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Personnel Tempo: Definition, Measurement, and Effects on Retention, Readiness, and Quality of Life

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Since the end of the Cold War, military involvement in operations and training exercises has increased, while resources have declined. This situation can stress Service members, increasing personnel tempo, or PERSTEMPO, usually defined as "the number of days that Service members are away from their home station to perform their duties." This report clarifies definitions and measures of PERSTEMPO, summarizes research linking PERSTEMPO to retention, readiness, and quality of life, and presents the results of three analyses of existing Army data to identify effects of PERSTEMPO.

Definitions of personnel tempo vary across Services, and are determined from self-reports and administrative records. Effects of PERSTEMPO have been inconsistent, and depend on individual and deployment characteristics.

Results of data analyses indicate a modest relationship between PERSTEMPO and retention. At low levels, PERSTEMPO tends to increase retention; this positive relationship decreases at higher levels and may become negative. The analyses show inconsistent relationship between PERSTEMPO and self-assessed readiness. High levels of PERSTEMPO were associated with measures of family strain; relationships with financial factors and general satisfaction were negative, but quite weak. The analyses identified other variables regarding managing deployments that had substantial relationships with several measures of retention, readiness, and quality of life.

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FINAL REPORT

PERSONNEL TEMPO: DEFINITION, MEASUREMENT, AND EFFECTS ON RETENTION, READINESS, AND QUALITY OF LIFE

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FOREWORD

Much has changed in the Armed Forces since the fall of the Berlin Wall in 1989. Before that historic event, our military forces were "forward deployed" facing a large, fixed foe primarily from permanent bases in Europe, South Korea, Turkey, and Japan. Today, U.S. forces are based primarily in the United States, but are on call for rapid deployments to locations around the globe. The fact that the United States is trying to accomplish its diverse missions with a smaller standing force is believed to be responsible for strains between service members and their families. These strains are of concern to not only the services but also the United States Congress.

The purpose of this report is to review how these strains have been defined and measured in the past, and what important military outcomes relate to these personnel strains. In addition, the results of three analyses of existing Army survey and administrative data are reported. Our sponsor for this project is The Army's Deputy Chief of Staff for Personnel (DCSPER). He is particularly concerned with how one of these strains – the amount of time that soldiers are spending away from their home station – is related to the following three important Army outcomes: career retention, military readiness, and quality of life. The main findings of the literature review were shared with key members of the DCSPER's staff during a meeting in December 1998, as well as in briefings to the U.S. Special Operations Command (May, 1999) and U. S. Total Army Personnel Command (June, 1999).

ACKNOWLEDGMENTS

This report has benefited from the guidance from Dr. Bruce Bell, the contracting officer's technical representative for this project. In addition, Major Jan Swicord gave us information defining Army concerns about personnel tempo (PERSTEMPO) and sources of information about existing Army data.

We are grateful for the assistance provided by other researchers working on this problem who have shared information regarding their work. We received information from researchers at the RAND Corporation, the Center for Naval Analysis, the Institutes for Defense Analysis, and the U.S. Army Personnel Command.

The authors thank the individuals, agencies, and organizations that provided the data that were the basis of our analysis. The Sample Survey of Military Personnel (SSMP) data were provided by the U.S. Army Research Institute (ARI); we also thank the other agencies that released specific items for our analysis. The Army Special Operations Forces data were provided by the U.S. Special Operations Command. Army deployment data were provided by the RAND Corporation, from an extract they constructed of the Total Army Personnel Data Base. Finally, the retention data for our analysis were provided by the Defense Manpower Data Center.

The authors acknowledge several members of our staff who worked on aspects of this literature review, including William Wharton, Eric Wetzel, and Sunny Sipes from HumRRO; and Jared Hughes from the Lewin Group. In addition, this report benefited from the editorial recommendations of Janice Laurence, William Strickland and Lola Zook.

PERSONNEL TEMPO: DEFINITION, MEASUREMENT, AND EFFECTS ON RETENTION, READINESS, AND QUALITY OF LIFE

EXECUTIVE SUMMARY

Research Requirement:

The time since the end of the Cold War has brought about some striking changes in the numbers and types of missions being performed by the military Services and in the forces available to perform these missions. During this period, military involvement in peacekeeping missions, military operations other than war, joint training exercises, and Service-unique training has increased, while personnel and resources have decreased. The dual problem of increased requirements and reduced resources can produce conditions that stress Service members and their units – heavier workloads, pressure to manage multiple requirements, and more time away from home and family. A particular concern of military leaders is the personnel tempo, or PERSTEMPO, which most officials define as "the number of days that Service members are away from their home station to perform their duties."

Unfortunately, the military Services, military researchers, and Congress have found it difficult to assess the impacts of PERSTEMPO. Because PERSTEMPO is a relatively recent concern, the Department of Defense (DoD) and the Services have only recently begun to develop formal, standardized methods to measure it and track its trends over time. In addition, research and analyses attempting to document the links between PERSTEMPO and important outcome measures have been hampered by both the complexity of the relationship and the interaction of PERSTEMPO with other elements that change when the Army must accomplish more missions with fewer people. Thus, the primary goal of this research is to clarify the definition and measurement of PERSTEMPO, as well as its relationship with retention, readiness, and quality of life.

Procedure:

The military research literature was reviewed to identify: (a) definitions and measures of PERSTEMPO; (b) research that links PERSTEMPO to retention, readiness, or quality of life; and (c) sources of existing data that could form the basis of additional analyses.

Based on the results of the review, three analyses of existing Army data were planned and conducted. Analysis of Army Special Operations Forces (SOF) data from the PERSTEMPO Impact Survey, conducted for the U.S. Special Operations Command (USSOCOM), focused on issues directly related to PERSTEMPO and the management of deployments for a high-deploying segment of the Army. Analysis of the Sample Survey of Military Personnel (SSMP) addressed a wide range of satisfaction measures assessed for a random sample of Army officers and enlisted personnel. Analysis of the Total Army Personnel Data Base (TAPDB),

supplemented by data from the Active Duty Military Master and Loss Files, provided objective measures of deployment and retention to complement the self-reported measures included in the two surveys.

Findings:

The review of the military literature on PERSTEMPO and related issues revealed only a small number of studies exploring PERSTEMPO's effects on various outcomes. Of these studies, many adopted case study and interview methodologies; few rigorously examined the relationships of interest. That observation notwithstanding, the literature revealed that PERSTEMPO has been difficult to define, measure, and track, especially across the military services. Those studies that did investigate the effects of PERSTEMPO on military Service members revealed inconsistent results, and underscored the complexity of the relationships between PERSTEMPO and such outcomes as retention, readiness, and quality of life.

Overall results of this project's three data analytic efforts indicate a modest relationship between PERSTEMPO and retention. At low levels, increasing time away from home station is associated with higher retention and greater Army career intentions. As the time away increases further, the positive effect is reduced and may become negative. The analysis of TAPDB indicates that the number of deployments prior to the end of a soldier's term of service is positively related to reenlistment likelihood, while the average length of these deployments is negatively related. We found no evidence that current levels of PERSTEMPO are having large adverse effects on a substantial segment of the Army population.

Although some have speculated that certain kinds of deployments can degrade readiness, quantitative links have not been found. The analyses of Army SOF and SSMP data show little relationship between time away from home station and self-assessed readiness measures.

The analysis of quality of life, using data from the Army SOF and SSMP surveys, focused on family factors, financial factors, and general satisfaction. High levels of PERSTEMPO were associated with several measures of family strain. In addition, soldiers with more time away from home were slightly more likely to report financial strains associated with their deployments. Time away from home was negatively associated with several general measures of satisfaction, but only slightly so.

Our analysis of Army SOF data identified other variables related to deployments – time between deployments, command support and training provided, family support activities, and support when job and personal responsibilities conflict – that had substantial relationship with several measures of retention, readiness, and quality of life.

Utilization of Findings:

These findings place limits on the effects of PERSTEMPO that can be used for personnel planning. They also suggest factors that are important in managing deployments. Finally, they

have implications regarding what populations and variables should be tracked to provide early warning of potential problems. The main findings of the literature review were shared with key staff of the Deputy Chief of Staff for Personnel during a meeting in December 1998, as well as in briefings to the U.S. Special Operations Command (May, 1999) and U. S. Total Army Personnel Command (June, 1999).

PERSONNEL TEMPO: DEFINITION, MEASUREMENT, AND EFFECTS ON RETENTION, READINESS, AND QUALITY OF LIFE

CONTENTS

Page

EXECUTIVE SUMMARY vii

INTRODUCTION 1

LITERATURE REVIEW: DEFINITIONS, MEASUREMENT AND EFFECTS OF PERSTEMPO 5

Definitions of PERSTEMPO 6
Service-wide Differences in PERSTEMPO Definition and Measurement 7
Measures of PERSTEMPO in the Army 9
Empirical Studies in the Military Services: The Impact of PERSTEMPO and Related Variables 10
Retention 12
Individual and Unit Readiness 15
Quality of Life 20

METHODOLOGY FOR DATA ANALYSES 25

Selection of Data Bases for Analysis 25
Analysis of Army SOF Data from the PERSTEMPO Impact Survey 27
Characteristics of the Sample 27
Overview of Analysis 27
Analysis of the Sample Survey of Military Personnel (SSMP) 32
Characteristics of the Population 32
Overview of the Analysis 33
Total Army Personnel Data Base and Active Duty Military Master and Loss Files 36
Data 37
Characteristics of the Sample 39
Models 39

RESULTS 41

Army SOF Data from the PERSTEMPO Impact Survey 41
Outcome Variance Predicted by Multiple Regressions 41
Effects of PERSTEMPO 41
Effects of Other Predictor Variables 44
Sample Survey of Military Personnel 49
Outcome Variance Predicted by Multiple Regressions 49
Effects of PERSTEMPO 50
Effects of Other Predictor Variables 52

Page

Total Army Personnel Data Base and Active Duty Enlisted Master and Loss Files 55
Descriptive Statistics for TAPDB data 55
Results for Aggregated Models 57
Three Choice Models (Multinomial Logit) 60
Occupation-Specific Estimates 61
Summary and Comparison to the Literature 64

SUMMARY AND DISCUSSION 67

Effects of PERSTEMPO 67
Retention 68
Readiness 70
Quality of Life 70
The Possibility of Undetected Relationships 71
Discontinuities and Cut Points 72
Accumulation of Effects 72
Isolated Effects 72
Effects of Deployments on Those Who Do Not Deploy 73
Effects of Soldier Selection 73
Effects of Other Factors 73
Tracking PERSTEMPO 74

REFERENCES 77

APPENDIX A. PERSTEMPO OUTCOMES AND THE RESERVE COMPONENTS A-1

B. PRELIMINARY ANALYSES OF ARMY SOF DATA FROM THE PERSTEMPO IMPACT SURVEY B-1

C. PRELIMINARY ANALYSIS FOR SAMPLE SURVEY OF MILITARY PERSONNEL C-1

List of Tables

Table 1. Definitions and Levels of PERSTEMPO Measurement Across Military Services 8

Table 2. PERSTEMPO Measures Used in the Military Literature 11

Table 3. Literature Review of the Relationship Between PERSTEMPO and Reenlistment/Retention 13

Table 4. Literature Review of the Relationship Between PERSTEMPO and Readiness 17

Page

Table 5. Literature Review of the Relationship Between PERSTEMPO and Quality of Life 22
Table 6. Description of Outcome Measures (Army SOF Data) 29
Table 7. Description of Other Predictor Variables (Army SOF Data) 31
Table 8. Description of Outcome Measures (SSMP Data) 34
Table 9. Description of Other Predictor Variables (SSMP Data) 36
Table 10. Squared Multiple Correlations from Hierarchical Regression Analyses (Army SOF Data) 42
Table 11. Results of One- and Two-Predictor Models (Army SOF Data) 43
Table 12. Correlations of Other Predictor Variables with Outcome Measures (Army SOF Data) 45
Table 13. Squared Multiple Correlations from Weighted Regression Analyses (SSMP Complete Sample) 50
Table 14. Results of One- and Two-Predictor Models (SSMP Complete Sample) 51
Table 15. Correlations[a] of Other Predictor Variables with Outcome Measures (SSMP Complete Sample) 53
Table 16. Zone A Deployment in the 24 Months Prior to ETS and Retention Rates at ETS for 30 Largest MOS and Overall 56
Table 17. Zone B Deployment in the 36 Months Prior to ETS and Retention at ETS for 30 Largest MOS and Overall 57
Table 18. Aggregate Analysis for Zone A (all MOS) 58
Table 19. Aggregate Analysis for Zone B (all MOS) 59
Table 20. Aggregate Analysis of Number of Deployments and Average Length 60
Table 21. Effects of Days Deployed and its Square for Six Selected MOS 62
Table 22. Effects of Number of Deployments and Average Deployment Length for Six Selected MOS 63
Table B-1. Rotated Factor Pattern[a] of 27 Outcome Items (Army SOF Data) B-2
Table B-2. Rotated Factor Pattern[a] of 18 Outcome Items (Army SOF Data) B-3
Table B-3. Rotated Factor Pattern[a] of 29 Outcome Items (Army SOF Data) B-4
Table B-4. Outcome Composites, Component Items, and Reliabilities (Army SOF Data) B-5
Table B-5. Rotated Factor Pattern[a] of 33 Outcome Measures (Army SOF Data) B-7

Page

Table B-6. Rotated Factor Pattern[a] of 18 Job-Related Items (Army SOF Data) B-8

Table B-7. Rotated Factor Pattern[a] of Nine Job-Related Items (Army SOF Data) B-8

Table B-8. Job-Related Composites, Component Items, and Reliabilities (Army SOF Data) .. B-9

Table B-9. Rotated Factor Pattern[a] of 18 Job Related Variables (Army SOF Data) B-10

Table B-10. Initial List of Background/Personal Variables (Army SOF Data) B-11

Table B-11. Enlisted/Officer Mean Levels of Satisfaction with Medical/Dental Benefits by Level of Days Deployed (Army SOF Data – Sample A) B-12

Table B-12. Disposition of 41 Independent Variables as a Result of Preliminary Hierarchical Regression Analyses (Army SOF Data) B-15

Table B-13. Sign of Multiple Regression Weights[a] of Dummy Variables with 20 Outcome Measures (Army SOF Data) B-16

Table C-1. Outcome and Job-Related Composites, Component Items, and Reliabilities (SSMP Data) C-1

Table C-2. Rotated Factor Pattern of 30 Outcome Measures (SSMP) C-2

Table C-3. Disposition of 42 Independent Variables as a Result of Preliminary Hierarchical Regression Analyses (SSMP) C-4

Table C-4. Squared Multiple Correlations of Confirmatory Regression Anslyses (SSMP) C-5

Table C-5. Sign of Multiple Regression Weights[a] of Dummy Variables with 20 Outcome Measures (SSMP Sample B) C-6

List of Figures

Figure 1. Analysis overview for SOF data. 28

Figure 2. Analysis overview for SSMP 33

Figure 3. Predicted relationship between days deployed and "can balance work and family demands." 44

Figure 4. Predicted relationship between weeks deployed and satisfaction with work tasking ... 52

INTRODUCTION

The post-Cold War era has brought about striking changes in the numbers and types of missions performed by the Military Services. Peacekeeping missions, operations other than war, joint training exercises, and service-unique training have increased, while both the size of the force and availability of resources have decreased. A variety of people – including Service men and women, military leaders, and members of Congress – have expressed concern that the stress caused by having to "do more with less" is reducing retention and adversely affecting the readiness and quality of life of military units.

The combination of increased requirements and reduced resources can overtax Service members and their units, resulting in heavier workloads, pressure to manage multiple requirements, and more time away from home and/or family. A particular concern of military leaders is the personnel tempo, or PERSTEMPO, which most officials define as "the number of days that Service members are away from their home station to perform their duties." The importance of PERSTEMPO was underscored by Defense Undersecretary for Personnel and Readiness Rudy de Leon, who singled out time away from home as the "biggest quality-of-life issue" currently confronting the military (Borlik, 1998).

The Military Services, military researchers, and Congress have found it difficult to define and measure PERSTEMPO and assess its impacts. Definitions of PERSTEMPO have varied; military leaders and researchers often use surrogate or related measures such as length of deployments, number of individual deployments, number of times the *unit* deployed, or length of average work week.[1] Though it is clear that PERSTEMPO is becoming an increasingly salient concern, the lack of standardization in defining it hinders efforts to rigorously examine shifts in deployment trends and their impact on service members. Further, the Department of Defense (DoD) and the Services have not developed formal, standardized methods to measure it and track its trends over time. In fact, only the Navy had systems to track PERSTEMPO prior to 1994 (General Accounting Office [GAO], 1996). Only since the Gulf War has the Army focused on PERSTEMPO and tried to build a reliable tracking system. Without effective tracking systems, DoD and the Services could not accurately assess the increase in deployment and other personnel pressures, and monitor their impact on Service members.

Research and analyses attempting to document links between various measures of PERSTEMPO and important military outcomes have been hampered by both the complexity of the relationships and the interactions of PERSTEMPO with other elements that change when the Army must accomplish more missions with fewer people. For example, days away from home might not have the same affect on all soldiers. Further, certain types of deployments or training exercises, especially those viewed by soldiers as highly relevant to their careers, might actually

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[1] "PERSTEMPO" generally encompasses any activities for which a service member is away from his/her home duty station. However, much of the literature has focused on only a component of PERSTEMPO, such as operational deployments, or time spent on training exercises. For the purposes of the present report, "PERSTEMPO" describes any measure of time spent away from home, whether it includes all reasons or a subset of them, and whether it is measured precisely in days or using a coarser measure such as number of deployments.

increase morale and prospects for retention. Conversely, those soldiers desiring certain opportunities for professional development experiences who are not deploying might indicate decreased morale and/or retention. It is also possible that the effects of increased PERSTEMPO could be especially acute when soldiers do not have sufficient time to recover between deployments, or when the support provided to their families is not adequate.

A variety of situations encountered while away from the home station may be salient factors moderating the effect of PERSTEMPO on retention, readiness, and quality of life. For example, the length of the workday, vulnerability to hostile actions, or the necessity to adjust to a foreign culture, may be salient moderating factors. In short, simply counting the number of days that a soldier is away from his or her home station may not fully capture the effects of PERSTEMPO.

Army Deputy Chief of Staff for Personnel (DCSPER) Lieutenant General F. E. Vollrath (1998) requested information to clarify the impact of high rates of PERSTEMPO on retention and quality of life. The present report addresses some of the issues raised by LTG Vollrath, focusing on Service members' voluntary retention decisions and quality of life, and further includes exploration of the effect of PERSTEMPO on military readiness, another salient concern among Service members and military leaders. Specifically, the research described in this report was designed to:

1. Examine the various definitions and measures of PERSTEMPO;

2. Review research on links between increased PERSTEMPO and measures of personnel retention, readiness, or quality of life, as well as variables that may moderate these effects;

3. Further analyze existing Army data that can illuminate the relationships between PERSTEMPO and retention, readiness and quality of life; and

4. Evaluate the ability of existing data and models to detect increased PERSTEMPO and predict its outcomes.

The remainder of this report describes both the procedures used to accomplish these goals, and the results of this project's data analytic efforts. The report first presents general trend and background information surrounding PERSTEMPO issues, then offers a review of the military research literature on PERSTEMPO. The review describes conceptualizations, definitions, and indicators of PERSTEMPO and its effects on retention, readiness, and quality of life.

The report then describes efforts to further analyze existing Army data that address PERSTEMPO issues from different viewpoints. The PERSTEMPO Impact Survey, conducted for the U.S. Special Operations Command (USSOCOM), focuses on issues directly related to PERSTEMPO and the management of deployments for a high-deploying segment of the Army. The Sample Survey of Military Personnel (SSMP) provides a wide variety of satisfaction measures assessed for a random sample of Army officers and enlisted personnel. The Total

Army Personnel Data Base (TAPDB), supplemented by data from the Active Duty Military Master and Loss Files, provides objective measures of deployment and retention to complement the self-reported measures included in the two surveys. Those data bases that contained appropriate variables (both predictor and outcome measures) were selected for critical analysis of PERSTEMPO's relationship with military outcomes.

Results of analyses conducted on each of the three data bases are presented next, followed by an integrated summary and discussion. The discussion summarizes the common findings of the three analyses and attempts to reconcile differences among analyses. Implications for measuring and tracking PERSTEMPO, predicting its outcomes, and alleviating its negative effects are discussed.

LITERATURE REVIEW:
DEFINITIONS, MEASUREMENT AND EFFECTS OF PERSTEMPO

Available data indicate that across the Services, deployments (and, hence, PERSTEMPO) continued to increase during the 1990s (GAO, 1996; Hosek & Totten, 1998; Sorter & Polich, 1998). The uneven distribution of deployments across units and jobs may pose a serious strain to the force; some units and Military Occupational Specialties (MOS) deploy at significantly higher rates than do others. Service members possessing skills that are in high demand – members of Special Forces units, electronic warfare squadrons, Patriot air defense units, and military police – typically experience a higher rate of deployment. For example, Army military police units were deployed an average of 160 days in 1992 (GAO, 1996). By 1995, this number had risen to 172 days (GAO, 1996). GAO's analysis of high-deploying units uncovered elements of these units that were deployed for more than half of the year.

A combination of activities has likely contributed to increased PERSTEMPO. The Defense Science Board (DSB) Quality of Life Task Force (1995) considered three factors to have heightened PERSTEMPO over the last decade. First, the force experienced a change in basing strategy from forward deployed to continental United States (CONUS) based troops. As reported by the Task Force (1995, pp. 65-66), "we have moved to a significantly smaller force that is CONUS-based, going more places, preparing to do more and requiring greater proficiency."

Another factor affecting PERSTEMPO is the increased number of deployments for contingency missions, joint exercises, and Service-unique training. Among high-deploying Army units studied by GAO (1996), the percentage of time spent in joint exercises rose from less than 8% in 1993 to more than 13% in 1995. In part, this increase stems from the increased need for coordination among the Services and with foreign troops required for peacekeeping missions. However, concern has been expressed that some joint activities may be redundant with Service-unique exercises. Responding to this concern, the Joint Staff developed a global military force policy and took actions to decrease deployments by integrating joint and Service training requirements. They also established a Joint Staff readiness and training oversight panel to oversee joint exercises and Service inspection activities in order to reduce deployment demands.

Finally, the downsizing of the force directly affects PERSTEMPO. Army enlisted strength, after holding relatively constant for several years, decreased 39% from a high of 668,400 in FY87 to 405,100 in FY 1996. Over the same period, Army officer strength decreased from 93,160 to 68,971, a reduction of 26% (Office of the Assistant Secretary of Defense for Force Management Policy, 1998). Strength has stabilized with the completion of the drawdown, but the Quadrennial Defense Review conducted in 1997 recommended further cuts of 15,000 Active Duty Army personnel over the next 5 years, representing a reduction of 3% (Kozaryn, 1997). A smaller overall force, without proportionally reduced demands on that force, means that greater demands are placed on the remaining soldiers. Thus, the Army has had to accomplish more with a smaller cadre of soldiers.

Military researchers and leaders have documented an increased pace of military activities over the past decade and have identified several factors that have likely combined to produce this increase. However, research that has empirically explored the relationships between

PERSTEMPO and personnel outcomes is limited. An understanding of the definitions and specific methods used to measure PERSTEMPO is critical for interpreting the results of the limited research evaluating its effects on retention, readiness, or quality of life. This understanding is especially relevant for studies at the DoD level, where differences among the Services in defining PERSTEMPO have complicated efforts to develop consistent, Service-wide measures.

Definitions of PERSTEMPO

The definition of personnel tempo from the Joint Staff (as reported by the Defense Science Board [DSB] Task Force on Quality of Life, 1995) is "a comparison of days in home port (home station) to days not in home port (home station) over a specific period of time." Implicit in this definition is the notion that all time away from home station should be counted, including peace operations, humanitarian assistance or disaster relief, counter-drug operations, joint or Service-unique training, and other activities. U.S. Special Operations Command Commander General Henry Shelton (now Chairman of the Joint Chiefs of Staff) expressed this notion in the guidance he gave regarding the types of activities that should be addressed in the PERSTEMPO Impact Survey for the Special Operations Forces (SOF). General Shelton stated that PERSTEMPO should include "all CONUS/OCONUS deployments, TDYs/TDAs, field exercises, etc. – any night your head doesn't hit your pillow at home."[2] The DSB Quality of Life Task Force recommended that the PERSTEMPO definition be expanded to include time spent "in deployed field activities while in home port (home station)" (1995). This addition was made to produce a more comprehensive assessment of the activities that can keep Service members away from their homes and families.

Interviews with Service members in the field conducted by the DSB Quality of Life Task Force indicated that these men and women equated PERSTEMPO with the time they were required to spend away from their homes and families. Based on this information, the Task Force recommended a simple definition of PERSTEMPO, represented by the following equation:

1 day away = 1 day away.

This equation implies that all military activities that take Service members away from their homes for at least a day should be counted, and should contribute to PERSTEMPO in proportion to their length. In the words of the Task Force: "A day in the field at Fort Stewart, Georgia, is the same as a day in the field deployed to Panama." Although total days away is the primary basis for assessing PERSTEMPO, the DoD PERSTEMPO Working Group (1996) suggested that reports of PERSTEMPO should include supplementary information to allow the calculation of average length of deployment, time between deployments, percentage of time deployed, and the percentage of the inventory deployed. In addition, the Working Group concluded that PERSTEMPO should be measured at both unit and individual skill levels.

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[2] General H. Shelton, personal communication, July 25, 1997.

Service-wide Differences in PERSTEMPO Definition and Measurement

Despite the guidance offered by the DSB and the DoD Working Group, the Services differ with respect to how they actually define and measure PERSTEMPO. Service-specific differences in organization, types of mission, and deployments may warrant different approaches to defining and measuring PERSTEMPO. For example, Services vary regarding the minimum amount of time away from home base required for an activity to be counted as a source of PERSTEMPO. Further, some Services track PERSTEMPO at the individual level, while others track it at the unit level. Such differences make inter-service comparisons difficult, if not impossible. Table 1 presents the Services' approaches to tracking PERSTEMPO, and broad policies guiding its definition and measurement.

The Defense Manpower Data Center (DMDC) has attempted to develop measures of PERSTEMPO that are consistent across the Services. The measures are based on two forms of special pay, the Family Separation Allowance (FSA) and Hostile Fire Pay (HFP). FSA is paid to personnel with dependents when they are separated for 30 or more consecutive days, and to Service members who have to establish a second residence abroad. HFP is paid to personnel subject to hostile fire or explosions, or on duty in areas deemed hostile (the name has since changed to Imminent Danger Pay). Both types of pay are paid monthly, using the same criteria across the four Services. These measures were used by GAO (1996) to document recent increases in PERSTEMPO. Recently Hosek and Totten (1998) refined the individual and unit measures and applied them in a DoD-wide analysis of PERSTEMPO.

In attempts to generate further consistency among the Services with respect to PERSTEMPO tracking and monitoring systems, both the DoD Working Group (1996) and the GAO (1996) have recommended that the DoD issue regulations to guide Service management of PERSTEMPO. Each Service would be required to (a) set a goal for the maximum amount of time that units or personnel can be deployed, (b) adopt a DoD-wide definition of deployment, and (c) define the minimum requirements for collecting and maintaining PERSTEMPO data. Further recommendations included the development of key indicators for measuring the impact of deployments on personnel readiness, and modification of existing data bases to facilitate PERSTEMPO analyses at the unit, skill group, and/or weapon-system level.

In response to these recommendations, the DoD and the Services have taken several actions to enhance the monitoring and management of PERSTEMPO. The Joint Staff developed a global military force policy and took actions to decrease deployments by integrating joint and Service training requirements. They established a Joint Staff readiness and training oversight panel to oversee joint exercises and Service inspection activities in order to reduce deployment demands. They also initiated rigorous discussion of PERSTEMPO issues in the Joint Monthly Readiness Reviews, and developed a Joint Personnel Asset Visibility System to track personnel assigned to Joint Task Force operations.

Table 1. Definitions and Levels of PERSTEMPO Measurement Across Military Services

Military Service	PERSTEMPO Defined	PERSTEMPO Policies
Army	Tracks activities at the individual and unit levels	Enables identification of individual or specialty tempo, and unit deployment rates. The Army has a goal that no single deployment last more than 179 days (GAO, 1996).[3] Army also collects self-report data on total deployment time over a 12-month period.
Navy	Tracks unit deployment rates	Minimum length of deployment is 56 days (GAO, 1996). Navy limits deployments to 180 days, keeping sailors in port for twice as long as they had deployed.
Marine Corps	Tracks accumulated time away from home station for the individuals in a unit	Tracks deployments lasting 10 or more days. The Marine Corps has a goal of limiting deployments to 6 months' duration and, like the Navy, follows deployments by periods without deployments of twice the length of the deployment.
Air Force	Tracks individuals and weapon systems	Enables identification of individual skills and/or weapon systems in particularly high demand, or that are likely to exceed the 120-day desired maximum annual PERSTEMPO.

To date, the Services[4] have taken action toward some of the goals stated in the recommendations. The Army started a more systematic PERSTEMPO data collection for its units in 1997 (Sorter & Polich, 1998). The Navy reorganized its fleets and revised its training strategy to reduce the number of days deployed for training for ships underway (GAO, 1996). To make deployments more predictable and, ultimately, improve morale, the Air Force is reorganizing its forces to form ten expeditionary units, two of which will be on call to deploy at any time (Erwin, 1998).

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3 The Army sought to reduce the total number of deployable days to less than 180 days per soldier in a given year. The Army's motivation for reducing deployments to 179 or fewer days is unknown, and is beyond the scope of this report.

4 PERSTEMPO also emerged as a salient issue among the Reserve Components (RC) of the nation's military Services, as RC are called on to lower PERSTEMPO for the active components. RC personnel confront similar problems from being away from home and/or family, but face the added challenge of balancing their military requirements with obligations of civilian employment. Appendix A explores and briefly describes the issues surrounding PERSTEMPO within the RC.

Measures of PERSTEMPO in the Army

In keeping with the recommendations of the PERSTEMPO Working Group, the Army calculates two objective measures of PERSTEMPO that describe activities at the individual and unit levels, respectively. The Army has also conducted several surveys to obtain soldiers' subjective, self-reported assessments of time away from station. This section first describes the objective measures that are based on administrative data, then elaborates on the subjective, self-report method employed by the Army to monitor personnel tempo.

Administrative data: SKILLTEMPO. The Office of the DCSPER tracks and reports individual PERSTEMPO in terms of the percentage of time a soldier spends out-of-station. Accordingly, SKILLTEMPO reflects data that are focused on the individual soldier or specialty. The information is entered at each installation, and reported by the Standard Installation/Division Personnel System (SIDPERS) by occupational specialty and skill level. SKILLTEMPO tracks eight categories of activity: operational deployments, major training exercises, combat training centers, training exercises off installation, U.N. Staff and Special Forces Teams, counter-drug, domestic civil, and humanitarian international activities. SKILLTEMPO includes temporary duty (TDY), but omits two types of activity: (a) training on the installation, and (b) training at local training areas off the installation (Sorter & Polich, 1998). Sorter and Polich (1998) indicated that SKILLTEMPO captures most overseas deployments, but that coverage of deployments within the continental U.S. is less complete. In addition, not all units reported deployments to combat training centers (CTCs), which were added as a reporting requirement in 1997.

