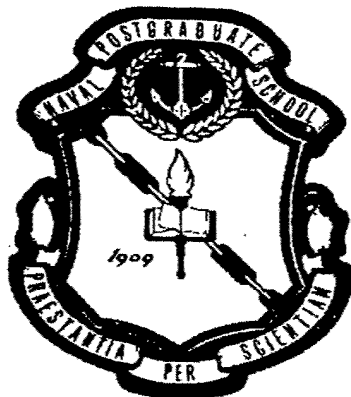


Naval Postgraduate School
Monterey, California 93943-5138

NPS-09-02-017



***SUMMARY
OF
RESEARCH
2001***



**Department of Defense Analysis
Graduate School of Operational and Information Sciences**

**Gordon McCormick
Chair**

**David Tucker
Associate Chair for Research**

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Prepared for: Naval Postgraduate School
Monterey, CA 93943-5000

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NAVAL POSTGRADUATE SCHOOL
Monterey, California

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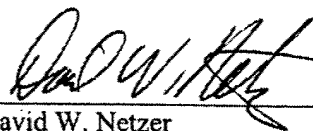
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This report contains project summaries of the research projects in the Department of Defense Analysis. A list of recent publications is also included, which consists of conference presentations and publications, books, contributions to books, published journal papers, and technical reports. Thesis abstracts of students advised by faculty in the Department are also included.

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THE NAVAL POSTGRADUATE SCHOOL MISSION

Increase the combat effectiveness of the U.S. and allied 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.

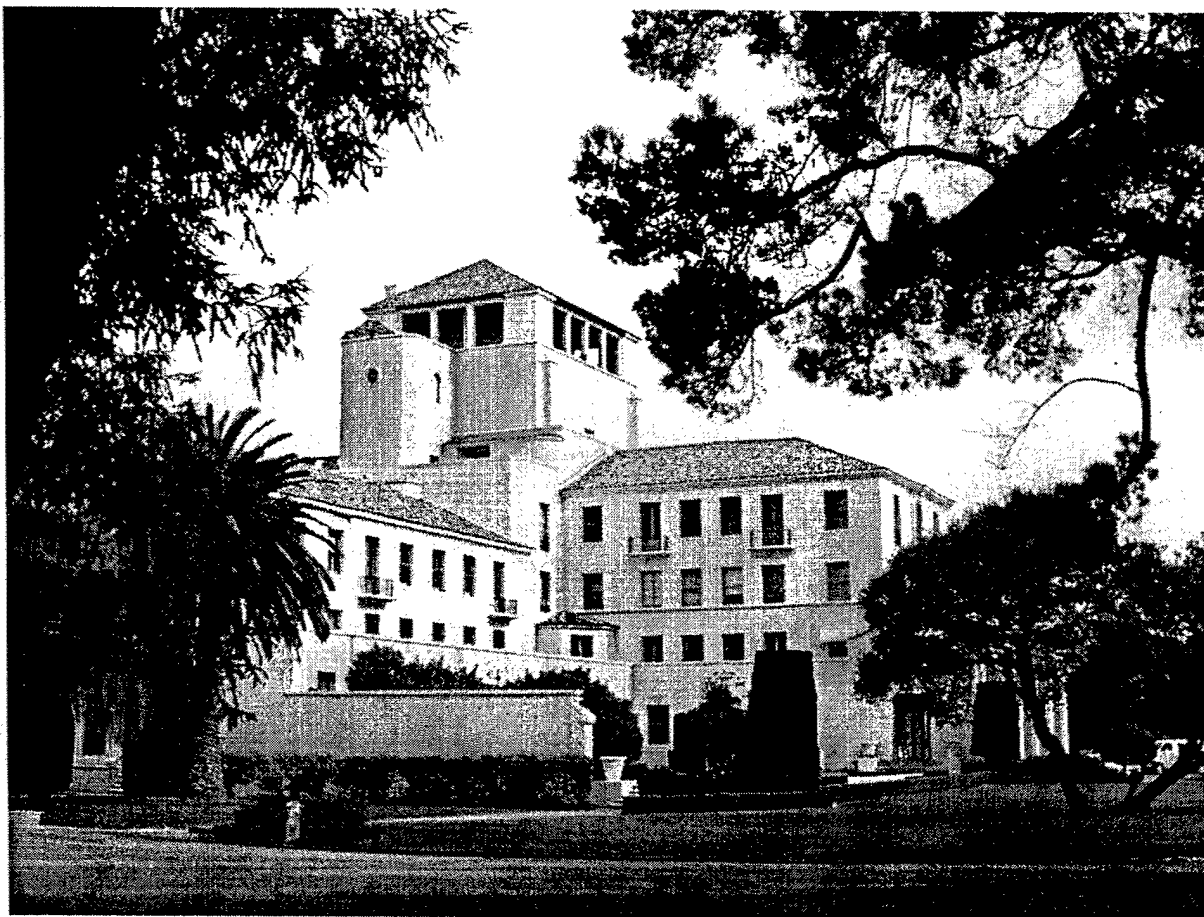


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PREFACE

Research at the Naval Postgraduate School is carried out by faculty in the four graduate schools (School of International Graduate Studies, Graduate School of Operations and Information Sciences, Graduate School of Engineering and Applied Sciences, and Graduate School of Business and Public Policy) and three Research Institutes (The Modeling, Virtual Environments, and Simulation (MOVES) Institute, Institute for Information Superiority and Innovation (I2SI), and Institute for Defense System Engineering and Analysis (IDSEA). This volume contains research summaries for the projects undertaken by faculty in the Department of Defense Analysis during 2001. The summary also contains thesis abstracts for those students advised by Defense Analysis faculty during 2001.

Questions about particular projects may be directed to the faculty Principal Investigator listed, the Department Chair, or the Department Associate Chair for Research. Questions may also be directed to the Office of the Associate Provost and Dean of Research. General questions about the Naval Postgraduate School Research Program should be directed to the Office of the Associate Provost and Dean of Research at (831) 656-2099 (voice) or research@nps.navy.mil (e-mail). Additional information is also available at the RESEARCH AT NPS website, <http://web.nps.navy.mil/~code09/>

Additional published information on the Naval Postgraduate School Research Program can be found in:

- *Compilation of Theses Abstracts*: A quarterly publication containing the abstracts of all unclassified theses by Naval Postgraduate School students.
- *Naval Postgraduate School Research*: A tri-annual (February, June, October) newsletter highlighting Naval Postgraduate School faculty and student research.
- *Summary of Research*: An annual publication containing research summaries for projects undertaken by the faculty of the Naval Postgraduate School.

