

First-Term Attrition in the Marine Corps

Aline O. Quester



CENTER FOR NAVAL ANALYSES

4401 Ford Avenue • Post Office Box 16268 • Alexandria, Virginia 22302-0268

Copyright CNA Corporation/Scanned October 2003

Distribution unlimited

For copies of this document, call the CNA Document Control and Distribution Section (703) 824-2943

**This Research Memorandum represents the best opinion of CNA at the time of issue.
It does not necessarily represent the opinion of the Department of the Navy.**



CENTER FOR NAVAL ANALYSES

4401 Ford Avenue • Post Office Box 16268 • Alexandria, Virginia 22302-0268 • (703) 824-2000

30 March 1993

MEMORANDUM FOR DISTRIBUTION LIST

Subj: CNA Research Memorandum 92-200

Encl: (1) CNA Research Memorandum 92-200, *First-Term Attrition in the Marine Corps*, by Aline O. Quester, Mar 1993

This research memorandum provides an overview of first-term attrition in the Marine Corps. It discusses trends in attrition, the timing and costs, and the historical relationship between attrition rates and recruit characteristics. Finally, it briefly discusses reasons for separation.

A handwritten signature in black ink, appearing to read 'Donald J. Cymrot'.

Donald J. Cymrot
Director
Manpower and Medical Program

Distribution List:
Reverse page

Subj: Center for Naval Analyses Research Memorandum 92-200

Distribution List

SNDL

24J1	CG FMFLANT		Attn: Dir, Personnel Procurement Div. (2 copies)
24J2	CG FMFPAC		Attn: Dir, Manpower Plans & Policy Div. (4 copies)
45A2	CG I MEF		Attn: Dir, Personnel Management Div. (2 copies)
45A2	CG II MEF		Attn: Manpower Analysis, Evaluation and Coord. (2 c
45A2	CG III MEF	A6	HQMC OLA
45B	CG FIRST MARDIV	A6	HQMC PA
45B	CG SECOND MARDIV	A6	HQMC R&P (2 copies)
45B	CG THIRD MARDIV	A6	HQMC PP&O
45B	CG FOURTH MARDIV	FF38	USNA ANNAPOLIS
45Q	CG FIRST FSSG		Attn: Nimitz Library
45Q	CG SECOND FSSG	FF42	NAVPGSCOL
45Q	CG THIRD FSSG		Attn: Code 64
45Q	CG FOURTH FSSG		Attn: Library (2 copies)
46B	CG FIRST MAW	FF44	NAVWARCOL
46B	CG SECOND MAW	FJA13	NAVPERSRANDCEN SAN DIEGO CA
46B	CG THIRD MAW		Attn: Technical Director (Code 01)
46B	CG FOURTH MAW		Attn: Technical Library
A1A	DASN - MANPOWER (2 copies)		Attn: Director, Manpower Sys (Code 11)
A1H	ASSTSECNAV MRA (2 copies)		Attn: Director, Personnel Sys (Code 12)
A2A	CNR		Attn: Information Support (Code 113)
A5	CHNAVPER WASHINGTON DC	V12	CG MAGTEC
A5	PERS-2	V12	CG MCCDC
A6	DNIGMC/IGME		Attn: Commanding General
A6	HQMC AVN		Attn: Studies and Analyses Branch (6 copies)
	Attn: Manpower	OPNAV	
A6	HQMC MPR & RA	N1	
	Attn: DC/S, Manpower & Reserve Affairs		
	(2 copies)		
	Attn: ADC/S, Manpower & Reserve Affairs		

First-Term Attrition in the Marine Corps

Aline O. Quester

Acquisition and Support Division



CENTER FOR NAVAL ANALYSES

4401 Ford Avenue • Post Office Box 16268 • Alexandria, Virginia 22302-0268

EXECUTIVE SUMMARY

First-term non-end-of-active service (non-EAS) attrition is costly for the Marine Corps. We estimate the yearly replacement costs--after Marines have completed boot camp, the School of Infantry, and their primary military occupational specialty training--to be in excess of \$100 million. We believe an examination of attrition is important for the following reasons:

- First-term non-EAS attrition appears to be increasing.
- The Corps never translated its improved accession quality into reduced attrition. (Today, the percentage of Marines leaving the Corps before EAS is about the same as it was in the early 1980s when recruit quality was considerably poorer.)
- Budgetary realities require the Corps to review any possible opportunities for savings.

In this paper, we examine attrition

- Levels
- Timing
- Costs
- Relationships with recruit characteristics
- Separation reasons.

Much of this work has been reported elsewhere. Here, we bring together the results of several previous analyses and update those analyses to FY 1992. To summarize, we find non-EAS first-term attrition to be higher for recruits:

- Who do not have regular high school diplomas
- Who score lower on the Armed Force Qualification Test (AFQT)
- Who do not enter through the delayed entry program
- Who do not meet the retention weight-for-height standard.

We also find that the following have higher attrition: recruits entering over the age of 25, recruits entering with a Bureau of Medicine waiver (or under the Medical Rehabilitation Program), and non-prior-service recruits who try boot camp a second time (after failing on their first "try"). We find no attrition differences by either moral code or moral waiver status. (We intend to revisit this analysis after more data are available. These new codes were only introduced in FY 1991.)

Finally, we suggest that analyses of separation reasons are not very revealing. We believe the Marine Corps can glean the most useful information by relating any premature separations to the background characteristics of recruits--not by analyzing separation reasons. Our general feeling is that a first-term non-EAS separation represents a failure. Many such failures result from a combination of reasons: The recruit is overweight, he doesn't perform satisfactorily, and he complains of back pain. However, the official record can list only one reason. Which one is chosen--weight, unsatisfactory performance, or some form of physical disability--depends on the subjective judgment of the commanding officer. Currently, there is a lack of consistency among the commands. Until the Corps institutes some sort of ranking for the separation codes (i.e., if this reason is applicable, then..., if not, then...), we do not feel we can perform meaningful analyses on separation reasons.

CONTENTS

	Page
Illustrations	vii
Tables	vii
Introduction	1
First-Term Attrition: An Overview	2
Levels of First-Term Attrition	2
Timing of First-Term Non-EAS Attrition	6
Costs of First-Term Attrition	8
Attrition Differences by Recruit Characteristics	10
The Most Important Determinants	10
Educational Background	10
Test-Score Category	12
Participation in the Delayed Entry Program	14
Height and Weight at Accession	14
Summary of the Most Important Determinants of Non-EAS Attrition	17
Categories of Recruits With Historically Low Accession Numbers but With High Attrition Rates	17
Medical Waivers	17
Age at Accession	18
Recruits Who Attempt Boot Camp a Second Time	19
Moral Waivers	19
Separation Reasons	21
Summary	25
References	27

THIS PAGE INTENTIONALLY LEFT BLANK

ILLUSTRATIONS

		Page
1	Forty-Five Month Attrition: All NPS Regular Recruits With Initial Obligations of 4-6 Years	3
2	Accession Quality for Marine Corps Male NPS Regular Recruits	4
3	Three-Month Attrition: NPS Male Regular Recruits	5
4	Joint Service Average Hands-On Performance Test Scores by AFQT Category and Military Experience	13
5	Attrition and the Weight-for-Height Retention Standard	16