Administrative data: DEPTEMPO. Deployment tempo (DEPTEMPO) focuses on the *unit's* rather than the individual soldier's time and rate of deployment. The DEPTEMPO of a particular unit is defined as the average number of days in a one-month period that soldiers in the unit spend away from home for any reason. In addition to the activities in SKILLTEMPO, DEPTEMPO includes overnight training conducted on the installation. It has been reported by unit in the Unit Status Report since mid-1997.

DEPTEMPO combines information about the percentage of the unit that is deployed during the month and the number of days deployed. Consequently, several different deployment patterns can produce a given DEPTEMPO measure. For example, a DEPTEMPO of 3 days in a given month could mean that the entire unit was deployed for 3 days, or it could mean that 10% of the unit was deployed for the entire month.

Self-report measures. The Army Research Institute for the Behavioral and Social Sciences (ARI) has conducted various surveys to assess soldier morale, attitudes, and career intentions. Two of these surveys, the Sample Survey of Military Personnel (SSMP) and the Survey of Officer Careers (SOC), have asked soldiers directly to estimate the time they have spent away from their home stations.

The SSMP asks Army personnel to estimate the number of weeks, in the last 12 months, that they have been away from their duty stations for military duties. Respondents are instructed to count not only time away due to deployments, but also due to training, assignments, and TDY. The self-report measure incorporates time away from home station from all sources, including

those that may not be completely covered using objective measures. However, the self-report used in the SSMP does not distinguish among different sources of PERSTEMPO to the extent that is possible with objective measures. That is, the single item asking respondents to indicate their total time away from home precludes research from determining the types of activities consuming soldiers' time. Further, the single item does not indicate the number of separations, time span between separations, or length of the deployments.

The ARI Survey of Officer Careers is administered to officers only, and hence does not provide information about PERSTEMPO among the enlisted force. It contains the same PERSTEMPO assessment included in the SSMP, as well as attitude and other potential outcome variables. However, unlike the SSMP, the SOC is not anonymous; consequently it can be linked to administrative outcome measures by using the respondents' Social Security Number (SSN). In fact, the 1996 SOC data contain objective personnel outcome measures, such as separation data, extracted from the Officer Longitudinal Research Data Base (OLRDB) and appended to SOC survey responses. Data from the 1998 SOC will also be automated and linked to objective data.

Another self-report measure was developed to assess PERSTEMPO and its impact on personnel in the U.S. Special Operations Command. The PERSTEMPO Impact Survey (Ramsberger & Wetzel, 1998), administered to over 4,000 soldiers and to smaller numbers of Navy and Air Force personnel, addressed deployment length, workload of non-deployed personnel, time between deployments, advance notice of deployments, expectations, and the extent to which deployments were personally rewarding. Some questions pertained to whether the effects of PERSTEMPO are greater or less for specific types of personnel. The data allow comparisons across rank, MOS, marital status, family size, racial/ethnic group, and unit assignment.

Empirical Studies in the Military Services: The Impact of PERSTEMPO and Related Variables

Anecdotal accounts of the effects of heightened PERSTEMPO on military Service members' lives suggest an increased strain on soldiers' families, lowered morale among Service members, decreased readiness among military units, and reduction in Service retention rates (Alderks, 1998; Diana, Zazanis, & Lappin, 1998; Fisher, 1996; Pine, 1996; Spence, 1997). However, a review of the military literature reveals only limited *empirical* research exploring the effects of PERSTEMPO and related variables on personnel outcomes such as retention. Both the Army DCSPER (Vollrath, 1998) and Air Force studies (Garcia & Nuanes, 1997) have generated a substantial list of potential PERSTEMPO outcomes. However, few researchers have empirically explored these potential outcomes of increased PERSTEMPO. The literature does, however, underscore the potential relationships between PERSTEMPO and outcome variables, and enables further research to generate and test plausible hypotheses.

Inconsistencies in the definitions and measures used in PERSTEMPO studies preclude rigorous comparison of results across studies (see Table 2 for overview of PERSTEMPO measures identified in the present literature review). Though the generally accepted definition of

Table 2. PERSTEMPO Measures Used in the Military Literature

Publication (Author(s)/Year)	Military Service	Nature of PERSTEMPO Measure(s)	PERSTEMPO Measure(s)
Alderks (1998)	Army	Self-report	Number of weeks, in last 12 months, soldier was away from duty station for military duties (includes deployments, training assignments, and TDY)
Cooke, Marcus & Quester (1992)	Navy	Administrative data	• Length of deployments • Ratio of time between deployments to total deployment time • How time is spent while not deployed
Fossen, Hanser, Stillion, Elliott & Moore (1997)	Air Force	Administrative data	Percentage of time spent in activity categories requiring time away from home
GAO (1996)	Cross-Services	Pay-based administrative data	Family Separation Pay and Hostile Fire Pay
Hosek & Totten (1998)	Cross-Services	Pay-based administrative data	Family Separation Pay and Hostile Fire Pay
Ramsberger & Wetzel (1998)	Army; (also Navy, Air Force)	Self-report	Days deployed in the last 12 months, where deployed is an inclusive term meaning "any night head doesn't hit pillow" (focused on Special Operations Forces)
Segal, Jones, Manos & Rohall (1997)	Army	Case study	Surveys/interviews – units with long/frequent deployments
Sorter, Leed, Leonard & Polich (1998)	Army	Interviews (discussed but did not use administrative data)	Interviews on stressors: "tempo," time away from home, turbulence, workload, level of installation support, and similar potential sources of stress
Sorter & Polich (1998)	Army	(Discussed but did not use administrative data)	SKILLTEMPO (at individual level), DEPTEMPO (at unit level)
Taw, Persselin & Leed (1998)	Army	Case studies, interviews, and other qualitative data	Focused on missions-other-than-war and other peacekeeping operations; impact of deployments for such activities
Vick, Orletsky, Shulsky & Stillion (1997)	Air Force	Case studies, interviews and other qualitative data	Focused on missions-other-than-war Optempo (including nature of tasks, amount of time spent on such missions)
Whitlow (1990)	Marine Corps	Interviews and administrative data	• Number of days deployed in last 12 months • Average length of service within the command • Manning profile by deployment status code (DSC)
Unpublished Briefing (1999) (PERSCOM–DCSOPS)	Army	Administrative data	• Deployment counts (TAPDB) • Deployment length (TAPDB)

PERSTEMPO is total number of days away from home, the literature review indicated only rare use of this precise definition. Most studies used self-report assessment of PERSTEMPO, or focused on a subcomponent of PERSTEMPO (e.g., considered only deployments, or training exercises). Several studies examined closely related and more readily available sources of personnel strain (e.g., recovery time between deployments, short notification time prior to deployments, financial strains associated with deployments).

Retention

The retention of highly trained and qualified Service members is of high priority to military leaders and policymakers; the repercussions of low retention rates can affect military recruitment and training systems, military readiness and national security. Policymakers, military leaders and soldiers in the field have expressed continued concern that the heightened pace of operations may adversely influence retention.

Table 3 offers a brief summary of the eight studies in this literature review that explored the relationship between PERSTEMPO (and its related variables) and retention. These studies reveal a complex relationship in which other factors, such as time between deployments, deployment hostility, or the nature of the activities performed during the deployment, may moderate the effects of PERSTEMPO on retention. The studies varied in their methodologies, including surveys, case studies, interviews, and use of objective military records and data, which limits the ability to reach definitive conclusions on the PERSTEMPO-retention relationship.

Studies focusing on the effect of total time deployed on retention revealed inconsistencies in the relationship identified, underscoring the complexity of this relationship. Alderks (1998), in her analysis of Sample Survey of Military Personnel data, found no consistent relationship between the total number of days a soldier reported spending away from his/her duty station and career intentions.[5] Interviews of Army officers, conducted by Sorter, Leed, Leonard and Polich, (1998) further suggested that the tempo experienced by most Army units was not perceived to seriously affect retention. Interviews suggested that retention was more affected by the draw from the economy for a civilian career, uncertainty of an Army career, and perceived erosion of benefits rather than a problem resulting from high tempo levels (Sorter et al., 1998).

Conversely, several studies identified an inverse relationship between deployments and retention. Whitlow (1990) identified "too much family separation" as the primary reason for leaving the Marine Corp. In a study of Navy sailors, Cooke, Marcus and Quester (1992) suggested that sailors with very long (i.e., 244-350 days) recent deployments were less likely to reenlist than those with more typical (i.e., 106-205 days) deployments, a finding particularly strong among married first-termers. Meanwhile, a case study of Patriot missile battalions suggested that factors associated with deployments, specifically, deployment frequency and prior

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[5] The SSMP is administered to a systematic, stratified random sample of Active Component Army officers and enlisted personnel, which precludes the opportunity to tap large numbers of units that experience high rates of deployments. The effects of PERSTEMPO may be "washed out" by such a diverse sample of officers and enlisted soldiers.

Table 3. Literature Review of the Relationship Between PERSTEMPO and Reenlistment/Retention

Publication (Author(s)/Year)	Military Service	PERSTEMPO measure(s)	Relationship with Criterion
Alderks (1998)	Army	Self-report data: Number of weeks, in last 12 months, soldier was away from duty station for military duties (includes deployments, training assignments, and TDY)	No consistent relationship between number of days away from duty station and career intentions
Cooke, Marcus & Quester (1992)	Navy	Administrative and self-report data: • Length of deployments • Ratio of time between deployments to total deployment time • How time is spent while not deployed	• Sailors with long recent deployments were less likely to reenlist than those with normal deployments (especially true for married sailors) • Too little and too much time underway during non-deployed periods indicated slightly lower retention rates
Hosek & Totten (1998)	Cross-Services	Administrative data: Family Separation Pay Hostile Fire Pay	PERSTEMPO could either increase or decrease retention, depending on overall level and other factors
Ramsberger & Wetzel (1998)	Army (some Navy, Air Force)	Self-report data: Days deployed in the last 12 months, where deployed is an inclusive term meaning "any night head doesn't hit pillow"	Soldiers reported that PERSTEMPO either did not change or increased career intentions; however, those with higher rates of deployment indicated lower career intentions
Segal, Jones, Manos & Rohall (1997)	Army	Surveys/interviews of units with long/frequent deployments	50% of married soldiers would leave if future assignments required long family separations
Sorter, Leed, Leonard & Polich (1998)	Army	Interviews on stressors: "tempo," time away from home, turbulence, workload, level of installation support, and similar potential sources of stress	Tempo experienced by Army units not perceived to seriously impact retention
Whitlow (1990)	Marine Corps	Interviews	"Too much family separation" primary reason for leaving
Unpublished Briefing (1999) (PERSCOM–DCSOPS)	Army	Administrative data: • Deployment counts (TAPDB) • Deployment length (TAPDB)	Terms of Service influenced the relationship between PERSTEMPO and reenlistment decisions – increased deployments decreased the reenlistment rates for soldiers with two- and three-year Terms of Service but not those with four years.

notification, affected retention (Segal, Jones, Manos, & Rohall, 1997). Though less rigorous in its methodology, the case study revealed that 50% of married members of a unit, deployed on short notice shortly after returning from its previous 6-month deployment, said they would leave the Service if future assignments required long family separations. Only 25% of the married members of a second unit, which received more advance warning and had lower PERSTEMPO prior to the same deployment, reported that they would leave under these circumstances. Hence, total deployment time, as well as deployment frequency and amount of prior notification, can influence career intentions[6].

Several additional studies revealed a more complex PERSTEMPO-retention relationship. In a sample of Special Operations Forces Service members, Ramsberger & Wetzel (1998) found that nearly 80% of those surveyed[7] indicated the current PERSTEMPO had either *not changed* or *increased* career intentions. However, results also revealed that respondents with higher rates of deployments indicated lower career intentions.

Hosek and Totten (1998) and Cooke and his colleagues (1992) found that PERSTEMPO could either increase or decrease retention, depending on its overall level and other factors. Constructing PERSTEMPO measures based on the payment of Family Support Allowance and Hostile Fire Pay[8], Hosek and Totten found that the incidence of at least one deployment was positively related to reenlistment. However, increasing total months of deployment (over a 24-month period) and total months of deployment to a hostile fire zone (over a 24 month period) were both negatively related to reenlistment in almost all cases; the highest negative relationship was associated with deployment to hostile environments. Service members reacted positively to having at least *one* deployment, but adversely to high rates of deployments. Focusing on the time Navy sailors spent away from their homes/families during *non-deployed* periods (i.e., time spent on a steaming ship in training or other exercises in areas around home port), Cooke and his colleagues found that too much *and* too little time on a steaming ship while *not* deployed was linked to decreased retention. Specifically, sailors reporting over 25% or under 15% of their non-deployed time was spent on a steaming ship indicated 1-3% lower retention rates than the Service members with average time underway when not deployed.

Several studies explored the impact of other factors (e.g., tenure, marital status [discussed previously], or the Service members' term of service) on retention. These factors may interact with PERSTEMPO to influence PERSTEMPO's relationship with retention. For example, long

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6 Much of the retention literature (akin to turnover in the civilian literature) uses career intentions as a precursory measure to actual retention decisions.

7 Almost 90% of those surveyed had deployed in the last 12 months, with an average of 127 total days deployed.

8 Hosek and Totten noted that there will be errors in measuring PERSTEMPO using these special pays, such as the potential under-counting of long deployments for non-married soldiers. FSA includes only personnel who have dependents. Also, these special pay measures generally omit short, non-hostile duty (i.e., less than 30 days) and do not address frequency of missions, and specific conditions (e.g., actual combat, bad weather, disease, toxic substances, etc.) of deployments.

deployments may have more detrimental effects for more junior personnel (Cooke et al., 1992). Such findings may possibly be related to self-selection out of the force by those with the greatest concerns about PERSTEMPO, such that longer-term Service members less concerned about PERSTEMPO remained in the force. Another potentially influential factor is term of service. There is some evidence that increased deployment rates were associated with decreased reenlistment rates for soldiers with two- and three- year terms of service relative to longer terms (PERSCOM, 1999).

In sum, the studies reviewed reveal inconsistencies in the relationship identified between PERSTEMPO and retention; the relationship is complicated and affected by other factors such as marital status, tenure, and deployment hostility. For example, the deployment experiences of married versus single Service members seem to differ markedly. The effect of deployments on a Service member's spouse and family, and the significant influence of spouse and family on career decisions (Bell, 1993; Reilly, 1994) likely affects the PERSTMPO-retention relationship. Further, the management of deployments (e.g., amount of prior notification; time between deployments) may pose a greater concern than the actual time Service members spend away from home. Finally, the findings suggest that both *too little* and *too much* PERSTEMPO affect retention, indicating a curvilinear relationship between these variables. Consequently, it is not surprising that negative effects of PERSTEMPO on retention are more evident in case studies examining units with an especially high level of activity than they are in Service-wide data from personnel records or surveys.

Much of the limited research reviewed, however, lacked rigor and refinement in the measurement of PERSTEMPO. Therefore, it is difficult to draw definitive conclusions regarding the PERSTEMPO-retention relationship; continued and more rigorous research is warranted to gain insight into this complex relationship.

Individual and Unit Readiness

The effect of PERSTEMPO on military readiness is also of significant concern. Heightened PERSTEMPO may impact readiness by decreasing retention, increasing turbulence or turnover within units, reducing the experience level of Service members, and increasing the resources required for recruiting and training. Another impact of PERSTEMPO on readiness may be manifested by its link with training. Service members have expressed concern that increased PERSTEMPO, especially for military operations other than war (MOOTW), may lessen opportunities to participate in combat-oriented training, result in some erosion of Service members' combat skills, lead to increased wear and tear on equipment, and, accordingly, reduce unit readiness. With limited time and resources, the performance of some activities necessarily detracts from the time, ability, and/or opportunity to perform other activities. To the extent that soldiers repeatedly must engage in activities that detract from their ability to train, or activities that limit the time available for mission-relevant training, PERSTEMPO may have a negative influence on readiness and performance.

The literature reveals five studies across the Services that explore the relationship between PERSTEMPO (or a related variable) and unit readiness and/or performance. The vast majority of these studies collected qualitative data through interviews and case study analyses. In

the absence of rigorous study designs and/or quantitative data, it is inappropriate to draw conclusions regarding the nature of the PERSTEMPO-readiness relationship. The results of these studies, however, can direct future research by highlighting potential relationships between deployments, training and/or other activities and military readiness. The studies addressing the PERSTEMPO-readiness relationship are summarized in Table 4.

Quantitative investigations revealed a generally positive relationship between PERSTEMPO and readiness. Both of the self-report survey-based studies that addressed the PERSTEMPO-retention relationship also explored PERSTEMPO's effects on unit and/or individual readiness. The PERSTEMPO Impact Study revealed a relatively positive effect of PERSTEMPO on readiness. Special Operations Forces soldiers were more than twice as likely to agree with positive than negative statements pertaining to the impact of PERSTEMPO on readiness and training (Ramsberger & Wetzel, 1998). Positive statements reflected potential benefits from deployments, such as opportunities for realistic training and real-world experiences. An example of a positive readiness statement would be "The experience I received while deployed has increased my readiness level." Negative statements reflected the negative impact of deployments on equipment (i.e., increased wear and tear), opportunities for individual and unit training, and readiness. An example of a negative readiness statement would be "Being deployed keeps me from receiving the type of training I need to stay current/proficient in my specialty."

Alderks' (1998) analysis of SSMP data[9] indicated the amount of time soldiers spent away from their duty station was *not* significantly related to self-assessments of individual or unit readiness. However, data also indicated that a greater proportion of enlisted personnel (63%-80%) who reportedly spent 13 or more weeks away from their duty station indicated being well/very well prepared; 54% - 61% of soldiers reporting less than one week away from home reported being well/very well prepared. However, this research could not determine whether deployments enhanced readiness, or the better-prepared units/individuals simply deployed more frequently.

A review of the remaining studies underscores the complexity of the relationship between PERSTEMPO and readiness. Focusing on the Air Force, Fossen, Hanser, Stillion, Elliott, and Moore (1997) surveyed all elements of three wings of the Eighth Air Force to assess their opinions on the effects of ten activities on readiness and quality of life. The activities included some that required considerable time away from home station, including off-station training, other exercises, and MOOTW, as well as others that required less time away, including routine peacetime operations, local training, inspections and wing exercises.

In general, activities that involved more time away from home were rated as degrading to readiness. However, there were exceptions to this general relationship. The nature of the activities in which the Service members engaged influenced the relationship between PERSTEMPO and readiness. Fossen et al. found that 70% of the Service members indicated that

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[9] The Spring SSMP data used in the Alderks study were collected between 1994 and 1997.

Table 4. Literature Review of the Relationship Between PERSTEMPO and Readiness

Publication (Author(s)/Year)	Military Service	PERSTEMPO measure(s)	Relationship with Criterion
Alderks (1998)	Army	Self-report data: Number of weeks, in last 12 months, soldier was away from duty station for military duties (includes deployments, training assignments, and TDY)	• Amount of time away from duty station had no statistically significant relationship with individual or unit readiness • Enlisted personnel who were away from their home station for more than 13 weeks indicate *higher* levels of readiness than those away for less than one week
Fossen, Hanser, Stillion, Elliott & Moore (1997)	Air Force	Percentage of time spent in activity categories requiring time away from home	In general, soldiers rated activities requiring greater lengths of time away from home as degrading to readiness; however, certain activities that did *not* require much time away from home were judged to seriously degrade readiness
Ramsberger & Wetzel (1998)	Mostly Army; some Navy, Air Force (Special Operations Forces)	Interview data; self-report PERSTEMPO data	• Interviews suggested concern for decreased proficiency due to increased PERSTEMPO • Self-report survey data indicated more positive than negative impact of PERSTEMPO on readiness and training
Sorter, Leed, Leonard & Polich (1998)	Army	Interviews on stressors: "tempo," time away from home, turbulence, workload, level of installation support, and similar potential sources of stress	• Staff are overstressed with a high workload; high workload/demands may decrease readiness • High pace of staff operations posed challenges to ability to train effectively, and had adverse effect on readiness
Taw, Persselin & Leed (1998)	Army	Interviews, case studies, other qualitative data	Some types of increased PERSTEMPO, especially in peacekeeping operations, may lead to decreased proficiency in combat skills and "losing edge"
Vick, Orletsky, Shulsky & Stillion (1997)	Air Force	Interviews	High training tempo that does not involve activities related to primary mission leaves little time for professional growth

excessive time on wing exercises and inspections was seriously degrading readiness, even though these activities typically did not involve much time away from home. These Air Force personnel wanted more time on routine operations and training, and less time on wing exercises and inspections because the latter "often entail fruitless activities that consume inordinate amounts of time" (p. viii). Furthermore, off-station training received positive ratings regarding its effects on both readiness and quality of life, even though it takes personnel away from their home station. Accordingly, this study suggests that the type of activity – during both deployments and time at home station – affected perceptions of readiness, and the relationship between PERSTEMPO and readiness

The results of interview and case study analyses further supports the notion that the nature of activities affects the PERSTEMPO-readiness relationship. There is consistent speculation that readiness suffers under heightened PERSTEMPO, as is reflected in a recent report in the public press that indicated that "the strain of the pace...on a much-reduced force has shown up in negative trend lines across all military Services and across various readiness categories" (Graham & Pianin, 1998). Interview data collected from focus groups of mostly Army SOF soldiers in the PERSTEMPO Impact Study revealed consistent concern that the considerable loss in proficiency levels during deployments might directly result from the pace of operations (Ramsberger & Wetzel, 1998)[10].

Similar concerns emerged from Army personnel interviewed at four U.S. Army Forces Command bases (Sorter, et al., 1998); however, interviewees offered a different perspective on the effect of deployments on readiness. The Sorter et al. interviews suggested that battalion and brigade-level staff were highly stressed. Increased turbulence and shorter assignments for officers in combat units (i.e., Table of Organization and Equipment Units), a rise in responsibilities for staff members, and an overall decline in the experience and knowledge of junior staff officers reflected an overstressed staff with a high workload. Further, many units reported having more deployments to plan and execute; the unscheduled deployments typically detracted from time for other previously-planned activities, including training. Sorter and his colleagues suggested that increased training requirements and deployments contributed to a sense of overwork and strain among officers, exacerbated the need to react to unplanned/unexpected events, and ultimately posed challenges to conducting effective training and increasing readiness.

The increase in peacekeeping operations experienced by each of the Services during the 1990s also posed a serious Service-wide concern. High PERSTEMPO rates, such as those connected with peacekeeping operations, may leave limited time for soldiers to acquire the training, schooling, and assignments they desire for professional and career development. Vick, Orletsky, Shulsky, and Stillion (1997) reported that the Air Force personnel they interviewed

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[10] Note that, as suggested earlier in this report, quantitative self-report data from the Special Forces Impact Study indicated that deployments had a *positive* affect on readiness, a finding which contradicts the findings from interviews with SOF soldiers. Given that SOF soldiers expect, and often desire, a high rate of deployment, it is possible that while deployments are generally viewed as a "good thing," the nature of the work on some activities, e.g., peacekeeping missions, is viewed less positively. Interviews may better capture the nuances of the PERSTEMPO-readiness relationship that quantitative data could not effectively capture.

indicated that a high training tempo that does not involve activities directly related to primary missions left little time for professional growth. Taw, Persselin, and Leed (1998) echoed these findings, suggesting that with some types of increased PERSTEMPO – particularly in peacekeeping operations – soldiers lose their "edge," and lose proficiency in important combat skills due to a lack of practice of those specific skills. The loss of such skills may influence a Service member's ability to attain desired opportunities for development and advancement, as well as his or her readiness in general.

Both the Taw et al. and Vick et al. studies noted the importance of considering the type of unit when examining PERSTEMPO, as the level of impact of peace operations on readiness likely differs across specialties. Taw et al. (1998) suggested that deployment to peacekeeping operations has reduced readiness for Major Theater War (MTW) for certain frequently deployed and/or low density unit types (e.g., military police, civil affairs, and psychological operations). They reported this decreased readiness to be a consequence of the following factors: (a) increased deployments for peacekeeping operations; (b) increased wear and tear on equipment; (c) the lack of available equipment for rapid deployment to a major regional conflict; (d) increased deployments of partial units, leaving severed units weakened in the event of a major regional conflict; and (e) cross-leveling to dissipate the impact of deployed units across the force.

Vick et al. noted that the pilots of certain aircraft (e.g., E-3, AC-130, HC-130 and MC-130) practice some of their surveillance and refueling skills, but do not typically perform some of the more difficult aspects of their missions, such as firing weapons and conducting low-level flights. Referring to Hammon and Horowitz's (1990) study of Navy and Marine Corps personnel, Vick and his colleagues quoted that "a 10% reduction in flight time led to a 2% increase in bomb miss distance for ground attack crews and a 5% reduction in air-to-air combat victories for flight crews" (p. 28). The time spent on certain activities that were not related to their primary missions seemingly detracted from the crewmen's ability to hone certain difficult, less refined skills. Hence, although Vick and his colleagues did not undertake a rigorous empirical examination of the PERSTEMPO-readiness relationship, their findings suggest that some decreased proficiency in combat skills for fighters is apt to result from continued deployment to extended peace operations at the expense of combat flight training.

Although increased deployments for MOOTW apparently have not significantly decreased unit availability for a major conflict (Sorter & Polich, 1998), Taw et al. (1998) and Vick et al. (1997) have speculated that some of the secondary effects of MOOTW deployments, particularly cross-leveling and the tailoring of the force, "consume an inordinate amount of unit leadership effort and time, leave some units missing critical personnel needed for training and deployment, and impede the collective training of units and personnel left at home station." (p. 6). It is not clear what impact these second order effects have; however, they could compromise training readiness for such units.

In summary, though the research is quite limited, indications from the field suggest readiness may suffer from certain activities that lessen opportunities for consistent and routine training. Hence, it may not be the time away from home, per se, that impacts readiness but, rather, the way that time is spent. These activities potentially detracting from readiness include MOOTW, which has been found to be one of the primary causes of the increased PERSTEMPO

in the last decade (GAO, 1996). In addressing this concern, it may be as important to focus on the experiences and opportunities available to Service members when they deploy, as it is to focus on the frequency and duration of their deployments.

Accordingly, researchers conducting PERSTEMPO studies must allow Service members the opportunity to evaluate and/or describe the extent to which the nature of their work/activities during both deployed and non-deployed periods of time affects their readiness. A broader focus on PERSTEMPO in general may not effectively represent the PERSTEMPO-readiness relationship. The two studies based on quantitative self-report data (Alderks, 1998; Ramsberger & Wetzel, 1998) indicated relatively positive effects of PERSTEMPO on readiness. Yet, Ramsberger and Wetzel's interviews with SOF soldiers, as well as other interview and case-study data, revealed a concern that PERSTEMPO *did* negatively affect readiness, with indications that certain types of missions and/or activities may decrease readiness. Future PERSTEMPO research that adopts the survey methodology would likely benefit from greater precision in survey items to solicit a more refined perspective on the PERSTEMPO-readiness relationship.

Quality of Life

Service members have voiced concern that PERSTEMPO affects quality of life. Quality of life encompasses a variety of factors that contribute to overall satisfaction or morale, and ultimately, military outcomes such as retention and readiness. Conceptual models of quality of life (e.g., Kerce, 1995) enumerate several domains that are relevant to the concept, including residence and neighborhood, health, leisure and recreation, marriage and family life, friends, income and standard of living, and personal development. These factors, along with individual characteristics, determine a soldier's morale or global satisfaction, which, in turn, affects military outcomes. For example, circumstances surrounding PERSTEMPO, such as possible financial repercussions and strain on families and personal lives, and dissatisfaction with the nature of missions may affect individual morale. Lowered levels of morale may translate directly into poorer performance, lower levels of readiness, and ultimately lower retention. Although many quality-of-life factors may be affected when soldiers spend time away from their home station to perform their military duties, existing research has focused primarily on family factors, financial factors, and morale.

Limited research has focused on the relationship between PERSTEMPO and morale, as measured via Service members' self reports of individual or unit morale levels, and various measures that reflect on quality of life. Such measures include self assessments of general satisfaction, the effects of PERSTEMPO on family, and the financial repercussions of deployments. Much of this literature also examined factors closely related to PERSTEMPO, such as the amount of pre-deployment notification time provided, the amount of time between deployments, and the nature of activities engaged in while deployed. Table 5 presents a summary of the studies included in this section of the literature review.

Limited research has explored the relationship between morale and PERSTEMPO. In fact, research has documented few studies demonstrating a link between temporary duty (TDY) rates and indicators of poor morale (Vick, et al., 1997). Nonetheless, based on interview data,

Vick and his colleagues reported that operational headquarters, unit commanders, and other Air Force personnel actively engaged in MOOTW in general (and peacekeeping operations in particular) expressed a pervasive concern with the negative impact of heightened TDY rates on morale. Turning to qualitative case study data, Segal et al. (1997) found significantly lower morale among soldiers receiving less prior notification and experiencing higher deployment rates than among soldiers receiving more advanced warning and having a lower deployment rate prior to the same deployment. More specifically, 9.5% of the enlisted soldiers in the former battalion (less prior notice, more frequent deployments) rated their *own* morale level as high/very high, and 3% indicated their battalion's morale to be high/very high. For the latter battalion (more prior warning, lower PERSTEMPO), 42% of the enlisted soldiers rated their *own* level of morale as high/very high, and 34% rated their ***battalion's*** morale as high/very high. Though lacking methodological rigor, these data suggest that PERSTEMPO affects morale.

Counter to the previous interview and case study data, Alderks' (1998) analysis of self-report survey data from the SSMP indicated no significant relationship between morale and PERSTEMPO (as measured by self-reports of the total time away from duty station over past 12 months). Alderks did, however, find that soldiers who had been away from their families for more than 13 weeks in the previous year were less satisfied with the "amount of time a soldier is separated from family." This concern is also reflected in the results of Fossen et al.'s (1997) Air Force research, which found that, with some exceptions, activities that took personnel away from their home station had negative effects on two indicators of quality of life: professional growth and personal/family life.

The effects of PERSTEMPO on family, finances, satisfaction, and other factors reflective of overall quality of life must not be overlooked. The PERSTEMPO Impact Survey, focused on Special Operations Forces, indicated that over half of the respondents agreed that PERSTEMPO (represented as total time away from home) had a negative effect on families; however, almost two-thirds also agreed that these problems were manageable if the family worked together (Ramsberger & Wetzel, 1998). The results of this survey also reinforced two additional conclusions. First, quality is more important than quantity when it comes to deployments. Respondents who rated the quality of their most recent deployment positively were also more likely to positively rate their satisfaction with the use of forces. Second, recovery time plays a significant role in the ability to cope with deployments. Respondents who felt they had sufficient recovery time indicated that they were more likely to be able to balance their work and family/personal life, that their families were more likely to be able to cope with their deployment schedule, and that they experienced lower levels of stress in their military and personal lives. Interviews of Army officers identified another potential strain imposed by heightened PERSTEMPO. These officers reported that the financial implications (e.g., loss of commuted ration allowance and the high cost of international telephone calls) of deployments added a seemingly unnecessary and unfair strain to troops and their families (Segal, et al., 1998).