This publication and those mentioned above can be found on-line at:
<http://web.nps.navy.mil/~code09/publications.html>.

INTRODUCTION

The research program at the Naval Postgraduate School exists to support the graduate education of our students. It does so by providing military relevant thesis topics that address issues from the current needs of the Fleet and Joint Forces to the science and technology that is required to sustain the long-term superiority of the Navy/DoD. It keeps our faculty current on Navy/DoD issues, and maintains the content of the upper division courses at the cutting edge of their disciplines. At the same time, the students and faculty together provide a very unique capability within the DoD for addressing warfighting problems. Our officers must be able to think innovatively and have the knowledge and skills that will let them apply technologies that are being rapidly developed in both the commercial and military sectors. Their unique knowledge of the operational Navy, when combined with a challenging thesis project that requires them to apply their focused graduate education, is one of the most effective methods for both solving Fleet problems and instilling the life-long capability for applying basic principles to the creative solution of complex problems.

The research program at the Naval Postgraduate School consists of both reimbursable (sponsored) and institutionally funded research. The research varies from very fundamental to very applied, from unclassified to all levels of classification.

- **Reimbursable (Sponsored) Program:** This program includes those projects externally funded on the basis of proposals submitted to outside sponsors by the School's faculty. These funds allow the faculty to interact closely with RDT&E program managers and high-level policymakers throughout the Navy, DoD, and other government agencies as well as with the private sector in defense-related technologies. The sponsored program utilizes Cooperative Research and Development Agreements (CRADAs) with private industry, participates in consortia with government laboratories and universities, provides off-campus courses either on-site at the recipient command, by VTC, or web-based, and provides short courses for technology updates.
- **Naval Postgraduate School Institutionally Funded Research (NIFR) Program:** The institutionally funded research program has several purposes: (1) to provide the initial support required for new faculty to establish a Navy/DoD relevant research area, (2) to provide support for major new initiatives that address near-term Fleet and OPNAV needs, (3) to enhance productive research that is reimbursably sponsored, and (4) to cost-share the support of a strong post-doctoral program.

In 2001, the level of research effort overall at the Naval Postgraduate School was 148 faculty work years and exceeded \$48 million. The reimbursable program has grown steadily to provide the faculty and staff support that is required to sustain a strong and viable graduate school in times of reduced budgets. In FY2001, over 93% of the research program was externally supported. A profile of the sponsorship of the Naval Postgraduate School Research Program in FY2001 is provided in Figure 1.

INTRODUCTION

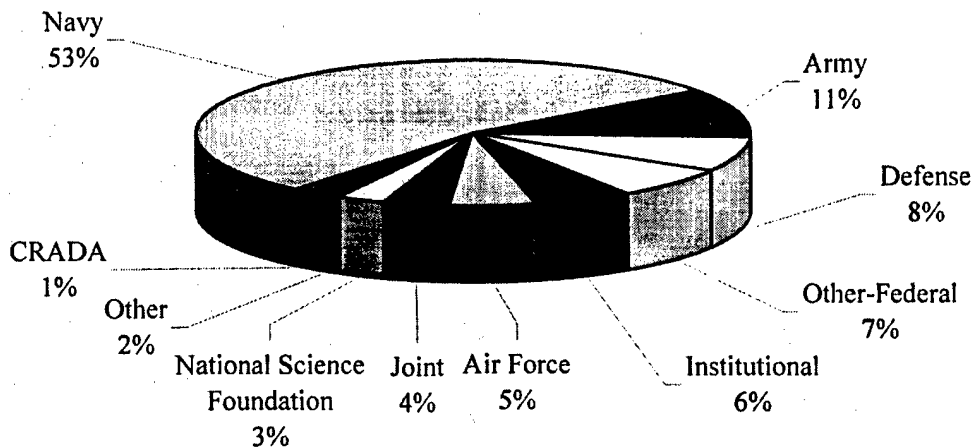


Figure 1. Profile of NPS Research and Sponsored Programs (\$52M)

The Office of Naval Research is the largest Navy external sponsor. The Naval Postgraduate School also supports the Systems Commands, Warfare Centers, Navy Labs and other Navy agencies. A profile of external Navy sponsorship for FY2001 is provided in Figure 2.

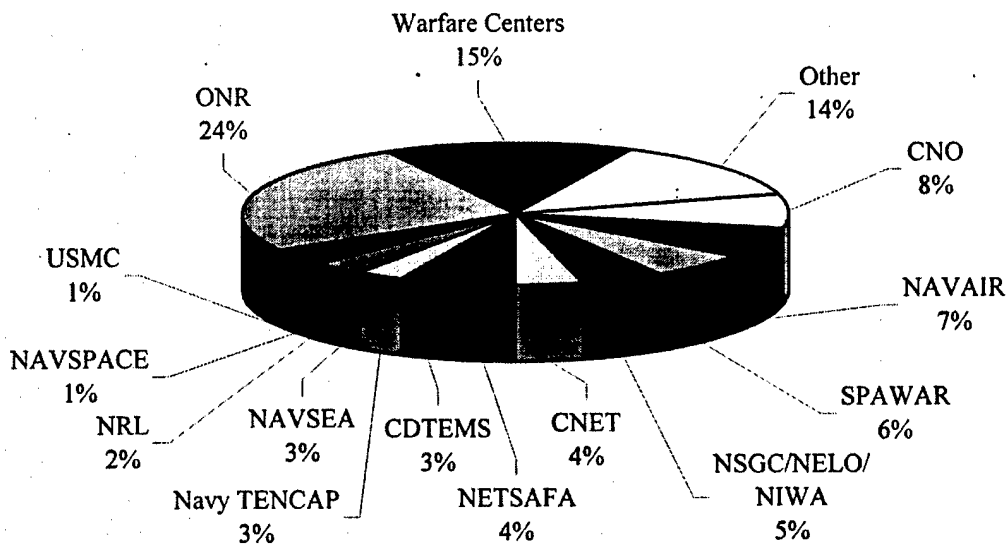


Figure 2. Navy External Sponsors of NPS Research and Sponsored Programs (\$29M)

These are both challenging and exciting times at the Naval Postgraduate School and the research program exists to help ensure that we remain unique in our ability to provide education for the warfighter.

