DISSERTATION

The Effect of Personnel Stability on Organizational Performance

Do Battalions with Stable Command Groups Achieve Higher Training Proficiency at the National Training Center?

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This document was submitted as a dissertation in September 2008 in partial fulfillment of the requirements of the doctoral degree in public policy analysis at the Pardee RAND Graduate School. The faculty committee that supervised and approved the dissertation consisted of Bart E. Bennett (Chair), Bryan W. Hallmark, and James T. Quinlivan.

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Preface

This dissertation was submitted to the Pardee RAND Graduate School in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Policy Analysis. This dissertation examines the relationship between personnel stability and organizational performance in the context of the Army's transition to lifecycle manning from the individual replacement system.

Those who read this dissertation, particularly those from the Army profession, could conclude that I am a heretic for questioning the importance of cohesion and personnel stability in attaining unit combat effectiveness. Shortly after reaching that conclusion, they may then conclude that I do not sufficiently understand the human dimension of combat. Both conclusions would be incorrect.

As to the first conclusion, I believe unit cohesion plays an important role in sustaining a unit during the intense stress of combat, thereby making it possible for units to remain in the fight. However, I remain unconvinced that personnel stability is the driving factor behind developing unit cohesion. Personnel stability may save the Army money and increase job satisfaction, but there is too much evidence countering the assumption that stability is necessary for achieving high levels of unit effectiveness or unit cohesion.

During my research, I came to realize the Army inconsistently defines cohesion and unit effectiveness. The use of multiple definitions for both concepts has led to poorly supported but strongly held assumptions about a causal path from stability to cohesion to improved unit effectiveness. I began to wonder if the Army was expending a lot of energy to fix something that was not essential for improving unit effectiveness.

As to the second assumption, I am familiar with the human dimension of combat because I am a career Army officer who has most recently served as a Squadron Commander for a Stryker Cavalry Squadron. The Squadron's personnel were managed using the lifecycle manning policy. I commanded the unit through an entire lifecycle, including a 15-month combat deployment to Baghdad, Iraq. I experienced first hand the tremendous comradery and brotherhood that develops through the shared experience of combat. I understand the Army's professional motivations for implementing this policy and the strong assumptions about relationship between cohesion, unit performance, and personnel stability.

However, in addition to being a professional Army officer, I am studying to become a policy analyst. While I understand the intensity and intuitive appeal concerning the benefits of personnel stabilization, I am also inclined to more closely examine the underlying assumptions upon which the

Army is making this policy decision. I am not attempting to discredit the Army's policy of lifecycle manning. There are compelling arguments supporting implementation of lifecycle manning, but there are equally compelling arguments supporting more flexibility in personnel manning decisions than is currently afforded under lifecycle manning. Few of these arguments are based upon empirical analysis and instead rely primarily of historical analysis, anecdotal evidence, and emphatic appeals to common sense.

Somewhere during this debate, the professional discussion focused less on whether or not stability is necessary and more about how to quickly implement lifecycle manning policies to achieve stability. My hope is that this empirical analysis combined with my experience and perspective as an Army officer will positively add to the debate and provide results that will help the Army manage personnel more effectively. Like every other Army professional officer, my desire is for our units and soldiers to be ready for their next mission, but as a policy analyst, I also want to prepare them in the most effective way possible.

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Abstract

Effective personnel management is one of many challenges facing the US Army as it prepares units for the complex demands of operational deployments. Prior to 2003 the Army managed the flow of personnel into and out of units on an individual basis, which resulted in persistent personnel turnover as soldiers routinely entered and departed the unit throughout the year. This steady source of personnel turnover is assumed to undermine unit effectiveness by disrupting unit training proficiency and unit cohesion.

In 2003, the Army began transitioning from an individual replacement system to a personnel management system called lifecycle manning. Lifecycle manning increases personnel stability by assigning approximately 3500 soldiers to a brigade combat team at the beginning of a three-year training and deployment cycle. These soldiers remain with the brigade for the entire cycle, thereby enabling teams to train together and develop high unit cohesion prior to an operational deployment. The lifecycle manning policy is based on an assumed causal linkage where personnel stability leads to higher unit cohesion that leads to increased unit effectiveness.

This dissertation empirically tests this assumption by analyzing the direct relationship between personnel stability and unit effectiveness without incorporating cohesion. The analysis applies production function theory with the factor input of interest being increased personnel stability and a production output of unit effectiveness. Using new measures of personnel stability and training proficiency scores from previous RAND research, this research assesses whether battalions with stable leadership achieve higher levels of training proficiency.

The analysis results do not show a prevalent or strong relationship between battalion leadership stability and battalion training proficiency. In the few cases where a relationship is found, diminishing returns to stability exist and the gains are realized within 6 months of team formation. From the Army's perspective, this unexpected result potentially calls into question whether the transition to lifecycle manning should continue in its current form as there may be more flexibility in officer management than lifecycle manning policies permit. The research also identifies other policy alternatives for improving unit effectiveness and raises questions about the cost-benefit analysis of implementing lifecycle manning.

Acknowledgements

My thanks to the many people who provided such generous support during this research begins with an explanation of my unique path to completion. This journey began in 2002 with my enrollment in the Pardee RAND Graduate School with plans to complete the program in three years before assuming my future assignment as a permanent faculty member in the Department of Social Sciences at West Point, NY. After completing two years of course work and the qualification examinations, I had the distinct honor to serve as a Squadron Commander for 1-14 Cavalry, 3-2 Stryker Brigade Combat Team at Ft. Lewis, Washington. This assignment required me to take a three year leave of absence that included a 15-month deployment to Iraq in support of Operation Iraqi Freedom. This leave of absence required great patience and support on the part of the RAND Graduate School, the RAND Arroyo Center, the Department of Social Science, my dissertation committee, and my family. Without their understanding and patience I never would have completed this task and I will forever be grateful to them.

My first thanks go to the members of my committee: Bart E. Bennett (Committee Chair), Bryan W. Hallmark, and James T. Quinlivan. Their generosity with their time and expertise greatly enhanced my experience. Their incredible patience to remain on the committee despite the extended leave of absence is a tribute to their commitment to the RAND Graduate School and the students they work with on a routine basis. All three of my committee members have been superb mentors in helping me develop the skills of a policy analyst. Beyond the work of a dissertation, I will never forget the many great days at the Long Road Home Ranch with Bryan Hallmark, the sharing of combat experiences with Jim Quinlivan, and the advice on raising daughters from Bart Bennett. They are all great men and I hope someday to achieve a small semblance of their expertise in both research and life.

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I also thank my future professional home, the Department of Social Sciences, for demonstrating great patience during this process. Supporting my attendance at PRGS, my duty as a Squadron Commander, and my unique situation for completing the dissertation is a great testimony to the Department's professionalism and commitment to caring for people. I am ready to rejoin the Social Sciences family at West Point and hope you will find your patience and investment in me worth the wait.

I saved the most important for the end. My most heart-felt thank you goes to my wife, Debbie, and my three daughters, Jessica, Kayci, and Sydney. You have stood by me through many long weeks of writing, four moves into different homes, fifteen months of separation while I served in Iraq, and several weeks of separation through these final stages of completing this project. Thanks for your patience, understanding, and encouragement. It is now time for us to settle down and be together. You truly inspire me and make everything worth while.

1. Policy Objective and Research Approach

> *"Objective Force Warriors, first and foremost, are a band of brothers and sisters…The emotional bonds and teamwork developed within these brotherhoods are not merely 'nice to have'; they will be the very foundation of the objective force…Arguably, the more advanced our technology becomes, the more critical it is that we build and maintain stable teams to employ it. Otherwise, we risk collective stagnation at a basic level of proficiency because of a revolving door of individual replacements who leave units just as they begin to master these new technologies…We are looking at the broad changes we could make to create more cohesive units, more stability for soldiers and families, and therefore higher readiness levels, as opposed to perpetuating a personnel system that detracts from cohesion." (White, 2002)*

The Army's Policy Objective

Secretary White's statement encapsulates the Army's assumptions concerning the entangled relationship between unit cohesion, unit effectiveness, and personnel management policy. Motivated to transform the Army into a responsive expeditionary force, senior Army leaders initiated a new personnel management policy designed to better prepare combat units for short notice deployments by stabilizing personnel within combat organizations. The Army expects the new policy to increase unit effectiveness by reducing the number of soldiers who depart the unit during pre-deployment training. Improved unit effectiveness should follow from a combination of higher unit cohesion and higher levels of training proficiency. This dissertation examines the assumptions upon which the new policy is based and empirically analyzes the relationship between personnel stability and unit effectiveness.

Prior to 2003 the Army managed the flow of personnel into and out of units on an individual basis. This assignment process resulted in persistent personnel turnover as soldiers arrived and departed the unit throughout the year. In 2003, the Army began transitioning from an individual replacement system to a new personnel management system called lifecycle manning. With lifecycle manning, all personnel are assigned to the unit at approximately the same time. The intent of lifecycle manning is to increase team stability so units become more cohesive before an operational deployment.

Lifecycle manning increases personnel stability by assigning all personnel to a brigade combat team of approximately 3500 soldiers at the beginning of a three-year cycle consisting of reset, training, and deployment. These soldiers remain assigned to the brigade combat team for the entire three year cycle, thereby enabling teams to train together and remain together for operational deployments. In contrast, the individual replacement system reassigns individual soldiers throughout the pre-deployment cycle without regard to unit training status or operational requirements. This steady source of personnel turnover, referred to by Secretary White as the "revolving door of individual replacements", is assumed to undermine unit effectiveness by disrupting unit training, team formation, and unit cohesion.

Why Does the Army Need to Change Personnel Management Policies?

The Army is faced with national security requirements and an operational environment that require smaller units to deploy more frequently for military operations ranging from high intensity conflict to counterinsurgency and stabilization operations. The demand for units capable of short notice operational deployments has increased dramatically in recent years. From 1990 to 2003, the Army participated in 56 deployments resulting in a 500% increase in missions from the previous decade. Simultaneously, the supply of deployable units has been reduced as the Army went through a 45% reduction in force structure during the same time period.[1] Since 2003 the operational pace has not slowed down as units continue to deploy in support of Operation Iraqi Freedom and Operation Enduring Freedom. In addition to the increased operational tempo, the complexity of the missions and the operating environment require units that are highly trained and prepared to endure the stress of continuous operations in uncertain situations. As a result, senior Army leaders decided to change personnel manning policies to better prepare units for these demands.

The following example illustrates the training challenges created when units are manned for operational deployments under the individual replacement system (Polich et al., 2000). Table 1.1 shows the impact of the individual replacement system on manning a combat battalion deploying to Bosnia for stability operations. The battalion designated for deployment had an assigned strength of 528 soldiers, but 42% of these personnel were non-deployable due to constraints imposed by the individual replacement system in peacetime conditions. These constraints included non-deployable status for soldiers scheduled to separate from the Army or to be reassigned for professional development and soldiers who were not deployable if they were recently assigned to the battalion following a one-year unaccompanied tour that had a guaranteed year at home before another deployment.

To satisfy the personnel demands of the deploying unit, stay behind units transferred their deployable soldiers to the deploying unit in exchange for non-deployable personnel. The personnel transfer solved the manning problem for the deploying unit but, as highlighted in Table 1.1, the stay behind units were left with 64% of their personnel non-deployable, rendering them unavailable for

[1] *Unit Manning Frequently Asked Questions*, https://www.unitmanning.army.mil/faqs.htm . Web site is no longer operational, but a copy of the web page is available from the author.

operational contingencies without a similar personnel transfer to reduce their percentage of non-deployable personnel.

Table 1.1
Personnel Transfers to Meet Deployment Requirements

Personnel Transfer Between Units			
	Authorized Personnel	Non-Deployable Before Transfer	Non-Deployable After Transfer
Deployable Unit	528	211 (42%)	0
Stay Behind Units	884	354 (40%)	**565 (64%)**

Source: Polich et al., 2000

The problem of manning units with deployable personnel is an Army-wide challenge. A study of three Army posts in the United States revealed similar problems with high percentages of non-deployable soldiers resulting from individual replacement system constraints (Polich et al., 2000).

Table 1.2
Peacetime Nondeployability Percentages for Three Army Posts

	Post 1	**Post 2**	**Post 3**
Wartime Non-Deployable	4.0	3.9	3.5
Individual Replacement Induced Non-Deployable	**31.6**	**35.5**	**36.5**
Total % Non-Deployable	35.6	39.4	40.0

Source: Police et al., 2000

Table 1.2 shows the total percentages of non-deployable soldiers for units at three Army posts in the United States and the proportions of "Wartime Non-Deployable" and "Individual Replacement Induced Non-Deployable." Wartime non-deployable status is provided to soldiers who are unavailable due to medical problems, legal proceedings, or specific family issues. These percentages of non-deployable personnel will persist under either personnel manning policy. However, the highlighted cells are the percentages of non-deployable personnel resulting from the individual replacement system for the same reasons mentioned for Table 1.1. Any battalion ordered to deploy from one of these installations would have required a personnel transfer of about one-third of the unit to achieve 100% deployable personnel for the operational requirement.

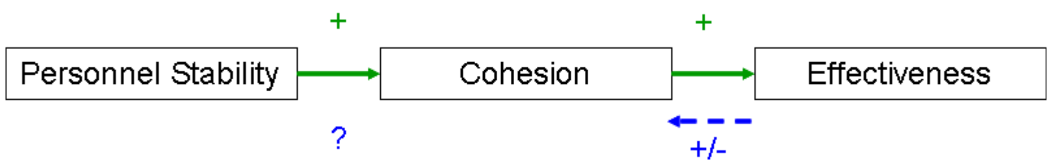
While the transfer of deployable personnel may have solved the manning problem, it created a training challenge for the deploying unit by turning over one-third of the unit 90 days before a deployment. Because so many members of the team changed, commanders conducted retraining to ensure all soldiers were trained to the same standard. New teams were formed with limited time to build the teamwork and cohesion the Army believes is essential for mission success. While the retraining requirements have not been systematically quantified and units have been able to accomplish their operational missions, the widely held view among Army professionals is that units subjected to these large personnel transfers are not as proficient as they should be. This belief is summarized by Secretary of the Army White who stated, "If we don't move the Army from its current individual replacement system to some sort of unit manning configuration, there will be a limit to the effectiveness that we can achieve with our transformation (Burgess, 2002)."

Lifecycle manning should reduce the percentages of non-deployable personnel by synchronizing the assignment of all personnel at the beginning of the lifecycle, thereby eliminating the requirement for large scale personnel transfer and the associated training challenges that were highlighted in the example of the combat battalion deploying to Bosnia. The end result is intended to be appropriately manned, cohesive units capable of executing short notice deployments and better trained to meet the demands of their increasingly complex mission.

The Policy Question

The following policy question is examined in this dissertation: Will increased personnel stability from lifecycle manning result in higher levels of combat effectiveness? The Army expects lifecycle manning to improve readiness based on the relationship depicted in Figure 1.1 and shown by the solid arrows and positive signs. Increased personnel stability is assumed to result in higher unit cohesion, which in turn is assumed to lead to improved combat effectiveness. While not specifically articulated through Army policy, this view closely parallels the concept of cohesion as a mediating variable. Baron and Kenny describe a mediating variable as "the generative mechanism through which the focal independent variable is able to influence the dependent variable of interest (Baron and Kenny, 1986, p. 1173)."

Figure 1.1
The Army's Policy Assumption



Secretary White's comments highlighted earlier in this chapter are an example of the common belief among Army professionals about the cohesion-effectiveness relationship and follow the concept of cohesion as a mediating variable. His statement that emotional bonds within the brotherhood of soldiers are the foundation of the objective force makes very clear the assumed positive relationship between cohesion and effectiveness. Additionally, he specifically references changes—the transition to lifecycle manning—that will create more cohesive units and, therefore, higher readiness levels. He also mentions the building of stable teams and the removal of the "revolving door" of individual replacements as an essential part of building higher cohesion. His statement is representative of the Army profession, which has a long-standing and deeply engrained belief in the positive, causal relationship between high cohesion and unit effectiveness. This belief is based upon a combination of personal testimonies of cohesion as a source of combat motivation and heroism, operational experience that associates high cohesion and social science research about the relationship between cohesion and unit effectiveness.[2]

Recent Research Does Not Support Lifecycle Manning Assumptions

A body of recent research suggests the relationship between cohesion and unit effectiveness is more complex and may be contrary to much of the previous research and the assumptions underlying lifecycle manning. This differing view is illustrated in Figure 1.1 with the dashed arrow and the corresponding positive and negative signs. There are two prominent publications that present findings in opposition to the Army's expectations for lifecycle manning. The first is a meta-analysis of 66 empirical studies examining the impact cohesion on organizational effectiveness (Mullen and Copper, 1994). This thorough study is a widely accepted and often cited analysis of

[2] The relationship between cohesion and unit effectiveness is the subject of extensive research. It is not the purpose of this research to examine this relationship in detail. However, the importance of this relationship as perceived by the Army and its influence on the motivation behind lifecycle manning make it an unavoidable topic of discussion. Chapter 2 presents a literature review and discussion of this relationship and the strong convictions of Army professionals about this relationship.

previous empirical research in this field. Mullen and Copper (1994) conclude there is a statistically significant, albeit small, positive impact of cohesion on organizational effectiveness. However, the benefit does not come from the strong attraction between members of the group which is how Army professionals most often define cohesion. The study concludes, "The cohesiveness-performance effect is due primarily to commitment to task rather than interpersonal attraction or group pride (Mullen and Copper, 1994, p. 210)." The authors also conducted a cross-lagged panel correlation analysis that identified a stronger directional relationship from high performance to high cohesion, which is the opposite direction of what lifecycle manning predicts.

Another opposing perspective was provided by Robert MacCoun as part of a RAND study analyzing the potential impact of allowing known homosexuals to serve in the US military. MacCoun conducted an extensive study and review of research about unit cohesion and military performance. He highlights a partitioning of cohesion that distinguishes between social cohesion and task cohesion.[3] Task cohesion, "the shared commitment among members to achieving a goal that requires the collective efforts of the group", is found to have a positive, albeit moderate, correlation with increased unit effectiveness. In contrast, social cohesion, which MacCoun defines as "the nature and quality of the emotional bonds of friendship, liking, caring, and closeness among group members", is not associated with effective performance and can have detrimental effects on unit performance if the group norms conflict with and take precedence over mission accomplishment (MacCoun, 1993). MacCoun reaches this conclusion after an extensive literature review of 185 articles examining cohesion and performance in a variety of settings—many of which were conducted or sponsored by military organizations.

The policy implications of these opposing conclusions are significant. While the effect of cohesion on organizational performance is statistically significant, the moderate effect raises the question of cost-benefit for lifecycle manning. Is the moderate performance increase attributed to cohesion worth the implementation costs? Also, the reverse causality findings identify other policy options for achieving cohesion. If higher cohesion is the desired outcome, then viable policy alternatives could focus on achieving commitment and competence in the organization's primary task. These alternatives could include conducting more frequent training, more varied training,

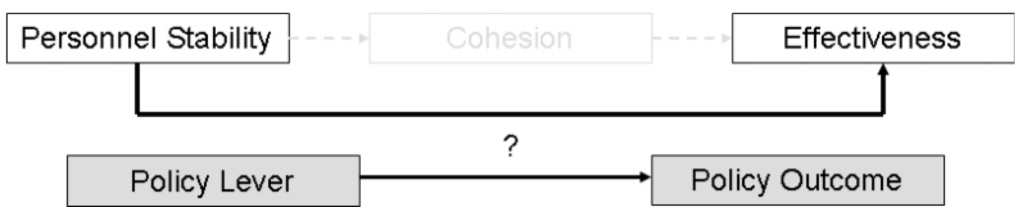
[3] The first writings that distinguished different types of group cohesion date back to Festinger (1950) and Back (1951). The distinction was further developed in the 1980's in a wide body of literature that included sports research by Carron (1982), military research by Griffith (1988), and social science research by Zaccaro and Lowe (1988) and Mullen and Copper (1994). MacCoun (1993) summarizes these various partitions into his definitions of social and task cohesion that are used for the remainder of this research.

and/or developing more competent leadership. As stated by Mullen and Copper (1994), "Practically, these results indicate that efforts to enhance group performance by fostering interpersonal attraction or 'pumping up' group pride are not likely to be effective. Researchers interested in the problems of bolstering group performance might most efficiently direct their efforts toward determining how to increase people's liking for or commitment to group tasks (Mullen and Copper, 1994, p. 210)." The conclusions of this more recent research stand in contrast to lifecycle manning assumptions and this contrast highlights the possibility that the cohesion-performance relationship may not be as beneficial as assumed under lifecycle manning.

Research Approach

I empirically analyze the underlying policy assumption that increased personnel stability leads to increased unit effectiveness. However, rather than analyze the relationship with cohesion as a mediating variable, I model the direct relationship between personnel stability (the policy lever) and unit effectiveness (the policy outcome) as shown in Figure 1.2.

Figure 1.2
Examine Direct Effect of Personnel Stability on Effectiveness



When considering the body of literature the relationships among stability, cohesion and effectiveness remain highly variable. In some cases cohesion may lead to better performance and in other cases it may be successful performance that leads to high cohesion. And so making recommendations based on the literature alone, without directly studying how stability affects training outcomes, is not sufficient. In addition, lifecycle manning policy does not per se include elements that would increase cohesion other than any gains that might be realized through improved unit stability. Not including levers to modify cohesion are reasonable given that personnel stability could have many possible positive effects on performance regardless of cohesion. The positive effect may result from having sufficient time to train teams before deployment and allowing those teams to remain together and retain the collective task proficiency. Increased personnel stability could also provide a better opportunity for teams to establish an efficient division of labor predicated on individual skills discovered over time. To the extent these training benefits and team dynamics are separate from unit cohesion there could be a distinct contribution of personnel stability to organizational effectiveness that this research attempts to identify. So in determining if lifecycle manning could improve outcomes, I needed to measure the policy lever that will be used by lifecycle manning—greater stability—and compare how changes to this lever would affect the stated desired outcome of enhanced unit effectiveness.

Unique Measurements for Personnel Stability and Effectiveness

Empirically analyzing the stability-effectiveness relationship requires a detailed understanding and measurement of personnel stability. The Army currently measures personnel turnover by counting the number of soldiers who leave the unit for a variety of reasons. Measures of personnel turnover capture the effect of a soldier departing the organization but fail to incorporate the full impact of a soldier's departure. Specifically, when a soldier departs the unit, there is potential for additional reassignments of personnel within the organization to fill the vacancy created by the departure of that soldier. This potential source of personnel turbulence is not captured by any metric of personnel turnover but may have a similar impact on team effectiveness since personnel are moved to different teams. Additionally, there is no consideration of responsibility or functional expertise of the departed soldier. For example, the organization can be impacted differently by the departure of a truck driver verses the departure of a communications expert. To overcome these shortfalls, I use Army personnel data bases to develop new metrics of personnel stability that measure the time teams are intact and the individual experience each soldier brings to their specific role on the team.

To measure unit effectiveness, I use training proficiency scores from major training operations. The training was conducted at the Army's premiere location for maneuver training designed to replicate high intensity combat.[4] Although actual combat is impossible to replicate, the training is considered by the majority of Army professionals to be the most realistic preparation possible for high intensity combat. Trained observers collected training proficiency scores in the course of completing previous RAND research. These measures of effectiveness provide a unique opportunity to evaluate the relationship between personnel stability and unit effectiveness and are discussed in more detail in Chapter 3.

[4] At the time the data used in this research was collected, the training focus was high intensity conflict. Since then the content of unit training rotations has been expanded to meet a wide range of missions, to include ongoing counterinsurgency operations in Iraq and Afghanistan.

A Brief Introductory Explanation of the Model

While a more detailed explanation follows in Chapter 4, I will now provide a brief explanation of the model. My research incorporates production function theory by using a quadratic function to estimate the relationship between battalion level stability and battalion level training proficiency scores. Production theory includes an underlying assumption of diminishing returns to increases of input factors, which in this model consists of increased team stability. The quadratic form shown in Figure 1.3 captures this underlying assumption of production theory by estimating the presence of diminishing returns to stability. If the assumption of diminishing returns is valid, a negative coefficient on the quadratic term coupled with a positive coefficient on the linear term would indicate positive returns to each additional month of stability at a decreasing rate.

Figure 1.3
Quadratic Function to Estimate Personnel Stability Effect on Unit Effectiveness

$$Y_{FTi} = \alpha + \delta_v S_{vi} + \lambda_v S_{vi}^2 + \beta_1 R_i + \beta_2 I_i + \beta_3 U_i + \varepsilon_{FTi}$$

S – Stability; R – Rating Team; I – Installation; U – Type of combat unit

The dependent variable (Y) is the training proficiency score for a particular task. There are two types of scores. The first score on a task is used as an indicator of entry level proficiency and the best score is used as an indicator of overall unit proficiency. The key independent variables are the new stability metrics (S) created during this research. These metrics will measure individual experience and team stability within the unit. Finally, the model will control for the evaluation team, the home installation of the unit evaluated, and the type of combat unit evaluated.

Research Questions

Using the framework depicted in Figure 1.2, the quadratic equation in Figure 1.3, new personnel stability metrics I develop in Chapter 3, and training proficiency scores from previous RAND research, I will attempt to answer the following research questions:

1. Are there measures of personnel stability that are more relevant to predicting unit effectiveness than those currently used by the Army?
2. Do higher levels of battalion command group and battalion command team stability result in higher battalion training proficiency?

3. Are there opportunities to manage personnel stability more effectively without a decrease in training proficiency?

This dissertation is presented in 6 chapters. Chapter 2 reviews previous research and Army professional literature concerning cohesion, personnel stability, and unit effectiveness. Chapter 3 provides a detailed look at personnel stability and the training proficiency scores used in the empirical model. Chapter 4 consists of a detailed explanation of the model and Chapter 5 provides the findings of the analysis. Chapter 6 discusses the implications of the analysis for current policy and future research.

2. Background and Literature Review

However strongly the belief about the positive impact of stability is held, the historical and scientific records provide ample evidence that the link between stability and increased effectiveness may be tenuous. Much support for this link is based on selective use of historical events and an oversimplification of the reasons behind unit success. In addition to contrarian historical evidence, there is scientific research—much of which was sponsored by the Army—that concludes high unit effectiveness is possible despite personnel turnover. There is also research in non-military settings that provides insights that run counter to the Army's assumptions about the benefits of lifecycle manning. Although there have been dissenting views within the military about the benefit of personnel stability, most of the military literature adheres to the intuitively appealing idea that personnel stability is good, high cohesion is better, and the Army needs more of both regardless of implementation costs or potentially negative impacts of stability and cohesion.

My hope is to bring some of the contrary evidence to the forefront of the discussion and add some balance to the discussion and additional empirical research regarding lifecycle manning. The goals of this chapter are to provide possible explanations for the Army's strongly held views about the benefits of stability, to summarize research that details how personnel stability may contribute to unit effectiveness, and to articulate how this dissertation contributes to the body of research about the stability-effectiveness relationship.

I begin with a simple question about what effectiveness problem the Army is trying to solve because it is not readily apparent that such a problem exists. Subsequently, I discuss the training challenge faced by the Army and why personnel stability is considered important in achieving unit effectiveness. Following the explanation of the training challenge, I delve into the cohesion-performance literature for two reasons. First, the concepts of stability, cohesion, and effectiveness have become so intertwined the study of one quickly becomes a study of all three. In many cases, the words are used interchangeably as if the connection between them is so strong and obvious that one is equivalent to the other. Furthermore, the Army often supports lifecycle manning by invoking the necessity of increasing unit cohesion to attain improved unit effectiveness. Because the Army places high importance on cohesion-performance relationship, my analysis would be incomplete if I ignored research in this area.

The chapter then progresses with a review of the historical and scientific research from both military and non-military settings to provide a balanced perspective about the relationship between stability and unit effectiveness. The review includes a section that summarizes some dissenting views concerning the importance of stability. At the conclusion of the chapter, I summarize the common themes of the literature and explain how this research adds a new perspective to the ongoing research in this area.

What Effectiveness Problem is the Army Trying to Solve?

Although there is widespread advocacy for lifecycle manning, there does not appear to be a unit effectiveness or cohesion problem despite the Army's use of the individual replacement system. Advocates assert the individual replacement system prohibits a higher level of effectiveness than would otherwise be achievable if personnel stability were the norm. However, there has been no attempt to quantify the untapped potential of training proficiency, nor have there been systemic indicators that Army units are unable to effectively accomplish their missions due to personnel turnover caused by the individual replacement system.

If any unit serves as a current example of extreme personnel turbulence, it is the 2nd Infantry Division stationed in Korea. Units in this division are manned by individual replacements who serve one year unaccompanied assignments. Korea is an extreme example of personnel turnover (25% per quarter) and there is no question it is difficult to manage training proficiency.[5] However, there has been no reported systemic readiness or unit cohesion problems indicating the 2nd Infantry Division is incapable of accomplishing its mission. The absence of reported readiness problems and the lack of sustained effort by the Army to reduce personnel turbulence in Korea would seem to indicate that any effectiveness problem that may be created by high rates of personnel turnover is not severe enough to require immediate attention. Unit rotations have been attempted for Korea but were never sustained due to competing demands—a sign that whatever benefits to readiness were achieved by unit rotations may not be worth the cost of sustaining a unit rotation system for the mission in Korea.

When assessing overall effectiveness, it is noteworthy that the US Army has successfully accomplished missions since the Vietnam War while using the individual replacement system and shows no indication of being unable to meet effectiveness levels adequate for current operational challenges. The conflicts the Army has participated in since the 1980's have not provided an example of failure caused by individual replacement. Modern military operations have occurred in Grenada, Panama, Haiti, Bosnia, Kosovo, Somalia, Iraq, and Afghanistan. One continuous and positive theme throughout reporting from Operations Iraqi Freedom and Enduring Freedom is the

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[5] The author served as an operations officer for a tank battalion in the 2nd Infantry Division and has firsthand experience with the personnel turbulence and training management issues facing a combat unit in Korea.

professionalism, morale, and quality of Army units. Even when the operational execution is criticized, the individual replacement system has not been identified as the reason behind poor performance. Despite pervasive criticism, there is little evidence to support a position that the current individual replacement system resulted in a failure to accomplish the mission or a case where mission accomplishment occurred at an unacceptable cost.

Another criticism of the individual replacement system is that units must conduct continual retraining on basic individual tasks for replacement soldiers and are, therefore, unable to reach their potential effectiveness. With limited time and resources, retraining new soldiers consumes training that would otherwise be spent on more advanced collective training. The argument for lifecycle manning posits that if the Army is expected to handle the complex missions of the future, then it must be able to tap into this reservoir of heretofore untapped team proficiency. The argument is for changing the system in anticipation of new operational requirements.

The concept of enhancing team proficiency by improving team stability is intuitively appealing—a team that works together for longer periods of time should get to know each other better, have the opportunity to establish a division of labor for complex tasks, and be able to anticipate how teammates will react in certain situations. However, team performance is impacted by many factors and proponents of lifecycle manning tend to focus on the positive aspects of keeping teams together and avoid discussion of potential downfalls.

For example, simply keeping the teams together longer is no guarantee they will coalesce into an effective fighting organization. It is quite possible that personnel will feel trapped with teammates they dislike. A sense of desperation may set in because they realize they will be assigned with these teammates for the next three years. Also, there may be measurable benefits to receiving "new blood" into the team that have not been considered in prior debate. Quantifying the tradeoffs between team stability and some personnel turnover has not received much research attention, which is one of the motivations for this dissertation.

One final issue of unit combat effectiveness is the challenge of integrating replacements during combat operations. Complete personnel stability is an unattainable goal for deployed combat units where personnel turnover is caused by a variety of factors beyond the unit's control. To remain effective, units must be able to manage personnel unavailability and integrate replacements at inopportune times. Prior to deployment, lifecycle manning reduces the requirement for integrating new personnel at unexpected times. In a casualty-generating operation, a unit experienced at integrating new soldiers could out-perform a unit where personnel stability is the norm and systems are not in place to properly integrate new soldiers. If the Army wants to train units in realistic conditions, then personnel stability may not be the most realistic condition.

