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THE EFFECT OF PERSONNEL STABILITY ON MARINE CORPS READINESS: ARE INFANTRY BATTALIONS READY TO RESPOND TO FUTURE CONFLICTS?

by

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The "next man up" slogan may be acceptable for competitive sports, but it seems more likely to characterize negligence when placed in the context of the potential life-and-death outcomes facing the members of a military organization. This research questions whether the Marine Corps' manning and staffing policies are adequately setting the conditions for infantry battalions to achieve optimal readiness prior to deployment. The clearest snapshot of an infantry battalion's readiness is displayed during the unit's mission rehearsal exercise. According to this research, the Marine Corps manning and staffing policies accomplish the commandant's guidance, but the results from the models in this study identify weaknesses in current policy metrics. In fact, the Marine Corps manpower process is underperforming the task of stabilizing infantry battalions prior to deployment. The resulting effect is a negative contribution toward unit cohesion and readiness. This study recommends including a stability metric in the current readiness model, adjusting the staffing window, and prioritizing the staffing of the statistically significant unit groups identified in this study. The Marine Corps can improve the readiness of infantry battalions by modifying the manning and staffing policy guidelines and enforcing the initiative known as the Deployed Unit Staffing Cohesion policy.

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ABSTRACT

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LIST OF ACRONYMS AND ABBREVIATIONS

ACMC	Assistant Commandant of the Marine Corps
ASR	Authorized Strength Report
BIC	Billet Identification Code
CCDR	Combatant Commander
CD&I	Combat Development and Integration
CJCS	Chairman of the Joint Chiefs of Staff
CLT	Central Limit Theorem
CMC	Commandant of the Marine Corps
COIN	Counter Insurgency
CONPLAN	Concept Plan
CSR	Command Staffing Report
DC CD&I	Deputy Commandant for Combat Development and Integration
DC M&RA	Deputy Commandant for Manpower and Reserve Affairs
DEERS	Defense Enrollment Eligibility Reporting System
DOD	Department of Defense
DRRS-MC	Defense Readiness Reporting System Marine Corps
DSR	Deployment Staffing Report
EMV	Enhanced Mojave Viper
EXFOR	Exercise Force
FDP&E	Force Deployment Planning and Execution
FGEN	Force Generation
FSRG	Force Structure Review Group
GAR	Grade Adjusted Recapitulation
GFMAP	Global Force Management Allocation Plan
HQMC	Headquarters, Marine Corps
HRDP	Human Resources Development Process
LOD	Lock-on Date
M&RA	Manpower and Reserve Affairs
MAGTF	Marine Air Ground Task Force
MARADMIN	Marine Administrative Message

MASS	Manpower Assignment Support System
MCAGCC	Marine Corps Air Ground Combat Center
MCC	Monitored Command Code
MCCDC	Marine Corps Combat Development Command
MCDP	Marine Corps Doctrinal Publication
MCT	Marine Corps Task
MCTFS	Marine Corps Total Force System
MCTIMS	Marine Corps Training and Education Information Management System
MEF	Marine Expeditionary Force
MEI	Mission Essential Equipment
MET	Mission Essential Task
METL	Mission Essential Task List
MM	Manpower Management
MMEA	Manpower Management Enlisted Assignments
MOOTW	Military Operations Other Than War
MOS	Military Occupational Specialty
MP	Manpower Plans
MROC	Marine Requirements Oversight Council
MRX	Mission Rehearsal Exercise
NCO	Non-Commissioned Officer
NDAA	National Defense Authorization Act
NMS	National Military Strategy
OEF	Operation Enduring Freedom
OPLAN	Operation Plan
P2T2	Patients, Prisoners, Training, and Transients
PCTEF	Percentage Effective
PEI	Principal End Item
PMOS	Primary Military Occupational Specialty
PP&O	Plans, Policies, and Operations
PTP	Pre-Deployment Training Plan
RCCPDS	Reserve Component Common Personnel Data System

RSO&I	Reception, Staging, Onward Movement, and Integration
SGM	Staffing Goal Model
SLE	Service Level Exercise
SLTE	Service Level Training Event
SME	Subject Matter Expert
SPMAGTF	Special Purpose Marine Air Ground Task Force
T&R	Training and Readiness
T/E	Table of Equipment
T/O	Table of Organization
TACP	Tactical Air Control Party
TD	Training Day
TECOM	Training and Education Command
TFDW	Total Force Data Warehouse
TFPM	Total Force Projection Model
TFSD	Total Force Structure Division
TFSMS	Total Force Structure Management System
TOECR	Table of Organization Change Request
TTECG	Tactical Training and Exercise Control Group
UDP	Unit Deployment Program
UNS	Universal Needs Statement
UUNS	Urgent Universal Needs Statement
WFF	Warfighting Function

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I. INTRODUCTION

> *"The personnel management system should seek to achieve personnel stability within units and staffs as a means of fostering cohesion, teamwork, and implicit understanding."*
>
> —MCDP-1, *Warfighting*
> (Headquarters, U.S. Marine Corps, 1997, p. 64)

A. PURPOSE

It has been said that the United States Marine Corps is a "force in readiness" able to deploy to "any clime or place" and is expected "to respond quickly and to win" (Commandant of the Marine Corps [CMC], 2015, p. 1). While these statements are true, to ensure that the Marine Corps continues to deliver it is critical to carefully cross-examine and improve the processes that contribute to readiness. General Joseph Dunford, the 36th commandant of the Marine Corps, also stated, "Everything we do must contribute to our combat readiness and our combat effectiveness" (Commandant of the Marine Corps, 2015, p. 4).

Two significant factors that contribute to Marine Corps readiness are force planning and personnel management policies. In 2011, the Marine Corps released a new policy to reinforce the concept of stabilizing units before and after their deployments rotations. This new policy, specified requirements to commanders and manpower planners intended to improve the readiness of the force. The purpose of this research is to examine the effect of that policy on the readiness of infantry battalions. This study is designed to isolate one component of readiness, the personnel staffing levels within infantry battalions, and assess its impact on the readiness of the force. If the most valuable resource for the Marine Corps is its human resources, or Marines, then the management of this resource balanced against the time constraints to prepare for deployments is a critical relationship the Marine Corps must accurately understand to assess the readiness of infantry battalions.

1. Background

In order to understand the nature of this research, it is useful to begin by examining related specific policies along with the key actors, relationships, and processes involved in this complex problem. Marine Corps Manpower and Reserve Affairs (M&RA) is responsible for planning and executing manpower policy for the Marine Corps. This task is possibly one of the most complex tasks performed by any organization in the Marine Corps, and is impossible to describe in detail due to the limitations of this research project. However, having acknowledged the complexity, it is important to have an appreciation for the magnitude of the task, which includes managing the assignments of the current force inventory that is around 184,100 active duty military personnel (Headquarters, U.S. Marine Corps, 2015). These personnel represent the human capital for the organization, and are arguably the most important resource possessed by the Marine Corps.

Today, the operational environment demands expeditionary infantry combat formations consisting of well-trained, adaptive, and resilient personnel who are able to respond decisively to threats under dynamic conditions. The Marine Corps has experienced significant stress on its force, along with its sister services, since Task Force 58 (TF58) was ordered into Afghanistan in November 2001 (Lowrey, 2011). Following the results of the latest Force Structure Review Group (FSRG), the Marine Corps as a "middleweight force" is forced to balance sustained high deployment requirements focused on crisis response with a reduced mandated end strength and three fewer infantry battalions in structure (Smith, 2011). These conditions place a premium on the personnel management policies within the service, which are critical to sustain the readiness of its small units and set the conditions for them to succeed when deployed.

Current personnel manning policies have adapted to these conditions as the "new normal" since 2001. This research aims to examine the effectiveness of these policies in stabilizing infantry battalions with personnel prior to deployment. If they are not stabilized, then these policies could create conditions where battalions are unable to achieve the necessary repetitions they need to reach proficiency in their mission essential tasks (METs), train to standard on unit collective tasks, develop sufficient unit cohesion within their teams, or progress efficiently through collective skills training due to personnel turbulence and instability. These factors could reduce the readiness of the unit and contribute to other inefficient activities such as needing to conduct resets during pre-deployment training as new personnel join. This in turn introduces less trained personnel and requires internal transfers due to their late arrival to the battalion.

In addition to increasingly disjointed training while building units, it is possible that personnel turbulence leads to inconsistent performance during battalion assessments for exercises and for evaluations at the final service level exercise (SLE) to certify readiness prior to deployment. In 2012, Major General Thomas Murray, Commanding General, TECOM, announced changes to the training objectives for the SLE known as Enhanced Mojave Viper (EMV). The new direction for the exercise is certainly needed to adjust to operational requirements, but there also seems to be a new approach for the assessment of the exercise forces. This shift in philosophy, from evaluation to coaching, could set a dangerous precedent that accepts lower proficiency and leads to eroding the nation's "force in readiness." It is one thing to do more with less in extremis and teach Marines to be adaptive out of necessity; it is entirely different to modify performance expectations and change policies because commanders are not producing proficient battalions or because the manpower model is not adequately servicing units in a timely manner to allow commanders to achieve the desired end state.

When assessing the impact of personnel stability on readiness, it seems intuitive that unit personnel stability, or unit cohesion, should correlate positively with readiness. However, it is not clear to what degree this is true, nor is it clear what the most significant determinants of unit readiness are for an infantry battalion. This research is focused on examining the characteristics of readiness and providing quantitative analysis of the relationship between personnel variables and readiness. In doing so, the research can provide Marine Corps decision makers with a better understanding of the impact of personnel stability relative to the current manpower management policy known as the Deployed Unit Staffing Cohesion policy.

a. Marine Corps Force Generation Policy

Since 2001, the Marine Corps has relied on the force generation process to keep pace with the demand for forces needed to support numerous operational requirements, including crisis response responsibilities, to the nation's combatant commanders (CCDRs). The Marine Corps is expected to maintain the highest readiness levels within its force to service the Global Force Management Allocation Plan (GFMAP) with forces, or capabilities, ranging from Marine Expeditionary Units (MEUs) and rotational force deployments under the Unit Deployment Program (UDP) to contingency and crisis response forces called Special Purpose Marine Air Ground Task Forces (SPMAGTFs). Individual augments may also be sourced from the Marine Corps to fill joint and service requirements to operational commanders (Deputy Commandant for Plans, Policies, and Operations [DC PP&O], 2013). As the stress on the force has steadily increased over the past 15 years, and the time constraints to organize, train, and equip those forces remain in effect, a careful review of the effectiveness of Marine Corps personnel management policies is warranted.

The Marine Corps Force Generation (FGEN) policy outlines the process, or methodology, the Marine Corps uses to respond to requests for forces (RFF) by Combatant Commands through the GFMAP. The purpose of the FGEN process, stated in MCO 3502.6A, is "to establish a process that focuses and synchronizes the efforts of HQMC, the supporting establishment, and the operating force towards efficiently and effectively preparing Marine Corps personnel and units in a timely manner for deployment" (DC PP&O, 2013, p. 2). The impact of this policy on unit readiness for the Marine Corps, as a force provider for the joint force, is to remain vigilant in assessing readiness to maintain the ability to supply forces trained in their mission METs who are ready to deploy when requested by Combatant Commands (DC PP&O, 2013).

The FGEN order outlines the steps the Marine Corps will use to provide a "systematic, Service wide approach to selecting, resourcing, and preparing units for deployment" (DC PP&O, 2013, p. 3). The approach described in the order provides a planning structure and timelines designed to balance the available inventory of forces provided by the Marine Corps, so that adequate levels of forces are available when unexpected requirements arise beyond the normal tasking in the GFMAP (see Table 1). The FGEN process relies heavily upon careful coordination of requirements through the force synchronization conference and the anticipation of future requirements from Combatant Commands. The target dates and milestones for Marine units programmed for deployment are adjusted following the force synchronization conferences to account for changes in deployment schedules identified during the conferences.

Table 1. Phases of the Marine Corps Force Generation Process

Phases	Time	Event	Requirements
Phase I	D-720 to D-360	Synchronize the Force	-Assess service capabilities and capacities -CCDR operational requirements -Develop force sourcing solutions
Phase II	D-360 to D-180	Generate the Force	-Identified units begin PTP planning -Identify staffing, training, resourcing requirements -Identify shortfall solutions
Phase III	D-180 to D-0	Ready the Force	-Core MET training combined with assigned MET training -Units begin readiness reporting -Units conduct a mission rehearsal exercise -Deployment readiness certified by MEF Commander -After action assessments to improve follow on units
Phase IV	D+0 to R-0	Deploy the Force	-Deploy prepared units to meet CCDR requirements -After action assessments to improve follow on units
Phase V	R+0 to R+180	Redeploy the Force	-Redeploy the force to point of origin -After action assessments to improve refine the process

Adapted from Deputy Commandant for Plans, Policies, and Operations (DC PP&O). (2013). *Marine Corps force generation process* (MCO 3502.6A). Washington, DC: Headquarters, Marine Corps. Retrieved from http://www.marines.mil/Portals/59/Publications/MCO%203502.6A.pdf

The scope of this research focuses on infantry battalions participating in Phase III as they "ready the force" for deployment. This period of time is referred to as the pre-deployment training period (PTP) throughout the remainder of this report. Marine infantry battalions make every effort to ensure they are maximizing their readiness metrics whether they are in a deployment cycle or not. In this way, they are prepared to support contingency operations or requests for forces that may arise from CCDRs. Every deploying Marine infantry battalion is expected to be "staffed, trained, and equipped to C-1 readiness and certified in deployment readiness against an assigned METL by the MEF Commander" (DC PP&O, 2013, p. 5). Once those criteria are met, then the infantry battalion is authorized to deploy per the FGEN order.

b. Deployed Unit Cohesion Staffing Policy

The Deployed Unit Cohesion Staffing policy, or MARADMIN 585/11, was released in October 2011 to provide amplifying guidance for manpower management to improve unit cohesion (Deputy Commandant for Manpower and Reserve Affairs [DC M&RA], 2011). The intent of the message was to "recommend changes to personnel assignment policies and plans with the overall goal of increasing unit cohesion at the battalion/squadron level" (DC M&RA, 2011, p. 1). The message highlights two specific areas that required attention from manpower planners to improve the readiness of Marine units participating in the deployment rotations. Pre-deployment stabilization for these units, or locking-on for deployment, was directed to occur no less than "six months prior to deployment," with specific ranks and key leaders highlighted for attention (DC M&RA, 2011, p.1). The second area mentioned in this message concerns post-deployment staffing policies. The policy states, "Marines will remain in returning full deploying units for 90 days following the completion of the unit deployment with minimal exceptions" (DC M&RA, 2011, p. 1). The specific requirements stated in this policy are echoed in MCO 3502.6A, and they serve as specified tasks to commanders and manpower management personnel in the Marine Corps.

This policy initially confounded the manpower planning and management system and was even referred to as a "wicked problem" by the staff at M&RA (McCarroll, 2012). Manpower problems whose solutions involve "interactive complexity" (Van Riper, 2013) of coordination tend to classify into the "wicked problem" category. Nonetheless, it is surprising that the directive was viewed as a problem to begin with, and not the institutional norm for manpower planners, since the Deployed Unit Cohesion Staffing policy effectively restated the implied requirements and references already outlined in the previous force generation order. There are a number of reasons why the specified requirements in the Deployed Unit Cohesion Staffing policy are so important to deploying units. The policy specifically states parameters to stabilize leadership within infantry units throughout their PTP and upon their return for a period of 90 days. This stabilization is believed to improve training and preparation for deployment, support the effort to build unit cohesion, and provide a mechanism to help units detect and assist those Marines who may experience post-traumatic stress disorder (PTSD) by reducing personnel turbulence within deployable units. This research uses manpower data for deploying infantry battalions to look for indicators of the effectiveness of this policy between the years of 2009 and 2012.

2. Research Approach

This research project is concerned with determining the impact of implementing the Deployed Unit Cohesion Staffing policy on infantry battalion readiness from 2009 to 2012. In particular, by using multivariate regression analysis, the study empirically estimates the relationship between personnel manning and staffing on infantry battalion readiness for deployment. Personnel stability is determined by comparing unit personnel table of organization (T/O) requirements, authorized strength report (ASR) levels, and personnel "on board" by month during the PTP period. More specifically, this research addresses the following questions:

a. Primary Research Question

- What are the determinants of infantry battalion readiness for deployment?

b. Secondary Research Questions

- What is the impact of personnel stability on metrics of infantry battalion readiness?
- Are there specific ranks or occupational specialties that are relatively more essential to stabilize earlier in the unit's PTP to achieve a higher state of readiness prior to deployment?

3. Benefits of the Study

This study aims to determine whether personnel stability is a relevant factor in forecasting infantry battalion readiness. The results provide insight into the effectiveness of the Deployed Unit Cohesion Staffing policy by analyzing the effect on units prior to implementation and the subsequent effect on units after implementation in 2011. An additional benefit from this study is the capability to identify specific personnel that contribute the most to an infantry battalion's readiness and analyze the effectiveness of the Marine Corps Human Resources Development Process (HRDP) in providing those personnel early in a unit's PTP schedule. The results of this study will help the Marine Corps understand the optimal amount of personnel stability required for an infantry battalion to prepare for deployment.

B. RESEARCH METHODS

This research conducts a quantitative analysis of the research question. The presumption, or hypothesis, is that a unit stabilized earlier in the PTP schedule generates an infantry battalion with higher readiness ratings. Units with higher readiness ratings are more prepared to deploy and able to conduct assigned missions. Ideally, the readiness rating indicates the potential of a unit to accomplish their mission. The readiness framework used to compare units in this research is based on the description of readiness known as the C-rating (P+T+R+S) described in the Marine Corps Readiness Reporting Standard Operating Procedures (see Figure 1; DC PP&O, 2010).

Figure 1. Multiple Linear Regression Model of Readiness Function

$$C = \beta_0 + \beta_1 P_i + \beta_2 T_i + \beta_3 R_i + \beta_4 S_i + \varepsilon_i$$

Adapted from Deputy Commandant for Plans, Policies, and Operations (DC PP&O). (2010). *Marine Corps readiness reporting standard operating procedures (SOP)* (MCO 3000.13). Washington, DC: Headquarters, Marine Corps. Retrieved from http://www.marines.mil/Portals/59/Publications/MCO%203000.13.pdf

An infantry battalion's readiness for deployment is described by a representative variable comprised of that unit's overall score during the service level exercise prior to deployment. The research will compare the changes in on-board staffing levels with required structure, authorized structure, and staffing goals for infantry battalions during Phase III of their PTP to describe the P-rating. The battalion's T-rating is comprised of a factor variable of the battalion's home station training base, which represents the various training opportunities and restrictions to training at those facilities. The significant omitted variables for this analysis include factors relating to equipment and supplies that contribute to the S and R ratings of the readiness score. These omitted variables are acceptable due to the fact that the representation for readiness is not dependent on these variables because those activities were not included in the scoring of the unit's performance for the exercise. The methodology proposed for this study allows the analysis to isolate the P-rating and to focus on the effect of personnel manning within each infantry battalion on their readiness for deployment.

C. OVERVIEW OF CHAPTERS

The following description offers a brief overview of the content within each of the remaining chapters in the report:

- "Literature Review": This chapter provides a review of the relevant existing literature relating to the research question. It begins with describing the concept of readiness for the Marine Corps and contains information on the manpower process, pre-deployment training process for infantry battalions, and an overview of the body of work on the subject of cohesion in groups.
- "Data and Methodology": This chapter provides a detailed description of the methods used to collect, normalize, merge and clean, model, and test the data that is used for this study.
- "Result": This chapter provides a list of the significant findings that were produced as a result of the model used in this study.
- "Conclusions": This chapter provides a summary of the research conducted for this study, it discusses the results that are relevant to the research question, and offers recommendations to improve infantry battalion readiness based on the results of the model.

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II. LITERATURE REVIEW

> *"During times of peace, the most important task of any military is to prepare for war."*
>
> —MCDP-1, *Warfighting*
> (Headquarters, U.S. Marine Corps, 1997, p. 53)

A. DESCRIPTION OF MARINE CORPS READINESS

The phrase "force in readiness" is often used to describe the Marine Corps in various forms, from the service's capstone doctrinal publication known as MCDP-1 (Headquarters, U.S. Marine Corps, 1997) to the words written by the 36th Marine Corps commandant in his initial planning guidance (CMC, 2015). There is a sense of urgency found in the mandate to "be ready" and the effects of the phrase can be observed everywhere in the Marine Corps. Every commander bears the responsibility to ensure their unit is prepared to conduct assigned missions, potentially on limited notice, in any operational environment, and accomplish the mission.

Similar to many other Department of Defense concepts, the definition of readiness set forth in CJCS Guide 3401D is applied differently at the strategic, operational, and tactical levels, which corresponds with the levels of war in joint doctrine.

> Readiness from the tactical perspective focuses on unit readiness, defined as the ability to provide capabilities required by the Combatant Commander to execute assigned missions, and derived from the ability of each unit to conduct the mission(s) for which it was designed. (Chairman of the Joint Chiefs of Staff, 2010, p. 1–2)

JP 1–02 defines readiness as "the ability of military forces to fight and meet the demands of assigned missions" (Joint Staff, 2015, p. 200). The purpose of reviewing the definitions is to answer the "so what" question of readiness. The Marine Corps must produce units ready to support the National Military Strategy (NMS) and the requests for forces by CCDRs. This fact is codified in Public Law 416 set forth by the 82nd Congress and reinforced in

United States Code, Title 10, which outlines the roles and missions of the Marine Corps as the nation's force in readiness (Headquarters, U.S. Marine Corps, 2011).

The applicable Marine Corps order for readiness echoes the joint definitions and goes on to describe two distinct levels of readiness for the service, one it labels as "unit readiness" and the other "joint readiness" (DC PP&O, 2010, p. 1–1). Each of these readiness categories relate to a specific level of command and have different specified requirements. The description of unit readiness outlined in the order highlights the requirement of units, such as infantry battalions, to not only be able not only to "execute their assigned missions" but it also specifies those units must be able to "deliver the outputs for which they were designed" (DC PP&O, 2010, p. 1–1).

It is not sufficient for a unit to demonstrate the ability to execute the mission, there is also an expectation that the unit can perform well and function as it was designed for the operation. For the Marine Corps, that means the ability to deliver "balanced, combined arms forces with organic command, ground, aviation, and sustainment elements" (Headquarters, U.S. Marine Corps, 1998, p. 69). By achieving this, an infantry battalion creates synergy between the parts and functions as a fully integrated Marine Air Ground Task Force (MAGTF; Headquarters, U.S. Marine Corps, 1998).

In addition to the levels of readiness described in MCO 3000.13, there are readiness codes known as C-level codes that describe a unit's state of readiness up the chain of command to the Chairman of the Joint Chiefs of Staff (CJCS). The five C-level codes (see Table 2) present a picture to the CJCS that describes the current status of resources (personnel, training, and equipment) contained in that unit and are not meant to estimate the potential of that unit once assigned to a Combatant Command for employment (DC PP&O, 2010, p. 7–1). Many within the profession see the readiness (C-level code) of a unit similar to McCarroll (2012) and they equate readiness with the deployability of a unit. This seems a fair characterization, since most of the occasions to employ the military are "away games," in the sense that they require the deployment of the forces requested away from their home station facility.

The principal weakness in the current process for determining readiness is captured by a comment in MCO 3000.13: "Readiness codes do not offer insight into the unit's potential once deployed" (DC PP&O, 2010). Under this presumption, the Marine Corps, and the entire joint force, is making the claim that all infantry battalions can function as designed based on the staffing level of the unit, completion of internally assessed training, and possessing the required equipment and supplies. This assumption may hold true against guerrilla forces with inferior technology, but the outcome may prove different against near peer competition in the future.

The goal for commanders is to maximize readiness within their unit at all times. This approach is supported by the Department of Defense and arguably is intended to avoid the creation of a "hollow force" (George, 1999) that is unable to respond to crisis or contingency operations with ready forces. Of course, this high degree of readiness comes at an incredible financial cost to the government. Many would argue that any cost is acceptable to maintain a ready military force, while others, such as Senator John McCain, have suggested another approach to military readiness that is called "tiered readiness" (George, 1999; McCarroll, 2012).

In fiscally constrained times, which really describes any period of time, the Department of Defense must possess units ready to respond and support the NMS while demonstrating fiscal responsibility to achieve readiness. It is possible that other approaches, such as tiered readiness, may actually provide better-trained and equipped forces to respond to smaller scale contingencies. However, this approach may also come at the expense of acting as a sufficient deterrent for nation-states committing larger actions. For example, recent aggressive behavior by China and Russian may be attributed to the removal of ready armored forces from Europe (Feng, 2015). If the United States military is unable to project power against these larger nation-states, it may encourage those actors to attempt even larger military operations in the future, rather than the smaller, more regional, military activities we have experienced in the last 14 years.

Table 2. C-Level Definitions

C-Level	Definition
C-1	The unit possesses the required resources and is trained to undertake the full wartime mission(s) for which it is organized or designed. The resource and training area status will neither limit flexibility in methods for mission accomplishment nor increase vulnerability of unit personnel and equipment. The unit does not require any compensation for deficiencies.
C-2	The unit possesses the required resources and is trained to undertake most of the wartime mission(s) for which it is organized or designed. The resource and training area status may cause isolated decreases in flexibility in methods for mission accomplishment, but will not increase vulnerability of the unit under most envisioned operational scenarios. The unit would require little, if any, compensation for deficiencies.
C-3	The unit possesses the required resources and is trained to undertake many, but not all, portions of the wartime mission(s) for which it is organized or designed. The resource or training area status will result in significant decreases in flexibility for mission accomplishment and will increase vulnerability of the unit under many, but not all, envisioned operational scenarios. The unit would require significant compensation for deficiencies.
C-4	The unit requires additional resources or training to undertake its wartime mission(s), but it may be directed to undertake portions of its wartime mission(s) with resources on hand.
C-5	The unit is undertaking a CMC-directed resource action and is not prepared, at this time, to undertake the wartime mission(s) for which it is organized or designed.

