

Naval Postgraduate School
Monterey, California 93943-5138



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March 2005



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Naval Postgraduate School

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PREFACE

This publication contains restricted abstracts (classified or restricted distribution) of theses submitted for the degrees Doctor of Philosophy, Master of Business Administration, Master of Science, and Master of Arts for the March 2005 graduation. Classified and restricted distribution abstracts are listed on the NPS SIPRnet.

This compilation of abstracts of theses is published in order that those interested in the fields represented may have an opportunity to become acquainted with the nature and substance of the student research that has been undertaken. Copies of theses are available for those wishing more detailed information. The procedure for obtaining copies is outlined on the last page of this volume.

For additional information on programs, or for a catalog, from the Naval Postgraduate School, contact the Director of Admissions.

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NPS Research, a tri-annual publication highlighting faculty and student research and *Summary of Research*, an annual publication of research projects and publications, are also available on-line.

INTRODUCTION

Mission

The Naval Postgraduate School (NPS) was established to serve the advanced educational needs of the Navy. The broad responsibility of the school is reflected in its stated mission:

Increase the combat effectiveness of U.S. and allied armed forces and enhance the security of the U.S.A. through advanced education and research programs focused on the technical, analytical, and managerial tools needed to confront defense related challenges of the future.

To fulfill its mission, the Naval Postgraduate School strives to sustain excellence in the quality of its instructional programs, to be responsive to technological change and innovation in the Navy, and to prepare officers to introduce and utilize future technologies.

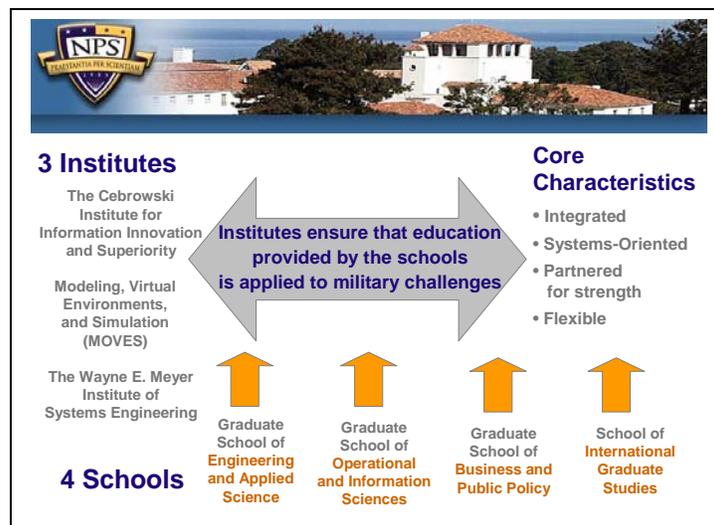
The research program at NPS exists to support the primary mission of graduate education. Research at NPS:

- maintains upper division course content and programs at cutting edge;
- challenges students with creative problem solving experiences on DoD relevant issues;
- advances DoN/DoD technology;
- solves warfare problems; and
- attracts and retains quality faculty.

Academic Programs

To meet its educational requirements, the Navy has developed a unique academic institution at the Naval Postgraduate School through the use of specially tailored academic programs, and a distinctive organization tying academic disciplines to naval and joint warfighting applications.

The Naval Postgraduate School has aligned its education and supporting research programs to achieve three major goals: 1) academic programs that are nationally recognized and support the current and future operations of the Navy and Marine Corps, our sister services, and our allies; 2) institutes that focus on the integration of teaching and research in direct support of the four pillars of Joint Visions 2010 and 2020 and their enabling technologies; and, 3) executive and continuing education programs that support continuous intellectual innovation and growth throughout an officer's career.



INTRODUCTION

Programs of Graduate Studies at NPS are grouped as follows:

Graduate School of Operational and Information Sciences

- Computer Science
- Computers and Intelligence (C4I) Systems
- Electronic Warfare Systems International
- Information Systems and Operations
- Information Systems and Technology
- Information Warfare
- Operations Analysis
- Operations Logistics
- Software Engineering
- Special Operations/Low Intensity Conflict

Graduate School of Engineering and Applied Sciences

- Combat Systems Science and Technology
- Electrical Engineering
- Electronic Systems Engineering
- Engineering Acoustics
- Meteorology
- Meteorology and Oceanography
- Naval/Mechanical Engineering
- Oceanography
- Operational Oceanography
- Reactors/Mechanical Engineering

Graduate School of Business and Public Policy

- Acquisition and Contract Management
- Contract Management
- Defense Systems Analysis
- Defense Systems Management (International)
- Financial Management
- Information Systems Management
- Leadership Education and Development
- Manpower Systems Analysis
- Material Logistics Support Management
- Program Management
- Resource Planning and Management for International Defense
- Supply Chain Management
- Systems Acquisition Management
- Transportation Management

School of International Graduate Studies

- Civil-Military Relations
- Defense Decision Making and Planning
- Homeland Security Leadership Development
- International Security: Post Conflict Security Building
- National Security and Intelligence
 - Europe/Russia/Central Asia
 - Far East/South-East Asia/Pacific
 - Middle East/Africa/South Asia
 - Western Hemisphere

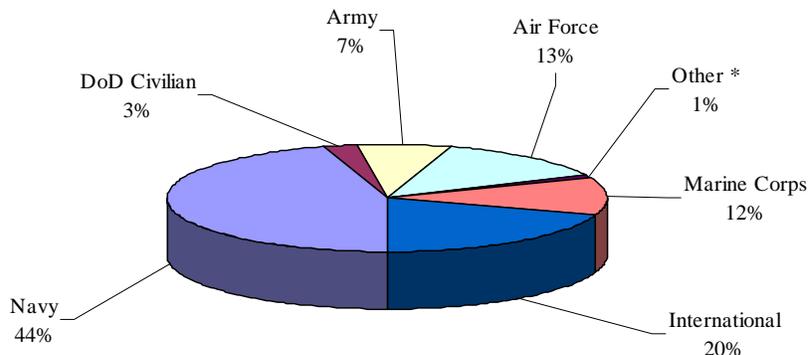
Interdisciplinary Curricula

- Modeling, Virtual Environments and Simulation
- Product Development
- Space Systems Engineering
- Space Systems Operations
- Space Systems Operations International
- Systems Engineering and Analysis
- Systems Engineering Management
- Undersea Warfare

Students

The student body consists of U.S. officers from all branches of the uniformed services, civilian employees of the federal government and military officers and government civilian employees of other countries. Resident degree/subspecialty student population for March 2005 is shown in Figure 1 on the following page.

INTRODUCTION



**Figure 1: Resident Degrees/Subspecialty Student Population for March 2005
(Total Enrollment: 1,544)**

* U.S. Coast Guard, U.S. Army National Guard, U.S. Army Reserve

Academic Degrees

Although the curricula are tailored to address defense requirements, they are developed within the framework of classical academic degrees, meeting the highest academic standards. Each curriculum leads to a Master's degree; however, additional study can lead to either an engineer's degree or the doctor's degree. Below is a listing of the degrees offered at NPS:

Master of Arts Degrees

National Security Affairs
Security Studies

Master of Business Administration

Executive MBA
Master of Business Administration

Master of Science Degrees

Applied Mathematics
Applied Physics
Applied Science
Astronautical Engineering
Combat Systems Technology
Computer Science
Contract Management
Defense Analysis
Electrical Engineering
Engineering Acoustics
Engineering Science
Information Systems and Operations
Information Technology Management
Leadership and Human Resource Development
Management
Materials Science and Engineering
Mechanical Engineering
Meteorology
Meteorology and Physical Oceanography
Modeling, Virtual Environments and Simulation
Operations Research
Physical Oceanography
Physics
Product Development
Program Management

Software Engineering

Space Systems Engineering
Space Systems Operations
Systems Engineering
Systems Engineering and Analysis
Systems Engineering Management
Systems Technology

Engineer Degrees

Astronautical Engineer
Electrical Engineer
Mechanical Engineer

Doctor of Philosophy

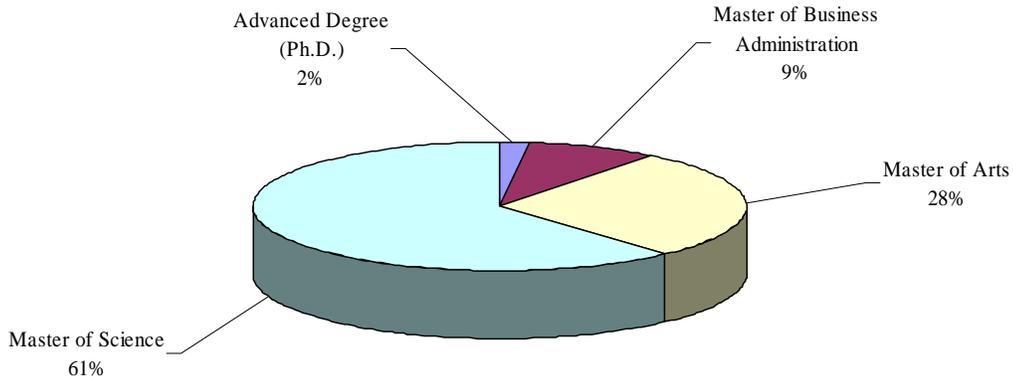
Applied Mathematics
Applied Physics
Astronautical Engineering
Computer Science
Electrical Engineering
Engineering Acoustics
Information Science
Mechanical Engineering
Meteorology
Modeling, Virtual Environments and Simulation
Operations Research
Physical Oceanography
Physics
Software Engineering

Doctor of Engineering

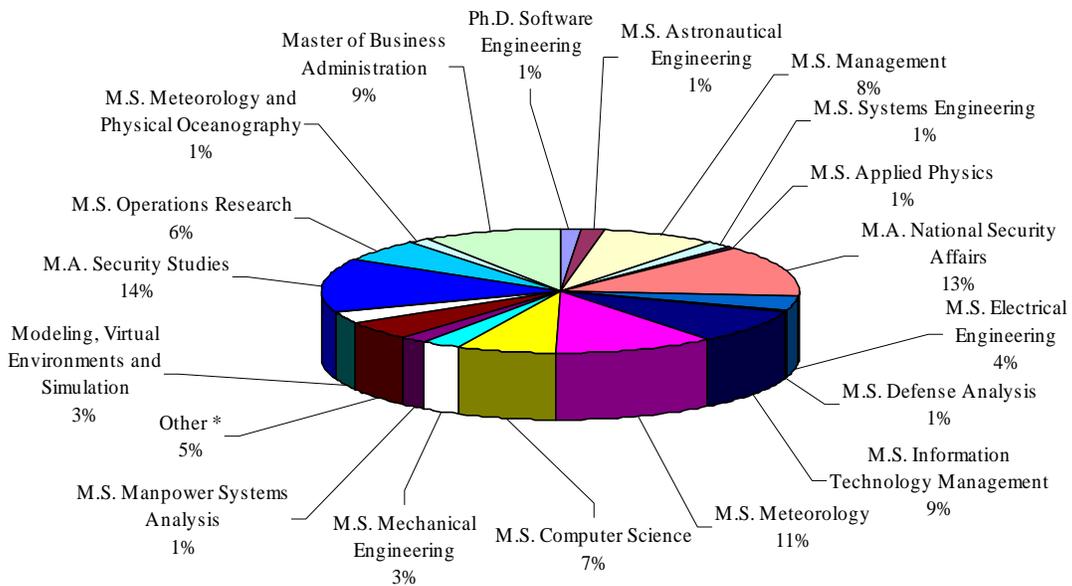
Astronautical Engineering
Engineering Acoustics
Mechanical Engineering

INTRODUCTION

There were 151 degrees conferred in March 2005. Figure 2 indicates the distribution of degree type; Figure 3 indicates the degree conferred.



**Figure 2. Distribution by Degree Type
(151 Degrees Conferred)**



**Figure 3. Degrees Conferred in March 2005
(151 Degrees Conferred)**

* Ph.D. Operations Research (1); M.A. International Security and Civil Military Relations (1); M.S. Information Systems (2); M.S. Information Systems and Operations (1); M.S. Leadership and Human Resource Development (1); M.S. Physical Oceanography (1); M.S. Product Development (1); M.S. Systems Engineering Management (1).

INTRODUCTION

Thesis

The thesis is the capstone achievement of the student's academic endeavor at NPS. Thesis topics address issues from the current needs of the Fleet and Joint Forces to the science and technology that is required to sustain long-term superiority of the Navy/DoD.

Students, with their faculty advisors, provide a very unique capability within the DoD for addressing warfighting problems. This capability is especially important at the present time when technology in general, and information operations in particular, are changing rapidly. Our officers must be able to think innovatively and have the knowledge and skills that will let them apply technologies that are rapidly being developed in both the commercial and military sectors. Their unique knowledge of operations, when combined with a challenging thesis project which requires them to apply their focused graduate education, is one of the most effective methods for both solving Fleet/Joint Force problems and instilling the life-long capability for applying basic principles to the creative solution of complex problems.

NPS is unique in its ability to conduct classified research. Restricted theses are available on the NPS SIPRNET.

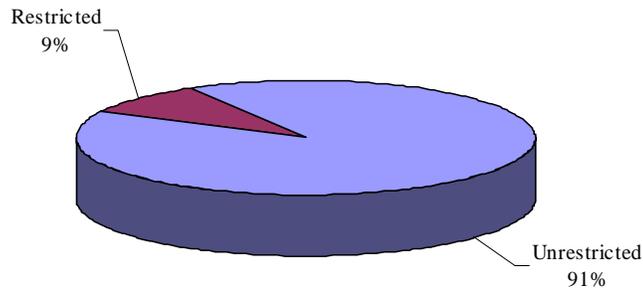


Figure 4. Classification of Theses

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ADVANCED DEGREES

Doctor of Philosophy

DOCTOR OF PHILOSOPHY

CHANCE-CONSTRAINED MISSILE-PROCUREMENT AND DEPLOYMENT MODELS FOR NAVAL SURFACE WARFARE

Ittai Avital-Lieutenant Commander, Israel Navy

B.S., Hebrew University of Jerusalem, 1995

M.S., Tel Aviv University, 2002

M.S., National University of Singapore, 2004

M.S., Naval Postgraduate School, 2004

Doctor of Philosophy in Operations Research-March 2005

Advisors: R. Kevin Wood, Department of Operations Research

Moshe Kress, Department of Operations Research

The problem of minimum-cost procurement and allocation of anti-ship cruise missiles to naval combat ships is modeled as a two-period chance-constrained program with recourse. Discrete scenarios in two periods define “demands” for missiles (i.e., targets and number of missiles required to kill those targets), which must be met with acceptable probabilities. After the first combat period, ships may replenish their inventories from a depot, if the depot’s inventory suffices. A force commander assigns targets to ships based on missile load-outs and target demands.

The deterministic-equivalent integer program solves too slowly for practical use. A specialized decomposition algorithm is proposed and implemented in MATLAB, which solves the two-period model via a series of single-period problems. The algorithm yields optimal solutions for a wide range of missile-allocation directives, and usually near-optimal solutions otherwise. Researchers exploit the fact that each single-period problem is a probabilistic integer program whose solution must be a p-efficient point (PEP) of that period’s demand distribution. The algorithm uses PEP-enumeration techniques developed by Beraldi and Ruszczyński, and a specialized algorithm from Kress, Penn, and Polukarov. The algorithm solves real-world problem instances in a few minutes or less.

KEYWORDS: Inventory Models, Target Assignment, Stochastic Programming, Probabilistic Programming

DEVELOPING DEPENDABLE SOFTWARE FOR A SYSTEM-OF-SYSTEMS

Dale Scott Caffall-DoD Civilian

B.S., University of Arizona, August 1986

M.S., Naval Postgraduate School, 2003

Doctor of Philosophy in Software Engineering-March 2005

Advisor: James Bret Michael, Department of Computer Science

Capturing and realizing the desired system-of-systems behavior in traditional natural language development documents is a complex issue given that the legacy systems in a system-of-systems exhibit independent behaviors. As a result of a development strategy of interconnecting systems, the emergent behavior of the system-of-systems cannot be predicted. In this consideration of dependable software for a system-of-systems, a case study of the Ballistic Missile Defense System is used to study the development of architectural views, distributed-system and real-time design considerations, components, contract interfaces, and the application of formal methods in system-of-systems specifications. Researchers developed a prototype of the battle manager and demonstrated a slice of the formal model of the battle

DOCTOR OF PHILOSOPHY

manager. Given the technical contributions of this research, it is concluded that it is possible to develop an architecture from which one can reason about the controlling software for a system-of-systems. Furthermore, the controlling software for a system-of-systems can be realized through the concepts of component-based software engineering. Finally, formal methods in the design and development of the controlling software for a system-of-systems can be applied by specifying the requirements for the software components with assertions and by employing a runtime-verification tool to verify the desired behavior as specified by the assertions.

KEYWORDS: System-of-Systems, Dependable Systems, Trustworthy Systems, Architecture, Distributed Computing, Real-Time Systems, Component-Based Software Engineering, Kernel, Formal Methods, Assertions, Model Checking

IMPROVING SOFTWARE QUALITY AND MANAGEMENT THROUGH THE USE OF SERVICE LEVEL AGREEMENTS

Leonard T. Gaines-Commander, United States Navy

B.S., University of Nevada, 1986

M.S., Naval Postgraduate School, 2000

M.S., Industrial College of the Armed Forces, 2004

Doctor of Philosophy in Software Engineering-March 2005

Advisor: James Bret Michael, Department of Computer Science

In this dissertation, the use of service level agreements (SLA) to improve the quality and management of software-intensive systems is explored. SLAs are typically used in outsourcing contracts for post-production support. Researchers propose that SLAs be used in software acquisition to support quality and process control throughout the lifecycle (requirements engineering through post-production support) of a software-intensive system. The hypothesis is tested using two methodologies. The first method explains how SLAs could be used throughout a system's lifecycle to improve software quality. This concept is validated by a survey of information technology (IT) professionals. The results of the survey indicate that practitioners in the IT field felt that SLAs could be used to improve overall quality in the development effort and in the end product. The second approach is to develop actual SLAs for a specific lifecycle phase (post-production) to illustrate the concepts of SLAs and to demonstrate their value as a quality control and management tool.

KEYWORDS: Software Engineering, Software Metrics, Software Management, Software Acquisition, Service Level Agreements, Software Quality

**MASTER
OF
BUSINESS ADMINISTRATION**

MASTER OF BUSINESS ADMINISTRATION

ANALYSIS OF THE PREDICTIVE ACCURACY OF THE RECRUITER ASSESSMENT BATTERY

**John H. Briggs-Lieutenant, United States Navy
B.S., Tennessee Technological University, 1997
Master of Business Administration-March 2005**

**Advisors: Stephen L. Mehay, Graduate School of Business and Public Policy
Mark J. Eitelberg, Graduate School of Business and Public Policy
Kathryn Kocher, Graduate School of Business and Public Policy**

The Recruiter Assessment Battery (RAB) is a predictive test being developed by Navy Personnel Research Studies and Technology (NPRST) to aid in the selection of U.S. Navy recruiters. This thesis analyzes the predictive accuracy of the RAB. Data were gathered from Commander, Navy Recruiting Command (CNRC) and the Defense Manpower Data Center (DMDC) for a sample of recruiters on duty in 2003. Data on the recruiters' RAB score, monthly production, and Naval Recruiting District (NRD) characteristics were obtained from Commander, Navy Recruiting Command (CNRC). Demographic information on the recruiters was obtained from DMDC. Multivariate models were estimated to determine the effects of the RAB score on the average monthly production of recruiters. The results of the models showed that the RAB score is positively correlated with recruiter productivity. The models also indicated that neither NRD characteristics nor personal demographic characteristics affected the relationship between the RAB score and recruiter production. The results of the study suggest that the RAB can be used to predict recruiter productivity. Further research should be conducted on implementing the RAB in the recruiter selection process. Additionally, the relationship of RAB score to recruiter productivity and personal demographic characteristics should be investigated more extensively.

KEYWORDS: Recruiting, Recruiter Selection, Recruiter Assessment Battery

STUDY OF THE DEPARTMENT OF DEFENSE STUDENT TESTING PROGRAM

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Master of Business Administration-March 2005**

**Advisor: Mark J. Eitelberg, Graduate School of Business and Public Policy
Second Reader: Stephen L. Mehay, Graduate School of Business and Public Policy**

This study evaluates selected features of the Armed Services Vocational Aptitude Battery (ASVAB) Career Exploration Program (CEP) and its contributions to Navy recruiting. The ASVAB-CEP is a Department of Defense program created in 1968, operating in 12,598 high schools throughout the nation as of 2004. ASVAB-CEP data for all military services (1998-2004) were examined, along with previous studies and literature on the program. An online survey was developed and administered to Navy Recruiters-in-Charge (RINC). Results show a steady decline of high school juniors and seniors tested, high schools tested, recruiter leads, and accessions. Survey results indicate that RINC's are generally positive regarding the program as a source of leads and in gaining access to schools, but question the value in testing sophomores. Several recommendations are offered to improve the program. In addition, further research is recommended.

KEYWORDS: ASVAB, CEP, STP, Leads, Accessions, Recruits, Recruiters-in-Charge, RINC's, AFQT, Testing, High School Students

MASTER OF BUSINESS ADMINISTRATION

MINORITY PERCEPTIONS OF OPPORTUNITIES AND INTENTIONS TO STAY IN THE NAVY

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Master of Business Administration-March 2005

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This thesis investigates how perceptions of military opportunities affect the intentions of racial/ethnic minorities to remain in the U.S. Navy. The study uses responses of Navy personnel on the 1996 Armed Forces Equal Opportunity Survey to assess minority perceptions of equal opportunity. Logistic regression models are developed for male and female enlisted personnel and officers to determine the relationship between perceptions that opportunities are better in the military and the decision to stay on active duty or leave the Navy. The results of the quantitative analysis show that the positive perceptions about training opportunities and quality of life were most often significant, across all racial/ethnic groups and models. Further, the results show that among racial/ethnic groups, blacks were most strongly influenced by perceptions in their retention plans. It is recommended that further research examine the relationship between racial/ethnic group and job assignments, or selection, along with the corresponding impact on perceptions and the effect of visible versus non-visible minority status on views of equal opportunity in the military.

KEYWORDS: Equal Opportunity, Manpower Policy, Perceptions, Retention

COMPARISON OF RETENTION CHARACTERISTICS OVER TIME: EVIDENCE FROM THE 1992 AND 1999 DEPARTMENT OF DEFENSE SURVEY OF ACTIVE DUTY PERSONNEL

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This thesis compares characteristics that influence intended stay/leave behavior of non-prior service junior Naval officers from two different time periods. Samples from the 1992 and 1999 Department of Defense Surveys of Active Duty Personnel are used for this analysis, focusing on officers under the rank of lieutenant with less than six years of active duty service. Metrics for important determinates of retention are constructed using similar questions from both surveys. Logistic regression is used to identify significant influences on retention intentions in both survey years.