Tangible Tension: Army Training and Personnel Turbulence

> *"Personnel turbulence is the enemy of cohesion and teamwork. It disrupts the creation of cohesive units by routinely breaking up the teams that we work so hard to create. The major downside to our otherwise sound individual replacement system is that it produces a high degree of personnel turbulence… " (White, 2002, p.5)*

Secretary White's comment highlights the professional view of how personnel turbulence hinders effectiveness by breaking up teams after the training investment to build those teams. Trainers at all echelons express frustration at their inability to exceed moderately acceptable standards for collective training because of the requirement to retrain basic tasks as new soldiers are integrated into their formations. The complexities of training soldiers for modern combat only strengthen this reasonable belief held by those leaders who are responsible for preparing soldiers for combat. To assist the reader in understanding why this is such an important issue for Army professionals, I explain the training challenge facing the Army as it prepares for war.[6]

The Army's Training Challenge

Training units for combat presents the commander with an extremely complex problem. He must train an entire range of skills starting with individual tasks and building to complex unit tasks. The most significant constraint facing the commander is time—there are more training requirements than time available. Therefore, the commander is continually looking for more efficient ways to execute quality training. Training soldiers on their individual tasks alone is a tremendous challenge because of the multitude of tasks a soldier must perform. Most individual tasks are prerequisites for training at the small unit level. For example, each soldier needs to achieve competence in the following military tasks before most of the collective tasks can be trained: individual weapons qualification, first responder medical tasks, mastery of communication systems, and basic reporting requirements. The unit can progress to small-unit level collective training once soldiers are

[6] The following explanation of the training challenge is based on my personal experience as a Squadron Commander for 1-14 Cavalry, 3-2 Stryker Brigade Combat Team (SBCT) at Ft. Lewis, WA. During my tenure as commander, I was responsible for training soldiers for a deployment to Iraq from July 2006 to September 2007.

competent on their individual tasks. If a soldier is reassigned after individual training, retraining must occur for replacement soldiers.

To illustrate the challenge of collective training, I provide an example of one small-unit task required of all combat arms units called "Battle Drill 6: Enter and Clear a Room". This task requires a 4-man team to forcibly enter a locked room, clear the room of enemy, secure the room against attack, and search the room for contraband. The complexity of this task is high and the interdependence of the four team members requires well-trained soldiers and teamwork. The task is a sophisticated small scale maneuver that requires each team member to execute not only his portion of the battle drill, but to execute the responsibilities of the other team members as well.

The drill begins with a 4-man team in a single file, standing just outside the door of the room to be cleared. On the appropriate signal, the team enters the room quickly, prepared to engage the enemy if required. Each soldier moves to a different, pre-determined location and assumes responsibility for a sector of fire. The sectors of fire are organized so that every area in the room is covered by at least one soldier and no soldier risks shooting another member of his team. The close confines and clutter that are possible in the room require each soldier to know his responsibility and what the other soldiers in the team are doing. There are multiple variables that increase the complexity of the task: light conditions, arrangement of furniture, direction of door opening, number and location of windows, position of closets or other entryways into the room, and enemy situation. Each of these variables can change the sequence slightly, resulting in numerous variations on a basic battle drill.

Achieving competence in this skill requires multiple repetitions in ever-increasingly difficult conditions. A common sequence for training this battle drill begins with practicing the maneuver in a "glass house"—the outline of the room on the ground, with no walls. This allows trainers to observe and critique each team as they go through the sequence of events. Once the team has mastered the glass house, they move to a "shoot house" to practice moving through real rooms with walls that absorb live ammunition. The crew goes through a series of dry runs with no ammunition, transition to live runs using blank ammunition, and culminate with live runs using live ammunition.

The complexity of the training increases once the team masters the basic battle drill under live fire conditions. The training will be conducted at night and different arrangements of furniture will be added to the rooms. Additionally, the training scenario will be expanded to require clearing of multiple rooms in the building and coordinating the building clearance with another team (or two) operating in the same building. Throughout the training, each member of the team will rotate through different positions in the stack so they thoroughly understand the role of each individual on the team. An important aspect of the training is the cumulative and sequential nature of the training—a team is not permitted to advance to more complex training without successfully completing the earlier steps.

Personnel stability is required for completion of the multiple iterations and repetitions required for the training sequence that results in team proficiency for this battle drill. Execution of the training enhances the effectiveness of the team and builds trust because each team member is confident the other team members can fulfill their role on the team, in a variety of situations, without putting the team members at unnecessary risk. Team stability is required to complete the training sequence and then to maintain team qualification once the training is complete. Personnel changes make it more difficult to achieve an initial level effectiveness by requiring the team to start the sequence of training from the beginning. Additionally, personnel changes that break up the team result in an unqualified rating for that team. When teams complete the training together, the team is reported as "qualified" on a particular task and the breakup of a team requires an "unqualified" rating until the training is conducted again.

In addition to Battle Drill 6, there are other small unit tasks that require a similar training model. Small-unit tasks such as dismounted patrolling in an urban environment, establishing a traffic control point, enforcing escalation of force procedures, and reacting to an improvised explosive device (IED) are just a few examples of the many tasks small units must be trained on before deployment. Also these tasks must be trained at the platoon, company, and battalion level. As one considers the vast array of individual and collective training tasks, it's not difficult to understand why Army trainers desire personnel stability. There is seldom enough time to train all these tasks once, let alone retraining the same tasks due to a lack of personnel stability.

Mitigating Factors for the Lack of Personnel Stability

After reviewing the training challenge, it would be easy to conclude that personnel turbulence would make successful combat preparation almost impossible. However, the training scenario is not as bleak as it seems due to several factors that mitigate the impact of personnel turbulence. The first mitigating factor is effective small unit leadership. Leaders who are competent in the drill and possess the required training skills can quickly integrate new members into their teams and regain effectiveness as long as the training resources are available.

Standardization of military tasks can also reduce the retraining requirement. If units and individuals are trained to the same standard throughout the unit, then personnel moves within the unit will have less impact as teams are reformed and retrained with their new members. On a larger scale, if the task is standardized across the Army, the externally generated turbulence could have less impact. Standardization prevents having to start from scratch and members spend time synchronizing their roles rather than learning the basics.

Also, highly trained and experienced soldiers reduce the re-training requirement. If a new soldier is competent in the basic individual and team skills, the re-training will require less time—even when the soldier comes from a different unit. Lastly, a unit that trains frequently can easily integrate new soldiers into the unit because the unit is not required to schedule additional training. The new soldiers simply participate in an already scheduled training event. This requires effective training management and a clear understanding of high payoff tasks.[7] All of these factors mitigate the effect of personnel turnover and lessen the impact of changing team composition.

Disentangling Personnel Stability, Unit Cohesion, and Unit Effectiveness

The Army's two dominant policy objectives for lifecycle manning are increased unit cohesion and unit effectiveness. Although I find no compelling argument that current problems exist with cohesion or unit effectiveness, improvement in either may be warranted if the benefit is sufficiently large enough to compensate for the implementation costs. However, debate continues about the benefits of personnel stability and cohesion that is rooted in different definitions of unit effectiveness and the potential role of stability and cohesion in improving effectiveness. Clarification of these policy components requires an excursion into the cohesion literature as I attempt to disentangle the concepts of stability, cohesion, and effectiveness.

The first step in reducing the confusion is to establish clear understanding of the meaning of effectiveness and cohesion. Much of the disagreement in the research results from a lack of clarity on what is meant by unit effectiveness. Recently, this conflict was highlighted in a written exchange between MacCoun (2004), Wong (2006), and Kolditz (2006) that originated from an article written by Wong (2003) about the role of cohesion in explaining successful US operations in Iraq. In response to this recent debate, Griffith (2007) posited that one source of disagreement between the authors was the different definitions of effectiveness and the role cohesion plays in achieving effectiveness. Specifically, he mentioned that one side of the debate viewed cohesion as a "performance enabler" with a significant role in explaining effectiveness, while the other considered

[7] High payoff tasks are those that apply to multiple situations or collective tasks. For example, team level direct fire control applies to Battle Drill 6, dismounted patrolling, and establishing a traffic control point. Training the one task of direct fire control increases the competence for many other collective tasks.

cohesion as a "performance enhancer" with a moderate effect on unit effectiveness (Griffith, 2007, p. 141). The result seems to be that both sides of the debate could be correct based on their definitions of unit effectiveness and interpretation of cohesion.

Defining Unit Effectiveness and the Role of Cohesion

The primary source of disagreement about the cohesion-effectiveness relationship seems to be different definitions of unit effectiveness. One side of the debate defines unit effectiveness as organizational and individual resilience that facilitates operations and serves as a force multiplier by keeping units and soldiers in the fight. Combat motivation (often explained as cohesion) is the force that enables the unit to withstand disintegration in the face of danger, adversity, and overwhelming odds. Without combat motivation, units will not be able to perform under the extreme conditions of combat or persevere through great difficulty.

The other definition of effectiveness is combat performance—the unit's proficiency in the complex tasks required in combat. Many factors influence combat performance (Hayward, 1968), but in the context of personnel stability, successful combat performance is based largely on a mutual understanding of relative skills, roles, responsibilities that facilitate the interaction and interdependence necessary for successful combat operations. The distinction between these two definitions of effectiveness clarifies the role of cohesion when policy makers strive to improve unit effectiveness.

When referring to a unit's ability to withstand disintegration and persevere in trying circumstances, researchers are attempting to answer the question, "Why do men fight?" The individual and group must be able to sustain performance in the face of great stress and personal danger. Cohesion is considered to be the force that motivates soldiers to risk death to achieve an objective or protect a comrade, to endure great hardship that would break most people, and to achieve victory against great odds. Often, this type of cohesion is described as primary group bond that creates a brotherhood between warriors who respond to inquiries of why they fight with the phrase similar to "I fight for my comrades." (Shils and Janowitz, 1948; Stouffer et. al, 1949; Marshall, 1978; Kellett, 1982) This motivation appears to be closely related to social cohesion—the mutual affection and emotional commitment the members of the unit have for each other (MacCoun, 1993, p. 291).

Effectiveness measured as combat performance seeks to answer a different question—"How well do men (units) fight?" The issue is combat performance, not combat motivation. This definition of effectiveness requires units and individuals who know what to do, how to do it, and are committed to success. The cohesion literature refers to this commitment to success as task cohesion (MacCoun, 1993, p. 291). Task cohesion is based upon commitment to achieving a common goal, individual competence, and team proficiency achieved through extensive training, good leadership, and clear mission requirements. Without explicitly using the term task cohesion, proponents of lifecycle manning appear to assert that task cohesion and the subsequent improved combat performance depends on personnel stability due to the training inefficiencies caused by the individual replacement system.

Clarification of Army Policy Objectives

Based on these two definitions of effectiveness and the perceived role of cohesion in achieving each type of effectiveness, the Army's publicly stated policy objectives for lifecycle manning become easier to clarify. When the Army refers to developing the bonds of brotherhood to increase effectiveness, the policy objective is to increase social cohesion and combat motivation so the unit can persevere under duress and so soldiers can withstand the psychological stress of combat. The second objective is to increase effectiveness in the form of combat performance through training efficiencies expected to be gained from improving team stability.

Without this clarification of these terms, the discussion of the benefits of personnel stability gets bogged down in circular debate that uses the identical words to convey significantly different meanings. By clarifying the terms, I can be very clear that my research is not assessing the importance of combat motivation and answering the question about why men are motivated to fight. I am researching whether or not personnel stability has a separate and significant effect on a unit's ability to fight well, which is clearly one of the Army's two primary goals for lifecycle manning.

Historical Analysis of Personnel Stability and Combat Effectiveness

The Army's belief about the importance of personnel stability is based on historical and scientific research that began in earnest during World War II.[8] A major theme of the literature is that units manned by some variation of unit manning were more cohesive (effective) than units manned by individual replacements. A slight variation of this theme is that United States Army units would have done better if they were manned by some form of unit manning policy instead of individual replacement. In some cases, the authors assert that the importance of stability and

[8] Three seminal works for academic study of the cohesion-performance relationship in military settings are Shils and Janowitz (1948), Marshall (1947), and Stouffer et al. (1949).

cohesion is so obvious that dissenting views are marginalized as academic exercises out of touch with the realities of combat (Wong, 2003).

Historical evidence from World War II and Vietnam is often cited as justification for unit manning policies. The two most frequently used examples are the German Army's tactical effectiveness towards the end of World War II despite overwhelming odds against victory and the disintegration of the US Army in the latter stages of the Vietnam conflict. In the first case, the German Army's effectiveness is often attributed to their unit manning policies. In the Vietnam history, disintegration of the US Army is largely attributed to the individual replacement system. However, these conclusions are based on an incomplete assessment of the situation and discount other explanatory factors highlighted by other researchers.

World War II: Why Did the German Army Keep Fighting?

The most frequently used historical example given in support of lifecycle manning is the German Army's tactical effectiveness towards the end of World War II in spite of impending defeat. A seminal article by Shils and Janowitz (1948) is one of the most frequently cited articles in the cohesion-performance literature. The authors conducted interviews with German prisoners to determine why they fought so ferociously through the end of the war. While the implication is that the units fought well, the article attempts to explain why the units throughout the German Army were able to hold together despite circumstances that would cause most units to disintegrate.

One of their conclusions was that the strength of primary group bonds was the force that kept a German soldier fighting:

> "He (the German soldier) was likely to go on fighting, provided he had the necessary weapons, as long as the group possessed leadership with which he could identify himself, and as long as he gave affection to and received affection from the other members of his squad and platoon. In other words, as long as he felt himself to be a member of his primary group and therefore bound by the expectations and demands of its other members, his soldierly achievement was likely to be good." (Shils and Janowitz, p. 284)

Many researchers combine the ideas behind this statement with how the German Army organized along regional lines and utilized a replacement system that emphasized primary group cohesion to reach the conclusion that personnel stability is the main reason for German fighting effectiveness.[9]

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[9] The German Army was organized based on geographical alignment where the members of a combat unit were recruited from a particular region, trained together, and then assigned to the same unit. The regional emphasis was integrated into the replacement system as additional soldiers were recruited, trained and assigned to the combat unit from their home region. This geographical organization, also characteristic of the British regimental system, is not sustainable in today's all-volunteer active duty US Army where each region

However, this conclusion neglects many other factors that explained the fighting effectiveness of the German Army.

Interestingly, Shils and Janowitz (1948), along with several other authors (Newland, 1987; Kellett, 1982; Bassford, 1990), point to several other factors as explanations for German performance. These factors are important because the German Army continued to fight effectively well after they abandoned their unit manning system and reverted to an individual replacement system due to casualty rates that made their standard unit replacement system unsustainable. These additional factors raise questions about the preeminent role of unit manning policies in explaining the German Army's resilience.

Shils and Janowitz (1948) also credit the presence of a "hard core" group committed to a warrior's life and the Nazi political cause who provided an example for weaker men and enforced standards of compliance by threats and squashing dissent (Shils and Janowitz, p. 286). Beyond a regional organization for combat units, the German Army also aligned their replacement and medical recovery units with combat units so a replacement soldier belonged to the same community from recruitment to completion of service—an investment in cadre personnel and infrastructure the US Army has not pursued as part of its current manning policy (Newland, 1987). Still other authors point to the German societal context, which is historically based upon communities held together against outside forces through integrated self interest rather than a strong sense of brotherhood. Because of this societal context, German soldiers were more prone to working together for survival whether they liked each other or not (Bassford, 1990). Finally, the German soldiers were under the threat of retribution against their families by the German authorities if they deserted (Shils and Janowitz, 1948; Towell, 2004). Many soldiers stood and fought because their families would be outcast from society or killed if they failed to continue. This was coercion and certainly not a result of personnel stability or cohesion. These factors are not all inclusive, but serve as evidence that unit manning (personnel stability) alone may not be sufficient or complete explanation for the German army's performance.

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of the nation is not compelled to form units. The US Army National Guard, which organizes at state level, possesses many characteristics of a regionally based organization. Lifecycle manning attempts to achieve the same effect as the German system, but can not rely on regional recruiting and training. Instead, the stable teams are built after initial training is complete and the soldiers are assigned to the unit for the duration of the lifecycle.

The Vietnam Conflict: Explaining the Decline in Army Performance

The drastic decline in soldier discipline and unit cohesion in the latter stages of the war has been a perpetual source of self-examination for the Army. Rampant drug use, ineffective small unit operations, and increased incidents of intentional fratricide rose to levels uncharacteristic of a professional Army. The Vietnam Conflict is often used as the historical example for ineffectiveness of the individual replacement system. In Prodigal Soldiers, James Kitfield (1995) describes how a generation of officers rebuilt the Army from its dismal condition following the Vietnam War to the Army that soundly defeated the Iraqi Army in Operation Desert Storm. Kitfield describes GEN Edward "Shy" Meyer's thoughts concerning the individual replacement system as he prepared to assume duties as Chief of Staff of the Army in 1980. This description provides insight into the depth and intensity of the Army's view of the individual replacement system used during the Vietnam War.

GEN Meyer was preparing to change the personnel management system from the individual replacement to a unit manning system. His reasoning was rooted in his generation's experience in Vietnam. During the Vietnam Conflict, they witnessed how the individual replacement system caused tremendous turmoil in their units and an army that rotated commanders every 6 months so every officer would get their turn at combat command. They saw the Army lose (or at least not get a clear victory) and they searched for reasons why: too much intervention by political leaders into military matters, a hostile media, and too many political constraints.

They also pointed to the individual rotation policy as the reason for the decline in US Army tactical performance and discipline that rendered some units incapable. In light of these perceptions and experience, as GEN Meyer contemplated his decisions as Chief of Staff, he sought ways to change the individual replacement system. Kitfield writes:

> "As chief, one of Meyer's first edicts was to declare that the length of command tours would rise from an average of two years to a minimum of three years. For an Army that had rotated officers through command every six months during Vietnam, it was an unprecedented nod in the direction of command stability over flexibility of movement and advancement for officers."
>
> "Trying to stabilize the enlisted ranks in an undermanned Army where turnover in companies and platoons averaged 15 to 20 percent each month was a far more difficult task, yet Meyer was determined. He still remembered returning to Vietnam and the 1st Cavalry Division in 1969, after being away for three years, and seeing the havoc wrecked by the constant officer shuffling and the individual-rotation system, even in what was one of the proudest divisions in the

> Army. Every military history book he had ever read stressed that men at war fight and die not for abstract ideals or flags, but for each other. He was intent that the next time U.S. soldiers went to war they would know the men they fought alongside." (Kitfield, 1995, p. 205-206)

GEN Meyers' views on personnel turbulence were shared by almost an entire generation of officers who served in Vietnam and they passed this belief on to subsequent generations of officers. Interestingly, Kitfield's description of GEN Meyer's thought process is yet another illustration of how the concepts of stability, cohesion, and effectiveness are frequently intertwined. GEN Meyer's motivation appears to be increasing personnel stability so soldiers will know each other better (social cohesion) with the expectation of increased effectiveness. However, much like the historical analysis of World War II, pointing to the individual replacement system as the cause for declining performance neglects other important factors.

The first indicator that the individual replacement system may not have been the reason for the decline in performance is that many historians agree the Army was tactically effective during the initial stages of the Vietnam War through 1968-69 while the Army was managing personnel under the individual replacement system (Towell, 2004). A widely used Army example of tactical effectiveness is provided by LTG Hal Moore (retired) in his book We Were Soldiers Once and Young (Moore and Galloway, 1992). Then LTC Moore's battalion experienced significant turbulence shortly before their deployment to Vietnam and yet the unit performed heroically and effectively against a numerically superior enemy. The book also provides an example of a similar battalion that performed poorly in a battle immediately following his battalion's successful performance and attributed that failure to poor leadership rather than the individual replacement system.

Two other factors help explain the downturn in Army performance: the deterioration of small unit leadership and the decline of national will (Towell, 2004, p. 46). By the latter stages of Vietnam, small unit leaders (company level and below) were inexperienced and untrained for their duties. A shortage on non-commissioned officers resulted in promising enlisted soldiers promoted to sergeant during their basic training. These "shake and bake" sergeants soon found themselves in charge of combat patrols with no combat or leadership experience. The soldiers suffered from this inexperience and their confidence in leadership declined accordingly.

Additionally, the quality of officer leadership declined and their combat tours were limited to 6 months while the soldiers' tour lasted 12 months. The soldiers' morale and cohesion suffered in two ways under such rapid officer turnover. First, they bore the costs of mistakes made by inexperienced officers as they learned to lead in a combat environment. Then, just as the officer began to gain competence, he would be replaced and another officer would go through the same learning process with the corresponding cost on the enlisted soldiers who remained in place. Second, many officers took unnecessary risks because they had limited time to make a name for themselves as a combat leader. This careerist attitude further alienated the enlisted soldiers who felt exploited by their officer leaders who they perceived to be striving for good performance evaluations and combat medals (Gabriel and Savage, 1978). Under these circumstances, soldiers soon resented their leaders and did not perform effectively.

During the time when performance and soldier discipline worsened, national will and support for the war also declined. The domestic political disagreement over the Vietnam conflict manifested itself as public disregard of and contempt for soldiers participating in the conflict. Most soldiers in Vietnam had no choice but to serve and then became objects of scorn and harassment by the American public. Although national support and respect have not been found to be a primary source of combat motivation, the lack of public support took away much of the motivation that comes from pursuing a mission supported by American people (Kellett, 1982, p. 177). As the anti-war sentiment grew, soldiers understandably became less willing to sacrifice for a war the majority of America no longer supported.

Towards the end of the war, when unit effectiveness and soldier discipline declined, the Army consisted of drafted soldiers, led by inexperienced tactical leaders, who were fighting a war the nation did not support. Combine these factors with the normal frustrations of a counterinsurgency conflict and it is easy to understand why performance declined. While it is possible the individual replacement system may have magnified the downturn in performance, it is unrealistic to assert it was the primary cause and that improved personnel stability would have overcome incompetent leadership and a lack of national will to achieve tactical proficiency.

Post-Vietnam: The Quest for Personnel Stability Continues

Convinced of the requirement for personnel stability to ensure unit effectiveness, the Army has pursued multiple programs emphasizing unit manning. None of these unit rotation or unit manning policies survived to achieve their intended purpose (Bunkerhoff, 2004). Reasons for their failure to achieve long-term viability are many: a lack of emphasis from senior army leadership, competing demands for personnel throughout the Army, a lack of infrastructure to support unit rotations, and a failure to apply personnel stabilization to all units.

Perhaps the most well-known and intensely studied program was the Cohesion, Operational Readiness, and Training (COHORT) soldier replacement program executed in the early 1980's. Initial reports of the program were promising as COHORT units were found to have higher levels of cohesion than non-COHORT units. However, within three years the difference in cohesion levels disappeared and the program did not continue (Towell, 2004, p. 55). Additionally, data was not collected to measure collective training proficiency so none of the research could determine if the COHORT units were more proficient than non-COHORT units (Towell, 2004, p. 61). Most arguments in support of lifecycle manning today point to COHORT as a program that shows the potential of personnel stability if appropriate adjustments were made to implementation (Bunkerhoff, 2004).

A review of military professional writing since the conclusion of Vietnam reveals the continued fervent support for replacing the individual replacement system with some form of unit manning. Much of this writing is based on anecdotal evidence and personal experience rather than a systematic analysis of the impact of personnel turbulence. At times, the writings assume a tone that anyone who disagrees on the importance of personnel stability and cohesion fails to understand military operations and culture. One example of this is provided by Lewis Sorley, a retired military officer and military historian:

> "*No one who has had to lead men* in tasks which are as difficult, dangerous, and demanding as those of military units in combat would doubt the value of building such shared values and outlooks. But neither would they deny that it takes time and stability to do this effectively, so that turbulence of personnel in a unit *must* be seen as a primary indicator of weakened coherence in assessing comprehensively what we are now considering as readiness to fight." (emphasis added) (Sorley, 1980, p.77)

The tone of this statement about personnel turbulence is fairly typical of military writing on this subject. He implies that anyone who disagrees with his conclusion has not commanded in combat and, therefore, does not have the credibility to challenge the declarative statement that personnel turbulence *must* be considered a sign of poor cohesion and inadequate unit readiness.

Other writings by military personnel are just as adamant about the necessity of reducing personnel turbulence as a requirement for improving cohesion and unit readiness. William D. Henderson, a retired Infantry Colonel and Vietnam veteran, wrote two books that were highly critical of the Army's individual replacement system. In these books, Henderson concluded the Army was dangerously unprepared for combat operations because of the negative effects of the individual replacement system. He cites examples of poor performance at the National Training Center as proof that training proficiency was low. Additionally, he cites some simple correlation studies that show units with more stability at the platoon level performed more effectively than those with high turbulence. However, these studies cannot be considered rigorous research because the analysis was limited to one unit and did not control for or consider other factors impacting unit performance.

In Cohesion, the Human Element of Combat, Henderson (1985) concluded the US Army was the worst of four Armies analyzed—North Vietnamese Army, Soviet Army, Israeli Army, US Army—in terms of building cohesion in its combat units. In both books, he recommends the Army adopt some form of unit manning to reduce personnel turbulence. However, the conditions he recommends for control and isolation of soldiers to build cohesion are unsustainable in a volunteer Army with high percentages of married personnel. Ironically, The Hollow Army (Henderson, 1990) was published just prior to the Army's successful execution of Operation Desert Storm. The Army's performance in this operation did not reveal a crisis in unit effectiveness as implied by Henderson.

Other publicly available sources continue with the theme of moving towards unit manning to achieve a higher level of cohesion and unit readiness. An examination of congressional testimonies, public news releases, publicly available Army briefings, and professional articles written for professional journals such as *Military Review* shows a consistent thread of support for some form of unit manning to increase unit effectiveness. These formal and informal publications are provided by numerous military officers ranging from the rank of Major to the Army Chief of Staff and are an indication of the prevalence of Army officers who publicly state that lifecycle manning is a necessary step towards improving the effectiveness of combat units.

Scientific Research on the Stability-Effectiveness Relationship in Military Settings

Several studies, some of which have been sponsored by the military, have shown the performance of some military organizations is either not impacted by personnel turbulence or that the organization adapts in ways to sustain a high level of performance despite high levels of personnel turbulence. One case study analysis of US Navy aircraft carrier operations concluded that effective performance was possible despite high levels of turnover (Rochlin and Roberts, 1998). The authors describe a "paradox of turnover" that takes place on an aircraft carrier. After a thorough description of the intense performance standards and complexity of operations, the authors highlight the paradox that extremely high levels of performance are maintained despite incredibly high personnel turnover for the crew of an aircraft carrier. They credit this high performance to training adjustments made by the crew to deal with the turbulence. As a positive outcome, managing personnel turnover turned the aircraft carrier into an operational schoolhouse that trained numerous sailors for duty throughout the Navy—thereby benefiting the entire Navy as the lessons from each carrier are distributed throughout the Navy.

Additionally, the crew developed a culture of testing, questioning, and refining standard operating procedures to achieve the dual objectives of properly training new sailors and preventing organizational stagnation in their operating procedures. The combination of experienced sailors that enforce established procedures and new sailors who question these same procedures provide a balance of old and new that keep the overall system effective. As stated by the authors, "The resulting dynamic can be the source of some confusion and uncertainty at times, but at its best leads to a constant scrutiny and rescrutiny of every detail, even for SOPs" (Rochlin and Roberts, 1998, p. 5).

The leaders of the carrier acknowledge the importance of providing the carrier crew sufficient time to train prior to operational deployment. They also imply the amount of time necessary to achieve acceptable crew effectiveness is lengthened due to personnel turbulence which continues through the training. However, given sufficient time the crew achieves effectiveness and is then able to maintain that effectiveness despite the continued turnover.

The Army Research Institute (ARI) sponsored several studies and experiments researching the impact of tank crew stability on tank crew performance.[10] The most conclusive experiment was a random control trial testing the impact of tank crew turnover on tank gunnery qualification scores (Keesling, 1995). The control group was 11 crews that were stabilized and trained together before qualifying on Tank Table VIII (TT VIII). After they completed TT VIII, the crews were randomly broken up and reassigned to form new crews. These newly formed crews performed as well as or better than stable crews despite the high level of personnel turbulence.

There are several factors that help explain this outcome. The individual crew members were well trained in the duties, they all had experience on the range and scenario of TT VIII, and the task of engaging targets is characterized by high levels of standardization. Other research on the effect of turbulence on tank crew gunnery reached similar conclusions: stability was not critical for

[10] Tank crew performance is measured by the scores achieved on tank crew gunnery qualification exercise, Tank Table VIII (TT VIII). TT VIII is a series of live fire engagements in a variety of conditions and the crew earns a score based on total target hits, crew interaction, and speed of engagement.

soldiers trained in their position and crew stability is not an important predictor of crew performance (Keesling, 1995, p. 20).

A second ARI research effort consisted of a quasi-experiment to examine the effects of battalion command group on unit performance (Ardison et al., 2001). The experiment consisted of fourteen battalions, seven of which were to be stabilized by holding the battalion command group in their positions for two years. The remaining seven would be managed under the current replacement system and allowed to change as policies would normally dictate. Surveys and interviews were conducted semi-annually intervals to assess unit performance, cohesion and command climate.

The results of the experiment were inconclusive due to small sample size and inability to stabilize the seven battalions selected for the experiment. However, some interesting results were found that support further research in this area. The limited empirical analysis showed positive correlation between battalion command group stability and measures of cohesion, performance, and communication. However, interview feedback from participants in both groups presented conflicting feedback about the benefit of command group stabilization. There were as many comments about the downside of command group stability as there were positive comments. This research on battalion command group stability, tank crew gunnery performance and the case study about US Navy carrier operations indicate the case for personnel stability may not be as clear cut as many in the Army believe.

Scientific Research on the Stability-Effectiveness Relationship in Non-Military Settings

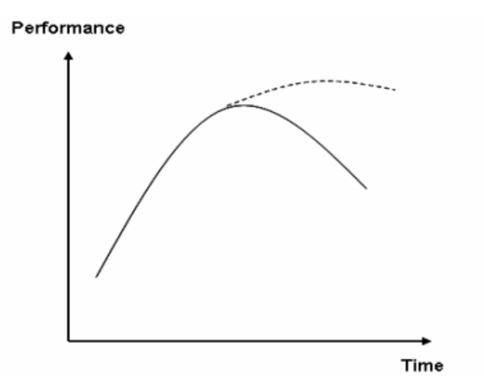
Other researchers not associated with the military have written articles that highlight some of the dangers of too much stabilization and the positive aspects of personnel turnover. One of the most thorough considerations of the advantages of personnel turnover is written by Barry M. Staw (1980). Staw does not provide an empirical analysis of turnover. However, he presents several considerations and logical arguments that discuss the positive aspects of personnel turnover. He does not present them as fact, but rather presents them as another way to view turnover and perhaps point to new directions for further research. He states,

> "The potential positive consequences of turnover have received very little attention in organizational psychology. The benefits of turnover are somewhat less obvious than the costs in that they may be less quantifiable and less attainable in the near-term. Yet the positive aspects of turnover may contribute to the long run viability of the organization." (Staw, 1980, p. 258)

Staw provides three examples of positive turnover consequences that are applicable to military organizations: increased performance, reduction of entrenched conflict, and improved organizational adaptation. Increased performance from personnel turnover (or a lack of personnel stability) may be a counterintuitive result to most military professionals, but upon further examination, the outcome makes logical sense. Personnel in deployed military units face highly stressful combat situations in which high performance is required. Soldiers may perform well during the early stages of deployment, but then experience a decline in performance as the soldier reaches his limit of endurance and suffers the effects of "burnout". Entrenched conflict is also quite possible in military units and can cause a downturn in performance or morale. Finally, military units face an ever-changing operational environment and must be able to adapt quickly based on new information.

Staw describes certain jobs involving work in a high stress environment where the typical job performance curve is best described with as an inverted "U". Typically, performance in a high stress environment increases for a period of time but declines with increased tenure, as shown in Figure 2.1 by the solid line.[11] This is in contrast to a more routine job where performance will increase or remain stable for a longer period of time.

Figure 2.1
Inverted "U" Performance Curve



With uniform stability in the organization, as would occur in lifecycle manned units, most personnel reach the downward slope of the "U" curve at the same time and organizational performance could suffer. On the other hand, individual replacement provides a tenure distribution

[11] This performance curve for high stress jobs has the same shape combat efficiency curves used to explain soldier combat performance over time as the number of days of combat exposure accumulated (Holmes, 1985, p. 214). In both graphs, the underlying premise is that soldiers reach some peak level of performance and then performance begins to decline with time due to the deteriorating effects of coping with stress.

that prevents such organizational decline as some portion of the organization is on the front part of the inverted "U" performance curve. This allows some members of the organization to provide new energy and enthusiasm while other members provide the experience and institutional knowledge of accomplishing the organization's mission. In more common terms, personnel turnover keeps the entire organization from burning out at the same time. The lack of turnover could result in an entire unit on the downward portion of the performance curve for the latter portions of a unit deployment.