TABLES

		Page
1	Attrition by Educational Background: Male NPS Regular Recruits	11
2	Attrition by AFQT Category: NPS Regular Male Recruits in FY 1992	13
3	Attrition Rates by Recruit Weight Status: FY 1986 and FY 1987 Male NPS Regular Recruits With Four- to Six-Year Enlistment Contracts	16
4	Attrition Rates by Recruit Weight Status: FY 1992 Male NPS Regular Recruits	17
5	Attrition Rates for NPS Regular Recruits: BUMED Waivers or MEDREP Program	18
6	Attrition by Moral Code and Moral Waiver Status: FY 1992 Male NPS Regular Recruits	20
7	Separation Reasons for Boot-Camp Attrition: First 11 Months of Each Fiscal Year Shown	23
8	Reasons for School of Infantry Attrition: First 11 Months of Each Fiscal Year Shown	24
9	Reasons for Non-EAS Attrition: First-Term Marines Separated After School of Infantry, First 11 Months of Each Fiscal Year Shown	25

INTRODUCTION

First-term attrition is costly for the Marine Corps. Some might mistakenly believe that because the Marine Corps is programmed to reduce its size, recent increases in first-term separations are not a problem. In FY 1992, for example, the Marine Corps involuntarily separated career Marines. It did not permit all Marines who wanted to reenlist at the first reenlistment point to do so. In addition, it used voluntary separation incentives to separate other career Marines. Since the Corps is now forcing out "good," career Marines, why should anyone worry about non-end-of-active-service (EAS) attrition in the first term of service?

Reasoning that equates first-term attrition with career attrition is incorrect. Separations beyond the first term of service are to reduce over-strength military occupational specialties (MOSs) or to ensure adequate promotion opportunities as the Corps reduces its size. As difficult as it is to separate good, career Marines, it is necessary if the Corps is to maintain its lean mix of careerists to first-termers as it becomes smaller. Non-EAS separations of first-term Marines at levels above those considered normal are quite different. They are not programmed. Each additional separation must be replaced with a new recruit if first-term requirements are to be met. And, these new replacements are costly because they must be found and trained.

In FY 1992, the Marine Corps experienced substantially more non-EAS attrition than planners had anticipated. Virtually all of this non-EAS attrition was in the first term of service. Because of these unexpected separations, the Corps did not meet FY 1992 endstrength levels.¹ To get

1. Authorized FY 1992 endstrength was 188,000; actual endstrength was 184,484--about 3,500 below the authorizations. Not all of these unplanned separations were non-EAS attrition. For a variety of reasons, first-term EAS attrition was also substantially underpredicted in FY 1992.

One problem (that has since been corrected) is that predictions in FY 1992 were not made separately for first-termers and for the career force. In FY 1992, there were substantially more first-termers at EAS than is normal. There were two reasons. First, FY 1988 had been an unusually large recruiting year, and large numbers of Marines with initial four-year obligations came to EAS in FY 1992. Second, FY 1992 was the first year that substantial numbers of Marines with five- or six-year initial enlistment contracts came to EAS. Since the probability of separation differs substantially for first-termers and career Marines, it is important that planners separately predict expected separations from each population.

Determining exactly what went wrong in FY 1992 is outside the scope of this effort. How much, in hindsight, was due to errors in planning and how much was due to changes in behavior are, however, very important questions. Our preliminary look at the first 11 months of the last four fiscal years shows there were 3,300 to 4,200 more EAS separations in FY 1992 than there had been in FY 1991, FY 1990, or FY 1989. This substantial increase is due entirely to first-term EAS separations. Non-EAS separations were about 1,000 higher in FY 1992 than in FY 1991 (but a little lower than the levels in FY 1989 or FY 1990). Again, all the increases are in the first-term separations.

the Corps back on the planned downsizing glide path, the number of FY 1993 accessions was increased substantially, by about 7,000 additional recruits.¹ The plan for FY 1993 is to access 36,800 regular recruits (versus about 32,000 in FY 1992). To execute such a large increase, about 300 recruiter man-years are being added (primarily by voluntary and involuntary extension of tours), monies are being shifted to a new college enlistment program, and most of the advertising budget is being spent earlier in the fiscal year.

Against this backdrop, it seemed important to widen the framework of the "accession strategies" task in the Managing the Enlisted Marine Corps in the 1990s study. The tasking originally suggested an analysis of waiver status at accession and subsequent non-EAS attrition behavior. We have enlarged this task to include a more complete analysis of first-term attrition. We begin the analysis by examining the changes over time in accession quality, and questioning whether the Marine Corps has translated these improvements in quality into reduced attrition. Next, we review attrition levels, timing, and costs, and discuss the relationships we have identified between recruit characteristics and attrition risk. Finally, we review the separation reasons for the attrition.

FIRST-TERM ATTRITION: AN OVERVIEW

Levels of First-Term Attrition

Historically, about one-third of non-prior-service (NPS) male recruits (and about one-half of NPS female recruits) do not complete their first enlistment. Both because attrition patterns for women Marines differ from those for male Marines and because the Corps is predominately male, we focus this paper on the attrition behavior of male NPS regular Marines.²

Figure 1 shows the 45-month attrition rates for male NPS regular recruits with four- to six-year initial obligations who entered the Marine Corps in FY 1980 through FY 1988.³

1. The actual amount of the increase depends upon which plan is used as the base.

2. See [1] for a discussion of the attrition behavior of women Marines.

3. The mixtures of three-, four-, and five-year initial enlistment contracts have changed over the years. To avoid having the mixture of contract lengths affect the attrition rate, we calculate first-term attrition as attrition before 45 months of service. We also restrict the analysis to those recruits with four-, five-, and six-year initial enlistment contracts.

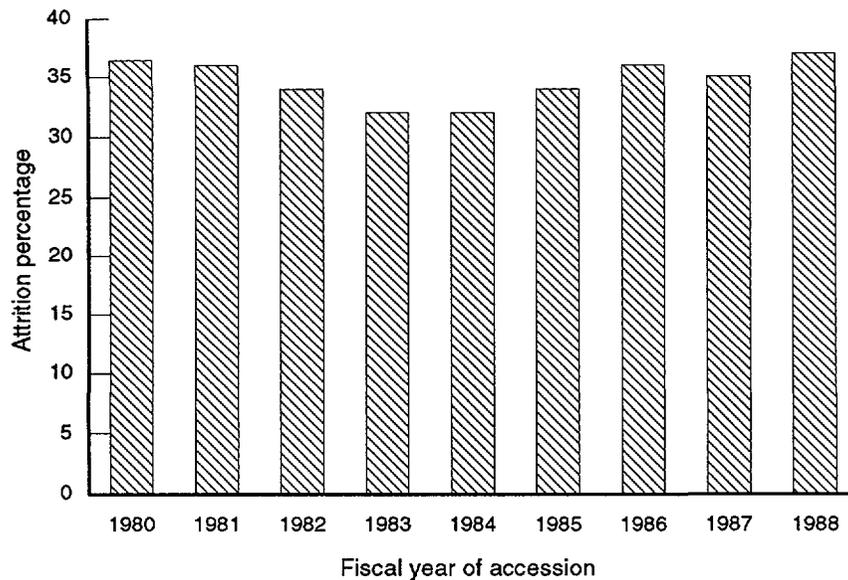


Figure 1. Forty-five month attrition: all NPS regular recruits with initial obligations of 4-6 years

Perhaps the most striking feature of figure 1 is that the first-term attrition has not been reduced during this period when the Marine Corps substantially improved accession quality. All the services, as well as the Department of Defense, measure accession quality as the percent of accessions who are high school diploma graduates¹ and test in the top half of the nationally normed Armed Forces Qualification Test (AFQT I-III A). Figure 2 shows how the Marine Corps has increased the proportion of quality accessions from less than 30 percent in FY 1979 to over 60 percent since FY 1987. Apparently what has happened is that standards have risen as the quality of accessions has improved.

