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AN ANALYSIS OF PROPOSED CHANGES TO THE U. S. MARINE CORPS PERMANENT CHANGE OF STATION POLICY: THE FISCAL AND READINESS IMPACTS

by

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An Analysis of Proposed Changes to the U. S. Marine Corps Permanent Change of Station Policy: The Fiscal and Readiness Impacts

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I. INTRODUCTION

A. PURPOSE

The purpose of this thesis is to analyze the U. S. Marine Corps permanent change of station (PCS) policy. The objective of the analysis is to determine if the PCS budget can be reduced without harming readiness. This thesis is important to the Marine Corps because budgetary resources are declining, and the Marine Corps can save millions of dollars by changing PCS policy. This chapter will provide the following: PCS background information; the research objectives and questions; the scope and assumptions that define and constrain the thesis; and the organization of the study.

B. BACKGROUND

The Marine Corps has approximately 177,000 active duty military personnel permanently assigned to various duty stations throughout the United States and around the world. At these duty stations, Marines are either performing their primary duties according to assigned "billets," or they are receiving formal training (known as occupying "school seats"). As a billet or a school seat becomes vacant, a Marine is ordered to fill the vacancy. Moving Marines from one duty station to another is called a PCS move. The Marine Corps

Personnel Assignment Policy, Marine Corps Order 1300.8P, states that:

> The policy of the Marine Corps is to limit PCS moves to those required to achieve/maintain combat readiness or to ensure equitable treatment and career development of individual Marines. Compliance with this policy improves combat readiness by controlling personnel turnover, reducing travel cost, and increasing the stability of Marine families. [Ref. 1:p.2]

Therefore, the impact of this assignment policy on readiness is a function of: efficient and effective staffing of billets; career development of personnel; and morale.

Annual PCS-move costs are a substantial expense the Marine Corps must pay from its military personnel budget. The Marine Corps' Fiscal Year (FY) 1994 Budget projects that more than $200 million will be spent on PCS moves. Minimizing personnel movement costs has been a continuing concern within the Marine Corps, Department of the Navy, Department of Defense, and Congress. However, the annual PCS movement of some Marines is unavoidable because vacancies occur when Marines: one, complete their duty assignment (i.e., an overseas tour, drill instructor duty, etc.); two, complete a formal school; three, separate from the service; and, four, are reassigned to duties that enhance their professional development (i.e., command, joint tours, career level school, intermediate level school, top level school, etc.). Consequently, personnel imbalances are created requiring the movement of more Marines to balance out the affected organizations to achieve and maintain readiness.

PCS moves are classified into six different categories: accessions, separations, training, operational, rotational, and unit. These PCS move categories are defined below. [Ref. 2:p. 9]

1. Accession. Travel from place of enlistment or commissioning (or from point of receipt of orders) to first (or new) permanent duty station or training school of 20 weeks or more. Attendance at flight training by newly commissioned officers is considered an accession move.

2. Separation. Travel upon separation from a military service between last permanent duty station and home of record or point of entry into said military service, including travel from overseas for the purpose of separation.

3. Training. Travel within the 48 Continental United States and the District of Columbia (CONUS) to and from permanent duty station to training school of 20 weeks or more. Excludes accession travel.

4. Operational. Travel within the CONUS to and from permanent duty stations. Travel between permanent duty stations overseas or between the CONUS and Canada or Mexico, when transoceanic travel is not involved. Excludes accession travel.

5. Rotational. Travel between CONUS and overseas permanent duty stations or travel between permanent duty stations overseas, if transoceanic travel is involved.

6. Unit. PCS movements in connection with the relocation of an organized unit.

Marine Corps decision-makers establish the policies that produce the PCS requirements for each of these move categories.

John T. Warner and Stanley A. Horowitz, in Geographic Movement of Military Personnel: Issues and Policies,

acknowledged the difficulties involved in changing existing PCS policy. They stated:

> The various categories of moves are interdependent. More separations may necessitate not only more accession moves, but also more training, operational and rotational moves. But if it is unacceptable to military personnel, a policy that tries to reduce rotational or operational moves may ultimately cause an increase in separations, and moves due to separation and accession may therefore increase. A host of non-PCS policies--where to locate the training establishments, when to train personnel, the level of reenlistment bonuses or retirement benefits, etc.-- affect movement. [Ref. 3:p. 4]

Notwithstanding the complexities of changing PCS policy, changes may be necessary to adjust to different requirements and declining resources. Some PCS-move categories are less compliant than others. Accession, separation, training, and unit moves are a function of force structure end strength, training requirements, and decisions made to optimally locate units. These move categories are not directly influenced by PCS policy changes. However, rotational and operational moves are more likely to be directly affected by policy modifications that change tour lengths. These policy modifications can decrease or increase the frequency that Marines perform rotational and operational moves. Consequently, the Marine Corps' annual budget for PCS moves is affected by rotational and operational tour length/PCS-move policy decisions.

There are two types of rotational tours: accompanied and unaccompanied (and this thesis is concerned with only those tours at Okinawa and Iwakuni, Japan). Upon request, most

officers and staff noncommissioned officers (Marines in grades E-6 and above; also, some noncommissioned officers, E-5's, are included in this group) are authorized to bring their families with them when they PCS overseas. They then serve a three-year "accompanied" rotational tour. Also, married officers and staff noncommissioned officers (SNCO's) can choose to leave their families in the CONUS and serve a one-year "unaccompanied" rotational tour. Unmarried Marines serve a one-year rotational tour. Married Marines in the grades of corporal (E-4) and below are not included in the accompanied tour West Pacific (WESTPAC) staffing plan, and consequently most serve a one-year unaccompanied rotational tour. Therefore, the Marines serving in a rotational tour will have either a three-year or one-year tour length, depending on their rank, marital status and personal choice. The Marine Corps encourages married officers and non-commissioned officers to volunteer for the three-year, accompanied rotational tour. However, the Marine Corps consistently fails to meet its accompanied rotational tour staffing goal because not enough Marines volunteer for the accompanied rotational tour. [Ref. 4]

The policy governing operational tours sets the standard length at three years. However, some operational tour billets are so arduous that they are considered a hardship; consequently, these billets have a two-year tour length.

The Marine Corps decision-makers consider the PCS program to be a target for budget reduction because of the apparent discretionary nature of rotational and operational PCS-move policies. Changing rotational and operational PCS-move policies would affect the frequency of moving Marines, and consequently the demand for PCS funds. However, adjusting tour lengths to reduce the PCS budget should be carefully analyzed to ensure that the savings from a reduced PCS budget are not offset by: (1) increases in requirements for other types of funding, (2) negative impacts to morale that may lead to lower retention (thereby increasing the number of separation moves and accession requirements), and (3) degrading career development.

C. OBJECTIVES

This thesis will analyze the advantages and disadvantages of altering Marine Corps rotational and operational PCS-move policies. The objective of this analysis is to enable Marine Corps decision makers to select options that effectively reduce the PCS budget without degrading readiness.

D. RESEARCH QUESTIONS

1. Primary

What are the effects to the Marine Corps budget if: one, unaccompanied rotational tour lengths are extended; and, two, operational tour lengths are extended?

2. Secondary A

Other than the fiscal effects to the budget, what effect will extended unaccompanied rotational tour length have on readiness?

3. Secondary B

What effect will extended operational tour lengths have on readiness and career development?

E. SCOPE

This study will be a manpower policy analysis that examines the fiscal and qualitative factors of the proposed rotational and operational move policy changes.

F. ASSUMPTIONS

In this study the assumption "ceteris paribus" will be invoked for a fiscal examination of the alternatives. Therefore, the number of accessions, separations, training, and unit moves is assumed to remain the same during the rotational and operational move analysis.

G. ORGANIZATION OF STUDY

Chapter II provides a review of the literature that is pertinent to the theoretical framework of this thesis. First, a discussion addresses the positive and negative effects of extended unaccompanied tours. Then, the positive and negative effects of extending operational tours is examined.

In Chapter III, a general overview of the Marine Corps manpower process is presented to provide an understanding of how billets and the demand for personnel are developed.

Chapter IV presents the data and methodology used in the research design and structure of the analysis.

Chapter V presents and examines data for the fiscal and quantitative analysis/interpretation of each alternative.

Chapter VI provides a summary, conclusions and recommendations.

II. LITERATURE REVIEW

A. OVERVIEW

The purpose of changing the current rotational and operational PCS-move policies is to save money without decreasing readiness and career development. The proposed policy changes in rotational and operational tour length/PCS moves could both benefit and hurt readiness. In general, longer tours decrease personnel turbulence. Fewer Marines moving improves both unit cohesion and personnel stability. This improves readiness. However, shorter tour lengths exist because some billets and assignment locations are more arduous than others. Extending tour lengths in these billets or at these locations could hurt readiness. The purpose of this chapter is to present an examination of studies that relate to the two proposed policy changes.

B. ROTATIONAL TOUR LENGTH/PCS-MOVE POLICY

From a fiscal standpoint, increasing the unaccompanied tour length from 12 months to 18 or 24 months would decrease the PCS budget in three ways: one, the demand for accompanied tours would increase (author's assumption); two, the turnover of personnel on unaccompanied tours would be less and, three, fewer operational moves would be needed to balance the force due to fewer overseas pulls from CONUS billets. The next two

subsections will review the literature that addresses the positive and negative effects of extending the unaccompanied tour.

1. Positive Effects Of Longer Unaccompanied Tours

An extended unaccompanied tour improves unit readiness in three ways. First, personnel turbulence is decreased. Horowitz and Wagner discuss the benefits of longer tours in their Geographic Movement of Military Personnel: Issues and Policies. Changing from a 12-month unaccompanied rotational tour to a 24-month tour would mean a substantial decrease in personnel turnover every year. Consequently, the demand for resources that are devoted to the training and orientation of new personnel is decreased, and more resources can be directed towards improving a unit's combat readiness [Ref. 3:p. 25]. Second, the Marines serve together longer. Marines function as team members, and a longer tour could enhance unit cohesiveness [Ref. 3:p. 19]. Research has shown that longevity in assignments, particularly in key billets, has a positive effect on individual and unit performance [Ref. 5:p. 15 and Ref. 6:p. 201]. The third positive effect is that more officers and SNCO's may be encouraged to accept an accompanied tour to avoid the longer unaccompanied tour and the consequences of a longer family separation. Additionally, if more Marines serve on accompanied tours there will be fewer Marines serving on the shorter unaccompanied tour.

Consequently, personnel turbulence is reduced further and unit cohesiveness is further enhanced.

2. Negative Effects Of Longer Unaccompanied Tours

Longer unaccompanied tours may diminish personal readiness. Personal readiness involves factors that affect an individual's ability to perform his or her job and contribute to the aggregate readiness of his or her unit. For example, if a male Marine is deployed overseas and is separated from his family, any marital or family strife that might require his presence at home affects this Marine's "personal readiness" and consequently his absence affects his unit's readiness. Three impacts could harm a Marine's personal readiness and indirectly affect combat readiness. They are: (a) family separation, (b) spouses who work, (c) family hardship.

a. Family Separation

Lengthening the unaccompanied tour aggravates the negative effects that come from family separation. Research has analyzed the effect of family separation on service members and their families [Refs. 7, 8, and 9]. Studies show that separating military personnel from their families creates stress for the service member, thereby lowering the individual's productivity [Ref. 9:p. 27]. Thus, extending the unaccompanied rotational tour will exacerbate the effects of family separation and create a more powerful disincentive for

retention. Sources of a Marine's stress may be concern for his or her family's welfare or just a lower morale borne from missing the family. Additionally, spouses may strongly object to family separations that are created as a matter of policy. Research has shown that a spouse's support (or lack of support) for the service member's military career has a direct influence on the retention of high-quality personnel [Ref. 9:p. 29]. Frequent and/or lengthy family separations are understood to be one of the reasons that personnel leave the military service [Ref. 7:p. 56]. Therefore, the lower individual productivity and retention rates that emanate from excessive family separation hurts readiness.

b. Spouses Who Work

One of the primary reasons married officers and SNCO's select the unaccompanied tour is that their spouses work [Ref. 10]. Working spouses experience difficulty relocating within CONUS every three years, but they cope either by selecting employment positions that are readily transferable or by accepting underemployment. Presumably, Marines and their working spouses consider the twelve-month unaccompanied rotational tour to be a more acceptable alternative than the three-year accompanied rotational tour, to preserving both careers.

However, one reason service members leave the military is that their military career is incompatible with

their spouse's career [Ref. 7:p. 114]. If a spouse works, there is a negative effect on the service member's retention [Ref. 8:p. 43]. Therefore, a longer unaccompanied rotational tour may harm Marine retention because both rotational tour alternatives are unsatisfactory. These Marines' alternatives are: one, accept the accompanied tour in which case the Marine's spouse faces limited employment opportunities overseas; or, two, accept the extended unaccompanied rotational tour, which carries the negative family separation impacts discussed in the previous section. Consequently, retaining Marines may be more difficult and readiness could be degraded.

c. Family Hardship

In 1993, 3,250 married officers and SNCO's on accompanied tours were stationed in Okinawa, Japan. These Marines were about sixty percent of the married officers and SNCO's serving in Japan who were eligible for an accompanied rotational tour. The remaining officers and SNCO's, approximately 2,400 Marines, selected the unaccompanied tour. If the assumption is correct that an extended unaccompanied tour will encourage more officers and SNCO's to volunteer for an accompanied tour, then it is prudent to consider some pertinent questions. How well will these reluctant volunteers, the Marines and their families, adjust to relocating overseas? Under the present circumstances, a small

percentage of the Marine families overseas do not complete the entire three-year accompanied rotational tour, but return early to CONUS because of various hardship reasons (other than medical). Will the level of family attrition increase when these additional volunteers - those families that would otherwise prefer to stay in CONUS and accept their sponsor's twelve-month unaccompanied rotational tour - relocate overseas on an accompanied tour?

The U.S. Army sponsored a study by Gary L. Bowen titled Family Adaptation to Relocation: An Empirical Analysis of Family Stressors, Adaptive Resources, and Sense of Coherence. This study considered the adaptive ability of Army families to living overseas in foreign countries. Bowen identified some significant factors that affected Army personnel and their families.

> Relocation to an overseas environment can result in numerous hardships for military families, including financial strains, geographic separation from extended family, and difficulties associated with assimilation to a new cultural setting. These hardships may pose serious challenges to the family system, resulting in a decreased level of family adaptation at the personal, family, and Army-system level. [Ref. 11:p. 17]

Studies have linked family adaptation with retention and individual and unit readiness [Ref. 12 and 13]. Therefore, as more officers and SNCO's choose the accompanied rotational tour, the negative effects these Marines and their families experience from locating overseas may reduce readiness and/or increase the demand for PCS funds because: one, a Marine's

productivity may decrease due to increased personal stress; and, two, a higher rate of family attrition may result.

C. OPERATIONAL TOUR LENGTH/PCS-MOVE POLICY

A longer operational tour will reduce the number of Marines that move every year and the PCS budget will be diminished accordingly. Intuitively, a longer operational tour seems to be a logical choice that could save money and improve readiness; however, there are some negative effects, too. The next two subsections will review the literature that addresses the positive and negative effects of extending the operational tour length.