DAVID W. NETZER
Associate Provost and Dean of Research

September 2002

**DEPARTMENT OF
DEFENSE ANALYSIS**

**GORDON MCCORMICK
CHAIR**

DEPARTMENT SUMMARY

OVERVIEW:

The Department of Defense Analysis is an interdisciplinary program, drawing on a wide range of academic specialties. The program provides a focused course of instruction on the dynamics of asymmetric warfare, sub-state conflict, terrorism, information operations, and other "high leverage" operations in U.S. defense and foreign policy. The core program also provides every student with a strong background in strategic analysis, international relations and comparative politics, organization theory, and formal analytical methods.

CURRICULUM SERVED:

- Special Operations

DEGREE GRANTED:

- Master of Science in Defense Analysis

RESEARCH THRUSTS:

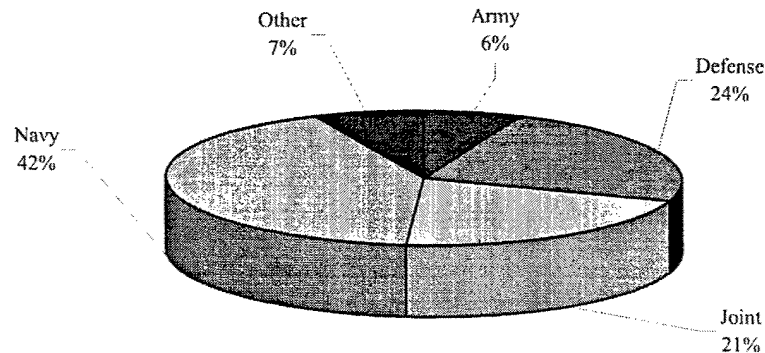
- Special Operations
- Asymmetric Warfare
- Sub-State Conflict
- Terrorism
- Information Operations
- Defense and Foreign Policy

RESEARCH CENTERS:

- Center on Terrorism and Irregular Warfare

SPONSORED PROGRAM (Research and Academic)-FY2001:

The Naval Postgraduate School's sponsored program exceeded \$49 million in FY2001. Sponsored programs include both research and educational activities funded from an external source. A profile of the sponsored program of the Department of Defense Analysis is provided below:



Size of Program: \$701K

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PROJECT SUMMARIES

DETECTING REGIONAL AGGRESSION

John Arquilla, Associate Professor

Gordon McCormick, Associate Professor

Department of Defense Analysis

Sponsor: U.S. Army Office of Operations and Plans

OBJECTIVE: To determine and analyze the trends emerging in international security at the regional level, including identification of potential adversaries and assessment of their technological capabilities.

SUMMARY: Throughout history great powers have had to wrestle with the problem of maintaining their influence over the world around them. Often these powers were simultaneously faced with more than one opponent. In order to meet multiple challenges, leading nations have had to maximize the number of potential adversaries they could influence with each action or policy. Those faced with this dilemma have included the Romans, Byzantines, and the British Empire. Studying these nations in their struggle to maintain control revealed tactics and techniques that proved effective. Forward deployment, statements of perseverance, the use of coalitions, strategic distraction of opponents, and the demonstration of their relative superiority over adversaries all helped to preserve the longevity of these empires. Additionally, an effective information campaign, which amplified successes, proved invaluable to these world powers.

THESIS DIRECTED:

Palmer, J., Stebbins, M. and Zacherl, A., "The Gunfighter's Dilemma: Multiple Adversary Deterrence and Coercion," Masters Thesis, Naval Postgraduate School, June 2001.

DoD KEY TECHNOLOGY AREAS: Other (International Security)

KEYWORDS: International Security, Economic Analysis

RESEARCH AND ANALYSIS OF TERRORIST INFORMATION OPERATIONS (RATIO): INFORMATION OPERATIONS CASE LITERATURE

John Arquilla, Associate Professor

David Tucker, Associate Professor

Department of Defense Analysis

Sponsors: Defense Intelligence Agency and Joint Special Operations Command

OBJECTIVE: The information revolution has already had profound effects on commerce and military affairs, and may transform or energize terrorism in the coming years. It is thus necessary that those who must defend against or counter acts of terror begin a process of assessing trends in terrorist usage of advanced information technologies, and identifying the ways in which terrorist might employ information operations and computer network attack tools.

SUMMARY: The research produced a series of studies on terrorist use of information technology and a database of tools.

PUBLICATIONS:

Craddock, D. and Palmer, J., "Cyberterror: Prospects and Implications," Naval Postgraduate School Technical Report, NPS-SO-00-01, October 2000.

Tucker, D., "The Future of Armed Resistance: Cyberterror? Mass Destruction?" Naval Postgraduate School Technical Report, NPS-SO-00-02, October 2000.

Zanini, M. and Edwards, S., "The Informatization of Terrorist Groups," Naval Postgraduate School Technical Report, NPS-SO-00-03, October 2000.

PROJECT SUMMARIES

Gerwehr, S., Weissler, R., Medby, J., Anderson, R. and Rothenberg, J., "Psyop and Deception in Cyber Conflict," Naval Postgraduate School Technical Report, NPS-SO-00-04, October 2000.

Moore, T., "Subs in the Andes: Rise of a Non-State Navy?" Naval Postgraduate School Technical Report, NPS-SO-01-01, June 2001.

Moore, T., "Winning the Psywar in Colombia," Naval Postgraduate School Technical Report, NPS-SO-01-02, June 2001.

THESES DIRECTED:

Foster, P., Moore, T., and Wheeler, J., "Cyberterrorism: Are We Ready for the Future," Masters Thesis, Naval Postgraduate School, June 2001.

Craddock, D., "Cover in Transition: Information Technologies in Overt, Covert, and Clandestine Activities," Masters Thesis, Naval Postgraduate School, June 2001.

DoD KEY TECHNOLOGIES: Other (Terrorism)

KEYWORDS: Cyberterror, Terrorism, Information Warfare, Psychological Operations

SPECIAL OPERATIONS ACADEMIC CURRICULUM

Gordon McCormick, Associate Professor

Department of Defense Analysis

Sponsor: Naval Special Warfare Command

OBJECTIVE: The special operations academic curriculum is an 18 month program supported by the U.S. Special Operations Command.