1. Current terminology calls these Tier I accessions. They are primarily high school diploma graduates. High school diploma graduates have always had lower attrition rates than alternate diploma graduates or nongraduates. Later in this paper, attrition for Tier I recruits will be discussed in more detail.

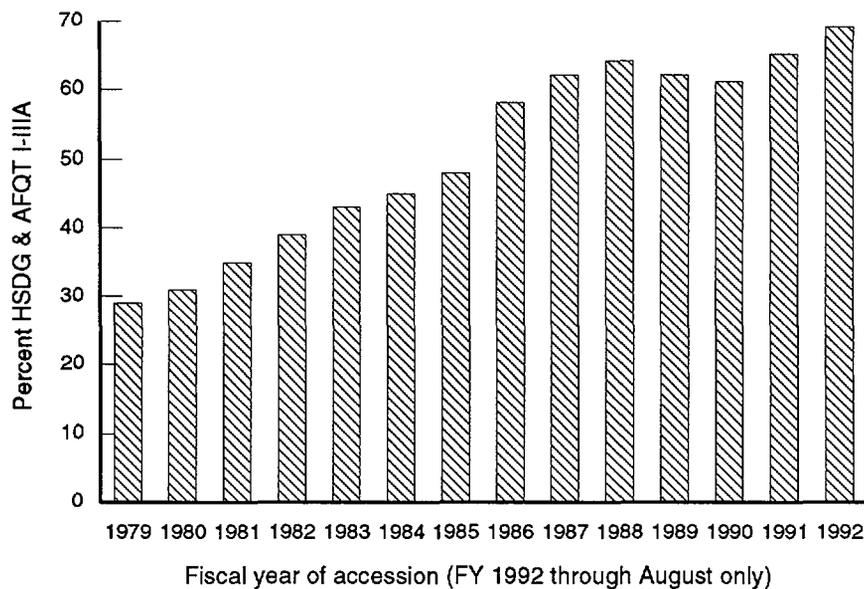


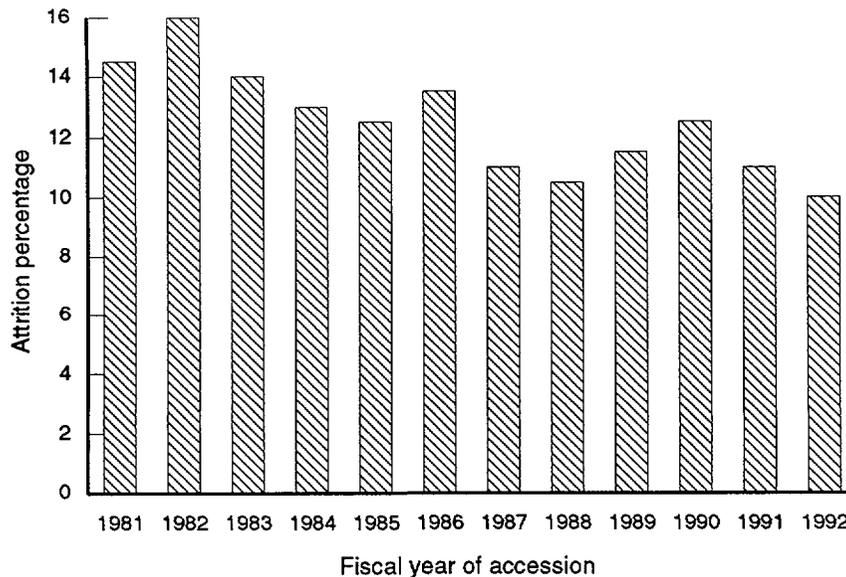
Figure 2. Accession quality for Marine Corps male NPS regular recruits

At present, we can only examine first-term attrition (attrition during the first four years of service) for recruits entering through FY 1988; however, we can examine boot-camp attrition for recruits entering through FY 1991 (figure 3). Here, we see some reduction in boot-camp attrition since FY 1987.¹ (For accessions in FY 1992, we can track boot-camp attrition only for those accessed through June.)

The increases in non-EAS first-term attrition in FY 1992 are not easy to see from these charts of first-term or boot-camp attrition over time, primarily because the increases are so recent. That FY 1992 attrition was considerably greater than planned is well documented in the monthly endstrength briefs given to the Deputy Chief of Staff, Manpower and Reserve Affairs. These briefings report that non-EAS attrition losses were 18,589 in FY 1992; this is 2,639 over the start-of-the-year plan of 15,950 and 1,350 over the revised plan of 17,239 from June 1992.²

1. The boot-camp attrition depicted in figure 3 is boot-camp attrition within the ordinary three-month time frame. Because some recruits are held back (and then attrite after a longer period at boot camp), total boot-camp attrition is about a percentage point higher. The figure averages boot-camp attrition for the two depots. In many years, the attrition rates between San Diego and Parris Island have been quite different.

2. FY 1992 Manpower Plan Memo Number 03, Jun 1992.



NOTE: FY 1992 accessions are through June only.

Figure 3. Three-month attrition: NPS male regular recruits

We have done some analysis on cohort attrition rates.¹ In particular, we have looked at the 12-month attrition rate for NPS accessions in FY 1991, the 24-month attrition rate for NPS accessions who entered in FY 1990, and the 36-month attrition rate for NPS accessions who entered in FY 1989. For FY 1989 accessions, we restrict our attention to those with initial enlistment contracts of four years or more. In this analysis, we ask three questions:

- What was the actual rate of attrition?
- What was the historical average rate of attrition?
- What, given the accession quality, should we have expected the attrition to be?

We can easily answer the first two questions using data from the accession cohort files that CNA maintains. To answer the third question, we calculate the average historical attrition rates for 16 categories of recruits. These categories are defined by characteristics

1. Cohorts are groups of individuals who experience a similar event at some point in time. Most of CNA's attrition analysis has been done by accession cohorts--e.g., Marines accessed in a particular fiscal year and followed for a specified number of months.

known to be predictors of attrition.¹ We then calculate what the expected attrition, given quality, should have been. For example, the expected 12-month attrition rate for FY 1991 accessions (given the quality of FY 1991 accessions) is:

$$\text{Expected attrition} = (n_i * a_i) / N ,$$

where

n_i = number of FY 1991 accessions in the i th category

a_i = historical 12-month attrition rate for this category of recruits

N = all FY 1991 accessions.

We use historical averages for accessions in FY 1979 through FY 1989 to compute 12- and 24-month attrition rates by quality type. For computing 36-month attrition, we use FY 1979 through FY 1988 data.

The results of this analysis show quite clearly, at least for accessions in FY 1990 and FY 1991, that the Corps has not translated the improved quality of recruits into expected reductions in attrition. Actual 12-month attrition for FY 1991 accessions was 18.8 percent, over two percentage points higher than the historical average rate of 16.5 percent. Given the quality of FY 1991 accessions, however, the historically-derived expected rate of attrition should have been just 14.9 percent. Similarly, for FY 1990 accessions, the actual 24-month attrition rate was 25.1 percent--higher than the historical rate of 23.3 percent. Given accession quality in FY 1990, however, the expected rate was 21.4 percent. For accessions in FY 1989, the results are better. The actual 36-month attrition rate was 28 percent--better than the historical rate of 29.5 percent, and very close to the expected rate of 27.6 percent.