Personnel turnover can also reduce irresolvable conflict. One can imagine a subordinate working for a difficult boss and the employee believes there is little opportunity for reconciliation or reduced conflict. With personnel turnover, it is possible the subordinate or senior will be reassigned and the conflict resolved. Under personnel stabilization, however, the conflict would remain and possibly result in negative organizational or individual outcomes. The prospect of not being able to avoid the conflict situation could lower the morale and performance of the subordinate who could perceive he is faced with the choice of enduring an intolerable situation or leaving the organization altogether.

Finally, turnover can increase the organization's ability to adapt to new situations. New personnel bring new abilities, new energy, new perspectives, and new motivation. Infusing organizations with "new blood" helps avoid organizational stagnation.

> "While inside succession may have a beneficial effect on organizational morale it negates much of the potential adaptation value of turnover. The new role occupant, up from the ranks, is likely to have similar background, experiences, and policy commitments to the departed member. The outside replacement, in contrast, is more likely to bring new perspectives and information to the organization, and if the new person has had reinforcing experiences elsewhere, he or she is less likely to conform to the new organization than the inside successor. Thus, turnover at high levels in the organization, accompanied by replacement with an experienced and successful outsider, may maximize the adaptive consequences of turnover." (Staw, 1980, p. 265)

Combat units that face an ever-changing external environment may benefit significantly from turnover of personnel that brings fresh and different perspectives on the environment and the challenges faced by the organization. These positive outcomes discussed by Staw, although not easy to quantify are potentially very important to long-term organizational effectiveness.

The Disadvantage of Too Much Trust

Another interesting analysis about the potential downside to personnel stability is provided in an article that focuses on trust within an organization (McEvily et al., 2003). When Army professionals discuss personnel stability, trust is often mentioned as an important aspect of effective units. The logic is that soldiers must be able to trust one another during operations and that trust will give them confidence in their teammates and motivate them to perform for each other. In soldier terms, this trust is described as "covering your buddy's back".

While McEvily et al. (2003) acknowledge the benefits of trust, they also caution the reader about the downsides of trust if taken too far. For example, trust can foster sharing of information but, when that information goes unchecked, the organization may experience strategic blindness, overconfidence, inertia, or inability to motivate its members (McEvily et al, p. 97). Secondly, trust enables teammates to identify strongly with needs, preferences, and priorities and begin to see them as their own. However, over identifying with group norms causes other problems such as being less accepting of alternate ideas, the "not invented here" syndrome, and other constrained thinking (McEvily et al, p. 97). Finally, trust causes suspension of judgment and willingness to give the target of trust the benefit of the doubt. This could lead to negative outcomes if standards of performance and behavior aren't enforced (McEvily et al, p. 98). These considerations are just as likely to occur in a military unit as any other organization.

Themes from Dissenting Views about the Importance of Stability

Although dissenting views about the benefits of personnel stability are not as numerous as advocates for lifecycle manning, there are several authors who provide compelling arguments that question the policy assumptions. The conclusions of these dissenters are based on contrary evidence from historical analysis, the lack of scientific research showing benefits of stability, and the differences between today's Army and the Army of World War II and Vietnam. This section summarizes some common threads of their arguments.

One observation of the dissenting authors is the noteworthy absence of rigorous debate over the benefits of lifecycle manning. There are many reasons for lack of professional debate. To a large degree, the importance of cohesion and the synonymous use of stability are viewed as so obviously important and part of the historical record that further debate about their benefits is superfluous. At times, the language used in support of lifecycle manning and cohesion implies that disagreement is rooted in ignorance about the human dimension of combat (Sorely, 1980, p.77; Ingraham, 1981, p. 4; Bunkerhoff, 2004, p. 36). Another explanation is the Army's operational pace does not permit time for reasoned debate. The Chief of Staff of the Army said "execute" and the Army staff moved out with a can-do attitude (Alford, 2004, p. 57). However, lifecycle manning has wide-ranging implications for infrastructure investment, number of units available for combat operations, and leader development that deserve consideration—especially in light of a questionable performance benefit. Professional debate and additional research should continue to ensure the policy either achieves the expected benefit or is adjusted as required (Towell, 2004, p. ii; Alford, 2004, p. 60)

There is also the potential for negative outcomes when high social cohesion exists. If social cohesion increases with more personnel stability, then a reasoned consideration of negative outcomes is warranted. The conflict between the goals of the highly cohesive small unit and the higher headquarters can have a negative effect on military effectiveness as highlighted by the following statement:

> "Cohesion is not always a positive factor when viewed in military effectiveness. A very cohesive primary group may value the survival of itself and its members higher than mission accomplishment. This can lead to shirking duty, such as lax patrolling or even early surrender. Thus, cohesion is not necessarily the cause of military effectiveness at the tactical level, but its presence is an indication of potential military effectiveness." (Bernasconi, 2007, p. 39)

The precedence of group and individual survival over mission accomplishment has manifested itself in World War I, World War II, Korea, and Vietnam (Kellett, 1982; Kindsvatter, 2003). One benefit of personnel turbulence is that new members of the team are able to question established group norms that contradict missions given by higher headquarters. There is also empirical evidence that shows a statistically significant negative relationship between social cohesion and performance (Mullen and Copper, 1994).

Some authors assert that stability alone may not accomplish much. They question whether or not stability is necessary for unit effectiveness and point to numerous historical examples of effective combat performance despite high personnel turbulence due to casualties. Dr. Robert Rush, a World War II historian, stated, "While the primary group counts, the traditional idea of long service together in itself is not necessary. Rather, cohesion is instead sustained by a common aim and common circumstances" (Rush, 2001, p.6). Another author was less delicate in his assessment of the supposed benefits of personnel stability:

> "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 3 (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'." (Bassford, 1990, p.75-76)

There is also debate over whether the lessons about the positive aspects of personnel stability drawn from history can be generalized to the modern Army, which is fundamentally different that the Armies of World War II and Vietnam. The composition of the Army has gone from drafted soldiers to an all-volunteer force. Both the officer and non-commissioned officer corps professional education systems have undergone significant changes. Finally, the equipment available to modern soldiers surpasses the capabilities of earlier generations of soldiers. These fundamental differences in the respective forces make it difficult to assume that policies deemed appropriate for the Armies of World War II and Vietnam are also appropriate for today's Army.

Additionally, the training improvements of the last two decades may have increased the expertise of the entire Army to the point where stability may not be essential for unit effectiveness (Towell, 2004). As mentioned earlier, highly trained individuals can reduce the negative impact of personnel turbulence in many tasks and modern soldiers may have reached a level of competency where it does not take very long for a team of soldiers to achieve training proficiency. Updated analysis of today's Army is needed to determine if stability achieves the expected payoff in unit effectiveness.

Conclusions Derived from the Literature on Personnel Stability

After reviewing the literature about personnel stability and organizational effectiveness, I have drawn the following general conclusions about personnel stability:

1. **Personnel stability may not have a direct positive effect on unit effectiveness**. Advocates of lifecycle manning make a compelling argument about the negative impact on team training efficiency caused by personnel turnover. However, the historical record provides numerous examples of units that performed well in combat and were manned using the individual replacement system. There are multiple factors influencing effectiveness that may have a larger impact than stability. Additionally, the Army has become more professional and well-trained, thereby possibly reducing the need for stability to achieve effectiveness.

2. **Where personnel stability occurs does matter**. 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.

3. **The type of task matters**. Complex small unit tactical tasks characterized by interdependent teamwork (such as clearing a room) may benefit more from personnel stability than small unit tasks characterized by predictability, technical expertise, and lower interdependence (such as tank crew gunnery). Additionally, higher level tasks that do not require interdependence of team members may not be significantly improved by personnel stability.

4. **The lack of a clear benefit to personnel stability provides an opportunity to pursue other policy options or adjust lifecycle manning without negatively impacting unit effectiveness**. The historical and scientific research provides evidence that personnel stability may not be required to achieve high levels of unit effectiveness. This reality opens the door to alternate policy options to achieve unit effectiveness without incurring the full cost of implementing lifecycle manning. Possible policy alternatives to enhance unit effectiveness include better leader training, more training opportunities, standardization of tasks, and partial unit stabilization.

What's Missing from the Current Body of Research

The literature on this subject contains numerous writings based on historical research and empirical analysis of the cohesion-performance relationship, but the deficiency in the research is the absence of empirical analysis of the stability-effectiveness relationship. This is partially due to the absence of an appropriate measure of stability (White, 2002; Towell, 2004) or case studies about the benefits of stability that are too limited for generalization to the entire Army (Ardison et al., 2001; Henderson, 1990; Cowdry, 1995). It is also partially due to the lack of an objective measure of unit effectiveness.

The need for empirical analysis to identify policy alternatives and measure the expected payoff in effectiveness expected from lifecycle manning is expressed in the following quote:

> "Ideally, the decision to implement unit-focused stabilization (lifecycle manning) should have been preceded by a searching assessment of whether stability produces the desired improvements in units made up of today's more professional and better trained soldiers. In fact, an assessment should consider not only stark 'either-or' options but also equal cost mixes of alternatives…Ideally, it would address the 'shape of the curve,' graphing the relationship between stabilization and performance: What level of increased stability produces a given increment of combat-relevant performance?" (Towell, 2004, p. 77 and Footnote 156)

Equipped with the necessary data, I conducted the analysis described by Towell and found a possible graph showing the incremental effect of increased stability. By doing so, this dissertation partially fills an important gap in the overall body of literature on this topic.

In light of the significant research that runs counter to Army lifecycle manning assumptions, it should not be surprising if my empirical analysis does not show a significant relationship between personnel stability and unit effectiveness. The absence of a significant effect could be a result of the model's inability to detect the relationship rather than the lack of one. But there is also a possibility that factors other than stability—such as leadership, training, and individual talent—have more influence on unit effectiveness. Personnel stability may have other benefits to the Army, but it should not be surprising if increased unit effectiveness is not one of them.

3. Measuring Personnel Stability and Unit Effectiveness

> *"…the fact remains that our present personnel system does not focus on maintaining teams, as it should, despite the fact that human connections are the glue that bonds our units together. The negative impacts of turbulence do not get the visibility they merit because we have no metrics for intangibles such as unit cohesion or teamwork." (White, 2002)*

A shortage of adequate metrics for personnel stability and unit effectiveness has been a persistent obstacle to empirical analysis of the relationship between the two. If the analysis of the stability-performance relationship is to move beyond historical case studies and professional intuition into quantitative research, suitable measures of stability and effectiveness must be developed. This chapter presents new metrics for stability I developed and explains the training proficiency scores I used as an indicator of unit effectiveness. The new stability metrics serve as the independent variable of interest and the training proficiency scores serve as the dependent variable for the quantitative modeling presented later in the dissertation.

Personnel Stability: A Team Perspective

The unit of analysis for this research is a combat battalion. Depending on the type of battalion, the number of personnel assigned ranges from 500 to 900 soldiers. A battalion is the lowest echelon of the military structure with a staff and every battalion submits a monthly readiness report to the Department of the Army.[12] Similar to many non-military organizations, combat battalions are composed of teams within the organization. There are three echelons between the battalion headquarters and the fighting soldier. A combat battalion consists of 3-5 companies, which consist of 3-5 platoons, and each of the platoons is further divided into 4 squads. Each of these companies, platoons, and squads are separate teams with complementary, but different missions. Every soldier assigned to a battalion is, therefore, a member of several teams. For example, a soldier assigned to a squad is also a member of a platoon, a company, and a battalion.

In addition to the teams created by the organizational structure of a combat battalion, there are teams organized along functional specialties such as logistics support, personnel management, communications, and equipment maintenance. These functional teams often cross sub-unit boundaries and exhibit their own team dynamics within the functional area. For example, medical support is provided by several people: a battalion physician's assistant (PA), a medical platoon, and

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[12] Lifecycle manning stabilizes personnel at the Brigade Combat Team level, which is one echelon higher than battalion. Brigade Combat Teams consist of 5-7 battalions for a total of about 3500 soldiers.

individual medics. All the medical personnel are part of a functional area team that provides medical support. However, some members of the medical platoon operate together in a medical facility while other medics are integrated into combat platoons and become part of that team as well.

When a medic assigned to a combat platoon is transferred out of the battalion or becomes non-deployable, several aspects of turbulence are revealed by this multi-team membership structure. The loss of a line medic affects the combat platoon the medic was supporting, the medical platoon he was also a member of, and the medical functional area. The loss of this one line medic could result in a series of other medical personnel reassignments and may disrupt other teams in the battalion. Interestingly, this domino effect of personnel reassignments resulting from the transfer of one soldier is magnified under lifecycle manning. Under the individual replacement system, the departing medic could be replaced by another medic and that single exchange could be the extent of the personnel turbulence. However, lifecycle manning does not provide an immediate replacement medic and internal battalion transfers are necessary to fill the vacancy.

The existence of teams within the battalion created by organizational structure or functional area expertise makes it possible to measure personnel stability from a team perspective as opposed to the current emphasis on individual turnover. In the next section, I examine the Army's current measurement of personnel stability and two broad classes of personnel turnover that disrupt team stability in a battalion. With a clear understanding of how personnel turbulence affects a battalion, two new perspectives of assessing team stability are presented.

The Army's Current Measure of Personnel Stability

The Army currently measures stability with the Army Personnel Turnover Percentage (APERT) in the monthly Unit Status Report (USR). APERT is the percentage of personnel who depart the battalion in the 90 days prior to the reporting deadline.[13] While APERT measures aggregate personnel turnover at battalion level, the metric does not capture the complete organizational impact of personnel departing the battalion. APERT does not identify where turbulence occurs within the battalion and what sub-teams are disrupted by the departing personnel. Additionally, this statistic assigns the same weight to every person who departs the battalion—despite differences in rank,

[13] The official reporting standard for personnel turnover rate is as follows: "Personnel turnover percentage (APERT) provides an indicator of unit turmoil (degradation of unit capability). The unit must compute personnel turnover percentage by comparing the total number of departures during the 3 months preceding the as-of date of the report against assigned strength on the as-of date. Total of personnel departed (90 days) divided by assigned strength X 100." This definition is from Army Regulation 220-1, Unit Status Reporting, paragraph 4-1 (a), 10 June 2003.

roles, functional area expertise, and responsibilities. The aggregate measure of turbulence gives no insight into whether the departed soldier is a commanding officer, experienced staff non-commissioned officer, a soldier with a unique specialty skill, or a trained member of a rifle squad. However, the departure of each of these soldiers would most likely have a different impact on the battalion's training proficiency.

Finally, APERT accounts for personnel that leave the battalion but does not account for personnel turbulence that results from personnel reassigned within the battalion. For example, a leader may be promoted and moved to a different position within the battalion. While APERT does not capture this personnel change, the move could certainly impose some costs. There is likely to be a period of adjustment as the promoted leader's old team adjusts to a new leader with different skills and personality. Additionally, the gaining team may have to adjust to the newly promoted leader. Even if both leaders are long time members of the battalion, there could remain a transition period when each new leader adjusts to new responsibilities and the teams adjust to different leadership styles.

Two Sources of Turbulence Undermine Personnel Stability

Battalions face two main sources of personnel turbulence: externally generated turbulence that occurs when soldiers are reassigned outside the battalion and internal turbulence that occurs when soldiers are reassigned within the battalion. Externally generated turbulence is the result of soldier assignments generated by Army personnel management policies not within the battalion's jurisdiction. These externally generated assignments include soldiers who depart the battalion because they are separating from the Army or being reassigned for a permanent change of station (PCS) move to fill a manning requirement somewhere else in the Army. Some of the externally generated turbulence is for the benefit of soldiers so they can pursue professional education or be assigned to a higher position in a different unit as part of their professional development. Under individual replacement policies, very few of these externally generated moves are synchronized with the battalion's training cycle or deployment requirements and consequently personnel turbulence can be created while the battalion is building training proficiency. The externally generated turbulence of a soldier departing the battalion is measured by APERT as previously discussed.

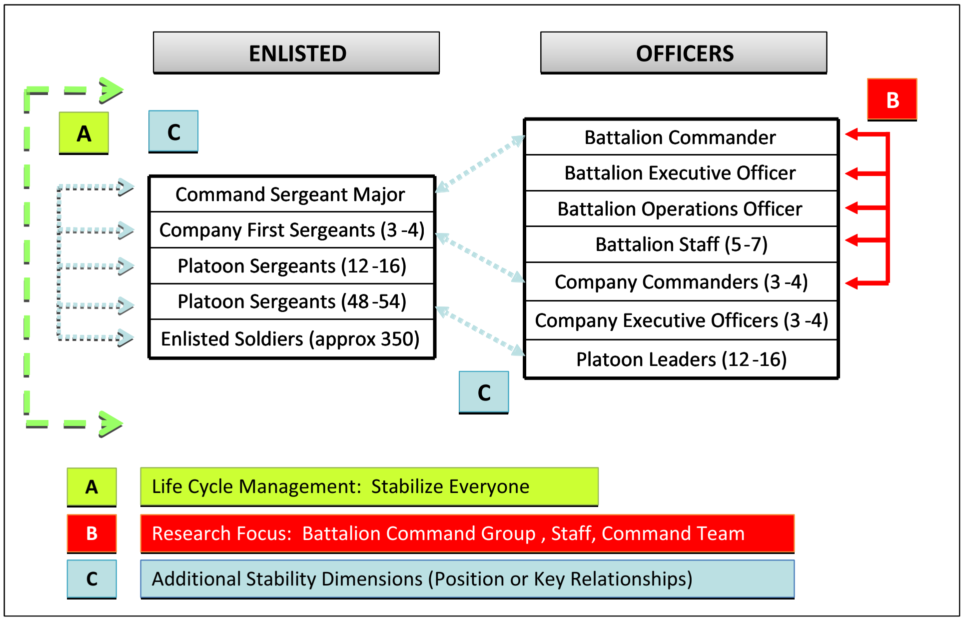
Personnel turbulence is also created by reassignments within the battalion and is not directly measured by any metric reported as part of unit readiness. Internal personnel reassignments are made for a variety of reasons. Many of the battalion's internal personnel changes result from externally generated vacancies. Soldiers who depart the battalion because of an externally generated requirement leave a vacancy that may require an immediate replacement. If the Army does not have a replacement available or chooses not to send one due to lifecycle manning, then the battalion must reassign a soldier from another position within the battalion to fill the vacancy. This creates a domino effect of reassignments until the inefficiency costs of vacancy that cannot be filled are acceptable to the battalion. Internal turbulence also occurs from filling vacancies left by soldiers who become non-deployable, soldiers who get promoted and move to a higher position, and soldiers who need to fulfill a professional development requirement somewhere else in the battalion.

Just as externally generated turbulence may disrupt unit effectiveness, internal personnel turbulence could also undermine effectiveness as teams adjust to new personnel. Theoretically, the impact of internally generated turbulence would be less because the soldiers are familiar with the battalion and may know the personnel on their new team. Nonetheless, internal reassignments cause changes to teams and have the potential to negatively impact training readiness. Unlike externally generated turbulence, however, APERT does not count internal personnel moves because the soldier doesn't leave the battalion. The lack of metrics for the battalion's internal personnel turbulence makes it difficult to completely understand the magnitude of the personnel turbulence challenge battalions face as they train for deployment. Any new measurements of personnel stability should account for internal personnel turbulence to capture the full effect of soldier reassignments.

Measuring Team Stability in the Battalion

Rather than measuring personnel turbulence, which the Army is attempting to minimize, I develop metrics for what the Army is trying to increase—the stability of teams within the battalion. The framework for measuring team stability within the battalion is provided in Figure 3.1. The left side depicts the enlisted personnel in the battalion beginning with the highest ranking non-commissioned officer, the Battalion Command Sergeant Major (CSM), progressing through the various non-commissioned officer (NCO) leadership positions, and ending with the enlisted soldiers. The various NCO leadership positions correspond to the different echelons within the battalion--the First Sergeants (1SG) are the highest ranking NCOs in the company, the platoon sergeants (PSG) are the highest ranking NCOs for the platoons, and the squad leaders (SL) are the highest ranking NCOs for the squads. The numbers in parentheses are the number of each position in the battalion.

Figure 3.1
The Teams Within a Combat Arms Battalion



The right side of the figure depicts the battalion officers, starting with the Battalion Commander and progressing to the platoon leaders who are the junior officers in the battalion. A significant difference on the officer side of the figure is the presence of the battalion executive officer, the battalion operations officer, and the battalion staff. These officers are responsible for all the logistical support, administrative support, resource allocation, and functional area expertise in the battalion, but they are not members of the chain of command. The staff is critical for successful accomplishment of the mission, but these officers do not provide routine combat leadership to the maneuver elements in the battalion. So, although the company commanders, company executive officers, and platoon leaders are depicted below the battalion staff, this is not intended to portray a command relationship between them.

The lettered boxes on the diagram illustrate possible alternatives for examining team stability within the battalion. Box A highlights the current policy of life-cycle management—stabilization of all personnel in the unit.[14] Ideally, force stabilization would keep every soldier on the same team, every leader in their current position, and every staff officer in their current position. Under the

[14] Specifically, life-cycle manning intends to stabilize personnel within the Brigade—the next higher echelon than battalion. The policy does allow for personnel to leave the battalion with the approval of the Brigade Commander. However, the *intent* of the policy is to keep teams together at every echelon in the Brigade.

assumptions of the policy, brigade wide stability would allow the team to become more effective as cohesion increases in time.

Box B highlights the grouping of the battalion command group officers, battalion primary staff, and battalion command team.[15] The battalion command group officers consist of a lieutenant colonel battalion commander and two majors—the battalion executive officer and the battalion operations officer. The battalion primary staff includes five to seven captains responsible for different functional area expertise such as personnel, intelligence, and logistics. The battalion command team includes the battalion commander and the three to five captains who command the companies in the battalion. The stability of these battalion officer teams is the focus of this research. The new stability variables I develop will measure how long each officer has been in position and how long the officer group served together as a team.

Finally, Box C illustrates additional ways to examine battalion team stability. A first possibility would be to measure stability by echelon or rank to measure the stability of specific populations such as enlisted personnel, platoon sergeants, platoon leaders, or company commanders. Another possibility is to measure individual tenure of key positions such as company commanders or key leadership teams. The stability measure could capture how long a company commander has worked with the same platoon leaders or how long a platoon sergeant has worked with the same squad leaders. For important leadership teams, the measurement could combine the officer and NCO combinations by measuring how long the company commander, first sergeant, platoon leaders, platoon sergeants, and squad leaders have served together. These relationships could be narrowed by looking at company commander and first sergeant teams or expanded to include all leadership positions throughout the battalion.

Functional Area Stability

Another way to measure stability is along functional area teams as depicted in Figure 3.3 which shows staff functional areas and the different echelons of personnel involved in that particular functional area. Each functional area has a commissioned officer, usually a captain, responsible for all activities related to the respective specialty. The staff officer leads a team of staff non-commissioned officers and other specialty skilled enlisted personnel. For example, the intelligence function is managed by a military intelligence captain responsible for enemy analysis and physical security. He has a non-commissioned officer with a military intelligence specialty that assists in

[15] The battalion command group also includes the Battalion CSM. However, the data were not available to include him in this research.

accomplishing the required tasks. Additionally, the section is manned with several analysts who are trained in military intelligence related tasks such as network analysis, human intelligence collection and analysis, and terrain analysis. Each of the functional areas in Figure 3.2 is organized along similar lines. The interface between the staff and the companies happens with either the company commander or company executive officer. By necessity, these two company officers must fill a multi-functional role and are responsible for executing the plans and support requirements generated by the battalion staff.

Figure 3.2
Functional Area Teams in the Battalion

	Personnel	Communications	Operations	Intelligence
Staff Officers	Personnel Officer	Communications Officer	Assistant Operations Officer	Intelligence Officer
Staff Sergeants	Personnel Sergeant	Communications Sergeant	Operations Sergeant	Intelligence Sergeant
Skilled Solders	Personnel Clerks	Radio & Network Specialists	Radio Operators	Intelligence Analysts
Company Officer	Executive Officer	Executive Officer	Company Commander	Company Commander
Company Sergeant	First Sergeant	First Sergeant	First Sergeant	First Sergeant

By Echelon

By Category

There are several possible ways to measure stability for functional area teams. The stability can be measured vertically in each of the functional areas to determine how long the functional area team has served together. Cross functional stability could measure how long the staff officers or staff non-commissioned officers from the different functional areas have served together, thereby providing insight into the stability of the staff as a whole rather than in a particular functional area. Finally, stability could be measured diagonally across functional areas at different echelons. Such a measure could show potential for cross-functional area coordination between echelons—staff officers in the logistical functional area coordinating with staff non-commissioned officers in the operations functional area.

There are several benefits to measuring stability under the two paradigms discussed in Figures 3.1 and 3.2. First, these stability metrics measure the longevity of teams within the battalion rather than measuring the total number of personnel departures for the battalion. While these concepts appear to be measuring the same concept, the impact of internal personnel turbulence makes measuring stability a more appropriate measure. A stability measure would change regardless of whether a team is broken up by an externally generated personnel move causing a soldier to depart the battalion or an internally generated reassignment that moves a soldier to a different position in the battalion. Also, the Army will be better able to determine whether or not stability at the critical echelons below brigade increases under lifecycle manning.

The new stability metrics facilitate empirical modeling to identify specific training proficiency tasks that receive the highest payoff from personnel stability. Each echelon and functional area in the battalion has a unique set of tasks for that group of soldiers. For example, a company could be required to conduct a raid to capture an enemy combatant and the battalion command group would be responsible for coordinating and synchronizing the resources to support the company during the mission. The company may benefit greatly from stability due to the unique requirements of their task while the battalion command group may not.

Measuring the stability of both the company and the battalion command group allows an empirical test for the relative benefits of stability for their respective tasks. By doing so, personnel managers and commanders can identify the teams within the battalion where stability is beneficial for increased unit effectiveness and those parts of the battalion where stability may be less important. For example, if there is not a strong positive relationship between battalion command group stability and battalion effectiveness, then it may not be detrimental to battalion effectiveness if the battalion command group experiences turnover. Through improved analysis provided by appropriate stability metrics, commanders and personnel managers could pursue policy alternatives that improve or maintain unit effectiveness while providing flexibility to meet competing personnel management requirements.

Building Stability Variables that Measure Experience

If stability is to have a positive effect on performance, the benefit should result in part from increased individual and team experience within the battalion. As previously described, internally generated turbulence can break up teams and hinder team formation. However, when a team reforms each soldier brings an experience profile that could mitigate or magnify the disruption effect. Stability metrics that quantify this individual experience profile can be combined with measurements of team stability to measure the overall impact of personnel stability. I consider the following three dimensions of experience:

1. **Experience in the unit**: The number of months a soldier spends in the unit, regardless of the specific position. This experience allows the soldier to become familiar with unit history, to learn standard operating procedures, and to develop relationships throughout the unit.

2. **Experience in the assigned position on his team that deploys:** The number of months a soldier spends in a specific position on a team, before the final team is formed. This experience allows the soldier to build specific expertise in the duties and responsibilities of his role on the team.

3. **Experience in a specific team:** The number of months a soldier spends with a specific team with all other members in their respective positions for the deployment. This experience allows a team to develop team expertise.

These three dimensions of individual and team experience theoretically contribute to building effective teams. Lifecycle manning, which stabilizes personnel in a brigade combat team, should result in higher values for all three dimensions of experience, with a primary goal of increasing team experience to facilitate small unit training proficiency. But even if team experience is disrupted due to the transfer of a team member, the first two dimensions of stability could be mitigating factors for the expected downturn in team performance.[16] Individual experience in the unit and/or on the team should reduce the time required to return to the level of proficiency attained before the team was broken. Improved stability metrics make it possible to determine the impact of these two types of individual experience on team effectiveness in addition to measuring the impact of team experience.

Building Stability Variables for the Battalion Command Group

In this section I describe the creation of stability variables for the battalion command group that measure both individual and team experience. The battalion command group consists of the battalion commander, battalion executive officer, and battalion operations officer. Using the Total Army Personnel Data Base—Officer (TAPDB-O), I created variables that measure the number of months an officer spent in the battalion before the command group is formed and the number of

[16] When new teams form, each team member also brings experience from other units and unique ability level to the team. These individual factors could have either a positive or negative effect on team effectiveness. In some situations, the talent of the new team member could compensate for any downturn in unit effectiveness caused by turbulence resulting in a net increase in overall effectiveness. Of course, the opposite could occur and unit effectiveness could suffer significantly due to turnover. This analysis assumes most soldiers and officers bring similar experience profiles to their new assignment. There is some variance in career paths, but for combat arms battalions the majority of personnel have similar career paths.

months all the officers served together as a command group team.[17] A timeline used for building the command group stability variables is depicted in Figure 3.3.

A critical event, such as a deployment or major training exercise, is used as the baseline event for building the stability variables and takes place at T=0. The command group team is formed at T=m generating the value for command group team experience. Individual experience is measured as depicted on the left side of Figure 3.3. Each member of the command group may serve some number of months in their assigned position prior to the command group forming. Also, the executive officer sometimes serves as the operations officer, or vice versa, and this experience is shown as "Field Grade Time in Unit" and represents his experience in the unit he brings to the executive officer position.

Figure 3.3
Forming the Battalion Command Group—Individual and Team Experience

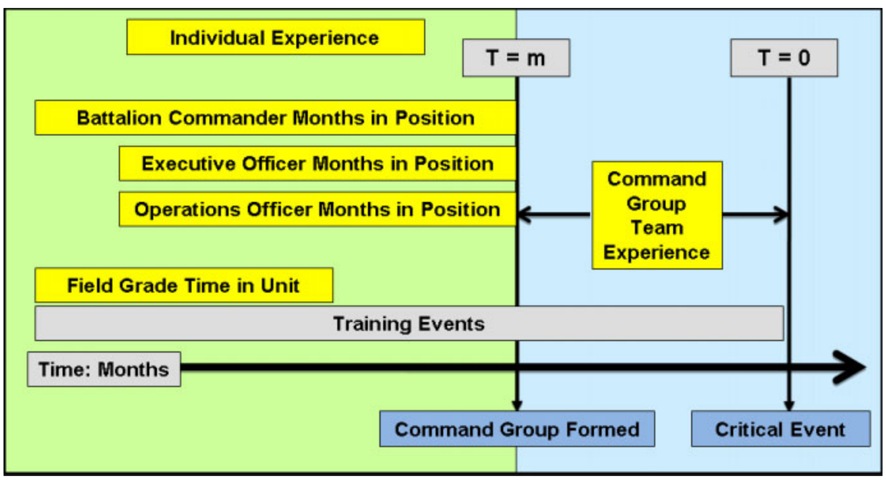


Table 3.1 shows the specific battalion command group stability variables and their descriptions. These variables capture both cumulative individual experience before the command group is formed and the team experience.

[17] The TAPDB-O provides positive monthly identification of the command groups members and what position they occupied in a specific unit.

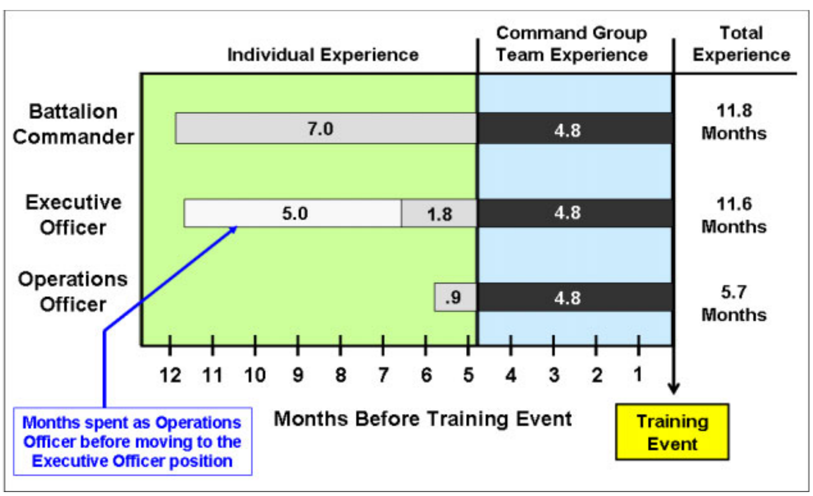
Table 3.1
Battalion Command Group Stability Variables

Name	Description
Command Group Tenure	Number of months the commander, executive officer, and operations officers serve as a team before training event
Commander	Number of months the battalion commander serves before the command group is formed
Executive Officer	Number of months the battalion executive officer serves before the command group is formed
Operations Officer	Number of months the battalion operations officer serves before the command group is formed
Field Grade Time in Unit	Number of months either the executive officer or operations officer serves in the battalion in a different position before the training event

Discussion of Battalion Command Group Stability

The results of building the stability variables for the battalion command are depicted in Figure 3.4. The data set consisted of the 66 combat arms battalions used for this research. For these 66 battalions, the critical event was a capstone maneuver training exercise.

