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CNR 74 / May 1984

THE FEASIBILITY OF LONGER ENLISTMENT CONTRACTS

Catherine A. Palomba



CENTER FOR NAVAL ANALYSES



DEPARTMENT OF THE NAVY
HEADQUARTERS UNITED STATES MARINE CORPS
WASHINGTON, D.C. 20380

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Subj: CNR 74, "THE FEASIBILITY OF LONGER ENLISTMENT CONTRACTS,"
July 1984

1. The objective of this study was to determine the feasibility of lengthening initial enlistment contracts within the Marine Corps.
2. The objective of the study was met.
3. This report is published for informational purposes only.
4. A copy of this letter will be affixed inside the front cover of each copy of the subject study report prior to its distribution.

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COLONEL, U. S. MARINE CORPS
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CNR 74 / May 1984

THE FEASIBILITY OF LONGER ENLISTMENT CONTRACTS

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ABSTRACT

In this paper we determined that longer enlistment contracts are feasible for the Marine Corps.

In addition to reviewing the literature, we examined data concerning the effect of contract length on accessions and on attrition. We estimated that requiring an additional year of enlistment is equivalent to an 8-percent pay reduction. We also found that attrition in the Marine Corps is not significantly affected by contract length. Using these findings, we determined that the cost per useful service year for 5- and 6-year enlistments is generally lower than for 4-year enlistments.

EXECUTIVE SUMMARY

This paper is concerned with enlistment contract length. Because of current recruiting successes and the prospect of a declining youth population, the Marine Corps is considering whether to require longer initial enlistments in program options that require extensive and/or expensive training. By examining a number of background issues, in this paper we attempt to determine whether longer contract lengths are feasible.

We

- Review the literature regarding contract length
- Examine evidence concerning the effect of contract length on accessions and attrition
- Estimate the cost per useful service year* for enlistments of 3, 4, 5, and 6 years for different combinations of training times and training costs
- Evaluate the feasibility of longer contract lengths.

In addition to the literature on contract length, our sources include data from the fall 1979 Youth Attitude Tracking Study and the 1979 DoD Survey of Personnel Entering Military Service. We also examine attrition data on recruits accessed in FY 1978 and FY 1979.

FINDINGS

From our review of previous studies, we find that:

- These studies leave many questions unanswered.
 - They contain no evidence concerning the effect of contract length on accessions.
 - They contain some evidence that longer enlistments increase attrition in the Navy and the Army.

From the survey data and other evidence we examine in this study, we find that:

- Accessions are influenced by both contract length and training guarantees.

* Useful service years are defined as years of service after training.

- Overall, we estimate that the reduction in propensity to enlist caused by requiring 1 additional year of enlistment is the equivalent of that caused by an 8-percent pay reduction.*
 - We also found that some enlistees, about 7 percent, are willing to sign longer contracts without any additional monetary incentive.
 - Furthermore, training guarantees convince many enlistees to sign contracts that are longer than their first choice of length.
- Attrition in the Marine Corps is not significantly affected by contract length.
 - Although 4-year enlistees tend to have slightly higher dropout rates than 3-year enlistees, the differences are generally small and not statistically significant.
 - Recruits who sign contracts that are longer than their first choice tend to have slightly higher dropout rates, but again the results are not statistically significant.
 - Job satisfaction may influence attrition, particularly for those with "open" enlistments.
 - The cost per useful service year** for 5- and 6-year enlistments is lower than for 4-year enlistments. This finding pertains:
 - If no enlistment bonus is required, or
 - If an enlistment bonus equal to \$3,500 per additional year is required, and training cost is at least \$25,000 or training time is at least 1.5 years.***

* As with most results based on survey data, there is considerable uncertainty attached to this estimate.

** Costs are in FY 1984 dollars.

*** This estimate allows for somewhat higher attrition patterns for the 5- and 6-year enlistments than for the 4-year enlistments.

CONCLUSIONS

Overall, we conclude that:

- Longer contract lengths are feasible.*
- If no enlistment bonus is available, 5-year enlistment contracts are feasible for
 - Approximately 5 percent of enlistment contracts**
 - Popular military occupational specialties (MOSs) or programs*** for which 4-year contracts are no longer available
 - MOSs with high training costs or long training times, if the greatest cost savings is desired.
- If an enlistment bonus equal to \$3,500 per additional year is available, 5- or 6-year enlistment contracts are feasible from a cost standpoint for MOSs whose training cost is at least \$25,000 or training time is at least 1.5 years.****

* The Marine Corps has, in fact, had recent success in increasing contract length. The percentages of 4- and 6-year contracts have increased from 73.3 percent and 0.8 percent respectively in the first quarter of FY 1983 to 91.2 percent and 2.8 percent, respectively, in the first quarter of FY 1984. The balance in both years was made up of 3-year enlistments.

** This recommendation is based on the Navy's success with 5-year contracts as well as on the results from the 1979 DoD Survey of Personnel Entering Military Service. Skillful recruiting could identify those recruits who are willing to serve longer terms without additional pay.

*** In appendix B we identify program A5, Avionics, as the most popular program.

**** From a legal standpoint, current enlistment bonus money could be diverted to this program only if the MOSs included were short of manpower.

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INTRODUCTION

Because manpower costs are a large share of the defense budget and because the declining youth population may increase these costs, there has been interest in the question of contract length.

In a fall 1981 article [1], William Schneider, Jr., of the Office of Management and Budget recommended that initial enlistments in the services be extended, perhaps to twice their current length. This change would result in a smaller number of annual accessions, and the human and material resources required to recruit and train new accessions would be substantially reduced. Schneider also recommended that first-term reenlistments be limited to 10 to 20 percent of accessions.

More recently, the Marine Corps has been considering whether to require longer initial enlistments in program options that require extensive or expensive training. It asked the Center for Naval Analyses to review the literature on contract length and to make recommendations concerning this proposal. This paper reports the results of CNA's effort. We consider such issues as the effect of longer enlistments on accessions and on attrition, and we present cost calculations.

The first section of this paper reviews the literature on contract length. The next two sections address two questions left unanswered in the literature review: What increase in compensation would be necessary to induce longer enlistments? And what impact would longer enlistments have on the pattern of attrition?

The next section of the paper presents cost calculations. The cost per useful service year is calculated for various combinations of training lengths and training costs. The costs we consider include accession, training, and military pay. The sum of these costs is divided by the number of useful service years to yield the cost per useful service year. Useful service years are defined as years of service after training. The costs are calculated for 3-, 4-, 5- and 6-year contracts. These calculations reflect the impact of spreading training costs over longer enlistments. They do not consider the savings in retirement costs that would result if reenlistments were limited.

Our conclusions are summarized in the final section.

LITERATURE REVIEW

Only a handful of papers address the question of enlistment contract length. A draft paper for the Office of Management and Budget by E. J. Devine [2] contains a useful review of current service practices and views with respect to contract length. A CNA Memorandum by Michael K. Duffy [3] uses a simple manpower supply model to assess the impact of

a 6-year initial enlistment obligation on the Navy. Another CNA Memorandum, by Aline Quester [4], develops a theoretical approach to the question of contract length. Finally, papers by George M. Anastasi of CNA [5] and Richard Buddin of Rand [6] present evidence on the effect of contract length on attrition.

Only the Navy and the Air Force have more than a small number of 6-year enlistments (10 percent and 16 percent, respectively), and the Navy is the only service with 5-year enlistments (see appendix A). The 5-year contracts were started in 1975 in 12 ratings that were popular because of skill applicability to civilian employment. The number of applicants was high enough in these ratings for the Navy to increase the initial enlistment from 4 to 5 years without any additional compensation.

Although the Navy would like to increase its 6-year enlistments to 21 percent, it would also like to offer 3-year or perhaps 2-year enlistments for those assigned to general detail (seamen, firemen, etc.). The Army would also like to add a 2-year enlistment option to its present mix [2].

All of the services oppose a uniform 6-year enlistment because of the effects on accessions, first-term attrition, and the experience distribution of the forces (if reenlistments are limited) [2].

Secretary of Defense Weinberger believes that minimum terms of enlistment could be increased in skills with high training costs and many applicants. He favors flexibility in contract length both among the services and among individual skills [2].

Since so little data exist, the Devine paper recommends a major research effort on the optimal length of the initial enlistment contract. Devine also favors current improvements in the present mix of enlistment contract lengths based on training costs and numbers of applicants by skill.

Duffy's memorandum [3] uses a simple manpower supply framework and previously derived parameter estimates to assess the effect of a 6-year minimum service obligation on Navy manpower levels. The model's basic premise is that manpower in a given year equals the sum of continuations and accessions. These in turn are functions of pay, length of obligation, and other factors.