Timing of First-Term Non-EAS Attrition

There is considerable interest in the timing of non-EAS attrition during the first term of service. Here, we analyzed the attrition patterns of enlisted male recruits entering in FY 1986 through FY 1991.

1. The relationships among recruit characteristics and subsequent attrition behavior will be reviewed later in this paper. We used shift-share analysis to predict what the attrition rate should have been, given the quality mix of recruits in FY 1990. This technique divides the recruits into subgroups and uses the historical attrition rate for each subgroup to predict the overall attrition. Our subgroups were based on educational background, AFQT category, Delayed Entry Program Status, and weight status at accession.

We restricted the analysis to regular NPS males with initial enlistment contracts of four, five, and six years.¹

Overall first-term non-EAS attrition in the Marine Corps is comparable to that in the Navy and the Army. Typically, it is between 33 and 35 percent (33 to 35 of every 100 NPS accessions do not complete 45 months of service). The Marine Corps, however, takes a larger proportion of its first-term attrition at the boot camp than does the Army or the Navy.² In the Corps,

- About one-third of the attrition occurs at the Marine Corps recruit depots (MCRDs) in the first three months of service (11 to 12 of every 100 accessions fail to complete boot camp).
- By six months of service, the attrition rate has been about 13 to 15 percent.
- The rest of the first-term non-EAS attrition has been remarkably level over time, about 3 percent for each six-month period.

Thus, for every 100 enlisted NPS Marines, there have been about:

- 88 to 89 who complete MCRD in the regular time period
- 85 to 87 who complete the first six months of service
- 83 who complete the first 12 months of service
- 80 who complete the first 18 months of service
- 77 who complete the first 24 months of service
- 74 who complete the first 30 months of service
- 71 who complete the first 36 months of service
- 68 who complete the first 42 months of service
- 65 to 67 who complete 45 months of service.

1. This section on the timing of attrition focuses on the historical patterns. It does not address the very recent increases in attrition in FY 1992.

2. Air Force non-EAS attrition rates are generally lower than those for the other services. Making attrition comparisons across services, however, is complicated because initial contracts differ in length. The Defense Manpower Data Center (DMDC) reports two-year attrition rates for FY 1985 accessions as 21.4 percent for the Army, 21.6 percent for the Navy, 22.3 percent for the Marine Corps, and 17.2 percent for the Air Force. (See [2].) Interestingly, non-EAS attrition rates for Marines entering with aviation program guarantees are lower than those for other recruits.

Sometimes, personnel inventory planning requires "thinking through"--from the accession point--how many Marines one can expect in future years. If a "typical" NPS Marine accession has 12 months of training and two 18-month cycles, each with a six-month pump, then the second cycle begins in about the 30th month of service (where, historically, there would be about 74 Marines for every 100 that had been accessed 30 months earlier). And, in the past at least, an additional 9 or so of these 74 Marines will leave the Corps between the 30th month and the end of the contract.

Costs of First-Term Attrition

How costly is first-term non-EAS attrition for the Marine Corps? The costs are the costs of replacing the separated Marine earlier than was anticipated. In 1992 dollars, we estimate these costs to be:

- \$5,430 to recruit each replacement¹
- \$19,035 to train each male and \$19,714 to train each female
- \$7,360 per Marine for combat training
- MOS training costs vary, but these are some examples:
 - \$6,103 for a rifleman (0311)
 - \$36,567 for a ground radio repairer (2841)
 - \$4,723 for a supply administration and operations clerk (3041)
 - \$5,172 for an administrative clerk (0151)
 - \$11,324 for a machine gunner (0331).

Thus, these are the costs of replacing each first-term male Marine who is lost to attrition:

- \$37,928 for an 0311
- \$68,392 for a 2841
- \$36,548 for a 3041

1. The recruiting costs include average personnel costs for the officers and enlisted personnel in recruiting. The training costs come from [3]. These training costs were in 1990 dollars. A price index was used to convert them to 1992 dollars. All costs are average costs.

- \$36,997 for a 0151
- \$43,149 for a 0331.

The Marine Corps intends that most recruits will not become careerists. This year, the Corps accessed about 32,000 regular recruits and will permit about 3,200 first-term reenlistments.¹ The proportion of the force that is first-term is driven by requirements. If first-term non-EAS attrition rises, new recruits must be brought in to keep the same mixture of first termers and careerists.

About 18 to 20 percent of non-prior service accessions leave the Corps after the first year of service (and before the end of their contract). Or, for FY 1992 accessions we can expect about 6,400 of the 32,000 accessions to leave after they have completed MCRD, the School of the Infantry, and probably their MOS school. To estimate how much this attrition costs, we must look at the timing of attrition. If, for example, all attrition occurred the day the contract was due to expire, no replacements would be needed and there would be no additional replacement costs. If, instead, all attrition occurred after one year of service, all would need replacing, and the Corps would incur full replacement costs. Similarly, if all attrition occurred in the middle of the remaining term of service, only half of this attrition would require replacements. Because non-EAS attrition after the first year of service has been very even, about 3 percent for each six-month period, the average Marine who leaves the Corps after the first year of service leaves in the middle of the remaining contract period. Thus, we can assume half of the non-EAS attrition requires a premature replacement accession.

It is worth estimating the yearly costs of these premature replacements. Taking \$40,000 as the average cost of recruiting and training a replacement, the costs of this first-term non-EAS attrition (after the first year of service) will be about \$128 million dollars for accessions in FY 1992. We calculate this total as

$$(\$40,000 \text{ replacement cost})(6,400 \text{ non-EAS attrition after the first year of service})(1/2 \text{ for early replacements}) = \$128 \text{ million} .$$

In brief, we estimate that the costs of non-EAS attrition after the first year of service for first-term Marines are in excess of \$100 million each year. These are real costs because these Marines must be replaced with new accessions.

1. Career force controls were first introduced in 1985, but the Marine Corps did not begin restricting first-term reenlistments until 1988. The controls say that for Marines to reenlist, they must be declared recommended and eligible by their commanding officers and there must be an occupational requirement for them.

ATTRITION DIFFERENCES BY RECRUIT CHARACTERISTICS

The Most Important Determinants

Many studies have analyzed the characteristics associated with the failure to complete either MCRD or the first term of service. (See references [1] and [4] through [10]). Historically, the rate of attrition has been largely determined by four factors:

- Educational background
- Test score category
- Participation in the delayed entry program
- Height and weight at accession.

Educational Background

By far the most important factor affecting non-EAS attrition is whether or not the recruit earned a regular high school diploma. Early attrition rates for non-high school diploma graduates are about double the rate of those with diplomas. The attrition rates for Marines with some type of alternative high school credentials have been somewhere in between those graduating with regular diplomas and those without any high school credentials. The Marine Corps has recognized this fact for many years and, during the 1980s, substantially increased the proportion of accessions with high school diplomas.

In 1988, the Department of Defense directed that changes be made in the educational background codes, and as a result, a three-tier system was set up. Because the current coding began in 1988, we use tabulations of FY 1988 accessions to illustrate the current differences in first-term attrition by educational background. We also show three-month attrition rates for accessions in FY 1990 and FY 1991 (table 1).

Several points should be made about the educational tiers. First, now virtually all Marine Corps accessions are high school diploma graduates (HSDGs). Thus, the attrition rates for HSDGs will be very close to (although somewhat lower than) the overall attrition rate. For example, the three-month attrition rate for all FY 1990 accessions was 12 percent,¹ whereas the rate for HSDG accessions was 11 percent. And, the attrition percentage for Tier I accessions is identical (to three digits) to the attrition percentage for HSDGs even though Tier I includes several other educational background codes, with varying attrition rates.