1. Positive Effects

A longer operational tour improves readiness. In a previous sub-section the positive effects of extending the unaccompanied tour were discussed; and likewise, lower personnel turbulence and enhanced unit cohesiveness may result if the operational tour length is changed from three years to four years. Unit readiness could be improved because personnel turbulence is decreased and Marines serve together longer. Also, a longer operational tour could increase personal readiness by reducing the stress Marines and their families experience from frequent relocation.

Research has shown that frequent relocation is another reason service members leave military service [Refs. 7 and 8]. Consequently, increasing the operational tour length

(decreasing the number of relocations/PCS) might be viewed positively by Marines and their spouses, and could have a beneficial impact on morale and retention. [Ref. 5:p. 21] Therefore, a longer operational tour may encourage more Marines to stay in the Marine Corps.

2. Negative Effects

Longer operational tours could negatively affect the career development and personal readiness of Marines. The literature that addresses the potential negative effects of an extended operational tour is limited. In August 1993, the Manpower and Reserve Affairs Department, Headquarters, Marine Corps published an information paper, 4 Year Tours, that consolidated multi-departmental staff comments regarding a four-year operational tour policy. The comments recorded in this document highlight the drawbacks of lengthening all operational tours. The following paragraphs will address the negative effects that a four-year operational tour could have on career development and personal readiness.

a. Career Development

A mandatory four-year operational tour will have a harmful effect on the career development of Marines, and consequently on readiness. A longer operational tour affects the career development of officers and to a lesser extent of some SNCO's. Horowitz and Warner stated,

> ...many in the services believe that in some circumstances more frequent rotation, especially among

> officers, enhances effectiveness over the long run even when it detracts currently from individual job performance or unit effectiveness. [Ref. 5:p. 20]

Generally, the consequence of fewer moves is fewer opportunities for individual Marines to obtain important factors of human capital (i.e., education, training, experience).

The consensus among Marine Corps manpower experts is best described by Brigadier General P. G. Howard:

> The policy of a four-year tour should only be mandated if career development and the needs of the Corps can be accommodated while at the same time maintaining family stability, operational readiness and meeting tight budget constraints. [Ref. 14:p. 2]

For the sake of equity and the good of the Marine Corps, all Marines should be afforded the same opportunities of education (professional military education, i.e., career, intermediate, and top level schools) and experience (for officers: joint and command tours; for enlisted: drill instructor and recruiter duty). Longer operational tours will decrease the number of opportunities Marines have to be assigned to duties that enhance their career, and consequently their education and experience attainment. Overall, readiness could be decreased because Marines might be less productive.

b. Personal Readiness

Some operational tour billets are more "difficult" than others. The difficulty of a particular assignment may be connected to higher work-related stress (i.e., drill

instructor duty) or family separation (i.e., security duty aboard a deployed ship). At the same time, most of these difficult assignments are considered career enhancing. Therefore, the justification for keeping these types of assignments at the current twenty four-month tour length are two-fold: one, frequent moves in and out of these billets allow more Marines the opportunity to obtain a particular experience; and, two, Marines would not be subject to hardships associated with a particular assignment for too long [Ref. 3:p. 20]. Making these types of assignments a four-year tour could hurt personal readiness.

III. BACKGROUND

A. OVERVIEW

An understanding of the PCS program/policy can be enhanced through a background discussion of the Marine Corps manpower process because PCS is just one "cog" within the complex manpower "machinery." In the Marine Corps, PCS program management falls within the organizational responsibility of the Manpower Department, Headquarters, Marine Corps. The mission of the Manpower Department is to: provide the appropriate number of adequately trained, sufficiently experienced, usable Marines to the commander so that he/she can accomplish his/her mission [Ref. 15:p. 1-1]. Section B of this chapter will discuss how the Manpower Department accomplishes this mission and how the PCS-move program fits into the macro-manpower process.

B. MANPOWER PROCESS

The Manpower Department's mission was presented in the previous section. Although this is a simple statement, unfortunately, the process is complex. The manpower process is actually a collection of subordinate processes that are interdependent, interrelated, iterative, and completely dependent on the **determination of personnel inventory requirements**.

To determine personnel inventory requirements, it is appropriate to begin with the requirement. "The National Security Act of 1947 directed that there be a Marine Corps consisting of three divisions and three air wings." [Ref. 15:p. 1-2] The Marine Corps requirement for manpower resides in this general guidance. These divisions and air wings include subordinate commands that facilitate meeting the requirement, as do many additional commands and organizations that comprise the "supporting establishment" that sustains them. Reality takes its toll when constraints affect determining personnel requirements. This can be explained by dividing this "requirement" discussion into four parts: personnel inventory requirements, authorized strength requirements, target inventory, and staffing goal.

1. **Personnel Inventory Requirements**

Each command has a "structure" composed of military billets. These structures are reflected in Tables of Organization (T/O's) that document/record the billets, missions, and requirements of all commands and organizations. Overall control of T/O's is coordinated by the Commanding General, Marine Corps Command Development Center (Integration Division), with decentralized control and input from four functional sponsors:

1. Commanding General, Marine Corps Command and Development Center: Command Elements (Marine expeditionary forces, brigades, and units)

2. Plans, Policies & Operations Department (PP&O), Headquarters Marine Corps: Ground Combat Arms (infantry division organizations) and Marine Corps Bases

3. Installations & Logistics Department (I&L), Headquarters Marine Corps: Combat Service Support (service support organizations) and Marine Corps Bases

4. Aviation Department, Headquarters Marine Corps: Aviation Combat Element (aviation organizations) and Marine Corps Air Stations

Manpower planners consolidate these T/O's into the Table of Manpower Requirements (T/MR). The T/MR represents the structure that is designed to provide the personnel resources needed to perform the Marine Corps' wartime mission. This T/O consolidation is an unconstrained "personnel inventory" requirement that consists of a total of about 209,000 billets.

The T/MR identifies the unconstrained personnel inventory requirement that "should" exist during wartime. During times of peace the Marine Corps personnel requirement looks much different from what the T/MR portrays. During peacetime, "fiscal constraints" limit the funding of the Marine Corps personnel requirement to what can be "afforded." For example, in FY 1993, the Marine Corps could afford only 179,000 Marines. The next step of the Manpower process is to apply the fiscal constraint to "determine authorized strength requirements."

2. Authorized Strength Requirements

Authorized strength requirements are formulated as a product of the Program Objective Memorandum (POM) process. The POM process allows manpower planners to allocate constrained resources (money and Marines) to accomplish the Marine Corps mission. Within the scope of the POM process, the planning cycle encompasses a seven-year period: the current year, the budget year (the next FY), and the following five years (the outyears). Given the fiscal constraints, the total personnel strength requirement (number of Marines that can be afforded) is set for each fiscal year, and strength levels are allocated to the structure sponsors.

The functional sponsors participate in a series of committees: the POM Working Group, the POM Coordinating Group, and the Assistant Commandant of the Marine Corps Committee, to produce their respective "Troop Lists." The Troop Lists represent the Marine Corps' total personnel strength requirement, and are the "cornerstone" of the manpower requirements determination process. The Troop Lists identify generic units with unit structure and unit manning - for example, 27 infantry battalions containing "X" Marine officers and "Y" Marine enlisted structure, to be manned with "Z" Marine officers and "Q" Marine enlisted [Ref. 15:p. 1-3]. The Troop Lists are one of three inputs that produce the authorized strength requirements.

Manpower planners determine the authorized strength requirement by combining the Troop Lists, the T/O's, and the Unit File (a document that specifies manning levels for specific units, i.e., Second Battalion, Fifth Marines) to produce the Authorized Strength Report (ASR). The ASR represents the "manning" level for the Marine Corps (links the Marine Corps personnel inventory to billets), and is the input that allows other manpower planners to produce two key "targets": a target force and a staffing goal. Planners from the Manpower Planning Division, Manpower Department use the target force for manpower planning. Planners from the Personnel Management Division, Manpower Department use the staffing goal as a target for assignments (it is here that PCS has its role). [Ref. 15:p. 1-4]

3. Target Force/The Planning Process

The ASR allows manpower planners to produce a target force for each fiscal year that represents an ideal personnel inventory (as depicted in the ASR for those fiscal years). The target force conforms to the "manning" levels portrayed in the ASR and reflects the personnel inventory by grade and occupational specialty. Also, it conforms to legal requirements that dictate grade constraints (e.g. only "X" percent of the force can hold a specific officer or enlisted grade). [Ref. 15:p. 1-5]

The manpower planners' job is to use the target force to build plans that shape the current personnel inventory into next year's target force (as well as the outyears, the five fiscal years following the budget year). Shaping the personnel inventory is extremely complex and requires detailed planning. These are some of the planning areas:

- Officer and enlisted non-prior-service accession plans.
- Prior-service accession plans.
- Officer and enlisted skill-classification and training-input plans.
- Overall-reenlistment and selective-reenlistment plans.
- Lateral-movement plan.
- Officer and enlisted promotion plans.
- The budget.

This process is a complicated manipulation of the "authorized strength." The results of this process determine the requirements/goals for accessions, training, promotions, reenlistment, and lateral moves from one occupation specialty to another. [Ref. 15:p. 2-3 and 2-4]

The target force "looks" different from the staffing goal, just as the T/MR looks different from the ASR (the ASR reflects the "fiscal" constraints on the personnel inventory). The staffing goal is different because it incorporates another personnel strength constraint. The Marine Corps has a personnel "overhead" that includes a group of personnel who are unavailable to any field command. This overhead is large

and represents approximately fifteen percent of the total Marines on active duty. These Marines are unavailable because they fall into one of the following categories: trainees, transients, patients, or prisoners (collectively called T^2P^2). For example, in FY 93 there were approximately 179,000 active duty Marines, and T^2P^2 averaged approximately 25,000 Marines. T^2P^2 is a constant liability that cannot be eliminated. Therefore, manpower planners produce a "staffing goal" (a manning target that excludes T^2P^2) to facilitate personnel assignments.

4. Staffing Goal/The Assignment Process

Just as the target force related to the manpower planning process, the staffing goal relates to the assignment process. Staffing goals are the ideal grade-and-skill distribution of the Marines that are in the current inventory. The current inventory excludes T^2P^2 Marines. Staffing goals are produced based on the following list of inputs:

- The current inventory.
- The authorized strength targets for the next 6-9 months.
- A myriad of manpower policies and requirements.

Policy dictates that certain commands or parts of commands have different "staffing precedence" than others. There are three types of staffing precedence: "excepted" command - staffed at 100 percent by skill and grade (no substitutions for a similar specialty or lower grade), "priority" command -

staffed at 100 percent of authorized strength in "gross numbers" (substitutions for similar specialties or lower grades allowed), and "proportionate share" command - commands that bear the brunt of fluctuations in the personnel inventory (lower manning levels). [Ref. 15:p. 1-8]

Staffing goals change continuously as they reflect changes in the current inventory and authorized billet mix (ASR) of each command. The staffing goal is a numerical assignment target 6 to 12 months in the future that the "assignment process" attempts to achieve. Using the staffing goal, "monitors" (the personnel assignment officers and SNCO's) transfer career and entry-level Marines, in compliance with staffing priorities, to achieve the optimal distribution of Marines. The Manpower Process, a handbook for manpower managers, describes the assignment process as the following:

> The assignment process is the monitor's attempt to match specific Marines to the staffing goals of commands and, where possible, meet the desires of the individual Marine. The goal of the assignment process is to make the "best" distribution of the existing inventory of assignable Marines to the authorized billets we have decided to staff--i.e., to place sufficient Marines by grade, skill, and experience at each command to meet the staffing goals. [Ref. 15:p. 1-8]

To support the monitors' assignment process, manpower planners must develop and maintain a **PCS-move plan.** The PCS-move plan is an important part of the POM and budget processes. The PCS-move plan identifies the number of moves required to support the assignment orders written by the enlisted and officer monitors and the resources needed to

execute the assignments. The outputs of the PCS-move plan process are calculated estimates of fiscal year PCS-move requirements for enlisted and officer personnel for the POM years. [Ref. 15:p. 2-9] These estimates are incorporated in the budget and are reviewed/authorized by Congress.

IV. DATA AND METHODOLOGY

A. OVERVIEW

This chapter contains three sections that present the data and methodologies used to analyze the effects of longer unaccompanied WESTPAC (rotational) tours and CONUS (operational) tours. The first section discusses the data and methodologies used to compute the budget savings that can be achieved by changing the rotational and operational PCS policies. The second section is an examination of the data and methodologies used to simulate the PCS movement of personnel within the current and proposed PCS policies. The third section is a study of the data and methodologies used to examine the effects an unaccompanied tour may have on married Marines.

B. PCS SAVINGS ESTIMATE

This section presents the data and methodology used to estimate the savings that can be achieved by changing rotational and operational PCS-move policy. This discussion and the corresponding analysis in the next chapter address the primary thesis research question:

> What are the fiscal effects to the Marine Corps budget if:
> (1) unaccompanied rotational tour lengths are extended and
> (2) operational tour lengths are extended?

This section is organized into two subsections: the data and the savings estimate methodology.

1. The Data

The author used a variety of sources to obtain the data used to produce the savings estimates. Marine Corps commands provided the personnel data. Demographic information was obtained from the Manpower Statistics For Manpower Managers. PCS budget data was extracted from the Military Personnel, Marine Corps Budget Justification Book. Additionally, a great deal of information was obtained from conversations with Marine Corps manpower analysts. This subsection proceeds in two parts: the WESTPAC rotational PCS-move data and the CONUS operational PCS-move data.

a. The WESTPAC Rotational PCS-Move Data

WESTPAC Marine Corps units at Marine Corps Air Station, Iwakuni, Japan and Marine Corps Base, Okinawa, Japan (Camps Schwab, Hansen, Courtney, Foster, Butler, Futema, and Kinser) are the focus of this rotational PCS-move analysis. As of January 1994, the combined Marine Corps personnel strength in WESTPAC was about 1,334 officers and 14,897 enlisted Marines. The officer population was comprised of 813 married/accompanied officers and 521 married/unaccompanied and single officers. The enlisted population was comprised of 2,846 married/accompanied Marines and 12,051 married/ unaccompanied and single Marines.

Marines will be categorized into sub-populations based on the following definitions (for the purposes of this thesis): **first-termers** are Marines in the grades private (E-1) through corporal (E-4); **career enlisted force** are Marines in the grades sergeant (E-5) through master gunnery sergeant/sergeant major (E-9); **officers**, include all warrant officers (WO-1 through CWO-5) and commissioned officers (O-1 through O-10). Given these definitions, some observations about the WESTPAC Marine populations can be estimated by reviewing historical data. For example, first-term Marines represent approximately 68 percent of the entire enlisted population [Ref. 16:p. 5]. Also, the marital status of a Marine sub-population can be estimated; for example, approximately 80 percent of the career enlisted force is married [Ref. 17:p. 61]. Armed with the data provided in the previous paragraph (i.e., accompanied, unaccompanied, and single status) and statistics similar to those presented in this paragraph, the following estimates about WESTPAC Marines can be made:

- Officers:
  married/accompanied = 813
  married/unaccompanied = 157
  single = 364

- Career Enlisted Force:
  married/accompanied = 2846
  married/unaccompanied = 968
  single = 953

- First-Term:
  married/unaccompanied = 3039
  single = 7091

These quantities and other quantities similarly derived are used to compute the savings estimate analysis in the next chapter.