SUMMARY: The Special Operations Curriculum is designed to provide a focused course of study of the conflict spectrum below general conventional war. Graduates of this curriculum will possess a close knowledge of the broad range of factors involved in the planning and conduct of these forms of conflict and a detailed understanding of the role of special operations and related forces in U.S. foreign and defense policy. The curriculum examines the sources and dynamics of inter-state and intra-state conflict, the challenge these forms of conflict have posed and are likely to increasingly pose for U.S. security planning, the doctrinal and institutional evolution of the U.S. special operations community, the recent history of political violence and "small wars" in Latin America, Asia, and the Middle East, the history of irregular warfare, and contemporary perspectives on low intensity conflict resolution. These curriculum specific requirements are supported by a larger program of study which provides the graduate with a broad background in the areas of international relations, comparative strategy, the technological revolution in military affairs, and advanced analytical methods.

DoD KEY TECHNOLOGY AREAS: Other (Special Operations)

KEYWORDS: Special Operations, Low Intensity Conflict

CAUSES OF MILITARY INNOVATION: CASE STUDIES FROM THE HISTORY OF SPECIAL OPERATIONS FORCES

David Tucker, Associate Professor

Department of Defense Analysis

Sponsor: Smith Richardson Foundation

OBJECTIVE: To develop an understanding of innovation in the military based on examining the post-World War II history of Special Operations Forces (SOF).

PROJECT SUMMARIES

SUMMARY: The research consists of an extensive review of the literature on military innovation and a series of case studies. The literature review culminates with a statement of a proposed model of innovation, which the case studies then test. The case studies are drawn from American, British and French experience.

PRESENTATIONS:

Tucker, D., "Innovating to Meet Unconventional Threats," presentation at the Bi-annual Meeting of the Inter-University Seminar on the Armed Forces and Society, October 2001.

THESIS DIRECTED:

Rainville, T., "Stimulating Innovation in Naval Special Warfare by Utilizing Small Working Groups," Masters Thesis, Naval Postgraduate School, March 2001.

DoD KEY TECHNOLOGY AREA: Other (Special Operations)

KEYWORDS: Special Operations Forces, Innovation

**DEPARTMENT OF
DEFENSE ANALYSIS**

**2001
Faculty Publications
and Presentations**

PUBLICATIONS/PRESENTATIONS

CONFERENCE PRESENTATIONS

Tucker, D., "Innovating to Meet Unconventional Threats," presentation at the Bi-annual Meeting of the Inter-University Seminar on the Armed Forces and Society, October 2001.

TECHNICAL REPORTS

Craddock, D. and Palmer, J., *Cyberterror: Prospects and Implications*, Naval Postgraduate School Technical Report, NPS-SO-00-01, October 2000.

Gerwehr, S., Weissler, R., Medby, J., Anderson, R. and Rothenberg, J., *Psyop and Deception in Cyber Conflict*, Naval Postgraduate School Technical Report, NPS-SO-00-04, October 2000.

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Tucker, D., *The Future of Armed Resistance: Cyberterror? Mass Destruction?* Naval Postgraduate School Technical Report, NPS-SO-00-02, October 2000.

Zanini, M. and Edwards, S., *The Informatization of Terrorist Groups*, Naval Postgraduate School Technical Report, NPS-SO-00-03, October 2000.

**DEPARTMENT OF
DEFENSE ANALYSIS**

Thesis Abstracts

THESIS ABSTRACTS

THE ILLICIT SMALL ARMS TRADE (U)

**David A. Abernathy, II-Lieutenant, United States Navy
B.S., Naval Postgraduate School, 2000
Master of Science in Defense Analysis-December 2000**

and

**Lance B. Dettmann-Lieutenant, United States Navy
B.S., Naval Postgraduate School, 2000
Master of Science in Defense Analysis-December 2000**

Advisor: John Arquilla, Information Warfare Academic Group

Second Reader: David Tucker, Command, Control, Communications, Computers, and Intelligence Academic Group

There are a variety of options that must be investigated when attempting to control the illicit Small Arms/Light Weapons (SA/LW) trade. This thesis weighs current control options via an economics-based analytic framework. Currently, solutions focus on three general areas of influence: prevention of production; prevention of sales and purchases; and coercion to relinquish. One can further delineate these areas of influence by looking at how these options could be best implemented—by political/diplomatic, judicial (policing), and/or military means.

There are short and long-term consequences to any actions taken to try to control the illicit SA/LW market. In our opinion, the key to controlling the illicit SA/LW market is two-fold. First, along with today's focus on supply-side options, decision makers need to implement demand-side options, such as social reconstruction and economic development. This will remove the security dilemma—peoples' perceived need to maintain weapons for self-protection against internal and external threats. Second, when decision makers choose to implement supply-side solutions, they need to keep the market continually in a state of having to react to varied control measures in the short term. This can be done by periodically exposing the SA/LW market to new control measures that force it to constantly do business by different means.

DoD KEY TECHNOLOGY AREAS: Conventional Weapons, Computing and Software

KEYWORDS: Small Arms, Light Weapons, SA/LW, Weapons Trafficking, Counterproliferation, Black Market, Gray Market, Arms Sales

STREET SMARTS: UNCONVENTIONAL WARRIORS IN CONTEMPORARY JOINT URBAN OPERATIONS

**Edward J. Amato-Major, United States Army
B.S., United States Military Academy, 1989**

Master of Science in Defense Analysis-June 2001

Advisor: David Tucker, Special Operations Academic Group

Second Reader: Anna Simons, Special Operations Academic Group

U.S. Army Special Forces (SF) has historically conducted Unconventional Warfare (UW) in the remote, rural, under-developed regions of the world. This thesis analyzes the relevance of UW to contemporary joint urban operations (JUO) during Military Operations Other Than War (MOOTW) and Stability and Support Operations (SASO). America's pre-eminence on the conventional battlefield, and the asymmetric advantages cities offer, should compel adversaries to engage us on urban terrain. Despite this observation, current doctrine inadequately prepares our forces for MOOTW or SASO in cities. Modernization efforts focus predominantly on improving high-intensity combat skills, and developing technological combat-multipliers. During MOOTW and SASO casualties, collateral damage, and political consequences can rapidly erode public support; conventional combat operations may entail excessive political risk. Forces trained for unit maneuver warfare are not sufficient for stabilizing politically charged conflicts short of war. Unique capabilities, training, and experience conducting UW makes SF ideally suited for conducting JUO in this arena. A case study of U.S. involvement in Bosnia-Herzegovina demonstrates the unique capabilities SF provides commanders, not otherwise available in the extant force structure. This thesis

THESIS ABSTRACTS

advocates using UW to counter urban, asymmetric threats, and concludes with a recommendation for developing amplifying doctrine for conducting UW in urban areas.

