTAGES OF THE ARMY'S PROGRAM

Under the Army's program, the quality of enlisted manpower would stay at an all-time high: 90 percent of recruits would hold high school diplomas, between 65 percent and 69 percent would score in AFQT categories I-III A, and only 10 percent would score in the bottom acceptable category (IV). As a result, the first-term enlisted force would almost certainly become more capable than it is now. Because high school graduates are much more likely than nongraduates to complete military training, personnel turnover would diminish. And the typical junior soldier would probably be more productive: soldiers above the 50th percentile on the AFQT perform 10 percent to 20 percent better than their lower-aptitude peers.

Because high-aptitude soldiers reenlist in comparatively low numbers, the career force would lose personnel under the Army's program. In spite of this, the career force's overall performance might improve because a higher percentage of senior personnel would be in the top three AFQT categories. Though not definitive, some evidence suggests that high-aptitude soldiers are more capable than those of lower aptitude in raising their productivity through job experience.

These improvements in soldiers' performance, argues the Army, would be cost-effective, because they would raise the enlisted force's overall capability by a greater percentage than they would increase its cost. Under the key assumption that the average AFQT I-III A soldier performs 10 percent better than the average AFQT IIIB soldier, the Army calculated that a four-percentage-point increase in AFQT I-III A content (from 65 to 69 percent) would improve the enlisted force's overall performance by roughly 0.40 percent. Further calculations showed that the portion of the Army budget directly associated with manning the enlisted force would increase by only 0.30 percent. Hence, the Army concluded that a 69 percent goal for AFQT I-III A recruits is cost-effective.

DRAWBACKS TO THE ARMY'S PROGRAM

Despite the above findings, critics may object to the Army's program on two disparate grounds. First, the Army should perhaps not seek higher average quality than that of the population as a whole. Second, the cost-effectiveness of the program is open to question. The next few sections detail these objections.

Representativeness

The Army's program would lead to a service that was not representative of youths in general. Of young men 18 to 23 years of age eligible to serve in the military, 59 percent belong in AFQT categories I-III A and about 25 percent in AFQT category IV. About 77 percent hold high school diplomas. A conscripted Army in wartime would almost certainly represent a lower level of quality than envisioned by the Army's program. The Office of the Assistant Secretary of Defense has therefore stated that it would be concerned only if recruits' quality fell below the average of the eligible youth population. ^{2/}

The ambiguity of the empirical evidence may also favor a population-based standard. Efforts to measure military performance show results that are contradictory or vague on many important points, such as the value of high school diplomas versus high AFQT scores; of quality versus experience; and of individual versus team performance. Indeed, considerable work remains to be done in refining and validating measures of job performance. ^{3/} Until more is known, some people say, the surest course for Army recruiting is to avoid falling below the average of the population.

2. *Defense Manpower Quality*, vol. 1 (May 1985) p. 79.

3. *Ibid.*

Cost-Effectiveness

The second objection to the Army's program centers around its cost-effectiveness. CBO found, after building a simple analytic framework for measuring the enlisted force's overall productivity, that the Army's cost-effectiveness claim invites questioning. Indeed, recruiting a lesser degree of quality might eventually achieve more productivity at less cost.

CBO bases its results on an index designed to show the long-run implications of various recruitment and compensation strategies.^{4/} It classifies soldiers into 18 groups defined by aptitude, education, and experience. Since relative performance depends to some extent on personal characteristics and experience, some groups of soldiers are "worth" more than others. For instance, first-term soldiers in the top three AFQT categories should be more productive than first-termers in AFQT category IIIB--CBO assumes about 10 percent more productive, in line with the empirical evidence discussed in Chapter IV. But a lower-aptitude soldier who has served for more than 20 years might well contribute more to the Army's effectiveness than any first-termer, no matter how bright.

CBO estimated relative productivities for the 18 groups of soldiers under various assumptions. A base case appears in Table 12. It assumes that both AFQT and high school graduation influence first-term performance, that the typical AFQT I-III A graduate outperforms the typical AFQT I-III A nongraduate, that the first-term effects of AFQT persist in the career force, and that enlisted productivity increases substantially with experience. Alternative assumptions that CBO tested include the following:

- o High school graduates outperform nongraduates regardless of AFQT; or high school graduation has no effect on first-term performance;
- o The effects of AFQT diminish in the career force; or the effects of AFQT disappear; and
- o Enlisted soldiers' productivity increases fairly modestly with experience.