Figure 3.4
Average Battalion Command Group Individual and Team Experience



On average, a battalion command group works together for about 5 months prior to the battalion's capstone training exercise—about 7 months less than the objective of life-cycle manning policies. Battalion commanders tend to have the most experience in position than any other member of the command group with 7 months before the command group forms.[18] Battalion executive officers usually have less than two months in the command group and the battalion operations officer tends to be the least experienced command group officer. However, many executive officers have about 5 months experience in the command group by serving as the operations officer. So although executive officers only have two months experience as an executive officer before the command group forms, they usually have additional command group experience as a battalion operations officer. This follows from the typical career progression from battalion operations officer to battalion executive officer.[19]

Battalion Command Team Stability Variables

Another important team of officers is the battalion command team consisting of the battalion commander and the maneuver company commanders. Battalion training proficiency should increase as the commanders become familiar with each other and understand their relative areas of expertise. The framework used to build the variable for the battalion command group is the same for the battalion command team. All but one commander brings prior experience as a commander when the battalion command team is formed, but I used a slightly different technique for measuring that experience. Some battalions have three maneuver companies while others have four. Therefore, rather than measure the individual months experience for each company commander before the command team was formed, I used the average number of months of company commander experience. By doing so, I ensure the impact of company command experience is measured the same across battalions that are organized differently. Additionally, this technique limits the number of independent stability variables for a data set of 66 observations by capturing individual commander experience in one variable rather than a separate stability variable for each of the company commanders. This was the most balanced way to account for the individual company commander experience while preserving degrees of freedom in the model.

Battalion command team stability averaged 5.26 months, which is slightly higher than battalion command group team stability of 4.8 months. Additionally, company commanders served an average of 6 months in position before the battalion command team was formed. This amounts to

[18] This outcome is most likely a result of the Army's objective of keeping a battalion commander in position for 24 months and the executive officer and operations officer in position for 12 months that was in place at the time of this study. Lifecycle manning would change these objectives. These time objectives were established to provide ample time for individual professional experience while ensuring all officers get an opportunity for the necessary professional development and promotion requirements.

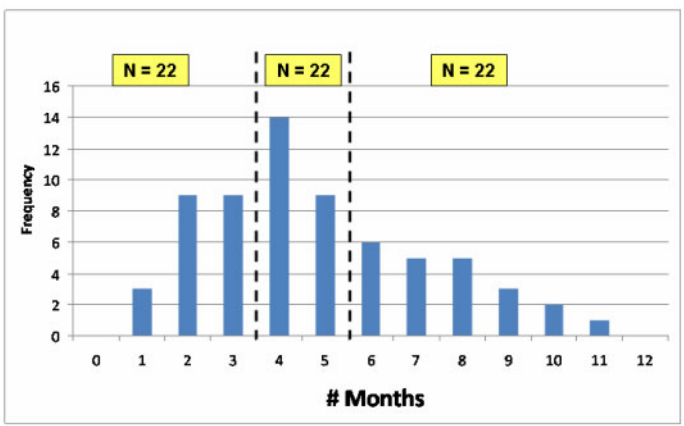
[19] In this data set, there is one example of the executive officer moving to the operations officer position.

about a year of total experience as a maneuver company commander prior to the capstone training event. The average of one year experience as a company before the critical training event was achieved under the individual replacement system and provides the same experience a company commander should achieve under lifecycle manning. This result shows that stability for some individual positions in the battalion is possible under the individual replacement system even if the team experience is reduced due to personnel turnover.

Battalion Stability Variable Distribution

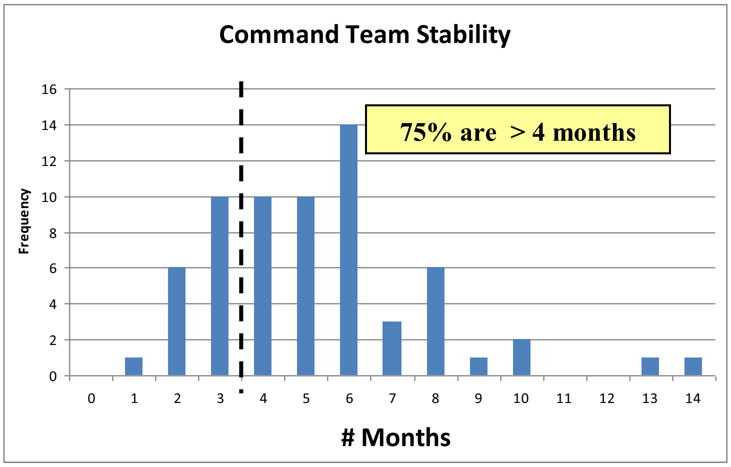
The distribution of command group stability for the 66 battalions is shown in Figure 3.5 and the battalion command team stability is show in Figure 3.6. About one third of battalion command groups were together for more than 6 months prior to capstone training event and about two thirds were together for more than 4 months. This is significant because the battalion's large collective training prior to the NTC rotation normally occurs within four months of the rotation. The implication is that two thirds of battalion command groups are together long enough to participate in the preliminary training before the capstone event.

Figure 3.5
Battalion Command Group Team Experience Distribution



The command team achieves slightly better stabilization with 43% of command teams serving together 6 months before the rotation and 75% serving together for 4 months before the rotation. It is a reasonable assessment that a significant majority of commanders were in position long enough to become familiar with their position and experience collective training prior to their training rotation at NTC.

Figure 3.6
Battalion Command Team Experience Distribution



Thus far I have presented how stability metrics for the battalion command groups and battalion command teams were created and how they could be used to determine how much battalion stability the individual replacement system achieved for these battalions before their capstone training event. In the next section, I discuss the indicator of unit effectiveness.

Measuring Unit Effectiveness

Referring to the research framework in Figure 1.2, I now transition from developing measures of personnel stability to discussing measures of unit effectiveness. Measuring unit effectiveness presents significant challenges for empirical modeling due to the lack of a clear definition for unit effectiveness, the lack of objective and observable measures of effectiveness, and the difficulty of replicating a combat environment in which to train the battalion. Before proceeding with an empirical model, I explain the benefits and limitations of the performance metric I use to estimate the battalion's ability to perform their combat mission.

The Challenge of Measuring Unit Effectiveness

A review of the literature on military effectiveness highlights the lack of a widely accepted definition of unit combat effectiveness. The most simplistic definition of success is mission accomplishment. However, the dichotomous outcome of victory or defeat does not account for the many factors that help determine the outcome of a battle, nor does it allow for the full spectrum of potential outcomes for military operations (Hayward, 1968). Some definitions of combat effectiveness include:

- The latent capacity of a force to achieve useful results in combat with its existing organization, training, equipment, support, motivation, and leadership. (Dubois et al., 1998)
- The realized capability of a force at any instant of time to achieve results in furtherance of a particular mission against a specific enemy force in a specific combat environment. (Dubois et al., 1998)
- The ability to convert potential combat power into applied combat power through fire and maneuver. (Bernasconi, 2007)
- The probability of success in combat operations. (Hayward, 1968)

Some common themes of these definitions are a dual emphasis on process and mission accomplishment, the multiple factors that impact effectiveness, and the varied conditions under which a unit conducts combat operations. In short, combat effectiveness depends on the capabilities, motivation, environment, and mission context. (Hayward, 1968; Millett et al., 1986; Weerasinghe, 2003; Bernasconi 2007)

The second challenge of measuring combat effectiveness is the difficulty of replicating a combat environment to assess battalion performance. From a practical perspective, units cannot train against an enemy that returns fire with lethal force, thereby eliminating one of the most stressful aspects of combat—the risk of death or serious injury. Training simulations cannot produce the noise, concussion, fear, confusion and chaos found on the battlefield. Even during the most realistic training exercises, the participants know the training event will end without permanent loss of life—even though simulated casualties occur. Because of this training limitation, the only way to know with certainty how a unit will perform in combat is to observe them in combat. Therefore, any attempt to measure effectiveness before combat operations is no more than an estimate of effectiveness based on the most realistic conditions possible and military judgment of those making the assessment. As stated by Philip Hayward, "…the most that can be claimed for any proposed measure of combat effectiveness is not that it is 'correct,' but that the arguments on which it is based are clear (i.e., capable of being analyzed and debated in a reasonable way), logically consistent, and in general accord with the judgments of military experts. (Hayward, 1968, p. 322)"

Battalion Training Proficiency Scores as Indicators of Effectiveness

Although overcoming the challenges of defining battalion combat effectiveness and replicating combat conditions is difficult to achieve, RAND research has provided objective measures of training proficiency that meet the criteria provided by Hayward (1968). Using these unique, objective indicators of unit effectiveness, this research moves beyond intuitive professional judgment into empirical analysis of the relationship between personnel stability and unit effectiveness.

As an indicator of combat effectiveness, I use training proficiency scores collected by trained evaluators at the National Training Center (NTC) as part of extensive RAND research on training proficiency sponsored by the US Army. [20] The NTC is a large maneuver training area located in the Mojave Desert in California designed for training heavy, mechanized brigade combat teams in conditions replicating traditional high intensity combat. The training consists of full scale force-on-force maneuvers against a fully equipped and trained opposing force manned by US Army soldiers. The training at NTC is considered by many Army professionals to be the premiere collective training event for a brigade.[21] Although exact replication of combat conditions is not achieved during the training event, this training environment is the most realistic available. A unit that performs effectively at the National Training Center is considered by operational commanders to be ready for combat operations.

The training proficiency scores provide a specific definition of success that includes an emphasis on both the process of conducting combat operations and the outcome of unit operations. The process dimension of effectiveness is measured by how well the battalion complies with task standards established in Army doctrine and agreed upon by military experts as important for success in combat operations (Hallmark and Crowley, 1997, p. 12). The outcome dimension is measured through an assessment of how well the battalion accomplished its mission given the conditions of the specific battle. This assessment incorporates the multiple factors affecting mission success through application of the professional military judgment of the observer. Additionally, the assessment of mission outcome allows for a spectrum of mission results rather than an oversimplified dichotomy of victory or defeat.

The most obvious limitation of the training proficiency scores is the measures are not a direct measure of combat effectiveness. Some would argue the training proficiency scores have limited value in determining battalion effectiveness because combat cannot be replicated and, therefore, training proficiency at the NTC falls short in predictive value for performance in combat. While this argument has merit, the fact remains there is no better measure available. Training at NTC

[20] The validity of the scores was established in previous RAND research. For a detailed discussion of the validity of these metrics see Hallmark and Crowley (1997).

[21] Training for high intensity conflict was true during the collection of this data. To train units for current deployment requirements the training audience emphasis and content of the training at the NTC has changed to reflect the current operational requirements for counterinsurgency and stability operations.

approximates combat to the limits of training simulations and the assessment scores are objectively made by military experts based on standards outlined in Army doctrine and training manuals. To improve the value of the proficiency scores, new training simulations or updated doctrinal standards are required. Until then, the NTC and these training proficiency scores are the best available alternative for estimating combat effectiveness.

A second limitation is the inherent subjectivity of a score assessed by an external observer despite the many steps taken to increase the objectivity of the score. The collection instruments were constructed to enable direct observation of events, the tasks were vetted by the observers before final data collection, the same task standards were applied to every mission, and the same evaluator assessed the battalion as it conducted the training rotation. Each member of the observation team was a subject matter expert in doctrine and training standards and they had experience serving in the staff and leadership roles they observed. Finally, the observers accompanied the training unit throughout the training event, providing a continuous presence that enabled the rater to provide complete assessment of the battalion task based on personal observation. While it is very difficult to remove all subjectivity that accompanies military judgment, the data collection instrument and score assessment process were structured to minimize subjectivity. As a result, the scores collected during this realistic training for combat battalions provide a break through opportunity to empirically estimate the personnel stability and unit effectiveness relationship. Even so, the model controls for the three different observer teams to account for any bias due to the influence of the observer team.

Assessing Battalion Training Proficiency at NTC

Scores were collected for twenty battalion level tasks, each of which belongs to one of three categories: planning, execution, or throughout. Each battalion task is an aggregate score of several sub-tasks which are averaged to provide the overall task score. For example, the battalion task of "Overall Plan Quality" has several subtasks that assessed by the observer. The sub-task scores are averaged to provide an aggregate score for the overall battalion task. Subsequently, the aggregate battalion task scores are averaged to provide a summary score for the appropriate category.

Table 3.2
Battalion Tasks Most Directly Influenced by the Battalion Command Group

Summary Category	Aggregate Task
Planning	1. Complete Plan
	2. Overall Plan Quality
Execution	1. Maneuver Tactics and Synchronization
	2. Complete Mission and Tasks
Throughout	1. Operational Command and Control
	2. Time Management
	3. Intelligence Plan

The right hand column of Table 3.2 shows the seven battalion aggregate tasks I used in this research. Although training proficiency scores were collected on a total of twenty aggregate battalion tasks, I selected this subset of seven tasks in the right column of Table 3.2 because they would most directly be influenced by the battalion command group or battalion command team. For example, "Execution of Maneuver Tactics and Synchronization" requires significant input from all members of the battalion command group, but the battalion task of planning combat service support mainly involves the battalion executive officer.

The left column of Table 3.2 contains three summary categories of battalion tasks: planning for the mission, execution of the mission, and tasks which are executed throughout the mission. Summary scores are the average of the battalion aggregate scores in that category. For example, the planning summary first score is the average of the first scores collected for the aggregate tasks in that category. By including the summary task proficiency scores, the model includes all twenty of the battalion tasks for which training proficiency scores were collected. If I incorrectly omitted an aggregate task, the summary task should indicate a relationship with the battalion command group stability and I would further investigate the aggregate tasks belonging to that summary category.

There are two scores for each task—first and best score. The first score is based upon the first valid observation of the task made during a training rotation and used as an indicator of initial entry proficiency. If the assumptions about the importance of personnel stability are valid, then units with higher stability should perform better based on first score. The best score is the highest value obtained for a battalion task during the entire training rotation. The best score enables a measure of how well a unit can perform a task taking into account the different conditions that can impact the execution of a specific task during any of the 5-7 training missions conducted during the rotation.

Finally, unit improvement--the difference between best and first score—could provide insight into how stability affects the benefit of an extensive training event. Units with lower team stability may show significant improvement because the NTC training provided the first opportunity to work through basic team processes and increase their scores more easily than a unit with high stability that achieves a high initial score and advances to more difficult tasks during the training. However, it is also possible that a high stability unit could achieve greater improvement because they can move beyond the basics and use the training to achieve significant breakthroughs in task execution.

Battalion Training Proficiency Score Results

The means of first score, best score, and the difference between scores for each of the ten battalion tasks analyzed in this research are provided in Table 3.4. On average, each battalion task showed statistically significant improvement as shown by the difference between the first and best scores and the percentage improvement shown in the right column of Table 3.4. The improvement in training proficiency scores as assessed by the trained observers indicates the training experience provided at the NTC achieves the desired outcome—unit effectiveness increased after the training. In order to protect information about overall readiness status of the battalions involved in this study, I am not providing a scoring scale that would enable a readiness classification of these units. For purposes of this research, the important issue is the relative proficiency levels between units of varying degrees of personnel stability. Whether or not the units were prepared for combat based on an assessment by the outside evaluator is not the issue addressed in this dissertation.

Table 3.4
First, Best, and Improvement Mean Scores for Battalion Tasks

Battalion Task	First Score	Best Score	Improvement
Planning Summary	1.98	2.26	.28 (14%)
Complete Plan	2.16	2.42	.26 (12%)
Overall Plan Quality	2.17	2.53	.36 (17%)
Execution Summary	1.63	2.00	.37 (23%)
Maneuver Tactics and Synchronization	1.45	1.87	.42 (29%)
Complete the Mission	1.69	2.27	.58 (34%)
Throughout Summary	2.04	2.30	.26 (13%)
Operational Command and Control	2.14	2.51	.36 (17%)
Time Management	2.32	2.72	.40 (17%)
Intelligence Plan	1.61	2.03	.42 (26%)

Having built new stability variables for the battalion command group and battalion command team and having described the measure of effectiveness used in the empirical analysis, I now proceed to a description of the model specification I used to analyze the stability-effectiveness relationship.

4. Model Specification for the Stability-Effectiveness Relationship

Formulating models to predict combat effectiveness is fraught with many challenges. Because no training environment can fully replicate combat conditions, effectiveness data gathered from training exercises must, at best, be considered an approximation of unit combat effectiveness. Data collection instruments are likely to omit variables that influence unit performance. Additionally, there is no widely accepted functional form for modeling tactical effectiveness against a thinking enemy. These challenges prevent a straight-forward solution to the problem of empirically predicting unit effectiveness. However, the need for the best possible empirical analysis is clear when the Army is incurring the costs of a significant policy change without knowing the magnitude of the benefits.

Attempts to model combat effectiveness are not new and faced the same practical problem for decades: the extent to which a model can predict combat effectiveness on the basis of empirical data, theory, and expert judgment (Hayward, 1968, p. 321). Hayward (1968) provides three ways an analyst can approach the problem—intuition, wargaming, and empirical analysis. The intuitive approach is the method most often used by advocates of lifecycle manning—in large part due to the lack of data and previous empirical work on the effects of stability. This approach primarily relies on historical evidence, individual testimonies, and exercising military judgment to search for explanations of a unit's performance during battle. This method can also be characterized as having a "lack of traceable connections between facts, assumptions, and conclusions" (Hayward, 1968, p. 321).

The second alternative is wargaming. At the time of his writing, Hayward (1968) could not foresee how his argument against wargaming as an expensive form of analysis would be nullified by the increased capability and reduced costs of wargaming and simulation in the information age. However, what has not changed is wargaming's reliance on data and mathematical relationships to predict most likely outcomes in a given scenario. Wargaming simulations are only as good as the data, assumptions, and rules programmed into the simulation. Limitations of wargaming a policy such as lifecycle manning exist because there has been no empirical treatment of how variations in personnel stability might affect unit effectiveness.

The third option is empirical analysis that combines data, theoretical analysis, and military judgment (Hayward, 1968). Undoubtedly, there are limitations to empirical modeling. Factors that impact effectiveness are likely to be omitted from the model. Any functional form chosen may not capture the underlying dynamics of an environment as fluid and random as combat. Despite these limitations, empirical analysis is the only way to move beyond the intuitive approach and into the arena of observable and measurable outcomes. A model based on sound analytical techniques and professional military judgment could "produce a method that might be expected to be more reliable than the unstructured use of military judgment and a great deal cheaper than wargaming" (Hayward, 1968, p. 322).

Production Function for Battalion Training Proficiency

I analyze the stability-effectiveness relationship using production function theory from economics. In the most general conceptualization of producing combat effectiveness, the Army provides a combat arms battalion with input factors of production such as equipment, personnel, time, and training resources (land, ranges, ammunition, and simulators) that are combined in some way by battalion commanders to produce the "output" of combat ready battalions. For the production function framework used in this dissertation, the output of battalion combat effectiveness is measured by training proficiency scores received for battalion tasks during the NTC rotation. Increased output is represented by higher training proficiency scores—the higher the score, the higher the output.

There are two principals from production theory that are intuitively appealing when considering the relationship between inputs and combat effectiveness. The first principal is the presence of diminishing returns to increases in one factor of production while the other input factors remain constant (Nicholson, 2002, pp. 268-9). In other words, the total production increases with the increase of an input factor but at a decreasing rate. As specifically applied to this model, production theory assumes diminishing returns to increased stability. Each additional month of stability would result in less improvement to the training proficiency score than the previous month. Intuitively, this assumption seems reasonable for the efficiencies expected from increased team stability. The first few months together would increase effectiveness quickly as team processes are established based on the capabilities of the various team members. Once those initial gains are made, however, the rate of improvement should decrease as the team progresses through more difficult team tasks. Effectiveness might continue to improve but not at the same rate as when the team first formed.

The second applicable principal is that total production increases over a range of increased input factors, but does not increase monotonically for all increases of the input factor. With all other factors held constant, a point exists where the marginal product of the variable input becomes negative and overall production begins to fall (Binger and Hoffman, 1998, p. 253). As applied to this model, there could be a value for team stability where further increases do not increase training proficiency and, if taken to the point where negative aspects of stability might begin, team stability could cause a decrease in performance reflecting a negative marginal benefit of stability.[22] These principals of production theory are contrary to the Army's implicit assumption that unit effectiveness increases monotonically in a positive, linear relationship with personnel stability.

As with any underlying theory, there are limitations to application of production theory to analysis of stabilization and unit effectiveness. The primary limitation is that production functions emphasize the technological combination of factor inputs to determine efficient allocations of capital and labor to obtain a certain level of output. Production theory does not consider the underlying process or human dynamics of production. If I were considering only the technical combination of input factors, I would analyze the impact of personnel by increasing the number of "soldier hours" in the production model.

However, my application of production theory to the stability-effectiveness relationship diverges from a straight-forward increase of labor input. Rather than increasing the quantity of labor, more personnel stability theoretically improves the quality of labor through team synergy that increases efficiency even though the quantity of labor (number of personnel) remains constant. So, although the amount of labor does not change, there should be an increase in training proficiency scores due to this marginal increase in stability each month the team remains together. If the assumption of diminishing returns holds true, each additional month of stability should increase the training proficiency score—albeit by a lesser amount than the previous month.

What factors of production should be considered?

Previous research provides ample discussion about what factors influence combat effectiveness (Hayward, 1968; Millet et al., 1986; Henderson, 1990; Weerasinghe, 2003; Bernasconi, 2007). Although there are many differing perspectives on the definition of military effectiveness and what factors are most important in determining high levels of effectiveness, the factors generally fall into the following categories:

[22] Total production is maximized once the marginal product of an input factor equals zero. If the objective is to maximize production, then adding more of the input beyond this point reduces total production and the input factor should be reduced. In the context of producing effectiveness, adding more stability beyond the time when the marginal benefit of stability equals zero translates into a reduction in overall performance. While the principal is the same as physical production, the reduced total production is more difficult to identify for an intangible product like readiness.

1. **Physical Dimension**: Material resources (equipment, supplies, weapons, etc.), number of personnel, and quantity/type of training
2. **Human Dimension**: Morale, leadership, cohesion, quality of personnel
3. **Professional Dimension**: Doctrine, standard operating procedures, education systems, management policies, and organizational structure
4. **Battlefield Environment**: Terrain, weather, light conditions
5. **Mission Requirements**: Type of mission, time available to plan, and enemy capabilities

All categories are potentially important for determining combat effectiveness, but specific inclusion into an empirical analysis is driven by several practical matters that seem obvious, but I mention anyway. First, to be included in an empirical model the factor must be quantifiable with either a continuous or categorical variable and the variable must accurately measure the factor under consideration. Second, the availability of data determines whether or not the factor can be included in the model. While it might be beneficial to know the battlefield conditions for a specific military action, the data may not be available for inclusion into the model. Finally, the sample size limits the number of factors that can be included in order to maintain statistical power and the need to preserve degrees of freedom.

These practical matters almost guarantee that any empirical analysis will omit factors that may have a significant relationship with unit effectiveness. However, this limitation should not discourage research that can provide insight into a specific factor of military effectiveness. Empirical analysis should control for as many factors as possible given the available data while isolating the effect of the variable of interest. By doing so, insights can be gained about that particular factor and the unexplained variance can chart a course for future research. At the very least, such analysis could establish a testable, explicit relation between observable and measurable factors and combat effectiveness (Hayward, 1968).

Specification of the Stability-Effectiveness Model

Given the underlying concepts of economic production theory, the different categories of factors that potentially influence military effectiveness, and the practical limitations of available data, I specified the function shown in Figure 4.1 to capture the five dimensions of unit effectiveness. The factor input of interest for this model is personnel stability, which is part of the human dimension of military effectiveness. While there are many aspects to the human dimension, I am focusing solely on the effect of personnel stability since that is how lifecycle manning attempts to increase the quality of that factor input. Other human factors are not included in the model and their influence will be part of the error term.

I included a quadratic term in the model specification to capture the assumption of diminishing returns to personnel stability and because a scatter plot of the data indicated the potential for diminishing returns occurring. An example of this potential quadratic is shown by the circled data points in Figure 4.2. If the stability-effectiveness relationship is statistically significant then production theory would support a negative coefficient for the quadratic term showing a decreasing benefit to each additional month of team stability. A point of concern for me was the presence of a few data points with high stability values and low training proficiency scores that could influence the model.[23]

Figure 4.1
Quadratic Production Function Model for Training Proficiency

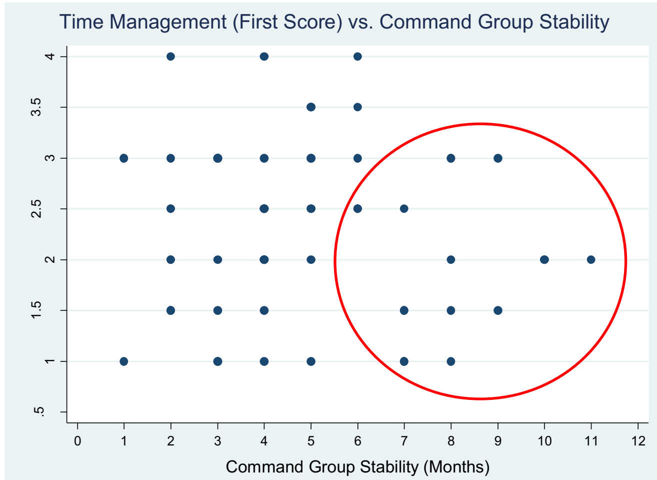
$$Y_{FTi} = \alpha + \delta_v S_{vi} + \lambda_v S_{vi}^2 + \beta_1 I_i + \beta_2 U_i + \beta_3 R_i + \varepsilon_{FTi}$$

S – stability; I – Installation; U – Type of combat unit; R - Rating Team

- Dependent Variable: Battalion training proficiency score
  - First score as an indicator of entry level proficiency
  - Best score as an indicator of overall unit proficiency
  - Subscripts→ *F*: Score, *T*: Task Number, *i*: Observation (N=66)
- Independent Variable of Interest: New Stability Metrics
  - Measure team stability of battalion leadership team
  - Measure individual experience of the team members
  - Subscripts→ *v*: type of stability variable, *i*: Observation (N=66)
- Control Variables:
  - 11 different home bases (training resource availability)
  - 4 different types of combat units (equipment, personnel, mission)
  - 3 different observer teams (observer bias)

[23] Scatter plots of all battalion task training proficiency scores against command group stability are available in Appendix A. They all show similar training proficiency outcomes for the observations with command group stability greater than six months.

Figure 4.2
Scatterplot for Time Management (First Score) vs. Command Group Team Stability



Through the inclusion of several indicator variables and three assumptions into the model, I attempt to capture as many input factors as possible in the five previously listed categories. The first category, the physical dimension, is captured by using indicator variables for the home installation where each unit is based and for the type of combat unit undergoing the training event. The indicator variable for the unit's home installation attempts to incorporate the effect of training resources on the unit training proficiency. Each installation has a unique set of training resources, such as maneuver areas and live-fire ranges that are used to prepare the units for their training rotation at the NTC. Some installations have access to large maneuver areas that enable large scale maneuver exercises, while others have limited maneuver areas that can support mechanized training. Installations also have different organizational cultures and training priorities due to the differences in higher headquarters that allocate resources among several competing organizations. Lastly, some installations send units to NTC more frequently than others and there may be training efficiencies derived from multiple iterations of preparing units for NTC.

The model integrates another aspect of the physical dimension by using an indicator variable to estimate the effect that the four different types of combat units could have on training proficiency outcomes. The four types of combat arms battalions considered in this research are light infantry battalions, mechanized infantry battalions, armor battalions, and cavalry squadrons. This controls for each unit's specific organizational structure, available equipment, unique application of doctrine, and tailored training programs. Light infantry battalions generally have more personnel, while mechanized units have more armored fighting vehicles. Each unit is manned and equipped for a particular set of missions most appropriate for their organization. For example, light infantry units are primarily used for dismounted operations in restricted terrain and mechanized forces are more appropriate for maneuver warfare in open terrain. Armor battalions are designed for offensive operations while cavalry units have a primary mission of reconnaissance. While there is similarity in battalion level tasks, each unit has their own distinct set of resources, or factor inputs, to produce training proficiency. The indicator variable for unit type attempts to capture those differences at the aggregate level to determine their influence on training proficiency.

Model Assumptions

I make three assumptions to include factors about the dimensions of the battlefield environment, the mission requirements, and the professional dimension. The first assumption is that the battlefield environment is the same for each battalion. I make this assumption because during the time this data was collected the operating environment at the NTC remained essentially the same for all training rotations. There are variations in the environment based on the weather and light conditions at the time of the mission, but the tactical impact of the terrain remains the same for all units.

The second assumption is that each battalion faces the same mission requirements that are appropriate for the type of combat unit in question. Not every rotation is identical, but they follow similar templates that include some combination of offensive operations (deliberate attack, hasty attack, or movement to contact) and defensive operations (deliberate defense and hasty defense) (Hallmark and Crowley, 1997).

One aspect of the mission that varies with each battalion is the enemy situation and capabilities. The enemy situation can vary based on size and capabilities. For example, the opposing force at the NTC can be allocated chemical strikes, helicopter sorties, and additional maneuver units based on the training objective for the battalion in question. These differences in the opposing forces capabilities, based upon an expectation that a more experienced command group can handle a more difficult mission, could result in units with high stability receiving low training proficiency scores because they faced a tougher scenario. Conversely, units with low stability receiving high training proficiency scores because they faced an easier scenario based upon a perception the command group needs some time and practice to develop the team synergy. I research this possibility by examining training records available for some of the battalions with high levels of stability. These records could contain information about the training scenario that helps explain training proficiency scores. I discuss some insights from this research in Chapter 5.

As for the professional dimension of factor inputs, I make a third assumption that members of the battalion command group have similar career paths. By the time officers join a battalion command group, each of them has commanded a combat arms company, served as a platoon leader, and completed staff assignments. Additionally, they have attended similar Army professional schools where they study Army doctrine. There is some variation in career paths based on assignments outside operational units such as graduate school, recruiting duty, joint staff duty, and other institutional assignments. However, I assume the commonality of career paths ensures that each member of the command group has sufficient similarity of background and no member of a command group has an experience that would provide a team with a unique advantage over the other command groups considered in the research.

Finally, the model controls for the three different rating teams that collected training proficiency scores during each battalion's training rotation. Each rating team may have their own culture and attitude about their responsibilities as observers. Teams may vary in their emphasis of certain tasks or their interpretation of how well the unit achieved a certain task. Additional variance could result from internal training procedures and specialty composition of the team. By controlling for the different rater teams, the model controls for any bias in the proficiency scores based on who is collecting the scores.

Having discussed the theory behind the model, the factors that influence military effectiveness, and the model specification, it is now time to move on to the analysis. Chapter 5 discusses the results of the analysis and Chapter 6 examines the policy implications of those results along with some recommendations for future research.

5. Analysis Results and Discussion

Army senior leaders have undertaken a significant transformation of personnel management policies with the expectation that increased personnel stability will result in higher levels of unit effectiveness at all echelons of the brigade combat team. They would expect the results of this model to show a prevalent, positive, and linear relationship between the battalion command group stability variables and the battalion training proficiency scores. Specifically, expectations for the stability-effectiveness analysis are that the model would show both a statistically significant relationship for all battalion tasks and a practical impact of sufficient magnitude to show a demonstrable payoff from increased battalion command group stability in attaining higher training proficiency scores. Also, even though I have not found an official Army document or statement that explicitly articulates a position regarding a linear relationship between stability and training proficiency, the implicit expectation appears to be that increases in personnel stability will result in ever increasing unit effectiveness.

Contrary to the expectations of lifecycle manning advocates this analysis does not show a prevalent or strong relationship between battalion command group stability and battalion training proficiency as measured during the battalion's NTC rotation. In the few tasks with a statistically significant relationship, the analysis does not show a linear relationship but finds diminishing returns to stability with the maximum benefit occurring between five and seven months. The dissenting views discussed in Chapter 2—which are based on historical analysis, scientific analysis, and professional judgment—raised reasonable doubts about the importance placed on personnel stability as a determining factor for increased unit effectiveness. The empirical results of this dissertation lend credence to these views as applied to battalion command groups. In this chapter I address the expected results based on the Army's assumptions about the benefits of stability, compare those expectations to the actual results of the empirical analysis, and provide explanations for the differences.

