

# Marine Corps Deployment Tempo and Retention in FY05

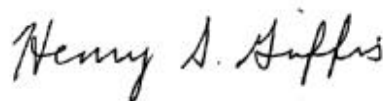
Aline O. Quester • Anita U. Hattiangadi  
Lewis G. Lee • Robert W. Shuford



4825 Mark Center Drive • Alexandria, Virginia 22311-1850

Approved for distribution:

March 2006

A handwritten signature in black ink that reads "Henry S. Griffis". The signature is written in a cursive style with a large initial 'H' and 'G'.

Henry S. Griffis, Director  
Workforce, Education and Training Team  
Resource Analysis Division

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

Approved for Public Release; Distribution Unlimited. Specific authority: N00014-05-D-0500.  
For copies of this document call: CNA Document Control and Distribution Section at 703-824-2123.

# Contents

<b>Executive summary</b> . . . . .	1
Findings for first-term enlisted Marines. . . . .	1
Findings for second- and third-term enlisted Marines . . .	2
Findings for Marine Corps officers . . . . .	2
<b>Introduction</b> . . . . .	3
Previous work. . . . .	3
This study. . . . .	4
<b>Reenlistment decisions in FY05.</b> . . . . .	5
First-term Marines . . . . .	5
Marines with and without dependents. . . . .	6
Most heavily deployed PMOSs . . . . .	8
Deployments to Iraq or Afghanistan. . . . .	8
Multivariate analyses of first-term reenlistment probabilities . . . . .	10
Career Marines. . . . .	12
Multivariate analyses for reenlistment decisions of careerists . . . . .	14
Commissioned officers. . . . .	14
Non-retirement-eligible officers . . . . .	15
Retirement-eligible officers. . . . .	16
<b>Conclusions</b> . . . . .	19
<b>Appendix A: Heavily deployed and very lightly deployed PMOSs for FY05 FTAP Marines.</b> . . . . .	21
<b>Appendix B: Logistic regressions.</b> . . . . .	25
Notes on data and variables . . . . .	25
Estimating reenlistment regressions with 1 year of data . . . . .	25
Deployments to Iraq or Afghanistan. . . . .	27
Regression results . . . . .	27

<b>References</b> . . . . .	31
<b>List of figures</b> . . . . .	33
<b>List of tables</b> . . . . .	35

## Executive summary

Despite high deployment tempo in FY05, the Marine Corps successfully met its FY05 enlisted reenlistment goals and the retention rate for officers was even higher than predicted. But as the Global War on Terrorism (GWOT) continues, there is concern as to how increasing deployment time (DEPTEMPO) will affect Marines' continuation in the Corps. This study statistically analyzes this issue.

### Findings for first-term enlisted Marines

For first-term Marines making reenlistment decisions in FY05, multiple deployments to crisis areas were associated with lower reenlistment rates in our cross-tabulations. After controlling for other factors in our regression analyses, we confirmed that deployments to crisis areas most negatively affected reenlistment rates for first-term Marines. We also looked at days deployed. Whereas reenlistment rates fell as deployed days increased for those making decisions in FY04, reenlistment rates turned up for the most heavily deployed first-termers in FY05. As in FY04, deployment tempo most negatively affected Marines without dependents (almost exclusively single Marines). In fact, when we controlled for other factors in our regression analyses for FY05 reenlistment decisions, reenlistment rates for Marines with dependents were *positively* related to deployed days, while the reenlistment rates of Marines without dependents were *negatively* related to deployed days.

Although most Marines in the first term of service are assigned to deployable billets, some Marines are not. In our focus groups, many Marines who had not deployed indicated that they would very much like to deploy, but their supervisors were reluctant to allow them to do so because their units were understaffed. High operational tempo has increased workload for all Marines, and Marines who stay behind have to pick up the workload of those who deploy. In our regression

analyses, we find that Marines with *no* deployment time in their first term of service had reenlistment rates 6 to 7 percentage points lower than Marines who deployed.

As in FY04, deployments to crisis areas most negatively affected Marines without dependents (almost exclusively single Marines). As in FY04, we also found substantial differences in *average days deployed* for first-term Marines making reenlistment decisions in FY05. Marines without dependents averaged 57 more deployed days than those with dependents.

## **Findings for second- and third-term enlisted Marines**

In contrast to the results for first-term Marines, deployments to Iraq or Afghanistan rates were positively related to retention for second- and third-term Marines. Similarly, the relationship between days deployed and reenlistment decisions for Marines making second- or third-term reenlistment decisions also was positive. Even for these career Marines, however, those without dependents were less likely to reenlist.

## **Findings for Marine Corps officers**

We also examined the relationship between the number of days deployed and officer retention rates in the March 2004 to March 2005 period. For Marine Corps officers, deployments to crisis areas or more deployed days were positively associated with retention. We estimated the effects for officers both before and after retirement eligibility and, for both groups, officers who deployed more or who were in crisis areas were more likely to be retained. Finally, our regression analyses show that non-retirement-eligible Marine Corps officers who placed in the top third of their TBS class are more likely to be retained.

# Introduction

Deployment tempo in FY05 probably was higher for Marines than at any other time in the history of the All-Volunteer Force. Against the backdrop of this high deployment tempo, the Marine Corps successfully met its FY05 reenlistment goals for first-termers and for career Marines, both in terms of numbers and in terms of occupational mix. Officer retention also was greater than predicted.

As the Global War on Terrorism (GWOT) continues, however, there is concern about the effect of significant deployment time (DEPTEMPO) on Marines' continuation in the Corps. This paper—the fourth of several on this topic—reviews the main findings from previous analyses and updates that work with new information on deployment tempo and retention decisions in 2005.

## Previous work

Our first effort began with a request from the Commandant of the Marine Corps (CMC) to analyze DEPTEMPO information on the Manpower and Reserve Affairs (M&RA) website. The CMC asked us how the information could be displayed to clearly show stress on Marines from current and past deployments, to help determine which squadrons and battalions should be deployed in the future, and to better understand the Marine Corps' overall deployment picture. The enhancements we proposed were adopted for the website. Reference [1] documents this work.<sup>1</sup>

Our second and third papers examined the relationship between DEPTEMPO and retention. Our findings from focus groups are documented in [2], and our statistical findings for officer continuation

---

1. The website is [www.manpower.usmc.mil/mpi](http://www.manpower.usmc.mil/mpi).

rates and reenlistments through FY04 are documented in [3]. The focus group findings support many of the statistical findings. In particular, we heard that nondeployers and single first-termers with significant deployed time were less likely to reenlist than others.