Second, just as the large numbers of HSDGs effectively determine the attrition rate for Tier I, the performance of the large numbers of "high school certificate of attendance" accessions in Tier II have historically

1. The rate for all accessions is not shown in the table.

Table 1. Attrition by educational background: Male NPS regular recruits

Educational code	45 months		3 months			
	FY 1988		FY 1990		FY 1991	
	Attrition (percent)	Number of accessions	Attrition (percent)	Number of accessions	Attrition (percent)	Number of accessions
<u>Tier I codes</u>						
L: High school diploma graduate	32	32,459	12	27,856	11	24,926
D: Associate degree	28	158	9	91	5	81
8: Non high school graduate, one semester college	47	19	16	334	16	379
B: Adult education	48	98	17	464	16	496
<u>Tier II codes</u>						
J: Certificate of attendance	40	1,110	19	837	16	308
E: Test-based equivalency	55	305	27	669	25	390
<u>Tier III code</u>						
1: Less than high school	50	193	21	184	12	61

dominated the overall attrition rate calculations for Tier II accessions. Recently, however, the small number of Tier II accessions has been roughly split between those who have certificates of attendance and those with test-based equivalencies (mostly GEDs).

Third, within Tier I and Tier II the average attrition rates for the individual educational codes show substantial variation. In Tier I, only HSDGs and those with associate degrees have had the low attrition rate that has characterized the group. In Tier II, only those with high school certificates of attendance have attrition rates that distinguish them from the nongraduates in Tier III. In particular, recruits entering with GEDs have had an attrition rate that is very similar to, or even worse than, that observed for high school dropouts.

In summary, in Tier I, those accessions who have earned high school diplomas or associate degrees have the lowest attrition rates. In Tier II, accessions who hold high school certificates of attendance have the lowest attrition rates. Finally, within Tier I or Tier II, the attrition rates for Marines with different civilian education codes have varied widely. The attrition rate for Tier III accessions has historically been the highest. Since FY 1991, however, the Marine Corps has accessed very few Tier III recruits.

Test-Score Category

Recruits who test in the top half of the Armed Forces Qualification Test (AFQT) have historically exhibited lower non-EAS attrition rates in the Marine Corps than have recruits with lower test scores. Attrition differences by AFQT test score categories, however, are not nearly so large as the differences by educational background. Probably the main reason why the Marine Corps has worked hard to increase the proportion of accessions who score high on the AFQT is that high scorers perform better than low scorers. (See [11] through [13] for a discussion of these performance differences for hands-on tests.) Figure 4 shows the relationships among hands-on performance, AFQT test scores, and time in the military. These relationships are averages across the services for 24 job skills. Although job performance increases with time in the military, there are persistent differences in the job performance by AFQT score category. For example, individuals in AFQT categories I and II had performance levels in their first year of service that were not reached by individuals in category IIIA until their third year of service.

Today, the Marine Corps does not access any AFQT category IV recruits (recruits who test in the 30th or lower percentile), and it carefully screens IIIB recruits (those in the 31st to 49th percentile); therefore, it may be somewhat misleading to examine current attrition rates by AFQT category. (For FY 1980 accessions, for example, first-term attrition rates were 33 percent for recruits testing above the 50th percentile, 38 percent for recruits testing in category IIIB, and 39 for recruits testing in category IV.) We did, however, tabulate the three-month attrition rates for NPS male recruits entering in FY 1992. They are shown in table 2.

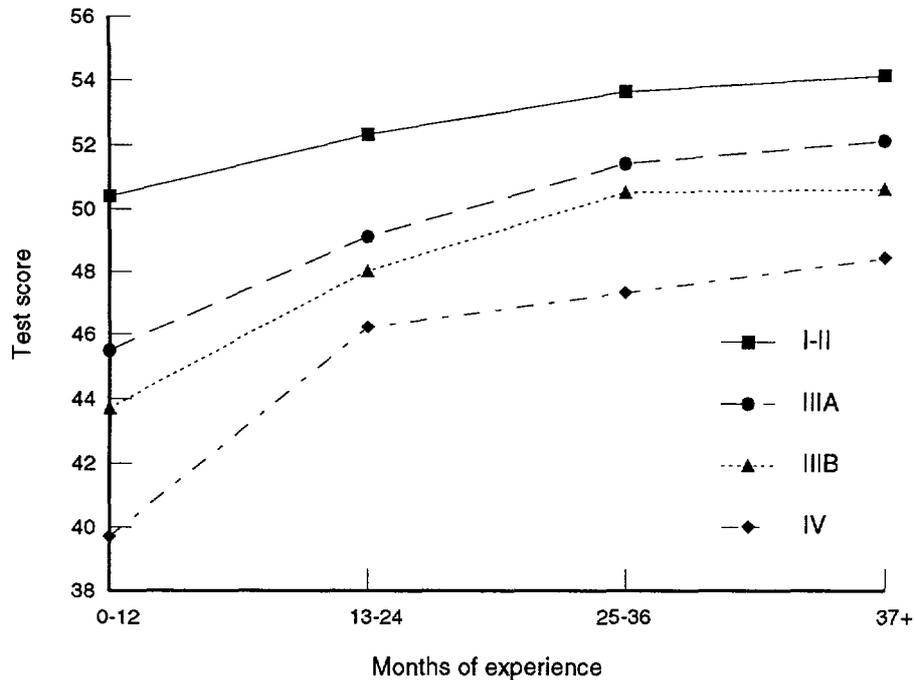


Figure 4. Joint service average hands-on performance test scores by AFQT category and military experience

Table 2. Attrition by AFQT category: NPS regular male recruits in FY 1992

AFQT category	Percentile	Three-month attrition rate	Number of recruits
I	93rd to 99th	8.1	731
II	65th to 92nd	8.8	7,719
IIIA	50th to 64th	9.9	6,369
IIIB			
(upper)	40th to 49th	10.2	3,122
(lower)	31st to 39th	12.4	3,478

NOTE: FY 1992 accessions are through June only.

Participation in the Delayed Entry Program (DEP)

A recruit can either sign a contract to enter the Marine Corps and ship within the month (direct ship), or he can sign a contract to ship in a later month, up to 12 months in the future. These latter recruits are in the DEP until they ship. Both because earlier research had identified DEP participation with lower active-duty attrition and because the DEP allows the recruiting force to better manage the flow of recruits, most recruits now enter the Marine Corps through the DEP. From FY 1988 to FY 1991, for example, 93 percent of NPS regular recruits entered through the DEP.¹

There are several reasons why those who participate in DEP before entering the Marine Corps have lower active-duty attrition. First, recruiters have time to meet with the men and women in their DEP pool and give them detailed information about the Marine Corps. As a result, some of these potential recruits decide against entering the Marine Corps. Thus, recruits entering from the DEP have had a longer time to think about whether or not they want to enter the Corps and are less likely to have made hasty decisions. Second, recruits are more likely to obtain their choice of occupation if they sign a contract early. (Direct shippers will have a much more limited choice of entry programs.)

An examination of FY 1987 NPS regular recruits with initial enlistment contracts of four to six years shows that the first-term attrition rate for the 30,000 recruits who entered from the DEP was 32.5 percent. For the 2,000 recruits who were direct shippers, the first-term attrition rate was 42.6 percent. For accessions in FY 1991, the three-month attrition rate was 11.5 percent for those who entered through the DEP and 14.8 percent for the direct shippers.