Are Higher Levels of Stability Associated with Higher Training Proficiency?

After developing new measures of personnel stability, the second research objective is to answer the following research question: Do higher levels of battalion command group and battalion command team stability result in higher battalion training proficiency? The expected answer to this question is "yes" but the answer appears to be "not very often." Tables 5.1 and 5.2 provide a summary of how often the battalion stability variables showed a statistically significant relationship with battalion raining proficiency. All ten battalion training tasks examined in this research are listed on the left side of the table and each of the stability variables, which include the quadratic term, are listed across the top of the chart. The black box indicates a relationship at a 95% confidence level, the grey box a 90% confidence level, and the empty box indicates no relationship. As shown in the tables, there does not appear to be a prevalent relationship between battalion command group stability and training proficiency scores.

Table 5.1
Stability Relationships with Battalion Level Tasks (First Scores)

Task Name	Command Group Stability	Command Team Stability	Battalion Commander Stability	Executive Officer Stability	Operations Officer Stability	Field Grade Unit Stability	Company Commander Stability
Planning (Summary)				90%			
Complete Plan				90%			
Overall Plan Quality				90%			
Execution Summary				90%			
Maneuver Tactics Synchronization	90%						
Complete Mission and Tasks							
Throughout Summary							
Operational Command and Control							
Time Management	90%			95%		95%	95%
Intelligence Plan							

95%	90%	None

Table 5.2
Stability Relationships Battalion Level Tasks (Best Scores)

Task Name	Command Group Stability	Command Team Stability	Battalion Commander Stability	Executive Officer Stability	Operations Officer Stability	Field Grade Unit Stability	Company Commander Stability
Planning (Summary)							
Complete Plan							
Overall Plan Quality	90%						
Execution Summary							
Maneuver Tactics Synchronization							
Complete Mission and Tasks							
Throughout Summary							
Operational Command and Control							
Time Management	95%			95%			
Intelligence Plan							

95%	90%	None

Based on the assumption of increased proficiency resulting from stability, first score training proficiency should show the highest frequency of tasks that benefit from stability. First scores are a more appropriate indicator of entry level proficiency than best scores because the unit has not yet experienced the training benefit from the training conducted during the NTC rotation. Yet, as illustrated in Table 5.1, the only task showing a clear benefit to stability at initial entry is Time Management. Even in the single case of Time Management, individual experience of the executive officer (which is also reflected in the Field Grade Time in Unit stability variable) and the company commander experience before the battalion command team is formed show a more significant relationship with training proficiency than battalion command group team stability.

The model does shows potential for a benefit to initial entry proficiency from the individual experience of the executive officer. In three planning tasks and the execution summary task, where the executive officer plays a key role in coordinating staff functions, the executive officer's experience in position shows a 90% significant relationship. Additionally, the executive officer's experience appears to play an important role in the battalion's time management. This is not surprising since the executive officer is the member of the command group responsible for adhering to the mission planning timeline. However, the model also shows that influence of the executive officer's experience does not remain except for Time Management (Best Score), which indicates the training conducted at NTC equalizes the proficiency of executive officers in supervising the execution of the mission and the mission planning tasks.

Table 5.2 highlights the presence of even fewer statistically significant relationships between battalion stability variables and the best scores achieved for battalion training proficiency. Whereas there were nine instances where stability showed a relationship with the first score of a battalion training proficiency score, there are only three examples of a significant relationship with best score. It appears that any slight benefit to initial training proficiency from stability does not remain once the battalion has an opportunity to train.

The Absence of Statistically Significant Relationships

Given the expectations of Army decision makers, further discussion is warranted concerning the absence of a prevalent relationship between training proficiency and most of the battalion stability variables that measure both team stability and individual experience. Because lifecycle manning policies are designed to increase team longevity, this analysis includes two stability variables designed to measure team longevity: command group stability and command team stability. However, neither of these two measures of team stability shows a frequent relationship with battalion training proficiency.

The first empirical result concerning team tenure is that command team stability—the amount of time the battalion and company commanders work together—is not found to be statistically significant in *any* task for both first score and best score. The second result is that command group stability—the group that should have the greatest impact on battalion task training proficiency—only affects Time Management (Best Score) at the 95% confidence level. Time Management (First Score), Maneuver Tactics and Synchronization (First Score), and Overall Plan Quality (Best Score) have a relationship with command group stability at the 90% confidence level. Despite the strong assumptions about the benefit of team stability, battalion command group stability and command team stability do not show a statistically significant relationship with battalion training proficiency.

In addition to the contrarian results about the benefit to team stability, the analysis also indicates an unexpected lack of benefit to individual experience. This is particularly true for the battalion commander because he fulfills a preeminent role in the battalion by providing guidance, focus, and direction for the organization. Conventional wisdom would expect battalion commander longevity to have a positive relationship with at least one, if not several, of battalion training proficiency scores. These results should not be interpreted as evidence that the commander does not play an important role in the functioning of the battalion. The more appropriate conclusion from the model is that the number of months the commander spends in position before the command group forms does not show a significant relationship with the battalion's training proficiency at the NTC.

The same expectation holds true for the battalion executive officer and operations officer, both of whom fulfill critical roles in producing the operations orders that direct the battalion's execution of the mission and providing oversight to ensure the battalion is properly controlled. Although the experience of the executive officer does appear in several tasks, albeit at the 90% confidence level, the operations officer results are the same as the battalion commander—no relationship between battalion training proficiency scores and the months of experience for the operations officer.

These results should not surprise those familiar with the Army's professional development program. The Army invests large amounts of time and money to professionally develop officers so they can succeed and contribute to unit success right away. Officers are expected to walk into a position during peacetime or combat and be able to lead immediately. Command groups formed shortly before the training event and still achieved high training proficiency scores. This outcome may be an indication of how well the Army's professional development model prepares officers to serve as part of a battalion command group. Most majors who fill the executive and operations officer positions completed the command and general staff college—a one-year residence professional school where the officer studies to become an effective staff officer. The real surprise would be if this professional education had no effect and units performed lower due to a difference of a few months in the position. By the time the officer arrives at the battalion, he should only need to become familiar with the specific operating procedures of the unit he joins and the style of the battalion commander.

Likewise, battalion commanders bring a wealth of experience and training that encompasses a minimum of fifteen years of experience and professional schooling. They are selected by a centralized board and are among the most talented officers of their commissioning year cohort in terms of past performance and future potential in operational assignments. Commanders are expected to perform effectively the day they assume command of the battalion and additional proficiency gained from a few additional months in the job should not be the difference between a highly proficient battalion and a poorly trained battalion.

Failure to Detect the Stability-Effectiveness Relationship

The analytical conclusion of a non-existent relationship between battalion level stability and battalion training proficiency should be viewed with some skepticism. There are many factors that potentially affect training proficiency and not all of them could be included in this model. The potential exists for this model to lack the appropriate power to detect a small relationship that is overwhelmed by other factors not included in the model. I addressed the probability of failing to detect an existing relationship by computing the probability of a Type II error (β).[24] The results are provided in Table 5.3.

The results in Table 5.3 show that all but the two shaded instances meet the standard accepted β=.20 maximum threshold. Because these two tasks have a Type II error probability exceeding the acceptable standard, I can not make the assertion that battalion level stability has no statistical relationship with the following two battalion tasks: Quality of the Plan (First Score) and Completing the Mission (Best Score).

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[24]The values were computed using a calculator program available at the following web address: http://www.danielsoper.com/statcalc/calc03.aspx.

Table 5.3
Type II Error Probability (β) for All Training Proficiency Scores

	First Score			Best Score		
Battalion Task	β	R-Square	N	β	R-Square	N
Planning Summary	.045	.3851	61	.035	.3775	65
Complete Plan	.051	.3692	63	.048	.3628	65
Overall Plan Quality	.289	.2632	60	.142	.3001	65
Execution Summary	.002	.4849	62	.187	.2803	65
Maneuver Tactics and Synchronization	.003	.4868	61	.179	.2838	65
Complete the Mission	.046	.3840	61	.244	.2586	65
Throughout Summary	.002	.4870	63	.026	.3892	65
Command and Control	.002	.4912	62	.063	.3438	65
Time Management	.037	.3893	62	.027	.3887	65
Intelligence Plan	.043	.3824	62	.105	.3187	65

$\alpha = .05$ for all β calculations

The lack of a statistically significant relationship between battalion command group stability and Complete the Mission (Best Score) accompanied by a high probability of a Type II error is worth further discussion. One possible criticism of the training proficiency scores is that the scores are based on adhering to doctrinal standards that more experienced command groups may not strictly follow in lieu of their more refined and appropriate techniques for planning and execution of battalion missions. As command groups become more proficient, they may rely more on their internal standards developed over time and would, therefore, receive a lower score because they are not in compliance with the specific standard outlined in the doctrine. The resulting training proficiency score may not measure the benefits of team stability that can occur outside the standards of established doctrine. However, if an experienced command group deviates from doctrinal standards based on their internal team effectiveness, the deviations should improve the battalion's ability to accomplish the mission. The apparent lack of a detectable relationship between team stability and mission accomplishment could undermine this criticism of the model, but the high β value for this task does not support the conclusion of no relationship for this task. Therefore, stability may have an effect on completing the mission that is not detected by this model.[25]

What is the Marginal Benefit of Stability?

The battalion level stability-effectiveness relationship may not widespread, but for the tasks where a statistical relationship was found it would useful for policy makers to know the magnitude

[25]Further discussion about techniques used increase statistical power is presented in Appendix D.

of the relationship. As mentioned in Chapter 2, the stability-effectiveness literature suffers from a lack of research on the quantifiable performance benefit of increased stability. From a decision maker's perspective, the additional benefit from increased stability is an important metric for determining the payoff to stabilizing the battalion command group. Using the language of the production function, this analysis estimates the marginal benefit to stability—otherwise stated as the percentage increase of training proficiency from an additional month of stability.

The starting point for determining the marginal benefit is the coefficient estimates determined with the regression analysis. The coefficient estimates for the statistically significant relationships are provided in Table 5.4.[26]

Table 5.4
Stability Variable Coefficient Estimates

	Command Group Stability	Command Group Stability (Quadratic)	Executive Officer Stability	Executive Officer Stability (Quadratic)	Field Grade Unit Stability	Field Grade Unit Stability (Quadratic)	Company Commander Stability	Company Commander Stability (Quadratic)
Time Management (First Score)	.101*	-.010*	.115**	-.009**	.043**	-.003**	.112**	-.010**
Maneuver Tactics and Synchronization (First Score)	.116*	-.011*						
Planning Summary (First Score)			.059*	-.005*				
Overall Plan Quality (First Score)			.082*	-.007*				
Execution Summary (First Score)			.072*	-.006*				
Complete Plan (First Score)			.056*	-.005*				
Overall Plan Quality (Best Score)	.085*	-.007*						
Time Management (Best Score)	.091**	-.009**	.075**	-.006**				

* p-value <= .10 ** p-value <= .05

Using these estimates from the model, I calculated the predicted values of the appropriate training proficiency scores to determine the estimated percentage increase in the training proficiency score for each additional month of stability. The results for the statistically significant relationships for first scores are shown in Table 5.5 and the results for best score are shown in Table 5.6. On both tables, the month where the maximum overall improvement occurs is highlighted with the grey shading. In the case of first score proficiency, the maximum benefit occurs from five to seven months. For best score, the maximum benefit occurs in five to six months.

[26] These coefficient estimates are based on a model with a square root transformation of the dependent variable. The transformation was required to ensure constant variance of the residuals. When analyzing the marginal benefit, the total effect will be on the untransformed training proficiency score.

The production function assumption of diminishing returns to stability holds for the cases where stability was statistically significant. While I can not assert this finding contradicts the Army's expectations, the presence of a quadratic implies a maximum benefit to stability rather than a purely linear relationship that assumes more stability will always result in better unit effectiveness. Because of the negative coefficient for the quadratic term, questions arise about the optimal amount of stability to attain the maximum benefit. This analysis provides insight for this policy issue.

Table 5.5
% Increase to Battalion Training Proficiency First Scores from Monthly Stability Increases

	Time Management				Maneuver Tactics and Synchronization	Planning Summary	Overall Plan Quality	Complete Plan	Execution Summary
Month	Command Group Stability	Executive Officer Stability	Field Grade Unit Stability	Company Commander Stability	Command Group Stability	Executive Officer Stability	Executive Officer Stability	Executive Officer Stability	Executive Officer Stability
1	17.6	20.6	7.5	19.8	19.3	8.2	11.6	7.0	11.8
2	12.5	15.4	6.2	14.4	13.8	6.4	8.9	5.4	9.1
3	8.4	11.3	4.9	10.1	9.4	4.8	6.5	4.0	6.7
4	4.9	7.9	3.8	6.4	5.7	3.3	4.4	2.6	4.6
5	1.7	4.9	2.7	3.2	2.4	1.9	2.5	1.4	2.7
6	-1.3	2.3	1.6	0.3	-0.7	0.5	0.6	0.1	0.9
7	-4.3	-0.3	0.7	-2.6	-3.7	-0.8	-1.1	-1.1	-0.9
8	-7.4	-2.8	-0.3	-5.5	-6.8	-2.1	-2.9	-2.3	-2.6
9	-10.8	-5.3	-1.3	-8.5	-10.1	-3.4	-4.8	-3.6	-4.4
10	-14.5	-7.9	-2.3	-11.8	-13.9	-4.8	-6.7	-4.8	-6.3
11	-19.0	-10.8	-3.3	-15.7	-18.2	-6.3	-8.8	-6.2	-8.3

Table 5.6
% Increase in Battalion Training Proficiency Best Scores from Monthly Stability Increases

	Time Management		Overall Plan Quality
Month	Command Group Stability	Executive Officer Stability	Command Group Stability
1	12.7	10.6	10.2
2	9.3	8.3	7.9
3	6.3	6.3	5.9
4	3.7	4.4	4.1
5	1.3	2.8	2.5
6	-1.0	1.2	0.9
7	-3.3	-0.4	-0.7
8	-5.7	-1.9	-2.2
9	-8.2	-3.5	-3.7
10	-11.0	-5.1	-5.4
11	-14.1	-6.8	-7.1

For each task and variable with a statistically significant relationship there is rapid improvement over the first three months. Following the initial gains from stability, performance still continues to improve until the five to seven month mark where the maximum benefit is achieved. However, while proficiency scores are increasing over this initial six month period each additional month brings less of an increase as the team or individual learns the basics quickly before proceeding to the more difficult tasks. These results seem intuitive when considering how teams probably experience high effectiveness gains as they work through the early phases of establishing group norms and procedures. Once the initial improvements are made improvement becomes more difficult as the team undertakes more difficult tasks.

A graphical depiction of the diminishing returns is shown for the task of Time Management (First and Best Score) in Figure 5.1 and Figure 5.2. These graphs show the relative contribution of the different stability variables for this task and the months where maximum benefit from stability is expected. The graphs also show which variables are estimated to contribute the most to the task. In this case, executive officer experience contributes the largest overall increase to the proficiency score and also shows the highest rate of increase. The company commander average experience is also estimated to show a larger influence on the training proficiency score than command group tenure. This result seems reasonable because more experienced commanders should require less specific guidance, making it possible for the battalion to issue the operations order more quickly because staff time is not required to provide as much detail in the order. The final individual stability variable depicted is the field grade experience in the battalion.

While statistically significant, the actual contribution of field grade experience is not estimated to be as large as the other individual experience variables. Both the magnitude and rate of increase is smaller—as shown by the flatter curve. In all but one battalion in the data base, the field grade experience reflected the experience gained in the battalion as the operations officer before becoming the battalion executive officer. The experience gained in the battalion may be part of the reason that executive officer experience has a larger impact than any other variable. The combination of operations officer experience and executive officer experience support the conclusion that keeping one Major in the battalion command group, who serves as both the operations officer and the executive officer before the command group forms, could have a positive impact on battalion training proficiency for at least the Time Management task.

Figure 5.1
Benefit of Command Group Stability to Time Management (First Score)

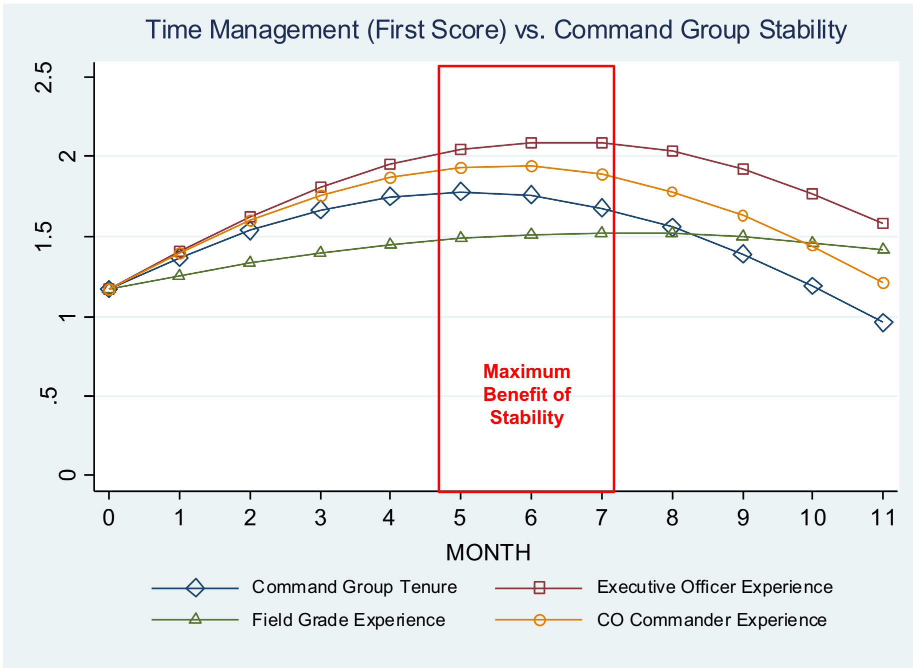
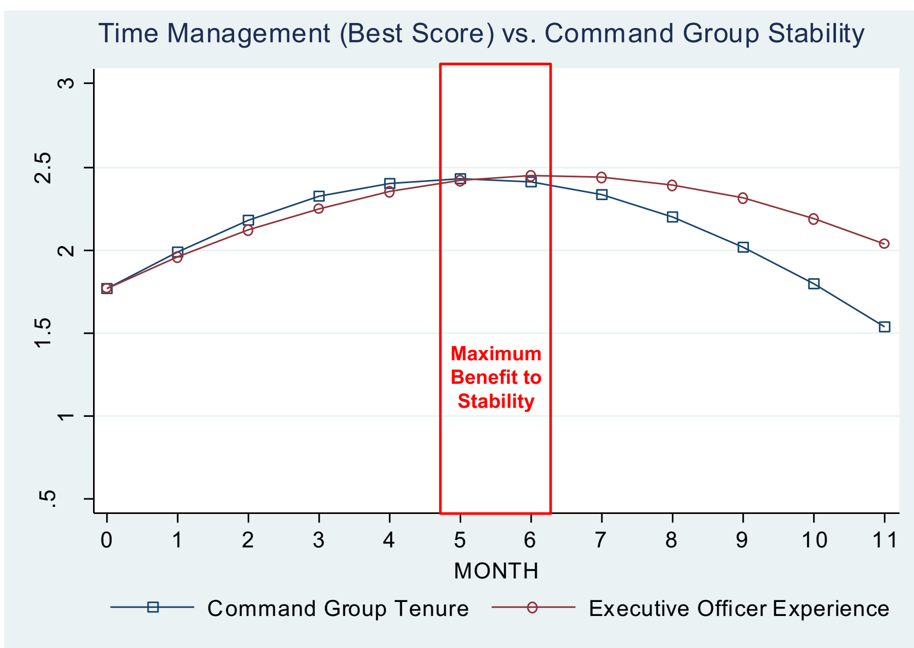


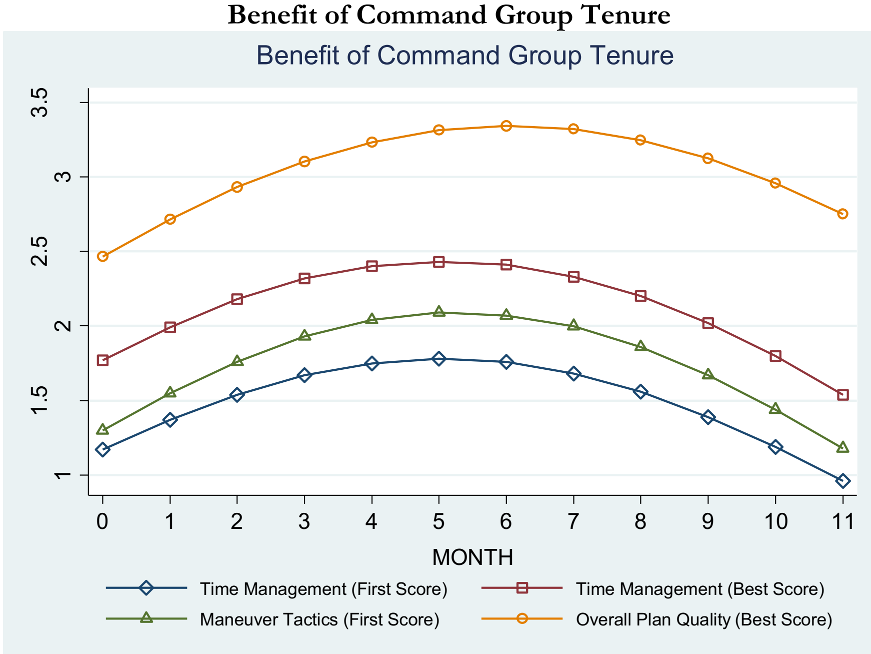
Figure 5.2
Benefit of Command Group Stability to Time Management (Best Score)



Examination of the Time Management (Best Score) graph tells a slightly different story. Company commander experience and field grade experience no longer have a statistically significant relationship with Time Management proficiency once the training at NTC has taken place. For the two remaining stability tasks, they are related to overall proficiency in a similar manner through 6 months of stability. Command group shows a slightly higher marginal benefit to increased tenure, but the cumulative increase in training proficiency is almost identical.

An alternate way of examining the marginal benefit to stability is looking at the effects of command group tenure and executive officer experience across multiple tasks where these two variables are statistically significant. Figure 5.3 illustrates the stability-effectiveness relationship for command group tenure for four different battalion tasks. Of the four tasks shown, Time Management (Best Score) is the only task that shows a relationship at the 95% confidence level. The other three tasks are at the 90% confidence level. All four tasks are consistent with diminishing returns to stability and a maximum effect occurring after the first 5-6 months of team stability. Overall Plan Quality (Best Score) shows both a faster rate of increase and a larger overall effect on the training proficiency score. This makes intuitive sense because the quality of the plan should improve as the commander becomes better at issuing guidance and the field grade officers become better at understanding the commander's guidance and producing more complete orders.

Figure 5.3
Benefit of Command Group Tenure



The relationship between command group tenure and Maneuver Tactics and Synchronization is also intuitively appealing. This task serves as an indicator of the battalion's proficiency at maneuvering forces to the correct location at the correct time. The forces include not just the maneuver forcers, but all the other resources available such as engineers, aviation, and artillery. Because this task is very complex, there could be efficiencies gained from members of the command group establishing an effective division of labor based on their relative competencies and an understanding of what information is required for effective decision making.

Another aspect of stability benefits illustrated on this graph is the improved training proficiency scores for Time Management from first score to best score. The shapes of the two curves are very similar, but the best score curve shows a higher level of proficiency. This is another indicator of the benefit to the NTC training event. For all levels of command group stability, units tend to perform better after conducting training than they did during the first time they were observed performing the Time Management task. These two curves show the effects of stability on training proficiency before and after the NTC training experience. The higher training proficiency scores shown for Time Management (Best Score) curve are most likely a result of the training, while the curve itself shows the benefit to increased command group tenure.

The benefit of executive officer experience to initial entry performance for three battalion planning tasks and the execution summary score are shown in Figure 5.4. All these relationships are at the 90% confidence level. As with the other curves, these examples continue to support the principle of diminishing returns. As described earlier, the executive officers primacy in managing the planning process provides an intuitively appealing explanation for these results.

A consistent theme of the analysis is that most of the improvement for the significant relationships occurs during the first three to four months of the team forming or the individual being assigned to the position. Table 5.7 shows the cumulative improvement at the three month mark and the maximum value of percent improvement for each of the variables that were statistically significant. As shown, more than 50% of the improvement takes place in the first three months. For the tasks showing a relationship, training proficiency improvements range from 20% to 62% for command group stability, company commander experience, field grade experience, and executive officer experience. These gains seem sizable but until the costs of lifecycle manning are quantified it is difficult to assess the policy based on a cost-benefit ratio. The good news for the Army is that command groups seem to improve rapidly and do not need more than six months to achieve the maximum benefit from stability. As will be discussed later, this provides personnel managers with much more flexibility in assignments for the members of the command group.

Figure 5.4
Benefit of Executive Officer Experience to Entry Level Proficiency

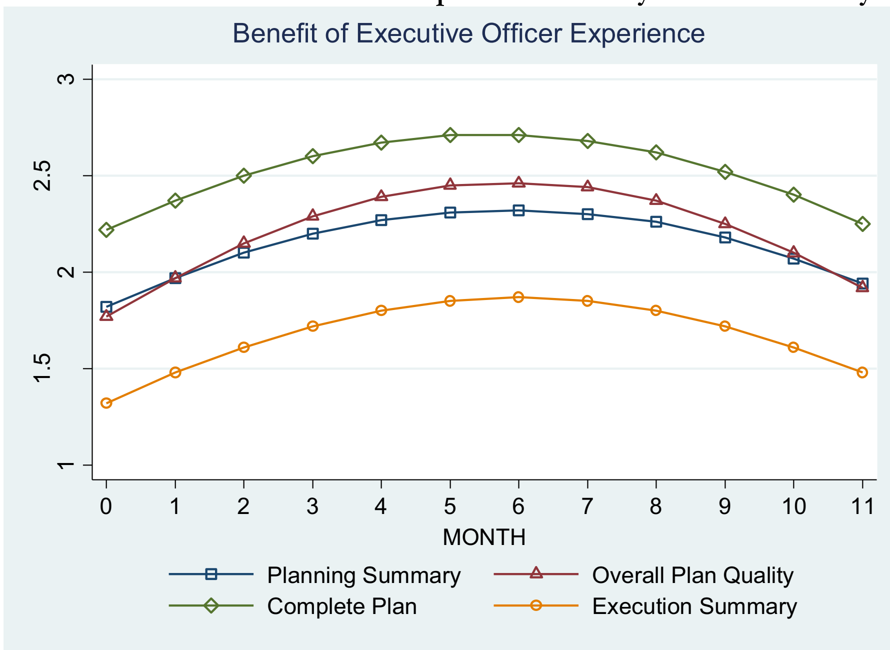


Table 5.7
Cumulative Percentage Improvement to Training Proficiency

		First Score			Best Score	
Task	Variable	3 Months Percentage Improvement	Maximum Percentage Improvement	Variable	3 Months Percentage Improvement	Maximum Percentage Improvement
Time Management	Command Group Stability	38.4	45.0	Command Group Stability	28.3	33.3
	Executive Officer Stability	47.3	62.3	Executive Officer Stability	25.2	33.6
	Field Grade Time in Unit	18.6	27.3			
	Company Commander Stability	44.2	54.2			
Maneuver Tactics and Synchronization	Command Group Stability	42.4	50.5			
Planning Summary	Executive Officer Stability	19.3	24.9			
Plan Quality	Executive Officer Stability	27.0	34.5	Command Group Stability	24.0	31.5
Complete Plan	Executive Officer Stability	16.3	20.4			
Execution Summary	Executive Officer Stability	27.6	35.8			

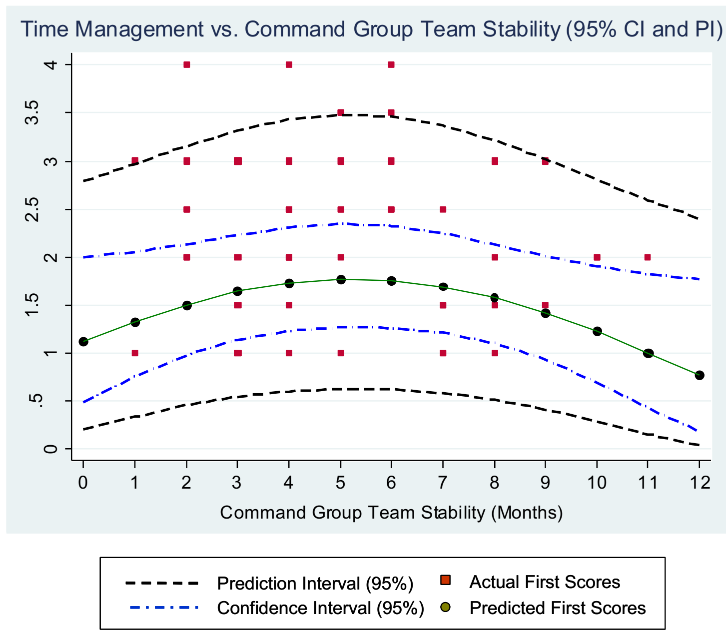
Does Too Much Stability Make Battalions Worse?

A strict interpretation of the model based on the coefficient estimates would lead to a conclusion that units demonstrate a decrease in training proficiency in some tasks once stability goes beyond six months. At the high end of the data range, the model shows a marked downturn in performance. There are three instances where increased command group stability results in a cumulative change in training proficiency that shows the unit at a lower level of proficiency than when the command group first formed. This conclusion does not make intuitive sense and any assertion that too much battalion command group stability results in a downturn in performance should be treated with great caution.

Figure 5.5
Scatterplots for Time Management Scores vs. Command Group Team Stability

One reason for caution in interpreting the downturn of the performance curve is the small number of data points at the high end of the data range for command group team stability. As depicted in Figure 5.5, the observations where command group stability is seven months or more are a primary source of the quadratic coefficient as they have relatively lower scores despite their higher values for command group team stability. Figure 5.6 shows the fitted curve along with the confidence interval and prediction intervals to show how the data points at the higher end of the command group tenure range influence the curve.

Figure 5.6
Fitted Curve for Time Management (First Score) vs. Command Group Tenure



In an effort to determine if there are unique characteristics of these observations with high stability values and lower scores, I conducted regression diagnostics for the Time Management task to identify the influential points and potential outliers. Of the six data points with high leverage, two of them were observations with command group stability greater than six months. None of the high command group stability observations violated the Cook's Distance cutoff for determining an influential data point. Additionally, tests of the residuals showed no indication that any of these data points were outliers. The conclusion of the diagnostics is that I can not find justification to drop any of these observations from the model based on some unique characteristic identified through regression diagnostics.

I was able to access after action reviews for some of the observations with high command group stability in an attempt to determine if there was a unique aspect of the training scenario that resulted in more difficult conditions for a unit with high stability. [27] It is possible that units with high stability were expected to be more proficient and were presented with a more difficult training scenario. Researching the after action reviews could identify characteristics of the mission or enemy situation

[27] The after action review consists of battle summaries, lessons learned, and a plan of action for future improvement. Each after action review is unique based on the challenges the unit is experiencing during the training and the goal is to provide the unit feedback on how to improve performance.

that explain lower scores for units that theoretically should achieve high training proficiency scores. I was not able to locate after action reviews for every observation with high command group stability, but one after action review provided some insight as to why these observations must remain in the model.

The after action review was for a unit with command group stability of eight months. The executive officer and operations officer arrived during the same month, two months after the battalion commander. The assistant operations officer was in position for eighteen months prior to the rotation and the average company commander experience before the command team formed was eleven months. The battalion commander and company commanders trained as a team for four months before the rotation, meaning that three of the four company commanders averaged fifteen months experience before the rotation. All stability indicators for this battalion were favorable and high proficiency first scores should have been achieved if stability were a determining factor in performance.

However, despite conducting a standard training scenario the battalion scored relatively low on the time management task. In fact, time management and command and control node operations were identified on the second day of training as an issue needing immediate attention. Their time management proficiency score improved during the rotation, but the initial proficiency did not match expectations for lifecycle manning. This battalion command group had stability almost to the degree expected under lifecycle manning, but still failed to achieve higher proficiency levels than battalions with low command group stability.

There could be several explanations for this event that I did not explore due to a lack of data about the battalion command group and the unit's experience during the NTC training event. For example, although the command group was together for a relatively longer period than most command groups, they may not have been able to train battalion tasks prior to the NTC rotation. If so, they were performing these tasks without the opportunity to establish procedures for effective performance and the time together could not overcome the lack of training experience. There may have been personality conflicts within the command group or other issues with group interaction that prevented effective group performance. Whatever the dynamics of this particular command group, its team stability did not result in training proficiency any higher than units with less battalion command group stability.