DoD KEY TECHNOLOGY AREAS: Battlespace Environments, Other (Special Operations, Unconventional Warfare)

KEYWORDS: Joint Urban Operations (JUO), Unconventional Warfare (UW), MOUT, ARSOF, U.S. Army Special Forces (SF) Employment, Military Operations Other Than War (MOOTW), Stability and Support Operations (SASO), Bosnia-Herzegovina, Joint Publication 3-06 (Draft)

HOW TO DEFEAT INSURGENCIES: SEARCHING FOR A COUNTER-INSURGENCY STRATEGY?

Michael A. Bottiglieri-Major, United States Army

B.B.A., Texas A&M University, 1989

Master of Science in Defense Analysis-December 2000

Advisor: Anna Simons, Special Operations Academic Group

Most people say that a hearts and minds campaign is the best strategy for defeating an insurgency. But there may be no one best solution applicable to countering all insurgencies. The opportunities and constraints, which affect both the insurgent and state, dictate the best strategy. This thesis tests this hypothesis against the most difficult form of insurgency. Two Maoist insurgencies will be analyzed to determine the effect of the state's strategy on the insurgent. Conclusions will then be drawn about the relevance of pursuing a universal counter-insurgency strategy.

While countering the Shining Path insurgency in Peru, the state employed three different strategies. In the end, the state recognized that the insurgency was elitist-based and launched a successful counter-leadership targeting campaign to defeat the insurgency. While countering the Malayan Communist Party insurgency in Malaya, the state employed two different strategies. In the end, the state recognized that the insurgency could be limited to the ethnic Chinese community and adopted a successful campaign to separate the insurgents from the population.

Analysis of each case study clearly demonstrates the success of two different strategies against similar insurgent organizations. In Peru the insurgency was defeated thanks to an inside-out approach, while in Malaya the insurgency was defeated from the outside-in. The strategy used in Peru would not have been successful in Malaya and the same can be said of the Malayan strategy in Peru. However, the cases demonstrate the need to understand general counterinsurgency principles before applying case specific strategies. Based on these observations it can be concluded that, just as the principles of war guide military operations, there are similar principles which bring success in counterinsurgency operations, with the important caveat that every case must be treated as unique.

DoD KEY TECHNOLOGY AREA: Other (Counterinsurgency)

KEYWORDS: Counterinsurgency, Guerrilla Warfare, and Insurgency

REVISITING THE BATTLE OF THE LITTLE BIG HORN

Matthew J. Burns-Lieutenant, United States Navy

B.S., Naval Postgraduate School, 2000

Master of Science in Defense Analysis-December 2000

Advisors: Gordon H. McCormick, Special Operations Academic Group

Bard Mansager, Department of Mathematics

The Battle of the Little Big Horn has captured the interest of historians, scholars, and military enthusiasts since the day that over 200 United States soldiers under General George Armstrong Custer's command were decimated by Crazy Horse and 2000 Indian warriors. Competing theories regarding the details of the battle have arisen, mostly due to conflicting first hand accounts.

THESIS ABSTRACTS

The purpose of this thesis is twofold. The first purpose is to perform an historical analysis of the Battle of the Little Big Horn, using war-gaming. A series of controlled, comparative simulations of the battle will be carried out using the Synchronization Matrix, a war-gaming tool obtained from U.S. Army Field Manual (FM) 101-5. This analysis will evaluate three competing theories and interpretations of the battle, with the objective of categorizing the theories by degree of plausibility. The second purpose is to examine the impact of alternative notional leadership decisions on the outcome of the battle, e.g. what if Custer had not split his force? The result is a confirmation that war-gaming can indeed be utilized for the study of historical combat, as well as for future planning.

DoD KEY TECHNOLOGY AREAS: Other (Primitive Technology)

KEYWORDS: War-Gaming, Course of Action Analysis

**COVER IN TRANSITION: INFORMATION TECHNOLOGIES IN
OVERT, COVERT, AND CLANDESTINE ACTIVITIES**

Douglas W. Craddock-Major, United States Army

B.S., University of Central Oklahoma, 1987

Master of Science in Defense Analysis-June 2001

Advisor: John Arquilla, Special Operations Academic Group

Second Reader: Anna Simons, Special Operations Academic Group

This study examines how unlimited database access through Web-based search parameters and advances in information technologies have undermined the security of cover for individuals engaged in overt, covert, and clandestine activities.

This study examines how cover is formulated and details a sample risk analysis. It also examines identification documents and their use in crafting cover-legends. Then it explores the effects that Web-based informational databases have on establishing and maintaining cover; analyzes the present and future impact that information and biometric technologies have, and will have, on the employment of cover.

Finally, this thesis outlines four strategies for crafting successful cover: institutional processes; "legend" development; sustainable documentation; and travel practices.

DoD KEY TECHNOLOGY AREAS: Other (Information Operations)

KEYWORDS: Cover-legend, Identification Documents, Databases, Biometric Technologies, Strategies

**THE REALIZATION OF INHUMANITY: THE TECHNOLOGY
OF WEAPONS OF MASS DESTRUCTION**

Michael R. Evans-Captain, United States Army

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Master of Science in Defense Analysis-June 2001

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Weapons of Mass Destruction (WMD) developed by non-state actors represent a serious potential threat to the United States. Current attempts at modeling both this threat and the doctrine to deal with this threat do not take into account the unique nature of specific types of WMD developed by and employed by non-state actors. This thesis addresses the problem of modeling WMD development according to supply-side variables that affect the potential, ability, and progress of groups to successfully realize their goals. In support of this, the thesis also reviews the technology, logistics, design challenges, and weaponization process specific to each type of WMD. These reviews form the technical basis for determination of the sets and subsets of supply variables and the relationships between them. Although assumptions have been made to simplify the process, in general these reviews offer a step-by-step "how-to" process for specific WMDs. These analyses serve two purposes: they demonstrate the degree to which, given open literature, a non-state

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actor may amass technology and resources in his developmental process and second, they provide data which substantiates the nomothetic sets discussed in the thesis.