Height and Weight at Accession

We have done considerable research on non-EAS attrition for "overweight" recruits, analyzing the attrition behavior of all NPS regular recruits who entered the Corps since 1979. We compare the retention standard (weight for height) with the recruit's weight and height recorded in the accession data files.² Our findings for male recruits

1. References [8] through [10] provide excellent summaries of the relationship between DEP participation and first-term survival.

2. Before July 1991, the only height/weight information in the accession data files was the recruit's height and weight when the first contract was signed. Since the large majority of recruits spend time in the delayed entry pool, this weight may differ from the recruit's weight when he starts boot camp. Next fall, we should have sufficient data to analyze the relationships among recruit weight at the first contract, weight at shipment, and weight at time of attrition. We expect this analysis to more strongly reinforce our findings that male recruits who are overweight have significantly higher attrition than those who are not.

are strong and consistent. They reflect over a decade's worth of decisions by drill instructors, separation officers, and commanding generals about which recruits should be separated from the Corps.

Our basic finding is that both MCRD attrition and first-term attrition are substantially higher for male recruits who enter the Corps weighing more than the retention weight standard for their height. We examined three-month MCRD attrition for all NPS male regular recruits who entered the Corps from 1979 through 1991:

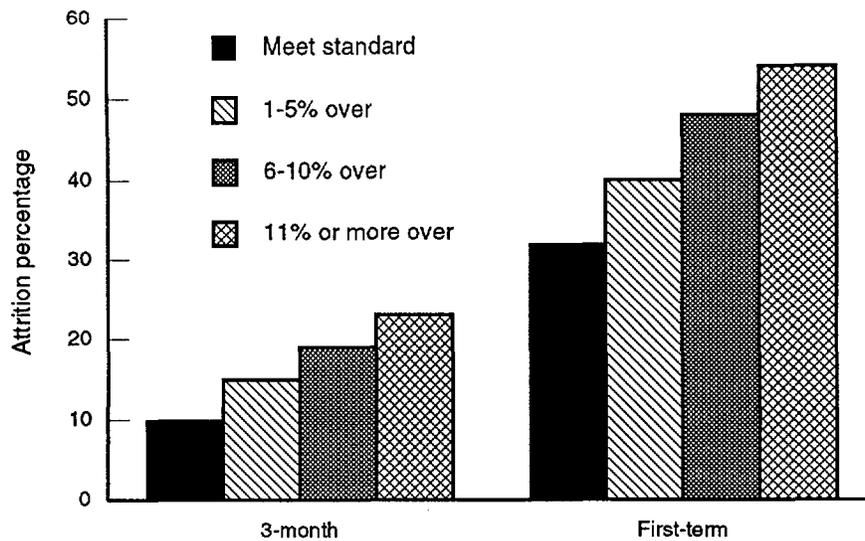
- 329,194 male recruits met the retention weight standard. Their MCRD attrition rate was 11.1 percent.
- 44,483 male recruits weighed more than the retention standard. Their MCRD attrition rate was 19.6 percent.

We examined first-term attrition for all NPS male regular recruits who entered the Corps between 1979 and 1987:

- 226,382 of these male recruits met the retention weight standard. Their first-term attrition rate was 32 percent.
- 27,986 of these male recruits weighed more than the retention standard. Their first-term attrition rate was 45 percent.

We further examined the relationship between percentage under or over the retention standard and subsequent attrition for male recruits. Our findings consistently show that attrition rates increase with larger percentages over the retention weight standard (see figure 5). And, the attrition rates for recruits weighing *less* than the retention weight standard are consistently lower than the rates for those over. Attrition patterns by the exact "percentage under" the retention standard, however, vary a bit depending on the time period selected. In general, there are only small differences in the attrition rates by percentage under the standard. Table 3 shows the 3-month and 45-month attrition rates for male NPS regular recruits entering the Corps between FY 1986 and FY 1987.

In response to the CNA findings, the Marine Corps has reduced the proportion of accessions who enter the Corps weighing more than the retention weight standard. We analyzed the FY 1992 accessions through May (table 4).



NOTE: FY 1987 NPS male regular accessions. Weight is measured at the time the enlistment contract is signed.

Figure 5. Attrition and the weight-for-height retention standard

Table 3. Attrition rates by recruit weight status: FY 1986 and FY 1987 male NPS regular recruits with four- to six-year enlistment contracts

Percentage under or over retention standard	Number of accessions	Attrition rates	
		3-month	45-month
More than 30 percent under	3,052	12.5	33.1
30 to 20 percent under	17,182	11.2	32.2
20 to 10 percent under	21,371	10.3	31.4
10 to 0 percent under	13,110	12.3	33.9
Over to 5 percent over	3,263	16.6	40.1
5 to 10 percent over	2,885	20.1	46.7
More than 10 percent over	1,762	23.2	54.2

**Table 4. Attrition rates by recruit weight status:
FY 1992 male NPS regular recruits (October 1991 to
May 1992 accessions only)**

Percentage over retention standard	Number of accessions	Three-month attrition rates
Meet retention standard	16,354	8.2
Over to 5 percent over	1,102	9.3
5 to 10 percent over	860	10.1
More than 10 percent over	255	17.7

Summary of the Most Important Determinants of non-EAS Attrition

Reference [10] developed a ranking system for assessing the attrition risk of recruits. Recruits were divided into 72 subgroups based on AFQT test scores, educational background, age at accession, DEP status, and whether or not the recruit was over the in-service weight standard for his height at accession. The findings from this ranking system generally mirror past studies. They show that males with the highest first-term survival rates were high school graduates who scored high on the AFQT, who participated in the DEP, and who met the in-service weight-for-height standard.

Categories of Recruits With Historically Low Accession Numbers but With High Attrition Rates

In this section, we examine some additional recruit categories that have consistently had higher than average attrition rates. Each of the categories examined here involves small numbers of recruits.

Medical Waivers

Each year, about 500 recruits enter with a waiver from the Navy Bureau of Medicine (BUMED), and about 100 recruits enter under the medical rehabilitation (MEDREP) program. Recruits entering under the MEDREP program have medical problems (identified by a list on the MEDREP order). These recruits, after administrative processing at the MCRD, proceed directly to a hospital. After their medical problems have been corrected, they begin recruit training. We analyzed the attrition behavior of all NPS regular recruits who entered the Marine Corps since FY 1988 under the Medical Rehabilitation Program (MEDREP) or with a BUMED waiver. Because these recruits started their training late, we calculated attrition rates at 6 months and at 12 months. Table 5 lists these attrition rates, as well as the attrition rates for all NPS regular recruits.

Table 5. Attrition rates for NPS regular recruits: BUMED waivers or MEDREP program

	<u>Fiscal year of accession</u>			
	1988	1989	1990	1991 ^a
6-month attrition				
All NPS regulars	12.4	13.4	15.8	15.0
BUMED waiver	16.5	19.4	18.0	19.4
MEDREP	20.4	17.6	21.2	17.2
12-month attrition				
All NPS regulars	15.2	15.3	20.2	
BUMED waiver	20.6	20.8	22.8	
MEDREP	25.9	17.6	25.0	

a. Accessions in the first three quarters only.

As is clear from the table, the attrition rates for recruits entering with either a BUMED waiver or under the MEDREP program are higher than average. For example, for recruits entering in FY 1990, the 12-month attrition rate was 20.2 percent for all recruits, 22.8 percent for recruits with a BUMED waiver, and 25.9 percent for recruits entering under the MEDREP program.