## **This study**

In this final report, we briefly review the main findings from the previous analyses and update that work with information on retention decisions in 2005. Specifically, we examine:

- Reenlistment decisions in FY05 for zone A, B, and C Marines
- Officer continuation decisions from December 2004 to December 2005.



## Reenlistment decisions in FY05

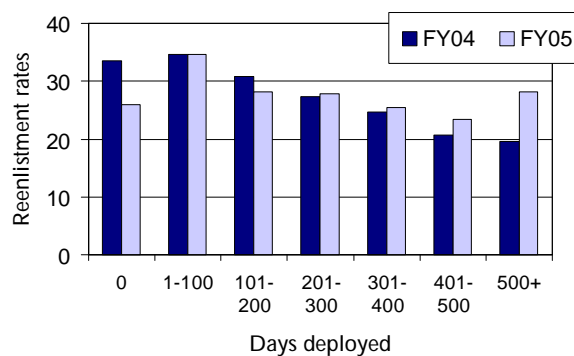
By matching individual-level information on the number of days deployed since October 2000 to personnel records for all Marines who made FY05 reenlistment decisions, we are able to answer the following questions:

- What were reenlistment patterns by days deployed?
- Did extensive deployed time discourage reenlistments?
- Do repeated deployments to Iraq discourage reenlistments?

### First-term Marines

Figure 1 shows the relationship between deployed days and reenlistments for Marines making first-term reenlistment decisions in FY04 and FY05.

Figure 1. Reenlistment rates by days deployed FY04 and FY05



Whereas heavy deployers in FY04 were much less likely to reenlist, we see an upturn in the reenlistment rate for very heavy deployers in FY05. Moreover, there were considerably more heavy deployers

making reenlistment decisions in FY05 than there were in FY04. In fact, Marines with 500 or more days deployed represented 17 percent of the FY05 FTAP population, compared with 10 percent of the FY04 FTAP population.

Marines with no deployed days (12 percent of the FY04 FTAP population and 8 percent of the FY05 FTAP population) had low reenlistment rates in both years.<sup>2</sup> This finding strengthens our earlier findings, particularly those from focus groups in which Marines in nondeployable billets said that they would rather deploy [2]. A 2006 RAND study that used focus groups and surveys to estimate the impact of deployments also found that one of the side effects of high operational tempo was long work hours for nondeployers because of reduced stateside manning. They conclude that “negative non-deployment experiences contribute to negative reenlistment attitudes” [4, p. 92]. Although RAND’s findings for nondeployers are for *expected* retention, our findings are for *actual* retention. Efforts to give all Marines a chance to deploy should improve retention.

## Marines with and without dependents

Analyses of first-term reenlistment decisions in FY04 showed that Marines without dependents were more deterred from reenlistment by heavy DEPTempo than Marines with dependents, although both groups’ reenlistment rates decreased as deployed days increased (see figure 2).

For Marines making first-term reenlistment decisions in FY05, however, the situation is both similar and somewhat different. Marines without dependents are still less likely to reenlist and more deterred by heavy DEPTempo than Marines with dependents. However, reenlistment probabilities do not decline monotonically as deployed days increase; the reenlistment probability turns up for very heavy deployers (see figure 3).

---

2. Appendix A has the PMOSs with the largest percentages of nondeployers.

Figure 2. FY04 first-term reenlistment rates by days deployed for Marines with and without dependents

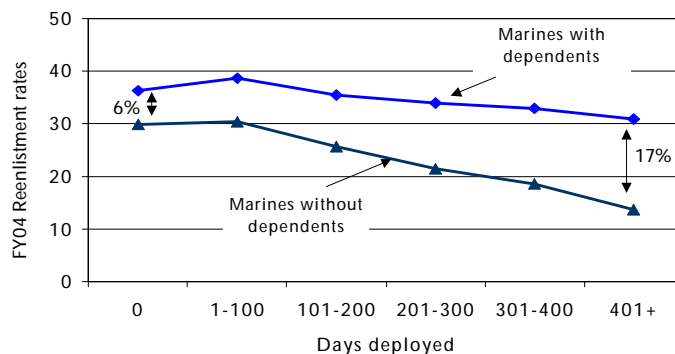
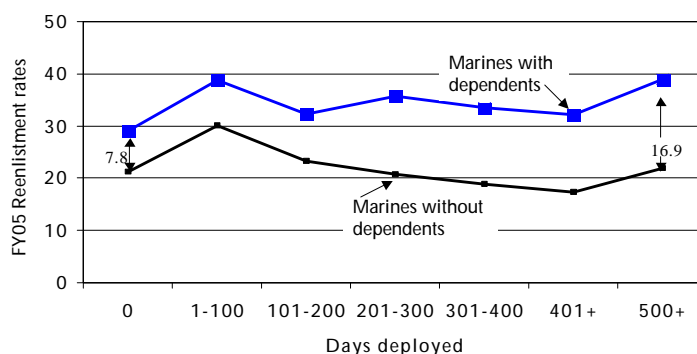


Figure 3. FY05 first-term reenlistment rates by days deployed for Marines with and without dependents



The popular press has focused on family separation as the primary retention problem for heavy deployers (see [5]). Although this is undoubtedly a problem, we consistently find that heavy deployment tempo most affects the retention of single first-term Marines without dependents.<sup>3</sup> Slightly more than half (53 percent) of FTAP Marines making reenlistment decisions in FY05 were single and without dependents.

3. See [2, 3, 6, and 7] for further support of this.

Not only are single Marines without dependents more deterred from reenlisting by high DEPTTEMPO than their counterparts with dependents, but these Marines also average more deployed days than Marines with dependents. This was true for every reenlistment zone and in every year of our post-9/11 data [3]. Differences were largest for first-termers; Marines with dependents in the FY05 first-term reenlistment population averaged 254 days deployed, and those without dependents averaged 311 days (see table 1).