DoD KEY TECHNOLOGY AREA: Other (Terrorism)

KEYWORDS: Weapon of Mass Destruction, Terrorism, Nuclear, Biological, Chemical Warfare

**POLITICAL VIOLENCE IN EURASIA:
RADICAL ISLAM OR RATIONAL ACTING?**

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Much of the violence in Eurasia since the break-up of the Soviet Union has been blamed solely on radical Islamic Fundamentalism. This characterization is at best simplistic and at worst dangerously insufficient. Misunderstanding the complexities of this instability will undermine efforts by diplomats and soldiers to prevent future violence. Poorly understanding this violence will likewise hinder U.S. and multilateral post-conflict operations. Given the high likelihood for continued instability and violence in this critical region, its causes and complexities must be understood, and applying off-the-shelf "lessons learned" from other conflicts must be avoided.

This thesis attempts to provide a framework to understand the complex socio-political underpinnings of societies in Central Asia and the Caucasus. The thesis dispels the popular notion that the preponderance of regional violence is purely predicated on Islamic fanaticism. Rather, through the use of three case studies of recent conflicts in the region, this thesis shows that political violence is largely the result of political entrepreneurs exploiting extant ethnic, national, and religious cleavages when opportunities arise. This violence is not representative of a deterministic "clash of civilizations." Only through understanding the fluid and malleable nature of this political violence can one craft meaningful engagement and post-conflict strategies.

DoD KEY TECHNOLOGY AREA: Other (Special Operations)

KEYWORDS: Ethnic Conflict, Islamic Fundamentalism, Central Asia, Wahabbism

UNMANNED AERIAL VEHICLES AND SPECIAL OPERATIONS: FUTURE DIRECTIONS

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Advances in computing, miniaturization, imaging, and data transmission technologies are precursors to a more important role for UAVs in warfare. UAVs are likely, first, to revolutionize the way reconnaissance and surveillance are conducted, second, to increase the capabilities of small units, third, to join manned platforms in the conduct of assault and attack missions, and finally help provide the numerous nodes necessary to facilitate both the digital connectivity and swarming forces envisioned in future network-centric formations.

This thesis focuses on answering six questions:

- What missions can UAVs perform?
- What missions should UAVs perform?
- What type of UAV is appropriate for each mission?
- How can SOF use UAVs?
- Who should own the UAV (from a SOF perspective)?

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- What level of control is required and where?

Results include what UAV missions and types could support special operations, which of these should be performed by UAVs organic to special operations, and which should be performed by the Services' UAVs, as well as recommendations for future command and control of UAVs supporting special operations. Results are presented in matrix form for easy correlation of related factors. The thesis concludes with a twenty-year prognostication of UAV development and recommends areas for future study.

DoD KEY TECHNOLOGY AREAS: Air Vehicles, Battlespace Environments, Command Control and Communications, Electronic Warfare, Sensors

KEYWORDS: Unmanned Aerial Vehicles, UAV, Special Operations Forces, SOF, Future of Warfare

INNOVATION FROM BELOW: THE ROLE OF SUBORDINATE FEEDBACK IN IRREGULAR WARFARE OPERATIONS

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Of the numerous variables that impact the outcome of irregular warfare operations, leadership is one of the most critical. Irregular operations require decentralization and the freedom of the local commander to create local solutions to the situations that he faces. These local solutions can have a dramatic and positive effect on the outcome of irregular military operations.

A review of cases that span a century of US irregular warfare operations provides evidence that, at times, the military hierarchy did allow subordinates to innovate and did listen to their recommendations, with positive outcomes as a result. This evidence also illustrates, however, that the military has failed to institutionalize these lessons and is prone to have to re-learn them from conflict to conflict, and at times this relearning process has resulted in the failure of an operation. Leaders must ensure that innovation and feedback are a part of the conduct of irregular warfare operations.

This thesis will illustrate that the doctrine and culture of the United States military does not provide for the systematic analysis and exploitation of subordinate innovation. The purpose of this thesis is to clearly articulate the important role that innovation and feedback from subordinates can have on the outcome of operations. The cases put forth to illustrate these points are the Philippines (1898-1902), Vietnam, and El Salvador. The goal is to draw conclusions and make recommendations on how the US military might better capture and utilize subordinate feedback and innovation in future operations.

DoD KEY TECHNOLOGY AREA: Command, Control, Communications

KEYWORDS: Counterinsurgency, Irregular Warfare, Decentralized Operations, Subordinate Feedback, Innovation, Feedback Mechanisms, Philippines, Vietnam, El Salvador

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MODELING MEDIA INFLUENCES IN INFORMATION OPERATIONS

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Military engagements are disruptive and expensive, draining economic and natural resources. As a result, military strategists, particularly in the nuclear age, seek to deter aggressive actions by historical and emerging challengers. Strategies that employ inexpensive, unobtrusive means to dissuade adversaries from aggressive action are particularly desirable.

Steady globalization and the concurrent rise of international media presence provide a promising, and perhaps overlooked, means for influencing adversary decision-making. Through a detailed case study, this paper provides a framework for leveraging media influences as an integral part of a broad deterrent strategy. Among the findings, the researchers discuss the expected complications and intricacies associated with implementing such an effort, as well as demonstrate how influence new modeling techniques can assist in identifying target audiences. The criticality of considering associated socio-cultural, historical, and geo-political contexts is also explored.

DoD KEY TECHNOLOGY AREAS: Other (Information Operations)

KEYWORDS: Adversary Decision-Making, Media Influences, Information Operations

MILITARY INTERVENTION IN IDENTITY GROUP CONFLICTS

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This thesis studies military intervention in identity group conflicts. Building on the theory of Eide about conflict entrepreneurship, it is argued that military commanders must coopt, confront, accommodate or compete with existing identity groups to be successful during intervention operations. It is argued that the local military commander is relatively autonomous and therefore can and should aid the community in rebuilding durable, long-term institutions such as police, judiciary and local councils.