Table 5. Literature Review of the Relationship Between PERSTEMPO and Quality of Life

Publication (Author(s)/Year)	Military Service	PERSTEMPO measure(s)	Relationship with Criterion
Alderks (1998)	Army	Self-report data: Number of weeks, in last 12 months, soldier was away from duty station for military duties (includes deployments, training assignments, and TDY)	• No relationship between PERSTEMPO and morale • Soldiers who had been away from their families for longer than 13 weeks in the previous year were less satisfied with the "amount of time a soldier is separated from family"
Ramsberger & Wetzel (1998)	Mostly Army; some Navy, Air Force (Special Operations Forces)	Interview data; self-report PERSTEMPO data (represented as any night the Service member's head did not hit his/her pillow)	• Over half respondents agreed PERSTEMPO had a negative impact on families • Almost two-thirds agreed that problems were manageable if the family worked together • Recovery time plays a significant role in Service members' ability to cope with deployments
Segal, Jones, Manos & Rohall (1997)	Army	Surveys/interviews of units with long/frequent deployments	• Lower morale for battalion that had more frequent deployments, less time between deployments, and less notification prior to deployment • Soldiers reported financial burden associated with deployments
Vick, Orletsky, Shulsky & Stillion (1997)	Air Force	Interviews	Personnel engaged in MOOTW expressed concern with negative impact of heightened TDY rates on morale
Fossen, Hanser, Stillion, Elliott & Moore (1997)	Air Force	Percentage of time spent in activity categories requiring time away from home	Activities requiring time away from home station had negative effect on professional growth and personal/family life.

In summary, findings suggested that PERSTEMPO affects morale and other aspects of quality of life; however, the limited empirical focus on this relationship, and the lack of methodological rigor in the studies reviewed herein highlight the need for further examination of the quality of life-PERSTEMPO relationship. The studies suggested that the nature of the mission and/or activities (e.g., MOOTW), the rate of deployment, and the management of deployments (e.g., prior notification given) affected Service members' morale. Still, the lack of relationship identified in the more quantitative study (Alderks, 1998) contradicts these findings. Because the Alderks study could not identify the extent to which frequently-deploying units were surveyed, it is difficult to determine the extent to which morale is more affected by very high PERSTEMPO rates. It is possible that an emphasis on high-deploying units may be warranted to better understand the affects of PERSTEMPO on morale. Alternatively, it is possible that there is a break point up until which morale is not affected, but after which PERSTEMPO evidences negative effects on morale.

Data focusing explicitly on highly deployed units (i.e., Special Forces soldiers) suggested that recovery time between deployments affected morale. Further, PERSTEMPO had a negative impact on other quality of life indices, including its effect on families. Taken together, the financial repercussions of deployments, the strains associated with limited recovery time between deployments, and the effect of PERSTEMPO on families speak to the possibility of improving the management of deployments to mitigate the potentially detrimental implications on quality of life.

METHODOLOGY FOR DATA ANALYSES

The data bases and methods selected for the analyses responded to several issues raised in the literature review. First, although many potential outcomes of high PERSTEMPO have been hypothesized (e.g., Vollrath, 1998; Garcia & Nuanes, 1997), only a few have been examined empirically. To respond to this issue, we selected two sources of data that included a variety of potential outcome measures related to retention, readiness and quality of life. Our analyses of these data bases were exploratory to identify likely effects of PERSTEMPO, rather than to test specific hypotheses. Second, some evidence indicated that the effects of PERSTEMPO on retention (and possibly other variables) might be curvilinear (Cooke, et al., 1992; Hosek & Totten, 1998). That is, a small amount of time away from home station increases retention up to a point. Additional time away from home beyond this point has a negative effect. We addressed this possibility by including the square of PERSTEMPO as a predictor in the analyses. The type of curvilinear relationship suggested by earlier results would be indicated by a significant negative effect of this quadratic term. Third, previous research indicated that other variables might moderate the effects of PERSTEMPO. These variables include job variables (e.g., amount of notice for deployments, type of deployment) as well as individual variables (e.g., tenure, marital status, and term of service). Our analyses considered other potential predictors of retention, readiness, and quality of life, both as potential moderator variables and to control for known effects. The issues raised by previous research provided the framework that guided the selection of data bases for analysis and the development of analysis methods.

Selection of Data Bases for Analysis

Analysis of the effects of PERSTEMPO requires three kinds of information: (a) a measure of the time spent away from home station; (b) one or more outcome measures assessing the status of individuals or units regarding retention, readiness, or quality of life; and (c) measures of soldier or unit characteristics that might moderate the effects of PERSTEMPO on outcome measures. Although a single measure of PERSTEMPO is sufficient for analysis, a variety of outcome measures and individual variables was desired because of the large number of variables that are hypothesized to be affected by PERSTEMPO. Ideally, both PERSTEMPO and outcome information would be found in a single data base. However, combining data from several sources is possible if there is a common identification field, such as Social Security Number (SSN) or Unit Identification Code (UIC), in each of the sources to be combined.

We examined 19 existing data bases to determine whether they contained sufficient information, either alone or in combination, to warrant comprehensive analysis. These data bases came from several sources, including (a) official Army personnel data bases, (b) survey and administrative data maintained by ARI, (c) personnel and outcome data maintained by DMDC, and (d) data sources identified during our literature review. Data bases were evaluated primarily based on whether they provided, either alone or in combination, sufficient PERSTEMPO, outcome, and moderator variables to conduct useful analyses. Consideration was also made of any limitations in either the segment of the Army population included or the time period covered. Finally, problems obtaining access to data due to confidentiality or security restrictions were identified.

Ultimately, we conducted three sets of analyses using the data bases delineated below:

1. Army SOF data from the PERSTEMPO Impact Survey, conducted in early 1998, provided a detailed description of a segment of the soldier population with high levels of PERSTEMPO. It was felt that a multivariate analysis of these data could expand on the results of the previous analysis by Ramsberger and Wetzel (1998), which focused on descriptive statistics and frequencies. This survey also included questions about several job factors that may moderate the effects of PERSTEMPO. Since the survey was designed specifically to address issues of PERSTEMPO for Special Operations Forces personnel, it contains many questions that address potential causes of personnel stress and military outcomes of stress. The data contain subjective measures of both indicator and outcome measures. Because it does not contain respondent SSN, these data cannot be linked to objective data or outcome measures. The data describe SOF personnel only, a population that experiences high levels of PERSTEMPO and is likely attracted to the special units, at least in part, because of the deployments.

2. The SSMP provided a broad overview of a wide variety of outcome measures for a representative sample of Army officers and enlisted personnel. We selected three administrations for analysis – Spring 1997, Fall 1997, and Spring 1998. These data provide a more recent view of PERSTEMPO than the previous analysis of data by Alderks (1998) from this survey. The SSMP data base contains a self-reported PERSTEMPO indicator and many attitudinal outcome measures (e.g., morale, satisfaction, commitment). The measure of PERSTEMPO in the SSMP is straightforward and relevant – the number of weeks the soldier was away from the duty station in the past 12 months for military duties. Because it does not contain respondent SSN, the SSMP cannot be linked to objective indicator or outcome measures. However, the attitudinal outcome measures contained in the survey provide ample opportunity for analysis.

3. The TAPDB, supplemented with data from the Active Duty Military Master and Loss Files, provided more objective measures of PERSTEMPO and its potential outcomes, in contrast to the self-reported measures included in the surveys. This data base contains the official Army measures of SKILLTEMPO and records the date at which each deployment begins, the return date, and the geographic area of the deployment. In addition, as the master personnel file for the Army, TAPDB contains many other demographic and institutional characteristics of Active Duty Army personnel required in a rigorous analysis of factors affecting retention (e.g., pay grade, promotion dates, MOS, and demographic characteristics).[11] The Active Duty Loss File and the Active Duty Master File contain personnel outcome measures, such as separation data, that can be linked to information in the TAPDB by SSN. We obtained data for enlisted personnel who were at an expiration of their first or second term of service (ETS) in FY 1996, FY 1997, or FY 1998.

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[11] The RAND Corporation has combined quarterly extracts of TAPDB from 1993 to the present to build a longitudinal data base through which researchers can track PERSTEMPO and its effects.

Both of the surveys include variables related to retention, readiness, and quality of life, such as intention to stay in the Army, self-assessed individual and unit readiness, satisfaction with Army benefits and pay, and satisfaction with family services (the latter of which are components of quality of life). In addition, our examination of the survey instruments identified other potential outcomes of high PERSTEMPO that did not fit into these three categories, but were relevant to the issues under investigation. The analysis of TAPDB data necessarily focused on retention, because measures of readiness and quality of life were not available in this data base.

Analysis of Army SOF Data from the PERSTEMPO Impact Survey

The PERSTEMPO Impact Survey was administered in early 1998 to approximately 6,000 Service members in SOF. In their original analysis of these data, Ramsberger and Wetzel (1998) presented frequency data and descriptive statistics. Our analysis focused exclusively on the 4,346 Army SOF personnel who took the survey. It examined the effects of PERSTEMPO on a variety of self-report measures related to retention, readiness, and quality of life. In addition, it investigated the effects of other predictor variables that might moderate the effects of PERSTEMPO.

This analysis was largely exploratory in nature, and involved many statistical tests. Such analyses often run the risk of overstating the statistical significance of effects found in the data. In an effort to minimize these risks, we focused our efforts on variables that had consistent effects on several outcomes. In addition, we divided the data into two subsets that were used for identifying potential relationships and estimating the size and statistical significance of these relationships, respectively.

Characteristics of the Sample

Army respondents to the PERSTEMPO Impact Survey had a median of 12 years of active duty service and 6 years in Special Operations. About one-half of the group (52%) were assigned to Special Forces Groups, while one-third (33%) were assigned to Ranger or Special Operations Aviation Regiments. The remainder came from Civil Affairs, Psychological Operations, joint, or headquarters units. Approximately 83% of the respondents were from the enlisted ranks, while 11% were commissioned officers.

Time away from home station varied substantially within this group. Although the average time away from home in the pervious year was 104 days, 13% of respondents reported no PERSTEMPO in the previous year, while nearly 18% reported more than 180 days. Nearly all respondents (99%) reported spending 270 days or less away from their home station in the previous 12 months.

Overview of Analysis

An overview of the analytic approach to the SOF data is shown in Figure 1. The figure portrays the major steps in the analysis and the flow of information from earlier to later steps. Preliminary factor analyses organized items into composites, and selected composites or items to serve as either predictors or outcomes in subsequent analyses. The results of these preliminary

analyses are discussed in detail in Appendix B. Subsequent analyses related PERSTEMPO, as well as other selected predictors, to the outcome measures.

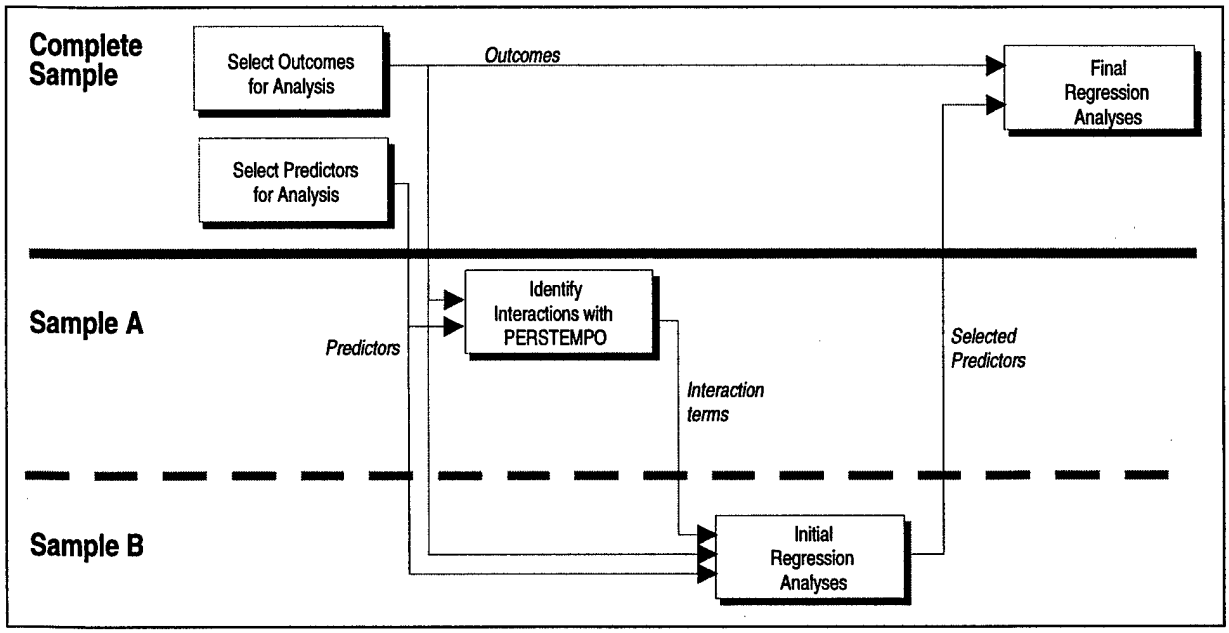

Figure 1. Analysis overview for SOF data.

The total sample was divided randomly into two halves, denoted "Sample A" and "Sample B." Sample A was used to identify potential interactions between PERSTEMPO and other predictors, and to construct variables representing these interactions (see Figure 1). Sample B was used to test whether the interactions identified in Sample A were significantly related to any of the outcomes. The results of the analysis of Sample B were applied to the entire sample to obtain more stable estimates of model parameters.

Select outcomes for analysis. Initial review of the questionnaire identified items representing potential retention, readiness, and quality of life outcomes of PERSTEMPO. The first step in the analysis employed factor analyses and intercorrelation matrices to identify groups of items that could be combined to form meaningful composites. After the reliabilities of the composites were established, a second factor analysis of the outcome measures and composites was conducted to identify a representative set of 20 relatively independent outcome measures.[12] Table 6 shows the names of the outcomes and number of items included in each outcome measure. In addition, the table shows the alpha reliability for all composite measures.

Measures were placed in categories based on their content. Six items are concerned with retention or related career issues. These outcomes assessed career intentions and attachment to

[12] The restriction to 20 measures, though somewhat arbitrary, was an attempt to focus the analysis and keep it within a manageable length.

service in the SOF, as well as the opportunity for advancement and other rewards that can come from deployments. Readiness measures assessed respondent opinions regarding whether deployments affect readiness and regarding the extent to which readiness is reduced by administrative demands or support activities. The survey did not include any direct measures of overall quality of life or morale. However, it included several measures related to family or financial strains that may be associated with deployments, two important components of quality of life. Finally, two outcomes assess the general satisfaction of respondents with leadership at several levels, and provide an overall measure of stress in military life.

Table 6. Description of Outcome Measures (Army SOF Data)

Outcome Measure	Number of Items	Alpha Reliability
RETENTION		
Intends to remain in Army & SOF	2	.90
Especially attached to SOF	5	.90
Leaving military now would be costly	4	.87
Finds deployments rewarding	2	.82
Deployments make for advancement	1	NA
Current PERSTEMPO increases desire for SOF	1	NA
READINESS		
Deployments have positive impact	5	.80
Administrative demands not limiting	2	.70
Support activities do not lower readiness	1	NA
FAMILY FACTORS		
Can balance work/family demands	3	.76
Family supports soldier's SOF role	2	.86
Family copes with recent deployment	1	NA
Deployments cause no financial strain	1	NA
FINANCIAL FACTORS		
Satisfaction with base pay	1	NA
Satisfaction with medical/dental benefits	3	.78
Satisfaction with retirement benefits	1	NA
Satisfaction with DFAS	1	NA
Satisfaction with AMEX credit card services	4	.92
GENERAL SATISFACTION		
Satisfaction with leadership, utilization	9	.89
Stress level in military is low	1	NA

Note: "NA" indicates that computation of the reliability coefficient was not applicable

Select predictors for analysis. Predictor variables included two types of items that were identified in the questionnaire.

1. Items that measured aspects of the soldiers' job such as hours worked per week when not deployed, amount of advance notice given prior to deployments, and time it takes to be reimbursed for travel expenses.

2. Items that measured background or personal characteristics of soldiers such as type of unit, amount of unit support for families, marital status, and years of service.

Because the number of potential predictor variables in the questionnaires was quite large, analytic steps similar to those employed with the outcome measures were taken to reduce the number of measures to a more manageable size. Factor analyses and intercorrelation matrices were used to identify items that could be combined into composites; reliability coefficients were calculated for proposed composites; and subsets of job-related measures and background and personal characteristics were selected.

Identify interactions with PERSTEMPO. The sample was then randomly divided into two halves, denoted Sample A and Sample B. In Sample A, the PERSTEMPO measure of deployment time and each of the other predictors were segmented into levels. Two-way analyses of variance were then conducted with the segmented PERSTEMPO measure and each of the other predictors serving, in turn, as the independent variables and each of the 20 selected outcome measures serving as the dependent variable. The purpose of these rather exhaustive analyses was to identify potential interactions between deployment time and each other predictor. As a result of the analyses of variance, measures capturing the significant interactions were developed and used in the next phase of the analysis.

Initial regression analyses. Before performing the initial regression analyses, adjustments were made to cases with missing data (see Appendix B). Cases with missing values for deployment time were dropped, as were cases with missing data on six or more other variables. Sample means[13] were substituted for missing data in the remaining cases, and dummy variables were created to indicate where substitutions had been made. Factor analyses of the dummy variables were conducted to further reduce the number of variables in the regression analysis. Only the dummy variables that loaded highest on the obtained factors or reflected high numbers of missing values were retained and used in the subsequent analyses.

Initial hierarchical multiple regression analyses were conducted on Sample B of the SOF data. The independent variables were introduced into the equation for estimating each of the 20 outcome variables in the following six steps.

1. The basic PERSTEMPO measure, time deployed in the last 12 months
2. The square of time deployed
3. The job-related predictors and their associated dummy variables
4. The job-related/PERSTEMPO interaction variables

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[13] The procedure of substituting means for missing data and creating dummy variables to reflect cases having substituted values is recommended by Cohen and Cohen (1983).

5. The background/personal predictors and their associated dummy variables
6. The background/personal/PERSTEMPO interaction variables

The improvement in prediction at each step was tested by comparing the squared multiple correlation coefficient (R^2) with the R^2 obtained in the previous step.

Based on an examination of the regression equations, we identified variables that had statistically significant regression weights both before and after the introduction of later variable sets. Variables that entered significantly into several of the outcome regression equations with consistently positive or negative weights were selected (along with any associated dummy variables) to comprise the final set of variables.[14] Also included in the final set of variables were the number of days deployed and its square. Table 7 names the 13 selected predictors, indicates the number of items that comprise each variable, and provides reliability estimates where appropriate.

Table 7. Description of Other Predictor Variables (Army SOF Data)

Predictor Variable	Number of Items	Alpha Reliability
DEPLOYMENT RELATED		
More time deployed than expected	3	.79
Lack of chain of command support*	2	.71
Insufficient time between deployments	3	.92
DFAS time to reimburse travel expenses*	1	NA
FAMILY RELATED		
Days deployed and maintain work/family balance	2	.82
Unit/installation activities support family*	2	.75
Unit supportive job/personal conflicts*	1	NA
OTHER JOB CHARACTERISTICS		
Hours worked minus hours would like to work**	2	NA
Own incentive pay less than others	1	NA
INDIVIDUAL CHARACTERISTICS		
Enlisted	1	NA
Married	1	NA
Years in Army and SOF	2	.88
In Special Forces Group	1	NA

* Indicates predictors with associated dummy variables to represent missing data.
** This variable represents a difference between responses to two items, rather than a composite.

[14] Variables that showed inconsistent relationships or that had significant relationships with few outcomes were dropped to reduce the likelihood of uncovering spurious relationships that can occur with this type of analysis.

The predictors were placed into four categories based on a review of their content. Four predictors were related to deployments and assessed the time deployed compared to expectations, the time between deployments, the perceived command support for deployments, and the time required for reimbursement of travel expenses. Three predictors were concerned with family issues, such as the perceived quality of unit activities providing family support. Two items reflected other job characteristics, including workload and incentive pay. Finally, four predictors were individual characteristics of the respondents.

Final regression analysis. In the final steps of the analysis, hierarchical regression analyses were conducted using the complete sample (A and B combined) of Army SOF data. For each of the 20 outcome measures, the variables were introduced into the regression equations in three steps:

1. The basic PERSTEMPO measure time deployed
2. Time deployed squared
3. The remaining selected predictor variables

After steps 2 and 3, a statistical test was performed to determine whether the addition of the variable, time deployed squared, resulted in a significant increase in R^2.

Analysis of the Sample Survey of Military Personnel (SSMP)

Our analysis of the SSMP is similar in many respects to that of the Army SOF data. However, differences between the two surveys allow the results of SSMP analysis to extend beyond those of the Army SOF data. The SSMP is given to a stratified random sample of all Army enlisted and officer personnel. Because of its wider range of purposes, it has a greater variety of items assessing potential retention, readiness, and quality of life outcomes of PERSTEMPO. On the other hand, it contains fewer items representing variables that might moderate the effects of PERSTEMPO.

Like the examination of Army SOF data, the analysis of the SSMP is largely exploratory. The same precautions were used in this analysis to reduce the risk of overstating the statistical significance of obtained effects. Because of the large sample size, we used a more stringent criterion for statistical significance. Even at the conservative level chosen, small effects were often significant.

Characteristics of the Population

Because the SSMP is given to a stratified sample of enlisted personnel and officers, its characteristics were weighted to represent the Army population as a whole. Soldiers had a median of 5-9 years of active-duty military service. The survey captured the full range of Army functions; 32% were from combat arms, 18% from combat support, 14% from combat service support, and 36% from joint or allied commands or other types of unit. Soldiers were predominantly male (86%), and included 9% Hispanics, and 24% non-Hispanic Blacks.

The distribution of time away from home station is positively skewed, as evidenced by the difference between the median time away of 5 weeks and the mean of 7.8 weeks. Over 28% of the population are estimated to have no time away from their home station, and an additional

9% had less than 1 week away. At the other end of the distribution, 7% have more than 26 weeks away from home, while about 2% have more than 39 weeks away.

Overview of the Analysis

Three SSMP survey administrations were chosen for inclusion in these analyses: Spring 1997, Fall 1997, and Spring 1998. We combined the data from the three administrations into a single file with 28,528 cases.[15] We eliminated from our analyses those items that occurred in only one of the three surveys.[16] The analyses of the SSMP data in general paralleled the analyses of the SOF data. Figure 2 presents an overview of the steps in the analysis. Appendix C describes the results of preliminary analyses in more detail.

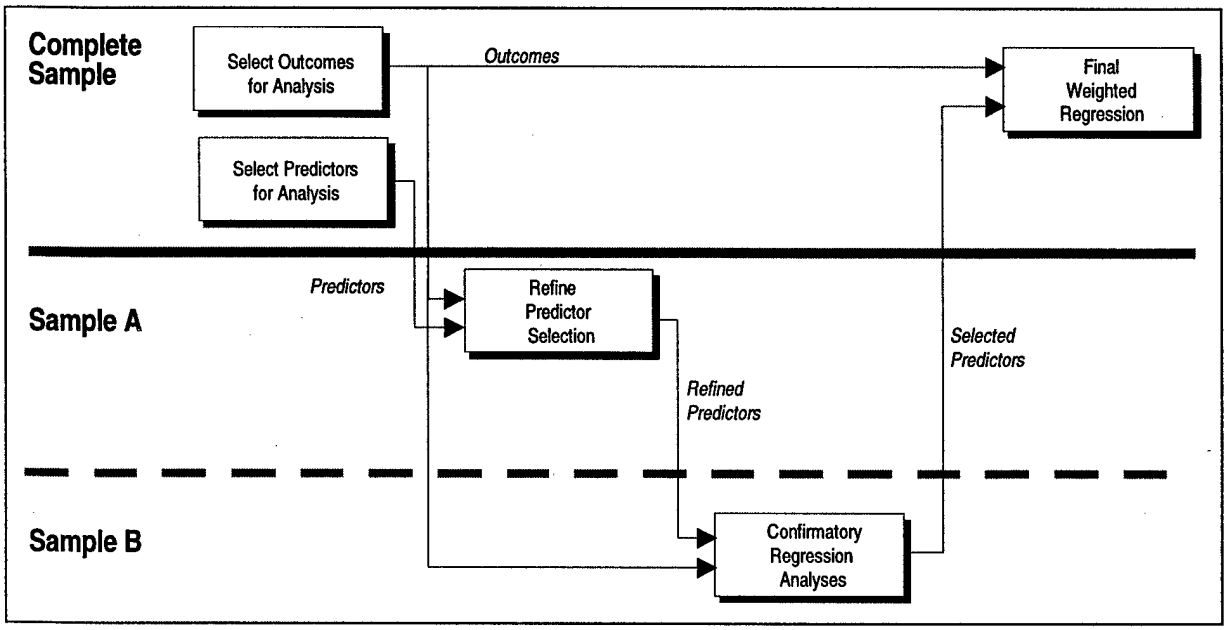

Figure 2. Analysis overview for SSMP

Select outcomes for analysis. Factor analyses were conducted to form composite measures, and select a representative subset of outcomes, thereby reducing their number. In these analyses, only those outcome measures contained in all three of the SSMP administrations were used. As was the case with the SOF data, 20 outcome measures were selected to provide representative coverage of the entire set of outcomes. Table 8 lists the outcome names, the number of items comprising each outcome, and the alpha reliability for all composite measures.

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[15] A small percentage of individuals would be expected to have participated in more than one administration. Because the survey is anonymous, these duplicates cannot be identified.

[16] Items occurring in more than one survey with identical or essentially identical item stems, but with non-identical response alternatives, were re-coded whenever possible, so that response alternatives were made identical.

Table 8. Description of Outcome Measures (SSMP Data)

Outcome Measure	Number of Items	Alpha Reliability
RETENTION		
Army career intentions	1	NA
Satisfaction with job fulfillment	9	.87
Not concerned about having to leave Army	2	.85
Satisfaction with overseas duty	1	NA
READINESS		
Individual and unit readiness	3	.76
Smaller Army has no negative effect	4	.73
Satisfaction with equipment and supplies	2	.88
Satisfaction with co-worker competence	1	NA
Satisfaction with education/training access	1	NA
FAMILY FACTORS		
Satisfaction with time away from family	1	NA
Satisfaction with services and family programs	8	.88
Spouse supports making Army career	1	NA
FINANCIAL FACTORS		
Satisfaction with pay	4	.75
Army will protect benefits/retirement	1	NA
GENERAL SATISFACTION		
Satisfaction with overall quality of life	1	NA
Morale of unit/self	2	.80
Satisfaction with quality of leadership	3	.87
Army leadership makes best decisions	1	NA
Satisfaction with regulation/discipline	1	NA
Satisfaction with work tasking	4	.71

Note: "NA" indicates that computation of a reliability coefficient was not applicable

The SSMP includes direct measure of the primary outcomes of concern for this project: career intentions, individual and unit readiness, satisfaction with overall quality of life, and individual and unit morale. In addition, the survey includes other items that are related to these concerns. Based on a review of the content, the outcomes were placed into one of the five categories shown in Table 8. The categories were compared to those used with the Army SOF data to ensure that similar items in the two surveys were placed in the same categories.

Select predictors for analysis. Predictors were selected based on an examination of the content of the SSMP questionnaires and the distribution of item responses. Because this method identified only 18 job-related variables and 15 background/personal variables, it was not necessary to reduce the set further using factor analysis. Rather, the number of variables was reduced in the following step.

Refine predictor selection. The analysis of SSMP data applied the same rules concerning missing data that were applied to the SOF data. To help control for any differences between the three samples, three dummy variables capturing time of survey administration were created. Additional dummy variables were created to mark the cases where means had been substituted for missing values. The results of a factor analysis of the dummy variables helped to reduce the number of dummy variables.

The combined sample was randomly split into two half samples (A and B) of over 13,000 cases each. Sample A was used in the generation of 20 initial hierarchical multiple regression equations, one for each selected outcome measure. The independent variables were introduced into the equations in four sets:[17]

1. Time deployed in the last 12 months
2. The square of time deployed
3. The job-related measures and their associated dummy variables including the dummy variables capturing time of administration
4. The background/personal measures and their associated dummy variables.

After each variable set had been introduced into the equations, a test of the significance of the increase in R^2 was conducted.

Examination of the regression equations indicated that some variables entered into several equations with highly significant regression weights, while other variables entered the equations with significant weights rarely or not at all. On the basis of these initial regressions, the number of independent variables was reduced. The 14 predictors that were selected (see Table 9) showed consistently significant ability to predict outcome measures.

Since the SSMP contains different items than the PERSTEMPO Impact Survey, different categories are required to describe them. In particular, the SSMP does not contain any of the deployment and family related predictors that showed substantial relationships with outcome variables in the SOF data. In addition, because the SSMP included a relatively small number of candidate predictors, it was not necessary to reduce the number further by forming composites, with the exception of two that were suggested by the similarity of content of the component items.

Confirmatory regression analyses. Multiple regression equations were computed using Sample B; with all retained variables entering the equations at the same time.. The results were examined to ensure that the selected variables maintained consistently significant relationships with outcome measures.

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[17] The reader may note that no variables attempting to capture any significant interactions between time deployed and predictors were introduced into these regression equations as was done in the analysis of the SOF data. The results of the earlier analyses of the interaction variables did not support their generation and use in further analyses.

Final weighted regression. The final multiple regression equations for each of the 20 outcome measures used the complete sample and incorporated sample weights so that the results represented the total Army population. The variables were introduced into the regression equation in three steps:

1. The basic PERSREMPO measure, time deployed
2. Time deployed, squared
3. The remaining selected predictor variables.

Statistical tests of the significance of the obtained differences in R^2 and the size of the regression weights were performed.

Table 9. Description of Other Predictor Variables (SSMP Data)

Predictor Variable	Number of Items	Alpha Reliability
DEMOGRAPHIC INFORMATION		
Gender (male)	1	NA
Hispanic origin	1	NA
Years of education	1	NA
Member of minority group*	1	NA
RANK AND EXPERIENCE		
Enlisted	1	NA
Years of service	1	NA
How long worked with most members of unit*	1	NA
CURRENT ASSIGNMENT		
OCONUS*	1	NA
FORSCOM	1	NA
Assigned to TDA unit*	1	NA
DISCRIMINATION AND HARASSMENT		
Subjected to discrimination in last 12 months*	1	NA
Subjected to racial discrimination in last 12 months	1	NA
Chain of command commitment against sexual harassment*	6	.94
Leadership endorses policies against sexual harassment	2	.87

* Indicates predictors with associated dummy variables to represent missing data
Note: "NA" indicates that computation of a reliability coefficient was not applicable

Total Army Personnel Data Base and Active Duty Military Master and Loss Files

The TAPDB analysis concerned "voluntary" retention decisions of active duty enlisted soldiers at the soldier's ETS; "voluntary" retention reflects a soldier's actively choosing to stay in or leave the Army, based on his or her own volition. The administrative data in TAPDB provided

records of deployments, while the Active Duty Military Master and Loss Files provided actual retention decisions to serve as the criterion measure.