Table 1. Differences in DEPTTEMPO for first-term Marines making reenlistment decisions in FY05

	Dependents	No dependents
Average days deployed	254	311
Deployed 500 or more days	13.2%	20.4%
Never deployed	10.6%	6.7%

### Most heavily deployed PMOSs

We also examined the primary military occupational specialties (PMOSs) of first-term Marines who deployed 500 or more days before making their reenlistment decisions in FY05, concentrating on occupations where at least a third of the FTAP population in the PMOS deployed 500 or more days. These include many small PMOSs (aviation mechanics, aviation technicians, and crew chiefs, as well as infantry and field artillery occupations (see appendix A for the full table). FTAP Marines deploying 500 or more days included:

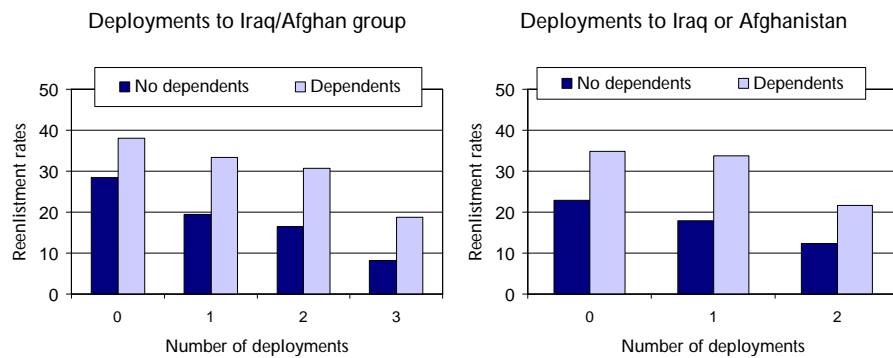
- 976 of the 2,369 Riflemen (41 percent)
- 11 of the 16 UH-1 Helicopter Crew Chiefs (69 percent)
- 32 of the 65 F/A 18 Mechanics (49 percent).

### Deployments to Iraq or Afghanistan

Despite the upturn in reenlistment rates for first-term Marines who had deployed 500 or more days, the relationship between reenlistment and deployments to crisis areas is still negative. Again, Marines without dependents have lower reenlistment rates, but the

reenlistment probabilities of first-term Marines both with and without dependents are negatively affected by deployments to the Iraq/Afghan country group<sup>4</sup> or specifically to Iraq or Afghanistan (see figure 4). We show the relationship between first-term reenlistments and deployments to both the Iraq/Afghan group and to Iraq or Afghanistan because the country code in the data seems to refer to the first country of the deployment. Thus, Marines who went to Kuwait before Iraq may only show a country code of Kuwait in their records.

Figure 4. FY05 reenlistments by number of times deployed to crisis areas: First-term (zone A) Marines



FY05 FTAP Marines without dependents were more likely to have deployed to crisis countries (the Iraq/Afghan group) than those with dependents (68 and 62 percent, respectively). Marines without dependents also were more likely to have deployed two or more times to crisis countries than those with dependents (27 percent versus 23 percent). The number of Marines whose records show deployments

4. The Iraq/Afghan country group comprises Algeria, Bahrain, Djibouti, Egypt, Israel, Iran, Iraq, Jordan, Kuwait, Oman, Spratly Islands, Pakistan, Qatar, Saudi Arabia, United Arab Emirates, Turkey, and Uzbekistan (Iraq group) and Afghanistan, Armenia, Georgia, Kyrgyzstan, and Tajikistan (Afghan group).

specifically to Iraq or Afghanistan is smaller than the number who show deployments to the Iraq/Afghan group of countries, but again Marines without dependents are more likely to have been deployed there than are Marines with dependents.<sup>5</sup>

## **Multivariate analyses of first-term reenlistment probabilities**

As in our earlier work, we estimate logistic regressions to explain reenlistments. In these regressions, we control for factors that can affect reenlistments. The regressions allow us to calculate the effect of a particular characteristic on reenlistment probability, all other characteristics held constant (see appendix B, table 6).

Demographic factors are important in the first-term reenlistment decision. We find that each dependent increased the reenlistment probability by about 4 percentage points. Black Marines were over 12 percentage points, and Hispanic Marines 4 percentage points, more likely to reenlist than other Marines, and there were no gender differences in reenlistment probabilities.

A one-level increase in the Selective Reenlistment Bonus (SRB) offered increased reenlistment probabilities by a little over 1 percentage point,<sup>6</sup> and lance corporals were about 12 percentage points less likely (and sergeants were over 3 percentage points more likely) than corporals to reenlist.

In the regressions, we measured DEPTempo by deployed days (no deployed days and number of deployed days, in hundreds) and number of deployments to Iraq or Afghanistan. Because deployed days and number of deployments are related, we used our logistic regressions to calculate reenlistment probabilities as the two descriptors of deployment tempo varied, holding all other reenlistment predictors at their mean values (see table 2).

- 
5. We used the Defense Manpower Data Center's crisis file to determine the number of deployments to the Iraq/Afghan group and to Iraq or Afghanistan.
  6. Although we try to control for what the reenlistment rate would be with no SRB, we believe estimated SRB effects from these regressions should be treated with caution. Correctly estimating the effect of SRBs on reenlistments requires observations over many years (see [3]).

Table 2. Predicted reenlistment rates from logistic regression: FY05 first-term reenlistments

	With dependents			Without dependents		
	Number of deployments to Iraq or Afghanistan			Number of deployments to Iraq or Afghanistan		
	0	1	2	0	1	2
100 deployed days	29.0%	26.8%	24.7%	27.0%	21.6%	17.1%
200 deployed days	29.8%	27.6%	25.4%	25.7%	20.6%	16.2%
300 deployed days	30.6%	28.3%	26.1%	24.5%	19.5%	15.3%
400 deployed days	31.3%	29.0%	26.8%	23.3%	18.5%	14.5%
500 deployed days	36.6%	34.1%	31.6%	29.2%	23.6%	18.7%
Nondeployers	21.9%			20.4%		

As shown earlier, first-term Marines with dependents have higher reenlistment probabilities than those without dependents. Given that, the findings are:

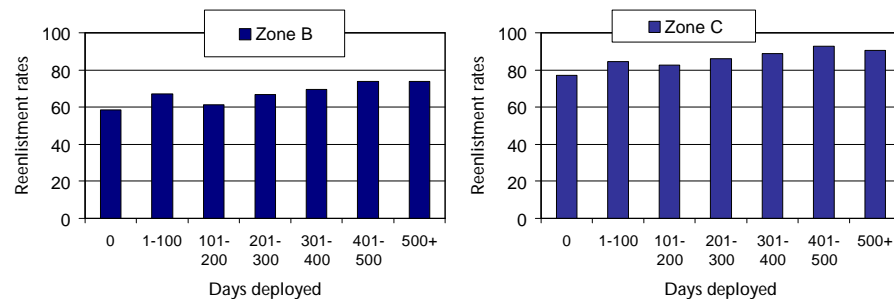
- Reenlistment probabilities for *Marines with dependents* increase *slowly* as days deployed increase until the number of days deployed reaches 500 days. At that point, they begin to increase more rapidly.
- Reenlistment probabilities for *Marines without dependents* decrease *slowly* as days deployed increase until the number of days deployed reaches 500 days. At that point, they increase.
- For Marines both with and without dependents, reenlistment probabilities decrease as the number of deployments to Iraq or Afghanistan increase.

For zone A Marines with dependents, the lowest reenlistment probabilities are for Marines with no days deployed (nondeployers). For Marines without dependents, nondeployers also have low reenlistment rates, but the lowest reenlistment rates for single Marines without dependents are for those who had two deployments to Iraq or Afghanistan.