Israel's 1982 intervention in Lebanon, Operation Peace for Galilee, and the United State's intervention in Somalia, Operation Restore Hope, are used to highlight the common elements of intervention and the activities that encourage cooperation with the intervention force. The paradox of intervention is that it often solves a short-term problem at the same time it spawns a new threat. This arises in part from the effect of the intervention on the political economy of the target society.

The activities of local commanders in Lebanon are assessed based on the historical record and documentary evidence. The activities of commanders on the ground in Somalia are analyzed based on a number of personal interviews, a compilation of unpublished lessons learned and the unpublished history of the Marines in Somalia. It is argued that the official "lessons learned" are inaccurate and suggest a set of Lessons (Un)Learned that are useful in planning and conducting intervention operations.

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DoD KEY TECHNOLOGY AREA: Other (Tactics)

KEYWORDS: Middle East, Operation Peace for Galilee, Operation Restore Hope, Military Intervention, Operations Other Than War, Nation-Building, Humanitarian Intervention, IDF, Peace Operations, Lebanon, Somalia.

DIRECTED ENERGY: APPLICATIONS AND VULNERABILITIES (U)

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Much has been made in recent years of the potential for directed energy (DE) to be used as a weapon, and of U.S. vulnerability to such modes of attack. This thesis surveys the current status of laser, high-power microwave, particle beam, and acoustic technology to answer two primary questions. First, what sorts of tactical DE weapons can be fielded in the next 10 years? Second, if developed, what sort of threat would these systems pose to the U.S.? Conclusions assess potential applications and threats of DE weapons in the next ten years and suggest areas for further research.

DoD KEY TECHNOLOGY AREA: Directed Energy Weapons

KEYWORDS: Directed Energy, LASER, High-Power Microwave, Radio Frequency, Particle Beam, Acoustic, Weapon

**ORGANIZATION DESIGN PRINCIPLES FOR COUNTERING
TERRORISM IN THE UNITED STATES**

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Recent terrorist activities (the World Trade Center bombing, the Oklahoma Federal Building bombing, the release of Sarin Gas in the Tokyo subway, etc.) have focused the national leadership on the topic of terrorism inside the borders of the United States. In response, two Presidential Decision Directives (PDD-62 and PDD-63) were issued to help define the terrorist threat and recommend a counter-terrorism organization in the federal government. However, the directives do not determine how the Federal government works with state and local authorities. The directives also do not focus on local, state, and federal capabilities to preempt a possible terrorist attack. This thesis builds a organizational framework of the U. S. counter-terrorism environment; explains the current U. S. counter-terrorism structure from a local perspective; develops a set of principles that could be used by any local or federal agency to develop a new or more efficient counter-terrorism organization; assesses two domestic counter-terrorism organizations; and proffers specific recommendations on how U. S. counter-terrorism organizations and programs could be more efficient.

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DoD KEY TECHNOLOGY AREA: Other (National Security Affairs, Special Operations)

KEYWORDS: Counter-Terrorism, Domestic Counter-Terrorism, Terrorism, FBI, Interagency Working Group, Organization Design, Network

NAVAL SPECIAL WARFARE-LEADING ORGANIZATIONAL CHANGE

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This thesis examines organizational transformation, utilizing Naval Special Warfare (NSW) as a model for DOD-wide organizational change. The broader context of the revolution in military affairs (RMA) highlights the unique role of special operations forces in general and NSW specifically regarding innovation and adaptation in the military and its diffusion to conventional forces.

Four elements: technological change, systems development, operational innovation, and organizational adaptation compromise a revolution in military affairs. Although technological change and systems development have made significant impacts upon military affairs, operational innovation and organizational adaptation are lacking. Organizational adaptation responding to information age realities—changing geo-political and social circumstances as well as rapidly advancing technology—is necessary to achieve the predicted revolution in military affairs. A transformation from a rigid hierarchical organization to a collaborative network of stakeholders is recommended.

Speed, agility, integration, and innovation are necessary success factors in the 21st century. In order to achieve these attributes, military organizations must leverage resources across hierarchal, functional, command, and social boundaries. This will require a long-term transformation effort.

DoD KEY TECHNOLOGY AREAS: Other (Organizations)

KEYWORDS: Organizational Transformation, Revolution in Military Affairs (RMA), Collaboration, Networks

THE GUNFIGHTER'S DILEMMA: MULTIPLE ADVERSARY DETERRENCE AND COERCION

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Throughout history great powers have had to wrestle with the problem of maintaining their influence over the world around them. Often these powers were simultaneously faced with more than one opponent. In order to meet multiple challenges, leading nations have had to maximize the number of potential adversaries they could influence with each action or policy.

Those faced with this dilemma have included the Romans, Byzantines, and the British Empire. Studying these nations in their struggle to maintain control revealed tactics and techniques that proved

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effective. Forward deployment, statements of perseverance, the use of coalitions, strategic distraction of opponents, and the demonstration of their relative superiority over adversaries all helped to preserve the longevity of these empires. Additionally, an effective information campaign, which amplified successes, proved invaluable to these world powers.

This thesis explores how a single action often affects more than just the two parties taking and receiving action. It then discusses the flow of how the information content of foreign policy actions transfers from the primary actor to multiple secondary actors. Historical cases of multi-adversary deterrence and coercion are used as models of how this hypotheses, coupled with a good information strategy, maximized the studied powers' effectiveness.

DoD KEY TECHNOLOGY AREA: Other (Information Operations)

KEYWORDS: Deterrence, Coercion, Information Operations

STIMULATING INNOVATION IN NAVAL SPECIAL WARFARE BY UTILIZING SMALL WORKING GROUPS

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Naval Special Warfare has produced successful innovation by using small working groups. Naval Special Warfare deems an innovation successful if it results in a more efficient, less risky, more cost effective method to conduct special operations. The Quantum Leap program is an example of successful innovation in Naval Special Warfare produced by a small working group. How have these small groups been able to produce successful innovations? Michael McCaskey's Theory offers an explanation of how small working groups innovate. His theory is a generally accepted theory on how to produce innovation in the business world by using small working groups. McCaskey identified three variables needed to produce innovation: 1) the small working group must have the support and protection of the leadership, 2) have access to resources, and 3) have autonomy from established structure within an organization. After interviews with senior Naval Special Warfare officers, two additional variables were deemed important. Ownership and the license to fail were added to McCaskey's three variables.