The retention analysis controlled for a variety of demographic and economic factors that have been found in the literature to affect voluntary retention behavior. These controls isolated the effects of the PERSTEMPO measures to obtain unbiased estimates. We estimated voluntary retention equations for first term (Zone A, which extends from year of service 3 through year of service 6) and second term (Zone B, which extends from year of service 7 through year of service 10) soldiers who were at an expiration of term of service (ETS) in FY 1996, FY 1997 or FY 1998.[18] We estimated both aggregated first term and second term retention equations, and selected equations by military occupational specialty (MOS).

Data

Retention data. We received files containing demographic information and retention outcomes for enlisted Army members who had ten years of service or fewer and who faced a voluntary retention decision (that is, they were at an ETS) in FY 1996, FY 1997, or FY 1998.[19] We restricted our analysis to the first and second term because retention rates typically become very high, with less variation to explain, after about ten years of service.[20] The analysis file contained a total of 161,907 records, one for each ETS during the period.

For each ETS for each member, we received the following data:

- Social security number (SSN)
- ETS date
- Decision outcome (reenlistment, extension, separation)
- Years of service
- Pay Grade
- Primary MOS (PMOS)
- Sex
- Ethnic Group
- Marital Status

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[18] We use first term and second term interchangeably with Zone A and Zone B, respectively. In practice, we consider soldiers who are at an ETS in the Zone A range of years of service, which are typically first term decisions, and at the Zone B range of years of service, which are typically second term decisions. However, the decision may not necessarily be all first reenlistment decisions in Zone A. or all second reenlistment decisions in Zone B.

[19] The source for the DMDC data is, of course, the Army's own personnel data bases. We used DMDC because the center maintains a history file and is organized to process requests such as ours.

[20] This homogeneity after about 10 years of service is due to selection (i.e., those who strongly dislike Army life have already left service) and the draw of the military retirement system which becomes vested on completion of 20 years of service.

- Number of Dependents
- Educational Certification
- Armed Forces Qualification Test (AFQT) category
- Selective Reenlistment Bonus (SRB) multiplier

Most of these variables were included in the retention equations as control variables to help isolate the effects of PERSTEMPO-related measures.

Deployment data. From TAPDB we obtained data concerning enlisted members' deployments.[21] For each enlisted member who was deployed between 1994 and 1998, we obtained the following information on each deployment:

- SSN
- Deployed country (destination)
- Date deployed
- Date returned
- Deployment type (e.g., operational, peacekeeping, training, etc.)

If there was no deployment record for the soldier, we inferred that the soldier was not deployed. Because deployment records are cumulative, we obtained information about all previous deployments for that soldier, back to the time when the Army began keeping records of deployment activity. As a practical matter we used 24 months of deployment history for first term soldiers and 36 months of deployment history for second term soldiers. There were approximately 140,000 incidents of deployment for 1994-1998.

Often, the Army is reluctant to deploy soldiers who are close to their ETS without a commitment to remain in the Army through the likely deployment period. For this reason, soldiers who plan to reenlist may have a greater opportunity to incur PERSTEMPO than those who do not. To control for this potentially biasing effect, we did not include deployments that began within six months of ETS in any constructed measures of PERSTEMPO.

We also excluded early reenlisters entirely from the analysis. Members who reenlisted more than six months before ETS were considered early reenlisters for the purpose of our analysis. They were excluded because they have less opportunity for deployments prior to their reenlistment. For similar reasons, we excluded soldiers in the first term who entered under two year enlistment contracts. These adjustments had only a small effect on sample size. After matching the deployment and retention files together by SSN and eliminating early reenlisters, we had a file with 157,092 records.

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[21] RAND has been constructing an historical file of deployments based on quarterly extracts from TAPDB. Because TAPDB is a data base used for operational purposes, the records of soldiers who leave active duty are overwritten. By making quarterly extracts, RAND has preserved a history for each soldier.

Characteristics of the Sample

A total of 110,922 (71%) of the soldiers in the sample were in Zone A with between 3 and 6 years of service (assumed to be completing their first term), while 46,170 (29%) were in Zone B with between 7 and 10 years of service (assumed to be completing their second term). Only 28% of those in Zone A had deployed in the two years prior to their ETS, while 22% of those in Zone B had deployed in the three years before their ETS.[22] Most (54%) of those who deployed did so only once; fewer than 8% of those who deployed did so three or more times. The soldiers who deployed were away from their home station for an average of 163 days for Zone A and 167 days for Zone B. The average days deployed for the entire sample was 46 days for Zone A and 38 days for Zone B.

Models

We estimated two types of models of retention. The first type was a logistic regression of the binomial reenlistment decision: 1 if stay, 0 if leave. The option, *stay*, combines reenlistment and extension. We separately modeled decisions for Zone A (presumed to be first-term reenlistments) and Zone B (presumed to be second-term reenlistments); we suspected that Zone A and Zone B members would differ from each other somewhat in their reenlistment decisions.

The second type of model considered all three of the options facing a soldier at ETS: reenlisting, extending, or leaving. Under an extension, a soldier commits to stay in the Army for two additional years, or less, beyond his or her ETS. We estimated several multinomial logit models to represent first and second term decisions where we included three potential outcomes. We did this to determine whether various measures of PERSTEMPO had differential effects on the reenlistment and extension decision.

Three major classes of explanatory variables were used in all models.

Demographic variables. Research suggests that women and ethnic minorities tend to reenlist at higher rates than others. We included dummy variables for both females and for non-whites. We also included a variable indicating soldiers who have graduated from high school and who scored above the 50th percentile on the Armed Forces Qualifying Test. Members with families tend to reenlist at higher rates than do single members, hence, we included a dummy

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[22] The estimate of the proportion of soldiers who were deployed at least once is consistent with the estimates from Sortor and Polich (1998). Also using TAPDB, they estimated that about 20% of all soldiers were deployed at least once over a three-year period (1994-1996). However, the TAPDB estimate is lower than the estimate inferred by Hosek and Totten (1998). They estimated that about 43% of "early career" (our Zone B) and 38% of first term soldiers experienced at least one incident of PERSTEMPO in a 24-month period prior to ETS, over the period FY 1993-1995. However, they infer deployments from special pay data. Specifically, those receiving a Family Separation Allowance are assumed to be deployed. Soldiers who were on an unaccompanied tour to Korea received a Family Separation Allowance; however, Korea is an unaccompanied PCS tour, not a deployment. Hence, it would not be recorded in TAPDB as a deployment. This, we believe, accounts for the differences in our respective deployment incidence statistics.

variable indicating whether a member was married and a dummy for indicating whether the member had children.

Institutional and economic variables. We included the soldier's pay grade, year of service, and SRB multiple offered (if any). The data did not include a variable indicating reenlistment eligibility. However, we believed that for each zone, the combination of pay grade and year of service captures eligibility status in most instances. For example, soldiers in pay grade E-3 with five years of service are not likely to be eligible to reenlist. We controlled for occupational specialty in two ways. In the aggregate models, we include dummy variables for many MOS. The specialties included as dummy variables were not exhaustive, but did account for over 60% of the soldiers in the aggregate models. We also separately modeled several of the larger MOS.

PERSTEMPO measures. We measured deployment-generated PERSTEMPO in three ways. The first is cumulative days away over the 24- or 36-month period prior to ETS. We used different periods in order to minimize differences in the opportunity for deployments among soldiers. Zone A members might not all have 36 possible months of PERSTEMPO opportunity prior to ETS, due to the training pipeline and short initial enlistment contracts. Most members, however, should have completed at least 24 months of active service excluding training time. Zone B members, on the other hand, will all have completed significantly more than 36 months of active service and therefore have 36 months of PERSTEMPO opportunity. We also included cumulative days squared to allow cumulative days away to have an increasingly non-linear effect.

A second measure of PERSTEMPO is the *number* of deployments during the period leading up to ETS. Again, we included the number of deployments over 24 and 36 months, respectively, prior to ETS for first- and second-term soldiers. We exclude deployments that begin within 6 months of ETS. A third measure of PERSTEMPO is the average length of deployment over the period leading up to ETS, calculated as cumulative days divided by number of deployments.

We also explored several other measures related to deployment. These included the longest deployment (measured in days); deployment days 1 and 2 years prior to ETS entered as separate explanatory variables; and a measure of cumulative deployed days that approximates the measure used by Hosek and Totten (1998).[23]

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[23] Hosek and Totten (1998) used receipt of two special pays, family separation pay and hostile file pay, to infer "months deployed". We constructed a measure of cumulative days away that included only deployments lasting 30 days or more (a requirement for eligibility for family separation pay) and a measure that approximated days deployed to areas for which hostile fire pay was authorized.

RESULTS

Army SOF Data from the PERSTEMPO Impact Survey

The preliminary analyses of the PERSTEMPO Impact Survey (described in detail in Appendix B) identified and selected the outcomes and predictors used in the final regressions reported in this section. In addition, the preliminary analyses identified potential interactions between PERSTEMPO and other predictors. To reduce the likelihood of identifying spurious relationships, variables representing these interactions were constructed using one half of the sample and tested on the other half. None of the interaction terms showed consistent and statistically significant relationships with the outcomes, so they were dropped from the final regression analysis.

Outcome Variance Predicted by Multiple Regressions

The final multiple regression analyses for each outcome measure were conducted in three steps. First, the number of days away from home during the previous year was entered as a single predictor. Second, the square of this variable was added to produce a two-predictor model. Third, the remaining 17 predictors were added to the model.

Table 10 shows the squared multiple correlation coefficients obtained for the three regression equations for each of the 20 outcome measures. Although the linear effect of PERSTEMPO was significant for 16 of the outcomes, this effect was small, accounting for an average of 1.6% of the outcome variance. Adding the square of PERSTEMPO increased the average R^2 slightly to 1.9%. This improvement was significant for eight of the outcomes. Overall, this two-predictor model accounted for less than 4.5% of the outcome variation.

Other variables added significantly to the prediction of all outcomes. Values of R^2 for the complete regression model ranged from a low of .05 for the outcome, *leaving military now would be costly*, to a high of .39 for the outcome, *satisfaction with leadership and how utilized.* The mean increase in R^2 attained through the addition of 17 predictors is about .21. These results suggest that on the average, each of the other predictors accounts for about the same proportion of the outcome variance as PERSTEMPO does (i.e., somewhat more than 1%).

Effects of PERSTEMPO

The effects of PERSTEMPO are shown in the results of the one- and two-predictor models (See Table 11). The correlations between the number of days deployed in the past year and the 20 outcome measures are consistently negative, but small for most outcomes. With one exception, all outcomes are negatively correlated with the number of days deployed. The one positive correlation (with *intentions to remain in the Army and SOF*) was not significantly different from zero. The fact that the correlations are quite low indicates a weak association between higher PERSTEMPO and lower outcomes. The relationship was somewhat stronger for family factors (average $r = -.19$), than for other outcome categories (average $r \geq -.10$). Two

Table 10. Squared Multiple Correlations from Hierarchical Regression Analyses (Army SOF Data)

Outcome Measures	1 Predictor (linear model)	2 Predictors (curvilinear model)	All Predictors
RETENTION			
Intends to remain in Army & SOF	.0001	.0002	.3479*
Especially attached to SOF	.0003	.0037*	.2071*
Leaving military now would be costly	.0016	.0016	.0464*
Finds deployments rewarding	.0105*	.0115	.3176*
Deployments make for advancement	.0160*	.0184	.1566*
Current PERSTEMPO increases desire for SOF	.0123*	.0176*	.1751*
READINESS			
Deployments have positive impact	.0034*	.0137*	.2024*
Administrative demands not limiting	.0278*	.0278	.2441*
Support activities do not lower readiness	.0058*	.0068	.1496*
FAMILY FACTORS			
Can balance work/family demands	.0282*	.0371*	.3475*
Family supports soldier's SOF role	.0091*	.0130*	.1664*
Family copes with recent deployment	.1136*	.1159*	.3360*
Deployments cause no financial strain	.0170*	.0194*	.2087*
FINANCIAL FACTORS			
Satisfaction with base pay	.0000	.0002	.1469*
Satisfaction with medical/dental benefits	.0069*	.0073	.1494*
Satisfaction with retirement benefits	.0044*	.0044	.1239*
Satisfaction with DFAS	.0051*	.0053	.2793*
Satisfaction with credit card services	.0443*	.0448	.3619*
GENERAL SATISFACTION			
Satisfaction with leadership, utilization	.0170*	.0194*	.3861*
Stress level in military is low	.0027*	.0030	.1491*

* Significant improvement in R^2, $p < .01$

individual correlations with absolute value greater than .20 are shown in bold in the table. Respondents with more days deployed indicated that their family had more trouble coping with their deployment schedule, and were less satisfied with their credit card services.

As shown in Table 10, introduction of a quadratic (or squared) term into the regression equations significantly improved the prediction for eight of the outcome variables. Of particular interest was a relationship in which increasing the number of days deployed was associated with *higher* outcome values up to a point, after which the relationship would turn negative. In the multiple regressions, this type of relationship was indicated by a positive weight for the number of days deployed and a negative weight for its square. The results of the multiple regression, shown in Table 11, indicate that this pattern of weights occurred for 11 of the outcome measures, although not always significantly so. In addition, for eight of the outcome measures, weights for *both* the number of days away and its square were negative. For these dependent variables, higher PERSTEMPO was associated with decreased outcome values throughout the range. The fact that the quadratic term in the equation was negative for all but one outcome indicates a consistent tendency for any negative effects associated with PERSTEMPO to increase slightly as the number of days deployed increases. The sign for the linear term is not consistent, but tends to

Table 11. Results of One- and Two-Predictor Models (Army SOF Data)

Outcome Measure	One Predictor	Two Predictors		
	Correlation with Days Deployed	Regression Weight Sign		Days Deployed with Maximum Outcome
		Days Deployed	Days Deployed Squared	
RETENTION				
Intends to remain in Army & SOF	.01	-	+	NA
Especially attached to SOF	-.02	+*	-*	107
Leaving military now would be costly	-.04	-	-	0
Finds deployments rewarding	-.10*	+	-	1
Deployments make for advancement	-.13*	+	-*	12
Current PERSTEMPO increases desire for SOF	-.11*	+	-*	56
READINESS				
Deployments have positive impact	-.06*	+*	-*	95
Administrative demands not limiting	-.17*	-*	-	0
Support activities do not lower readiness	-.08*	+	-	22
FAMILY FACTORS				
Can balance work/family demands	-.17*	+	-*	46
Family supports soldier's SO role	-.10*	+	-*	55
Family copes with recent deployment	-.34*	-*	-*	0
Deployments cause no financial strain	-.13*	+	-*	10
FINANCIAL FACTORS				
Satisfaction with base pay	-.01	+	-	104
Satisfaction with medical/dental benefits	-.08*	-	-	0
Satisfaction with retirement benefits	-.07*	-	-	0
Satisfaction with DFAS	-.07*	-	-	0
Satisfaction with credit card services	-.21*	-*	-	0
GENERAL SATISFACTION				
Satisfaction with leadership, utilization	-.13*	+	-*	10
Stress level in military is low	-.05*	-	-	0

* Significantly different from zero, $p < .01$

be positive for those outcomes in which the quadratic weight is significantly negative (eight of nine outcomes).

The final column shows the number of days deployed that maximizes each outcome variable, based on the weights of the two-predictor model. This point ranged from 0 to 107 days. It averaged about 47 days across the 11 outcome measures in Table 11 that had positive weights for days deployed and negative weights for days deployed squared. When both weights are negative, the regression equation is a decreasing function of the number of days deployed throughout its range. Consequently, its maximum is at zero days. The one case that did not fit either of these patterns of weights was an outcome that was essentially unrelated to the number of days deployed.

Figure 3 presents a plot of the curve obtained for estimating the values of the outcome measure, *soldier can balance work/family demands*, using the multiple regression equation weights for days deployed and days deployed squared. This variable showed the strongest curvilinear relationship with PERSTEMPO. Because of the positive weight for the number of days deployed,

the estimated value of this variable rises at first with increasing days deployed. However, at about 46 days, the negative effect of the quadratic term takes over, and the estimated value declines. The curve is rather flat, indicating that the relationship depicted is not particularly strong.

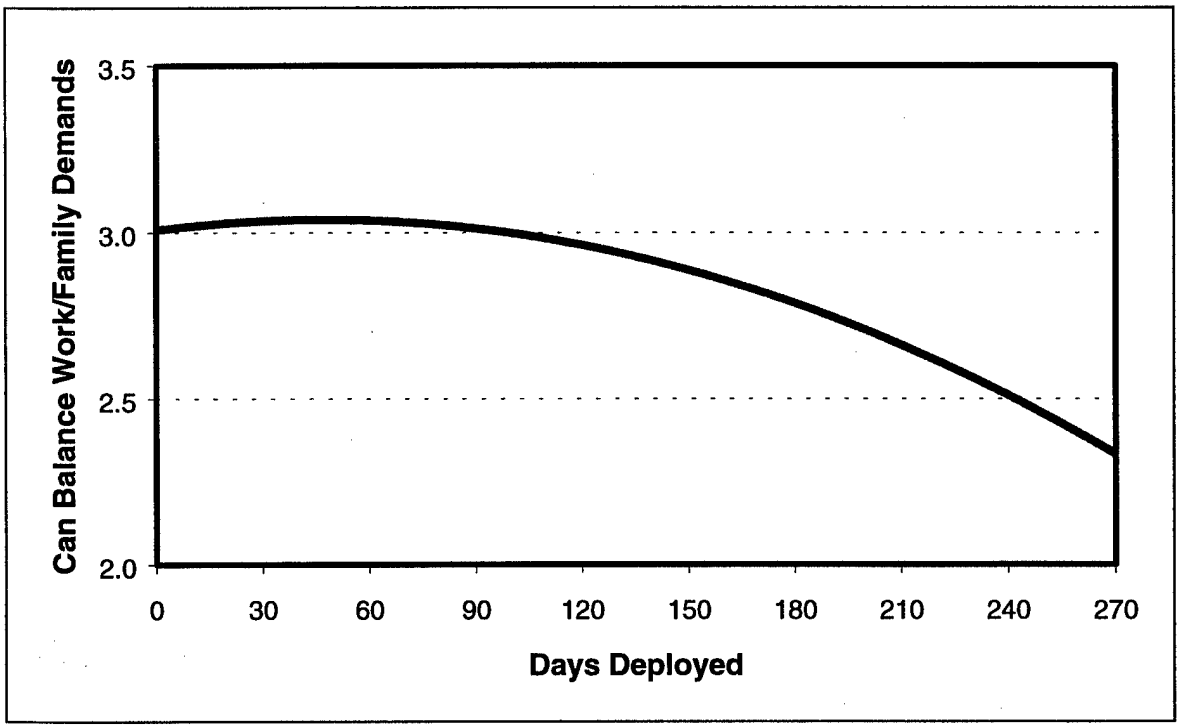

Figure 3. Predicted relationship between days deployed and "can balance work and family demands."

Effects of Other Predictor Variables

The relationship between predictor variables and outcomes was assessed by examining the correlations between predictors and outcomes as well as the results of the multiple regression model in which all predictors were included (including days deployed and its square). The correlations describe the overall association between each predictor and each outcome, while the multiple regression analyses assess the unique contribution that each predictor makes in estimating the outcomes.

Table 12 presents both the correlations and the results of the multiple regression analysis. Each entry in the table represents the correlation between predictor indicated by the column and the outcome indicated by the row, with correlations of .20 or greater shown in bold type. Correlations with absolute values of .05 or larger are significantly different from zero at the .01 level. Regression weights that are significantly different from zero ($p < .01$) are indicated by a dagger (negative weight) or double dagger (positive weight) following the correlation. For example, the correlation between the predictor variable, *more time deployed than expected*, and

Table 12. Correlations of Other Predictor Variables with Outcome Measures (Army SOF Data)

Outcome Measure	Deployment Related				Family Related		
	More Time Deployed Than Expected	Lack of Chain of Command Support	Insufficient Time Between Deployments	DFAS Time to Reimburse Travel Expenses	Days Deployed & Maintain Work/Family Balance	Unit/ Installation Activities Support Family	Unit Supportive Job/Personal Conflicts
RETENTION							
Intends to remain in Army & SOF	−.06	−.11†	−.07	.02†	.13‡	.11‡	.19‡
Especially attached to SOF	−.05	**−.35†**	−.14	−.03†	.10	**.21‡**	**.32‡**
Leaving military now would be costly	.02	−.02	−.02	−.04	−.07†	.04	.03
Finds deployments rewarding	−.14†	**−.52†**	**−.28†**	.00	.11‡	**.23‡**	**.25‡**
Deployments make for advancement	−.13†	**−.23†**	**−.21†**	−.06†	.11‡	**.20‡**	.13
Current PERSTEMPO increases desire for SOF	−.18†	**−.24†**	**−.21†**	−.05†	**.20‡**	**.23‡**	**.22‡**
READINESS							
Deployments have positive impact	**−.26†**	**−.29†**	**−.26†**	−.01†	**.20‡**	.15‡	**.21‡**
Administrative demands not limiting	.02‡	**−.24†**	−.12	−.08‡	−.05	.18‡	.10
Support activities do not lower readiness	.04‡	**−.20†**	−.11†	−.08‡	−.04	.10	.06
FAMILY FACTORS							
Can balance work/family demands	**−.33†**	**−.26†**	**−.39†**	−.05†	**.34‡**	**.25‡**	**.31‡**
Family supports soldier's SO role	−.12	−.16	**−.20†**	−.06	.15‡	.19‡	**.26‡**
Family copes with recent deployment	**−.38†**	**−.23**	**−.42†**	−.06	**.27‡**	**.23‡**	**.25‡**
Deployments cause no financial strain	−.18†	**−.21†**	**−.30†**	−.11	.17‡	.16‡	.18‡
FINANCIAL FACTORS							
Satisfaction with base pay	−.02	−.08	−.11†	−.04†	.00	.07	.14‡
Satisfaction with medical/dental benefits	−.04	−.15†	−.15†	−.17	.00	**.23‡**	.14
Satisfaction with retirement benefits	.00‡	−.14	−.11†	−.06‡	.01	.12‡	.11
Satisfaction with DFAS	.00	−.13†	−.12†	**−.50†**	−.05	.11‡	.08
Satisfaction with credit card services	−.01‡	**−.20†**	−.14†	**−.25†**	−.09	.19‡	.11
GENERAL SATISFACTION							
Satisfaction with leadership, utilization	.00‡	**−.47†**	**−.20**	−.05†	−.01	**.30‡**	**.32‡**
Stress level in military is low	−.15†	−.10	**−.25†**	−.03†	.15‡	.08	**.22‡**

† Negative regression weight corresponding to this correlation significantly less than 0, $p < .01$

‡ Positive regression weight corresponding to this correlation significantly greater than 0, $p < .01$

Table continues

Table 12 (cont'd). Correlations of Other Predictor Variables with Outcome Measures (Army SOF Data)

Outcome Measure	Other Job Characteristics		Individual Characteristics				PERSTEMPO
	Hrs. Worked Minus Hrs. Would Like to Work	Own Incentive Pay Less Than Others	Enlisted	Married	Years in Army and Special Forces	Special Forces Group	Days Deployed[a]
RETENTION							
Intends to remain in Army & SOF	-.10†	-.07†	-.19†	**.28‡**	**.51‡**	**.23‡**	.01
Especially attached to SOF	-.13	-.05	-.09	.03	.07‡	-.04	-.02‡
Leaving military now would be costly	-.04	-.09†	-.01	.13	.08	.01	-.04
Finds deployments rewarding	-.08	-.10†	-.13†	-.04	-.05†	-.10	-.10
Deployments make for advancement	-.06†	-.13†	-.04†	-.12	-.19†	-.16†	-.13
Current PERSTEMPO increases desire for SOF	-.14†	-.12†	.01‡	.00	-.03	-.07†	-.11‡
READINESS							
Deployments have positive impact	-.08	-.03	-.04	-.06	-.05†	-.05	-.06‡
Administrative demands not limiting	-.05†	-.13†	-.03†	-.09	**-.28†**	**-.39†**	-.17
Support activities do not lower readiness	-.02	-.07	.04	-.09	**-.24†**	**-.29†**	-.08
FAMILY FACTORS							
Can balance work/family demands	-.19†	-.11†	-.07†	.01‡	-.01†	-.01	-.17‡
Family supports soldier's SO role	-.10	-.08	-.08	**.22‡**	.06	.01	-.10
Family copes with recent deployment	-.18†	-.13†	-.06	.11‡	.02	-.12 †	**-.34**
Deployments cause no financial strain	-.16†	-.18†	-.09†	-.10‡	-.10†	-.11†	-.13
FINANCIAL FACTORS							
Satisfaction with base pay	-.15	**-.22†**	**-.25†**	.02	.09	.03	-.01
Satisfaction with medical/dental benefits	-.12†	-.17†	-.02	-.03	-.18†	-.07	-.08
Satisfaction with retirement benefits	-.10†	-.18†	-.15†	-.08	-.01‡	-.13†	-.07
Satisfaction with DFAS	-.08	-.06	-.02	.01	-.09	-.13†	-.07
Satisfaction with credit card services	-.07	-.16†	-.01	-.03	**-.21†**	**-.52†**	**-.21**
GENERAL SATISFACTION							
Satisfaction with leadership, utilization	-.12†	**-.21†**	-.15†	-.03	-.16†	**-.30†**	-.13
Stress level in military is low	-.19†	-.08†	.00	.07	.04†	.11‡	-.05

[a] Outcomes with significant positive weight for days deployed also had significant negative weight for days deployed squared.

† Negative regression weight corresponding to this correlation significantly less than 0, $p < .01$

‡ Positive regression weight corresponding to this correlation significantly greater than 0, $p < .01$

the outcome, *deployments have positive impact*, is -.26, indicating a significant and meaningful relationship between these two variables. In addition, the weight for this predictor in the multiple regression equation estimating this outcome was significantly less than zero, indicating that the predictor accounts for outcome variance that is not captured by other predictors.

Our presentation of results focuses on relationships indicated both by correlations that are .20 or larger, and by regression weights that are significantly different from zero. In addition we identify predictors that have consistent relationships with most of the outcomes, even if these relationships are generally small.

Consistent predictors. Four deployment or family related predictors showed substantial and consistent relationships with outcome measures in several categories. These variables are stronger predictors of most outcomes than the number of days away from home is.

1. A perceived lack of chain-of-command support and appropriate training for missions showed significant negative correlation with 19 of the 20 outcomes, and significant negative weights in multiple regressions for 14 outcomes.

2. Soldier perceptions of insufficient time between deployments also has a uniformly negative relationship with outcome measures, indicated by 19 significant correlations and 15 significant regression weights.

3. Ratings of unit or installation activities to support the family have substantial positive relationships with retention, family factors and satisfaction. This effect is indicated by 19 significant positive correlations with outcomes, as well as the 16 significant positive regression weights.

4. The soldier's perception of the level of unit support provided when job demands conflict with personal responsibilities has a uniformly positive relationship to outcome variables, as indicated by 19 significant correlations and 12 significant regression weights.

These four predictors are notable, because they represent areas where the Army may be able to improve the management of deployments to enhance retention, readiness, and quality of life.

Three additional variables had consistently negative relationships with outcomes, although they were fairly weak. Soldiers expressed slightly more negative attitudes in several areas if any of the following conditions was true (a) they felt that their own incentive pay was lower than that of comparably trained and experienced SOF personnel, (b) they had to work more hours than they would like when they were *not* deployed, (c) they reported that the Defense Finance and Accounting Service (DFAS) took longer on the average to reimburse them for travel expenses.

Predictors of retention. The four predictors with consistent relationships across outcomes are the strongest predictors of retention outcomes. Respondents who perceived a lack of chain-of-command support for recent deployments, or who indicated that there was insufficient time between deployments, were less positive regarding retention (average r of -.25 and -.16, respectively). In fact, lack of support from the chain of command was the single factor

that had the strongest negative association with rewarding deployments (r = -.52). In addition, respondents' ratings of unit or installation family support activities and of unit support when job requirements conflicted with personal responsibilities were both associated with higher ratings of retention variables (average r of .17 and .19, respectively).

Several individual characteristics were substantially associated with stated Army and SOF career intentions, but were much less related to other retention variables. The regression analyses confirmed well-known effects indicating that Army career intentions are stronger for officers than enlisted personnel, stronger for married than single soldiers, and increase with longer time in service. When respondents were asked whether their current deployment schedule increased their desire to remain in SOF, their responses were relatively independent of these individual characteristics.

Predictors of readiness. Many of the factors associated with retention also have substantial and significant relationships with readiness. The most direct measure of readiness is a composite variable that assesses the perceived effect of the deployment schedule on several training and readiness factors. Ratings on this measure were lower for soldiers whose time deployed was greater than their expectations (r = -.26), who perceived a lack of chain-of-command support for deployments (r = -.29), or who expressed that they had insufficient time between deployments (r = -.26). Family-related factors have a positive effect on this outcome. Soldiers indicating that they can maintain a balance between work and family requirements through longer deployments rate the effects of deployments on readiness more positively (r = .20). Positive ratings on this readiness composite were also associated with an indication that the unit provided support when job requirements conflicted with personal responsibilities (r = .21).

The remaining two readiness outcomes assessed the effects of administrative demands and support activities. These two outcomes showed a similar pattern of relationships with the predictors. Both were affected negatively by the perception of a lack of chain-of-command support for deployments. In addition, they received lower ratings from more experienced soldiers and members of a Special Forces group.

Predictors of family factors. Outcome measures assessing family factors are substantially associated with deployment- and family-related predictors. Average correlations with deployment-related predictors (with the exception of DFAS reimbursement time) ranged from -.22 to -.33, while average correlations with family-related predictors ranged from .21 to .25. Associations with other job characteristics and individual characteristics were weaker and less consistent.

Predictors of financial factors. With a few exceptions, financial factors are not strongly-associated with the predictor variables in this analysis. Some of the correlations that are present represent obvious connections between specific predictors and outcomes. For example, the rated time required for DFAS to reimburse travel expenses is substantially related to satisfaction with DFAS (r = -.51). In addition, enlisted personnel, and those who consider their own incentive pay to be less than others with comparable qualifications are less satisfied with their base pay (r = -.25 and -.22, respectively).

Predictors of general satisfaction. The factors associated with general satisfaction are those that predict other types of outcome, as well. These predictors include the four predictors with consistent and substantial relationships across all outcomes. Other deployment- and family-related predictors have relatively small associations with general satisfaction.

Effects of PERSTEMPO in the full regression model. The effects of PERSTEMPO are reduced somewhat when all predictors are considered. However, the same general pattern of results, characterized by a positive weight for days deployed and a negative weight for its square, is present in 16 of the 20 outcomes. Although this pattern of weights was significant ($p < .01$) for only four outcome measures, the fact that the positive/negative pattern was obtained for so many variables points to a weak curvilinear relationship in general between days deployed and outcome values.

Sample Survey of Military Personnel

The preliminary analyses of the SSMP (described in Appendix C) identified and selected the outcome measures and predictors used in the final regressions. The final regressions incorporated the survey sampling weights for gender, rank, and location, so that results of the analyses represent the Army population.