The rotational PCS costs used in this thesis are derived from the Military Personnel, Marine Corps, Budget Justification Book. **Average** rotational PCS costs are based on the FY 1994 budget estimates. These average PCS costs are as follows: officer equals $9,376 and enlisted equals $2,736. The rotational PCS-cost estimates reflect an adjustment made to exclude the expense for shipment of privately-owned vehicles because Marines are not authorized to ship their cars to Japan. It must be stated that using Marine Corps **average PCS-cost** data is not ideal for this analysis. The author made every effort to obtain more accurate data without success. Using available average cost estimates skews some items in this analysis. Ideally, the best cost estimates would be those that differentiate between senior and junior officers, married and single career enlisted force Marines, unaccompanied first-term and single first-term Marines, etc. The Marine Corps manpower budget section computes average costs based on cost codes and computes an average based on three years of costs divided by the total movers in each move category. The Marine Corps has only one fiscal analyst

assigned to PCS, and understandably she was not able to devote the hours to segregate only WESTPAC data for this analysis.

b. The CONUS Operational PCS-Move Data

Operational PCS moves are the movement of career officers and enlisted Marines within CONUS. First-term Marines and junior officers do not perform an operational PCS move unless they have obligated themselves for further service subsequent to the expiration of their initial obligation. Generally, this means that the enlisted Marine has reenlisted and the junior officer is allowed to remain on active duty. For officers, accepting orders that involve an operational PCS move obligates them to continue their service for the duration of their next assignment. In essence, these junior enlisted Marines and officers join the career enlisted and officer force.

The literature review discussed the negative effects of longer CONUS tours. In that discussion, potential harm to career development and personal readiness were cited. There is considerable consensus among Marine Corps policy analysts and decision makers that some billets should be excluded from being changed to a longer tour length. In the Manpower and Reserve Affairs Department, Headquarters, United States Marine Corps, 4 Year Tours document, some officer and enlisted billets were recommended to remain three-year and two-year tours.

These officer billets are listed in Table 4-1. The row categories in this table identify the billet type and the manning of this billet category. The column headings identify the tour length for the specific billet. Each column is summed and divided by the tour length to obtain an estimate of the number of Marines in the category that will move every year. The combined officer move requirement is 856.

TABLE 4-1 EXCLUDED OFFICER BILLETS

Billet	36 Months	24 Months
Marine Security Forces	91	12
Recruit Training Commands	326	
Inspector, Instructor Staffs	233	
Combat Cargo Officer	53	
Marine Officer Instructor, ROTC	80	
Joint tours	360	
ANGLICO	64	
RPV Company	30	
Forward Air Controller		68
SEP/ADP payback tour	389	
Recruiter duty	324	
Officer selection	72	
"V" units	426	
Total	2448/3yr	80/2yr
Moves per year	816	40
Total move per year requirement:	856 = 816 + 40	

Table 4-2 lists the enlisted billets to be excluded from the proposed tour extensions. The number of enlisted Marines moving every year is estimated similarly to that for Table 4-1. The enlisted move requirement for these billets is 2,159.

TABLE 4-2 EXCLUDED ENLISTED BILLETS

Billet	36 Months	24 Month
Drill Instructor duty		1108
Recruiter duty	2154	
Combat Cargo duty		52
Marine Security Forces	532	
"V" unit	2052	
Total	4738/3yr	1160/2yr
Moves per year	1579	580
Total move per year requirement:	2159 = 1579 + 580	

The operational PCS costs and move frequencies used in this thesis are derived from the Military Personnel, Marine Corps Budget Justification Book.

2. The Savings Estimate Methodology

This subsection describes the methodologies used to estimate the savings that can be achieved by changing: (1) the rotational WESTPAC one-year tour to two years for married/unaccompanied and single Marines and (2) the operational (CONUS) three-year tour to four years. This description proceeds in two parts: the WESTPAC rotational tour length change and the operational tour length change.

a. The WESTPAC Rotational Tour Length Change

Increasing the rotational unaccompanied tour length will reduce the number of Marines performing PCS moves and reduce the PCS budget. Three options are discussed here and are examined in the next chapter. First, a WESTPAC rotational cost estimate is computed based on current PCS-tour-length

policies; this is called the "status quo" option. Second, a cost estimate is computed that incorporates changing all the one-year tours to two-year tours. Third, a cost estimate is computed that applies the tour length change only to first-term Marines. Each cost estimate is computed using three simple formulas.

Formula 1 computes the number of billets to be filled. The number of billets to be filled equals the staffing goal divided by the tour length, i.e., total number of married/accompanied officers, 813, divided by the tour length, three years, equals a billet fill requirement of 271 accompanied officers. This billet fill (BF) requirement is an input to the next formula for computing the move requirement.

Formula 1. Billet Fill

Billet Fill (BF) = Staffing Goal/Tour Length

Formula 2 computes the move requirement. The move requirement (REQ) equals the billet fill requirement, minus 8 percent of the billet fill requirement, and then this quantity is multiplied by two. Subtracting 8 percent of the billet fill requirement provides an estimate for overseas extensions net the number of short tours. Multiplying the resulting requirement by two accounts for the Marines that are inbound and outbound to the WESTPAC billet assignment. The number of move requirements is an input for the next formula that computes the number of personnel required to rotate.

Formula 2. Move Requirement

Move Requirement (REQ) = [BF - (.08*BF)]*2

Formula 3 computes the total number of personnel required to be moved, rotating (ROT). The number of Marines rotating (ROT) equals the requirement, minus 6 percent of accessions, and minus 8 percent of separations. The element, 6 percent of accessions (total accessions into the Marine Corps), adjusts the REQ to exclude moves categorized as an accession move. The element, 8 percent of separations (total Marine Corps separations), adjusts the REQ to exclude the moves categorized as separations. Multiplying the rotational moves (ROT) by the average PCS cost provides a PCS cost estimate for that specific (officer or enlisted) requirement. [Ref. 2:p. 25]

Formula 3. Marines Rotating

Rotating (ROT) = REQ - .06*ACCESS - .08*SEP

b. The Operational Tour Length Change

Increasing the operational tour length from three years to four years will decrease the PCS budget. Three options are examined in the next chapter. First, an operational move estimate incorporating current PCS policies is computed; this is called the **status quo** option. Second, an operational move estimate reflecting the tour length change from three years to four years is computed. Third, an operational move estimate reflecting the tour length change

from three years to four years but excluding the billets identified in Tables 4-1 and 4-2 is computed because longer tours in these assignments may inflict unnecessary hardship on a Marine or harm an individual Marine's career development.

The Military Personnel, Marine Corps Budget Justification Book, provides operational PCS average costs (officer is $9,218 and enlisted is $2,976) and move estimates for fiscal years 1993, 1994, and 1995 (these estimates are presented in the next chapter). Three options are examined using these average PCS costs and move estimates. First, a three-year average is computed using these estimates, and the resulting averaged estimate becomes the status quo move requirement. The status quo move requirement is multiplied by the average PCS cost to obtain the status quo PCS-cost estimate. Second, the 1993, 1994, and 1995 operational move estimates are summed and divided by four to compute a PCS-move requirement that reflects a four-year operational tour length. This move requirement is multiplied by the average PCS cost to obtain this option's cost estimate. Third, the billets identified for exclusion from the four-year tour length adjustment are subtracted from the CONUS billet population. The remaining billets are adjusted to a four-year tour. Next, the requirements from Table 4-1 and Table 4-2 are added to the adjusted move requirement, and this sum is multiplied by the average PCS cost to produce this cost estimate.

C. PCS-MOVE SIMULATION

This section presents the data and methodology used to forecast the movement of personnel based on current and proposed PCS policies. The purpose of conducting a move simulation is to analyze how PCS policy affects the assignment of Marines. This discussion and the corresponding analysis in the next chapter will address the secondary thesis research questions:

> Other than the fiscal effects to the budget, what effect will extended unaccompanied rotational tour lengths have on readiness? And, what effect will extended operational tour lengths have on readiness and career development?

The author uses the Markov Chain Model to simulate personnel movement. This section is organized into two subsections: the data and the Markov Chain Model.

1. The Data

The author selected a population of Marines that share the same Military Occupational Specialty (MOS) and rank. Ground supply (MOS 3002) majors were selected for this simulation. This population of 123 officers was organized into categories based on their assignment status as follows:

- Overseas (WESTPAC only) accompanied three-year tour (WP/3)
- Overseas (WESTPAC only) unaccompanied one-year tour (WP/1)
- CONUS Fleet Marine Force (FMF) three-year tour (CF/3); personnel assigned to an operational unit, i.e. an infantry division or force service support group, etc.

- CONUS supporting establishment three-year tour (CS/3); personnel assigned to a Marine Corps base, Inspector and Instructor staff, etc.
- Training two-year tour (T/2); personnel attending the Special Education or Advanced Degree programs
- Training one-year tour; personnel attending intermediate level school, i.e., U.S. Marine Corps Command and Staff School, U.S. Navy War College, etc.

Table 4-3 shows how the ground supply majors were distributed among the specified categories as of January 1994 [Ref. 18]. The distribution, geographic location, tour length, and occupational/school status are fundamental inputs for simulating the effects PCS policy has on the assignment process. The next subsection introduces the simulation model.

TABLE 4-3 GROUND SUPPLY MAJORS' DISTRIBUTION

WP/3:	9	CF/3:	59	T/2:	4
WP/1:	6	CS/3:	37	T/1:	8

2. The Markov Chain Model

The Markov Chain Model (MCM) is a mathematical description of how change can take place in a manpower system. The MCM can be used by manpower planners to forecast what may happen if assumed trends continue as they have been observed in the past. It is a management tool that can serve as a guide to achieve a desired objective. The purpose of this subsection is to familiarize the reader with the characteristics and capabilities of the MCM as it applies to a personnel transfer system. This familiarization will

proceed in two parts: the Markov elements and the Markov formula [Ref. 19].

a. *The Markov Elements*

The MCM has the following characteristics:

- Discrete Time: Time is measured in discrete increments (week, month, or year). The MCM analysis in this thesis uses one fiscal year as its time increment.

- Categorization: Personnel in an organization can be classified into several mutually exclusive categories, i.e., grades and ranks; length of service; geographic location; profession or skill (such as MOS); or, some combination of two (or more) of these examples. The author categorized the ground supply majors by geographic location, occupational or school assignment, and tour length.

- Stocks: The quantity/distribution of personnel within the categories at any given time. For example, the ground supply majors' population totals 123 officers with nine majors assigned to WESTPAC on accompanied tours (WP/3), eight majors assigned to intermediate level school (T/1), etc.

- Internal Flows: The personnel moving from one category to another during a discrete time period. For example, if nine majors are assigned to WP/3, a manpower planner could forecast that three majors will move out of this category during a fiscal year. This forecast is based on the assumption that at the **beginning** of the discrete time period: three majors were in the first year of their assignment, three majors were in the second year of their assignment, and three majors were in the third year of their assignment.

- Attrition Flows: The personnel losses from a system to the "outside world." In the system of ground supply majors, attrition occurs when personnel are promoted to lieutenant colonel or separated from the Marine Corps.

- Recruitment Flows: The new personnel that enter a system from the outside world. In a ground supply majors' system, the new entries are the ground supply captains who are promoted to major during the fiscal year.

Additionally, the concept of **steady state** must be introduced. When using the MCM, values for the personnel distribution among the system's categories may stay the same after the passage of successive time periods. In other words, the "system" may achieve equilibrium where stocks do not change.

b. The Markov Formula

The MCM theory is based on empirical observations that show personnel flows are proportional to personnel stocks [Ref. 20:p. 96]. Table 4-4 gives a system that has three categories with the transition proportions between each category arranged in an array.

TABLE 4-4 SYSTEM ARRAY

p_{11}	p_{12}	p_{13}	w_1
p_{21}	p_{22}	p_{23}	w_2
p_{31}	p_{32}	p_{33}	w_3

The element, p_{ij} (a generic representation of p_{11}, p_{23}, etc.), is the proportion of personnel in category "i" at the beginning of a time period that move to category "j" by the end of the period. W_i is the proportion of the personnel in category "i" that leave the system by the end of the discrete time period. The p_{ij}'s found in the array's diagonal (i.e., p_{11}, p_{22}, and p_{33}) represent the proportion of personnel that do not move out of the category during the discrete time

period. The p_{ij}/w_i array is called a transition matrix, and is represented by the symbol "$\underline{P}$".

Formula 4 gives the MCM equation used in this thesis. This equation assumes that total recruitment (all entries into the system) is fixed for every discrete time increment [Ref. 19:p. 7].

Formula 4. MCM Equation

$$\underline{n}(t) = \underline{n}(t-1)\underline{P} + R(t)\underline{r}$$

Elements of the MCM equation are explained as follows:

- $\underline{n}(t)$: Represents the stocks at the end of the discrete time period, (t).
- $\underline{n}(t-1)\underline{P}$: Represents the stocks, ($\underline{n}$), at the beginning of a discrete time period, (t-1), multiplied by the transition matrix ($\underline{P}$) during the discrete time period, (t).
- $R(t)\underline{r}$: Represents the total recruits, R, entering the system during a discrete time period, (t), multiplied by the recruitment vector ($\underline{r}$). The recruitment vector represents the proportion of total recruitment that is distributed to each category.

A more detailed account of Markov models for manpower systems is provided in D. J. Bartholomew's, Stochastic Models for Social Processes.

D. WESTPAC ONE-YEAR TOUR EFFECTS

This section presents the data and methodology used to analyze the effects a WESTPAC one-year tour has on married/unaccompanied Marines. This discussion and the

corresponding analysis in the next chapter will address the secondary thesis research question:

> Other than the fiscal effects to the budget, what effect will extended unaccompanied rotational tour lengths have on readiness?

The effects a one-year tour may have on married/unaccompanied Marines are examined by using data obtained from a survey instrument, the 1993 Marine Corps Quality of Life Questionnaire. This discussion is organized into three subsections: (1) survey description, (2) the data, and (3) analysis methodology.

1. Survey Description

The 1993 Marine Corps Quality of Life Questionnaire was created by Dr. Elyse W. Kerce, Navy Personnel Research and Development Center (NPRDC). Dr. Kerce designed the questionnaire to support her Marine Corps Quality of Life (QOL) Assessment Model research, a multi-year project being conducted by the NPRDC on behalf of Headquarters, U.S. Marine Corps. The Marine Corps has a number of programs whose purposes are to improve the quality of life of Marines and their families, and to provide support services to assist them in coping with stresses of life in the Marine Corps [Ref. 21:p. 1]. The funding of these programs represents a substantial use of resources that the Marine Corps cannot afford to misuse. In their interim report, Outcome Variables

Used in the Marine Corps Quality of Life (QOL) Model, Dr. Kerce and Barrie Cooper, also of NPRDC, state:

> Although the primary justification for such funding is that it is "the right thing to do," it has also been implicitly understood that QOL programs should positively affect recruitment, individual performance, and retention of Marine personnel. A further presumption is that Marine Corps readiness will be improved as a result of these programs. [Ref. 21:p. 1]

Responses to the 1993 Marine Corps QOL Questionnaire provide the subjective and perceptual data needed for Dr. Kerce's research to assess the relationships between programs and desired organizational outcomes (i.e., performance, personal readiness, and intention to reenlist).