Two composite dimensions positively affected retention intentions in both survey years: satisfaction with Service Attributes and satisfaction with Present Employment Attributes. Being female negatively affected retention intentions in both surveys. The minority variable, black, the number of Permanent Change of Station (PCS) moves, and having debts greater than \$7,500 positively affected retention intentions, while being stationed onboard a ship, probability of finding a civilian job, and the composite dimension, satisfaction with Future Employment Attributes, negatively affected retention intentions in 1992. Influence from a significant other and the number of hours worked positively affected retention in 1999.

Monetary variables were highly significant for retention intentions in 1992 but not in 1999. It is likely that the force drawdown, base closures, and a weak economy in 1992 explain these differences.

KEYWORDS: Navy, Officer, Retention, Females

MASTER OF BUSINESS ADMINISTRATION

ANALYZING THE ASSIGNMENT OF ENLISTED RECRUITING GOAL SHARES VIA THE NAVY'S ENLISTED GOALING AND FORECASTING MODEL

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Master of Business Administration-March 2005

**Advisors: Stephen L. Mehay, Graduate School of Business and Public Policy
Tom Means, Department of Economics, San Jose State University**

This thesis examines the process by which enlisted goal shares are generated by Commander, Navy Recruiting Command (CNRC) and assigned to Navy Regional recruiting commands. Through use of an econometric goaling and forecasting model employed by CNRC and a less complicated weighting system used by Regions, goal shares are generated using factors believed to accurately predict future recruiting success. The factors used in the new contract prediction model include local economic conditions, population demographics, and recruiting resources. This thesis evaluates these factors to obtain a clear understanding of how each affects the establishment of goal shares. The various levels within the recruiting organization are analyzed, including a discussion on how each of these levels prioritizes assigned goals, specifically accessions and new contract objectives, and the reasons why these priorities differ across levels within the organization. The thesis analyzes the role of past production data and Production per Recruiter (PPR) in establishing goal. Recruiter incentives and potential impacts of these incentives on the attainment of quality contracts are also discussed. Finally, the accuracy of CNRC forecasts is evaluated and recommendations are made to help ensure the continued success of these forecasts well into the future. This thesis finds CNRC's goaling forecasts to be quite accurate; however, with more precise data for a few specific variables within the goaling model, it is believed the accuracy of forecasts could be improved. Additionally, this thesis finds that due to current recruiter incentives, recruiters may not be motivated to contract the best possible candidates for enlistment at all times.

KEYWORDS: Recruiting, Enlisted Recruiting, Enlisted Goaling, Enlisted Supply, Recruiter Incentives, ERIS, Production per Recruiter, PPR, Recruit Forecasting, Attrition, CNRC, Recruiting Region, Navy Recruiting District, NRD

COST BENEFIT ANALYSIS OF GOVERNMENT FURNISHED EQUIPMENT VERSUS CONTRACT FURNISHED EQUIPMENT FOR THE PROCUREMENT AND INTEGRATION OF THE MK-44 CHAIN GUN WITH THE UNITED STATES MARINE CORPS EXPEDITIONARY FIGHTING VEHICLE

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Master of Business Administration-March 2005

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Master of Business Administration-March 2005

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The Direct Reporting Program Manager (DRPM) for the United States Marine Corps Expeditionary Fighting Vehicle (EFV) is conducting an analysis of two acquisition tactics concerning the commercial procurement of the MK-44 chain gun to be integrated with the EFV. General Dynamics (GD) manufactures the EFV and the MK-44 is manufactured by Alliant Techsystems, Inc. (ATK). The purpose of this thesis is to assist the DRPM in determining which of two tactics the government should use for the procurement of the MK-44. The two alternatives for acquiring and integrating the MK-44 are to procure it as government furnished equipment (GFE) or as contractor furnished equipment (CFE). The fundamental difference is that a GFE arrangement will provide a direct contractual relationship between the government and ATK, whereas a CFE contract will eliminate that relationship, as ATK will become a sub-contractor to GD, the prime contractor for the EFV. These two options present a variety of issues for analysis in determining which approach is most advantageous to the government with respect to cost and other risks.

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KEYWORDS: Marine Corps, Expeditionary Fighting Vehicle, Advanced Amphibious Assault Vehicle Program, AAV, Direct Reporting Program Manager EFV, Program Management, Government Furnished Equipment and Contract Furnished Equipment Analysis, Chain Gun, General Dynamics, Alliant Techsystems, Inc.

DEVELOPING A MARKOV MODEL TO BE USED AS A FORCE SHAPING TOOL FOR THE NAVY NURSE CORPS

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Master of Business Administration-March 2005

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Master of Business Administration-March 2005

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Second Reader: Kathryn Kocher, Graduate School of Business and Public Policy

A Markov Model is used to determine the number of nurses the Navy must gain each year in order to maintain desired end strength. Significant characteristics affecting career progression of individuals in the Navy Nurse Corps are identified. The characteristic of primary concern, accession source, is determined to be significant. Markov models are created to identify personnel flow from ENS through LCDR. The models' end-strength projections for 2006-2009 are then compared to Nurse Corps targeted end-strengths for this same period. Several scenarios are run to minimize overages and underages in rank distribution. Optimization is achieved by changing both the distribution of accession sources and the distribution of recruited ranks. Optimal distribution of accession source and rank are dependant upon the degree of acceptable deviation from these targets. As stated above, researchers were not able to acquire this information, limiting the ability to accurately forecast optimized distribution of accession source or rank. The Markov Model demonstrates that the Nurse Corps' current business practices optimize accessions for two-year projections. Increasing variation between the current force structure plan and the models' projections suggests that greater efficiency could be obtained in the out-years. This Markov Model provides a tool for improving extended forecasts.

KEYWORDS: Markov Model, Nurse Corps Manpower, Manpower Planning, Solver, Overages, Underages, Accession Source

THE RETENTION OF FEMALE UNRESTRICTED LINE OFFICERS

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William R. Bowman, United States Naval Academy

This thesis analyzes the retention of female Naval officers, focusing on the relationship between officer selection metrics and retention beyond minimum service obligation and the effect of lateral transfers on the retention of junior officers in the Unrestricted Line. The retention analysis utilizes data from Naval Academy cohorts 1988-1991, while the lateral transfer analysis uses data from officer cohorts 1986-1991. This information is available through the Officer Promotion History File. The retention analysis focuses on whether the elements of the Naval Academy's Whole Person Multiple (WPM) are valid predictors of graduation and fleet retention beyond minimum service requirement for female officers. Results indicate that the WPM is generally a poor predictor of female graduation and retention, a result that is contrary to previous research that used mixed gender or male-only samples. Only the Math SAT, English/Math teacher recommendation score, and athletic/non-athletic extra-curricular activities score have positive and significant relationships with retention beyond minimum service requirement. Thus, it is recommended that the Naval Academy Admissions Board develop a revised selection metric for females in order to select and commission female officers with a greater propensity for career service. The lateral transfer analysis

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seeks to determine the characteristics of officers in the Navy's lateral transfer system. Results reveal that women are more likely than men to transfer from Unrestricted Line to Restricted Line communities. This higher likelihood of lateral transfer for women is considered a major contributor to the low retention of female officers in Unrestricted Line communities.

KEYWORDS: Female Officer Retention, U.S. Naval Academy Admissions, Whole Person Multiple, Lateral Transfer

EFFECT OF INCREASED OPERATIONAL TEMPO (POST 9/11) ON THE RETENTION RATE OF HOSPITAL CORPSMEN

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Master of Business Administration-March 2005

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The purpose of this thesis is to explore the effect of increased operational tempo on the retention behavior of Navy Hospital Corpsmen in pay grades E1-E6. Two data files are obtained from the Defense Manpower Data Center, one for first term personnel on active duty on 1 September 1998 and who were eligible to reenlist/separate prior to 11 September 2001, and another for those on active duty on 11 September 2001 and who were eligible to reenlist/separate prior to March 2004. The two groups differ significantly in demographics and military background characteristics.

A logistic regression model incorporating individual and organizational factors affecting retention is estimated for each group. Model results indicate that personnel who have been deployed regardless of whether they were assigned to sea- or shore-type duty and regardless of the frequency of deployments are more likely to remain on active duty than those assigned to shore-type duty and who have not deployed. Additionally, willingness to serve appears to intensify during periods of conflict. Women were significantly more likely to reenlist than men in 2001, though this was not the case in 1998. The effects of occupational specialty also differed between the two periods.

KEYWORDS: Retention, Operational Tempo, Enlisted, Hospital Corpsmen, Turnover

ANALYSIS AND TESTING OF A DIGITIZED APPLICATION FOR U.S. NAVY OFFICER RECRUITING

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Master of Business Administration-March 2005

Advisor: Mark J. Eitelberg, Graduate School of Business and Public Policy

Second Reader: Douglas E. Brinkley, Graduate School of Business and Public Policy

This thesis describes the analysis, development, and testing of a new, digitized format for the Naval Nuclear Officer application. The methodology consists of creating a beta officer application CD that is tested in the eight Naval Recruiting Districts (NRDs) within Region West. Online surveys are conducted with Navy recruiters at the NRD level to gauge satisfaction with the current application process and solicit feedback. The effectiveness of the application CD is analyzed using the responses of the surveys. The results indicate that most officer recruiters in Region West think the CD is an overall improvement over the current application format. The application CD format merits further exploration and development based on the positive results of the surveys and beta-testing. In the short term, Commander, Navy Recruiting Command (CNRC), should provide online support, including a web site, to aid officer application processing. Further, CNRC should seek to simplify and streamline the officer application forms.

KEYWORDS: Recruiting Application, Digital Application Format, Digitized Application, Web-Based Application, CD-ROM Format, U.S. Navy Officer Recruiting, Recruiter Application Satisfaction, Web-Based Surveys, Human Factors Principles

MASTER OF BUSINESS ADMINISTRATION

AFFILIATION OF NAVAL VETERANS WITH THE SELECTED RESERVE IN THE 21ST CENTURY

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CDR Suzanne Bosque, USN, Graduate School of Business and Public Policy

This thesis analyzes the factors that influence the decision of first-term Naval Veterans (NAVETs), who are eligible for reenlistment, to choose to affiliate with the Selected Reserve (SELRES). Multivariate logit models of the determinants of affiliation are specified and estimated using data on active Navy separations and Navy Reserve accessions during the period between 1990 and 2002. A data set was provided by the Defense Manpower Data Center that permitted analysis of the affiliation decisions of 388,637 NAVETs. Some of the features in the maximum likelihood logit models include the use of rating groups to determine differences in affiliation patterns by occupational categories, determining differences over various time periods, and looking at pay and unemployment rate elasticities across rating groups. Overall, NAVET affiliation in the SELRES is found to depend upon Reserve pay, unemployment rates, census region, gender, race, marital status, dependents, age at time of separation from active duty, education, mental category, and Navy rating. More specifically, the findings indicate that technical ratings are more responsive to changes in pay than non-technical ratings and that affiliation increases with increases in the local area unemployment rate. Various time periods are analyzed to determine if the drawdown years of the early 1990s differed from the rest of the sample, and to determine if differences existed during and after the “dot.com” boom of the late 1990s. In both cases, the results indicate that the impact of various determinants differed significantly across these different years. Females, blacks, and Hispanics were more likely to affiliate, while those NAVETs who are married, have children, and are older are less likely to affiliate. Finally, there is a significant regional effect in the probability of affiliation.

KEYWORDS: Naval Reserve, Affiliation, Reserve Recruiting, Naval Veterans, NAVET, Manpower, Human Capital Strategy

MASTER OF SCIENCE

Applied Physics
Astronautical Engineering
Computer Science
Defense Analysis
Electrical Engineering
Information Systems and Operations
Information Technology Management
Leadership and Human Resource Development
Management
Mechanical Engineering
Meteorology
Meteorology and Physical Oceanography
Modeling, Virtual Environments and Simulation
Operations Research
Physical Oceanography
Product Development
Systems Engineering
Systems Engineering Management

MASTER OF SCIENCE IN APPLIED PHYSICS

LIGHT EMITTING POLYMERS ON FLEXIBLE SUBSTRATES FOR NAVAL FIREFIGHTING APPLICATIONS

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Master of Science in Applied Physics-March 2005

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Second Reader: Peter Crooker, Department of Physics

Display technologies in the current market range from the simple and cheap incandescent bulb behind a graphic overlay to the upwardly expensive flat panel, high definition plasma display. To provide a foundation of understanding for Light Emitting Polymers (LEP), samples are imaged in a scanning electron microscope. This is performed to identify a potential method for answering questions on polymer charge mobility and diffusion mechanisms, which are currently unknown. Light Emitting Polymer displays offer a viable alternative to the active matrix style, when an application calls for information to be sent in a simple visible format. By using the flexibility of the fabrication process, LEP displays can be applied to offer a low cost, lightweight, and durable means of communicating information during shipboard damage control and firefighting. A unique screen-printing method is used, in collaboration with Add-Vision, to produce a prototype that is designed, fabricated, and tested for use in Naval shipboard firefighting evolutions. The application of the LEP technology to shipboard damage control is motivated by the experience gained from being both the Officer in Charge of a Naval Firefighting School and from time in the Fleet as a Damage Control Officer.

KEYWORDS: Light Emitting Polymers, Flexible Substrates, Firefighting, Screen Printing

MASTER OF SCIENCE IN ASTRONAUTICAL ENGINEERING

INVESTIGATION OF TRANSIENT PLASMA IGNITION FOR A PULSE DETONATION ENGINE

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Elimination or reduction of auxiliary oxygen use in Pulse Detonation Engines (PDEs) is necessary if the technology is to compete with existing Ramjet systems. This thesis investigates a Transient Plasma Ignition (TPI) system and finds that the technology can at least reduce and may be able to completely remove the auxiliary oxygen requirement of current PDE systems. TPI is tested and compared with a traditional capacitive discharge spark plug system in a dynamic flow, ethylene/air mixture combustor. Ignition delay time, Deflagration-to-Detonation Transition (DDT) distance and time, detonation wave speed, and fire success rate performance are analyzed for various mass flow rates and stoichiometric ratios. A transient plasma dual-electrode concept was also employed and analyzed.

Results show that TPI is more effective and reliable than spark plug ignition with considerable improvements to DDT performance. The TPI dual-electrode concept is proven to be the most effective configuration with average reductions in DDT distance and time of 17% and 41% respectively when compared to the capacitive discharge spark plug system configuration.

KEYWORDS: Pulse Detonation Engines, PDE, PDE Ignition, Transient Plasma Ignition, Pseudo-spark Discharge

FUEL OPTIMAL LOW THRUST TRAJECTORIES FOR AN ASTEROID SAMPLE RETURN MISSION

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This thesis explores how an Asteroid Sample Return Mission might make use of solar electric propulsion to send a spacecraft on a journey to the asteroid 1989ML and back. It examines different trajectories that can be used to get an asteroid sample return or similar spacecraft to an interplanetary destination and back in the most fuel-efficient manner. While current plans call for keeping such a spacecraft on the asteroid performing science experiments for approximately 90 days, it is prudent to inquire how lengthening or shortening this time period may affect mission fuel requirements. Using optimal control methods, various mission scenarios are modeled and simulated. The results suggest that the amount of time that the spacecraft may spend on the asteroid surface can be approximated as a linear function of the available fuel mass. Furthermore, it can be shown that as maximum available thrust is decreased, the radial component of the optimal thrust vector becomes more pronounced.

KEYWORDS: Low Thrust, Solar Electric Propulsion, Optimal Design, Trajectory Design, Ion Thruster, Asteroid Rendezvous

MASTER OF SCIENCE IN COMPUTER SCIENCE

UNDERWATER ACOUSTIC COMMUNICATIONS: EVALUATION OF THE IMPACT OF MEDIA ACCESS CONTROL ON LATENCY IN A DELAY CONSTRAINED NETWORK

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Geoffrey Xie, Department of Computer Science

Second Reader: John Gibson, Department of Computer Science

This thesis presents an evaluation of the performance, in terms of throughput and latency, of two Media Access Control (MAC) mechanisms in Underwater Acoustic Networks (UANs), using a model designed in the commercial-off-the-shelf (COTS) simulation tool OPNET 10.5. The carrier sense multiple access with collision avoidance is the predominant approach for implementing the MAC mechanism in UANs. However, the underwater acoustic environment is characterized by extreme propagation delays and limited bandwidth, which suggests that an Aloha-like scheme may merit consideration. The performance of these two schemes is compared with respect to two topologies: tree and grid. The results show that an Aloha-like scheme that does not segment messages outperforms the contention-based scheme under all load conditions, in terms of both throughput and latency, for the two topologies. This thesis is the first to establish that Aloha-like MAC mechanisms can be more than a limited alternative for lightly loaded networks; more specifically, they can be the preferred choice for an environment with large propagation delays.

KEYWORDS: Underwater Acoustic Networks, Network Simulation, Network Latency, End-to-End Delay, Media Access Control, Link Layer, Delay Constrained Network

REMOTE APPLICATION SUPPORT IN A MULTILEVEL ENVIRONMENT

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The use of specialized single-level networks in current military operations is inadequate to meet the need to share information envisioned by the Global Information Grid (GIG). Multilevel security (MLS) is a key Information Assurance enabler for the GIG vision. The Monterey Security Architecture (MYSEA), a distributed MLS network, eliminates the need to use separate equipment to connect to many networks at different classification levels. It allows users to view data at different sensitivities simultaneously. MYSEA also allows commercial software and hardware to be used at clients.

To address the threat of residual data on the client after a user session change in security state, the MYSEA clients are required to be "stateless," i.e., there is no non-volatile writable memory. Hence the MYSEA server must provide the clients with the ability to execute server-resident client-side applications to access data at different security levels over the MLS Local Area Network (LAN). The MYSEA server currently does not support such capability. This thesis addresses this limitation. A new trusted process family is introduced to provide a pseudo-socket interface for the single level remote application to access the MLS LAN interface. Detailed design specifications were created to facilitate implementation of the remote application support.

KEYWORDS: Multilevel Security, MLS, Information Assurance, IA, Monterey Security Architecture, MYSEA, Client-Side Remote Application, Trusted Remote Session Management

COMPUTER SCIENCE

IMPLEMENTATION OF DATA FLOW QUERY LANGUAGE ON A HANDHELD DEVICE

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Handheld devices have evolved significantly from simple organizers to more powerful handheld computers that are capable of network connectivity, giving them the ability to send e-mail, browse the World Wide Web, and query remote databases. However, handheld devices, because of their design philosophy, are limited in terms of size, memory, and processing power compared to desktop computers.

This thesis investigates the use of Data Flow Query Language (DFQL) in querying local and remote databases from a handheld device. Creating Standard Query Language (SQL) queries can be a complex undertaking; and trying to create one on a handheld device with a small screen only adds to its complexity. However, by using DFQL, the user can submit queries with an easy-to-use graphical user interface.

Although handheld devices are currently more powerful than earlier PCs, they still require applications with a small footprint, which is a limiting factor for software developed. This thesis also investigates the best division of labor between handheld devices and remote servers.

KEYWORDS: Standard Query Language, SQL, Data Flow Query Language, DFQL, .NET Compact Framework, Object Oriented Programming, Wireless Network Communication, Handheld Application

BUILDING A SIMULATION TOOLKIT FOR WIRELESS MESH CLUSTERS AND EVALUATING THE SUITABILITY OF DIFFERENT FAMILIES OF AD HOC PROTOCOLS FOR THE TACTICAL NETWORK TOPOLOGY

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Wireless mesh networking has emerged as the successor of the traditional ad hoc networks. New technological advances, the standardization of protocols and interfaces, and the maturity of key components have made it possible for current mesh research groups to set goals that are close to the world's expectations. The objective of this research is to design and implement a simulation toolkit for wireless mesh clusters that can be used as an additional performance evaluation technique for the Tactical Network Topology program of the Naval Postgraduate School. This toolkit is implemented in the OPNET simulation environment and incorporates various nodes running different ad hoc routing protocols. Furthermore, investigation of a suitable combination of protocols for the Tactical Network Topology is achieved by creating scenarios and running a number of simulations using the mesh toolkit.

KEYWORDS: Ad Hoc Networking, MANET, Wireless Mesh Networks, OLSR, DSR, AODV, Tactical Network Topology, OPNET, IEEE 802.16, DOCSIS, Network Modeling and Simulation

AN ANALYSIS OF DISC CARVING TECHNIQUES

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Second Reader: George Dinolt, Department of Computer Science

Disc carving is an essential element of computer forensic analysis. However the high cost of commercial solutions, coupled with the lack of availability of open source tools to perform disc analysis, has become a

hindrance to those performing analysis on UNIX computers. In addition, even expensive commercial products offer only a fairly limited ability to “carve” for various files.

In this thesis, an open source tool known as Foremost is modified to address the need for such a carving tool in a UNIX environment. An implementation of various heuristics for recognizing file formats is demonstrated, as well as the ability to provide some file system specific support.

As a result of these implementations, a revision of Foremost is provided that will be made available as an open source tool to aid analysts in their forensic investigations.

KEYWORDS: Computer Forensics, Disc Carving, Data Carving

API DEVELOPMENT FOR PERSISTENT DATA SESSIONS SUPPORT

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Advisors: Su Wen, Department of Computer Science

Arijit Das, Department of Computer Science

This thesis studies and discusses the development of the API, called the persistency API, for supporting the persistent data sessions. Without persistent session support, network applications often need to be restarted from the beginning when intermittent physical connection loss happens. Application programmers can use the persistency API to achieve service continuity. The persistency API provides the interface that allows a program to continue to retrieve data from the point the connection is lost after the physical connection is restored. The focus of this thesis is to develop a generalized persistency API that supports various types of applications. This thesis studies the persistent session support for two types of transport protocols, TCP and UDP, which are used by major network applications. An application that performs text file and video file transfer is implemented to demonstrate the persistent data transfer sessions for TCP and UDP, respectively. The study shows that the proposed APIs can support the data transfer continuity in the reconnection process.

KEYWORDS: Persistency API, M-TCP, UDP, TCP, PFTP

EVALUATION OF EMBEDDED FIREWALL SYSTEM

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The performance aspect and security capabilities of Embedded Firewall (EFW) system are studied in this thesis. EFW is a host-based, centrally controlled firewall system consisting of network interface cards and “Policy Server” software. A network consisting of EFW clients and a Policy Server is set up in the Advanced Network Laboratory of the Naval Postgraduate School. The Smartbits packet generator is used to simulate realistic data transfer environment. The evaluation is performed centered on two main categories: performance analysis and security capability tests. TTCP program and a script written in TCL are used to perform throughput and packet loss tests respectively. Penetration and vulnerability tests are conducted in order to analyze the security capabilities of EFW. Symantec Personal Firewall is used as a representative application firewall for comparing test results. This study shows that EFW has better performance, especially in connections with high amounts of encrypted packets, and is more effective in preventing insider attacks. However, current implementation of EFW has some weaknesses, such as not allowing sophisticated rules that application firewalls usually allow. It is recommended that EFW be used as one of the protection mechanisms in a defense-in-depth concept, consisting of application firewalls, intrusion detection systems, and gateway protocols.