Outcome Variance Predicted by Multiple Regressions

The final multiple regression analyses developed three models for estimating each of the 20 outcome measures. The first model used the time deployed as a linear predictor of each outcome. The second model added the square of the number of weeks deployed to predict the outcomes based on a curvilinear function of PERSTEMPO. The final model included all predictors.[24] Table 13 shows the squared multiple correlation coefficients obtained for the three models for each outcome.

The effects of PERSTEMPO are generally quite small. On average this factor accounts for about 0.6% of the outcome variance, slightly more than one-third of the comparable value of R^2 for the Army SOF data. Because of the large sample size, these differences are significant for 16 outcomes. Adding the square of the number of weeks deployed increases the average R^2 slightly to 0.007, which is a significant increase for 7 outcomes.

Adding other predictors improves prediction significantly, but for the most part, the improvement was not great, considering the number of predictors that were added. Values of R^2 for the final regression model ranged from .03 for the outcome, *satisfaction with overseas duty*, to .39 for *Army career intentions*. The mean value of R^2 across outcomes is .09, which indicates that on the average, each of the other predictors accounts for a slightly smaller percentage of the outcome variance than PERSTEMPO does (about .5%).

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[24] The square of weeks deployed was not included in the final model, because including both weeks deployed and its square (which are highly correlated with each other) in the regressions reduced the significance of the linear relationship with PERSTEMPO.

Table 13. Squared Multiple Correlations from Weighted Regression Analyses (SSMP Complete Sample)

Outcome Measures	1 Predictor (linear model)	2 Predictors (curvilinear model)	All[a] Predictors
RETENTION			
Army career intentions	.0003	.0003	.3908*
Satisfaction with job fulfillment	.0013*	.0017	.1351*
Not concerned about having to leave Army	.0000	.0007*	.0508*
Satisfaction with overseas duty	.0000	.0008*	.0306*
READINESS			
Individual and unit readiness	.0076*	.0104*	.0907*
Smaller Army has no negative effect	.0011*	.0033*	.0406*
Satisfaction with equipment and supplies	.0057*	.0057	.0656*
Satisfaction with co-worker competence	.0038*	.0038	.0668*
Satisfaction with education/training access	.0141*	.0174*	.0663*
FAMILY FACTORS			
Satisfaction and time away from family	.0354*	.0354	.0825*
Satisfaction with services and family programs	.0032*	.0033	.0551*
Spouse supports making Army career	.0000	.0000	.1199*
FINANCIAL FACTORS			
Satisfaction with pay	.0019*	.0022	.0817*
Army will protect benefits/retirement	.0037*	.0038	.0715*
GENERAL SATISFACTION			
Satisfaction with overall quality of life	.0086*	.0086	.0692*
Morale with unit/self	.0023*	.0023	.1120*
Satisfaction with quality of leadership	.0019*	.0029*	.1344*
Army leadership makes best decisions	.0045*	.0045	.0518*
Satisfaction with regulation/discipline	.0022*	.0023	.0411*
Satisfaction with work tasking	.0168*	.0204*	.0828*

[a] The square of weeks deployed was not included. The test of statistical significance compares this model to the one-predictor model.

* Significant improvement in R^2, $p < .0001$

Effects of PERSTEMPO

Table 14 presents the effects of PERSTEMPO as reflected in the results of the one- and two-predictor models. Most of the correlations are negative and close to zero in value; the outcome in which the correlation has the greatest magnitude is *satisfaction with time away from family*, which showed a correlation of -.19 with *number of weeks deployed*.[25] In addition, two outcome measures had significant ($p < .0001$) *positive* correlations with weeks deployed. These measures were the direct measure *individual and unit readiness* and the belief that a smaller Army would not negatively affect soldiers. The small magnitude of these correlations, in contrast to those found in the Army SOF data, may reflect, in part, the lower levels of time

[25] Because of the large sample size, very small correlations may be statistically significant. We set a stringent criterion for statistical significance to reduce the number of significant, but small relationships. Even at this level, correlations with an absolute value of .03 or greater are statistically significant.

deployed in the SSMP sample on the average. The mean *days deployed* in the SSMP sample was about 55 days while the mean *days deployed* in the Special Operations data was 104 days.

Table 14. Results of One- and Two-Predictor Models (SSMP Complete Sample)

Outcome Measure	One Predictor	Two Predictors		
	Correlation with Weeks Deployed	Regression Weight Sign		Weeks Deployed with Maximum Outcome
		Weeks Deployed	Weeks Deployed Squared	
RETENTION				
Army career intentions	.02	+	-	184.3
Satisfaction with job fulfillment	-.04*	+	-	4.0
Not concerned about having to leave Army	+.00	+	-	17.2
Satisfaction with overseas duty	-.01	+	-	15.3
READINESS				
Individual and unit readiness	.09*	+*	-*	27.5
Smaller Army has no negative effect	.03*	+*	-*	21.2
Satisfaction with equipment and supplies	-.08*	-	+	NA
Satisfaction with co-worker competence	-.06*	-	-	0.0
Satisfaction with education/training access	-.12*	-*	+*	12.1
FAMILY FACTORS				
Satisfaction with time away from family	-.19*	-*	+	NA
Satisfaction with services and family programs	-.06*	-	-	0.0
Spouse supports making Army career	-.00	+	-	12.1
FINANCIAL FACTORS				
Satisfaction with pay	-.04*	-	-	0.0
Army will protect benefits/retirement	-.06*	-*	+	NA
GENERAL SATISFACTION				
Satisfaction with overall quality of life	-.09*	-	-	0.0
Morale of unit/self	-.05*	-	-	0.0
Satisfaction with quality of leadership	-.04*	+	-	7.0
Army leadership makes best decisions	-.07*	-	+	NA
Satisfaction with regulation/discipline	-.05*	-	-	0.0
Satisfaction with work tasking	-.13*	-*	+*	NA

* Significantly different from zero, $p < .0001$

Multiple regression analyses in which both the number of weeks deployed and its square were used to predict outcomes revealed evidence of weak curvilinear relationships between PERSTEMPO and some of the outcome measures. Analysis of eight outcomes revealed a curvilinear relationship characterized by a positive weight for weeks deployed and a negative weight for its square, although this relationship was significant for only 2 outcomes. For these outcomes, additional deployments *improved* the outcome at low levels of PERSTEMPO, but *degraded* the outcomes at higher levels of PERSTEMPO. The point at which the relationship with weeks deployed turned from positive to negative varied across the outcome measures, as shown in the final column of Table 14.

Analysis of two outcome measures revealed a significant pattern of regression weights that was the reverse of the positive/negative weights described above. For the outcome measures, *satisfaction with work tasking* and *satisfaction with access to education and training*, weeks deployed had a statistically significant ($p < .0001$) negative weight while its square had a significant *positive* weight. Figure 4 shows this curvilinear relationship between weeks deployed and *satisfaction with work tasking*, the outcome for which this relationship was stronger. The low R^2 for this relationship reflects the relative flatness of the curve. For six of the outcome measures, the weights of both weeks deployed and weeks deployed squared were negative in the two-variable regression equations. In none of these cases, however, were the regression weights in the multiple regression significantly different from zero.

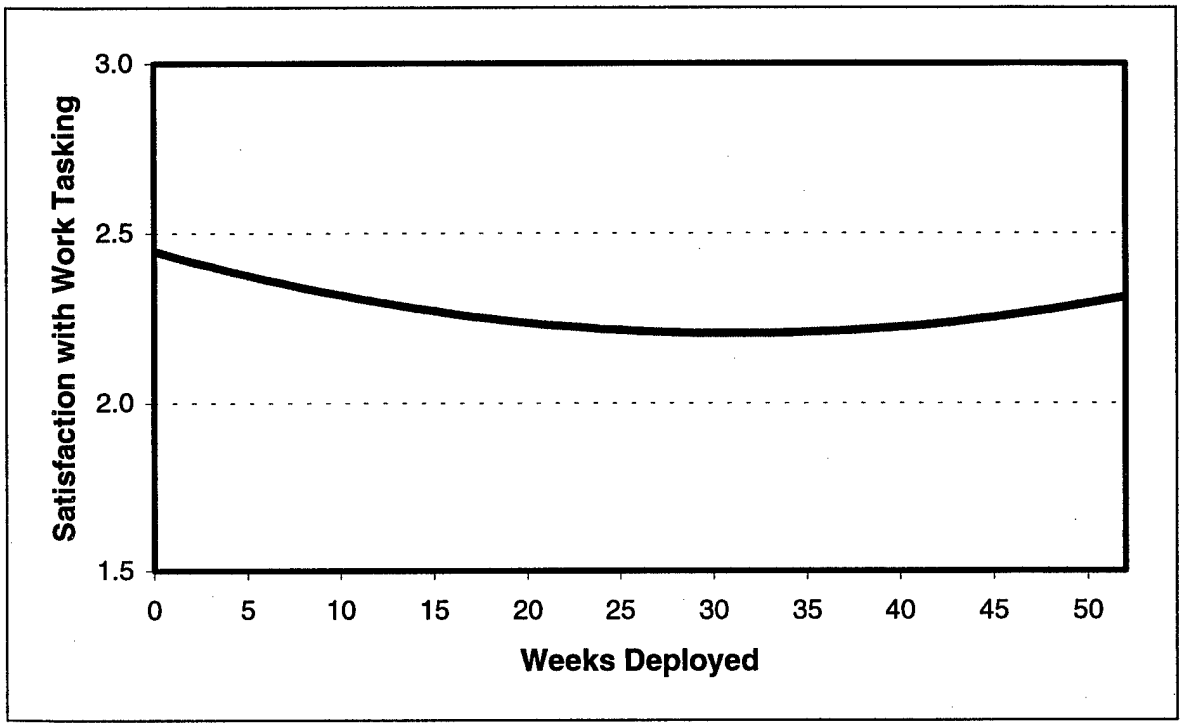

Figure 4. Predicted relationship between weeks deployed and satisfaction with work tasking.

Effects of Other Predictor Variables

Table 15 presents both the correlations and the results of the multiple regression analysis in the same format that was used in presenting SOF data in Table 12. A relatively small number of correlations have a magnitude of.20 or larger (indicated in bold in Table 15). However, several predictors have a consistently positive or negative relationship with the outcomes, although the relationship is generally small. In addition, there are some substantial correlations between predictors and outcomes related to retention.

Table 15. Correlations[a] of Other Predictor Variables with Outcome Measures (SSMP Complete Sample)

Outcome Measure	Demographic Information				Rank and Experience		
	Gender (Male)	Hispanic Origin	Years of Education	Member of Minority Group	Enlisted	Years of Service	How Long Worked With Most Members of Unit
RETENTION							
Army career intentions	.08	-.02	**.27**	.05‡	**-.20**†	**.61**‡	.08
Satisfaction with job fulfillment	.01	-.04	.17	-.01	**-.22**†	**.16**‡	-.02
Not concerned about having to leave Army	-.01	-.07†	.18‡	-.12†	-.17†	.02†	-.02
Satisfaction with overseas duty	.01	-.01	.08	-.06†	-.08	.07	.01
READINESS							
Individual and unit readiness	.12‡	.01‡	.10	-.03	-.11†	**.16**‡	.06
Smaller Army has no negative effect	.03	-.05	.08‡	-.03	-.05	.03	-.04
Satisfaction with equipment and supplies	-.05†	-.01	**.16**‡	.05‡	-.13	.14‡	.01
Satisfaction with co-worker competence	-.00	-.02	.13	.05‡	-.14†	.10‡	-.02
Satisfaction with education/training access	-.04	-.03	.09	.06‡	-.09†	.09‡	-.03†
FAMILY FACTORS							
Satisfaction with time away from family	.04‡	-.02	.11	-.03	-.10	.13‡	.03
Satisfaction with services and family programs	.01	-.02	.02	.02	-.06†	-.02	-.06
Spouse supports making Army career	.05	.01‡	.13	.03	-.11	**.31**‡	.03
FINANCIAL FACTORS							
Satisfaction with pay	-.02†	-.03	**.18**	-.08†	**-.23**†	.08	-.03
Army will protect benefits/retirement	.02‡	.05‡	-.09†	.06‡	.03†	-.19†	-.07
GENERAL SATISFACTION							
Satisfaction with overall quality of life	-.02	.00	.10	-.01	-.12†	.10‡	-.02
Morale of unit/self	.05‡	.04‡	.11	.05‡	-.14†	.13‡	-.07†
Satisfaction with quality of leadership	.05	-.02	.13	-.01	-.17†	.10‡	-.08†
Army leadership makes best decisions	.05‡	.03‡	.02	.05‡	-.04†	-.01	-.04
Satisfaction with regulation/discipline	.01	.01	.03	.02‡	-.05†	-.00	-.02
Satisfaction with work tasking	-.06	.03	-.11	.09‡	.10‡	-.13†	-.05

[a] Correlations with absolute values of .03 or more are significantly different from zero, $p < .0001$.

† Regression weight corresponding to this correlation significantly less than zero, $p < .0001$

‡ Regression weight corresponding to this correlation significantly greater than zero, $p < .0001$

Table continues

Table 15 (cont'd). Correlations[a] of Other Predictor Variables with Outcome Measures (SSMP Complete Sample)

Outcome Measures	Current Assignment			Discrimination and Harassment				Weeks Deployed
	OCONUS	FORSCOM	Assigned to TDA Unit	Subjected to Discrimination Within Last 12 Months	Subjected to Racial Discrimination Within Last 12 Months	Chain of Command Commitment Against Sexual Harassment	Leadership Endorses Policies Against Sexual Harassment	
RETENTION								
Army career intentions	.01‡	-.05	.21‡	-.11†	-.07	.10	.14‡	.02
Satisfaction with job fulfillment	-.01	-.03	.10	-.24†	-.19	.13‡	.20‡	-.04
Not concerned about having to leave Army	-.02	-.01	.05	-.03	-.04	.01	.01	.00
Satisfaction with overseas duty	.08‡	-.05	.04	-.07	-.07	.07	.08‡	-.01
READINESS								
Individual and unit readiness	.02	.03	-.01	-.12†	-.08	.11‡	.18‡	.09‡
Smaller Army has no negative effect	.02	.03	.00	-.12†	-.09	.08	.11‡	.03
Satisfaction with equipment and supplies	-.06†	-.06†	.14‡	-.09	-.09†	.05	.08‡	-.08†
Satisfaction with co-worker competence	-.04	-.04	.10	-.15†	-.13	.09‡	.10‡	-.06†
Satisfaction with education/training access	-.04	-.07	.16‡	-.12†	-.09	.07	.11‡	-.12†
FAMILY FACTORS								
Satisfaction with time away from family	-.08	-.04	.14‡	-.11	-.10	.06	.09‡	-.19†
Satisfaction with services and family programs	-.04	.02	-.00	-.15†	-.12	.11	.16‡	-.06
Spouse supports making Army career	.00	-.04	.11	-.12†	-.09	.10	.11	-.00
FINANCIAL FACTORS								
Satisfaction with pay	.02	-.04	.04	-.13†	-.12	.06	.07	-.04†
Army will protect benefits/retirement	.04	-.02†	-.09†	-.09†	-.07	.03	.03	-.06†
GENERAL SATISFACTION								
Satisfaction with overall quality of life	-.02	-.03	.09	-.16†	-.14	.10‡	.14‡	-.09†
Morale of unit/self	-.03	-.00	.04	-.21†	-.16	.13‡	.19‡	-.05†
Satisfaction with quality of leadership	-.06†	.01	.06	-.27†	-.21†	.16‡	.20‡	-.04
Army leadership makes best decisions	-.01	-.01	-.00	-.15†	-.12	.07	.12‡	-.07†
Satisfaction with regulation/discipline	-.01	-.04†	.04	-.14†	-.13†	.08‡	.10‡	-.05
Satisfaction with work tasking	-.05†	-.06†	.05‡	-.11†	-.11†	.04	.08‡	-.13†

[a] Correlations with absolute values of .04 or more are significantly different from zero, $p < .0001$.

† Regression weight corresponding to this correlation significantly less than zero, $p < .0001$

‡ Regression weight corresponding to this correlation significantly greater than zero, $p < .0001$

Consistent predictors. Six of the predictors showed a consistent relationship with nearly all of the outcomes, although this relationship was usually small. As was true in the Army SOF data, enlisted personnel were more negative on 18 of the 20 outcome measures than officers were. On the other hand, years of education showed positive relationships to 18 of the 20 outcomes. The predictors related to discrimination and sexual harassment had consistent effects on all outcome variables in the expected direction. Soldiers subjected to discrimination in the last 12 months or subjected specifically to racial discrimination gave more negative ratings on all 20 outcomes. Soldiers who reported that their chain of command had a strong commitment to creating a workplace free of sexual harassment and that their leadership was taking action to enforce policies against sexual harassment had higher values on the outcome measures.

Predictors of retention. The results confirm well-established relationships between predictors and retention measures. Years of service is the best predictor of career intentions. In addition, enlisted personnel showed substantially lower values on Army career intentions and satisfaction with job fulfillment. Those with more education expressed higher career intentions, in part because they are more likely to be officers ($r = .72$) or to have longer service ($r = .39$). Finally, predictors associated with discrimination or harassment showed substantial correlations with *satisfaction with job fulfillment.*

Predictors of other outcomes. Relationships between predictors and outcomes other than retention show few substantial correlations with no discernable pattern. Several substantial correlations are shown in Table 15. Enlisted personnel were less satisfied with their pay. Soldiers with longer service reported greater spouse support for their Army careers. Finally, ratings regarding discrimination and harassment showed substantial correlations with *satisfaction with the quality of leadership.*

Total Army Personnel Data Base and Active Duty Enlisted Master and Loss Files

Descriptive Statistics for TAPDB data

The relationship between retention and deployment-based measures of PERSTEMPO were examined using analysis files that combined information from TAPDB with information from the enlisted master and loss personnel files. Table 16 and Table 17 present deployment statistics by MOS in our sample for the largest 30 enlisted occupational specialties, as well as for the total sample, for Zone A and Zone B, respectively. The first column of data is the percentage of personnel in that PMOS who had at least one deployment. The second column is the average number of deployments for all in the MOS. The third column is the average cumulative days deployed for all in the MOS, and the fourth column is the percentage of soldiers in that PMOS who either reenlist or extend their term of service beyond the ETS decision point. The MOS with the highest average number of days deployed in Zone A is Military Police (MOS 95B), while the MOS with the highest average deployment days in Zone B is Fighting Vehicle Infantryman (MOS 11M).

We present the results of retention models using three general sets of specifications. The first type estimates an overall model for first term and second term retention decisions, respectively, aggregating over occupational specialties. The MOS are represented by dummy variables in this analysis. The dependent measure is the "stay" or "leave" decision for those at an ETS. The

decision is "stay" if the soldier either reenlists or extends beyond ETS. The models are estimated as logistic regressions, a form appropriate for a binary outcome variable. The second set of specifications considers three outcome variables: reenlist, extend, or leave. A multinomial logit model is used in this case. We again estimate overall models that aggregate occupational specialties for first and second term ETS decisions. The third set of specifications is MOS-specific equations. The outcome variable is "stay" versus "leave", as in the initial aggregate specifications, and the models are estimated by logistic regression. For the initial aggregated models, we present the coefficients and significance levels for all the variables in the model. For subsequent models, we present only the coefficients for the PERSTEMPO related variables.

Table 16. Zone A Deployment in the 24 Months Prior to ETS and Retention Rates at ETS for 30 Largest MOS and Overall

MOS	Description	Percentage Deployed at Least Once	Average Number of Deployments	Average Days Deployed	Percentage Who Stay (ETS Retention Rate)
11B	Infantryman	40.53%	0.648	64.23	28.28%
11C	Indirect Fire Infantryman	36.71%	0.531	58.35	29.21%
11H	Heavy Antiarmor Weapons Infantryman	32.59%	0.452	49.12	27.79%
11M	Fighting Vehicle Infantryman	40.46%	0.597	74.28	27.49%
12B	Combat Engineer	36.88%	0.537	55.09	30.63%
13B	Cannon Crewmember	24.17%	0.316	30.87	29.56%
13F	Fire Support Specialist	28.71%	0.400	41.61	27.19%
13M	Multiple Launch Rocket Sys Crewmember	9.89%	0.139	17.20	32.62%
14S	Avenger Crewmember	32.24%	0.429	47.02	33.02%
19D	Cavalry Scout	39.63%	0.552	73.76	27.15%
19K	M1 Armor Crewman	35.09%	0.473	52.95	30.79%
31F	Network Switching Sys Op-Maint	22.50%	0.275	37.63	29.79%
31R	Multichannel Transmissions Sys Op-Maint	26.56%	0.358	46.13	31.95%
31U	Signal Support Systems Specialist	31.03%	0.452	51.79	39.28%
52D	Power Generation Equipment Repairer	22.84%	0.306	38.18	36.33%
54B	Chemical Operations Specialist	19.82%	0.294	28.85	38.09%
63B	Light Wheel Vehicle Mechanic	21.40%	0.287	34.02	37.87%
63S	Heavy Wheel Vehicle Mechanic	27.73%	0.367	43.86	29.67%
63T	BFV System Mechanic	27.72%	0.362	41.31	27.72%
63W	Wheel Vehicle Repairer	24.49%	0.317	42.87	32.53%
71L	Administrative Specialist	16.56%	0.226	28.48	50.68%
75B	Personnel Administration Specialist	16.42%	0.218	25.79	44.71%
77F	Petroleum Supply Specialist	24.46%	0.356	36.56	37.81%
88M	Motor Transport Operator	33.90%	0.477	51.04	38.68%
91B	Medical Specialist	27.51%	0.411	46.51	40.84%
92A	Automated Logistical Specialist	26.10%	0.361	45.32	45.19%
92G	Food Service Specialist	26.09%	0.371	44.55	41.95%
92Y	Unit Supply Specialist	17.26%	0.234	27.88	44.09%
94B	Food Service Specialist	26.14%	0.402	37.37	42.95%
95B	Military Police	49.19%	0.774	107.66	33.70%
	All MOS	28.35%	0.409	46.21	34.97%

Table 17. Zone B Deployment in the 36 Months Prior to ETS and Retention at ETS for 30 Largest MOS and Overall

MOS	Description	Percentage Deployed at Least Once	Average Number of Deployments	Average Days Deployed	Percentage Who Stay (ETS Retention Rate)
11B	Infantryman	34.43%	0.711	51.80	51.50%
11C	Indirect Fire Infantryman	27.20%	0.514	49.32	54.40%
11M	Fighting Vehicle Infantryman	38.53%	0.809	73.06	56.01%
12B	Combat Engineer	30.12%	0.604	49.96	53.05%
13B	Cannon Crewmember	26.58%	0.476	43.40	51.99%
19D	Cavalry Scout	31.08%	0.596	63.15	54.54%
19K	M1 Armor Crewman	31.32%	0.633	49.83	58.83%
31F	Network Switching Sys Op-Maint	17.01%	0.313	31.74	48.13%
31R	Multichannel Transmissions Sys Op-Maint	20.83%	0.354	41.16	47.99%
31U	Signal Support Systems Specialist	25.46%	0.506	42.37	48.61%
52D	Power Generation Equipment Repairer	25.41%	0.480	43.10	49.39%
54B	Chemical Operations Specialist	21.74%	0.424	36.50	59.83%
63B	Light Wheel Vehicle Mechanic	21.46%	0.395	33.99	49.87%
63S	Heavy Wheel Vehicle Mechanic	26.82%	0.499	43.80	48.71%
63W	Wheel Vehicle Repairer	25.98%	0.449	45.41	49.41%
67T	UH-60 Helicopter Repairer	11.64%	0.194	20.95	52.05%
71L	Administrative Specialist	8.52%	0.134	15.60	57.38%
74C	Record Telecommunications Operator	9.82%	0.174	15.59	52.23%
75B	Personnel Administration Specialist	11.24%	0.172	17.55	59.11%
75H	Personnel Services Specialist	11.63%	0.198	20.81	71.29%
77F	Petroleum Supply Specialist	23.21%	0.450	33.17	57.35%
88M	Motor Transport Operator	30.89%	0.624	53.51	56.89%
91B	Medical Specialist	22.16%	0.443	35.08	59.77%
91C	Practical Nurse	5.97%	0.098	7.90	52.24%
92A	Automated Logistical Specialist	19.44%	0.336	30.91	53.27%
92G	Food Service Specialist	20.28%	0.390	32.39	58.27%
92Y	Unit Supply Specialist	13.30%	0.224	21.99	61.15%
94B	Food Service Specialist	24.00%	0.467	31.16	52.00%
95B	Military Police	34.44%	0.590	63.58	43.66%
96B	Intelligence Analyst	23.01%	0.449	34.14	54.90%
	All MOS	21.81%	0.410	36.80	52.91%

Results for Aggregated Models

Tables 18 and 19 present the results of the logistic regression models for Zone A and Zone B retention decisions, respectively. Note that soldiers from all occupational groups are pooled together in these models. PERSTEMPO is measured as the total days deployed over the most recent 24 months and 36 months for the first and second term, respectively. In addition, we allow the effect of *deployed days* to vary by *year of service*, through an interaction. (Not shown

in the tables are MOS-specific dummy variables that allow the underlying retention rate to vary by MOS.)

The signs, magnitudes, and significance levels of the control variables are, generally, consistent with the literature. *Deployed days* has a positive and statistically significant effect on voluntary retention in both Zone A and Zone B. The effect declines with increasing days as indicated by the negative coefficient on *squared deployed days*. However, the quadratic term is not statistically significant. The positive effect of *days deployed* is still positive but is smaller at years of service (YOS) 4, 5, and 6, compared to year of service 3, the reference year of service. The column labeled "marginal effect" shows an estimate of the effect of one additional day deployed on retention. For the interactions of *days deployed* and *years of service*, the marginal effect is the sum of the main effect (or reference group effect) and the interaction effect.[26]

Table 18. Aggregate Analysis for Zone A (all MOS)

Variable	Coefficient	Standard Error	Chi-Square	Pr > Chi (p-value)	Marginal Effect (effect of unit increase)
Intercept	-1.0647	0.0319	1112.169	0.0001	
Non-white	0.5959	0.0142	1752.044	0.0001	
Female	0.1525	0.021	52.819	0.0001	
High-Quality	0.00808	0.0266	0.0921	0.7615	
Married	0.2979	0.0166	323.4372	0.0001	
Children	0.2834	0.0201	197.9411	0.0001	
PERSTEMPO Days	0.00193	0.000193	99.7887	0.0001	0.000439039
PERSTEMPO Days ^{2}	-4.11E-07	5.02E-07	0.6684	0.4136	
YOS 4	-0.0447	0.02	4.9692	0.0258	
YOS 5	-0.013	0.0252	0.2645	0.6071	
YOS 6	-0.0477	0.0257	3.444	0.0635	
Days X YOS 4	-0.00054	0.000174	9.7334	0.0018	0.000316267
Days X YOS 5	-0.00048	0.000204	5.4337	0.0198	0.000329918
Days X YOS 6	-0.00013	0.000227	0.3459	0.5565	0.000409554
FY 1997	0.0839	0.0156	28.7417	0.0001	
FY 1998	-0.2219	0.0173	164.9102	0.0001	
E3	-0.3351	0.0213	247.4929	0.0001	
E5	0.4861	0.0212	527.4116	0.0001	
E6	1.2301	0.0954	166.3113	0.0001	

[26] We also estimated models that included interactions between PERSTEMPO variables and family status variables, such as marital status and dependents. In general, we did not find a statistically significant variation in the effects of PERSTEMPO on retention by these family status variables

Table 19. Aggregate Analysis for Zone B (all MOS)

Variable	Coefficient	Standard Error	Chi-Square	Pr > Chi (p-value)	Marginal Effect
Intercept	-0.1664	0.0429	15.0524	0.0001	
Non-white	0.5285	0.0205	663.3849	0.0001	
Female	0.1036	0.0325	10.1794	0.0014	
High-Quality	-0.022	0.0306	0.5143	0.4733	
Married	0.0882	0.0249	12.5478	0.0004	
Children	0.159	0.0227	49.2021	0.0001	
Deployed Days	0.00226	0.000322	49.2893	0.0001	0.00056361
Deployed Days ^{2}	-6.10E-07	8.70E-07	0.4909	0.4835	
YOS 8	-0.1591	0.025	40.5907	0.0001	
YOS 9	0.055	0.0345	2.5443	0.1107	
YOS 10	0.1932	0.037	27.3283	0.0001	
Days X YOS 8	-0.0002	0.000265	0.5925	0.4414	0.000513872
Days X YOS 9	-0.00113	0.000356	10.0451	0.0015	0.000281881
Days X YOS 10	-0.00113	0.000393	8.2051	0.0042	0.000281881
FY 1997	0.3051	0.0228	179.1784	0.0001	
FY 1998	-0.2058	0.0258	63.4715	0.0001	
E4	-1.0154	0.0231	1939.598	0.0001	
E6	0.7378	0.0328	504.6508	0.0001	
E7	0.9641	0.1765	29.8339	0.0001	

Though the effects we estimate are positive and statistically significant, they are quantitatively small. Taken literally, thirty additional days deployed, calculated at the mean, results in an increase in first term retention probability at ETS of about 1.2 percentage points for soldiers at year of service 3, about 0.9 percentage points for soldiers at year of service 4 or 5, and about 1.2 percentage points for soldiers at year of service 6. The effects on retention probability at ETS in the second term are also small. At year of service 7 and 8, an additional thirty days of deployment are associated with about a 1.5 percentage point increase in the ETS retention rate, while it is associated with about a 0.9 percentage point increase in retention probability at ETS at year of service 9 and 10.

In Table 20, we present results for an alternative way of measuring deployment-related PERSTEMPO. We include a count of the number of deployments and the average length of deployment for each individual soldier, and estimate separate models for the first and second term.

The number of deployments has a positive, statistically significant effect on both first and second term retention. Taken literally, an additional deployment is associated with a .08 increase in the probability of retention at the first term decision, and about a .06 increase in the probability of retention at the second term, other factors remaining constant. The average length of deployment, on the other hand, has a negative and statistically significant effect on retention. Apparently, frequent, but short, deployments are associated with higher retention than fewer, long ones. Note that the positive effect of deployments on retention is lower at higher years of

service for both first and second term soldiers. We have also included variables indicating the proportion of deployments that were for training and the proportion that were to hostile areas. Surprisingly, a higher proportion of training deployments is associated with lower ETS retention at both the first and the second term, but the effect is not statistically significant. The net effect of deployments remains positive.