When evaluating these rates, remember that both of these programs involve *additional costs*. (BUMED waivers require that Navy physicians spend time evaluating medical records, and MEDREP accessions incur hospital costs). Because these accessions are more costly than others, perhaps they should be used only if (1) BUMED waived and MEDREP accessions had lower attrition rates than other recruits or (2) the Marine Corps was experiencing real difficulty in procuring accessions.

Age at Accession

Most male recruits enter the Marine Corps soon after leaving high school. Slightly over one percent of recruits, however, enter the Marines Corps as NPS regular recruits at age 26 or older. Apparently, these recruits are not as successful as younger recruits in adapting to life in the Marine Corps because they have very high first-term attrition rates. For NPS male regular recruits who entered the Marine Corps between FY 1979 and FY 1987, the first-term attrition rate was 33.5 percent.¹ For recruits who entered at age 26 or older, however, the

1. These attrition rates are calculated for recruits with four-, five-, and six-year initial enlistment contracts. There were 254,371 male recruits in this category; 2,698 entered at age 26.

first-term attrition rate was 48.3 percent. In brief, almost half of them did not complete the first enlistment.

In FY 1991, there were 26,752 male NPS regular accessions. Their three-month attrition rate was slightly over 11 percent. Of these recruits, 419 were 26 years old. These older recruits had a three-month attrition rate of slightly over 17 percent.

It may be that older recruits require special attention. Or, it may be that the Marine Corps should consider--when recruiting times are good--further restricting the accession of older NPS Marines.

Recruits Who Attempt Boot Camp a Second Time

We identified this small category of recruits quite by accident.¹ The time frame of the study did not permit a complete analysis, but our preliminary finding is that recruits who fail boot camp the first time are likely to fail it the second time. And, if they do complete boot camp, they still remain a higher than average attrition risk for the rest of their first term.

If a recruit does not complete boot camp, policy states that he must wait two years before trying again.² If recruits are allowed to try again, they enter as *non-prior-service* recruits because they did not complete 180 days of service in their first attempt. In FY 1991, 67 NPS recruits who began MCRD were beginning it for the second time. Almost half of these recruits had separated by March 1992 (47.8 percent). In the three years from FY 1989 through FY 1991, there were a total of 259 "second-time" accessions. Although the attrition rates for the FY 1991 group are the largest, the attrition rates for FY 1989 and FY 1990 accessions in this category are substantially above average.

Moral Waivers

There has been considerable interest in the attrition behavior of recruits entering with moral waivers. There has also been considerable confusion about the coding of the moral waiver variables. These codes were changed in FY 1991. The new coding scheme has codes at three levels (at the contracting point, at the shipping point, and at the depot). For each level, there is a two-digit moral code, a two-digit

1. All of our attrition analysis has been done for NPS regular recruits. We build the accession files from the ARMS data, and then we match the records in the accession file to a separation file we have built. Because all the accessions are non-prior service, the separation file contains the first loss we find for each SSN. We identified the "twice-tried" boot-camp category because we calculated their number of months of service as a negative number. (We had their loss date as the date of their loss at their first attempt at boot camp.)

2. We have not verified whether or not this policy is being upheld.

moral waiver, and space for up to three waiver codes of three digits each.¹

After the new codes were introduced in FY 1991, there seemed to be considerable doubt as to whether or not they were being properly used. For example, virtually all FY 1991 male accessions fell into the categories of clean (no moral code), minor traffic, or drugs (non-felonious), and the proportions for each of these categories were roughly equal. After discussions with Marine Corps officers in the Personnel Procurement Division, we decided to allow those in the field time to adjust to the new coding scheme and planned to analyze FY 1992 accessions. To date, we have not had sufficient time to watch much of the attrition behavior for FY 1992 accessions. We have, however, examined the moral waiver/moral code status and the three-month attrition behavior for FY 1992 recruits accessed through June 1992. (See table 6.)

Table 6. Attrition by moral code and moral waiver status: FY 1992 male NPS regular recruits (accessions through June only)

	Number	Three-month attrition (percent)
Moral code		
Clean	5,822	9.5
Minor traffic, less than 1 year probation	6,837	9.3
Probation (1-2 years)	149	9.4
Probation (2 plus years)	108	12.0
Drugs (non-felonious)	7,818	10.6
Drug involvement (10 times or 90 days)	378	11.9
Felony/drug felony	319	11.3
Moral waiver		
Clean	10,056	9.8
Minor traffic	2,861	9.0
Minor nontraffic, 3 to 5 offenses	1,260	9.8
Minor nontraffic, 6 to 9 offenses	227	9.7
Serious offense(s)	505	9.7
Felony (committed as adult)	154	10.4
Felony (committed as juvenile)	243	10.7
Serious traffic	16	a
Preservice illegal use of drugs	5,729	10.6
Preservice alcohol abuse	311	9.0
Drug use while in DEP	56	10.7

a. Number too small for reliable calculation.

1. It is not clear to us why there are both moral waivers and moral codes.

Accessions between October 1991 and June 1992 have a much broader mix of moral waiver/moral codes. In brief, people in the field appear to be using the new codes more than they did the old. However, we observed no significant differences in three-month attrition rates by either moral code or moral waiver status. There are differences, but they are not statistically significant. Still, it is only part of one year's accessions. After we have about two years of service for these accessions, probably in FY 1994, we will again analyze any differences in attrition behavior by moral waiver or moral code status.

SEPARATION REASONS

Every Marine discharged from the Marine Corps is given a four-digit separation program designator (SPD) code to identify the reason for the separation. Previous work had analyzed the discharge reasons for all enlisted Marines separated between FY 1979 and FY 1988 [14]. These were the main findings:

- Although there are hundreds of SPD codes, a relatively small number of codes accounted for virtually all separations. For example, ten four-digit codes accounted for 85 percent of the FY 1988 separations of Marines with less than one year of service. We argued in [14] that sometimes it is more useful to examine separations under individual codes, rather than separations under more general "reasons" categories.
 - We noted some substantial increases in separations for codes with vague descriptions. For example, code JFV7, which the JUMPS/MMSCODEMAN describes as "COG, condition not a physical disability, character and behavior disorder (without administrative board)" or JFV1, which is described as "condition, nonphysical disability (not a physical disability, which interferes with performance of duty)."
- Although there were no real increases in non-EAS attrition from 1979 to 1988, the reasons for non-EAS attrition had changed. Misconduct separations were down, and physical disability separations were up. This trend started in about FY 1983. The substantial increases in physical disability separations were for separations both with and without severance pay.
- The separation reasons were not always explicitly defined, nor were they used consistently by the different commands. Subsequent work showed considerable (and consistent) differences in discharge reasons for the two recruit depots.

We have updated this analysis, examining separation reasons through August 1992. We restricted the examination to non-EAS separations of enlisted Marines in their first term of service.