Adapted from Deputy Commandant for Plans, Policies, and Operations (DC PP&O). (2010). *Marine Corps readiness reporting standard operating procedures (SOP)* (MCO 3000.13). Washington, DC: Headquarters, Marine Corps. Retrieved from http://www.marines.mil/Portals/59/Publications/MCO%203000.13.pdf

The remaining information describes the components of readiness that serve as inputs to determine the C-level code for military units. Each category is directed to report on specific information within the unit and each category is measured to determine the unit's readiness in that particular functional area. The final C-level code submitted by the commander describing the unit's readiness for the reporting period cannot be higher than the lowest rating determined in the personnel, training, or equipment (P, T, S, or R) categories (DC PP&O, 2010, p. 7–1).

1. Personnel (P-Rating)

The S-1 section is the proponent for assembling personnel readiness measurements in an infantry battalion. Personnel readiness is described by the unit's P-rating within the readiness function (see Table 3; DC PP&O, 2010, p. 2–2). The personnel readiness rating considers the availability of personnel within the unit in relation to non-deployable and structure, but it is also expected to consider the qualifications of those personnel to perform their duties (see Figure 2; DC PP&O, 2010, p. 2–1). This requires an integrated team that takes input from supervisors within the battalion to account for this factor properly. The order allows the infantry battalion to designate critical military occupational specialties (MOSs) related to their mission and highlight their status within the unit (DC PP&O, 2010, p. 2–3).

Table 3. P Rating Calculation

Rule	**P1**	**P2**	**P3**	**P4**
Personnel Strength	≥90%	80–89%	70–79%	<70%
MOS Fill	≥85%	75–84%	65–74%	<65%

Source: Deputy Commandant for Plans, Policies, and Operations (DC PP&O). (2010). *Marine Corps readiness reporting standard operating procedures (SOP)* (MCO 3000.13). Washington, DC: Headquarters, Marine Corps. Retrieved from http://www.marines.mil/Portals/59/Publications/MCO%203000.13.pdf

Personnel Strength Percentage
= (Assigned Strength – Nondeployables / Structure Strength) X 100

MOS Fill Percentage
= (MOS *Fill* – Nondeployables / Structure Strength) X 100

Figure 2. Personnel Percentages

Source: Deputy Commandant for Plans, Policies, and Operations (DC PP&O). (2010). *Marine Corps readiness reporting standard operating procedures (SOP)* (MCO 3000.13). Washington, DC: Headquarters, Marine Corps. Retrieved from http://www.marines.mil/Portals/59/Publications/MCO%203000.13.pdf

2. Training (T-Rating)

One weakness in determining the T-rating is the potential for highly subjective input to training. Normally, the proponent of the training rating is the S-3 within an infantry battalion. The operations officer collects information from the company commanders on the status of training relative to the METs, and presents the assessment to the battalion commander for final determination. MCO 3000.13 states, "The T-rating is an assessment of the unit's training to accomplish its designed mission" (DC PP&O, 2010, p. 5–1). However, it is the infantry battalion's responsibility, in accordance with the guidance of their regimental and division headquarters, to develop an assessment methodology to measure the training readiness within the organization.

The Marine Corps Infantry Training and Readiness (T&R) manual is one document that assists commanders in measuring their unit's training relative to their METs (Commanding General, Training and Education Command, 2013). But, this document has weaknesses as well, particularly in the area of team and unit level collective tasks, which can be more subjective assessments than the more mechanical and well-defined individual tasks.

Another factor that influences infantry battalion training readiness is the effect of internal and external personnel transfers that occur in the unit. These events tend to make it difficult for the battalion to reflect its proper state of training readiness accurately. The arrival of new personnel during the PTP schedule or the re-assignment of existing personnel should lower the T-rating in that period, if the units are considering those factors, until those personnel have caught up to the rest of the unit.

As the battalion progresses, it is likely to schedule its training events to build from the team, then to squad, then to platoon, and company levels to gain proficiency in each MET in a manner that builds upon the previous events. Each training event is progressive and adds complexity by increasing the size of the unit training to the given standard in the T&R manual. For instance, once the unit moves from 5000 to 6000 level tasks it is assumed that all members of the unit are proficient and evaluated on all previous tasks. When new Marines arrive it forces a regression in training to reset the unit to that proficiency level. The arrival of new personnel during these steps can have a disruptive and negative effect on the unit's training plan.

The order offers commanders the flexibility to consider these factors and adjust the C-level code reported through DRRS-MC, but they must provide comments to explain the decision and not alter the T-rating reported. Therefore, the final determination of training readiness relies on the commander's judgment to assess the training readiness of the whole unit while acting within the guidance provided in the order (see Table 4).

Table 4. T-Rating Calculation

Rule	**T1**	**T2**	**T3**	**T4**
Percentage of Core METs Trained to Standard	≥85%	70–84%	55–69%	<55%

Source: Deputy Commandant for Plans, Policies, and Operations (DC PP&O). (2010). *Marine Corps readiness reporting standard operating procedures (SOP)* (MCO 3000.13). Washington, DC: Headquarters, Marine Corps. Retrieved from http://www.marines.mil/Portals/59/Publications/MCO%203000.13.pdf

3. Equipment (S-Rating/R-Rating)

The final category measured for an infantry battalion that contributes toward its readiness for deployment is equipment readiness. The status of equipment is typically supervised by the battalion executive officer and primarily supported by the S-4 and the S-6 in an infantry battalion. This category specifically deals with the "quantity and quality of equipment" items the battalion has relative to its assigned table of equipment (T/E; DC PP&O, 2010, p. 3–1).

To account for both of these measurements, equipment readiness is divided into two separate ratings: S-rating and R-rating (DC PP&O, 2010, p. 3–1). As stated in MCO 3000.13, "the S-rating is a material measurement of an organization's possessed equipment quantity against its designed requirement. The R-rating indicates the material condition of the organization's possessed equipment" (DC PP&O, 2010, p. 3–1).

The structure requirements, or tables of equipment, for all Marine units are managed by Total Force Structure Division (TFSD) within Marine Corps Combat

Development Command (MCCDC) and maintained in the Total Force Structure Management System (TFSMS; DC PP&O, 2010, p. 3–2). Specific unit equipment found on the T/E is designated as either mission essential equipment (MEI) or principal end item (PEI), and each type of equipment has separate guidelines to consider for calculating the associated ratings (see Tables 5 and 6; DC PP&O, 2010, p. 3–3).

Table 5. S-Rating Calculation

Rule	**S1**	**S2**	**S3**	**S4**
Mission Essential Equipment (MEI)	≥90%	80-89%	65-79%	<65%
Support Equipment (PEI)	≥90%	80-89%	65-79%	<65%

Adapted from Deputy Commandant for Plans, Policies, and Operations (DC PP&O). (2010). *Marine Corps readiness reporting standard operating procedures (SOP)* (MCO 3000.13). Washington, DC: Headquarters, Marine Corps. Retrieved from http://www.marines.mil/Portals/59/Publications/MCO%203000.13.pdf

Table 6. R-Rating Calculation

Rule	**R1**	**R2**	**R3**	**R4**
Mission Essential Equipment (MEI)	≥90%	70-89%	60-69%	<60%
Support Equipment (PEI)	≥90%	70-89%	60-69%	<60%

Adapted from Deputy Commandant for Plans, Policies, and Operations (DC PP&O). (2010). *Marine Corps readiness reporting standard operating procedures (SOP)* (MCO 3000.13). Washington, DC: Headquarters, Marine Corps. Retrieved from http://www.marines.mil/Portals/59/Publications/MCO%203000.13.pdf

4. Mission Essential Task (MET) Assessment

The mission essential task (MET) assessment reports the unit's ability to perform each of its mission essential tasks. These tasks are divided into three categories that relate to the types of missions they may be called upon to support. Core METs are common to all units that perform the same function, such as infantry battalions. The next category is Major OPLAN/CONPLAN METs, which a unit may be assigned once it is sourced to support a specific operational plan for a CCDR. The final category, Named Operation METs, relates to specific operations that are designated by the CJCS (DC PP&O, 2010, p. 4–2). Each MET that an infantry battalion is assigned, whether only Core METs or a combination of the categories, requires a report on the status of those METs and the battalion's ability to accomplish them. The status of the METs is described by submitting one of three assessments: yes, qualified yes, or no (DC PP&O, 2010, p. 4–2).

5. Commander's Assessments

Commanders are responsible for reviewing and approving all of the content contained in the readiness report, but they are specifically tasked to provide their personal assessments by assigning the C-level to the unit along with their percent effective (PCTEF) assessment, as required. The order states: "The C-level reflects the status of the selected unit resources measured against the resources required to undertake the core mission for which the unit is task organized or designed" (DC PP&O, 2010, p. 7–1). These represent the unit's status in its Core METs, which are the fundamental tasks every infantry battalion is expected to be able to perform. The PCTEF assessment differs from the C-level in that it relates specifically to the assigned mission METs and they may be significantly different from the Core METs of the unit (DC PP&O, 2010).

The combination of C-level and the PCTEF assessments, along with the other details provided by the unit for personnel, training, and equipment, comprise the readiness report that is reviewed by the Joint Chiefs of Staff (JCS) to assess military capabilities and the availability of units for employment. However, Horowitz (1986) pointed out that one must understand the interaction between these elements to know the final effect on readiness (Horowitz, 1986, pp. 4–6). The interaction of these parts seems to be accounted for by affording Commanders the flexibility to adjust the final C-level for the battalion. Another significant claim made by Horowitz (1986) is that the personnel category should not be part of the readiness function (see Figure 1) at all because the "quality and quantity of people attached to a unit" have a "multifaceted and indirect role" with the other categories (Horowitz, 1986, pp. 4–6). According to the readiness models presented by Horowitz (1986), personnel is so critical to understanding the readiness of a unit that it should be measured separately with special attention paid to its effect on the other readiness factors. This adds credibility to need to understand the impact of personnel stability on unit readiness.

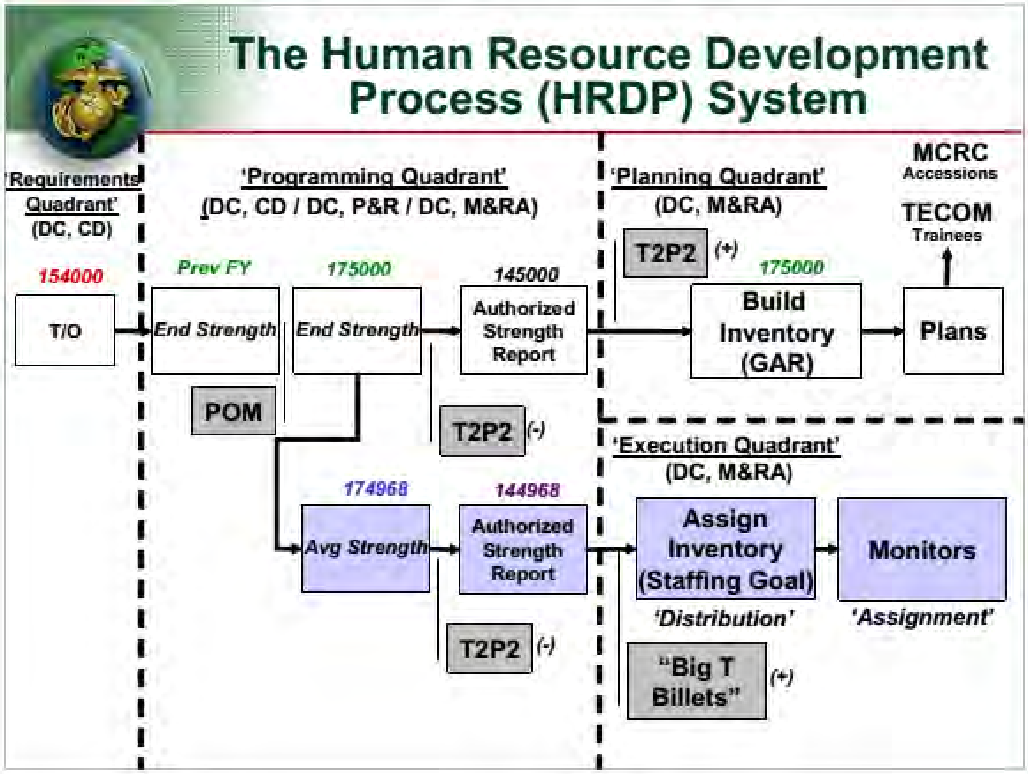
B. THE HUMAN RESOURCES DEVELOPMENT PROCESS

The Marine Corps Human Resources Development Process (HRDP) is the enterprise-level manpower architecture, or system of systems, managed by the deputy commandant of manpower and reserve affairs (DC M&RA). The collective activities involved in the HRDP create and execute policy to ensure manpower requirements from commanders in the operational forces and the supporting establishment are fulfilled. This task places a premium on planning and coordination to provide personnel at the right place at the right time for all Marine units (Deputy Commandant for Combat Development and Integration [DC CD&I], 2009).

In support of this goal, the HRDP relies on close coordination with the office of Combat Development and Integration (CD&I), an equivalent command, to integrate the assignment of personnel with the Total Force Structure Process (TFSP) for the Marine Corps. For the HRDP to work properly, three major processes within the Marine Corps must function in harmony: the force structure process (CD&I), the manpower staffing process (M&RA), and the training development process (CD&I). The interaction of these processes contributes to provide the optimal solution for the Commandant of the Marine Corps (DC CD&I, 2009).

It is impossible to explain the details of this complex process fully in the limited scope of this report. This report provides a general overview of the HRDP with emphasis on the process flow and the assignments process. Barry and Gillikin (2005) described the HRDP as having four distinct quadrants, each with inputs and outputs, that assess the manpower challenges under the given constraints and organize the information in a manner that leads to personnel assignments. The four quadrants of the HRDP are described as requirements, programming, planning, and execution (see Figure 3; Barry & Gillikin, 2005). The commandant is actively involved in this process, providing planning guidance and setting the priorities necessary to reach the desired level of readiness for the Marine Corps. The readiness of operational forces and supporting establishment units in the Marine Corps is directly impacted by the efficiency and effectiveness of these headquarters organizations to execute the commandant's guidance for the force.

Figure 3. Marine Corps Human Resource Development Process (HRDP)



Source: Barry, J. C., & Gillikin, P. L. (2005). Comparative analysis of Navy and Marine Corps planning, programming, budgeting and execution systems from a manpower perspective. (Master's thesis, Naval Postgraduate School). Retrieved from http://hdl.handle.net/10945/2322

1. Manpower Requirements

There are two distinct processes that must be carefully integrated to allocate required and budgeted "spaces" to the right "faces" in the Marine Corps. The organizations involved in this activity must define structure (CD&I) and deliver appropriate personnel (M&RA) and equipment (CD&I) to Marine Corps units. Manpower requirements are derived from the force structure outlined in tables of organization (T/O) that are necessary for units to accomplish their assigned missions. This force structure, based on assigned missions, defines Marine Corps requirements to Congress for appropriations and serves as the point of departure for the HRDP.

The requirement validation process begins with the civilian leadership and the guidance from the NMS and includes several key military actors and stakeholders such as the commandant of the Marine Corps (CMC), Combatant Commanders (CCDRs), and advocates (Deputy Commandants). The assistant commandant of the Marine Corps (ACMC) chairs the Marine Requirements Oversight Council (MROC) that is responsible for bringing the advocates together to ensure the requirements are valid and to reconcile existing requirements against the current needs identified by operational commanders.

There are three mechanisms available to commanders to identify personnel or resource shortfalls: the table of organization and equipment change request (TOECR), the universal needs statement (UNS), and the urgent universal needs statement (UUNS; DC CD&I, 2009). After routing through the chain of command, these requests are "staffed" and "a recommended solution is provided to DC CD&I" by Total Force Structure Division (TFSD) (DC CD&I, 2009, p. 5–2). Any shortfall in warfighting capability that is identified to the MROC is first resolved within existing Doctrine, Operations, Training, Material, Leadership, Personnel, and Facilities (DOTMLPF) before seeking external solutions or additional funding.

The CMC sets the priority for the manning and staffing of Marine Corps units relative to the stated manpower requirements (T/O) through the guidance provided in MCO 5320.12H (Commandant of the Marine Corps [CMC], 2012). The manning and staffing precedence order directs the DC CD&I to supervise the force structure process, including the development of the Authorized Strength Report (ASR), which balances the authorized end strength against force structure requirements and manning controls (CMC, 2012). The order also designates the DC M&RA as the lead for the HRDP that takes the ASR published by the DC CD&I and staffs Marine units according to the CMCs priorities and available personnel inventory (CMC, 2012). There are four precedence level categories used to allocate personnel to monitored command codes (MCC) outlined in the order (CMC, 2012). Each precedence level specifies the CMC's minimum requirements for each type of command (see Table 7).

Table 7. Manning and Precedence Level

Precedence Level	Minimum Manning Level	Description
Excepted Command	100% officers and enlisted	Commands that fill a vital or mandated need
OpFor Command	95% officers, 97% enlisted	Commands identified as integral to current operational needs
Priority Command	95% officers and enlisted	Commands that while not excepted or specifically integral to the operating forces, serve a significant function
Proportionate Share Command (Pro-Share)	92% officers, 94% enlisted	Those units not categorized within the Excepted, OpFor, or Priority manning precedence levels

Adapted from Commandant of the Marine Corps (CMC). (2012). *Precedence levels for manning and staffing* (MCO 5320.12H). Washington, DC: Headquarters, Marine Corps. Retrieved from http://www.marines.mil/Portals/59/Publications/MCO%205320.12H.pdf

2. Manning Process

The manning process is conducted by Marine Corps Combat Development Command (MCCDC) under the supervision of the DC CD&I. Force structure (T/O) requirements are the Marine Corps stated personnel requirement to accomplish their assigned missions. These requirements are not specifically constrained by law, but in practice, the service attempts to ensure the size remains relatively the same from year to year. An interesting point for operational commanders, relating to their T/O's, is that Congress may not actually appropriate funds to pay for the entire force structure in the National Defense Authorization Act (NDAA). Depending on the severity of the budget shortfall, there may be difficult decisions for the DC CD&I and DC M&RA to optimize the use of manpower in the force. The effect of these decisions may indirectly lead to unplanned and unwanted force shaping similar to what George (1999) described as tiered readiness. Under these conditions, Commanders may be forced to shift personnel around to make the next deploying unit ready, rather than the normal progression that allows the service to sustain maximum readiness within most of its units.

In addition to funding, Congress and the Marine Corps impose constraints and manning controls that impact the number of Marines available to fill billets (Strobl, 2005). Congressionally mandated constraints include the targeted aggregate end strength of the service and restrictions within grades for officer and senior enlisted personnel, and neither of these constraints are tied to mission requirements (Manpower and Reserve Affairs, 2015). Finally, the Marine Corps handles personnel who are patients, prisoners, trainees, and transients (P2T2) by subtracting P2T2 from its end strength prior to calculating authorized strength. What this effectively means is that P2T2 are funded but not assignable to operating forces. That equates to an overhead cost close to 17% of the total allowable end strength that is not available for assignment to a billet every year (Strobl, 2005). The benefit of this manning control is to ensure that the Marine Corps continues to invest in training and educating its force, by paying the bill up front, although that investment comes at the expense of shortages in the inventory to fill some units in the Marine Corps (Manpower and Reserve Affairs, 2015).

The goal, or output, for the force structure process is to produce a plan to allocate manning to T/O requirements (Strobl, 2005). This is accomplished when the DC CD&I publishes the authorized strength report (ASR). The ASR is calculated, generally speaking, by comparing the T/O, mandated end strength, manning controls, and subtracting P2T2 (Manpower and Reserve Affairs, 2015). The solution to this model allocates manning for the Marine Corps and produces what is known as the authorized strength of the Marine Corps (see Figure 3). Once the ASR is published, the process shifts from CD&I (manning) to M&RA (staffing) with the objective of assigning available personnel to units.

3. Staffing Process

The staffing process is directed by the DC M&RA and begins upon receipt of the ASR from the DC CD&I. M&RA is a large organization with numerous divisions, but this report focuses on the following two major divisions: Manpower Plans division (MP) and Manpower Management division (MM). Manpower Plans is responsible for developing the personnel inventory to "grow and shape" the force (Manpower and Reserve Affairs, 2015). Manpower Management distributes the personnel inventory according to the results of the staffing goal model (SGM) and then assigns personnel to specific units (Manpower and Reserve Affairs, 2015).

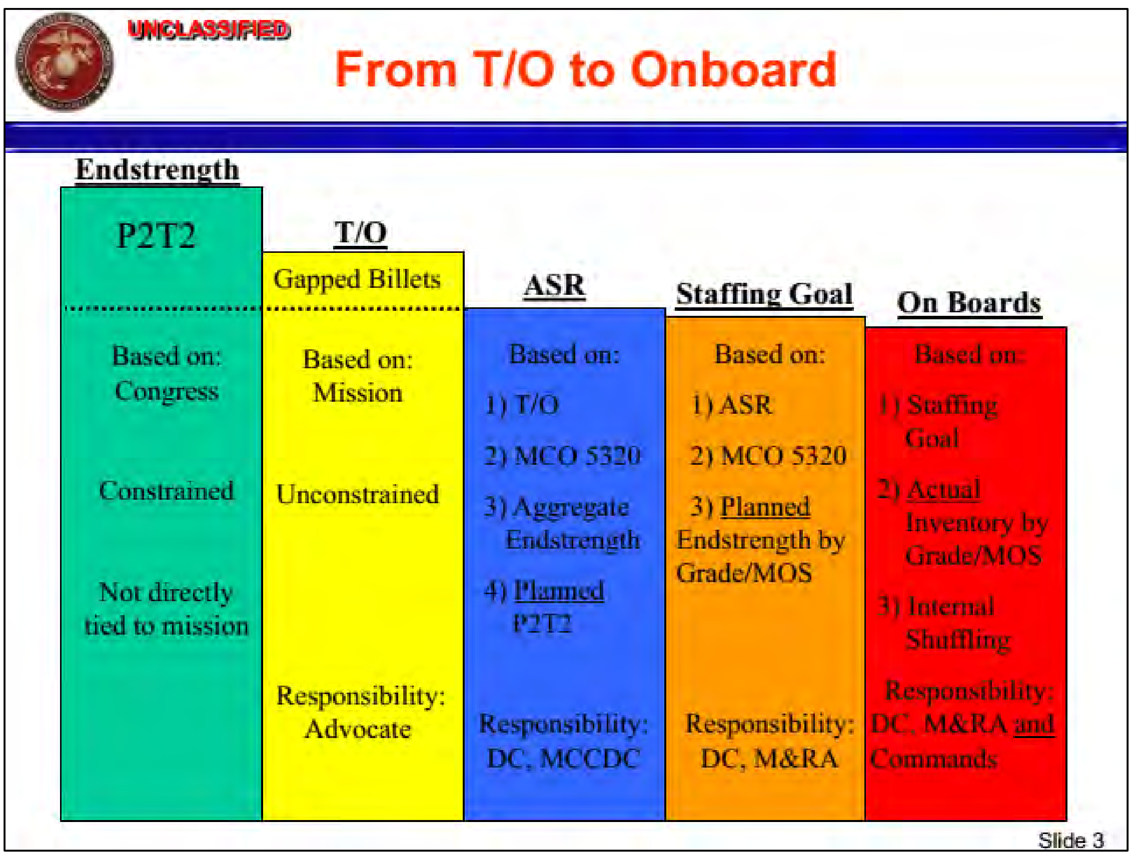
Manpower Plans (MP) is responsible for force shaping and uses a forecasting model called the Total Force Projection Model (TFPM) to produce the grade adjusted recapitulation (GAR) from the ASR (Barry & Gillikin, 2005). The GAR represents "the target (ideal) inventory" for the Marine Corps (Barry & Gillikin, 2005). Generally speaking, the GAR is developed by taking the ASR and adding P2T2 back into the model. Next, the model accounts for B-billets that are not associated with a primary military occupational specialty (MOS). Once that is accomplished, the existing constraints and manning controls are applied, which produces a holistic picture of the future inventory for manpower planners (Manpower and Reserve Affairs, 2015). The results of the GAR provide manpower planners with the information necessary to drive the accession, classification, promotion, retention, and bonus plans for the Marine Corps. The GAR is the primary tool used to evaluate the health and sustainability of the force, and it frames the decision space to senior leaders who set manpower policy for the service (Barry & Gillikin, 2005).

4. Distributing and Assigning Personnel

Manpower Management (MM) is comprised of the MOS monitors and their supervisors who are concerned with the "close fight" of distributing and assigning personnel. MM uses the ASR as the principal input to determine unit staffing goals, which serve as "the mission for the monitors" (Strobl, 2005). It is important to note that MCO 5320.12H allows for grade substitution, which is where the 1-up/1-down concept in the assignment process comes from (CMC, 2012). This policy is a way that manpower managers mitigate the shortages within grades in relation to aggregate end strength that exists for some MOSs (Strobl, 2005).