Table 20. Aggregate Analysis of Number of Deployments and Average Length

Variable	Coefficient	Pr > Chi (p-value)	Marginal Effect
First Term			
Deployments	0.3431	0.0001	0.077112
Average Deployment Length	-0.00252	0.0001	-0.00056637
Proportion Training Deployments	-0.0184	0.7856	-0.00413541
Proportion Hostile Deployments	0.5006	0.0001	0.11251025
Deployments * LOS 4	-0.0398	0.0493	-0.00894508
Deployments * LOS 5	-0.0375	0.1460	-0.00842815
Deployments * LOS 6	-0.0293	0.2592	-0.0065852
Second Term			
Deployments	0.2406	0.0001	0.06013983
Average Deployment Length	-0.00125	0.0001	-0.00031245
Proportion Training Deployments	-0.1000	0.3749	-0.02499578
Proportion Hostile Deployments	0.3651	0.0001	0.09125957
Deployments * LOS 8	-0.2138	0.0001	-0.05344097
Deployments * LOS 9	0.0297	0.4006	0.00742375
Deployments * LOS 10	0.1548	0.0001	0.03869346

Our measure of deployments and deployment days included all deployments recorded in TAPDB. Hosek and Totten (1998) inferred deployments based on receiving hostile fire pay or family separation pay. Hence, they were able to count only deployments to areas where hostile fire pay was authorized, and deployments of 30 days or more. We reestimated the models reported in Tables 18 and 19 approximating the Hosek and Totten (1998) measure of deployment time as closely as possible given our data. The results were about the same as those reported in Tables 18 and 19.

Three Choice Models (Multinomial Logit)

A soldier at a reenlistment point typically has three choices regarding retention: reenlist, leave, or extend. Under an extension, the soldier commits to stay two additional years, or less, beyond his or her ETS. We estimated several models for first and second term decisions where we included three potential outcomes. We did this to determine whether various measures of PERSTEMPO had differential effects on the reenlistment and extension decision.

We used a multinomial logit model to analyze this three-alternative choice. The estimated equations provided a set of probabilities associated with the choices of reenlist, extend, or leave, for a soldier with a given set of characteristics, including the soldier's deployment

experience. We then estimated the effect of measured deployment-related PERSTEMPO on the probability that the soldier would choose each option.

The basic models are similar to the aggregate retention models discussed previously. We estimated separate equations for first term decisions and second term decisions. Further, we specified measures of PERSTEMPO two different ways. In the first specification, the PERSTEMPO variable enters as *days deployed* and *days deployed squared.* The cumulative number of days deployed are calculated over the 24 months prior to ETS for first-term decisions, and 36 months prior to ETS for second term decisions. Deployments beginning within six months of ETS are excluded from both the first and second term calculations. The control variables in each equation are, with minor exceptions, the same as in the aggregate logistic regression models, where the decision is simply stay or leave.

A second set of PERSTEMPO related variables enter a second set of equations for the first- and second-term decisions. Here, we enter the total number of deployments over the previous 24 month (first term) and 36 months (second term), and the average length (in days) of deployments for the first and second term.

For the equations using days deployed, we found that days deployed has a positive and statistically significant effect on the probability that the soldier will reenlist at the first term point, but that the effect is diminishing: The coefficient for days deployed squared is negative and statistically significant. However, days deployed has a negative effect on the probability that the soldier will choose to extend, rather than reenlist. We found similar effects on reenlistment and extension probabilities at the second-term decision point.

For the equations using number of deployments and average length of deployment, we found that the number of deployments had a positive and statistically significant effect on both the probability of reenlistment and the probability of extension at the first term decision point. However, the average length of deployment had a negative and statistically significant effect on both reenlistment and extension probability at the first term. At the second-term decision, number of deployments again had a positive and statistically significant effect on both the probability of reenlistment and of extension. Moreover, the average length of deployment also has negative and statistically significant effect on reenlistment probability, and a negative and statistically nonsignificant effect on the probability of extension. In general, then, the results from the three-choice model were consistent with the results for the stay-leave models reported in Tables 18 and 19. When cumulative days away is used as a measure, the quadratic term has a negative and statistically significant effert on reenlistments at both the first and second term, indicating that the positive effect of days deployed diminishes with increasing numbers of deployed days.

Occupation-Specific Estimates

Tables 21 and 22 present the results of MOS-specific estimates of the effects of various measures of deployment-related PERSTEMPO on ETS retention. Because sample sizes at the MOS level are small for some MOS, it is more difficult to obtain statistically significant effects. The models were estimated with demographic, economic and institutional variables included. We report, however, only the coefficients and marginal effects of the PERSTEMPO-related variables.

Table 21. Effects of Days Deployed and its Square for Six Selected MOS

	11B Infantryman N First term: 9547 N Second Term: 3083			63B Light Wheel Vehicle Mechanic N First Term: 3369 N Second Term: 1551		
Variable	**Coefficient**	**Pr > Chi**	**Marginal Effect**	**Coefficient**	**Pr > Chi**	**Marginal Effect**
First term						
Days deployed	0.000246	0.6894	4.99E-05	0.00137	0.2754	0.000326
Days deployed^2	0.000002363	0.2582	4.8E-07	-1.87E-06	0.6652	-4.4E-07
Second Term						
Days deployed	0.00352	0.0027	0.00088	-0.00238	0.2824	-0.00059
Days deployed^2	0.00000401	0.3755	1E-06	0.000015	0.0616	3.75E-06
	95B Military Police N First Term: 3664 N Second Term: 2424			**91B Medical Specialist** N First Term: 4401 N Second Term: 1622		
Variable	**Coefficient**	**Pr > Chi**	**Marginal Effect**	**Coefficient**	**Pr > Chi**	**Marginal Effect**
First Term						
Days deployed	0.00162	0.0059	0.00036	0.0023	0.0044	0.000555
Days deployed^2	-0.00000239	0.0598	-5.31E-07	-3.23E-06	0.1822	-7.8E-07
Second Term						
Days deployed	0.000893	0.3265	0.000218	0.00171	0.297	0.000426
Days deployed^2	0.000002306	0.3738	5.64E-07	8.636E-07	0.8669	2.15E-07
	31U Signal Support Sys Spec N First Term: 1919 N Second Term: 1076			**71L Administrative Specialist** N First Term: 2496 N Second Term: 1347		
Variable	**Coefficient**	**Pr > Chi**	**Marginal Effect**	**Coefficient**	**Pr > Chi**	**Marginal Effect**
First Term						
Days deployed	0.00192	0.1079	0.000457	0.000538	0.7018	0.000134
Days deployed^2	-0.00000116	0.7359	-2.76E-07	3.519E-06	0.4416	8.8E-07
Second Term						
Days deployed	-0.00186	0.4534	-0.000465	0.00371	0.2903	0.000908
Days deployed^2	0.000014	0.115	3.5E-06	-6.67E-06	0.5625	-1.6E-06

Table 22. Effects of Number of Deployments and Average Deployment Length for Six Selected MOS

	11B Infantryman N First Term: 9547 N Second Term: 3083			63B Light Wheel Vehicle Mechanic N First Term: 3369 N Second Term: 1551		
Variable	**Coefficient**	**Pr > Chi**	**Marginal Effect**	**Coefficient**	**Pr > Chi**	**Marginal Effect**
First term						
Deployments	0.5078	0.0001	0.1030602	0.2855	0.0046	0.067939
Average deployment length	-0.00458	0.0001	-0.00093	-0.00313	0.0008	-0.000745
Second Term						
Deployments	0.3297	0.0001	0.0823858	-0.1917	0.1661	-0.047925
Average deployment length	-0.0015	0.0803	-0.000375	-0.00024	0.8685	-0.000005
	95B Military Police N First Term: 3664 N Second Term: 2424			**91B Medical Specialist** N First Term: 4401 N Second Term: 1622		
Variable	**Coefficient**	**Pr > Chi**	**Marginal Effect**	**Coefficient**	**Pr > Chi**	**Marginal Effect**
First Term						
Deployments	-0.00182	0.9758	-0.000404	0.3688	0.0001	0.088976
Average deployment length	-0.00195	0.0009	-0.000433	-0.00297	0.0001	-0.000717
Second Term						
Deployments	0.3188	0.0013	0.0779401	-0.0911	0.4972	-0.022678
Average deployment length	-0.00218	0.0067	-0.000533	-0.00105	0.4863	-0.000261
	31U Signal Support Sys Spec N First Term: 1919 N Second Term: 1076			**71L Administrative Specialist** N First Term: 2496 N Second Term: 1347		
Variable	**Coefficient**	**Pr > Chi**	**Marginal Effect**	**Coefficient**	**Pr > Chi**	**Marginal Effect**
First term						
Deployments	0.5246	0.0001	0.1248369	0.1178	0.3303	0.029445
Average deployment length	-0.00118	0.2232	-0.000281	-0.00021	0.8516	-0.000053
Second Term						
Deployments	-0.435	0.0127	-0.108666	0.5840	0.0530	0.142879
Average deployment length	0.000183	0.9117	-0.000046	0.00232	0.2722	0.000568

Two sets of estimates are presented for each MOS considered. In the first set, the measure of PERSTEMPO is days deployed and days deployed squared. In the second set of estimates, the measure of PERSTEMPO is number of deployments and average length of deployments. For the first set of estimates (Table 21), days deployed generally has a positive, but statistically nonsignificant, effect on voluntary ETS retention at both the first and second term points. It has a significant effect at Zone B for infantrymen, and Zone A for military police and medical specialists. For military police, the square of days deployed is negative and statistically

significant at the 0.1 level, indicating that "too many" days away may begin to have a negative effect on retention for this frequently deployed MOS.

In the second set of estimates (Table 22), the number of deployments generally has a positive and statistically significant effect on first term retention for all but two MOS. The effect for Military Police is negative, but statistically nonsignificant, while that for Administrative Specialist is positive, but nonsignificant. The effect of average length of deployment at the first term is negative and statistically significant in four of the six MOS considered, and is negative but nonsignificant in the remaining two considered. At the second term decision points, the effect of number of deployments is negative and statistically significant for Signal Support System Specialist, and is negative for Light Vehicle Mechanic and Medical Specialist. It is positive and statistically significant for the remaining three MOS. The effect of average length of deployment is negative for four of the six MOS. In the two where it is positive, it is not statistically significant.

We conclude that while the effects of PERSTEMPO as measured by the number and average length of deployments vary by MOS, the number of deployments and total days deployed generally have a positive effect on ETS retention, while the average deployment length tends to have a negative effect.

Summary and Comparison to the Literature

Using administrative data on actual retention decisions and deployments, we find that *days deployed* is positively associated with the probability of retention at ETS for both first and second term soldiers. However, the positive effect generally declines with increasing deployment days, and also declines with length of service. Though the effects are positive and statistically significant, as a practical matter the effects of a modest increase in days deployed—30 or 60 additional days—on retention are modest.

The number of deployments also appears to be positively associated with ETS retention. The effects are not insubstantial. An additional deployment is associated with about a 0.07 increase in the probability of retention.[27] However, average length of deployment is generally negatively related to retention. Frequent, shorter deployments are associated with higher retention compared to fewer longer deployments. Effects vary by MOS, however.

Our results appear to be generally consistent with Hosek and Totten (1998). Measuring PERSTEMPO as the number of months deployed months over a 24 month period, they found that deployments generally had a positive effect on first term Army retention in the period FY 1993-FY 1995, but that the effect diminished with increasing deployment. An unpublished

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[27] Recall that, as soldiers near ETS, they are likely to be deployed only if they agree to stay beyond ETS, if the deployment period would bring them past their ETS. Obviously, failure to account for this would bias the results toward finding a positive effect of deployments on retention. We attempted to adjust for this by not counting deployments that began within 6 months of ETS in our measures of deployment-related PERSTEMPO. This adjustment may not have been sufficient to eliminate bias.

Army briefing (PERSCOM, 1999), measuring PERSTEMPO simply as the number of deployments, found that reenlistment rates of first term Army soldiers with 2- or 3-year initial terms of service decreased slightly with the number of deployments, but reenlistment rates of soldiers with initial terms of 4 or more years were unaffected or increased with increasing deployments. Our results, while they do not perfectly coincide with PERSCOM (1999), are not inconsistent.

In general, we found that deployment-related measures of PERSTEMPO have a positive effect on retention, but that long deployments offset this positive effect. Moreover, the effect diminishes with increasing days away. The magnitudes of the effects of deployment-related PERSTEMPO on voluntary retention are modest. Retention is difficult to predict using PERSTEMPO alone. Economic and psychological factors, some of which are included in our models but many of which are not, are important in understanding and predicting retention.

SUMMARY AND DISCUSSION

The research reviewed in this report suggested a subtle and complex relationship between PERSTEMPO and retention, readiness and quality of life. Both measurement difficulties and the existence of variables that moderate the effects of PERSTEMPO have stymied generalizations about this relationship. Our results, while not necessarily definitive, set some limits on the impact of PERSTEMPO, identify other variables that may reduce or exacerbate its effects, and provide some guidance for tracking.

Effects of PERSTEMPO

Most of the results of our literature review and analyses are specific to the outcome variable being addressed, whether it is retention, readiness, or quality of life. The following three general findings apply across the populations examined, or across the outcomes that were investigated within these populations.

1. The effects of PERSTEMPO on retention, readiness, and quality of life are relatively small.

2. The effects of PERSTEMPO are often not linear.

3. Different ways of measuring PERSTEMPO and outcome variables produce different assessments of the magnitude of relationships between them.

The following paragraphs discuss these findings in greater detail.

The research literature has acknowledged that time away from home station may have both positive and negative effects. Positive effects include the opportunity to travel, the ability to practice job skills in realistic settings or in actual missions, and the sense of accomplishment at the completion of a mission. Negative effects include the time spent away from home and family, the difficulty meeting financial obligations, and lost opportunities for training or other career-enhancing activities. The overall effect of increased PERSTEMPO depends on the level of PERSTEMPO the soldier or unit has endured. Modest amounts of PERSTEMPO appear to be associated with neutral or positive outcomes. Increasing amounts, however, tend to be associated with adverse outcomes. The three analyses we performed gave somewhat different pictures about this balance. In the Army SOF data, the overall balance was slightly negative. In the SSMP data, the balance depended on the outcome; overall, the effects were small in either direction. In the TAPDB data, the balance was generally positive. Although these analyses differ in the direction of the relationship between PERSTEMPO and the outcome variables analyzed, none of them found a very large relationship. Consequently, it does not seem likely that the current level of PERSTEMPO has large adverse effects on a substantial segment of the military population.

The combination of positive and negative effects of time away from home station tend to produce a curvilinear relationship between PERSTEMPO and measures of retention, readiness and quality of life. This type of relationship is not found for all outcomes, nor would such a result be expected. The balance between positive and negative effects would be expected to

depend on the type of outcome. For example, some family hardships might occur shortly after a deployment begins, while financial hardships might not occur until monthly bills are due for payment. Effects on readiness might be further delayed until critical skills begin to decay for lack of practice. The analyses of Army SOF and SSMP data showed significant curvilinear effects of PERSTEMPO for somewhat fewer than one-half of the outcome variables that were considered. Thus, curvilinear effects were by no means universal; nor were they large. When they were statistically significant, they usually indicated a positive effect of PERSTEMPO at low levels that decreased and often became negative at higher levels. The analysis of the TAPDB showed a similar relationship between PERSTEMPO and retention, although the negative part of this relationship was weaker in these data. Taken together, these results offer support for the positive effects of moderate levels of PERSTEMPO, corroborating the earlier results of Hosek and Totten (1998) on this topic.

The research literature has used several different measures to characterize the time that a service member spends away from his or her home station. These measures have included the number of deployments and the average deployment length in addition to the total number of days deployed. Since these measures are all closely related to the concept of "time away from home station," they were used interchangeably. Our analysis of the TAPDB data indicates that these variables have different effects on retention. Specifically, both the number of days deployed and the number of deployments are positively related to retention, while the average deployment length is negatively related. The other data bases did not include multiple measures of PERSTEMPO. Consequently, they did not provide information to allow us to test this difference with other dependent measures. However, the results of Ramsberger and Wetzel (1998) suggest that the way that outcome measures are defined may also have an effect on the magnitude and direction of relationships with PERSTEMPO that are found.

These general findings focus on similarities between the analyses. A more detailed examination of our results organized by outcome identifies the differences as well as similarities. Our discussion summarizes the basic findings and attempts to reconcile these differences.

Retention

The complexity of the effects of PERSTEMPO was highlighted primarily by studies that focused on retention. Our analyses of three data bases have produced somewhat different results regarding these effects, as summarized in the following discussion.

Two of the outcomes considered in our analysis of the Army SOF data assessed the respondents' intentions to remain in the Army and in Special Operations, and how those intentions were changed by the current level of PERSTEMPO. These outcomes are the most direct measures of retention in the survey; four other outcomes are indirectly related to retention. Our analysis of the Army SOF data indicates no correlation between the number of days away from home and career intentions. However, this variable might not reveal effects of PERSTEMPO, because career intentions were very high for this group of experienced soldiers. The assessment of changes in intentions is likely to be a more sensitive indicator of potential effects of increased PERSTEMPO on retention than a simple statement of intention. This item showed the curvilinear relationship to the number of days away from home with the following

three characteristics: (a) a small negative correlation between the outcome and days away, (b) a positive weight for days away when its square was entered into the prediction equation, and (c) a negative weight for days-away squared. Thus, this more sensitive measure showed negative effects of high amounts of time away from home on Special Operations career intentions that were not reflected in the more general measure of intentions.

The SSMP includes a single direct measure of Army career intentions, as well as three outcomes that are indirectly related to retention. Our analysis of SSMP data showed no significant linear or curvilinear relationship between career intentions and PERSTEMPO. Two other outcomes related to retention showed the same general type of curvilinear function as was found in the Army SOF data, but the magnitude of this relationship was very small.

The administrative data that we analyzed recorded actual reenlistments or extensions of contracts for Army enlisted personnel. The total days deployed was positively related to retention with only a modest moderating effect of a quadratic term. When the total days deployed was replaced by the number of deployments and their average length, retention was positively related to the first of these predictors and negatively related to the second.

Some of the differences between these results probably reflect differences in the deployment rates within the three samples. If the general curvilinear relationship we have suggested is correct, then data from high-deploying groups would be expected to show more negative effects of PERSTEMPO. In fact, this is the result that occurred. The Army SOF sample showed the highest level of PERSTEMPO, both in terms of the percentage of the sample that had deployed in the past year and in terms of the average number of days deployed. This sample also showed the most consistently negative effect of PESTEMPO across outcomes (although there was no consistent relationship with stated Army or SOF career intentions). The SSMP sample showed a lower deployment rate, no relationship between PERSTEMPO and Army career intentions, and weaker relationships between PERSTEMPO and other outcomes. Finally, the TAPDB data showed the lowest deployment rate and the most positive effect of PERSTEMPO. However, since both the SSMP and the TAPDB represent the Army as a whole, differences between the deployment rates must be related, at least in part, to the differences in how deployment data were collected in these two samples. Those differences are discussed in greater detail when we address considerations for tracking PERSTEMPO.

The result that different measures of PERSTEMPO had different effects on retention implies that the admonition that "1 day away = 1 day away" is not an accurate characterization of PERSTEMPO. The results of our TAPDB analysis suggest that a day that is a part of a long deployment has a more negative impact on retention than a day in a short deployment. Differences in the measurement of PERSTEMPO can account for some of the apparent inconsistencies in the research literature. For example, our finding that long deployments are associated with lower retention confirms the results of the analysis by Cooke et al. (1992) and the case study by Segal et al. (1997). Our finding of a curvilinear relationship between days deployed and retention confirms the results of Hosek and Totten (1998), who also found a positive effect of the number of deployments.

Inconsistencies still remain in the research literature, even after differences between measures of PERSTEMPO are factored out. Some of these inconsistencies may be related to other differences in the measurement of PERSTEMPO or the definition of the sample that was analyzed. For example, the study conducted by PERSCOM (1999) found negative effects for the number of deployments, but primarily for those with two- or three-year terms of service. Our analysis eliminated those with two-year terms of service, because they did not have sufficient opportunity to be deployed over a 24-month period prior to their ETS.

Readiness

Although our review of the research literature indicated that little relationship has been found between PERSTEMPO and readiness, there has been consistent speculation that missions that do not fully exercise a soldier's combat skills will take time away from the training required to maintain readiness. According to this conjecture, then, the effects of PERSTEMPO on readiness will depend on the type of mission and the combat duties of the soldier. None of the data sources that we examined allowed us to classify soldiers and missions so that we could make unambiguous predictions of the effects on readiness. However, both of the surveys did include items that assessed the respondents' perceptions of individual and unit readiness. All relationships that we found between PERSTEMPO and readiness outcomes were small. However, our analysis of Army SOF data indicate a slight negative relationship between days deployed and self-assessed readiness measures. This result must be interpreted in light of the results of Ramsberger and Wetzel (1998) that most respondents to the survey endorsed statements that expressed a positive relationship between PERSTEMPO and readiness. Apparently, those soldiers with more days deployed are slightly less positive about the effects of these deployments on readiness.

The SSMP data, on the other hand, indicate a small positive relationship between weeks deployed and stated individual and unit readiness, although the relationship of PERSTEMPO with other outcomes related to readiness was mixed. These other outcomes represent the three primary components of readiness: equipment, personnel, and training. It is puzzling that those with more time away from home station would rate overall readiness higher, while simultaneously rating equipment, personnel and training components of readiness lower than those with less PERSTEMPO.

Quality of Life

Quality of life includes a variety of factors; our analyses considered factors related to family, financial issues, and general satisfaction.

Family factors. The effects of deployments on a soldier's family have been a major consideration in evaluating the effects of increased PERSTEMPO. In both surveys, the effect on families was the largest issue for personnel deployed away from home. In the Army SOF data, respondents with more time away from home expressed that their family had greater difficulty coping with their deployment schedule. Respondents to the SSMP who had more time away from home were less satisfied with the amount of time that their job took them away from their family. Both of these results confirm the findings of earlier analyses (Alderks, 1998; Ramsberger

& Wetzel, 1998). For both of these relationships, even low levels of PERSTEMPO had detrimental effects on the outcomes. Other family variables showed less consistent relationships with PERSTEMPO. For example, respondents to the PERSTEMPO Impact Survey with greater time away from home indicated that it was more difficult to maintain a balance between their work and family life, and that their family showed less support for their career in Special Operations. Both of these relationships showed the more familiar curvilinear pattern in which intermediate levels of PERSTEMPO were rated more positively than either high or low levels.

Financial factors. Deployments, especially long ones, can place a substantial financial burden on service members and their families. However, our analyses did not uncover substantial relationships between time deployed and any financial variable. A weak relationship in the Army SOF data indicated that those with greater time deployed were more likely to indicate that their families were financially strained by deployments (this item was considered a family factor in output tables). Since neither the PERSTEMPO Impact Survey nor the SSMP provide information on the length of recent deployments, it is impossible to determine from these data the extent to which longer deployments place a greater strain on soldiers and their families.

General satisfaction. Our review of the literature found no quantitative studies that identified significant relationships between PERSTEMPO and satisfaction or morale. Our analyses of Army SOF and SSMP data are consistent with previous results. Two outcomes in the PERSTEMPO Impact Survey and six outcomes in the SSMP assessed some aspect of general satisfaction or morale. Overall, the relationships between these variables and time away from home were negative, but not always significantly so. The average magnitude of the correlations was larger for the Army SOF data than for the SSMP, but overall, the correlations did not indicate a practically meaningful relationship.

The Possibility of Undetected Relationships

Although we found only modest effects of PERSTEMPO, it is important to investigate the possibility that larger effects exist that we were unable to find because of the nature of our sample or analytic methods. We consider the following five possibilities for such effects:

1. Although current deployment levels may have a small effect on retention, readiness, and quality of life, there is a discontinuity or cut point in the relationship, so that further increases will have a much larger effect.

2. The effects of deployments accumulate over time.

3. While the effects of PERSTEMPO may be modest when looking at the entire Army, there are relatively small groups that are feeling great adverse effects of excessive deployments.

4. The effects of PERSTEMPO on those who deploy are matched by the effects of increased workload on the members in the same units who remain at home.

5. Soldiers tend to select occupational areas that are consistent with their temperament. Those in jobs that frequently take them away from home may be less impacted by the negative effects of high PERSTEMPO.

Although we cannot conclusively reject any of these hypotheses, the results of our analyses cast serious doubts on the first two of them. Our results do not allow us to reject the third hypothesis, but suggest that the effects are probably localized to individual units or segments of high deploying specialties. The final two hypotheses cannot be addressed using the data we selected, but should be considered in future research.

Discontinuities and Cut Points

In evaluating the possibility that there are cut points in the relationship between PERSTEMPO and retention, readiness, or quality of life, it is important to look at the overall distribution of time deployed in the samples that we analyzed. If the time deployed covers a wide range, then discontinuities should be evidenced in the analysis results. All three of the data sources included individuals who had deployed for a substantial portion of the period covered in the estimate. Both the Army SOF data and the SSMP recorded individuals who had deployed for the entire year before they took the survey. TAPDB recorded individuals in their first term who were deployed for 95% of the previous two years, and individuals in their second term who were deployed for two of the previous three years. Although these extreme levels were rare, there were a substantial number of soldiers in each sample that had been deployed for most of the period covered in their estimate.

A discontinuity would appear in the analyses we performed as a large negative weight for the square of the PERSTEMPO measure. Although we found such negative effects, they were modest and typically accounted for 1% of the variance or less in multiple regression analyses. Furthermore, these effects were usually not statistically significant in the logistic regressions. Given these results, it seems unlikely that the relationship between PERSTEMPO and retention, readiness, or quality of life has substantial discontinuities.

Accumulation of Effects

A possible criticism of the PERSTEMPO measures used in the two surveys is that they look only at deployments over the previous year. While it may be possible for a soldier and his or her family to tolerate extensive time away from home station for a year, repeated deployments over a longer period of time may prove to be a greater burden. The results of the analysis of administrative data indicate that measuring PERSTEMPO over a longer time period does not appreciably alter its effects.

Isolated Effects

Case studies and interviews with members of high-deploying units have identified problems associated with high PERSTEMPO that our analyses have not been able to confirm. A possible reason for our inability to find large adverse effects of PERSTEMPO is that they are isolated in low-density specialties that are in high demand. Such isolated affects, even if they are fairly large in magnitude, might not be detected because they affect a small segment of the soldier population. Furthermore, the statistical techniques we have used might not have sufficient power to detect these effects if a smaller sample were used. Our analysis of the Military Police data suggested the possibility that the effect of PERSTEMPO on this high

deploying group might be more negative than the effects on other specialties. Furthermore, effects of PERSTEMPO revealed in the Army SOF data were, on the whole, somewhat more negative than the Army-wide results in the SSMP and TAPDB analyses. However, even in this group, the effects of PERSTEMPO were small. Consequently, our results indicate that adverse effects of high PERSTEMPO are either localized to small segments or they are not particularly high in magnitude.

Effects of Deployments on Those Who Do Not Deploy

Deployments may increase the workload for those remain at home and who must take on the added duties of their deployed colleagues. The effects of the added workload on those who do not deploy may mask the effects of PERSTEMPO on those who do. This suggestion is similar to one made by Sorter et al. (1998) regarding the effects of PERSTEMPO on readiness. Our analysis of Army SOF data indicated that workload had a consistently negative relationship with all outcome measures that was, on the average, roughly the same magnitude as their relationship with PERSTEMPO. However, because all the data we analyzed were at the individual level, we could not identify individuals whose workload was increased by deployments in which they did not participate. Consequently, we cannot either accept or reject this hypothesis. If it is true, then analysis of measures of unit DEPTEMPO should show larger effects of time away from home station than was found in our analyses.

Effects of Soldier Selection

Analyses of the effects of PERSTEMPO on highly deployed groups such as the SOF need to consider the fact that often soldiers may select their occupation because it provides an opportunity for frequent deployments. Further increases in the requirement for deployments might require others who would prefer to remain at home to deploy more frequently than they would prefer. PERSTEMPO might have a greater adverse effect for this wider group than the relatively small negative effect that was found for the SOF. Although this possibility was addressed to a small extent in our analysis of MOS differences in the TAPDB data, a complete investigation of this possibility would require collection of new data. Some of the items of the PERSTEMPO Impact Survey would shed some light on this issue if they were given to a wider sample of soldiers.

Effects of Other Factors

The Army SOF data included a number of job-related variables that showed a substantial relationship with one or more outcome variables. Results of the analyses of these data indicated that soldiers who thought that they did not receive sufficient command support or training for a mission or sufficient time between deployments to recover and prepare were less positive regarding several retention, readiness, family, and general satisfaction measures. A reasonable conclusion from this result is that the Army should improve the management systems used to schedule deployments and to assign them to specific units. However, the Army SOF data do not allow us to be more precise regarding issues such as how much recovery time is required, how length and type of mission affect the required recovery time, or what kind of command support would be most useful. They also do not indicate whether these effects found in the SOF

population occur with other specialties and organizations, although some previous studies, such as the case study conducted by Segal et al. (1997), suggest that they do. Some of these issues could be addressed with a more detailed analysis of TAPDB data that explicitly examines the effects of different mission timing. Addressing others would require collection of new data.

Army SOF data also indicate that soldiers are more positive about retention, family factors, and general satisfaction when they perceive that their unit or installation provides activities to support their families during deployments and that their unit is supportive when the responsibilities of their jobs and families conflict. Given this finding, it may be appropriate for the Army to devote additional effort and resources to identifying family support needs and developing and promoting programs to meet these needs. The results of our analysis do not suggest either what specific problems should be addressed or what programs should be implemented to address them.

Finally, the Army SOF data contained several variables that had small, but consistent correlations with all, or nearly all, of the outcomes. The two most notable examples of such variables are the number of hours worked compared to preferences and the perception of the value of incentive pay received compared to others with comparable skills. Although the rationalization of incentive pay is an issue that probably applies more to the SOF than to other parts of the Army, workload applies to everyone. Increased workload that occurs when the Army must accomplish more with fewer people is a parallel concern to PERSTEMPO and deserves further study. Our results identify workload as a potential problem that has wide, but relatively weak effects on retention, readiness, and quality of life.

The job information included in the SSMP is not as useful as the variables in the Army SOF data for identifying factors that may moderate the effects of increased PERSTEMPO. The analysis of SSMP data revealed negative effects of discrimination, as well as positive effects of commitment to reduce sexual harassment, but the survey did not contain items that could be used to guide policy related to PERSTEMPO.

Finally, all three analyses used individual background variables either as controls or as separate predictors. In general, these variables had the expected relationships with retention, readiness, and quality of life. For example, those with greater years of service expressed a more positive attitude toward an Army career, officers were more satisfied with their pay than enlisted personnel, and minorities and women were more likely to reenlist than white males. Although these results do not add to our knowledge about the effects of PERSTEMPO, they indicate that our analyses were sensitive enough to identify these known effects.

Tracking PERSTEMPO

The modest relationships between PERSTEMPO and outcome measures limit the conclusions that can be drawn regarding tracking the effects of PERSTEMPO. However, some aspects of the results have implications that deserve mention.

The Army currently tracks PERSTEMPO at both the individual and unit level. In accordance with the recommendations of the DoD PERSTEMPO Working Group (1996), the

data recorded allow the calculation of average length of deployment, time between deployments, percentage of time deployed, and percentage of the inventory deployed. However, as Sorter and Polich (1998) point out, the data base has two weaknesses: it is incomplete in its coverage and historical files are not readily accessible. Both the deployment rate and the number of days deployed reported in the TAPDB are far lower than the estimate that soldiers make in the SSMP. Some of the causes of this difference are known. The TAPDB is more complete in its coverage of overseas deployments than deployments within CONUS. Deployments to CTCs have only recently been required and are not reported by all units. Finally, some activities that take soldiers away from their home station are not covered. Uncovered activities include overnight exercises at or near their home station, and individual job-related travel. Incompleteness can affect the results of analysis if soldiers with low reported PERSTEMPO have correspondingly higher levels of unreported PERSTEMPO, or if the effects of reported categories of deployment are different from the categories that are not reported.