2. The Data

The 1993 Marine Corps QOL Questionnaire was administered to more than 10,000 active duty Marines and 5,000 spouses during the second and third quarters of FY 1993 [Ref. 21:p. 2]. The Marines were randomly selected and the sample was stratified by pay grade and location. The questionnaire contains well over a hundred questions that address demographics and how the Marines **feel** about their: life as a whole, residence, neighborhood, leisure/ recreation, health, friends/friendships, marriage/intimate relationship, relations with offspring, relations with relatives, income/standard of living, job, self, and hassles/uplifts.

The author of this thesis selected four questions from the survey instrument for the analysis. A demographic

question was selected to divide the sample personnel into three categories: married/accompanied by family, married/unaccompanied by family, and single. A geographic question was selected to allow the analysis to focus on only the WESTPAC Marines. Then, the author selected two subjective questions, depicted in Table 4-5 and Table 4-6, that likely relate to the negative effects of longer unaccompanied tours, as was discussed in Chapter II.

TABLE 4-5 LIFE AS A WHOLE

First, which point on the scale below best describes how you feel about your life as a whole at this time?
Terrible Unhappy Mostly unhappy Neither unhappy nor pleased Mostly pleased Pleased Delighted

TABLE 4-6 CAREER INTENTIONS

Which of the following statements BEST describes your career intentions at this time?
I intend to remain on active duty in the Marine Corps until eligible for retirement. I am eligible for retirement, but intend to stay. I intend to stay in, but not until retirement. I'm not sure what I intend to do. I intend to leave the Marine Corps as soon as I can. I intended to remain on active duty, but I am being released due to reduction in force.

The literature supports the observation that frequent and/or lengthy **family separations** are reasons Marines choose to leave the Marine Corps. Also, family separation is a source of stress for Marines, and stress can be a source of

lower productivity and morale. Therefore, the Marines' responses to the two survey questions (Tables 4-5 and 4-6) may indicate that unaccompanied tours have a negative effect on a married Marine's life as a whole and intent to stay in the Marine Corps.

3. Analysis Methodology

This subsection describes the methodologies used to analyze the unaccompanied one-year tour effects on married Marines. This description will proceed in three parts: a general description of hypothesis testing; the specific hypotheses used to analyze the WESTPAC one-year tour; and, the statistical analysis techniques.

a. Hypothesis Testing, the General Case

Inferential statistics are often used to make decisions about the value of a population mean or proportion. Inferential statistics are methods used to draw conclusions about a population based on data taken from a **sample** of the population [Ref. 22:p. 2]. One method of evaluating inferential statistics is to perform a **hypothesis test** on the test statistic (mean or proportion). A hypothesis test, using inferential statistics, is a statement that something is true about a population (inferred by the statistics taken from a sample of a population) [Ref. 22:p. 416].

Usually, there are two hypotheses in a hypothesis test; one is called the **null hypothesis** and the

other is called the **alternative hypothesis**. Weiss and Hassett, Introductory Statistics, define the two hypotheses as follows:

- Null hypothesis: A hypothesis to be tested. We use the symbol H_o to stand for null hypothesis.
- Alternative hypothesis: A hypothesis to be considered as an alternate to the null hypothesis. We use the symbol H_a to stand for alternative hypothesis.

Generally, the null hypothesis says that any variance (to an inferential statistic) found in a population is due to chance and not due to any statistically significant differences with the population. The alternative hypothesis states a different opinion about the population.

Choosing an alternative hypothesis depends on and should reflect the purpose in performing the hypothesis test [Ref. 22:p. 417]. Table 4-7 gives a simple example of a hypothesis test. Here, the null hypothesis postulates that the mean value of some variable in sub-group one equals the mean value of the variable in sub-group two (both sub-groups belong to the same population). The alternative hypothesis submits that the mean value of sub-group one's variable is different (does not equal) from the mean value of sub-group two's variable. The purpose of this hypothesis test would be to determine whether or not the null hypothesis should be rejected in favor of the alternative hypothesis.

TABLE 4-7 HYPOTHESIS TEST EXAMPLE

H_o: $Mean_{sub1} = Mean_{sub2}$
H_a: $Mean_{sub1} \neq Mean_{sub2}$

After null and alternative hypotheses are designed, a test statistic is computed to evaluate the null hypothesis. This test statistic is computed from the sample data and is compared to reference values that would indicate if the null hypothesis were true. This comparison value is a probability value (P-value) that interprets the validity of the null hypothesis [Ref. 23:p. 5]. A large P-value indicates that it would not be unlikely to observe the value for the test statistic if the null hypothesis were true. In other words a large P-value indicates that the null hypothesis cannot be rejected as possible. However, a small P-value indicates that it would be unlikely to observe the value for the test statistic if the null hypothesis were true. Therefore, a small P-value indicates that the null hypothesis is false [Ref. 22:p. 447].

The P-value can also be used to determine if the test results are **statistically significant**. Statistical significance refers to the probability of making a Type I error. A Type I error is the probability of rejecting a true null hypothesis. Traditionally, there are three acceptable levels of risking a Type I error: 0.10 (moderately significant), 0.05 (significant), and 0.01 (highly significant). Therefore, in designing a hypothesis test, a P-value is selected based on a significance level (0.10, 0.05, or 0.01); and when the data's test statistic compares favorably with the P-value, the alternative hypothesis can be

reasonably counted as true at the significance level used for computing the P-value.

b. WESTPAC One-Year Tour Hypotheses

The scope of this analysis is limited to the effects a WESTPAC one-year tour has on Marines. The literature indicates that the family separation caused by one-year unaccompanied tours might harm the performance, retention, and morale of married Marines. The survey performed with the 1993 Marine Corps Quality of Life Questionnaire produced a data base with over 10,000 Marines. In this data base are 607 Marines from WESTPAC. There are 40 officers (grades W-1 through O-6), 200 career enlisted (grades E-5 through E-9), and 367 first-term enlisted (grades E-2 through E-4, serving in their first enlistment). For the analysis, these Marines are separated by pay grade into three groups: officer, career enlisted force, and first-term Marines. Each of these groups will represent a **population**. The data for these populations will provide the statistics that infer the behavior of all officers, career enlisted, and first-term enlisted serving in WESTPAC. The remainder of this subsection describes the two hypotheses.

(1) Quality of Life. Table 4-5 presented the question that asked Marines how they felt about their life as a whole. Table 4-8 gives the hypotheses developed based on the Marines' responses to this question. The null hypothesis

is that the mean values for "life as a whole" are equal for Marines who are: married/accompanied by dependents, married/unaccompanied by dependents, and single. The alternative hypothesis is that the mean values between these subgroups are significantly different. This test is performed on each of the following populations: WESTPAC first-term Marines, WESTPAC career enlisted force, and WESTPAC officers. The purpose of this test is to find out if the data supports the inference that married/unaccompanied Marines view their life as a whole differently when compared to married/accompanied and single Marines.

TABLE 4-8 LIFE AS A WHOLE HYPOTHESES

H_o: $Mean_{acc} = Mean_{unacc} = Mean_{sgl}$ H_a: $Mean_{acc} \neq Mean_{unacc} \neq Mean_{sgl}$

(2) Intent to Stay in the Marine Corps. Table 4-6 presented the question that asked the Marines to reflect their intent to stay (past their current obligation) in the Marine Corps. Table 4-9 gives the hypotheses developed based on the Marines' responses to this question. The null hypothesis is that the mean values for "intent to stay in the Marine Corps" are equal for married/accompanied, married/unaccompanied, and single Marines. The alternative hypothesis is that the mean values between these subgroups are significantly different. This test is performed on each of the populations. The purpose of this test is to ascertain whether the married/unaccompanied Marines' intent to stay in

the Marine Corps is different when compared to married/ accompanied and single Marines.

TABLE 4-9 INTENT TO STAY IN THE U. S. MARINE CORPS

H_o: $Mean_{acc} = Mean_{unacc} = Mean_{sgl}$ H_a: $Mean_{acc} \neq Mean_{unacc} \neq Mean_{sgl}$

c. The Statistical Analysis

This thesis performs a statistical analysis of the data obtained from the 1993 Marine Corps Quality of Life Questionnaire. The data obtained from this survey instrument is analyzed based on the hypotheses developed in the previous subsection. The purpose of performing these hypothesis tests is to infer the effects a WESTPAC one-year unaccompanied tour has on married Marines. The statistical tools used for this analysis are bivariate and statistical significance analysis.

(1) Bivariate Analysis. Data that involve two characteristics of the members in a sample are called **bivariate**. The next chapter contains bivariate data tables that show the frequency and relative frequency of the responses to the survey questions. This presentation provides an opportunity to observe how the married/accompanied, married/unaccompanied, and single Marines' responses differ.

(2) Statistical Significance Analysis. In a statistical test that compares different groups within a population, the hypotheses are tested by partitioning the total variation in the data into variation due to differences

between groups and variation due to error. The error variation does not refer to mistakes in the data but to the natural variation within a group and variation due to other factors that are not considered in the hypothesis test. This thesis uses a statistical computer program, SAS, to analyze the data. SAS has an "analysis of variance" procedure called ANOVA that analyzes variation in data. The ANOVA test provides information on statistically significant differences of paired groups. Additionally, a post hoc test is required to identify which group means are statistically different among several groups [Ref. 23:p. 8].

The post hoc test used in this thesis is the TUKEY test. The TUKEY test is designed for pairwise comparisons between different groups of a population when the groups are of a different size. The TUKEY test can determine when two means are considered significantly different, and allows the analyst to reject the null hypothesis of equal population means. [Ref. 24:p. 944]

For this thesis, the ANOVA and TUKEY procedures are performed using SAS. The ANOVA test will identify when there is a statistically significant difference between married/accompanied, married/unaccompanied, and single Marines. The TUKEY test will isolate the possible difference between specific groups at the 0.05 significance level.

V. DATA ANALYSIS

A. OVERVIEW

The previous chapter described the data and methodologies used to perform the analysis. The purpose of this chapter is to present the analysis results that can lead to conclusions about the budget savings and readiness impacts of changing the operational and rotational PCS policies. In the first section, the financial data analysis is examined to determine if budget savings can be gained by changing PCS policy. The second section studies the Markov Chain Model analysis that simulates the movement of personnel within the current and proposed PCS policies. The final section examines the statistical analysis of the effects an unaccompanied tour may have on married Marines.

B. PCS SAVINGS ESTIMATE

This section analyzes the savings that can be achieved by changing Marine Corps tour length/PCS policy. The purpose of this analysis is to compare current PCS policy costs to proposed PCS policy costs. The corresponding section in the previous chapter introduced the data and analysis methodologies. This section presents the analysis in three parts: (1) the WESTPAC tour length change analysis; (2) the

operational tour length change analysis; and, (3) the analysis review.

1. The WESTPAC Rotational Tour Length Change Analysis

This subsection analyzes the effect changing the WESTPAC one-year tour to a two-year tour has on the Marine Corps PCS budget. In this analysis three PCS-cost estimates are computed. First, a WESTPAC rotational PCS-cost estimate is computed based on current PCS tour length policies; this is called the "status quo" option. Second, a PCS-cost estimate is computed that incorporates changing all the one-year tours to two-year tours. Third, a PCS-cost estimate is computed that applies the tour length change only to first-term Marines.

a. Status Quo PCS-Cost Estimate

PCS-cost estimates that represent the current policy are presented in this section. The current PCS policy establishes a three-year tour for married/accompanied Marines and a one-year tour for married/unaccompanied and single Marines. This presentation will proceed in three parts: (1) a PCS-cost estimate for officers; (2) a PCS-cost estimate for enlisted Marines; and, (3) a PCS-cost estimate review.

(1) Officer PCS-Cost Estimate. The move requirement is estimated by computing the accompanied three-year tour requirement separately from the unaccompanied/single one-year tour requirement. In Table 5-1, using Formulas 1, 2, and 3,

the officer rotations are estimated. This rotational move requirement, 1,229, is used to compute the officer rotational PCS-cost estimate.

TABLE 5-1 OFFICER ROTATIONS ESTIMATE

Formula 1: Billet Fill (BF) = Accomp Staffing Goal/Tour Length 271 = 813/3 Billet Fill (BF) = Unaccomp Staffing Goal/Tour Length 521 = 521/1 Total Billet Fill: 792 = 271 + 521 Formula 2: Move Requirement (REQ) = [BF - (.08*BF)]*2 1457 = [792 - (.08*792)]*2 Move Requirement (REQ) = 1457 Formula 3: Rotations (ROT) = REQ - .06*Access - .08*Sep 1229 = 1457 - .06*1348 - .08*1841 Rotations = 1229

In Table 5-2, the officer rotational PCS-cost estimate is computed. The officer rotational PCS-cost estimate equals $11.5 million.

TABLE 5-2 OFFICER ROTATIONAL PCS-COST ESTIMATE

Rotational PCS-Cost Estimate (EST) = ROT*Average PCS Cost EST = 1229*$9376 EST = $11.5 million

(2) Enlisted PCS-Cost Estimate. The enlisted move requirement is estimated using the same methodology as in the previous section. In Table 5-3, using Formulas 1, 2, and 3, the enlisted Marine rotations are computed. The rotational

move requirement, 17,749, is used to compute the enlisted rotational PCS-cost estimate.

TABLE 5-3 ENLISTED ROTATIONS ESTIMATE

Formula 1: Billet Fill (BF) = Accomp Staffing Goal/Tour Length 949 = 2846/3 Billet Fill (BF) = Unaccomp Staffing Goal/Tour Length 12051 = 12051/1 Total Billet Fill: 13000 = 949 + 12051 Formula 2: Move Requirement (REQ) = [BF - (.08*BF)]*2 23920 = [13000 - (.08*13000)]*2 Move Requirement (REQ) = 23920 Formula 3: Rotations (ROT) = REQ - .08*Access - .10*Sep 17749 = 23920 - .08*33464 - .10*34938 Rotations = 17749

In Table 5-4 the enlisted Marine rotational PCS-cost estimate is computed. The enlisted rotational PCS-cost estimate equals $48.5 million.

TABLE 5-4 ENLISTED ROTATIONAL PCS-COST ESTIMATE

Rotational PCS-Cost Estimate (EST) = ROT*Average PCS Cost EST = 17749*$2736 EST = $48.5 million

(3) PCS-Cost Estimate Review. The status quo officer and enlisted WESTPAC rotational PCS-cost estimates added together equal $60 million. This sum will be compared with subsequent PCS-cost estimates.

b. All One-Year Tours Change to Two-Year Tours

This section presents the PCS-cost estimates that reflect the proposed PCS policy: all of the one-year tours change to two-year tours. This presentation will proceed in three parts: (1) a PCS-cost estimate for officers; (2) a PCS-cost estimate for enlisted Marines; and, (3) a PCS-cost estimate review.