The manpower management assignments process is basically a two-step process that begins with establishing an acceptable distribution of the inventory (unit staffing goals) and then assigning specific personnel to units (Barry & Gillikin, 2005). The process starts with the ASR and the available inventory available "to optimally match staffing to manned billets in the ASR" (Strobl, 2005). This is accomplished through the use of the staffing goal models (SGMs) (Barry & Gillikin, 2005). The results of the SGMs are then checked for compliance with the guidance provided by the CMC in the precedence and manning order (Barry & Gillikin, 2005). Once the optimal distribution, or unit staffing goals, is established the command staffing report (CSR) is published and the assignment process begins for the monitors. MOS monitors consider the remaining factors such as individual preferences, career progressions, and oversees control dates before making a final determination on assignment and issuing orders to direct a Marine to a unit (Barry & Gillikin, 2005).

Figure 4. Relationship Between Endstrength, Manning Levels, and Staffing Levels



Source: Manpower Management Officer Assignments. (2005). *Officer assignments* [PowerPoint slides]. Retrieved from https://www.manpower.usmc.mil/portalpage /portal/M_RA_HOME

The key take-away from this overview of the HRDP is that assignments originate from the T/O, but they are constrained by much more than the structure alone. There are several inputs and dictionary rules that drive the process. The CSR and staffing goals are the key components to the assignment process. There are many factors that influence the aggregate number of Marines available to be assigned to a battalion during each year (see Figure 4). The cascading effect of these constraints and manning controls on end strength tends to result in shortages of personnel in certain MOSs. The Center for Naval Analyses (CNA) conducted a study on officer shortages from 1990 to 2005 and found evidence of shortages of PMOS against the GAR and assignment shortages below 85% of structure (McHugh et al., 2006). The primary finding in the CNA report relating to officer staffing within infantry battalions was a systemic shortage for MAGTF intelligence officers (McHugh et al., 2006). Shortages will likely continue to occur in high demand/low density MOSs, ceteris paribus, unless the MOS pipelines are redesigned, personnel inventory increases, or the structure for these MOSs decreases within the Marine Corps. One of the goals of this research is to identify the most significant MOSs relative to readiness to offer some insight into where the Marine Corps should begin looking to improve the HRDP for infantry battalions.

C. ENHANCED MOJAVE VIPER

Enhanced Mojave Viper (EMV) began in 2009, adapted from the existing Mojave Viper program, to focus the Marine Corps pre-deployment certification exercise toward the operational culture requirements for forces deploying to Afghanistan. The exercise is conducted aboard Marine Corps Air Ground Combat Center (MCAGCC) in Twentynine Palms, California, and supervised by the Tactical Training Exercise and Control Group (TTECG). TTECG is the service level organization tasked with evaluating Marine Corps unit performance, specifically infantry battalions, prior to deployment. The mission statement for the organization at this time states: "Conduct block IV pre-deployment training program (PTP) assessment of tactical elements of the MAGTF in the execution of core competency combined arms techniques and procedures during full spectrum operations in order to prepare units for deployment to OEF" (Tactical Training Exercise and Control Group [TTECG], 2010). TTECG has a unique perspective as evaluators because they see numerous units each year and they are staffed with the subject matter experts (SMEs) to assess each unit's proficiency in their assigned mission essential tasks (METs).

The assessment TTECG provides during EMV serves as a service level training event (SLTE) for the exercise force (EXFOR) outlined in MCO 3500.11F (DC CD&I, 2015) and meets the requirements for a mission rehearsal stated in MCO 3502.6 (see Table 8; DC PP&O, 2010). EMV was normally the final certification exercise for infantry battalions that deployed in support of OEF between 2009 and 2012. The successful completion of EMV signals that the battalion is ready to deploy, having completed the required phase III "ready the force" activities, and the directed PTP training outlined in MCO 3502.6 (see Table 8; DC PP&O, 2010).

Table 8. Marine Corps Pre-Deployment Training Program Blocks

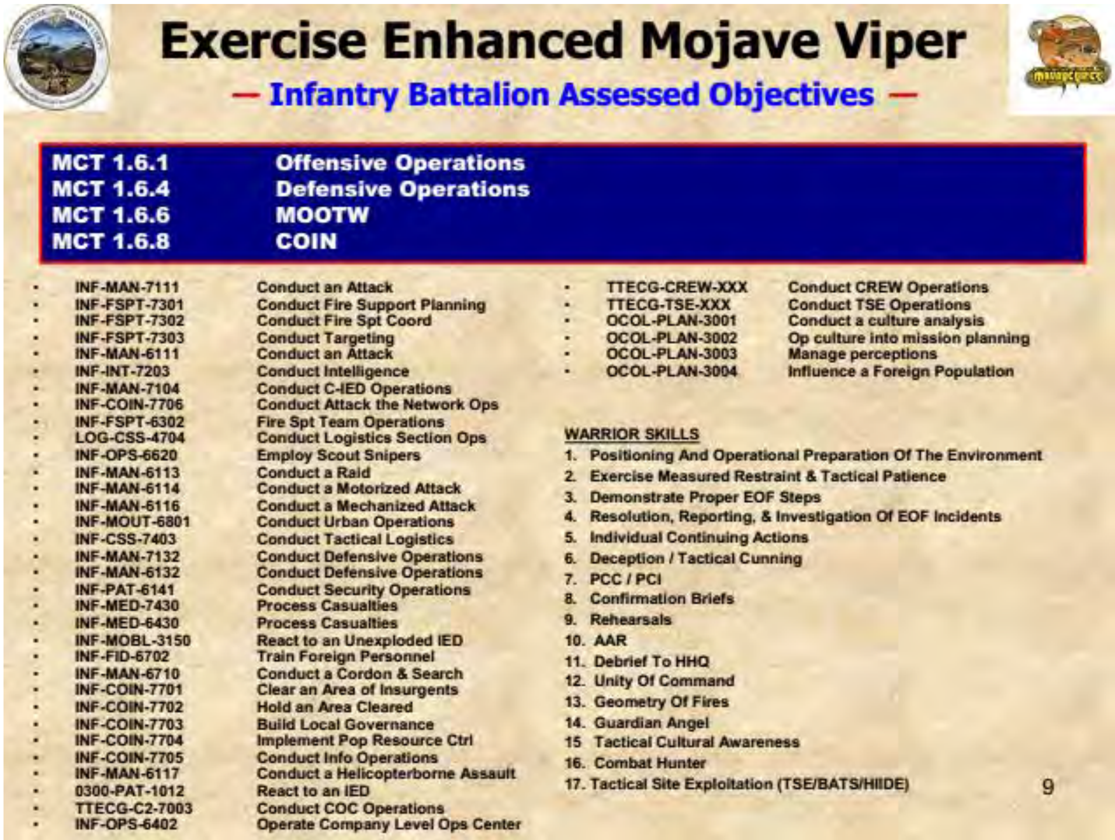
Block	**Category**	**Description**	**Responsibility for Assessment**	**Remarks**
Block 1	Individual Training	Formal schools, sustained core skills training, core plus skills training, and common skills sustainment training.	Unit conducting training	TECOM supports training
Block 2	Collective Training	Core capabilities and theater-specific training conducted by the unit. Company-level and below.	Unit conducting training	Unit HHQ supports assessment. TECOM supports training.
Block 3	Advanced Collective Training	Core (plus) capabilities training conducted by the unit's higher headquarters, and/or by other agencies. Battalion-level.	Unit HHQ	Unit HHQ supports assessment. TECOM supports training.
Block 4	MRX	The graduation pre-deployment training exercise. Individually tailored to support and assess a unit's ability to perform tasks on its assigned mission METL(s).	TECOM approves unit assessment plan in order to provide service standardization.	Operating forces support assessment. TECOM supports training. MRX supports unit deployment readiness certification.

Adapted from Deputy Commandant for Plans, Policies, and Operations (DC PP&O). (2010). *Marine Corps force generation process* (MCO 3502.6). Washington, DC: Headquarters, Marine Corps.

1. Infantry Battalion Assessed Objectives

The training at EMV allows an infantry battalion to leverage and test all of the warfighting functions and truly experience the power and capability of the MAGTF. The assessment provided by TTECG is centered on the battalion's Core METs to validate the proficiency of the unit in the conduct of mission profiles associated with those tasks within the framework and context of an Afghan scenario. The exercise is organized around four Marine Corps Tasks (MCTs), which correspond to battalion METs, and each training event requires the battalion to perform the individual and collective tasks required to achieve proficiency in those METs (see Figure 5). The goal for TTECG is to provide realistic training scenarios that test the battalion's planning and execution while providing feedback to those conducting the exercise. The four METs assessed during the exercise are offensive operations, defensive operations, military operations other than war, and counterinsurgency operations. Along with these four METs, the battalion is also assessed on its employment of basic warrior skills that are indicators of the discipline and force protection awareness of the unit. At the completion of the exercise, the infantry battalion has been tested in all of its critical warfighting functions and the commander understands the strengths and weaknesses of the battalion.

Figure 5. Infantry Battalion Assessed Objectives



Source: Tactical Training and Exercise Control Group (TTECG). (2010a). *Exercise Mojave Viper: Exercise overview* [PowerPoint slides]. Retrieved from https://vcepub.tecom.usmc.mil/sites/msc/magtftc/TTECG/Shared%20Documents/Forms/AllItems.aspx?RootFolder=/sites/msc/magtftc/TTECG/Shared%20Documents

2. Sequence of Events

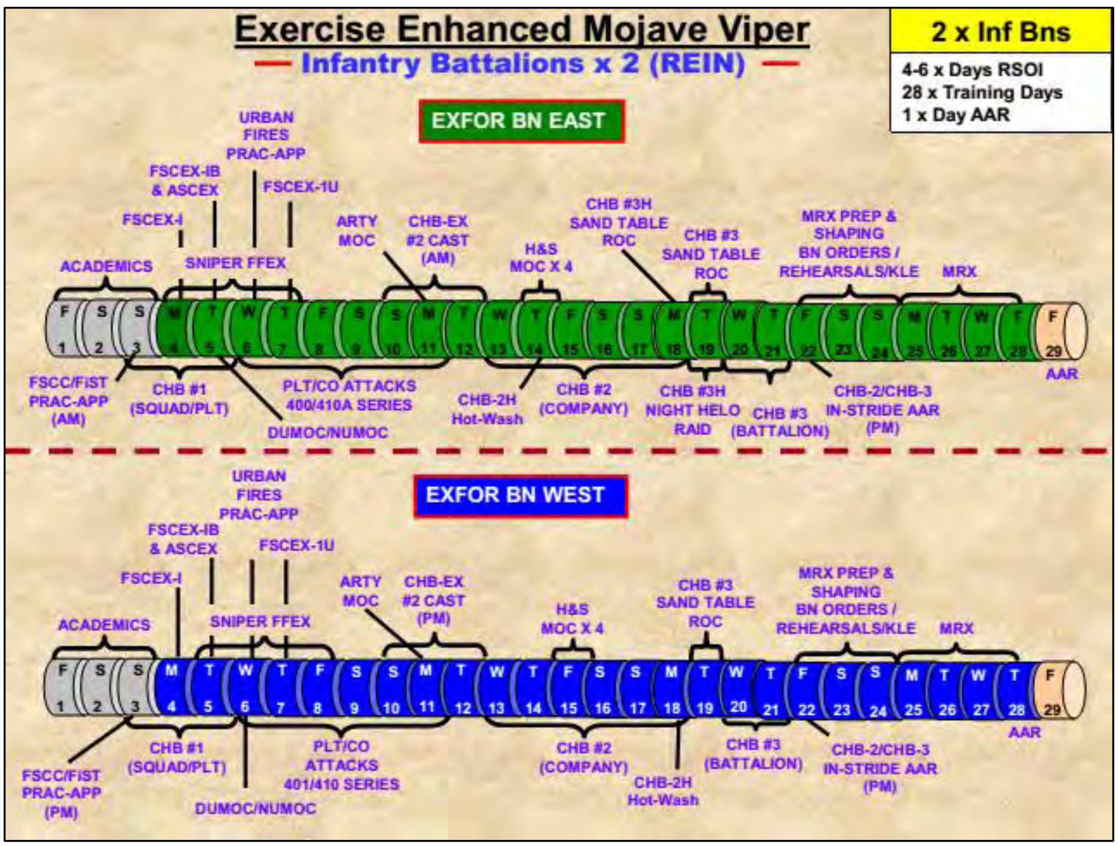
The exercise design incorporates a "crawl, walk, run" approach and each training event builds on the previous event in size and complexity (TTECG, 2010). For battalions not located at MCAGCC, the training begins well before the first training day. The planning and coordination required to move an infantry battalion from home station to MCAGCC tests the battalion's force deployment capability and procedures, which offers valuable insight into the agility, discipline, and expeditionary nature of the unit. It can be a significant task to plan and execute movement, arrive on time, and reconstitute with the appropriate personnel and equipment to conduct the training exercise. Specific guidance relating to the rapid deployment of Marine Corps forces is contained in MCO 3000.18B Force Deployment Planning and Execution Manual (FDP&E Manual).

Once the battalion arrives, they complete reception, staging, onward movement, and integration and finalize coordination with the TTECG staff to certify that the battalion is ready to participate in the exercise. TTECG organizes the exercise into four training blocks that are referred to as "clear, hold, build" or CHB 1 through 4 (TTECG, 2010). Each of the prescribed training blocks consists of a series of individual and collective training events that are assessed in terms of strengths and weaknesses for the unit relative to the Infantry T&R standards (see Figure 6). Although the exercise is also a training exercise, the TTECG staff does not consider it their mission to train the EXFOR participating in the exercise.

TTECG is concerned with assessing the proficiency of the battalion in their Core METs and the application of specific tactics, techniques, and procedures (TTPs) to complete the training events. This philosophy has recently changed to more "training" and "coaching" from TTECG as described in the current standing operating procedures (TTECG, 2014) and command brief (TTECG, 2015). The question our senior leaders need to investigate is whether this philosophical change occurred because it is the best use of Coyote resources (adds value to readiness), or whether the approach changed because battalions are not arriving prepared for a rigorous evaluation by TTECG to certify them for deployment.

EMV begins with CHB-1. This series of events occurs from training day (TD) 1 through 11 in the schedule. The training consists of introductory academics, site exploitation and cultural lane training, first responder, sniper training, fire support coordination exercises, and infantry platoon and company level combined arms training on the 400-series ranges. CHB-2 occurs from TD 12–19 and is built around a series of company-sized combined arms operations. Each company will conduct either a mechanized attack or a heliborne attack and transition into a defense of the objective. TTECG personnel evaluate the task-organized company team's ability to conduct offensive, defensive, and COIN/MOOTW during this block. CHB-3 occurs on TD 20–21 and tests the battalion's ability to plan, occupy, and conduct a battalion defensive operation. The battalion is expected to demonstrate proficiency in all of the tasks associated with occupying a defense and then in its ability to conduct a simulated fight against an adversary from its defensive position. The battalion completes CHB-3 by executing a counterattack from its deliberate defensive position. The final training block is CHB-4, or the mission rehearsal exercise (MRX), that is conducted from TD 22–28. This is a non–live fire scenario that integrates operational culture through the use of mission specific role players. CHB-4 presents the EXFOR with a full speed, realistic training scenario designed to replicate conditions in the current operating environment.

Figure 6. EMV Training Schedule

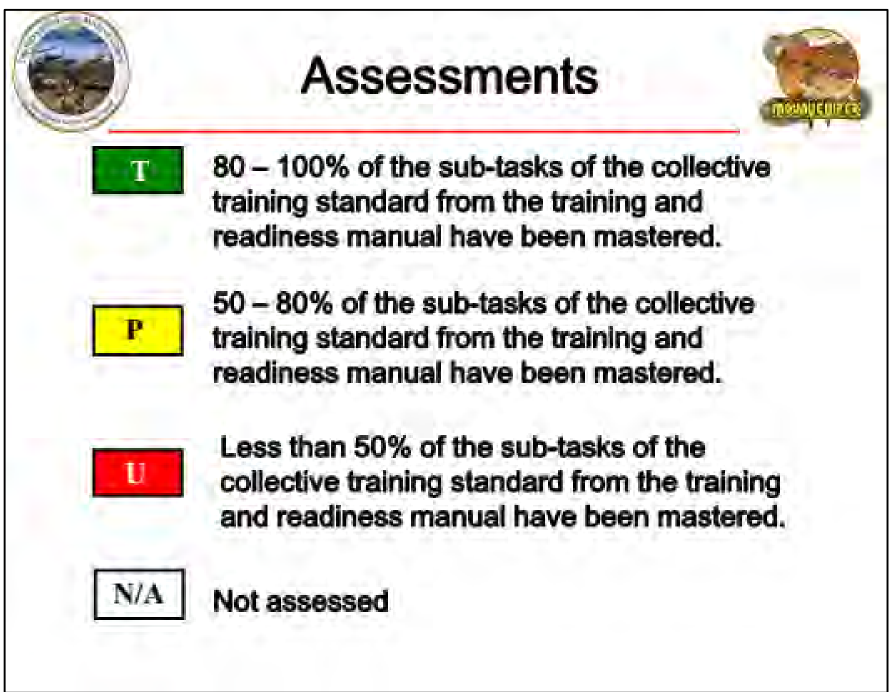


Source: Tactical Training and Exercise Control Group (TTECG). (2009). *Exercise Mojave Viper: Exercise overview* [PowerPoint slides]. Retrieved from https://vcepub.tecom.usmc.mil/sites/msc/magtftc/TTECG/Shared%20Documents/Forms/AllItems.aspx?RootFolder=/sites/msc/magtftc/TTECG/Shared%20Documents

3. Assessment Methodology

The assessment methodology used by TTECG for exercise forces at EMV is designed around three categories: trained (T), partially trained (P), or untrained (U). Each training event has a performance checklist that contains the collective tasks from the Infantry T&R Manual pertaining to that training event. The TTECG staff, also commonly referred to as "Coyotes" during the exercise, assess the performance of the unit conducting the training and submit their results to the TTECG Academics section. At the conclusion of each exercise, the EXFOR is debriefed on its performance and systemic trends are noted to the battalion commander of the EXFOR and the director of TTECG. The EXFOR's final results are forwarded to the battalion's Marine Expeditionary Force (MEF) commander for final review and certification for deployment. The battalion will use the final out brief from TTECG to guide its Block V (remediation) training plan with any remaining time it has prior to deployment.

Figure 7. EMV Assessment Methodology (T/P/U)



Source: Tactical Training and Exercise Control Group (TTECG). (2010b). *FPC brief to GCE* [PowerPoint slides]. Retrieved from https://vcepub.tecom.usmc.mil/sites/msc/magtftc/TTECG/Shared%20Documents/Forms/AllItems.aspx?RootFolder=/sites/msc/magtftc/TTECG/Shared%20Documents

D. THE ROLE OF COHESION IN THE MARINE CORPS

This section addresses the topic of cohesion, because the word *cohesion* appears in the policy directive driving the changes to the manpower process. However, the research in this study does not address the numerous sociological and psychological factors that must be included in any analysis of group cohesion. The purpose of including this information is strictly for context and to establish that personnel stability is at least a significant part of cohesion. It is not believed that any correlation between personnel stability and readiness constitutes a causal relationship with unit cohesion. To establish a causal relationship, one must conduct extensive research in areas that are well beyond the scope of this report.

1. Description of Cohesion in Groups

Military group cohesion has its roots in the study of how individuals relate to their primary group (Cooley, 1962). It involves the bond between individuals and the people they immediately interact with at the lowest level. From there, the study of cohesion goes on to examine the levels of cohesion and includes topics such as social and task cohesion, social relationships, relationship to performance, emotional and instrumental factors, goal commitment, teamwork, bonding, and trust (Siebold, 2011). Siebold (2011) presented a comprehensive review of the literature and the progression of the military's understanding of the topic of cohesion by outlining the work from social-psychologists and other experts in the study of group cohesion. The author describes the importance of cohesion thus:

> This interaction between the parts and the whole is at the heart of social psychology or, more specifically, the relationship between the individual members and their group as well as among the members. In this arena, cohesion pertains to the extent to which the parts come together to form the social group and hold together under stress to maintain the group. Cohesion is thus a relevant social matter to most groups and organizations in social institutions such as education, business, and government. It is particularly relevant to the military where group cohesion can at times provide the difference between winning and losing, life and death. (p. 450)

The significance of the study of group cohesion in the military is critical to understanding how to build cohesive units in the Marine Corps properly. The current body of knowledge presented by Siebold (2011) is captured in a model called "The Standard Model" which is a framework for understanding cohesion in small groups and is structured around "the primary group" and "the secondary group" (Siebold, 2011, p. 455). Each group represents a different level of bonding and contains unique characteristics that affect the degree of cohesion that can be achieved (Siebold, 2011).

2. Does the Marine Corps Need a Cohesion Policy?

The Marine Corps' warfighting philosophy, explained in MCDP-1, presents an extensive argument for the importance of cohesion in military units (Headquarters, U.S. Marine Corps, 1997). The maneuver warfare concept is central to the warfighting philosophy and serves as the guiding operational concept for the Marine Corps. Maneuver warfare was introduced in the 1980s to enable the Marine Corps, a relatively small force, to compete against a numerically superior force. Maneuver warfare relies on the focused and combined efforts of the military force aimed at the critical weakness of the adversary to

> render the enemy incapable of resisting effectively by shattering his moral, mental, and physical cohesion—his ability to fight as an effective, coordinated whole—rather than to destroy him physically through the incremental attrition of each of his components, which is generally more costly and time-consuming (Headquarters, U.S. Marine Corps, 1997, p. 73)

This unique approach to warfighting is intended to optimize the allocation and employment of its limited resources against a numerically superior opponent with an emphasis, in part, toward disrupting cohesion. This suggests the Marine Corps believes unit cohesion is important, especially since the fundamental warfighting concept is directed at taking that advantage away from an adversary.

Applying this warfighting philosophy to personnel management, MCDP-1 goes on to state,

> The personnel management system should seek to achieve personnel stability within units and staffs as a means of fostering cohesion, teamwork, and implicit understanding. We recognize that casualties in war will take a toll on personnel stability, but the greater stability a unit has

> initially, the better it will absorb those casualties and incorporate replacements (Headquarters, U.S. Marine Corps, 1997, pp. 64–65)

MCDP-1 makes a significant effort to demonstrate the importance of unit cohesion in its text, primarily for the benefits it offers its units and the opportunities to exploit against its adversaries, so it seems logical to continue researching this claim in more detail.

In a similar study conducted on U.S. Army units, Peterson (2008) discussed the need to "disentangle personnel stability, unit cohesion, and unit effectiveness" (p. 17) to understand the impact they have on personnel management policy in the military. Several detailed studies including Shils and Janowitz (1948), Millett, Murray, and Watman (1986), Butler, Blair, Phillips, and Schmitt (1987), and Beal, Cohen, Burke and McLendon (2003) attempted to define these variables and describe their relationship to the question of cohesion. It is clear that a detailed discussion on unit cohesion can quickly become a complicated conversation based on the understanding and relationship of these terms. As presented by Bassford (1990), any discussion of unit cohesion must go beyond a simple discussion of personnel stability, which this research is unable to accomplish, but mentions in an attempt to place the hypothesis in proper context. As Bassford (1990) observes:

> The fundamental problem is probably in our concept of the meaning of "cohesion," and our illusion that it is synonymous with personnel stability. Simply keeping 100 (or 16,000) soldiers together for three (or 30) years will not bring battlefield cohesion. It is not enough simply that these people know each other intimately; this is romanticism. Familiarity is far more likely to breed contempt than it is to produce 'tight, proud families. (pp. 75–76)

In the effort to assess the impact of the Deployed Unit Cohesion Staffing policy on the Marine Corps during the years 2009 to 2012, this research focuses solely on the impact of personnel stability and its contribution to unit cohesion. Clearly, there are many other factors involved in describing cohesion; however, personnel stability is a significant part of that solution. It is more important for the Marine Corps to understand the impact of personnel stability on unit readiness. The hypothesis for this study is that personnel stability leads to higher readiness in the force. If that is true, then personnel stability is significant for that reason, even if the degree that personnel stability contributes to cohesion cannot be determined from this research.

3. Significance of Personnel Stability—Is It Even Relevant?

In order to engage in critical thinking, one must thoroughly cross-examine perceived truths and question the assumptions behind those beliefs to either validate or disprove the stated claim. The Marine Corps places significance on the idea of unit cohesion. There is also a large body of work on the topic, and several of the findings regarding relevance are quite interesting. In Simmons (2001), the author stated a desire to rethink cohesion:

> One aim in doing this is to underline the fact that everyone need not like one another or be alike in order to attain a common goal. A corollary aim is to point out that the degree of attention traditionally paid to peer bonding is overblown (Simmons, 2001, p. 5)

There appears to be a wide range of academic opinions relating to the significance of personnel stability. The Marine Corps clearly believes that cohesion is relevant, but there is a gray area for discussion relating to the group levels targeted by current policy and the effectiveness of those policies enhancing unit cohesion.

MCO 3500.28 outlines the Marine Corps Unit Cohesion Program. The purpose of this program is "to establish a program that will enhance unit readiness and stability throughout the operating forces of the Marine Corps" (CMC, 1999, p. 1). This order describes the important aspects of the transformation process, as recruits are transitioned from the civilian sector to become members of the military. It explains the importance the Marine Corps places on building the cohesion of teams and units in the organization. The fundamental concept driving this policy is the idea of moving Marines from basic training to their operational commands in groups, and then conducting their subsequent deployments together, to maximize the amount of time Marines spend training together and building trust with each other. This policy solves part of the problem, if the cohorts are actually assigned to units in this manner, but it does not resolve the remaining issue relating to the amount of time spent with the leaders in the unit prior to deployment. The end result is often a truncated pre-deployment cycle for the Marines with their leadership.