This example of a high stability command group with low proficiency scores, the empirical results, and the conclusions of the regression diagnostics indicate there is no compelling reason to remove the observations with high command group stability from the model despite the counter-intuitive result of a downturn in training proficiency scores with higher stability. The fact remains that units with high levels of command group stability have scored lower than units with less command group stability and the available evidence and analysis indicates that higher levels of command group tenure are not significantly related to higher levels training proficiency at the NTC. A reasonable conclusion is that for the few battalion tasks that showed a statistically significant relationship with training proficiency, diminishing returns to stability exist for the first 5-6 months together, but beyond this period continued stability no longer indicates further increases in training proficiency. To reach a more robust conclusion about whether the performance curve levels off or shows a downturn would require more data with command group stability beyond the current maximum value of eleven months.

If not Stability, Then What Explains Training Proficiency?

Since the results of this model do not show a strong relationship between command group stability and training proficiency, the question arises as to what factors determine the training proficiency level of a battalion during an NTC rotation. There are several potential explanations that are not addressed by this research, but are mentioned in Chapter 4 during the discussion of what factors to include in a model for military effectiveness. Ideally, this model would have included factors from all five categories noted in Chapter 4. For example, equipment availability or weather conditions could influence a unit's proficiency score. Perhaps the units with high command group stability and lower scores were uniquely affected by some factor of military effectiveness that explains their proficiency score and the effect of high personnel stability was insufficient to overcome these other factors.

An additional explanation is that individual talent and leadership skills are more important than command group team stability in determining battalion training proficiency levels. A team of talented individuals may not need much time to become effective, while a team of less talented individuals may not improve no matter how long they stay together. Command group members may be sufficiently trained and talented enough to know the requirements of their jobs. Once they join together as a team, they work hard enough to overcome potential problems associated with being new to the job or having a newly formed team. The evidence indicates that officers can form a command group quickly and demonstrate as much proficiency at the NTC as command groups with more team stability. The ability of officers to form teams quickly provides great flexibility to officer assignments and could be an indicator of the effectiveness of the officer professional development system.

Another significant and somewhat obvious factor for achieving higher levels of training proficiency is the amount of training conducted by the unit. This factor is not only supported by intuition, but it is supported by the results of the model. The number of instances where stability showed at least a 90% confident relationship with training proficiency dropped by six occurrences from first score to best score. This would indicate that after two weeks of intense training, units are achieving the same level of improved training proficiency whether or not the battalion leadership teams and members of the command group were stable before the training event, although it is unknown if this effect is limited to a short-term improvement or a lasting increase in training proficiency. While I do not have data about unit training conducted prior to the rotation, further analysis in this area would benefit from a close examination of the payoff from training prior to the rotation to determine if the training experience before an NTC rotation explains a portion of the variability in initial entry proficiency.

6. Policy Implications and Recommendations for Future Research

This research sought to develop new variables that more accurately capture the full effect of personnel turbulence by measuring individual and team stability. These new variables give a more complete picture of team stability and provide a more focused means of determining the benefit of personnel stability and measuring the improvement of stability at all echelons of combat units. The new variables also enabled an empirical analysis to measure the impact of increased stability on unit effectiveness. Using these variables and training proficiency data, empirical analysis did not show a prevalent, strong, or linear relationship between battalion stability and training proficiency. In the few cases where stability was statistically significant, the maximum benefit to stability was achieve in five to seven months with most of the benefit gained in three months. These answers to the first two research questions provide the basis for answering the third research question: Are there opportunities to manage personnel stability more effectively without a decrease in training proficiency?

The lower than expected benefit from command group stability indicates that personnel managers have more flexibility in the management of command group assignments without risking a negative impact on battalion training proficiency. The empirical analysis also highlights the positive effect of NTC training, which serves as an indication that training may have a larger impact on effectiveness than personnel stability. Lastly, if the benefit to unit effectiveness is less than expected, the resultant increase in the cost-benefit ratio could make lifecycle manning cost ineffective. This chapter discusses each of these implications and closes with recommendations for future research.

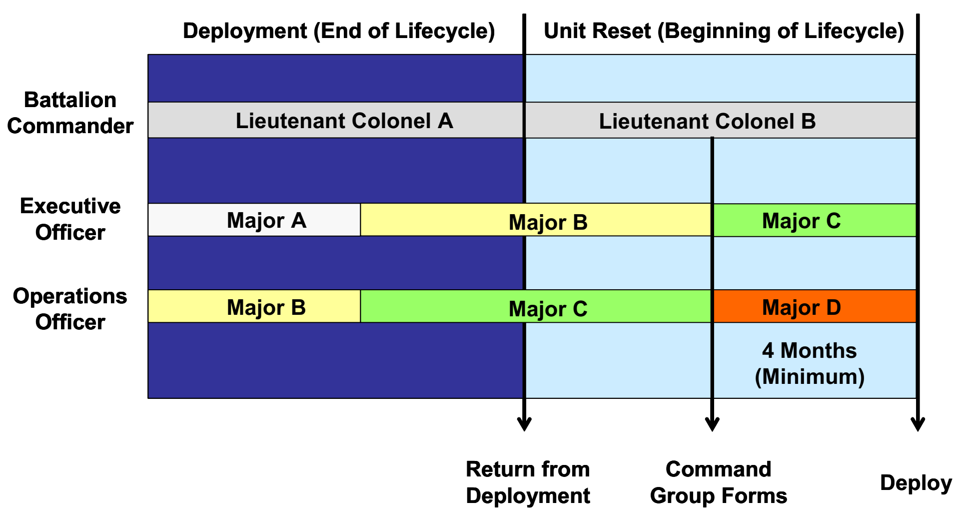
Flexibility in Managing Command Group Assignments

Based on the results of this analysis, personnel managers have some flexibility in managing command group assignments without negatively impacting battalion training proficiency. Increased flexibility could facilitate meeting personnel demands for experienced majors in other parts of the Army such as higher level staffs, important institutional assignments, or joint service positions.[28] With the authority to release either the battalion executive officer or operations officer before the lifecycle ends, the battalion could also achieve better continuity during the next unit lifecycle without hindering performance in the current lifecycle.

[28] The flexibility for reassignment of command group members is primarily for the Executive Officer and Operations Officer, both with the rank of Major. The Army Chief of Staff established a policy that Battalion Commanders would not be reassigned during deployments except in extreme circumstances.

The following example illustrates the flexibility available to personnel managers that enables them to manage continuity between lifecycles rather than stability within the lifecycle, even if the rest of the battalion is managed under lifecycle manning. In a strict lifecycle manning model, all members of the command group depart the unit upon redeployment. Although information sharing occurs during any transition, much of the operational experience leaves the battalion with the outgoing command group—just as the subsequent reset period of the next lifecycle begins. In most cases, no member of the command group will have specific experience with that particular battalion but they are required to coordinate training resources because they are programmed early in the reset period. The new command group' unfamiliarity with the battalion increases the likelihood of training resource coordination errors, thereby impacting the effectiveness of future training. For example, the new commander may prioritize tasks the battalion already executes well or the operations officer may not be familiar with the training resources available to get maximum benefit for a particular training task. The immediate training benefit of recent operational experience is lost when all members of the command group depart simultaneously.

Figure 6.1
Example of Increased Flexibility with Command Group Assignments



However, with more flexible management of command group assignments, personnel managers can achieve continuity that will reduce the inefficiencies associated with transition. An example of managing the battalion executive officer and operations officer is provided in Figure 6.1. The left half of Figure 6.1 represents the deployment portion of the unit lifecycle. In this example, the command group consists of Lieutenant Colonel A (Battalion Commander), Major A (Executive

Officer), and Major B (Operations Officer). At some point during the operational deployment, Major A can be reassigned out of the battalion and becomes available for reassignment. Major B, who is familiar with the battalion, assumes responsibilities as the battalion executive officer while a replacement, Major C, assumes the duties as the battalion operations officer. Based on the results of this analysis, the lack of stability in the battalion command group should not negatively impact the battalion's effectiveness.

The advantage of this reassignment is twofold. First, a combat experienced member of the command group can be reassigned to another position that requires his experience—most likely a higher level staff operating in the combat zone. His reassignment benefits the gaining organization and expands the breadth of the departing officer's experience. The second advantage is the continuity provided during the transition between lifecycles. As shown in Figure 6.1, both the battalion executive officer and operations officer remain in place when the battalion commander changes at the beginning of the reset period. This leaves two members of the command group, both of whom are familiar with the battalion, in place to coordinate resources and manage issues that are critical for an efficient reset period.

Several months into the reset period, Major C moves to the executive officer position, newly assigned Major D assumes responsibilities as the operations officer, and Major B is available for reassignment outside the battalion. During this transition, the new battalion commander and former operations officer provide continuity because they've both served in the battalion for several months. The timing of this transition should take place a minimum of four months before the next deployment to gain the majority of increased proficiency from command group stability as discussed in Chapter 5. With the new command group forming at least four months before deployment battalion training proficiency should not suffer; there is sufficient time for any small gains from stability to occur; and the same reassignment process is established to occur for the next lifecycle. Coordinating command group assignments under this more flexible model changes the focus from managing stability to managing continuity—without the risk of decreased battalion proficiency in the short term and potentially increasing the effectiveness of the reset in the longer term.

Managing command group majors under the model proposed in Figure 6.1 also improves flexibility to personnel managers by increasing the number of field grade officers available for assignment to the battalion. For the two tasks that showed a positive relationship with command group stability, the majority of the benefit was gained in the first 3-4 months of the command group being formed. Rather than limiting the pool of available officers to those who are available twelve months before deployment, the assignment window can be expanded to include officers who can report from four to twelve months before deployment. This expanded window could allow officers to complete professional schooling or schedule a move that better suits their family situation. The specifics of each assignment will vary based on the needs of the unit and the officer in question, but the research indicates that personnel managers have more options available to balance the needs of all stakeholders than originally established with lifecycle manning. Furthermore, they can pursue these additional options without having a negative impact on battalion training proficiency.

Improve Effectiveness with More Training Rather than Stability

The analysis in Chapter 5 does provide evidence supporting the benefits of the NTC training. Analysis of the first and best score results show that the small effect of stability for first score proficiency almost disappears completely for best score analysis. There were nine cases where a stability variable indicated a significant relationship with training proficiency, but there were only three instances for the best score analysis. Since positive difference between first scores and best scores was statistically significant and less than a month of additional stability occurred between first and best score, it appears the completed training had the desired effect of increasing unit training proficiency. The factor for improvement was not the amount of time spent together, but rather the training that occurred during the time the team was together.

Improving unit effectiveness by increasing training is not a revolutionary recommendation and any Army professional will consider this an obvious conclusion. However, what is unique about this analysis is that training appears to have a statistically significant effect on training proficiency while personnel stability did not show an effect. The evidence does not support the assertion that personnel stability is the essential component for improving training proficiency. Rather than expending organizational energy and incurring implementation costs in pursuit of lifecycle manning, resources may be better utilized by increasing the training opportunities for battalions without sacrificing the flexibility of the individual replacement system.

Further support for the importance of training over personnel stability is provided by the example of the opposing force unit stationed at the National Training Center. Many professionals have expressed concern about the Army's inability to defeat the opposing force at the NTC (Henderson, 1990; McGregor, 1997; Rosenberger, 1995; Reese, 2002). An interesting aspect of this concern is that the opposing force units are so effective and dominant even though they are manned under the same individual replacement system and experience the same personnel turbulence as any other unit in the Army. Leaders throughout the Army have described the many advantages enjoyed by the opposing force unit, but the common theme of all these advantages is summarized by a commander of an opposing force battalion: "Rigorous and repetitive training is the core of our training program" (Zanol, 1997, p. 61).

In his explanation of how he trains his opposing force battalion to such high levels of effectiveness, Zanol (1997) does not provide any new insights apart from established Army training doctrine that is used by every battalion in the Army. The performance difference is the result of establishing and enforcing clear training priorities, seizing every opportunity to train within the priorities established by the commander, and executing multiple repetitions in realistic environments.[29] Zanol (1997) did not express frustration over the lack of personnel stability while training to a high level of effectiveness. Reese (2002), who writes an article about the crippling events of personnel turbulence, acknowledges that the opposing force training enables them to overcome the supposed negative effects of personnel turbulence.

Colonel John Rosenberger, the former commander of the opposing forces at NTC, is an outspoken critic of the Army's inability to defeat the opposing forces at NTC and attributes that failure to a noncompliance with established training doctrine. He cites several reasons why the opposing force is able to achieve superior effectiveness relative to the brigades they fight against at NTC, but the general theme emphasizes multiple repetitions of training that enable opposing force units to refine their procedures, certify their leaders, and build an intuitive sense for combat synchronization (Rosenberger, FY95). In other words, the opposing forces execute the Army's training doctrine while the other units do not. He highlights personnel turbulence as one of the justifications for poor performance that is often provided by training units. In response to this justification, he asserts that blaming poor NTC performance on the lack of team stability does not address the "root of the problem", which is the failure of Army units to train properly—particularly since the opposing force is subject to the same personnel turbulence as any other Army unit that trains at NTC (Rosenberger, FY95, pp. 1-2).

The evidence provided by this research and the example of the opposing force unit effectiveness at the NTC support a policy alternative of adjusting of training policies rather than expecting a

[29] The opposing forces at the NTC perform significantly more field training than a typical unit that deploys from their home installation for a training rotation. As a general rule, the opposing forces conduct two weeks of full scale maneuver exercises against the units that deploy to the NTC for a training rotation. That translates into 20 weeks of maneuver training compared to the two weeks every 12-18 months a rotational unit receives at the NTC. While the rotating units conduct training at their home installation, they do not have the resources to replicate the realism provided by the NTC and they are competing against other units for the scarce training resources.

significant increase in unit proficiency from increased personnel stability. Instead of relying on more time together without changes in the training program, the Army would probably achieve greater payoff from increasing training opportunities for units. Rosenberger (1999) provides several training policy adjustments he believes would greatly increase unit effectiveness across the Army: changing the permanent combat organizational structure of brigade combat teams to match the way brigades are organized to operate in combat; train and certify leaders and staff officers before they are allowed to serve in their respective positions; increase the rigor and repetition of field training; and focus unit training on fundamental combat tasks (Rosenberger, 1999, p. 14).

Rosenberger (1999) and Zanol (1997) never recommend increasing personnel stability as the primary means of improving unit effectiveness. Rather, they emphasis the importance of repetitious training to units are trained in spite of the turbulence. However, this is not their primary motivation for repetitious training. Both authors emphasize the need for repetition because of increased complexity of combat tasks and diminishing proficiency if the skills are not routinely practiced—a condition that is true regardless of personnel turnover rates. This assertion is an important insight because if repetitious training becomes the standard, then unit training would not be as drastically undermined by personnel turbulence as advocates of lifecycle manning proclaim. In light of Rosenberger's and Zanol's professional experience, the Army appears to be striving to substitute personnel stability for insufficient training frequency. Personnel turbulence has become the explanation for less than desired levels of training proficiency, but limited opportunities to train may be the primary reason for the perceived lack of effectiveness. Changing Army training policies could enable units to become more effective without changing the personnel management system—as demonstrated by the opposing forces at the NTC.

Training policy change must include more than simply adding more training events to an already full training calendar. New policies should be established to increase the number of training repetitions in the same manner that opposing forces are able to train. Such policy changes could include making training resources such as land, ranges, ammunition, and shoothouses more readily available. They could create additional training time by eliminating non-combat related tasks from unit training calendars and increasing the payoff of events that are dedicated to combat training.

One example of a training policy change that supports these principles is the evolution of the Mission Readiness Exercise (MRE) that is part of the unit training and preparation for combat operations and is required of every unit prior to deployment. Typically, this training occurs at the National Training Center for mechanized units and at the Joint Readiness Training Center for light units.[30] However, because of reduced time available between operational deployments to Iraq and Afghanistan, some units have conducted their MRE at their home installation.[31] They did so because the units would normally have spent two weeks deploying to and from the training centers, but the units were able to use that time for training by remaining at their home station. The units who made this training policy change were certified as ready to deploy for combat operations and successfully completed combat tours in Iraq. This is an example of a training policy change increased the quantity of training without requiring more time commitment on the training calendar—they simply used the time more efficiently.

Low Proficiency Benefit Changes the Cost-Benefit Analysis

Since the primary goal of lifecycle manning is to increase unit effectiveness, the absence of an empirically supported large benefit potentially changes the cost-benefit analysis for implementing this policy. To the extent these results can be applied to other echelons below battalion, costs incurred from implementing lifecycle manning may render the policy cost-ineffective. At a minimum, these results raise doubts about the expected increase in unit effectiveness that should motivate more rigorous discussion about the costs of lifecycle manning.

Largely due the widely accepted belief that personnel stabilization will result in more effective units, there is very little discussion about the costs of lifecycle manning. A thorough search of available public documents stating the official Army position on lifecycle manning and professional military articles fails to uncover a discussion that addresses the specific costs of lifecycle manning. Due to the lack of discussion concerning the costs, I will address some potential costs of force stabilization. Specifically, I will address changes to leadership development, operational mission effectiveness in a counterinsurgency mission, and readiness status throughout the Army as a whole.

Changing the Leader Development Model

Past officer management and leader development policies have pursued a generalist model of leader development, but this generalist model changes under lifecycle manning. Officers have traditionally transitioned between jobs quite frequently as a means to exposing the officer to a wide variety of units and assignments intended to prepare the officer for future service. Lifecycle manning keeps officers assigned in their positions and units longer, thereby reducing the variety of

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[30] The Joint Readiness Training Center (JRTC) is a training complex located at Ft. Polk, LA. The JRTC provides a similar training model as the NTC, but is designed specifically for light infantry training.
[31] The two units who conducted the MRE at their home installations were 3rd Armored Cavalry Regiment at Ft. Carson, CO and 4/2 Stryker Brigade Combat Team at Ft. Lewis, WA.

professional experiences. The leader development model is transitioning from a system that pursued breadth for a more narrowly focused system that pursues depth.

The impacts of this change are already occurring in units manned under lifecycle manning.[32] In one Brigade Combat Team, it was not uncommon for Captains to fill platoon leader spots normally filled by Lieutenants. The officers were promoted to Captain but remained as platoon leaders for almost two life-cycles because there were no vacancies in Captain positions. Many of these officers went from platoon leader to the career course without serving as a staff officer, specialty platoon leader, or company executive officer. In the same Brigade, several field grade officers are now serving in their second or third life-cycle. There is no question these officers have developed deeper expertise in the Brigade, but the cost was breadth of experience.

In an effort to articulate the need for depth in leadership experience, the Chief of Staff of the Army, GEN Schoomaker, is quoted in the Wall Street Journal, "We are very good in the army in developing single-event people. If we were a track team, we'd have the best 100-yd-dash people, the best milers and the best discus throwers. But what we really need to be making right now are decathletes that are just good enough at everything." (Jaffe, 2003) However, rather than supporting depth (a really good discus thrower), this statement seems to support the argument for breadth (decathletes that are just good enough at everything).

Furthermore, today's operating environment is presenting today's leaders with a multitude of complex situations that require the officer to learn quickly and apply solutions on the fly. The leader's role today has expanded well beyond fighting to include economic development, governance, and developing security forces. Leaders are being required to learn quickly and adapt to new situations for which they have not received training. On the surface, it seems a model that requires a leader to learn quickly through frequent reassignment might better equip a leader to deal with such situations.

There are some writings about military effectiveness that express concerns about the narrowness of an officer's experience under a unit manning system. The following quotation is one example:

> "Operational effectiveness (for the Army as a whole) has a distinct human element. The nature of the professional and personal relationships between officers of different branches within the same service as well as between different services provides the institutional and psychological underpinnings for integrated action. …The practice of assigning officers to a regiment for the duration of their career

[32] These examples are from the author's experience while commanding 1-14 Cavalry, 3-2 Stryker Brigade Combat Team.

> may have a positive impact on unit cohesion, but it also may create narrow professional and psychological perspectives. The result of a parochial personnel policy may be the creation of officers with an intense 'us-them' feeling that discourages their full integration into an all-arms concept. (Millett et al., 1986, p. 53)"

Given that the previous generalist leadership models provided multiple opportunities for the cross fertilization and relationship building described by Millet et al, some consideration should be given to the cost of reducing these opportunities.

As specifically applied to the battalion command groups analyzed in this dissertation, keeping members of the command group in the same unit for an entire lifecycle presents tradeoffs for the career development of these officers. First, while each member of the command group gains more experience in the battalion, they incur an opportunity cost of forgone assignments that may be important for future service. Secondly, by holding members of the command group in place, fewer officers get the opportunity to serve in these important developmental positions and the pool of officers with the relevant battalion experienced is reduced. I am not making an assessment about whether these tradeoffs are appropriate. However, these changes to the leader development model that has served the Army well for decades are worthy of closer examination—particularly since the proficiency benefit to increased stability does not appear to be very large.

Negative Impact on Overall Mission Effectiveness

Lifecycle manning and the associated unit rotation has the potential to undermine the Army's overall effectiveness in a long duration counterinsurgency mission such as the current operations in Iraq and Afghanistan. There is general professional agreement that knowledge of the environment and cultural nuance is critical for success in counterinsurgency operations and that it takes time to develop this knowledge. The knowledge gained through experience, much of which is tacit and unique to the specific location, is not easily transferred between units. Under a unit rotation policy, there is degradation in mission effectiveness when an entire unit is replaced by a unit unfamiliar with the area of operations. Knowledge that was gained through months of patrolling is largely lost as the experienced unit rotates out of the area. Relationships with local leaders are set back as the trust must be rebuilt between the Army units and the local population. The amount of time it takes to regain this knowledge is debatable, but my experience is that it takes somewhere between 30-60 days to understand an area and develop relationships enough to enhance operations.

Examination of a typical 12 month deployment highlights the time lost to transitional tasks associated with a unit rotation. Units spends approximately 1 month on each end of the deployment preparing equipment for combat operations or redeployment. Making a conservative assumption, it takes 30 days to understand the area of operations and build relationships with local leaders sufficient enough to conduct effective counterinsurgency operations. Finally, there is a minimum of 2 weeks required for transition tasks such as equipment transfer and command post transition. Summing this time dedicated to transition tasks amounts to 3.5 months of a 12 month deployment consumed by tasks that have limited impact of completion of the overall mission.

Conversely, if units were permanently assigned an area of operations and manned with individual replacement packages, there would be less area specific knowledge lost during the transition. Furthermore, there would be fewer opportunities for the enemy to exploit transitions when there is a reduction in effectiveness as the new unit learns the area. While the overall level of effectiveness of the unit may be reduced due to individual replacement—although this is debatable—there would not be the drastic reduction in effectiveness that accompanies unit rotations. The drastic reduction would be reduced by distributing the inefficiencies of transition over time and space, thereby reducing the overall impact. The unintended consequence of lifecycle manning could be marginal increases for individual unit effectiveness, but less overall effectiveness in the conduct of the mission due to the transitions required for unit rotations.[33]

Fewer Units Available for Operational Contingencies

Finally, there is the cost of having fewer units available for deployment because of the cyclical process of preparing units for deployment. To implement lifecycle manning and unit rotations, the Army needs three times as many brigade combat teams necessary for steady state operations. For every deployed Brigade, there is one recovering from deployment and one preparing for deployment. If the number of Brigades required exceeds the number of Brigades ready for deployment, the Army must accelerate the training period and reduce the dwell time of soldiers.

[33] Although personal experience is anecdotal, my personal experience commanding a Squadron in Baghdad, Iraq provides an example of the loss in mission effectiveness from unit rotation. After six months of developing relationships with local leaders, professionalizing Iraqi Security Forces, reducing insurgent networks, and beginning civil works projects, my unit was transferred to another sector and replaced by a different unit. Shortly after our departure, violent activity increased significantly and the situation deteriorated as the enemy exploited the inherent weakness associated with transitions. The setback was not the result of a less proficient unit assuming responsibility for the area. Rather, the setback occurred before the replacement unit could establish the knowledge and relationships necessary to thwart the forces of instability. Further research of counter-insurgency operations could help determine if examples such as this occurred during other unit transitions and measure the cost of time lost (and costs gained) due to unit rotations.

This reality undermines one of the main reasons to pursue force stabilization—predictability and increased dwell time for the soldiers and their families.

Conversely, with individual replacements readiness is distributed more evenly across the entire Army. Each unit may be less ready than a unit prepared under force stabilization, but if the unit is ready enough then there are more brigades available for other contingencies. The tradeoff becomes one of deciding to have one-third of combat units highly effective level or all of the units at a potentially lower, but sufficient, level of effectiveness. As long as operational demands do not exceed one-third of the Army's brigade combat teams, the implementation of rotation policy is straightforward. However, in an environment where the demand for forces exceeds what is available under lifecycle manning, the tradeoff in uneven readiness becomes more difficult to make. The Army is then faced with a decision to expand the Army, an expensive alternative, or distribute readiness more evenly across the Army, an alternative that has worked in the past.

The intent of this discussion is not to provide a detailed cost-benefit analysis based on these three potential costs. Rather, they are addressed because there has been very little discussion of the potential costs for implementing force stabilization. Because lifecycle manning has not been fully implemented, the opportunity remains to adjust the policy based on additional research into the costs lifecycle manning. A realistic appraisal of the costs would result in a more complete assessment of the ramifications of lifecycle manning—particularly in light of the questionable increase to unit proficiency.

Recommendations for Future Research

There are two areas where additional research could make significant contributions for continued analysis and assessment of lifecycle manning. This research is not sufficient to generalize the results to lower echelons of military organizations. While the proficiency of the opposing forces provides an example of a high performing unit in spite of current personnel turbulence levels, that example does not empirically support a conclusion that personnel stability will not have significant benefit to unit effectiveness at echelons below battalion. A second area requiring more research is a systematic quantification of the costs associated with the implementation of lifecycle manning. The costs I discussed previously are worth consideration, but these costs need to be quantified in a meaningful way before their impact on the cost-benefit analysis of lifecycle manning can be properly assessed.

Analysis of Stability's Effect on Lower Echelons

Applying this empirical model to companies, platoons, and squads requires building stability variables that capture the team stability within these organizations at a level of detail not available through current Army personnel data bases. The one existing document that captures the required specificity is the unit battle roster. The battle roster is a by-name listing of every position in the battalion and is normally updated on a monthly basis. The document is an internal management tool that is not officially submitted to higher headquarters and is, therefore, not readily available through a centralized location beyond the battalion headquarters. A research effort that collected these battle rosters from battalions could build stability variable for all levels of the battalion and enable a statistical analysis similar to the empirical model used in this dissertation.

The next research challenge would be matching the additional stability variables to an empirical measure of training proficiency for each echelon. Relative assessments of training proficiency could be gathered through a subjective commander's assessment of each squad, platoon, and company. Additionally, scores could be collected at the battalion's mission readiness exercise in a manner similar to how scores were collected for this analysis. Training proficiency data collected in this manner, combined with stability variables created from battle rosters, would enable a multi-level analysis of the stability-performance relationship. An added benefit could be analyzing units currently managed under lifecycle manning and comparing the results to units not manned under lifecycle manning.

Another approach to determining the stability-performance relationship at lower echelons is to apply the model to different organizations that perform tasks with similar characteristics. Such organizations may include athletic teams or emergency service organizations. Lifecycle manning advocates often use sports analogies to explain the criticality of stability and cohesion in successful organizations. Emergency service organizations such as fire-fighting units or special weapons action teams face life-death situations that require effective teamwork. Any relationship between stability and performance in these organizations may be applicable to Army units as well.

Professional is one sport that seems particularly conducive for application of this stability-effectiveness model. Professional sport archives include team rosters, starting lineups, game conditions, and win-loss records could make it possible to build stability variables. Football team organizations are organized as a team of teams, very much like a military organization. For example, the offense integrates teams of offensive linemen, receivers, and running backs. Each of these teams has a very specific role, but they must be able to work together effectively to succeed.

Stability variables could be built for each of these teams and analyzed for their relationship with many possible measures of effectiveness—win-loss record, yards gained, quarterback sacks, or touchdowns scored. The number of observations could be sufficiently large to control for multiple factors such as individual talent, opponent caliber, weather conditions, and any other factor that may affect a particular outcome. To the degree that stability influences football game outcomes; there may be application to military operations.

Measuring the Costs of Lifecycle Manning

Quantifying the costs of lifecycle manning would enable decision makers to reassess the cost-benefit ratio based upon the apparently smaller than expected benefit. The first cost measurement would be to determine the differences between the experience profiles of those leaders who have served in units managed by lifecycle manning and the historical experience profiles of leaders managed under the individual replacement system. The differences in the number of positions filled during an average career should measure the tradeoff between breadth of experience and depth of expertise. This analysis could also include how the timing of leader professional education is affected by lifecycle manning. Once a new leader development model has emerged based on the constraints of lifecycle manning it can be compared to the older leader development career path and decision makers can determine whether or not the changes are acceptable.

The potential reduction of overall mission effectiveness could be empirically analyzed from the historical record of current operations in Iraq and Afghanistan. In both countries, US forces have been rotated in and out of sectors to sustain the mission over several years. Knowing when and where these rotations occurred identifies transition events that can be matched against measures of mission outcomes such as enemy attacks, sectarian violence, enemy captured, civil works projects initiated, and governance progress. Changes in these measures could be an indicator of how the transition period affects the overall mission of increasing stability.

Examining the transitions helps address the difficult problem of controlling for the many factors that impact mission in a combat environment. By focusing on the transitions, the general situation on the ground remains the same and the only policy change in the US force assuming responsibility for the mission. By controlling for other factors that may explain mission effectiveness, an analyst can measure the effect of transition by applying a difference of differences model to the many transitions that occur throughout both countries over the several years of conflict. If mission outcomes remain constant, then transitions would appear to have no effect on overall mission effectiveness. On the other hand, if enemy activity increases or civil works progress show a measurable slowdown, then transitions could have a negative effect on mission effectiveness. The differences in measures of effectiveness that can be attributed to unit transition could then be compared to the performance benefit of stability to better assess the overall cost-benefit ratio.

The cost of having one third of Army units available for deployment depends on two questions. How many units does the Army need to meet expected requirements? What level of unit effectiveness is required to successfully complete the mission at an acceptable cost? The first question concerns how large the Army needs to be and the second question addresses how to best distribute readiness across the entire Army. Lifecycle manning and unit rotations assume that having one-third of the Army's brigades is sufficient for future requirements and the expected increases in effectiveness are required to be successful. However, if operational demand exceeds one-third of the Army's brigades, the Army then accepts risk that additional brigades will be less ready and potentially not ready enough to meet the mission demands asked of them. As a result, the Army may create a readiness distribution problem where some units are over prepared for their mission while other units are under prepared. Further research to quantify the potential costs of this readiness distribution and the associated risk could be useful for decision makers who are responsible for the overall readiness of the Army.

Conclusion

This analysis did not find a prevalent, positive relationship between battalion command group stability and battalion training proficiency. This result is contrary to the Army's expectations and has several implications for future adoption of lifecycle manning. Based on this research, the Army should not expect a large unit performance benefit from lifecycle manning. Personnel managers can exercise flexibility in managing command group assignments without negatively impacting battalion level proficiency. To better assess the cost-effectiveness of lifecycle manning, more research should be done to quantify the costs of obtaining what appears to be a small performance benefit. Finally, the Army may achieve greater gains to unit effectiveness by adjusting training policies to increase the number of training iterations rather than expending resources to achieve greater personnel stability.