Duffy estimates that continuations are relatively insensitive to pay and contract length. Whereas the elasticity of accessions with respect to pay has been previously estimated as 1, the response of accessions to changes in contract length is unknown. Duffy calculates that if the elasticity of accessions with respect to contract length is more negative than -0.65, a 15-percent pay increase would not be

sufficient to maintain current levels of manpower.* He concludes that the benefits of a 6-year minimum service obligation are questionable.

Quester's memorandum [4] develops a model for determining optimal first-term enlistment lengths for the different military occupations. The optimal first-term enlistment length is defined as that which equates the present value of costs to the present value of output.

These calculations require knowledge of the time path of output, that is, the net marginal product of output. The latter is defined as the output of the enlistee minus the output lost due to the supervisory time spent in training the enlistee. Although unable to directly measure military output, Quester proposes using subjective supervisory data on the time path of an enlistee's output. These data express the enlistee's net contribution to output relative to the average output of someone with 4 years of experience in the occupation.**

These productivity estimates must be expressed in dollars if they are to be compared to costs. Quester proposes multiplying the relative productivity estimates by the average fifth-year wage including bonuses. The assumption here is that individuals in their fifth year of military service are paid a wage that at least approximately reflects the value of their marginal product.

CNA has already published some analysis using the Enlisted Utilization Survey (EUS). In particular, results from supervisory assessments of the progress of the typical trainee in 12 Navy ratings appeared in a January 1983 CNA Memorandum [7].***

The paper by George Anastasi [5] deals specifically with the effect of contract length on attrition. The services are concerned that enlistees who become discontented with the military are more likely to drop out if they have a longer obligation. They believe, for example, that an individual who becomes discontented after 1 year is more likely

* Here, a 50-percent increase in contract length (from 4 years to 6 years) would result in a 32.5-percent decrease in accessions.

** These data were collected in 1975 by the Rand Corporation for the Defense Advanced Research Project Agency. Supervisors were asked in the Enlisted Utilization Survey (EUS) to assess recruit performance at different time periods (the first month, the present, 1 year from the present, and after 4 years of service).

*** The Rand survey included first-term personnel in 58 Army, Navy, and Air Force occupational specialties. No data were collected for the Marine Corps. The Rand researchers analyzed the survey responses from the Air Force personnel fairly extensively. The questions of formal school training versus on-the-job training and of tradeoffs between career and first-term personnel were examined [8, 9].

to "stick with it" if he has only 2 years remaining on his contract than if he has 5 years.

The Navy has been particularly concerned about attrition among general-detail personnel. Anastasi's study analyzed the survival performance of general-detail enlistees with 2-, 3-, and 4-year obligations. The 3- and 4-year obligors were from the 1977 cohort, and the 2-year obligors were from the 1979 cohort. The results are shown in table 1. Those with shorter enlistment contracts have higher survival for the first 2 years, and 3-year survival is higher for those with 3-year contracts than for those with 4-year contracts.

TABLE 1
COHORT SURVIVAL BY YEARS OF SERVICE^a

<u>Years of service</u>	<u>Survival percent</u>		
	<u>1st year</u>	<u>2nd year</u>	<u>3rd year</u>
2-year obligors	80	73 ^b	N/A
3-year obligors	70	59	53
4-year obligors	65	54	48

^aSource: [5].

^bProjected to 24 months.

Anastasi's study did not include a cost-effectiveness analysis and therefore did not recommend any specific contract length.

Similar findings were cited in a recent Rand report [6], which indicated that attrition is higher among 4-year Army enlistees than among 3-year enlistees. In fact, the difference appeared to be as much as 10 percent over the first 3 years of the contract.

What can be concluded about contract length from these studies? There is agreement that since training costs, training times, the time paths of productivity, and civilian opportunities all vary among skills, the optimum contract length will also vary among skills. In addition, there is agreement that much data need to be gathered. The effect of contract length on accessions has not been determined. More evidence needs to be gathered on the effect of contract length on attrition. In addition, data on the productivity of military manpower need to be collected and analyzed.

In the following sections we present evidence on the effect of contract length on accessions and on attrition. Although we were not able to correct our estimates for productivity differences, we also calculate cost estimates for 3-, 4-, 5-, and 6-year enlistments.

THE EFFECT OF CONTRACT LENGTH ON ACCESSIONS

As our literature review highlights, choosing the optimum mix of enlistment contract lengths is hampered by the lack of appropriate data. In particular, little evidence exists on the effect that lengthening the initial enlistment obligation will have on accessions. In this section we examine two data sets that bear on this question.

The fall 1979 Youth Attitude Tracking Study [10] indirectly addressed the issue of contract length through questions on the enlistment bonus.* Respondents were asked their likelihood of enlisting to get the current bonus. The bonus was described as a payment of up to \$3,000 for certain combat-related jobs. The respondents were told that the bonus required an additional year of service.

Each respondent was then asked to consider one of five possible changes in the bonus program.** The respondent was asked how much more likely he would be to join the service, given the proposed change. The changes considered were an increase in the bonus payment to \$4,000, an increase in the bonus payment to \$5,000, a bonus payment of \$3,000 that did not require an additional year of service, a bonus payment of \$4,000 that did not require an additional year of service, and a bonus payment of \$5,000 that did not require an additional year of service. Table 2 displays the results of the survey. As suggested by columns (2) and (3) of the table, the responses indicate that a \$3,000 bonus that eliminated the additional year and a \$5,000 bonus that retained the additional year would have about the same effect on the likelihood of enlisting. This comparison suggests that in 1979 the respondents would have been willing to serve an additional year for a payment of an additional \$2,000.***

* The survey sample included 16- to 21-year-old males who did not have prior or current military involvement and who were not beyond their second year of college. A total of 5,187 interviews were completed.

** Approximately 1,000 respondents evaluated each option. Table 2 gives the exact numbers.

*** Many other comparisons can be made from this table. For example, we can conclude that requiring an extra year of service with no other change would decrease the percent of those much more likely to join by 42.2 percent for a \$3,000 bonus, 20.5 percent for a \$4,000 bonus and 2.8 percent for a \$5,000 bonus.

TABLE 2

SURVEY RESPONSE CONCERNING EFFECT OF CHANGES IN BONUS POLICY
ON LIKELIHOOD OF ENLISTING^a
(Fall 1979)

	(1) \$4,000 and 1 extra year (percent)	(2) \$5,000 and 1 extra year (percent)	(3) \$3,000 and no extra year (percent)	(4) \$4,000 and no extra year (percent)	(5) \$5,000 and no extra year (percent)
More likely to join	27.7	41.7	42.2	48.2	44.5
Much more likely	8.2	14.0	13.4	17.1	14.4
Somewhat more likely	10.4	17.7	18.1	19.4	17.8
Just a little more likely	9.1	10.0	10.7	11.6	12.3
Not more likely to join	70.1	54.4	53.8	49.5	52.5
Don't know	2.2	3.8	4.0	2.3	3.0
Average ^b	1.56	1.91	1.91	2.04	1.94
Number	1,046	1,190	931	1,039	957

^aBase case: \$3,000 bonus and 1 extra year.

^bTable shows mean scale values where:

- 4 = Much more likely
- 3 = Somewhat more likely
- 2 = Just a little more likely
- 1 = Not more likely.

Therefore, larger values indicate greater perceived likelihood.

Note also that once the extra year was eliminated from the proposed bonus package, raising the payment did little to increase the likelihood of enlisting and, in effect, was unnecessary. That is, the responses in columns (3), (4), and (5) are roughly the same.

In 1979 an additional \$2,000 bonus payment represented an approximate increase of 8 percent in the military-to-civilian pay ratio.* For our purpose, these results indicate that compared to current pay and bonus levels, an approximate 8-percent pay increase would compensate the respondents for the commitment to an additional year of service.**

We must be cautious in applying these survey results. For one thing, the survey did not make clear whether the additional year would be the fourth or the fifth year of the initial enlistment. (The enlistment bonuses currently in use typically extend the contract from 3 to 4 years.)

Furthermore, the additional year that the respondents were considering was to be served in combat occupations. Since these occupations are generally not transferable to the civilian economy, an extra year in these occupations may be less attractive to a potential recruit than an extra year in a technical occupation.