## Career Marines

For career Marines making reenlistment decisions in FY05, reenlistment probabilities increased somewhat as days deployed increased (see figure 5). This is a small change from what was observed for those making decisions in FY04, when reenlistment rates were relatively constant irrespective of the number of days deployed. Note that the lowest reenlistment rates are for Marines who did not deploy.

Figure 5. FY05 reenlistments by days deployed: Second-term (zone B) and third-term (zone C) Marines

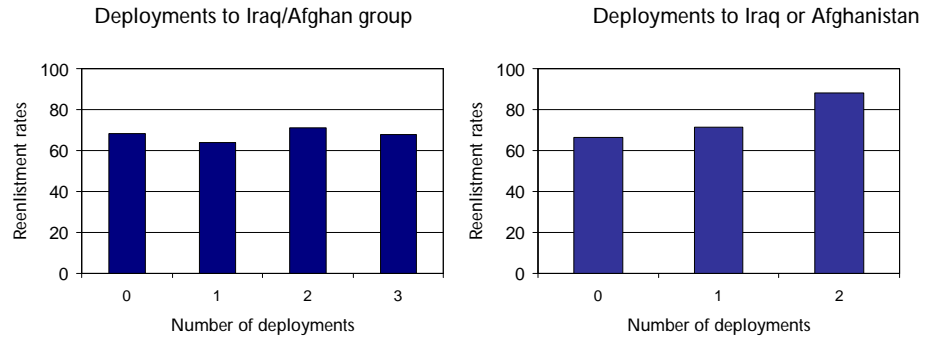


We also examined the relationship between the number of deployments to crisis areas and second-term (zone B) reenlistments, measuring crisis areas by the Iraq/Afghan country group (left panel of figure 6) or, specifically, Iraq or Afghanistan (right panel of figure 6). For these career second-term Marines, there is no indication that reenlistment is negatively affected by deployment to either Iraq or Afghanistan.

Many Marines serve in CONUS billets during their second term of service. For Marines making zone B reenlistment decisions in FY05, 55 percent did not deploy to the Iraq/Afghan country group, 30 percent deployed once, and 5 percent deployed two or more times. The number of Marines whose records specifically indicated deployments to Iraq or Afghanistan is smaller than those whose records indicated deployment to one of the countries in the Iraq/Afghan group.

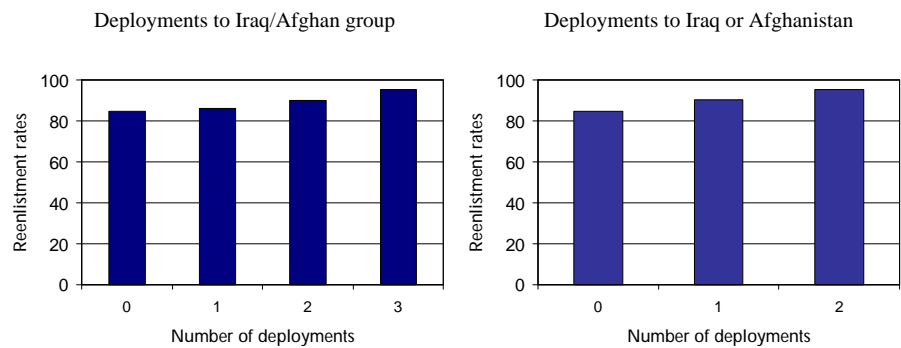


Figure 6. FY05 zone B (second-term) reenlistments by number of times deployed to crisis areas



For Marines making third-term (zone C) reenlistment decisions in FY05, 57 percent had not deployed, 28 percent had deployed once, 14 percent had deployed twice, and 1 percent had deployed three times to the Iraq/Afghan country group. Figure 7 shows that their reenlistment probabilities are positively related to these deployments.

Figure 7. FY05 zone C (second term) reenlistments by number of times deployed to crisis areas



## Multivariate analyses for reenlistment decisions of careerists

In our multivariate analyses, we can see the effect of a particular characteristic on reenlistment, holding constant all other characteristics.<sup>7</sup> For second-termers, black and Hispanic men are much more likely to reenlist (7 and 6 percentage points, respectively) than other Marines. Male Marines are almost 10 percentage points more likely to reenlist than female Marines; Marines who are married or have dependents are over 7 percentage points more likely to reenlist than Marines with no dependents. Each increase in the SRB level is associated with an increase in reenlistment probability of over 4 percentage points.

Some of the characteristics differentiating first- and second-term Marine reenlistment probabilities, such as gender or race/ethnic backgrounds, are not statistically significant for third-term decisions. By the third reenlistment, Marines have about 12 years of service; those who have stayed in the Marine Corps that long have very high reenlistment rates (86 percent for those reenlisting in FY05). Even for these career Marines, however, those who are married or have dependents are more likely to reenlist than Marines with no dependents, as are Marines with higher grades at the reenlistment point.

We measured deployment tempo by deployed days and deployments to Iraq or Afghanistan. Both second- and third-term Marines' reenlistment probabilities increase as deployment tempo increases. Second-termers who did not deploy had estimated reenlistment rates more than 8 percentage points lower than those who did deploy.

## Commissioned officers

We analyzed retention from December 2004 to December 2005 for commissioned officers, doing separate analyses for those who were and were not eligible for retirement. Overall, Marine Corps officer retention is very high and positively related to deployment tempo. Some of this may be self-selection since those Marine officers who are most committed to their careers seek out opportunities for additional deployments.

---

7. Table 7 in appendix B contains the results of the logistic reenlistment regressions for FY05 zone B and zone C Marines.

## Non-retirement-eligible officers

Figure 8 shows the relationship between days deployed and retention. What is probably most notable about the figure is that officers who did not deploy at all have the lowest retention rates. Next we looked at deployments to crisis areas, both to the Iraq/Afghan country group and then specifically to Iraq and Afghanistan (see figure 9).