KEYWORDS: Firewall, Embedded Firewall, Firewall Evaluation, Firewall Performance, Defense-in-Depth

ARCHITECTURES FOR DEVICE AWARE NETWORK

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In today's heterogeneous computing environment, a wide variety of computing devices with varying capabilities need to access information in the network. The existing network is not able to differentiate different device capabilities and indiscriminately sends information to the end-devices without regard to the ability of the end-devices to use the information.

The goal of a device-aware network is to match the capability of the end-devices to the information delivered, thereby optimizing the network resource usage. In the battlefield, all resources – including time, network bandwidth, and battery capacity – are very limited. A device-aware network avoids the waste that happens in current, device-ignorant networks. By eliminating unusable traffic, a device-aware network reduces the time the end-devices spend receiving extraneous information, and thus saves time and conserves battery-life.

In this thesis, two potential DAN architectures, Proxy-based and Router-based approaches, are evaluated based on the key requirements identified. To demonstrate the viability of DAN, a prototype is built using a hybrid of the two architectures. The key elements of the prototype include a DAN browser, a DAN Lookup Server, and a DAN Processing Unit (DPU). Researchers demonstrate how the architecture can enhance the overall network utility by ensuring that only appropriate content is delivered to the end devices.

KEYWORDS: Device Aware Network, Content Re-Purposing, Heterogeneous Device, Capability Matching, Web Proxy, Web Browser, Device Profile

MASTER OF SCIENCE IN DEFENSE ANALYSIS

STRATEGIC PSYCHOLOGICAL OPERATIONS (PSYOP) MANAGEMENT: A MARKETING MANAGEMENT APPROACH

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Master of Science in Defense Analysis-March 2005

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United States Military Psychological Operations (PSYOP) are engaged in a type of mass marketing of ideas. To accomplish this, the United States Army Civil Affairs and Psychological Operations Command (USACAPOC) employs active and reserve PSYOP units to conduct PSYOP campaigns. However the methodology used to manage these campaigns often hinders the effective employment of timely and effective Psychological Operations. PSYOP must accomplish a difficult job, but they do not have the proper management tools and their national stakeholders do not understand the process. The opportunity derived from this study is to adapt principles of civilian marketing management to provide a framework and tools to develop PSYOP campaign management into a more efficient, target audience-based mechanism.

KEYWORDS: PSYOP, Strategic PSYOP, PSYOP Management, Marketing Management, Information Operations

MASTER OF SCIENCE IN ELECTRICAL ENGINEERING

PROPAGATION MODELING OF WIRELESS SYSTEMS IN SHIPBOARD COMPARTMENTS

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Master of Science in Systems Engineering-March 2005

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In today's Navy, it is becoming more and more important to reach all areas onboard a ship with key technical resources. In order to accomplish this goal, the already existing physical networks need to be complemented with wireless capability. A sophisticated Wireless Local Area Network (WLAN) can provide that vital connectivity to the ship's network resources from almost anywhere on the ship. It would allow sailors to access critical information and immediately communicate with others throughout the ship from any standard wireless device (PDA, laptop, and many other hand-held devices). In addition, WLANs greatly mitigate problems due to physical damage to wires or fiber optic cables that are used today. Because the Navy's emphasis is on building ships with reduced manning, advanced technology, and lower cost in mind, the idea of a WLAN, which has a deep impact on all those areas, has been of a growing interest to the Navy.

The purpose of this thesis is to analyze, model, and simulate a wireless environment onboard a variety of Naval ship compartments, using the Urbana code. Starting from known inputs (frequency, building geometry, material properties, propagation computation model, and antenna type), analytical results reflecting the propagation mechanisms, coverage area, and security posture of the WLAN are presented. Variable inputs can then be optimized to achieve a desired signal distribution and to meet security requirements for a specific shipboard environment.

KEYWORDS: Simulation of Wireless Propagation, Shipboard Modeling, Antenna Propagation, Urbana, Wireless Security, Indoor Propagation, Indoor-to-Outdoor Propagation

DESIGN, IMPLEMENTATION, AND TESTING OF A SOFTWARE INTERFACE BETWEEN THE AN/SPS-65(V)1 RADAR AND THE SRC-6E RECONFIGURABLE COMPUTER

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Master of Science in Electrical Engineering-March 2005

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This thesis outlines the development, programming, and testing of a logical interface between a radar system, the AN/SPS-65(V)1, and a general purpose reconfigurable computing platform the, SRC-6E. Additionally, a limited radar image processor is built to confirm the proper operation of the interface and associated subcomponents. The interface, as proven by the signal processing results, accurately reflects radar imagery generated by the radar system when compared to maps of the surrounding area. The research accomplished here will allow follow-on research to evaluate the potential benefits reconfigurable computing platforms may offer for radar image processing.

KEYWORDS: C Programming, Field Programmable Logic Device, FPGA, Hardware Description Language, HDL, Programmable Logic Device, PLD, Radar, Reconfigurable Computing, Signal Processing, VHDL

ELECTRICAL ENGINEERING

HARDWARE INTERFACE TO CONNECT AN AN/SPS-65 RADAR TO AN SRC-6E RECONFIGURABLE COMPUTER

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Master of Science in Electrical Engineering-March 2005

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A hardware interface is designed, developed, constructed, and tested to interface a Naval radar to the SRC-6E reconfigurable computer. The U.S. Navy AN/SPS-65 radar provides in-phase (I) and quadrature (Q) channels along with the AGC voltage to the hardware interface in analog form. The hardware interface receives a sampling clock from the SRC-6E and in turn performs the requisite attenuation and digital conversion before presenting the signals to the SRC-6E through its CHAIN port. Results show that the SRC-6E can effectively generate a sampling clock to drive the analog-to-digital converters and that real-time radar data can be brought into the SRC-6E via its high-speed CHAIN port for performing high-speed digital signal processing.

KEYWORDS: Radar Signal Processing, Reconfigurable Computer, SRC-6E, SRC

PERFORMANCE ANALYSIS OF MANAGEMENT TECHNIQUES FOR SONET/SDH TELECOMMUNICATIONS NETWORKS

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Master of Science in Electrical Engineering-March 2005

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Second Reader: Su Wen, Department of Computer Science

The performance of network management tools for SONET/SDH networks subject to load conditions is studied and discussed in this thesis. Specifically, a SONET network, which consists of four CISCO ONS 15454s managed by a CISCO Transport Manager, is set up in the Advanced Network Laboratory of the Naval Postgraduate School. To simulate a realistic data transfer environment for the analysis, Smartbits Avalanche software is deployed to simulate multiple client-server scenarios in the SONET network. Traffic from the management channel is then captured using a packet sniffer. Queuing analysis on the captured data is performed with particular emphasis on properties of self-similarity. In particular, the Hurst parameter, which determines the captured traffic's degree of self-similarity, is estimated using the Variance-Index plot technique. Link utilization is also derived from the computation of first-order statistics of the captured traffic distribution. The study shows that less management data was exchanged when the SONET network was fully loaded. In addition, it is recommended that CTM 4.6 be used to manage not more than 1552 NEs for safe operation. The results presented in this thesis will aid network planners in optimizing the management of their SONET/SDH networks.

KEYWORDS: Cisco Transport Manager, Network Management, SNMP, SONET, Optical Networks, Self-similarity, Queuing Theory and Traffic Analysis

ELECTRICAL ENGINEERING

PERFORMANCE EVALUATION OF A PROTOTYPED WIRELESS GROUND SENSOR NETWORK

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Second Reader: Herschel H. Loomis, Department of Electrical and Computer Engineering

This thesis investigates the suitability of wireless, unattended ground sensor networks for military applications. The unattended aspect requires the network to self-organize and adapt to dynamic changes. A wireless, unattended ground sensor network is prototyped using commercial-off-the-shelf technology and three to four networked nodes.

Device and network performance are measured under indoor and outdoor scenarios. The measured communication range of a node varies between three and nineteen meters depending on the scenario. The sensors evaluated are an acoustic sensor, a magnetic sensor, and an acceleration sensor. The measured sensing range varies by the type of sensor. Node discovery durations observed are between forty seconds and over five minutes. Node density calculations indicate that the prototype is scalable to five hundred nodes. This thesis substantiates the feasibility of interconnecting, self-organizing sensor nodes in military applications. Tests and evaluations demonstrate that the network is capable of dynamic adaptation to failure and degradation.

KEYWORDS: Wireless Sensor Network, Unmanned Sensor, Unattended Sensor, Ground Sensor, Ground Sensor Network

MASTER OF SCIENCE IN INFORMATION SYSTEMS AND OPERATIONS

EVALUATION OF THE LITTORAL COMBAT SHIP (LCS) AND SPARTAN SCOUT AS INFORMATION OPERATIONS (IO) ASSETS

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Master of Science in Information Systems and Operations-March 2005

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Second Reader: Steven J. Iatrou, Department of Information Sciences

This thesis addresses the planned configuration of Lockheed Martin's Flight Zero, Module Spiral Alpha Littoral Combat Ship (LCS) and the ongoing development of the SPARTAN SCOUT, one of the Navy's Unmanned Surface Vessels (USV). Both currently available and developmental technologies are recommended for implementation in order to make the LCS and SCOUT assets to information operations (IO) objectives. Specific technology includes Outboard, TARBS, HPM, Loudspeakers, LRAD, and Air Magnet. This thesis includes an evaluation of the current policy for authorizing information operations missions, specifically in Psychological Operations (PSYOP).

KEYWORDS: SPARTAN SCOUT, Littoral Combat Ship, Information Operations, IO, PSYOP, Electronic Warfare, EW, Long Rang Acoustic Device, LRAD, COMMANDO SOLO, TARBS

MASTER OF SCIENCE IN INFORMATION TECHNOLOGY MANAGEMENT

AN ANALYSIS OF NETWORK AND SENSOR PERFORMANCE WITHIN IEEE 802.X WIRELESS MESH NETWORKS IN THE TACTICAL NETWORK TOPOLOGY (TNT)

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Master of Science in Information Technology Management-March 2005

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Second Reader: Douglas E. Brinkley, Graduate School of Business and Public Policy

The objective of this research is to analyze the network performance and sensor functionality, efficacy, and usability of IEEE 802.x wireless MESH networks within a Department of Defense (DoD) tactical network environment. Multiple sensor configurations operating with wireless MESH network technologies are researched and analyzed for performance in expeditionary environment situations. Specifically, this thesis attempts to establish the foundation for the development of wireless MESH “network health” models by examining the performance of sensors operating within a MESH network and defining which network performance metrics equate to good quality of service. This research experiments with different application, sensor, and network configurations of currently available commercial-off-the-shelf (COTS) components such as voice, video, and data hardware. This thesis lays the groundwork for wireless network MESH predictability, which will enable the optimal use of sensors within a tactical network environment.

KEYWORDS: Wireless MESH Networking, Ad Hoc Networking, IEEE 802.11, IEEE 802.16, IEEE 802.15.4, Global Information Grid, Wireless, MANET, Sensor Networks, Tactical Network Topology, TNT, Modeling

EFFECTIVE USE OF COLLABORATIVE INFORMATION TECHNOLOGY TO ENHANCE GROUP PERFORMANCE

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Master of Science in Information Technology Management-September 2004

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This research was inspired by the need to create a universal net-centric environment to enable collaborative defense capabilities and deliver knowledge dominance to the Department of Defense (DoD). Since superior information management and the use of collaborative information technology (IT) are fundamental to building intelligence capabilities, this study aims to contribute to the optimization of collaborative system use by military groups and organizations.

The proposed research model illustrates and explains the direct relationships between collaborative IT competence and collaborative functionalities, which can be used not only to assess current technologies but also to aid in requirements generation for designing the ideal collaborative tool suite. Central to the research model is the concept of collaborative IT competence, defined as the effective use of collaborative functionalities, and its relationship to performance outcomes is explored in this thesis.

Having pre-tested and validated the proposed research model by means of empirical data collection in the form of an end-user survey instrument, it is recommended that further research be conducted on a Navy-wide scale to evaluate the 181 collaborative technology tools currently in use. End-user/warfighter insight will dramatically influence future CIT investment decisions by providing decision makers critical

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information regarding the pragmatic versus the advertised attributes of the application/tool suite. Additionally, this model is designed to provide the road map to the ideal combination of core functionalities and required collaborative IT competence.

KEYWORDS: E-Mail Overload, Information Technology, IT, E-Mail, Net-Centric Environment, Collaboration, Collaborative Information Technology

AN ANALYSIS OF THE FEASIBILITY OF IMPLEMENTING ULTRA WIDEBAND AND MESH NETWORK TECHNOLOGY IN SUPPORT OF MILITARY OPERATIONS

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Master of Science in Information Technology Management-March 2005

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Second Reader: Glenn Cook, Department of Information Sciences

This thesis analyzes the feasibility, functionality, and usability of Ultra Wideband technology as an alternative to 802.11 in wireless mesh networks for multiple Department of Defense (DoD) contexts. Ultra wideband and wireless mesh network technologies and applications are researched and analyzed through multiple field and lab experiments for usability in current, real-world situations. Hardware and software investigations are conducted to determine any implementation issues between ultra wideband and wireless mesh networks. A detailed assessment is conducted of the various elements and operational constraints for developing an ultra wideband mesh network that can be utilized to improve situational awareness in network-centric operations. Through joint research with Lawrence Livermore National Laboratories, various hardware and software components are developed to create a test bed for tactical level ultra wideband and mesh networking experimentation in a highly mobile environment. This thesis also lays the groundwork for future ultra wideband and mesh networking applications.

KEYWORDS: Wireless Mesh Networking, IEEE 802.11, Global Information Grid, Mesh Networks, Ultra Wideband, Lawrence Livermore National Laboratories, UWB, LLNL

BUILDING A SIMULATION TOOLKIT FOR WIRELESS MESH CLUSTERS AND EVALUATING THE SUITABILITY OF DIFFERENT FAMILIES OF AD HOC PROTOCOLS FOR THE TACTICAL NETWORK TOPOLOGY

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Master of Science in Information Technology Management-March 2005

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Wireless mesh networking has emerged as the successor of the traditional ad hoc networks. New technological advances, the standardization of protocols and interfaces, and the maturity of key components have made it possible for current mesh research groups to set goals that are close to the world's expectations. The objective of this research is to design and implement a simulation toolkit for wireless mesh clusters that can be used as an additional performance evaluation technique for the Tactical Network Topology program of the Naval Postgraduate School. This toolkit is implemented in the OPNET simulation environment and incorporates various nodes running different ad hoc routing protocols. Furthermore, investigation of a suitable combination of protocols for the Tactical Network Topology is achieved by creating scenarios and running a number of simulations using the mesh toolkit.

KEYWORDS: Ad Hoc Networking, MANET, Wireless Mesh Networks, OLSR, DSR, AODV, Tactical Network Topology, OPNET, IEEE 802.16, DOCSIS, Network Modeling and Simulation

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COLLABORATIVE APPLICATIONS USED IN A WIRELESS ENVIRONMENT AT SEA FOR USE IN COAST GUARD LAW ENFORCEMENT AND HOMELAND SECURITY MISSIONS

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Master of Science in Information Technology Management-March 2005

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Master of Science in Information Technology Management-March 2005

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This thesis analyzes the potential impact of incorporating wireless technologies, specifically an 802.11 mesh layer architecture and 802.16 Orthogonal Frequency Division Multiplexing, in order to effectively and more efficiently transmit data and create a symbiotic operational picture between Coast Guard Cutters, their boarding teams, Coast Guard Operation Centers, and various external agencies. Two distinct collaborative software programs, Groove Virtual Office and the Naval Postgraduate School's Situational Awareness Agent, are utilized over the Tactical Mesh and OFDM network configurations to improve the Common Operating Picture of involved units within a marine environment to evaluate their potential impact for the Coast Guard. This is being done to increase the effectiveness and efficiency of Coast Guard units while they carry out their law enforcement and homeland security missions. Through multiple field experiments, including Tactical Network Topology and nuclear component sensing with Lawrence Livermore National Laboratory, commercial-off-the-shelf (COTS) equipment and software are utilized to evaluate their impact on these missions.

KEYWORDS: Mesh, Orthogonal Frequency Division Multiplexing, OFDM, Groove Virtual Office, Situational Awareness Multi Agent System, Internet, Nodes, Wireless, IEEE 802.11, IEEE 802.16, Peer to Peer relationships, Collaborative Environment, Common Operating Picture, Tactical Network Topology, Lawrence Livermore National Laboratory, Tactical Satellite, Deepwater

CONCEPT OF OPERATIONS (CONOPS) FOR FOREIGN LANGUAGE AND SPEECH TRANSLATION TECHNOLOGIES IN A COALITION MILITARY ENVIRONMENT

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Master of Science in Information Technology Management-March 2005

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This thesis presents concept of operations (CONOPS) for two specific automated language translation (ALT) devices, the P2 Phraselator and the Voice Response Translator (VRT). The CONOPS for each device are written as Appendix A and Appendix B respectively. The body of the thesis presents a broad introduction to the present state of ALT technology for the reader who is new to the general subject. It pursues this goal by introducing the human language translation problem followed by nine characteristic descriptors of ALT technology devices to provide a basic comparison framework of existing technologies. The premise is that ALT technology is presently in a state where it is tackled incrementally with various approaches. Two tables are provided that illustrate six commercially available devices using the descriptors. A scenario is then described in which the author observed the two subject ALT devices (depicted in the CONOPS in the Appendices) being employed within an international military exercise. Some unique human observations associated with the use of these devices in the exercise are discussed. A summary is provided of the Department of Defense (DoD) process that is exploring ALT technology devices, specifically the Language and Speech Exploitation Resources (LASER) Advanced Concept Technology Demonstration ACTD.

KEYWORDS: Human Systems, Human Language Translation, Automated Human Language Translation, Automated Language Translation, ALT, Machine Language Translation, Voice Response Translator, VRT, P2 Phraselator, Concept of Operations, CONOPS, Language and Speech Exploitation Resources, LASER, Speech-to-Speech Translation, Phrase Based Translation

INFORMATION TECHNOLOGY MANAGEMENT

AN ANALYSIS OF HARDWARE REQUIREMENTS FOR AIRBORNE TACTICAL MESH NETWORKING NODES

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Wireless mesh mobile ad hoc networks (MANETs) provide the military with the opportunity to spread information superiority to the tactical battlespace in support of network-centric warfare (NCW). These mesh networks provide the tactical networking framework for providing improved situational awareness through ubiquitous sharing of information, including remote sensor and targeting data. The Naval Postgraduate School's Tactical Network Topology (TNT) project, sponsored by U.S. Special Operations Command, seeks to adapt commercial-off-the-shelf (COTS) information technology for use in military operational environments. These TNT experiments rely on a variety of airborne nodes, including tethered balloon and UAVs such as the Tern, to provide reachback from nodes on the ground to the Tactical Operations Center (TOC), as well as to simulate the information and traffic streams expected from UAVs conducting surveillance missions and fixed persistent sensor nodes. Airborne mesh nodes have unique requirements that can be implemented with COTS technology, including single board computers and compact flash.

KEYWORDS: Wireless Mesh Networking, Ad Hoc Networking, IEEE 802.11, Global Information Grid, MANET, Wireless, OLSR, Sensor Networks, Tactical Network Topology, Single Board Computer, PC/104, Tern UAV

A CASE STUDY OF INTERNET PROTOCOL TELEPHONY IMPLEMENTATION AT UNITED STATES COAST GUARD HEADQUARTERS

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Master of Science in Information Technology Management-March 2005

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Recent advances in information technology communications have brought about increases in bandwidth and processing speeds to encourage the growth of Internet Protocol Telephony (IPT), a method of transmitting voice conversations over data networks. Many organizations are replacing portions of their traditional phone systems to gain the benefits of cost savings and enhanced feature sets through the use of IPT. The Coast Guard has an interest in exploiting this technology, and has taken its first steps by implementing IPT at Headquarters Support Command in Washington, D.C. This thesis investigates the successful implementation practices and security policies of commercial, educational, and government organizations in order to create recommendations for IPT security policies and implementation practices relevant to the Coast Guard. It includes discussion of the public switched telephone network, an overview of IPT, IPT security issues, the safeguards available to counter security threats, the tradeoffs (e.g., voice quality, cost) required to mitigate security risks, and current IPT security policy and implementation guidance. It is supported by the study and analysis of the IPT system at Coast Guard Headquarters. The Coast Guard gains an understanding of the advantages, limitations, and security issues that it will face as it considers further implementation of IPT.

KEYWORDS: Voice Over Internet Protocol, VOIP, Internet Protocol Telephony, IP Telephony, Security, Policy, Implementation Guide, Coast Guard

INFORMATION TECHNOLOGY MANAGEMENT

MULTI-ANGLE IMAGING WITH SPECTRAL REMOTE SENSING FOR SCENE CLASSIFICATION

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Master of Science in Information Technology Management-March 2005

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Scene classification is studied using the tool of texture analysis of multi-angle, high-spatial resolution panchromatic and multi-spectral imagery. This study analyzes the Bidirectional Reflectance Distribution Function (BRDF) impact and effectiveness of texture analysis on terrain classification within the Fresno County area in the state of California. QuickBird panchromatic (0.61 meter) and multi-spectral (2.44 meter) imagery collected in July 2003 are examined to determine the impact of adding multi-angles and filtered texture information to the standard MSI classification approaches. Four images are collected, with view angles from -64° to $+64^\circ$, including a nadir view. Texture filter function and maximum likelihood classifier are used in this study. Both texture analysis and the results of classifications using multi-angle (BRDF) information are promising. Fine discrimination of similar soil classes is produced by the BRDF variations in the high-spatial resolution panchromatic image. Texture analysis results depend on the directionality of the gray level co-occurrence matrix (GLCM) calculation. Combining the different modalities of analysis does not improve the overall classified, perhaps illustrating the consequences of the Hughes paradox (Hughes, 1968).

KEYWORDS: Bidirectional Reflectance Distribution Function, BRDF, Texture Analysis, QuickBird, Multi Angle Imaging, Multispectral, Panchromatic, Scene Classification

REQUIREMENTS ANALYSIS AND COURSE IMPROVEMENTS FOR EO3502 TELECOMMUNICATIONS SYSTEMS ENGINEERING

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Master of Science in Information Technology Management-March 2005

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This thesis evaluates the requirements and provides course improvement recommendations for Telecommunications Systems Engineering, EO3502, taught at the Naval Postgraduate School. Other graduate programs in Information Technology Management are evaluated to determine the standard for telecommunications engineering expected from some of the most respected academic institutions. Graduates of the Naval Postgraduate School's Information Technology Management (ITM) and Information Systems and Operations (ISO) curricula are surveyed to determine how important telecommunications engineering is for their follow-on assignments. In addition, lesson topic vignettes are developed to provide fleet/field examples to reinforce the relevance of individual topics. Finally, recommendations are provided for improving EO3502 and the ITM curriculum in general.