In addition, the respondents included in the survey represented youths with varying initial propensities to join the service. Youths with a strong commitment to military service may not show the same indifference between the proposed bonus change of \$3,000 with no extra year and \$5,000 with the extra year. The survey report contains some evidence on this point, which is displayed in table 3. In fact, the table shows that the mean response of the positive-propensity group (those who said they would definitely or probably join the military) is

* For this calculation we found the increases in pay that, if received over 4 years, would have the same discounted present value as the discounted present value of a \$3,000 bonus and of a \$5,000 bonus. Using a 10-percent discount rate and assuming that the bonus would be received after 6 months, these figures are \$1,136 and \$1,876. These pay increases were then included with the FY 1979 military and civilian pay figures of \$7,617 and \$7,471 to determine the effect of an increase in the bonus on the military-to-civilian pay ratio.

** Since this 8-percent figure is based on results from survey data, there is considerable uncertainty attached.

TABLE 3
DEMOGRAPHIC EFFECTS OF CHANGES IN BONUS POLICY ON
LIKELIHOOD OF ENLISTING^a

Demographic group	Proposed bonus	
	\$3,000 and no extra year	\$5,000 and 1 extra year
Total U.S.	1.91	1.91
Propensity		
Positive	2.61	2.60
Negative	1.64	1.63
Age		
17 years old	2.24	2.09
18 years old	1.80	1.84
19 years old	1.80	1.85
Education		
10-11th grade	2.20	2.29
Senior	2.07	1.93
In college	1.70	1.64
High school graduate not in school	1.69	1.64
Not high school graduate	2.01	2.41
Race		
White	1.87	1.84
Black	2.13	2.32

^aTable shows mean scale values where:

- 4 = Much more likely
- 3 = Somewhat more likely
- 2 = Just a little more likely
- 1 = Not more likely.

almost identical for the two proposed bonus packages. The same is true for the negative-propensity group.*

The 1979 DoD Survey of Personnel Entering Military Service also addressed the question of contract length [11]. This survey was conducted by the Rand Corporation under the sponsorship of the Office of the Assistant Secretary of Defense. It was administered to Marine Corps enlistees at the Armed Forces Examination and Entrance Stations (AFEES) immediately after the enlistees were sworn in. Here we consider responses to Form 1 of the questionnaire, which was given in March and April 1979.

The survey asked the respondents, "If you could choose the length of your first enlistment, how many years of active duty would you sign up for?" The choice was 1 through 10 years. Of 914 responses, 7.5 percent chose an initial enlistment length of 5 years or more (see table 4).

When the DoD survey results were matched with demographic information from USMC headquarters, there were 696 matched responses** to the question. Almost 7 percent of these respondents chose 5 years or more as the desired length of their initial enlistment. This response was also given by 7.2 percent of the 443 respondents in mental groups I to IIIA*** (see table 4).

These results indicate that among current enlistees there is some potential to increase the length of the initial enlistment contract without an increased monetary payment. Whether, in fact, increasing contract length would provide additional manpower to the Marine Corps is not clear because these recruits may well serve beyond their initial contract anyway. They may reenlist (sign up for 3 or more additional years) or extend their contracts (sign up for less than 3 additional

* Some of the demographic subgroups do rate the proposed changes differently. For example, high school seniors tend to rate the \$3,000 bonus without the extra year more highly than they rate the \$5,000 bonus with the extra year. This means that the pay increase necessary to serve an additional year may be greater than 8 percent for high school seniors.

** We were only able to locate HQMC records for 696 respondents because many of those answering the DoD survey either did not report their social security number or reported it incorrectly.

*** These mental-group categories are based on Armed Forces Qualification Test (AFQT) scores.

TABLE 4

YEARS CHOSEN FOR FIRST ENLISTMENT LENGTH

<u>Years chosen</u>	All respondents (percent)	<u>Matched responses^a</u>	
		All (percent)	AFQT categories I to IIIA (percent)
1	6.5	4.7	5.6
2	26.5	25.9	25.5
3	31.1	33.2	29.6
4	28.4	29.6	32.1
5	1.2	1.1	1.1
6	3.8	3.2	3.4
7	0.1	0.1	0.2
8	0.4	0.3	0.5
9	0.1	0.0	0.0
10	1.9	1.9	2.0
Number	914	696	443
Percent choosing 5 years or more	7.5	6.6	7.2

^aShows results for survey respondents whose records were matched to information available from Marine Corps Headquarters.

years).* Depending on their military occupational specialty, those who reenlist may be eligible for a Selective Reenlistment Bonus. This bonus constitutes a cost at the reenlistment point that needs to be balanced against the possible increased cost of accessions for longer initial enlistment contracts.

It is also clear that many recruits sign enlistment contracts that are longer in length than their first choice. The results in table 4 indicate that over 60 percent of the respondents would prefer initial enlistment contracts of 3 years or less. This finding contrasts with the current recruiting experience of the Marine Corps, in which over 70 percent of contracts are for 4 years or more.

The guarantee programs that the Marine Corps makes available to recruits play a major role in determining contract length. Whereas some guarantees allow recruits to enlist for 3 or 4 years, many require 4-year enlistments.

The contrast between the actual enlistment length, as determined from the HQMC record, and the desired enlistment length is shown in table 5. This contrast is shown overall as well as for those with guarantee programs and those with "open" enlistments.**

Nearly half of the 1979 recruits with guarantees (47.2 percent) signed contracts that were longer than their desired contract length, compared to only about one-third of those with open enlistments (35.6 percent). This difference demonstrates the importance of training guarantees in determining contract length. Although a small number of the recruits with guarantees were in the bonus program, most of the guarantee programs did not offer a monetary payment for signing a 4-year contract. Thus, the promise of training is itself often enough to encourage recruits to sign contracts that are longer than their first choice of length.

* Respondents choosing 5 years or more as the desired length for their first enlistment were more likely to have said yes when asked if they thought they would reenlist at the end of their first enlistment (88 percent versus 68 percent overall). They also were more likely to have said it was very difficult or almost impossible to get a full-time job in the area where they were currently living (19 percent versus 13 percent overall).

** Recruits who enter without program guarantees are referred to as having "open" enlistments.

TABLE 5
ACTUAL ENLISTMENT LENGTH
VERSUS DESIRED ENLISTMENT LENGTH^a

	Respondents		
	With program guarantees (percent)	With open enlistment (percent)	Total (percent)
Wanted to enlist for			
More years	6.8	11.7	9.4
Same number of years	46.0	52.7	49.7
Less years	47.2	35.6	40.9
Number	326	370	696

^aIncludes respondents to 1979 DoD Survey of Personnel Entering Military Service whose HQMC records were available.

The results of the Youth Attitude Tracking Study lead us to conclude that:

- Overall, requiring an additional year of enlistment is the equivalent of an 8-percent pay reduction. This requirement would reduce enlistments by 5.6 percent if the pay elasticity is 0.7 or by 8 percent if the pay elasticity is 1.*
- If high-quality enlistments are to be maintained at current levels, requiring an additional year of service would necessitate an 8-percent increase in military pay.

Although we estimate that, overall, recruits see the requirement of an additional year as an 8-percent pay reduction, the DoD survey suggests that a number of recruits view longer enlistment contracts positively, and that skillful recruiting could help avoid an overall 8-percent pay increase. Specifically, the survey indicates that:

- About 7 percent of enlistees are willing to sign initial enlistment contracts of 5 or more years without any

* Recent estimates of pay elasticity for the Marine Corps are approximately 0.7 [12, 13].

additional monetary incentive. These longer contracts will save funds for the Marine Corps, if these recruits are currently receiving reenlistment bonuses.

- Many enlistees sign contracts that are longer than their first choice to receive program guarantees, typically without any promise of a bonus payment.
- About 36 percent of enlistees with open contracts sign longer contracts than they wanted in order to join the Marine Corps (apparently for no additional money or special training).

The guarantee of training and the length of the enlistment contract are both elements of the initial enlistment package. It is quite possible that the Marine Corps could identify programs that are typically good sellers* and introduce longer contract lengths in these or similar programs without any additional payment.

THE EFFECT OF CONTRACT LENGTH ON ATTRITION

Little is known about the effect of contract length on attrition. As our literature review points out, some analysts believe attrition early in the enlistment may be high among those with long enlistment contracts. High early attrition may occur because recruits discouraged early in their enlistment may be less likely to "stick with" a long enlistment than with a short enlistment. Some evidence for both the Navy and the Army supports this view.

Here we present evidence from two different data sets. Although the data sets were constructed for other purposes, they provide some evidence with respect to the effect of contract length on attrition in the Marine Corps.

With the first set of data, we examined separations among male recruits accessed in FY 1978.** Since our interest is in the effect of contract length on attrition, we restricted our attention to those programs offering either a 3- or 4-year enlistment contract.

* In appendix B we review some evidence concerning program sales to help identify the most popular programs.