The other factor contributing to this problem is Marines arriving into their deploying units to find their leader away at school because they require additional training. Creating cohesive groups formed during entry-level training (ELT) may not translate to proficient teams ready for deployment.

Cohesion seems to begin with the primary group bonds as Siebold (2011) explained in his model. Nevertheless, the discussion of cohesion must extend to the secondary group for military organizations. This is supported by Bassford (1990) who described military unit cohesion as the "bonding of soldiers of equal rank as well as between ranks, commitment of all ranks to the military mission, and the affirmation of special properties of their group, team, crew, company, or battery that keeps them alive in combat" (Bassford, 1990). Cowdrey (1995) described the concept of primary and secondary group cohesion within the framework of "vertical and horizontal integration" (pp. 3–4) between leaders, Marines, and the personnel management systems found in the Marine Corps. Jozwiak (1999) expanded upon the Cowdrey (1995) explanation of vertical and horizontal integration by including a model by Dr. Nora Stewart that adds the components of organizational and societal cohesion (Jozwiak, 1999). These frameworks outlined by Cowdrey (1995) and Jozwiak (1999) appear to support the underlying factors of cohesion described by Siebold (2011). The Deployed Unit Cohesion Staffing policy appears to address the factors of "vertical and horizontal" cohesion described by Cowdrey (1995) and the "primary and secondary groups" outlined by Siebold (2011). What is still unknown is how effective the policy is contributing to the cohesion of these groups.

The German model provides some insight into the importance of team building and the factors required to develop "primary group" bonds in military units (Shils & Janowitz, 1948, p. 280). Shils and Janowitz (1948) detailed the characteristics leading to successful unit cohesion in the German military in World War II and outlined the numerous factors that contributed to the effectiveness of German military units. The authors described the factors affecting German military cohesion and the ability to fight effectively under brutal conditions:

> Deterioration of group solidarity in the Wehrmacht which began to appear toward the very end of the war was most frequently found in hastily fabricated units. These were made up of new recruits, dragooned stragglers, air force men who had been forced into the infantry (and who felt a loss of status in the change), men transferred from the navy into the infantry to meet the emergency of manpower shortage, older factory workers, concentration camp inmates, and older married men who had been kept in reserve throughout the war and who had remained with the familial primary group until the last moment. (p. 288)

This finding lends some credibility to the argument that personnel stability does have an impact on combat readiness. The Germans were so successful at preserving the critical, intangible characteristic of unit cohesion by ensuring personnel had sufficient time to assimilate and train together prior to experiencing contact with an adversary. This applied to units directly engaged in combat. Once units were rendered completely combat ineffective, due to heavy losses on the battlefield, they would remove the entire unit from the front to a rear area and re-generate that unit prior to pushing them forward again into combat (Shils & Janowitz, 1948). According to Shils and Janowitz (1948), the rifle company was the most important level of an infantry formation to focus the effort of preserving unit cohesion. Additionally, the Germans believed the rifle company was the highest level infantry formation for which unit cohesion was relevant, because the personal interaction and team cohesion was vital to the success of that type of unit (Shils & Janowitz, 1948).

Based on these points, personnel stability appears to matter in the discussion of generating cohesion, but the extent to which stability matters on readiness is still open to debate. The study conducted by Peterson (2008) made a similar claim based on his research regarding personnel stability. He also claimed that the level at which cohesion occurs is significant, which was verified in the findings of his study. As Peterson (2008) stated:

> Primary group cohesion is a small group phenomenon that quickly loses its motivational effect above platoon level (Shils and Janowitz, 1948; Marshall, 1947). Additionally, the tactical team tasks requiring multiple repetitions to master may benefit from team stability. Much of the professional military writing points to the small unit level as being impacted the most by personnel turbulence. In contrast, higher echelons

> above platoon may not receive significant benefit from personnel stability because the tasks and relationships are different than lower echelon units. (pp. 33–34)

This is a significant claim and one this research intends to test further. In particular, the analysis determines the effect personnel stability has on readiness in the Marine Corps, focusing on infantry battalions deploying before and after the implementation of the Deployed Unit Cohesion Policy. If the hypothesis holds, then the empirical evidence from this research should provide more insight into the extent of this phenomenon for Marine infantry battalions.

Based on the results of Peterson (2008), "the historical and scientific research provides evidence that personnel stability may not be required to achieve high levels of unit effectiveness" (Peterson, 2008, p. 34). He went on to state that "the deficiency in the research is the empirical analysis of the stability-effectiveness relationship" (Peterson, 2008, p. 34). The analysis in this research is unable to make specific claims about cohesion, but the intention of this study is to assess the impact of personnel stability on combat readiness for infantry units. This research attempts to isolate personnel stability and draw appropriate conclusions based on an understanding of the larger body of work on cohesion. Ideally, the research can provide evidence to focus manpower planners on the most significant MOSs an infantry battalion needs on-board early in the pre-deployment schedule to maximize readiness and generate higher quality battalions for the Marine Corps.

III. DATA AND METHODOLOGY

> *"Data serve as the raw material for knowledge and understanding. Knowledge and understanding result when human beings add meaning to data."*
>
> —MCDP-6, Command and Control
> (Headquarters, U.S. Marine Corps, 1996, p. 56)

A. DATA COLLECTION

This research attempts to employ quantitative methods to explore the readiness of infantry battalions. In order to use these methods, such as descriptive statistics or multivariate regression analysis, the empirical analysis requires historical data analogous to the components of the problem relating to the research questions. Qualitative research is conducted in much the same manner as quantitative research, just with less precision, since it also bases its findings on historical context and makes assumptions to test a hypothesis.

This research uses observational data for its empirical analysis. The data collected from M&RA, CD&I, and TTECG merged into the master data file is pooled cross sectional data that combine the characteristics of time series and cross sectional data. Panel data is not possible because each unit does not complete a PTP cycle every year. However, the type and characteristics of the data are sufficient for the research being conducted in this study.

On the other hand, the statistical power of the sample is constrained by the number of MCCs (36 battalions) on file at TTECG with usable data for the years 2009 to 2012. The sample is not a random sample of all Marine Corps infantry battalions during that period, and it does not contain battalion landing teams (BLTs), reserve battalions, or otherwise assigned battalions. While the sample is restricted to active duty Marine Corps infantry battalions that completed EMV from 2009 to 2012, this data includes nearly the entire population of active duty Marine Corps infantry battalions that completed EMV.

1. Manpower and Reserve Affairs (M&RA)

M&RA maintains a manpower data system called the Total Force Data Warehouse (TFDW) that

> contains 30 years of historical manpower data from a variety of USMC or other DOD systems including MCTFS, MASS, RCCPDS, MCTIMS and DEERS, in one location to provide manpower analysts with a comprehensive view of a Marine's career from street to fleet (Total Force Data Warehouse, n.d., p. para 1)

This system serves as the "system of record for historical manpower data" and is the "authoritative data source per USC Title 10" for the Marine Corps (Garrick, 2014, p. 3). This research uses infantry battalion personnel data from TFDW to provide monthly snapshots of on-board strength for each of the battalions in the study.

To capture the relevant time period for the study, data extracted from the TFDW data includes monthly snapshots beginning nine months prior to and ending three months after the battalion began EMV for the study. Each monthly snapshot contains aggregate data by MOS and grade for on-board personnel in the battalion on the date of the snapshot. The original data set from TFDW contains 140,200 observations organized by MCC. The process for obtaining this data from M&RA includes providing approval from the originating command to conduct research from originating command, certification to conduct human subject research from internal review board, and a manpower information request submitted through the M&RA website.

2. Combat Development and Integration (CD&I)

CD&I serves as the data source for personnel and equipment structure in the Marines Corps. This report solicited TFSD for the T/O structure requirements and the authorized strength for Marine Corps infantry battalions during 2008–2013. The data set contains 42,100 observations arranged by MCC with each Billet Identification Code (BIC). Additionally, the data contains numerous other fields including MCC, home station, MEF, billet descriptions, ranks, grades, and MOSs. The reason 2008 and 2013 are included in this study is to account for a battalion that conducted EMV early in 2009 or late in 2012. For those cases, the appropriate structure is available to apply to the on-board snapshots from M&RA for the months leading up or following EMV for the battalion.

3. Tactical Training and Exercise Control Group

TTECG has an internal academics section within the command that is responsible for maintaining performance data on EXFORs that participate in the exercise. The scores are structured around the individual and collective T&R tasks evaluated for the exercise. Each training event is assigned to a Coyote for assessment and scoring. The scores are assigned based on the unit's performance conducting the assigned task and then noted within the database file for the exercise that is maintained by the academic's section. The scoring scale for each subtask is based on the following methodology: 1 for untrained, 2 for partially trained, and a 3 for trained. The final value of the supported T&R task is generated by dividing the average of the subtasks by a value of 3, indicating the percentage of proficiency the unit demonstrated on that skill.

The master assessment tool was provided by TTECG academics to support this research for the infantry battalions participating in EMV from 2009 to 2012. The assessment tool contains the percentages for each battalion organized by MET, collective tasks, and subtasks contributing to the total score. The total scores for each battalion were used to reflect the dependent variable of readiness for the purposes of this research. Per the request from TTECG, unit MCCs have been removed from the output to prevent specific units from being identified within the results of this report.

B. DATA ISSUES AND NORMALIZATION

A critical component of any empirical analysis is availability of good data relative to the research goals. However, data sources always present unique challenges. This section details how the data for analysis are derived, what impact their complexities may impose on the results of the research, and how the author attempted to resolve these data issues.

1. Billet Identification Code (BIC)

The original idea for this study was to use the billet identification code (BIC) to group specific personnel into their actual warfighting groups. Unfortunately, there are several reasons this level of detail is not possible with the data sources available for this research. Following the initial data pull from M&RA, the author discovered approximately 50,000 BICs are empty fields for every snapshot produced by TFDW for the research. Additionally, a closer examination of the data reveals the BICs that are assigned in the TFDW system are potentially highly inaccurate due to the failure of units to update those fields as personnel are internally transferred or otherwise re-assigned.

To resolve the issue with BIC, the researcher turned to the MOS fields to build the model. This creates a new set of problems for certain MOSs such as an 0331 machine gunner who resides in both a Rifle Company and Weapons Company. This is not necessarily an issue for those dealing with structure alone, but it limits the ability of this research to analyze specific elements or task-organized units within the battalion (e.g. Rifle vs. Weapons Company). As another example, fire support is one of the warfighting functions and is also a critical component of the battalion that is evaluated by TTECG (i.e., the fire support coordination center [FSCC]). Without BICs, however, it is impossible to identify the company commander that is the fire support coordinator in the data, typically this would be the Weapons Company Commander. The rest of the FSCC has the same issue because that function is assembled from Marines throughout the battalion. This research is able to differentiate only the tactical air control party (TACP) related to FSCC, and that is because naval aviators possess unique MOSs that are easily identified in the data file.

If monitors assign Marines to a BIC rather than an MCC, then the inability to look at specific functions in the battalion would not be an issue for this research. That practice removes some of the flexibility of units to place personnel according to their desires in task organization, or at least that is likely the complaint battalions would make. MMOA and MMEA are in the business of wholesale assignments and battalions are responsible for the retail assignments within their respective units. The U.S. Navy has recently implemented BIC level assignments with some degree of success. However, one would think that a little communication between the receiving unit and the monitor on the front end of the process would alleviate the initial flexibility concerns and provide for more efficient tracking of the inventory problem. The other solution is actually the one most units might prefer, which is leaving the current assignment practice in place and enforcing accountability by implementing reporting requirements to ensure BIC data fields are kept up to date.

2. Impact of Non-Deployables

According to MCO 3000.13, non-deployables are subtracted from assigned strength (on-board) to determine the personnel strength readiness for an infantry battalion. However, it is not possible in this data pull to determine the number of non-deployables carried by each battalion during each monthly (on-board) personnel snapshot. In fact, the analysis below reveal several MOSs are well over T/O throughout the PTP schedule, and then large numbers are dropped near the deployment dates. Carrying large numbers of non-deployable Marines affects the BIC issue as well, since there is a limited number of BICs for a battalion’s structure. If BICs are tracked for assignment by monitors then units may not receive fills because they appear to be overstaffed. The author attempted to account for this issue by requesting access to the infantry battalion Deployment Staffing Reports (DSRs) for the periods covered in this research, but Manpower Management Enlisted Assignments (MMEA) branch does not archive these monthly reports for their records.

The DSR contains enlisted deployment staffing information for the battalion and readily displays data such as the staffing goal, deployables (on-board), non-deployables (on-board), and status at lock on date plus 60 (LOD+60). The data in the DSR offers valuable insight into the personnel readiness for an infantry battalion. Similar data for officers would likely be informative as well. Since this research is unable to determine the non-deployable levels in each unit there is an unknown amount of distortion within the results. The overall readiness can be ascertained from the data, but the specific level of deployable Marines is skewed by the data source. In some cases, DSRs are provided by the battalion to TTECG for each exercise. However, due to inconsistent format and submission irregularity the data are not useful to infer non-deployable levels from the TTECG data files. On the other hand, to the extent that non-deployables are uniformly carried across MCC units and over time, the analysis below can control for these challenges in the model.

3. Percentages for Manning and Staffing

The CMC guidance provided in MCO 5320.12H provides priorities for manning and staffing precedence (CMC, 2012). These priorities are stated as percentages of aggregate numbers for officers and enlisted rather than providing specific guidance for each MOS in an infantry battalion. This means that it is possible that an infantry battalion with a shortage of six infantry platoon commanders produces the same fill percentage as a battalion missing six lieutenants in support or staff billets within the battalion. That approach is likely to bias the manning and staffing percentages in regards to readiness.

This issue was also addressed by McHugh et al. (2006), a CNA study that proposes including the number a PMOS is over or under structure in addition to the current percentage filled metric used by the manpower process (p. 93). The greatest effect of this is seen within certain high demand and low density MOSs for infantry battalions. If a battalion has only have two intelligence officers, and they are both currently gapped, the battalion intelligence warfighting function is significantly degraded, but the fill percentage may be acceptable within the guidance of MCO 5320.12H. McHugh et al. (2006) provided empirical evidence to support the claim that the current mechanism used to determine personnel readiness is an insufficient indicator of unit readiness.

4. TTECG Data and Scoring

The data sources provided by the TTECG academics section contains EXFOR performance data for the years 2009–2012. Initially, it was the intention of this research to analyze infantry battalions from 2001 to present, but that is not possible due to a data storage issue that occurred in 2008 where previous records were lost and unavailable to retrieve for this research. The usable data provided by TTECG is specific to EMV and covers the period 2009–2012, so this report does not contain information on infantry battalions related to the Combined Arms Exercise (CAX), Revised CAX (RCAX), Mojave Viper (MV), or the current exercise titled the Integrated Training Exercise (ITX).

The level of detail in the scores also does not allow the research to account for multiple attempts a unit may require to achieve proficiency within a particular task. It is not uncommon for a unit to need multiple attempts, time permitting, to achieve their final score represented in the master assessment tool. After analyzing the algorithms used in the TTECG master assessment tool the author identified instances where a unit was assigned a value of "1" for subtasks that they may not have participated in during the exercise. This contributes a negative effect on the unit's overall score. This effect appears to be consistent throughout all units, so the author determined that the overall trend in scoring is still an acceptable metric. The final data issue is the existence of empty fields in the TTECG master assessment tool. In order to remove the effect of these empty fields, the author utilized the rowmean() command in the STATA coding software to eliminate the effect of these empty fields on the average scores for each MET. The author decided not to weight the averages of particular subtasks or collective tasks for the purposes of this research. All scores are represented as the mean for that task, excluding empty data fields from missing scores in the calculation of the mean.

C. DATA CONSTRUCTION

This research uses STATA statistics and data analysis software version 13.1 to perform the empirical analysis of the model. The CD&I data file contains the data for infantry battalion structure and consists of merged elements from T/O and authorized strength. The first step to preparing the data file is to aggregate BICs into the lowest level group categories. For instance, to assign observations to a unit group "1," the researcher created variable unit_group=1 if the billet MOS="0302" and A_GRADE="LTCOL." That is, the variable "unit group" places the BIC for a battalion commander into the command group. Every BIC is thus assigned a specific unit group within the STATA program. In order to match those variables with the M&RA data file, a second dummy variable named _adj_grade accounts for the 1-up/1-down concept identified in the assignment process. This is necessary to account for Marines filling billets above or below the grade specified for the BIC in structure. Dummy variables for _MEF_code and _BASEcode account for the parent unit and home station. Once these adjustments are complete, the file is saved and named ASRCLEAN. Due to the structure of the data file, the data for each year are stripped from ASRCLEAN and saved to a new data file (i.e., ASRCLEAN2008). After every year is separated, the years are appended in sequence to transform the data in ASRCLEAN from a horizontal or wide format to a vertical or long layout. This is necessary to prepare the data to merge with the M&RA data. Finally, the unnecessary years and additional variables were dropped to produce the ASRMASTER data file.

TFDW data is contained in a single, text delimited file that is easily uploaded to the STATA format. Multiple adjustments, including formatting dates and converting string to numeric characters, are executed to align the fields in TFDW data file with those found in ASRMASTER. Next, the same _unit_group and _adj_grade dummy variables are created in the file to prepare for the merge with ASRMASTER. Finally, the merged personnel count data are aggregated to _MCC, _fy, _unit_group, _snapshot, and _emv_fy. That is, the data are observed by MCC unit, unit group, snapshot month, and FY. This data file is saved as a new file named UNIT_COUNTCLEAN.

Once the TFDW (on-board) and the CD&I (structure) data file are clean then they are ready to merge. With UNIT_COUNTCLEAN as the master file, the information from the structure data file ASRMASTER was merged. Observations that did not occur during the relevant years for this research are dropped from the file. The new data file is named MANPOWER_MASTER.

The TTECG data was compiled from numerous Excel spreadsheets and combined into a single Excel spreadsheet named UNIT_SCORES. This file contains 36 records by MCC and a field for each MET, collective task, and subtask for the exercise. Similar to the other files, several fields require renaming and dates are formatted to match the variables found in MANPOWER_MASTER. Since the author was unable to retrieve the actual deployment dates for MCCs, an assumption is made relative to the FGEN process that units normally deploy within 60 days of completing EMV (Deputy Commandant for Plans, Policies, and Operations, 2013). Using that rule of thumb, the _est_ddate and

_PTP_begin variables are created to establish D-180 and D for each MCC. The last step to prepare the UNIT_SCORES data file is to calculate each units score for each MET and an overall total score for the exercise.

D. MASTER DATA FILE

The master data file is created by merging (m:1) MANPOWER_MASTER with UNIT_SCORESCLEAN. All observations occurring less than six months prior to the unit's deployment date or more than three months after the unit's deployment date are dropped from the file, resulting in 8,839 observations for analysis. Again, the unit of observation is MCC unit, unit group, snapshot month, and FY. This datafile is named MASTER_DATA_FILE.

E. MODELING THE DATA

Combat readiness is the fundamental concept this research attempts to provide insight toward. There are countless factors that one may consider relevant to an analysis of readiness. Some are quantifiable and available to the service while others are not. The research framework used in this approach provide a unique perspective and opportunities for further research on the topic of infantry battalion readiness. The key question that leaders and strategic planners must define to manpower planners is the answer to the question: "Ready for what?" The answer to that question is vital to achieve unity of effort throughout the Marine Corps to optimize readiness. The CMC and FSRG planners in Smith (2011) described the "expeditionary force in readiness" in the following way:

> (1) An integrated and balanced air-ground-logistics team.
>
> (2) Fwd deployed and fwd engaged—ever ready to respond to the full range of crisis and contingencies.
>
> (3) Responsive and scalable, *ready today* to respond to the full range of crisis and contingencies.
>
> (4) Trained and equipped to Integrate with other Services, Allies, and Interagency partners.
>
> (5) The USMC is a *Middleweight Force*…"light enough to get there quickly, and heavy enough to carry the day upon arrival." (p. 5)

With these principles in mind, the USMC must provide forces that are ready to respond to any crisis it is trained and equipped to handle. Although the DRRS-MC reports offers insight and provides certain indicators of infantry battalion readiness, this research contends that a battalion's performance during EMV provides the most holistic picture of the unit's readiness relative to what they are designed to offer the CCDR. Readiness goes well beyond simply having the required personnel and equipment on-hand, or the judgment of the commander; any discussion of readiness must include a demonstration of proficiency and ability of the unit to function as it was designed, as assessed by evaluators external to the command. For this reason, EMV scores are used to represent the dependent variable of readiness for this research.

1. Conceptual Framework for the Readiness Model

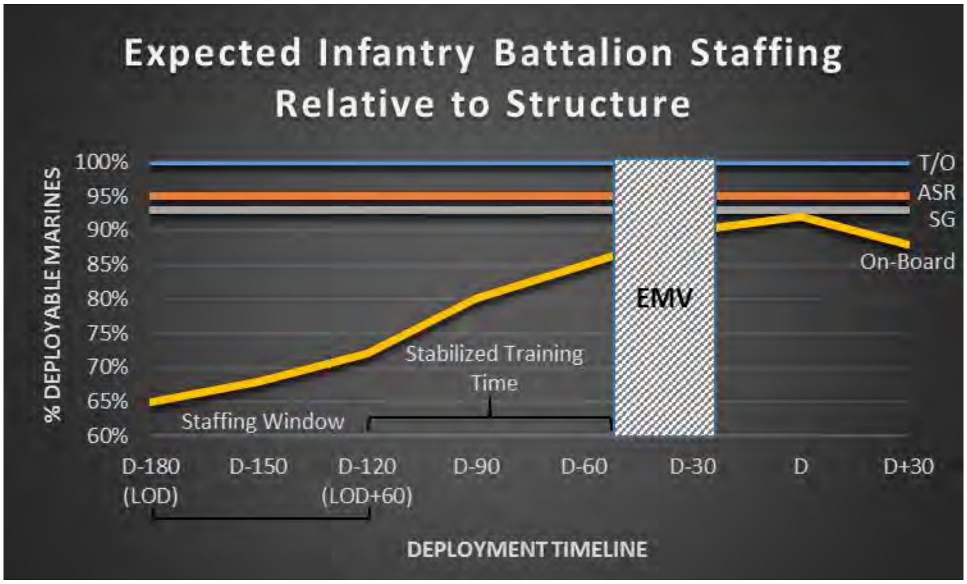
The idea for this research is born out of the author's experience while serving as a battalion operations officer during a recent work up and deployment to Afghanistan. The battalion commander purposefully required a personnel stabilization date of D-180 in his guidance for the battalion's PTP training plan and his tenacity to pursue its achievement made a significant impact on the unit's readiness for deployment. Following his initial guidance, he regularly questioned the battalion XO and S-1 as to the status of inbound and outbound personnel. He took specific interest in the internal transferring of personnel between billets and enacted battalion policies aimed to curtail those practices. It became clear to this researcher that the battalion commander's belief of the importance of personnel stability on unit readiness was vital to the unit's success during the deployment.

Personnel stability is not central to the author's responsibilities as the operations officer, but the effect on training and preparation was evident in several areas. The act of stabilizing personnel by D-180 is critical for the battalion and necessary to prevent the highly inefficient practice of "taking 1 step forward and 2 steps backward" during the conduct of the PTP. The current manpower assignment process allows monitors to take credit for meeting staffing goal when inbound orders are dropped into the system by the monitor. That business rule does not account for the time it takes for the Marine to get to the unit, which can be months, and it certainly does not mean the Marine is fully certified (school complete, and so on) and ready to perform the job. Monitors are satisfied they are fulfilling the manning and staffing precedence order as long as the Marines arrive between LOD (D-180) and LOD+60 (D-120) on the battalion's deployment timeline (see Figure 8). This factor, along with horse trading within the division, individual augments, and the skills of the inbound Marines, contributes to personnel turbulence within the battalion.

The presence of non-deployable Marines also produces an inaccurate picture of personnel readiness for the battalion, and in some cases, adds significant administrative burden onto the unit as it prepares to deploy. The counter argument for carrying non-deployable Marines on the unit roster is to boost readiness numbers for crisis response and increase the cohesion of the unit at that time, but those practices are at the expense of the cohesion of the deployable personnel. In some ways, personnel readiness and the cohesion policy actually seem to work against each other as a battalion prepares for deployment. The trade-off is that force is the most prepared to act as a crisis response force, but the current Global Response Force (GRF) requirement is not impacted by these practices. The USMC GRF battalions are typically not improved as a result of carrying non-deployable Marines.

After considering all of these facts, the author set out to understand the problem and developed a model attempting to identify the most significant Marines (by MOS) within an infantry battalion relative to readiness. If the USMC and manpower planners understand this effect on infantry battalions, then it is possible for manpower planners to prioritize these Marines to arrive at an infantry battalion, with the necessary skills, by the battalion's LOD. It is probably too difficult under current manning constraints to shape the inventory for all BICs to arrive by LOD. However, adjusting priorities to staff the most significant by the LOD would enhance unit readiness levels and enable commanders with the potential to produce even better infantry battalions than they are currently able to achieve.