Figure 8. Non-retirement-eligible commissioned officer retention rates by days deployed: December 2004 through December 2005

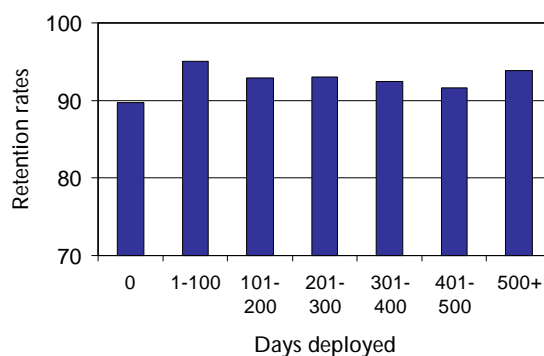
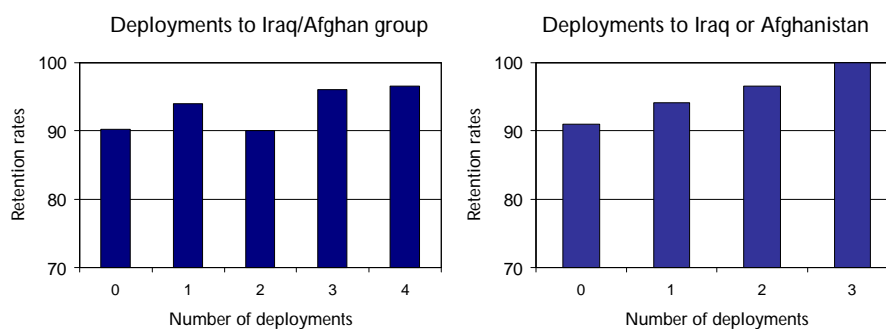


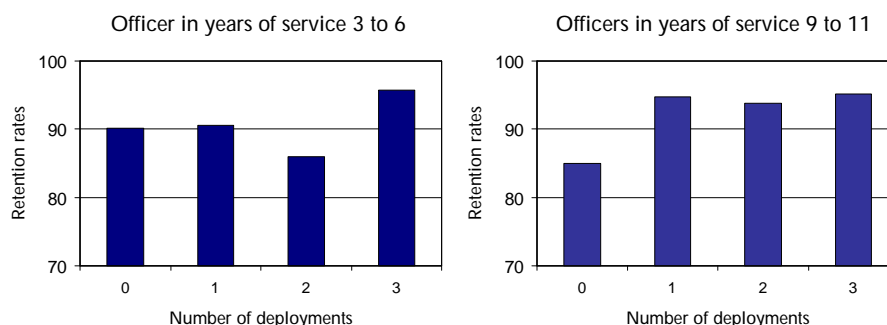
Figure 9. Non-retirement-eligible commissioned officer retention rates by number of deployments to crisis areas<sup>a</sup>



a. Retention rates are calculated from December 2004 to December 2005.

Figure 10 shows the two groups of officers with the lowest overall retention: those with 3 to 6 years of service and those with 9 to 11 years of service in December 2004. The first group is coming off initial service obligations, while the second is making decisions about whether to stay for a full career. Again, additional deployments increase the probability that the officer will stay in the Marine Corps.

Figure 10. Retention rates for officers in years of service 3 to 6 and years of service 9 to 11, by number of deployments to crisis areas<sup>a</sup>



a. Retention rates are calculated from December 2004 to December 2005.

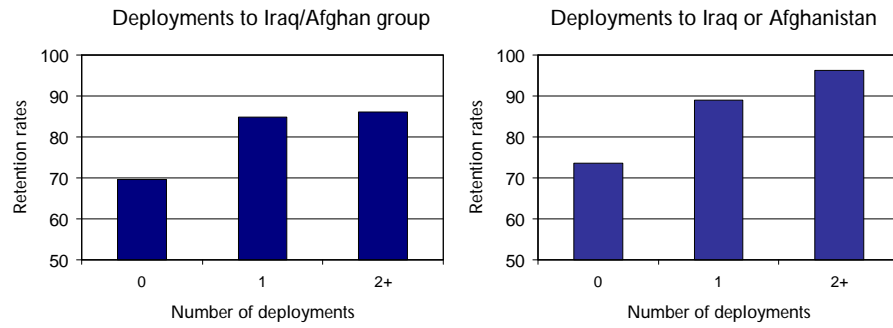
Table 8 in appendix B shows the logistic regressions for officer retention. Controlling for year-of-service categories for pilots and non-pilots, none of the race/ethnic backgrounds except African American is a significant predictor of attrition (black officers are about 3 percentage points more likely to be retained than other officers). Other things equal (including deployment histories), there is no difference between the retention of male and female officers. Finally, officers who were in the top third of their TBS classes are more likely to be retained.

### Retirement-eligible officers

Our findings for retirement-eligible officers may surprise some, just as they may confirm the beliefs of others. There were over 1,600 retirement-eligible active-duty commissioned officers in December 2004; by December 2005, over 25 percent of them had left the Marine

Corps. As figure 11 shows, retention of these retirement-eligible officers is very positively related to deployment tempo. At this point, none of the background variables are statistically significant in explaining retention, but both days deployed and number of deployments to crisis areas are very positively related to retention (see appendix B, table 8).

Figure 11. Retention rates of retirement-eligible officers, by number of deployments to crisis areas





## Conclusions

Understanding the relationship between operational tempo and retention is critical in today's wartime environment. This paper, which updates our previous work with new information on FY05 retention decisions, presents several key findings.

For first-term Marines, unlike our FY04 results, we find an upturn in the reenlistment rate for very heavy deployers in FY05. This is particularly significant because there were more heavy deployers making reenlistment decisions in FY05 than in FY04. As we found in FY04, Marines with no deployed days had low reenlistment rates.

Examining first-term Marines with and without dependents separately, we still found in FY05 that Marines without dependents were more deterred from reenlistment by heavy DEPTempo than those with dependents. However, we also found that reenlistment probabilities turned up for very heavily deployed first-term Marines in both groups in FY05 (in FY04, reenlistment rates had decreased monotonically). Marines without dependents averaged more deployed days than Marines with dependents—particularly in the first term—and deployments to crisis areas lowered reenlistment probabilities for first-term Marines both with and without dependents.

Disentangling the effects of deployed days and number of deployments to crisis areas in our regression analyses, we found that the number of deployed days modestly increases reenlistment rates for first-term Marines with dependents, while it modestly decreases reenlistment rates for first-term Marines without dependents. Deployments to Iraq or Afghanistan decrease reenlistment rates for first-term Marines both with and without dependents, although the effect is considerably larger for Marines without dependents.

For career Marines making reenlistment decisions in FY05, reenlistment probabilities increased somewhat as days deployed increased—a small change from FY04, when reenlistment rates were relatively

constant irrespective of the number of days deployed. Reenlistment rates were positively affected by deployment to crisis areas, and career Marines who did not deploy at all had the lowest reenlistment rates. These results for career Marines held in our regression analyses.

Our examination of commissioned officers found that both high deployment tempo and deployments to crisis areas increase retention rates. These results held for both retirement-eligible and non-retirement-eligible officers.

Although the effect of high deployment tempo on retention must continue to be carefully monitored, we find that it has had no negative effect on the continuation of career Marines and commissioned officers to date. Where it has had an effect, however, is on the reenlistment of first-term Marines, particularly those without dependents.