** This data set included high-school-graduate recruits with AFQT scores of 31 or above and General Technical (GT) scores of 90. Holders of General Educational Development (GED) certificates were included if their AFQT score was 31 or above and their GT score was 95. The data set was constructed for a study of the Marine Corps combat arms enlistment bonus [14]. In general, the data set included most males eligible for enlistment guarantees.

Table 6 lists the programs we investigated, the number of recruits in each program, and the proportion of recruits with 4-year enlistment contracts.

TABLE 6
PROGRAMS WITH BOTH 3- AND 4-YEAR ENLISTMENTS

<u>Program name(s)</u>	<u>Program identifier^a</u>	<u>Number of recruits</u>	<u>Proportion of recruits with 4-year enlistments</u>
Combat Support	Z1	609	0.45
Combat	Z6	275	0.48
Infantry	G1	561	0.50
Radio Communications	G4	563	0.56
Administration, Logistics, etc. ^b	Z2, Z3	1,213	0.52
Open	Open	9,422	0.60

^aThese are the symbols used by the Marine Corps to identify the recruits' enlistment guarantee.

^bThese options also include MOSs in supply, transportation, repair services, disbursing, and Marine Corps Exchange.

Table 7 displays the dropout rates for these programs during the first, second, and third years of the initial enlistment contract. Figures are shown separately for 3- and 4-year enlistees. With the exception of open enlistments, the first-year dropout rates were all higher for the 4-year group than for the 3-year group, but the differences between the groups were generally small.

The difference was highest in the combat program, where the first-year dropout rate was 19 percent for 4-year enlistees and 15 percent for 3-year enlistees. The other first-year differences ranged from 1 to 3 percent.

Over the entire 3-year period, the dropout rates for the 4-year enlistees were higher than for the 3-year enlistees in the Combat, Infantry, and Administrative, Logistics groups. Most of the difference in the dropout rates between the 3- and 4-year enlistees in the Infantry group occurred during the third year rather than earlier in the enlistment. For the Combat and Administrative, Logistics groups the largest difference in dropout rates was in the first year.

TABLE 7
DROPOUT RATES FOR SELECTED PROGRAMS

Program	Dropout rates (percent)			
	First year	Second year	Third year	Total over 3 years
Combat Support				
3-year enlistees	9	6	6	21
4-year enlistees	10	5	6	21
Combat				
3-year enlistees	15	5	3	23
4-year enlistees	19	6	4	29
Infantry				
3-year enlistees	16	4	2	22
4-year enlistees	17	4	6	27
Radio Communications				
3-year enlistees	10	4	5	19
4-year enlistees	12	4	3	19
Administrative, Logistics				
3-year enlistees	11	7	2	20
4-year enlistees	14	8	4	26
Open				
3-year enlistees	18	7	5	30
4-year enlistees	17	7	5	29

To explore these differences in dropout rates further, we used a regression model that controlled for the mental group, age, education level, race, and marital status of the recruits.

The effect of enlistment length on attrition in each of the six programs was examined at the 1-, 2-, and 3-year points.* The dependent variable, survival, took on the value of one if the recruit had not separated in the given time interval and zero if he had separated.

Length of enlistment was entered in the model as an independent variable that took on the value of one if enlistment was 4 years or more and zero otherwise.

* Since the data set extended from October 1977 through March 1981, survival through an average of 3 years from date of enlistment was examined. Those who separated after completing 3-year terms were included with the survivors.

The hypothesis being tested was that survival will be lower among those with longer enlistments. Thus, we expected a negative sign on the coefficient of the enlistment-length variable. Table 8 shows the regression coefficients. These coefficients estimate the difference in survival rates between 3- and 4-year enlistees after the first, second, and third years of enlistment when mental group, education, and other demographic variables have been controlled for.

We see in table 8 that all the coefficients on the enlistment-length variable are negative, including those for open enlistments. The coefficients are statistically significant, however, only for the survival rates at the 3-year point for the Administrative, Logistics group and for open enlistments.*

TABLE 8
EFFECT OF CONTRACT LENGTH ON ATTRITION

	Coefficients		
	<u>1 year</u>	<u>2 years</u>	<u>3 years</u>
Combat Support	-0.005	-0.034	-0.007
Combat	-0.026	-0.040	-0.053
Infantry	-0.021	-0.030	-0.056
Radio Communications	-0.042	-0.034	-0.029
Administrative, Logistics	-0.026	-0.032	-0.060 ^a
Open	-0.003	-0.006	-0.019 ^a

^aSignificant at the 5-percent level.

The difference in survival rates between 3- and 4-year enlistees for the first year ranges from 0.003 to 0.042. The regression results show the largest first-year difference for the Radio Communications group. This difference narrows over time so that at the 3-year point it is down to 0.029.

For each of the other programs, the difference in survival rates is greater at the 3-year point than at the 1-year point. The largest 3-year differences (as in table 7) are for the Combat, Infantry, and

* Since people who voluntarily choose a longer contract length are likely to have a greater taste for the military and therefore a lower average propensity to separate, these regression results may understate the effect of contract length on attrition.

Administrative, Logistics groups, but only the last is statistically significant.

Our estimates of the differences between survival rates for 3- and 4-year enlistees are similar to those in table 7. In general, the largest difference in dropout rates occurs in the first year, with slight increases over time.

The regressions show that after 3 years, the overall difference in survival rates for these programs is small, ranging from 0.007 to 0.060. Whether these results would apply to other programs is unclear. Since most technical programs now require 4-year enlistments, it is impossible to compare 3-year and 4-year survival rates for these programs. It is also unclear whether differences in survival rates would continue to be small if we were comparing 4-year enlistees to 5- or 6-year enlistees. Again, we have no evidence concerning this point.

The results of the 1979 DoD Survey of Personnel Entering Military Service were also examined to gain some insight into the effects of contract length on attrition. When the results of the survey were merged with Marine Corps records, we were able to determine whether the recruit had separated early in his enlistment. For recruits in this sample, an average of 1-1/2 years had passed since date of enlistment. A regression model with survival as the dependent variable was examined.

In addition to control variables for mental group, race, education, and program of enlistment, the regression included two variables to reflect the length of enlistment contract. We wanted to determine the effect of years of enlistment on attrition, and also to see if those who signed contracts that were longer than their first choice were more likely to drop out. The first variable, enlistment length, took on the value of one if enlistment length was for 4 years or more and zero otherwise. The second variable, extra years, was created by comparing the recruit's actual enlistment length to his first choice of enlistment length. If the actual enlistment length was greater than the desired enlistment length, the extra-years variable took on the value of one. It was zero otherwise. The coefficients of both the enlistment-length variable and the extra-years variable were expected to have negative signs.

The model also included a variable reflecting job satisfaction. The recruit was asked, "How satisfied are you with the military job you signed up for?" The answers were on a 5-point scale ranging from very satisfied to very dissatisfied. For our regression, the job-satisfaction variable took on the value of one if the recruit was somewhat dissatisfied or very dissatisfied and zero otherwise. The coefficient of this variable was also expected to have a negative sign.

The coefficients for these variables are shown in table 9.* Results are shown for all survey respondents whose records were available through HQMC, for those in AFQT categories I to IIIA, and for those with open enlistments.

In each case the coefficient of the enlistment-length variable has a positive sign. Thus, in this data set, enlistment length did not increase attrition. The coefficient of the extra-years variable has a negative sign. The results suggest that after an average of 1-1/2 years from the date of enlistment, separations may be 2 percent higher among those who sign contracts that are longer than their first choice. The coefficients of the extra-years variable, however, are not significant.**

TABLE 9
EFFECT OF CONTRACT LENGTH, EXTRA YEARS, AND
JOB SATISFACTION ON ATTRITION

Variable	Coefficients		
	All	AFQT category I to IIIA	Open
Enlistment length	0.013	0.021	0.036
Extra years	-0.021	-0.025	-0.020
Job satisfaction	-0.110	-0.055	-0.262 ^a
Number	696	443	326

^aSignificant at the 5-percent level.

* In this model, recruits are observed at different times. Those who have been in a short time are less likely to have separated, and so forth. This can be thought of as measurement error in the dependent variable. Although this measurement error does not bias the estimates, it does lead to larger standard errors, which may explain why almost none of the coefficients are significant.

** The extra-years and enlistment-length variables were correlated at the 21-percent level. Although this correlation is fairly low, we did run models that included only the extra-years variable but not the enlistment-length variable and vice versa. The results were similar to those in table 9.

The coefficients of the job-satisfaction variable are negative. Thus, the results suggest that signing up for a job with which the recruit is not satisfied may increase early attrition, particularly for those with open enlistments, where the coefficient of the job-satisfaction variable is -0.262 and is statistically significant.