Our discussion regarding a tracking system to provide an early warning of problems regarding PERSTEMPO focuses on three issues: (a) who should be tracked, (b) what measures of PERSTEMPO should be used, and (c) what outcome measures should be used.

The curvilinear relationship between PERSTEMPO and outcome measures indicates that specialties or units that are in high demand would be the first to show adverse effects of PERSTEMPO. Specialties such as the military police, who have a high deployment rate in their first term of service, would be better targets than soldiers in SOF, who are all in their second term or beyond. The Army identifies high-deploying specialties as a part of their monthly SKILLTEMPO report. For tracking purposes, specialties that are on this list regularly would be good candidates to be part of a tracking system.

The results of the analysis of TAPDB data indicate that deployment length may be the best variable to track, because it showed the most consistently negative relationship with retention. In addition, time between deployments was identified in previous literature as well as in our analysis of Army SOF data as a factor that can increase the strain due to high PERSTEMPO. The Army currently tracks variables such as the number and percentage of members of an MOS that are deployed and the total soldier-days of deployment during the previous month, but does not report the average time deployed for those who are currently deployed. The time deployed would be defined from the start and end dates for deployments that were completed during the month, and from the start date and the last date of the month for ongoing deployments. Both the average length and the percentage of deployments longer than a criterion length would be useful measures.

Currently, the Army does not track potential outcomes of high PERSTEMPO at the individual or specialty level. Because of the weak relationships between PERSTEMPO and outcome variables, the results of our analysis are not sufficient to specify criterion levels or PERSTEMPO goals. Consequently, tracking selected outcomes would provide verification of whether the current deployment rate or average deployment length is having an adverse effect. The results of our analyses indicate that the most sensitive outcome measures reflect family strains due to time away from home. This information is currently not recorded in administrative

data bases. It would most easily be obtained using a survey, but could perhaps be obtained indirectly from other sources.

There is no guarantee that taking any of the steps discussed above would ultimately result in higher soldier retention, readiness, or quality of life. The suggestions stem from relationships found in survey data and administrative data bases, and not from carefully executed experimental programs where cause and effect can more reasonably be inferred. Furthermore, it is difficult to assess how much improvement is possible, given the size of the relationship. However, it is reasonable to believe that improvements in the management of PERSTEMPO can have a positive effect on retention, readiness, and quality of life.

REFERENCES

Alderks, C. E. (1998). *PERSTEMPO: Its effects on soldier's attitudes.* (ARI Study Report 98-02). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

Bell, D. B. (1993, October). Families: Influential Members of the Army Community. *U.S. Army Research Institute (ARI) Newsletter* (Vol. 13, pp. 1-5). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

Borlik, A. K. (1998, February 6). DoD tracks military deployments (Document 9868). American Forces Press Service. Available http://www.dtic.mil/afps/news/9802065.html.

Bowen, G.L. (1989). Family factors and member retention: A key relationship in the work and family equation. In G.L. Bowen and D.K. Orthner (Eds.), *The organization family: Work and family linkages in the U.S. military.* New York: Praeger.

Cohen, J., & Cohen, P. (1983). *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences* (2nd Edition). Hillsdale, NJ: Lawrence Erlbaum Associates.

Cooke, T., Marcus, A., & Quester, A. (1992). *Personnel tempo of operations and Navy enlisted retention* (CRM 91-150). Alexandria, VA: Center for Naval Analyses.

Defense Science Board (1995). *Report of the Defense Science Board Task Force on Quality of Life.* Washington, DC: Author.

Diana, M. (1998). *Work environment, career, and family influences on the reenlistment intentions of Army soldiers.* Unpublished doctoral dissertation, George Mason University, Virginia.

Diana, M., Zazanis, M. M., & Lappin, M. S. (1998). *Special Forces: A report from the field* (ARI Research Product 98-21). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

Erwin, S. I. (1998, October). Air Force realignment aimed at boosting retention. *National Defense,* pp. 22-23.

Fisher, I. (1996, December 24). For G.I.s, more time away from home fires. *New York Times,* p. 1.

Fossen, T., Hanser, L. M., & Stillion, J. (1997). *What helps and what hurts: How ten activities affect readiness and quality of life at three 8AF wings* (DB-223-AF). Santa Monica, CA: RAND.

Garamone, J. (1998, September 8). Cohen meets, listens to Drum soldiers (Document 98538). American Forces Press Service. Available http://www.dtic.mil/afps/news/9809081.html.

Garcia, A., & Nuanes, R. (1997, January). *Stressed systems study, Phase II* (Briefing). Force Application Division, Air Force Studies and Analysis Agency.

General Accounting Office (1996). *Military readiness. A clear policy is needed to guide management of frequently deployed units* (GAO/NSIAD-96-105). Washington, DC: Author.

Gilroy, C. L., Horne, D. K., & Smith, D. A. (Eds.). (1991). *Military compensation and personnel retention: Models and evidence.* Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

Graham, B., & Pianin, E. (1998, August 13). Military readiness, morale show strain. *The Washington Post*, pp. A1, A28.

Grissmer, D. W., Kirby, S. N., & Sze, M. (1992). *Factors affecting reenlistment of Reservists: Spouse and employer attitudes and perceived unit environment* (R-4011-RA). Santa Monica, CA: RAND.

Hammon, C. P. & Horowitz, S. A. (1990). *Flying hours and aircrew performance* (Final Report IDA-P-2379). Alexandria, VA: Institute for Defense Analyses. (ADA228582)

Hosek, J., & Totten, M. (1998). *Does perstempo hurt reenlistment? The effect of long or hostile perstempo on reenlistment* (MR-990-OSD). Santa Monica, CA: RAND.

Kerce, E. W. (1995). *Quality of life in the U.S. Marine Corps* (TR-95-4). San Diego: Navy Personnel Research and Development Center.

Kozaryn, L. D. (1997, May 20). Cut troops, civilians, bases, DoD study urges (Document 97392). American Forces Press Service. Available http://www.dtic.mil/afps/news/9705201.html.

Office of the Assistant Secretary of Defense (Force Management Policy) (1998). *Population representation in the military services, fiscal year 1997.* Washington, DC: Author.

Pine, A. (1996). U.S. military highly rated, but strains begin to show. *Los Angeles Times* (Washington, DC Edition), March 19, 1996, p. 1.

Ramsberger, P., & Wetzel, E. (1998). *Personnel tempo impact study* (Report FR-WATSD-98-51). Alexandria, VA: Human Resources Research Organization.

Reilly, M. E. (1994). *Modeling military reenlistment: The moderating effects of enlistment motivations.* Unpublished doctoral dissertation, George Mason University, Virginia.

Schneider, B., & Dachler, H. P. (1978). *Work, family, and career considerations in understanding employee turnover intentions* (ARI Research Report 19). Arlington, VA: Personnel and Training Research Programs, Office of Naval Research.

Segal, D. R. (1995). Five phases of United Nations peacekeeping: An evolutionary typology. *Journal of Political and Military Sociology, 23* (Summer), 65-79.

Segal, D. R., Jones, J., Manos, A. M., & Rohall, D. (1997). *Meeting the missions of the 1990s with a down-sized force: Human resource management lessons from the deployment of Patriot missile units to Korea.* (Paper prepared for presentation at the Research Committee on Armed Forces and Conflict Resolution, International Sociological Association, Modena, Italy.)

Sorter, R. E., Leed, M., Leonard, H., & Polich, J. M. (1998). *Management of OPTEMPO and PERSTEMPO in FORSCOM: A status report* (Draft Report AB-251-A). Santa Monica, CA: RAND.

Sorter, R. E., & Polich, J. M. (1998). *Army data for assessing "tempo"* (Draft Report DRR-1941-A). Santa Monica, CA: RAND.

Spence, F. D. (1997 May 26). How ready are we? *Army Times*, p. 54.

Taw, J. M., Persselin, D. M., & Leed, M. (1998). *Meeting peace operations' requirements while maintaining MTW readiness* (MR-921-A). Santa Monica, CA: RAND.

Teplizky, M. L. (1991). *Junior Army officer retention intentions: A path analytic model* (ARI Technical Report 934). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

U.S. Department of Defense (1996). *Report of the PERSTEMPO Working Group.* Washington, DC: Author.

U.S. Total Army Personnel Command (PERSCOM) (1999). Unpublished briefing, *An analysis of the effects of deployment and soldier demographics on first term soldier reenlistment rates.*

Vick, A., Orletsky, D. T., Shulsky, A. N., & Stillion, J. (1997). *Preparing the U.S. Air Force for military operations other than war* (MR-842-AF). Santa Monica, CA: RAND.

Vollrath, F. E., (1998, April 21). Memorandum, SUBJECT: PERSTEMPO.

Whitlow, J. L. (1990). *A method for collectively measuring the operating tempo of individuals in the Marine Corps: Why and how?* Maxwell Air Force Base: Air War College (ADA241099).

Youngblood, S.A., Mobley, W.H., & Meglino, B.M. (1983). A longitudinal analysis of the turnover process. *Journal of Applied Psychology, 68*(3), 507-516.

APPENDIX A.
PERSTEMPO OUTCOMES AND THE RESERVE COMPONENTS

The nature of the job of the members of the Reserve Component (RC) and the distinct pressures and challenges these Service members face warrants a separate brief discussion of potential PERSTEMPO outcomes for this component. While the broad-based categories of outcomes (e.g., retention/reenlistment, performance and readiness, morale and quality of life) mirror those in the Active Duty military, increased PERSTEMPO may have fundamentally different effects on members of the RC than it does on Active Duty Service members.

Reservists volunteer for their units with an expectation of spending 1 weekend per month on drills, and 2 weeks per year in training. Knowledge of their Reserve obligations and requirements enables these Service members to coordinate them with their civilian jobs, as well as non-job activities. Finding the balance between work and family is often difficult for employees (Hall & Hall, 1979; Hom & Griffeth, 1995; Orthner & Pittman, 1986), a struggle seemingly exacerbated in the military Services by the demanding characteristics of the job (e.g., frequent and unexpected deployments, relocation requirements). Members of the RC often endure an additional strain, that between satisfying civilian sector job demands and military Service obligations and requirements. And, since RC activities tend to occur during prime family times (e.g., summer, weekends, night drills), there may be an additional strain on families.

While Reservists clearly understand that they may be called up for duty, the repercussions of heightened PERSTEMPO on the morale, readiness, and/or retention of Reservists may differ markedly from PERSTEMPO's effects on the Active Duty force. Increasing PERSTEMPO is apt to be significantly more disruptive to the Reservist's life than it would be for the Active Duty Service member, who probably has greater expectations that he or she will be deployed. "Call-ups" for service may seriously impact a Reservist's life; even a relatively small increase in PERSTEMPO may have repercussions for these soldiers in a civilian setting.[1] It is particularly important to understand the potential effects of increased PERSTEMPO for the RC in light of a national policy that more fully integrates active and reserve units and makes it increasingly likely that reserves may be deployed along with active units to meet various contingencies.

The distinctive demands and stresses that characterize the job of a Reservist highlight the need to analyze RC PERSTEMPO data and outcome relationships separately from Active Component data. Though such statistical analysis is beyond the scope of the current effort, a brief description of the more salient concerns of RC Service members is in order. A review of the Reservist PERSTEMPO literature revealed that several issues arise for Reservists, especially spending time away from family and civilian work, and spousal pressure to leave the Service (the latter of which is inherently linked to the former). The pressures are apt to be manifested in Service members' reenlistment decisions and their overall level of morale. An additional factor that figures prominently in the RC is the possible financial implications of PERSTEMPO.

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[1] Some RC functions are truly volunteer, and in other situations the RC puts out a nationwide call to get individuals with specific skills. In those cases, being called up may provide structure (and income) for individuals who are temporarily unemployed or otherwise wishing to change aspects of their lives.

Financial Implications of PERSTEMPO

For Reservists, time away is complicated by the possible loss of pay from their regular jobs (depending on the Reservist's civilian salary and the pay policy of the employer). The loss in pay often exacerbates family problems. Grissmer, Kirby, Sze, and Adamson (1995) documented the economic losses Reserve personnel anticipate upon mobilization. They first analyzed data from the 1986 Survey of Reserve Forces, which had a large representative sample of Reservists who answered detailed questions about civilian and military income. Results reflected a pervasive concern among Reservists: Approximately 40% of all RC personnel reported that they would lose income during a hypothetical 12-month mobilization, and the economic losses were highly variable. Large losses were more frequent for higher-ranking personnel and those who were self-employed as civilians.[2]

Grissmer et al.'s (1995) second analysis used the 1991 Survey of Mobilized and Nonmobilized Reservists ("the Operation Desert Storm (ODS) Survey"), which oversampled medical occupational specialists. Results indicated that ODS personnel experienced income losses that were more severe than those estimated from the 1986 survey. In the ODS sample, 55% of officers and 45% of enlisted personnel reported that they lost income (compared to the 40% who estimated that they would in the 1986 survey). In addition, 70% of enlisted personnel and 80% of officers in the ODS sample reported that they incurred extra expenses. These expenses were usually less than $2,500, but 40% of officers and 25% of enlisted personnel had additional expenses over that amount. Examples of additional expenses included child care, other family expenses because of the absence of the Reservist, upkeep of medical practices or other types of offices, and possibly unreimbursed travel, quarters, and subsistence expenses.

Estimated financial changes are also available from a deployment of RC and Active Duty personnel on a peacekeeping mission at the Egyptian-Israeli border in the Sinai (Lakhani & Abod, 1996). This deployment was unusual in that RC personnel were volunteers who responded to a nationwide call. The test battalion consisted of 80% RC and 20% Active Duty personnel, with RC soldiers filling almost all of the junior enlisted positions (96%), while officer and noncommissioned officer positions were filled equally between the two components (Farr, 1996). A survey was administered during the predeployment training and again during deployment, asking for self-reported financial gains and losses from volunteering, civilian and military employment experience, and spouse employment experience and earnings. Monthly pay for Active Duty soldiers was computed from administrative information. Results showed an average loss for the Active Duty ($102 per month) and an average gain for the RC ($386 per month). Thus, the financial implications to RC personnel who volunteer for deployments may be substantially different from those for Reservists who are called up involuntarily. This difference

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[2] Income loss was reported to be more frequent among higher pay grades; almost 50% of O-4 to O-6 officers indicated they would lose income and over 50% of E-6 to E-8 personnel would lose income. Among those who speculated that they would lose income, the median family loss for officers was approximately $11,000 and for enlisted was $7,000. The median percentage of family income lost was 17 for both officers and enlisted (again, among those who indicated that they would lose income). The amounts and percentages varied with pay grade but were spread through all ranks and military occupations.

is especially salient when the volunteers are junior personnel who probably have lower earnings in their civilian jobs.

Impact on Reenlistment/Retention and Morale

Within the Reserve Component, training requirements such as Annual Training (AT) and full-time Initial Active Duty Training (IADT) impose time restrictions on Reservists' lives. A study of Reserve reenlistment indicated that the time required for AT and extra time spent on Reserve duties appeared to be the main source of employer and family problems (Grissmer, Kirby, & Sze, 1992). Grissmer and Nogami (1988) examined Army National Guard units that had National Training Center (NTC) rotations for their AT between 1983 and 1985. The NTC rotation increased AT from 2 to 3 weeks, and required train-up in several extra days of drills during the year before NTC. The NTC-rotation units had significantly higher attrition compared to units that did not go to NTC. Grissmer, Buddin, and Kirby (1989) and Grissmer et al. (1992) reported that extended training time due to extra drills or longer AT reduced reenlistment rates by 7 to 13%, based on data from the 1986 Reserve Components survey.

Oliver, Hayes, and Tiggle (1996) surveyed the perceptions of Army National Guard and Individual Ready Reserve soldiers who were deployed in the Sinai in the composite battalion with the AC. The survey, administered both before and during deployment, included questions regarding the effects of their deployment on the following three areas of their lives:

1. Perceived effects on soldiers' lives, including physical health, emotional well-being, civilian job, career, military career, marriage, adjustment to spouse upon return, children, likelihood of volunteering for future operations, and likelihood of remaining in the military.

2. Mid-deployment status, including career intentions, educational aspirations, and organizational commitment.

3. Comparison with predeployment status, including attitudes toward careers, education, travel, and Army organization.

Several changes occurred in the variables from their predeployment levels. During the deployment, soldiers were less likely to consider staying in the military for 20 years or to volunteer for similar assignments in the future, compared to responses before deployment. Decreases seemed to result from discrepancies between soldier expectations formed during recruiting/assignment and what they actually experienced on duty. Examples were costs and opportunities for leisure travel and education. Officers rated commitment and satisfaction measures more positively than enlisted personnel. The authors note that the waning of initial enthusiasm as reality sets in is a common phenomenon (Oliver et al., 1996).

A study by Schumm et al. (1998) asked RC Service members to estimate the effect of a hypothetical deployment pattern on several variables related to retention and morale. The hypothetical situation was that the Pentagon might call up the members of the Reserves or National Guard on Active Duty for missions like Bosnia, Somalia, or Haiti as often as every 5

years. A substantial proportion of respondents (42%) thought that such a pattern of deployments would lead to difficulties in keeping their civilian job, and roughly half (51%) of respondents thought that they would be more likely to have severe difficulty with their marriage or other family relationships. On two items related to retention, slightly more than half of the respondents expressed the opinion that the deployments would make it less likely for them to reenlist (56%) or to stay in the Reserve or National Guard until retirement (51%). Results also indicated a potential problem for recruitment into the RC, as 55% of respondents stated that knowledge of these hypothetical deployments would have made them less likely to enlist. The authors concluded that increasing deployments would impact on the families, military situations, and future employment of Reservists. However, some Reservists thought that it would not negatively impact their family life or employment, and that they would be more likely to stay in the RC as a result.

Finally, Buddin and Kirby (1996) examined the effects of Operation Desert Storm on retention of Reservists.[3] They distinguished two different kinds of attrition, termed inventory attrition and attrition of gain cohorts. Inventory attrition is annual aggregated turnover rate for the RC inventory as a whole; it is the major determinant (with end strengths) of the demand for replacements. Inventory attrition remained stable at a little over 21% in the FY 1989 to FY 1993 inventories, which led the authors to conclude that "contrary to gloomy predictions, Operation Desert Storm does not appear to have spawned a huge outflow of Reservists in the succeeding years" (p. 21). The attrition of gain cohorts presents a more detailed view of attrition that highlights differences between segments of the RC. Results from this measure were consistent with those from inventory attrition. Both measures show an increase in attrition after 1993, which is attributed to the drawdown of military forces during that time.

In summary, RC Service members must coordinate their military obligations with requirements of their civilian jobs, as well as their family life. Because of the additional burden placed on Reservists, it is reasonable to expect that effects of increased PERSTEMPO might have a more uniformly negative effect on them than it has on Active Duty Service members. Results of research seem to confirm this expectation, at least with regard to retention. Increases as small as an additional week of AT and several days of drills have been shown to decrease retention. This effect occurs despite the fact that training during drills and AT may be viewed positively, because of the usefulness of the training, and the unit morale and camaraderie that develop during the training. However, it is difficult to make any firm conclusions because of the variety of ways that the RC is integrated with Active Duty forces, the very limited research on the effects of PERSTEMPO in the RC, and the fact that existing research is based primarily on individual cases, rather than on component-wide trends. Consequently, there is a need for further rigorous research, especially if increased utilization of the RC is going to be used to alleviate problems of excessive PERSTEMPO within the Active Component.

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[3] Since only one-third to one-half of losses in the past were to civilian life (Kirby & Grissmer, 1993), their criterion data counted Reservists who changed Services, but who remained in some part of the RC, among those who remained. Unfortunately, they were not able to track those who separated from the RC to go into the AC (Buddin & Kirby, 1996).

References

Buddin, R., & Kirby, S. N. (1996). *Enlisted personnel trends in the Selected Reserve 1986 - 1994* (MR-681/2-OSD). Santa Monica, CA: RAND.

Farr, B. J. (1996). Personnel profile: Soldiers of the 28th rotation. In R.H. Phelps & B.J. Farr (Eds.), *Reserve Component soldiers as peacekeepers* (Book 96-07). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (ADA321857)

Grissmer, D. W., Buddin, R., & Kirby, S. N. (1989). *Improving Reserve compensation: A review of current compensation and related personnel and training readiness issues* (RAND/R-3707-FMP/RA). Santa Monica, CA: RAND.

Grissmer, D. W., & Nogami, G. (1988). *Retention patterns for Army National Guard units attending the National Training Center (NTC).* Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

Grissmer, D. W., Kirby, S. N., & Sze, M. (1992). *Factors affecting reenlistment of Reservists: Spouse and employer attitudes and perceived unit environment* (R-4011-RA). Santa Monica, CA: RAND.

Grissmer, D. W., Kirby, S. N., Sze, M., & Adamson, D. (1995). *Insuring mobilized Reservists against economic losses: An overview* (RAND/MR-446-OSD). Santa Monica, CA: RAND.

Hall, F. S., & Hall, D. T. (1979). *The two-career couple.* Reading, MA: Addison-Wesley.

Hom, P.W., & Griffeth, R.W. (1995). *Employee turnover.* Cincinnati: South-Western College Publishing.

Kirby, S. N., & Grissmer, D. W. (1993). *Reassessing enlisted Reserve attrition: A total force perspective* (N-3521-RA). Santa Monica, CA: RAND.

Lakhani, H., & Abod, E. T. (1996). The financial impact of peacekeeping in the Sinai. In R. H. Phelps & B. J. Farr (Eds.), *Reserve Component soldiers as peacekeepers* (Book 96-07, 333-352). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (ADA321857)

Oliver, L. W., Hayes, S. M., & Tiggle, R. B. (1996). Soldiers' perceptions of deployment effects. In R. H. Phelps & B. J. Farr (Eds.), *Reserve Component soldiers as peacekeepers* (Book 96-07, 315-332). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (ADA321857)

Orthner, D. K., & Pittman, J. F. (1986). Family contributions to work commitment. *Journal of Marriage and the Family, 48,* 573-581.

Schumm, W. R., Jurich, A. P., Stever, J. A., Sanders, D., Castelo, C., & Bollman, S. R. (1998). *Attitudes of Reserve Component Service members regarding the consequences of frequent overseas deployments.* Manuscript submitted for publication.

APPENDIX B. PRELIMINARY ANALYSES OF ARMY SOF DATA FROM THE PERSTEMPO IMPACT SURVEY

Select outcomes for analysis. The first steps in the analyses of the PERSTEMPO Impact Survey data reduced the number of variables that would be used in later analyses. Seventy-four survey items were identified as potential outcome measures. These measures were then grouped by content into three subsets, and analysis was performed on each subset using the entire sample. Table B-1 presents the rotated (varimax) factor pattern resulting from the analyses of one of the subsets that consisted of 27 questionnaire items. Seven factors were extracted using an iterated principal component factor analysis in which the minimum preliminary eigenvalue was set at 1.0. Using the same analytic techniques on the other subsets, 18 questionnaire items yielded 4 factors (see Table B-2) and 29 items yielded 6 factors (see Table B-3).

The factor analysis indicated that a number of reliable composite measures might be constructed by averaging the responses to questionnaire items with similar content that had high factor loadings on the same factor and that were highly correlated. For example, the four questionnaire items with factor loadings of .80 or more on Factor II in Table B-1 all concern satisfaction with the use of the American Express card issued to Special Operations personnel. These items had intercorrelations ranging from .65 to .85. They formed a composite with a Cronbach Alpha reliability coefficient of .92.

Table B-1. Rotated Factor Pattern[a] of 27 Outcome Items (Army SOF Data)

		Factor						
Questionnaire Item	Item Description	I	II	III	IV	V	VI	VII
9d	Last deployment was personally rewarding	.37						
17a	Deployments don't increase marital problems	.43		.43				
17b	Family deployment problems are manageable	.50						
17c	More deployments do not lead to school problems	.33		.83				
17d	More deployments do not lead to problems with law	.30		.76				
17e	Time away from spouse can be good	.50						
17f	Suicide is not more likely in SOF	.31						
18	Satisfaction with cash advances		.80					
19	Satisfaction with credit card acceptability		.82					
20	Satisfaction with credit billing system		.82					
21	Overall satisfaction with credit card		.95					
25	Satisfaction with DFAS		.30					
33	Deployments cause no financial strain	.31						
34a	Family support for being in military					.84		
34b	Family support for being in SOF	.32				.80		
35	Family copes with recent deployments	.49						.41
38	Satisfaction with availability of medical care				.83			
39	Satisfaction with availability of dental care				.57			
43a	SOF allows work/personal life balance	.76						
43b	SOF rewards compensate for limited other time	.67						
43c	SOF demands allow preferred family/personal life	.61						
49a	Satisfaction with base pay						.64	
49b	Satisfaction with medical benefits				.63		.40	
49c	Satisfaction with retirement benefits						.60	
49d	Satisfaction with additional pay opportunities						.53	
51a	Stress level in military is low							.45
51b	Stress level in personal life is low							.71

[a]Factor loadings less than .30 were omitted from table to facilitate examination.

Table B-2. Rotated Factor Pattern[a] of 18 Outcome Items (Army SOF Data)

		Factor			
Questionnaire Item	**Item Description**	**I**	**II**	**III**	**IV**
9c	Mission contributed to professional deployment				
13a	Training more realistic when deployed	.61			
13b	Being deployed doesn't inhibit needed training				
13c	Deployment experience has increased readiness	.68			
13d	Increased demands will not exceed unit capabilities		.71		
13e	Time between missions hasn't decreased readiness		.65		
13f	Support activities do not lower readiness				
13g	Deployments give unit real world experience	.72			
13h	Contingencies do not prevent regular unit training		.50		
13i	Deployment positives outweigh negatives	.65			
13j	Deployment experiences decrease accidents	.47			
13k	Deployment wear and tear doesn't increase accidents		.45		
14	Soldier prepared to perform wartime duties			.64	
15	Unit prepared to perform wartime duties			.85	
16a	Deployments make for advancement				.64
16b	Deployments don't limit advancement				.63
16c	Opportunities for education even when deployed				
16d	Current PERSTEMPO increases experience opportunities	.43			

[a]Factor loadings less than .30 omitted from table in order to facilitate examination

Table B-3. Rotated Factor Pattern[a] of 29 Outcome Items (Army SOF Data)

		Factor					
Questionnaire Item	Item Description	I	II	III	IV	V	VI
44a	Feels like part of the family in SO	.32	.67				
44b	SO has great personal meaning		.79				
44c	Feels sense of belonging to SO		.84				
44	Feels emotionally attached to SO		.77				
45	Army career intentions					.80	
46	SO career intentions					.88	
47	Current PERSTEMPO increases desire for SO	.32					
48a	Feels like a part of the family in military	.33			.60		
48b	Military has great personal meaning				.73		
48c	Would be costly to leave military			.77			
48d	Afraid to quit military without job lined up			.83			
48e	Life would be disrupted if left military now			.81			
48f	Feels sense of belonging to military				.80		
48g	Feels emotionally attached to military				.74		
48h	Lack of alternatives to military			.73			
49e	Satisfaction with utilization of SOF	.65					
49f	Satisfaction with utilization of specialty in SO	.63					
49g	Satisfaction with SO career prospects	.58					
49h	Satisfaction with SO in general	.73	.33				
49I	Satisfaction with USSOCOM leadership	.75					
49j	Satisfaction with service-level leadership	.68					
49k	Satisfaction with 0-6 leadership	.66					
49l	Satisfaction with enlisted leadership	.54					
52a	Glad joined SO	.37	.59				
52b	Work satisfaction outweighs frustrations	.50	.41				
52c	SO deployment perks have not been eroded						.50
52d	SO administrative demands don't detract						.77
52e	SO micromanagement doesn't limit creativity and initiative	.34					.59
52f	Sense of pride and professionalism in SO	.43	.48				

[a]Factor loadings less than .30 omitted from table in order to facilitate examination

Table B-4 presents the reliabilities attained by the outcome composites identified through the factor analyses. The table contains only those composites with reliabilities of .70 or higher. The individual items comprising the composites are also given in the table, as are the factors in Tables B-1, B-2 and B-3 that underlie the composites. These factors have been given an abbreviated description in the table.

Altogether, the 15 outcome composites listed in Table B-4 have 53 component variables. Of the 21 remaining items, 3 were eliminated because they overlap the content and are moderately correlated with items already selected as components of the composite measures. The 18 remaining items and the 15 composites were combined into one set of 33 outcome measures, and a factor analysis was then performed on the set. The purpose of the factor analysis was to help identify a subset of 20 outcome measures that spanned the criterion space of the total set. A subset of measures relatively independent of each other but representative of the set of outcome measures as a whole was desired.

Table B-4. Outcome Composites, Component Items, and Reliabilities (Army SOF Data)

Composite Description	Component Items	Alpha Reliability	Factor Table	Factor No.
Deployments have positive impact	13a, c, g, i, j	.80	B-2	I
Increased deployments do not have negative effects	13d, e, h, k	.70	B-2	II
Prepared to perform wartime duties/mission	14, 15	.74	B-2	III
Can balance work/family demands	43a, b, c	.76	B-1	I
School and law problems not more likely	17c, d	.84	B-1	III
Satisfaction with Am Ex services	18, 19, 20, 21	.92	B-1	II
Family supports soldier's SO role	34a, b	.86	B-1	V
Satisfaction with medical/dental benefits	38, 39, 49b	.78	B-1	IV
Administrative demands not limiting	52d, e	.70	B-3	VI
Intends to remain in Army & SO	45, 46	.90	B-3	V
Satisfaction with leadership/utilization	49e, f, g, h, i, j, k, l; 52b	.89	B-3	I
Especially attached to SO	44a, b, c, d; 52a	.90	B-3	II
Leaving military now would be costly	48c, d, e, h	.87	B-3	III
Especially attached to military	48a, b, f, g	.88	B-3	IV
Finds deployments rewarding	9c, d	.82	*	*

* Composite suggested by correlations between variables.

Table B-5 presents the rotated factor pattern obtained for the 33 outcome measures. Eight factors were extracted. The factor loadings of the measures were examined and for each factor the measure that had the highest loading on the factor was selected. Considering the content of the outcome measures as well as the factor loadings, additional outcome measures that had high loadings on the first four factors extracted were also selected as were several measures that did not have high loadings on any of the factors. The latter measures were selected to enhance the representativeness of the selected measures to the original 74 items. The 20 selected outcome measures are marked with an asterisk in Table B-5.

Select predictors for analysis. Analyses that paralleled the ones described above for the outcome measures were conducted on the PERSTEMPO Impact Survey questionnaire items that measured job-related factors. Including the basic PERSTEMPO measure of days deployed in the last 12 months, 27 items were identified as measuring aspects of the soldiers' jobs. These items were split into two subsets on the basis of their content, and a factor analysis was performed on each subset. The rotated factor patterns are presented in Tables B-6 and B-7. The obtained factor loadings were examined to identify potential composite measures. Table B-8 presents the Alpha reliabilities and component items for the composites that had reliabilities of .70 or more. Through the formation of these composites the number of job-related variables was reduced to 19.