KEYWORDS: Telecommunications Systems Engineering, Communications Systems Engineering, EO3502, Course Improvements, Requirements Analysis

MASTER OF SCIENCE IN LEADERSHIP AND HUMAN RESOURCE DEVELOPMENT

THE CITIZEN-OFFICER IDEAL: A HISTORICAL AND LITERARY INQUIRY

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Due to their unique expertise, military officers have always held a special position within western society. Yet, while individuals who have demonstrated knowledge of warfare and prowess in battle have long been held in high regard by society and the members of their profession, it is those who have also demonstrated the ideals of citizenship and chivalry who serve as the icons for thoughtful military officers. The purpose of this thesis is to examine the evolution of the citizen-officer ideal through a close study of historical and literary case studies. By establishing a common theme or values among completely separate exemplars of this ideal, a continuum joining Odysseus, Cincinnatus, Beowulf, and Gawain to Washington, Chamberlain, and Marshall might eventually be carried forward to the present and the modern military officer. Specific focus is given to the roles that classical notions of citizenship and the Code of Chivalry have played in shaping the ethos of the American officer.

KEYWORDS: George Washington, Joshua Lawrence Chamberlain, George C. Marshall, Citizenship, Beowulf, Sir Gawain, Cincinnatus, Chivalry, Citizen-Officer, Citizen-Soldier, Soldier-Statesman

MASTER OF SCIENCE IN MANAGEMENT

COMPARATIVE ANALYSIS OF NAVY AND MARINE CORPS PLANNING, PROGRAMMING, BUDGETING, AND EXECUTION SYSTEMS FROM A MANPOWER PERSPECTIVE

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Master of Science in Management-March 2005

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This study provides analysis, conclusions, and recommendations to assist the Deputy Commandant (DC), Manpower and Reserve Affairs Department (M&RA) and DC, Programs and Resources Department (P&R) in structure and process decisions concerning Marine Corps Manpower budget execution. DC, M&RA, is the owner of the Marine Human Resource Development Process (HRDP) and the Military Personnel Marine Corps (MPMC) appropriation sponsor, while the DC, P&R, has budgetary (1517) authority for MPMC budget execution. In contrast, the Navy has both sponsorship and 1517 authority within one cell at N1. By comparing these two services' organizational factors and Planning, Programming, Budgeting, and Execution Systems (PPBES), relevant differences surface, conclusions are drawn, and recommendations offered for improvements. Recommendations include realignment of 1517 authority within MPMC execution, and the melding of the Programs and Budget Branch of Manpower Plans Division, M&RA, with the Military Personnel Branch, Fiscal Division, P&R (RFM). This new office will be responsible for all facets of MPMC programming, budgeting, and execution.

KEYWORDS: Deputy Commandant, DC, Manpower and Reserve Affairs Department, M&RA, Programs and Resources Department, P&R, Marine Corps Manpower Budget Execution, Marine Human Resource Development Process, HRDP, Military Personnel Marine Corps, MPMC, N1, 1517 Authority, Planning, Programming, Budgeting and Execution Systems, PPBES, Programs and Budget Branch of Manpower Plans Division, Military Personnel Branch, Fiscal Division, P&R RFM

AN ANALYSIS OF THE EFFECT OF MARITAL/DEPENDENCY STATUS ON RETENTION, PROMOTION, AND ON-THE-JOB PRODUCTIVITY OF MALE MARINE CORPS OFFICERS

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This thesis investigates the effect of marital and family status on the performance and job productivity of male U.S. Marine Corps officers. The analysis includes evaluation of fitness reports, retention, and promotion to O-4 and O-5 ranks as performance measures. The primary goal is to examine the existence of any marriage premium on officers' performance and productivity and to investigate potential causal hypotheses. The personnel database used for the analysis includes more than 27,000 male Marine officers who entered the Marine Corps between FY 1980 and 1999.

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After controlling for selection, estimating fixed effects, and using panel data in order to capture timely-varying effects, this study finds that there is a marriage premium for all performance measures. The thesis rejects the explanation that such premiums are due to supervisor favoritism. Moreover, married male officers obtain higher fitness report scores, higher promotion probabilities, and higher retention probabilities than single officers. Each additional year spent in marriage increases fitness report scores and retention probabilities. Having additional non-spousal dependents increases fitness report scores and retention probabilities. On the other hand, being a currently single but “to-be-married” officer yields higher premium, than married officers, for all productivity and performance indicators. This supports selectivity into marriage as a partial explanation of the source of the marriage premium.

KEYWORDS: Marriage Premium, Non-Spousal Dependents, Multivariate Analysis, Fixed-Effects, Heckman, Maximum Likelihood Probit Estimation with Sample Selection, MLPE, Selection Bias, Selectivity, Promotion, Retention, Performance Evaluation

ANALYSIS OF THE U.S. MARINE CORPS FITREP: CONTEMPORARY OR INFLEXIBLE?

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The purpose of this thesis is threefold. First, to attempt to provide validity for the two-sided matching process; second, to analyze fitness report (FITREP) attributes to determine their suitability for a weighted criteria evaluation system; and third, to compare the U.S. Marine Corps (USMC) promotion and assignment process with contemporary human resource management practices. Using data from the USMC Officer Accession Career file (MCCOAC), a logit model is used to estimate the effects of The Basic School (TBS) preference and other officer characteristics on retention to the seven-year mark. Findings indicate that there is little difference in the probability of retention throughout most preference levels except for the bottom sixth. Using USMC FITREP data, an ordinary least squares model is used to estimate the effects of rank and Military Occupational Specialty (MOS) on FITREP scores across all attributes. Multiple comparison tests demonstrate that there are statistical differences at the 0.05 level between the means of the MOSs. Additionally, reporting creep continues across all attributes.

Surveys are also conducted. The first survey indicates that USMC officers believe the FITREP attributes are not all equally important within and across each MOS – although the USMC assesses them as such. The second survey indicates that the USMC promotion and assignment process can be strengthened through a clearly defined Human Resource Management (HRM) plan that extends beyond “faces” and “places,” and provides very clear links to the organizational strategy. Based on the findings, it is recommended that the USMC review its HRM processes and conduct further analyses on the FITREP data for correlation, longitudinal analysis as a predictor for success, and relevance and relationship to MOS characteristics, position descriptions, and organizational strategy.

KEYWORDS: Attrition, Accession, Commissioning Sources, Manpower, Officer Retention, Parametric, Personnel Attrition, Retention, Requirements Determination, Personnel Management, Human Resource Management, HRM, Ordinary Least Squares, OLS, Logit, FITREP, Performance Appraisal, Two-sided Matching, Military Occupational Specialty, MOS, The Basic School, TBS, TBS Class Standing, TBS Performance

MANAGEMENT

ANALYSIS OF THE SURVIVAL PATTERNS OF UNITED STATES NAVAL OFFICERS

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Master of Science in Management-March 2005

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In this thesis, the factors that affect the longevity of officers in the U.S. Navy, especially commissioning source, are identified and quantitatively evaluated. A survival analysis is conducted on the survival patterns of officer cohorts who entered the service between the years 1983 and 1990. Using data created from Navy Officer Data Card information and annual promotion board results, three survival analysis procedures, LIFETEST, LIFEREG, and PHREG, are used to examine the factors that influence the survival of U.S. Naval officers. The results of the survival analysis indicate that commissioning source has a significant effect on survival rates, with Naval Academy graduates having a better survival rate than other commissioning sources. Also, the analysis shows that females and African-Americans have better survival rates than males and whites, respectively, and prior enlisted, older, graduates from non-selective colleges have higher survival rates than their counterparts. Additionally, Surface Warfare, Fleet Support, and Supply Corps officers are found to have lower survival rates than officers in other communities. When survival functions for involuntary and voluntary separations are analyzed separately, the results are found to be different. Commissioning age, being African-American, single with children, commissioned from a Naval Reserve Officer Training Corps (NROTC) contract program, commissioned from OTHERSOURCE, being prior enlisted, having a high grade point average, and being designated in the Air community have significant negative effects on involuntary separations and significant positive effects on voluntary separations.

KEYWORDS: Commissioning Source, Survival Analysis, Navy Officer Data Card Information Results, Annual Promotion Board Results, LIFETEST, LIFEREG, PHREG

A STUDY OF PROMOTION AND ATTRITION OF MID-GRADE OFFICERS IN THE U.S.

MARINE CORPS: ARE ASSIGNMENTS A KEY FACTOR?

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This study analyzes the relationship between selection to Major in the Marine Corps, and the survival of mid-grade officers to the promotion point of Major, by investigating the effects of billet assignments. Specifically, this study looks at the influence of the percentage of time spent in the Fleet Marine Forces (FMF), the percentage of time spent in primary military occupation (PMOS) billet assignments, and the effect of having served in combat, recruiting, security forces, joint, and drill field duties.

Models are formulated using groundwork established in previous promotion, retention, and attrition studies. Assignment variables are then introduced to the models. To account for officers' choice for continued service vice forced attrition, the sample is restricted to officers who had attained five years of service. Probit regression is used to find the influence of career assignments on the probability of selection; Heckman's correction is used to control for self-selection bias and Cox proportional-hazard regression is used, utilizing the same assignment factors, to find the influence of assignments on the likelihood of attrition.

The findings indicate that FMF and PMOS ratios above 60 percent had a negative effect on promotion and retention. Findings also indicate that time spent outside the PMOS, in "B" billets, had a positive effect on retention. In a time of budgetary constraints, this information may provide assistance to personnel planners as an alternative to pecuniary measures used to maintain and shape the force.

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KEYWORDS: Attrition, Billet Assignments, "B" Billets, Cox Regression, Fleet Marine Force Duty, Probit Regression, Manpower, Officer Retention, Officer Promotion, Operational Time, Proportional Hazards, Retention, Survival Analysis

ANALYSIS OF THE U.S. MARINE CORPS RECRUITING STATION COMMANDING OFFICERS SCREENING AND SELECTION PROCESS

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Recruiting is the most challenging peacetime assignment for any United States Marine. It involves many internal and external factors that are generally beyond the control of recruiting personnel. In particular, Recruiting Station (RS) Commanding Officers are subject to intense pressure to make their assigned recruiting goals or be relieved from duty. It is thus critical for the Marine Corps Recruiting Command (MCRC) to select only the best-qualified officers to serve as recruiting commanders.

This thesis has three main objectives: (1) analyze the current screening and selection process used by MCRC since fiscal 1996; (2) evaluate whether this process is more effective than the previous method; and (3) determine if the process can be improved. To accomplish these goals, the study reviews MCRC's responsibilities, policies, procedures, and rationale in determining the required characteristics of a successful RS Commanding Officer. The methodology relies on a literature review, personal interviews with individuals from all recruiting command levels, and descriptive data on RS Commanding Officers from fiscal 1990 through fiscal 2003.

The results suggest that the current screening and selection process is effective and an improvement over the previous system. Recruiting commanders are more experienced, more diverse, and more suited to the task, based on several indicators. Recommendations are offered to change common perceptions of the current process as a "selection board."

KEYWORDS: Recruiting Station, Marine Corps, Commanding Officers, Analysis of Screening and Selection Process

FORECASTING RETENTION IN THE UNITED STATES MARINE CORPS RESERVE

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This is an empirical study using a logistic regression model to assess the impact of mobilization and unemployment on an individual's decision to stay in or leave the reserves. The goal is to identify the attrition behavior of U.S. Marine Corps Reserve participants in order to better establish recruiting and retention goals in the reserve population. Questions regarding attrition influencers, effects of mobilization, and applicability to both officer and enlisted personnel are reviewed in this process.

Being called to active service is shown to have a positive effect on retention in the reserves. Similarly, the model shows that serving in the SMCR and the Stand-by Reserves both have a positive effect on reserve retention. This makes sense, in that when an individual volunteers in the Marine Reserves, he or she evidences a desire to serve his country when called to do so. The negative effect of an increase in the number of days served on active duty, as shown in the results of the model, follows similar logic. Had the individual wanted to serve on a full-time active duty basis, he would have volunteered for the active duty component. The longer he is asked to remain on active duty, the more dissatisfied he is, on average, with his participation in the reserves.

The negative effect of an increase in the individual's home of record unemployment rate is also consistent with previous findings, and when combined with the negative effect of continued mobilization

MANAGEMENT

and recall from the IRR or a retired status, a significant negative impact is seen on the individual's decision to stay in the reserves. The findings indicate that multiple short activations have a positive impact; whereas the impact of fewer, lengthy activations is negative. This study validates previous research regarding the likelihood of continued service in the Marine Corps Reserves. As a result, the Marine Corps has the potential to better allocate resources and schedule individual activations, reducing attrition. This can assist in shaping the force structure when the Marine Corps are needed.

KEYWORDS: Attrition, Retention, Reserve, Marine Corps, Forecasting

A QUALITATIVE ANALYSIS OF THE TURKISH GENDARMERIE ASSIGNMENT PROCESS

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The Turkish General Command of the Gendarmerie, as a paramilitary police force, provides public security and order for people throughout 81 provinces and 902 districts. The Gendarmerie performs security and public order services in 92% of the geographic area of Turkey and for 41% of the total population. Approximately 27 million people live in Gendarmerie jurisdiction areas; this number increases to 43 million (65% of the population) in the summer months.

This study is an organizational analysis of the current assignment process of the Turkish General Command of the Gendarmerie. The analysis recommends long-term and short-term policy changes and implementation methodologies to the assignment process while taking into consideration such a geographically diverse region and often difficult assignment choices for individuals.

In addition to the law-enforcement-related operations, the Gendarmerie is tasked to carry out various other types of operations, such as border security, anti-terrorism, and peacekeeping. The Gendarmerie Organization, Duty, and Jurisdiction Law classify these duties under four categories: administrative, judicial, military, and other duties. As a result of this job diversity, the Gendarmerie personnel perform different tasks in different unit areas. Therefore, the existence of geographically diverse billet characteristics has been an obstacle in the Gendarmerie assignment process.

KEYWORDS: Gendarmerie, Manpower, Personnel, Assignment, Billet Diversity

ANALYSIS OF CAREER PROGRESSION AND JOB PERFORMANCE IN INTERNAL LABOR

MARKETS: THE CASE OF FEDERAL CIVIL SERVICE EMPLOYEES

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The objective of this thesis is to investigate various factors that influence the job performance and promotion of Department of Defense (DoD) civilian workers. The data used in this study are drawn from the Department of Defense Civilian Personnel Data Files provided by the Defense Manpower Data Center (DMDC). The initial data is restricted to employees who were initially hired in 1995 and stayed in service until 2003 and were paid under the General Schedule (GS) pay system. Three general performance measures are used: compensation (salary), annual performance ratings, and promotions. Multivariate models are specified and estimated for each of these performance measures. The results indicate that females receive lower annual and hourly compensation and are less likely to be promoted than men, even though they receive better performance ratings. Results also indicate that minorities are paid less and are less likely to be promoted than majority workers, while veterans are paid more, perform better, and are more likely to become supervisors. The models also reveal that performance rating is a weak measure of productivity and that more highly educated employees are paid more and more likely to be promoted more, even if they are not always the best performers.

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KEYWORDS: Performance, Promotion, Retention, Compensation, Selection Bias, Manpower, Ordinary Least Squares, OLS, Probit, Partial Effects

**PROCESS ANALYSIS OF BASIC ALLOWANCE FOR HOUSING (BAH) WITHIN THE
MILITARY PERSONNEL, MARINE CORPS (MPMC) APPROPRIATION**

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Douglas W. Edwards, Marine Reserve and Affairs, Headquarters Marine Corps

This thesis evaluates the current methodologies used to determine Basic Allowance for Housing (BAH) requirements for Military Personnel, Marine Corps (MPMC) Budget Estimate Submissions (BES) and provides recommendations to improve the management of the BAH program within the U.S. Marine Corps. The research includes a detailed analysis of BAH requirement methodologies throughout the Department of Defense (DoD) and BAH program management. The thesis also addresses the problem of the MPMC underfunded appropriation since FY01. As the BAH accounts for approximately 10% of the MPMC appropriation (\$1.053B of \$9.5B), BAH execution shortfalls result in \$30-\$40M (3% variance) deficits annually. As a result, funds must be reprogrammed or taken from other programs to pay for these shortfalls. This thesis recommends eliminating certain inefficiencies within the BAH process. Most important of these inefficiencies is the information gap between the Office of the Secretary of Defense (OSD) and the service level Programs and Resources. Eliminating such inefficiencies would allow the services to avoid execution bills associated with BAH shortfalls. The current BAH program meets its goal of providing service members fair compensation for housing; however, the current Planning, Programming, Budgeting and Execution (PPBE) system, information flow, and technology need adjustments to allow for a more efficient BAH program.

KEYWORDS: BAH Process Analysis, MPMC, PPBE

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

MULTI-CRITERIA ANALYSIS IN NAVAL SHIP DESIGN

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Master of Science in Mechanical Engineering-March 2005

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Numerous optimization problems involve systems with multiple and often contradictory criteria. Such contradictory criteria have been an issue for marine/naval engineering design studies for many years. This problem becomes more important when one considers novel ship types with very limited or no operational record. A number of approaches have been proposed to overcome these multiple criteria design optimization problems. This thesis follows the Parameter Space Investigation (PSI) technique to address these problems. The PSI method is implemented with a software package called MOVI (Multi-criteria Optimization and Vector Identification). Two Marine/Naval engineering design optimization models are investigated using the PSI technique along with the MOVI software. The first example is a bulk carrier design model that was previously studied with other optimization methods. This model, which is selected due to its relatively small dimensionality and the availability of existing studies, is utilized in order to demonstrate and validate the features of the proposed approach. A more realistic example is based on the "MIT Functional Ship Design Synthesis Model," with a greater number of parameters, criteria, and functional constraints. A series of optimization studies are conducted for this model and they demonstrate that the proposed approach can be implemented in a Naval ship design environment and can lead to a large design parameter space exploration with minimum computational effort.

KEYWORDS: Multi-criteria Analysis, Multi-criteria Optimization and Vector Identification, Parameter Space Investigation, Ship Design and Optimization

AN EMPIRICAL INVESTIGATION OF THE PERFORMANCE OF STAGGERED PIN-FIN ARRAY LAMINAR FLOW HEAT EXCHANGERS

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This study concentrates on the empirical characterization of a staggered pin-fin array heat exchanger placed in a modular, rectangular wind tunnel. A full analysis of the heat transfer and pressure drop behavior is conducted on various pin-fin shapes, sizes, and configurations. The study is based on airflow over a wide range of Reynolds numbers in the laminar regime. The empirical data gathered can be used to corroborate and develop better numerical models to characterize the performance of such heat exchangers as well as scale down to the micro level for comparison with micro-heat exchangers.

KEYWORDS: Compact Heat Exchanger, Experimental Study, Pin-Fin Array

MECHANICAL ENGINEERING

INVESTIGATION AND DEVELOPMENT OF OIL-INJECTION NOZZLES FOR HIGH-CYCLE FATIGUE ROTO SPIN TEST

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Resonant excitation tests of rotor blades in vacuum spin pits using discrete oil jets showed that impact erosion of the blades could limit test times, but lower excitation amplitudes were produced using mist nozzles. Smaller diameter discrete jets might extend test times, but to fully prevent erosion, oil mist droplet size needed to be 30 microns or less. The present study examines both approaches. Prototype nozzles are developed to create 0.005 inch diameter multiple discrete jets using first alumina, then stainless steel tubing, laser and micro-machine drilling. The latter technique is selected and 50 are manufactured for evaluation in High Cycle Fatigue (HCF) spin tests. A vacuum test chamber is built to observe and photograph spray patterns from the prototype nozzles and from commercially available mist nozzles. A Laser Doppler Velocimetry (LDV) system is used successfully to determine the velocity of the oil droplets within the mist. A complete mapping of mist nozzle sprays is required to allow routine design of blade excitation systems.

KEYWORDS: High Cycle Fatigue, Laser Drilled Holes, Micro-Drilled Holes, Mist Nozzles, Discrete Jet Nozzles, Laser Doppler Velocimetry, Liquid Impact Erosion, Rotor Spin Test

STABILITY ANALYSIS OF A TOWED BODY FOR SHIPBOARD UNMANNED SURFACE VEHICLE RECOVERY

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As the U.S. Navy develops new technologies that enhance automation and reduce crew size onboard Naval vessels, unmanned vehicles will become increasingly valuable in conducting maritime operations. Effective launch and recovery systems (LARS) are necessary for unmanned vehicles to efficiently conduct operations at sea. The Towed Body system is a LARS with a wide range of applications for unmanned vehicle operations. The Towed Body can be evaluated as a small vessel with horizontal and vertical control surfaces. Since it is being towed, the directional stability of the Towed Body requires unique consideration due to the presence of the towing force. This thesis examines the effect of varying the longitudinal location of the vertical control surfaces, as well as the effective aspect ratio, size, and number of vertical control surfaces. The results identify critical stability values for the various fin configurations.

KEYWORDS: Launch and Recovery System, LARS, Unmanned Vehicles, UV, Unmanned Surface Vehicles, USV, Unmanned Underwater Vehicles, UUV, Directional Stability, Motion Stability, Towing Stability

MASTER OF SCIENCE IN METEOROLOGY

ENHANCEMENT OF THE DAYTIME GOES-BASED AIRCRAFT ICING POTENTIAL ALGORITHM USING MODERATE-RESOLUTION IMAGING SPECTRORADIOMETER (MODIS)

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In this thesis, a fuzzy logic algorithm is developed for the detection of potential aircraft icing conditions using the Moderate-Resolution Imaging Spectroradiometer (MODIS). The fuzzy MODIS algorithm is developed in a manner similar to the cloud mask currently used to process MODIS imagery. The MODIS icing potential detection algorithm uses thresholds for eight channels in a series of twelve tests to determine the probability of icing conditions being present within a cloud. The MODIS algorithm results are compared to results of the GOES icing potential detection algorithm run on MODIS imagery for four cases. When compared to positive and icing pilot reports for the cases, the MODIS algorithm identifies regions where icing is encountered more effectively than the GOES algorithm. Furthermore, the use of fuzzy thresholds on MODIS, rather than the hard thresholds of the GOES algorithm, allows for less restrictive coverage of potential icing conditions, making the MODIS algorithm more reasonable in assessing all cloud regions for icing potential. The results found are preliminary, as further statistical analysis with a larger validation dataset would be more effective. Algorithm details are provided in the appendix for reference.

KEYWORDS: MODIS, Aircraft Icing, Multi-Spectral Satellite Analysis, Cloud Thermodynamic Phase

A CASE STUDY OF INSITU-AIRCRAFT OBSERVATIONS IN A WATERSPOUT PRODUCING CLOUD

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An analysis of in-situ aircraft observations collected in the parent cloud of a waterspout is presented. Previous waterspout studies were confined mainly to photometric and model simulated data, no in-situ observations were made internal to the parent cloud. On 27 June 2002, the Center for Interdisciplinary Remotely Piloted Aircraft Studies (CIRPAS) UV-18A Twin Otter aircraft collected observations in a cloud that had developed in a cloud line, located approximately 15km south of Key West, and that formed a waterspout. This study attempts to analyze the waterspout formation process using these data and through a series of scale interactions, from the synoptic scale down to the individual cloud scale. Based upon the analyzed data a hypothetical formation process is developed.