Figure 8. Expected Infantry Battalion Staffing Relative to Structure



2. Determine the Parameters for the Readiness Model

This research uses a parametric approach to analyze the data collected. That means the research assumes "this pattern holds" or "everything else held constant" for each parameter or characteristic in the model. The results of the model are based on the historical data collected during the specified years of the research. As technology, processes, training standards, or other inputs to the model change the coefficients may not accurately represent the effect of the parameter on the dependent variable of readiness.

a. Personnel Parameters

The personnel parameters in the model are derived by grouping MOSs and grades available in the data into several levels for comparison (see Table 9). The personnel parameters include all of the BICs for the infantry battalion assigned by structure during the year the battalion is evaluated. The lowest level accounted for in the model is focused on infantry MOSs and includes the 24 base groups for the study. In order to establish the next level of the model, the author used the recode command to group the original MOSs into the next category. For instance, _Inf_Capt, _Inf_Msgt, and _Inf_GySgt were combined to create the _Co_staff variable. First Sergeants were placed in the "other" category for the purposes of this study because they are not always from an infantry occupational specialty in the Marine Corps.

As previously stated, it was the author's desire to use more precision in the groups used for analysis in this study but the inability to obtain reliable BICs from TFDW data led to the stated model personnel parameters. The research tested four groupings of personnel to determine the best model based on F-test, p-value and R-squared results provided by the STATA software. The best model was selected after comparing the results of multiple iterations of the model and sensitivity testing.

Table 9. Personnel Parameters for the Model

WFF	Functional	Leadership	MOS	Unit	Groups	Description	MOS
C2	Cmd	Cmd	Cmd	Cmd	**1**	Bn CO, SGTMAJ, Bn XO, OpsO	0302(O5/O5E), 8999(E9), 0302(O4/O4E)
Intel	Intel	Intel	Intel	Intel	**2**	S2	0202, 0203, 0231
Maneuver	Infantry	Co Staff	0302	Inf_Capt	**3**	Infantry Captains	0302(O3/O3E)
			0369	Inf_MSgt	**4**	Infantry MSgts	0369(E8)
				Inf_GySgt	**5**	Infantry GySgts	0369(E7)
		Plt Staff	0302	Inf_Lt	**6**	Infantry Lts	0302(O1/O1E/O2/O2E)
			0369	Inf_SSgt	**7**	Infantry SSgts	0369(E6)
		NCOs	0311	Inf_NCO	**8**	Infantry NCO	0311(E4-E5)
			0331	MG_NCO	**9**	MG NCO	0331(E4-E5)
			0341	Mortar NCO	**10**	Mortar NCO	0341(E4-E5)
			0351	Assault NCO	**11**	Assault NCO	0351(E4-E5)
			0352	Missile NCO	**12**	Missile NCO	0352(E4-E5)
		Infantry	0311	Infantry	**13**	Infantryman	0311(E1-E3)
			0331	MG	**14**	Machine Gunner	0331(E1-E3)
			0341	Mortar	**15**	Mortarman	0341(E1-E3)
			0351	Assault	**16**	Assaultman	0351(E1-E3)
			0352	Missile	**17**	Anti-Tank Guided Missileman	0352(E1-E3)
		SSP	0317	SSP	**18**	Scout Snipers	0317(E1-E6)
Fires	TACP	TACP	TACP	TACP	**19**	AirO, FACs	7502, 7523, 7525, 7563
Logistics	Admin	Admin	Admin	Admin	**20**	S1	0102, 0111, 0180, 4821
	Logistics	Logistics	Logistics	Logistics	**21**	S4	0402, 0411, 0431, 2111, 2171, 2311, 3002, 3043, 3051, 3381,3521,3529,3531, 3537,
C2	Comm	Comm	Comm	Comm	**22**	S6	0602, 0612,0619, 0621, 0629, 0651, 0659, 0699, 2834, 2841 2844, 2847, 2862
FPRO	CBRN	CBRN	CBRN	CBRN	**23**	CBRN officer, specialists	5702(W2), 5711(E3)
Other	Other	Other	Other	Other	**0**	1stSgts, Gunner, Bn Ops Chief, 81s Plt Sgt	8999(E7/E8), 0306(W3), 0369(E9), 0848(E7)

b. *Testing Pre-2011 Significance*

The independent variable _pre2011 is used to test the significance of readiness scores prior to the implementation of the Deployed Unit Cohesion Staffing policy. The _pre2011 variable is generated following a conditional test that determines whether the observation occurs prior to 2011. Once the independent variable is generated, a multivariate linear regression model is estimated to measure the significance of the independent variables relative to readiness.

c. *Control Variable for Training and Mediating Factors*

Figure 9. Original Model

$$R_{it} = \beta_0 + \beta_1 d_{pre2011} + \beta_2 d_{MEFcode} + \beta_3 d_{BASEcode} + \beta_4 d_{unitgroup} + \beta_5 d_{unitgroup*asrgap} + \beta_6 ASRgap + \beta_7 d_{tmonth*stable} + \beta_8 stable + \varepsilon_{it}$$

[i = group (24), t = month{-6,-5,…0,1,2}, $d_{pre2011}$=1 if {fy<2011, 0 otherwise}, $d_{MEFcode}$=1 if MEF{IMEF, IIMEF, IIIMEF}, $d_{BASEcode}$=1 if base{Pendleton, Lejeune, Kaneohe, 29 Palms}, $d_{unigroup}$=1 if group{other,cmd...cbrn}, ASRgap=count-ASR, stable=0.9(ASR)]

Not all Marine Corps infantry battalions are created equally and there are two key factors contributing to that effect. Training is directly impacted by two parameters, which are both examined in this research. The Marine Expeditionary Force (MEF) where the battalion originated from is the first characteristic used to represent training levels. This parameter describes the MEF Commander's priorities, the standards of training quality in the MEF, and the regional focus for operations within the command, relative to readiness. The second parameter used in the model representing training levels is the home station base for the infantry battalion. This parameter indicates the training opportunities available at the base such as ranges, training areas, and other facilities or support relative to readiness. Due to a lack of specific data to reflect training proficiency, these control variables are used to represent a fixed effect from training relative to readiness. The original model contained both independent variables (see Figure 10), but the results from the model showed high collinearity between these two variables. The decision is made to use only _BASEcode for subsequent models.

d. Omitted Variables for Equipment

The infantry battalions participating in the exercise bring a large logistics footprint of equipment and supplies from their consolidated memorandums of receipt and supply accounts to use in the exercise. Personal and unit equipment is either self-transported by the Marine or embarked into shipping containers for commercial transport to MCAGCC. The exercise support detachment issues additional equipment to battalions for use in the exercise to complete the exercise requirements. These items include vehicles, communications equipment, and other mission-specific items required for the exercise that units may not own until arriving in theater. By necessity, this research assumes all units begin the exercise with the same equipment and that all of the required equipment is operational at the time the exercise begins. From personal experience, this is a reasonable assumption although an argument can be made to the contrary. Regardless, the author is unable to identify a suitable representative parameter to reflect the existing variance in equipment relative to equipment readiness for the model. The R & S ratings from the DDRS-MC readiness model are omitted variables and accounted for by the error term of the model (see Figure 9).

e. Interaction Terms to Estimate Effect of Group with Staffing Gap

Figure 10. Interaction Term Between Unit Group and Staffing Gap

$$gapcount = onboard(count) - asr(count)$$

$$\frac{\delta R}{\delta x} = \frac{\delta R_{it}}{\delta x_{gapcount}} \int unitgroup = i$$

After examining the results of the original model (see Figure 9), the author set out to account for the partial effect of the difference between on-board strength and structure requirements. This difference is represented by _gapcount and the differential effect is included in the subsequent models through the use of the interaction term between _unitgroup and _asrcount (see Figure 10). Including this variable in the model allows the research to not only examine the effect of total personnel numbers on-board, but it also allows the research to examine the effect of the difference relative to structure on the dependent variable of readiness. Furthermore, the effect of this gap is allowed to vary by unit group (MOSs). This allows the research to identify whether there are certain unit groups (or MOSs) whose manning relative to structure has relatively more impact on readiness than others.

3. Estimate Parameters in Regression Models

a. Unit Group Model

Figure 11. Unit Group Model

$$R_{it} = \beta_0 + \beta_1 d_{pre2011} + \beta_2 d_{BASEcode} + \beta_3 d_{unitgroup} + \beta_4 d_{unitgroup*asrgap} + \beta_5 ASRgap + \beta_6 d_{tmonth*stable} + \beta_7 stable + \varepsilon_{it}$$

[i = group (24), t = month{-6,-5,…0,1,2}, $d_{pre2011}$=1 if {fy<2011, 0 otherwise}, $d_{BASEcode}$=1 if base{Pendleton, Lejeune, Kaneohe, 29 Palms}, $d_{unigroup}$=1 if group{other,cmd...cbrn}, ASRgap=count-ASR, stable=0.9(ASR)]

The unit group model estimates the relationship between the independent variables (see Figure 11) relative to readiness. The unit group variable arranges the BICs for each infantry battalion in groups primarily representing MOS/grade categories (see Figure 9). The primary reason for including the grade distinction in this model represents the attempt to determine the specific impact of infantry non-commissioned officers (NCOs) relative to readiness. The emphasis of this research is on infantry MOSs and the unit group categories clearly highlight this fact. Although all BICs are present, the model arranges the infantry MOSs in more detail to allow the author to closely examine the effect of infantry Marines. An opportunity exists to expand this study for the other unit groups in the same manner, but that is not the focus of this research. The aggregate effect of non-infantry BICs is included to balance the model's output and account for their effect relative to readiness.

b. MOS Group Model

Figure 12. MOS Group Model

$$R_{it} = \beta_0 + \beta_1 d_{pre2011} + \beta_2 d_{BASEcode} + \beta_3 d_{mosgroup} + \beta_4 d_{mosgroup*asrgap} + \beta_5 ASRgap + \beta_6 d_{tmonth*stable} + \beta_7 stable + \varepsilon_{it}$$

[i = group (24), t = month{-6,-5,…0,1,2}, $d_{pre2011}$=1 if {fy<2011, 0 otherwise}, $d_{BASEcode}$=1 if base{Pendleton, Lejeune, Kaneohe, 29 Palms}, $d_{mosgroup}$=1 if group{other,cmd...cbrn}, ASRgap=count-ASR, stable=0.9(ASR)]

The primary adjustment made in the MOS group model is the grouping of infantry BICs strictly by MOS and removing the separation between NCOs and junior enlisted Marines (see Figure 12). The remaining independent variables for the model remain the same as the unit group model. The intent of this model is to isolate MOSs and determine whether there is a mediating effect from the construct of the unit group model.

c. Leadership Group Model

Figure 13. Leadership Group Model

$$R_{it} = \beta_0 + \beta_1 d_{pre2011} + \beta_2 d_{BASEcode} + \beta_3 d_{leadgroup} + \beta_4 d_{leadgroup*asrgap} + \beta_5 ASRgap + \beta_6 d_{tmonth*stable} + \beta_7 stable + \varepsilon_{it}$$

[i = group (24), t = month{-6,-5,…0,1,2}, $d_{pre2011}$=1 if {fy<2011, 0 otherwise}, $d_{BASEcode}$=1 if base{Pendleton, Lejeune, Kaneohe, 29 Palms}, $d_{leadgroup}$=1 if group{other,cmd...cbrn}, ASRgap=count-ASR, stable=0.9(ASR)]

The leadership group model (see Figure 13) approaches the problem by grouping the unit groups into specific infantry leadership groups (see Figure 9). The infantry leadership groups are designated as the company staff, platoon staff, NCOs, infantry, and scout snipers. All other BICs are included within their previously assigned unit groups to generate the leadership groups for the model. The intent for this model is to determine the effect of specific leadership groups relative to readiness.

d. *Functional Group Model*

Figure 14. Functional Group Model

$$R_{it} = \beta_0 + \beta_1 d_{pre2011} + \beta_2 d_{BASEcode} + \beta_3 d_{fxngroup} + \beta_4 d_{fxngroup*asrgap} + \beta_5 ASRgap + \beta_6 d_{tmonth*stable} + \beta_7 stable + \varepsilon_{it}$$

[i = group (24), t = month{-6,-5,…0,1,2}, $d_{pre2011}$=1 if {fy<2011, 0 otherwise}, $d_{BASEcode}$=1 if base{Pendleton, Lejeune, Kaneohe, 29 Palms}, $d_{fxngroup}$=1 if group{other,cmd...cbrn}, ASRgap=count-ASR, stable=0.9(ASR)]

The functional group model (see Figure 14) is organized to allow the examination of the distinction between the company and battalion levels (see Figure 9) relative to readiness. Originally, the author intended to use this model differently and arrange the BICs into task-organized teams en route to the final model for warfighting functions. Due to the data issues associated with BICs values, the approach was adapted to examine the different effect between personnel at the company and battalion levels in an infantry battalion.

e. *Warfighting Function Model*

Figure 15. Warfighting Function Model

$$R_{it} = \beta_0 + \beta_1 d_{pre2011} + \beta_2 d_{BASEcode} + \beta_3 d_{wffgroup} + \beta_4 d_{wffgroup*asrgap} + \beta_5 ASRgap + \beta_6 d_{tmonth*stable} + \beta_7 stable + \varepsilon_{it}$$

[i = group (24), t = month{-6,-5,…0,1,2}, $d_{pre2011}$=1 if {fy<2011, 0 otherwise}, $d_{BASEcode}$=1 if base{Pendleton, Lejeune, Kaneohe, 29 Palms}, $d_{wffgroup}$=1 if group{other,C2...FPRO}, ASRgap=count-ASR, stable=0.9(ASR)]

The warfighting function model (see Figure 15) organizes personnel according to their contribution to the observable warfighting functions for this research. According to MCDP 1–0, the Marine Corps organizes into six warfighting functions (WFF) for planning and execution: command and control (C2), intelligence, maneuver, fires, logistics, and force protection (Headquarters, U.S. Marine Corps, 2011, pp. B1-B3). This research examines the effect of each warfighting function relative to readiness. The intent of this framework is to determine which WFFs contribute to infantry battalion readiness.

4. Interpret the Results from the Models

The final step in modeling the data is to interpret the results of the models. The results of the models indicated the best model for this research is the unit group model. The descriptive statistics and regression results are discussed in detail in Chapter 4 of this report.

F. SENSITIVITY ANALYSIS

The final step in the research methodology is conducting sensitivity analysis on the elements used in the various models for the research. It is necessary to determine the extent to which omitted variable bias (OVB) is contributing to the models. The intent of sensitivity analysis is to look closely at the omitted variables and develop additional tests for the potential effects created by omitted variables in the model. The research estimated additional regressions to test the stability of TTECG scores and the unit groups used in the model. After reviewing these tests, the main results of the research continue to hold.

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IV. RESULTS

"If you torture the data long enough, it will confess"

—Edward Leamer
(Leamer, 1978, p. 1)

The only claim one can make with any degree of certainty relating to quantitative research is that every empirical model is wrong. Models are not intended to be an exact reflection of the state of nature, but are designed to be approximations. The gain to this simplification is that empirical models offer particular insight and allow for systematic testing of hypothesis. On the other hand, empirical research is fraught with issues in that data with missing or omitted variables, so-called noisy variables, incomplete data, skewed or non-random samples, or a mis-specified model can lead to biased results. This research recognizes these facts, and attempts to analyze the data in the spirit of providing useful information toward understanding readiness. Specifically, the models are designed to look for opportunities to improve the readiness of infantry battalions in the Marine Corps.

This chapter asks questions of the data to see what it is willing to confess about readiness. The chapter begins by examining the distribution of the dependent variable across fiscal years. An examination of the scoring trends reflects how well the infantry battalions performed during the EMV exercise over time. Recall that the dependent variable represents readiness in the sense the unit can perform as it was intended or designed (i.e., output-based), not simply based on the presence of the inputs for readiness. It seems logical that if one intends to claim a unit is ready then some metric or assessment is required to validate the battalion's claim of readiness.

Next, the analysis shifts its focus to the determinants of readiness of infantry battalions. In particular, the research assesses the impacts of staffing level gaps and duration of stability within infantry battalions to get a sense of the direction in which these factors influence readiness. This chapter presents the results of estimating the five readiness models described in Chapter III. Each of the models offers a different look at the impact of personnel stability on readiness. The findings from the models indicate a problem with aggregate metrics currently used to assess manning and staffing levels in the Marines Corps. Aggregate metrics obscures the underlying heterogeneity across unit groups. Empirical analysis described in more detail below shows that stabilizing certain personnel earlier in the PTP period, compared to other groups, is relatively more critical in determining readiness as measured by EMV performance.

A. SCORING TRENDS FOR ENHANCED MOJAVE VIPER

The summary statistics for the dependent variable _totalScore contains 36 observations with a sample mean of 0.7485, standard deviation of 0.0447, minimum score of 0.6644, and maximum score of 0.8463. The percentage value for _totalScore is derived using the methodology explained in Chapter 3 and aggregates the scores for each of the five METs based on the averages of the subordinate tasks associated with each MET. The total number of tasks assessed by the staff at EMV for the exercise is 574 tasks and all of the values for those tasks are included in the _totalScore variable for each infantry battalion.

The distribution of the dependent variable (see Figure 16) represents a normal distribution and satisfies the central limit theorem for this analysis. A skewness and kurtosis test confirmed the normality of the dependent variable despite the small sample size. This means the distribution of the sample averages approximates a normal distribution even though the sample size contains fewer than 120 observations.

A multivariate linear regression of _totalScore on _fy reveals an interesting relationship between the average score in each fiscal year (see Table 10). With FY2009 as the base year, coefficient estimates indicate a decrease in _totalScore on average from 2009 to 2012. The scatter graph (see Figure 17) plots the _totalScore values for each observation and depicts a fitted line minimizing the sum of squared errors (SSE). The fitted line reveals the decreasing trend of the dependent variable across the fiscal years. There are several possible explanations for this result, such as the annual turnover of Coyotes at TTECG, increases in grading standards on evaluated tasks, or a general decrease in the proficiency of the infantry battalions conducting the exercise during those years. It is not within the scope of this research to determine causality, but it is important to note the downward trend in scoring.

In addition, seven infantry battalions observed in this research produced a below-average total score (see Figure 18) for the exercise. Due to limitations of the data, it is unclear whether these units had sufficient time following the exercise to correct their deficiencies before deployment. The pressing question our leaders must answer is a difficult one – were these battalions ready? It is highly likely operational tempo dictates a battalion deploys whether it is ready or not. An interesting study might include further research on the performance of these below-average battalions during their deployments.

There are many factors that may cause an infantry battalion to score below average. Recall that some battalions may have made multiple attempts on these tasks, and that these scores do not reflect potential multiple attempts. It is thus possible additional battalions might fall into the category scoring below average. That is, some battalions actually scored much lower than reported, but were given the highest score among multiple event attempts. Additionally, depending on the fiscal year, the battalion score for the exercise may reflect variation from the evaluators due to transfer or re-assignment. The bottom line, however, is that these factors have a uniform or equal effect on each battalion in the research. As such, issues such as a different group of evaluators from year to year are not likely to bias findings, particularly since the analysis controls for time period. What this research attempts to highlight is the contribution of personnel stability to the outcome of readiness as measured by EMV scores, holding all else constant.

Figure 16. EMV Distribution of Total Scores

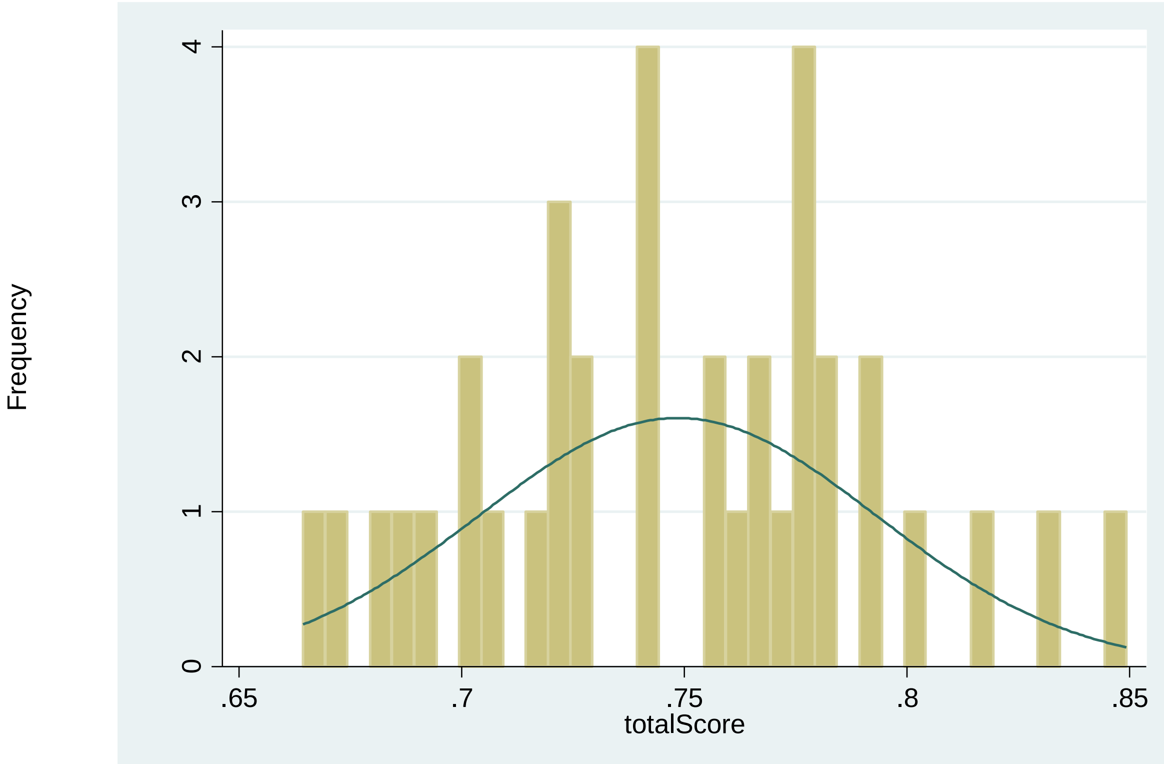


Table 10. EMV Scoring Averages Over Time

VARIABLES	LABELS	(1) Annual Scores
Dependent Variable		
_totalScore		
Independent Variables		
Fiscal Years		
_Ify_2010	fy==2010	-0.0167***
		[0.0012]
_Ify_2011	fy==2011	-0.0332***
		[0.0011]
_Ify_2012	fy==2012	-0.0681***
		[0.0013]
Constant		0.7759***
		[0.0009]
Observations		8,597
R-squared		0.262
Standard errors in brackets		
*** p<0.01, ** p<0.05, * p<0.1		

Figure 17. EMV Scoring Trend Analysis

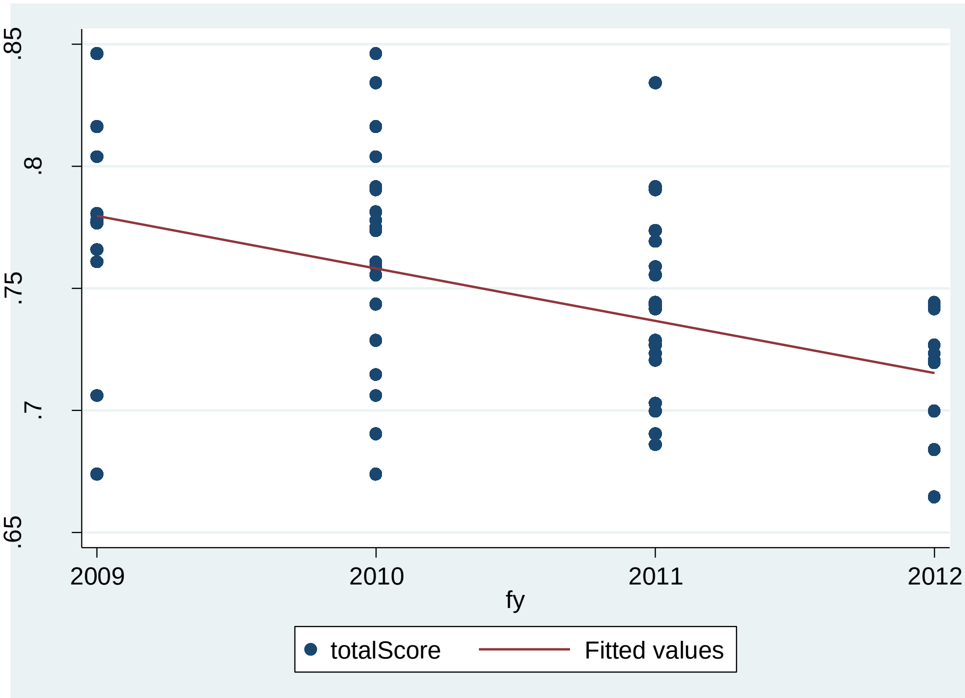
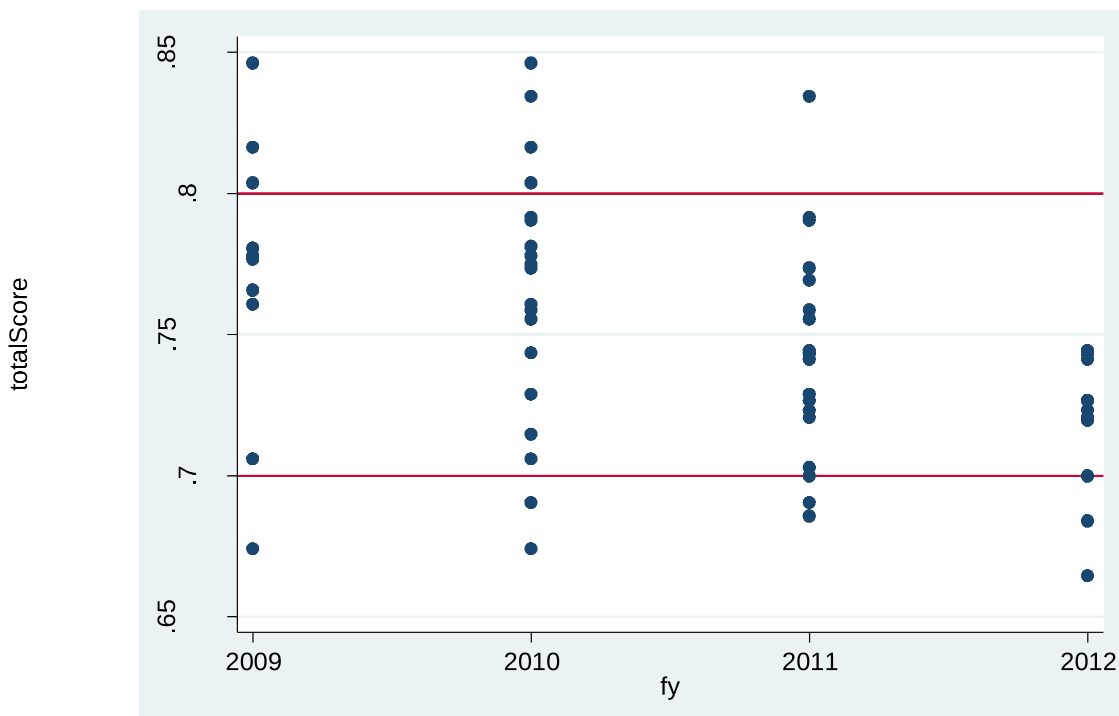


Figure 18. Infantry Battalion Proficiency Levels Relative to FY



B. ANALYSIS OF STABILIZED TRAINING TIME BEFORE DEPLOYMENT

Measuring personnel stability for infantry battalions is one of the key concepts of this research. One way to identify stability is empirically determining the month in the PTP cycle during which an infantry battalion achieves stability. To do so, one has to make a logical assumption as to what it actually means for an infantry battalion to be stable. To begin, this research assigns a value _stable=1 to the month unit groups in the infantry battalion reach 90% of its authorized strength. There are many alternative empirical definitions for stability, such as: the time on station for a particular Marine, the duration a Marine spends in his or her assigned billet, or the amount of time a group of individuals spends together prior to deployment. Due to limitations of the data, this research is unable to assess stability using individual metrics such as the ones listed above. Such level of detail was in fact requested for this research through BICs, but as previously discussed the BIC data is not a reliable data field to use for this research. Currently, the Marine Corps does not have sufficient detail in TFDW to observe stability on an individual basis.