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Appendix A: Scatterplots for Command Group Stability vs. Training Proficiency Scores

Figure A.1
Planning Summary Score (First and Best Score) vs. Command Group Stability

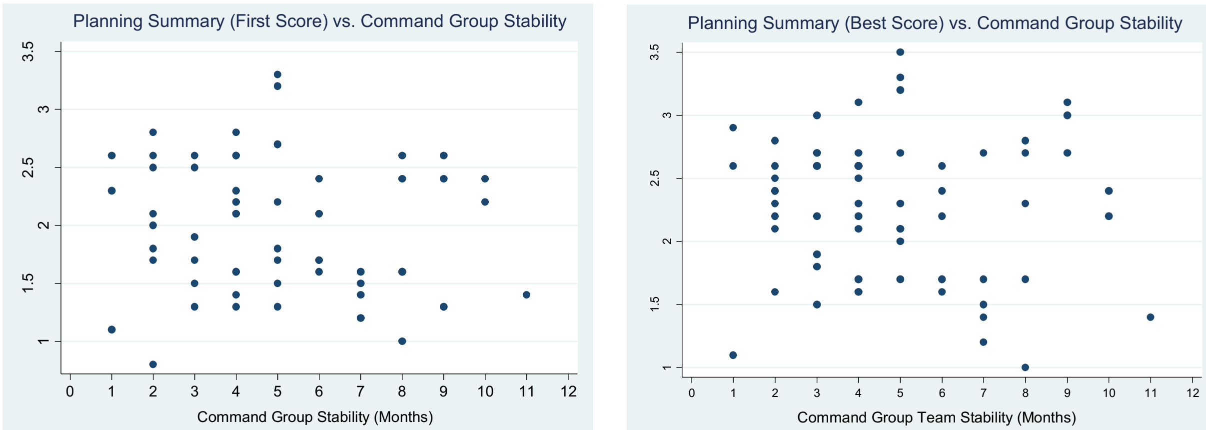


Figure A.2
Complete Plan (First and Best Score) vs. Command Group Stability

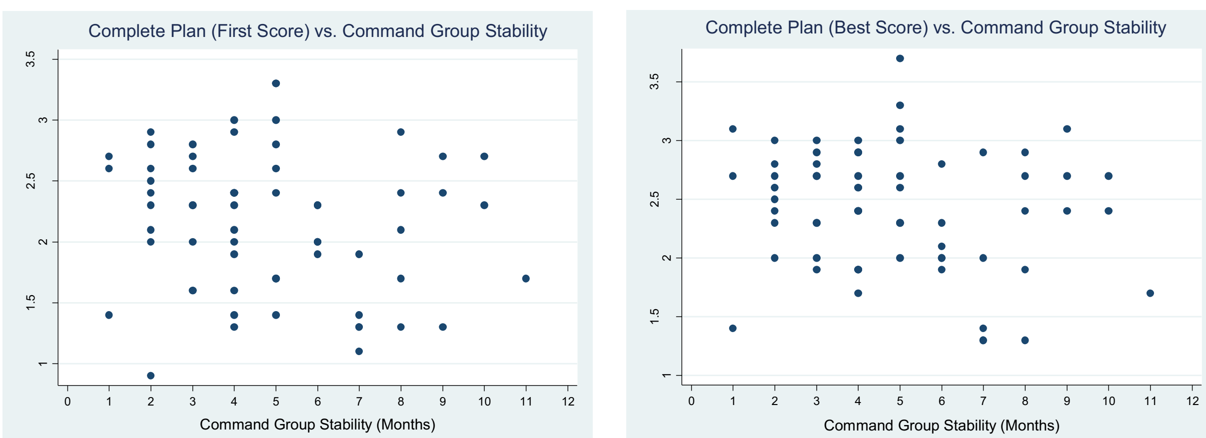


Figure A.3
Overall Plan Quality (First and Best Score) vs. Command Group Stability

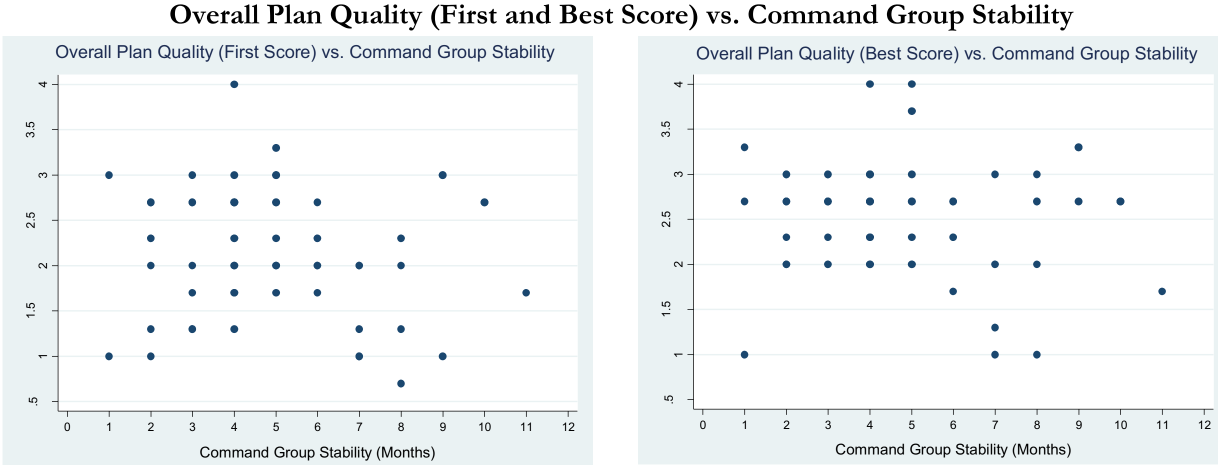


Figure A.4
Execution Summary (First and Best Score) vs. Command Group Stability

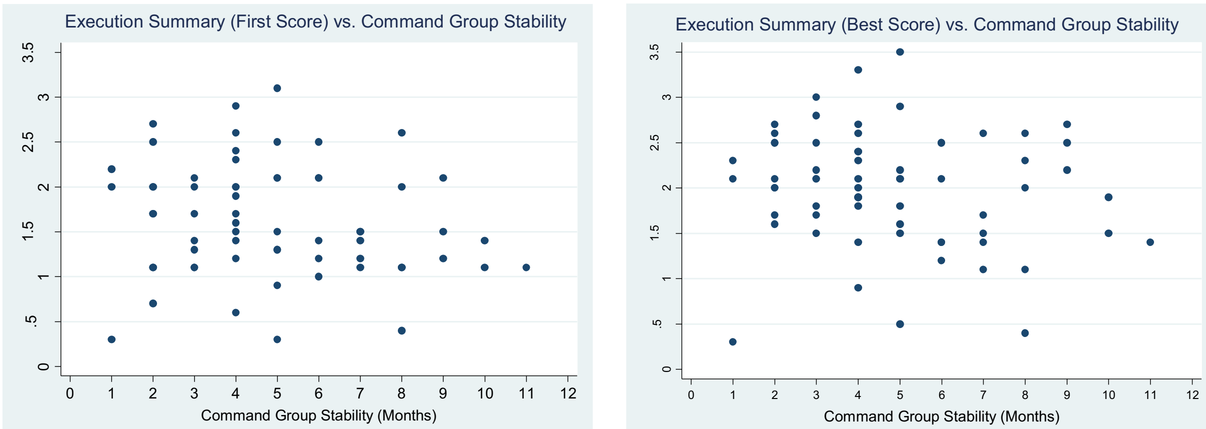


Figure A.5
Maneuver Tactics and Synchronization (First and Best Score) vs. Command Group Stability

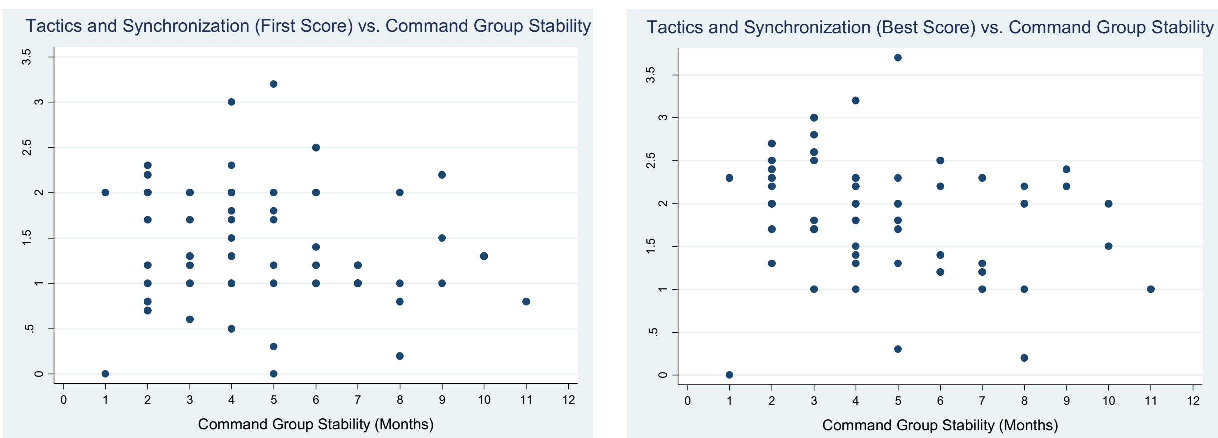


Figure A.6
Complete Mission (First and Best Score) vs. Command Group Stability

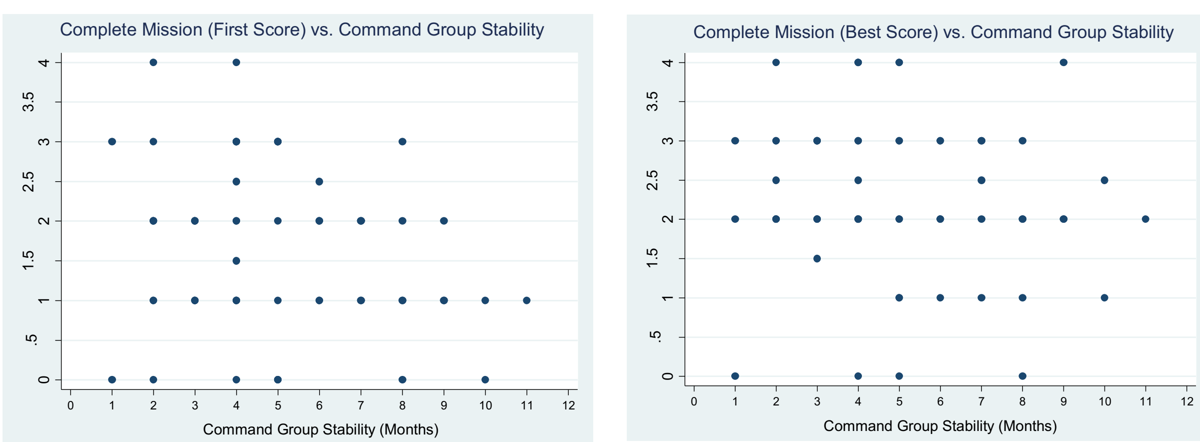


Figure A.7
Throughout Summary (First and Best Score) vs. Command Group Stability

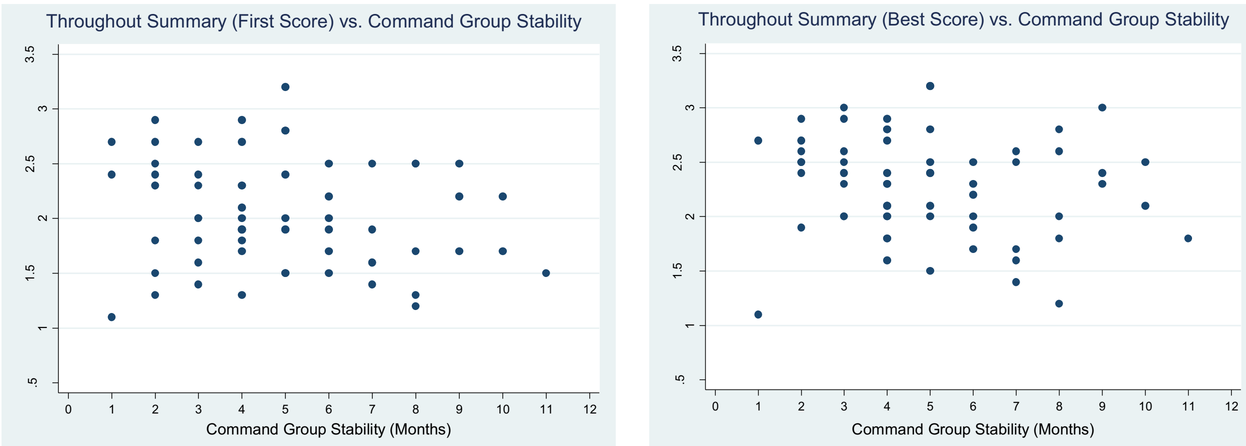


Figure A.8
Command and Control (First and Best Score) vs. Command Group Stability

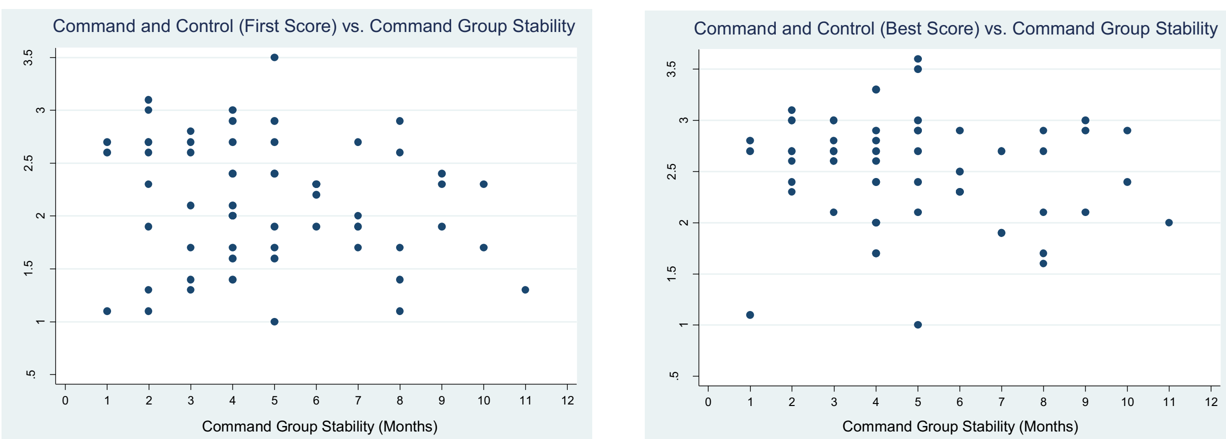


Figure A.9
Time Management (First and Best Score) vs. Command Group Stability

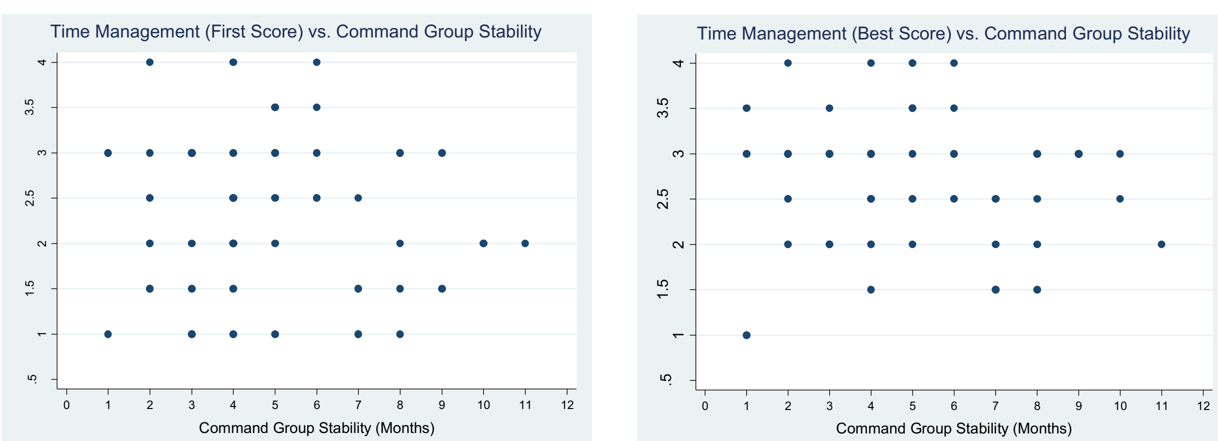
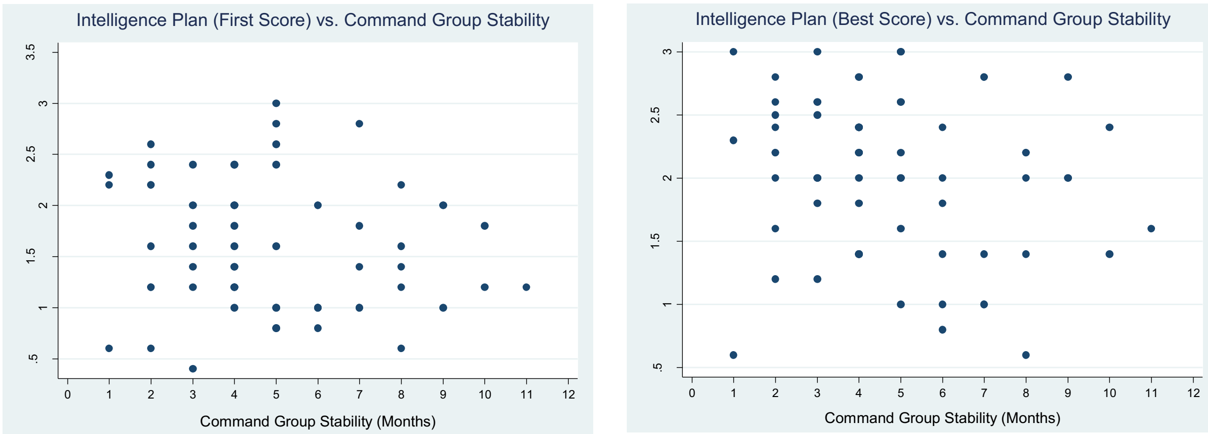


Figure A.10
Intelligence Plan (First and Best Score) vs. Command Group Stability



Appendix B: Battalion Training Task Definitions[34]

1. Complete Plan:
    a. How well did commander's guidance specify intent with tasks, purpose, and end state?
    b. Integrate input and analysis from all operating systems into the intelligence analysis?
    c. Form a comprehensive picture of likely enemy courses of action?
    d. Incorporate overall intent and concept of the brigade commander?
    e. Develop maneuver, fire support, and obstacle plans based on intelligence analysis and current operational information?
    f. Establish an effective set of control measures?
    g. Assign a complete set of tasks to subordinate units?

2. Overall Plan Quality:
    a. How tactically sound was the plan?
    b. How complete was the plan?
    c. Was the plan clearly understandable?

3. Maneuver Tactics and Synchronization:
    a. Maneuver to achieve favorable force ratios?
    b. Employ the reserve correctly?
    c. How well did the battalion employ combat multipliers in isolating the enemy, optimizing mutual support, and using massing effects?
    d. Maintain operational momentum and tempo?

4. Complete Mission and Tasks:
    a. How well did the battalion accomplish its mission?
    b. How well did the battalion accomplish its assigned tasks?

5. Operational Command and Control:
    a. Tracking battle information at the battalion headquarters?
    b. Tracking battle information in the battalion command group?
    c. How well did the battalion maintain situational awareness?
    d. How well did the battalion respond to changes in the operating environment?
    e. Did the battalion issue timely adjustments to orders in response to changes in the operating environment?
    f. Did the battalion comply with the reporting requirements?
    g. Did the battalion keep the subordinate units updated and informed?

6. Time Management
    a. Was the battalion plan issued in a timely manner?
    b. How well did the battalion manage its time?

7. Intelligence Plan
    a. How well were collection, reconnaissance and surveillance function accomplished?

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[34] These task definitions were taken from RAND research on Army training proficiency at the National Training Center (NTC) conducted by Bryan Hallmark and James Crowley.

b. How well did the battalion exploit collection results?
c. Was a focused list of priority information requirements produced?
d. Was an intelligence collection plan produced to gather the priority information requirements?
e. How well was the battalion scout platoon integrated into the intelligence collection plan?

Appendix C: Regression Results

Table C-1
Variable Names and Definitions

Variable	Variable Name	Definition
cgten	Command Group Tenure	Number of Months the commander, executive officer, and operations officers serve as a team before training event.
cgten2	Command Group Tenure Quadratic	
co	Commander Months in Position	Number of months the battalion commander serves before the command group is formed
co2	Commander Months in Position Quadratic	
xo	Executive Officer Months in Position	Number of months the executive officer serves before the command group is formed
xo2	Executive Officer Months in Position Quadratic	
s3	Operations Officer Months in Position	Number of months the operations officer serves before the command group is formed
s32	Operations Officer Months in Position Quadratic	
fgtiu	Field Grade Time in Unit	Number of months either the executive officer or operations officer serves in the battalion in a different position before the command group is formed
fgtiu2	Field Grade Time in Unit Quadratic	
cdravg	Company Commander Average Months in Position	Average number of months the company commanders served in position before the command team is formed
cdravg2	Company Commander Average Months in Position Quadratic	
cmdten	Battalion Command Team Tenure	Number of months the battalion commander and all the company commanders serve as a team before training event
cmdten2	Battalion Command Team Tenure Quadratic	
team3	Observer Team 3	Indicator Variable
light	Light Infantry Battalion	Indicator Variable
_cons	Regression Intercept	

Table C-2
Planning Summary First Score

Source	SS	df	MS
Model	.953639287	16	.059602455
Residual	1.52266369	44	.034605993
Total	2.47630298	60	.041271716

Number of obs	=	61
F(16, 44)	=	1.72
Prob > F	=	0.0779
R-squared	=	0.3851
Adj R-squared	=	0.1615
Root MSE	=	.18603

First Score	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cgten	.0453651	.0446092	1.02	0.315	-.0445388	.135269
cgten2	-.0049451	.0038242	-1.29	0.203	-.0126523	.0027621
co	.0041908	.0139874	0.30	0.766	-.023999	.0323806
co2	-.0006916	.0007647	-0.90	0.371	-.0022329	.0008496
xo	.0591928	.0342903	1.73	0.091	-.0099148	.1283005
xo2	-.0054464	.0031449	-1.73	0.090	-.0117845	.0008917
s3	-.0461083	.040399	-1.14	0.260	-.1275272	.0353107
s32	.0033523	.0040226	0.83	0.409	-.0047547	.0114593
fgtiu	.0106289	.0143653	0.74	0.463	-.0183225	.0395802
fgtiu2	-.0006634	.0009534	-0.70	0.490	-.0025848	.001258
cdravg	.0548493	.0313695	1.75	0.087	-.0083717	.1180703
cdravg2	-.0040543	.0026056	-1.56	0.127	-.0093055	.0011969
cmdten	-.0091683	.044975	-0.20	0.839	-.0998095	.0814728
cmdten2	-.0001427	.0028368	-0.05	0.960	-.0058599	.0055745
team3	-.2257478	.0575483	-3.92	0.000	-.3417288	-.1097669
light	-.0770151	.0697823	-1.10	0.276	-.2176521	.063622
_cons	1.347889	.2002667	6.73	0.000	.9442781	1.7515

Table C-3
Planning Summary Best Score

Source	SS	df	MS
Model	.892704832	16	.055794052
Residual	1.4722141	48	.030671127
Total	2.36491893	64	.036951858

Number of obs	=	65
F(16, 48)	=	1.82
Prob > F	=	0.0562
R-squared	=	0.3775
Adj R-squared	=	0.1700
Root MSE	=	.17513

Best Score	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cgten	.0605395	.0409804	1.48	0.146	-.0218571	.1429361
cgten2	-.0056886	.0035216	-1.62	0.113	-.0127693	.0013922
co	.0055988	.0125219	0.45	0.657	-.0195781	.0307758
co2	-.0003529	.0006584	-0.54	0.594	-.0016768	.000971
xo	.0368832	.0300615	1.23	0.226	-.0235596	.0973259
xo2	-.0036409	.0027535	-1.32	0.192	-.0091772	.0018954
s3	-.0160499	.0355768	-0.45	0.654	-.0875818	.0554821
s32	-.000659	.0035559	-0.19	0.854	-.0078086	.0064906
fgtiu	-.0003498	.0134799	-0.03	0.979	-.027453	.0267534
fgtiu2	-.0000531	.0008951	-0.06	0.953	-.0018528	.0017467
cdravg	.0399757	.0284285	1.41	0.166	-.0171837	.097135
cdravg2	-.0027302	.0023964	-1.14	0.260	-.0075484	.002088
cmdten	-.0605619	.0400673	-1.51	0.137	-.1411226	.0199988
cmdten2	.0024424	.0025801	0.95	0.349	-.0027451	.00763
team3	-.2048102	.0518543	-3.95	0.000	-.3090702	-.1005501
light	-.1015938	.0624842	-1.63	0.111	-.2272267	.024039
_cons	1.59398	.1763244	9.04	0.000	1.239456	1.948504

Table C-4
Complete Plan First Score

Source	SS	df	MS
Model	.873775734	16	.054610983
Residual	1.49320862	46	.032461057
Total	2.36698436	62	.038177167

Number of obs	= 63
F(16, 46)	= 1.68
Prob > F	= 0.0852
R-squared	= 0.3692
Adj R-squared	= 0.1497
Root MSE	= .18017

First Score	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cgten	.0306621	.0425751	0.72	0.475	-.0550372	.1163613
cgten2	-.003815	.0036639	-1.04	0.303	-.01119	.0035601
co	-.0010118	.0131566	-0.08	0.939	-.0274947	.025471
co2	-.0003848	.0007226	-0.53	0.597	-.0018394	.0010698
xo	.0563828	.0320516	1.76	0.085	-.0081337	.1208992
xo2	-.0048405	.0029079	-1.66	0.103	-.0106938	.0010127
s3	-.0185886	.0391003	-0.48	0.637	-.0972934	.0601162
s32	.0011855	.0038921	0.30	0.762	-.0066489	.0090199
fgtiu	.016679	.0138931	1.20	0.236	-.0112864	.0446444
fgtiu2	-.000983	.0009214	-1.07	0.292	-.0028377	.0008717
cdravg	.0451092	.0295489	1.53	0.134	-.0143697	.104588
cdravg2	-.0035714	.0024774	-1.44	0.156	-.0085583	.0014154
cmdten	-.0170643	.0429054	-0.40	0.693	-.1034284	.0692997
cmdten2	.0002174	.0027206	0.08	0.937	-.0052588	.0056937
team3	-.1906799	.0546891	-3.49	0.001	-.3007634	-.0805964
light	-.1047088	.0662285	-1.58	0.121	-.2380198	.0286023
_cons	1.488999	.1882854	7.91	0.000	1.11	1.867998

Table C-5
Complete Plan Best Score

Source	SS	df	MS
Model	.641377682	16	.040086105
Residual	1.12624362	48	.023463409
Total	1.7676213	64	.027619083

Number of obs	= 65
F(16, 48)	= 1.71
Prob > F	= 0.0775
R-squared	= 0.3628
Adj R-squared	= 0.1505
Root MSE	= .15318

Best Score	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cgten	.0425291	.0358432	1.19	0.241	-.0295384	.1145967
cgten2	-.00448	.0030802	-1.45	0.152	-.0106731	.0017131
co	.0029697	.0109522	0.27	0.787	-.0190511	.0249905
co2	-.0001613	.0005759	-0.28	0.781	-.0013192	.0009966
xo	.0380044	.0262931	1.45	0.155	-.0148614	.0908702
xo2	-.0032697	.0024083	-1.36	0.181	-.008112	.0015726
s3	.0030831	.031117	0.10	0.921	-.0594818	.0656479
s32	-.0017004	.0031101	-0.55	0.587	-.0079537	.0045529
fgtiu	.0094918	.0117901	0.81	0.425	-.0142138	.0331975
fgtiu2	-.0005336	.0007829	-0.68	0.499	-.0021078	.0010406
cdravg	.0269559	.0248648	1.08	0.284	-.0230381	.0769499
cdravg2	-.0022621	.002096	-1.08	0.286	-.0064763	.0019521
cmdten	-.0525813	.0350446	-1.50	0.140	-.1230431	.0178805
cmdten2	.0020041	.0022566	0.89	0.379	-.0025331	.0065414
team3	-.1739298	.045354	-3.83	0.000	-.2651202	-.0827395
light	-.0884254	.0546513	-1.62	0.112	-.1983093	.0214584
_cons	1.672444	.1542208	10.84	0.000	1.362362	1.982526

Table C-6
Overall Plan Quality First Score

Source	SS	df	MS
Model	.963660153	16	.06022876
Residual	2.69705638	43	.062722241
Total	3.66071653	59	.062046043

Number of obs	= 60
F(16, 43)	= 0.96
Prob > F	= 0.5132
R-squared	= 0.2632
Adj R-squared	= -0.0109
Root MSE	= .25044

First Score	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cgten	.0600752	.0647914	0.93	0.359	-.0705891	.1907396
cgten2	-.0061124	.0054166	-1.13	0.265	-.0170361	.0048113
co	.0019679	.0188349	0.10	0.917	-.0360162	.0399521
co2	-.0004545	.0010296	-0.44	0.661	-.0025309	.001622
xo	.0821333	.0473283	1.74	0.090	-.0133133	.1775799
xo2	-.0071683	.0043107	-1.66	0.104	-.0158618	.0015251
s3	-.0332483	.054476	-0.61	0.545	-.1431097	.076613
s32	.0022411	.0054206	0.41	0.681	-.0086907	.0131728
fgtiu	.0265896	.0194547	1.37	0.179	-.0126446	.0658238
fgtiu2	-.0014107	.0012835	-1.10	0.278	-.0039991	.0011778
cdravg	.030702	.0427696	0.72	0.477	-.055551	.116955
cdravg2	-.0029391	.0035321	-0.83	0.410	-.0100623	.0041841
cmdten	.0070167	.0624478	0.11	0.911	-.1189213	.1329548
cmdten2	-.0015878	.0039015	-0.41	0.686	-.009456	.0062804
team3	-.2064249	.0785024	-2.63	0.012	-.36474	-.0481098
light	-.0263643	.0943888	-0.28	0.781	-.2167174	.1639888
_cons	1.330239	.2702037	4.92	0.000	.785321	1.875156

Table C-7
Overall Plan Quality Best Score

Source	SS	df	MS
Model	.838174772	16	.052385923
Residual	1.95463929	48	.040721652
Total	2.79281406	64	.04363772

Number of obs	= 65
F(16, 48)	= 1.29
Prob > F	= 0.2444
R-squared	= 0.3001
Adj R-squared	= 0.0668
Root MSE	= .2018

Best Score	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cgten	.0850608	.0472198	1.80	0.078	-.0098808	.1800025
cgten2	-.007628	.0040578	-1.88	0.066	-.0157868	.0005307
co	-.0049496	.0144284	-0.34	0.733	-.0339598	.0240606
co2	.0003627	.0007587	0.48	0.635	-.0011627	.0018882
xo	.0432512	.0346385	1.25	0.218	-.0263942	.1128965
xo2	-.0046153	.0031728	-1.45	0.152	-.0109945	.001764
s3	-.0168955	.0409935	-0.41	0.682	-.0993184	.0655274
s32	.0005134	.0040973	0.13	0.901	-.0077247	.0087516
fgtiu	.0123914	.0155323	0.80	0.429	-.0188383	.0436212
fgtiu2	-.0008905	.0010314	-0.86	0.392	-.0029643	.0011833
cdravg	.0083741	.0327569	0.26	0.799	-.057488	.0742362
cdravg2	-.0001979	.0027612	-0.07	0.943	-.0057497	.0053539
cmdten	-.0203053	.0461677	-0.44	0.662	-.1131316	.0725209
cmdten2	-.000677	.0029729	-0.23	0.821	-.0066544	.0053004
team3	-.201226	.0597493	-3.37	0.002	-.32136	-.081092
light	-.0817968	.0719976	-1.14	0.262	-.2265577	.062964
_cons	1.57174	.2031703	7.74	0.000	1.163239	1.980242

Table C-8
Execution Summary First Score

Source	SS	df	MS
Model	2.08393821	16	.130246138
Residual	2.21376863	45	.049194858
Total	4.29770684	61	.07045421

Number of obs	= 62
F(16, 45)	= 2.65
Prob > F	= 0.0053
R-squared	= 0.4849
Adj R-squared	= 0.3017
Root MSE	= .2218

First Score	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cgten	.0706073	.0525861	1.34	0.186	-.0353065	.1765212
cgten2	-.0076085	.0045264	-1.68	0.100	-.0167251	.0015081
co	.0232906	.016571	1.41	0.167	-.0100852	.0566664
co2	-.0016494	.0009015	-1.83	0.074	-.0034652	.0001663
xo	.0718633	.0408842	1.76	0.086	-.0104818	.1542084
xo2	-.0064637	.0037216	-1.74	0.089	-.0139595	.0010321
s3	-.0881821	.0481413	-1.83	0.074	-.1851437	.0087794
s32	.0066342	.0047916	1.38	0.173	-.0030165	.016285
fgtiu	-.0210784	.0171169	-1.23	0.225	-.0555537	.0133969
fgtiu2	.0011648	.0011355	1.03	0.310	-.0011222	.0034517
cdravg	.0260445	.0372577	0.70	0.488	-.0489963	.1010853
cdravg2	-.0011046	.0030883	-0.36	0.722	-.0073247	.0051155
cmdten	-.0005844	.0530928	-0.01	0.991	-.1075187	.10635
cmdten2	.0001754	.0033494	0.05	0.958	-.0065705	.0069214
team3	-.3501132	.068179	-5.14	0.000	-.4874327	-.2127937
light	.0830566	.0826839	1.00	0.321	-.0834774	.2495906
_cons	1.146976	.2345718	4.89	0.000	.6745238	1.619427