The two data sets lead us to conclude that:

- Although 4-year enlistees tend to have slightly higher dropout rates than 3-year enlistees, the differences are generally small and not statistically significant.
- Recruits who sign contracts longer than their first choice may have slightly higher dropout rates, but again the results are not statistically significant.
- Job satisfaction may influence attrition. Recruits dissatisfied with open enlistments are significantly more likely to drop out than those who are satisfied.

COST ESTIMATES

This section presents the results of cost calculations. Details of the calculations are reported in appendix D. Our results illustrate the conditions under which 5- or 6-year contracts are more cost effective than 4-year contracts. They reflect the savings that occur if formal training costs are spread over successively more years. They do not reflect savings in retirement costs that would result if reenlistments were limited to some arbitrary percentage of initial enlistments.*

We calculated the cost per useful service year averaged over 6 years for different combinations of training lengths and training costs. We considered the costs of accession, training and military pay. The sum of these costs was divided by the number of useful service years to yield the cost per useful service year. The term "useful service years" was defined as years of service after training. These years were corrected for the probability of attrition, extension, and/or reenlistment. The estimates do not reflect productivity increases over the period of service.

* Part of the Schneider proposal was to limit reenlistments to some low level to reduce pension payments [1].

The formula* we used for the cost per useful service years, C, was:

$$C = \frac{\sum_{i=1}^6 P_i M_i + TC + AC}{U}, \quad (i = 1, \dots, 6)$$

where:

P_i = average proportion of recruits receiving compensation in the i th year

M_i = average regular military compensation for the i th year

TC = average training cost excluding enlistee pay

AC = average accession costs

U = useful service years.

Our results show the cost per useful service year for 3-, 4-, 5- and 6-year contracts. We calculated figures for various combinations of training times and training costs. The training times used were 6 months, 1 year, 1-1/2 years and 2 years. The training costs varied from \$5,000 to \$50,000.**

Since useful service years is defined as years of service after formal school training, we are, in effect, assuming a flat productivity profile. If recruits are more productive in their fifth and sixth year than in previous years, assuming a flat productivity profile will undervalue part of the benefit of 5- and 6-year contracts. Appendix C presents some evidence on the time path of productivity for recruits in several Navy ratings. Based on this evidence, we feel that our comparisons are helpful, even without productivity corrections.

A 1982 CNA study [16] computed average regular military compensation and base pay by years of service for the Marine Corps for FY 1981 (see appendix D). We used this data inflated to constant FY 1984 dollars for our calculations. Based on information from the Marine Corps Cost Factor Manual, we used a figure of \$4,000 for the sum of average fixed plus variable accession costs. The latter includes recruiting, advertising, and examining costs and is our estimate of the cost of accessing recruits in mental groups I-III A. We used an accession-cost figure for these mental groups because a program

* In a 1976 study, Huck and Midlam used a similar formula to calculate the cost effectiveness of enlistment bonuses [15].

** Although all combinations are shown in the tables, some combinations, such as 6 months and \$25,000, are not likely to occur in practice.

requiring longer enlistments would most likely be limited to recruits in the upper mental groups.

Consistent with our earlier findings, we assumed in the calculations that those signing a 5-year contract would receive a bonus representing about 8 percent* of the present value of military pay over the first 4 years of enlistment. This amount would have been \$2,000 in FY 1979; we estimate that it would be \$3,500 in FY 1984. We assumed that those signing a 6-year contract would receive a bonus with a present value of \$7,000.** We also calculated results for the case in which there is no contract-length enlistment bonus.

To calculate the cost per useful service year, we had to include figures reflecting the pattern of attrition. Although we concluded earlier that there is little difference between the attrition patterns of 3- and 4-year enlistees, we performed two sets of calculations. In the first set we assumed that the attrition pattern for each of the contract lengths was the same. In the second set we assumed higher attrition among those with 5- and 6-year enlistments.

We then had to choose appropriate patterns of attrition to use in our calculations. A recent study estimated that in FY 1981, the first-year dropout rate in the Marine Corps was 11 percent, and the second-year dropout rate was 10 percent [16].*** This estimate is quite different from the rates reported in table 7. In general, the rates we calculated were higher in the first year and lower in the second year.

We did observe that attrition patterns shown in table 7 vary a great deal among the enlistment options. We therefore examined the attrition patterns of enlistees in the several options that require 4-year enlistments. We believed these rates would be more representative of those for the types of technical occupations for which 5- or 6-year enlistments would be most likely. As shown in table 10, the dropout rates for these options averaged 8 percent, 4 percent, and 3 percent in the first 3 years.**** The highest dropout rates for any of these 4-year options were 10 percent in the first year, 7 percent in the second year, and 4 percent in the third year. Since the average rates were quite low, we decided to use 10, 7, and 4 percent in our

* Since the 8-percent figure was based on survey responses, there is considerable uncertainty attached to this result.

** We used constant FY 1984 dollars for our calculations and a 10-percent discount rate.

*** Since the data were not separated by contract length, the continuation rates for the third year and beyond mixed together those separating early with those reaching end of service.

**** Our data only extended through 3 years on average from date of enlistment.

first set of calculations. We also assumed a dropout rate of 4 percent in the fourth, fifth, and sixth years of enlistment.

TABLE 10
DROPOUT RATES FOR 4-YEAR PROGRAMS

Program	Dropout rates (percent)			
	First year	Second year	Third year	Total over 3 years
Avionics	10	4	3	17
Aviation Ordnance	7	5	2	14
Aviation Support, Administration	9	3	4	16
Aviation Technical Support	5	2	2	9
Aircraft Maintenance	9	3	4	16
Electronics	7	7	1	15
Computer Operations	2	2	2	6
Military Police	9	3	3	15
Mechanical, Electrical	9	5	4	18
Average	8	4	3	
Maximum	10	7	4	

In our second set of calculations we used 10-, 9-, and 6-percent attrition figures for the first 3 years of 5- and 6-year enlistments. We continued to use 10, 7, and 4 percent for the first 3 years of 3- and 4-year contracts.

Finally, we assumed that approximately 30 percent of those remaining at the end of the enlistment contract would continue to serve (reenlist or extend). Consistent with recent evidence, one-third of these were assumed to be extensions, and two-thirds reenlistments [16].

Tables 11 through 16 present our results. Tables 11 and 12 show the cost per useful service year by contract length for 3-, 4-, 5-, and 6-year enlistments in FY 1984 constant dollars. As described above, these results include a contract-length enlistment bonus for those with 5- and 6-year enlistments. Table 11 assumes that attrition patterns are the same regardless of contract length, whereas table 12 includes higher attrition rates for those with 5- and 6-year enlistments. Tables 13 and 14 are based on tables 11 and 12 and show the costs of 5- and 6-year contracts and of 3-year contracts relative to 4-year contracts. Note the high cost of the 3-year contract relative to the 4-year contract.

With the same attrition patterns, 5- and 6-year enlistments are generally less costly than 4-year enlistments, even with a bonus. With

TABLE 1

COST PER USEFUL SERVICE YEAR WITH BONUS^a
(FY 1984 constant dollars)

Training times	Training costs				
	\$ 5,000	\$10,000	\$15,000	\$25,000	\$50,000
6 months					
3-year contract	16,352	18,131	19,911	23,469	32,366
4-year contract	15,337	16,812	18,286	21,236	28,611
5-year contract	15,662	16,910	18,199	20,776	27,220
6-year contract	15,772	16,921	18,071	20,408	26,117
1 year					
3-year contract	19,721	21,867	24,016	28,304	39,034
4-year contract	17,866	19,585	21,303	24,739	33,330
5-year contract	17,776	19,246	20,716	23,658	31,011
6-year contract	17,637	18,929	20,221	22,805	29,265
1.5 years					
3-year contract	24,184	26,815	29,447	34,710	47,852
4-year contract	20,964	22,980	24,996	29,028	39,109
5-year contract	20,382	22,072	23,761	27,139	35,585
6-year contract	19,781	21,235	22,688	25,595	32,863
2 years					
3-year contract	31,472	34,897	38,321	45,171	62,294
4-year contract	25,486	27,937	30,388	35,290	47,545
5-year contract	23,791	25,768	27,744	31,696	41,578
6-year contract	22,589	24,256	25,922	29,256	37,589

^aThese calculations assume that attrition patterns are the same regardless of contract length.