Table 7 details the reasons for recent boot-camp attrition. Because the two boot camps have differed substantially in how they define reasons for separation, we list the separation reasons separately for Parris Island (PI) and San Diego (SD). (In making year-to-year comparisons, we count separations for only 11 months (October through August) of each year. Large numbers of boot-camp separations are for "unsatisfactory performance." Attrition for this reason has been relatively steady. Other reasons for attrition have switched around a bit, and it is not clear to us that they convey much information. In FY 1989, Parris Island separated large numbers of recruits under an erroneous enlistment separation code for physical problems, while San Diego separated individuals whose problems were probably similar under physical disability separation codes. We can make several quick points about recent boot-camp attrition:

- In FY 1991 in particular, MCRD attrition rates between San Diego and Parris Island differed substantially. (These differences are reflected in the fact that Parris Island had many more separations than San Diego. (See table 7).) These attrition differences were substantially reduced in FY 1992.
- Also in FY 1991, large numbers of Parris Island recruits were separated under particularly vague separation codes that said "condition, not a physical disability, that interferes with performance of work." The number of these separations is down sharply in FY 1992, and the two depots appear to be much more consistent in their use of separation codes.

Table 8 describes the reasons for attrition from the two Schools of Infantry in the same period. At both schools, physical disability is the main reason for attrition. The School of Infantry at Camp Pendleton had fairly sharp increases in attrition in both FY 1991 and FY 1992. These increases occurred mainly in the spring, attrition in the summer of 1992 appears to be back to more normal levels.

Table 9 lists the reasons for first-term attrition after recruits have completed boot camp and the Schools of Infantry. Separations for misconduct and unsatisfactory performance are up substantially over FY 1990 and FY 1991 levels. Courts martial and convenience of the government (COG)/good of the service (GOS) separations are down. When examining these separations, remember that the Marine Corps was smaller in 1992 than it was in 1989. Thus, separations at FY 1989 levels imply higher attrition rates.

Table 7. Separation reasons for boot-camp attrition: first 11 months of each fiscal year shown

	FY 1989		FY 1990		FY 1991		FY 1992	
	PI	SD	PI	SD	PI	SD	PI	SD
Fraudulent enlistment	286	548	310	739	359	404	490	345
Erroneous enlistment	605	26	365	54	202	39	163	51
Physical, not physical disability	270	40	895	181	1,048	32	197	24
Unsatisfactory performance	830	575	646	621	703	467	697	395
Physical disability	165	586	155	516	337	620	275	629
Drugs/alcohol/homosexuality/ misconduct/pregnancy/ parenthood/court martial	40	50	38	38	34	42	34	28
Death/dependency/hardship/ COG/GOS/miscellaneous	19	16	21	16	12	10	17	18
Total	2,215	1,841	2,430	2,165	2,695	1,614	1,873	1,490

NOTE: Data are from CNA's all-loss file.

Table 8. Reasons for School of Infantry attrition: first 11 months of each fiscal year shown

	<u>FY 1989</u>		<u>FY 1990</u>		<u>FY 1991</u>		<u>FY 1992</u>	
	CL ^a	CP ^b	CL	CP	CL	CP	CL	CP
Convenience of government/ good of the service	44	88	119	252	123	48	112	83
Misconduct/drugs/alcohol/ homosexuality/court martial/ unsatisfactory performance	21	12	16	27	6	21	7	30
Death/fraudulent entry/erroneous enlistment/dependency hardship/ miscellaneous	2	7	9	18	7	16	7	9
Physical, not physical disability	1	6	1	8	8	9	117	15
Physical disability/retired with disability	275	60	322	185	292	473	239	761
Total	343	173	467	490	436	567	482	898

NOTE: Data are from CNA's all-loss file.

a. CL = Camp Lejeune.

b. CP = Camp Pendleton.

Table 9. Reasons for non-EAS attrition: first-term Marines separated after School of Infantry, first 11 months of each fiscal year shown

	Fiscal year			
	1989	1990	1991	1992
Death	129	90	128	94
Fraudulent/erroneous enlistment	29	19	27	35
Convenience of government/good of the service	1,217	846	712	878
Pregnancy/parenthood	317	355	337	267
Dependency/hardship	283	355	343	324
Physical, not physical disability	107	82	83	107
Unsatisfactory performance	322	255	195	459
Misconduct	1,027	881	740	1,183
Drugs/alcohol	644	481	349	631
Retirement (disability)	172	133	107	164
Homosexuality	33	43	25	36
Court martial	773	1,022	668	744
Physical disability	2,338	2,160	2,053	2,176
Miscellaneous	<u>51</u>	<u>121</u>	<u>59</u>	<u>27</u>
Total	7,442	6,843	5,826	7,125

NOTE: Data are from CNA's all-loss file.

SUMMARY

The original study tasking asked for an analysis of attrition behavior by waiver status at accession, with a particular focus on moral waivers. Both because there appeared to be no statistically significant differences in attrition behavior by moral waiver status and because of concern within the Marine Corps about the levels of non-EAS attrition, we decided to expand the original tasking. Thus, we have taken a fairly broad look at first-term non-EAS attrition, and have examined:

- Levels
- Timing
- Costs
- Relationships with recruits' background characteristics
- Non-EAS separation reasons.

First-term non-EAS attrition is costly. This fact, particularly as the Marine Corps tries to achieve efficiencies in these tight budgetary climates, is important for all to remember.

The Corps sharply increased accession quality in the 1980s. With a less stringent budgetary climate in the 1980s, the Corps primarily translated this improved quality into a "better" quality Marine Corps. However, attrition levels did not drop. It may be time for this to change.

REFERENCES

- [1] CNA Research Memorandum 90-71, *Enlisted Women in the Marine Corps: First-Term Attrition and Long-Term Retention*, by Aline O. Quester, Aug 1990
- [2] CNA Research Memorandum 90-57, *A Shift-Share Analysis of First-Term Attrition*, by Timothy W. Cooke, Dec 1990
- [3] CNA Research Memorandum 90-238, *Average Costs of Training for First-Term Marines*, by Marianne Bowes Apr 1991
- [4] CNA Research Contribution 326, *Profile of a Successful Marine*, by William H. Sims, Jan 1977
- [5] CNA Memorandum 74-3024, *Relationship Between Delayed Entry Programs and Recruit Quality*, by William H. Sims, Dec 1977
- [6] CNA Research Memorandum 86-168, *Estimating the Cost of Attrition of First-Term Enlistees in the Marine Corps*, by Jacquelyn Hughes and Laurie May, Jun 1986
- [7] CNA Research Memorandum 89-16, *Using Attrition Rates in Setting Height-Weight Standards*, by Timothy E. Rupinski, May 1989
- [8] CNA Research Memorandum 89-314, *Identifying Successful Marine Corps Recruits*, by Aline O. Quester, James H. North, and Theresa H. Kimble, Mar 1990
- [9] CNA Research Memorandum 90-219(Revised), *Rankings by Historical Attrition Rates of Potential Marine Corps Recruits*, by James H. North and Adebayo M. Adedeji, Sep 1991
- [10] CNA Research Memorandum 90-62, *Length of Time in the Delayed-Entry Program and Its Effect on Marine Corps First-Term Survival*, by James H. North, Aug 1990
- [11] CNA Research Memorandum 90-182, *Validation of ASVAB Against Infantry Job Performance*, by Paul W. Mayberry, Dec 1990
- [12] CNA Research Memorandum 91-99, *Analysis and Prediction of Infantry Unit Leaders' Performance*, by Paul W. Mayberry, Jun 1991
- [13] CNA Research Memorandum 92-192, *Relationship Between ASVAB and Mechanical Maintenance Job Performance*, by Paul W. Mayberry and Neil B. Carey, forthcoming
- [14] CNA Research Memorandum 89-230, *Discharge Reasons for Enlisted Marines: FY 1979 through FY 1988 Separations*, by Aline O. Quester and Roberta T. Taggart, Sep 1989

27 920200.00



03-23-93