Table C-9
Execution Summary Best Score

Source	SS	df	MS
Model	1.14729317	16	.071705823
Residual	2.94546705	48	.061363897
Total	4.09276021	64	.063949378

Number of obs	= 65
F(16, 48)	= 1.17
Prob > F	= 0.3259
R-squared	= 0.2803
Adj R-squared	= 0.0404
Root MSE	= .24772

Best Score	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cgten	.061797	.0579652	1.07	0.292	-.0547499	.1783439
cgten2	-.006185	.0049812	-1.24	0.220	-.0162005	.0038304
co	.0191928	.0177117	1.08	0.284	-.016419	.0548047
co2	-.0007805	.0009314	-0.84	0.406	-.0026531	.0010922
xo	.0463697	.0425209	1.09	0.281	-.0391244	.1318638
xo2	-.0044994	.0038948	-1.16	0.254	-.0123303	.0033316
s3	-.0281171	.0503221	-0.56	0.579	-.1292963	.0730622
s32	.0002054	.0050297	0.04	0.968	-.0099075	.0103182
fgtiu	-.0015038	.0190669	-0.08	0.937	-.0398403	.0368327
fgtiu2	-.0001275	.0012661	-0.10	0.920	-.0026732	.0024182
cdravg	.0098005	.0402111	0.24	0.808	-.0710494	.0906503
cdravg2	-.0002937	.0033896	-0.09	0.931	-.0071089	.0065214
cmdten	-.05653	.0566737	-1.00	0.324	-.1704801	.0574201
cmdten2	.002448	.0036494	0.67	0.506	-.0048896	.0097857
team3	-.234417	.073346	-3.20	0.002	-.381889	-.086945
light	.0108364	.0883816	0.12	0.903	-.1668667	.1885394
_cons	1.481871	.2494043	5.94	0.000	.9804098	1.983332

Table C-10
Maneuver Tactics and Synchronization First Score

Source	SS	df	MS
Model	3.38438873	16	.211524295
Residual	3.56818754	44	.081095171
Total	6.95257627	60	.115876271

Number of obs =	61
F(16, 44) =	2.61
Prob > F =	0.0061
R-squared =	0.4868
Adj R-squared =	0.3002
Root MSE =	.28477

First Score	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cgten	.1159745	.0675188	1.72	0.093	-.0201008	.2520497
cgten2	-.0105719	.0058142	-1.82	0.076	-.0222897	.0011459
co	.0351751	.0212991	1.65	0.106	-.0077503	.0781005
co2	-.0021222	.0011601	-1.83	0.074	-.0044603	.0002158
xo	.0852437	.0525188	1.62	0.112	-.0206009	.1910884
xo2	-.0076457	.0047786	-1.60	0.117	-.0172764	.0019849
s3	-.1332622	.0618834	-2.15	0.037	-.25798	-.0085444
s32	.0094843	.006152	1.54	0.130	-.0029143	.021883
fgtiu	-.0169943	.0219769	-0.77	0.443	-.0612859	.0272973
fgtiu2	.0011768	.0014583	0.81	0.424	-.0017621	.0041158
cdravg	.0188511	.0478445	0.39	0.695	-.0775731	.1152753
cdravg2	-.0005978	.0039651	-0.15	0.881	-.0085889	.0073934
cmdten	-.0286572	.0779982	-0.37	0.715	-.1858523	.1285379
cmdten2	-.0006671	.0054631	-0.12	0.903	-.0116773	.010343
team3	-.4333982	.0876538	-4.94	0.000	-.6100528	-.2567436
light	-.08832	.1066935	-0.83	0.412	-.3033467	.1267066
_cons	1.14412	.3151577	3.63	0.001	.5089611	1.779278

Table C-11
Maneuver Tactics and Synchronization Best Score

Source	SS	df	MS
Model	1.67401451	16	.104625907
Residual	4.22555924	48	.088032484
Total	5.89957375	64	.09218084

Number of obs =	65
F(16, 48) =	1.19
Prob > F =	0.3108
R-squared =	0.2838
Adj R-squared =	0.0450
Root MSE =	.2967

Best Score	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cgten	.0954347	.0694277	1.37	0.176	-.0441589	.2350284
cgten2	-.0089414	.0059662	-1.50	0.141	-.0209373	.0030545
co	.0360965	.0212142	1.70	0.095	-.0065575	.0787505
co2	-.0014258	.0011155	-1.28	0.207	-.0036687	.0008171
xo	.0600226	.0509293	1.18	0.244	-.0423776	.1624229
xo2	-.0058808	.0046649	-1.26	0.214	-.0152603	.0034987
s3	-.0388798	.0602731	-0.65	0.522	-.1600669	.0823074
s32	.0017548	.0060243	0.29	0.772	-.0103578	.0138674
fgtiu	-.0040984	.0228373	-0.18	0.858	-.0500158	.041819
fgtiu2	-.0001165	.0015165	-0.08	0.939	-.0031656	.0029327
cdravg	.0051885	.0481627	0.11	0.915	-.0916491	.1020261
cdravg2	.0007247	.0040598	0.18	0.859	-.0074381	.0088876
cmdten	-.0390497	.0678807	-0.58	0.568	-.1755331	.0974337
cmdten2	.0005661	.0043711	0.13	0.897	-.0082225	.0093547
team3	-.2724593	.0878499	-3.10	0.003	-.4490934	-.0958251
light	-.0505281	.1058587	-0.48	0.635	-.2633713	.1623152
_cons	1.282777	.2987232	4.29	0.000	.6821538	1.8834

Table C-12
Complete Mission and Tasks First Score

Source	SS	df	MS
Model	6.82987557	16	.426867223
Residual	10.9539943	44	.248954415
Total	17.7838698	60	.296397831

Number of obs	=	61
F(16, 44)	=	1.71
Prob > F	=	0.0796
R-squared	=	0.3840
Adj R-squared	=	0.1601
Root MSE	=	.49895

First Score	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cgten	.0813082	.1272609	0.64	0.526	-.1751692	.3377857
cgten2	-.011874	.0106881	-1.11	0.273	-.0334144	.0096664
co	.0168826	.0372803	0.45	0.653	-.0582509	.092016
co2	-.0019293	.0020281	-0.95	0.347	-.0060166	.002158
xo	.1100379	.094276	1.17	0.249	-.0799629	.3000386
xo2	-.0112375	.0085109	-1.32	0.194	-.0283901	.005915
s3	-.0897282	.1084869	-0.83	0.413	-.3083693	.1289128
s32	.0063786	.0107877	0.59	0.557	-.0153626	.0281197
fgtiu	-.0815343	.0387225	-2.11	0.041	-.1595744	-.0034941
fgtiu2	.004227	.0025544	1.65	0.105	-.000921	.0093749
cdravg	.0491893	.0847947	0.58	0.565	-.1217032	.2200818
cdravg2	-.0011656	.0069891	-0.17	0.868	-.0152511	.01292
cmdten	.0919864	.1235605	0.74	0.461	-.1570335	.3410062
cmdten2	-.0024759	.0077166	-0.32	0.750	-.0180277	.0130758
team3	-.5071604	.1552089	-3.27	0.002	-.8199633	-.1943574
light	.373941	.1870471	2.00	0.052	-.0030277	.7509097
_cons	.8019422	.5284129	1.52	0.136	-.263004	1.866889

Table C-13
Complete Mission and Tasks Best Score

Source	SS	df	MS
Model	3.38084175	16	.211302609
Residual	9.69097006	48	.20189521
Total	13.0718118	64	.204247059

Number of obs	=	65
F(16, 48)	=	1.05
Prob > F	=	0.4288
R-squared	=	0.2586
Adj R-squared	=	0.0115
Root MSE	=	.44933

Best Score	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cgten	.0831329	.1051415	0.79	0.433	-.1282681	.294534
cgten2	-.0073817	.0090353	-0.82	0.418	-.0255484	.010785
co	.0391239	.0321268	1.22	0.229	-.0254715	.1037192
co2	-.0012967	.0016894	-0.77	0.447	-.0046934	.0021
xo	.0766271	.0771275	0.99	0.325	-.0784482	.2317024
xo2	-.0069521	.0070646	-0.98	0.330	-.0211564	.0072522
s3	-.0086832	.0912777	-0.10	0.925	-.1922094	.174843
s32	-.0021151	.0091232	-0.23	0.818	-.0204585	.0162283
fgtiu	-.001651	.0345848	-0.05	0.962	-.0711885	.0678864
fgtiu2	.0000844	.0022966	0.04	0.971	-.0045332	.004702
cdravg	-.0038314	.0729378	-0.05	0.958	-.1504826	.1428198
cdravg2	.0021388	.0061482	0.35	0.729	-.010223	.0145007
cmdten	-.1164314	.1027988	-1.13	0.263	-.3231223	.0902595
cmdten2	.0065478	.0066196	0.99	0.328	-.0067617	.0198573
scorpion	-.3433682	.1330402	-2.58	0.013	-.6108635	-.0758729
light	.1723679	.1603128	1.08	0.288	-.1499626	.4946984
_cons	1.491664	.4523874	3.30	0.002	.5820785	2.40125

Table C-14
Throughout Summary First Score

Source	SS	df	MS
Model	.893478938	16	.055842434
Residual	.941024498	46	.020457054
Total	1.83450344	62	.029588765

Number of obs	=	63
F(16, 46)	=	2.73
Prob > F	=	0.0040
R-squared	=	0.4870
Adj R-squared	=	0.3086
Root MSE	=	.14303

First Score	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cgten	.0310728	.0337984	0.92	0.363	-.0369598	.0991055
cgten2	-.0039024	.0029086	-1.34	0.186	-.0097571	.0019523
co	.0044811	.0104444	0.43	0.670	-.0165424	.0255046
co2	-.0003197	.0005737	-0.56	0.580	-.0014745	.000835
xo	.0283043	.0254442	1.11	0.272	-.0229123	.0795209
xo2	-.0019801	.0023084	-0.86	0.395	-.0066267	.0026665
s3	-.0316051	.0310399	-1.02	0.314	-.0940851	.030875
s32	.0017933	.0030898	0.58	0.564	-.004426	.0080127
fgtiu	-.0032258	.0110291	-0.29	0.771	-.0254263	.0189746
fgtiu2	-.0002602	.0007315	-0.36	0.724	-.0017326	.0012121
cdravg	.035688	.0234575	1.52	0.135	-.0115295	.0829054
cdravg2	-.003141	.0019667	-1.60	0.117	-.0070998	.0008179
cmdten	.0007513	.0340606	0.02	0.982	-.0678091	.0693116
cmdten2	-.0005426	.0021597	-0.25	0.803	-.0048899	.0038048
team3	-.2371248	.0434151	-5.46	0.000	-.324515	-.1497346
light	.013226	.0525757	0.25	0.803	-.0926034	.1190554
_cons	1.420847	.1494709	9.51	0.000	1.119977	1.721716

Table C-15
Throughout Summary Best Score

Source	SS	df	MS
Model	.629531409	16	.039345713
Residual	.987963662	48	.020582576
Total	1.61749507	64	.02527336

Number of obs	=	65
F(16, 48)	=	1.91
Prob > F	=	0.0429
R-squared	=	0.3892
Adj R-squared	=	0.1856
Root MSE	=	.14347

Best Score	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cgten	.0221268	.0335707	0.66	0.513	-.0453717	.0896253
cgten2	-.0026112	.0028849	-0.91	0.370	-.0084117	.0031893
co	.0046909	.0102578	0.46	0.650	-.0159338	.0253156
co2	-.0000238	.0005394	-0.04	0.965	-.0011083	.0010607
xo	.0125319	.0246261	0.51	0.613	-.0369823	.062046
xo2	-.0006377	.0022557	-0.28	0.779	-.005173	.0038976
s3	-.0109897	.0291442	-0.38	0.708	-.069588	.0476086
s32	-.0008285	.0029129	-0.28	0.777	-.0066854	.0050284
fgtiu	.0008753	.0110426	0.08	0.937	-.0213274	.023078
fgtiu2	-.0003698	.0007333	-0.50	0.616	-.0018441	.0011046
cdravg	.0059871	.0232884	0.26	0.798	-.0408374	.0528115
cdravg2	-.0001465	.0019631	-0.07	0.941	-.0040935	.0038006
cmdten	-.0476245	.0328228	-1.45	0.153	-.1136191	.0183701
cmdten2	.0019016	.0021136	0.90	0.373	-.002348	.0061512
team3	-.170606	.0424786	-4.02	0.000	-.2560149	-.0851971
light	-.0585089	.0511865	-1.14	0.259	-.1614261	.0444084
_cons	1.703611	.1444433	11.79	0.000	1.413188	1.994034

Table C-16
Operational Command and Control First Score

Source	SS	df	MS
Model	1.23841404	16	.077400877
Residual	1.28302475	45	.028511661
Total	2.52143878	61	.041335062

Number of obs =	62
F(16, 45) =	2.71
Prob > F =	0.0043
R-squared =	0.4912
Adj R-squared =	0.3102
Root MSE =	.16885

First Score	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cgten	.0453506	.0400334	1.13	0.263	-.0352808	.125982
cgten2	-.0051492	.0034459	-1.49	0.142	-.0120896	.0017912
co	.0084346	.0126154	0.67	0.507	-.0169741	.0338433
co2	-.0004694	.0006863	-0.68	0.498	-.0018517	.000913
xo	.0489329	.0311248	1.57	0.123	-.0137558	.1116215
xo2	-.0037716	.0028333	-1.33	0.190	-.0094781	.0019349
s3	-.0544913	.0366496	-1.49	0.144	-.1283074	.0193247
s32	.0030582	.0036478	0.84	0.406	-.0042889	.0104052
fgtiu	-.003911	.013031	-0.30	0.765	-.0301568	.0223348
fgtiu2	-.0002524	.0008644	-0.29	0.772	-.0019934	.0014886
cdravg	.0159961	.028364	0.56	0.576	-.0411318	.0731241
cdravg2	-.0014822	.0023511	-0.63	0.532	-.0062175	.0032531
cmdten	-.0074551	.0404191	-0.18	0.854	-.0888634	.0739532
cmdten2	.0004518	.0025498	0.18	0.860	-.0046839	.0055874
team3	-.2612593	.0519041	-5.03	0.000	-.3657996	-.1567191
light	.073337	.0629466	1.17	0.250	-.053444	.2001181
_cons	1.456265	.1785777	8.15	0.000	1.096591	1.815939

Table C-17
Operational Command and Control Best Score

Source	SS	df	MS
Model	.666875907	16	.041679744
Residual	1.27272237	48	.026515049
Total	1.93959828	64	.030306223

Number of obs =	65
F(16, 48) =	1.57
Prob > F =	0.1140
R-squared =	0.3438
Adj R-squared =	0.1251
Root MSE =	.16283

Best Score	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cgten	.028333	.0381028	0.74	0.461	-.0482779	.1049439
cgten2	-.0029629	.0032744	-0.90	0.370	-.0095465	.0036206
co	.0090805	.0116426	0.78	0.439	-.0143286	.0324896
co2	-.0001889	.0006122	-0.31	0.759	-.0014198	.0010421
xo	.0145433	.0279507	0.52	0.605	-.0416554	.0707419
xo2	-.0007635	.0025602	-0.30	0.767	-.0059111	.0043841
s3	-.006398	.0330787	-0.19	0.847	-.0729071	.0601112
s32	-.0020811	.0033062	-0.63	0.532	-.0087286	.0045665
fgtiu	.0088941	.0125334	0.71	0.481	-.016306	.0340942
fgtiu2	-.0007564	.0008323	-0.91	0.368	-.0024298	.000917
cdravg	.0052867	.0264323	0.20	0.842	-.047859	.0584325
cdravg2	-.0006861	.0022281	-0.31	0.759	-.005166	.0037937
cmdten	-.071436	.0372539	-1.92	0.061	-.1463399	.0034679
cmdten2	.0034375	.0023989	1.43	0.158	-.0013858	.0082608
team3	-.1546501	.0482132	-3.21	0.002	-.2515893	-.057711
light	-.0445099	.0580967	-0.77	0.447	-.1613211	.0723013
_cons	1.80262	.1639433	11.00	0.000	1.47299	2.13225

Table C-18
Time Management First Score

Source	SS	df	MS
Model	1.81333826	16	.113333641
Residual	2.84510379	45	.063224529
Total	4.65844205	61	.076367902

Number of obs	=	62
F(16, 45)	=	1.79
Prob > F	=	0.0631
R-squared	=	0.3893
Adj R-squared	=	0.1721
Root MSE	=	.25144

First Score	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cgten	.1009843	.0594241	1.70	0.096	-.0187019	.2206705
cgten2	-.0102411	.0051311	-2.00	0.052	-.0205757	.0000935
co	.0147414	.0183847	0.80	0.427	-.0222873	.05177
co2	-.0012974	.0010093	-1.29	0.205	-.0033302	.0007353
xo	.115896	.0447515	2.59	0.013	.0257618	.2060302
xo2	-.0088949	.0040604	-2.19	0.034	-.0170729	-.0007168
s3	-.0015916	.054953	-0.03	0.977	-.1122726	.1090895
s32	-.0020969	.0054661	-0.38	0.703	-.0131062	.0089123
fgtiu	.0433654	.0196214	2.21	0.032	.0038458	.082885
fgtiu2	-.0027225	.0013018	-2.09	0.042	-.0053444	-.0001005
cdravg	.1115958	.0413056	2.70	0.010	.0284021	.1947895
cdravg2	-.0099749	.0034591	-2.88	0.006	-.0169418	-.003008
cmdten	-.0084865	.0598789	-0.14	0.888	-.1290889	.1121158
cmdten2	.0008707	.0038017	0.23	0.820	-.0067863	.0085276
team3	-.1969679	.0764032	-2.58	0.013	-.3508519	-.0430839
light	-.0535459	.0926188	-0.58	0.566	-.2400899	.132998
_cons	1.079115	.2629577	4.10	0.000	.5494909	1.608739

Table C-19
Time Management Best Score

Source	SS	df	MS
Model	1.10084767	16	.06880298
Residual	1.73128114	48	.036068357
Total	2.83212881	64	.044252013

Number of obs	=	65
F(16, 48)	=	1.91
Prob > F	=	0.0434
R-squared	=	0.3887
Adj R-squared	=	0.1849
Root MSE	=	.18992

Best Score	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cgten	.0914942	.04444	2.06	0.045	.0021415	.1808468
cgten2	-.0088987	.0038189	-2.33	0.024	-.0165772	-.0012202
co	.0069859	.013579	0.51	0.609	-.0203165	.0342883
co2	-.0004788	.000714	-0.67	0.506	-.0019144	.0009569
xo	.0752595	.0325994	2.31	0.025	.009714	.140805
xo2	-.0062568	.002986	-2.10	0.041	-.0122605	-.0002531
s3	.0076874	.0385803	0.20	0.843	-.0698833	.0852582
s32	-.0031843	.0038561	-0.83	0.413	-.0109375	.0045689
fgtiu	.0249625	.0146179	1.71	0.094	-.0044288	.0543538
fgtiu2	-.001422	.0009707	-1.46	0.149	-.0033737	.0005297
cdravg	.0513489	.0308285	1.67	0.102	-.010636	.1133338
cdravg2	-.0027691	.0025987	-1.07	0.292	-.0079941	.0024559
cmdten	-.000475	.0434499	-0.01	0.991	-.0878368	.0868868
cmdten2	-.0004968	.0027979	-0.18	0.860	-.0061223	.0051287
team3	-.1905682	.0562319	-3.39	0.001	-.3036301	-.0775063
light	-.0896188	.0677592	-1.32	0.192	-.2258578	.0466202
_cons	1.334657	.19121	6.98	0.000	.9502033	1.71911

Table C-20
Intelligence Plan First Score

Source	SS	df	MS
Model	1.54596936	16	.096623085
Residual	2.49670932	45	.055482429
Total	4.04267868	61	.066273421

Number of obs	62
F(16, 45)	1.74
Prob > F	0.0729
R-squared	0.3824
Adj R-squared	0.1628
Root MSE	.23555

First Score	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cgten	.0139855	.0563353	0.25	0.805	-.0994796	.1274505
cgten2	-.0030931	.0048279	-0.64	0.525	-.0128169	.0066307
co	.0011514	.0172947	0.07	0.947	-.0336819	.0359846
co2	-.0007124	.0009546	-0.75	0.459	-.0026351	.0012102
xo	.0271842	.0419076	0.65	0.520	-.0572221	.1115904
xo2	-.0015825	.0038398	-0.41	0.682	-.0093164	.0061513
s3	-.037987	.0511448	-0.74	0.462	-.1409979	.0650239
s32	.0015278	.0050931	0.30	0.766	-.0087303	.0117858
fgtiu	-.0240791	.0181735	-1.32	0.192	-.0606824	.0125242
fgtiu2	.0008989	.0012058	0.75	0.460	-.0015297	.0033275
cdravg	.056189	.0388289	1.45	0.155	-.0220165	.1343945
cdravg2	-.0044105	.0032616	-1.35	0.183	-.0109797	.0021587
cmdten	.0170167	.0566176	0.30	0.765	-.097017	.1310505
cmdten2	-.0016333	.0035914	-0.45	0.651	-.0088668	.0056002
team3	-.3130668	.0719019	-4.35	0.000	-.4578847	-.168249
light	-.0276306	.0870594	-0.32	0.752	-.2029773	.1477161
_cons	1.329829	.2503036	5.31	0.000	.8256918	1.833967

Table C-21
Intelligence Plan Best Score

Source	SS	df	MS
Model	1.11816817	16	.06988551
Residual	2.3789309	48	.04956106
Total	3.49709907	64	.054642173

Number of obs	65
F(16, 48)	1.41
Prob > F	0.1774
R-squared	0.3197
Adj R-squared	0.0930
Root MSE	.22262

Best Score	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cgten	.0287117	.0520932	0.55	0.584	-.0760287	.1334522
cgten2	-.0038921	.0044766	-0.87	0.389	-.0128929	.0051088
co	.0068374	.0159175	0.43	0.669	-.0251669	.0388417
co2	-.0002378	.000837	-0.28	0.778	-.0019208	.0014451
xo	.022088	.0382135	0.58	0.566	-.0547453	.0989214
xo2	-.0021813	.0035002	-0.62	0.536	-.009219	.0048563
s3	.0015822	.0452243	0.03	0.972	-.0893474	.0925118
s32	-.002778	.0045202	-0.61	0.542	-.0118664	.0063104
fgtiu	-.0234546	.0171353	-1.37	0.177	-.0579075	.0109983
fgtiu2	.0008189	.0011379	0.72	0.475	-.001469	.0031067
cdravg	.0029298	.0361376	0.08	0.936	-.0697298	.0755894
cdravg2	-.0003212	.0030462	-0.11	0.916	-.006446	.0058036
cmdten	-.0142646	.0509325	-0.28	0.781	-.1166713	.0881422
cmdten2	-.0006927	.0032797	-0.21	0.834	-.007287	.0059016
team3	-.2289282	.0659159	-3.47	0.001	-.361461	-.0963954
light	-.02289	.0794283	-0.29	0.774	-.1825914	.1368113
_cons	1.600337	.2241392	7.14	0.000	1.149675	2.050999

Appendix D: Additional Stability Analysis

Because the results of the base model are contrary to the expectations of lifecycle manning, I attempted several other ways of measuring stability to ensure I thoroughly searched for any relationship that might exist between battalion command group stability and battalion training proficiency. In this appendix, I will summarize an alternative method for measuring battalion command group stability, the use of indicator variables for command group stability, and the introduction of enlisted personnel stability into the model. None of these attempts to check alternative measures of stability provided meaningful insights or statistically significant results.

An Alternative Measure for Command Group Stability

During the time period this data was collected, the Army used the individual replacement system to manage the average amount of time the commander, executive officer, and operations officer served in their respective positions in the battalion command group. Personnel officers managed the command group assignments to achieve an objective of 24 months for battalion command and 18 months (+/- 6 months) for a field grade officer in some combination of time spent as executive officer and/or operations officer.

This model for managing the duration of command group assignments creates endogeneity between command group stability and the executive officer and operations officer months in position. Almost by definition, either the executive officer experience or operations officer experience will be low when command group stability is high. Since the executive officer or operations officer changes the command group composition more frequently than the commander, this endogeneity could create problems for the model even though the correlations between these three variables are low.

I constructed the following variables in an attempt to avoid any endogeneity between command group measures of stability:

- **Institutional Knowledge**: The number of months the first individual of the command group arrived before the second member of the command group arrived.
- **Paired Stability**: The number of months the first and second arrivals served together before the command group formed.
- **Command Group Tenure**: The number of months the command group served as a team before the training event (same as previous measure of command group tenure)
- **Commander Indicator Variable**: An indicator variable to show if the battalion commander was the newest member of the command team.

Building the battalion command group stability variables in this manner captured the individual experience of the member with the longest time in the unit, the advantage of two members of the command group working together before the third member arrived, and an indicator of the commander being the member with the least amount of time in the command group. This also had the advantage of reducing the endogenous characteristics of command group tenure and executive officer/operations officer experience. Although these measures were intuitively appealing, they did not provide meaningful results that would help answer the research questions.

Indicator Variables for Command Group Stability

Another alternative for measuring command group stability was the use of indicator variables to indicate a high level of stability for the different variables. I considered any stability variable with a value greater than four months to be high stability. I did this because any group together for more than four months would most likely complete major training exercises as a team before the training rotation at NTC. Additionally, this technique would allow me to check the interaction of various high stability and low stability variables to determine if different combinations of high and low stability provided any insights into battalion training proficiency scores. Multiple combinations of interaction variables and indicator variables combined with continuous variables did not reveal any statistically significant relationship.

Introduction of Enlisted Personnel Stability

Enlisted personnel stability could affect the battalion's training proficiency by influencing the effectiveness of the battalion's execution of the mission. For example, a battalion command group with high stability may issue a clear order in a timely fashion but mission execution could suffer if there is a low level of experience in the enlisted ranks the mission may not get accomplished to standard. In such a case, the battalion would receive a low training proficiency score on the task of accomplishing the mission. Another possibility is that the battalion command group issues an overly simplistic plan based on the inexperience of the enlisted personnel and suffers on the training proficiency score for issuing a complete or high quality plan.

I used available enlisted personnel data for the 6 months prior to the training rotation to measure the following: the average monthly percentage of enlisted personnel turnover, the total percentage of enlisted personnel turnover, and the total number of enlisted personnel lost. The data was provided for all enlisted ranks, so I could divide the data into the categories of junior enlisted and non-commissioned officer ranks. These categories enabled the model to include the effect of soldier experience and small unit leadership experience. Based on these variables I also developed indicator variables for high enlisted stability and high non-commissioned officer stability (lower 50% of enlisted personnel turnover).

The size of the data set (N=66) prevented me from including all possible interaction variables for the various combinations of command group stability, enlisted stability, and non-commissioned officer stability. Doing so reduced the power of the regression and increased the probability of a Type II error. To preserve the power of the regression, I used the continuous variables of enlisted personnel monthly turnover and non-commissioned officer turnover. As with the other attempts to find the relationship between battalion stability and battalion training proficiency, the results did not show a statistically significant relationship.

Increasing Statistical Power[35]

Because my analysis generally accepts the null hypothesis of no relationship between battalion command group stability and battalion training proficiency, further discussion about the power of the analysis is warranted. The analysis results are contrary to the Army's expectation so I must be careful of committing a Type II error—a failure to detect the relationship with the empirical model even though the relationship exists. Army professionals and social scientists may be quick to criticize the model because of the small sample size and the strong belief that a significant, positive, and relevant relationship exists between personnel stability and unit effectiveness. This discussion addresses those criticisms.

The previous discussion about statistical power was based on the widely accepted standard of β=.20 as acceptable probability for a Type II error. However, for the conclusions of this analysis a Type II error may be more severe than a Type I error because of the assumed relationship. To reduce the probability of a Type II error, I used a statistical technique of varying α to increase the power of the analysis (Descoteaux, 2007; Cascio and Zedeck, 1983). Since the empirical data was collected prior to this analysis I am unable to adjust the sample size to attain a lower β value. Therefore, my only option is to increase the value of α. By doing so I am making a tradeoff between Type I and Type II errors which results in more stability variables showing a relationship

[35] The motivation for this sensitivity analysis was provided by Dr. Robert MacCoun who provided comments as an outside reader. I wish to express my sincere thanks for his thoughtful comments on the entire dissertation, his highlighting of this potential shortcoming in the research and his directing me to sources with background material for increasing statistical power.

with stability at a higher α, but also increases power well beyond the normally accepted value of β=.20. The following tables show the results of this sensitivity analysis.

Figure D-1 shows the values of β for every task as α varies from .05 to .15. Of particular note are the shaded areas which highlight the two tasks that exceeded the values of β, resulting in an unacceptably high probability of Type II error. When α increases to .10, the β is reduced below .20—the normally acceptable level of β. The results of this adjustment make the relative impact of a Type I and Type II error almost the same with a β/α ratio close to 1 (Descoteaux, 2007). The next incremental increase of a further reduces β and makes the Type II error relatively more important than a Type I error—which for this analysis is an acceptable risk. Furthermore, the table highlights the fact that the statistical power (1-β) for the remainder of the tasks is well above the widely accepted values.

Table D – 1
Statistical Power Sensitivity Analysis

	First Score			Best Score		
Battalion Task	α = .05	α = .10	α = .15	α = .05	α = .10	α = .15
Planning Summary	.045	.019	.010	.035	.014	.007
Complete Plan	.051	.022	.012	.048	.021	.011
Overall Plan Quality	.289	.177	.121	.142	.075	.046
Execution Summary	.002	.001	.000	.187	.105	.067
Maneuver Tactics and Synchronization	.003	.001	.000	.179	.099	.063
Complete the Mission	.046	.020	.010	.244	.145	.097
Throughout Summary	.002	.000	.000	.026	.010	.005
Command and Control	.002	.000	.000	.063	.032	.018
Time Management	.037	.015	.008	.027	.011	.005
Intelligence Plan	.043	.018	.009	.105	.053	.032

The additional question about the sensitivity analysis is whether or not additional variables enter the model when α increases to .15 and the answer is yes. The additional tasks are highlighted in Tables D-2 and D-3. As with the original analysis, the highest number of additional variables was found significant in the First Score results. Of note, command group tenure did not enter the model even with the relaxed standards for α. Battalion commander and executive officer stability entered the model for one task—the first for the battalion commander, but the sixth for the executive officer. This provides further support that executive officer experience matters the most in the battalion command group for the tasks analyzed. Lastly, company commander stability entered the model in three additional tasks. This provides some evidence that company commander experience plays a key role in battalion training proficiency and there may be some payoffs to extending the amount of time spent in company command before a deployment.

The Best Score results are consistent with the original findings. Only two additional variables entered the model under the new standard for α. Command group stability did enter the model for best score in the Planning Summary and field grade time in unit for Time Management. The training still appears to be the equalizer for training proficiency as most benefits to stability are negated after the training experience.

Table D-2
Stability Relationship with Battalion Level Tasks (First Scores)

Task Name	Command Group Stability	Command Team Stability	Battalion Commander Stability	Executive Officer Stability	Operations Officer Stability	Field Grade Unit Stability	Company Commander Stability
Planning (Summary)							
Complete Plan							
Overall Plan Quality							
Execution Summary							
Maneuver Tactics Synchronization							
Complete Mission and Tasks							
Throughout Summary							
Operational Command and Control							
Time Management							
Intelligence Plan							

95%	90%	85%	None

Table D-3
Stability Relationship with Battalion Level Tasks (Best Scores)

Task Name	Command Group Stability	Command Team Stability	Battalion Commander Stability	Executive Officer Stability	Operations Officer Stability	Field Grade Unit Stability	Company Commander Stability
Planning (Summary)							
Complete Plan							
Overall Plan Quality							
Execution Summary							
Maneuver Tactics Synchronization							
Complete Mission and Tasks							
Throughout Summary							
Operational Command and Control							
Time Management							
Intelligence Plan							

95%	90%	85%	None

This sensitivity analysis indicates the robustness of the initial results and conclusions. While the sample size appears to be small relative to some statistical analysis, the power of the model is sufficient to detect an existing relationship at a standard that far exceeds the acceptable standard in most research.