TABLE 2

COST PER USEFUL SERVICE YEAR WITH BONUS AND VARYING ATTRITION^a
(FY 1984 constant dollars)

Training times	Training costs				
	\$ 5,000	\$10,000	\$15,000	\$25,000	\$50,000
6 months					
3-year contract	16,352	18,131	19,911	23,469	32,366
4-year contract	15,337	16,812	18,286	21,236	28,611
5-year contract	15,909	17,279	18,649	21,389	28,238
6-year contract	16,085	17,310	18,536	20,987	27,114
1 year					
3-year contract	19,721	21,867	24,016	28,304	39,034
4-year contract	17,866	19,585	21,303	24,739	33,330
5-year contract	18,195	19,767	21,340	24,484	32,346
6-year contract	18,063	19,448	20,833	23,603	30,528
1.5 years					
3-year contract	24,184	26,815	29,447	34,710	47,852
4-year contract	20,964	22,980	24,996	29,028	39,109
5-year contract	20,812	22,623	24,435	28,058	37,116
6-year contract	20,114	21,677	23,239	26,364	34,177
2 years					
3-year contract	31,472	34,897	38,321	45,171	62,294
4-year contract	25,486	27,937	30,388	35,290	47,545
5-year contract	24,502	26,639	28,776	33,049	43,733
6-year contract	23,161	24,966	26,771	30,381	39,406

^aThese calculations reflect higher attrition for those with 5- or 6-year enlistments compared to those with 3- or 4-year enlistments.

TABLE 13

RELATIVE COST^a PER USEFUL SERVICE YEAR WITH BONUS^b
(FY 1984 constant dollars)

Training times	Training costs				
	\$ 5,000	\$10,000	\$15,000	\$25,000	\$50,000
6 months					
3-year contract	1.07	1.08	1.09	1.11	1.13
4-year contract	1.00	1.00	1.00	1.00	1.00
5-year contract	1.02	1.01	0.99	0.98	0.95
6-year contract	1.03	1.01	0.99	0.96	0.91
1 year					
3-year contract	1.10	1.12	1.13	1.14	1.17
4-year contract	1.00	1.00	1.00	1.00	1.00
5-year contract	0.99	0.98	0.97	0.96	0.93
6-year contract	0.99	0.97	0.95	0.92	0.88
1.5 years					
3-year contract	1.15	1.17	1.18	1.20	1.22
4-year contract	1.00	1.00	1.00	1.00	1.00
5-year contract	0.97	0.96	0.95	0.93	0.91
6-year contract	0.94	0.92	0.91	0.88	0.84
2 years					
3-year contract	1.23	1.25	1.26	1.28	1.31
4-year contract	1.00	1.00	1.00	1.00	1.00
5-year contract	0.93	0.92	0.91	0.90	0.87
6-year contract	0.87	0.87	0.85	0.83	0.79

^aRelative to 4-year enlistment contract.

^bThese calculations assume that attrition patterns are the same regardless of contract length.

TABLE 14

RELATIVE COST^a PER USEFUL SERVICE YEAR WITH BONUS
AND VARYING ATTRITION^b
(FY 1984 constant dollars)

<u>Training times</u>	<u>Training costs</u>				
	<u>\$ 5,000</u>	<u>\$10,000</u>	<u>\$15,000</u>	<u>\$25,000</u>	<u>\$50,000</u>
6 months					
4-year contract	1.00	1.00	1.00	1.00	1.00
5-year contract	1.04	1.03	1.02	1.01	0.99
6-year contract	1.05	1.03	1.01	0.99	0.95
1 year					
4-year contract	1.00	1.00	1.00	1.00	1.00
5-year contract	1.02	1.01	1.00	0.99	0.97
6-year contract	1.01	0.99	0.98	0.95	0.92
1.5 years					
4-year contract	1.00	1.00	1.00	1.00	1.00
5-year contract	0.99	0.98	0.98	0.97	0.95
6-year contract	0.96	0.94	0.93	0.91	0.87
2 years					
4-year contract	1.00	1.00	1.00	1.00	1.00
5-year contract	0.96	0.95	0.95	0.94	0.92
6-year contract	0.91	0.89	0.88	0.86	0.83

^aRelative to 4-year enlistment contract.

^bThese calculations reflect higher attrition for those with 5- or 6-year enlistments compared to those with 3- or 4-year enlistments.

TABLE 15

RELATIVE COST^a PER USEFUL SERVICE YEAR WITH NO BONUS^b
(FY 1984 constant dollars)

Training times	Training costs				
	\$ 5,000	\$10,000	\$15,000	\$25,000	\$50,000
6 months					
4-year contract	1.00	1.00	1.00	1.00	1.00
5-year contract	0.96	0.95	0.95	0.94	0.92
6-year contract	0.93	0.92	0.90	0.89	0.86
1 year					
4-year contract	1.00	1.00	1.00	1.00	1.00
5-year contract	0.94	0.94	0.93	0.92	0.90
6-year contract	0.90	0.88	0.87	0.86	0.83
1.5 years					
4-year contract	1.00	1.00	1.00	1.00	1.00
5-year contract	0.92	0.92	0.91	0.90	0.88
6-year contract	0.86	0.85	0.84	0.82	0.80
2 years					
4-year contract	1.00	1.00	1.00	1.00	1.00
5-year contract	0.89	0.88	0.88	0.87	0.85
6-year contract	0.81	0.80	0.79	0.77	0.75

^aRelative to 4-year enlistment contract.

^bThese calculations assume that attrition patterns are the same regardless of contract length.

TABLE 16

RELATIVE COST^a PER USEFUL SERVICE YEAR WITH NO
BONUS AND VARYING ATTRITION^b
(FY 1984 constant dollars)

Training times	Training costs				
	\$ 5,000	\$10,000	\$15,000	\$25,000	\$50,000
6 months					
4-year contract	1.00	1.00	1.00	1.00	1.00
5-year contract	0.98	0.97	0.97	0.96	0.96
6-year contract	0.94	0.93	0.93	0.91	0.89
1 year					
4-year contract	1.00	1.00	1.00	1.00	1.00
5-year contract	0.96	0.96	0.96	0.95	0.94
6-year contract	0.92	0.91	0.90	0.89	0.86
1.5 years					
4-year contract	1.00	1.00	1.00	1.00	1.00
5-year contract	0.95	0.94	0.94	0.93	0.92
6-year contract	0.88	0.87	0.86	0.85	0.83
2 years					
4-year contract	1.00	1.00	1.00	1.00	1.00
5-year contract	0.92	0.91	0.91	0.91	0.90
6-year contract	0.84	0.83	0.82	0.81	0.79

^aRelative to 4-year enlistment contract.

^bThese calculations reflect higher attrition for those with 5- and 6-year enlistments compared to those with 3- or 4-year enlistments.

higher attrition rates, there are fewer instances when the 5- and 6-year enlistments are the least costly. The 6-year enlistment is least costly if training cost is \$25,000 or more, or if training time is 1.5 years or more. The 5-year enlistment is less costly than the 4-year enlistment if training cost is \$50,000 or more, or if training time is 1.5 years or more.

Tables 15 and 16 show the cost of 5- and 6-year enlistments relative to 4-year enlistments when no contract-length enlistment bonus is given.* We assumed when we calculated the values for table 16 that attrition rates are higher for 5- and 6-year enlistments than for 4-year enlistments. Without an enlistment bonus, the 5- and 6-year enlistments are always less costly than the 4-year enlistment, even with higher attrition. The relative cost of the 3-year enlistment is not shown in tables 14 through 16 because it is the same as in table 13.

The figures in tables 11 through 16 reflect our assumptions. If we included higher accession costs, a larger bonus multiple, or lower reenlistment rates, the cost per useful service year of longer contracts would appear even more favorable relative to shorter contracts. On the other hand, if we had assumed even higher attrition rates for the longer contracts than for the shorter contracts, the cost per useful service year of the longer contracts would appear less favorable.

To determine which MOSs should have 5- or 6-year enlistments, the Marine Corps needs to examine the training costs and training times for each MOS. Only some of this information is currently available.

CONCLUSIONS

Our overall conclusion is that longer enlistment contracts are feasible. If an enlistment bonus equal to \$3,500 per additional year** is available, 5- or 6-year enlistment contracts are feasible for MOSs whose training cost is at least \$25,000 or training time is at least 1.5 years.

* Our calculations allow us to compare the results of an 8-percent bonus with that of no bonus. Our general conclusion, that longer contract lengths are feasible, is the same for both cases.

** Costs are in FY 1984 dollars.

This estimate reflects our particular cost calculations. Based on our analysis of survey data, we included an enlistment bonus equal to 8 percent of the present value of military pay per additional year.* Although we estimated that attrition patterns would be the same for the 4-, 5- and 6-year enlistments, we also show calculations in which attrition rates are higher for the 5- and 6-year enlistments.** Alternative assumptions would affect the results. For example, an enlistment bonus greater than 8 percent would make the longer enlistments less cost effective.