To empirically identify the window during the PTP period that units achieve stability, defined as achieving 90% of ASR, the researcher estimates a probit model (see Figure 19). The model fits the data to predict the likelihood of stability using a non-linear model (see Table 11). The coefficients generated from the model indicate significance and a positive direction beginning at tmonth=-4 relative to the base month tmonth=-6, but the magnitude of the effect cannot be determined without further calculation. The marginal effects (see Table 12) indicate a significance increase of 0.0414 in the probability that a battalion stabilizes in tmonth=-4 relative to the base month, all else held constant. To test whether battalions are just as likely to attain stability in tmonth=-4 vs tmonth=-5, to the researcher tested the hypothesis that tmonth=-4 is equal to tmonth=-5 is equal to zero. The results of this test fail to reject the null hypothesis (prob>chi2=0.1418); that is, there is insufficient statistical evidence to reject the hypothesis that battalions are just as likely to attain stability in tmonth=-4 as -5. Next, the hypothesis test is modified to test whether battalions are just as likely to attain stability in tmonth==-4 vs tmonth==-3. This null hypothesis is rejected (prob>chi2=0.0275). Together the tests show that on average, infantry battalions are statistically likely to stabilize only between D-120 and D-90 based on the definition of stability (90% of ASR).

If battalions stabilize only within this window, it suggests the HRDP is underperforming relative to stability. The HRDP may not possess the necessary inventory to complete the pre-deployment buildup of personnel for infantry battalions according to the current target window. It is also possible that certain high demand low density MOS pipelines are not programmed to allow monitors to meet this requirement. The bottom line is that the staffing and assignment process is performing outside the desired window LOD (D-180) to L+60 (D-120) to stabilize deploying units, and this window is notably outside the parameters stated in the Deployed Unit Cohesion Staffing policy. This finding presents evidence that the Marine Corps needs to look at the manning and staffing process to determine causality for this issue.

It is also possible the definition of stability for this research and the measure of stability by unit groups contributes to this negative outcome. Each unit group is organized by MOS's and not as aggregate values for officers and enlisted as stated in MCO 5320.12H (CMC, 2012). The HRDP delivers according to the guidance found in MCO 5320.12H, but this research presents evidence that those guidelines may be insufficient to provide stable infantry battalions with sufficient training time prior to deployment.

Figure 19. Probit Regression for Maximum Likelihood Estimation of Stability

$$\Pr(stable_{it} = 1) = \Phi(\beta_0 + \beta_{1t} * d\_tmonth)$$

(i = battalion, t = {-6,-5,…0,1,2}, Φ = Probit function, β_{1t} = 9x1 vector of coefficients)

Table 11. Probability a Battalion Stabilizes in a Month Relative to Estimated Deployment

VARIABLES	LABELS	(1) Probit 1
Dependent Variable		
stable	0.90 * ASR	
Independent Variables		
Month Relative to Deployment		
_Itmonth_2	tmonth==-5	0.0510
		[0.0632]
_Itmonth_3	tmonth==-4	0.1253**
		[0.0637]
_Itmonth_4	tmonth==-3	0.1629**
		[0.0639]
_Itmonth_5	tmonth==-2	0.1993***
		[0.0641]
_Itmonth_6	tmonth==-1	0.1922***
		[0.0641]
_Itmonth_7	tmonth==0	0.1376**
		[0.0637]
_Itmonth_8	tmonth==1	0.1155*
		[0.0635]
_Itmonth_9	tmonth==2	0.0884
		[0.0634]
_Itmonth_10	tmonth==3	0.0817
		[0.0633]
Constant		0.4480***
		[0.0446]
Observations		8,597
chi2		17.13
r2_p		0.00166
Standard errors in brackets		
*** p<0.01, ** p<0.05, * p<0.1		

Table 12. Marginal Effects for Probit Regression 1

VARIABLES	LABELS	(1) Marginal Effects
Dependent Variable		
stable	0.90 * ASR	
Independent Variables		
Change in P(stabilized) Relative to Base Month		
_Itmonth_2	tmonth==-5	0.0172
		[0.0210]
_Itmonth_3	tmonth==-4	0.0414**
		[0.0204]
_Itmonth_4	tmonth==-3	0.0533***
		[0.0200]
_Itmonth_5	tmonth==-2	0.0646***
		[0.0197]
_Itmonth_6	tmonth==-1	0.0624***
		[0.0197]
_Itmonth_7	tmonth==0	0.0453**
		[0.0202]
_Itmonth_8	tmonth==1	0.0382*
		[0.0204]
_Itmonth_9	tmonth==2	0.0295
		[0.0207]
_Itmonth_10	tmonth==3	0.0273
		[0.0207]
Observations		8,597
Standard errors in brackets		
*** p<0.01, ** p<0.05, * p<0.1		

C. STABILITY AND STAFFING LEVELS RELATIVE TO DEPLOYED UNIT STAFFING COHESION POLICY

The Deployed Unit Cohesion Staffing policy is designed to stabilize units throughout the entire PTP cycle beginning at D-180 and for a minimum of 90 days following deployment (DC M&RA, 2011). Several metrics can define stability such as the threshold described in the previous section. Another metric involves measuring the change in stability relative to the implementation of the Deployed Unit Cohesion Staffing policy. This research observes this effect based on staffing levels before and after 2011 to get a sense of the performance of the system relative to the new policy guidance. This research recognizes the magnitude of implementing manpower policy, and understands that the manpower process cannot completely turn the ship quite as fast as called for in this instance. It may take several years to realize the effects of shifts in manpower policy. While the time period after the policy was implemented included in this data sample is relatively narrow, it is still sufficient to detect whether or not the new policy guidance is implemented.

This section begins with another probit regression to predict the probability of stabilization in relation to FY2011 (see Figure 20). The intent is to assess to initial impact of the Deployed Unit Cohesion Staffing policy. The coefficient on the variable _Ipre2011_1 is -0.0911 (see Table 13) and predicts a negative direction for stability relative to FY2011. This output indicates an infantry battalion is less likely to be stable prior to 2011. The marginal effects confirm the value of the coefficient is -0.0310 and represents the probability a battalion is stable prior to 2011 (see Table 14). The final step in this analysis is to confirm the statistical significance of the probability that a battalion is stable post-2011. This is accomplished by testing the marginal effects [margins, at(_Ipre2011_1=0)] resulting in a p-value of 0.0000 and a conditional probability of 0.7283. This means battalions are 72.83% more likely to be stabilized during the period the Deployed Unit Cohesion Staffing policy is in place, relative to before the order.

In addition to estimating the change in stability, the research examines the staffing levels of each infantry battalion to identify trends between structure and on-board levels. It appears the staffing levels gradually tightened toward authorized strength during each of the successive years of the study (see Figure 21). In aggregate numbers, all infantry battalions remain well above authorized strength (~890) and appear to be on solid footing from a personnel perspective. However, these aggregate numbers mask an underlying pattern. The numbers on personnel stability are remarkable as one descends from a 30,000 feet perspective and observes the staffing levels relative to authorized strength by the unit groups defined in this research.

The gap between authorized strength and on-board staffing by unit group are presented in Figure 22. On average, each infantry battalion appears to possess 102 infantrymen above authorized strength. This excess capacity skews the aggregate numbers for every infantry battalion and masks the staffing deficiencies in other areas. Furthermore, the negative coefficient on many overstaffed categories indicates diminishing returns on readiness from this practice. According to the data, there are consistent and significant shortages for every battalion in the following occupational specialties: intelligence, weapons platoon/company NCOs, scout snipers, and administration Marines. Upon closer look relative to FY2011, the data shows some improvement for intelligence, scout snipers, and administration Marines but reveals increasing shortages for weapons platoon/company NCOs. These patterns suggest that a problem may exist in these MOS pipelines requiring more research to determine the cause of these shortages (see Figure 23).

Figure 20. Probit Regression for Maximum Likelihood Estimation of Stability Relative to FY2011

$$\Pr(stable_{it} = 1) = \Phi(\beta_0 + \beta_{1t} * d\_tmonth * d\_pre2011)$$

(i = battalion, t = {-6,-5,…0,1,2}, Φ = Probit function, β_{1t} = 9x1 vector of coefficients)

Table 13. Probability the Month an Infantry Battalion Stabilized Changes Relative to FY2011

VARIABLES	LABELS	(1) Probit 2
Dependent Variable		
stable	0.90 * ASR	
Independent Variables		
Month Relative to Deployment		
_Itmonth_2	tmonth==-5	0.0485
		[0.1062]
_Itmonth_3	tmonth==-4	0.0452
		[0.1026]
_Itmonth_4	tmonth==-3	0.1115
		[0.1016]
_Itmonth_5	tmonth==-2	0.1389
		[0.0993]
_Itmonth_6	tmonth==-1	0.1036
		[0.0989]

VARIABLES	LABELS	(1) Probit 2
_Itmonth_7	tmonth==0	0.0462
		[0.0964]
_Itmonth_8	tmonth==1	-0.0151
		[0.0950]
_Itmonth_9	tmonth==2	0.0075
		[0.0952]
_Itmonth_10	tmonth==3	-0.0286
		[0.0941]
Relationship to 2011		
_Ipre2011_1	pre2011==1	-0.0911
		[0.0933]
Interaction Terms		
_ItmoXpre_2_1	tmonth==-5 & pre2011==1	0.0038
		[0.1322]
_ItmoXpre_3_1	tmonth==-4 & pre2011==1	0.1280
		[0.1311]
_ItmoXpre_4_1	tmonth==-3 & pre2011==1	0.0781
		[0.1311]
_ItmoXpre_5_1	tmonth==-2 & pre2011==1	0.0946
		[0.1312]
_ItmoXpre_6_1	tmonth==-1 & pre2011==1	0.1516
		[0.1311]
_ItmoXpre_7_1	tmonth==0 & pre2011==1	0.1660
		[0.1309]
_ItmoXpre_8_1	tmonth==1 & pre2011==1	0.2696**
		[0.1315]
_ItmoXpre_9_1	tmonth==2 & pre2011==1	0.1452
		[0.1307]
_ItmoXpre_10_1	tmonth==3 & pre2011==1	0.2274*
		[0.1317]
Constant		0.5067***
		[0.0750]
Observations		8,597
chi2		26.47
r2_p		0.00257
Standard errors in brackets		
*** p<0.01, ** p<0.05, * p<0.1		

Table 14. Marginal Effects for Probit Regression 2

VARIABLES	LABELS	(1) Marginal Effects
Dependent Variable		
Stable	0.90 * ASR	
Independent Variables		
Change in P(stabilized) Relative to Base Month		
_Itmonth_2	tmonth==-5	0.0163
		[0.0353]
_Itmonth_3	tmonth==-4	0.0152
		[0.0342]
_Itmonth_4	tmonth==-3	0.0369
		[0.0327]
_Itmonth_5	tmonth==-2	0.0457
		[0.0315]
_Itmonth_6	tmonth==-1	0.0344
		[0.0320]
_Itmonth_7	tmonth==0	0.0155
		[0.0321]
_Itmonth_8	tmonth==1	-0.00516
		[0.0325]
_Itmonth_9	tmonth==2	0.00254
		[0.0323]
_Itmonth_10	tmonth==3	-0.00979
		[0.0324]
Relationship to 2011		
_Ipre2011_1	pre2011==1	-0.0310
		[0.0317]
Interaction Terms		
_ItmoXpre_2_1	tmonth==-5 & pre2011==1	0.00130
		[0.0449]
_ItmoXpre_3_1	tmonth==-4 & pre2011==1	0.0421
		[0.0416]
_ItmoXpre_4_1	tmonth==-3 & pre2011==1	0.0260
		[0.0428]
_ItmoXpre_5_1	tmonth==-2 & pre2011==1	0.0314
		[0.0424]
_ItmoXpre_6_1	tmonth==-1 & pre2011==1	0.0495
		[0.0409]
_ItmoXpre_7_1	tmonth==0 & pre2011==1	0.0539
		[0.0404]
_ItmoXpre_8_1	tmonth==1 & pre2011==1	0.0848**

VARIABLES	LABELS	(1) Marginal Effects
		[0.0377]
_ItmoXpre_9_1	tmonth==2 & pre2011==1	0.0475
		[0.0409]
_ItmoXpre_10_1	tmonth==3 & pre2011==1	0.0725*
		[0.0389]
Observations		8,597
Standard errors in brackets		
*** p<0.01, ** p<0.05, * p<0.1		

Figure 21. Average On-Board Staffing Levels in Estimated Deployment Month Relative to Fiscal Year

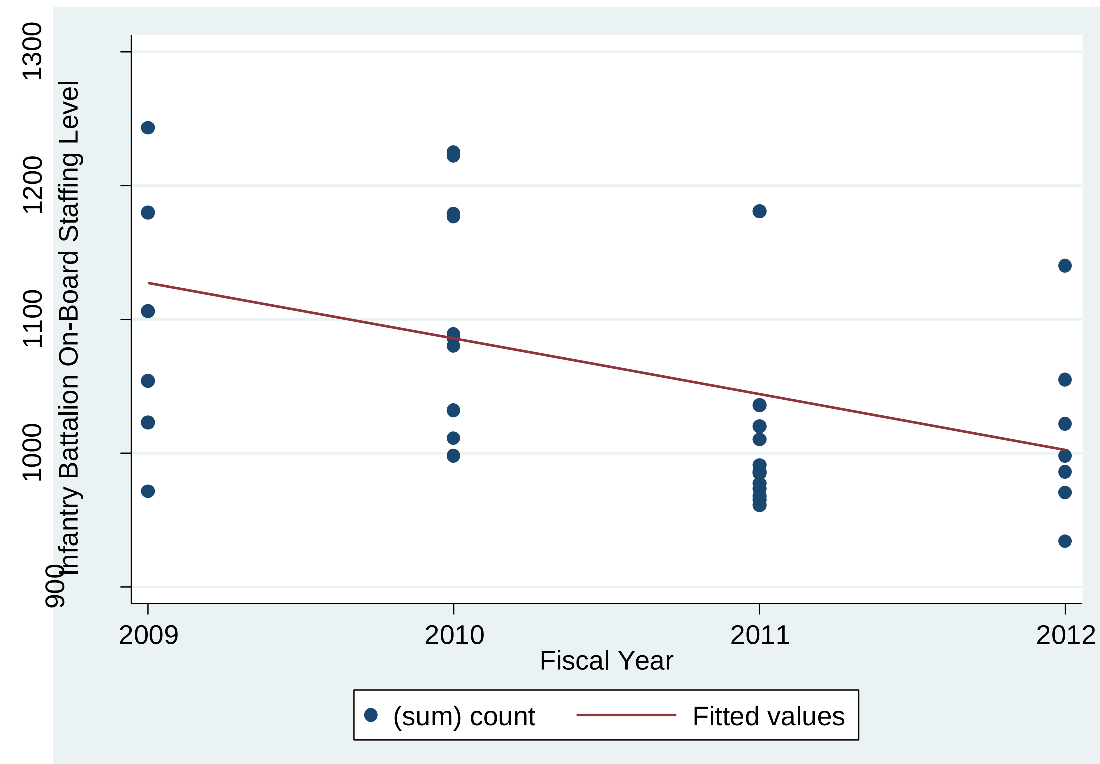


Figure 22. Average Gap Between On-Board and Structure Relative to Unit Group

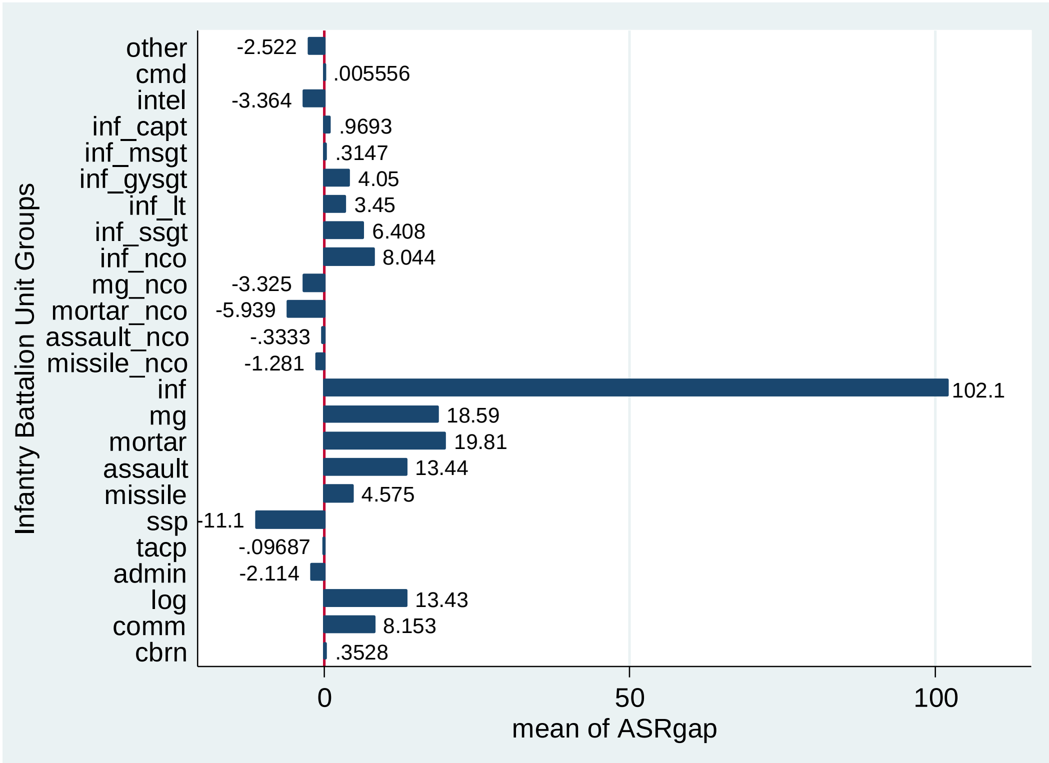
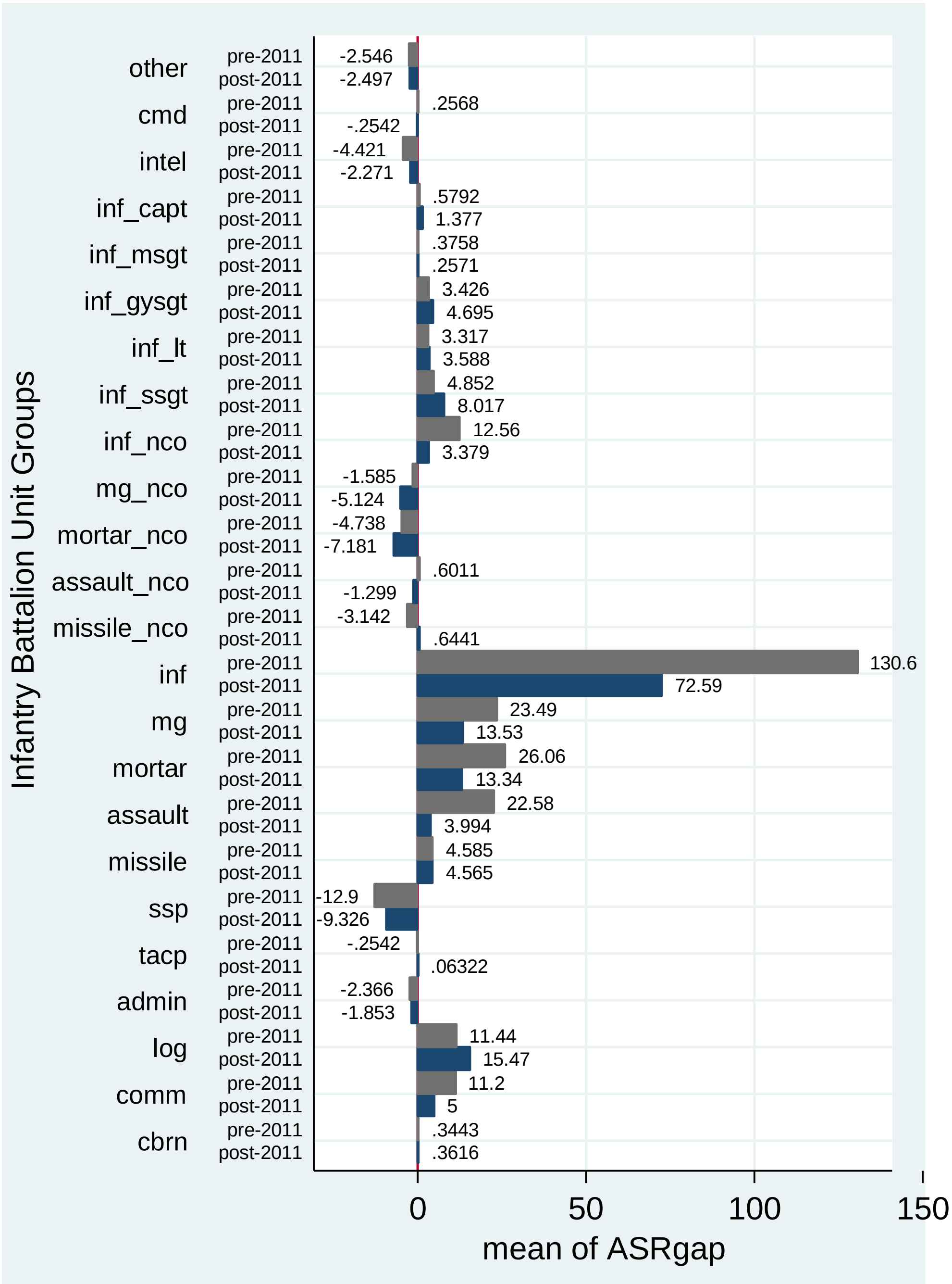


Figure 23. Average Staffing Levels by Unit Group Relative to Unit Staffing Cohesion Policy



D. READINESS REGRESSION MODEL RESULTS

The initial questions presented to the data reveal interesting trends related to the readiness and staffing metrics. In this section multivariate regression models relate the staffing metrics and stability to readiness. The results in this section represent select partial results from the readiness regression models of the significant variables for discussion. The complete results for each regression model are listed in the appendix. Readiness is as previously defined and reflects a battalion's ability to perform its assigned METs. However, performing this task adequately indicates a battalion has the quantities of personnel, training, and equipment (i.e., inputs) prescribed in the readiness function. In addition, the output-based test score measure demonstrates the battalion's capacity to integrate its warfighting functions and perform to the standards outlined in the T&R manual. The critical component enabling a battalion to perform to this standard is the proficiency and cohesion of its human resources–the Marines in the battalion.

1. Unit Group Model

The unit group model proves the best-fitting model in this research. The significant independent variables relative to personnel are 0369 GySgts, 0302 Lts, 0369 SSgts, 0341 NCOs, 0331 machine gunners, and 0341 mortar men (see Table 15). Interestingly, each of these unit group categories correspond to the platoon level of Marine Corps infantry battalion task organization. The exception to this rule is the 0369 GySgt who may function as a platoon sergeant or a company gunnery sergeant. The results of the model combined with the data relating the gap between on-board strength and structure (see Figure 21) show significant shortages in certain critical MOSs, and that these have a significant impact on infantry battalion readiness.