Table B-5. Rotated Factor Pattern[a] of 33 Outcome Measures (Army SOF Data)

		Factor							
Questionnaire Composite Item	**Outcome Measure Description**	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**
*Composite	Deployments have positive impact					.69			
Composite	Increased deployments do not have negative effects	.55							
Composite	Prepared to perform wartime duties/mission	.65							
*Composite	Can balance work/family demands	.60							
Composite	School and law problems not more likely				.65				
*Composite	Satisfaction with credit services								
*Composite	Family supports soldier's SO role			.46					
*Composite	Satisfaction with medical/dental benefits				.47			.51	
*Composite	Administrative demands not limiting		.45						
*Composite	Intends to remain in Army & SO		.65						
*Composite	Satisfaction with leadership/utilization		.73						
*Composite	Especially attached to SO								.40
*Composite	Leaving military now would be costly		.59						
Composite	Especially attached to military								
*Composite	Finds deployments rewarding								
16c	Opportunities for education even when deployed								
13b	Being deployed doesn't inhibit needed training					.48			
*13f	Support activities do not lower readiness								
*33	Deployments cause no financial strain	.46							
*35	Family copes with recent deployments	.69							
17b	Family deployment problems are manageable	.50							
*47	Current PERSTEMPO increases desire for SO								
17f	Suicide is not more likely in SO	.42							
*25	Satisfaction with DFAS				.43				
*16a	Deployments make for advancement						.65		
16b	Deployments don't limit advancement						.54		
17a	Deployments don't increase marital problems	.65							
52c	SO deployment perks have not been eroded							.43	
*49a	Satisfaction with base pay			.65					
*49c	Satisfaction with retirement benefits			.64					
49d	Satisfaction with additional pay opportunities			.51					
*51a	Stress level in military is low	.43							
51b	Stress level in personal life is low	.55							

[a]Factor loadings less than .30 omitted from table in order to facilitate examination

* Outcome measure selected for further analyses.

Table B-6. Rotated Factor Pattern[a] of 18 Job-Related Items (Army SOF Data)

		Factor					
Questionnaire Item	Item Description	I	II	III	IV	V	VI
1	Expected no. of days deployed per year		.55				
2a	Spending more time deployed then expected	.83					
2b	Spending more time deployed when joined SO	.83					
2c	Spending more time deployed than would prefer	.58					
3a	No. of times deployed 1-15 days				.67		-.42
3b	No. of times deployed 16-30 days				.51		
3c	No. of times deployed 31-60 days			.43			.41
3d	No. of times deployed 61-90 days			.66			
3e	No. of times deployed more than 90 days			.81			
4	Days deployed in last 12 months				.46		
5	Currently deployed						
6	Average time between deployments				-.62		
8	Average days advanced warning of deployment						
10	Hours work per week not deployed					.65	
11	Hours like to work per week not deployed					.85	
12	Percent of time of support-type activities						
41	Period gone and still balance work & family		.70				
42	Total days gone and still balance work and family	.	.95				

[a]Factor loadings less than .30 omitted from table in order to facilitate examination

Table B-7. Rotated Factor Pattern[a] of Nine Job-Related Items (Army SOF Data)

		Factor			
Questionnaire Item	Item Description	I	II	III	IV
7a	Insufficient time to recover from previous deployment	.91			
7b	Insufficient time to attend to personal/family matters	.87			
7c	Insufficient time to prepare for next deployment	.88			
9a	Did not receive appropriate training for last mission		.68		
9b	Did not receive support from chain of command		.72		
23	Average time takes DFAS reimburse expenses			.68	
24	How often re-submit travel vouchers			.60	
26	Incentive pay less than comparable others'				.63
27	Travel pay less than comparable others'				.61

[a]Factor loadings less than .30 omitted from table in order to facilitate examination

Table B-8. Job-Related Composites, Component Items, and Reliabilities (Army SOF Data)

Composite Description	Component Items	Alpha Reliability	Factor Table	Factor No.
More time deployed than expected	2a, b, c	.79	B-6	I
Days deployed and maintain work/family balance	41,42	.82	B-6	II
Times deployed for over a month in year	3c, d, e	.77	B-6	III
Insufficient time between deployments	7a, b, c	.92	B-7	I
Lack of chain of command support	9a, b	.71	B-7	II

A factor analysis was performed on the remaining job-related variables, not including the measure of days deployed in the last 12 months. The purpose of the factor analysis was to identify a subset of job-related variables that were relatively independent of each other and that held promise of being related to the selected outcome measures. Seven factors were extracted in the analysis and for each factor the measure that had the highest loading on the factor was selected. Considering the content of the job-related variables as well as their factor loadings, five additional variables were selected. The 12 selected job-related variables are asterisked in Table B-9.

A total of 27 variables were derived initially from the items in the PERSTEMPO Impact Survey questionnaire that addressed background and personal aspects of the soldiers. Fourteen of these variables were dichotomous variables, where a "1" indicated the characteristic was present and a "0" indicated the characteristic was absent. For example, for the variable, married, a soldier was scored 1 if married and 0 if not. Similarly, for the variable, enlisted status, a soldier was scored a 1 if enlisted and 0 if not.

Many of the background/personal variables were derived after examining frequency distributions that showed how the respondents had classified themselves, (e.g., the racial/ethnic group to which they indicated they belonged or the type of unit to which they were assigned). For a number of these variables, a soldier in one group could not be in another group. A substantial negative correlation between such variables was thereby "built into" the way the questionnaire items and the variable definitions had been formulated. Instead of running factor analyses on the intercorrelations of the 27 variables, the intercorrelations among the variables and the variable means and variances were examined. The goal was to identify a comprehensive subset of items that had relatively low intercorrelations and seemed to show promise of being related to outcome measures. The 14 variables that were selected are asterisked in Table B-10, which lists the 27 initial variables and indicates how they were derived from the soldiers' responses to the questionnaire. The number of variables was further reduced to 12 by forming two composites, one consisting of the average of Questions 36 and 37 and the other the average of questions 55a and 55b. The correlations between these pairs of variables were both greater than .60.

Table B-9. Rotated Factor Pattern[a] of 18 Job Related Variables (Army SOF Data)

		Factor						
Questionnaire Item	Item Description	I	II	III	IV	V	VI	VII
*Composite	More time deployed than expected	-.42						.58
*Composite	Days deployed and maintain work/family balance	.77						
*Composite	Times deployed for over a month in year							.40
*Composite	Insufficient time between deployments					.57		
*Composite	Lack of chain of command support					.49		
*6	Average time between deployments		-.61					
*10	Hours work per week not deployed			.83				
* 5	Currently deployed							
* 1	Expected no. of days deployed per year	.64						
8	Average days advanced warning of deployment							
12	Percent of time of support-type activities							
*23	Average time takes DFAS reimburse expenses				.68			
*11	Hours like to work per week not deployed			.71				
24	How often re-sub travel vouchers				.64			
*3a	No. of times deployed 1-15 days		.69					
3b	No. of times deployed 16-30 days		.49					
26	Incentive pay less than comparable others'						.65	
27	Travel pay less than comparable others'						.65	

[a]Factor loadings less than .30 omitted from table in order to facilitate examination

* Job-related measure selected for further analyses.

Identify interactions with PERSTEMPO. The selected background/personal and job-related variables were then used in two-way analyses of variance to determine whether there was evidence that these factors interacted with the number of days deployed to produce higher or lower outcome values than one would expect on the basis of the factors acting alone. The total Special Operations sample was split randomly into two halves and these analyses of variance were conducted on one half of the sample (Sample A). The model was then validated using the second half of the sample (Sample B). An example of the type of interaction that was investigated is shown in Table B-11. The table gives the means of enlisted personnel and officers on the outcome measure, *satisfaction with medical/dental benefits.* The means are given for six levels of days deployed. In the analysis of variance of these data, there was no significant difference between the enlisted and officer mean satisfaction levels. Nor were there significant differences in mean levels of satisfaction with medical/dental benefits between the six levels of days deployed. However, the analysis of variance indicated that there was a significant (.01 level) interaction effect between enlistment status and days deployed.

Table B-10. Initial List of Background/Personal Variables (Army SOF Data)

Question Item	Variable Name	Special Derivation Instructions
*28	Married	Married or legally separated = 1; other =0
28	Marriage problems	Separated or divorced = 1; otherwise =0
29	Always single	Never married =1; otherwise =0
29	Times married	Number of times married
30a, b	Length of time married	
*31a	No. of children living with soldier	
31b	No. of children not living with soldier	
31a, b	Total children	Sum of 31a and 31b
31a, b	Has child	Has 1 or more children = 1; otherwise = 0
32a	Age of youngest child	
32b	Age of oldest child	
*36	Helpfulness of unit as source of support	
*37	Helpfulness of post as source of support	
*40	Support of unit for job/personal conflicts	
50	Importance of job satisfaction vs. pay	
*54	Enlisted status	Enlisted =1; other = 0
*54	Commissioned officer status	Commissioned officer = 1; other = 0
*55a	Years on active duty	Subtract value from 98
*55b	Years in Special Operations	Subtract value from 98
*56	Minority status	White = 0; all other = 0
*56	African American	African American = 1; other = 0
*56	Hispanic	Hispanic = 1; other = 0
*57a	Joint Special Operations Command	Joint SO Command = 1; other = 0
*57b	Special Forces Group	Special Forces Group = 1; other = 0
*58	Infantry	Infantry MOS = 1; other = 0
58	Combat Career Management Field	Combat CMF = 1; other = 0
*58	Special Forces	Special Forces MOS = 1; other = 0

* Background/personal measure selected for later analyses.

Table B-11. Enlisted/Officer Mean Levels of Satisfaction with Medical/Dental Benefits by Level of Days Deployed (Army SOF Data – Sample A)

Personnel	Level of Days Deployed						
	Low			High			
	1	2	3	4	5	6	Total
Enlisted	2.53	2.45	2.40	2.48	2.33	2.18	2.38
Officer	2.14	2.52	2.33	2.35	2.46	2.60	2.41
Total	2.46	2.47	2.39	2.45	2.35	2.26	2.39

Examination of the subgroup means presented in Table B-11 gives an indication of why the data analysis resulted in the rejection of the hypothesis that the interaction between enlisted status and days deployed was equal to zero. Note that the highest average satisfaction levels with medical/dental benefits were reported by enlisted personnel having the lowest level of days deployed and the lowest level of satisfaction was given by enlisted personnel with the highest levels of days deployed. The results for the officers were just the opposite: the highest average satisfaction levels were reported by officers with high levels of days deployed and the lowest satisfaction level by officers with low levels of days deployed.

Examination of the results of the significance tests and the subgroup means obtained in all the analyses of variance led to the derivation of six variables which attempted to capture the interaction between days deployed and selected background/control and job-related variables. For example, an enlisted/days deployed interaction variable was derived in which enlisted personnel with high levels of days deployed received a score of "0" on the variable as did officer personnel with low levels of days deployed. Scores of 2 on the variable were given to enlisted personnel with low levels of days deployed and to officer personnel with high days deployed levels. Enlisted and officer personnel with intermediate days deployed were assigned a value of 1. This variable and the other five interaction variables were used in the preliminary hierarchical regression analyses conducted with the selected job-related and background/personal variables.[1]

Initial regression analyses. Before proceeding with multivariate analyses relating the PERSTEMPO and other job-related factors, and the background/personal characteristics to the 20 outcome measures, we addressed the problem of how to handle missing data. The basic problem was that practically all of the questions used in the analyses were not answered by one or more of the sampled soldiers, and to eliminate all soldiers that had missing data would reduce the sample size prohibitively.

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[1] The interaction variables involved the measures of enlistment status, belonging to a Special Forces Group, being deployed more times than expected, lack of chain of command support, estimate of days deployed and still maintain work/family balance, and days expected to be deployed.

The following decision rules were adopted to mitigate the problem:

1. Soldiers for whom deployment time was missing were dropped from further analyses. (Deployment time was considered the basic research variable.)

2. Soldiers with missing data on six or more variables were dropped from further analyses

3. Soldiers missing a given outcome measure were dropped from analyses involving that outcome measure.

4. Sample means[2] were substituted for missing data in the remaining cases. For example, if hours worked per week when *not* deployed was missing for a given soldier, then the sample average number of hours worked per week would be assigned to that soldier.

5. Dummy variables, consisting of a "one" for soldiers where sample means were substituted and a "zero" for soldiers with actual response data, were created.

After substituting mean values for missing values, a set of 23 dichotomous dummy variables indicating which cases had substituted means was developed.[3] The factor analysis of these dummy variables resulted in 9 factors being extracted. The dummy variable with the highest loading on each factor was selected. Two additional dummy variables were also selected. These dummy variables were for two measures, number of times deployed from 1 to15 days and in the Joint Special Operations Command, that had very high rates of omissions (over 30%). A third measure, currently deployed, which also had a high omission rate (39%), was dropped from the analyses. The item for this measure was located in the PERSTEMPO Impact Questionnaire at the very bottom of a page and easily could have been overlooked by the respondents. The corresponding dummy variable for currently deployed did not have a high loading on any of the 9 factors extracted, suggesting that failure to respond to the item may have been more an oversight than deliberate on the part of many respondents.

The final data adjustment made prior to running the preliminary hierarchical regression equations was to eliminate any sample cases that were missing data for more than six of the remaining 21 independent variables. It was felt that these cases (about 5% of the sample) may not have been paying much attention to the task of completing the questionnaire.

The preliminary hierarchical regression equations were run on the second half of the Special Operations sample, (Sample B).[4] The initial purpose of these analyses was to identify the

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2 The procedure of substituting means for missing data and creating dummy variables to reflect cases having substituted values is recommended by Cohen and Cohen (1983).

3 Dummy variables were not created for the 6 interaction variables as any cases missing an interaction variable value would also be missing the job-related or background/personal variable underlying the interaction variable.

4 As mentioned earlier, cases missing the key independent variable, days deployed, were dropped from the analysis first. Cases missing an outcome variable were excluded from the hierarchical regression analysis for that dependent variable.

job-related and background/personal factors that entered each of the equations for the 20 outcome measures most significantly. The goal was to obtain a subset of independent variables for each outcome measure that could be used in a hierarchical regression equation for the outcome. It soon became apparent, however, that the same independent variables had significant regression weights in a number of the outcome equations, and that one subset of common variables could probably account for almost as much of the variance of the outcome measures as separate subsets unique to each outcome measure. The 20 regression equations were therefore examined and the dependent variables identified that entered the equations most significantly, frequently, and consistently in terms of the sign of their regression weights. The selected variables are listed in Table B-12. The variables that were dropped for lack of statistical significance in the equations are also given in Table B-12. The dropped variables included all six of the interaction variables and the dummy variables associated with independent variables that had been dropped for lack of significance or that had very low variances.

The dropped variables also included the variables, average work hours per week when not deployed and hours per week would like to work when not deployed. The pattern of negative and positive regression weights for these two variables suggested that a new variable, defined as the difference between actual work hours per week and preferred hours, should be included in subsequent analyses. The addition of this difference measure brought to 19 the number of independent variables including dummy variables used in the final hierarchical regression analyses. The results of these final analyses are given in the Results section.

Table B-12. Disposition of 41 Independent Variables as a Result of Preliminary Hierarchical Regression Analyses (Army SOF Data)

Selected Variables		Dropped Variables	
1	Days deployed in last 12 months	20	Average time between deployments
2	Days deployed squared	21	Expected no. of days deployed per year
3	Lack of chain of command support	22	Number of times deployed 1-15 days
4	Insufficient time between deployments		
5	No. of hours worked minus hours would like to work	23	Hours work per week not deployed
6	Days deployed and maintain work/family balance	24	Hours like to work per week not deployed
7	Own incentive pay less than others	25	African American status
8	Average time it takes DFAS to reimburse expenses	26	Hispanic status
9	More time deployed than expected	27	Joint Special Operations Command
10	Enlisted status	28	Infantry status
11	Member of a Special Forces Group	29	No. of children living with soldier
12	Married status	30	Interaction between variables 1 & 3
13	Unit/installation activities support family	31	Interaction between variables 1 & 6
14	Unit supportive in job/personal conflicts	32	Interaction between variables 1 & 9
15	Years in Army and Special Forces	33	Interaction between variables 1 & 10
16-19	Dummy variables for variables 3, 8, 13, 14	34	Interaction between variables 1 & 11
		35	Interaction between variables 1 & 21
		36–41	Dummy variables for variables 12, 20, 22, 24, 26 & 29.

Effects of dummy variables. Each of the four dummy variables that were used in the multiple regression analyses entered into some of the equations with statistically significant weights (see Table B-13). As mentioned earlier, these dummy variables were included in the equations to take into account the substitution of mean values for missing data, thereby avoiding the exclusion of a large number of cases from the analyses. A significant regression weight indicates that those who had means substituted tended to be higher (positive weight) or lower (negative weight) on the outcome measure when controlling for the other factors in the equation.

Table B-13. Sign of Multiple Regression Weights[a] of Dummy Variables with 20 Outcome Measures (Army SOF Data)

Outcome Measure	Dummy Variables for			
	Lack of Chain-of-Command Support	DFAS Time to Reimburse Travel Expenses	Unit Supportive Job/Personal Conflicts	Unit/ Installation Activities Support Family
RETENTION				
Intends to remain in Army & SO	+	–	–	
Especially attached to SO		–		
Leaving military now would be costly			–	
Finds deployments rewarding				
Deployments make for advancement		–		
Current PERSTEMPO increases desire for SO	+	–		
READINESS				
Deployments have positive impact		–		
Administrative demands not limiting		+		
Support activities do not lower readiness		+		
FAMILY FACTORS				
Can balance work/family demands		–		
Family supports soldier's SO role				
Family copes with recent deployment				+
Deployments cause no financial strain			+	+
FINANCIAL FACTORS				
Satisfaction with base pay		–		
Satisfaction with medical/dental benefits				
Satisfaction with retirement benefits		+		
Satisfaction with DFAS				
Satisfaction with AMEX services				
GENERAL SATISFACTION				
Satisfaction with leadership, utilization		–		
Stress level in military is low	+	–		+

[a] All weights with signs indicated were significant at .01 level.

One of the dummy variables, the dummy variable for missing the time it takes DFAS to reimburse travel expenses, could be considered a variable in its own right. For the most part, anyone who had not processed a travel voucher in the last 12 months received a score of "one" on this variable while those who had processed a travel voucher received a "zero." This variable entered into 9 of the regression equations with a significant negative weight and 3 of the equations with a significant positive weight. The latter positive results may indicate that having some travel may be beneficial for Special Operations personnel. Another dummy variable that could be considered a variable in its own right is the dummy variable for *unit/installation activities support families*. For the most part, any soldier who did not have a wife or children received a score of "one" in this variable. These soldiers on the average reported that deployment caused less financial strain and that their stress level in the military was lower.

APPENDIX C. PRELIMINARY ANALYSIS FOR SAMPLE SURVEY OF MILITARY PERSONNEL

Select outcomes for analysis. Using procedures parallel to those employed with the Army SOF data, the preliminary analysis of the SSMP data first focused on obtaining a comprehensive subset of outcome measures. Considering only questionnaire items found in all three survey administrations (Spring 97, Fall 97, and Spring 98), 76 items were categorized as potential outcome measures. Items that were negatively worded were scaled so that a high item score indicated a high outcome value.

Factor analysis was performed on the 76 items. The alpha reliabilities of composites suggested by the analyses were determined. Composites having reliabilities of .70 or larger are listed in Table C-1. The formation of these 13 composites reduced the number of potential outcome measures to 34. Four of these variables were subsequently dropped because of their high content overlap with already selected measures.

Table C-1. Outcome and Job-Related Composites, Component Items, and Reliabilities (SSMP Data)

Composite Description	Spring 97 Component Items	Alpha Reliability
Not concerned about having to leave Army	2b, c	.85
Smaller Army will have no negative effect	3a, b, c, d	.73
Not concerned over downsizing	4a, b, c, d, e, f	.83
Morale of unit/self	25, 26	.80
Individual and unit readiness	23, 24, 27	.76
Satisfaction with job fulfillment	5 – 1, 2, 3, 14, 15, 16, 17, 18, 20	.87
Satisfaction with equipment and supplies	5 – 7, 8	.88
Satisfaction with work tasking	5 – 4, 9, 11, 12	.71
Satisfaction with quality of leadership	5 – 21, 22, 23	.87
Satisfaction with pay	5 – 24, 25, 26, 31	.75
Satisfaction with service and family programs	5 – 38, 39, 40, 41, 42, 43, 53, 54	.88
Satisfaction with medical/dental benefits	5 – 44, 45, 46, 47, 48, 49	.90
Satisfaction with quality of housing	5 – 33, 34	.70
Chain of command commitment vs. sexual harassment	60a, b, c, d, e, f	.94
Leadership enforces policies vs. sexual harassment	66c, d	.87

The 30 remaining outcome measures were intercorrelated and factor analyzed. The obtained rotated factor pattern is presented in Table C-2. Six factors were extracted. At least one outcome measure with high loadings on each factor was selected. Ten additional outcome measures were selected based on their content and apparent relevance to an examination of PERSTEMPO effects. Finally, three outcome measures that had no high (.40 or above) loadings on any of the six factors were selected to round out the sample of 20 outcome measures.

Table C-2. Rotated Factor Pattern of 30 Outcome Measures (SSMP)

		Factor					
Question Item/Composite	**Description of Measure**	**I**	**II**	**III**	**IV**	**V**	**VI**
*Composite	Not concerned about having to leave Army				.75		
*Composite	Smaller Army will have no negative effect						
Composite	Not concerned over downsizing	.31			.44		
*Composite	Morale of unit/self		.58				
*Composite	Individual and unit readiness		.45				
*Composite	Satisfaction with job fulfillment		.65	.31			
*Composite	Satisfaction with equipment and supplies	.40	.40				
*Composite	Satisfaction with work tasking	.39	.44				
*Composite	Satisfaction with quality of leadership		.67				
*Composite	Satisfaction with pay	.60					
*Composite	Satisfaction with service and family programs	.57					
Composite	Satisfaction with medical/dental benefits	.58					
Composite	Satisfaction with quality of housing	.58					
*1a	Army leadership makes best decisions		.31			.55	
*1b	Army will protect benefits/retirement	.36				.71	
1c	Army leadership aware of job loss anxiety					.45	
2d	Less concerned about financial burden of leaving Army				.84		
*5–30	Satisfaction with overseas duty			.61			
5–36	Satisfaction with no. of PCS relocations	.32		.48			
*5–19	Satisfaction with education/training access	.32	.38				
5–27	Satisfaction with retirement benefits	.57					
*5–50	Satisfaction with time away from family	.37		.35			
*8	Army career intentions						.66
*35	Spouse supports making Army career						.53
*5–5	Satisfaction with co-worker competence		.52				
5–51	Satisfaction with spouse career work opportunities	.46					
*5–55	Satisfaction with overall quality of life	.55	.31				
5–13	Satisfaction with geographic location of jobs			.48			
*5–10	Satisfaction with regulation/discipline		.49				
5 – 32	Satisfaction with living conditions overseas	.47		.39			

* Outcome measure selected for later analyses.

Select predictors for analysis. After examination of the item content of the SSMP questionnaires and the frequency distributions of the item response field, 18 potential job-related variables and 15 background/personal variables were identified. The 18 job-related variables included two composites, *chain of command commitment vs. sexual harassment and leadership endorses policies vs. sexual harassment* (see Table C-1). These composites were suggested by the similarity of the content of the component items.

Refine predictor selection. Before using the 33 selected independent variables in preliminary hierarchical regression analyses, the problem of missing data was addressed. As was done with the Army SOF data, cases that were missing time deployed were dropped from the analysis. Variable means were substituted for missing values, and dummy variables signifying the substitutions were created. A factor analysis of the dummy variables was then conducted. Based on the obtained factor loadings and the amount of required substitution of means for missing values, dummy variables were selected for six of the job-related variables and three of the background/personal variables. As was also done with the Army SOF data, cases missing six or more variable values were dropped from the SSMP analysis.

The preliminary hierarchical regression analyses were conducted on Sample A, a randomly split half of the combined sample (Spring 97, Fall 97, and Spring 98), and validated using Sample B. The analyses were directed at reducing the number of independent variables used in the equations by identifying a common set of variables that accounted satisfactorily for the variances of the outcome measures. The variables were introduced into the equation for each of the selected outcome measures in four steps:

1. Weeks deployed,
2. Weeks deployed squared,
3. Job-related variables and associated dummy variables, and
4. Background/personal variables and associated dummy variables.

The variable reduction procedure was carried out in two iterations. First, the statistical significance and the signs (positive or negative) of the regression weights of the independent variables were noted when the variables first entered the equations and after all 42 variables were in the equations. The 17 variables including associated dummy variables that entered the equations with a statistically significant weight (.0)01 level) only a few times or not at all were dropped from the variable set. The consistency of the signs of the variable regression weights across the 20 equations was also considered in the decision to retain or drop a variable. The analyses were then repeated with the 25 remaining variables and the four variables with the fewest significant weights were dropped. Table C-3 lists the 21 variables that were not included in the final set of independent variables, as well as the 21 variables that were included.

Table C-3. Disposition of 42 Independent Variables as a Result of Preliminary Hierarchical Regression Analyses (SSMP)

Selected Variables		Dropped Variables	
1	Weeks deployed	22	Weeks deployed squared
2	How long worked with most members of unit	23	Member TRADOC
3	Located OCONUS	24	Subjected to sexual harassment last 12 months
4	Member FORSCOM	25	Member Combat Arms Unit
5	Subjected to discrimination last 12 months	26	Usually works with unit to which assigned
6	Subjected to racial discrimination last 10 months	27	Assigned to USAREUR
7	Chain of command commitment against sexual harassment	28	Subjected to gender discrimination last 12 mos.
8	Leadership endorses policies against sexual harassment	29	Not deployed to select locations
9	Enlisted status	30	Deployed Southwest Asia (Aug 90 – Apr. 91)
10	Years of service	31	Deployed Bosnia (Dec. 95 – Present)
11	Gender (male)	32	Deployed elsewhere during time periods
12	Hispanic origin	32	Married status
13	Years of education	34	Spouse working in civilian job
14	Assigned to TDA unit	35	No. of dependent children
15	Member of minority group	36	Member support unit
16-21	Dummy variables for 2, 3, 4, 6,14 and 15	37	Time of administration
		38	Spouse living with soldier
		39	Spouse on active military duty
		40–42	Dummy variables for 24, 29, 39

The variable *weeks deployed squared* was dropped from the set of job-related independent variables after the first iteration. After all 42 of the independent variables were in the equations, the regression weights of weeks deployed and weeks deployed squared were positive and negative respectively in only 3 of the 20 equations. Moreover, the regression weight of weeks deployed squared was statistically significant (.001 level) in only 4 equations. Weeks deployed, on the other hand, had a significant weight in 8 of the equations (7 negative, 1 positive).

There was little indication that the time (Spring 97, Fall 97, or Spring 98) of the SSMP administration impacted the output measures. Time of administration did not significantly enter

any of the 20 equations and was dropped after the first iteration. Also dropped after the second iteration was a related dummy variable that takes account of differences in outcome measures between the two spring and one Fall administrations. All 21 of the independent variables that were not dropped were based on items that appeared in all three questionnaires.

Confirmatory regression analysis. Further analyses of the SSMP data were accomplished with three multiple regression analyses. Analyses of effects of weeks deployed and its square were based on the complete sample. The squared multiple correlations for these models are shown in the first two columns of Table C-4. The third regression model addressed the effects of weeks deployed and other predictors. The values of R^2 for these equations are shown in the final column of the table.

Table C-4. Squared Multiple Correlations of Confirmatory Regression Anslyses (SSMP)

Outcome Measures	1 Predictor (linear model)	2 Predictors (curvilinear model)	All Predictors
RETENTION			
Army career intentions	.0026*	.0044*	.4327*
Satisfaction with job fulfillment	.0001	.0019*	.1676*
Not concerned about having to leave Army	.0003	.0010*	.0678*
Satisfaction with overseas duty	.0000	.0018*	.0443*
READINESS			
Individual and unit readiness	.0108*	.0158*	.1246*
Smaller Army has no negative effect	.0042*	.0070*	.0506*
Satisfaction with equipment and supplies	.0057*	.0058	.0868*
Satisfaction with co-worker competence	.0015*	.0016	.0764*
Satisfaction with education/training access	.0123*	.0136*	.0736*
FAMILY FACTORS			
Satisfaction and time away from family	.0569*	.0570	.1206*
Satisfaction with services and family programs	.0069*	.0070	.0508*
Spouse supports making Army career	.0000	.0003	.1259*
FINANCIAL FACTORS			
Satisfaction with pay	.0002	.0019*	.1156*
Army will protect benefits/retirement	.0042*	.0045	.0565*
GENERAL SATISFACTION			
Satisfaction with overall quality of life	.0084*	.0084	.0749*
Morale with unit/self	.0013*	.0016	.1321*
Satisfaction with quality of leadership	.0006*	.0027*	.1427*
Army leadership makes best decisions	.0041*	.0041	.0529*
Satisfaction with regulation/discipline	.0026*	.0026	.0408*
Satisfaction with work tasking	.0250*	.0310*	.0919*

* Significant improvement in R^2, $p < .0001$

Three of the six dummy variables that were used to mark cases with missing values had no significant regression weights in any of the 20 outcome equations. Table C-5 shows the sign of the regression weight for the remaining three dummy variables. The dummy variable associated with the question concerning the chain of command's commitment to creating a workplace free of sexual harassment had significant negative weights in five outcome equations. Soldiers who failed to respond to the question tended to have lower satisfaction levels with the

quality of leadership at their place of duty and agreed less strongly that Army leadership will make the best decisions to maintain a quality Army. These soldiers also reported lower morale for their unit and themselves and less satisfaction with promotion/advancement and job fulfillment opportunities.

Table C-5. Sign of Multiple Regression Weights[a] of Dummy Variables with 20 Outcome Measures (SSMP Sample B)

Outcome Measure	Dummy Variable for		
	Subject to Discrimination Within Last 12 Months	Chain of Command Commitment against Sexual Harassment	Assigned to TDA Unit
RETENTION			
Army career intentions			–
Satisfaction with job fulfillment		–	
Not concerned about having to leave Army			
Satisfaction with overseas duty			
READINESS			
Individual and unit readiness			
Smaller Army has no negative effect			–
Satisfaction with equipment and supplies			
Satisfaction with co-worker competence			
Satisfaction with education/training access			+
FAMILY FACTORS			
Satisfaction with time away from family			
Satisfaction with services and family programs			
Spouse supports making Army career			
FINANCIAL FACTORS			
Satisfaction with pay		–	
Army will protect benefits/retirement	+		+
GENERAL SATISFACTION			
Satisfaction with overall quality of life			
Morale of unit/self		–	
Satisfaction with quality of leadership		–	
Army leadership makes best decisions		–	
Satisfaction with regulation/discipline			+
Satisfaction with work tasking	+		+

[a] All weights with signs indicated were significant at .0001 level.