Our calculations reflect the cost savings that would occur if training costs were spread over more years. They do not incorporate the savings in pension costs that would occur if reenlistments were limited. In addition, we did not correct our figures for likely increases in productivity in the fifth and sixth years of enlistment (see appendix C). Had these considerations been included, the longer enlistments would appear more cost effective.

We were not able to identify the particular MOSs that fit our criteria because we did not have specific cost information for all the MOSs. Such information should be collected and analyzed.

If no enlistment bonus is available, longer contract lengths are feasible from a cost point of view. We also believe, based on the Navy's experience and the 1979 DoD survey results, that supply would be adequate if 5-year enlistment contracts were introduced for approximately 5 percent of accessions.*** In fact, the survey indicated that 7 percent of enlistees are willing to sign contracts that are for 5 years or longer without any additional payment. These enlistments should be in popular programs, which should no longer be open for 4-year enlistments. Our analysis of program sales (appendix B) identified A5, Avionics, as the most popular program.

* This figure is based on evidence from the Youth Attitude Tracking Study which indicates that an additional year of initial enlistment is the equivalent of an 8-percent pay reduction.

** The evidence we have examined leads us to conclude that contract length has had little effect on attrition in the Marine Corps. Job satisfaction immediately after enlistment may, in fact, play a larger role in attrition, particularly for recruits with open enlistments. If they are not satisfied, those with open enlistments have a significantly higher chance of dropping out than if they are satisfied.

*** The Marine Corps has, in fact, had recent success in increasing contract length. The percent of 4- and 6-year contracts have increased from 73.3 percent and 0.8 percent in the first quarter of FY 1983 to 91.2 percent and 2.8 percent, respectively, in the first quarter of FY 1984 [17].

The Marine Corps' current guarantee program offers bonuses of \$3,000 through \$5,000 for enlistments in various groupings of MOSs. The current versions of the bonus program have not had a high percentage of sales. On the other hand, aviation programs--such as A5, Avionics, and AD, Aircraft Maintenance--have traditionally sold well. These sales may illustrate the importance to the recruit of the specific training guarantee.* This guarantee may, in fact, be as important as the monetary payment.**

* The 1979 DoD survey indicated that nearly 50 percent of recruits were willing to sign contracts that were longer than their first choice to get training guarantees, compared to 36 percent of those with open contracts.

** An alternative explanation is that with current recruiting successes, the recruiters have not been making use of the existing bonus program. Traditionally, the bonuses are used by recruiters to close sales only when necessary.

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APPENDIX A
OTHER SERVICES' PRACTICES

APPENDIX A

OTHER SERVICES' PRACTICES

The Navy requires 6-year enlistments for 22 ratings in three fields. These fields and the ratings within them are listed in table A-1. These ratings, however, have 4-year counterparts so that, in effect, the requirement for 6-years is attached to the field, rather than to the rating itself. Recruits with 6-year enlistments would have more schooling than those with shorter enlistments.

The Navy also requires 5-year enlistments in 12 ratings. Four-year enlistments are not available in these ratings. Finally, the Navy has a program with bonuses available for recruits who enlist for 5 years rather than 4 years (see table A-2).

The Air Force allows recruits to sign 6-year contracts in 73 of about 235 skills but does not require 6-year enlistments. The Air Force does not offer 5-year enlistments.

TABLE A-1

6-YEAR NAVY PROGRAMS

<u>Program</u>	<u>Rating/ designator</u>	<u>Description</u>
Nuclear field	ET	Electronics Technician
	EM	Electrician's Mate
	MM	Machinist's Mate
Advanced electronics field	AQ	Aviation Fire Control Technician
	AT	Aviation Electronics Technician
	AX	Aviation Antisubmarine Warfare Technician
	CTM	Cryptologic Technician (Maintenance)
	DS	Data Systems Technician
	ET	Electronics Technician
	EW	Electronics Warfare Technician
	FTB	Fire Control Technician (Ballistic Missile Fire Control)
	FTG	Fire Control Technician (Gun Fire Control)
	FTM	Fire Control Technician (Surface Missile Fire Control)
	MT	Missile Technician
	OT	Ocean Systems Technician
	RM	Radioman
	STG	Sonar Technician (Surface)
	STS	Sonar Technician (Submarine)
Advanced technical field	BT	Boiler Technician
	GS	Gas Turbine Systems Technician
	HM	Hospital Corpsman
	HT	Hull Maintenance Technician
	IC	Interior Communications Electrician

TABLE A-2

5-YEAR NAVY PROGRAMS

<u>Program</u>	<u>Rating/ designator</u>	<u>Description</u>
5-year required	AC	Air Traffic Controller
	JO	Journalist
	PH	Photographer's Mate
	DP	Data Processing Technician
	EA	Engineering Aid
	BU	Builder
	DT	Dental Technician
	SW	Steelworker
	CE	Construction Electrician
	UT	Utilitiesman
	EO	Equipment Operator
	CM	Construction Mechanic
5-year bonus	BT	Boiler Technician
	CTI	Cryptologic Technician (Interpretive)
	CTR	Cryptologic Technician (Collection)
	CTT	Cryptologic Technician (Technical)
	GM	Gunner's Mate
	MM	Machinist's Mate
	MS	Mess Management Specialist
	OS	Operations Specialist
	SM	Signalman
	ST	Sonar Technician
	TM	Torpedoman's Mate

APPENDIX B
PROGRAM SALES

APPENDIX B
PROGRAM SALES

The Secretary of Defense has suggested that enlistment lengths be extended in skills that have high training costs and many applicants. The Navy, in fact, has been successful in extending contract length to 5 years in several popular ratings. The DoD survey also indicates that program guarantees influence contract length. Here we present some evidence about program popularity for the Marine Corps. Our objective is to identify those programs that are most popular and therefore most likely to continue to fill their quotas, even if the required enlistment length is increased.

It is difficult to get an accurate measure of program popularity. The percent of quota that is sold will be influenced by the size of the quota. As quotas are lowered, the percentage of allocations (positions available) sold will frequently rise, and vice versa.

With this caution in mind, we examine the percentage of allocations sold for each program for the first 6 months of fiscal years 1982, 1983, and 1984.*

The first three columns of table B-1 show how each of the programs ranked in terms of percentage sales. The most notable result is the rather large change in rankings from one year to the next. As noted above, this partly reflects changes in quota. (See tables B-2, B-3 and B-4 for data on the size of quota).

There were five programs that ranked in the top ten for each of the 3 years. These were ZK (Radio Communications), G7 (Computer Operations), G8 (Military Police), A5 (Avionics), and AD (Aircraft Maintenance).

Note that the rank of ZK fell for FY 1984 as its quota was raised. The same was true for both G8 and AD in FY 1983. On the other hand, the quota for A5 was raised in FY 1983, and this program still maintained a high rank in terms of sales in both FY 1983 and FY 1984.

There were five programs that ranked high in 2 of the 3 years. These included the ground programs: ZG (Mechanical/Electrical), ZJ (Infantry), and ZL (Electronics). While the rank of ZG increased in

*When we collected our data, sales for the last months of FY 1983 had been ended, and sales for the delayed entry program had only gone through the first 6 months of FY 1984. In fact 29 percent of program allocations for the first 6 months of FY 1984 had been sold.

TABLE B-1

RANKINGS OF PROGRAMS

	Program code	Program rank				Delayed entry time
		FY 1982 sales	FY 1983 sales	FY 1984 sales		
Combat Support	ZD	13	16	8	17	
Administration	ZE	11	10	14	12	
Supply, Logistics, Disbursing	ZF	18	13	11	16	
Mechanical, Electrical	ZG	9	11	3	8	
Combat	ZH	21	20	16	21	
Infantry	ZJ	15	5	9	19	
Personnel Administration	G2	14	18	13	14	
Motor Transport	G3	16	14	10	10	
Signals Intelligence	3A	-	22	7	-	
Radio Communications	ZK	2	3	7	11	
Electronics	ZL	8	7	15	7	
Marine Corps Security Forces	ZM	-	26	23	-	
Food Services	G6	20	23	22	18	
Computer Operations	G7	10	1	5	2	
Military Police	G8	3	8	1	1	
Avionics	A5	6	6	4	4	
Aviation Ordnance	AA	19	4	18	13	
Aviation Support, Administration	AB	1	15	6	5	
Aviation Technical Support	AC	7	12	12	6	
Aircraft Maintenance	AD	4	9	2	3	
Bonus, \$4,500	WB	17	19	19	-	
Bonus, \$3,500	WC	5	2	-	-	
Bonus, \$3,000	WD	12	17	-	-	
Bonus, \$2,500	WE	22	21	-	-	
Bonus, \$3,500, FY 1983	WH	-	25	20	-	
Bonus, \$3,000, FY 1983	WJ	-	24	21	-	
Technical Skills Enlistment Bonus	-	-	-	-	9	
Combat Arms Enlistment Bonus	-	-	-	-	15	