The background synoptic scale flow is shown to establish the necessary ambient shear as a key factor in the waterspout formation. The orientation of mesoscale convergent boundaries and thermodynamic processes, internal to the cloud, prove to be an essential factor in developing the vertical motion patterns necessary for formation of an organized circulation in the shear region and to provide the tipping and stretching of the resultant vortex necessary to account for the waterspout formation. This is consistent with conclusions derived from previous studies.

KEYWORDS: Waterspout, Aircraft Data, CIRPAS, Synoptic Analysis, Sea Surface Temperature

METEOROLOGY

ACCURACY OF WESTERN NORTH PACIFIC TROPICAL CYCLONE INTENSITY GUIDANCE

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Consensus methods require that cyclone intensity guidance techniques have no bias and have skill. The accuracy of six statistical and dynamical model tropical cyclone intensity guidance techniques is examined for western North Pacific tropical cyclones during the 2003 and 2004 seasons using a climatology and persistence technique called ST5D as a measure of skill. A framework of three phases, i) initial intensification, ii) maximum intensity with possible decay/re-intensification cycles, and iii) decay, is used to examine the skill.

During both the formation and intensification stages, only about 60% of the 24-36 h forecasts are within +/- 10 kt, and the predominant tendency is to under-forecast the intensity. None of the guidance techniques predict rapid intensification well. All of the techniques tend to under-forecast maximum intensity and miss decay/re-intensification cycles. A few of the techniques provide useful guidance on the magnitude of the decay, although the timing of the decay is often missed. Whereas about 60-70% of the 12-h to 72-h forecasts by the various techniques during the decay phase are within +/- 10 kt, the strong bias is to not decay the cyclone rapidly enough. In general, the techniques predict too narrow a range of intensity changes for both intensification and decay.

KEYWORDS: Tropical Meteorology, Tropical Cyclone Intensity, Tropical Cyclone Intensity Change Forecast Techniques, Numerical and Statistical Intensity Change Guidance

NORTH PACIFIC TROPICAL CYCLONES AND TELECONNECTIONS

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This thesis investigates the hypothesis that variations in tropical cyclone (TC) activity in the western North Pacific (WNP) may affect the teleconnection between the tropical WNP and North America. The teleconnection patterns of the 500 hPa geopotential height between a base point in the WNP (20°N 115°E) and a domain over North America (30° - 45°N , 70° - 90°W) from 1951-2001 are examined. The 25 most active and the 25 least active TC years for two regions with the highest climatological average of TC activity, near the Philippines and Taiwan respectively, are compared to determine if stronger teleconnection patterns occur during the more active years. For both regions, the correlation pattern is significant during active years and insignificant during inactive years, with the results based on TC activity in the Philippines region showing a larger difference. An analysis of 500 hPa mean winds show weaker winds in the mid-latitudes during active TC years when the teleconnection is stronger, which suggests that the teleconnection may consist mainly of Lau and Weng's (2000) zonally-elongated mode (Mode 1). Further cross correlations of the geopotential height and TC frequency parameters with the tropical eastern and western Pacific sea-surface temperatures (SST) show a significant correlation between TC activity and tropical eastern Pacific SSTs, but the North America-WNP correlation is unlikely to be a result of a direct influence of SSTs on the two regions.

KEYWORDS: Tropical Cyclones, Summertime Teleconnections

METEOROLOGY

INFLUENCE OF ANTARCTIC OSCILLATION ON INTRASEASONAL VARIABILITY OF LARGE-SCALE CIRCULATIONS OVER THE WESTERN NORTH PACIFIC

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This study examines southern hemisphere mid-latitude wave variations connected to the Antarctic Oscillation (AAO) to establish connections with the 15- to 25-day wave activity in the western North Pacific monsoon trough region. The AAO index defined from the leading empirical orthogonal functions of 700 hPa height anomalies led to seven distinct circulation patterns that vary in conjunction with the 15- to 25-day monsoon trough mode. For nearly one half of the significant events, the onset of 15- to 25-day monsoon trough convective activity coincided with a peak negative AAO index and the peak in monsoon trough convection coincided with a peak positive index. The remaining events either occur when the AAO is not significantly varying or when the AAO-related southern hemisphere mid-latitude circulations do not match 15- to 25-day transitions.

When a significant connection occurs between the southern hemisphere mid-latitude circulations related to the AAO and the 15- to 25-day wave activity in the western North Pacific monsoon trough, the mechanism is via equatorward Rossby-wave dispersion. When wave energy flux in the southern hemisphere is directed zonally, no connection is established between the AAO and the alternating periods of enhanced and reduced convection in the western North Pacific monsoon trough.

KEYWORDS: Antarctic Oscillation, Rossby Wave Dispersion, Large-scale Tropical Circulations, Intraseasonal Variability

FORECASTING THE ONSET AND INTENSITY OF VERTICALLY PROPAGATING MOUNTAIN WAVES OVER THE ALPS

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Vertically propagating waves (VPW) generated by prominent mountain ridges are a severe hazard to military aircraft operations. Properly forecasting the initiation and duration of such a phenomenon is critical, yet quite often missed by turbulence forecasters. A primary reason for poor forecast skill is vague VPW forecasting guidelines at the Air Force operational centers, focusing a majority of attention on the less severe, more common trapped lee wave response. The United States Air Forces in Europe Operational Weather Squadron (USAFE OWS) has requested a tool to aid in improving forecast ability of VPW events. Satellite analysis from October 2003 through March 2004 indicated an occurrence of six major VPW events to the lee of the Alps. Actual verification of turbulence in each VPW is unavailable due to the minimal pilot report (PIREP) database kept for military flights over Europe, therefore, a subjective assessment of turbulent conditions is determined depending on the resulting cloud signature. Using NCEP GFS model analysis and upstream upper air soundings during these events, an average synoptic condition and critical weather parameters are created.

These developed tools are then tested from October 2004 through March 2005 to prove their reliability. In a limited data set, these tools identify all VPW events with only a 25% false alarm rate. This is compared to a 6% forecast ability with 0% false alarm rate determined during the 2003-2004 winter season by USAFE OWS forecasters. These new rules should be valuable in that they will provide a much needed capability for synoptic scale turbulence forecasters to better determine hazardous aviation conditions associated with VPWs.

KEYWORDS: Vertically Propagating Wave, Mountain Wave, Alps, Turbulence, USAFE OWS

METEOROLOGY

DETERMINING THE FINE STRUCTURE OF THE ENTRAINMENT ZONE IN CLOUD-TOPPED BOUNDARY LAYERS

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The objective of this thesis is to obtain a better understanding of cloud-top entrainment through an in-depth analysis of entrainment-zone structure. In situ aircraft measurements taken during the Atlantic Stratocumulus Transition Experiment (ASTEX) are used for this purpose. Using data collected from multiple cloud-top penetrations, the presence of an interfacial layer in-between the top of the cloud mixed-layer and the base of the free atmosphere is identified and consequently defined as the entrainment zone. The depth of the entrainment zone is on the order of tens of meters, where turbulence and sometimes cloud droplets are detectable. Inhomogeneous mixing is found to occur within the entrainment zone. Parcels of inversion-layer air and boundary-layer air are identified within the entrainment zone. Analyses suggest that turbulence intensity and cloud amount in the entrainment zone vary depending on the distribution of entrainment mixing fraction. Furthermore, continuous mixing in the entrainment zone appears to dissipate the upper-cloud layer. However, continuous dissipation of the upper-cloud layer has not been observed. Further study is needed to determine the interaction between cloud-top entrainment and the full integration of boundary-layer dynamics.

KEYWORDS: Cloud-Top Entrainment, Entrainment-Zone Structure, Aircraft Measurements, ASTEX, Entrainment Zone, Inhomogeneous Mixing, Entrainment Mixing Fraction

CHARACTERISTIC ERRORS IN 120-H TROPICAL CYCLONE TRACK FORECASTS IN THE WESTERN NORTH PACIFIC

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All large (>400 n mi at 96 h, >500 n mi at 120 h) Navy Operational Global Atmospheric Prediction System (NOGAPS) and U.S. Navy version of the Geophysical Fluid Dynamics Laboratory Model (GFDN) tropical cyclone track forecast errors in the western North Pacific during the 2004 typhoon season are examined. Responsible error mechanisms are described by conceptual models that are related to known tropical cyclone motion processes being misrepresented in the dynamical models. Of the 162 (135) cases of large NOGAPS (GFDN) forecast errors, 39 were due to tropical influences with excessive direct cyclone - tropics (E-DCI) interaction occurring most frequently. For the 217 large-error cases due to mid-latitude influences, the most frequent error mechanisms were E-DCI (mid-latitude), excessive response to vertical wind shear, excessive mid-latitude cyclogenesis (E-MCG), insufficient mid-latitude cyclogenesis (I-MCG), excessive mid-latitude cyclolysis (E-MCL), and excessive mid-latitude anti-cyclogenesis (E-MAG), which accounted for 68% of all large errors occurring in both NOGAPS and GFDN. Characteristics and symptoms of the erroneous forecast tracks and model fields are documented and illustrative case studies are presented. Proper identification and removal of the track forecast displaying an error mechanism could form a selective consensus that will be more accurate than a non-selective consensus.

KEYWORDS: Tropical Cyclone Track Forecasting, Systematic Approach, Conceptual Model Error Mechanisms, Dynamical Model Track Errors, 96-H and 120 H Tropical Cyclone Track Forecasting, Joint Typhoon Warning Center, Navy Operational Global Atmospheric Prediction System, NOGAPS, U.S. Navy Version of the Geophysical Fluid Dynamics Laboratory Model, GFDN, Tropical Cyclone Motion, Western North Pacific Typhoons

METEOROLOGY

ANALYSIS AND FORECASTS OF 300 HPA DIVERGENCE ASSOCIATED WITH SEVERE CONVECTION USING ETA-212 AND MM5 MODEL DATA

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Master of Science in Meteorology-March 2005

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This study investigates severe weather events occurring in the Midwest, central, and northeastern United States from May through September 2004. Severe weather events are pinpointed using tornado and hail reports and correlating them with NEXRAD radar data to determine maximum intensity of the event. Severe storms that occur within 30 minutes of a model forecast hour are catalogued for further investigation. Once these events are diagnosed, ETA-212 and MM5 model data is regrided, centered on the storm. Divergence values at 300 hPa are extracted from the model data for each storm event. These storms are then grouped in three ways: all storms, tornadic storms, and hail producing storms. The averaged maximum divergence values from the ETA-212 for each group are examined from the 0 hour analysis through the 21 hour forecast. From these averaged divergence values, a matrix of recommended divergence threshold values is derived. For the MM5 data, a subset of storms is examined. The MM5 and ETA-212 are run on an identical set of storms, and the divergence forecasts are compared.

KEYWORDS: Analysis, Forecasts, 300 hPa, Divergence, Severe Convection, ETA-212, MM5

THE IMPACT OF BACKGROUND RESOLUTION ON TARGET ACQUISITIONS WEAPONS SOFTWARE (TAWS) SENSOR PERFORMANCE

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Master of Science in Meteorology-March 2005

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This thesis evaluates the sensitivity of Target Acquisitions Weapons Software (TAWS) detection range calculations to the spatial resolution of scenario backgrounds. Sixteen independent sites are analyzed to determine TAWS background. Multispectral satellite data are processed to different spatial resolutions from 1m to 8km. The resultant imagery is further processed to determine TAWS background type. The TAWS background type is refined to include soil moisture characteristics. Soil moisture analyses are obtained using in situ measurements, the Air Force's Agricultural-Meteorological (AGRMET) model, and the Army's Fast All-Seasons Soil Strength (FASST) model. The analyzed imagery is compared to the current default 1o latitude by 1o of longitude database in TAWS. The use of the current default TAWS background database is shown to result in TAWS ranges differing from the 1m standard range by 18-23%. The uncertainty is reduced to 5% when background resolution is improved to 8km in rural areas. By contrast, in urban areas the uncertainty is reduced to 14% when spatial resolution is reduced to 30m. These results suggest that the rural and urban designations are important to the definition of a background database.

KEYWORDS: TAWS, Target Acquisitions Weapons Software, Background Soil Moisture Range Uncertainty, Multispectral, Agricultural-Meteorological, AGRMET, Fast All Seasons Soil Strength, FASST, Urban Rural Model

METEOROLOGY

METEOROLOGICAL MEASUREMENTS WITH A MWR-05XP PHASED ARRAY RADAR

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Scanning strategies for research and operational applications are developed for meteorological measurements with an experimental phased array radar, the MWR-05XP. A tornadic storm sampling strategy is developed with a 502.26 ms volumetric update and a resolution of 1.8° Az x 2° El x 150 m range. A sampling strategy for severe thunderstorm clusters is developed with a 10 second volumetric update and a resolution of 1.8° Az x 2° El x 300 m range. An operational weather scanning strategy is developed with an 81 second volumetric update and a resolution of 1.8° Az x 2° El x 150 m range. In general, for the acquisition of weather data, single frequency phased array radars offer only a slight sampling advantage over conventional scanning radars. This research verifies that for meteorological sampling with the MWR-05XP, frequency diversity coupled with electronic elevation scanning offers a significant sampling advantage over conventional radars. The combination of electronic beam steering and frequency diversity produces a synergistic reduction in sampling time that increases the overall volumetric update rate. This research also shows that, based on assumptions about the MWR-05XP operating parameters, it is possible to incorporate operational weather scanning into the radar's multifunction capability.

KEYWORDS: Phased Array Radar, Beam Steering, Frequency Steering, Meteorological Scanning, Weather Radar, Sampling Strategy, Scanning Strategy, Weather Scanning, MWR-05XP, Doppler Spectrum, Reflectivity, Doppler Velocity, Spectrum Width, Meteorological Moment Estimators, Tornado Radar Measurements, Tornado Chasing, Storm Chasing

THE NORTH ATLANTIC OSCILLATION INFLUENCE ON THE WAVE REGIME IN PORTUGAL: AN EXTREME WAVE EVENT ANALYSIS

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Master of Science in Physical Oceanography-March 2005

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Waves in the North Atlantic are strongly seasonal and peak in the winter season. The west coast of Portugal is exposed to winter swell, generated by wind associated with North Atlantic extratropical cyclones. The track of these storms, generated near the North American East Coast, is strongly influenced by the North Atlantic Oscillation (NAO). When the NAO is in its positive phase, they normally track northeast and reach Western Europe well north of the Iberian Peninsula, in the British Islands or Scandinavia. However, in the negative NAO situation, the track of the storms is more zonal and south than usual, due to a weakened NAO. The characteristics of wave regime in Portugal are shown to be strongly related to the NAO phase and corresponding storm tracking. Positive NAO storms, tracking northeast towards the north of Europe, drive longer period swell from the northwest, whereas negative NAO storms have associated shorter period swell arriving to Portugal from a more westerly direction. The relation between the NAO phase and the storm tracks and the characteristics of the wave regime is investigated with ten year observations from four directional waverider coastal buoys, located off the coast of Portugal.

KEYWORDS: North Atlantic Oscillation, NAO, Fetch, Waves, Portugal, Storm Tracking, Hindcast, WAVEWATCH III

METEOROLOGY

VALIDATION OF COUPLED OCEAN ATMOSPHERIC MESOSCALE PREDICTION SYSTEM (COAMPS) TM/DUST DURING UAE2

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Dust forecasting has become important to military operations over the past three decades. Rules of thumb have been the primary resource for forecasting dust. In recent years, algorithms for weather models have been created to produce atmospheric dust concentration forecasts. These algorithms are now coming into use operationally. Questions now arise regarding how good the models are and what causes errors in their forecasts.

This study examines the accuracy of the U.S. Navy's Coupled Ocean Atmospheric Mesoscale Model dust module during the United Arab Emirates Unified Aerosol Experiment. The study also attempts to determine what causes any error, if present. The primary method used to verify the model's aerial coverage accuracy is equitable threat score. Case studies are conducted to verify the scores and identify sources of any errors identified.

Results indicate that the model performs well with respect to sourcing dust plumes. Errors in modeled aerial coverage as compared to real world observations appear to be the result of an inability of the model to properly advect suspended dust near the surface layer. Unconfirmed dust plumes in the model seem to be the result of inaccurate surface characteristics.

KEYWORDS: Weather, COAMPS, COAMPS/Dust, Dust Modeling, Model Verification, Equitable Threat Score

MICROWAVE ESTIMATES OF THE EXTRATROPICAL TRANSITION PROCESS

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Microwave satellite imagery is a valuable tool for the observation of mature tropical cyclones. This study examines the application of microwave data to the extratropical transition (ET) process. During ET, a tropical cyclone (TC) moves into an area of large gradients in many atmospheric parameters. The data sparse regions in which these gradients exist make the examination of key physical mechanisms responsible for the ET process difficult. The Advanced Microwave Sounding Unit (AMSU) is used to investigate temperature and water vapor gradients. Advanced Microwave Scanning Radiometer is used to examine WV gradients and precipitation intensities. These observations are combined with diagnostic analysis of frontogenesis during the ET process of a TC that re-intensified as an extratropical cyclone and a TC that dissipated. Although the different outcomes of ET are related to differences in coupling between the decaying TC and the mid-latitude environment, microwave data are useful for defining specific characteristics that either inhibit or enhance the coupling of the decaying TC with the mid-latitude environment.

KEYWORDS: Tropical Cyclones, Extratropical Transition, Advanced Microwave Sounding Unit, Advanced Microwave Scanning Radiometer, Polar-orbiting satellites, Frontogenesis

METEOROLOGY

AEROSOL SCATTERING PHASE FUNCTION RETRIEVAL FROM POLAR ORBITING SATELLITES

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The retrieval of an aerosol scattering phase function using a multi-satellite technique is proposed. A total of 33 phase functions are derived from 18 smoke cases and 15 dust cases. Each case is interrogated using four to nine satellite passes over the aerosol region in a two- to four-hour timeframe. The radiance values for the red and near-infrared (NIR) channels are combined with backscattering angles to determine the shape of the scattering phase function. The radiance values are input into the Naval Postgraduate School (NPS) aerosol model to determine optical depths and sample phase functions. A comparison is made between the actual phase functions retrieved and the NPS model phase functions. It is found that the phase functions for the smoke cases more closely match the model phase functions than in the dust cases. Some conclusions could be drawn about the actual aerosol size and density distribution based on how well it matched the model phase function. Further analysis is necessary to define the exact size and number of the aerosol particles. Fully understanding the aerosol composition is crucial in determining its effects on military sensors and impacts to operations.

KEYWORDS: Scattering Phase Function, Aerosol Optical Depth, Aerosol Model, Mie Scattering, Smoke, Dust, Aerosol

MASTER OF SCIENCE IN METEOROLOGY AND PHYSICAL OCEANOGRAPHY

EVALUATION OF COUPLED OCEAN ATMOSPHERIC MESOSCALE PREDICTION SYSTEM (COAMPS) PERFORMANCE FORECASTING ALONG COAST WIND EVENTS DURING A FRONTAL PASSAGE

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Performance of high-resolution mesoscale models has been in a continuous state of refinement since their inception. Mesoscale models have become quite skillful in forecasting synoptic scale events such as mid-latitude cyclones. However, atmospheric forcing becomes a much more complicated process when faced with the challenge of forecasting near topography along the coastline. Phenomena such as gap flows, blocked flow winds, and low-level stratification become important to predictability at these scales. The problem is further complicated by the dynamics of a frontal passage event. The skill of mesoscale models in predicting these winds is not as well developed.

This study examines several forecasts by the Coupled Ocean Atmospheric Mesoscale Prediction System (COAMPS) during frontal passage events for the winter of 2003-2004. An attempt is made to characterize the predictability of the wind speed and direction both before and after frontal passage along the California coast. Synoptic forcing during this time is strong due to the effects of the mid-latitude cyclones propagating across the Pacific.

The study's results indicate that the wind field predictability is subject to several consistent errors associated with the passage of fronts over topography. These errors arise due to difficulty in the model's ability to capture weak thermal advection events and topographic wind funneling. The rough model representation of topography contributes to these errors.

KEYWORDS: Mesoscale Modeling, COAMPS, Model Verification, Predictability

EVOLUTION OF BOUNDARY LAYER HEIGHT IN RESPONSE TO SURFACE AND MESOSCALE FORCING

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Master of Science in Meteorology and Physical Oceanography-March 2005

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This thesis study focuses on understanding the dissipation processes of the stratocumulus deck after sunrise. This objective is met through careful analyses of observational data as well as model simulations. Measurements from the Marine Atmosphere Measurement Lab (MAML) of the Naval Postgraduate School (NPS) are used in this study. In particular, the half-hourly wind profiler/Radio Acoustic Sounding System (RASS) measurements are used to determine the boundary layer top and the evolution of the boundary layer mean thermodynamic properties during the cloud breakup period. Measurements from a laser ceilometer and routine surface measurements are also used to detect the variation of cloud base height, the evolution of the cloud deck, and the onset of sea breeze. These measurements reveal the increase of the boundary layer depth after sunrise, followed by a decrease of the boundary layer depth after the onset of the sea breeze, which points to the role of surface heating and sea breeze development in modulating cloud

METEOROLOGY AND PHYSICAL OCEANOGRAPHY

evolution. The effects of surface heating and sea breeze are further tested using a 1-dimensional mixed layer model modified for coastal land surfaces.

KEYWORDS: Marine Atmosphere Measurement Lab, MAML, Wind Profiler/Radio Acoustic Sounding System, RASS, Boundary Layer Depth, Mixed Layer Model

MASTER OF SCIENCE IN MODELING, VIRTUAL ENVIRONMENTS AND SIMULATION

AGENT-BASED TARGET DETECTION IN 3-DIMENSIONAL ENVIRONMENTS

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Master of Science in Modeling, Virtual Environments and Simulation-March 2005

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Second Reader: Jeff Crowson, Department of Operations Research

Visual perception modeling is generally weak for game artificial intelligence (AI) and computer generated forces (CGF), or agents, in computer games and military simulations. Several tricks and shortcuts are used in perceptual modeling. The results are, under certain conditions, unrealistic behaviors that negatively effect user immersion in games and call into question the validity of calculations in fine resolution military simulations. By determining what the computer-generated agent sees using methods similar to that used to generate the human players' screen view in 3-D virtual environments, researchers hope to present a method that can more accurately model human visual perception, specifically the problem of an entity "hiding in plain sight" using camouflage and smoke.

KEYWORDS: Perceptual Modeling, Target Detection, Artificial Intelligence, Non-Player Characters, Synthetic Players

AGENT-BASED SIMULATION OF DISEASE SPREAD ABOARD SHIP

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Extreme examples like the Spanish Flu pandemic of 1918 make clear the devastating impact that communicable diseases can have on military readiness. It is highly desirable to have models and tools that can be used to evaluate the course of a disease over time. These tools can help assess the effectiveness of strategies employed to contain the outbreak, such as constraining movement, wearing protective gloves or masks, closing high traffic areas, etc. Armed with these tools, a medical practitioner can better assess the right course of action in a time critical situation.