The Marine Corps made all of its retention goals in FY04 and FY05, and it is on target for FY06. Still, first-term Marines without dependents and first-termers in undermanned nondeploying units are perhaps those most in need of particular attention as the war continues.



## Appendix A: Heavily deployed and very lightly deployed PMOSs for FY05 FTAP Marines

Table 3 shows the most heavily deployed PMOSs for first-term Marines making reenlistment decisions in FY05. Table 4 shows the least heavily deployed PMOSs for Marines making reenlistment decisions in FY05.

Table 3. PMOSs in which more than one-third of FY05 FTAP Marines deployed 500 or more days

	PMOS	FTAP FY05 Marines	Percentage with more than 500 deployed days
6386	EA-6B Technicians	7	71.4%
6174	UH-1 Helicopter Crew Chief	16	68.8%
6287	F/A 18 Safety Mechanic	16	62.5%
6213	EA-6 Mechanic	6	50.0%
6283	EA-6 Safety Equipment Mechanic	4	50.0%
6217	F/A 18 Mechanic	65	49.2%
6112	CH-46 Mechanic	66	47.0%
6282	AV-8/TAV-8 Mechanic	15	46.7%
6153	CH-53 Airframe Mechanic	61	45.9%
6257	F/A Airframe Mechanic	46	45.7%
6322	CH-46 Comm., Nav., Elec. Technician	44	43.2%
6114	UH/AH-1 Mechanic	98	42.9%
7314	UAV Operator	7	42.9%
6152	CH-46 Airframe Mechanic	45	42.2%
0311	Rifleman	2,369	41.2%
6154	UH/AH-1 Airframe Mechanic	66	40.9%
0341	Mortarman	451	40.6%
0352	Antitank Missileman	125	40.0%
6333	EA-6 Electrical Systems Technician	10	40.0%
6113	CH-53 Mechanic	69	39.1%
0331	Machine Gunner	432	38.2%

Table 3. PMOSs in which more than one-third of FY05 FTAP Marines deployed 500 or more days (continued)

	PMOS	FTAP FY05 Marines	Percentage with more than 500 deployed days
0811	Field Artillery Cannoneer	337	38.0%
6313	AV-8 Comm., Nav., Elec. Technician	8	37.5%
0313	LAV Crewman	155	36.8%
6337	F/A-18 Electrical Systems Technician	36	36.1%
6323	CH-53 Comm., Nav., Elec. Technician	86	34.9%
0351	Infantry Assaultman	305	34.1%
6253	EA-6 Airframe Mechanic	9	33.3%
0861	Fire Support Man	52	32.7%
0321	Reconnaissance Man	96	32.3%
6173	CH-53 Crew Chief	56	32.1%
0231	Intelligence Specialist	125	32.0%
All MOSs		20,014	17.0%

Table 4. PMOSs with largest percentage of non-deployed FY05 FTAP Marines

	PMOS	FTAP FY05 Marines	Percentage with 0 deployed days
5821	Criminal Investigator (CID) Agent	1	100.0%
5831	Correctional Specialist	68	77.9%
6226	Fixed-Wing Aircraft Power Plants Mechanic, T-56	11	63.6%
4067	Programmer, ADA	13	53.8%
3451	Fiscal/Budget Technician	58	51.7%
2674	European I (West) Cryptologic Linguist	30	50.0%
3300	Basic Food Service Marine	2	50.0%
6156	Tiltrotor Airframe Mechanic, MV-22	2	50.0%
6493	Aviation Meteorological Equipment Technician, OMA/IMA	8	50.0%
4421	Legal Services Specialist	59	49.2%
3112	Traffic Management Specialist	82	48.8%
6222	Fixed-Wing Aircraft Power Plants Mechanic, F-402	16	43.8%
2676	European II (East) Cryptologic Linguist	21	42.9%
2800	Basic Ground Electronics Maintenance Marine	10	40.0%
2871	Test Measurement and Diagnostic Equipment Technician	20	40.0%
6464	Aircraft Inertial Navigation Systems Technician, IMA	8	37.5%

Table 4. PMOSs with largest percentage of non-deployed FY05 FTAP Marines (continued)

PMOS	FTAP FY05 Marines	Percentage with 0 deployed day
0121 Personnel Clerk	552	36.8%
3432 Finance Technician	110	34.5%
4100 Basic Marine Corps Exchange Marine	3	33.3%
4611 Combat Illustrator	6	33.3%
6211 Fixed-Wing Aircraft Mechanic-Trainee	3	33.3%
9811 Member, The President's Own, U.S. Marine Band	9	33.3%
4612 Combat Lithographer	16	31.3%
0151 Administrative Clerk	518	31.1%
6482 Aircraft Electronic Countermeasures System Tech, FW, IMA	18	27.8%
6694 Aviation Information Systems (AIS) Specialist	62	27.4%
0613 Construction Wireman	20	25.0%
6800 Basic (METOC) Marine	4	25.0%
7051 Aircraft Rescue and Firefighting Specialist	174	24.1%
5952 Air Traffic Control Navigational Aide Technician	17	23.5%
6492 Aviation PME/Calibration and Repair Technician	103	23.3%
5954 Air Traffic Control Communications Technician	32	21.9%
7257 Air Traffic Controller	92	21.7%
5953 Air Traffic Control Radar Technician	28	21.4%
6124 Helicopter Power Plants Mechanic, T-400/T-700	14	21.4%
6461 Hybrid Test Set Technician, IMA	14	21.4%
2311 Ammunition Technician	181	21.0%
2600 Basic Signals Intelligence/Ground Electronic Warfare Operator	5	20.0%
6842 METOC Forecaster	5	20.0%
0161 Postal Clerk	54	18.5%



## Appendix B: Logistic regressions

Table 5 describes the variables used in the regressions. A more complete description of the data is available in [3].

### Notes on data and variables

#### Estimating reenlistment regressions with 1 year of data

Estimating reenlistment regressions with only 1 year of data presents a problem for one of the independent variables: the SRB variable. SRBs are offered in MOSs with low reenlistment propensities to boost the reenlistment rate; however, a model estimated using only 1 year of data would probably find that SRBs *negatively* affected reenlistment because MOSs with high SRBs still have lower reenlistment rates than MOSs without SRBs.<sup>8</sup> To overcome this problem, we included a “base” variable in our regressions—the average predicted reenlistment rate for the MOS if the bonus level is zero.<sup>9</sup> It is predicted from the logistic regressions estimated in a previous study [8].