Appendix A details these alternative assumptions and explains their origin.

4. Analysts at the Rand Corporation first suggested this approach. See David Jacquette and Gary Nelson, *The Implications of Manpower Supply and Productivity for the Pay and Composition of the Military Force: An Optimization Model* (Santa Monica, Calif.: The Rand Corporation, July 1974).

TABLE 12. RELATIVE PRODUCTIVITIES OF ENLISTED SOLDIERS UNDER BASE-CASE ASSUMPTIONS ^{a/}

Education and Experience	AFQT Categories		
	I-III A	III B	IV
	First-Term Force ^{b/}		
High School Graduate	0.77	0.70	0.63
Nongraduate	0.70	0.63	-- ^{c/}
	Career Force		
Years of Military Service			
5 to 8	1.00	0.91	0.82
9 to 12	1.28	1.16	1.05
13 to 16	1.51	1.37	1.24
17 to 30	1.75	1.59	1.43

- a. Relative to a fully-trained AFQT I-III A soldier with five to eight years of military experience.
- b. Soldiers with less than five years' experience.
- c. The Army does not enlist non-high school graduates who place in the lowest acceptable AFQT category.

For any combination of the above assumptions, CBO's index shows the overall productivity of a specified enlisted force. For example, suppose the percentage of AFQT I-III A recruits stays at 65 (as proposed in the Army's program) but the percentage of high school graduates rises from 69 to 94. ^{5/} In the long run, two things happen as the graduate percentage rises:

5. An overall high school graduate percentage of 69 percent includes females; it corresponds roughly to 65 percent male high school graduates, the statutory minimum.

the number of career soldiers increases because of lower attrition, and more of those soldiers are in AFQT categories I-III A. Table 13 shows how this affects overall productivity. In the base case, each three to four percentage-point increase in high school graduates registers about a 0.30 percent gain on the productivity index. Under alternative assumptions, the productivity gain varies from 0.10 percent to 0.45 percent.

Manpower-related costs would also vary. To support increasingly higher percentages of high school graduates, the Army would need more and more high-quality recruits, meaning substantial growth in the costs of recruitment--offset somewhat by savings from lower turnover. CBO projects that in the base case, over the full range of high school graduate percentages, the long-run variable cost of manning the enlisted force would rise from \$22.4 billion to \$23.0 billion, an increase of about 2.7 percent. The other two cases--see Table 13--yield a range of 2.1 percent to 3.4 percent.

To show the cost-effectiveness of its recruiting program, the Army compared an estimated increase in soldiers' performance of 0.4 percent with a growth in costs of 0.3 percent. This may not be an entirely appropriate comparison, since from the standpoint of national security a given percent gain in performance might be worth more or less than an equal percent increase in cost, depending on its contribution to U.S. ability to deter or fight wars. But accepting the Army's measure of cost-effectiveness, CBO's analysis still raises questions about the program.

As recruit quality increases to the levels desired by the Army, costs may be expected to rise faster than overall productivity. Under base-case assumptions, increasing the high school graduate percentage from 76 to 90 (while holding the AFQT I-III A percentage at 65) would raise overall productivity by 1.1 percent, while costs would grow by about 1.8 percent. Other assumptions produce similar results. Only when CBO's index makes comparatively strong assumptions about relative productivity (the "high case" in Table 13), and a low assumption about the appropriate earnings base, does an increase to 90 percent high school graduates appear to be strongly "cost-effective."

Nor does CBO's analysis necessarily support the Army's objective for AFQT I-III A recruits. Increasing their percentage from 65 to 69 (while holding the percentage of high school graduates at 90) would increase productivity by about 0.25 percent, but costs by roughly 0.50 percent. And while productivity would fall if the Army recruited fewer than 65 percent AFQT I-III A, costs might fall faster. Table 14 presents results for a 61.5

percent case, the proportion actually recruited in 1983: at 90 percent high school graduates, 65 percent may be less cost-effective than 61.5 percent.

One reason these results differ from the Army's is that CBO takes a more conservative approach to calculating a baseline for costs. The Army, in addition to counting soldiers' pays and benefits, included most of its expenses for operating and maintaining barracks, training bases, medical facilities, family housing, and so on--a large part of which would be likely to stay fixed even as the composition of the enlisted force changed. ^{6/} CBO, in contrast, included only those operation and maintenance expenses that would vary with changes in the enlisted force. The smaller baseline means, of course, lower percentage changes from equal changes in quality-related costs.