(1) Officer PCS-Cost Estimate. The move requirement is estimated by computing the accompanied three-year tour requirement separately from the unaccompanied/single two-year tour requirement. In Table 5-5, using Formulas 1, 2, and 3, the officer rotational move requirement is computed. The rotational move requirement, 751, is used to compute the officer rotational PCS-cost estimate.

TABLE 5-5 OFFICER ROTATIONS ESTIMATE

Formula 1:
Billet Fill (BF) = Accomp Staffing Goal/Tour Length
271 = 813/3

Billet Fill (BF) = Unaccom Staffing Goal/Tour Length
261 = 521/2

Total Billet Fill: 532 = 271 + 261

Formula 2:
Move Requirement (REQ) = [BF - (.08*BF)]*2
979 = [532 - (.08*532)]*2

Move Requirement (REQ) = 979

Formula 3:
Rotations (ROT) = REQ - .06*Access - .08*Sep
751 = 979 - .06*1348 - .08*1841

Rotations = 751

In Table 5-6, the officer rotational PCS-cost estimate is computed. The officer rotational PCS-cost estimate equals $7 million.

TABLE 5-6 OFFICER ROTATIONAL PCS-COST ESTIMATE

Rotational PCS-Cost Estimate (EST) = ROT*Average PCS Cost EST = 751*$9376 EST = $7 million

(2) Enlisted PCS-Cost Estimate. The enlisted move requirement is estimated using the same methodology as in the previous section. In Table 5-7, using Formulas 1, 2, and 3, the enlisted rotations are computed. This rotational move requirement, 6,663, is used to compute the enlisted rotational PCS-cost estimate.

TABLE 5-7 ENLISTED ROTATIONS ESTIMATE

Formula 1: Billet Fill (BF) = Accomp Staffing Goal/Tour Length 949 = 2846/3 Billet Fill (BF) = Unaccomp Staffing Goal/Tour Length 6026 = 12051/2 Total Billet Fill: 6975 = 949 + 6026 Formula 2: Move Requirement (REQ) = [BF - (.08*BF)]*2 12834 = [6975 - (.08*6975)]*2 Move Requirement (REQ) = 12834 Formula 3: Rotations (ROT) = REQ - .08*Access - .10*Sep 6663 = 12834 - .08*33464 - .10*34938 Rotations = 6663

In Table 5-8 the enlisted rotational PCS-cost estimate is computed. The enlisted rotational PCS-cost estimate for this option equals $18.2 million.

TABLE 5-8 ENLISTED ROTATIONAL PCS-COST ESTIMATE

Rotational PCS-Cost Estimate (EST) = ROT*Average PCS Cost EST = 6663*$2736 EST = $18.2 million

(3) PCS-Cost Estimate Review. By changing the one-year tour to a two-year tour, the officer and enlisted PCS-cost estimates summed equal $25.2 million. This reflects a $34.8 million savings compared to the status quo cost estimate (which was $60 million).

c. First-Term Marines Only

This section presents the PCS-cost estimates that reflect the proposed PCS policy: one-year tour change to two-year tour for first-term Marines only. This presentation will proceed in three parts: (1) the officer PCS-cost estimate; (2) a PCS-cost estimate for enlisted Marines; and, (3) a PCS-cost estimate review.

(1) Officer PCS-Cost Estimate. This PCS-cost estimate equals the status quo officer cost estimate because there are no tour length changes for officers in this option. Therefore, the officer PCS-cost estimate is the same $11.5 million that was computed in Table 5-4.

(2) Enlisted PCS-Cost Estimate. This PCS policy affects only the first-term Marines. Therefore, three enlisted tour length categories exist within this option: (1) accompanied career enlisted force Marines serving on three-year tours, (2) unaccompanied or single career enlisted force Marines serving on a one-year tour, and, (3) unaccompanied and single first-term Marines serving on the two-year tour. Approximately 32 percent of the enlisted force is comprised of career force Marines, and conversely the first-term enlisted comprise 68 percent of the enlisted force. Therefore, Table 5-9 gives a population estimate for the WESTPAC accompanied career enlisted force, unaccompanied or single career enlisted force, and first-term enlisted force. The accompanied career enlisted force is 2,846; this quantity was provided by the WESTPAC commands. The unaccompanied or single career enlisted force is equal to 1,921 based on the estimated total WESTPAC career enlisted force population of 4,767. The first-term enlisted force of 10,130 is based on 68 percent of the WESTPAC enlisted population (14,897).

TABLE 5-9 WESTPAC ENLISTED POPULATION BREAKDOWN

WESTPAC Enlisted Population = 14897
Career enlisted Force: .32*14897 = 4767
Accompanied Career Enlisted Force = **2846**
Unaccompanied or Single Career Enlisted Force: 4767 - 2846 = **1921**
First-Term Enlisted Force: .68*14897 = **10130**

The enlisted move requirement is estimated using the same methodology as in previous sections. However, in this case the requirements are computed for three enlisted categories. In Table 5-10, using Formulas 1, 2, and 3, the enlisted Marine rotations are computed. The rotational move requirement, 8,429, is used to compute the enlisted rotational PCS-cost estimate.

TABLE 5-10 ENLISTED ROTATIONS ESTIMATE

Formula 1:
Billet Fill (BF) = Accomp Staffing Goal/Tour Length
949 = 2846/3

Billet Fill (BF) = Unaccomp Staffing Goal/Tour Length
1921 = 1921/1

Billet Fill (BF) = First-Term Marines/Tour Length
5065 = 10130/2

Total Billet Fill: 7935 = 949 + 1921 + 5065

Formula 2:
Move Requirement (REQ) = [BF - (.08*BF)]*2
14600 = [7935 - (.08*7935)]*2

Move Requirement (REQ) = 14600

Formula 3:
Rotations (ROT) = REQ - .08*Access - .10*Sep
8429 = 14600 - .08*33464 - .10*34938

Rotations = 8429

In Table 5-11 the enlisted rotational PCS-cost estimate is presented. The enlisted rotational PCS-cost estimate for this option equals $23 million.

TABLE 5-11 ENLISTED ROTATIONAL PCS-COST ESTIMATE

Rotational PCS-Cost Estimate (EST) = ROT*Average PCS Cost
EST = 8429*$2736
EST = $23 million

(3) PCS-Cost Estimate Review. By changing the one-year tour to a two-year tour, for the first-term Marines only, the officer and enlisted PCS-cost estimates summed equal $34.5 million. This is a $25.5 million savings compared to the status quo cost estimate (which was $60.0 million).

2. The CONUS Operational Tour Length Change Analysis

This subsection analyzes the effects that changing the operational three-year tour to a four-year tour would have on the Marine Corps PCS budget. In this analysis three PCS-cost estimates are computed. First, an operational PCS-cost estimate is computed based on current PCS tour length policies; this is called the "status quo" option. Second, a PCS-cost estimate is computed that incorporates changing all the three-year tours to four-year tours. Third, a PCS-cost estimate is computed that excludes applying the tour length change to the billet assignments identified in Table 4-1 and Table 4-2 because of the potential harm to a Marine's career development and personal readiness.

a. Status Quo PCS-Cost Estimate

This section presents the PCS-cost estimate that represents the current policy. The current operational PCS policy dictates a standard three-year tour length for career officers and enlisted Marines. This presentation proceeds in three parts: (1) an officer PCS-cost estimate, (2) an enlisted Marine PCS-cost estimate and, (3) a PCS-cost review.

(1) Officer PCS-Cost Estimate. The move requirement is estimated by taking a three-year average of the officer operational moves based on Marine Corps move estimates for fiscal years 1993, 1994, and 1995. In Table 5-12 the officer operational moves are estimated. The officer move quantity equals 1,860, and this quantity is used to compute the officer operational PCS budget estimate [Ref. 16:p. 87].

TABLE 5-12 OPERATIONAL MOVE ESTIMATES

Fiscal Year	Operational Move Estimates:
1993:	1915
1994:	1832
1995:	+1832
	5579/3 = 1860 Moves

In Table 5-13 the officer PCS budget estimate is computed. The status quo officer operational PCS-cost estimate equals $17.1 million.

TABLE 5-13 OPERATIONAL PCS-COST ESTIMATE

Budget Estimate = Officer Moves*$9219
$17.1 million = 1860*$9219

(2) Enlisted PCS-Cost Estimate. The enlisted move requirement is estimated using the same methodology as in the previous section. In Table 5-14 the enlisted Marine moves are computed. The enlisted Marine move quantity equals 11,357, and is used to compute the enlisted Marine operational PCS budget estimate [Ref. 16:p. 88].

TABLE 5-14 OPERATIONAL MOVE ESTIMATES

Fiscal Year	Operational Move Estimates:
1993:	11858
1994:	10407
1995:	+11807
	34072/3 = 11357

In Table 5-15 the enlisted PCS budget estimate is computed. The status quo enlisted rotational PCS-cost estimate equals $33.8 million.

TABLE 5-15 OPERATIONAL PCS-COST ESTIMATE

Budget Estimate = Enlisted Moves*$2976
$33.8 million = 11357*$2976

(3) PCS-Cost Estimate Review. The status quo officer and enlisted operational PCS-cost estimates added together equal $50.9 million. This sum is compared with subsequent operational PCS-cost estimates.

b. Four-Year Tour PCS-Cost Estimate

This section presents the PCS-cost estimate that represents the proposed PCS policy: all three-year tours change to four-year tours. This presentation proceeds in three parts: (1) an officer PCS-cost estimate, (2) an enlisted Marine PCS-cost estima nd, (3) a PCS-cost estimate review.

(1) Officer PCS-Cost Estimate. The officer move requirement is estimated by computing the **status quo** two-year tour billets separately from the three-year tour billets to avoid any flaws in the results. Table 5-16 gives the two-year tour billet move requirement recomputed relative to the

results in Table 4-1. The column is summed and divided by the new four-year tour length to obtain the new operational move estimate for these billets. The new estimate, 20, is added to the move estimate in Table 5-17.

TABLE 5-16 TWO-YEAR BILLET MOVE ESTIMATE

Billet	24 Months
Marine Security Forces	12
Forward Air Controllers and Air Officers	68
Total	80/4yrs
Moves per year	20

In Table 5-17, an officer move estimate that reflects the change to a four-year tour is computed. The officer move quantity equals 1,385, and is used to compute the officer operational PCS budget estimate.

TABLE 5-17 OPERATIONAL PCS-MOVE ESTIMATE

FY Operational Move Estimates minus Two-year Billets:

1993:	1915 - 40 =	1875
1994:	1832 - 40 =	1792
1995:	1832 - 40 =	+1792
		5459/4 = 1365

New Operational Move Estimate plus Table 5-16 Move Est:

1365
+ 20
1385

In Table 5-18 the officer PCS budget estimate is computed. The four-year tour officer operational PCS-cost estimate equals $12.8 million.

TABLE 5-18 OPERATIONAL PCS-COST ESTIMATE

Budget Estimate = Officer Moves*$9219
$12.8 million = 1385*$9219

(2) Enlisted PCS-Cost Estimate. The enlisted move requirement is estimated using the same methodology as in the previous section. Table 5-19 gives the enlisted two-year tour billet move requirement recomputed relative to the results in Table 4-2. The new estimate, 290, is added to the move estimate in Table 5-20.

TABLE 5-19 TWO-YEAR BILLET MOVE ESTIMATE

Billet	24 Months
Drill Instructor Duty	1108
Combat Cargo Duty	52
Total	1160/4
Moves per year	290

In Table 5-20 an enlisted move estimate is computed that reflects the change to a four-year tour. The enlisted Marine moves equal 8,373, and are used to compute the enlisted Marine operational PCS budget estimate.

TABLE 5-20 OPERATIONAL PCS-MOVE ESTIMATE

FY Operational Move Estimates minus Two-Year Billets:

1993:	11858	- 580	=	11278
1994:	10407	- 580	=	9827
1995:	11807	- 580	=	+11227
				32332/4 = 8083

New Operational Move Estimate plus Table 5-19 Move Est:

8083
+ 290
8373

In Table 5-21 the enlisted Marine operational PCS budget estimate is computed. The four-year tour enlisted Marine operational PCS-cost estimate equals $24.9 million.

TABLE 5-21 OPERATIONAL PCS-COST ESTIMATE

Budget Estimate = Enlisted Moves*$2976 $24.9 million = 8373*$2976

(3) PCS-Cost Estimate Review. The four-year tour officer and enlisted Marine operational PCS-cost estimates added together equal $37.7 million. This reflects a $13.2 million savings compared to the status quo cost estimate (which was $50.9 million).

c. Four-Year Tour PCS-Cost Estimate With Exceptions

This section presents the PCS-cost estimate that represents the proposed PCS policy: all three-year tours change to four-year tours except those billets in which career development and personal readiness might be harmed. This presentation proceeds in three parts: (1) an officer PCS-cost estimate, (2) an enlisted Marine PCS-cost estimate and, (3) a PCS-cost estimate review.

(1) Officer PCS-Cost Estimate. The officer move requirement is estimated by separating the billets identified in Table 4-1 from the mover population, adjusting the mover population to a four-year tour estimate, and then adding the excepted movers to the four-year tour estimate. Table 5-22 gives the officer move estimate that reflects the change to a four-year tour. The officer move quantity equals 1,609, and this quantity is used to compute the officer operational PCS budget estimate.

TABLE 5-22 OPERATIONAL PCS-MOVE ESTIMATE

FY Operational Move Estimates minus Table 4-1 Moves: 1993: 1915 - 856 = 1059 1994: 1832 - 856 = 976 1995: 1832 - 856 = +976 3011/4 = 753 New Operational Move Estimate plus Table 4-1 Moves: 753 +856 1609

In Table 5-23 the officer PCS budget estimate is computed. This four-year tour officer operational PCS-cost estimate equals $14.8 million.

TABLE 5-23 OPERATIONAL PCS-COST ESTIMATE

Budget Estimate = Officer Moves*$9219 $14.8 million = 1609*$9219

(2) Enlisted PCS-Cost Estimate. The enlisted move requirement is estimated using the same methodology as in the previous section. Table 5-24 gives the enlisted Marine move estimate that reflects the change to a four-year tour excluding the billets listed in Table 4-2. The enlisted Marine move quantity equals 9,058, and this quantity is used to compute the enlisted Marine operational PCS budget estimate.

TABLE 5-24 OPERATIONAL PCS-MOVE ESTIMATE

FY Operational Move Estimates minus Table 4-2 Moves:				
1993:	11858	- 2159 =	9699	
1994:	10407	- 2159 =	8248	
1995:	11807	- 2159 =	+9648	
			27595/4 = 6899	
New Operational Move Estimate plus Table 4-2 Moves:				
			6899	
			+2159	
			9058	

In Table 5-25 the enlisted Marine operational PCS budget estimate is computed. The four-year tour enlisted Marine operational PCS-cost estimate equals $27 million.

TABLE 5-25 OPERATIONAL PCS-COST ESTIMATE

Budget Estimate = Enlisted Moves*$2976
$27 million = 9058*$2976

(3) PCS-Cost Estimate Review. The four-year tour officer and enlisted Marine operational PCS-cost estimates added together equal $41.8 million. This reflects a $9.1 million savings compared to the status quo cost estimate (which was $50.9 million).