---

8. This is because some MOSs with very high reenlistment rates will have small (or zero) SRBs. Other MOSs may have low reenlistment rates—even with high SRB levels. These latter MOSs would have had *even lower* reenlistment rates if they had lower SRB multiples, but, unless we can observe the lower multiples (and their associated reenlistment rates), it will appear that high SRB levels are associated with low reenlistment rates. For popular MOSs, it will appear that low SRB levels are associated with high reenlistment rates. To overcome this problem, we normally use many years of reenlistment information for our estimates—hoping that we get sufficient bonus variation within MOSs to offset variation between MOSs.

9. We then normalized this variable to an approximate mean of zero.

Table 5. Variables used and their definitions

Variable	Variable definition
<b>Dependent variables</b>	
Reenlistment	1 if the Marine reenlists; else 0. The population is all recommended and eligible Marines.
Retention	1 if an officer in the Marine Corps in March 2004 is still in the Corps in March 2005; else 0.
Retention plan	1 if the officer had not submitted separation or retirement papers as of March 2005; else 0.
<b>Independent variables</b>	
Male	1 if male; else 0.
Race/ethnic identifiers	A set of 0/1 variables that describe the Marine's race/ethnic background (Black or Hispanic); else 0.
Married or dependents	1 if the Marine is married or has dependents; else 0.
Number of dependents	Number of dependents
No dependents, 3-6 years	1 if the officer has no dependents and has 3 to 6 years of service; else 0.
SRB level	Selective reenlistment bonus (SRB) level; varies from 0 to 5.
Base	Historical estimated reenlistment rate for PMOS if SRB level is zero
Paygrade identifiers	1 if Marine is in the specified grade; else 0.
Years of service and pilot/non-pilot identifiers	For the officer models, we use several years of service and pilot/non-pilot identifiers: pilot, 3-6 years; pilot, 7-8 years, pilot, 9-11 years; non-pilot, 3-6 years; non-pilot, 7-11 years; 12-18 years. These variables are 1 if the Marine belongs to the category; else 0.
O4, retirement eligible	1 if the officer is an O4 who is retirement-eligible, else 0. Because there are some mistakes in the Marine Corps data used to compute years of service, this variable has some errors. If the variable was computed correctly, the model would not estimate an effect since all retirement-eligible officers would leave.
Number deployments to Afghanistan or Iraq	Number of times the Marine deployed to Afghanistan or Iraq.
Days deployed	Measured in hundreds of days.
Deployed 500 or more days	1 if the Marine deployed 500 or more days; else 0.
Never deployed	1 if the Marine was never deployed; else 0.

## Deployments to Iraq or Afghanistan

We used crisis data from the Defense Manpower Data Center (DMDC) to construct this variable (see [3] for a more complete description of these data). Although DMDC had cleaned the data, we found it necessary to do some additional cleaning in order to calculate the number of deployments.<sup>10</sup> Specifically, we dropped deployments if the begin date was after the end date. We closed all 1-day gaps, and we closed all gaps that were less than 30 days if the result was a deployment that was not more than a year in length.<sup>11</sup> Apparently, as units changed from one command to another, sometimes one crisis deployment record was ended and another crisis deployment record was begun.

## Regression results

Table 6 has the first-term (zone A) reenlistment logits, table 7 has the second- and third-term reenlistment logits (zone B and C), and table 8 has the retention logits for commissioned officers in the period of December 2004 to December 2005. Table 8 has two logistic regressions—one for non-retirement-eligible officers and one for retirement-eligible officers.

Table 6. FY05 first-term (zone A) reenlistment logit

Variable	Mean <sup>a</sup>	Coefficient <sup>b</sup>	Derivative
Male	.939	-.072 (-1.05)	Not sig.
Black	.116	.619** (12.57)	.128
Hispanic	.178	.212** (4.95)	.041
Number of dependents	.657	— .209**	.041

10. In our earlier work, we indicated only whether the Marine had deployed to Iraq or Afghanistan (avoiding the problem of calculating the number of deployments).

11. Headquarters Staff have deployed to Iraq for 1 year.

Table 6. FY05 first-term (zone A) reenlistment logit (continued)

Variable	Mean <sup>a</sup>	Coefficient <sup>b</sup>	Derivative
		(9.00)	
SRB level	1.015	.062**	.012
		(3.73)	
E3	.124	-.741**	-.120
		(-12.55)	
E5 and up	.256	.175**	.035
		(4.65)	
Days deployed (in 100s)			
Marine with dependents	1.182 <sup>^</sup>	.037**	.007
		(2.25)	
Marine with no dependents	1.663 <sup>^</sup>	-.065**	-.013
		(-3.85)	
Deployed 500 or more days			
Marine with dependents	.062 <sup>^</sup>	.196**	.038
		(2.31)	
Marine with no dependents	.109 <sup>^</sup>	.368**	.073
		(4.51)	
Number deployments to Iraq or Afghanistan			
Marine with dependents	.859 <sup>^</sup>	-.109**	-.020
		(-1.98)	
Marine with no dependents	.961 <sup>^</sup>	-.291**	-.052
		(-5.16)	
Never deployed			
Marine with dependents	.106 <sup>^</sup>	-.339**	-.060
		(-4.06)	
Marine with no dependents	.067 <sup>^</sup>	-.429**	-.074
		(-4.21)	
Constant		-1.126**	
		(-14.58)	
Average reenlistment rate		.275	
Chi-Square		1,098	
Observations		20,014	

a. <sup>^</sup> indicates the mean is a conditional mean. For example, Marines with dependents averaged 188 deployed days.

b. z statistic in parentheses beneath coefficients. \*\* indicates significance at the 1-percent level. The regression also included the variable "base."



Appendix B

Table 7. FY05 logistic reenlistment regressions for second-term (zone B) and third-term (zone C) reenlistments

Variable	Zone B			Zone C		
	Mean <sup>a</sup>	Coefficient <sup>b</sup>	Derivative	Mean	Coefficient	Derivative
Male	.936	.456** (3.71)	.097	.954	.200 (.62)	Not sig.
Black	.181	.383** (4.38)	.074	.215	.106 (.57)	Not sig.
Hispanic	.176	.297** (3.44)	.058	.175	.019 (.10)	Not sig.
Married or dependents	.785	.361** (3.30)	.075	.875	1.186** (4.50)	.125
SRB level	.362	.230** (4.68)	.044		-.042 (-.24)	Not sig.
E3 or E4	.020	-2.898** (-8.56)	-.539			
E6 and up	.348	.700** (9.88)	.138			
E4 or E5				.111	-3.28** (-18.87)	-.596
E7, E8, or E9				.183	.867 (3.13)	.047
Number deployments to Iraq or Afghanistan	.190	.242** (2.82)	.047	.204	.349 (1.61)	Not sig.
Days deployed (in 100s)						
Marine with dependents	1.879 <sup>^</sup>	.047** (1.98)	.007	1.768 <sup>^</sup>	.115** (1.99)	.019
Marine with no dependents	2.228 <sup>^</sup>	-.051 (-1.52)	Not sig	2.192 <sup>^</sup>	.335** (3.34)	.058
Never deployed	.088	-.393** (-3.47)	-.083	.083	-.216 (-.85)	Not sig.
Constant		-.392** (-2.56)			.914* (2.30)	
Average reenlistment rate		.673			.858	
Chi-Square		465			519	
Observations		5,208			2,229	

a. <sup>^</sup> indicates the mean is a conditional mean. For example, Marines with dependents averaged 188 deployed days.  
b. z statistic in parentheses beneath coefficients. \*\* indicates significance at the 1-percent level and \* represents significance at the 5-percent level. Both regressions also included the variable "base."