As Chapter V showed, attempts to measure the Army's output are fraught with difficulty. Researchers have to substitute proxies in the form of promotion rates, job-test scores, or supervisory ratings, on the assumption that increases in these translate into more military capability. Moreover, the definition of some manpower costs is itself sensitive to alternative assumptions. Allowing for these difficulties, critics appear to have grounds for questioning the cost-effectiveness of the Army's program.

ALTERNATIVES TO THE ARMY'S PROGRAM

What follows is a discussion of three alternative approaches to the Army's program for recruiting. Table 15 summarizes their effects.

Alternative I: Hold the Line

This alternative would maintain recruiting resources at today's levels. It would not allow the added spending needed to meet the goals of the Army's program. Enlistment bonuses, education assistance, and all the other expenses of recruiting would increase just enough to match future inflationary changes. All military personnel would continue to receive an annual pay raise keeping pace with increases in civilian wages.

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6. The Army arrived at a baseline of \$34.6 billion by averaging two series of calculations. The first summed all military personnel appropriations for pays and benefits (\$14.5 billion), retirement (\$4 billion), the enlisted share of family housing (\$1.4 billion), and the entire operation and maintenance budget (\$20.2 billion), except for the portion estimated to be related to officers (\$2.8 billion), for a grand total of \$37.3 billion. The second differed by excluding all civilian personnel costs from the O&M budget (leaving an adjusted \$11.9 billion from the original \$20.2 billion), for a grand total of \$31.8 billion.

TABLE 13. PROJECTIONS OF LONG-RUN PRODUCTIVITY AND COSTS IN THREE CASES UNDER VARYING HIGH SCHOOL GRADUATE PERCENTAGES a/

Cases	Percent of Recruits Who Are High School Graduates							
	69	73	76	80	83	87	90	94
Productivity								
Base Case <u>b/</u>								
Productivity Index	623.2	624.9	626.7	628.4	630.1	631.8	633.4	635.0
Percent Increase		0.28	0.28	0.28	0.27	0.26	0.26	0.25
High Case <u>c/</u>								
Productivity Index	613.5	616.4	619.3	622.2	625.0	627.8	630.5	633.1
Percent Increase		0.47	0.47	0.46	0.45	0.44	0.43	0.42
Low Case <u>d/</u>								
Productivity Index	602.9	603.7	604.3	604.8	605.4	605.9	606.4	606.9
Percent Increase		0.13	0.09	0.09	0.09	0.09	0.08	0.08
Manpower-Related Costs (In millions of 1987 dollars)								
Base Case <u>e/</u>								
Variable Cost	22,410	22,405	22,480	22,560	22,675	22,780	22,885	23,000
Percent Change		-.02	0.33	0.36	0.50	0.46	0.48	0.52

(Continued)

TABLE 13. (Continued)

Cases	Percent of Recruits Who Are High School Graduates							
	69	73	76	80	83	87	90	94
Manpower-Related Costs (In millions of 1987 dollars)								
High Case <i>f</i> /								
Variable Cost	23,380	22,370	22,465	22,565	22,705	22,840	22,885	23,005
Percent Change		-0.03	0.41	0.46	0.61	0.58	0.61	0.67
Low Case <i>g</i> /								
Variable Cost	22,440	22,435	22,490	22,560	22,735	22,790	22,815	22,910
Percent Change		-0.03	0.27	0.29	0.40	0.41	0.37	0.40

SOURCE: Congressional Budget Office.

- a. All cases assume that 10 percent of recruits are in AFQT category IV and 65 percent in categories I to IIIA.
- b. Assumes that both AFQT scores and high school graduation are predictive of first-term performance; that graduates outperform nongraduates during the first term; that first-term AFQT effects persist in the career force; and that enlisted performance increases substantially with experience. Compared with all other possible assumptions, these yield roughly the average response on the productivity index.
- c. Assumes substantial increases in enlisted productivity with experience; that graduates always outperform nongraduates during the first-term, regardless of AFQT; and that first-term AFQT effects persist in the career force.
- d. Assumes modest increases in enlisted productivity with experience; that high school graduation has no effect on first-term performance; and that AFQT has no effect on career performance.
- e. In calculating enlistment bonuses, this assumption defines earnings as the discounted value of basic pay over the first three years of service. See box on page 15.
- f. Defines earnings as the discounted value of regular military compensation over the first three years of service.
- g. Defines earnings as the discounted value of regular military compensation over one year of service.