3. The Analysis Review

The analysis indicates that the PCS budget can be reduced by extending tour lengths, thereby reducing the PCS-move frequency. This general result was expected. The purpose of this analysis was to determine the savings magnitude, and it appears that substantial savings can be achieved by changing any one of the proposed options. The

rotational and operational PCS-move analysis results are discussed in the next two subsections.

a. Rotational Move Analysis Results

Three rotational PCS policy options were analyzed: the status quo, change all one-year tours to two years, and change first-term Marine tour lengths only. Table 5-26 summarizes the results from the analysis.

TABLE 5-26 ROTATIONAL PCS-MOVE SAVINGS SUMMARY

Option	Cost ($M)	Savings ($M)
Status Quo	60.0	0
All 1-Yrs Tour to 2-Yrs	25.2	34.8
All 1-Yrs Tour to 2-Yrs for First-Term Marines Only	34.5	25.5

As can be observed, changing all the one-year tours to two years yields the most savings, $34.8 million. The reader should be reminded that some variance in the analysis may exist because averaged rotational PCS costs were used. Using an average PCS cost might be appropriate if the reduction in PCS moves were evenly distributed throughout the officer, enlisted, married/accompanied, married/unaccompanied, and single Marine populations. However, this is not the case; the policy change affects the least costly Marines the most, the first termers. Consequently, the move reductions predominately affect single and unaccompanied first-term Marines whose actual PCS costs are probably less than the average cost used in the analysis. Therefore, the cost

savings in this analysis are probably inflated. More accurate cost data is needed to improve the accuracy.

b. Operational Move Analysis Results

Three operational PCS-move policy options were analyzed: the status quo, four-year tours for all, and four-year tours with exceptions. Table 5-27 summarizes the results from the analysis.

TABLE 5-27 OPERATIONAL PCS-MOVE SAVINGS SUMMARY

Option	Cost ($M)	Savings ($M)
Status Quo	50.9	0
4-Year Tours for All	37.7	13.2
4-Year Tours w/Except	41.8	9.1

Relative to the rotational PCS move analysis, these savings are smaller. However, both options offer sizable savings compared to the current policy (status quo). One potentially inherent flaw in this analysis is the question: Is a four-year operational tour **feasible**? The answer to this question is pursued in the next section.

C. PCS MOVE SIMULATION ANALYSIS

This section analyzes the movement of personnel by using the Markov Chain Model. The purpose of this analysis is to compare the assignment effects of current and proposed PCS policies. The hypotheses are:

- Increasing the WESTPAC (rotational) unaccompanied tour length from one year to two years will reduce personnel shortages and overages in the entire ground supply majors' system.

- However, increasing the duration of the CONUS (operational) tours will exacerbate personnel shortages and overages in the ground supply majors' system.

For this analysis, the Marine population introduced in the previous chapter, ground supply majors, will be analyzed. This section is divided into three subsections: (1) the assumptions, (2) the system design, and, (3) the analysis review.

1. Assumptions

The Markov Chain Model analysis will show that different PCS policies affect the flow and distribution of ground supply majors. However, some assumptions are necessary to insure that the observed effects are controlled, that is, the scope of the analysis is limited to the hypothesis criteria. The assumptions are:

- The total number of ground supply majors remains constant at 123.
- The current distribution of ground supply majors is the desired objective: WP/3 = nine, WP/1 = six, CF/3 = fifty-nine, CS/3 = thirty-seven, T/2 = four, T/1 = eight. This means that the end stocks, $\underline{n}(t)$, should equal the beginning stocks, $\underline{n}(t-1)$, and implies that the system is in steady state.
- Attrition (w_i) of ground supply majors remains constant. For this simulation, 12.2 percent of the majors leave each category per fiscal year. This equates to approximately fifteen majors a year who are promoted to lieutenant colonel or are separated from the Marine Corps.
- Recruitment, $\underline{R}(t)\underline{r}$, of ground supply majors remains constant. This refers to the total number and proportional distribution of ground supply captains who are promoted to major each fiscal year.

- The recruitment and attrition quantities are equal. Therefore, approximately fifteen majors, proportionally distributed, enter and leave this system's population. By making this assumption, the total population can be controlled and maintained at 123 majors. Also, changes in category distribution are controlled for recruitment and attrition.

Presented with these assumptions and the data from the sample population, the MCM can predict the effects that current and proposed policies may have on the distribution of the ground supply majors' population.

2. System Design

Within this subsection three alternatives are designed to reflect current and proposed PCS policy "systems." First is the current policy (the status quo) where there are: three-year accompanied WESTPAC tours, one-year unaccompanied WESTPAC tours, three-year CONUS FMF tours, three-year supporting establishment tours, two-year school tours, and one-year school tours. Second is the proposed rotational move policy (WESTPAC) change, where there are: three-year accompanied WESTPAC tours, **two-year unaccompanied WESTPAC** tours, three-year CONUS FMF tours, three-year supporting establishment tours, two-year school tours, and one-year school tours. Third is the proposed operational move policy (CONUS) change, where there are: three-year accompanied WESTPAC tours, one-year unaccompanied WESTPAC tours, **four-year CONUS FMF** tours, **four-year supporting establishment** tours, two-year school tours, and one-year school tours.

In Chapter IV, the Markov Chain Model equation was presented: $\underline{n}(t) = \underline{n}(t-1)\underline{P} + R(t)\underline{r}$. Based on the assumptions discussed in the previous subsection, all elements of this equation except the transition matrix ($\underline{P}$) and end stocks are controlled and constant. The $\underline{P}$ matrix reflects the differences among the three alternatives because the tour lengths in one or more of a system's categories are different. Consequently, if one alternative maintains the desired distribution of ground supply majors better than another alternative, this indicates a better fit (produces the desired equilibrium) between category stocks and tour lengths.

a. Status Quo Alternative

The transition matrix for the status quo alternative is exhibited in Table 5-28. The top and left margins identify the different categories. There are two CF/3 categories. The CF/3 category was split in half to control for the ground supply majors who may move from one CF/3 location to another CF/3 location (i.e., Camp Pendleton, CA to Camp Lejeune, NC). The same is true of the CS/3 category. However, the other categories are not represented twice because PCS moves beginning in these categories never end in the same category. Additionally, as a matter of policy, moves between WP/3 and WP/1 do not occur; and moves between T/2 and T/1 do not occur.

TABLE 5-28 STATUS QUO TRANSITION MATRIX

	WP/3	WP/1	CF/3	CF/3	CS/3	CS/3	T/2	T/1	Attrition
WP/3	.585	0	.081	.078	.052	.049	.011	.022	.122
WP/1	0	0	.244	.236	.154	.146	.033	.065	.122
CF/3	.028	.019	.585	.091	.060	.057	.013	.025	.122
CF/3	.028	.019	.093	.585	.059	.056	.013	.025	.122
CS/3	.025	.017	.084	.082	.585	.051	.011	.023	.122
CS/3	.025	.017	.084	.081	.053	.585	.011	.022	.122
T/2	.036	.024	.118	.115	.075	.071	.439	0	.122
T/1	.071	.048	.237	.229	.150	.143	0	0	.122

Table 5-29 presents a conservation of flow diagram that represents the effects of the status quo alternative after the first fiscal year transpires when using the MCM. The numbers within the matrix come from the probabilities in Table 5-28 multiplied by the beginning stocks in Table 5-29. For example, the number of majors who move from WP/3 to T/1 (the "cell" that represents the intersection of the WP/3 row and T/1 column) equals the corresponding probability from Table 5-28, .022, multiplied by the WP/3 beginning stock, 9, or .198 "stocks" in the T/1 category after one fiscal year passes. Summing the categories horizontally gives the beginning stocks, which are listed along the right-side margin. Summing the categories vertically gives the ending

stocks (listed along the bottom margin) after the passing of one fiscal year. Changes to the distribution of ground supply majors are reflected by comparing the ending stocks to the beginning stocks. With a MCM computer program, MARKOV, multiple fiscal year manipulations of the MCM can be performed [Ref. 25:p. 32].

TABLE 5-29 STATUS QUO CONSERVATION OF FLOW

	WP/3	WP/1	CF/3	CF/3	CS/3	CS/3	T/2	T/1	Attrition	Beginning Stocks
Recruits	1	1	4	4	2	2	1	0		
WP/3	5.265	0	.729	.702	.468	.441	.099	.198	1.098	9
WP/1	0	0	1.464	1.416	.924	.876	.198	.390	.732	6
CF/3	.84	.57	17.55	2.73	1.80	1.71	.39	.75	3.66	30
CF/3	.812	.551	2.697	16.965	1.711	1.624	.377	.725	3.538	29
CS/3	.475	.323	1.596	1.558	11.115	.969	.209	.437	2.318	19
CS/3	.45	.306	1.512	1.458	.954	10.53	.198	.396	2.196	18
T/2	.144	.096	.472	.46	.30	.284	1.756	0	.488	4
T/1	.568	.384	1.896	1.832	1.20	1.144	0	0	.976	8
End Stocks	9.554 ≅ 10	3.23 ≅ 3	31.916 ≅ 32	31.121 ≅ 31	20.472 ≅ 20	19.578 ≅ 20	4.227 ≅ 4	2.896 ≅ 3	15.006 ≅ 15	

Table 5-30 reflects the "steady state" for this policy alternative; using MARKOV a steady state was achieved after the fourth fiscal year passed.

TABLE 5-30 STATUS QUO STEADY STATE DISTRIBUTION

WP/3	WP/1	CF/3	CF/3	CS/3	CS/3	T/2	T/1
10	3	31	31	21	20	4	3

The status quo's performance is demonstrated by comparing the beginning stocks in Table 5-29 to the steady state stocks in Table 5-30. Shortages are observed in the WP/1, and T/1 categories, where the number in steady state is less than the beginning stock. Also, overages are observed in the WP/3, CF/3 and CS/3 categories, where the number in steady state is greater than the beginning stock.

b. WESTPAC Alternative

The WESTPAC transition matrix is exhibited in Table 5-31. The WESTPAC transition matrix is different from the status quo transition matrix because the WESTPAC unaccompanied tour length has increased to two years. In Table 5-31, only the horizontal WP/2 line has changed when compared to the status quo transition matrix (Table 5-28).

TABLE 5-31 WESTPAC TRANSITION MATRIX

	WP/3	WP/1	CF/3	CF/3	CS/3	CS/3	T/2	T/1	Attrition
WP/3	.585	0	.081	.078	.052	.049	.011	.022	.122
WP/2	0	.439	.122	.118	.077	.073	.016	.033	.122
CF/3	.028	.019	.585	.091	.060	.057	.013	.025	.122
CF/3	.028	.019	.093	.585	.059	.056	.013	.025	.122
CS/3	.025	.017	.084	.082	.585	.051	.011	.023	.122
CS/3	.025	.017	.084	.081	.053	.585	.011	.022	.122
T/2	.036	.024	.118	.115	.075	.071	.439	0	.122
T/1	.071	.048	.237	.229	.150	.143	0	0	.122

Table 5-32 presents a conservation of flow diagram that presents the WESTPAC effects after the first fiscal year transpires in this manual MCM manipulation. The end stocks are listed along the bottom margin. The change to the distribution of ground supply majors is observed by comparing the end stocks to the beginning stocks.

TABLE 5-32 WESTPAC CONSERVATION OF FLOW

	WP/3	WP/1	CF/3	CF/3	CS/3	CS/3	T/2	T/1	Attrition	Beginning Stocks
Recruits	1	1	4	4	2	2	1	0		
WP/3	5.265	0	.729	.702	.468	.441	.099	.198	1.098	9
WP/2	0	2.634	.732	.708	.462	.438	.096	.198	.732	6
CF/3	.84	.57	17.55	2.73	1.80	1.71	.39	.75	3.66	30
CF/3	.812	.551	2.697	16.965	1.711	1.624	.377	.725	3.538	29
CS/3	.475	.323	1.596	1.558	11.115	.969	.209	.437	2.318	19
CS/3	.45	.306	1.512	1.458	.954	10.53	.198	.396	2.196	18
T/2	.144	.096	.472	.46	.30	.284	1.756	0	.488	4
T/1	.568	.384	1.896	1.832	1.20	1.144	0	0	.976	8
End Stocks	9.554 ≅ 10	5.864 ≅ 6	31.184 ≅ 31	30.413 ≅ 30	20.01 ≅ 20	19.14 ≅ 19	4.125 ≅ 4	2.704 ≅ 3	15.006 ≅ 15	

Using the computer model, a steady state is achieved after the fourth fiscal year is run, Table 5-33. The performance of the WESTPAC alternative is demonstrated by comparing the beginning stocks in Table 5-32 to the steady state stocks in Table 5-33. The T/1 category has the only shortage. Overages are observed in the WP/3, CF/3, and CS/3 categories.

TABLE 5-33 WESTPAC STEADY STATE DISTRIBUTION

WP/3	WP/2	CF/3	CF/3	CS/3	CS/3	T/2	T/1
10	6	31	20	20	19	4	3

c. CONUS Alternative

The CONUS transition matrix is exhibited in Table 5-34. The CONUS transition matrix is different from the status quo transition matrix because the CONUS (CF and CS) tour length has increased to four years. In Table 5-34, the horizontal lines, CF/4 and CS/4, have changed compared to the status quo transition matrix.

TABLE 5-34 CONUS TRANSITION MATRIX

	WP/3	WP/1	CF/4	CF/4	CS/4	CS/4	T/2	T/1	Attrition
WP/3	.585	0	.081	.078	.052	.049	.011	.022	.122
WP/1	0	0	.244	.236	.154	.146	.033	.065	.122
CF/4	.021	.014	.659	.068	.045	.042	.010	.019	.122
CF/4	.021	.014	.070	.659	.044	.042	.009	.019	.122
CS/4	.019	.013	.063	.061	.659	.038	.008	.017	.122
CS/4	.019	.013	.062	.060	.040	.659	.008	.017	.122
T/2	.036	.024	.118	.115	.075	.071	.439	0	.122
T/1	.071	.048	.237	.229	.150	.143	0	0	.122

Table 5-35 presents a conservation of flow diagram that presents the effects of the CONUS policy alternative on the distribution of majors after the first fiscal year transpires. The changes to this distribution are reflected along the bottom margin when compared to the beginning stocks.