Table 8. Retention logits for commissioned officers (December 2004 to December 2005)

Variables	Non-retirement-eligible			Retirement-eligible		
	Mean	Coefficient <sup>a</sup>	Derivative	Mean	Coefficient	Derivative
Black	0.069	0.442** (2.77)	0.026**	0.043	-.169 (-.61)	Not sig.
Hispanic	0.033	0.149 (0.975)	Not sig	0.008	.606 (.77)	Not sig.
Other ethnicity	0.043	0.114 (.66)	Not sig	0.017	.529* (.97)	Not sig.
Female	0.0554	-0.0141 (-1.03)	Not sig	0.026	.227 (.60)	Not sig.
Top third TBS	0.364	0.240** (2.95)	0.016**	0.346	0.107 (0.87)	Not sig.
Deployments to Iraq or Afghanistan	0.391	.436** (5.19)	.025**	.234	.731** (3.60)	.096**
Pilot, 3-6 YOS	.220	2.32** (5.47)	.034**			
Pilot, 7-8 YOS	.047	-.653** (-3.24)	-.033**			
Pilot, 9-11 YOS	.063	-1.167** (-7.70)	-.075**			
Non-pilot, 3-6 YOS	.295	-1.144** (-9.64)	-.072**			
Non-pilot, 7-8 YOS	.100	-.600* (-3.85)	-.029*			
Non-pilot, 9-11 YOS	.099	-.619** (-4.05)	-.030**			
No dependents, 3-6 YOS	.168	-.631** (-6.07)	-.031**			
O4, Retirement eligible				.069	-1.838 (-8.62)	-.382**
Days deployed (in 100s)	1.705	.042 (1.52)	Not sig	.947	.245** (3.71)	.032**
Constant		2.904** (28.41)			.879** (9.96)	
Mean dependent variable		.922			.768	
Chi-Square		497			169	
Observations		10,812			1,630	

a. z statistics in parentheses beneath coefficients. \*\* indicates significance at the 1-percent level and \* indicates significance at the 5-percent level.

## References

- [1] Aline O. Quester, Anita U. Hattiangadi, William B. Lambert, and Lewis G. Lee. *Using DEPTempo Data To Understand the Marine Corps' Deployment Picture*, Dec 2004 (CNA Annotated Briefing D0011146.A1)
- [2] Anita U. Hattiangadi, Lewis G. Lee, and Aline O. Quester. *Deployment Tempo and Retention in the Marine Corps*, Oct 2005 (CNA Annotated Briefing D0013118.A1)
- [3] Aline O. Quester, Anita U. Hattiangadi, and Robert W. Shuford. *Marine Corps Retention in the Post-9/11 Era: The Effects of Deployment Tempo on Marines With and Without Dependents*, Jan 2006 (CNA Research Memorandum D0013462.A1)
- [4] James Hosek, Jennifer Kavanagh, and Laura Miller. *How Deployments Affect Service Members*, 2006 (RAND, MG-432-RC)
- [5] "Deployments Strain Marriages." *Poughkeepsie Journal*, 24 Apr 2005
- [6] James Hosek and Mark Totten. *Serving Away From Home: How Deployments Influence Reenlistment*, 2002 (RAND, MR-1594-OSD, pp. 47-48)
- [7] James Hosek and Mark Totten. *Does Perstempo Hurt Reenlistment? The Effect of Long or Hostile Perstempo on Reenlistment*, 1998 (RAND, MR-990-OSD)
- [8] Anita U. Hattiangadi, Deena Ackerman, Theresa H. Kimble, and Aline O. Quester. *Cost-Benefit Analysis of Lump Sum Zone A, Zone B, and Zone C Reenlistment Study: Final Report*, 2003 (CNA Research Memorandum D0009652.A2)



## List of figures

Figure 1.	Reenlistment rates by days deployed FY04 and FY05 . . . . .	5
Figure 2.	FY04 first-term reenlistment rates by days deployed for Marines with and without dependents . . . . .	7
Figure 3.	FY05 first-term reenlistment rates by days deployed for Marines with and without dependents . . . . .	7
Figure 4.	FY05 reenlistments by number of times deployed to crisis areas: First-term (zone A) Marines . . . . .	9
Figure 5.	FY05 reenlistments by days deployed: Second-term (zone B) and third-term (zone C) Marines . . . . .	12
Figure 6.	FY05 zone B (second-term) reenlistments by number of times deployed to crisis areas. . . . .	13
Figure 7.	FY05 zone C (second term) reenlistments by number of times deployed to crisis areas. . . . .	13
Figure 8.	Non-retirement-eligible commissioned officer retention rates by days deployed: December 2004 through December 2005 . . . . .	15
Figure 9.	Non-retirement-eligible commissioned officer retention rates by number of deployments to crisis areas . . . . .	15
Figure 10.	Retention rates for officers in years of service 3 to 6 and years of service 9 to 11, by number of deployments to crisis areas . . . . .	16
Figure 11.	Retention rates of retirement-eligible officers, by number of deployments to crisis areas . . . . .	17



## List of tables

Table 1.	Differences in DEPTempo for first-term Marines making reenlistment decisions in FY05 . . . . .	8
Table 2.	Predicted reenlistment rates from logistic regression: FY05 first-term reenlistments . . . . .	11
Table 3.	PMOSs in which more than one-third of FY05 FTAP Marines deployed 500 or more days . . . . .	21
Table 4.	PMOSs with largest percentage of non-deployed FY05 FTAP Marines . . . . .	22
Table 5.	Variables used and their definitions . . . . .	26
Table 6.	FY05 first-term (zone A) reenlistment logit . . . . .	27
Table 7.	FY05 logistic reenlistment regressions for second-term (zone B) and third-term (zone C) reenlistments . . . . .	29
Table 8.	Retention logits for commissioned officers (December 2004 to December 2005) . . . . .	30