The primary difficulty with creating models and simulations for this purpose is that disease spread depends upon the details of human behavior and environmental variables which are not accounted for in current mathematical models. The likelihood that a particular individual will catch a given disease depends upon such specifics as where he works, whom he interacts with, where he sleeps, what he eats, his habits of personal hygiene, etc. It is hypothesized that a software disease simulation can combine agents that mimic human behavior, a ship specific environment, and disease specific attributes to model the spread of disease aboard ship more accurately than a mathematical model.

KEYWORDS: Mathematic Model, Agents, Simulation, Modeling, Disease, Epidemiology

MODELING, VIRTUAL ENVIRONMENTS AND SIMULATION

LOCOMOTION IN VIRTUAL ENVIRONMENTS AND ANALYSIS OF A NEW VIRTUAL WALKING DEVICE

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Second Reader: Joseph Sullivan, Modeling, Virtual Environments and Simulation Institute

This thesis investigates user interfaces for locomotion in virtual environments (VE). It looks initially at virtual environments and user interfaces, then concentrates on locomotion interfaces, in particular the Omni-Directional Treadmill (ODT) (Darken and Cockayne, 1997) and a new virtual walking device, LocoX, which was developed at the Modeling, Virtual Environments and Simulation Institute (MOVES), Naval Postgraduate School. This research analyzes and compares the ODT and LocoX in terms of the application of human ability requirements (HARs). It also compares the results of the analysis of the ODT and LocoX to real-world locomotion.

The analysis indicates that LocoX, a new way of exploring virtual environments (VEs), provides a close match to real locomotion on some subtasks in VEs--compared to the ODT--and produces relatively closer representation on some subtasks of real world locomotion. This thesis concludes that LocoX has great potential and that the locomotion provided is realistic enough to simulate certain kinds of movements inherent to real-world locomotion. LocoX still requires maturation and development, but is nonetheless a viable locomotion technique for VEs and future game-based simulations.

KEYWORDS: Locomotion, Locomotion Interface, VE User Interface, Virtual Environments

A MULTI-AGENT SYSTEM FOR TRACKING THE INTENT OF SURFACE CONTACTS IN HARBORS AND WATERWAYS

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Maritime security is especially critical for countries like Singapore, an island nation situated on one of the world's busiest shipping routes, whose economic prosperity is highly dependent on international trade from her busy port, petrochemical complexes, and other high value units located along her coastline. This thesis borrows ideas and techniques suggested for identifying air threats in the Air Defense Laboratory (ADL) and employs them to identify asymmetric maritime threats in ports and waterways. Each surface track is monitored by a compound multi-agent system comprised of the several intent models, each containing a nested multi-agent system. The attributes that define intent models of friendly, neutral, unknown, and potentially hostile surface contacts are obtained from movement and communication protocols defined by the Vessel Traffic Information System (VTIS), maritime navigation rules, and cues for surface warfare threat assessment. The underlying cognitive mechanism of the models is conceptual blending. The study includes a simulation of a mock VTS for the port of Singapore and surrounding waterways to test the ability of the models to compress data and information regarding multiple simulated surface contacts into integration networks, and to then determine the surface contacts' intent through the expansion of the integration networks.

KEYWORDS: Threat Assessment, Maritime Protection, Multi-agent Systems, Intent Tracking, Conceptual Blending

MASTER OF SCIENCE IN OPERATIONS RESEARCH

SCHEDULING AMMUNITION LOADING AND UNLOADING FOR U.S. NAVY SHIPS IN SAN DIEGO

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Master of Science in Operations Research-March 2005

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Tomahawk cruise missiles (TCM) cost over one million dollars and are in short supply. U.S. Navy ships require that TCM and other conventional ammunition be loaded in appropriate amounts prior to deploying to sea. A typical deployment lasts for six months and, when completed, any remaining ammunition must be unloaded and made ready for other deploying ships. For ships under Commander, Naval Surface Force U.S. Pacific Fleet (SURFPAC), about 3,500 tons of ammunition must be loaded and unloaded annually; this currently costs 14 million dollars for just pilots, tugboats, and fuel. This thesis formulates and solves an integer linear program, Surface Navy Scheduler (SNSKED), to prescribe an ammunition load and unload schedule for San Diego homeported ships. SNSKED seeks a schedule with minimized costs subject to constraints on ships availability, port capabilities, and support assets. SNSKED is tested on a realistic quarterly scenario consisting of 19 combatant ships, three weapons stations, two ammunition ships, five mission types, two ammunition types, and three ways of loading ammunition. SNSKED provides optimal schedules that reduce costs by over 16 percent. SNSKED is also used to evaluate different operational policies, ammunition port utilization, and ammunition loading times.

KEYWORDS: Mixed Integer Linear Programming, Ships Scheduling, Optimization, Ordnance, GAMS

OPTIMIZING COST VERSUS TIME SHIPPING OF U.S. NAVY RETROGRADE MATERIEL

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The Naval Inventory Control Point (NAVICP) provides program and supply support for the weapons systems that keep U.S. Naval forces mission ready. NAVICP conducts more than 380,000 repair actions annually to keep sufficient repair parts available or ready for issue to the fleet upon demand. These repair actions have totaled \$3.08B in shipping and redistribution costs of Not Ready for Issue (NRFI) materiel. This thesis models the NAVICP shipping of unserviceable but repairable (retrograde) Navy materiel or Depot Level Repairables (DLRs). An integer linear program is developed to prescribe minimum cost shipment recommendations of DLRs from fleet to repair locations within the NAVICP and Defense Logistics Agency (DLA) distribution system subject to constraints on average shipping time (AveTime). NAVICP provided data on DLR shipments for one year, from which six representative DLRs, three of aviation and three of maritime cognizance, are constructed. It is found that a cost and time savings can be achieved for all representative DLRs by avoiding the use of DLA as storage prior to induction for repair. In this study, shipping costs are compared for each of the six DLRs when constrained for AveTime from two to eight days. It is found that 2-day constrained AveTime shipping, on average, costs 18 times that of 7-day AveTime shipping, twice that of 3-day shipping, and a minimum of 5 times and a maximum of 11 times that of the costs of 4 through 6-day shipping.

KEYWORDS: Optimization, Mixed Integer, Linear Programming, Retrograde

OPERATIONS RESEARCH

OPTIMIZING GLOBAL COMBAT LOGISTICS FORCE SUPPORT FOR SEA BASE OPERATIONS

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The Navy has to choose the number and design for ships in the Combat Logistics Force (CLF) and then plan how to use them to provide logistical support to Carrier Strike Groups, Expeditionary Strike Groups, and Seabasing platforms engaged in any variety of worldwide conflicts. CLF ships are very expensive to build and equip and budgets are limited—ships purchased and the manner in which they are integrated with the CLF fleet must continue to provide the flexible support required by the Navy. A decision support tool using a global sea route and resupply base model, and a daily time resolution optimization of CLF ship activities to support any complete, worldwide scenario is introduced. The result is an optimal, face-valid daily operational logistics plan—a schedule of evolutions for each available CLF ship. Researchers discover exactly how to use CLF ships to support a notional, but particularly relevant preemptive combat scenario, with follow-on humanitarian assistances mission. Finally, researchers study how change CLF ship numbers and missions can enhance operational effectiveness.

KEYWORDS: Optimization, Mixed Integer Program, Global Sea Route, Combat Logistics Force, T-AKE, T-AOE(X), Station Ship, Shuttle Ship, Logistics Planning Factors, Safety Stocks, Underway Replenishment, Consolidation, Cycle, Humanitarian Assistance, Sea Base

TACTICAL DECISION AID FOR UNMANNED VEHICLES IN MARITIME MISSIONS

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Master of Science in Operations Research-March 2005

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Steven E. Pilnick, Department of Operations Research

Second Reader: W. Matthew Carlyle, Department of Operations Research

An increasing number of unmanned vehicles (UV) are being incorporated into maritime operations as organic elements of Expeditionary and Carrier Strike Groups for development of the recognized maritime picture. This thesis develops an analytically-based planning aid for allocating UVs to missions. Inputs include the inventory of UVs, sensors, their performance parameters, and operational scenarios. Operations are broken into mission critical functions: detection, identification, and collection. The model output assigns aggregated packages of UVs and sensors to one of the three functions within named areas of interest. A spreadsheet model uses conservative time-speed-distance calculations, and simplified mathematical models from search theory and queuing theory, to calculate measures of performance for possible assignments of UVs to missions. The spreadsheet model generates a matrix as input to a linear integer program assignment model, which finds the best assignment of UVs to missions based on the user inputs and simplified models. The results provide the mission planner with quantitatively-based recommendations for unmanned vehicle mission tasking in challenging scenarios.

KEYWORDS: Unmanned Aerial Vehicles, UAV, Unmanned Surface Vehicles, USV, Recognized Maritime Picture, RMP, Random Search Theory, Erlang's Loss, Tactical Decision Aid, Expeditionary Strike Group, Carrier Strike Group, Micro-UAV, VTUAV

OPERATIONS RESEARCH

USING WEB-BASED INTERACTIVE MULTIMEDIA TO SUPPLEMENT TRADITIONAL TEACHING METHODS: A PILOT PROGRAM FOR MEDICAL TRAINING OF NON-MEDICAL PERSONNEL

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This thesis proposes that it is possible to create an adjunct to traditional instructor-led training that will reduce training time and costs and at the same time improve performance using commercial-off-the-shelf (COTS) software. Motivated by the lessons learned following the attack on the *USS COLE* on 12 October 2000, in which 17 sailors were killed and 42 were wounded, researchers created a simulator using readily available software in minimal time with zero funding. The simulator is tested against small sample sizes of eventual recipients of the training. The simulator, as part of a blended learning solution, is shown to be as effective as traditional instructor-based learning, but was conceived at a fraction of the cost and with a significant reduction in total training time. Both of these factors are increasingly being valued in today's reality of increased operational tempo and reduced resources.

KEYWORDS: Blended Learning, E-Learning, Interactive Media, COTS, Training, Simulation, Web-Based Training, GITMO Wounds, Medical Training, ADDIE, Adult Learning

INTERDICTING A TIME-PHASED FORCE DEPLOYMENT (TPFDD): TWO-SIDED OPTIMIZATION OF ASSET SELECTION, LIFT SCHEDULING, AND MULTI-COMMODITY LOAD PLANNING

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A military deployment is visible and vulnerable. Deployments are currently planned assuming they can be completed with surprise or defended from any threat. JFAST, the current deployment planning and visualization tool of choice, uses heuristics of unknown reliability that yield deployment plans of unknown quality, and ignores vulnerability. This thesis introduces LIFTER, an integer-linear program (ILP) that optimizes a time-phased force deployment (TPFDD) by day, asset cycle, and TPFDD line (individual shipment from an origin to a destination), and ATTACKER, also an ILP, representing a smart enemy's resource-limited interdictions to maximally disrupt LIFTER's subsequently re-optimized TPFDD plan. LIFTER activates transport assets from an allocation list, and yields a complete logistic plan that minimizes disruption represented by penalties for early, tardy, late, or dropped shipments, and for under-utilization of asset capacity. LIFTER is used to qualitatively assess JFAST heuristic plans. Both ILPs are linked in a decomposition-based search for the best deployment plan around the worst-case interdiction, given that the actions of deployer and interdictor are transparent to both parties. An explanation of how JFAST could be embellished with its own version of ATTACKER is presented. A key discovery is a gauge of the value of intelligence, deception, and secrecy.

KEYWORDS: TPFDD, Time-Phased Force Deployment, JFAST, Optimization, Interdiction, Two-Sided Optimization, Value of Intelligence

OPERATIONS RESEARCH

ANALYSIS OF HIGH-SPEED VESSELS FOR SEVENTH FLEET LOGISTICS SUPPORT

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Commander, Logistics Group, Western Pacific (COMLOGWESTPAC), is concerned with the delivery of high priority material, ordnance, and passengers to U.S. Navy ships due to a very large operations area and limited Combat Logistics Force (CLF) assets. High-speed vessels (HSV) may have the potential to improve the delivery of these materials when used to complement existing logistics shuttle ships. This thesis quantifies current levels of traditional Naval logistics support and provides comparison to HSV-based alternatives in various scenarios. The CLF Scenario Analysis Tool (CLFSAT), a newly developed discrete event simulation model of Naval logistics support, performs the analysis. Given a scenario depicting combatant movements and operations, CLFSAT provides insight into the comparative performance of different supporting Naval logistics force structures.

This analysis determines that HSVs can be effective logistics platforms in specific scenarios when distributing high priority material, ordnance, and stores. HSVs are very effective in small theaters with short transit distances, but for larger theaters, their effectiveness is inversely proportional to distance from the Forward Logistics Site. Regardless of theater size, HSVs show significant improvements in theater distribution of “low density, high priority” cargo, such as precision guided munitions (PGMs) or critical repair parts when customers are outside COD range.

KEYWORDS: Global Sea Route, Combat Logistics Force, CLF, Station Ship, Shuttle Ship, Logistics Planning Factors, Safety Stocks, Underway Replenishment, UNREP, Consolidation, CONSOL, Inport Replenishment, INREP, High-Speed Vessel, HSV, Precision Guided Munitions, PGM, Casualty Report, CASREP, High Priority Material, Simkit, Java

EFFECTIVENESS OF A MINE-AVOIDANCE SENSOR ON MINEFIELD TRANSIT

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Master of Science in Operations Research-March 2005

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Patricia A. Jacobs, Department of Operations Research

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Simulation is used to study the effectiveness of mine avoidance sonar (MAS) use on safe minefield transit by a ship. A MAS is able to detect mine-like objects but currently cannot classify the detected object as a mine or a NON-mine Mine-like Bottom Object (NOMBO). The tactic is to avoid all detected objects. The minefield is represented by a finite grid of fixed width and length. The representation of ship maneuvering in the simulation is similar to that of a wall-tracing algorithm for a computer mouse going through a maze. The simulation results indicate that the use of the mine avoidance sonars can increase the probability of successful transit. The probability of successful transit increases as the probability of detection increases for minefield object densities less than 50% of the field. However, the probability of successful transit is sensitive to the mine and NOMBO density. The probability of successful transit can be increased if the density of mine-like objects is decreased. Suggestions on mine avoidance tactics are made, using results obtained to show the limitations and effectiveness of the MAS with regard to the open waters, narrow channels, ports, and harbors.

KEYWORDS: Mines, Minefield Transit, NOMBO, Mine Warfare, Mine-Counter-Measures, Probability of Detection, False Alarms, Simulation

MASTER OF SCIENCE IN PHYSICAL OCEANOGRAPHY

THE NORTH ATLANTIC OSCILLATION INFLUENCE ON THE WAVE REGIME IN PORTUGAL: AN EXTREME WAVE EVENT ANALYSIS

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Master of Science in Physical Oceanography-March 2005

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Waves in the North Atlantic are strongly seasonal and peak in the winter season. The west coast of Portugal is exposed to winter swell, generated by wind associated with North Atlantic extratropical cyclones. The track of these storms, generated near the North American East Coast, is strongly influenced by the North Atlantic Oscillation (NAO). When the NAO is in its positive phase, they normally track northeast and reach Western Europe well north of the Iberian Peninsula, in the British Islands or Scandinavia. However, in the negative NAO situation, the track of the storms is more zonal and south than usual, due to a weakened NAO. The characteristics of wave regime in Portugal are shown to be strongly related to the NAO phase and corresponding storm tracking. Positive NAO storms, tracking northeast towards the north of Europe, drive longer period swell from the northwest, whereas negative NAO storms have associated shorter period swell arriving to Portugal from a more westerly direction. The relation between the NAO phase and the storm tracks and the characteristics of the wave regime is investigated with ten year observations from four directional waverider coastal buoys, located off the coast of Portugal.

KEYWORDS: North Atlantic Oscillation, NAO, Fetch, Waves, Portugal, Storm Tracking, Hindcast, WAVEWATCH III

MASTER OF SCIENCE IN PRODUCT DEVELOPMENT

THE EFFECT OF FUNDING SCHEME ON THE PERFORMANCE OF NAVY REPAIR ACTIVITIES

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Navy repair activities are social and political as well as financial and technical systems. As systems, their architecture has a controlling effect on their behavior. One factor that works throughout the architecture is the particular funding scheme and the rules, both written and cultural, that any particular scheme brings with it. This paper examines the interaction of funding scheme, as a rules-based force, with the changing architectures of Navy repair activities to try to determine the effect of the funding scheme on the performance of that architecture. It shows that changes to the architecture of the ship maintenance system in the Northwest region have worked, together with a conversion of the funding scheme to Mission Funding, to improve the decisions that are made within that architecture.

KEYWORDS: Mission Funding, Navy Working Capital Fund, Intrapreneuring

MASTER OF SCIENCE IN SYSTEMS ENGINEERING

PROPAGATION MODELING OF WIRELESS SYSTEMS IN SHIPBOARD COMPARTMENTS

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In today's Navy, it is becoming more and more important to reach all areas onboard a ship with key technical resources. In order to accomplish this goal, the already existing physical networks need to be complemented with wireless capability. A sophisticated Wireless Local Area Network (WLAN) can provide that vital connectivity to the ship's network resources from almost anywhere on the ship. It would allow sailors to access critical information and immediately communicate with others throughout the ship from any standard wireless device (PDA, laptop, and many other hand-held devices). In addition, WLANs greatly mitigate problems due to physical damage to wires or fiber optic cables that are used today. Because the Navy's emphasis is on building ships with reduced manning, advanced technology, and lower cost in mind, the idea of a WLAN, which has a deep impact on all those areas, has been of a growing interest to the Navy.

The purpose of this thesis is to analyze, model, and simulate a wireless environment onboard a variety of Naval ship compartments, using the Urbana code. Starting from known inputs (frequency, building geometry, material properties, propagation computation model, and antenna type), analytical results reflecting the propagation mechanisms, coverage area, and security posture of the WLAN are presented. Variable inputs can then be optimized to achieve a desired signal distribution and to meet security requirements for a specific shipboard environment.

KEYWORDS: Simulation of Wireless Propagation, Shipboard Modeling, Antenna Propagation, Urbana, Wireless Security, Indoor Propagation, Indoor-to-Outdoor Propagation

REMOTE SENSING OF SULFUR DIOXIDE (SO₂) USING THE LINEATE IMAGING NEAR-ULTRAVIOLET SPECTROMETER (LINUS)

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The Lineate Image Near Ultraviolet Spectrometer (LINUS) is a spectral imager developed to operate in the 0.3-0.4 micron spectral region. The 2-D imager operates with a scan mirror, forming image scenes over time intervals of 10-20 minutes. Sensor calibration is conducted in the laboratory, and the system response to Sulfur Dioxide (SO₂) gas is determined. The absorption profile for SO₂ is measured, and curves of growth are constructed as a function of gas concentration. Test measurements are performed at the Naval Postgraduate School (NPS), from the roof of Spanagel Hall. Field observations are conducted at a coal-burning factory site at Concord, California, with the purpose of quantifying the presence of SO₂. The Concord field measurement shows traces of SO₂, with further analysis still required.

KEYWORDS: Sulfur Dioxide, SO₂, Remote Sensing, Ultraviolet Spectral Imaging, UV, LINUS

MASTER OF SCIENCE IN SYSTEMS ENGINEERING MANAGEMENT

PLANNING CONCEPTS TO SUSTAIN, DEVELOP, AND TEST COMPLEX NAVAL COMBAT SYSTEMS AT THE SURFACE COMBAT SYSTEMS CENTER, WALLOPS ISLAND, VIRGINIA

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The Surface Combat Systems Center (SCSC), Wallops Island, Virginia, is a combination of personnel, geography, airspace, and technology located on a barrier island off Virginia's eastern shore. First opened in 1985 as a U.S. Navy AEGIS Land-Based Test Site (LBTS), SCSC has grown and now includes the Ship Self Defense (SSD) and DD(X) combat system facilities. SCSC is chartered to support computer program development, life cycle and in-service engineering, team training, and research, development, test, and evaluation services while adapting to evolution of U.S. Naval combatants and emerging requirements. The purpose of this document is to present an analysis of existing U.S. Navy shipboard and land-based organization business practices and apply them to the existing SCSC command organization. The objective is to combine U.S. Navy transformation concepts and SCSC planning concepts to provide the documentation needed to support the development of new strategic business plans for the command. The goal is to provide a long-term strategy to transform SCSC into the U.S. Navy's East Coast Weapons Range Facility or otherwise named, the Wallops Island Test and Evaluation Range Facility (WITERF), while maintaining its synergy an LBTS for research, development, testing, and evaluation of Naval combat systems.

KEYWORDS: Land-Based Test Sites, Test and Evaluation, AEGIS, Ship Self Defense, DD(X), Missile Range Facilities, Sea Power 21, NAVSEA, Wallops Island, Virginia, NASA, Atlantic Fleet Weapons Training Facility, AFWTF

MASTER OF ARTS

**International Security and Civil-Military Affairs
National Security Affairs
Security Studies**

MASTER OF ARTS IN INTERNATIONAL SECURITY AND CIVIL-MILITARY RELATIONS

NATO'S ROLE IN THE PROTECTION OF THE CIVIL POPULATION AGAINST THE CONSEQUENCES OF CHEMICAL, BIOLOGICAL, RADIOLOGICAL, AND NUCLEAR TERRORIST ATTACKS

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The rapidly growing threat to civilian populations from different terrorist organizations and nuclear states involved in regional conflicts requires new and unorthodox solutions. This research analyzes steps that have been taken on the European continent before and after September 11th, 2001 (hereinafter referred to as September 11), in order to create a new, more efficient system of protecting the civilian population against chemical, biological, radiological, and nuclear (CBRN) terrorist attacks. NATO's role in the most problematic issues is explored.

The research examines what has been done within NATO since 1998 by members of the Euro-Atlantic Partnership Council in the field of improving the population protection against consequences of CBRN terrorist attacks in two dimensions: national and international. This evaluation supports the case for the creation of an international system of mutual assistance in case of CBRN terrorist attacks under NATO's leading role.

KEYWORDS: Protection of the Civilian Population, CBRN Terrorist Attacks, NATO's Role, NATO

MASTER OF ARTS IN NATIONAL SECURITY AFFAIRS

RACES AT WAR: NATIONALISM AND GENOCIDE IN TWENTIETH CENTURY EUROPE

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Second Reader: Hans-Eberhard Peters, Department of National Security Affairs

Europe in the 20th century witnessed the large-scale displacement and mass murder of civilian populations because of their ethnic or national identity. Genocide is the ultimate expression of this form of integral nationalism. As a result of the Second World War, the term “genocide” was introduced to describe the victimization of nations, and became codified in international law and agreements. The end of the century saw the introduction of a new term: “ethnic cleansing.” This term was used to signify something less than the total physical annihilation of a people in the Balkans Wars, in contrast to the extermination campaign of the Nazis in World War Two, or the Turks following World War One. This work examines both campaigns, the Nazis against the Jews and the Serbs against the Bosnians, to argue that ethnic cleansing is genocide. While much of the debate of the 1990s focused on body counts to justify the distinction between the two, a careful analysis of the original work on genocide and the UN Agreement that outlaws such phenomenon reveals that this “body count” notion is neither correct nor justifiable. Similarly, a look at these two cases reveals that acts of genocide developed gradually, rather than as part of pre-existing master plans.