TABLE 5-35 CONUS CONSERVATION OF FLOW

	WP/3	WP/1	CF/3	CF/3	CS/3	CS/3	T/2	T/1	Attrition	Beginning Stocks
Recruits	1	1	4	4	2	2	1	0		
WP/3	5.265	0	.729	.702	.468	.441	.099	.198	1.098	9
WP/1	0	0	1.464	1.416	.924	.876	.198	.390	.732	6
CF/4	.63	.42	19.77	2.04	1.35	1.26	.30	.57	3.66	30
CF/4	.609	.406	2.03	19.111	1.276	1.218	.261	.551	3.538	29
CS/4	.361	.247	1.197	1.159	12.521	.722	.152	.323	2.318	19
CS/4	.342	.234	1.116	1.08	.72	11.862	.144	.306	2.196	18
T/2	.144	.096	.472	.46	.30	.284	1.756	0	.488	4
T/1	.568	.384	1.896	1.832	1.20	1.144	0	0	.976	8
End Stocks	8.919 ≅ 9	2.787 ≅ 3	32.674 ≅ 33	31.800 ≅ 32	20.759 ≅ 21	19.807 ≅ 20	3.91 ≅ 4	2.338 ≅ 2	15.006 ≅ 15	

Using the computer model, Table 5-36 shows that steady state is achieved after the third fiscal year is run. This alternative's performance is demonstrated by comparing the beginning stocks in Table 5-35 to the steady state stocks in Table 5-36. Shortages are observed in the WP/3, WP/1, and

T/1 categories. Overages are observed in the CF/4 and CS/4 categories.

TABLE 5-36 CONUS STEADY STATE DISTRIBUTION

WP/3	WP/1	CF/4	CF/4	CS/4	CS/4	T/2	T/1
8	3	33	32	21	20	4	2

3. The Analysis Review

Earlier in this section, the author hypothesized that increasing the duration of WESTPAC unaccompanied tours will reduce personnel shortages and overages in the ground supply majors' system. Also, that longer CONUS (operational) tours will exacerbate personnel shortages and overages. The analysis results are summarized in Table 5-37. This table presents this system's beginning distribution and steady state stocks for the three PCS policy alternatives. The parenthetically enclosed numbers adjacent to the steady stocks reflects the percent difference between that personnel stock compared with the beginning distribution stocks. Along the bottom margin, the best performing alternative in each category is noted. "Best" is defined as the smallest difference or the closest quantity to the desired distribution.

TABLE 5-37 CATEGORY DISTRIBUTION PERFORMANCE

	WP/3	WP/unacc	CF/3 or 4	CF/3 or 4	CS/3 or 4	CS/3 or 4	T/2	T/1
Beginning Stocks	9	6	30	29	19	18	4	8
Status Quo	10(.111)	3(.50)	31(.033)	31(.069)	21(.105)	20(.111)	4(0.0)	3(.625)
WESTPAC	10(.111)	6(0.0)	31(.033)	30(.034)	20(.052)	19(.056)	4(0.0)	3(.625)
CONUS	8(.111)	3(.50)	33(.10)	32(.103)	21(.105)	20(.111)	4(0.0)	2(.75)
Performance	Tie	WESTPAC	CONUS & WESTPAC Tie	WESTPAC	WESTPAC	WESTPAC	Tie	CONUS & WESTPAC Tie

For every category, the WESTPAC alternative is the best performing alternative or is tied with one or both of the other alternatives for having the least variation compared to the beginning distribution. The status quo alternative is the next best and the CONUS alternative is the worst.

D. WESTPAC ONE-YEAR TOUR ANALYSIS

This section analyzes the effects a WESTPAC unaccompanied one-year tour has on married Marines. The purpose of this analysis is to determine if there is a statistically significant difference between married/accompanied, married/unaccompanied, and single WESTPAC Marines in how they view their life as a whole (LAAW) and in their intent to stay in the Marine Corps (past their current obligation). The previous chapter presented the data and analysis methodologies. This section presents the analysis in three parts: (1) the quality of life; (2) the intent to stay in the Marine Corps; and, (3) the analysis review.

1. The Quality of Life

This section analyzes the effect a WESTPAC unaccompanied tour has on the way a married Marine views his/her life as a whole. The hypothesis test for this analysis is presented in Table 5-38. The null hypothesis is that the mean values for "how the Marine views his or her life as a whole" are equal for married/accompanied, married/unaccompanied, and single Marines. The alternative hypothesis is that the married/unaccompanied Marine's mean value is different from that of the married/accompanied and single Marines. The WESTPAC Marines are divided into first-term enlisted, career enlisted force, and officer populations. These three population groups are analyzed separately using the bivariate, ANOVA, and (as required) TUKEY procedures.

TABLE 5-38 LIFE AS A WHOLE HYPOTHESES

H_o:	$Mean_{acc} = Mean_{unacc} = Mean_{sgl}$
H_a:	$Mean_{acc} \neq Mean_{unacc} \neq Mean_{sgl}$

a. First-Term WESTPAC Marines

There are 349 first-term WESTPAC Marines in the QOL data set. In Table 5-39, these Marines are grouped in a bivariate contingency table that stratifies the Marines by two characteristics, their accompanied/unaccompanied/single status (left margin) and "how they view their life as whole" (top margin). The "mostly pleased," "pleased," "and delighted" columns, summed, present the relative frequency (proportion) of Marines who view their LAAW in a positive way, based on

their accompanied (ACC), unaccompanied (UNACC), or single (SGL) status. The parenthetically enclosed number is the quantity of Marines for that particular row category (ACC/UNACC/SGL). The ACC subgroup has a 77.8 percent frequency (summing: mostly pleased - 38.9 percent, pleased - 38.9, and delighted - 0.0) of viewing their LAAW positively, to some extent, the UNACC subgroup has a 53.7 percent frequency, and the SGL subgroup has a 49.5 percent frequency.

TABLE 5-39 FIRST-TERM MARINES' LIFE AS A WHOLE

	Terrible	Unhappy	Mostly Unhappy	Neither Unhappy or Pleased	Mostly Pleased	Pleased	Delighted	Mostly Pleased to Delighted	Total
ACC	0.0 (0)	0.0 (0)	5.5 (1)	16.7 (3)	38.9 (7)	38.9 (7)	0.0 (0)	77.8 (14)	5.2 (18)
UNACC	5.5 (3)	1.9 (1)	14.8 (8)	24.1 (13)	27.8 (15)	14.8 (8)	11.1 (6)	53.7 (29)	15.6 (54)
SGL	5.1 (14)	4.7 (13)	8.7 (24)	31.8 (88)	25.6 (71)	19.8 (55)	4.3 (12)	49.7 (138)	79.2 (277)
TOTAL	4.9 (17)	4.0 (14)	9.5 (33)	29.8 (104)	26.6 (93)	20.1 (70)	5.1 (18)	51.9 (181)	100.0 (349)

Note: Quantities for each cell appear in parentheses ().

The ANOVA test results are presented in Table 5-40. This analysis of variance procedure indicates that there is no statistically significant difference between the three subgroups in how the ACC/UNACC/SGL Marines view their LAAW. A statistical significance would be portrayed by an **F Value** (the test statistic) of approximately 5.0 or higher and a **Pr**

> F of 0.05 or lower (the probability of making a Type I error). In this case, the F Value, 1.92, is too low to indicate a statistical significance. Also, the Pr > F is too high, meaning that if the null hypothesis is rejected, there is a .1489 probability that rejecting the null hypothesis is a mistake. Therefore, the null hypothesis cannot be rejected, and this means that there is no significant difference between married/accompanied, married/unaccompanied, and single WESTPAC first-term Marines in the way they view their LAAW. The TUKEY procedure is not performed because the ANOVA procedure has indicated that the null hypothesis cannot be rejected.

TABLE 5-40 FIRST-TERM MARINE ANOVA TABLE

Dependent Variable: LIFEWH1					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	7.54611479	3.77305740	1.92	0.1489
Error	346	681.70316887	1.97024037		
Corrected Total	348	689.24928367			
	R-Square	C.V.	Root MSE		LIFEWH1 Mean
	0.010948	31.18235	1.4036525		4.5014327
Source	DF	Anova SS	Mean Square	F Value	Pr > F
STATUS	2	7.54611479	3.77305740	1.92	0.1489

b. Career Enlisted WESTPAC Marines

There are 182 career enlisted WESTPAC Marines in the QOL data set. In Table 5-41, these Marines are grouped in a bivariate contingency table. The ACC subgroup has an 80.0 percent frequency (summing: mostly pleased - 31.6 percent, pleased - 38.9 percent, and delighted - 9.5 percent) of

viewing their LAAW positively, to some extent, the UNACC subgroup has a 60.0 percent frequency, and the SGL subgroup has a 83.3 percent frequency.

TABLE 5-41 CAREER ENLISTED MARINES' LIFE AS WHOLE

	Terrible	Unhappy	Mostly Unhappy	Neither Unhappy or Pleased	Mostly Pleased	Pleased	Delighted	Mostly Pleased to Delighted	Total
ACC	0.0 (0)	2.1 (2)	6.3 (6)	11.6 (11)	31.6 (30)	38.9 (37)	9.5 (9)	80.0 (76)	52.2 (95)
UNACC	4.5 (2)	2.2 (1)	8.9 (4)	24.4 (11)	37.8 (17)	20.0 (9)	2.2 (1)	60.0 (27)	24.7 (45)
SGL	0.0 (0)	0.0 (0)	7.2 (3)	9.5 (4)	33.3 (14)	35.7 (15)	14.3 (6)	83.3 (35)	23.1 (42)
TOTAL	1.1 (2)	1.7 (3)	7.1 (13)	14.3 (26)	33.5 (61)	33.5 (61)	8.8 (16)	75.8 (138)	100.0 (182)

Note: Quantities for each cell appear in parentheses ().

The ANOVA test results are presented in Table 5-42. This analysis of variance procedure indicates that there is a statistically significant difference between the subgroups in how they view their LAAW. The F Value is high - 7.03 - and the Pr > F is low, .0011. Therefore, the null hypothesis can be rejected and the alternate hypothesis is accepted.

TABLE 5-42 CAREER ENLISTED MARINES' ANOVA

Dependent Variable: LIFEWH1

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	18.85412891	9.42706446	7 05	0.0011
Error	179	239.98103592	1.34067618		
Corrected Total	181	258.83516484			

R-Square	C.V.	Root MSE	LIFEWH1 Mean
0.072842	22.56246	1.1578757	5.1318681

Source	DF	Anova SS	Mean Square	F Value	Pr > F
STATUS	2	18.85412891	9.42706446	7.03	0.0011

The TUKEY test results are presented in Table 5-43. This analysis indicates that there is a statistically significant difference between married/unaccompanied and married/accompanied Marines; also, there is a statistically significant difference between married/unaccompanied and single Marines. This means that the married/unaccompanied Marines are significantly less pleased with their LAAW than are married/accompanied and single Marines.

TABLE 5-43 CAREER ENLISTED MARINES' TUKEY

Tukey's Studentized Range (HSD) Test for variable: LIFEWH1

NOTE: This test controls the type I experimentwise error rate.

Alpha= 0.05 Confidence= 0.95 df= 179 MSE= 1.340676
Critical Value of Studentized Range= 3.342

Comparisons significant at the 0.05 level are indicated by '***'.

STATUS Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit	
3 - 1	-0.5760	0.1311	0.6382	
3 - 2	0.2399	0.8270	1.4141	***
1 - 3	-0.6382	-0.1311	0.5760	
1 - 2	0.2007	0.6959	1.1911	***
2 - 3	-1.4141	-0.8270	-0.2399	***
2 - 1	-1.1911	-0.6959	-0.2007	***

The foregoing interpretations can be observed by: first, referring to the "status comparison" column, where 1 corresponds to married/accompanied, 2 corresponds to married/unaccompanied, and 3 corresponds to single (the left margin); and, second, referring to the "***" on the right margin. By reading horizontally and left to right, the status comparison 2 - 1 and 2 -3 in the left margin depicts a *** in the right margin.

c. WESTPAC Officers

There are 40 WESTPAC officers in the QOL data set. In Table 5-44, these Marines are grouped in a bivariate contingency table. The ACC subgroup has a 90.4 percent frequency (summing: mostly pleased - 28.6 percent, pleased - 42.8 percent, and delighted - 19.0 percent) viewing their LAAW positively, to some extent, the UNACC subgroup has a 100.0 percent frequency, and the SGL subgroup has an 85.7 percent frequency.

TABLE 5-44 OFFICERS' LIFE AS A WHOLE

	Terrible	Unhappy	Mostly Unhappy	Neither Unhappy or Pleased	Mostly Pleased	Pleased	Delighted	Mostly Pleased to Delighted	Total
ACC	0.0 (0)	0.0 (0)	4.8 (1)	4.8 (1)	28.6 (6)	42.8 (9)	19.0 (4)	90.4 (19)	52.5 (21)
UNACC	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	20.0 (1)	40.0 (2)	40.0 (2)	100.0 (5)	12.5 (5)
SGL	0.0 (0)	0.0 (0)	0.0 (0)	14.3 (2)	14.3 (2)	42.9 (6)	28.5 (4)	85.7 (12)	35.0 (14)
TOTAL	0.0 (0)	0.0 (0)	2.5 (1)	7.5 (3)	22.5 (9)	42.5 (17)	25.0 (10)	90.0 (36)	100.0 (40)

Note: Quantities for each cell appear in parentheses ().

This analysis of variance procedure indicates that there is no statistically significant difference between the subgroups in how they view their LAAW. The F Value is low - 0.61 - and the Pr > F is high, .5506. The TUKEY procedure is not performed because the ANOVA procedure has indicated that the null hypothesis cannot be rejected.

TABLE 5-45 OFFICERS' LIFE AS A WHOLE ANOVA

Dependent Variable: LIFEWHl					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	1.21904762	0.60952381	0.61	0.5506
Error	37	37.18095238	1.00489060		
Corrected Total	39	38.40000000			
	R-Square	C.V.	Root MSE		LIFEWHl Mean
	0.031746	17.28349	1.0024423		5.8000000
Source	DF	Anova SS	Mean Square	F Value	Pr > F
STATUS	2	1.21904762	0.60952381	0.61	0.5506

2. The Intent to Stay in the Marine Corps

This section analyzes the effect a WESTPAC unaccompanied tour has on a married Marine's intent to stay in the Marine Corps. The hypothesis test for this analysis is presented in Table 5-46. The null hypothesis is that the mean values for "intent to stay in the Marine Corps" are equal for married/accompanied, married/unaccompanied, and single Marines. The alternative hypothesis is that the married/unaccompanied Marine's mean value is different from that of the married/accompanied and single Marines. The WESTPAC Marines were divided into first-term enlisted, career enlisted, and officer populations. These three population groups are analyzed separately using the bivariate, ANOVA, and (as required) TUKEY procedures.

TABLE 5-46 INTENT TO STAY IN THE MARINE CORPS HYPOTHESES

H_o: $Mean_{acc} = Mean_{unacc} = Mean_{sgl}$ H_a: $Mean_{acc} \neq Mean_{unacc} \neq Mean_{sgl}$

a. *First-Term WESTPAC Marines*

There are 346 first-term WESTPAC Marines in the QOL data set. In Table 5-45, these Marines are grouped in a bivariate contingency table that stratifies the Marines by two characteristics, their accompanied/unaccompanied/single status (left margin) and intent to stay in the Marine Corps (top margin).

TABLE 5-47 FIRST-TERM MARINES WHO INTEND TO STAY

	Intend to Leave	Not Sure	Intend to Stay	Total
ACC	33.3 (6)	44.5 (8)	22.2 (4)	5.2 (18)
UNACC	51.9 (28)	22.2 (12)	25.9 (14)	15.6 (54)
SGL	40.9 (112)	34.7 (95)	24.4 (67)	79.2 (274)
TOTAL	42.2 (146)	33.2 (115)	24.6 (85)	100.0 (346)

Note: Quantities for each cell appear in parentheses().