This thesis will test which variables were or were not present during three Naval Special Warfare case studies where small working groups attempted to produce innovation. Two of the case studies successfully produced innovation, but the final case study failed to produce an innovation. This thesis will evaluate the five variables in each case study and attempt to explain why the innovation was a success or a failure.

DoD KEY TECHNOLOGY AREA: Other (Innovation)

KEYWORDS: Innovation, Small Working Groups, Quantum Leap, MKV SOC, Vision 2000

UNDERSTANDING ETHNIC CONFLICT: A FRAMEWORK

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Within the last ten years the phrase ethnic conflict has become extremely common. I spent the majority of my time as a Special Forces Detachment Commander dealing with ethnic conflict situations in Northern Iraq, Turkey, and the Balkans. While in these places it became apparent to me that ethnic conflict is very complicated and that most Americans have a difficult time comprehending it. My purpose in writing this

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thesis is to offer Special Forces soldiers or other US military personnel a framework for gaining a better understanding of the dynamics involved in ethnic conflict. This framework includes three preconditions and two advanced conditions which are tested against three case studies: Bosnia, Kosovo, and Kurdish/Turkish relations in Southeast Turkey. The framework offers an objective, non country-specific, way to sort through and make sense of the situation on the ground. After becoming familiar with this framework, it would be my hope that the individual will have the ability to function more effectively and efficiently, particularly when there is little time to become intimately familiar with the situation before arriving on the scene.

DoD KEY TECHNOLOGY AREA: Other (Conflict)

KEYWORDS: Ethnic Conflict, Bosnia, Kosovo, Kurds

OPEN SOURCE TOOLS: APPLICATIONS AND IMPLICATIONS

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The Internet provides users with unparalleled access to a wide variety of open source tools. Some of the tools may be used in conjunction with others or by themselves, often with great disruptive effect on a target. The rapid pace of discovered vulnerabilities in computer systems, along with the cooperation of expert programmers, has given users access to tools that lower the "entry costs" for conducting sophisticated attacks. Internet security is dependent upon reacting effectively to continually changing modes of attack, and is therefore almost always a step behind, in an action-reaction process.

The availability of pre-tailored attack codes gives possible enemies an avenue to attack the U.S. anonymously, with only a small investment of resources. However, attackers do still need both tools and the knowledge of how to use them to carry out most attacks. Still, more knowledge of the proper utilization of open source tools is progressively being coded into these open source tools, opening up the ability to conduct attacks to a higher percentage of the Internet population.

DoD KEY TECHNOLOGY AREA: Computing and Software

KEYWORDS: Internet, Open Source Tools, Computer Vulnerabilities, Information Operations

DEVELOPING AND IMPLEMENTING AN ARMY-SPECIFIC INFORMATION TECHNOLOGY MANAGEMENT CURRICULUM AT THE NAVAL POSTGRADUATE SCHOOL

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As the Department of Defense and the Army move into the 21st Century, the need for quality trained Information Systems Management officers, or Functional Area 53 (FA53) officers, is becoming more and more important to meet the demands of the technologically advanced battlefield. These officers are called upon to manage increasingly complex information systems while maintaining an understanding of the limitations imposed by external factors such as the communications systems on which these information systems reside. To ensure Advanced Civil Schooling (ACS)-educated FA53 officers are receiving an education that enables them to function as a fully qualified FA53 officer, this thesis analyzes a series of related areas. This thesis first addresses the military and civilian ACS institutions from which a FA53 officer may receive an advanced degree in the Information Technology (IT) discipline. This thesis will also address the FA53 task list and directly compare this list with the IT curricula at these institutions.

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Additionally, this thesis will explore the possible implementation of an Army-specific Information Technology Management curriculum at the Naval Postgraduate School (NPS), the potential increase in Army instructors at the NPS to support such a curriculum, and the necessary procedure for periodic updates to the curriculum.

DoD KEY TECHNOLOGY AREAS: Manpower, Personnel and Training

KEYWORDS: Information Technology, Information Systems Management Officers

PERCEPTION MANAGEMENT AND COALITION INFORMATION OPERATIONS

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This thesis focuses on the conduct of perception management (PM) within coalitions. Research has alluded to the possibility of predicting human behavior by creating stories that convey a believable reality. Further, does PM have any organizational process relationship with engagement planning? Target selection? Press statement coordination? The thesis focuses on how well coalitions are poised to conduct integrated PM operations. It identifies current PM capabilities by studying two recent coalition operations and determines how to best coordinate integration efforts.

The purpose of this study is to analyze various methods of perception management and determine how they can be incorporated into current U.S. Information Operations. One area of study will be the importance of credibility of our leaders when placed in a position of authority. This study will show that credibility is one of the toughest factors to achieve. A second area of study will be the value of story telling in gaining populace support and validation for intervening in conflicts that require the use of force and soldiers. As Stephen Pease said, "the message must be believable, though not necessarily true." (Stephen Pease 1950)

DoD KEY TECHNOLOGY AREAS: Other (Information Systems and Operations, Perception Management)

KEYWORDS: Perception Management, Coalition Operations, Information Systems and Operations, Information Warfare, Information Operations

PROPERLY APPLYING THE MILITARY DECISION MAKING PROCESS IN LOW INTENSITY CONFLICT AND SMALL SCALE CONTINGENCIES

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The purpose of this thesis is to demonstrate that current doctrine, applied effectively through the Military Decision Making Process, is more than adequate to the task of providing military planners the flexibility needed to develop plans and prosecute campaigns in the Low Intensity Conflict/Small Scale Contingency (LIC/SSC) arena.

Most of the writing about the supposed inefficacy of our present doctrine deals with the structure, and "mind-set" of the military establishment. Suggested solutions presently range from fixing the problem

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through scaling down conventional units (currently reflected in the push for the medium brigade), to arguments made for flattening the present command infrastructure and adopting new doctrines made possible through the development of information warfare (IW) assets, capabilities, and technology.

We argue in this thesis that the problem, however, is not with the doctrine, but with its application. The change of mind we advocate would have the Army learn how to accomplish its tasks by applying the same tools but in a different way. We believe that the key to properly utilizing present doctrine lies in a three-fold solution incorporating information management, education, and training.

DoD KEY TECHNOLOGY AREA: Other (Low Intensity Conflict, Small Scale Contingencies)

KEYWORDS: Military Decision-Making Process, Low Intensity Conflict, Small Scale Contingencies, Doctrine, Culture

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