KEYWORDS: Nationalism, Genocide, Holocaust, Bosnian Genocide, Eugenics, Euthanasia

JORDANIAN-PALESTINIAN RELATIONS: A JORDANIAN VIEW

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Jordanian--Palestinian relations are deeply rooted in history. They date back to the first quarter of the twentieth century, to the period of British and French involvement in the region in the aftermath of World War I, and the establishment of the state of Israel in 1948. Since the early days of the British mandate, the two peoples, Jordanian and Palestinian, found themselves obliged to interact with each other due to geographic, social, economic, and demographic considerations. Following the decision to unite the West Bank and Transjordan in order to create the Hashemite Kingdom of Jordan in 1950, the West Bank and its people were in the process of integration within Jordan until war halted progress in 1967. This study presents the evolution of Jordanian – Palestinian relations through history. These relations have been both challenged by hardships and influenced by several other Arab states. The current peace process between the Israelis and Palestinians, which could bring about an independent Palestinian state, requires that Jordanians and Palestinians restructure their relations in order to be of mutual benefit.

KEYWORDS: Jordanian-Palestinian Historical Relations, Struggle Over the West Bank, Relations After 1967 War, Jordan’s Civil War, Disengagement of West Bank, Jordan’s Umbrella at Madrid Peace Conference, Scenarios for Future Relations

NATIONAL SECURITY AFFAIRS

MITIGATING THE MANNED PORTABLE AIR DEFENSE SYSTEMS (MANPADS) THREAT: INTERNATIONAL AGENCY, U.S., AND RUSSIAN EFFORTS

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There are in excess of 500,000 Manned Portable Air Defense Systems (MANPADS) in worldwide inventories, including several thousand outside of government control. MANPADS are surface-to-air missile systems enabling the operator to launch missiles at aircraft from the ground. The most common MANPADS are the Russian SA-7 and U.S. Stinger, which feature infrared guidance systems. The concern that MANPADS can be easily acquired by non-state actors intent on downing civilian and military aircraft has led international agencies, the U.S., and Russia to implement measures to reduce the risk of a MANPADS attack. International agencies such as the Wassenaar Arrangement work to stop illegal MANPADS proliferation. The U.S. MANPADS Defense Act and the U.S. Department of Homeland Security have implemented measures to counter the MANPADS threat. Russia has revised its export controls and forged a counter-proliferation agreement with most countries of the Commonwealth of Independent States (CIS). However, the multilateral initiatives to better control MANPADS stocks and transfers are far from comprehensive. A new approach to mitigating the MANPADS threat adopts elements from the 1997 Mine Ban Treaty and the Landmine Monitor. The conclusion of this thesis is that if MANPADS counter-proliferation efforts remain status quo, an attack on a commercial aircraft in the western world is imminent.

KEYWORDS: MANPADS, SA-7, Stinger, Commercial Aircraft, UN Register of Conventional Arms, Wassenaar Arrangement, MANPADS Defense Act, Russian Federation, Export Controls, Counter-Proliferation

AFRICAN SUB-REGIONAL ORGANIZATIONS IN PEACEKEEPING AND PEACEMAKING: THE ECONOMIC COMMUNITY OF WEST AFRICAN STATES (ECOWAS)

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This thesis examines the emerging role of a sub-regional organization dealing with peacekeeping and peacemaking missions in the post-Cold War period in West Africa. This examination focuses mainly on the Economic Community of West African States (ECOWAS) and ECOMOG, its military wing, as the most prominent sub-regional organization in conducting peacemaking and peacekeeping missions in Africa. This thesis focuses on the first generation interventions of ECOWAS/ECOMOG in undertaking peacemaking and peacekeeping missions in Liberia (1990-1997), Sierra Leone, (1998-2000), and Guinea Bissau (1998-1999), and the second generation of interventions in Liberia in 2003 and in Côte d'Ivoire (2003-2004). This examination assesses ECOWAS' strengths and limitations and compares the level to which the second generation interventions have benefited from the lessons of the first.

KEYWORDS: Evolution of UN Peacekeeping, Sub-Regional Organizations in Peacekeeping, ECOWAS/ECOMOG Peacekeeping and Peace Making in Liberia, Sierra Leone, Guinea-Bissau, Cote d'Ivoire

NATIONAL SECURITY AFFAIRS

UNITED STATES-PEOPLE'S REPUBLIC OF CHINA MILITARY-TO-MILITARY RELATIONS: PROSPECTS FOR PROGRESS

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American military relations with the Chinese People's Liberation Army (PLA) have been in a constant state of flux since their rocky beginnings during the Second World War. Since the Tiananmen Square incident of June 1989, efforts to reestablish a positive working relationship between the U.S. Department of Defense and the PLA have been restrained by domestic political pressures within both polities and a number of crises, which increased political tensions between both nations' governments. Due to reactive policies implemented by both governments, engagement programs between the United States and the People's Republic of China (PRC) have yielded few tangible benefits to either side in the past fifteen years.

This thesis addresses the history of U.S. military engagement with the PRC and discusses past American policies of "containment" and "engagement" of China. Case studies concerning American engagement with Taiwan and Thailand reveal the benefits of close links with partners in Asia and provide programs for possible emulation in the U.S.-PRC relationship. Through managed engagement programs such as systematic security summits, educational exchanges, and partnership operations initiatives, a stable defense dialogue between American and Chinese militaries can yield significant results in reducing tensions between their two governments and averting future crises through improved communication and cooperation.

KEYWORDS: Military Relations, People's Liberation Army, People's Republic of China, PLA, PRC, Military Education, Military Exchanges, Military Engagement, Military Modernization, Military Professionalism, U.S.-Thai Relations, U.S.-Taiwan Relations

STATE AND LOCAL POLICY CONSIDERATION FOR IMPLEMENTING THE NATIONAL RESPONSE PLAN

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This thesis examines state and local implementation of the National Response Plan, which requires simultaneous implementation of the National Incident Management System (NIMS), Incident Command System (ICS), Unified Command, and the Multiagency Coordination System (MACS). A terrorist induced Foot and Mouth Disease bioattack is used to examine the impact that fully implementing the NRP and the NIMS will have on under-developed areas and agriculturally-based communities.

KEYWORDS: National Response Plan, NRP, National Incident Management System, NIMS, NIIMS, Incident Command System, ICS, Unified Command, Multiagency Coordination System, MACS, Foot and Mouth Disease, FMD, Agroterrorism, Highly Contagious Diseases, HCD, Serotype, Vaccination, Cattle, Pigs, Swine, Sheep, Virus, Vesicle

NATIONAL SECURITY AFFAIRS

HOW WILL THE INDIAN MILITARY'S UPGRADE AND MODERNIZATION OF ITS INTELLIGENCE, SURVEILLANCE, AND RECONNAISSANCE (ISR), PRECISION STRIKE, AND MISSILE DEFENSE AFFECT THE STABILITY IN SOUTH ASIA?

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India has made a concerted effort to upgrade its Intelligence, Surveillance, and Reconnaissance (ISR), precision strike, and missile defense capabilities as it competes with China and Pakistan for regional power. The Phalcon Airborne Warning and Control System, Su-30MKI fighter-bomber aircraft, and S-300PMU surface-to-air missile system are some examples of the new capabilities India is acquiring. The author argues that if India continues its military modernization, Pakistan will become more insecure. The increase in the conventional military capabilities gap will likely upset the existing balance of power in South Asia, leading to a regional arms race, lowering the nuclear threshold, and increasing instability in the region.

The strategic stability/tactical instability paradox that exists between two nuclear countries may lead them to engage in "small" wars. India's increasing military capabilities may encourage it to conduct a preventive strike against Pakistan. In such a climate, a regional arms race eventually may lead Pakistan to establish a "hair-trigger" nuclear posture. India's effort to achieve a significantly superior conventional military force over Pakistan may, paradoxically, reduce Indian security by causing greater instability, and may possibly lead to nuclear war. Regional stability is enhanced to the extent that there is a rough conventional military balance between India and Pakistan.

KEYWORDS: Intelligence, Surveillance, and Reconnaissance, ISR, Precision Strike, Missile Defense, Stability, Instability, India, Pakistan, China, United States, Conventional Military Balance, Balance of Power, South Asia

ACCESS ISSUES ASSOCIATED WITH U.S. MILITARY PRESENCE IN THAILAND AND THE PHILIPPINES

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In pursuit of the objectives of the U.S. National Security Strategy and the National Military Strategy, the U.S. armed forces require access to military and logistics facilities overseas in order to support and sustain its combat power projection. Access to these places translates into capabilities. Therefore, forward presence has a deterrent value even in a potential conflict scenario where the United States policy is one of "strategic ambiguity," e.g., as in a Taiwan-People's Republic of China (PRC) military confrontation. An American military forward presence in times of peace as well as in times of heightened regional tensions lends credibility to U.S. diplomacy. Moreover, access to forward locations is expedient when engaging transnational threats or supporting humanitarian missions, e.g., the South and Southeast Asia tsunami relief operations.

This thesis analyzes the political opposition to U.S. military presence in Thailand and the Philippines. The historical context that led to the development of this opposition is examined in detail to identify the domestic sources of disagreement with the United States military presence or policies on access to base facilities. The rationale of those who oppose, as well as those who support, U.S. presence are clearly delineated. By understanding the sensitive political issues, American military planners and operators can adapt basing and access strategies according to the political climate in these two countries. The politics unique to each environment will dictate the combination of "pure" basing strategies tailored to meet the U.S. military objectives, as well as the public diplomacy required to support them.

NATIONAL SECURITY AFFAIRS

KEYWORDS: U.S.-Thai Relations, U.S.-Philippine Relations, Public Diplomacy, Forward Presence, Access Strategy, Radicalism, Leftist Nationalism, Rightist Nationalism, Muslim Nationalism, Anti-American, Anti-U.S., Propaganda, United Front, USPACOM, Theater Security, Military Bases, Military Presence, Basing Strategies, Political Mobilization, Democratization

MODERNIZATION OF THE INDIAN AIR FORCE: SECURITY IMPLICATIONS FOR SOUTH ASIA

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This thesis analyzes the Indian Air Force's (IAF) robust modernization campaign and explores why the IAF is on the path to transforming itself from an air force dedicated to air defense to one capable of global force projection. The stunning examples of airpower in the two Gulf Wars, Kosovo, and Afghanistan proved to the Indian leadership the value of modern airpower. Thanks to the amazing growth of the Indian economy, the IAF is gradually acquiring the weapon systems characteristic of a global aerospace force. Pakistan and China are concerned about the motivations behind IAF's modernization efforts and have already begun to improve their own air capabilities in response to any conventional or nuclear contingency. The responses of Pakistan, in particular, indicate the lowering of the nuclear threshold in South Asia. On the other front, a potential arms race between India and China is anticipated.

The United States may be able to neutralize the damaging effects of India's military build-up by increasing its arms exports to both India and Pakistan. Specifically, the sale of American F-16s to both countries would fortify bilateral relations with the United States, maintain the fragile security balance in South Asia, and minimize China's influence in the region.

KEYWORDS: Modernization, Indian Air Force, Pakistan Air Force, People's Liberation Army Air Force, U.S-Indian relations, U.S.-Pakistani relations, SU-30MKI, South Asia, Limited War

REINTEGRATION OF THE IRAQI MILITARY IN POST-CONFLICT ERA

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Historical analysis of the Iraqi military suggests that certain actions should be taken if the state-building process of the United States-led coalition is to be successful. The fulcrum of power in Iraq has always been the internecine ethnic, religious, and tribal relationships and interactions. This thesis studies the recently constructed security structure of Iraq, particularly the new Iraqi Armed Forces, by focusing on likely influences of the ethnic and sectarian factions and the social structure of the country on the security and reconstruction/reintegration of the new Iraqi military. The thesis brings into sharp focus the singular fact that the military of Iraq has always been used, in one way or another, against one section of the population or another, by the prevailing political power and its use of the time-honored virtues of patronage and corruption. The use of the military in Iraq as an internal political tool has, more than anything else, contributed to the lack of national identity, a prerequisite for a sound military structure. The thesis presents 25 situational operating methodologies that, if followed, should provide a structurally sound modern Iraqi military rather than a supernumerary police force. Following the recommendations presented in this thesis would not only provide a military that serves as a strong basis for national unity and identity, but would also create a military that contributes to regional stability.

KEYWORDS: Iraq, Ethnic and Religious Factions, Second Gulf War, Iraqi Security Forces, Iraqi Military

NATIONAL SECURITY AFFAIRS

RESHAPING THE SWORD AND CHRYSANTHEMUM: REGIONAL IMPLICATION OF EXPANDING THE MISSION OF THE JAPAN SELF DEFENSE FORCES

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Since taking office in 2001, Japanese Prime Minister Koizumi has pressed for greater expansion to the mission of the Japan Self Defense Force (JSDF), first by endorsing deployments in support of counter-terrorism operations in the Indian Ocean, and eventually, through the domestically unpopular decision to deploy to Iraq. Recently, an update to the 1996 National Defense Program Outline was published that accelerated the shift in the mission of the JSDF away from a pure self-defense force capable of operating with the United States in defense of Japan's sovereignty to that of an internationally recognized force capable of conducting operations in varying environments throughout the globe. Japan's accelerated military involvement in world affairs has provoked concerns among neighbors, whose perceptions are often quite different from those of the United States or Japan. Japan's legacy of militarism has created resistance to change among regional partners. In order for changes to succeed without upsetting the regional balance of power, Japan must improve not only the capability, but also the international trust and standing of the JSDF. This thesis provides information to allow policy makers to better understand the challenges that the government of Japan will face in response to changes in security strategy.

KEYWORDS: Japan, Self-Defense Force, JSDF, China, North Korea, South Korea

THE EFFECTS OF GLOBALIZATION ON STATE CONTROL OF CIVIL SOCIETY: THE CATHOLIC CHURCH IN VIETNAM DURING AUTARKY AND INTERDEPENDENCE

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Aurel S. Croissant, Department of National Security Affairs**

This thesis examines how globalization has affected Vietnam's view and treatment of religious institutions. In a larger context, this thesis argues that the conditions of globalization foster increased liberalism and the latent development of civil society. The implications of globalization on religion in Vietnam are explored through a case study of the Catholic Church in Vietnam from 1975 to 2004. The Catholic Church is examined during two different periods: during autarky from 1975 to the Doi Moi reforms in 1986, and during international interdependence from 1987 to 2004.

Isolated from international norms and pressures during its period of autarky, Vietnam suppressed, rigidly controlled, and severely restricted the Catholic Church. As Vietnam entered its present period of global integration and interdependency, Vietnam's view and treatment of the Catholic Church improved: suppression lessened, controls eased, and many restrictions lifted. The thesis concludes that in order to foster religious freedom and build civil society, policy makers should implement policies that engage rather than isolate. Engagement policies tend to increase a country's degree of global interdependency and integration with the world economy and community. As the level of interdependency increases, countries tend to become more subject to international norms and standards.

KEYWORDS: Vietnam, Religious Freedom, Catholic Church, Doi Moi, Civil Society, Engagement, Interdependency, Autarky

NATIONAL SECURITY AFFAIRS

COMMAND AND CONTROL OF SPECIAL OPERATIONS FORCES MISSIONS IN THE U.S. NORTHERN COMMAND AREA OF RESPONSIBILITY

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The need for a well thought out, planned, and rehearsed command and control organization to conduct special operations in the U.S. Northern Command (USNORTHCOM) Area of Responsibility (AOR) is vital to success in defending the homeland. Currently, USNORTHCOM does not have an apportioned or assigned command and control structure for the conduct of special operations. This thesis analyzes three courses of action to fulfill this requirement: use the current USNORTHCOM battle staff command structure, including the integration of the Standing Joint Force Headquarters-North; rely on the newly formed U.S. Special Operations Command's Joint Task Force structures; and establish a Theater Special Operations Command North assigned to USNORTHCOM. Through the conduct of analysis and research, this thesis recommends that the Joint Staff direct the reorganization required to establish a Theater Special Operations Command North to exercise command and control of special operations forces conducting operations in the USNORTHCOM AOR.

KEYWORDS: Special Operations Forces, SOF, Homeland Security, HLS, Homeland Defense, HLD, U.S. Northern Command, USNORTHCOM, Command and Control, C2, Joint Task Force, JTF, Joint Special Operations Task Force, JSOTF, Threat to Homeland, Posse Comitatus

DEMOCRATIC CHAOS: HOW TAIWANESE DEMOCRACY DESTABILIZED CROSS-STRAIT RELATIONS

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Since 1988, democracy in Taiwan has evolved and developed a great deal. Experts argue whether this growth constitutes "democratic consolidation" but there is no contention of the idea that the ROC is more democratic now versus pre-1988. In addition, public opinion polls show that the populace view themselves very differently in 2004 than they did in 1988 in terms of their national identity and their preferences for mainland relations. Finally, the democratic period in Taiwan witnessed greater hostility between the PRC and ROC than in the preceding thirty years combined. This heightened level of belligerence has subsided in recent years, but still remains a Sword of Damocles hanging over each step of Taiwan's democratic process. With these facts in mind, it is clear that the addition of ROC democratization has destabilized relations between China and Taiwan. One should note that Taiwan's political liberalization has not damned cross-strait relations to a cataclysmic fate. As noted many times in this essay, there are prospects for hope and increased cooperation. However, with the advent of democracy for the first time in an ethnically Chinese society, relations moved from a fairly stable equilibrium to a somewhat chaotic new reality resplendent with uncertainty and ripe for catastrophic miscalculation.

KEYWORDS: China, Taiwan, PRC, ROC, Cross-Strait Relations

NATIONAL SECURITY AFFAIRS

LESSONS NOT LEARNED: THE REKINDLING OF THAILAND'S PATTANI PROBLEM

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This thesis explores the ongoing Malay-Muslim separatist insurgency in southern Thailand. In particular, it argues that historically-rooted structural factors, including relative economic deprivation, limited political integration, and the struggle to maintain ethnic-religious identity, are at the root of this insurgency. The year 2001 produced two catalysts for the renewal of this insurgency, one internal and one external. The internal catalyst was a newly elected suppressive government regime under the leadership of Prime Minister Thaksin and the Thai Rak Thai Party. The external catalyst was the growing, increasingly radicalized Islamist movement, largely defined through terrorist violence, which expressed itself in the 9/11 attacks. The combination of these has produced rekindled secessionist violence of a previously unknown level in the Thai provinces of Pattani, Narathiwat, and Yala.

Given the deeply ingrained structural cause of this insurgency, as well as a government administration whose policies and conflict mismanagement continually fuel the violence, the prospect for conflict resolution is not promising. Nonetheless, it remains in the best interests of the United States that this conflict is resolved soon. Should the insurgency continue growing, the situation may reach a point of drastic consequences for Thailand as well as the United States.

KEYWORDS: Insurgency, Islamism, Malay, Muslim, Narathiwat, Pattani, Secessionism, Separatism, Southern Thailand, Terrorism, Thailand, Thai Rak Thai, Thaksin, Yala

THE EFFECTIVENESS OF ISRAEL'S COUNTER-TERRORISM STRATEGY

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In this thesis, Israel's counter-terrorism strategy and its effectiveness are analyzed. Because of ongoing suicide attacks from Palestinian and other terrorist organizations, Israel will continue to have an aggressive counter-terrorism strategy. The thesis examines how the impact of past wars, campaigns, and deadly terrorist attacks influenced the thinking of past and current leaders. The Israelis vehemently believe the security of the nation relies on what the Israeli Defense Force (IDF), the Israeli Security Agency (ISA), and Shin Bet do to counter terrorism, not on the actions of outside governments. The IDF, ISA, and Shin Bet employ three different measures in an attempt to thwart terrorist attacks both in Israel and in the Occupied Territories. Defensive, operative, and punitive measures are used in different phases of terrorist attacks in an attempt to protect the lives of Israeli citizens. Of all the three measures used by the IDF and other security agencies, defensive actions have by far been the most effective to date.

KEYWORDS: Israeli/Arab Conflict, Israeli/Arab Wars, HAMAS, Palestine Islamic Jihad, Al Aqsa Martyr Brigades, Fatah Tanzim, HEZBULLAH, Israeli Prime Ministers, IDF

NATIONAL SECURITY AFFAIRS

WHY THEY HATE US: DISAGGREGATING THE IRAQI INSURGENCY

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Since April 2003, the United States and its coalition partners have been involved in a complex insurgency in Iraq. The violent and diffuse nature of the insurgency has become a major obstacle to Iraq's reconstruction and the withdrawal of coalition military forces. The central problem with the coalition's counterinsurgency strategy is that it fails to take into account the diverse nature of the Iraqi insurgency, as well as the goals and historical motivations of the groups involved. A coalition counterinsurgency strategy that is flexible enough to deal with Iraq's insurgent groups differently as opposed to monolithically will be more effective in achieving America's goal of stability in Iraq. This thesis argues that the Iraqi insurgency can be disaggregated into categories that will better assist policymakers in identifying and understanding insurgent groups. Sunni, Shi'ite, and transnational categories are used to divide insurgents, showing each to have specific traits, largely rooted in history. Categories of insurgents are further divided into sub-categories, where insurgent groups are examined in more detail. Based on the disaggregation, recommendations for counterinsurgency strategy orientations toward each of these categories and sub-categories are proposed. America's long-term legacy in the Middle East will depend on the conditions of the U.S. departure from Iraq, and the past two years have shown that "winning the peace" can be more difficult than winning the war. It is only through a more thorough understanding of Iraq's insurgent groups and the proper application of a counterinsurgency strategy that accounts for the differences between groups that America will be able to make this legacy a positive one.

KEYWORDS: Al-Qaeda, Ba'ath Party, Ba'athist, Counterinsurgency, Disaggregate, Former Regime Loyalist, Insurgency, Insurgent, Iraq, Islamist, Jihadist, Saddam Hussein, Shi'ite, Sunni, Sunni Triangle, Terrorist, Transnational, Tribal, Tribe, Zarqawi

THE EFFECTS OF WESTERN FEMINIST IDEOLOGY ON MUSLIM FEMINISTS

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This research shows that women are potent symbols of identity. They signify a vision of society that identifies a nation. The Middle East provides a perfect example of this. It has one of the highest rates of population growth in the world, yet maintains one of the lowest literacy rates and labor force participation among women. This has a direct impact on their ability to be seen as modern states. Furthermore, the Middle East has come under attack for having one of the poorest records of human rights, particularly in reference to women. Contrary to this implication, Middle Eastern women have taken extremely active roles in the gender debate and the socio-political struggles within their societies. The results of this participation have yielded a number of different interpretations of what it means to be a feminist and if this title is even something that Muslim women want. It has also created a very complex relationship between the West and western feminism, which has deep implications in contemporary gender politics.