TABLE 14. PROJECTIONS OF LONG-RUN PRODUCTIVITY AND COSTS FOR VARYING PROPORTIONS OF AFQT I-III A RECRUITS AND HIGH SCHOOL GRADUATES, UNDER BASE-CASE ASSUMPTIONS

Productivity and Costs	Percent of Recruits Who Are High School Graduates							
	69	73	76	80	83	87	90	94
Productivity Index								
Percent in I-III A:								
69	624.7	626.5	628.2	629.9	631.6	633.3	634.9	636.5
65	623.2	624.9	626.7	628.4	630.1	631.8	633.4	635.0
61.5	621.9	623.6	625.4	627.1	628.8	630.5	632.1	633.7
Percent Change in Productivity from:								
65 to 69 percent I-III A	0.25	0.24	0.24	0.24	0.24	0.24	0.23	0.23
65 to 61.5 percent I-III A	-0.21	-0.21	-0.21	0.21	-0.21	-0.21	-0.20	-0.20
Manpower-Related Costs (In millions of 1987 dollars)								
Percent in I-III A:								
69	22,395	22,435	22,530	22,650	22,755	22,875	23,000	23,125
65	22,410	22,405	22,480	22,560	22,675	22,780	22,885	23,000
61.5	22,365	22,420	22,485	22,555	22,630	22,730	22,830	22,930
Percent Change in Costs from:								
65 to 69 percent I-III A	-0.07	0.13	0.23	0.40	0.37	0.43	0.49	0.53
65 to 61.5 percent I-III A	-0.20	0.02	0.02	-0.03	-0.19	-0.21	-0.26	-0.33

SOURCE: Congressional Budget Office.

NOTE: The base case assumes that both AFQT scores and high school graduation are predictive of first-term performance; that AFQT III B graduates outperform AFQT I-III A nongraduates during the first term; that first-term AFQT effects persist in the career force; and that enlisted performance increases substantially with experience (for example, the average soldier with 20 years' experience is assumed to be 2.5 times more productive than the average first-term soldier).

Effects on the Force. Holding the line would yield the baseline enlisted force that was highlighted in Chapter II. Although the supply of high-quality recruits would decline by about 18 percent over the next five years, quality would stay comparatively high. By 1991, about 81 percent of male recruits would be high school graduates. (The percentage of graduates would be greater if the Army eased the 10 percent limit on recruits in AFQT category IV.) And about 62 percent of all recruits would be in the top three AFQT categories I-III A.

These results would have little effect on the Army's career force over the next five years. From about 303,000 soldiers in 1985, it would peak at 305,000 in 1988 and then decline to 300,000 in 1991. But the proportion of career soldiers in AFQT categories I-III A would steadily grow, from today's figure of 44 percent to more than 52 percent five years hence. Under these conditions, the five-year cost of manning the Army would amount to roughly \$96.6 billion (in current dollars). In the longer run, holding the line would lead to a career force of 281,600 soldiers, of whom 62 percent would be in the upper AFQT categories. Manning this long-run force would cost (in 1987 dollars) about \$22.6 billion a year.

Pros and Cons. While avoiding substantial real increases in costs over the Army's program--\$410 million to \$785 million over the next five years--this alternative would supply the Army with a relatively high degree of quality. There would be more high school graduates, and higher test scores among recruits, than among youths as a whole. The outcome would also compare favorably with historical averages. Since 1974, for instance, the proportion of male high school graduates has averaged about 68 percent. Before that, during the years of conscription in 1964 through 1972, the average was also around 68 percent.

In the long run, under the "hold the line" alternative, the career force would be somewhat smaller than under the Army's program, and proportionately fewer soldiers would be in the upper AFQT categories. Holding the line would thus lessen the enlisted force's overall capability, though perhaps not dramatically. CBO's productivity index suggests there would be a decline (relative to the 65 percent AFQT I-III A version of the Army's program) of between 0.30 percent and 1.40 percent. Yet the long-run cost of manning the Army would be about 1.5 percent lower.

Holding the line would lessen the Army's hedge against adverse trends in recruitment or retention. If economic developments that are unfavorable to military recruiting were to materialize (such as lower unemployment or a

TABLE 15. 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)