The "intend to stay" column presents the relative frequency (or proportion) of Marines who intend to stay in the Marine Corps by their accompanied (ACC), unaccompanied (UNACC), and single (SGL) status. The parenthetically enclosed number is the quantity of Marines for that particular row category. The ACC subgroup has a 22.2 percent frequency of Marines who intend to stay in the Marine Corps, the UNACC subgroup has a 25.9 percent frequency, and the SGL subgroup has a 24.4 percent frequency.

The ANOVA test results are presented in Table 5-48. This analysis of variance procedure indicates that there is no

statistically significant difference between the three subgroups in their intent to stay in the Marine Corps. A statistical significance would be portrayed by an **F Value** (the test statistic) of approximately 5.0 or higher and a **Pr > F** of 0.05 or lower (the probability of making a Type I error). In this case, if the null hypothesis is rejected, there is a .6836 probability that rejecting the null hypothesis is a mistake. Therefore, the null hypothesis cannot be rejected; and this indicates that there is no significant difference between married/accompanied, married/unaccompanied, and single Marines in the mean frequency at which they intend to stay in the Marine Corps. The TUKEY procedure is not performed because the ANOVA procedure has indicated that the null hypothesis cannot be rejected.

TABLE 5-48 FIRST-TERM MARINES' INTEND TO STAY ANOVA

Dependent Variable: STAYER					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	0.48802754	0.24401377	0.38	0.6836
Error	343	219.75763720	0.64069282		
Corrected Total	345	220.24566474			
	R-Square	C.V.	Root MSE		STAYER Mean
	0.002216	43.89062	0.8004329		1.8236994
Source	DF	Anova SS	Mean Square	F Value	Pr > F
STATUS	2	0.48802754	0.24401377	0.38	0.6836

b. Career Enlisted WESTPAC Marines

There are 182 career enlisted WESTPAC Marines in the QOL data set. In Table 5-49, these Marines are grouped in a bivariate contingency table. The ACC subgroup has an 89.5

percent frequency of Marines who intend to stay in the Marine Corps, the UNACC subgroup has an 82.2 percent frequency, and the SGL subgroup has an 81.0 percent frequency.

TABLE 5-49 CAREER ENLISTED MARINES WHO INTEND TO STAY

	Intend to Leave	Not Sure	Intend to Stay	Total
ACC	4.2 (4)	6.3 (6)	89.5 (85)	52.2 (95)
UNACC	4.5 (2)	13.3 (6)	82.2 (37)	24.7 (45)
SGL	7.1 (3)	11.9 (5)	81.0 (34)	23.1 (42)
TOTAL	5.0 (9)	9.3 (17)	85.7 (156)	100.0 (182)

Quantities for each cell appear in parentheses().

The ANOVA test results are presented in Table 5-50. This analysis of variance procedure indicates that there is no statistically significant difference between the subgroups in their intent to stay in the Marine Corps. The F Value is low - 0.85 - and the Pr > F is high, .4289. The TUKEY procedure is not performed because the ANOVA procedure has indicated that the null hypothesis cannot be rejected.

TABLE 5-50 CAREER ENLISTED MARINES INTEND TO STAY ANOVA

Dependent Variable: STAYER					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	0.43556327	0.21778163	0.85	0.4289
Error	179	45.83366750	0.25605401		
Corrected Total	181	46.26923077			
	R-Square	C.V.	Root MSE		STAYER Mean
	0.009414	18.02255	0.5060178		2.8076923
Source	DF	Anova SS	Mean Square	F Value	Pr > F
STATUS	2	0.43556327	0.21778163	0.85	0.4289

c. WESTPAC Officers

There are 40 WESTPAC officers in the QOL data set. In Table 5-51, these Marines are grouped in a bivariate contingency table. The ACC subgroup has a 100.0 percent frequency of Marines who intend to stay in the Marine Corps, the UNACC subgroup has an 80.0 percent frequency, and the SGL subgroup has a 90.0 percent frequency.

TABLE 5-51 OFFICERS WHO INTEND TO STAY

	Intend to Leave	Not Sure	Intend to Stay	Total
ACC	0.0 (0)	0.0 (0)	100.0 (21)	52.5 (21)
UNACC	20.0 (1)	0.0 (0)	80.0 (4)	12.5 (5)
SGL	0.0 (0)	21.4 (3)	78.6 (11)	35.0 (14)
TOTAL	2.5 (1)	7.5 (3)	90.0 (36)	100.0 (40)

Quantities for each cell appear in parentheses().

The ANOVA test results are presented in Table 5-52. This analysis of variance procedure indicates that there is no statistically significant difference between the subgroups in their intent to stay in the Marine Corps. The F Value is low - 2.72 - and the Pr > F is too high, .0789 (because this test is using a 0.05 significance standard). The TUKEY procedure is not performed because the ANOVA procedure has indicated that the null hypothesis cannot be rejected.

TABLE 5-52 OFFICERS INTEND TO STAY ANOVA

Dependent Variable: STAYER					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	0.81785714	0.40892857	2.72	0.0789
Error	37	5.55714286	0.15019305		
Corrected Total	39	6.37500000			
	R-Square	C.V.	Root MSE		STAYER Mean
	0.128291	13.47991	0.3875475		2.8750000
Source	DF	Anova SS	Mean Square	F Value	Pr > F
STATUS	2	0.81785714	0.40892857	2.72	0.0789

3. The Analysis Review

It is appropriate to discuss the limitations of the population groups: first-term enlisted, career enlisted, and officer. First, the first-term enlisted Marine population is affected by U.S. Marine Corps PCS policy that does not authorize first-term married Marines to go to WESTPAC accompanied by their dependents. Consequently, the low number of married/accompanied first-term Marines reflects this policy. The few married/accompanied first-term Marines are either married to spouses they met in WESTPAC or they brought their dependents at their own expense and are serving on a one-year tour. Therefore, the comparison between the married/ unaccompanied and single Marines has the most emphasis for the hypothesis testing. Second, the career enlisted Marine population may have some bias regarding their intent to stay in the Marine Corps because of their previous career decisions to remain in the Marine Corps. This may affect the usefulness of the "intent to stay in the Marine Corps" hypothesis test.

Third, the officer population is limited by its small sample size. A small sample makes it difficult to determine any statistical significance. Additionally, because of the small sample size, first-term and career officers were not separated, and their potentially different characteristics regarding their "intent to stay in the Marine Corps" may harm this analysis.

The following observations can be made regarding the "life as a whole" and "intent to stay in the Marine Corp" hypothesis testing:

- First-Term Marines: The analysis shows that married/ unaccompanied Marines **do not** view their life as a whole and intent to stay in the Marine Corps any differently than their peers. These observations are not consistent with the literature review findings. This may mean that these Marines have low expectations for family stability, and a longer unaccompanied tour may not significantly harm their quality of life and retention.

- Career Enlisted Marines: The analysis shows that the married/unaccompanied Marines are significantly less happy about their life as a whole when compared to their married/accompanied and single Marine peers. This observation parallels the literature review findings that show family separation harms married Marines' morale. However, there is no significant difference in how these Marines view their intent to stay in the Marine Corps. This may mean that career enlisted Marines have selected to stay in the Marine Corps knowing full well that they will experience family separation, and they accept the paradigm of a one-year unaccompanied WESTPAC tour. Changing the one-year WESTPAC tour to two years may require a new paradigm for these Marines. Until they accept a new paradigm their "life as a whole" may be harmed further and retention may decrease.

- **Officers:** The officer sample was too small to make any significant observations about this Marine population.

VI. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

A. SUMMARY

This thesis analyzed the advantages and disadvantages of altering Marine Corps rotational and operational PCS-move policies. The objective of this analysis is to enable Marine Corps decision makers to select options that effectively reduce the PCS budget without degrading readiness. The research was designed to answer these questions:

- What are the effects on the Marine Corps budget if: one, unaccompanied rotational tour lengths are extended and, two, operational tour lengths are extended?
- Other than the fiscal effects to the budget, what effect will extended unaccompanied rotational tour lengths have on readiness? and,
- What effect will extended operational tour lengths have on readiness and career development?

This thesis uses a literature review and data analyses to address these questions. Chapter II reviewed other authors' literature in similar research areas. In Chapter V, analyses were presented that provide answers to the thesis questions. The following subsections summarize the findings of these two chapters.

1. Literature Review

The literature review provides insight to the positive and negative effects that may occur if unaccompanied rotational tours and operational tours are extended. A longer

rotational tour for single and married/unaccompanied Marines will reduce personnel turbulence and may enhance unit readiness. However, married/unaccompanied Marines' personal readiness and retention may be harmed because of increased family separation. Longer operational tours for career officer and enlisted Marines will also reduce personnel turbulence and thereby enhance unit cohesion and readiness. However, a longer operational tour may harm officer career development and to a lesser degree enlisted Marine career development.

2. PCS Savings Estimates

All of the proposed PCS policy options reduce PCS moves relative to the current, status quo, PCS policy. The different options are presented below along with the estimated savings.

- All WESTPAC rotational one-year tours change to two years: a $34.8 million savings.
- WESTPAC rotational one-year tours change to two years for first-term Marines only: a $25.5 million savings.
- All (CONUS) operational tours (three-year and two-year) change to four years: a $13.2 million savings.
- Operational tours change to four years for all career officers and enlisted except those Marines in selected billets: a $9.1 million savings.

3. PCS-Move Simulation Analysis

A PCS-move simulation was designed to evaluate how the proposed PCS policy options affect Marine assignments. Using the Markov Chain Model, simulations were run on the ground

supply majors' population to compare current policy (the status quo), the WESTPAC option, and the CONUS option. The WESTPAC option, changing all rotational one-year tours to two years, had the least category shortages and overages. The status quo option was the second best in limiting category shortages and overages. The CONUS option, changing all operational tours to four years, had the most category shortages and overages.

4. WESTPAC One-Year Tour Analysis

This analysis studied the data obtained from the Marine Corps Quality (QOL) of Life Survey. WESTPAC officer, career enlisted force, and first-term Marine populations were defined and studied separately. For each population, comparisons were made between married/accompanied, married/unaccompanied, and single Marine subgroups based on how they responded to questions that asked them about their quality of life as a whole and intent to stay in the Marine Corps. Of the three populations, only the married/ unaccompanied career enlisted force Marines significantly viewed their life as a whole differently (less pleased with their LAAW). Also, the differences between these subgroups in their intent to stay in the Marine Corps are not statistically significant for any of the populations.

B. CONCLUSIONS

The literature review and analysis results indicate that conclusions can be made about the proposed changes to rotational one-year tour and operational three-year tour lengths. These results show that the proposed changes to PCS-move policy can save money. Also, "readiness" can be harmed and improved by imposing any one of the options, and some options may be more harmful to readiness than others. One problem is that these readiness impacts, both the positive and negative ones, are difficult to quantify; but, we can surmise that these effects will equate to a "net" positive or negative effect to Marine Corps resources (i.e., PCS budget, recruitment, retention, training, and family service programs). Unfortunately, it is beyond the scope of this thesis to compute this net effect; but, the primary thesis objective is to provide Marine Corps decision-makers with sufficient results and recommendations to enable them to make well-informed decisions.

1. Rotational One-Year Tours

The PCS savings estimate analysis shows that substantial savings can be achieved by changing the one-year tour to two years. For ground supply majors, the PCS-move simulation shows that this policy change could provide the most assignment stability. Also, first-term married/ unaccompanied Marines do not appear to be harmfully affected

by their family separations. They view their "life as a whole" and "intent to stay in the Marine Corps" relatively the same as their single peers. Possibly, these junior Marines have lower expectations about their "family life" in the Marine Corps. However, a two-year unaccompanied tour will probably harm the reenlistment rate for married first-term Marines; but this may be an acceptable "cost" because of the PCS budget savings. On the other hand, the quality of life analysis shows that married/unaccompanied career enlisted Marines are significantly less pleased with their life as a whole when they are compared to their married/accompanied and single peers. However, the way they view their life as a whole does not impede their intent to stay in the Marine Corps; but, then, the paradigm of a one-year unaccompanied tour is probably part of their decision to stay in the Marine Corps. Changing this one-year tour to two years for career enlisted force Marines could harm retention unless a new paradigm is accepted by all Marines facing career decisions.

Research limitations may affect inferences based on the above conclusions. First, using an average PCS cost may inadvertently inflate the savings estimates. Second, although the PCS-move simulation indicates that changing the one-year tours to two years improves how ground supply majors can achieve assignment requirements, it is not known whether this small subgroup is representative of all ranks and occupations. Third, the WESTPAC officer sample used in the life as a whole

and intent to stay in the Marine Corps analysis was hampered by its size and the consequent pooling of senior and junior officers. Therefore, the WESTPAC officer sample may be unsuitable for statistical analysis because of sample size and composition. However, a conclusion may be drawn based on family separation research that the married/unaccompanied officers may view their LAAW similarly to the career enlisted force Marines.

2. Operational Four-Year Tours

The PCS savings estimate analysis shows that savings can be achieved by changing the standard tour length to four years. Also, the literature review reflects the potential positive effects to unit cohesion and the morale of Marines and their dependents. However, the PCS-move simulation demonstrated that this option may exacerbate assignment stability (i.e., create shortages in billets that have shorter tour lengths and require a manipulation to fix the imbalance) and thereby harm readiness. Therefore, although ceretis paribus was imposed to evaluate rotational and operational PCS move policy, in fact, the **feasibility** of extending the operational tour length may not be wise because of the secondary effects just described. Additionally, other research indicates that officers' career development may be harmed because fewer moves corresponds to fewer opportunities

to obtain important factors of human capital (i.e., education, training, and experience).

C. RECOMMENDATIONS

Data and analysis limitations were highlighted throughout the analysis reviews in the previous chapter. These limitations should be corrected before any decisions are made to change PCS-move policy. Therefore, the following recommendations are made to guide those analysts who will pursue similar research questions with further study:

- Refine the WESTPAC rotational PCS-cost data. Obtain average costs for the following: accompanied, unaccompanied, and single officers; accompanied, unaccompanied, and single career enlisted force Marines; and, unaccompanied and single first-term Marines.
- Recompute rotational move cost estimates using the refined PCS-cost data and the analysis methodologies applied in this thesis.
- Evaluate, using a Markov Chain Model simulation to determine the effects a four-year operational tour may have on other grade/occupation officer and enlisted communities.

Also, given the analysis presented in this thesis and further study in areas relating to the previous recommendations, the following actions (and non-actions) are recommended:

- Armed with improved cost estimates (based on the first two recommendations stated above), change the WESTPAC rotational one-year tour to two years for first-term Marines only.
- Do not change the WESTPAC rotational one-year tour length for officers or career enlisted force Marines.

- **Do not change** the CONUS operational three-year tour length **unless analyses show that a longer operational tour will not disrupt the PCS assignment process.**

- **Should a longer operational tour appear supportable, consider changing the tour length for only career enlisted Marines because the harm to their career development (and readiness) is minimal.**

- **Do not change** the CONUS operational three-year tour length **for officers because of the potential harm to their career development.**

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