TABLE B-4

PROGRAM SALES, OCTOBER THROUGH MARCH, FY 1984

	Program code	Attainment	Allocation	Percent	Rank
Combat Support	ZD	217	700	31.0	8
Administration	ZE	181	790	22.9	14
Supply, Logistics, Disbursing	ZF	226	800	28.3	11
Mechanical, Electrical	ZG	689	1,400	49.2	3
Combat	ZH	62	300	20.7	16
Infantry	ZJ	221	720	30.7	9
Personnel Administration	G2	137	540	25.4	13
Motor Transport	G3	185	650	28.5	10
Signals Intelligence	3A	24	120	20.0	17
Radio Communications	ZK	267	740	36.1	7
Electronics	ZL	126	580	21.7	15
Marine Corps Security Forces	ZM	74	1,629	4.5	23
Food Services	G6	45	390	11.5	22
Computer Operations	G7	54	144	37.5	5
Military Police	G8	256	426	60.1	1
Avionics	A5	496	1,140	43.5	4
Aviation Ordnance	AA	20	105	19.0	18
Aviation Support, Administration	AB	205	560	36.6	6
Aviation Technical Support	AC	186	690	26.9	12
Aircraft Maintenance	AD	734	1,368	53.7	2
Bonus, \$4,500	WB	82	450	18.2	19
Bonus, \$3,500	WC	-	-	-	-
Bonus, \$3,000	WD	-	-	-	-
Bonus, \$2,500	WE	-	-	-	-
Bonus, \$3,500, FY 1983	WH	121	740	16.4	20
Bonus, \$3,000, FY 1983	WJ	205	1,600	12.8	21
Totals		4,813	16,582	29.0	

TABLE B-3

PROGRAM SALES, OCTOBER THROUGH MARCH, FY 1983

	Program code	Attainment	Allocation	Percent	Rank
Combat Support	ZD	480	610	78.7	16
Administration	ZE	693	820	84.5	10
Supply, Logistics, Disbursing	ZF	514	640	80.3	13
Mechanical, Electrical	ZG	1,145	1,365	83.9	11
Combat	ZH	231	360	64.2	20
Infantry	ZJ	530	580	91.4	5
Personnel Administration	G2	431	604	71.4	18
Motor Transport	G3	441	555	79.5	14
Signals Intelligence	3A	68	120	56.7	22
Radio Communication	ZK	414	440	94.1	3
Electronics	ZL	337	380	88.7	7
Marine Corps Security Forces	ZM	4	270	1.5	26
Food Services	G6	149	290	51.4	23
Computer Operations	G7	121	111	109.0	1
Military Police	G8	423	480	88.1	8
Avionics	A5	1,012	1,140	88.8	6
Aviation Ordnance	AA	83	90	92.2	4
Aviation Support, Administration	AB	531	674	78.8	15
Aviation Technical Support	AC	532	640	83.1	12
Aircraft Maintenance	AD	1,243	1,460	85.1	9
Bonus, \$4,500	WB	266	395	67.3	19
Bonus, \$3,500	WC	398	393	101.3	2
Bonus, \$3,000	WD	382	524	72.9	17
Bonus, \$2,500	WE	186	294	63.3	21
Bonus, \$3,500, FY 1983	WH	32	174	18.4	25
Bonus, \$3,000, FY 1983	WJ	213	517	41.2	24
Totals		10,859	13,926	78.0	

TABLE B-4

PROGRAM SALES, OCTOBER THROUGH MARCH, FY 1984

	Program code	Attainment	Allocation	Percent	Rank
Combat Support	ZD	217	700	31.0	8
Administration	ZE	181	790	22.9	14
Supply, Logistics, Disbursing	ZF	226	800	28.3	11
Mechanical, Electrical	ZG	689	1,400	49.2	3
Combat	ZH	62	300	20.7	16
Infantry	ZJ	221	720	30.7	9
Personnel Administration	G2	137	540	25.4	13
Motor Transport	G3	185	650	28.5	10
Signals Intelligence	3A	24	120	20.0	17
Radio Communications	ZK	267	740	36.1	7
Electronics	ZL	126	580	21.7	15
Marine Corps Security Forces	ZM	74	1,629	4.5	23
Food Services	G6	45	390	11.5	22
Computer Operations	G7	54	144	37.5	5
Military Police	G8	256	426	60.1	1
Avionics	A5	496	1,140	43.5	4
Aviation Ordnance	AA	20	105	19.0	18
Aviation Support, Administration	AB	205	560	36.6	6
Aviation Technical Support	AC	186	690	26.9	12
Aircraft Maintenance	AD	734	1,368	53.7	2
Bonus, \$4,500	WB	82	450	18.2	19
Bonus, \$3,500	WC	-	-	-	-
Bonus, \$3,000	WD	-	-	-	-
Bonus, \$2,500	WE	-	-	-	-
Bonus, \$3,500, FY 1983	WH	121	740	16.4	20
Bonus, \$3,000, FY 1983	WJ	205	1,600	12.8	21
Totals		4,813	16,582	29.0	

These results are consistent with our earlier conclusion that programs A5, Avionics, AD, Aircraft Maintenance, and G8, Military Police, are the strongest programs in terms of consistent popularity. Since both A5 and AD are programs with high training costs and long training times, they are possible candidates for longer enlistment contracts.

APPENDIX C
PRODUCTIVITY ESTIMATES

APPENDIX C

PRODUCTIVITY ESTIMATES

A recent CNA study [C-1] used results from the Rand Enlisted Utilization Survey to examine the time path of productivity for first-term enlistees in several Navy ratings. In this survey, supervisors were asked to report the enlistee's net contribution to output relative to the average output of someone with 4 years of experience in the occupation. The enlistee's net contribution to output was to be assessed at various times between 1 month and 4 years after arrival at the duty station. The CNA study reports these estimates. In addition, to convert the estimates into a continuous measure of productivity growth over time, the following equation was estimated for each rating:

$$NP = a + b_1t + b_2t^2 ,$$

where:

NP = value of net productivity

t = time, in months, at the duty station.

The CNA study reports the regression coefficients for 12 Navy ratings for recruits trained in A school and on the job. We have used these coefficients to calculate how many months it takes for productivity to reach its peak after recruits arrive at the first duty station. Table C-1 reports this information for those trained in A school. The table also includes the average number of months it takes to reach the first duty station.

Looking at total time to reach peak productivity, we see that in 4 of the 12 ratings, productivity reaches its peak in the fourth year. An additional five ratings reach their productivity peak within 4-1/2 years. Thus, these data do not indicate that productivity is higher in the fifth or sixth years than in the fourth year.

It must be remembered that these data are based on supervisors' ratings of productivity during the first 4 years only. The equations do not include any actual data on productivity in the fifth and sixth year.

APPENDIX D

COST CALCULATIONS

In the main text we present the cost per useful service year, C , for enlistment contracts of various lengths. The formula we use is

$$C = \frac{\sum_{i=1}^6 P_i M_i + TC + AC}{U}, \quad (i = 1, \dots, 6)$$

where:

P_i = average proportion of recruits reviewing compensation in the i th year

M_i = average regular military compensation for the i th year

TC = average training cost excluding enlistee pay

AC = average accession costs

U = useful service years.

The values we used for TC ranged from \$5,000 to \$50,000. We used a figure of \$4,000 for AC . The latter is an estimate of the average cost of accessing recruits in mental groups I-III A.

Both P_i and U depend on attrition patterns, as well as on reenlistment and extension rates. As discussed in the main text, we present results for two sets of attrition patterns. For one set we assumed the same attrition pattern for all contract lengths. In the second set we assumed that attrition rates were higher for those with 5- and 6-year enlistment contracts than for those with 3- and 4-year contracts. Table D-1 is based on our assumed attrition patterns and shows the proportion of recruits beginning each contract year. Besides being corrected for attrition, the 3-, 4- and 5-year enlistments reflect reenlistments and extensions in the later years. Based on recent Marine Corps experience, the reenlistment rate was assumed to be 21 percent of those completing the previous year, and the extension rate was assumed to be 10 percent [D-1]. Table D-2 shows useful service years, U , by contract length. These figures were calculated based on the values in table D-1. Each year's service time was calculated by multiplying 365 by the proportion of recruits serving at mid-year. In calculating U , days spent in training were subtracted from total service days.

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