Table 15. Unit Group Model Results (Model 1)

VARIABLES	LABELS	(1) Model 1
Dependent Variable		
_totalScore	Battalion EMV score	
Independent Variables		
Relationship to 2011		
pre2011	pre2011	0.0357***
		[0.0008]
Home Station Base Codes		
_IBASEcode_2	Lejeune	-0.0296***
		[0.0011]
_IBASEcode_3	Kaneohe	-0.0330***
		[0.0013]
_IBASEcode_4	29 Palms	-0.0536***
		[0.0013]
Battalion Unit Groups		
_Iunit_grou_5	Inf_GySgts	0.0110**
		[0.0050]
_Iunit_grou_6	Inf_Lts	-0.0103**
		[0.0044]
_Iunit_grou_7	Inf_SSgts	-0.0112**
		[0.0048]
_Iunit_grou_10	Mortar_NCO	-0.0070*
		[0.0038]
_Iunit_grou_14	MG	-0.0102**
		[0.0043]
_Iunit_grou_15	Mortar	-0.0126***
		[0.0043]
Difference Between On-Board and ASR		
ASRgap	ASRgap	0.0005
		[0.0009]
Interaction Terms		
_IuniXASRg_4	(unit_group==4)*ASRgap	-0.0107***
		[0.0042]
_IuniXASRg_5	(unit_group==5)*ASRgap	-0.0033***
		[0.0013]
_IuniXASRg_6	(unit_group==6)*ASRgap	0.0024**
		[0.0012]
_IuniXASRg_9	(unit_group==9)*ASRgap	-0.0015*
		[0.0009]
Personnel Strength defined as 90% of ASR		
Stable	stable	-0.0054**

VARIABLES	LABELS	(1) Model 1
		[0.0023]
Interaction Terms		
_ItmoXstab_5	(tmonth==-2)*stable	0.0046**
		[0.0021]
_ItmoXstab_6	(tmonth==-1)*stable	0.0050**
		[0.0021]
_ItmoXstab_7	(tmonth==0)*stable	0.0066***
		[0.0021]
_ItmoXstab_8	(tmonth==1)*stable	0.0079***
		[0.0021]
_ItmoXstab_9	(tmonth==2)*stable	0.0081***
		[0.0021]
_ItmoXstab_10	(tmonth==3)*stable	0.0087***
		[0.0021]
Constant		0.7603***
		[0.0033]
Observations		8,597
R-squared		0.320
Adjusted R^2		0.315
Standard errors in brackets		
*** p<0.01, ** p<0.05, * p<0.1		

2. MOS Group Model

The MOS group model is designed to align the model toward the MOSs maintained in an infantry battalion. This begins the trend toward aggregated groups and presents more homogeneity in the model. Despite the increased homogeneity, the scout snipers MOS proves to be a significant independent variable in the model (see Table 16). This provides evidence that the staffing of high-demand low-density specialties such as the scout snipers is significant to the overall readiness of an infantry battalion. Additionally, the shortages of these Marines (see Figure 21) compounds the issue relating to readiness. The overall effect, or significance of the findings, revealed by the unit group and MOS group models is masked as the models progress toward more aggregate groups. This highlights the relevance of including a PMOS metric related to readiness as proposed by McHugh et al. (2006) in their assessment of officer shortages in the Marine Corps.

Table 16. MOS Group Model Results (Model 2)

VARIABLES	LABELS	(1) Model 2
Dependent Variable		
_totalScore	Battalion EMV score	
Independent Variables		
Relationship to 2011		
pre2011	pre2011	0.0356***
		[0.0008]
Home Station Base Codes		
_IBASEcode_2	Lejeune	-0.0288***
		[0.0011]
_IBASEcode_3	Kaneohe	-0.0324***
		[0.0013]
_IBASEcode_4	29 Palms	-0.0532***
		[0.0013]
Battalion MOS Groups		
_Imos_group_10	SSP	-0.0138**
		[0.0068]
Difference Between On-Board and ASR		
ASRgap	ASRgap	0.0014
		[0.0009]
Interaction Terms		
_ImosXASRg_10	(mos_group==10)*ASRgap	-0.0021**
		[0.0010]
_ImosXASRg_13	(mos_group==13)*ASRgap	-0.0018*
		[0.0010]
Personnel Strength defined as 90% of ASR		
Stable	stable	-0.0122***
		[0.0021]
Interaction Terms		
_ItmoXstab_5	(tmonth==-2)*stable	0.0046**
		[0.0021]
_ItmoXstab_6	(tmonth==-1)*stable	0.0050**
		[0.0021]
_ItmoXstab_7	(tmonth==0)*stable	0.0065***
		[0.0021]
_ItmoXstab_8	(tmonth==1)*stable	0.0078***
		[0.0021]
_ItmoXstab_9	(tmonth==2)*stable	0.0079***
		[0.0022]
_ItmoXstab_10	(tmonth==3)*stable	0.0086***
		[0.0022]
Constant		0.7639***

VARIABLES	LABELS	(1) Model 2
		[0.0033]
Observations		8,597
R-squared		0.312
Adjusted R^2		0.308
Standard errors in brackets		
*** p<0.01, ** p<0.05, * p<0.1		

3. Leadership Group Model

The leadership group model contains one significant leadership group relating to readiness (see Table 17). The platoon staff independent variable is a combination of the 0369 SSgt and the 0302 Lt from the unit group model. Interestingly, this finding is consistent with previous results indicating staffing gaps at the platoon level as the most significant contribution to readiness. This is also consistent with the research by Peterson (2008), Siebold (2011), and Bassford (1990) who all point toward the significance of stability at the lowest level relative to readiness.

It is also important to note the lack of significance in command group stability. This is consistent with the research conducted by Peterson (2008) who also found little evidence to support a significant contribution from command group stability toward readiness. That the command group is not significant may be attributed to the Marine Corps practice of screening and assigning battalion commanders and command sergeants major to units early in the PTP. The only real variance in the command group variable is contained in the battalion XO and operations officers who are the other components in the command group for this study.

The lack of significance in the infantry NCO independent variable is a notable surprise to the author. The infantry NCO is the one leadership group the author expected to appear significant in this model. A possible explanation may be the on-average, above structure on-board staffing numbers (see Figure 21). However, leaning on personal experience, shortages of these Marines in infantry battalions seem the rule and not the exception. This is partially attributed to infantry NCOs requiring school during the PTP cycle and being unavailable to train with their Marines. Another possible explanation may be that Marines filling in for the infantry NCOs are doing as well as the infantry NCOs. That claim requires more research and if proven true, adds credibility to the current initiative to make the infantry NCO a formal MOS designed to improve the proficiency of Marines performing that billet. The bottom line is the data analysis shows staffing gaps in the infantry NCO are not significant. This also indicates a low contribution to readiness for infantry battalions for the leadership group.

Table 17. Leadership Groups Model Results (Model 3)

VARIABLES	LABELS	(1) Model 3
Dependent Variable		
_totalScore	Battalion EMV score	
Independent Variables		
Relationship to 2011		
pre2011	pre2011	0.0359***
		[0.0008]
Home Station Base Codes		
_IBASEcode_2	Lejeune	-0.0289***
		[0.0011]
_IBASEcode_3	Kaneohe	-0.0324***
		[0.0013]
_IBASEcode_4	29 Palms	-0.0532***
		[0.0013]
Battalion Leadership Groups		
_Ilead_grou_4	Plt_staff	-0.0083**
		[0.0038]
Difference Between On-Board and ASR		
ASRgap	ASRgap	0.0007
		[0.0009]
Interaction Terms		
_IleaXASRg_4	(lead_group==4)*ASRgap	0.0010
		[0.0010]
Personnel Strength defined as 90% of ASR		
Stable	stable	-0.0073***
		[0.0021]
Interaction Terms		
_ItmoXstab_5	(tmonth==-2)*stable	0.0047**
		[0.0021]
_ItmoXstab_6	(tmonth==-1)*stable	0.0051**

VARIABLES	LABELS	(1) Model 3
		[0.0021]
_ItmoXstab_7	(tmonth==0)*stable	0.0065***
		[0.0021]
_ItmoXstab_8	(tmonth==1)*stable	0.0078***
		[0.0021]
_ItmoXstab_9	(tmonth==2)*stable	0.0078***
		[0.0021]
_ItmoXstab_10	(tmonth==3)*stable	0.0085***
		[0.0022]
Constant		0.7608***
		[0.0032]
Observations		8,597
R-squared		0.313
Adjusted R^2		0.310
Standard errors in brackets		
*** p<0.01, ** p<0.05, * p<0.1		

4. Functional Group Model

The functional group model continues to aggregate the unit groups within the battalion into functional groups in the battalion. The intent for this model is to determine if any functional groups are significant relative to the research question. The results of this model did not reveal any significant functional groups within the battalion (see Table 18). This outcome is likely the result of diminishing heterogeneity in the data and masked effects of personnel stability on readiness. The functional groups that appear behind infantry in the model (although not statistically significant) are intelligence and logistics which seems consistent with the expectations of the research.

Table 18. Functional Group Model Results (Model 4)

VARIABLES	LABELS	(1) Model 4
Dependent Variable		
_totalScore	Battalion EMV score	
Independent Variables		
Relationship to 2011		

VARIABLES	LABELS	(1) Model 4
pre2011	pre2011	0.0357***
		[0.0008]
Home Station Base Codes		
_IBASEcode_2	Lejeune	-0.0285***
		[0.0011]
_IBASEcode_3	Kaneohe	-0.0320***
		[0.0013]
_IBASEcode_4	29 Palms	-0.0530***
		[0.0013]
Battalion Functional Groups		
None		
Difference Between On-Board and ASR		
ASRgap	ASRgap	0.0008
		[0.0009]
Interaction Terms		
None		
Personnel Strength defined as 90% of ASR		
Stable	stable	-0.0078***
		[0.0019]
Interaction Terms		
_ItmoXstab_5	(tmonth==-2)*stable	0.0047**
		[0.0021]
_ItmoXstab_6	(tmonth==-1)*stable	0.0050**
		[0.0021]
_ItmoXstab_7	(tmonth==0)*stable	0.0064***
		[0.0021]
_ItmoXstab_8	(tmonth==1)*stable	0.0076***
		[0.0021]
_ItmoXstab_9	(tmonth==2)*stable	0.0076***
		[0.0022]
_ItmoXstab_10	(tmonth==3)*stable	0.0084***
		[0.0022]
Constant		0.7610***
		[0.0032]
Observations		8,597
R-squared		0.309
Adjusted R^2		0.307
Standard errors in brackets		
*** p<0.01, ** p<0.05, * p<0.1		

5. Warfighting Function Model

The warfighting function model is based on the doctrinal Marine Corps warfighting functions (Headquarters, U.S. Marine Corps, 2011) and is designed to determine whether there are any significant issues of personnel stability related to readiness in these categories. The warfighting function model did not yield any significant results for warfighting function groups relative to readiness. These results suggest that all of the warfighting functions are sufficiently stabilized with personnel which is misleading based on the previous models.

Table 19. Warfighting Functions Model Results (Model 5)

VARIABLES	LABELS	(1) Model 5
Dependent Variable		
_totalScore	Battalion EMV score	
Independent Variables		
Relationship to 2011		
pre2011	pre2011	0.0358***
		[0.0008]
Home Station Base Codes		
_IBASEcode_2	Lejeune	-0.0285***
		[0.0011]
_IBASEcode_3	Kaneohe	-0.0319***
		[0.0013]
_IBASEcode_4	29 Palms	-0.0529***
		[0.0013]
Battalion Warfighting Function Groups		
None		
Difference Between On-Board and ASR		
ASRgap	ASRgap	0.0007
		[0.0009]
Interaction Terms		
None		
Personnel Strength defined as 90% of ASR		
Stable	stable	-0.0072***
		[0.0018]
Interaction Terms		
_ItmoXstab_5	(tmonth==-2)*stable	0.0046**
		[0.0021]
_ItmoXstab_6	(tmonth==-1)*stable	0.0049**

VARIABLES	LABELS	(1) Model 5
		[0.0021]
_ItmoXstab_7	(tmonth==0)*stable	0.0063***
		[0.0021]
_ItmoXstab_8	(tmonth==1)*stable	0.0075***
		[0.0021]
_ItmoXstab_9	(tmonth==2)*stable	0.0076***
		[0.0022]
_ItmoXstab_10	(tmonth==3)*stable	0.0084***
		[0.0022]
Constant		0.7606***
		[0.0032]
Observations		8,597
R-squared		0.309
Adjusted R^2		0.307
Standard errors in brackets		
*** p<0.01, ** p<0.05, * p<0.1		

V. CONCLUSIONS

"The Marine Corps is devoted to an expeditionary way of life. Marines understand that true readiness means much more than being deployable…This agile force can react rapidly across the range of military operations and must prevail, even thrive, in the uncertainty and chaos of emerging crisis."

—MCDP 1–0, Marine Corps Operations
(Headquarters, U.S. Marine Corps, 2011, p. 2–19)

A. SUMMARY

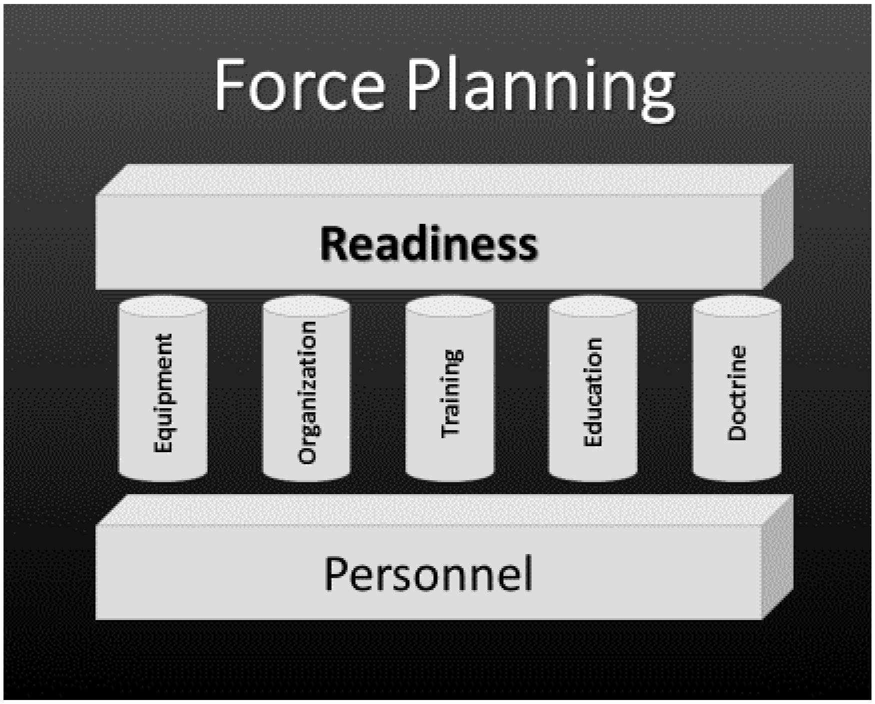
The United States Marine Corps is the nation's premier middleweight expeditionary force in readiness (CMC, 2015). It is imperative to protect this strength and continue to provide forces ready to respond to future conflicts. This research focuses on understanding the determinants of readiness, particularly the readiness of infantry battalions, and how personnel stability contributes to this readiness.

The author's understanding of readiness has evolved over the course of this research. The phrase "expeditionary force in readiness" means more than just preparing for deployment. Readiness in the Marine Corps is readiness *at all times*, that is, it is able to provide forces in response to unforeseen crises and contingency operations. However, this state of continuous readiness introduces inefficiencies with respect to infantry battalion's preparations for planned deployments. This includes diminishing returns from carrying high numbers of non-deployable Marines, continuous personnel turbulence due to internal and external transfers throughout the PTP cycle, and possibly a negative overall effect of cohesion within the unit preparing for deployment. Trade-offs are necessary given the Marine Corps' resource constraints, so perhaps the Marine Corps approach to readiness is optimal in that sense. However, it has to be acknowledged that the gaps in personnel staffing of infantry battalions preparing for deployment are associated with improperly trained units that are not cohesive, and thus unable to optimally function as intended once deployed.

Another interesting finding in the research involves the mismatches between the factors of certain inputs of the force generation process. The methodology and metrics used to optimize utilization for personnel, training, and equipment may not tell the complete story of readiness. Specifically, the research presents some evidence that using aggregate metrics relative to officers and enlisted may be insufficient to adequately stabilize units preparing for deployment. It answers part of the question and certainly offers insight into potential problems, but the actual answer to stability resides in the more specific comparison of staffing billet MOSs relative to on-board Marines by PMOS. The stated goal of the HRDP is to "get the right Marines, to the right place, at the right time, with the right skills" (Strobl, 2005, p. 1). This research suggests the current manpower policies and business rules for assignment of personnel are underperforming in this goal. Systematic data analysis shows the predicted timeframe a Marine Corps infantry battalion stabilizes occurs between D-90 and D-120, slightly outside the desired target for M&RA and definitely beyond the target specified in the Deployed Unit Cohesion Staffing policy of D-180.

The Marine Corps describes force planning as "planning that is associated with the creation and maintenance of military capabilities" (Headquarters, U.S. Marine Corps, 1997, p. 53). The performance of the force planning function relies on the effectiveness of the Marine Corps to coordinate and integrate the foundational pillars of "training, education, doctrine, organization, personnel management, and equipment acquisition" (Headquarters, U.S. Marine Corps, 1997, p. 54). Similar to Horowitz (1986) description of the relationship between the four principle factors of readiness, this research suggests an interactive element between personnel readiness, or stability, and the other factors in the model. This research supports the argument that personnel factors impact the other factors described as the pillars of force planning (see Figure 24).

Figure 24. Components of Force Planning



Adapted from Headquarters, U.S. Marine Corps. (1997). *Warfighting* (MCDP-1). Washington, DC: Author. Retrieved from http://www.marines.mil/Portals/59/Publications/MCDP%201%20Warfighting.pdf

The bottom line for the evaluation of the impact of personnel management on readiness is the understanding that stability matters. The research offers evidence that stability is statistically significant in determining readiness. This finding is consistent with previous research, the warfighting concepts in Marine Corps doctrine, and the guidance provided in the Marine Corps unit cohesion program. In addition, readiness would benefit from a clearly defined metric for stability within the Marine Corps. This research suggests a clearly defined metric for stability could serve to focus the complex manning and staffing processes and informs the prioritization of staffing critical MOSs for infantry battalions in the Marine Corps. There is a relationship between personnel management, stability, cohesion, and performance that could be improved beyond the current outcomes produced by the HRDP. Finally, and on a positive note, the research suggests the implementation of the Deployed Unit Cohesion Staffing policy in 2011 did improve stability for infantry battalions.

The Marine Corps' future excellence as a force provider of "expeditionary forces in readiness" is only guaranteed through continued cross-examination of its policies and processes supporting force planning. It is beneficial to preserve a healthy amount of institutional paranoia in this area to ensure the Marine Corps continues to get it right. The importance of readiness as a center of gravity for the Marine Corps is given additional perspective by analogies from Collins (2001) who describes the importance of organizations to act like a "hedgehog" and cultivate their "flywheel" (Collins, 2001). This research suggests the Marine Corps must approach readiness as its single organizing idea that it can do better than anyone else in the world (Collins, 2001). The human resources for the Marine Corps are the flywheel, which is explained as the mechanism used to build momentum for the organization over the long term. These two concepts from Collins (2001) demonstrate the importance of continuing to improve the personnel management policies in the Marine Corps. The success of the Marine Corps in future conflicts may depend on how well the organization manages the flywheel.

B. CONCLUSIONS AND RECOMMENDATIONS

In conclusion, readiness is not improved simply by random aggregate increases in quantities of personnel, training, and equipment. The quality of the force, or its readiness, requires more scrutiny and cross-examination to determine if an infantry battalion can function as it was designed. In this sense, having more personnel is not always better and the data in this research indicate this finding is true. So, is the Marine Corps ready for future conflicts? The answer to that question requires knowing what types of conflicts the Marine Corps may face in the future. Regardless of the actual event, the data from this research suggest the current approach to readiness provides a sub-optimal solution. The predicted readiness scores increase by 0.04 (or one standard deviation) when a battalion is stabilized at D-120 vs the current practice of D-90 relative to the base month (D-180). This degree of improvement is significant relative to the ideas presented by lean thinking and six sigma process improvements.

Although, the current model is based on flexibility it fails to provide the best infantry battalion to respond to crises or to generate the best infantry battalion to conduct a deliberate deployment. This approach has been sufficient to deal with non-state actors, but it could prove problematic if the Marine Corps is asked to respond to near peer competition where the competitive advantage of technology is neutralized. The results of this research suggest the HRDP is overextended in relation to its assigned mission. The primary way to resolve this tension is to increase the inventory of Marines or decrease the existing structure for infantry battalions. In the absence of these measures, this research offers evidence that stabilizing specific MOS categories earlier in the PTP provides marginal improvement to readiness.

This section presents the conclusions and recommendations organized by the research questions. The conclusions of this research are derived from the empirical analysis of these questions. The first question involves analyzing the current readiness model and determining the appropriate inputs for infantry battalion readiness. The second question involves analysis of the metrics used to determine infantry battalion readiness. This question includes analysis of the impact of the Deployed Unit Cohesion Staffing policy on infantry battalion stability. The final question involves analysis to determine the statistically significant occupational specialties that are essential to stabilize early in the PTP cycle for an infantry battalion. The conclusions and recommendations for these questions offer insight into the effectiveness of the Marine Corps manning and staffing policies and potential areas for improvement in the HRDP.

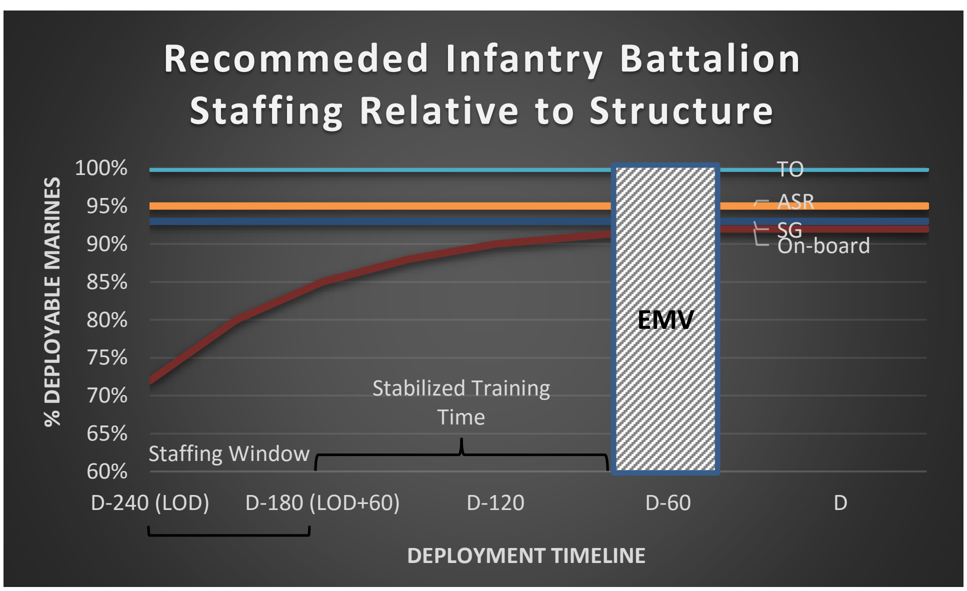
After analysis of the existing readiness model, this research suggests it may benefit the Marine Corps to include additional fields such as Division or TECOM evaluated events in the readiness function to capture ability to perform as intended (see Figure 1). It may also benefit the readiness model to include a stability metric in addition to the existing aggregate levels reported in DRRS-MC. This research suggests that is necessary to fully understand the personnel readiness of an infantry battalion. As the quote opening this chapter suggests, readiness is more than a simple measure of the ability for an infantry battalion to deploy. In order to achieve a more accurate picture of infantry battalion readiness the Marine Corps could improve the training and personnel metrics used for reporting in the DRRS-MC system.

There is an opportunity for significant improvement regarding the metrics used to determine infantry battalion readiness. After analysis of the data from TTECG, this research believes the Marine Corps would benefit from adding analytics sections to Training and Education Command (TECOM) structure. The data collected by TTECG provides the research a unique ability to assess the performance of Marine Corps infantry battalions in the integration across all of the warfighting functions. However, the data used for this research was incomplete and contained various calculation errors and incomplete data for each battalion. This fact is not the result of a lack of effort by TTECG to collect data on EXFOR battalions, but is a result of a lack of staffing and support for this vital function within the command. Similar to professional sports, this research believes adding support for analytics in TECOM commands has the potential to improve training trend analysis, real-time feedback and critiques, after action reviews for participating units, and serves to focus the Block V remediation training prior to deployment. Critics would argue this might provide a mechanistic solution to performance, but this research suggests that the Marine Corps would benefit from more precise information from these exercises.