KEYWORDS: Gender, Feminism, Orientalism, Iran, Egypt, Middle East, Muslim, Western Feminist

MASTER OF ARTS IN SECURITY STUDIES

RWANDA GACACA TRADITIONAL COURTS: AN ALTERNATIVE SOLUTION FOR POST-GENOCIDE JUSTICE AND NATIONAL RECONCILIATION

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Initially, many Rwandans placed their hopes in the well-funded International Criminal Tribunal for Rwanda (ICTR), but it has been plagued by inefficiencies and delays. Although the Rwandan national courts have tried a significantly larger number of cases than the ICTR, they are also criticized as being too slow. Therefore, the government of Rwanda has proposed using the “Gacaca” traditional courts to accelerate post-genocide justice. The purpose of this thesis is to determine whether, and under what conditions, the Gacaca courts can be an effective mechanism of justice and national reconciliation.

KEYWORDS: Rwanda, International Criminal Tribunal For Rwanda, ICTR, Gacaca

COMMUNITY POLICING AS THE PRIMARY PREVENTION STRATEGY FOR HOMELAND SECURITY AT THE LOCAL LAW ENFORCEMENT LEVEL

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In the wake of September 11, 2001, local law enforcement agencies throughout the country find themselves struggling to identify their responsibilities and define their future role in the effort against terrorism in the U.S. homeland. At a time when law enforcement organizations are competing for limited funds and resources, agencies will have to look at how to adapt existing policing philosophies and strategies, such as community-oriented policing, to address the issue of homeland security.

The goal of terrorism is centered on creating an atmosphere of fear in society to achieve a philosophical goal. Terrorism is about the impact of its violence on society. This requires the application of the basic concepts of law enforcement: protection and prevention of terrorism.

As a result of the events of September 11, 2001, law enforcement agencies have had to assimilate homeland security strategies into their existing responsibilities for combating crime and maintaining social order. This thesis identifies how homeland security prevention and deterrence responsibilities and efforts can be effectively integrated into local law enforcement’s existing community policing framework. This thesis also examines the extent to which local law enforcement agencies in the state of Florida have adopted community policing efforts into their homeland security strategy.

KEYWORDS: Homeland Security, Community Policing, Fear, Local Law Enforcement

SECURITY STUDIES

THE SEAMLESS MARITIME CONCEPT

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The Seamless Maritime Concept is the need to treat awareness, security, and defense in a comprehensive, cohesive manner. Continuing discussion of maritime homeland security and defense capability requirements and resources allocation fails to recognize the unique requirements of the maritime domain. Enormous thought and resources have been put towards enhancing maritime homeland security and maritime homeland defense readiness. Unfortunately, the efforts to date treat “defense” and “security” disparately, ignoring the necessity to include all maritime domain partners. The Seamless Maritime Concept suggests that incremental changes to processes, boundaries, and markets have little chance to dramatically improve performance. The Seamless Maritime Concept suggests a new way of addressing the problem.

The Coast Guard’s motto is “Semper Paratus” or “Always Ready.” It reflects the quality of the people; the people will not let any obstacle prevent them from accomplishing the mission. Admiral Loy’s “dull knife” declares the desperate need to re-capitalize the Coast Guard cutter and aircraft fleets. Combined with the Coast Guard’s long-standing record of success, these factors demonstrate that given some resource support that the Coast Guard can get it (maritime security) done. Conversely, failure to recapitalize will drive the Coast Guard toward obsolescence and preclude an opportunity to enhance the security and defense readiness of the maritime domain.

KEYWORDS: Maritime Homeland Security, Maritime Homeland Defense, Coast Guard, Seamless Maritime Concept

BIOSECURITY OF SELECT AGENTS AND TOXINS

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In this thesis, the concept of biosecurity as it pertains to biological select agents and toxins in American biomedical research institutions is explored. Posing the research question “How can specific public biomedical research universities securely use and store biological select agents?” the thesis outlines the dynamics of the select agents and toxins list. The thesis also examines the relevant history of the control of biological agents in both international and domestic settings, including federal regulations pertaining to biosecurity (42CFR73). Two specific case studies are presented within the thesis and the biosecurity strategies and tactics at these two distinct biomedical research facilities are compared. An answer to the research question is proposed and additional areas for research are outlined.

KEYWORDS: Select Agents, Select Biological Agents and Toxins, Biosecurity

SECURITY STUDIES

BUILDING A CONTINGENCY MENU: USING CAPABILITIES-BASED PLANNING FOR HOMELAND DEFENSE AND HOMELAND SECURITY

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A capabilities-based approach to contingency planning offers important opportunities to strengthen both homeland defense and homeland security. The Department of Defense (DoD) and the Department of Homeland Security (DHS) have already begun moving beyond traditional threat-based and scenario-based planning methodologies toward a more capabilities-based approach, but require embracing this concept more in order to counter challenges in developing contingency plans against current threats to the U.S. homeland. Additionally, given the critical responsibilities of state and local governments in homeland security, this planning approach might be applied far beyond the federal government. This thesis examines ways that a specialized capabilities-based planning process might be applied to homeland defense and homeland security, and applies the proposed methodology to two case studies: the U.S. Navy component of the U.S. Northern Command and the New York City Fire Department.

KEYWORDS: Contingency Planning, Planning, Homeland Defense, Homeland Security, Capabilities-Based Planning

U.S. COAST GUARD REORGANIZATION: WHY MERGING THE FIELD UNITS IS NOT ENOUGH TO REMAIN SEMPER PARATUS (ALWAYS READY)

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After the terrorist attacks of September 11, 2001, the U.S. Coast Guard shifted much of its effort toward maritime homeland security activities. In response to this major shift in mission priorities, the Coast Guard is merging its Operational and Marine Safety field units into Sector commands. This reorganization is designed to ensure unity of effort, allow more efficient use of resources, improve training of Coast Guard members, and ensure better customer service. This thesis shows that further reorganization will be necessary at the operational and strategic levels of the Coast Guard. The organization-wide changes recommended by the author will allow the Coast Guard to align with the new Sector field commands, better align with the other agencies within the Department of Homeland Security, and ensure that the critical tenets of unity of command, unity of direction, and unity of accountability are realized. Research data gathered for this project includes surveys, personal interviews, and a use-case. The author also conducts a detailed review of documents produced at a Coast Guard Reorganization Summit, other internal Coast Guard documents, and published literature. Based on the results of this study, the author offers 10 recommendations for the leaders of the post-9/11 Coast Guard.

KEYWORDS: Coast Guard, Public Sector Mergers, Reorganization, Organizational Change, Alignment, Vertical Alignment, Unity, Unity of Command, Unity of Direction, Unity of Accountability, Organizational Structure, Organizational Culture, Organizational Design, High-Performance Organizations

SECURITY STUDIES

STUDY OF CIVIL-MILITARY RELATIONS IN CRISES OF CZECHOSLOVAK HISTORY

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This thesis examines civil-military relations during the critical moments of Czechoslovakian history, particularly during the deep political and societal crises in 1938, 1948, 1968, and 1989. Such a method offers an opportunity to study civilian control of the military in a situation in which civil-military relations are in deep crisis. By concluding that even under such conditions there were stable civil-military relations in the former Czechoslovakia, this thesis affirms the theory of military professionalism as a crucial factor in civil-military relations, as presented by Samuel P. Huntington. Thus, the study of civil-military relations in the crises of Czechoslovakian history provides an exceptional opportunity to test the Huntington's model of the equilibrium of objective civilian control in the circumstances of profound societal disturbances. In accordance with the Huntington's theory of stable civil-military relations, this thesis attests that strong military professionalism, typified by the bonds of traditions, obedience, and patriotic loyalty, plays crucial role in determining stability of civil-military relations, i.e., an objective civilian control of the military. Subsequently, by following this reasoning, this thesis also justifies the assumption of permanently stable civil-military relations in Czechia, because it intentionally concentrates only on the continuum of the Czechoslovak and the Czech civil-military relations.

KEYWORDS: Czechoslovakia, Civil-Military Relations, Civilian Control of the Military, Military Professionalism

PLANNING FOR SUCCESS: CONSTRUCTING A FIRST RESPONDER PLANNING METHODOLOGY FOR HOMELAND SECURITY

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The planning methodologies used today by most U.S. fire departments are excellent for traditional missions, but wholly inadequate for the threats posed by terrorism. Planning in the fire service and the rest of the first responder community has historically relied on a one-dimensional approach that uses a scenario-based planning (SBP) methodology. This thesis argues that the fire service and others in the first responder community will be able to contribute to homeland security missions much more effectively and efficiently by switching to specially adapted versions of capabilities-based planning.

This thesis proposes a new integrated planning methodology that combines the planning strengths of scenario-based planning, threat-based planning, and capabilities-based planning. The new method identifies capabilities that could be used to manage and mitigate the consequences of the different types of contingencies within the various response spectrums. It allows an organization to perform analysis and efficiency studies to evaluate the different spectrums of contingencies against existing capabilities and to create a menu of capabilities necessary for the first responder to respond to all its missions, including immediate threats and terrorism, in the most efficient and cost-effective manner.

KEYWORDS: Fire Service, First Responder Community, Planning Methodology, Scenario-based Planning, SBP, Threat-based Planning, TBP, Capabilities-based Planning, CBP, Traditional Response, Immediate Threats, Homeland Security Missions, Contingency Spectrums, Full Spectrum Emergency Response Preparedness, FSERP

SECURITY STUDIES

ORGANIZATION FOR SECURITY AND COOPERATION IN EUROPE: PAST, PRESENT, AND FUTURE MISSIONS

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This thesis examines the role of the Organization for Security and Cooperation in Europe (OSCE) among organizations dealing with security issues, such as the United Nations, the European Union, and NATO. This study further analyzes the OSCE commitments in the fields of human rights, democracy, rule of law, and national minorities. This analysis is performed in order to promote the OSCE to a broader public. The thesis further analyzes and describes the origins of the Conference for Security and Cooperation in Europe (CSCE) and its development since 1975, when the Helsinki Final Act was signed by the Heads of State or Government of all participating States. The development of the international situation in Europe, the end of Cold War, and escalation of violence, especially in South Eastern Europe, Caucasus, and Central Asia, caused fundamental changes in the European, and subsequently, the world security environment. The CSCE identified and responded to this new situation, resulting in a dramatic growth of its own role in shaping a common security area. Consequently, the CSCE changed its name to the Organization for Security and Cooperation in Europe. However, some critics think that OSCE is a "dead" organization, lacking tangible results and the necessary "teeth." It is necessary to review the main ideas why the CSCE was established and to properly identify the role of the OSCE in the European Security Architecture. Therefore, the main part of the thesis focuses on the European Security Architecture, the OSCE itself, and the OSCE missions, three of which are detailed and evaluated as case studies.

KEYWORDS: OSCE, EU, NATO, European Security Architecture, Security, Field Activity, Field Operation, Mission

THE PRINCIPLES OF PREVENTION AND THE DEVELOPMENT OF THE PREVENTION TRIANGLE MODEL FOR THE EVALUATION OF TERRORISM PREVENTION

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In this thesis, authors propose the theoretical and practical development of the "Prevention Triangle," a graphical model designed to define a system for evaluating national, state, and local terrorism prevention mandates and programs. Based upon objectives detailed in the National Strategy for Homeland Security and derived through an analysis of selected prevention theories and programs, primarily those aimed at crime prevention, this study first seeks a theoretical basis for the prevention of terrorism in the form of four principles before deriving and defining representative evaluative criteria for designing and measuring the efficacy of prevention programs.

As conceived, the Prevention Triangle has, through dispositional and experiential theory, further application to the ritualizing of many of the strategic and operational components associated with the present alliance against global terrorism. This reflects our understanding that while the theoretical premises and evaluative proxies of contemporary terrorism prevention theory largely rely on situational prevention strategies and tactics, the true measure of any prevention mandate is more akin to dispositional and experiential prevention, in that it occurs over time, through societal change and communal observation, and is therefore more accurately evaluated through the development of long-term baseline data.

KEYWORDS: Terrorism, Prevention, Situational Prevention, Dispositional Prevention, Experiential Prevention, Prevention Triangle, Evaluation

SECURITY STUDIES

THE FINAL STATUS OF KOSOVO AND ITS IMPLICATIONS IN BALKANS' STABILITY

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This thesis presents possible scenarios for the final political status of Kosovo, undecided since 1999, and the implications of these scenarios for stability in the Balkans.

Basic elements of theory regarding reconstruction of war-torn societies are presented in terms of security, governance, economy, and justice. The goal is to gain an understanding of the current situation in Kosovo, the challenges that the international administration had to handle when it arrived in Kosovo in June 1999, and its achievements and weaknesses to date.

Finally, possible scenarios for Kosovo's final status are examined and the best one for regional stability is suggested.

KEYWORDS: Kosovo, Final Status, Regional Stability

HOSPITAL BASED FIRST RESPONDER MASS PROPHYLAXIS PLAN

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As the United States improves its collective awareness and emergency preparedness in the face of increased terrorist activity, more efforts are being made to create and enhance community readiness for catastrophic events. There have been substantial efforts to improve the nation's bioterrorism preparedness. Better planning, equipment, training, surveillance, and pharmaceutical caches have elevated the nation's readiness for biological attacks. In order to effectively meet the challenges created by a bioterrorism attack, its first lines of defense, the first responders, must be rapidly prophylaxed to allow the continuance of their mission.

Many states and localities have tackled the gigantic undertaking of mass prophylaxis plans to provide chemoprophylaxis to civilians should the need arise. Many cities have developed and tested their plans to provide general public mass prophylaxis. It is assumed, or briefly mentioned, that the mass prophylaxis of first responders will occur, but few plans have been developed. The primary objective of this research is to develop, test, and make recommendations for a straightforward, adaptable mass prophylaxis plan to meet the prophylactic requirements of local first responders in the event of a biological attack.

KEYWORDS: Homeland Security, First Responder, Mass Prophylaxis

THE SECOND WAVE OF NATO ENLARGEMENT: A KEY CONTRIBUTOR TO MAINTAINING AND DEVELOPING THE TRANSATLANTIC LINK

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The purpose of this study is to determine how post-Cold War NATO allies have contributed to transatlantic relations, both in times of crisis and in times of harmony. Their contribution, although less significant when compared to long-time members' military capabilities, takes various forms. Their support in times of disagreement among allies over the Iraq 2002-2003 issue proved to be more valuable than was anticipated.

Therefore, my research is an introspective look at the events that marked NATO's evolution during the last fifteen years and their implications for NATO members as units and for traditional transatlantic relations as a whole.

Successive NATO enlargements proved that each decision to add new members reflected NATO's priorities at that particular moment. Whether it was a pre-Cold War enlargement or a post-Cold War enlargement, the decision reflected NATO's interests. Some of the decisions were predominantly military; some were in accordance with the international order established after World War II. The post-Cold War enhancements had two major characteristics: the first enlargement was more symbolic than the second because it erased the artificial lines set by Yalta, whereas the second one was much more practical.

The geo-strategic position of the NATO candidates and their willingness to join, prior to their formal invitation, were favorable factors, and the decisions made regarding membership proved to have long-term, positive consequences. New NATO members, particularly Romania, appreciated their new status and participated actively in both NATO operations and in "coalition of the willing." Their equal participation in NATO-led operations and coalitions made a palpable contribution to both NATO and to the transatlantic relations.

KEYWORDS: NATO Enlargement, Transatlantic Relations, Romania

**PSYCHOLOGICAL OPERATIONS (PSYOP) IN STABILIZATION AND RECONSTRUCTION
OPERATIONS: PREPARING FOR KOREAN REUNIFICATION**

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Psychological operations (PSYOP) forces should undertake significant doctrinal, training, and operational reforms to ensure the viability of support provided to U.S.-led stabilization and reconstruction efforts. Such operations involve increased civil-military interactions and necessitate effective cross-cultural communications with not only the indigenous populace, but a host of transnational actors as well. Today's PSYOP training is reflective of a persisting "Cold War mentality" that fails to adequately prepare soldiers for effective post-conflict situations, such as the reunification of the Korean peninsula, whether brought about either through a renewal of combat operations or the result of diplomatic means. Meanwhile, North Korea's formidable and adept propaganda machine has persisted in isolating its populace from external influences for more than a half-century. Post-Korean War generation North Koreans have been successfully indoctrinated since birth to despise the United States. Furthermore, anti-U.S. sentiment has been on the rise in South Korea for a number of years. Under the current training model, contemporary psychological operations forces are ill-prepared to conduct effective operations in an environment involving two-way, face-to-face communications such as those required while stabilizing and reconstructing a nation. The case of Korean reunification serves as an extreme scenario that nevertheless depicts the drastic need for improvements in the capabilities of modern PSYOP forces.

KEYWORDS: Psychological Operations, PSYOP, Psychological Warfare, PSYWAR, Psychological Operations Networks, Stabilization and Reconstruction, Post-Conflict Reconstruction, Korean Reunification, North Korean Propaganda, Social Capital

SECURITY STUDIES

AGROTERRORISM RISK COMMUNICATION: CHALLENGES AND IMPLICATIONS FOR COMMUNICATORS

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There are many potential targets for terrorists in the United States, one of which is the food supply system. An attack on the food supply system would create great need for information dissemination to many audiences, primarily the general public, about the risk resulting from such an attack.

The Multi-State Partnership for Security in Agriculture, a collaborative effort of 10 states, has identified the need for development of a strategy for communicating to the public the risk resulting from an agroterrorism incident. Before the Partnership begins development of a strategy, however, it must take into consideration the factors that are important when communicating about agroterrorism risk: recognition that communication of risk about food carries with it specific challenges; the public's level of trust in government will affect how it perceives and accepts risk messages; and Americans' post-September 11, 2001, fear associated with terrorism alters perception and acceptance of risk.

Recognition of the existence of these factors is not enough, however. The Partnership must recognize, as well, that these factors may present barriers to effective communication. To overcome these barriers, the Partnership should apply tried-and-true risk communication principles, tailored to specifically address the factors that make agroterrorism risk communication unique.

KEYWORDS: Agroterrorism, Risk Communication, Multi-State Partnership for Security in Agriculture, Agriculture Security

THE SECOND FRONT: GRAND STRATEGY AND CIVIL-MILITARY RELATIONS OF WESTERN ALLIES AND THE UNION OF SOVIET SOCIALIST REPUBLICS (USSR), 1938-1945

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The debate about grand strategy in the Second World War has scarcely ended, even in the 21st century. The present study examines the classical issue of the grand strategy in Europe and the anti-Hitler coalition as concerns the U.S.-UK-Soviet exchange about the Second Front. The great phenomenon of the Second World War was the creation of an unprecedented military alliance between the western powers and the Soviet Union. Due to mutual antagonism, inter-Allied cooperation during the Second World War was very complicated and at times extremely tense. Perhaps the most acute disagreement in the relationship between the Allies was the "Second Front" controversy. Despite desperate Soviet demands to open the Second Front as soon as possible, the Western Allies launched a massive cross-channel operation in northwestern Europe only in June 1944. This thesis analyzes the reasons why it took the western powers so long to organize and execute such an operation and its implications for the post-war order. A detailed analysis of the grand strategy during the Second World War is one of the ways to comprehend the violent 20th century and its own problems of grand strategy.

KEYWORDS: The Second Front, Grand Strategy, Western Allies and the Soviet Union

SECURITY STUDIES

EURO-ATLANTIC INTEGRATION - UKRAINIAN SECURITY OPTIONS IN THE TWENTY-FIRST CENTURY: ORIGINS AND DEVELOPMENTS

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This thesis reviews security options available to the Ukraine since it emerged as an independent state. The choice of taking the European model for the development, integration to the Euro-Atlantic security structures and then to European economic and political space, became the dominant option for the current Ukrainian government. Neutrality and Euro-Asian (Russian) vectors of policy, exploited in the past, gained less attention under the current domestic and international environment. However, certain encouragement and support for Ukraine from western societies is needed. Otherwise, ambitious Ukrainian plans would remain declarations, Euro-skepticism among Ukrainians might increase, and a shift from Europe to Eurasia may occur.

KEYWORDS: Ukraine, Euro-Atlantic Integration, European Union, NATO

ASSESSING THE UTILITY OF WORK TEAM THEORY IN A UNIFIED COMMAND ENVIRONMENT AT CATASTROPHIC INCIDENTS

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Since 9/11 much progress has been made by federal, state, and local authorities to prepare for future catastrophic incidents. The 1 March 2004 release of the National Incident Management System (NIMS) mandated the use of Unified Command and Incident Management Teams (IMTs) for multi-agency, multi-jurisdictional incidents. These teams have strong potential for improving complex incident management. However, the potential for interagency conflict threatens effectual IMT functioning in the absence of team skills instruction as part of a national training curriculum. The current curriculum teaches technical skills and ICS role responsibilities, and omits skills needed to build healthy team dynamics.

Training for IMTs needs to include more than technical skills (“what to do”). The Department of Homeland Security (DHS) should expand the curriculum to include team dynamics (“how to do it”). Further, DHS need not “re-invent the wheel” when looking for sources of team dynamic theory, but need only look to and adapt the experience of business and academia. Over the past 20-25 years, a variety of inter-organizational networks and Work Teams have been studied and field-tested. This thesis examines literature lessons on the problems shared by Work Teams and IMTs, with particular emphasis on effectiveness and managing conflict.

KEYWORDS: NIMS, Incident Management, Unified Command, Incident Management Teams, Incident Command System, Emergency Response Providers

SECURITY STUDIES

FUSING INTELLIGENCE WITH LAW ENFORCEMENT INFORMATION: AN ANALYTIC IMPERATIVE

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The tragedy of 11 September 2001 revealed two major shortcomings: the U.S. military and the Department of Defense's inability to respond quickly to and defend against the threat posed by foreign terrorists to the United States, and the inability of the intelligence and law enforcement communities to fuse and analyze foreign threat intelligence with domestic law enforcement information in a timely fashion to provide adequate indications and warning of such an attack. The United States Northern Command (USNORTHCOM) Intelligence Directorate (J2) has the primary mission in providing accurate, timely, and relevant indications and warnings of potential threats to the Commander, USNORTHCOM. The USNORTHCOM J2 must be able to use all intelligence sources, including law enforcement information, to better understand the potential threats and capabilities arrayed against it. This enables the USNORTHCOM J2 to provide the Commander, USNORTHCOM, an all-source, fused analytic assessment of potential threats as the command carries out its mission to "deter, prevent, and defeat threats and aggression aimed at the United States," thus fulfilling the command's role as the Department of Defense's primary lead command in homeland defense and homeland security.

KEYWORDS: Intelligence, Law Enforcement, PATRIOT Act, September 11, 9/11, Terrorism, Terrorists, Homeland Security, Homeland Defense, Counterterrorism

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