This research also confirms the findings of McHugh et al. (2006) describing the problem aggregate metrics contribute to shortages of personnel. The Marine Corps may benefit from including a metric to account for on-board staffing relative to PMOS in addition to the current aggregate metric relative to officers and enlisted. The result of the current policy masks the effects caused by overstaffing certain MOS categories. When a battalion is overstaffed by ~102 basic infantrymen the aggregate metric can present a stabilized enlisted percentage even though several critical MOSs may be short or missing altogether. In order to track this recommendation, the Marine Corps has to resolve the inaccuracy of BIC assignments. Under current practices, the BIC is underutilized and inaccurate to the point that it is an unusable field for tracking individual assignments. Unit commanders are responsible for this data and must ensure these records are accurate. This finding significantly degraded the ability to determine stability for infantry battalions in this research.

The final metric presenting a problem relative to the stability of infantry battalions is the target fill window used to guide monitor assignments. As long as monitors get credit for assigning Marines to infantry battalions between LOD and LOD+60 the Deployed Unit Cohesion Staffing policy will not achieve the maximum potential relative to unit cohesion and stabilization. This research is not opposed to the existence of a window, that seems reasonable due to the complexity of the manning and staffing process. However, it is the location of the window that is problematic. The result of the current target window does not specifically affect readiness as currently defined, but research suggests it does have a negative impact on personnel stability and cohesion. This research recognizes many factors such as shifting or unpredictable deployment schedules and school graduation cycles constrain a monitor's ability to achieve this goal. Further research is required to confirm the feasibility of this recommendation, but the results of this study suggest looking into the impact of shifting the window to the left on the PTP timeline to align with the intent of the force generation process and the Deployed Unit Cohesion Staffing policy to improve readiness (see Figure 25).

Figure 25. Recommended Staffing Target Window



Personnel turbulence is described primarily in terms of internal and external transfers of Marines (Peterson, 2008). One element compounding the disruptive effects of personnel turnover is the current practice of assigning Marines to units that require follow on education to possess “the right skills” (Strobl, 2005). The readiness of an infantry battalion may benefit from reduced turbulence if the assignments process also takes a closer look at the qualifications of the Marine and includes schooling in the timeline prior to arrival at the battalion. This is a complicated suggestion that may be difficult to coordinate with availability of schools relative to the Marines transition time. Regardless, the finding is relevant to the discussion and may benefit the unit’s ability to stabilize sooner and achieve higher readiness.

The results of the models used in this research suggest several statistically significant occupational specialties that should be prioritized in staffing to maximize readiness. Results show that resolving staffing gaps in 0369 GySgts, 0302 Lts, 0369 SSgts, 0341 NCOs, 0331 E1-E3, 0341 E1-E3, and scout snipers have a statistically significant impact on readiness as defined in this research. These findings are based on data from 36 infantry battalions that participated in EMV from 2009–2012. Since the exercise has changed to ITX, it may benefit the Marine Corps to validate these categories relative to the new exercise standards. Finally, a notable finding is the lack of significance of staffing the infantry NCO in determining readiness. This finding is discussed in detail in chapter 4 and further research is required to determine causality in this case.

C. TOPICS FOR FURTHER RESEARCH

The Marine Corps can benefit in many ways from continuing to “torture the data” related to improving metrics used to determine the readiness of the force. This research provides evidence for several possible approaches such as: including a stability metric in measuring personnel readiness, adjusting the assignment window, prioritizing the staffing of statistically significant unit groups, and continuing the guidance provided in the Deployed Unit Cohesion Staffing policy. These items only represent the tip of the iceberg of potential topics for further research on readiness.

An extension of this research includes an expansion of the unit group model to include more specific categories for support MOS categories. This research intentionally targeted the infantry MOSs to determine the statistically significant combat arms specialties within an infantry battalion. However, several support MOSs are likely to be statistically significant once they are disaggregated from their functional groups. Of particular interest would be the identification of low density high demand MOSs within the support functions in an infantry battalion.

This research used exercise data from infantry battalion performance at EMV to represent the dependent variable. In doing this, the research excluded the primary forward deployed MAGTFs used by the Marine Corps. The Marine Corps can benefit from a similar study focused on the readiness of Marine Expeditionary Units (MEUs), specifically Battalion Landing Teams (BLTs), through the performance of those units during the certification exercise evaluated by Special Operations Training Group (SOTG). These infantry battalions are evaluated on their ability to execute mission profiles according to a different set of assigned missions. The results of a study on MEUs could be used as a comparative assessment with the infantry battalions used in this research.

The data also show apparently significantly overstaffed MOSs within the infantry battalions in the study. This finding was unexpected, and the researcher's inability to remove the non-deployable Marines from the data skewed the results to some extent. It became apparent through the course of the research that this is an intentional practice by the Marine Corps to maximize readiness at all times rather than in relation to a particular deployment. What is unknown from this research is the impact that policy has on the stability, cohesion, and readiness of the battalion. Further research is recommended to determine the effect of carrying non-deployable Marines relative to readiness.

The final topic recommended for further research relates to the cost of maintaining an "expeditionary force in readiness" (CMC, 2015). Maintaining a force that is always ready comes at significant monetary cost to the nation. Many would argue, and this research would agree, that the nation should pay any cost to protect its vital interests and the Marine Corps is a critical element to that strategy. However, the question of tiered readiness suggested by George (1999) and McCarroll (2012) provide an interesting opportunity to conduct a cost benefit analysis of the levels of readiness for the Marine Corps.

APPENDIX. READINESS REGRESSION MODEL RESULTS

A. UNIT GROUP MODEL RESULTS

VARIABLES	LABELS	(1) Model 1
Dependent Variable		
_totalScore	Battalion EMV score	
Independent Variables		
Relationship to 2011		
pre2011	pre2011	0.0357***
		[0.0008]
Home Station Base Codes		
_IBASEcode_2	Lejeune	-0.0296***
		[0.0011]
_IBASEcode_3	Kaneohe	-0.0330***
		[0.0013]
_IBASEcode_4	29 Palms	-0.0536***
		[0.0013]
Battalion Unit Groups		
_Iunit_grou_1	Cmd	-0.0011
		[0.0035]
_Iunit_grou_2	Intel	-0.0070
		[0.0049]
_Iunit_grou_3	Inf_Capts	-0.0004
		[0.0036]
_Iunit_grou_4	Inf_MSgts	0.0010
		[0.0038]
_Iunit_grou_5	Inf_GySgts	0.0110**
		[0.0050]
_Iunit_grou_6	Inf_Lts	-0.0103**
		[0.0044]
_Iunit_grou_7	Inf_SSgts	-0.0112**
		[0.0048]
_Iunit_grou_8	Inf_NCO	0.0005
		[0.0036]
_Iunit_grou_9	MG_NCO	-0.0043
		[0.0036]
_Iunit_grou_10	Mortar_NCO	-0.0070*
		[0.0038]
_Iunit_grou_11	Assault_NCO	-0.0011
		[0.0035]
_Iunit_grou_12	Missile_NCO	-0.0008

VARIABLES	LABELS	(1) Model 1
		[0.0035]
_Iunit_grou_13	Infantry	0.0035
		[0.0049]
_Iunit_grou_14	MG	-0.0102**
		[0.0043]
_Iunit_grou_15	Mortar	-0.0126***
		[0.0043]
_Iunit_grou_16	Assault	-0.0024
		[0.0040]
_Iunit_grou_17	Missile	-0.0007
		[0.0037]
_Iunit_grou_18	SSP	-0.0104
		[0.0068]
_Iunit_grou_19	TACP	-0.0013
		[0.0035]
_Iunit_grou_20	Admin	0.0019
		[0.0048]
_Iunit_grou_21	Logistics	0.0053
		[0.0056]
_Iunit_grou_22	Comm	-0.0043
		[0.0041]
_Iunit_grou_23	CBRN	-0.0015
		[0.0037]
Difference Between On-Board and ASR		
ASRgap	ASRgap	0.0005
		[0.0009]
Interaction Terms		
_IuniXASRg_1	(unit_group==1)*ASRgap	0.0009
		[0.0021]
_IuniXASRg_2	(unit_group==2)*ASRgap	-0.0022
		[0.0013]
_IuniXASRg_3	(unit_group==3)*ASRgap	-0.0012
		[0.0013]
_IuniXASRg_4	(unit_group==4)*ASRgap	-0.0107***
		[0.0042]
_IuniXASRg_5	(unit_group==5)*ASRgap	-0.0033***
		[0.0013]
_IuniXASRg_6	(unit_group==6)*ASRgap	0.0024**
		[0.0012]
_IuniXASRg_7	(unit_group==7)*ASRgap	0.0012
		[0.0010]
_IuniXASRg_8	(unit_group==8)*ASRgap	-0.0006

VARIABLES	LABELS	(1) Model 1
		[0.0009]
_IuniXASRg_9	(unit_group==9)*ASRgap	-0.0015*
		[0.0009]
_IuniXASRg_10	(unit_group==10)*ASRgap	-0.0015
		[0.0009]
_IuniXASRg_11	(unit_group==11)*ASRgap	-0.0013
		[0.0010]
_IuniXASRg_12	(unit_group==12)*ASRgap	-0.0003
		[0.0009]
_IuniXASRg_13	(unit_group==13)*ASRgap	-0.0005
		[0.0009]
_IuniXASRg_14	(unit_group==14)*ASRgap	0.0001
		[0.0009]
_IuniXASRg_15	(unit_group==15)*ASRgap	0.0001
		[0.0009]
_IuniXASRg_16	(unit_group==16)*ASRgap	-0.0003
		[0.0009]
_IuniXASRg_17	(unit_group==17)*ASRgap	-0.0004
		[0.0009]
_IuniXASRg_18	(unit_group==18)*ASRgap	-0.0012
		[0.0010]
_IuniXASRg_19	(unit_group==19)*ASRgap	-0.0001
		[0.0024]
_IuniXASRg_20	(unit_group==20)*ASRgap	0.0010
		[0.0018]
_IuniXASRg_21	(unit_group==21)*ASRgap	-0.0009
		[0.0010]
_IuniXASRg_22	(unit_group==22)*ASRgap	-0.0000
		[0.0009]
_IuniXASRg_23	(unit_group==23)*ASRgap	0.0021
		[0.0029]
Personnel Strength defined as 90% of ASR		
stable	stable	-0.0054**
		[0.0023]
Interaction Terms		
_ItmoXstab_2	(tmonth==-5)*stable	-0.0001
		[0.0021]
_ItmoXstab_3	(tmonth==-4)*stable	0.0014
		[0.0021]
_ItmoXstab_4	(tmonth==-3)*stable	0.0024
		[0.0021]
_ItmoXstab_5	(tmonth==-2)*stable	0.0046**

VARIABLES	LABELS	(1) Model 1
		[0.0021]
_ItmoXstab_6	(tmonth==-1)*stable	0.0050**
		[0.0021]
_ItmoXstab_7	(tmonth==0)*stable	0.0066***
		[0.0021]
_ItmoXstab_8	(tmonth==1)*stable	0.0079***
		[0.0021]
_ItmoXstab_9	(tmonth==2)*stable	0.0081***
		[0.0021]
_ItmoXstab_10	(tmonth==3)*stable	0.0087***
		[0.0021]
Constant		0.7603***
		[0.0033]
Observations		8,597
R-squared		0.320
Adjusted R^2		0.315
Standard errors in brackets		
*** p<0.01, ** p<0.05, * p<0.1		

B. MOS GROUP MODEL RESULTS

VARIABLES	LABELS	(1) Model 2
Dependent Variable		
_totalScore	Battalion EMV score	
Independent Variables		
Relationship to 2011		
pre2011	pre2011	0.0356***
		[0.0008]
Home Station Base Codes		
_IBASEcode_2	Lejeune	-0.0288***
		[0.0011]
_IBASEcode_3	Kaneohe	-0.0324***
		[0.0013]
_IBASEcode_4	29 Palms	-0.0532***
		[0.0013]
Battalion MOS Groups		
_Imos_group_1	Cmd Group	-0.0010
		[0.0035]
_Imos_group_2	Intel	-0.0062
		[0.0049]

VARIABLES	LABELS	(1) Model 2
_Imos_group_3	0302	-0.0022
		[0.0035]
_Imos_group_4	0369	-0.0002
		[0.0034]
_Imos_group_5	0311	0.0016
		[0.0035]
_Imos_group_6	0331	-0.0013
		[0.0033]
_Imos_group_7	0341	-0.0022
		[0.0033]
_Imos_group_8	0351	-0.0012
		[0.0033]
_Imos_group_9	0352	-0.0012
		[0.0033]
_Imos_group_10	SSP	-0.0138**
		[0.0068]
_Imos_group_11	TACP	-0.0002
		[0.0036]
_Imos_group_12	Admin	0.0039
		[0.0049]
_Imos_group_13	Logistics	0.0078
		[0.0056]
_Imos_group_14	Comm	-0.0020
		[0.0041]
_Imos_group_15	CBRN	0.0008
		[0.0037]
Difference Between On-Board and ASR		
ASRgap	ASRgap	0.0014
		[0.0009]
Interaction Terms		
_ImosXASRg_1	(mos_group==1)*ASRgap	0.0024
		[0.0021]
_ImosXASRg_2	(mos_group==2)*ASRgap	-0.0020
		[0.0013]
_ImosXASRg_3	(mos_group==3)*ASRgap	0.0001
		[0.0010]
_ImosXASRg_4	(mos_group==4)*ASRgap	-0.0010
		[0.0010]
_ImosXASRg_5	(mos_group==5)*ASRgap	-0.0014
		[0.0009]
_ImosXASRg_6	(mos_group==6)*ASRgap	-0.0012
		[0.0009]

VARIABLES	LABELS	(1) Model 2
_ImosXASRg_7	(mos_group==7)*ASRgap	-0.0012
		[0.0009]
_ImosXASRg_8	(mos_group==8)*ASRgap	-0.0012
		[0.0009]
_ImosXASRg_9	(mos_group==9)*ASRgap	-0.0010
		[0.0009]
_ImosXASRg_10	(mos_group==10)*ASRgap	-0.0021**
		[0.0010]
_ImosXASRg_11	(mos_group==11)*ASRgap	0.0015
		[0.0024]
_ImosXASRg_12	(mos_group==12)*ASRgap	0.0021
		[0.0018]
_ImosXASRg_13	(mos_group==13)*ASRgap	-0.0018*
		[0.0010]
_ImosXASRg_14	(mos_group==14)*ASRgap	-0.0009
		[0.0009]
_ImosXASRg_15	(mos_group==15)*ASRgap	0.0017
		[0.0029]
Personnel Strength defined as 90% of ASR		
stable	stable	-0.0122***
		[0.0021]
Interaction Terms		
_ItmoXstab_2	(tmonth==-5)*stable	0.0000
		[0.0022]
_ItmoXstab_3	(tmonth==-4)*stable	0.0015
		[0.0021]
_ItmoXstab_4	(tmonth==-3)*stable	0.0025
		[0.0021]
_ItmoXstab_5	(tmonth==-2)*stable	0.0046**
		[0.0021]
_ItmoXstab_6	(tmonth==-1)*stable	0.0050**
		[0.0021]
_ItmoXstab_7	(tmonth==0)*stable	0.0065***
		[0.0021]
_ItmoXstab_8	(tmonth==1)*stable	0.0078***
		[0.0021]
_ItmoXstab_9	(tmonth==2)*stable	0.0079***
		[0.0022]
_ItmoXstab_10	(tmonth==3)*stable	0.0086***
		[0.0022]
Constant		0.7639***
		[0.0033]

VARIABLES	LABELS	(1) Model 2
Observations		8,597
R-squared		0.312
Adjusted R^2		0.308
Standard errors in brackets		
*** p<0.01, ** p<0.05, * p<0.1		

C. LEADERSHIP GROUP MODEL RESULTS

VARIABLES	LABELS	(1) Model 3
Dependent Variable		
_totalScore	Battalion EMV score	
Independent Variables		
Relationship to 2011		
pre2011	pre2011	0.0359***
		[0.0008]
Home Station Base Codes		
_IBASEcode_2	Lejeune	-0.0289***
		[0.0011]
_IBASEcode_3	Kaneohe	-0.0324***
		[0.0013]
_IBASEcode_4	29 Palms	-0.0532***
		[0.0013]
Battalion Leadership Groups		
_Ilead_grou_1	Cmd Group	-0.0011
		[0.0035]
_Ilead_grou_2	Intel	-0.0066
		[0.0049]
_Ilead_grou_3	Co_staff	0.0009
		[0.0033]
_Ilead_grou_4	Plt_staff	-0.0083**
		[0.0038]
_Ilead_grou_5	Inf_NCO	-0.0011
		[0.0031]
_Ilead_grou_6	Infantry	-0.0005
		[0.0032]
_Ilead_grou_7	SSP	-0.0109
		[0.0068]
_Ilead_grou_8	TACP	-0.0010
		[0.0036]
_Ilead_grou_9	Admin	0.0026

VARIABLES	LABELS	(1) Model 3
		[0.0049]
_Ilead_grou_10	Logistics	0.0058
		[0.0056]
_Ilead_grou_11	Comm	-0.0036
		[0.0041]
_Ilead_grou_12	CBRN	-0.0009
		[0.0037]
Difference Between On-Board and ASR		
ASRgap	ASRgap	0.0007
		[0.0009]
Interaction Terms		
_IleaXASRg_1	(lead_group==1)*ASRgap	0.0013
		[0.0021]
_IleaXASRg_2	(lead_group==2)*ASRgap	-0.0021
		[0.0013]
_IleaXASRg_3	(lead_group==3)*ASRgap	-0.0016
		[0.0010]
_IleaXASRg_4	(lead_group==4)*ASRgap	0.0010
		[0.0010]
_IleaXASRg_5	(lead_group==5)*ASRgap	-0.0009
		[0.0009]
_IleaXASRg_6	(lead_group==6)*ASRgap	-0.0007
		[0.0009]
_IleaXASRg_7	(lead_group==7)*ASRgap	-0.0015
		[0.0010]
_IleaXASRg_8	(lead_group==8)*ASRgap	0.0004
		[0.0024]
_IleaXASRg_9	(lead_group==9)*ASRgap	0.0014
		[0.0018]
_IleaXASRg_10	(lead_group==10)*ASRgap	-0.0011
		[0.0010]
_IleaXASRg_11	(lead_group==11)*ASRgap	-0.0003
		[0.0009]
_IleaXASRg_12	(lead_group==12)*ASRgap	0.0020
		[0.0029]
Personnel Strength defined as 90% of ASR		
stable	stable	-0.0073***
		[0.0021]
Interaction Terms		
_ItmoXstab_2	(tmonth==-5)*stable	0.0000
		[0.0021]
_ItmoXstab_3	(tmonth==-4)*stable	0.0016

VARIABLES	LABELS	(1) Model 3
		[0.0021]
_ItmoXstab_4	(tmonth==-3)*stable	0.0025
		[0.0021]
_ItmoXstab_5	(tmonth==-2)*stable	0.0047**
		[0.0021]
_ItmoXstab_6	(tmonth==-1)*stable	0.0051**
		[0.0021]
_ItmoXstab_7	(tmonth==0)*stable	0.0065***
		[0.0021]
_ItmoXstab_8	(tmonth==1)*stable	0.0078***
		[0.0021]
_ItmoXstab_9	(tmonth==2)*stable	0.0078***
		[0.0021]
_ItmoXstab_10	(tmonth==3)*stable	0.0085***
		[0.0022]
Constant		0.7608***
		[0.0032]
Observations		8,597
R-squared		0.313
Adjusted R^2		0.310
Standard errors in brackets		
*** p<0.01, ** p<0.05, * p<0.1		

D. FUNCTIONAL GROUP MODEL RESULTS

VARIABLES	LABELS	(1) Model 4
Dependent Variable		
_totalScore	Battalion EMV score	
Independent Variables		
Relationship to 2011		
pre2011	pre2011	0.0357***
		[0.0008]
Home Station Base Codes		
_IBASEcode_2	Lejeune	-0.0285***
		[0.0011]
_IBASEcode_3	Kaneohe	-0.0320***
		[0.0013]
_IBASEcode_4	29 Palms	-0.0530***
		[0.0013]
Battalion Functional Groups		

VARIABLES	LABELS	(1) Model 4
_Ifxn_group_1	Cmd Group	-0.0011
		[0.0035]
_Ifxn_group_2	Intel	-0.0065
		[0.0049]
_Ifxn_group_3	Infantry	-0.0006
		[0.0030]
_Ifxn_group_4	TACP	-0.0009
		[0.0036]
_Ifxn_group_5	Admin	0.0028
		[0.0049]
_Ifxn_group_6	Logistics	0.0061
		[0.0056]
_Ifxn_group_7	Comm	-0.0034
		[0.0041]
_Ifxn_group_8	CBRN	-0.0007
		[0.0037]
Difference Between On-Board and ASR		
ASRgap	ASRgap	0.0008
		[0.0009]
Interaction Terms		
_IfxnXASRga_1	(fxn_group==1)*ASRgap	0.0015
		[0.0020]
_IfxnXASRga_2	(fxn_group==2)*ASRgap	-0.0021
		[0.0014]
_IfxnXASRga_3	(fxn_group==3)*ASRgap	-0.0008
		[0.0009]
_IfxnXASRga_4	(fxn_group==4)*ASRgap	0.0005
		[0.0024]
_IfxnXASRga_5	(fxn_group==5)*ASRgap	0.0015
		[0.0018]
_IfxnXASRga_6	(fxn_group==6)*ASRgap	-0.0012
		[0.0010]
_IfxnXASRga_7	(fxn_group==7)*ASRgap	-0.0004
		[0.0009]
_IfxnXASRga_8	(fxn_group==8)*ASRgap	0.0020
		[0.0029]
Personnel Strength defined as 90% of ASR		
stable	stable	-0.0078***
		[0.0019]
Interaction Terms		
_ItmoXstab_2	(tmonth==-5)*stable	-0.0000
		[0.0022]

VARIABLES	LABELS	(1) Model 4
_ItmoXstab_3	(tmonth==-4)*stable	0.0015
		[0.0021]
_ItmoXstab_4	(tmonth==-3)*stable	0.0025
		[0.0021]
_ItmoXstab_5	(tmonth==-2)*stable	0.0047**
		[0.0021]
_ItmoXstab_6	(tmonth==-1)*stable	0.0050**
		[0.0021]
_ItmoXstab_7	(tmonth==0)*stable	0.0064***
		[0.0021]
_ItmoXstab_8	(tmonth==1)*stable	0.0076***
		[0.0021]
_ItmoXstab_9	(tmonth==2)*stable	0.0076***
		[0.0022]
_ItmoXstab_10	(tmonth==3)*stable	0.0084***
		[0.0022]
Constant		0.7610***
		[0.0032]
Observations		8,597
R-squared		0.309
Adjusted R^2		0.307
Standard errors in brackets		
*** p<0.01, ** p<0.05, * p<0.1		

E. WARFIGHTING FUNCTION MODEL RESULTS

VARIABLES	LABELS	(1) Model 5
Dependent Variable		
_totalScore	Battalion EMV score	
Independent Variables		
Relationship to 2011		
pre2011	pre2011	0.0358***
		[0.0008]
Home Station Base Codes		
_IBASEcode_2	Lejeune	-0.0285***
		[0.0011]
_IBASEcode_3	Kaneohe	-0.0319***
		[0.0013]
_IBASEcode_4	29 Palms	-0.0529***
		[0.0013]

VARIABLES	LABELS	(1) Model 5
Battalion Warfighting Function Groups		
_Iwff_group_1	C2	-0.0020
		[0.0034]
_Iwff_group_2	Intel	-0.0066
		[0.0049]
_Iwff_group_3	Maneuver	-0.0007
		[0.0030]
_Iwff_group_4	Fires	-0.0010
		[0.0036]
_Iwff_group_5	Logistics	-0.0010
		[0.0034]
_Iwff_group_6	FPRO	-0.0009
		[0.0037]
Difference Between On-Board and ASR		
ASRgap	ASRgap	0.0007
		[0.0009]
Interaction Terms		
_IwffXASRga_1	(wff_group==1)*ASRgap	-0.0004
		[0.0009]
_IwffXASRga_2	(wff_group==2)*ASRgap	-0.0021
		[0.0014]
_IwffXASRga_3	(wff_group==3)*ASRgap	-0.0007
		[0.0009]
_IwffXASRga_4	(wff_group==4)*ASRgap	0.0004
		[0.0024]
_IwffXASRga_5	(wff_group==5)*ASRgap	-0.0007
		[0.0009]
_IwffXASRga_6	(wff_group==6)*ASRgap	0.0021
		[0.0029]
Personnel Strength defined as 90% of ASR		
stable	stable	-0.0072***
		[0.0018]
Interaction Terms		
_ItmoXstab_2	(tmonth==-5)*stable	-0.0001
		[0.0022]
_ItmoXstab_3	(tmonth==-4)*stable	0.0014
		[0.0021]
_ItmoXstab_4	(tmonth==-3)*stable	0.0024
		[0.0021]
_ItmoXstab_5	(tmonth==-2)*stable	0.0046**
		[0.0021]
_ItmoXstab_6	(tmonth==-1)*stable	0.0049**

VARIABLES	LABELS	(1) Model 5
		[0.0021]
_ItmoXstab_7	(tmonth==0)*stable	0.0063***
		[0.0021]
_ItmoXstab_8	(tmonth==1)*stable	0.0075***
		[0.0021]
_ItmoXstab_9	(tmonth==2)*stable	0.0076***
		[0.0022]
_ItmoXstab_10	(tmonth==3)*stable	0.0084***
		[0.0022]
Constant		0.7606***
		[0.0032]
Observations		8,597
R-squared		0.309
Adjusted R^2		0.307
Standard errors in brackets		
*** p<0.01, ** p<0.05, * p<0.1		

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